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A stratigraphic log of Semantan Formation along part of the Mentakab-Temerloh Bypass, Pahang

I. METCALFE[1] AND K.R. CHAKRABORTY[2]

[1]Department of Geology & Geophysics
University of New England
Armidale, NSW 2351, Australia

[2]Department of Geology
University of Malaya
Kuala Lumpur, Malaysia

Abstract: A single 1.25 km thick sequence of the Triassic Semantan Formation has been logged along the western portion of the Mentakab-Temerloh bypass. Bivalves and ammonites indicate a Middle Triassic age. The coarse and fine tuffs and mudstones exposed in the sections represent an overall fining upwards sequence implying a possible waning of volcanic activity or shift of volcanic centres. There is no evidence of isoclinal folding or imbricate thrusts in the section which appears to form part of one limb of a large kilometer-scale broad open fold. The Semantan Formation cannot therefore form part of an accretionary prism but could form part of a forearc or intra-arc basin constructed over an accretionary wedge.

INTRODUCTION

The Middle to Upper Triassic Semantan Formation crops out in the Central Belt of Peninsular Malaysia. This formation has previously been interpreted as forming part of an accretionary complex or a forearc sequence (Mitchell, 1977; Sengör, 1986; Hutchison, 1989) in a convergent plate margin setting. In many proposed models (Mitchell, 1977; Ridd, 1980; Sengör, 1984; Hutchison, 1989), this sequence is considered to have been involved in a later collisional deformation. This paper reports important stratigraphical and structural information from a continuous section of more than 1 km thickness which has implications for interpreting the tectonic environment of the Semantan Formation.

In November, 1982 the authors logged exposures of the Semantan Formation (Jaafar, 1976) along the then under construction Mentakab-Temerloh Bypass. Rapid weathering and vegetation cover has now obliterated much of the detail that was visible to the authors at that time. A single stratigraphic sequence of 1.25 km, with a consistent westward dip was logged between the Mentakab end of the Bypass and where the road crosses the railway. Nine road cutting exposures (Fig. 1) were logged in detail. It is felt that the details of this section and its implications should be made available to other geologists who cannot now unfortunately observe these due to decay of the exposures.

LITHOLOGY

The overall sequence comprises interbedded coarse to fine tuffs and grey mudstones and an overall simplified composite section and representative detailed logs of exposures are given in Figures 2–11. Mudstones are more predominant in the younger part of the sequence and coarse tuff beds more common in the older parts of the section thus giving a generally fining upwards sequence.

SEDIMENTOLOGY

The coarse and fine-grained tuffs in the sequence exhibit graded bedding most commonly of normal type (fining upwards) but also of inverse type (coarsening upwards). The bases of beds are usually sharp but their upper boundaries are often transitional into mudstone. Small scale cross bedding is also observed in the upper finer parts of the tuff beds along with rarer ripple marks. Some of the coarser, thicker tuff beds also contain lutite rip-up clasts. These features are well documented in tuff beds of the Semantan Formation elsewhere (Lum, 1976; Metcalfe *et al.*, 1982) and indicate deposition by turbidity currents or debris flows. The mudstones of the sequence are rather featureless apart from some diagenetic chert and calcareous nodules. Palaeocurrent directions have been determined at a few localities and both easterly and westerly directions are recorded, even within a single exposure.

Soft-sediment deformation is present in the lower part of the sequence (sections 6–9), including slump folds and sedimentary faults and this again implies greater volcanic activity or closer proximity to volcanic centres.

PALAEONTOLOGY

Pelagic bivalves and ammonites have been recorded at a number of horizons in the section including the bivalve genera *Posidonia*, and *Daonella* and the ammonite *Arpadites*, all suggestive of a Middle Triassic age. An interesting aspect of these fossil occurrences is the relative abundance of *Posidonia* compared to *Daonella*. *Posidonia* is found abundantly throughout the section and is extremely abundant at certain horizons whereas only one or two fragmentary specimens of *Daonella* have been found. This is in contrast to other localities of the Semantan Formation where *Daonella* occurs in abundance (Lum, 1976; Jaafar, 1976; Metcalfe *et al.*, 1982). The reason for this may be an ecological one, with the two bivalve genera living in different environments or depths of water, or it may be an effect of sedimentological sorting of bivalve shells.

STRUCTURE

The entire sequence logged exhibits a uniform attitude of beds. Measured strike values range from 160°–170° and dip ranges 30°–50° westerly. Steeper dips, of more than 60°, are occasionally observed. The section described in this paper probably represents one limb of a large kilometer-scale open fold such as those previously reported

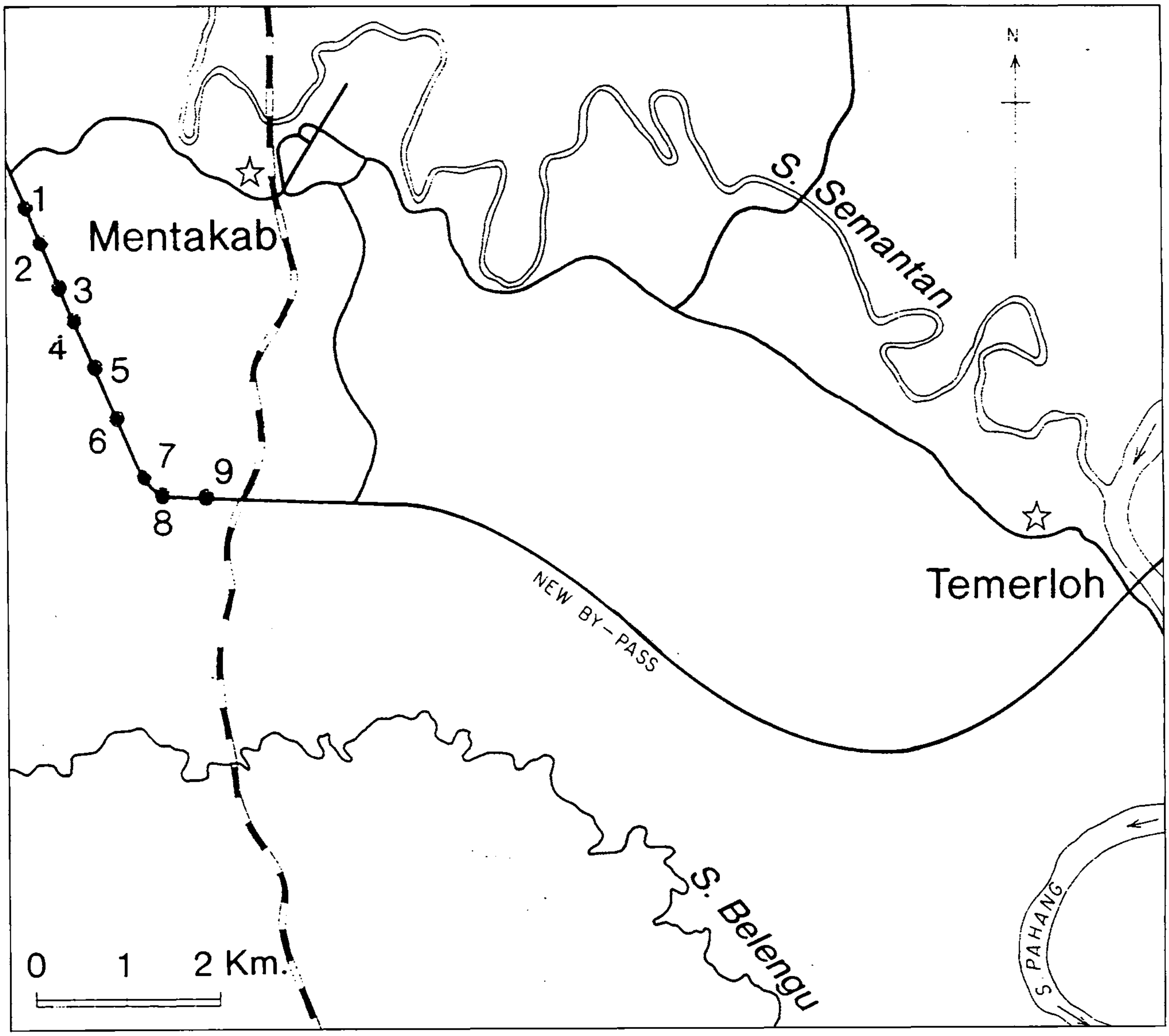

Figure 1. Map showing the locations of the nine road cut sections on the Mentakab-Temerloh Bypass.

from the Semantan Formation (Jaafar, 1976). Isoclinal folding or imbricate thrusting of the sequence has been discounted since no repetition of beds have been observed within the 1.25 km stratigraphic section. A single axial plane cleavage is generally developed in the rocks which results in some deformation of fossils present (Metcalfe *et al.*, 1982).

DISCUSSION AND IMPLICATIONS

The overall fining-upwards nature of the sequence indicates a waning of the supply of coarser volcaniclastic material to the area during the Middle Triassic. This may be due to three possible causes, a deepening of the basin, waning of volcanic activity or shifting of the volcanic centres. Much more

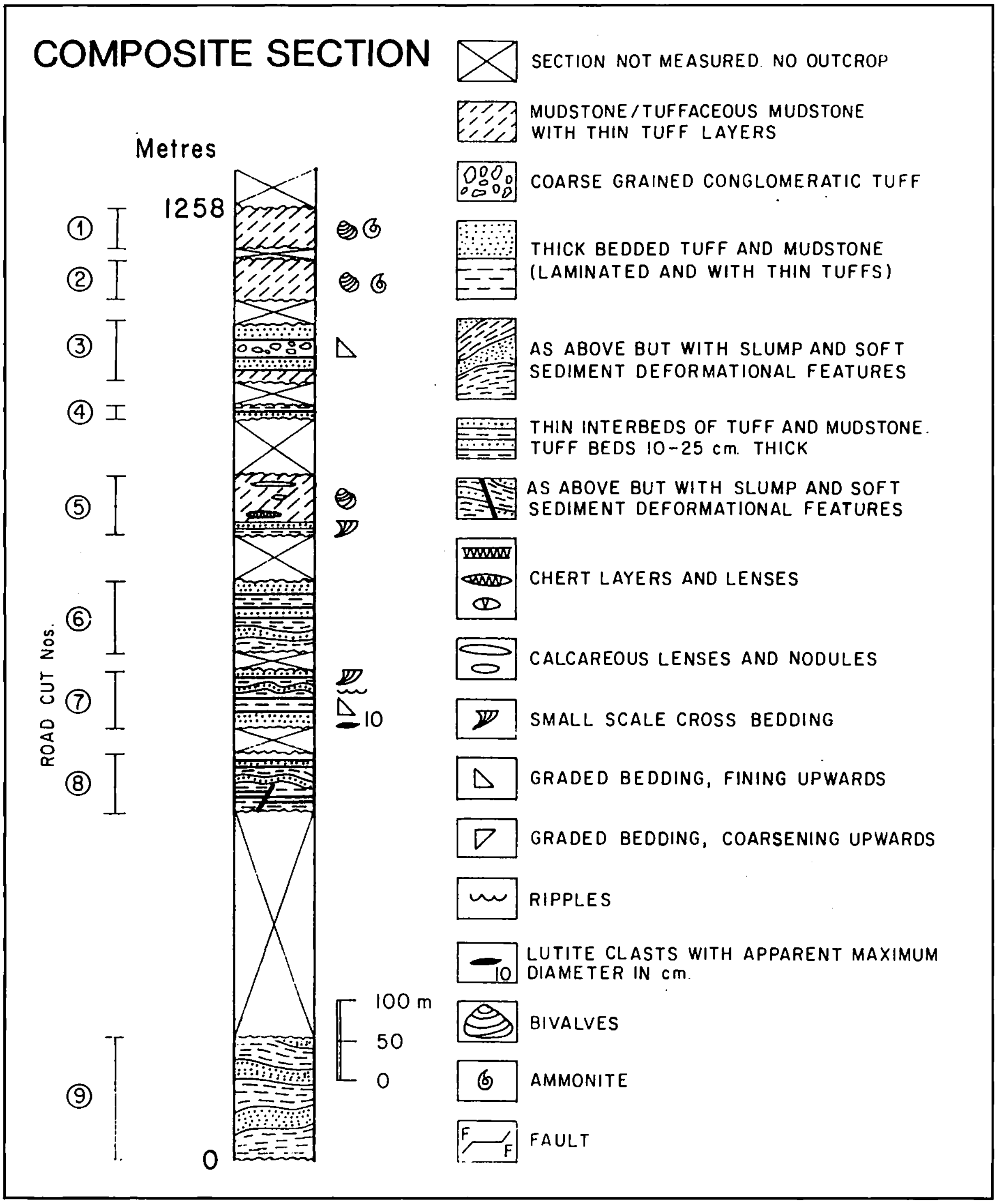

Figure 2. Composite section exposed in the Bypass compiled from road cuts 1-9.

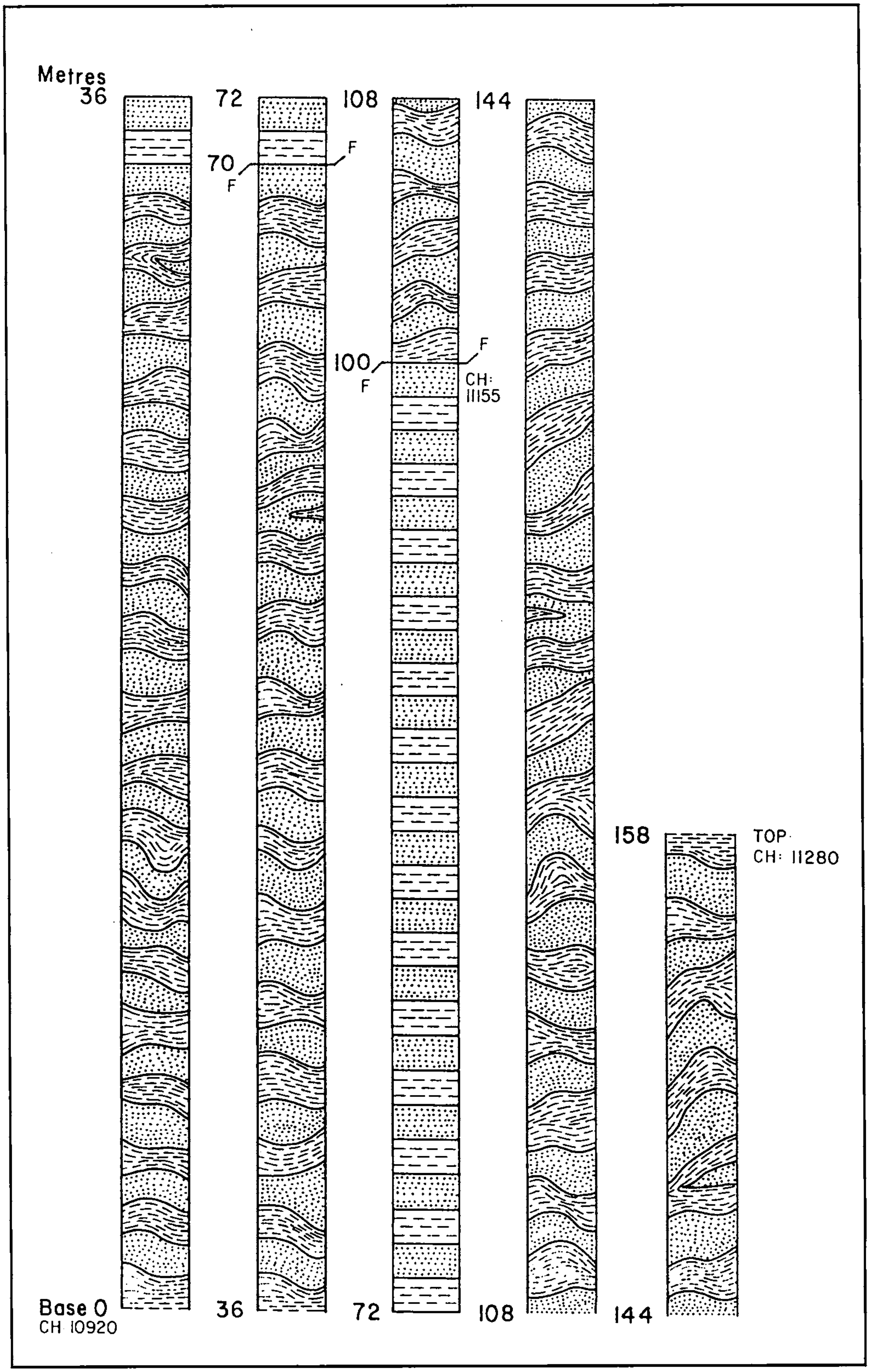

Figure 3. Detailed stratigraphic section recorded at road cut no. 9. For legend see Figure 2.

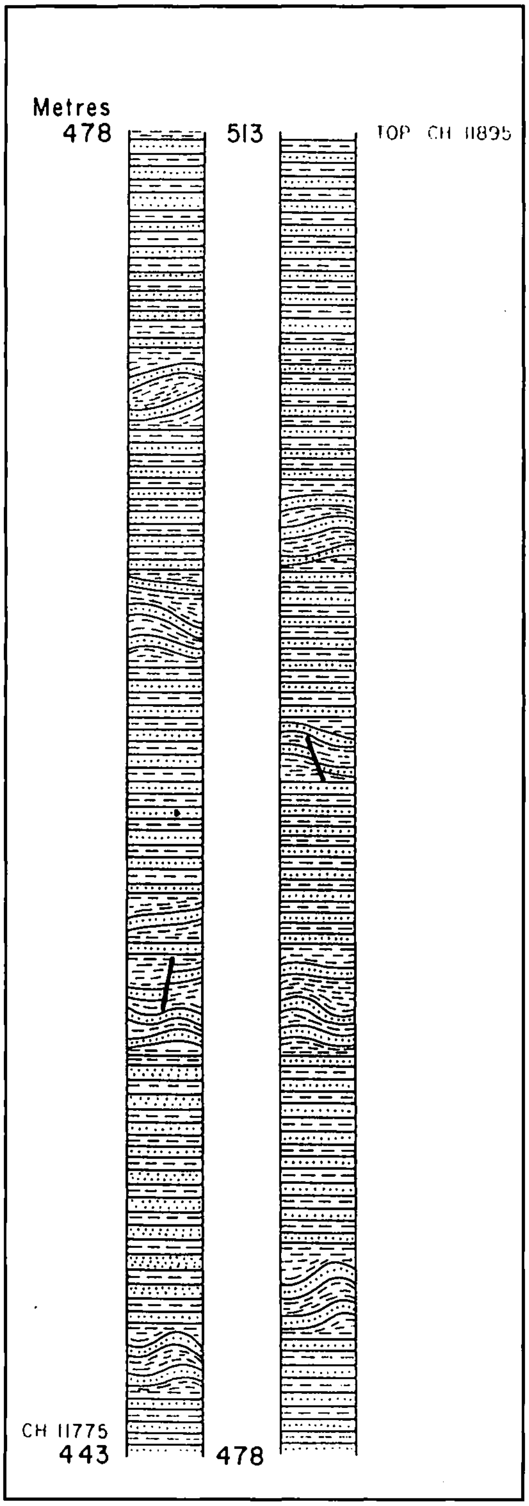

Figure 4. Detailed stratigraphic section recorded at road cut no. 8. For legend see Figure 2.

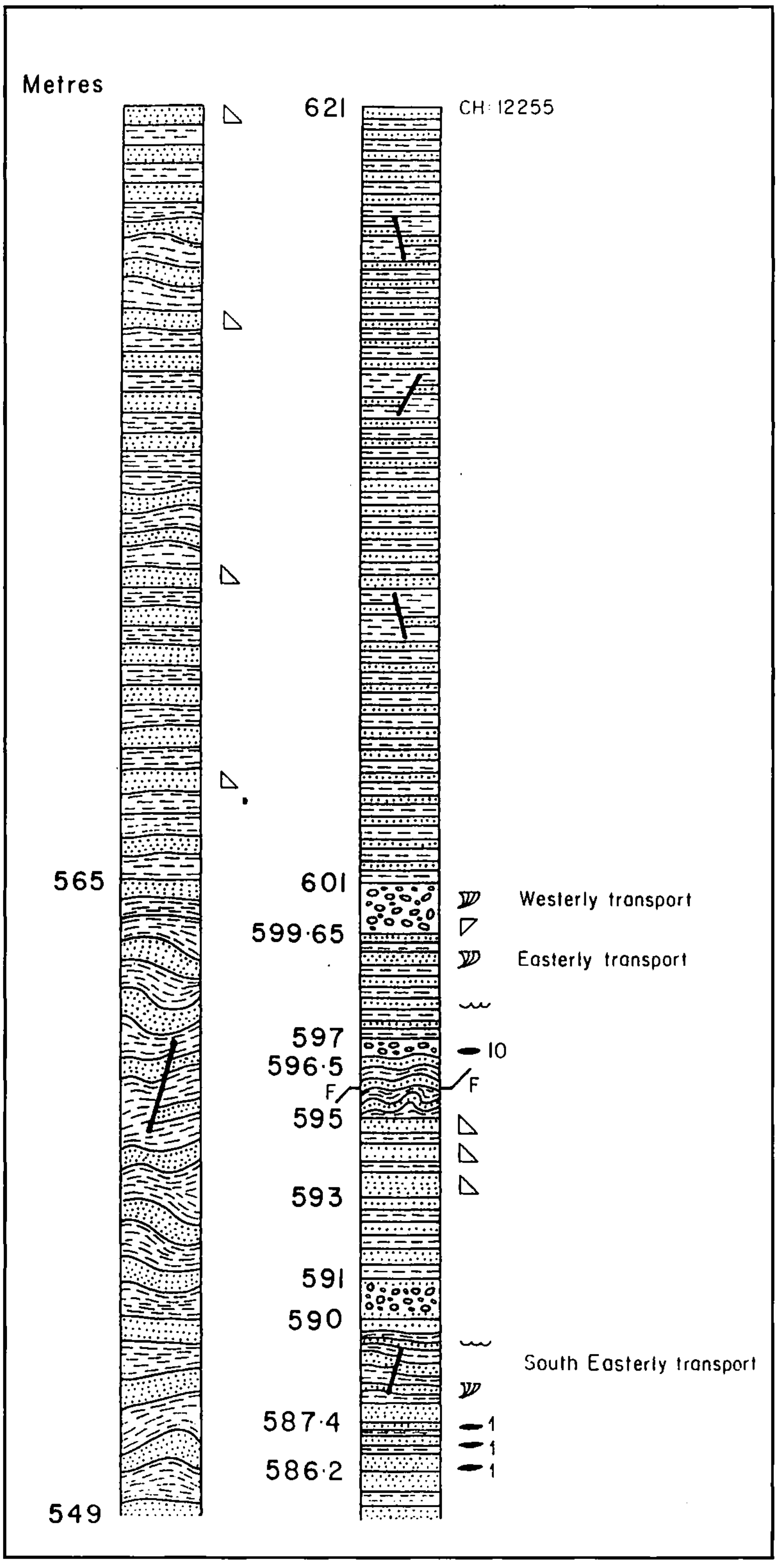

Figure 5. Detailed stratigraphic section recorded at road cut no. 7. For legend see Figure 2.

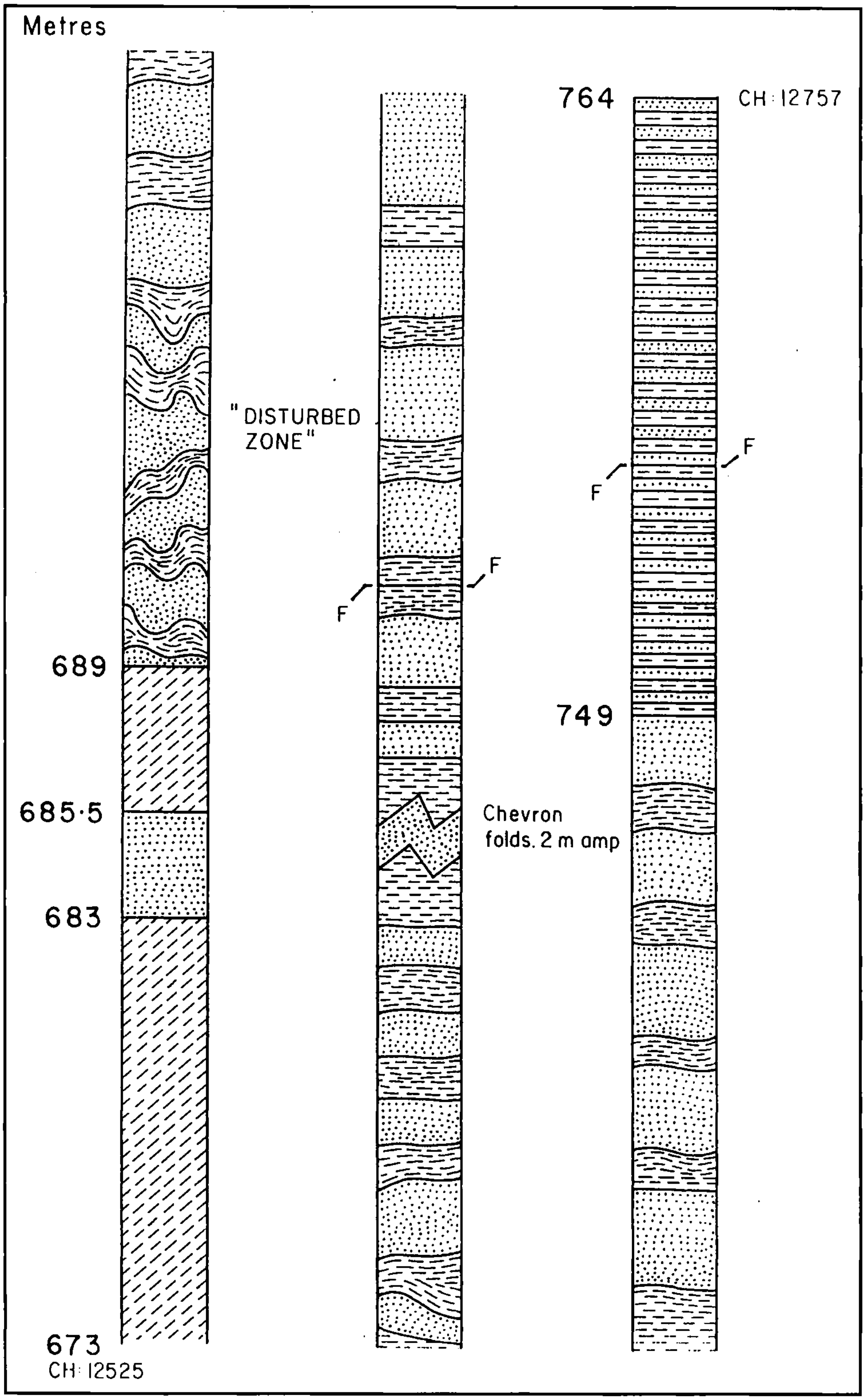

Figure 6. Detailed stratigraphic section recorded at road cut no. 6. For legend see Figure 2.

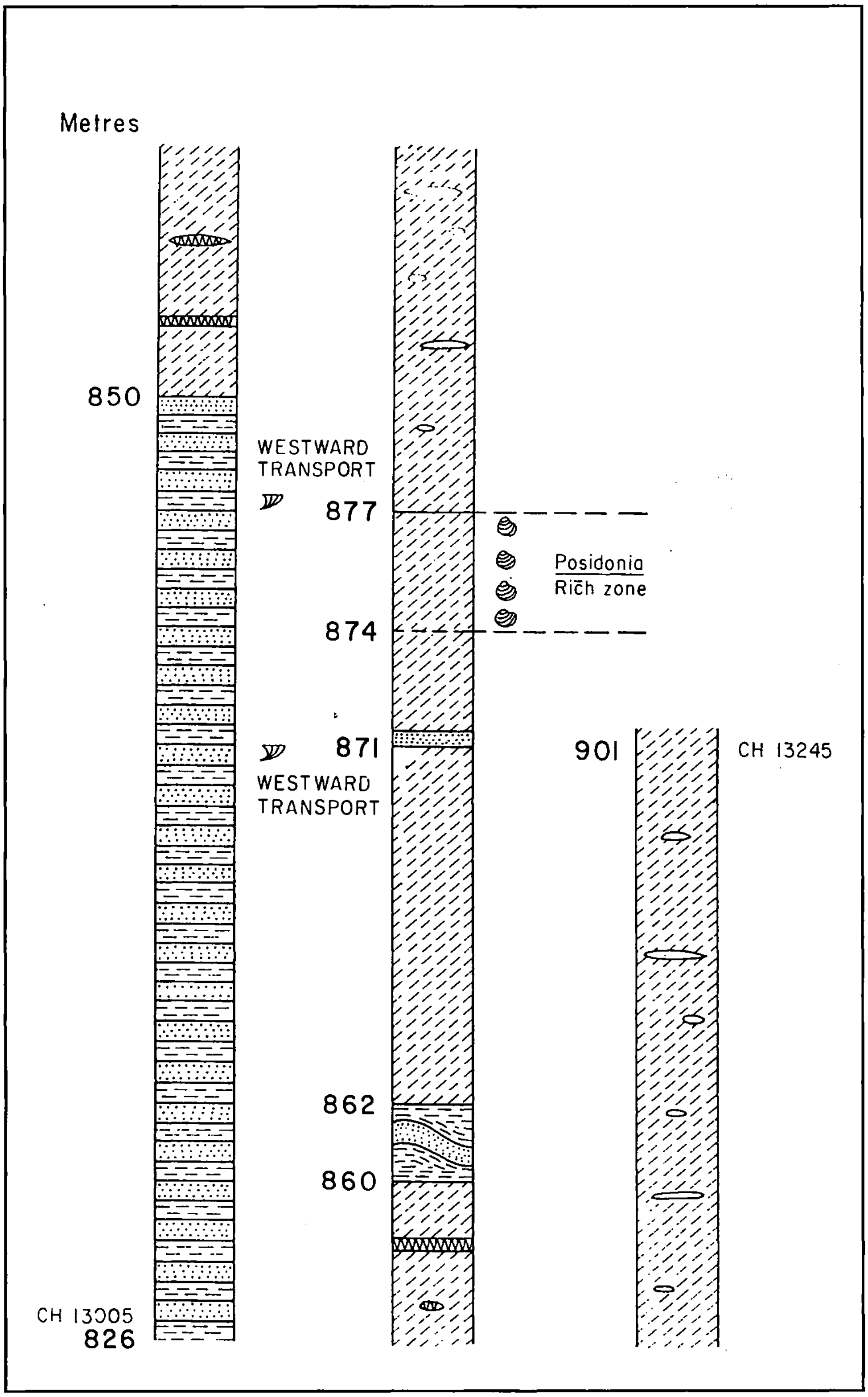

Figure 7. Detailed stratigraphic section recorded at road cut no. 5. For legend see Figure 2.

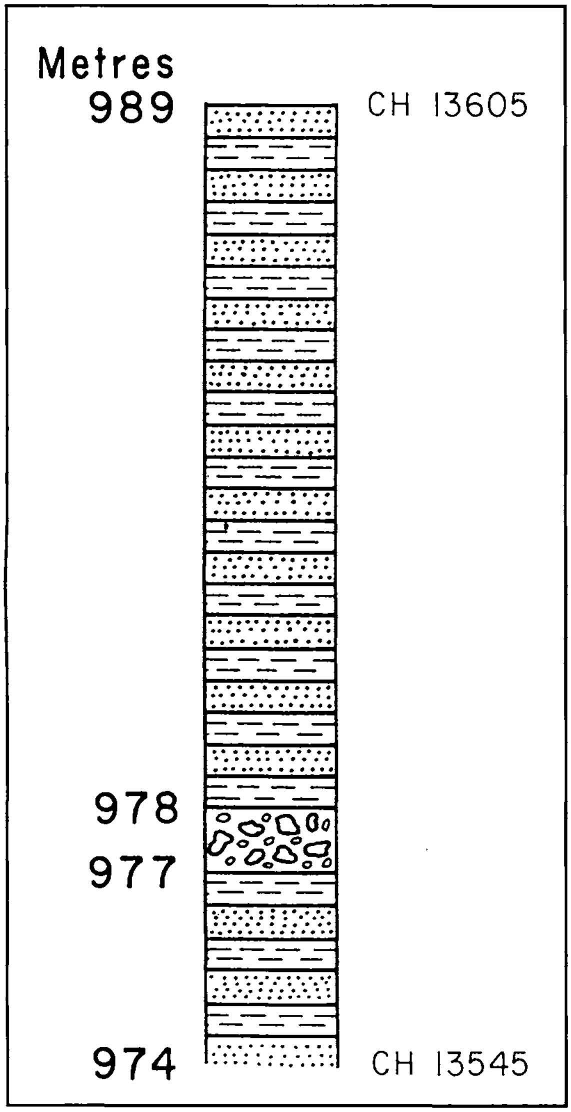

Figure 8. Detailed stratigraphic section recorded at road cut no. 4. For legend see Figure 2.

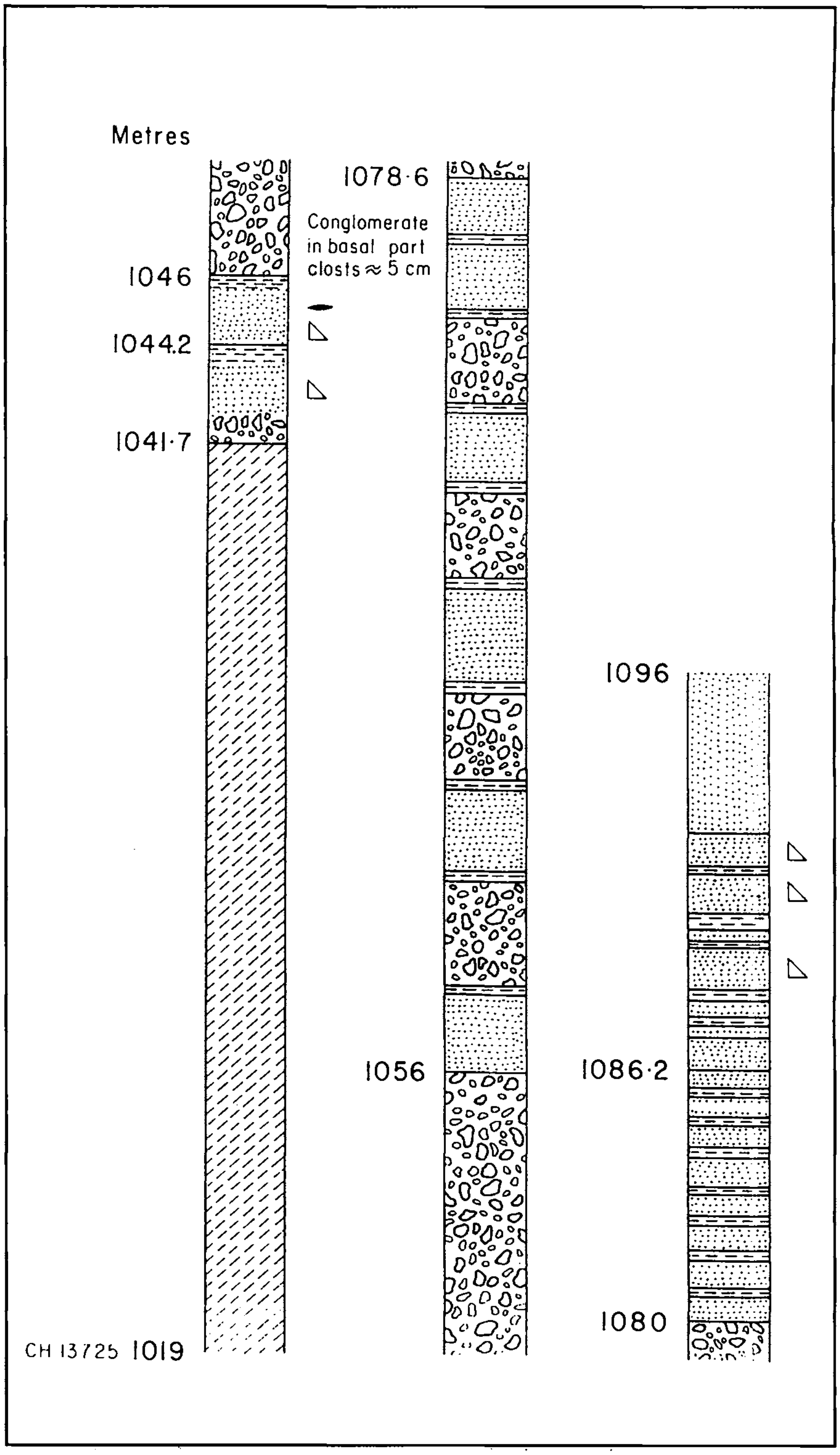

Figure 9. Detailed stratigraphic section recorded at road cut no. 3. For legend see Figure 2.

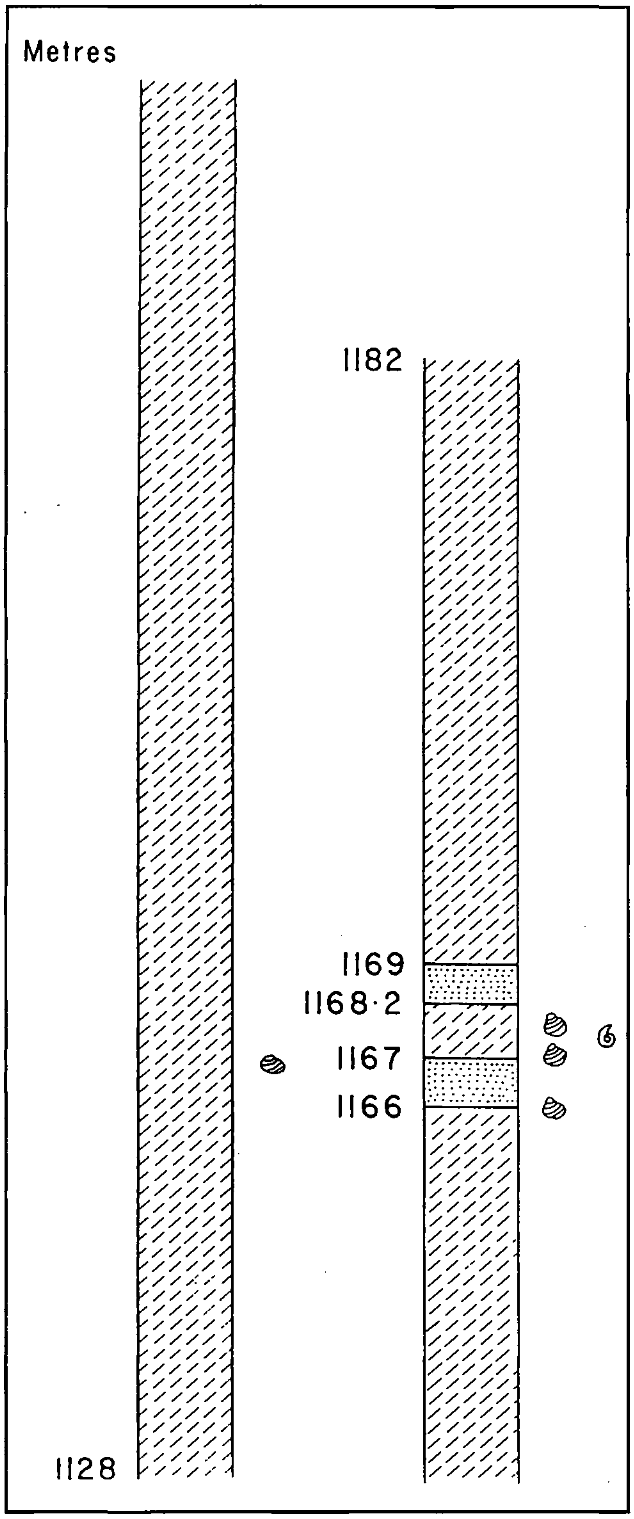

Figure 10. Detailed stratigraphic section recorded at road cut no. 2. For legend see Figure 2.

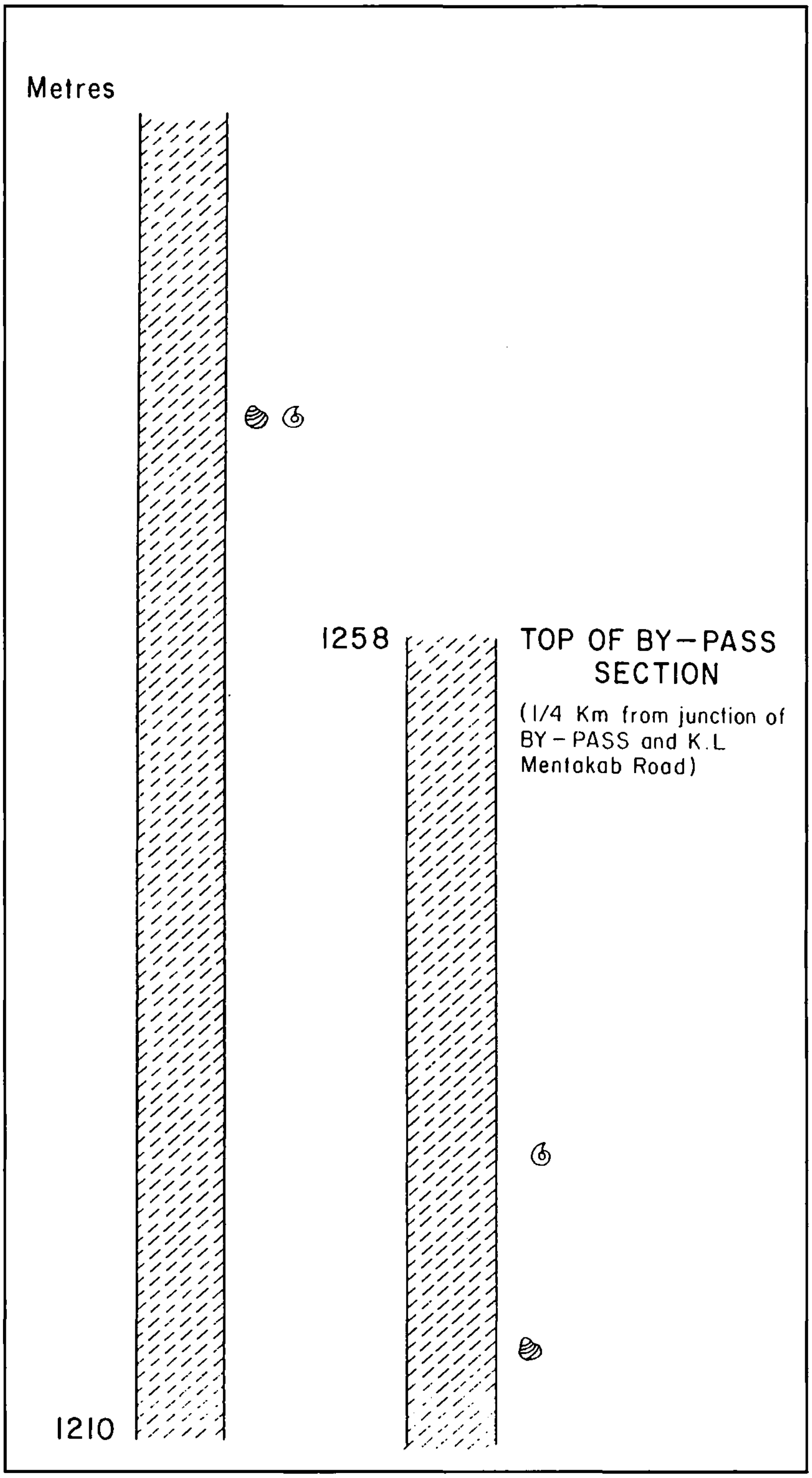

Figure 11. Detailed stratigraphic section recorded at road cut no. 1. For legend see Figure 2.

detailed sedimentological work is required to resolve these possibilities.

The presence of an undisturbed 1.25 km thick section which forms part of the Middle to Upper Triassic Semantan Formation and which is considered to be probably entirely of Middle Triassic age has implications for total thickness estimations of the Semantan Formation. The measured thickness, together with other isolated sections of Middle and Upper Triassic Semantan suggest a minimum thickness of 2 km for the formation. This is in accord with the thickness of around 2 km suggested by Khoo (1983).

The strike and dip are essentially constant throughout the measured section and no repetition of beds was detected. There is therefore no evidence of isoclinal folding, or imbricate thrusts which would result in repetition of beds. This data should be taken into account for tectonic models of the region. Since there is no evidence of imbricate thrusting, the Semantan Formation cannot be an accretionary prism as has been suggested by some workers. It also appears that the Semantan Formation has not been subjected to strong compressional orogenic deformation. This appears to lend support to the views expressed by Chakraborty (1987, 1988) who argued against Late Triassic collision in the Malay Peninsula. The data presented here however does not preclude the Semantan having formed in a fore-arc or intra-arc basin developed over an accretionary wedge.

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