

CHAPTER III

LITHOFACIES DESCRIPTION FROM CORE SAMPLES

3.1 INTRODUCTION

Lithology of rock is one of the most crucial information that leads to interpretation of petrogenesis; in fact, it is only visible evidence that can be taken from petroleum-subsurface exploration. Lithofacies, a body of rock with certain specified attributes which defined by Leeder (cited in Rider, 1996: 154), are directly obtained from lithology. For subsurface exploration, lithology and lithofacies are mostly described from core samples. Core is defined as a cylindrical section of rock by Bates and Jackson (cited in Rider, 1996: 154).

In this study, core samples collected from thirteen wells in Sirikit oil field are described in comparison with lithofacies scheme of Knipscheer (1997). These samples represent different members (e.g. K, L and M) of the Lan Krabu Formation.

3.2 LITHOFACIES

Lithofacies scheme of the Lan Krabu Formation in the Sirikit oil field has been investigated by several workers. Van Geuns and Burgisser (1982) proposed the initial lithofacies scheme, which was subsequently modified by Flint et al. (1989). Currently, Knipscheer (1997) suggested a new scheme (Table 3.1) containing four sandstone lithofacies, one heterolithic lithofacies, three claystone lithofacies and two subordinate lacustrine-transgressive lag deposits (a shell coquina and a silty-sandy pelletal mixed siliciclastic). The last lithofacies scheme is therefore selected for comparison in this study.

One typical coarsening-upward sequence consists of open lacustrine claystone, passing upwards through thin delta front heterolithic beds in thin mouthbar sandstones. Floodplain claystone associated with some lignite beds and fluvial

channels occur commonly on top layer and are overlain by the next transgressive lacustrine claystone. Another lithofacies association comprises predominantly floodplain clays, fluvial channel sands and thin crevasse splay sands. These deposits represent maximum progradation of alluvial deposits over lacustrine deposits.

Table 3.1 Description and sub-environment of lithofacies scheme of the Lan Krabu Formation (after Knipscheer, 1997).

Facies	Description	Sub-environment
C1	Mottled claystone	Well-drained floodplain
C2	Carbonaceous claystone	Poor-drained floodplain
C3	Grey molluscan claystone	Lacustrine
CS	Interbedded sand and claystone	Prodelta
P	Pelletal siltstone and sandstone	Transgressive-lacustrine
SC	Shell coquina	Transgressive-lacustrine
S1	Coarsening upwards sandstone	Mouthbar
S2	Fining upwards sandstone	Channel
S3	Fine grained sandstone	Crevasse splay
S4	Thin bedded sandstone	Prodelta

3.3 LITHOFACIES DESCRIPTION

All core samples were lithologically described and classed into lithofacies scheme of Knipscheer (1997). Details for each lithofacies are as follows:

Lithofacies C1 (*Mottled claystones*) : This lithofacies is characterized by pale green to greenish-grey mottled claystones with lamina and patches of greenish siltstone. The mottling is a result of calcite. Rootlets and plant fragments have been found locally. Bioturbation varies from moderate to intense occurrences. Thickness of this lithofacies varies from a few centimeters to more than 5 meters. The C1 may represent by samples LKU-E02 at depth between 2058.50 and 2060.8 meters (Figure 3.1).

Lithofacies C2 (*Carbonaceous claystone*) : C2 claystone has grey to black colors and contains locally laminated lignitic coal. Thickness of individual layer is usually less than 10 meters. This facies is commonly associated with either C1 or C3. Representative of this lithofacies (LKU-C01 at depths of 1884.40 to 1884.83 meters) is presented in Figure 3.2

Lithofacies C3 (*Grey molluscan claystones*) : It is characterized by grey to brown claystones with or without lamination. Floating gastropods and siderite nodules are locally preserved, and fish fragments are occasionally found. In addition, lamina and lenses of siltstone and sandstone also expose within this lithofacies. Darker colors (medium to dark gray) usually present along laminated zone. Their maximum thickness is recorded up to 15 meters. Samples LKU-A01 at depths between 1539.12 and 1540.02 meters (Figure 3.3) are a representative of this lithofacies

Lithofacies CS (*Interbedded sand /claystone heterolithics*) : Claystone of C3 type is interlaminated or interbedded by light grey-yellow sandstone and siltstone. Deformation structures, siderite nodules/cementation and carbonaceous lamina, are commonly present along with bioturbation. This lithofacies would be represented by sample LKU-W02 at depths from 2044.35 to 2046.60 meters (Figure 3.4)

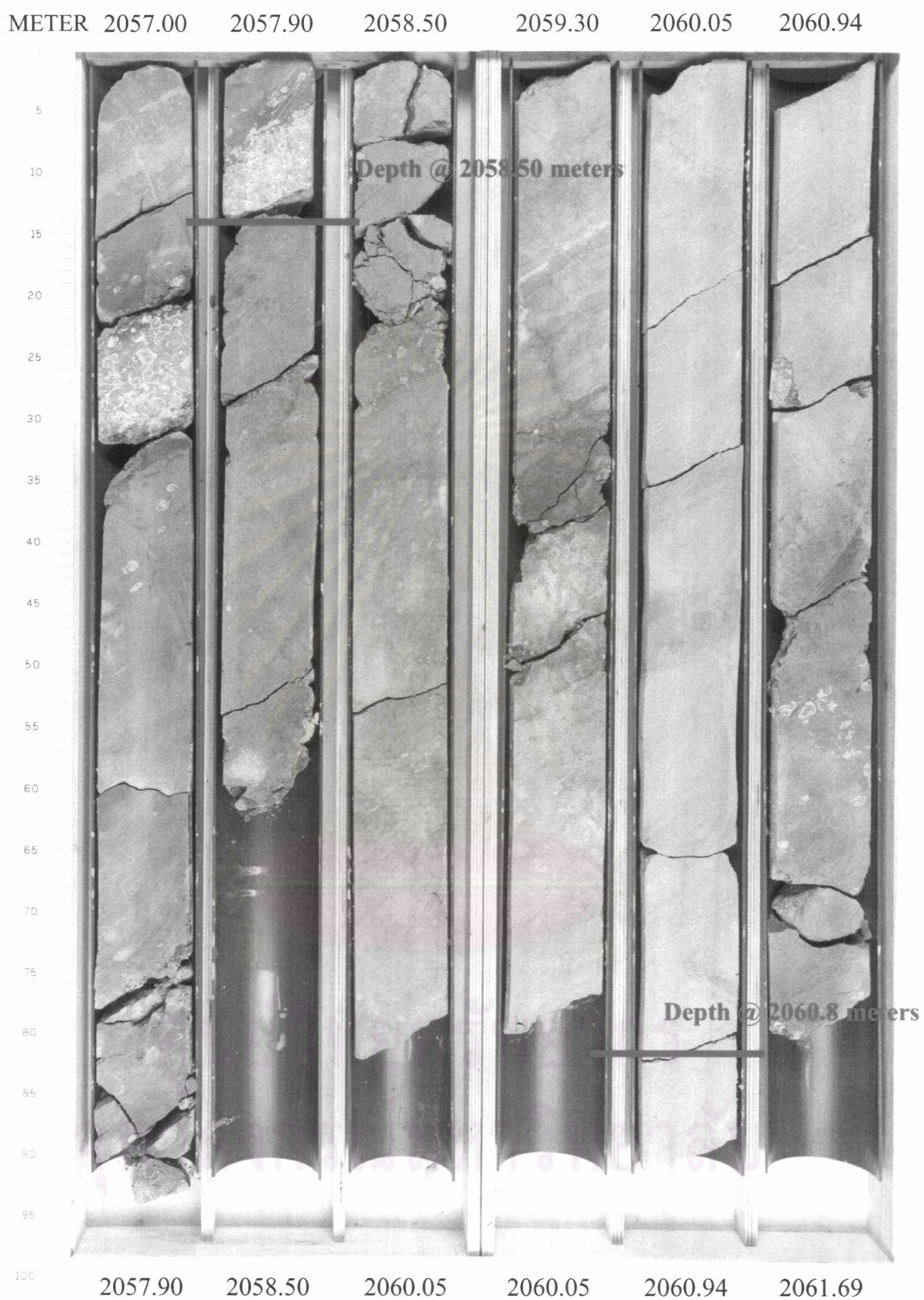


Figure 3.1 Greenish-grey mottled claystones of well LKU-E02 between depths of 2058.50 and 2060.8 meters are representative of lithofacies C1.

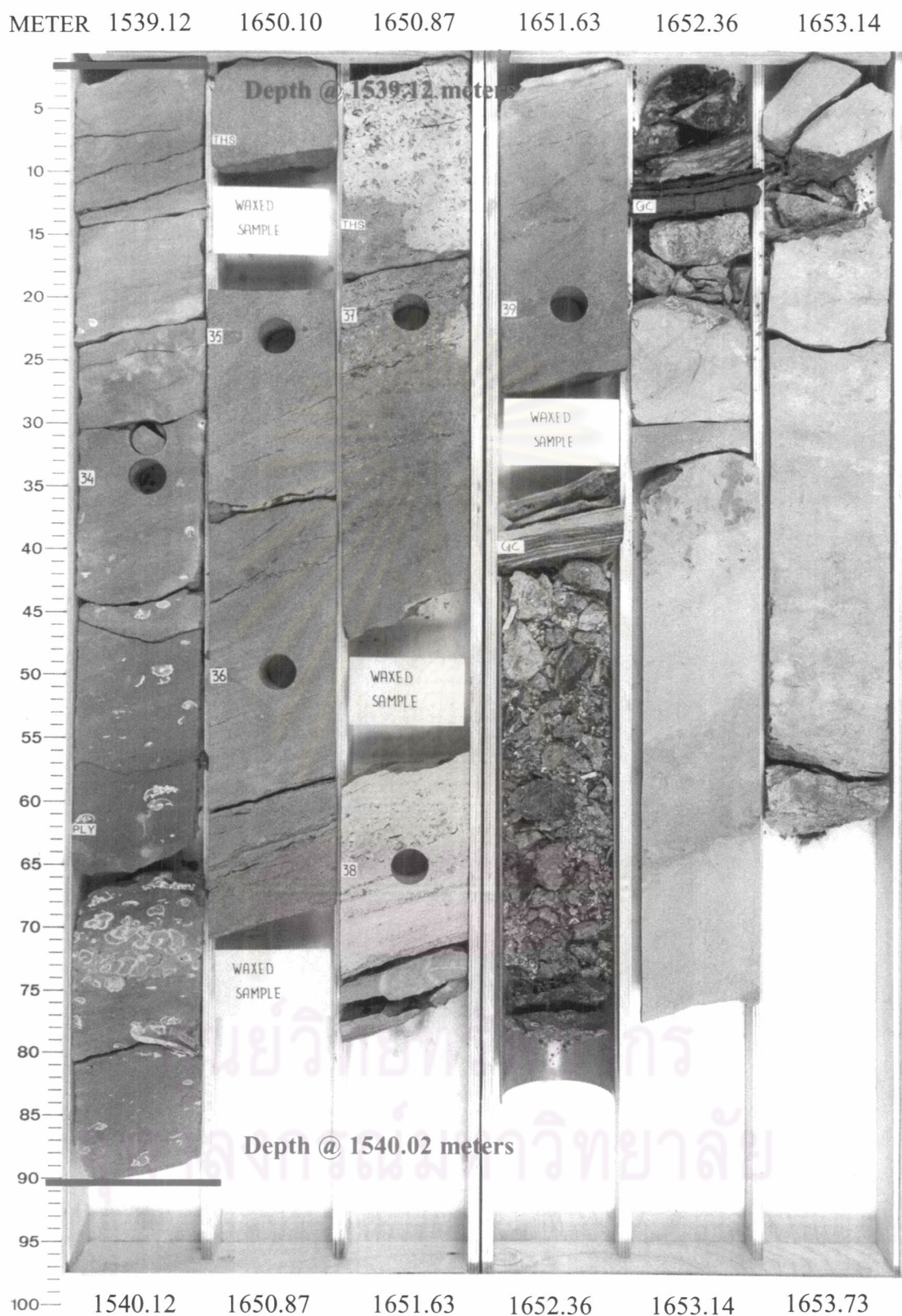


Figure 3.3 Sample LKU-A01 at depths from 1539.12 to 1540.02 meters of lithofacies C3 presents brown limonite claystone.



Figure 3.4 Lithofacies CS shows claystone interlaminated and interbedded with light grey sandstone and siltstone (sample LKU-W02 at depths between 2044.35 and 2046.60 meters).

Lithofacies P (*Pelletal siltstone/sandstone*) : They are composed of poorly sorted dark greenish pellets, fish fragments and shells. Maximum thickness of about 40 centimeters has been observed. Sample LKU-B01 along depths from 1786.66 to 1786.76 meters is representative of this lithofacies (Figure 3.5).

Lithofacies SC (*Shell coquina*) : Coquina, consisting of gastropod, bivalve shell and fish fragments, is cumulated with silt and fine- to medium-grained quartz sand. Siderite cement is extensively pervasive, whereas ferroan calcite and calcite are minor cements. The coquina occurs stratigraphically at equivalent position of P lithofacies; however, it also occurs within C3 lacustrine molluscan claystones. Bed thickness ranges approximately from 20 to 40 centimeters. This lithofacies is represented by sample LKU-E02 along depths 2057.23 to 2057.32 meters (Figure 3.6).

Lithofacies S1 (*Fine-grained sandstone*) : S1 lithofacies is characterized by well sorted, fine-grained, grey to brown sandstones. Sedimentary structures are usually presented by parallel lamination, cross lamination and cross bedding. In addition, lithofacies S1 commonly shows coarsening-upwards cycle, particularly along boundary associated with lithofacies CS. Range of thickness is recorded between 1 and 5 meters. Sample LKU-F01 at depths from 1898.25 to 1900.67 meters (Figure 3.7) can use to demonstrate characteristic of this lithofacies.

Lithofacies S2 (*Fine- to medium-grained sandstones*) : This lithofacies contains predominately fine- to medium-grained sandstones with some pebble particles. They are poorly to well sorted and sometimes present fining-upwards sequences. This lithofacies lies on the lower lithofacies with sharp or erosive contacts. Sedimentary structures contain cross, trough and laminated bedding. Bed thickness ranges from 0.5 to 3 meters. Sample LKU-A01 at depths 1650.10 to 1651.59 meters (Figure 3.8) is a representative of this lithofacies.

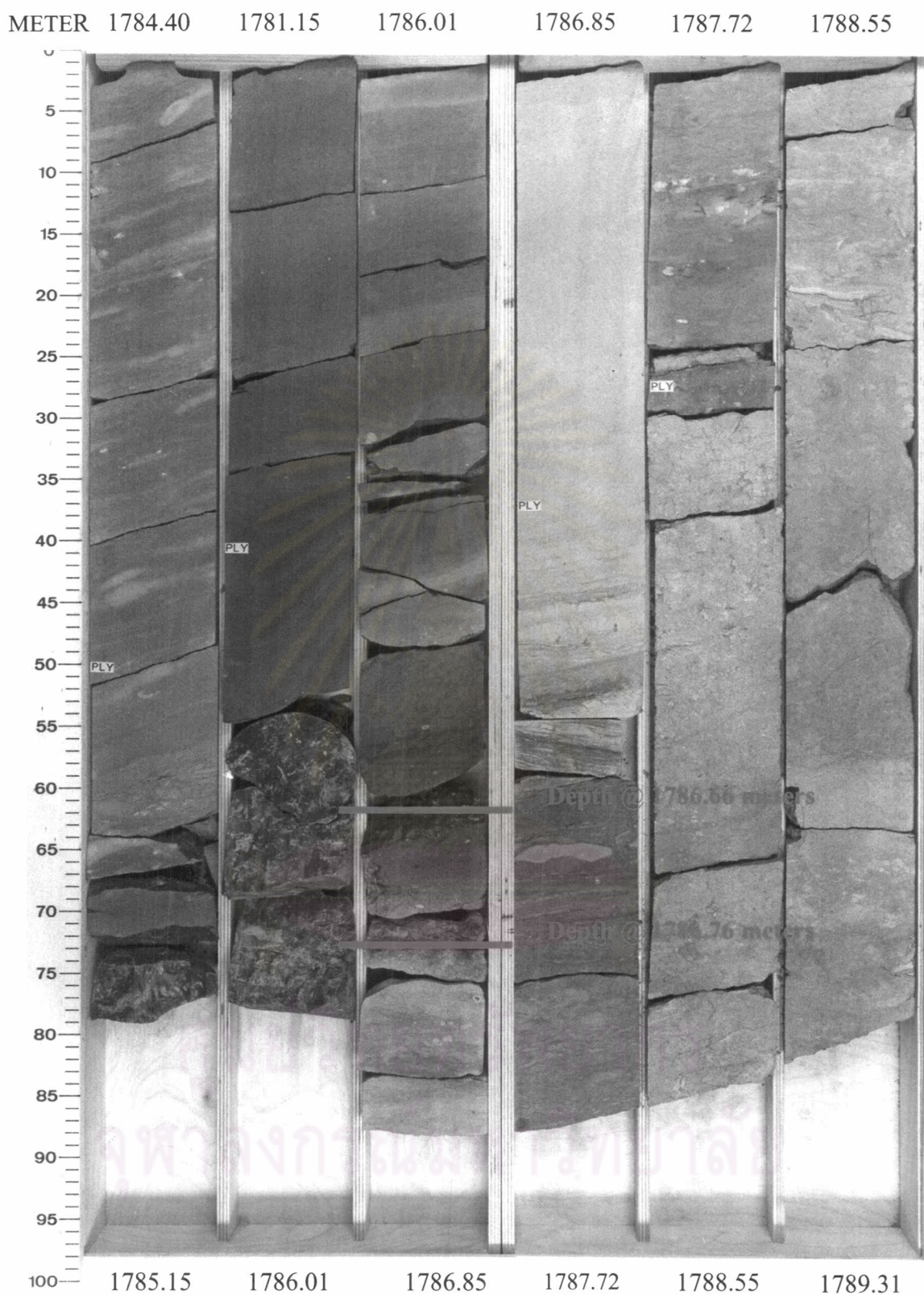


Figure 3.5 Sample LKU-B01 at depths between 1786.66 and 1786.76 meters, predominated by poorly sorted dark-green pelletal siltstone, representative of lithofacies P.

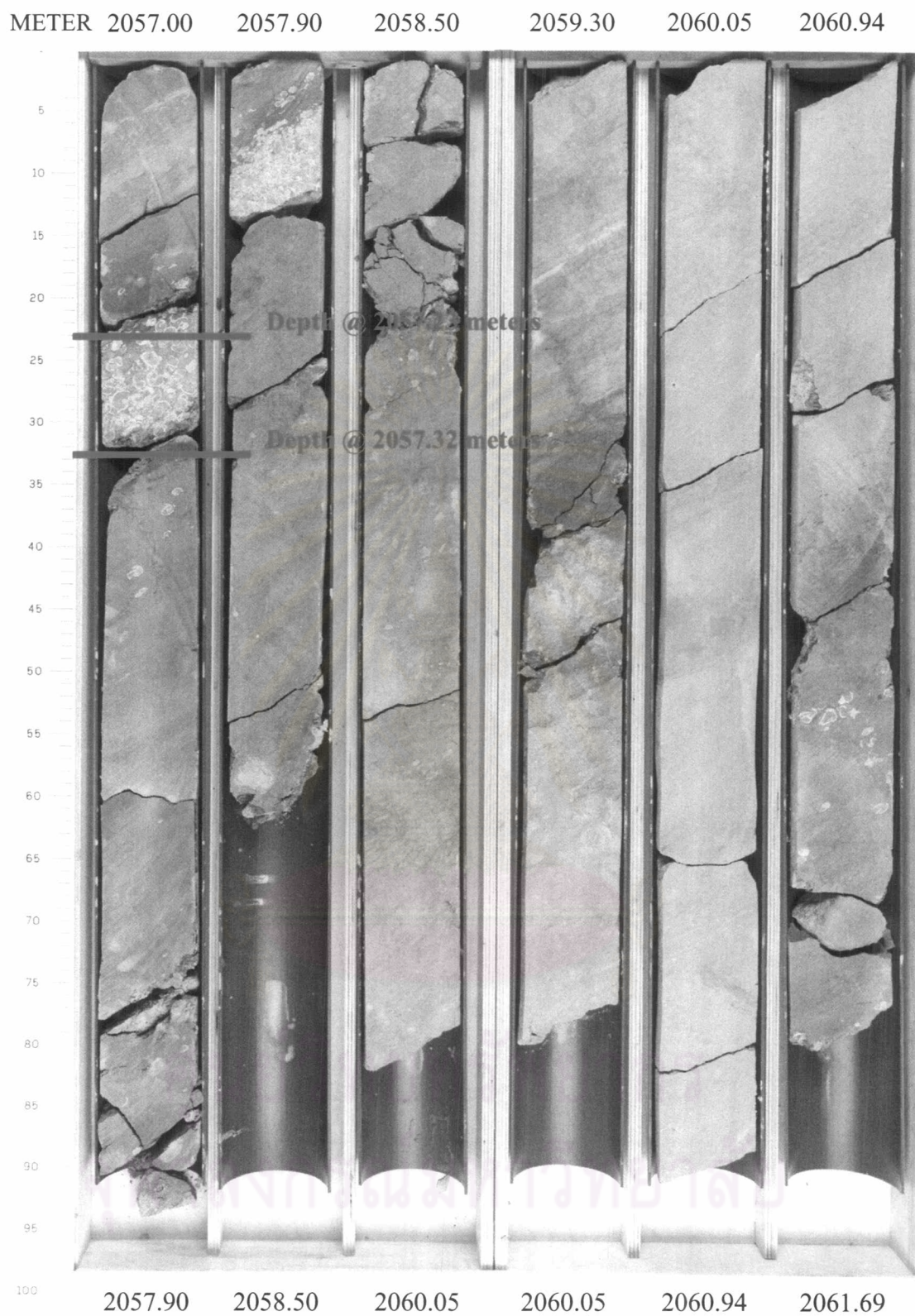


Figure 3.6 Representative of lithofacies SC (sample LKU-E02 at depths of 2057.23 to 2057.32 meters) shows shell coquina; which contains of broken gastropod and bivalve shell materials mixed with fish fragments.

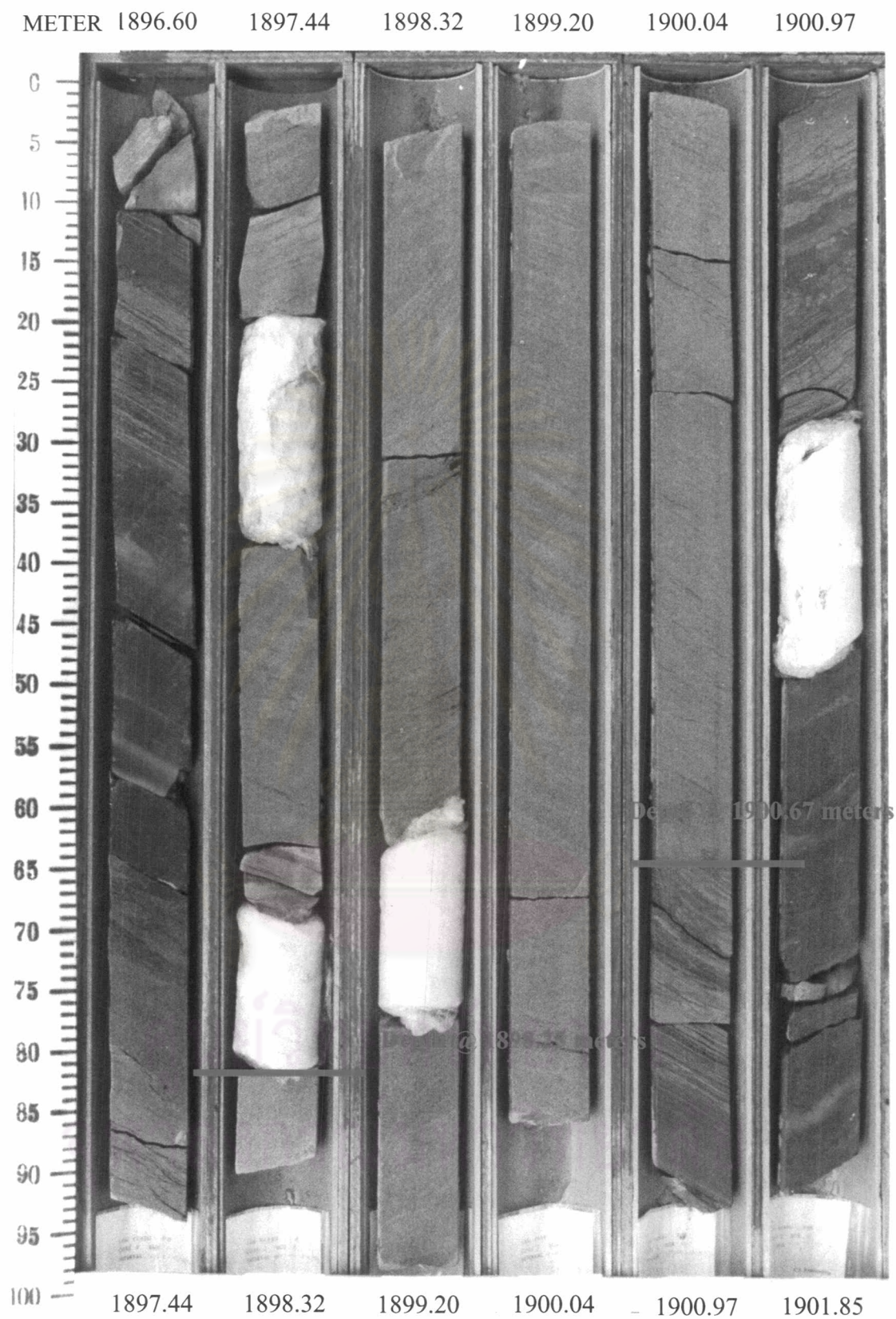


Figure 3.7 Well sorted, fine-grained sandstone, representative of lithofacies S1 (sample LKU-F01 between depths of 1898.25 and 1900.67 meters).

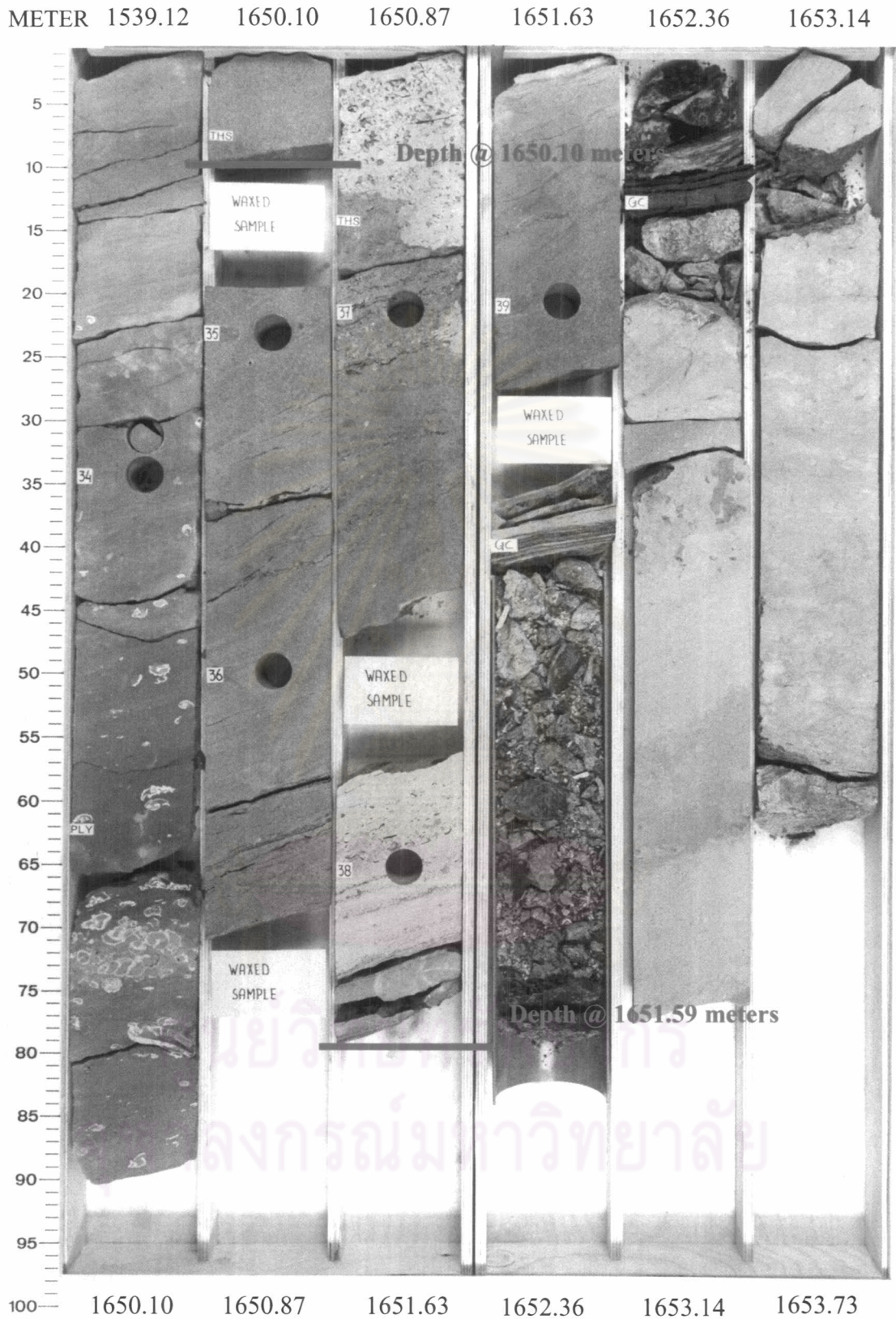


Figure 3.8 Representative of lithofacies S2 (sample LKU-A01 at depths between 1650.10 and 1651.59 meters) contains fine- to medium-grained sandstone.

Lithofacies S3 (Fine-grained sandstones) : Lithofacies S3 is commonly characterized by fine-grained, yellowish grey sandstone forming thin to medium normal beds. Base of this lithofacies forms typically sharp contacts with underlying claystones, while top boundary is gradually transitional to silt/claystones. Beds of this lithofacies, less than 2 meters thick, are usually encased by C1 or C3 claystones. Average thickness is about 0.5 to 1 meter. Representative of this lithofacies is presented by sample LKU-A01 along depths 1518.05 to 1518.82 meters (Figure 3.9).

Lithofacies S4 (Thin bedded sandstones) : Lithofacies S4 is generally composed of well sorted, fine-grained sandstones, these are occasionally present graded bedding. Typical structures of soft sediments (e.g. convolute bedding, load casting and ripple mark) are frequently found in this lithofacies. Thickness of each bed is generally less than 1.5 meters. Sample LKU-A01 at depths 1523.27 to 1523.93 meters is a representative of this lithofacies (Figure 3.10).



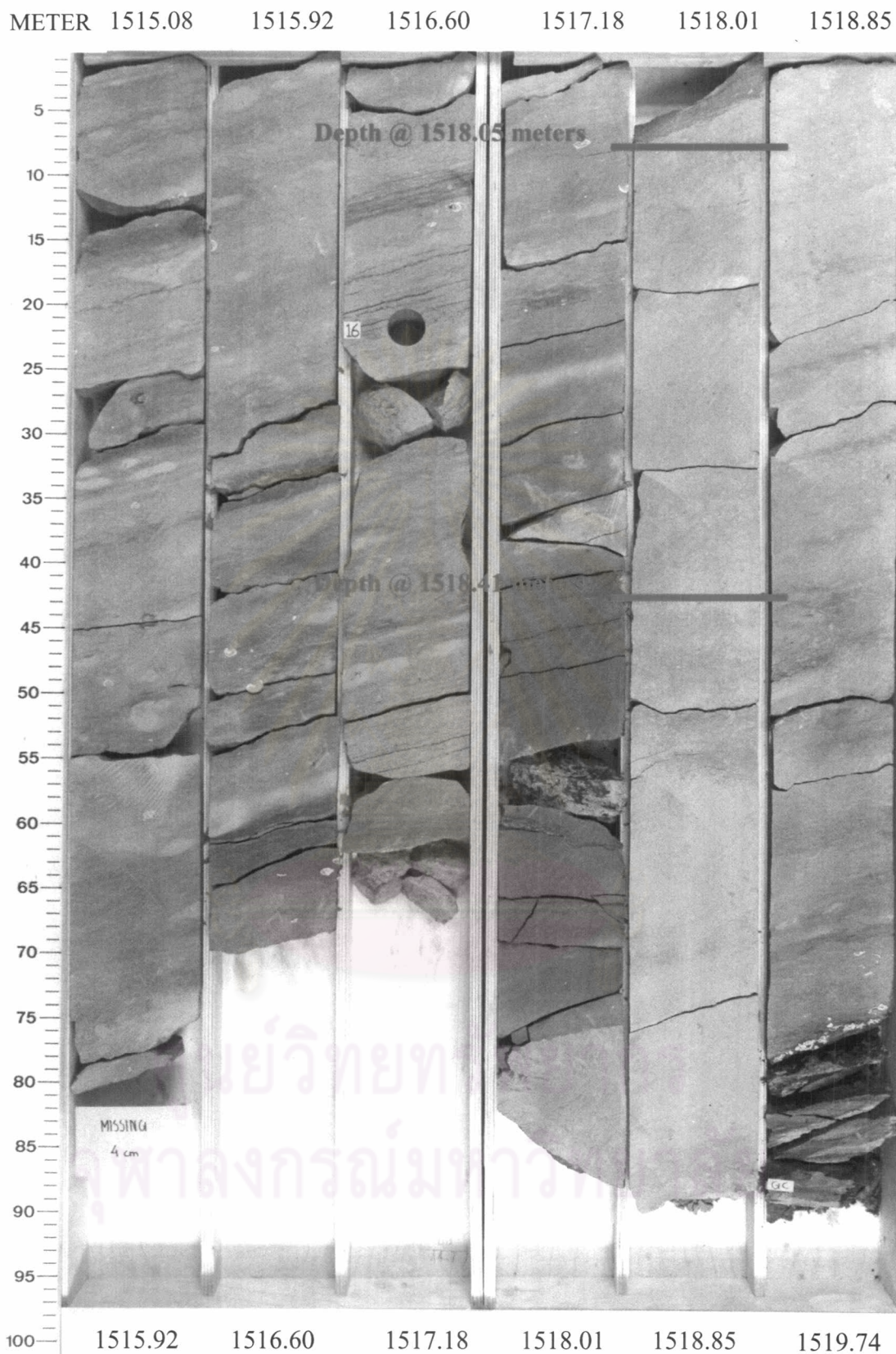


Figure 3.9 Lithofacies S3 shows yellowish grey, fine-grained sandstone (sample LKU-A01 between depths of 1518.05 and 1518.82 meters).

