Indication of Gold and Silver Occurrence at Sampit Bay, Kota Waringin Timur District, Central Kalimantan Province

Indikasi Keterdapatan Emas dan Perak di Perairan Teluk Sampit, Kabupaten Kota Waringin Timur, Propinsi Kalimantan Tengah

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ABSTRACT : The study area is fluviatile deposit which consists of yellow to light gray loose sand, iron oxide, and kaoline spreading from the land shallowing to sea direction. Concentration grade for determining of gold and silver content used a total analysis of the hot mixture HF-HNO_3-$HClO_4$ with measurements "Atomic Absorption Spectrofotometry".(AAS). Highest concentration of gold and silver found at sample GCTS-31 that gold 0.096 ppm and silver 2.284 ppm, in muddy sand type sediment, at 3.1 meters depth and arround 1,250 meter length from coast line. While the lowest concentration of the gold was 0.025 ppm found at sample GBTS 14 in very fine sand type sediment located at 1.07 meter depth and approximately 320 meters length from coast line.

The lowest concentration of the silver was founded at sample GBTS 25 that is 0.860 ppm in sandy mud sediment type located at 2.49 meters depth and approximately 3,000 meters length from the coast line.

The gold placer is may derived from weathering of Pambuang Formation which spreads in the west and north of Sampit Bay, and transported by Mentaya River and longshore current system.

Key word : sediment samples, laboratory analyses, gold, silver and Sampit Bay.

ABSTRAK : *Daerah penelitian merupakan endapan fluviatil terdiri dari pasir lepas berwarna kuning muda sampai abu-abu pucat, oksida besi, dan kaolin yang memiliki sebaran makin mendangkal ke arah laut. Kadar konsentrasi untuk menentukan kandungan emas dan perak menggunakan analisis total campuran HF-HNO_3-$HClO_4$ dengan metoda AAS. Analisa besar butir digunakan untuk memisahkan sedimen fraksi kasar sedangkan analisa pipet dilakukan terhadap sediment fraksi halus.*

Kadar emas dan perak tertinggi terdapat pada contoh GCTS -31, yaitu emas 0,096 ppm dan perak 2,284 ppm, pada jenis sedimen lumpur pasiran, di kedalaman 3,1 meter dan sekitar 1.250 meter dari garis pantai. Sedangkan kadar emas terendah yaitu 0,025 ppm terdapat pada contoh GBTS 14 pada jenis sedimen pasir sangat halus di kedalaman 1,07 meter dan sekitar 320 meter dari garis pantai. Kadar perak terendah dijumpai pada contoh GBTS 25 yaitu 0,860 ppm dengan jenis sedimen pasir lumpuran pada kedalaman 2,49 meter dan sekitar 3.000 meter dari garis pantai.

Sumber emas plaser diperkirakan dari lapukan Formasi Pembuang yang memiliki sebaran cukup luas di sebelah barat dan utara Teluk Sampit dan ditransportasi oleh Sungai Mentaya dengan anak-anak sungainya, serta sistem arus memanjang pantai.

Kata kunci : *contoh sedimen, analisis laboratorium, emas, perak dan Perairan Teluk Sampit.*

INTRODUCTION

Placer deposit is a surface mineral deposits which is concentrated mechanically, namely naturally density separation of heavy minerals from light minerals by water or air, where by their nature or behavior of minerals collected in a sediment (Jensen, 1981).

Sampit Bay is the place of the river mouths several large and small rivers such as the Mentaya River is the largest river, Katingan, Siteruk, Katayungan, Lampuyang, Seranggas, and Bujur Rivers. So that, the supply of sediment which is deposited in the Sampit Bay from various types litology crossed by rivers flowing into the bay, such sediment deposits containing gold and silver.

Gold and silver are heavy minerals that have a density of 19,3 gm/cm^3 and generally found in fluviatil sediment as secondary mineral or placer deposits. (Breninninkmeyer, 1978). Generally sediment of study

area is including fluviatil sediment and which has spread widely, so the possibility of the presence of gold and silver is very strong. The purpose of research is to collect and inventory of basic data about the presence gold placer and their accessories minerals, in order to provide information of mineral resources. Geographically, the study area is located at coordinates of 112.9^{o} - 113.35^{o} E and 03.0^{o} - 03.25^{o} S belong to the Kecamatan Samuda, Kota Waringin Timur District.

The study area within the geology map of Kuala Pembuang Sheets (Soetrisno, et al., 1995) as shown in Figure 1, with details of the units on the onland lithology as follows :

- ***Unclassified clastic*** sediment composed of sand, silt,clay and peat.
- ***Coastal deposit*** consist of sand, silty clay, loose quartz sand, white to yellowish colored, medium-fine-grained, not layered, locally founded organic marine. These sediments forming of the sand dune morphology extends along the coast with 2 meters thickness.
- ***Swamp deposit*** consist of peat, clay, silt and mud.
- ***River deposit*** consist of gravel / bolder, sand, silt, clay, which contains land organic remains.
- ***Pembuang Formations*** composed by calcareous sandstone, conglomerates, silt, clay and peat. Calcareous sandstone medium-coarse grained, F-feldspar composition, carbon and biotite. Conglomerates have various material, quartz fragment particularly, calcite and sand stone. Uncompacted sandstone, fine- medium grained.

This formation was deposited by traction currents mechanism in fluvial environment, branching and meandering river, covering 3 cycles sedimentation and the estimated age of sedimentation was Late Pleistocene.

METHODS

Seafloor surfacial sediments sampling were collected by using a grab sampler, while determining the position using global positioning system (GPS) Garmin 250 Map. The grid sediment sampling is assumed representing the study area (Figure 2). Retheon echosounder for measuring sea water depth. Hand drilling was done at three location for fluvial sediments analysis

Nomenclature sediments are classified according to the triangle diagram of Folk (1980). Triangle diagram is divided into two classes, first class for the sediments containing gravel that is based on the percentage proportion of gravel on the comparison of mud-sand. Second class for the sediments without gravel percentage is the proportion of sand to silt-clay ratio.

Granulometric analysis was done by sifting dry (sieve analysis) for 100 grams of gravel-sand sediment fraction and mud fraction, and that was left in the pan 20 grams weight, carried out by using a pipette. Class interval with sieve openings 0.5 phi and for pipettes is 1 phi. Nomenclature sediments are classified according to the triangle diagram, with statistical parameters using "Moment". Concentration grade for determining of gold and silver content used a total analysis of the hot mixture HF-HNO_3-$HClO_4$ with measurements "Atomic Absorption Spectrofotometry".(AAS).

RESULTS

Bathymetry

Bathymetric contour patterns of the study area is following the coastline pattern, where the lowest depth that can be recorded is 1 meter and the deepest 34 meters water depth, with 1 meter contour intervals, as shown in Figure 3.

The deepest region is located at middle of study area that lens resemble with the southeast–northwest direction. This condition is estimated as paleo river channel, where at the northern and southern part of the channel have been covered by sediment.

At the northern part is covered by sediment which is supplied from rivers that empties at Sampit Bay, such as the Sranggas, Lempuyang and Cemeti River. Whereas at the southern part is covered by coastal sediments, which is supplied from long shore current system.

At eastern and southeastern parts of Sampit Bay, it shows contours density relatively tight compared to the western part.

This conditions correspond to the geographical situations, where at the western part of the bay is protected by Banaran Cave, conducing the a quiet environment, so that sedimentation occurs intensively. While in the eastern and southwestern of study area is located at position which is strongly influenced by very dynamic season, so that sedimentation is not as intensive as in the western part.

Type and Seafloor Surfacial Sediment Distribution

The results of grain size analysis from 51 sediment samples show that the study area covered by four types of sediment texture such as mud, sandy mud, muddy sand and sand. (Figure 4).

Mud (M)

Spatial distribution of this unit most extensive and covers study area ranging from near shoreline at 1 meter water depths to the offshore until more then 20 meters depths. This mud light brown to black, generally

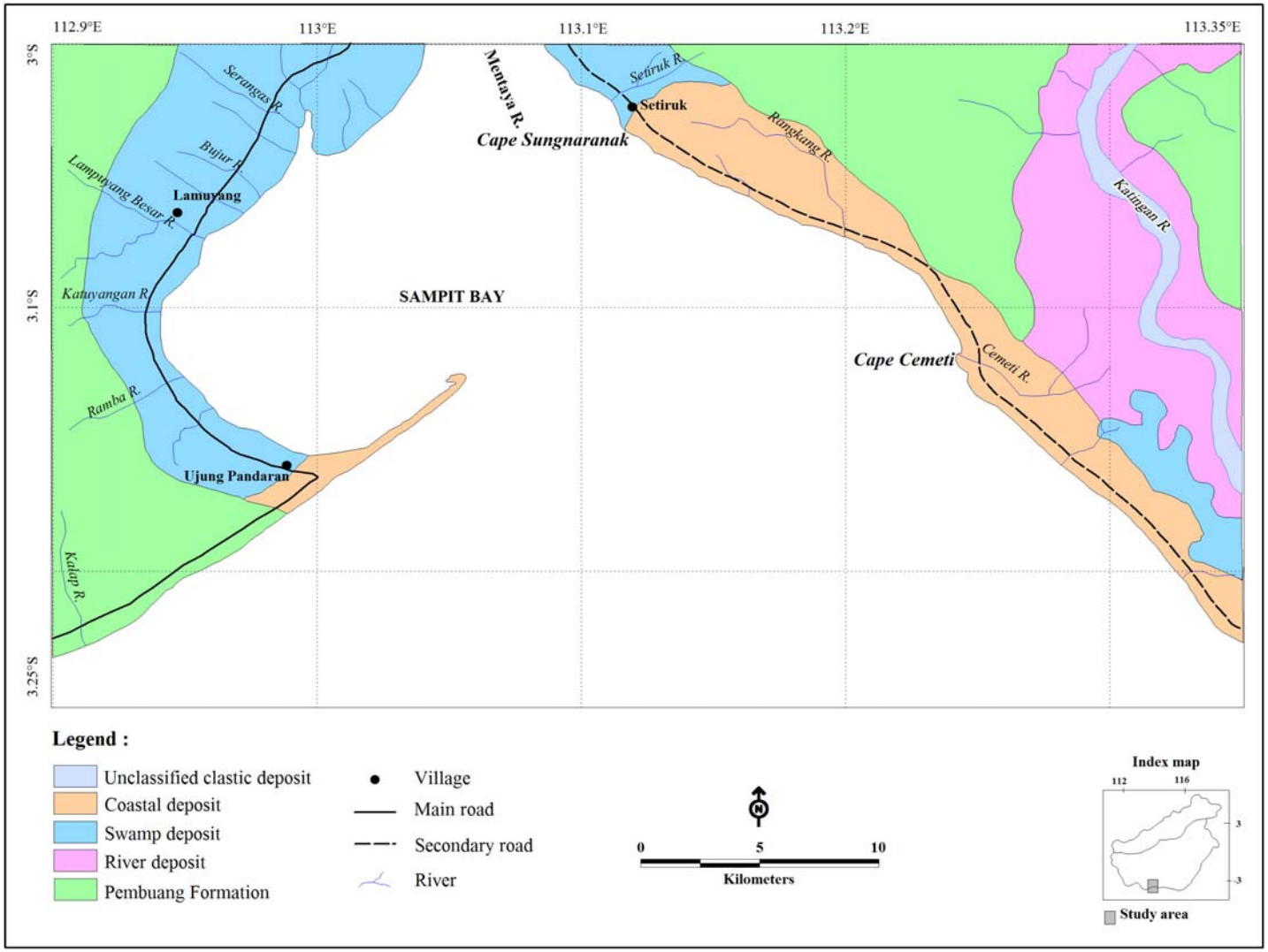

Figure 1. Geological map of the Sampit Area (Surono et.al., 1995)

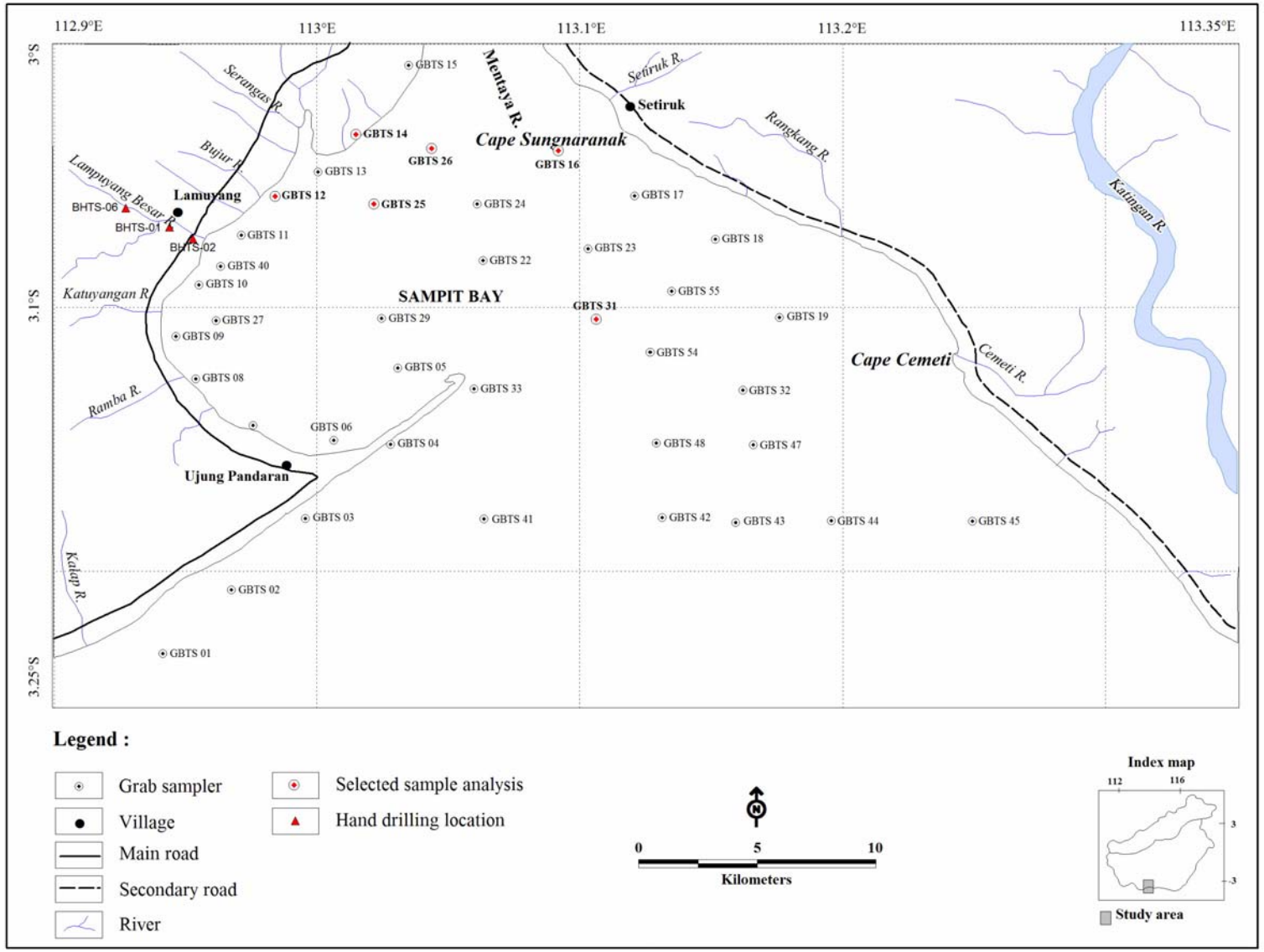

Figure 2. Sample location map of the Sampit Bay

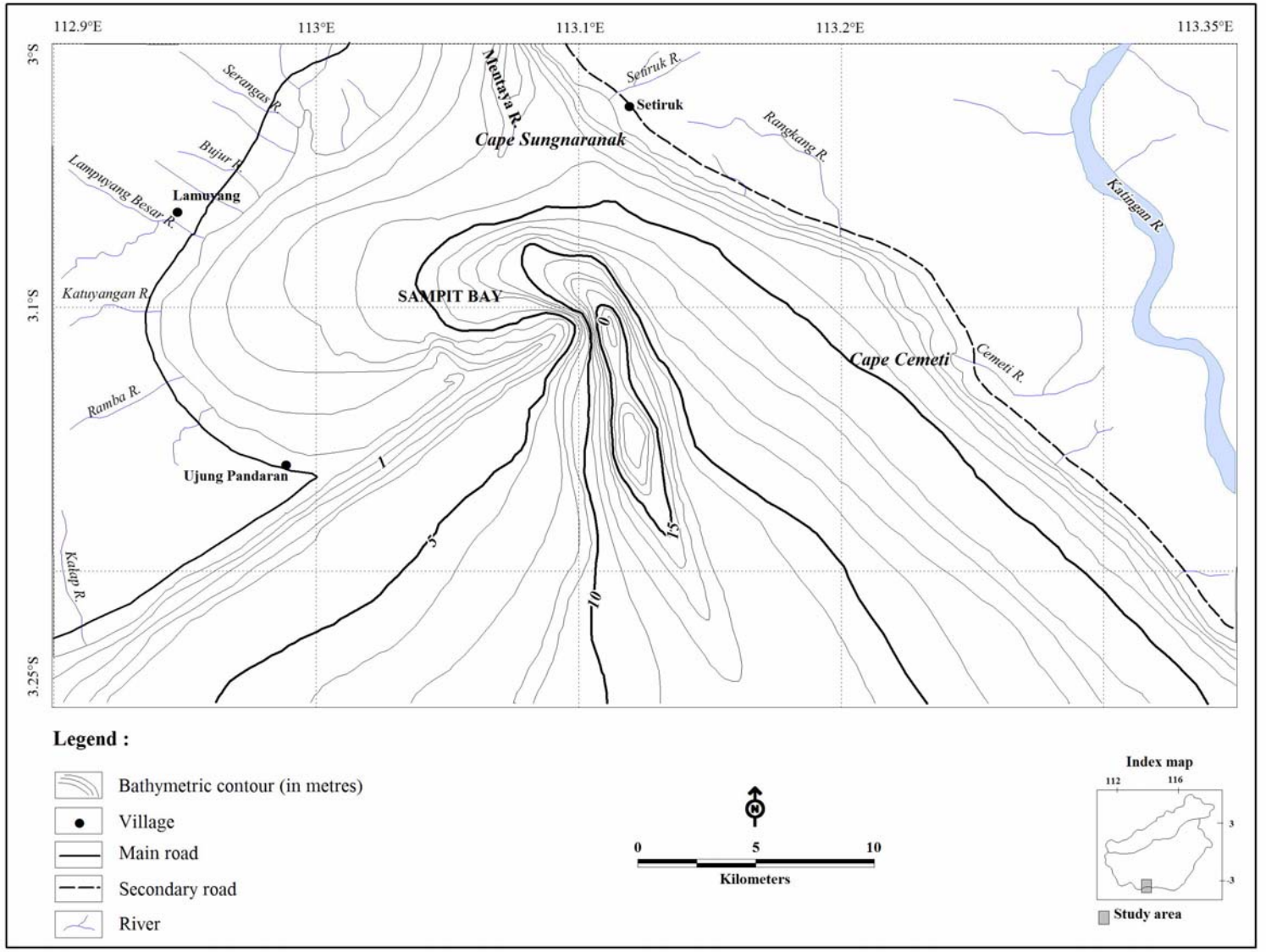

Figure 3. Bathymetric map of the Sampit Bay

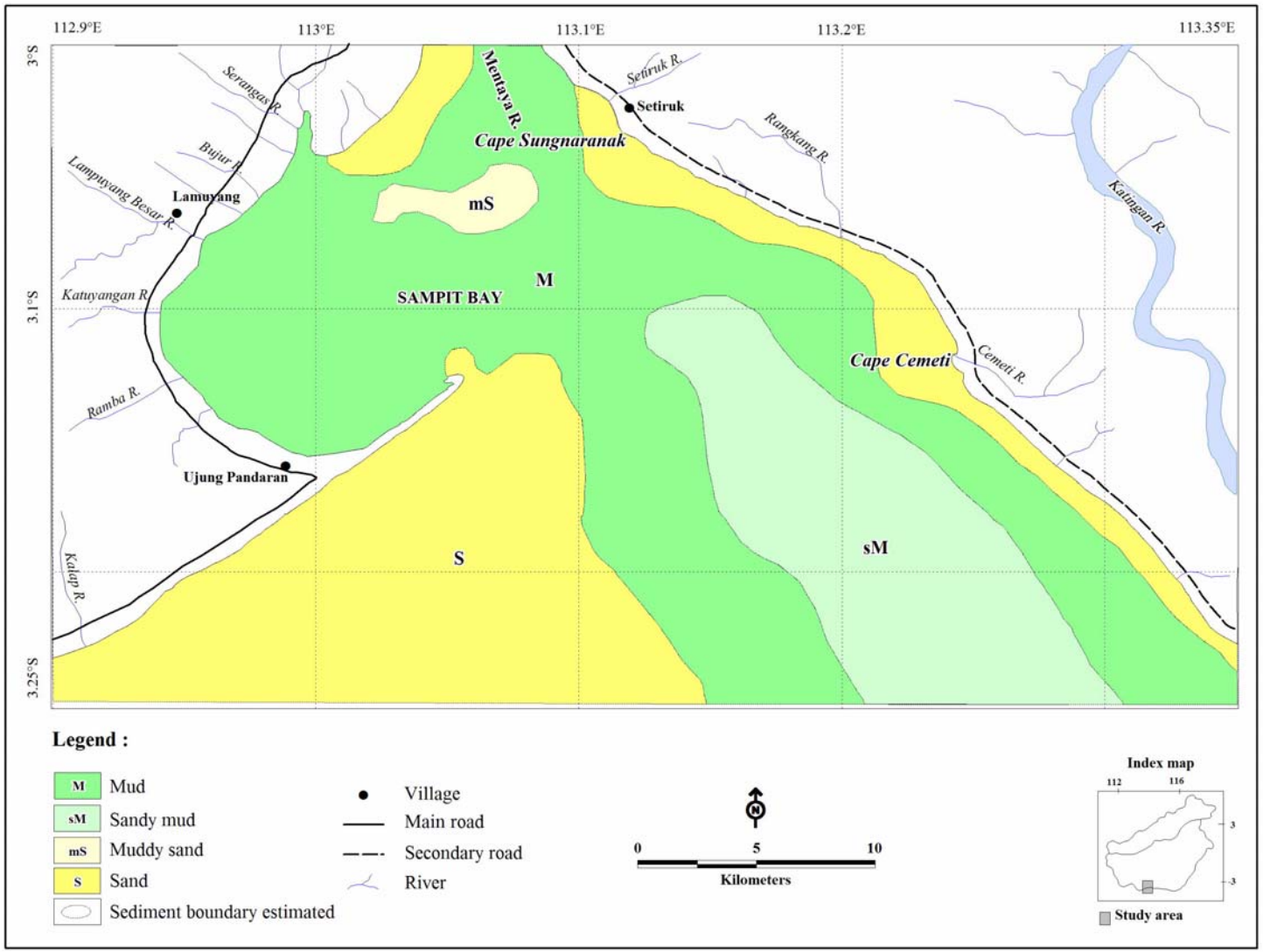

Figure 4. Sea floor surfacial sediment map of Sampit Bay

contains of fine particles of remnant plant or organic materials.

Sandy mud (sM)

This sediment unit has the smallest distribution and located at from the middle part toward the south eastern part of the study area, fine-grained sand, light brown mud, muscovite <2 mm size, containing mollusk shells of fine to coarse sand.

Muddy sand (mS)

Distribution of this sedimentary unit occupy smallest area located at the middle of study area, close to Seranggas River, depths ranging from 5 to 18 meters. This sediment unit is light brown, black minerals and some fragments of mollusk shells, less than 3 mm size.

Sand (S)

Sand unit is occupied in the west side of Sampit Bay, along the east coast and the northwest of the study area. Physical properties of sand deposits are not the same in all locations, visible from the deposits of sand that occupies the western part of the river and estuary on the east coast of study area, fine to medium grain, light brown to brown grayish, contains of quartz, black minerals, well sorted, rounded to sub-rounded grain. The western side, the type of sand which occupies the southwestern region of east Ujung Pandaran, consisting of medium - coarse sand, yellowish brown, contains of quartz, poor sorted, angular to sub-angular, also founded mollusk shells fragments.

Based on the sand composition in this area, it is probably derived from sandstone layers of Pambuang Formation. That exposed in the cliff coast and eroded by the waves energy, which is strike the coast and deposited along the shore and offshore area by long shore current.

Over laying of bathymetry and seafloor surfacial sediment map, will be give features that certain types of sediments located at a certain depth (Figure 5). Sand sediments in the north and east of the study area is spread at 1 to 2 meters water depth, while in the south and southwest scattered from 1 to 10 meters water depth. Mud is encountered at 1 to 10 meters water depth, while the sandy mud found at 2-6 meters water depth. Muddy sand found at 2 to 5 meters water depth, located at the mouth of Mentaya River estuary

Fluvial Deposit

Fluvial sediment was deposited from land up to the coastal area at sites BHTS-06 (6.10 meters hand drilling depth), BHTS-01 (6.80 meters) and BHT0 2 (7.20 meters) that can be described as follows :

Fluvial deposit consists of loose sand, light yellow to light gray, medium to coarse grain, sub-rounded to angular, poor sorted, dominated by quartz, also found the iron oxide, and kaolinite. Fluvial sediment at BHTS -06 was found from 5.40 to 6.10 meters depth. While at BHTS-01 from 6.4 to 6.80 meters depth.(Lugra, et al.,1997).

The section distribution of fluvial sediment from land to the nearshore, it will show the existence of fluvial sediment more shallowest as long as profile of topographic changes (Figure 6).

Gold and silver.

Six sediment samples were selected for gold and silver analysis from mud, very fine sand, sandy mud, and muddy sand as that representative of the study area.

The results of AAS analysis, show that the indications of gold and silver placer deposit, have varied contents (Table1).

Based on gold and silver analysis (Table 1), it indicates that highest silver and gold content are in the sample GBTS-31. It is located at the mouth estuary of the Mentaya River (0.096 ppm) and silver (2.284 ppm), in sandy mud sediment type, at 3.1 meter water depth and about 1,250 meters from the nearest coastline.

Table 1. The results of geochemical analysis

No.	SAMPLE NUMBER	GOLD CONTENT (ppm)	SILVER CONTENT (ppm)	SEDIMENT TYPE	Sea floor depth/distance from nearest shore line (meters)
1.	GBTS-12	0.068	2.196	Mud	1.05/500
2.	GBTS-14	0.025	1.366	Very fine sand	1.07/320
3.	GBTS-16	0.057	1.421	Very fine sand	1.18/410
4.	GBTS-25	0.041	0.860	Sandy mud	2.49/3,000
5.	GBTS-26	0.053	1.401	Very fine sand	2.41/3,250
6.	GBTS-31	0.096	2.284	Muddy sand	3.10/1,250

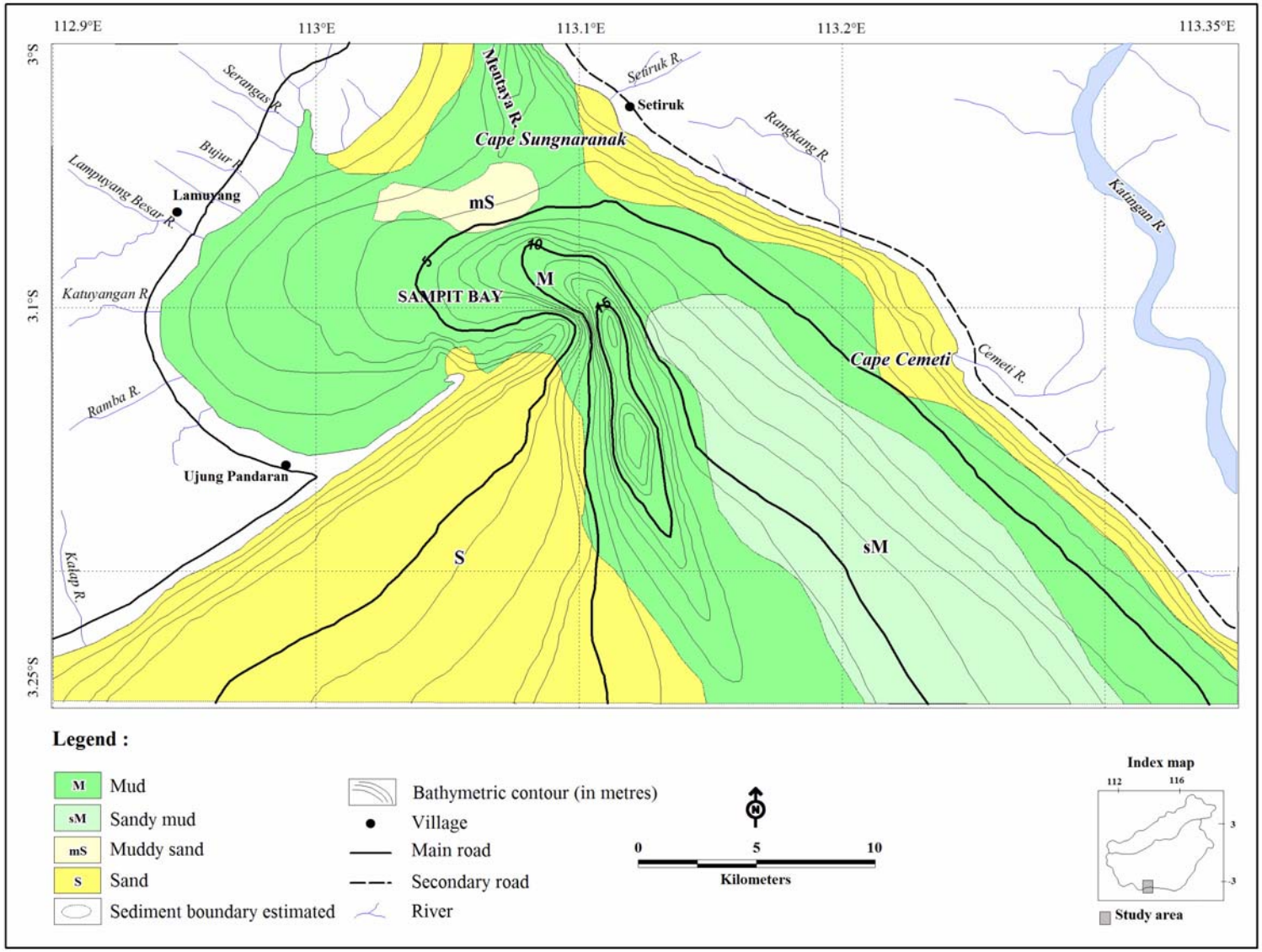

Figure 5. Overlaying bathymetric and sea floor surfacial sediment map of Sampit Bay

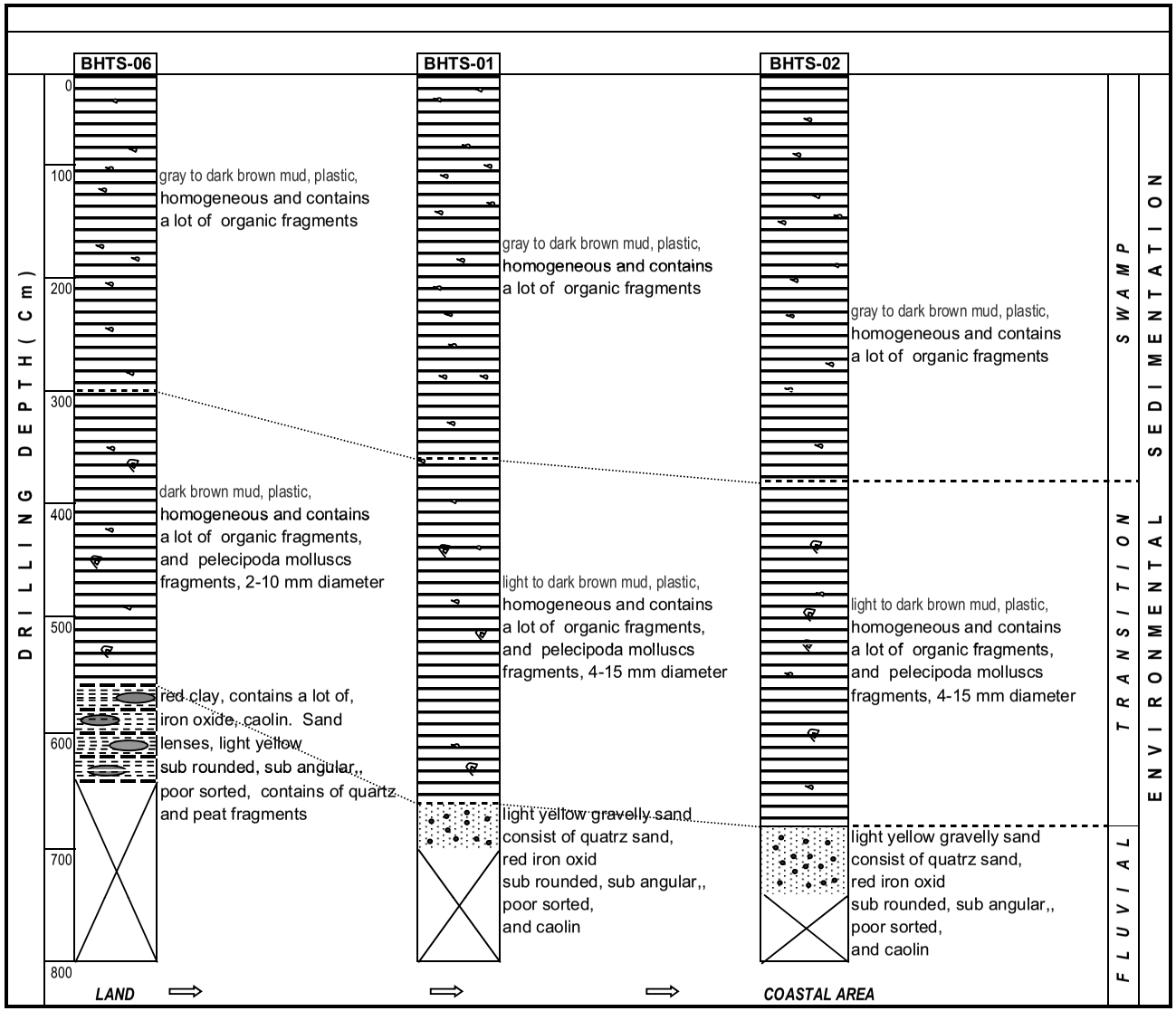

Figure 6. Profile of hand drilling from land to the coastal area of Sampit Bay

Whereas the lowest of gold content found at sample GBTS-14 (0.025 ppm), in very fine sand, located at the west mouth of Mentaya River, at 1.0 meters water depth, about 320 meters from the nearest coastline.

The lowest silver content at GBTS-25 is about 0.860 ppm, in muddy sand sediment types at 2.49 meters water depths and 3,000 meters from the nearest coastline.

DISCUSSION

Pembuang Formation has a wide distribution in the west of Sampit Bay , and continued to the north, turning to east at the north of Sampit Bay, and notched by Mentaya River and tributaries.

Gold that was deposited in Sampit Bay, may derived from the weathering of fluvial sediment of Pambuang Formation that is composed of calcareous sandstone, conglomerates, silt, clay and peat. Calcareous sandstone coarse-medium grained, consist of F-feldspar, carbon and biotite. While the conglomerates composed by various materials, especially quartz, calcite and sandstone.

Unconsolidated sandstone, fine- medium grained. This formation is deposited by traction currents mechanism and suspended in the fluvial environment, namely woven river and meandering river, includes 3 cycles and estimated sedimentation was Pleistocene.

The weathering of these formations transported by rivers empties at Sampit Bay, and deposited in the bay because it was blocked by tidal flow system.

Pembuang Formation was deposited in fluviatile environment as of gold deposits (gold placer). because about 20 km to the north of Sampit Bay, there is large enough gold traditional mining.

The mine area has a similarity geological environment with Sampit Bay . Stratigraphy of this area was initiated by lava unit and alternated by volcanic breccia Dahor Formations consist of conglomerate brownish black, commposed by quartzite and basalt fragments, 1-3 cm diameter size, with sand-sized matrix.

Alternating with sandstone, yellowish to gray colored, medium to coarse grained, locally interfingering sediment structure. Claystone gray color, slightly soft, calcareous locally containing lignite, outcropping as inserts in sandstone with 20-60 cm thickness. This formation is estimated Middle Miocene-Pleistocene, with 300 meters thickness was deposited in terrestrial environments (Nila et al.,1995).

Fluviatile sediment in the Sampit Bay, may be more shallow than onland. This can be observed from the results of samples analysis that was taken by using hand drill. Toward the coastal area, the existence of fluviatile sediment more shallow, according to the tophographic changes, therefore its predicted at sea will be more shallow, or might be even have been as seafloor

Another evidence could support the statement is the rather high gold content in samples GBTS-31, located at 3 meters water depth.

From explanation above, it can be concluded that the indications of gold deposits in the Sampit Bay are strong enough by discovered the gold content is 0.096 grams/ton, and silver content 2.26 grams/ton. This refers to Wolfe (1994, in Kurnio, et al., 1996)) which states that the gold content of 1 g/ton in volume of 40 million cubic meters has an economical concentration.

CONCLUSIONS

The surficial sediment of the study area consist of mud, sandy mud, muddy sand and sand.

The fluviatile sediment consists of loose sand, soft yellow until pale gray colored, iron oxide, and kaolinite, that is spreading more shallow to the sea.

The highest gold and silver content are found in sample GCTS-51 located at east of mouth Mentaya River, (0.086 grams of gold/ton) and silver 2.284 grams / ton, the type of sediment sandy mud, at about 3.1 meters water depths, and 1250 meters from the coastline. Whereas the lowest of gold content in samples GBTS -14, is 0.025 g / ton founded in very fine sand sediment, located at west mouth of Mentaya River, at about 1.0 meters water depth and 320 meters from the coastline.

Lowest silver content found at samples GBTS 25, (0.860 g/ton), in muddy sand sediment type, located at 2.49 meters water depth and 3,000 meters from the nearest coastline.

Resources of gold placer are estimated from Pembuang Formation weathered, which has a wide distribution in the west and north of Sampit Bay and transported by Menatara River and tributaries.

Indication of gold deposits in Sampit Bay is quite strong, with the discovery of the gold content of 0.086 grams/ton silver and 2.26 grams/ton this refers to Wolfe, 1994 (in Kurnio et al, 1996), which states that the gold content of 1 g/ton in volume of 40 million cubic meters materials have been economical concentration.

To get a better maximum features the indication of gold placer at Sampit Bay, it is necessary to analysis all sediment samples that was taken during survey.

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