GEOPHYSICAL PROSPECTING ON COAL DEPOSIT AT PARAMBAHAN AREA,WEST SUMATERA

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ABSTRACT

Changing coal mine method from open to underground mines needs preparing new data such as the type and the thickness of rocks as overburden on coal seam. Geophysical prospecting method is chosen to gather such the data. Based on 30 point measurements and compilated by regional geological data, it was assumed that the rocks at Parambahan area contained top soil, alternating beds of sand, silt and weathered clay, alternating beds of sand, silt and massive clay, coally clay and massive sand stone.

Key words : prospecting, resistivity coal deposit.

1. INTRODUCTION

Coal mining in Indonesia will changes from open pit to underground. Referring to such a condition, Parambahan area which has a number of coal seam will be mined by underground method. However no information regarding rock condition available (PT. Allied Indo Coal and Team, 1988). Therefore, it needs prospecting the area to estimate geological condition there. Geophyisical method is the way to get information fast at Parambahan area.

According to regional geology, Parambahan is included into Ombilin basin that is formed in Early Palaeosen by forming Ombilin basin at the beginning. Other formations such as Silungkang, Kuantan and Ombilin formations dominate Parambahan area. The consist of micaceous quartz sandstone intercalated with arcose, clayey shale, quartz conglomerate and coal (Silitonga and Kastowo, 1995). The sediment rocks generally consist of clays, siltstone, coaly clay, sandstone and coal (Figure 1).

2. METHOD OF STUDY

Instrument to measure field resistivity was ABEM type SAS.300. The team made 3 measuring lines containing 30 measuring points. The data were processed by matching curve method. Figure 2 illustrates the flow chart of study method.

3. RESULT AND DISCUSSION

Table 1 and 2 show the resistivity either derived from the field (true resistivity) or calculated at the base camp (apparent resistivity). Results indicate that apparent resistivity (ð) value difference is not so far and matches with a number of layers. Spacing current electrode (AB/2) are used between 1.50 to 250 m and potencial electrode (MN/2) 0.5 to 25 m. Δv is significantly changed as a result of tool measuring. Figure 3a and 3b exhibit apparent resistivity after matching method.

Resistivity sounding have been conducted at 30 points which is divided into 3 measuring lines. Every line consist of 10 sounding points. Resistivity data have been compiled with the regional geological and borehole data. Resistivity sounding values at line 1 varies at each sounding depth. The apparent resisitivity values of 9.28 - 42.16 ohm m are assumed the top soil; followed by alterna- ting bed of sand, silt and weathered clay (35.60 - 193.43 ohm m), alternating into beds of sand, silt and massive clay (59.28 - 139.80 ohm m), alternating beds of sand, silt and coaly clay

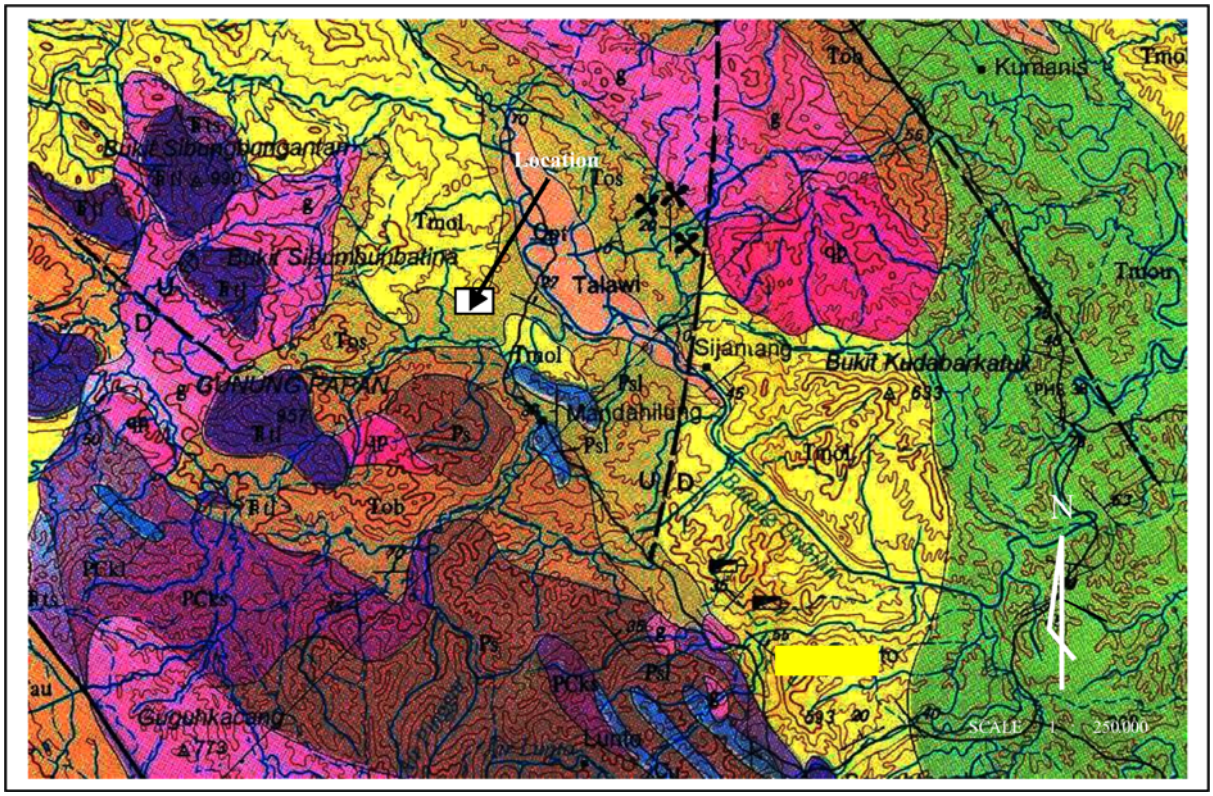


Figure 1. The location map of Parambahan, West Sumatera

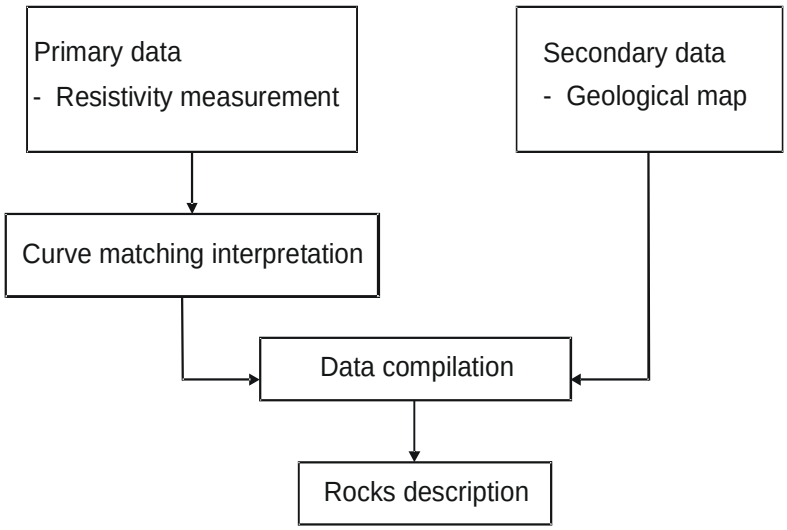


Figure 2. Schema of methodology used

Table 1. Vertical electric or electrical sounding

VES No : 1 Researcher : Equipment : ABEM TERAMATER SAS 300'C
Direction : Date : Method : Schlumberger

No	AB/2 (m)	MN/2 (m)	K	ΔV/I (ohm)	Apparent Resistivity (ohm.m)	True Resistivity (ohm.m)
1	1.50	0.5	6.28	3.18	19.98	19.98
2	2.00	0.5	11.78	2.00	23.56	50.94
3	2.5	0.5	18.85	1.44	27.11	68.24
4	4	0.5	49.48	0.70	34.88	66.78
5	5	0.5	77.75	0.54	42.07	239.77
6	7	0.5	153.15	0.37	56.21	351.90
7	9	0.5	253.68	0.26	64.76	138.49
8	10	0.5	313.37	0.22	70.01	258.93
9	9	2.5	46.97	1.55	72.84	72.84
10	10	2.5	58.90	1.18	69.72	50.32
11	15	2.5	137.44	0.58	79.72	111.79
12	20	2.5	247.40	0.42	103.91	1158.56
13	25	2.5	388.77	0.23	90.31	59.28
14	30	2.5	561.56	0.15	84.23	63.02
15	40	2.5	1001.38	0.09	90.12	114.04
16	50	2.5	1566.87	0.07	109.68	832.02
17	40	10	235.62	0.38	88.67	88.67
18	50	10	376.99	0.26	98.02	169.52
19	60	10	549.78	0.21	115.45	1041.07
20	80	10	989.60	0.12	120.50	138.70
21	100	10	1555.09	0.08	121.67	126.59
22	80	25	362.85	0.34	122.01	122.01
23	100	25	589.05	0.21	120.97	116.98
24	150	25	1374.45	0.08	109.96	93.03
25	200	25	2474.00	0.05	123.70	197.88
26	250	25	3887.72	0.04	150.08	1021.17

VES = Vertical Electrical / Electric Sounding

(35.39 - 340.04 ohm m) and massive sand (36.0 - 850 ohm m) as shown in Figure 3c.

Line 2 is assumed to have top soil (13.30 - 488.80 ohm m), alternating beds of sand, silt and wheatered clay (60.07 - 321.71 ohm m); alternating sand, silt and massive clay (9.75 - 110.66 ohm m); alternating beds of sand, silt and coaly clay (23.03 - 250.11 ohm m) and massive sand (11.6 - 560 ohm m) as shown in Figure 3d.

Line 3 is top soil (12.32 - 2971.95 ohm m); alternating beds of sand, silt and wheatered clay (19.22 - 659.91 ohm m); alternating beds of sand, silt and massive clay (17.11 - 645.75 ohm m); alternating beds of sand, silt and coaly clay (26. 05 - 580.55 ohm m) and massive sand (4.8 - 1440 ohm m) as shown in Figure 3e.

Based on the resistivity of three-line measurement, it is assumed that the area has 5 layers namely top soil, alternating beds of sand-silt-clay (3 layers) and massive sand. Top soils are 0.8 - 2.5 m in depth; sand-silt-wheatered clay are 2 - 15 m in depth. The sand-silt-massive clay is 2 - 50 m while the sand-silt-coaly clay is 23 - 103 m. The massive sand is more than 100 meter. The average thickness of top soil is 1.7 m, sand-silt-coaly clay is 57.4 m and the massive sand is more than 140.74 m.

Table 2. Vertical electric or electrical sounding

VES No : 10 Researcher : Equipment : ABEM TERAMATER SAS 300'C
Direction : Date : Method : Schlumberger

No	AB/2 (m)	MN/2 (m)	K	ΔV/I (ohm)	Apparent Resistivity (ohm.m)	True Resistivity (ohm.m)
1	1.50	0.5	6.28	3.68	23.12	23.12
2	2.00	0.5	11.78	2.33	27.45	62.65
3	2.50	0.5	18.85	1.73	32.61	131.45
4	4	0.5	49.48	0.77	38.10	52.96
5	5	0.5	77.75	0.57	44.24	124.49
6	7	0.5	153.15	0.34	51.46	86.93
7	9	0.5	253.68	0.23	57.59	98.77
8	10	0.5	313.37	0.18	57.03	52.44
9	9	2.5	46.97	1.19	55.68	55.68
10	10	2.5	58.90	0.95	56.23	61.72
11	15	2.5	137.44	0.37	50.85	42.68
12	20	2.5	247.40	0.21	51.95	55.56
13	25	2.5	388.77	0.15	58.32	114.46
14	30	2.5	561.56	0.11	61.77	87.71
15	40	2.5	1001.38	0.07	70.11	117.84
16	50	2.5	1566.87	0.05	75.31	107.08
17	40	10	235.62	0.31	73.04	73.04
18	50	10	376.99	0.21	77.69	104.23
19	60	10	549.78	0.15	82.47	119.11
20	80	10	989.60	0.09	89.06	117.14
21	100	10	1555.09	0.05	77.75	51.56
22	80	25	362.85	0.21	75.97	75.97
23	100	25	589.05	0.06	35.34	11.26
24	150	25	1374.45	0.04	48.72	200.67
25	200	25	2474.00	0.02	60.08	199.94
26	250	25	3887.72	0.01	56.65	46.12

VES = Vertical Electrical / Electric Sounding

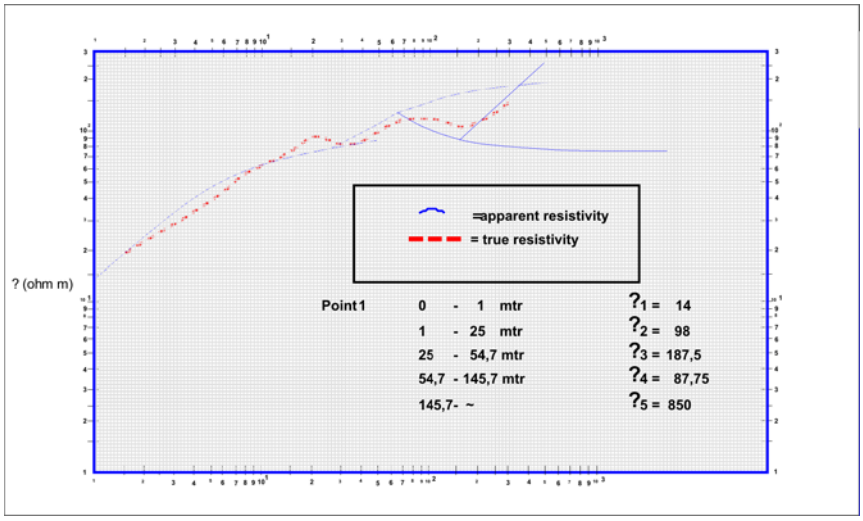


Figure 3a. Apparent resistivity curve

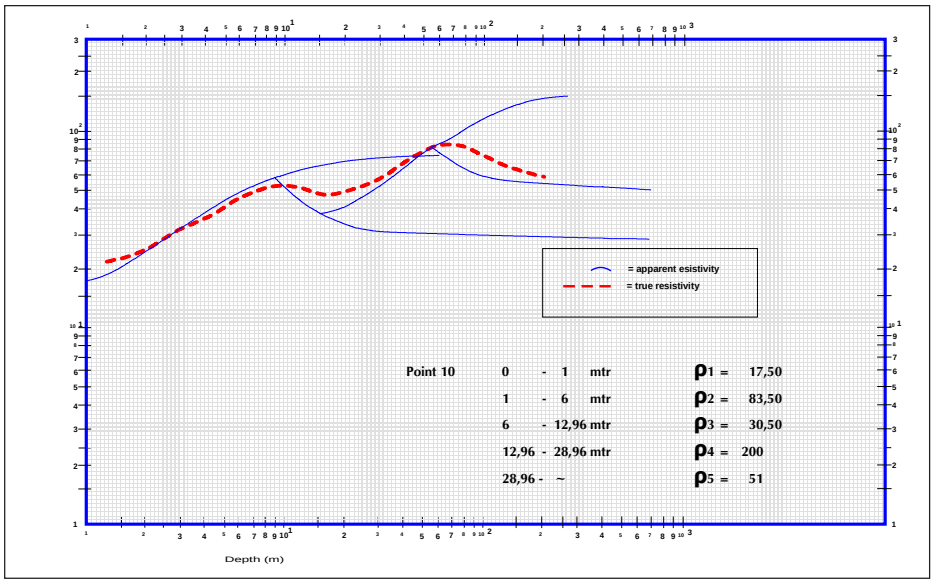
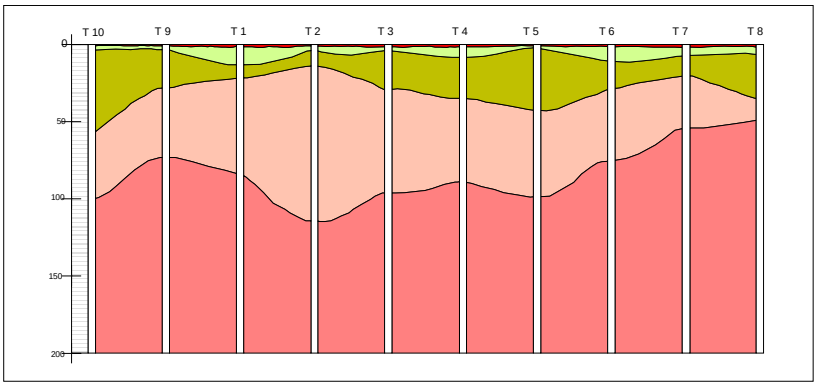
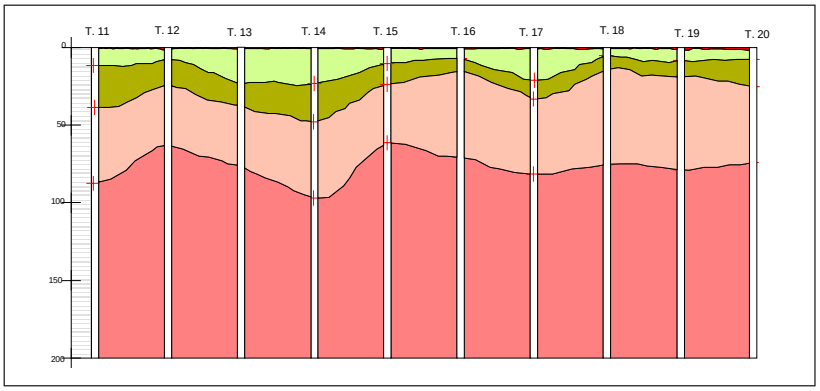


Figure 3b. Apparent resistivity curve



1. 19,28 O - 42,16 O
2. 35,60 O - 193,43 O
3. 59,28 O - 139,80 O
4. 35,39 O - 340,04 O
5. 38 O - 850 O

Figure 3c. First line resistivity cross section



1. 13,30 O - 488,89 O
2. 60,07 O - 321,71 O
3. 9,75 O - 110,66 O
4. 23,03 O - 250,11 O
5. 11,6 O - 560 O

Figure 3d. Second line resistivity cross section

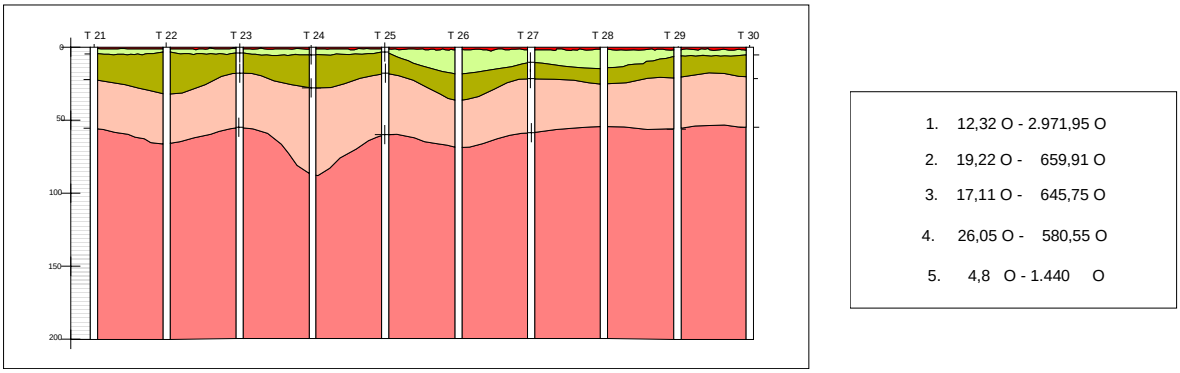


Figure 3e. Third line resistivity cross section

Note :

- Top Soil
- Alternating bed of sand, silt, weathered clay
- Alternating bed of sand, silt, massive clay
- Alternating bed of sand, silt, coaly clay
- Massive sand

4. CONCLUSION

Parambahan area is characterized by 5 rock layers, namely, top soil, alternating beds of sand, silt sand wheatered clay, alternating bads of sand, silt and massive clay, alternating beds of sand, silt and coaly clay and massive sand.

Every rock layer varies in depth, for examples the 0 - 2.5 m of top soil, 2 - 15 m of alternating beds of sand, silt and wheatered clay, 2 - 50 m of alternating beds of sand, silt and massive clay, 23 - 103 m of alternating beds of sand, silt and coaly clay and over 100 m of massive sand. The average thickness of top soil, alternating beds of sand - silt - wheatered clay, alternating beds of sand - silt - massive clay, alternating beds of sand - silt - coaly clay and massive sand are respectively 1.7 m, 12.6 m, 23.15 m, 57.4 m and 140.74 m.

It is suggested conducting drilling activities using a space distance less than a 100 m to confirm the geo-electric survei results.

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