

REPORT ON
HYDROGEOLOGICAL STUDIES AND GEOPHYSICAL
INVESTIGATIONS OF SITING FOUR (4) No. BOREHOLE
FOR MECHANISATION
AT
AFRCAN MINERALS WORK SITE, FERENGBEYAH-
TONKOLILI DISTRICT

Prepared by:

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DECEMBER, 2010

1. INTRODUCTION

African Minerals Limited Work Site is located at Ferengbeya in the Tonkolili District of the Northern part of Sierra Leone. The authorities in charge of the Mines Site want to explore the possibility of getting good source of groundwater for both commercial and domestic use.

In the quest to search for sustainable aquifer, the authorities of the site engaged Edal Consult & Drilling Company Limited to undertake Hydrogeological Studies and geophysical investigations of four (4) No. borehole at the site.

The studies were, among others, to provide enough data and information to be used in assessing the possibility of striking fresh underground water in the alternative of a borehole at the site. This report documents the work carried out at the site between December 3, 2010 and December 4, 2010

2. BACKGROUND OF THE STUDY AREA

Background information was obtained by means of a study consisting of the acquisition of previous work (Geophysics, Drilling logs, Geo-electrical logs of the area) carried out in and around the study area, geological and Topographical Maps of the area. Based on that, a siting strategy was deployed.

Geologically, the area is composed of the Kambui Group which is Amphibolite grade Archean greenstones comprising metasediments including banded iron formation, mafic volcanics and ultramafic Schists.

Hydrogeologically, the greenstone belt of this formation is interpreted to hold good to reasonable yield prospectivity.

3. FIELD WORK

3.1 Field Reconnaissance Survey

The aim of the reconnaissance survey was to select target areas for geophysical survey. The field reconnaissance survey was undertaken together with Mr. Peter Erasmus (S.A), few hours before the survey, and the activities that were carried out involved;

- ◆ Geomorphologic survey of areas not identified during desk study but could be significant in hydrogeological studies; and
- ◆ Demarcation of area for traverse lines for geophysical survey.

3.1.1 Selection of Traverse Lines

Traverse lines were run on the basis of geomorphologic and physical features such as vegetation, stream direction as well as any significant hydrogeological features encountered in the premises. The traverse lines were perpendicular to the major strike direction of the geological formation of the area.

Four (4) traverse lines were run in the NE-SW and NW-SE direction. The rationale behind the selection of these traversing trends was to intercept the major trends of NW-SE and NE-SW fractures in the area.

3.2 Geophysical Survey

The Geophysical survey consisted mainly of Electrical Resistivity Profiling and Vertical Electrical Sounding (VES) using SAS 1000/4000 DZD 6A Multifunction Electrical meter.

3.2.1 Resistivity Profiling

Resistivity Profiling were carried out along the traverse lines using the recommended Schlumberger configuration. Two depths of 19m and 40m were investigated, using the electrode separations of (L/2, a/2) given by 19m, 0.5m and (40m, 5.0m). The electrode separations (19m, 0.5m) and (40m, 5.0m) were assumed to probe the weathered layer and Bed rock respectively (WRRI, 1994).

3.2.2 Selection of VES Points

The profiling results were plotted on a linear scale, and preliminary interpretation was done on the field to select the best anomalous points for Vertical Electrical Sounding (VES). The VES points were restricted to areas where relatively lower apparent resistivities were recorded on the horizontal profile.

Seven (7) anomaly points were selected altogether for VES on the four profile lines. The VES points are marked with inscription on pegs at the various sites.

3.2.3 Vertical Electrical Sounding (VES)

Vertical Electrical Sounding (VES) was carried out with the aim of determining the formation resistivities and the depth to bedrock, as well as finding the possibility of obtaining fracture at depth the sounding points.

The Schlumberger electrode configuration and the expanding procedure were used for the VES. Data control was ensured by plotting the VES results on the field as VES measurements were in progress. Unreasonable values that registered high standard deviation (sd) greater than unity were rejected and sounding repeated at the same spot several times until reasonable values were recorded. Changing the position of the electrodes and varying the current input ensured this.

4. DATA ANALYSIS AND INTERPRETATION

4.1 Geophysical Survey

The electrical resistivity profiling results and its corresponding response curves are presented in Fig 1A---1D, while the Vertical Electrical Sounding results and corresponding curves are presented in Fig 2A---2G.

4.1.1 Resistivity Profiling

The interesting feature of resistivity profiling interpretation is the identification and selection of anomalous points or zones. On the average, the measured apparent resistivity values for the (19m, 0.5m) and (40m, 5.0m) were medium-high. Values ranging between 294 ohm-m and 171368 ohm-m, and averaging 80171ohm-m were recorded.

The general medium-high resistivity values recorded in the area could indicate shallow overburden thickness and slight weathering as well as fracture development conditions in the area. The groundwater potential in this is considered reasonable to high.

The measured apparent resistivity values range between 294 ohm-m and 17,1368 ohm-m with a mean of 80171 ohm-m for the (19m, 0.5m) separation. For the (40m, 5.0m) separation, the measured apparent resistivity values were in the range of 398 ohm-m and 5715ohm-m with a mean of 3438ohm-m. In general, high resistivity values were recorded with the (40m, 5.0m) than the (19m, 0.5m) separation along the traverse. Well-defined anomalous points of low resistivity values were selected for Vertical Electrical Sounding.

4.1.2 Vertical Electrical Sounding (VES)

Based on the results of the resistivity profiling, the points A30, B30, B90, C50, C100, D40 and D90m were selected for VES. The VES results and response curves at the points are presented respectively in Fig 2A----2G. The interpretation was carried out using the RESIST software/ GeoVES

4.2 Selection of Promising Points

The selected points for test drilling at AML Works Site been done by considering the thickness of the various layers of the subsurface structure and their corresponding apparent resistivity from the analyses of VES results as well as the behaviour of the anomalous points during the profiling.

Table 1: The rank list of VES points in order of preference for test drilling

RANK	VES POINTS	LAYER	DEPTH (m)	THICK-NESS (m)	APPARENT RESISTIVITY (Ohm-m)	POSSIBLE WATER ZONES (m)	TEST DRILLING RANKING	MAX DRILLING DEPTH (m)
1	A30/S1	1 2 3	0.5 7 -	0.5 6.5 -	140 3200 600 -	10-20 25-35	3 rd	60
2	B30/S2	1 2 3 4 5	0.5 6.0 7.0 9.0 -	0.5 5.5 1.0 2.0 -	1500 3400 500 40 800 -	10-20 30-45 55-65	1 st	70
3	B90/S3	1 2 3 4	0.6 5.6 6.6 -	0.6 5.0 1.0 -	70 2550 20 600 -	15-25 35-50	4 th	60
4	C50/S4	1 2 3 4	2.0 16.0 36.0 -	2.0 14.0 20.0 -	1100 7500 5000 1400 -	35-40 55-65	5 th	80
5	C100/S5	1 2 3 4	2.0 8.0 19.0 -	2.0 6.0 11.0 -	1100 815 3000 7400 -			
6	D40/S6	1 2 3 4	0.2 22.2 29.2 -	0.2 22.0 7.0 -	3000 8300 2100 80 -	30-40 50-60	6 th	70
7	D90/S7	1 2 3 4	0.5 14.5 34.5 -	0.5 14.0 20.0 -	2800 7500 5000 1000 -	35-50 60-75	2 nd	80

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Based on the analyses of the entire results, and in line with the aims of the study, the drawn conclusions are;

- ♣ the study area is composed of the Kambui Group
- ♣ the formation has undergone various degree of weathering which control groundwater occurrence and accumulation.
- ♣ Groundwater potential could be good - reasonable.

5.2 Recommendation

In this regard, it is recommended that,

- ♣ test drilling could be out at **B30/S2, D90/S7, A30/S1 & C50/S4** with the others as alternative to confirm the existence of aquifer system.
- ♣ the **maximum drilling depth** at this site should be **80m** below ground level. However, the supervisor may **exceed** or go **below** this depth based on the field conditions.
- ♣ both physico-chemical and bacteriological test should be carried out on the borehole water samples from completed well.

FIG 1A: Resistivity Profiling results and corresponding responds curves along Profile A

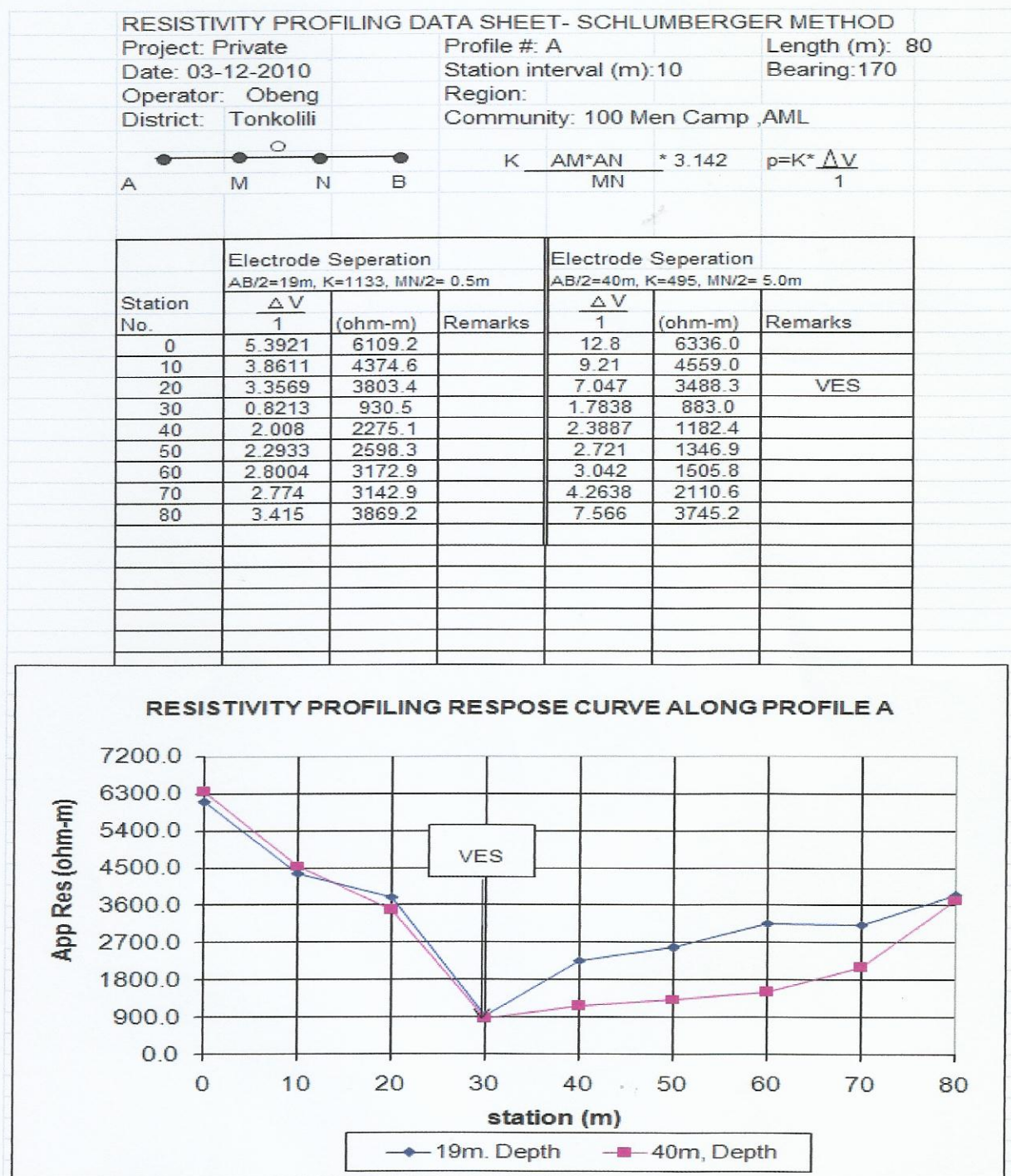


FIG 1B: Resistivity Profiling results and corresponding responds curves along Profile B

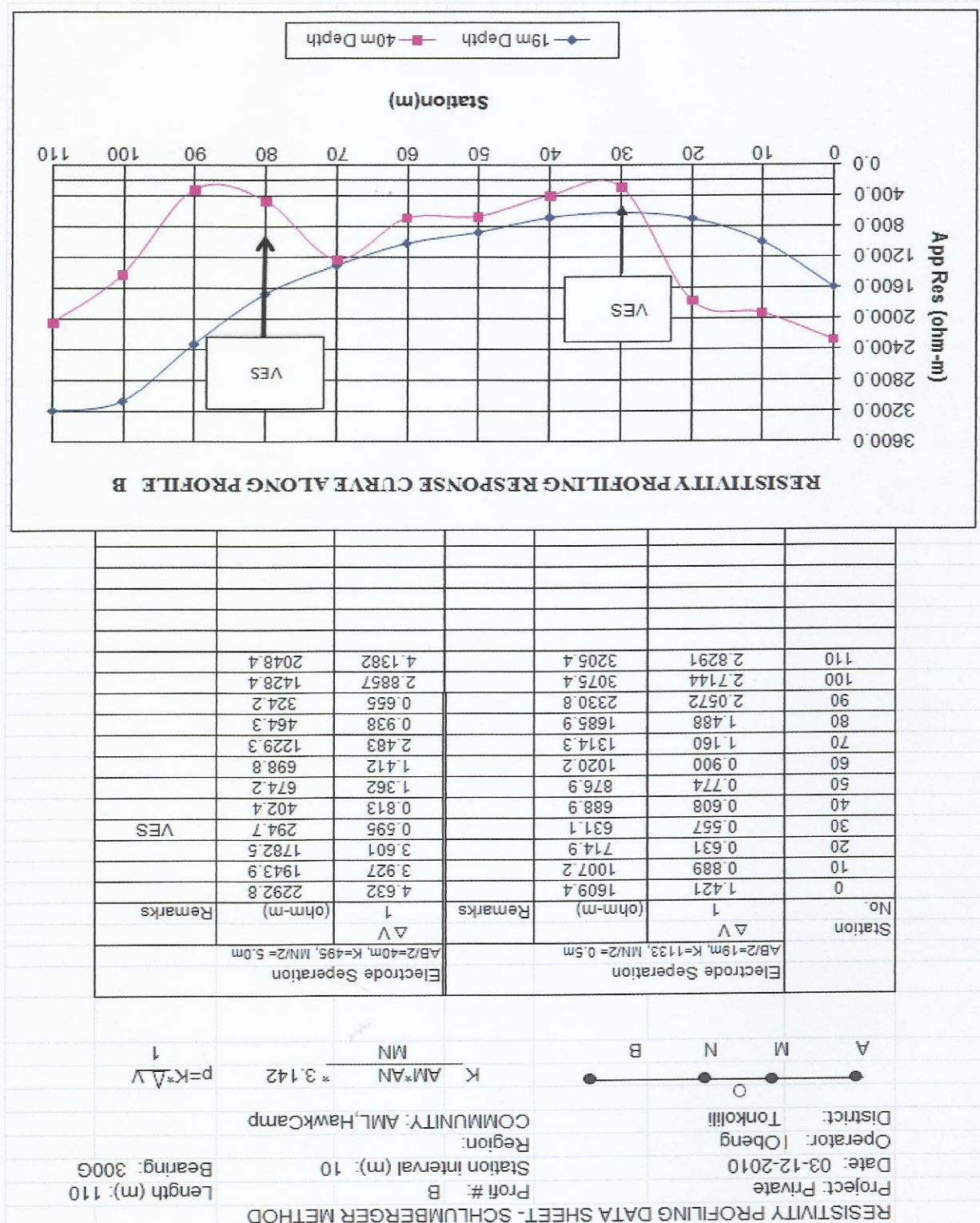
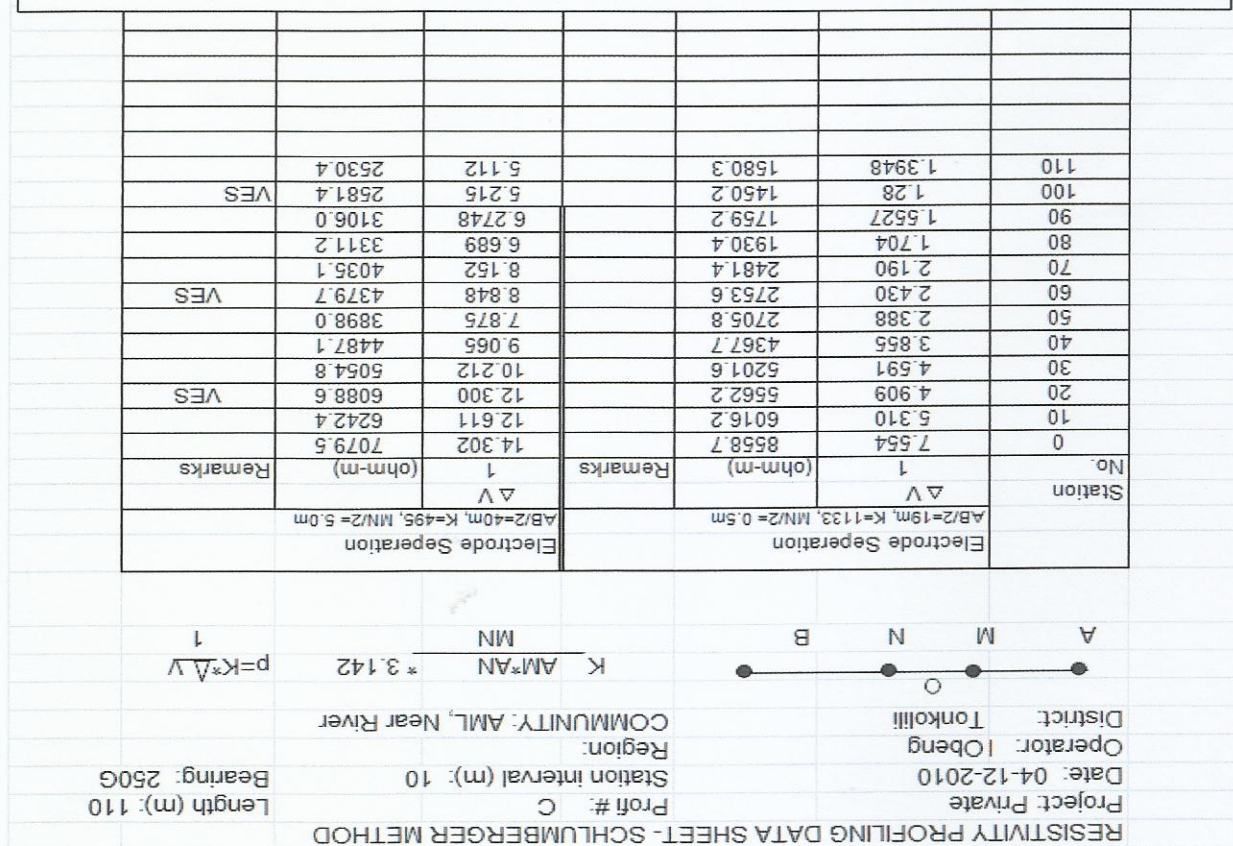


FIG 1C: Resistivity Profiling results and corresponding curves along Profile C



RESISTIVITY PROFILING RESPONSE CURVE ALONG PROFILE C

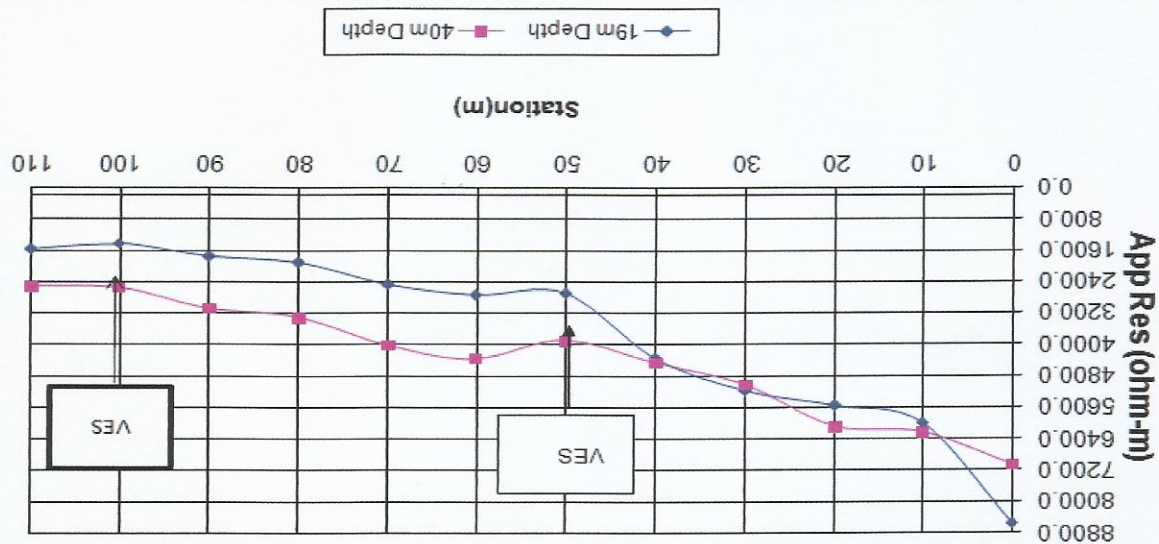
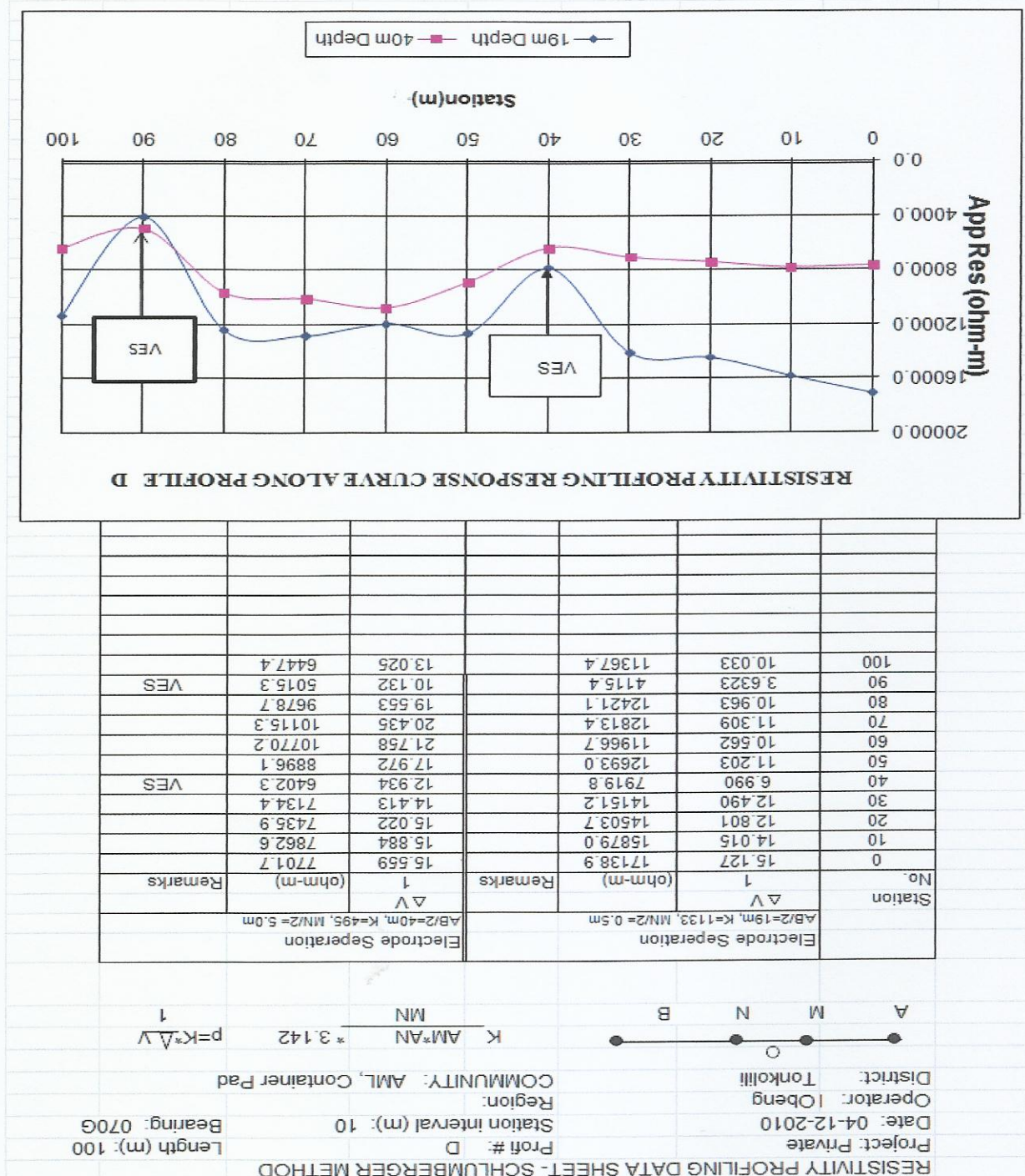


FIG 1D: Resistivity Profiling results and corresponding responses curves along Profile D



100 Men Camp, AML - A30/S1

[illegible]

Client : AML
 Project : Private
 District : Tonkolili
 Date : 03-12-2010
 Field Operator : Obeng
 Interpreted by : Obeng

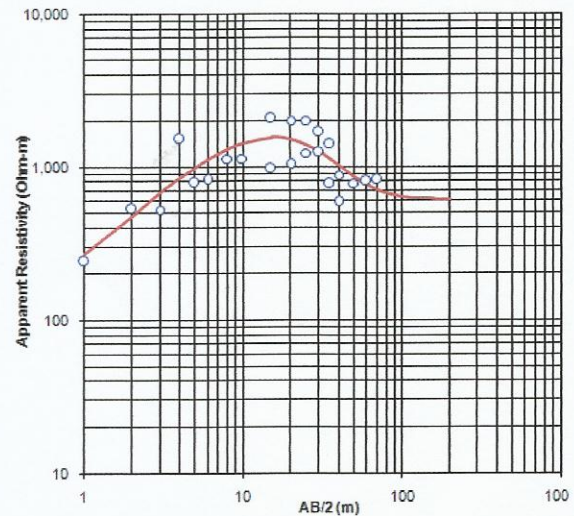
Community : 100 Men Camp, AML
 Sounding Number : A30/S1
 Coordinates East : 02.017.27
 Coordinates North : 99.500.89
 GPS Datum :
 Azimuth : 170

100 Men Camp, AML - A30/S1

GeoVES 1.3

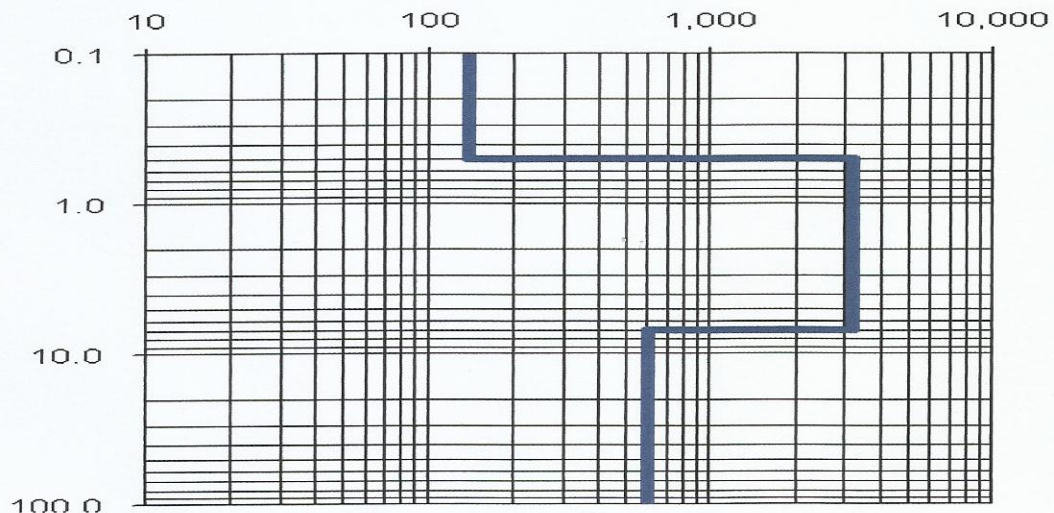
MS Excel based modelling of Vertical Electrical Soundings
 in the Schlumberger Array using Gosh linear filters

Data		Model		
AB/2 (m)	Measured Apparent Resistivity (Ohm-m)	Modelled Apparent Resistivity (Ohm-m)	Model Error	Included in Model (1=yes)
1.0	242.0	265	526	1
2.0	529.1	480	2,442	1
3.0	525.6	674	21,933	1
4.0	1524.5	841	488,823	1
5.0	786.5	985	39,310	1
6.0	817.6	1,107	83,802	1
8.0	1123.4	1,297	30,302	1
10.0	1122.5	1,426	92,177	1
15.0	961.7	1,549	344,698	1
20.0	1021.0	1,501	230,077	1
25.0	1222.8	1,382	25,430	1
30.0	1240.9	1,249	58	1
35.0	773.8	1,124	122,828	1
40.0	588.0	1,019	185,351	1
45.0	2082.9	1,549	285,249	1
50.0	2007.6	1,501	258,973	1
55.0	2006.9	1,382	390,219	1
60.0	1675.8	1,249	182,525	1
65.0	1399.4	1,124	75,634	1
70.0	882.2	1,019	18,580	1
75.0	775.4	864	7,769	1
80.0	804.3	788	1,347	1
85.0	822.9	710	12,831	1



Model Parameters						
Model Layer	Resistivity (Ohm-m)	Resistivity Range	Thickness (m)	Thickness Range	Depth (m)	Depth Range
1	140		0.5		0.5	
2	3200		6.5		7	
3	600					
4						
5						
6						
7						
8						

Geoelectrical Model



Hawk Camp, AML - B30/S2

[illegible]

Client : AML
 Project : Private
 District : Tonkolili
 Date : 03-12-2010
 Field Operator : Obeng
 Interpreted by : Obeng

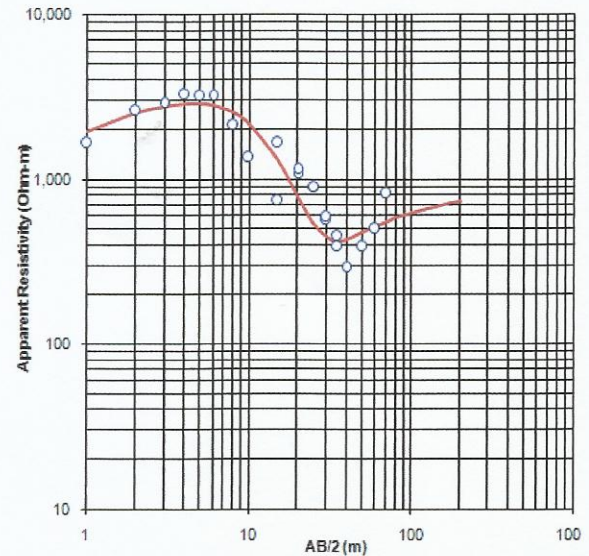
Community : Hawk Camp, AML
 Sounding Number : B30/S2
 Coordinates East : 02,023.06
 Coordinates North : 09,956.14
 GPS Datum :
 Azimuth : 300

Hawk Camp, AML - B30/S2

GeoVES 1.3

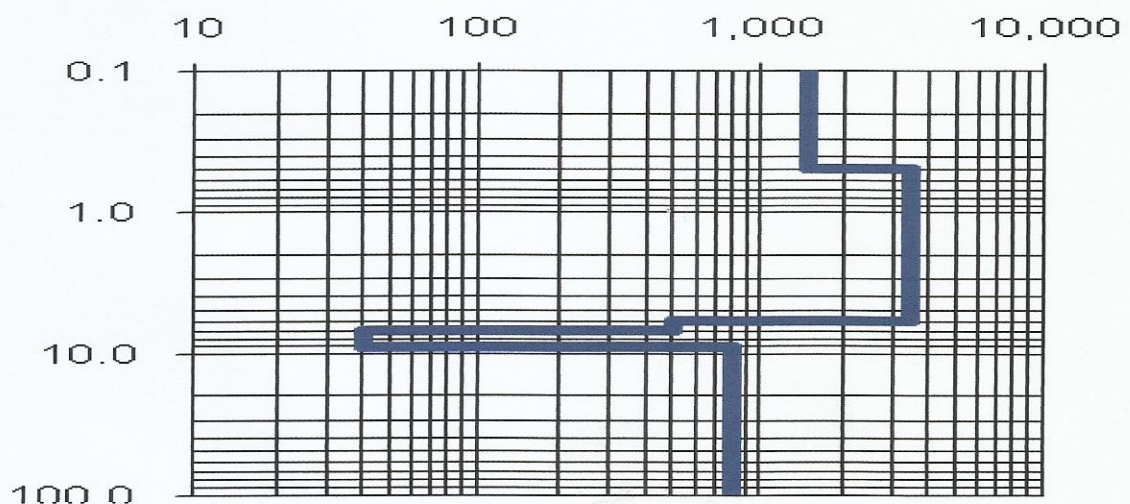
MS Excel based modelling of Vertical Electrical Soundings
 in the Schlumberger Array using Gosh linear filters

Data		Model		
AB/2 (m)	Measured Apparent Resistivity (Ohm-m)	Modelled Apparent Resistivity (Ohm-m)	Model Error	Included in Model (1=yes)
1.0	1645.6	1,946	90.434	1
2.0	2591.5	2,509	6.873	1
3.0	2884.7	2,767	13.874	1
4.0	3278.3	2,865	171.014	1
5.0	3178.1	2,866	97.548	1
6.0	3178.9	2,796	146.218	1
8.0	2110.9	2,516	164.074	1
10.0	1333.3	2,145	658.784	1
15.0	739.3	1,292	305.527	1
20.0	1060.0	783	88.519	1
25.0	897.0	541	126.536	1
30.0	569.0	447	14.954	1
35.0	450.2	423	740	1
40.0	1659.0	1,292	134.696	1
50.0	1143.4	783	130.243	1
60.0	888.6	541	120.651	1
70.0	588.0	447	19.958	1
80.0	388.3	423	1.202	1
90.0	292.4	431	19.075	1
100.0	390.3	474	6.935	1
120.0	496.4	518	455	1
140.0	822.9	554	72.413	1



Model Parameters					
Model Layer	Resistivity (Ohm-m)	Resistivity Range	Thickness (m)	Thickness Range	Depth (m)
1	1500		0.5		0.5
2	3400		5.5		6
3	500		1		7
4	40		2		9
5	800				
6					
7					
8					

Goelectrical Model



Hawk Camp, AML - B90/S3

[illegible]

Client : AML
 Project : Private
 District : Tonkolili
 Date : 03-12-2010
 Field Operator : Obeng
 Interpreted by : Obeng

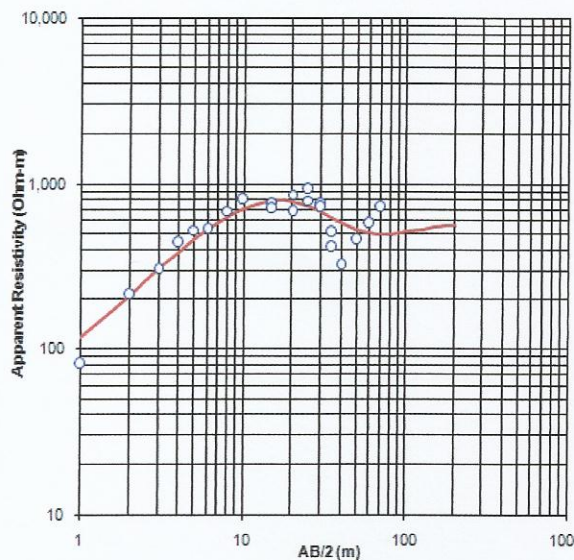
Community : Hawk Camp, AML
 Sounding Number : B90/S3
 Coordinates East : 02.023.28
 Coordinates North : 09.956.71
 GPS Datum :
 Azimuth : 300

Hawk Camp, AML - B90/S3

GeoVES 1.3

MS Excel based modelling of Vertical Electrical Soundings
 in the Schlumberger Array using Gosh linear filters

Data		Model		
AB/2 (m)	Measured Apparent Resistivity (Ohm-m)	Modelled Apparent Resistivity (Ohm-m)	Model Error	Included in Model (1=yes)
1.0	81.1	117	1,272	1
2.0	213.1	213	0	1
3.0	302.8	306	11	1
4.0	439.2	390	2,439	1
5.0	525.3	464	3,820	1
6.0	528.5	528	0	1
8.0	684.9	632	2,797	1
10.0	799.9	707	8,721	1
15.0	778.5	792	172	1
20.0	859.4	784	5,855	1
25.0	926.6	736	36,356	1
30.0	774.5	678	9,360	1
35.0	508.3	624	13,472	1
40.0	706.0	792	7,327	1
50.0	682.2	784	10,361	1
60.0	790.9	736	3,017	1
70.0	721.9	678	1,950	1
	415.6	624	43,577	1
	324.1	581	65,984	1
	458.0	525	4,516	1
	575.0	500	5,582	1
	724.4	494	53,289	1



Model Parameters						
Model Layer	Resistivity (Ohm-m)	Resistivity Range	Thickness (m)	Thickness Range	Depth (m)	Depth Range
1	70		0.6		0.6	
2	2550		5		5.6	
3	20		1		6.6	
4	600					
5						
6						
7						
8						

Geoelectrical Model

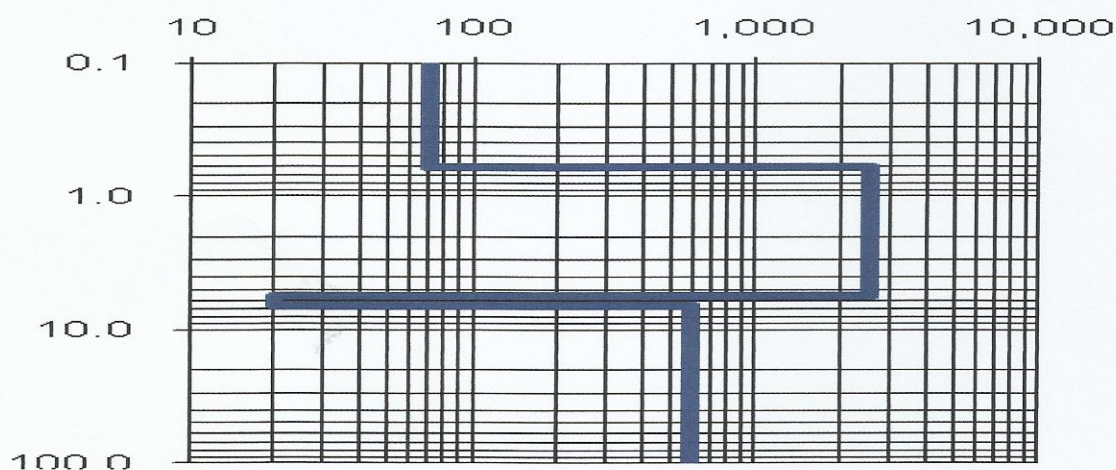


FIG 2D: SCHLUMBERGER VES & MODEL AT THE POINT C50/S4

[illegible]

Client : AML
 Project : Private
 District : Tonkolili
 Date : 04-12-2010
 Field Operator : Obeng
 Interpreted by : Obeng

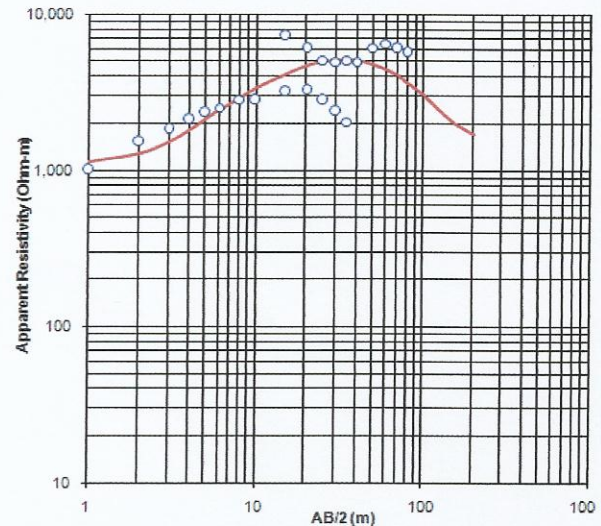
Community : AML, Near Tonkolili River
 Sounding Number : C50/S4
 Coordinates East :
 Coordinates North :
 GPS Datum :
 Azimuth : 250

AML, Near Tonkolili River - C50/S4

GeoVES 1.3

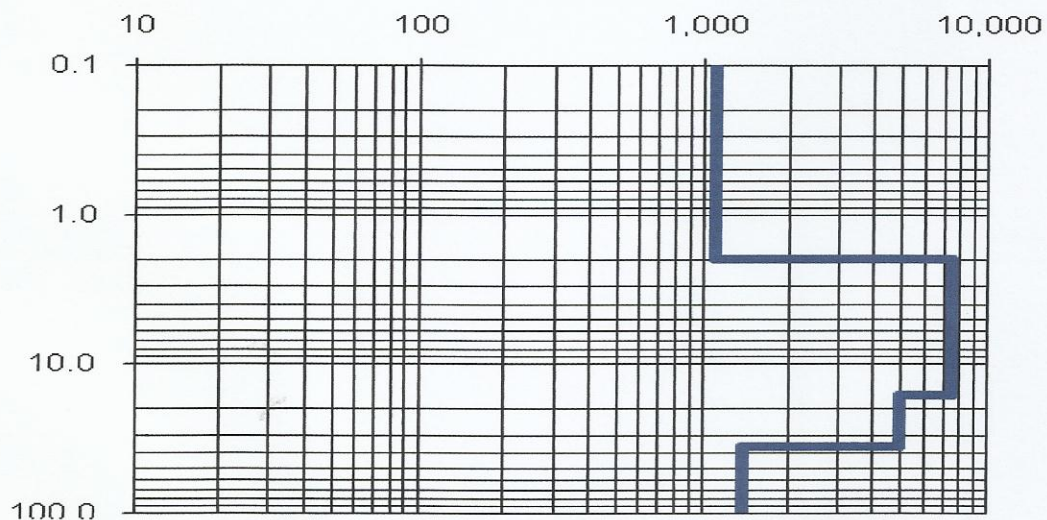
MS Excel based modeling of Vertical Electrical Soundings
 in the Schlumberger Array using Gosh linear filters

Data		Model		
AB/2 (m)	Measured Apparent Resistivity (Ohm-m)	Modelled Apparent Resistivity (Ohm-m)	Model Error	Included in Model (1=yes)
1.0	1005.6	1,139	17,693	1
2.0	1513.0	1,273	57,650	1
3.0	1818.2	1,520	88,747	1
4.0	2115.7	1,819	87,857	1
5.0	2327.0	2,125	41,013	1
6.0	2524.7	2,416	11,755	1
8.0	2859.1	2,937	6,079	1
10.0	2839.4	3,374	285,621	1
15.0	3181.5	4,171	978,831	1
20.0	3237.1	4,865	2,039,474	1
25.0	2833.6	4,952	4,487,936	1
30.0	2405.5	5,091	7,210,949	1
35.0	2047.3	5,121	9,444,683	1
40.0	1730.4	4,171	9,794,271	1
50.0	6061.3	4,865	1,949,166	1
60.0	5070.9	4,952	14,083	1
70.0	4973.6	5,091	13,742	1
80.0	5063.4	5,121	3,271	1
90.0	4984.3	5,071	11,274	1
100.0	6101.2	4,815	1,853,314	1
120.0	6500.4	4,453	4,193,676	1
140.0	6058.3	4,059	3,998,398	1
160.0	5718.3	3,677	4,167,334	1



Model Parameters					
Model Layer	Resistivity (Ohm-m)	Resistivity Range	Thickness (m)	Thickness Range	Depth (m)
1	1100		2		2
2	7500		14		16
3	5000		20		36
4	1400				
5					
6					
7					
8					

Geoelectrical Model



AML,Near Tonkolili River - C100/S5

[illegible]

Client : AML
 Project : Private
 District : Tonkolili
 Date : 04-12-2010
 Field Operator : Obeng
 Interpreted by : Obeng

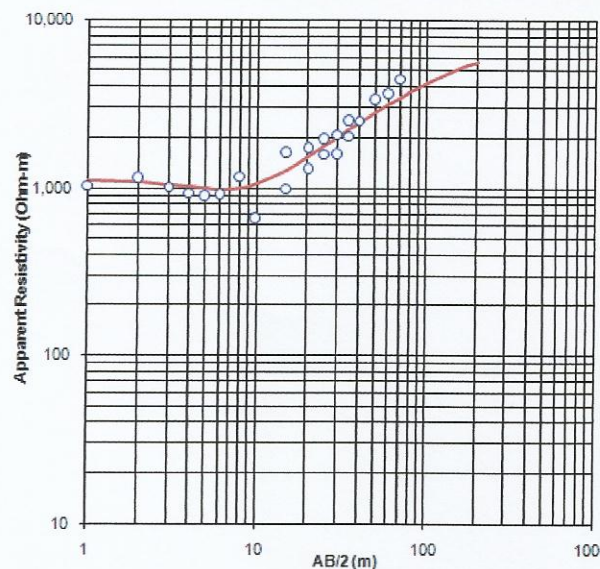
Community : AML, Near Tonkolili River
 Sounding Number : C100/S5
 Coordinates East :
 Coordinates North :
 GPS Datum :
 Azimuth : 250

AML, Near Tonkolili River - C100/S5

GeoVES 1.3

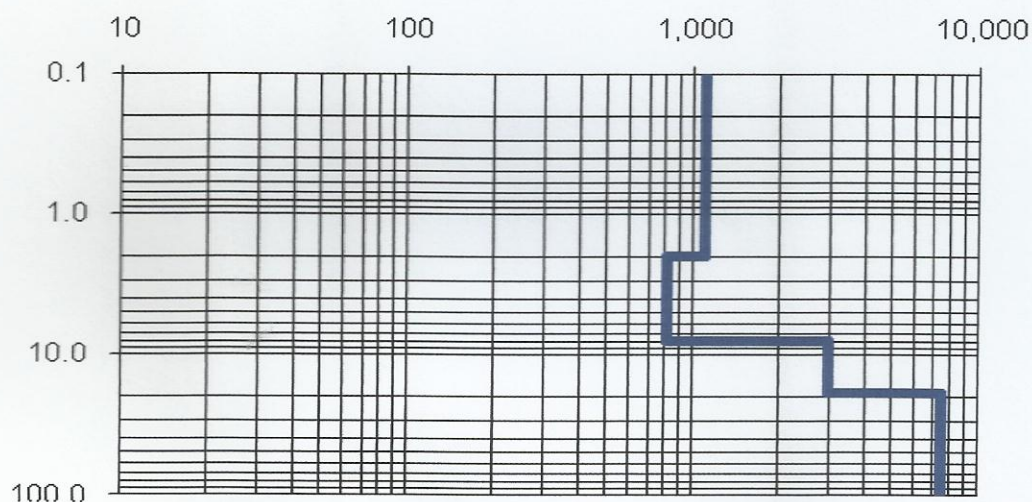
MS Excel based modelling of Vertical Electrical Soundings
 in the Schlumberger Array using Gosh linear filters

Data		Model		
AB/2 (m)	Measured Apparent Resistivity (Ohm-m)	Modelled Apparent Resistivity (Ohm-m)	Model Error	Included in Model (1=yes)
1.0	1036.3	1.099	3,940	1
2.0	1139.0	1.081	3,387	1
3.0	1013.6	1.048	1,213	1
4.0	934.7	1.017	6,775	1
5.0	889.3	998	11,310	1
6.0	911.4	987	5,738	1
8.0	1171.1	1,008	27,153	1
10.0	650.0	1,062	189,462	1
15.0	994.9	1,277	79,619	1
20.0	1282.2	1,525	58,780	1
25.0	1603.9	1,770	27,579	1
30.0	1588.3	2,005	173,478	1
35.0	2047.3	2,227	32,428	1
40.0	1607.5	1,277	109,160	1
45.0	1727.7	1,525	41,212	1
50.0	1946.0	1,770	30,988	1
55.0	2092.8	2,005	7,752	1
60.0	2489.8	2,227	68,863	1
65.0	2524.2	2,438	7,446	1
70.0	3336.4	2,824	262,153	1
75.0	3595.1	3,169	181,216	1
80.0	4492.0	3,478	1,028,235	1



Model Parameters					
Model Layer	Resistivity (Ohm-m)	Resistivity Range	Thickness (m)	Thickness Range	Depth (m)
1	1100		2		2
2	815		6		8
3	3000		11		19
4	7400				
5					
6					
7					
8					

Geoelectrical Model



Container Pad,AML - D40/S6

[illegible]

Client : AML
 Project : Private
 District : Tonkolili
 Date : 04-12-2010
 Field Operator : Obeng
 Interpreted by : Obeng

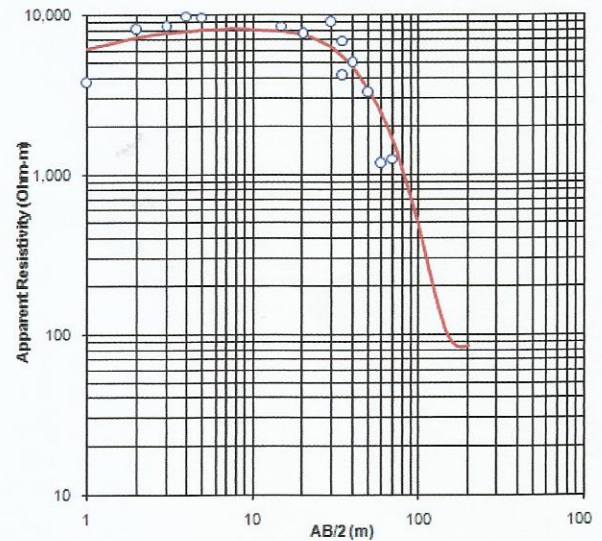
Community : Container Pad,AML
 Sounding Number : D40/S6
 Coordinates East : 02°016.18"
 Coordinates North : 09°944.02"
 GPS Datum :
 Azimuth : 70

Container Pad,AML - D40/S6

GeoVES 1.3

MS Excel based modeling of Vertical Electrical Soundings
 in the Schlumberger Array using Gosh linear filters

Data		Model		
AB/2 (m)	Measured Apparent Resistivity (Ohm-m)	Modelled Apparent Resistivity (Ohm-m)	Model Error	Included in Model (1=yes)
1.0	3748.7	6,100	5,530,372	1
2.0	8028.4	7,283	555,470	1
3.0	8420.7	7,714	499,164	1
4.0	9887.0	7,922	3,552,149	1
5.0	9850.9	8,035	2,612,079	1
6.0	10563.7	8,095	6,096,274	1
8.0	10682.3	8,127	6,426,724	1
10.0	10374.9	8,096	5,194,244	1
15.0	8489.8	7,873	380,905	1
20.0	7551.6	7,479	6,822	1
25.0	10650.6	8,920	13,914,830	1
30.0	10812.6	8,240	20,912,110	1
35.0	4184.0	5,501	1,734,011	1
40.0	26818.5	7,873	358,948,129	1
50.0	29825.9	7,479	499,382,916	1
60.0	10456.6	8,920	12,504,820	1
70.0	6958.2	8,240	7,444,520	1
80.0	6903.5	5,501	1,987,543	1
90.0	5005.4	4,761	59,636	1
100.0	3238.0	3,424	34,485	1
120.0	1161.4	2,373	1,468,907	1
140.0	1247.7	1,608	130,133	1



Model Parameters						
Model Layer	Resistivity (Ohm-m)	Resistivity Range	Thickness (m)	Thickness Range	Depth (m)	Depth Range
1	3000		0.2		0.2	
2	8300		22		22.2	
3	2100		7		29.2	
4	80					
5						
6						
7						
8						

Geoelectrical Model

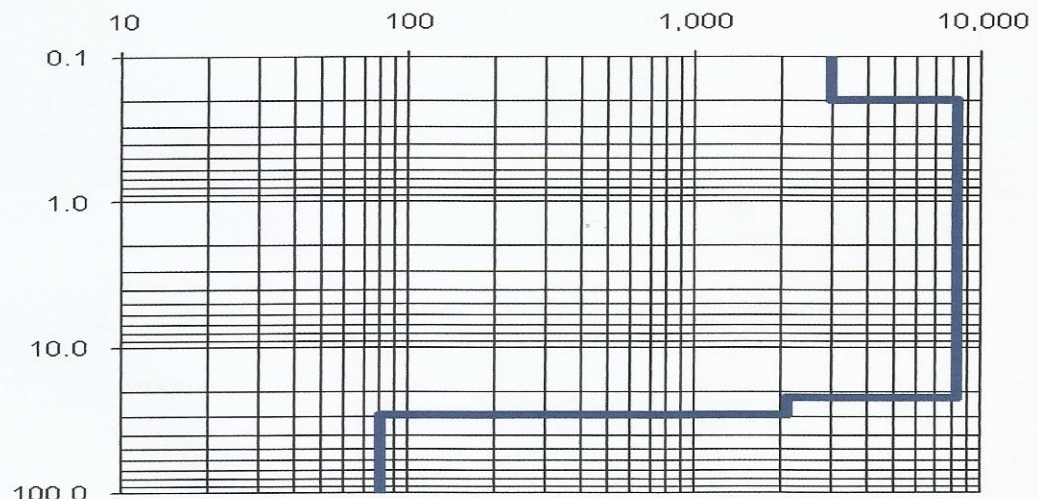


FIG 2G: SCHLUMBERGER VES & MODEL AT THE POINT D90/S7

AML, Container Pad - D90/S7

Client : AML	Community : AML, Container Pad
Project : Private	Sounding Number : D90/S7
District : Tonkolili	Coordinates East : 02°06.44"
Date : 04-12-2010	Coordinates North : 09°94.44"
Field Operator : Obeng	GPS Datum :
Interpreted by : Obeng	Azimuth : 70

Schlumberger Array VES Field Data

AB/2 (m)	MN(m) 1.0 (MN-1)	MN(m) 10 (MN-2)	MN(m) 30 (MN-3)	ΔV I (MN-1)	ΔV I (MN-2)	ΔV I (MN-3)	P (ohm-m) (MN-1)	P (ohm-m) (MN-2)	P (ohm-m) (MN-3)
1.0	2.4			#####			2677.3		
2.0	11.8			466.7600			5499.1		
3.0	27.5			266.1200			7315.4		
4.0	49.5			151.5000			7496.2		
5.0	77.8			91.1930			7090.7		
6.0	112			59.2890			6658.9		
8.0	200			31.6080			6330.3		
10.0	313			21.2820			6669.2		
15.0	706	63		9.4466	114.2800		6670.0	7180.4	
20.0	1,256	118		5.5968	60.5960		7031.3	7138.8	
25.0	1,963	188		3.5264	41.2870		6921.3	7782.4	
30.0	2,827	275		2.2168	26.4370		6266.1	7267.2	
35.0	3,848	377		1.7210	17.8710		6621.8	6737.2	
40.0	495			9.4622			4681.9		
50.0	778			6.0402			4696.5		
60.0	1,123			3.0121			3382.9		
70.0	1,532			1.6671			2563.2		
80.0									
100.0									
125.0									
150.0									
175.0									
200.0									

Client : AML
 Project : Private
 District : Tonkolili
 Date : 01-12-2010
 Field Operator : Obeng
 Interpreted by : Obeng

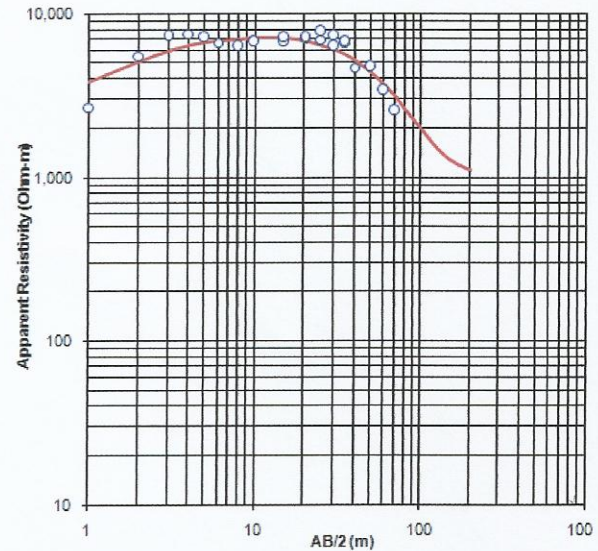
Community : AML, Container Pad
 Sounding Number : D90/S7
 Coordinates East : 02°016.44"
 Coordinates North : 09°944.44"
 GPS Datum :
 Azimuth : 70

AML, Container Pad - D90/S7

GeoVES 1.3

MS Excel based modelling of Vertical Electrical Soundings
 in the Schlumberger Array using Gosh linear filters

Data		Model		
AB/2 (m)	Measured Apparent Resistivity (Ohm-m)	Modelled Apparent Resistivity (Ohm-m)	Model Error	Included in Model (1=yes)
1.0	2677.3	3.829	1,326,234	1
2.0	5499.1	5.146	125,030	1
3.0	7315.4	5.892	2,028,806	1
4.0	7496.2	6.336	1,346,704	1
5.0	7090.7	6.818	223,669	1
6.0	6658.9	6.804	20,981	1
8.0	6330.3	7.010	462,599	1
10.0	6669.2	7.092	178,947	1
15.0	6670.0	7.031	130,326	1
20.0	7031.3	6.777	64,459	1
25.0	6921.3	6.430	241,620	1
30.0	6266.1	6.034	53,816	1
35.0	6621.8	5.817	1,009,757	1
40.0	7180.4	7.031	22,329	1
45.0	7138.8	6.777	130,626	1
50.0	7782.4	6.430	1,829,701	1
55.0	7267.2	6.034	1,520,582	1
60.0	6737.2	5.817	1,254,943	1
65.0	4581.9	5.196	264,558	1
70.0	4596.5	4.393	92,191	1
75.0	3382.9	3.687	92,526	1
80.0	2553.2	3.100	299,093	1



Model Parameters					
Model Layer	Resistivity (Ohm-m)	Resistivity Range	Thickness (m)	Thickness Range	Depth (m)
1	2800		0.5		0.5
2	7500		14		14.5
3	5000		20		34.5
4	1000				
5					
6					
7					
8					

Goelectrical Model

