ANNEX D:
GEOPHYSICAL EXPLORATION

Final Report
The Study for Improvement Plan of
Livestock Farming System in Rural Area

March, 2006

ANNEX D Geophysical Exploration

D.1 OUTLINE OF THE GEOPHYSICAL EXPLORATION

(1) Purpose of the survey

Obtain the geological and hydro-geological structures by measuring the underground resistivity.

(2) Term of the survey

August 26, 2003, - October 9, 2003

(3) Investigation quantity

Soums	Abbr.	Number of stations	Period of measurements
Airag	AR	14	9/23 – 9/26
Altanshiree	AS	11	10/7 – 10/8
Dalanjargalan	DJ	11	10/6 – 10/8
Delgrekh	DG	10	9/25 – 9/26
Erdene	ER	29	8/26 – 9/13
Ikhet	IH	10	9/24
Khatanbulag	KT	17	9/4 – 9/10
Khuvsgul	KV	21	9/3 – 9/5
Mandakh	MD	18	9/10 – 9/19
Saihandulaan	SD	13	9/18 – 10/9
Sainshand	SS	9	9/1 – 9/30
Urgun	OR	11	9/12 – 9/14
Ulaanbadlag	UL	38	8/28 – 10/3
Zaminuud	ZU	3	8/27

(4) Investigation methods

1) The outline of the time domain electromagnetic method

The *time domain electromagnetic method* (also called Transient Electromagnetic Method abbreviated as TEM) was introduced to measure the underground resistivity for this project. This technique has been used not only in Mongolia but many other countries such as Myanmar (central dry zone), Bangladesh, China, Peru, Argentina and many other countries for the groundwater explorations. Judging from the fact that this technique has excellent resolution for the deep structures, the method was decided to be most suitable for the project. The Schlumberger and Wenner methods have been in common use for the groundwater exploration of up to 200 to 300 m depth, but the electrode separations of up to 1000m are needed for the survey and measurement of one station per day will be the possible average survey rate due to its tedious field operation. TEM method can operate more easily and efficiently since the measurement can be done with only 100m square loop on the surface, and it will take less than 20 minutes to lay out, and actual average measurement time for this project was about 35 minutes including laying out loops, measurements and removal. The average measuring rate for this project was about 7 measurements per day. Most time consuming process for this project was the traveling between stations.

2) The principle of the TEM method and its characteristics

The TEM methods was among relatively new techniques put to practical use in the late 1960s. The configuration in which TEM systems are commonly used is the central induction loop sounding mode in which a square single-turn transmitting loop of edge dimension typically 20 to 200 m for groundwater studies is laid out for each sounding with the receiving coil located at the loop center. When the transmitter shuts off, rapidly terminating the primary magnetic field, eddy currents are instantly generated near the transmitting wire so as to maintain the magnetic field in the earth at the value that existed just before cut-off . These horizontal eddy currents diffuse to greater depths and expand in radius with the passage of time. Measurement of the decaying magnetic field at the loop center as a function of time is equivalent to measurement of resistivity as a function of time.

A significant problem with many electromagnetic methods is that a small secondary field must be measured in the presence of a much larger primary field, with a consequent decrease in accuracy. This problem is overcome in time-domain electromagnetic method. A series of pulses are applied to the transmitter loop, and the secondary field induced by the primary is only measured during the interval when the primary is absent. The eddy currents induced in a subsurface confined conductor tend to diffuse inwards when the inducing field is removed and gradually dissipate by resistive heat loss. Within highly conductive bodies, however, eddy currents circulate around the boundary of the body and decay more slowly. The decaying magnetic field at the surface, which is generated during the period that the primary magnetic field is off, is measured relatively easily to detect subsurface conductive bodies or measure the conductivity of the earth itself. The absence of the primary field while measurement is going on causes several advantages over convenient electrical and electromagnetic methods:

① Sensitive to the difference of underground resistivities
② No need to increase the transmitter-receiver separation for the deep sounding..
③ For the deeper sounding, it is necessary to measure at the later time, and this can be done through the increase of the transmitter currents and increase the number of the averaging time to improve the S/N ratio.
④ The influence of the near surface structures and the terrain are not significant for the deeper sounding.
⑤ The measurements are carried out without direct contact to the earth, and can be used in the desert and in the area covered with rocks where the set up of the electrodes is difficult.
⑥ Measurement is rapid and efficient.

3) Specificatio n of the measurements

Transmitter	Canada, Geonics	TEM47 and TEM57 transmitter
Receiver	Canada, Geonics	PROTEM-D receiver
Receiver coil	Canada, Geonics HF coil	

Transmitting loop 100 × 100m square loop、wire 5.5 mm^2

Transmitting currents 0.6A (TEM47), 12A (TEM57)

Measurement frequency : 4 frequency

u (285Hz)	7 μ sec	～	696 μ sec
v (75Hz)	35 μ sec	～	2792 μ sec
H (30Hz)	88 μ sec	～	6978 μ sec
M (7.5Hz)	353 μ sec	～	27920 μ se

The measurement of the position GPS (Garmin etrex VISTA)

4) Measurement

After arriving the measuring site, the transmitting loop of 100×100m is laid out. Moreover, a receiving coil is set at the center of the loop at the same time, and the receiver is put 5m apart, connected with a cable. A transmitter is set up at one corner of the transmitting loop. Then the receiver is connected to the transmitter with a reference cable so that transmitter is synchronized with receiver.

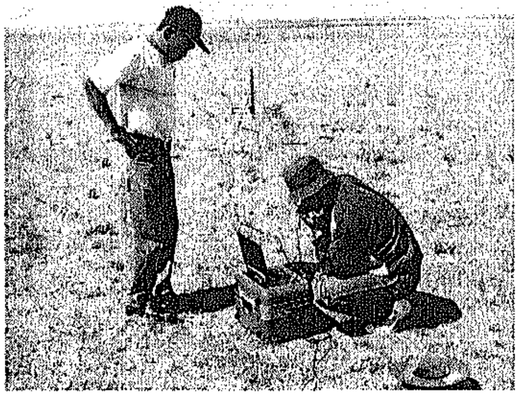
At first, transmitting currents of 0.6A is introduced by using the TEM-47 transmitter, and 2 measurements using frequencies of u and v are done. Next, the transmitter is replaced to TEM-57, and measured with the frequency of H and M using the currents of about 12 A.

Data are acquired for about 60 seconds and averaged. The results are written into the memory of the receiver, and taken in the computer with a transfer cable later.

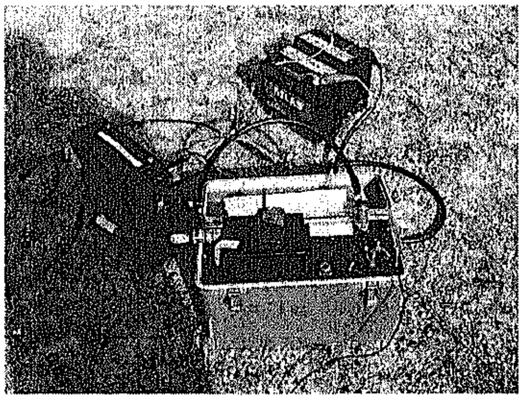
5) Interpretation

Two inversion techniques, standard multilayer least square inversion and 19 layer Occam's inversion, are applied to the obtained data.

Picture of TEM measurement



PROTEM Receiver



Transmitter

TEM-47 : black box

TEM-57 : orange box

Two 12V batteries

Battery charger and Generator

Receiver coil

D.2 OUTLINE OF THE SURVEY RESULTS

(1) *Result of the survey*

Name of the measurement point, coordinate, level, measured date, inversion results are summarized in the appendix. Here several resistivity curves are shown as the examples.

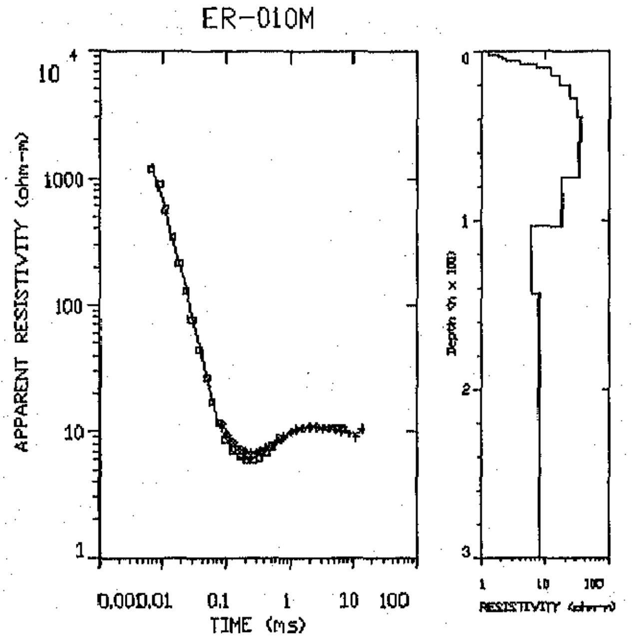


Fig-1 ER-010 Smooth Inversion

① Near surface conductive layer (ER-010)

This investigation point is close to the very shallow wells in the wadi in the Erdene soum. The result of the Occam's Inversion is shown here. The square marks of the left graph show measured data, and the curve looks like connecting them is the result of the numerical calculation for the structure right hand side. The interpretation is as accurate as a curve aligns closer to the square points. Near the surface, very conductive (about 1 ohm-m) layers exist, and the resistivity increases with depth. The resistivity quickly increases to about 50 ohm-m at the depth of 20 m. This surface conductive layer seems to be loose sand and silt saturated with not so clean water. From the near by dug well, water can be obtained from 0 to 2 m, and it is well coincide with this TEM results. Such results are commonly obtained at the survey points in the wadi, and the possibility to obtain water through dug well is high.

② Shallow resistive basement (ER-020)

This investigation site is the place where a Buddhism temple existed, and the ridges of the granite exist near by. From the TEM measurement, very resistive layer is obtained below 20m. For such structure, which has very high resistivity contrast, multi-layer inversion of 4 to 5 layer is better than Occam's inversion in general. Granite is usually non-

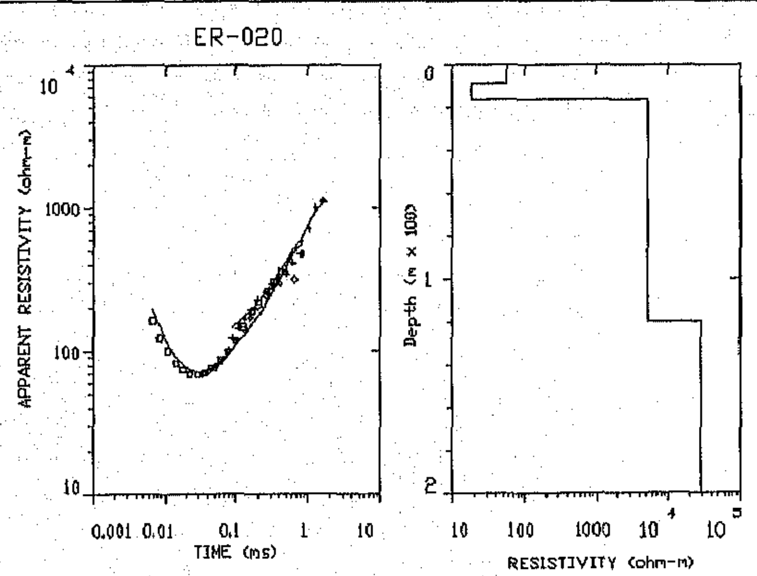


Fig.2 ER-020 Least Square Inversion

permeable and sometimes water can be obtained adjacent upper layer or in the fractures. But in this example, granite is as shallow as 20m, and it will not easy to get water from the shallower layers. It is necessary to do more detailed geophysical survey to obtain the information of the structures in the granite.

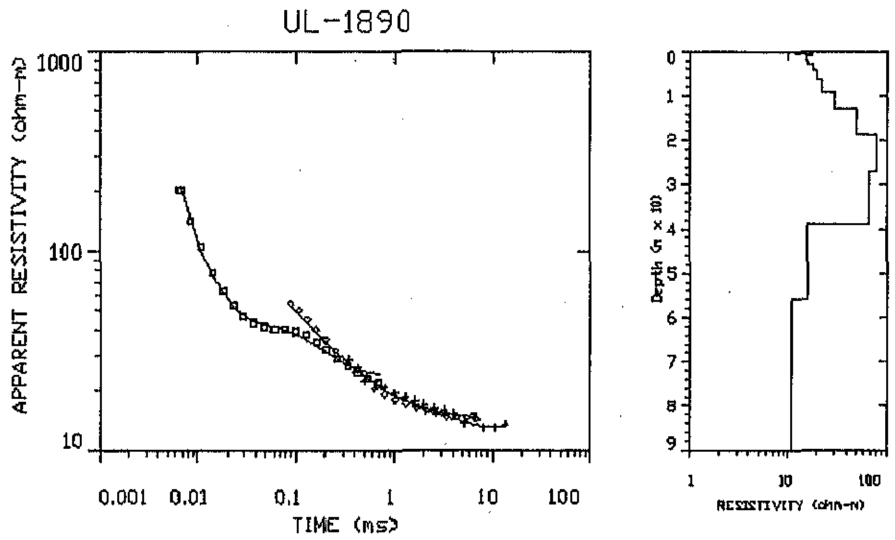


Fig.3 UL-1890

③ Cretaceous sediments (UL-1890) (JN-3)

This is the drilling site of JN-3 at the *Ulaanbatrakh Soum*. This TEM survey was done to decide the location and the depth of the drilling. Figure 3 shows the result of the Occam's inversion. The resistivity increases with depth to the depth 20m. From the geological information, this area is covered with Cretaceous layers, and they correspond to the conductive layers below 40m. From the results of the electrical sounding carried by the Ministry of Food and Agriculture (MFA), it was estimated that water can be obtained from 21m depth. That means resistive layer from 20 to 40 m are non-permeable, and water can be obtained between 0 to 20 m. In this site there are two possible water-bearing layers, shallow 0 to 20m layers and below 40m. Since we don't have enough information to decide the depth of the drilling, the depth of 40m was decided. But from the drilling, enough water can not be obtained from upper 40m. Because Cretaceous layers are the main water resources in the Gobi area, the drilling was continued below 40m, and from the gravel, reasonable amount of water can be obtained. TEM results and drilling results coincide well, but other hydro geological information was not enough at that time, to decide the actual water bearing layers. Information of resistivity structure alone is not enough to decide the drilling site and depth in general.

④ **Wadi sediment (ER-1270) (JN-1)**

This point was selected based on the requirement from the Erdene soum to get water near the Erdene sanatorium resort. After completing several TEM surveys few kilometers east of the resort, this site was selected as the best place for the drilling. Resistivities of the layers getting smaller with the increase of the depth, and minimum value of 3 ohm-m at the depth between 50 to 70 m. There are no resistivity sounding data near by, and all the decision must be based on this TEM results. The layers below 50m is so conductive that means contents of the clay is high and water quality may not so good. The aquifer suitable for the project was believed to be 20 to 50m, and 50m drilling was carried out at this site. The drilling results were good accord with the TEM results, and found two sand layers between 23 to 25 and 40 to 42, could get reasonable amount of water (2.9 l/sec).

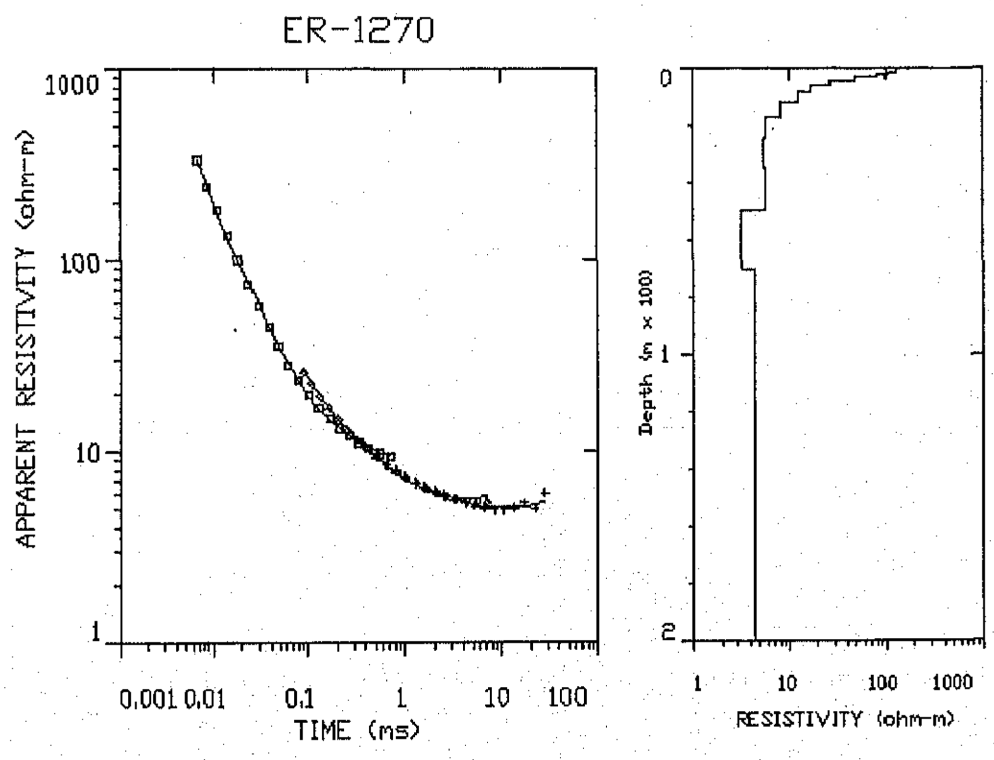


Fig.4 ER-1270

⑤ **North of *Erdene Soum* (around JN-2)**

The TEM surveys were carried out after the requirement from the *Erdene Soum* to check the possibility to obtain water from the area, the depth of the drilling. Three TEM sites were selected, ER-1230, ER-1240 and ER-1250 from the north to south.

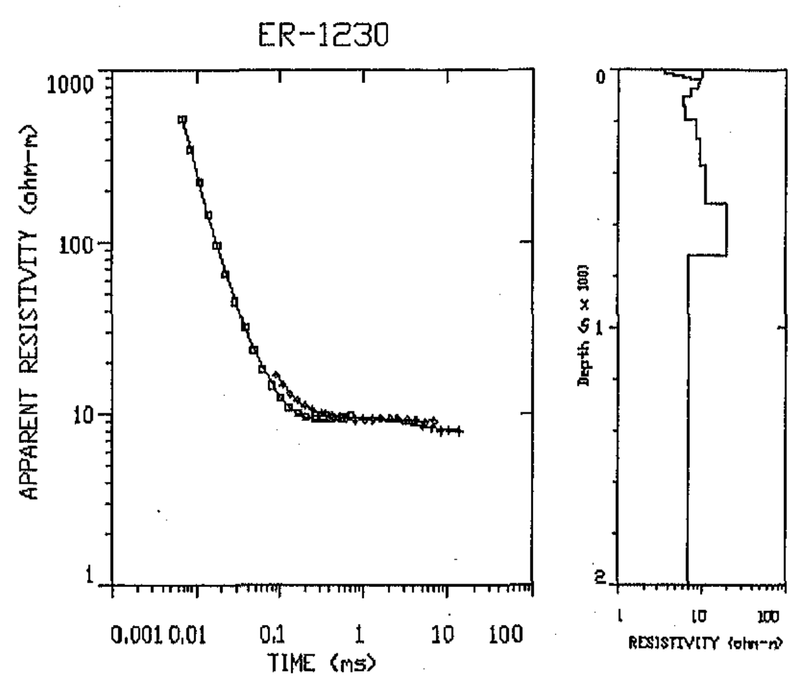


Fig.5 ER-1230

At the ER-1230 station, the resistivity increases with depth from the surface to up to 50m. Information about the relation between resistivity and hydrogeology is none, but the MFA believes the possibility of acquiring water at the depth of 50m near this area. That means they believe the resistive layer of 50 to 70 m is impermeable, and can get water from the upper layers. This resistivity structure is a bit similar to that of UL-1890, where we could get water beneath the resistive layers, which corresponds to below 70m for this site.

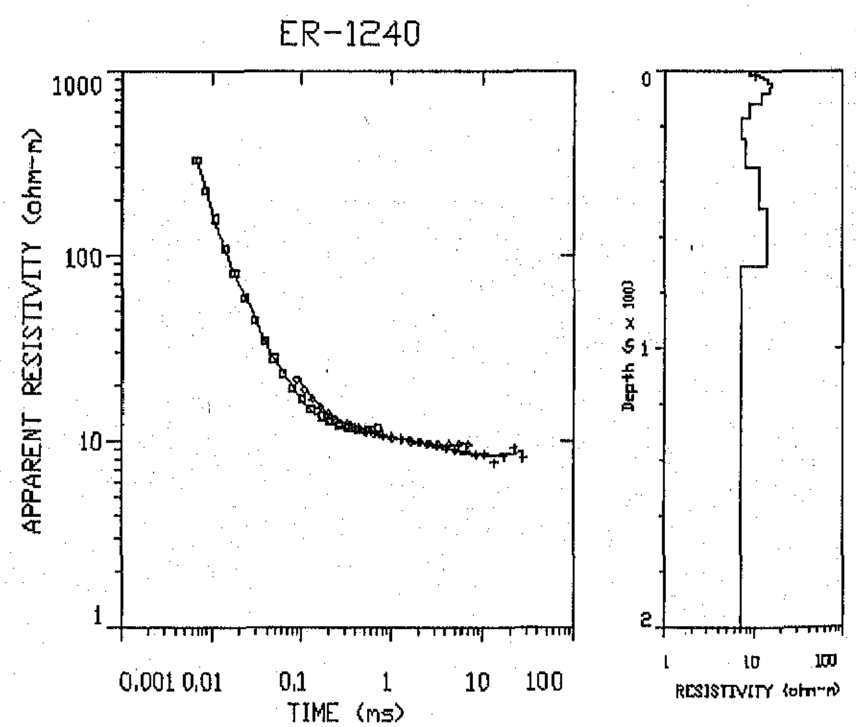


Fig.6 ER-1240

Fig.6 shows the TEM results at the ER-1240 site, and similar results were obtained with ER-1230 but some conductive layers around 20m depth and thicker resistive layers. Since the geology of this area is Cretaceous, and as we could get water from the deep conductive layers, it is high possibility we can get water below 70m. If we take into account the judgment of MFA at the ER-1230, it looks possible to obtain water between 20 and 30m. But this was the actual drilling site but could not get enough water from 20 to 30 m. The reason of these unsuccessful results will be discussed later.

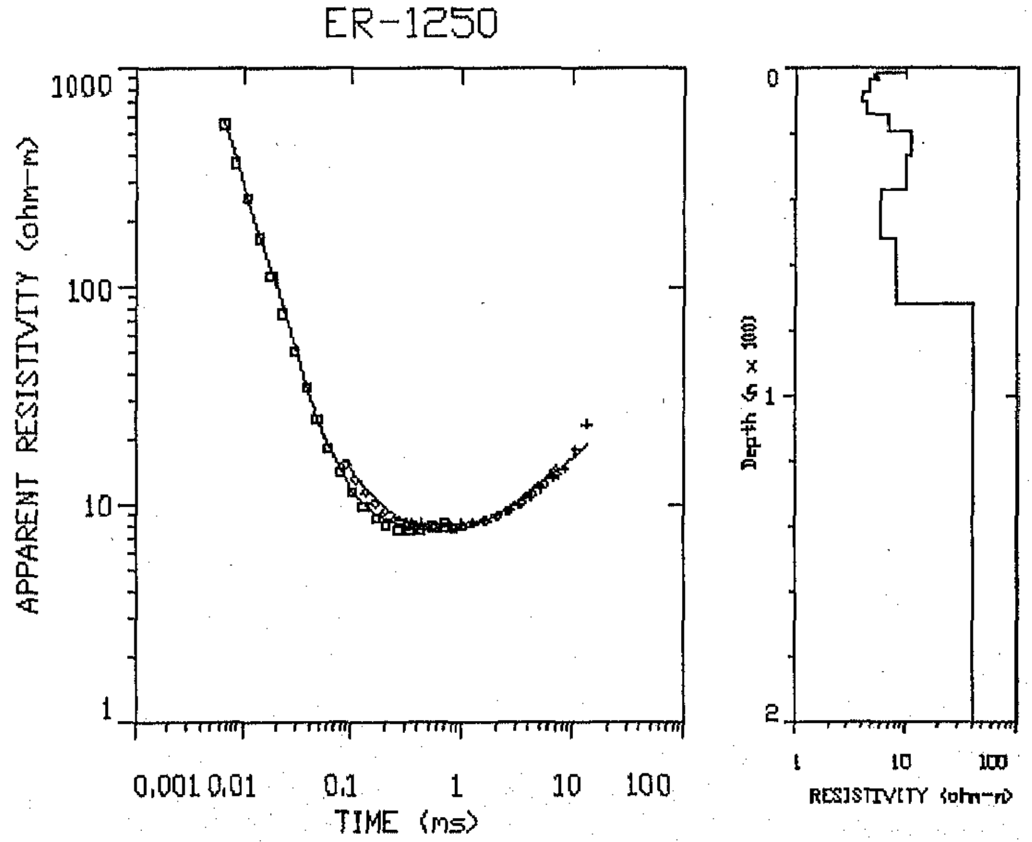


Fig.7 ER-1250

Fig.7 shows the TEM results of the ER-1250 site, where MFA interpreted the aquifer level of 5.5m. The resistivity section shows significant difference to the previous two stations. There are some possibility obtaining water between 10 and 20m but if we consider the terrain, it may be difficult to obtain stable water through the year. It may be possible to get water between 40 and 75m assuming that relatively resistive basement is impermeable.

Sufficient amount water could not be obtained from the drilling of ER-1240 site. The main reason of this failure is due to the lack of the information as the precondition of the interpretation. According to the previous two drilling (those were the only information we had to analyze the resistivity and hydro geological structures),the key layer is the resistive layer around 50 m depth. In ER-1230, we can get water from the upper layers of the resistive layer, and in UL-1890 water can be obtained below the layer. Therefore we hoped to get water from the upper part of the

ER-1240 site also. We thought we would get water below 70m, since it is the main aquifer of the area, but due to the limitation of the depth of the drilling, we tried to obtain water from upper layers.

If we combine our TEM results and drilling results, it may be possible to obtain water there below 70m layers at ER-1240, or we may get water from ER-1250 if we drill to below 75m (to resistive layers).

D.3 TEM results for 5-layer inversion Estimated depth to the aquifer

No.	Station	N.L(deg)	E.L(deg)	Level(m)	Date	ρ-1	ρ-2	ρ-3	ρ-4	ρ-5	t-1	t-2	t-3	t-4	error(%)	Depth	Possibility
1	AR-1290	45.41577	109.84779	1002	9/23	33	18	35	25	26	25	37	49	63	4	120	○
2	AR-1300	45.50202	109.91034	952	9/23	65	5.7E+04	2.5E+05	2.7E+05	7.9E+05	26	8.5	50	90	19	60	△
3	AR-1310	45.57269	109.95946	956	9/23	17	11	10	16	1130	2.6	5.2	12.8	95.5	5.9	100	○
4	AR-1320	45.60673	109.79776	986	9/23	28	12.7	16	153	36000	11.6	17	36.6	36	4.5	100	△
5	AR-1330	45.67798	109.71126	980	9/23	33	29	6.9	15	13	23	41	88	152	2.3	150	○
6	AR-1340	45.79464	109.75520	968	9/23	17	32	42	103	75	12	19	16	116	5.5	120	○
7	AR-1350	45.80947	109.61151	1004	9/23	15	9.6	48	14	2660	12	8	18	43	7.4	100	△
8	AR-1360	46.00076	109.61222	1019	9/24	27	14	27	247	51	19	15	18	80	6.5	150	○
9	AR-1560	45.79727	109.18378	1085	9/26	108	131	32	6.8	2	15	76	48	97	5.3	120	△
10	AR-1570	45.79624	109.04978	1169	9/26	41	47	162	771	4.7	6.8	45	85	76	11.8	150	△
11	AR-1600	45.50096	108.85896	1124	9/26	453	88	289	2630	430	20	16	25	194	7.1	160	△
12	AR-1610	45.38073	108.71236	1093	9/26	85	37	40	80	35	8.1	63	63	183	7.9		×
13	AR-1620	45.21745	108.72394	1062	9/26	13	63	814	62	2490	9.5	6.3	30	57	9.2	80	△
14	AR-1630	45.17483	108.80409	1061	9/26	5.4	9.7	42	7.8	57	5.7	21	6.6	18	5.1	80	△
15	AS-2030	45.97090	110.77431	1096	10/7	25	27	33	24	15	17	24	106	64	4.9	160	△
16	AS-2040	45.95161	110.69037	1052	10/7	6.4	14.7	9.2	18	10	4.5	3	26	35	3	100	△
17	AS-2050	45.89861	110.59255	1007	10/7	12.5	10.5	15.1	5.1	46	9.1	29	75	178	2.5	100	○
18	AS-2060	45.81926	110.47957	993	10/7	11	4.8	3	42	7.6	0.7	8.9	79	129	5.9		×
19	AS-2070	45.49346	110.52796	953	10/8	12.5	8	8.9	9.3	12.4	5.4	7.9	35	85	2.6	40	△
20	AS-2080	45.67658	110.20752	989	10/8	21	20	717	3.9	7.1	3.3	38	67	76	4.6	100	○
21	AS-2090	45.55143	110.09147	955	10/8	8.5	20	84	8.1	19	12	16	40	110	3.4	120	○
22	AS-2100	45.54868	110.27207	979	10/8	17	3.2	1500	9800	2.8E+04	4.8	1.9	7.9	33	11.8		×
23	AS-2110	45.52497	110.57530	983	10/8	7.9	25	11	12	13	4.4	4.7	20	53	3.2	40	△
24	AS-2120	45.43994	110.82436	934	10/8	27	7.5	13	57	1510	2.3	4.1	36	72	8.5		×
25	AS-2130	45.34032	110.84201	868	10/8	8.4	17	6.8	9.2	62	3.5	39	17	155	4.8	120	○
26	DG-1930	45.49876	111.27565	1042	10/6	196	172	611	111	412	16	26	64	83	3.8	100	S○
27	DG-1940	45.63009	111.26016	1024	10/6	370	6.2	5.9	7.4	60	1.1	20	38	154	4.5	80	S○
28	DG-1950	45.73328	111.22646	1026	10/6	85	7.3	5.3	7.8	2.1	1.7	2.5	40	53	3.2	100	△
29	DG-1960	45.85282	111.27922	1055	10/6	12.7	8.2	18	1.3	6.2	7.3	52	26	59	5.4	100	S○
30	DG-1970	46.01311	111.57266	1074	10/6	234	49	133	80	546	9	11	57	109	7.8	90	S○
31	DG-1980	46.07287	111.61214	1011	10/6	23	21	62	28	60	18	21	73	82	4.4	80	S○
32	DG-1990	46.05884	111.52845	1048	10/6	15	3.4	2830	544	55	13	4	80	72	6.6		S×
33	DG-2000	46.01160	111.19482	1134	10/7	20	24	68	46	2500	9.5	15	51	65	9.5	80	S△
34	DG-2010	46.16322	111.19580	1137	10/7	16	15	16	17	27	11	28	32	65	3.8		S×
35	DG-2020	45.99789	111.05508	1133	10/7	186	4.7	4	12.9	82000	3.2	7.5	12	11	21.4	50	S○
36	DJ-1470	45.93481	109.16516	1075	9/25	6.7	7.2	24.7	750	26	7.6	15	49	75	4		×
37	DJ-1480	45.97883	109.20371	1086	9/25	32	70	43	53	35	9.2	18	41	51	3.6	70	△
38	DJ-1490	46.01164	109.14083	1120	9/25	9.9	11	648	2980	27	8.1	21	53	140	3.8	140	△
39	DJ-1500	46.05443	109.10210	1202	9/25	67	48	90	230	56	12	11	104	92	3.5	160	△
40	DJ-1510	46.00291	108.83917	1255	9/25	332	1040	78	170	1580	42	94	65	170	9.6	140	△
41	DJ-1520	45.90620	108.89645	1155	9/25	430	16	7.5	2070	24	6.3	2.1	25	70	12.1	80	○
42	DJ-1530	45.85021	108.77189	1167	9/25	860	84	348	119	460	20	15	62	148	5.1	100	○
43	DJ-1540	45.84236	108.67837	1157	9/25	91	1700	392	4.8E+05	3.4E+06	17	7.1	4.9	78	43		×
44	DJ-1550	45.79877	108.58083	1068	9/25	13.9	9.2	16.2	5.5	5.1	16.4	16.5	54.7	91	11.5	90	△
45	DJ-1580	45.80573	108.88030	1179	9/26	65	62	3120	44	19	23	63	83	86	4.7		×
46	DJ-1590	45.59979	108.85516	1145	9/26	12	12	9.9	18	30	8.1	12	26	41	4		×
47	ER-0010	44.62754	111.05519	961	8/26	1.6	17.5	165	24.2	8.5	6.6	3.4	13.4	55.1	6	10	S◎
48	ER-0020	44.64559	111.01901	994	8/26	32.1	12.2	3280	8770	39200	9.8	2.9	9.8	51.3	20		×
49	ER-0030	44.68233	111.10766	988	8/26	11.2	8.9	9.7	16.1	804	8.2	11.7	64.4	39	2.3	120	△
50	ER-0040	44.71986	111.18008	1029	8/26	72	890	131	24.8	7.6	6.6	9.8	53.6	28.7	3.2	100	○
51	ER-0050	44.70417	111.24231	1030	8/26	2850	91	32.2	13.1	11.8	12.6	4.4	23.2	40.1	2.7	40	○
52	ER-0090	43.72466	111.62914	977	8/27	96.2	48.2	9.9	25.4	6.7	6.1	13.2	15.4	25.8	3.2	80	△
53	ER-0100	43.70649	111.53719	992	8/28	33.2	100	6	10	7.8	5.1	14.2	24.6	47.9	4.1	100	△
54	ER-0110	43.71369	111.48649	1000	8/28	33	46.8	7.7	7.8	17.2	9.6	11.5	13.8	37.9	3.2	80	△
55	ER-0120	43.74010	111.45738	990	8/28	25.2	8.7	85.7	430	89.1	13.6	8.6	46.8	85.5	3.9	30	○
56	ER-0130	43.75191	111.39532	969	8/28	94.2	138	54.4	13.8	944	15.4	19.7	55.2	90.9	8.5	100	○
57	ER-0140	43.77062	111.35000	968	8/28	21.3	35.2	287	24.1	311	8.4	11.9	15.3	33.7	4.9	60	△
58	ER-0150	43.77118	111.24839	976	8/28	29.8	43	16.8	9.3	300	21.5	24.9	23.5	45.5	3.5	60	○
59	ER-0160	43.75015	111.15708	956	8/28	14.6	6.9	9.7	23.6	25.9	11.9	20.7	15.3	120	6.2	50	○
60	ER-0190	44.24123	110.75658	1009	8/29	56.7	11	6.1	19	295	9.5	16.5	48.6	69.3	2.7	80	△
61	ER-0200	44.35530	110.83398	959	8/28	77.6	28.2	6.7	4.1	142	5.2	10.2	17.2	131	4.6	100	△
62	ER-0210	44.30254	110.73004	944	8/29	40.6	9.7	5.9	3.4	257	5.1	8.8	61.4	54.8	4.8	150	△
63	ER-0220	44.28337	110.64594	949	8/28	97.2	23.5	7.5	4.8	183	5.9	19.5	30.1	178	2.9	100	△
64	ER-0230	44.35368	110.52750	907	8/29	15	12	62.8	46.2	16	15.7	17.5	29.3	45.3	3.7	140	○
65	ER-0830	44.62875	111.03007	964	9/12	1060	0.6	10.9	8.8	3390	3.8	1.7	4.3	24.5	8.9	30	S△
66	ER-0840	44.66927	111.06823	970	9/12	2.6	1.6	8.1	22.7	4.7E+07	3.2	2	2.2	2.9	35.5	30	S○
67	ER-0850	44.68517	111.06794	981	9/12	64	2.4	16	4260	3.5E+05	3.9	3.1	4.6	20	26.3	30	S△
68	ER-0860	44.71062	111.09529	1004	9/12	3420	2.2	3.9	5.6	3400	2.4	2.7	10.3	12.9	7.5	50	△
69	ER-0890	44.62878	111.03008	964	9/13	2980	3	3.1	6.4	3700	1.8	1	7.6	23.3	9.9	30	△
70	ER-1230	44.81661	111.47228	985	9/22	13700	4.3	7	10.3	5.8	0.8	3.1	20.4	93.7	2.9	80	×
71	ER-1240	44.81000	111.46550	986	9/22	26.6	11.2	7.6	10	6.4	0.9	13.9	18.6	76.1	2.7	80	○
72	ER-1250	44.80617	111.45301	987	9/22	104000	5.1	13	9.3	1300	0.4	24.6	47.6	54.2	3.8	80	S△
73	ER-1260	44.23984	110.88066	978	9/22	27.4	18.7	3.6	1.1	34	9.9	0.1	26.9	65.7	3	40	△
74	ER-1270	44.23525	110.85834	979	9/22	44.8	13.5	6	4.1	7.7	6.9	13.2	38.1	186	2.6	40	◎
75	ER-1280	44.22518	110.83969	981	9/22	558	9	4.6	1.8	7.2	5.1	7.9	58	70	2.5	50	△
76	IH-1370	46.06362	109.76788	1033	9/24	17	23	14	27	105	8.7	33	61	35	3.5	60	○
77	IH-1380	46.10723	109.85073	1039	9/24	18.7	11.9	90	9.2	86	16	14	86	67	3.5	80	S△
78	IH-1390	46.17094	109.91777	1104	9/24	349	148	47	20	86	11	11	94	205	3.6	100	△
79	IH-1400	46.22690	110.02536	1123	9/24	342	17	43	108	54	5.6	5.7	93	53	4.8		×
80	IH-1410	46.33096	110.10093	1139	9/24	18.7	5.8	6.1	5.6	3.4	4.7	10.9	42.2	159	2.6	140	△
81	IH-1420	46.30499	110.18875	1151	9/24	13.9	51	26	45	37	6.9	10.5	24	63	2.4	120	S△

D.3 TEM results for 5-layer inversion Estimated depth to the aquifer

No.	Station	N.L(deg)	E.L(deg)	Level(m)	Date	ρ-1	ρ-2	ρ-3	ρ-4	ρ-5	t-1	t-2	t-3	t-4	error(%)	Depth	Possibility
82	IH-1430	46.22539	110.17935	1191	9/24	2200	307	590	2250	1500	15	27	48	82	32		×
83	IH-1440	46.11935	110.21283	1090	9/24	157	100	213	980	6000	20	32	52	89	15		S×
84	IH-1450	46.00010	110.19016	1001	9/24	12	5.8	9.5	14	6.8	8.6	12	41	86	1.8	140	SΔ
85	IH-1460	45.90217	110.13861	962	9/24	14	6.4	35	88	28	13	14	70	150	4.5	200	SΔ
86	KT-0560	43.22977	109.66804	1143	9/4	50	78	82	153	142	21	20	39	57	3.4	80	Δ
87	KT-0570	43.16826	109.72135	1172	9/4	11	9.55	26	55	1714	11	12	5	17	4.7		S×
88	KT-0660	43.32575	109.14496	1134	9/8	86	484	7.1	18	126	23	21	38	259	4.2	100	○
89	KT-0670	43.33569	109.12690	1038	9/8	184	30	7	37	17	7.5	11	24	52	4.4	100	○
90	KT-0680	43.31945	109.15570	1042	9/8	12	8.9	34	15	25	7.4	24	79	149	3.9	100	○
91	KT-0690	43.17115	109.51801	1141	9/9	56	19	18	15	1487	5.1	12	15	62	2.8	120	Δ
92	KT-0700	43.04772	109.33932	1194	9/9	98	58	135	229	941	19	10	42	173	4.7		×
93	KT-0710	42.87893	109.46916	1104	9/9	16	9.2	3.9	22	10	13	24	177	258	3	120	Δ
94	KT-0720	42.84591	109.41402	1093	9/9	30	13	5.1	18.6	12	12	31	168	150	2.8	100	Δ
95	KT-0730	42.76506	109.00510	1057	9/9	14	7.1	5.9	7.1	4.7	16	15	117	88	2.6	140	Δ
96	KT-0740	42.87445	108.89870	1098	9/9	50	178	72	37	84	14	18	12	73	3.3	80	SΔ
97	KT-0750	42.85499	108.73361	1088	9/9	67	80	50	42	6.68	12	8.5	142	376	3.6		×
98	KT-0760	42.95474	108.85501	1091	9/9	19	8.9	6.9	18	13	14	31	170	130	3.5		×
99	KT-0770	43.25285	109.16827	1103	9/10	16	23	23	44	10	6.1	24	16	97	4.9	140	Δ
100	KT-0780	43.34882	109.12663	1009	9/10	29	7.1	18	68	9.6	10	6.7	238	387	5.6	100	Δ
101	KT-0790	43.42767	109.03862	925	9/10	17	8.2	14	6	19	19	10	80	115	2.4	100	Δ
102	KT-0800	43.51946	109.01751	913	9/10	12	10	58	181	263	9.4	8	5.9	60	6.5		×
103	KV-0430	43.54240	110.06734	1036	9/3	64	50	56	17	29	25	23	25	48	2.9	100	Δ
104	KV-0440	43.55040	109.98175	1089	9/3	28	46	23	30	157	13	8.8	29	215	5.5	100	○
105	KV-0450	43.54411	109.93232	1029	9/4	34	18	39	17	15	10	11	29	77	3.2	120	○
106	KV-0460	43.49511	109.96100	1047	9/4	15	9	16	3025	1.6E+06	11	13	5.6	17	25		×
107	KV-0470	43.46151	109.98184	1043	9/4	20	36	15	25	178	14	12	17	151	4.6	120	Δ
108	KV-0480	43.43786	109.93532	1089	9/4	35	8.6	204	102	557	7	3.5	44	48	16		×
109	KV-0490	43.41307	109.88774	1101	9/4	130	318	900	321	2498	24	18	63	158	4.6		×
110	KV-0500	43.40680	109.83378	1074	9/4	23	5.8	83	3190	97	14	6.1	7.1	355	10		S×
111	KV-0510	43.40976	109.76596	1071	9/4	23	52	15	19	11	8.7	14	17	156	2.5		×
112	KV-0520	43.44433	109.71422	1044	9/4	46	9	4.2	3.2	218	3.2	5	53	31	7.3	100	Δ
113	KV-0530	43.40774	109.64200	1097	9/4	261	667	1621	748	251	24	20	45	259	11	50	Δ
114	KV-0540	43.35599	109.63401	1128	9/4	115	122	370	173	104	27	16	37	87	2.5		×
115	KV-0550	43.30510	109.65081	1111	9/4	93	1.2	52	900	1520	3.1	2.2	3.6	12	20		S×
116	KV-0580	43.55874	109.64900	953	9/5	52	15	35	147	154	2.8	10	27	51	4.5		×
117	KV-0590	43.55643	109.46974	910	9/5	22	41	84	83	1470	7.6	5.5	23	67	6.6		×
118	KV-0600	43.63149	109.43038	918	9/5	26	32	15	6.7	64	20	64	52	133	3	100	Δ
119	KV-0610	43.69723	109.29289	847	9/5	43	15	11	12	12	4.2	4.9	17	27	3.1		×
120	KV-0620	43.80567	109.22846	804	9/5	20	30	17	10	7.6	7.6	11	32	67	6.2	100	Δ
121	KV-0630	43.86202	109.38267	856	9/5	24	33	9.1	6.9	14	6.9	8.8	41	166	3.7	100	Δ
122	KV-0640	43.88337	109.48847	869	9/5	27	10	7	12	40	28	45	104	46	5.6	100	Δ
123	KV-0650	43.92129	109.59188	869	9/5	25	23	30	11	7	17	20	26	43	5.7		×
124	MD-0810	43.58310	108.86394	832	9/10	28	14	14	18	11	10	15	202	159	2.9	100	Δ
125	MD-0820	43.70110	108.68613	851	9/10	37	14	30	41	34	4.1	4	29	85	7.8	120	Δ
126	MD-0990	44.19017	109.11983	810	9/16	29	15	8.3	16	2.9	5.1	20	40	136	3.1	150	○
127	MD-1000	44.07352	109.04321	821	9/16	10700	40	8.1	3.8	18.6	22	25.8	59	61	3.1	100	○
128	MD-1010	43.91861	108.88402	786	9/16	6.7	9.3	25	15	12	13	30	40	50	2.9	140	Δ
129	MD-1020	43.83240	108.82251	834	9/16	28	16	39	193	74	13	18	13	65	4	140	○
130	MD-1030	43.69924	108.55824	932	9/16	25	70	106	120	400	38	74	47	97	5.3		×
131	MD-1040	43.68350	108.45243	972	9/16	7.3	6.4	4.6	17.9	1380	10.8	21	41	22	20.1	80	×
132	MD-1050	43.71745	108.25657	870	9/17	2.7	9.9	2.8	3.6	1.4	1.8	4.2	14.3	168	3.7	140	Δ
133	MD-1060	43.75494	108.42644	949	9/17	11.6	34.5	12.2	8.4	22	7.7	5.8	33.8	138	3.1	100	Δ
134	MD-1070	43.84385	108.40498	919	9/17	361	81	320	109	290	18	17	65	282	4.8	120	○
135	MD-1080	44.36618	108.07262	1348	9/18	33	138	246	416	1.4E+05	11	2.5	4	7	122		×
136	MD-1090	44.32548	107.76176	1206	9/18	21	29	62	942	21000	9.7	12	45	64	28.6		×
137	MD-1100	44.37442	107.70785	1230	9/18	79	115	191	123	613	19	19	138	144	4.4		×
138	MD-1110	44.52091	108.34164	1270	9/18	12	8	15	45	886	7.2	13.8	12.8	86	6.7	120	Δ
139	MD-1180	44.25353	109.04837	873	9/19	20	12	8.5	11	6.3	9.7	24	27	235	5.2		×
140	MD-1190	44.23474	108.90819	884	9/19	30	11	19	107	4	8.8	27	42	95	3.3	140	Δ
141	MD-1200	44.34187	108.92783	926	9/19	74	8.3	5.1	4.7	89	8	3.7	36	78	3.1	140	Δ
142	OR-0870	44.80111	111.12604	990	9/12	10	5.8	12	76	628	9	8.2	11	102	5	40	Δ
143	OR-0880	44.89644	111.17121	942	9/12	20	23	30	2.9	49	4	17	54	69	4.5	80	Δ
144	OR-0900	44.72202	110.50854	968	9/14	34	7.3	5.9	347	2390	5.3	10	27	56	8.6	80	Δ
145	OR-0910	44.65830	110.56385	997	9/14	115	867	6.5E+04	1.1E+05	1.3E+05	20	102	18	50	21		×
146	OR-0920	44.69508	110.69307	977	9/14	9.4	4.2	7.8	2.4	33	9.4	14	68	76	3.2	100	○
147	OR-0930	44.76536	110.84341	967	9/14	33	14	52	38	260	9.2	18	78	73	4.9	80	◎
148	OR-0940	44.78439	110.92590	974	9/14	20	140	380	1070	3300	14	13	220	64	11.3		×
149	OR-0950	44.84209	111.02969	952	9/14	10	35	58	32	740	15	6.5	20	61	3.5	100	Δ
150	OR-0960	44.88526	111.09775	939	9/14	14	7.7	6.7	11.8	2.7	12.3	18	35	105	4	150	○
151	OR-0970	44.97893	111.16095	1005	9/14	24	122	397	15	5.8	17	4.5	65	57	4.6	120	Δ
152	OR-0980	45.08507	111.21780	975	9/14	19	11	17	14	7.5	10	21	42	133	3.2	150	○
153	SD-1120	44.62496	108.65646	1225	9/18	18	96	44	20	3911	12	14	29	39	6.3	50	Δ
154	SD-1130	44.65656	108.82022	1155	9/18	19	43	129	64	1344	17	18	51	39	5.9	80	Δ
155	SD-1140	44.61556	109.03228	1170	9/19	13	18	42	41	212	6.4	3.2	9.4	60	6.2	120	Δ
156	SD-1150	44.54440	109.02140	1090	9/19	36	34	38	37	18	16	17	26	159	2.8	150	Δ
157	SD-1160	44.45256	109.03794	952	9/19	13	8.2	15	9.6	658	14	11	16	116	1.9	140	Δ
158	SD-1170	44.36684	109.07835	902	9/19	52	8.9	21	5.7	7.3	0.9	3.4	5.6	17	2.3	150	Δ
159	SD-1210	44.49025	108.94566	1019	9/19	18	8.7	7.1	4.9	28	8.3	24	15	124	2.6	140	Δ
160	SD-1220	44.58255	109.13837	1085	9/19	22	51	96	150	233	8.5	9.1	11	71	5.8	30	SΔ
161	SD-1720	44.87328	109.75420	961	9/30	17	12	12	12	9.6	3.9	12	32	46	2.4		×
162	SD-1730	44.83680	109.53896	993	9/30	10	22	8.7	7.6	6.6	5.9	4.8	4.7	39	6.1	140	Δ

D.3 TEM results for 5-layer inversion Estimated depth to the aquifer

No.	Station	N.L(deg)	E.L(deg)	Level(m)	Date	ρ-1	ρ-2	ρ-3	ρ-4	ρ-5	t-1	t-2	t-3	t-4	error(%)	Depth	Possibility
163	SD-1740	45.16102	109.53146	907	9/30	28	15	5.1	31	1166	7.7	6.8	43	26	3	80	○
164	SD-2140	44.75245	108.96537	1193	10/9	19	40	388	37	7300	8.9	6.6	22	24	11.7		×
165	SD-2150	44.99251	108.72224	1073	10/9	14	57	15	4.8	20	9.3	42	81	77	6	100	△
166	SS-0240	44.45324	110.13110	706	9/1	13	9.3	32	16	17	12	18	24	76	4.6	80	△
167	SS-1640	44.48255	110.12911	736	9/29	27	33	36	22	25	11	19	27	71	3.3	100	△
168	SS-1650	44.47671	110.06995	748	9/29	1.7	29	4.2	3.2	1.2	0.9	5.8	3.7	63	5		×
169	SS-1660	44.50087	109.97713	808	9/29	54	22	26	13	15	6.2	25	22	259	2.2		×
170	SS-1670	44.51665	109.89864	882	9/29	16	24	21	4.4	8.3	10	25	86	60	9.5	140	○
171	SS-1680	44.54346	109.80523	952	9/29	27	12	8.8	8.2	13	15	30	37	55	1.8	80	△
172	SS-1690	44.58961	109.68955	1051	9/29	30	24	13	6.4	6.2	23	26	123	88	3.6	140	△
173	SS-1700	44.74361	110.12873	844	9/29	15	24	11	22	2.9	19	18	60	68	4.5	140	○
174	SS-1710	44.89427	110.02083	961	9/30	27	15	23	8.8	84	15	26	65	115	3	100	○
175	UL-0170	43.70858	111.05564	948	8/28	20	13	22	21	11	12	17	22	85	1.9	140	△
176	UL-0180	43.67236	111.06069	988	8/28	14	38	19	8.5	3.8	5.5	7.7	10	46	2.4		×
177	UL-0250	44.32742	110.30347	774	9/1	54	11	1067	7724	2E+05	13	16	8.9	16	7.5		×
178	UL-0260	44.10521	110.35384	868	9/1	75	75	25	4.4	1.1	7.2	33	92	141	5.2		×
179	UL-0270	43.78094	110.68314	954	9/1	34	34	12	3.6	337	24	25	31	38	5.7	80	△
180	UL-0280	43.80543	110.72698	929	9/1	41	8.9	7.7	5.9	288	18	26	35	39	3	80	△
181	UL-0290	43.84726	110.76933	933	9/1	22	24	8.9	4.2	321	7.8	36	68	124	3.6	80	△
182	UL-0300	43.72628	110.92720	950	9/1	66	39	85	49	323	22	48	42	94	4.2		×
183	UL-0310	43.69050	110.92853	948	9/2	677	2.7	3600	46	2240	3.9	1.6	54	75	9.2	120	△
184	UL-0320	43.66403	110.95098	980	9/2	24	17	68	24	80	17	31	54	163	4	100	△
185	UL-0330	43.63043	110.96092	1013	9/2	31	14	5.8	7.7	2.8	7..3	24	26	122	2.6	140	△
186	UL-0340	43.61167	111.01958	1046	9/2	33	11	12	6.7	2.2	6.2	17	31	142	2.3	140	△
187	UL-0350	43.57801	111.06486	1052	9/2	5040	11	3.7	3	20000	6.5	1.5	13	11	15		×
188	UL-0360	43.48788	111.05722	1058	9/2	14	11	17	13	7.9	7.4	9.5	34	130	2.7	140	△
189	UL-0370	43.38633	111.07028	1031	9/2	6.9	5.3	4.1	3.4	10.1	6.2	8.8	33	74	2.1		×
190	UL-0380	43.34136	111.03717	1110	9/2	44	19	1400	673	81	20	44	98	245	5.3	160	△
191	UL-0390	43.48937	111.01004	1070	9/2	103	139	171	147	400	21	44	175	249	7.3		×
192	UL-0400	43.72484	110.60471	963	9/3	26	107	33	82	271	10	23	23	135	3.5		S×
193	UL-0410	43.64656	110.66541	981	9/3	10	5.1	5.5	59	5.9	6.6	19	55	126	2.9	140	△
194	UL-0420	43.46840	110.74726	1171	9/3	172	288	594	238	846	35	28	107	199	7.2		×
195	UL-1750	43.88993	110.70059	984	10/1	32	15	5.9	24	5.1	63	39	83	139	4.2	140	△
196	UL-1760	43.88358	110.67188	963	10/1	30	17	4.8	60	11	42	57	81	344	2.5	140	△
197	UL-1770	43.90029	110.73123	1006	10/1	39	116	5.7	23	1.4	72	14	53	97	3.1	150	S△
198	UL-1780	44.09852	110.67365	992	10/1	20	10	13	14	8.7	14	18	138	120	4.8	140	S○
199	UL-1790	44.06642	110.66120	996	10/1	14	41	12	30	4.5	9.5	18	146	61	5.6	140	△
200	UL-1800	43.88737	110.37621	996	10/2	146	26	108	43	2.3	3.7	4	215	304	5.2		×
201	UL-1810	43.86531	110.33735	995	10/2	17	23	7.5	1334	2423	21	24	50	102	4.2	100	○
202	UL-1820	43.86330	110.40494	968	10/2	16	44	12	75	1220	10	19	53	26	6.3	80	△
203	UL-1830	43.87974	110.42311	985	10/2	489	19	2600	70	157	4.3	4.4	60	39	9.8	80	○
204	UL-1840	43.88675	110.42322	1000	10/2	464	127	833	6232	75200	38	25	22	46	15	100	△
205	UL-1850	43.90400	110.47083	1003	10/2	700	16	118	2.8E+04	9.8E+05	9.6	3.9	6.8	21	38	40	S○
206	UL-1860	43.89612	110.10270	1042	10/2	36	119	182	136	151	21	22	41	59	6.7		×
207	UL-1870	43.94130	110.11324	990	10/2	20	39	16	6.2	420	10	54	41	117	2.8	140	○
208	UL-1880	43.98857	110.19515	969	10/2	27	70	7.9	23	417	8.8	12	32	61	4	80	△
209	UL-1890	44.08171	110.28637	874	10/2	18	39	87	9.8	11	8.7	17	21	37	5.7	60	○
210	UL-1900	43.90360	110.46883	993	10/3	77	316	725	4434	11220	18	27	23	40	26		×
211	UL-1910	43.86977	110.42842	985	10/3	32	58	17	6.7	74	17	9.1	28	51	3	100	△
212	UL-1920	44.21164	109.86819	722	10/3	69	15	0.2	8.4	12	5.4	7.3	26	146	2.9	60	○
213	ZU-0060	43.72935	111.79708	967	8/27	48.5	38.5	12.3	6.5	9.1	19.2	14.8	30	34	2.8	140	○
214	ZU-0070	43.72543	111.73767	962	8/27	70.5	25.7	22.9	8.5	7.8	12.5	10.2	48.1	83.2	3.9	80	△
215	ZU-0080	43.72979	111.68179	960	8/27	335	42.1	8.3	43.9	6.2	8	5.2	20.5	37.1	2.9	80	○

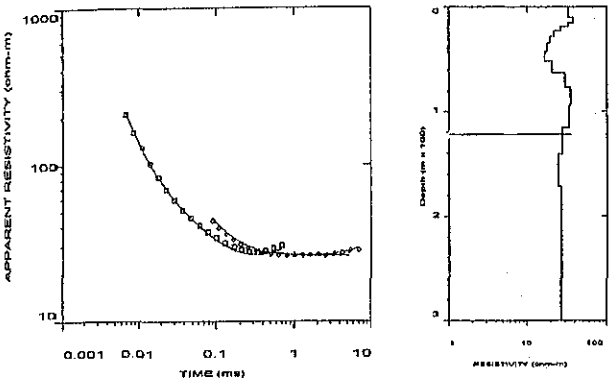
Depth : Estimated drilling depth to the aquifer
Possibility : ◎ : high possibility
○ : possible
△ : uncertain
× : low possibility, not enough data
S : possible shallow well

Fig D.1 Map of the stations

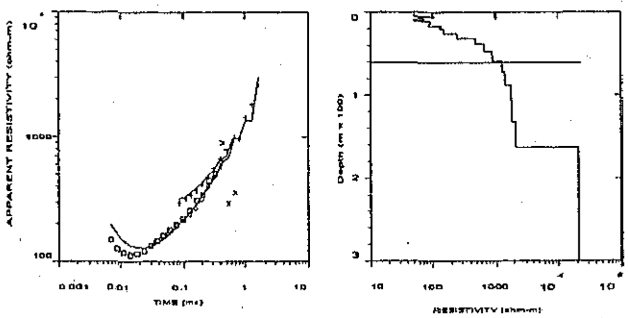
D.4 Figures of the results of smooth inversion (Occam's inversion)

AIRAG-SMOOTH INVERSION

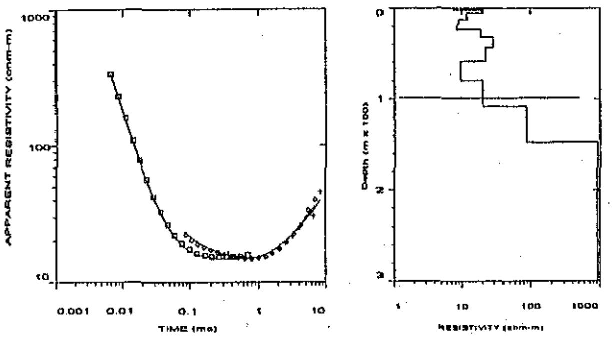
AR-1290



AR-1300



AR-1310



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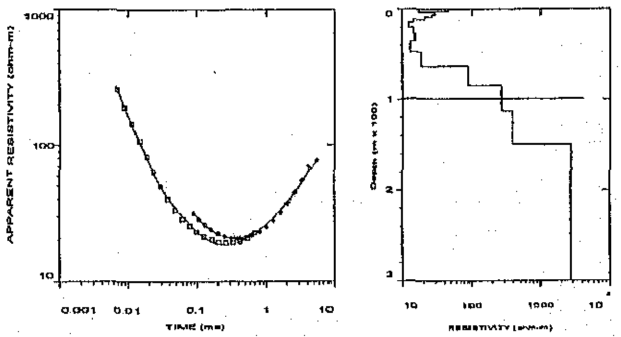

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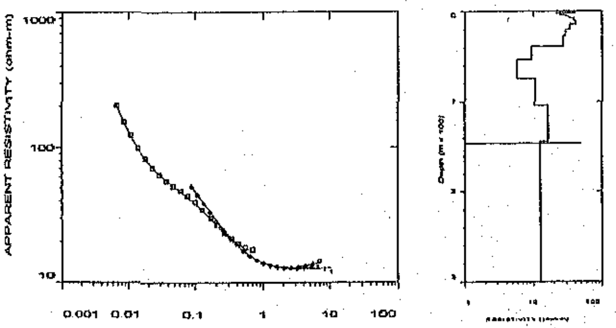

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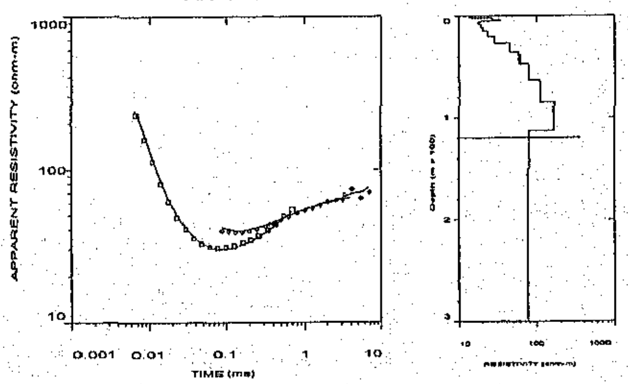

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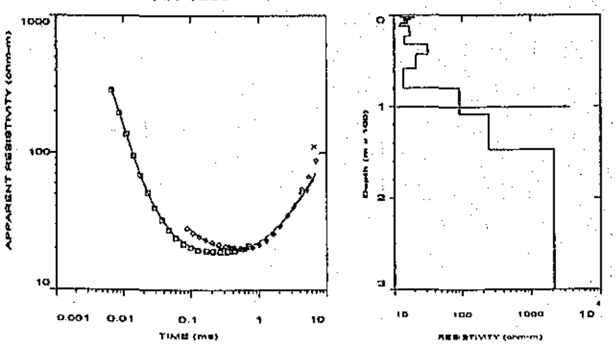

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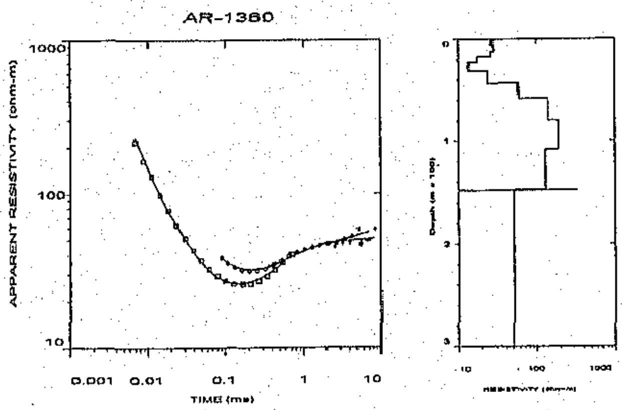
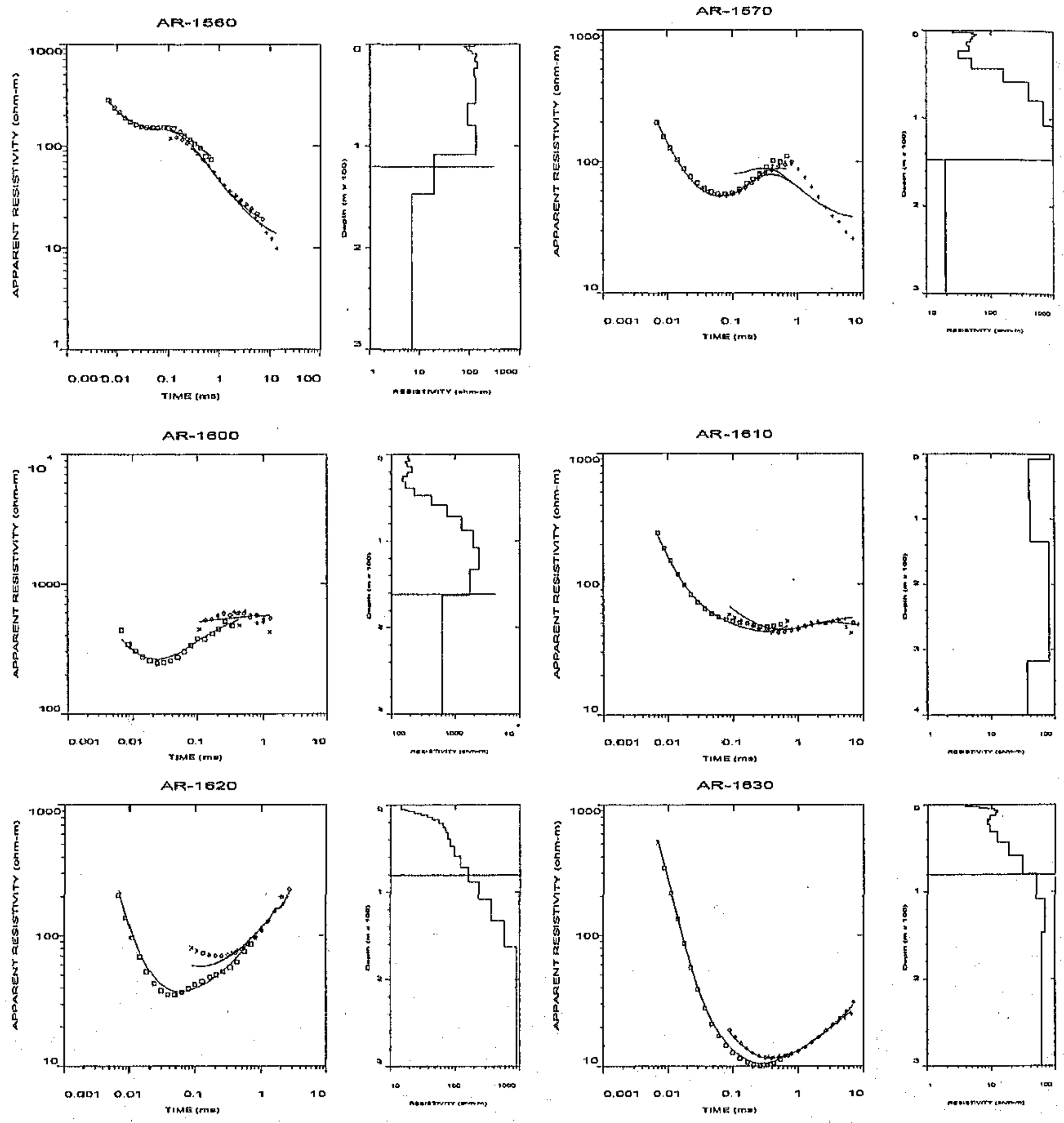
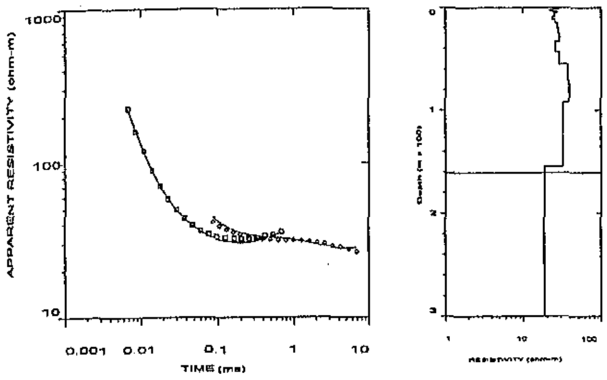


AIRAG-SMOOTH INVERSION



AS-2030



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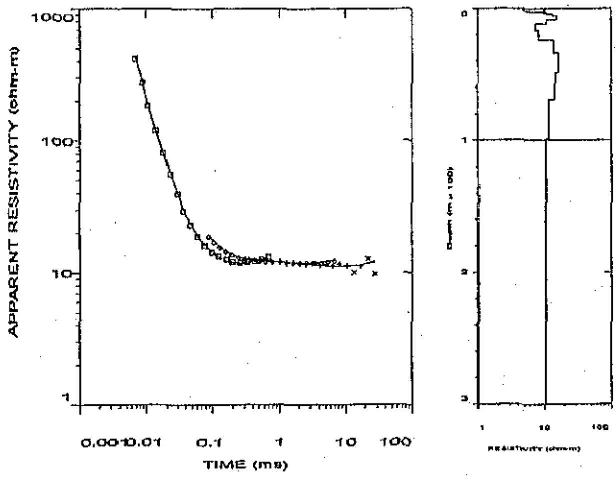

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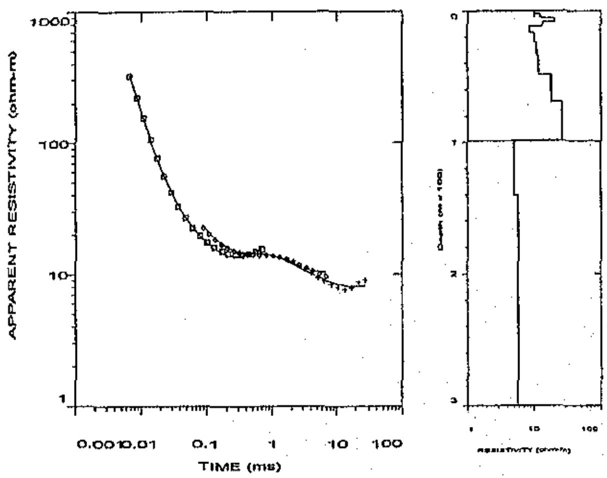

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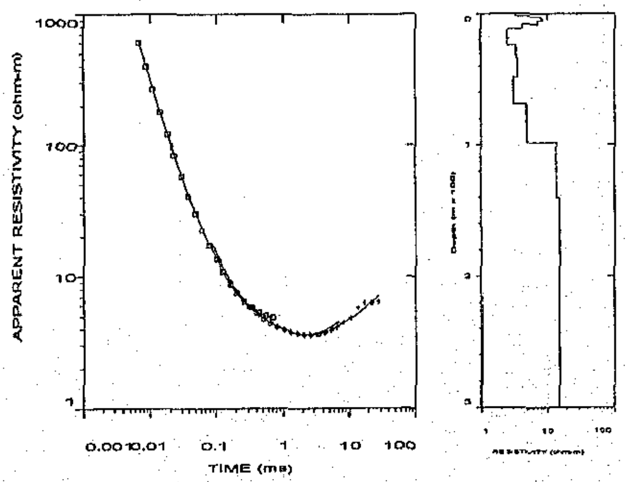

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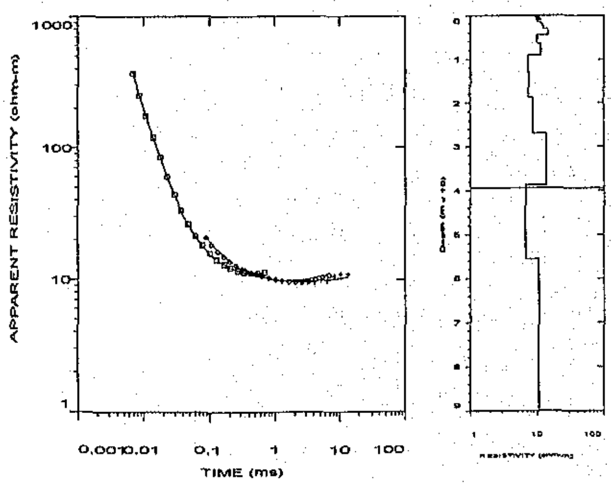
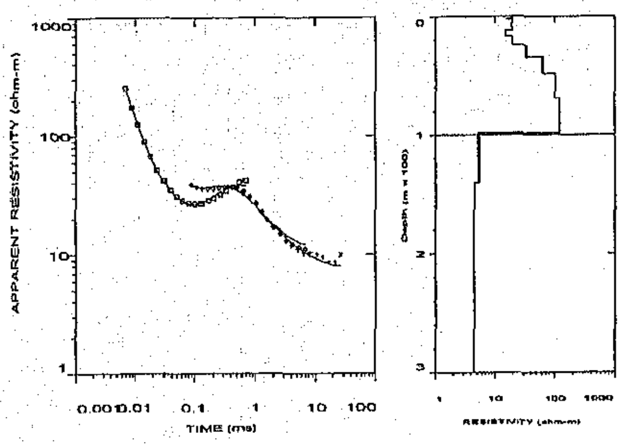
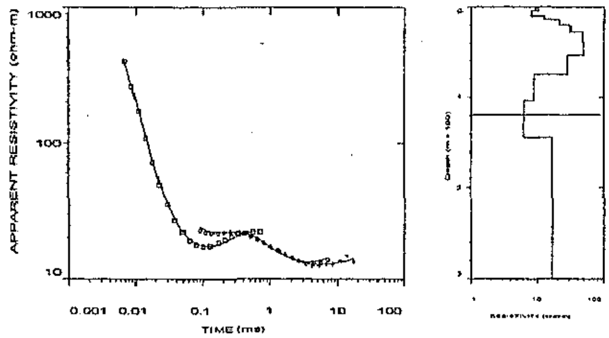


AS-2080



ALTANSHIREE-SMOOTH INVERSION

AS-2090



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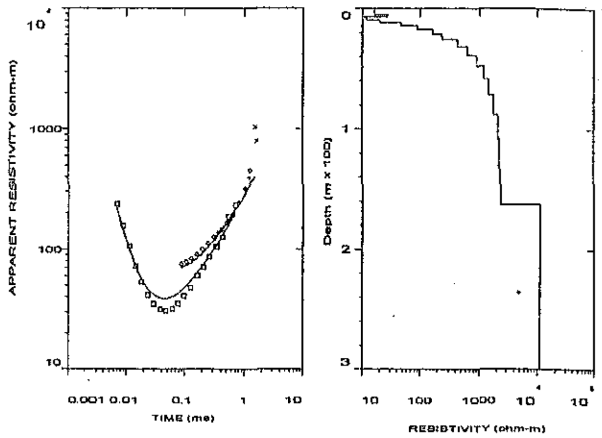
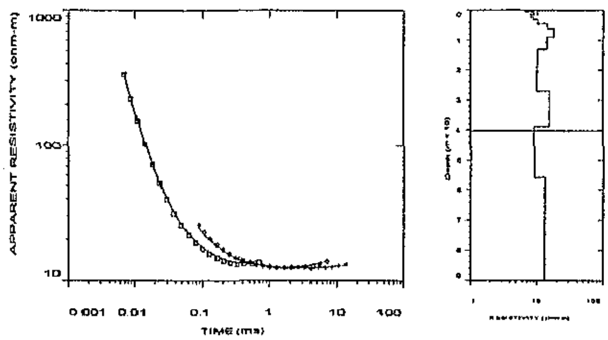


AS-2110



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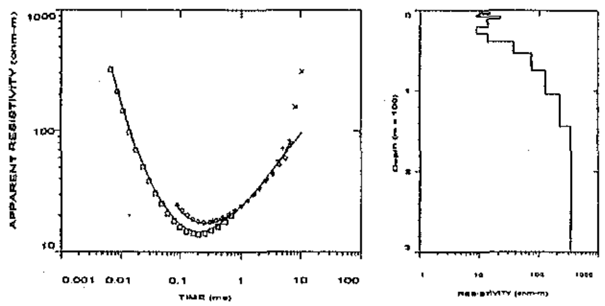

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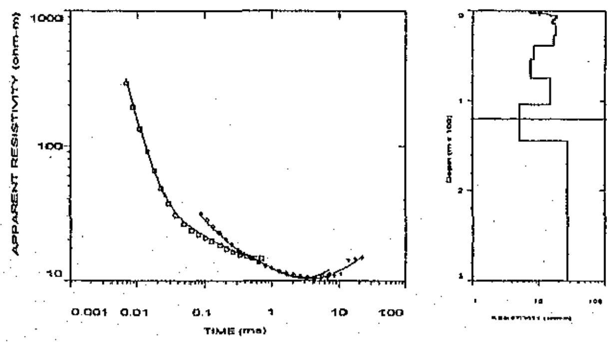
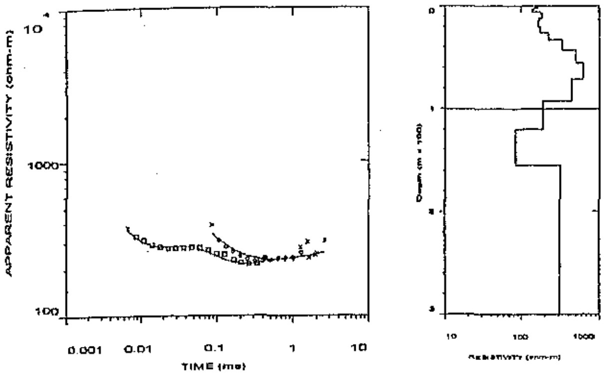
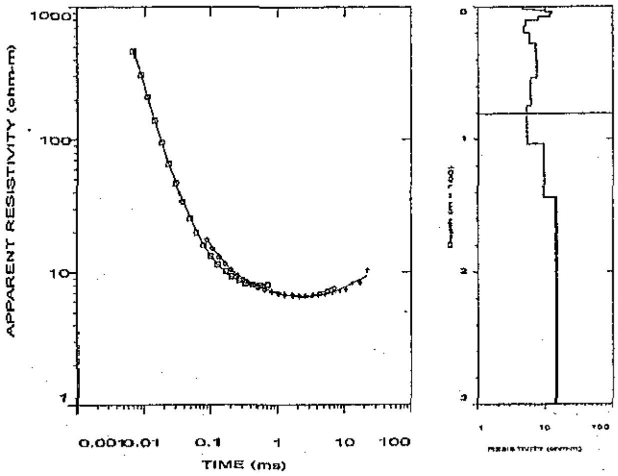


DELGREKH-SMOOTH INVERSION

DG-1930



DG-1940



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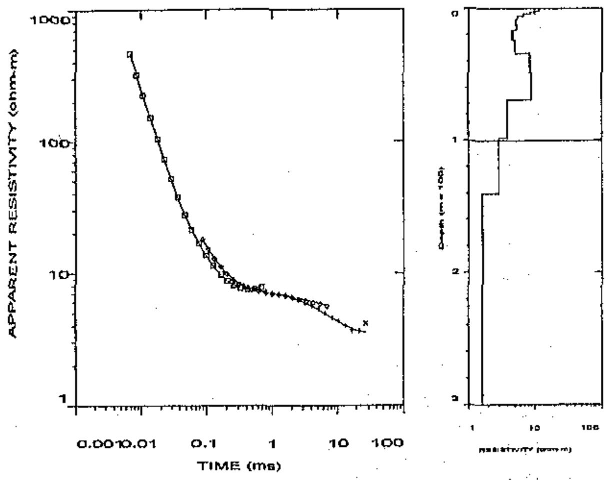

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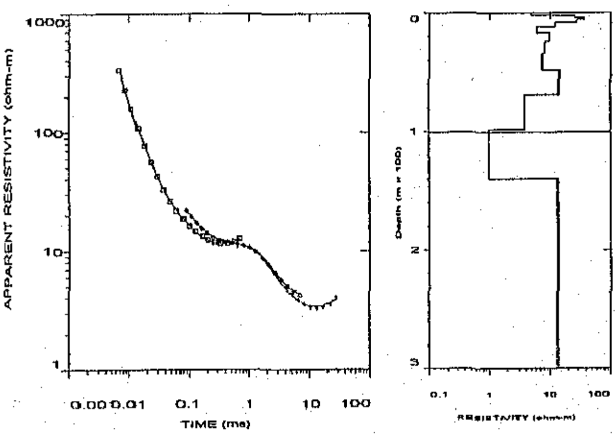

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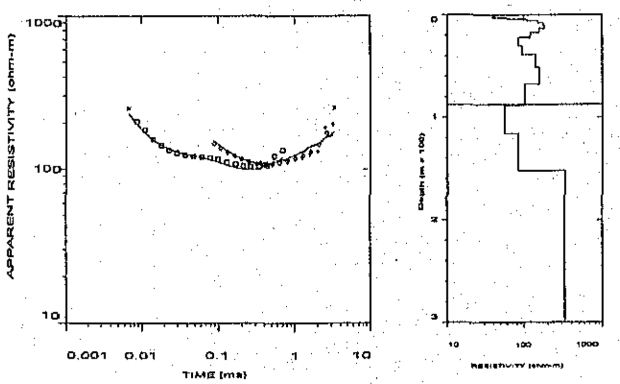

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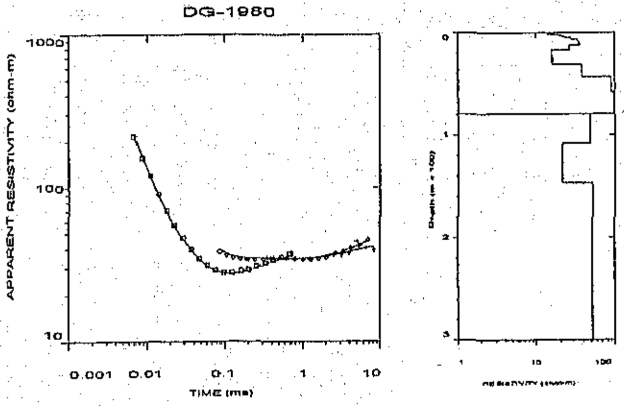
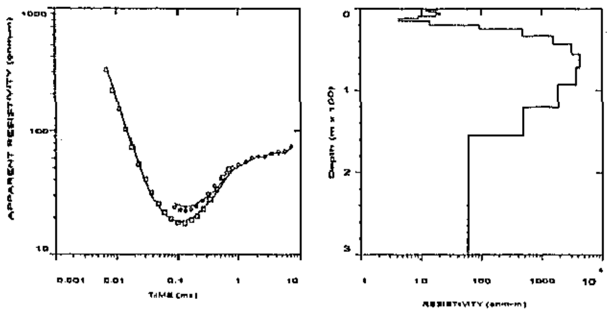


DELGREKH-SMOOTH INVERSION

DG-1990



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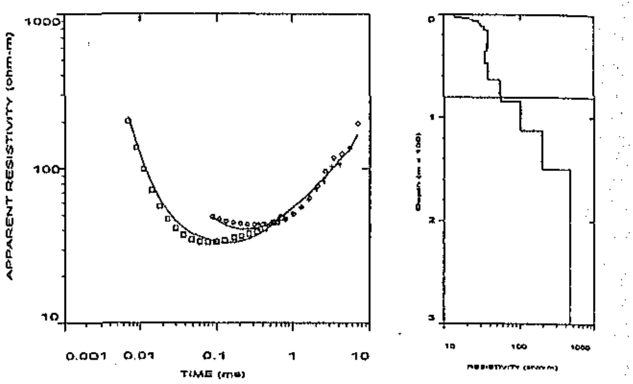

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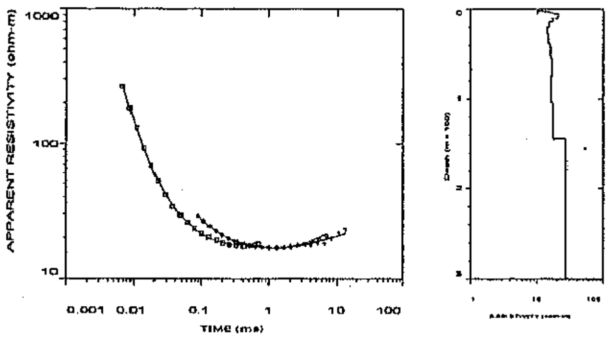
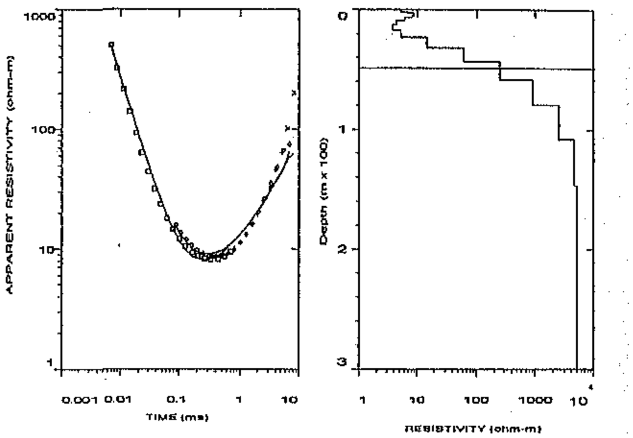
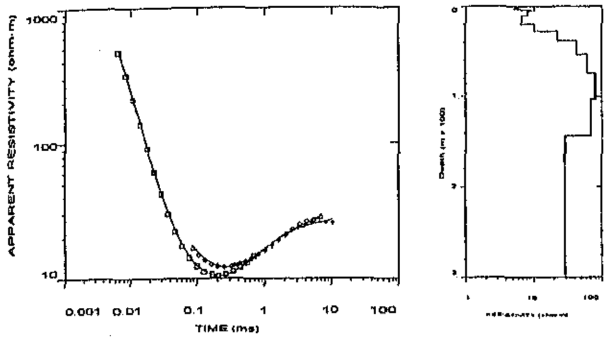


DG-2020



DALANJARGALAN-SMOOTH INVERSION

DJ-1470



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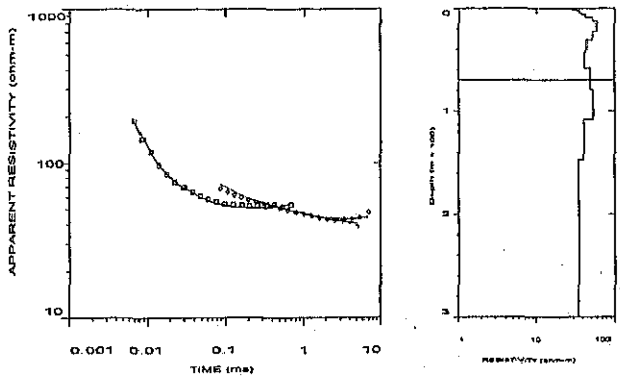

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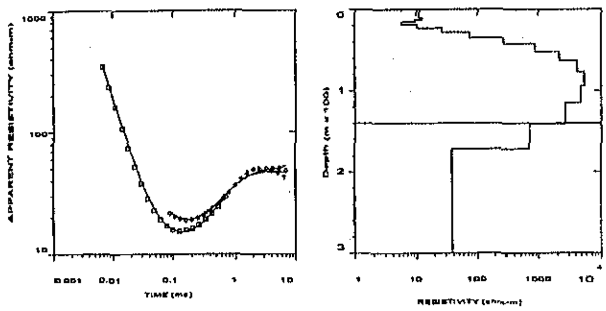

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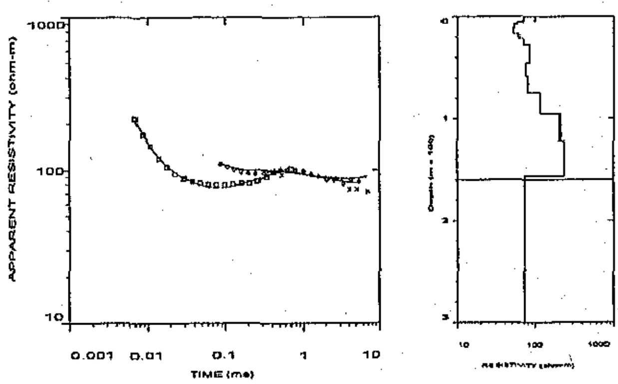

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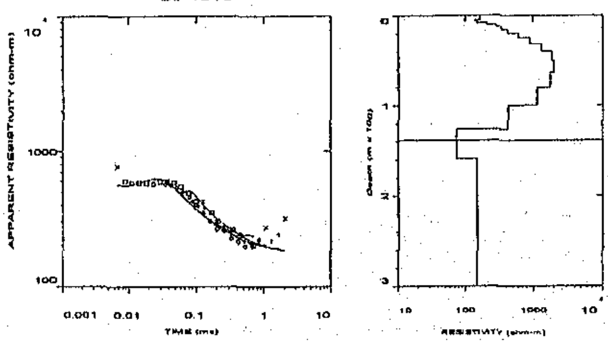

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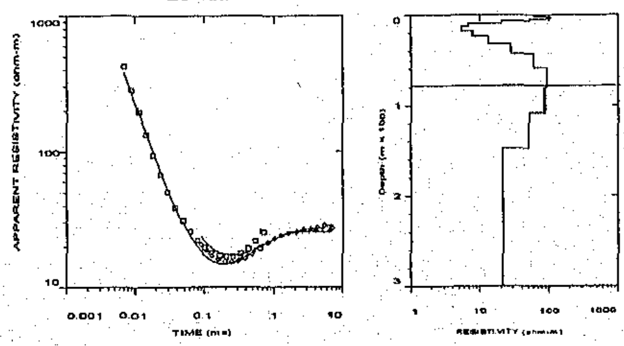

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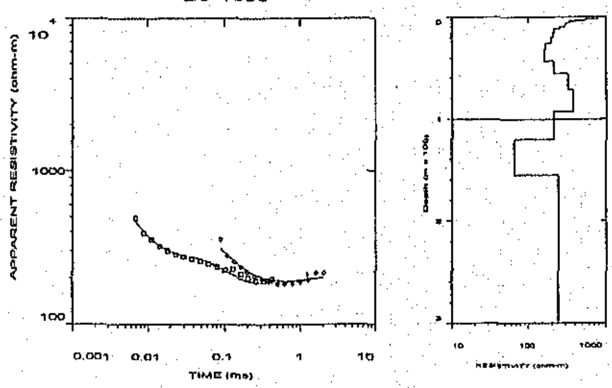

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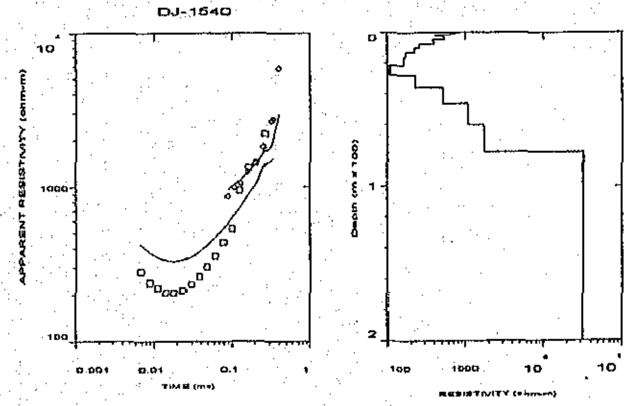

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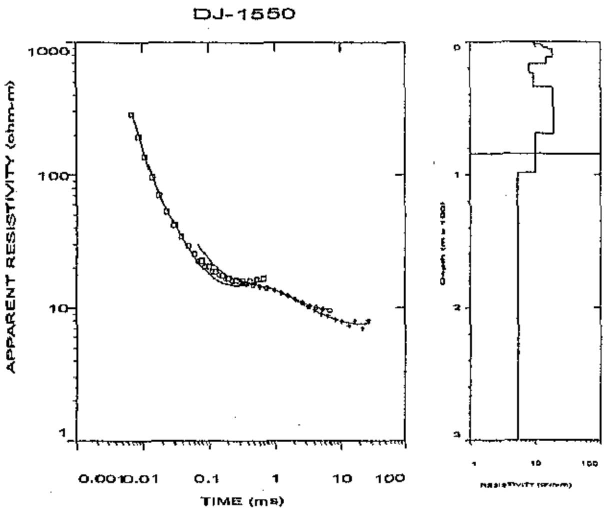
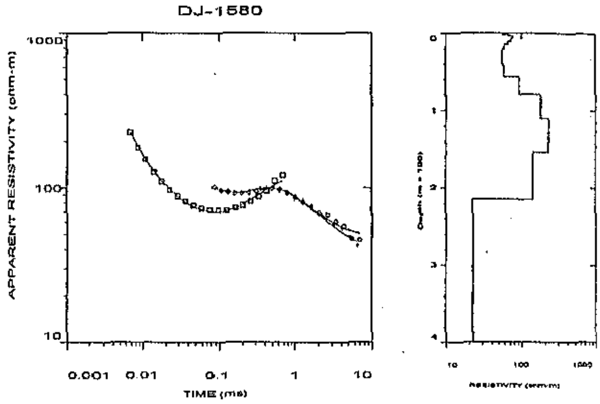
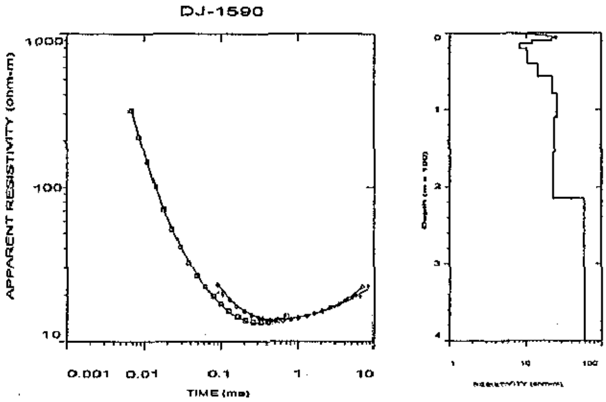
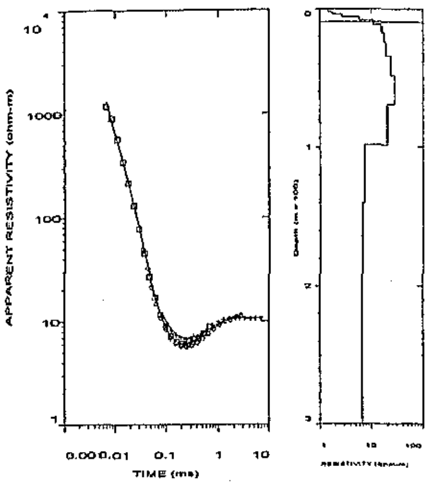




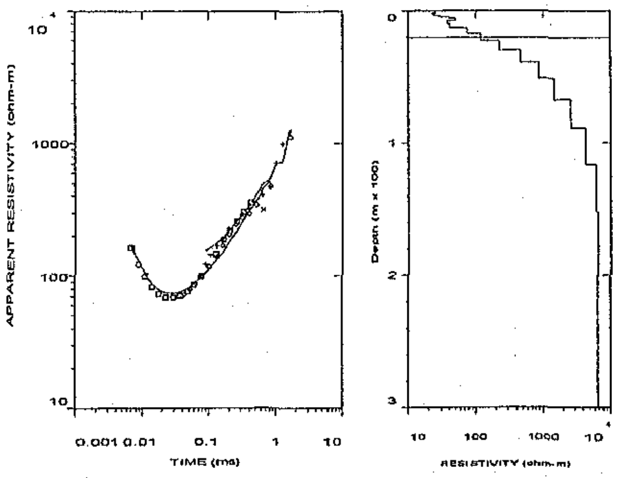


ERDENE - SMOOTH INVERSION

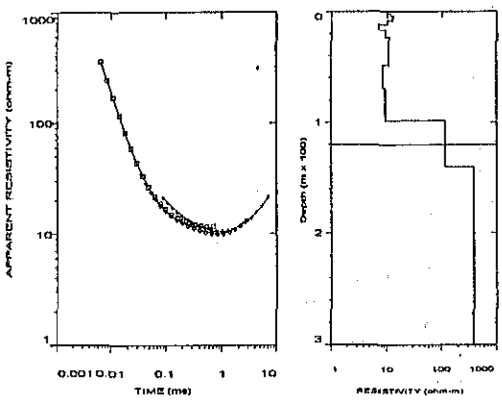
ER-010



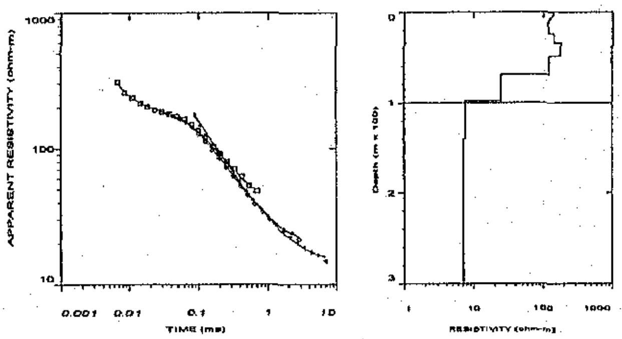
ER-020



ER-030



ER-040



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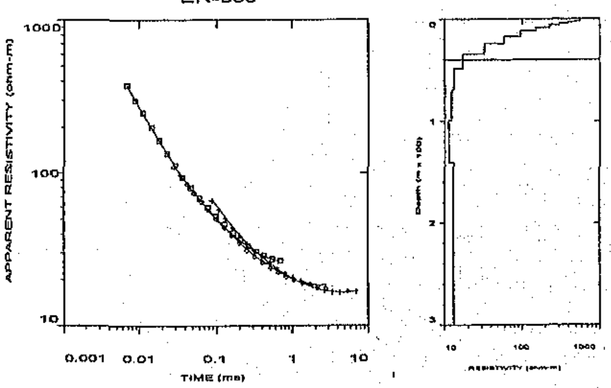
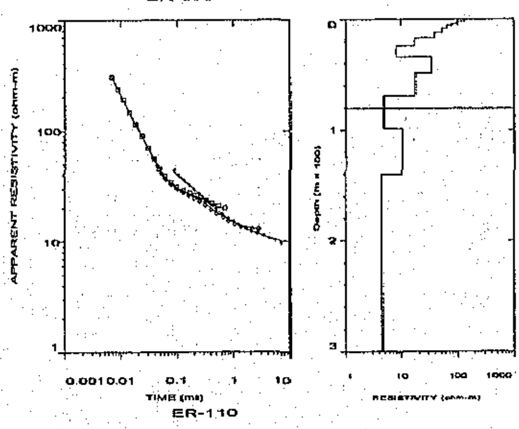


ER-000



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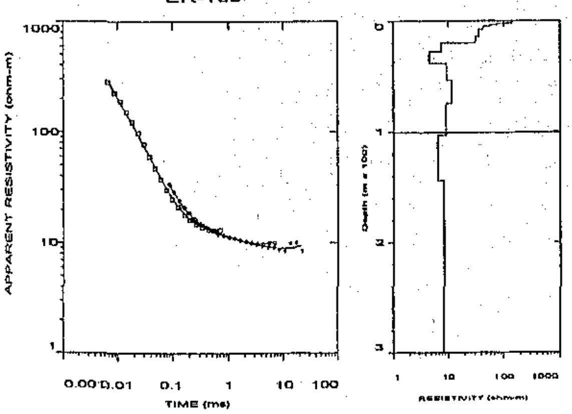
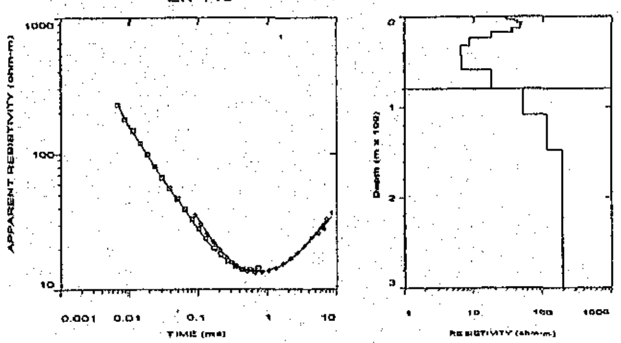
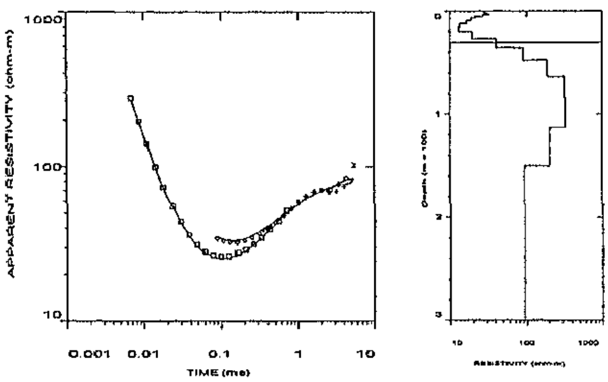


ER-110

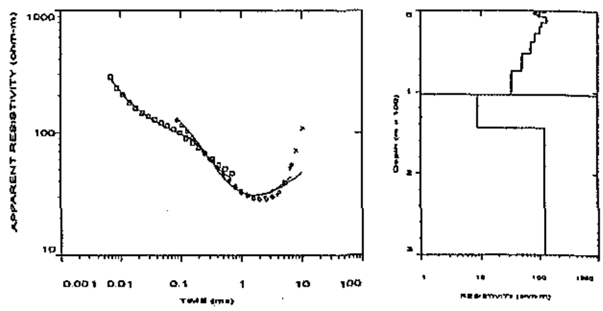


ERDENE - SMOOTH INVERSION

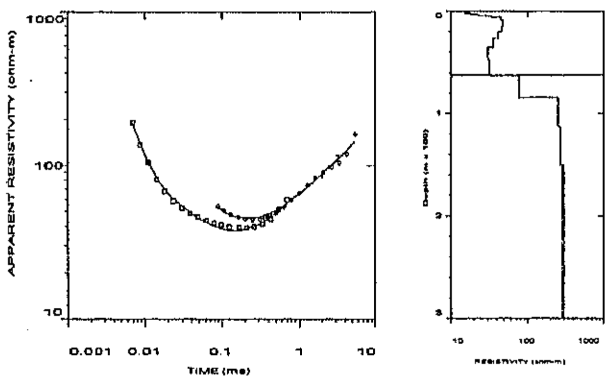
ER-120



ER-130



ER-140



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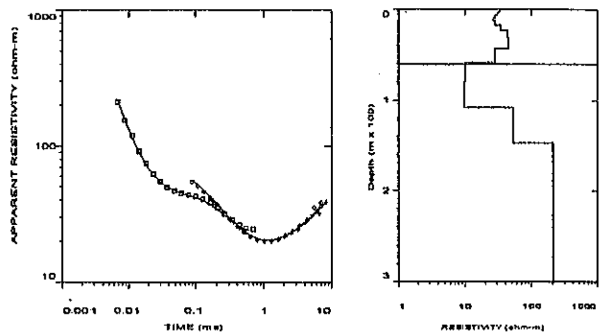
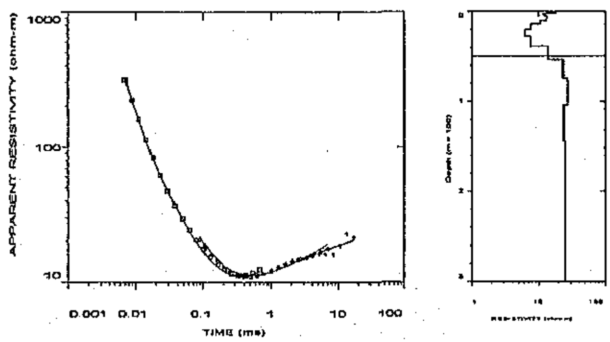


ER-160



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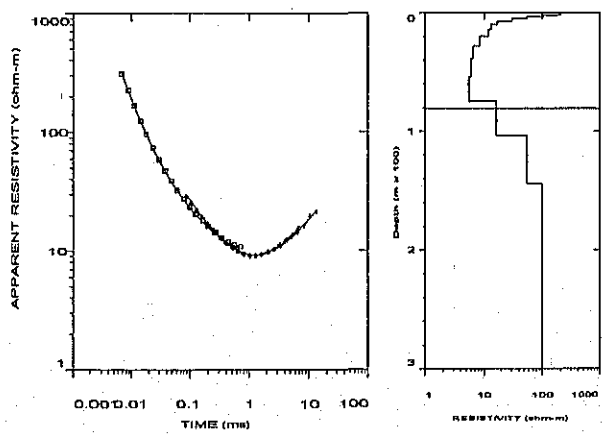

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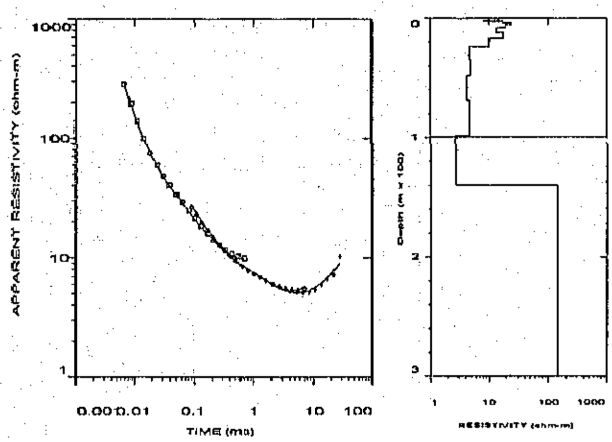
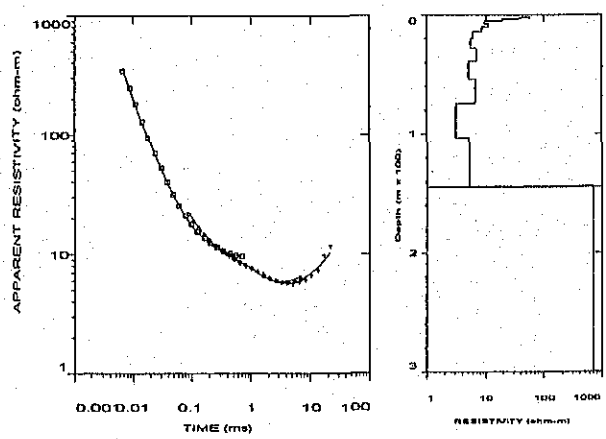
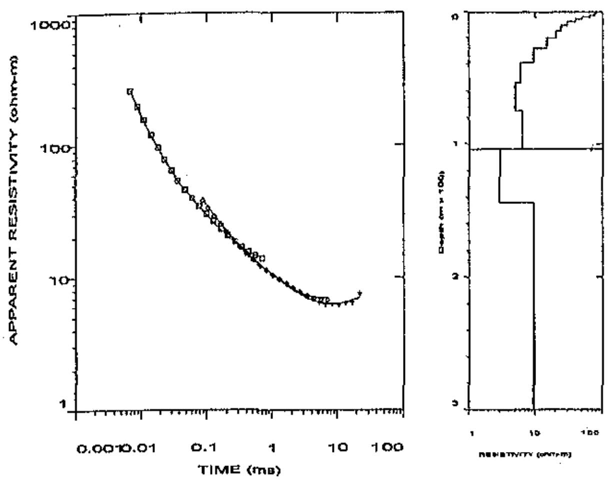


ER-210

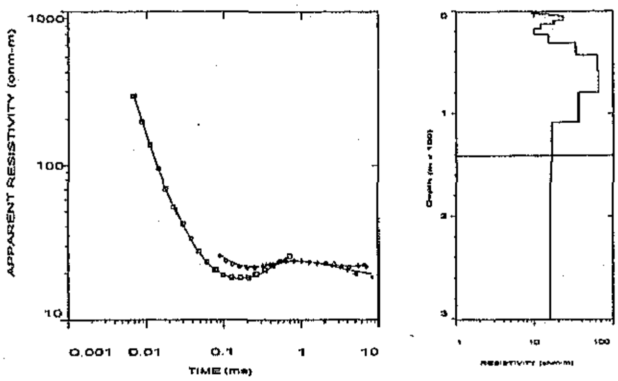


ERDENE - SMOOTH INVERSION

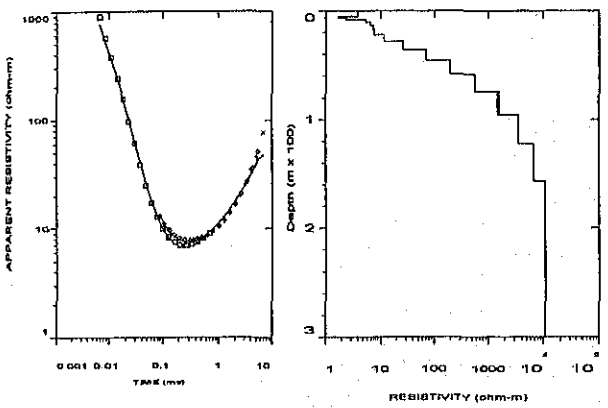
ER-220



ER-230



ER-830



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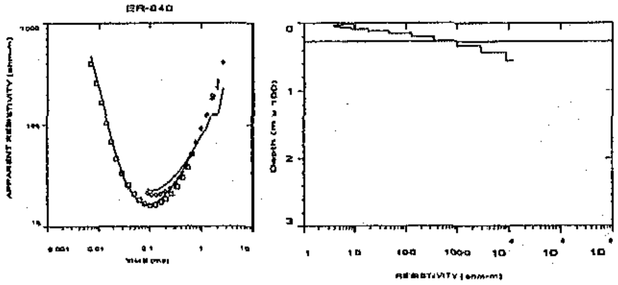

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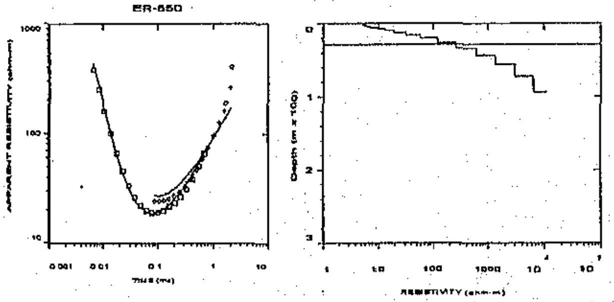

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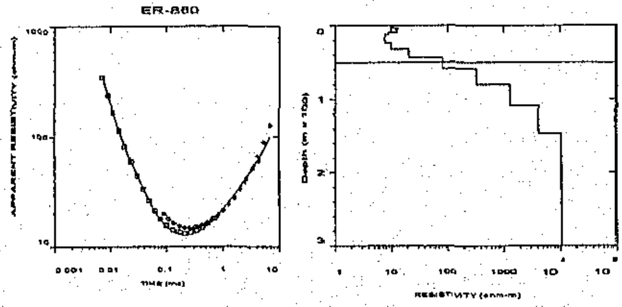

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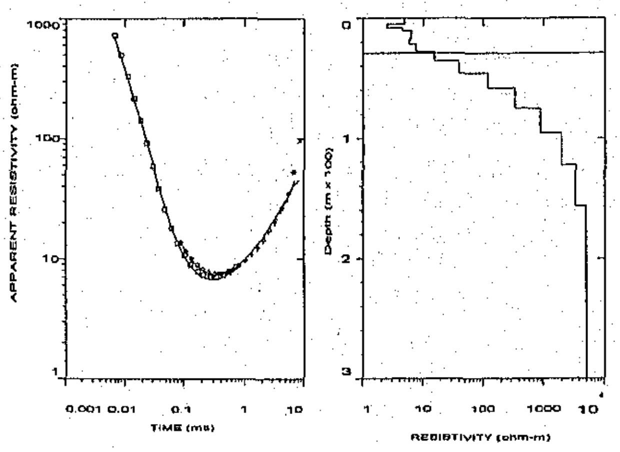

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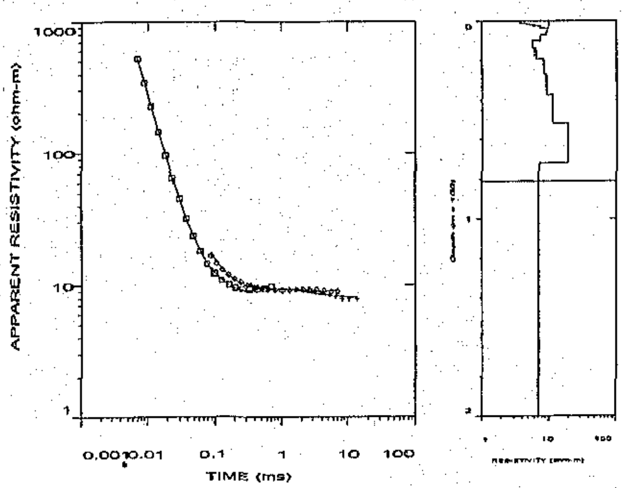
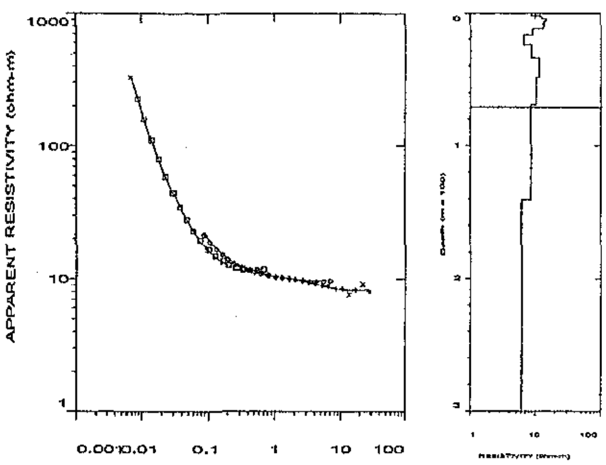
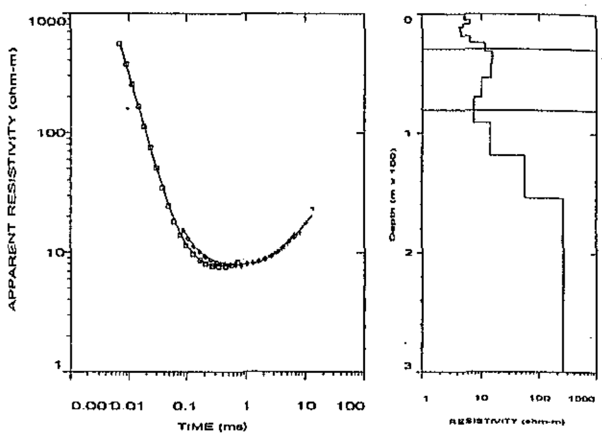


ERDENE - SMOOTH INVERSION

ER-1240



ER-1250



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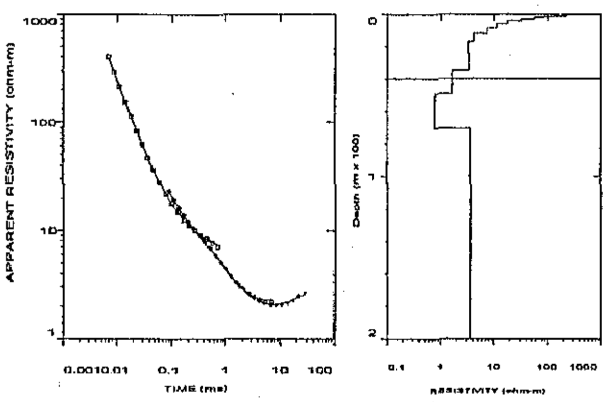

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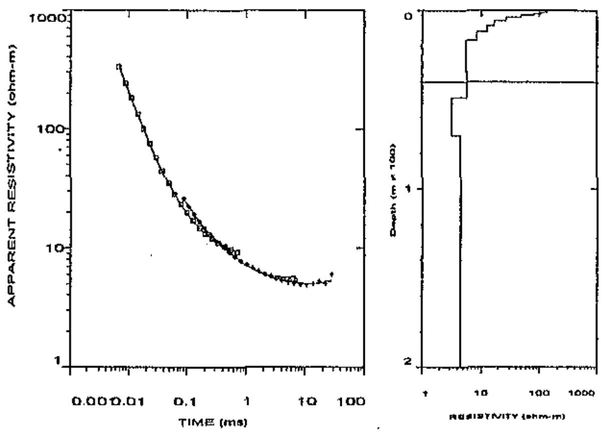

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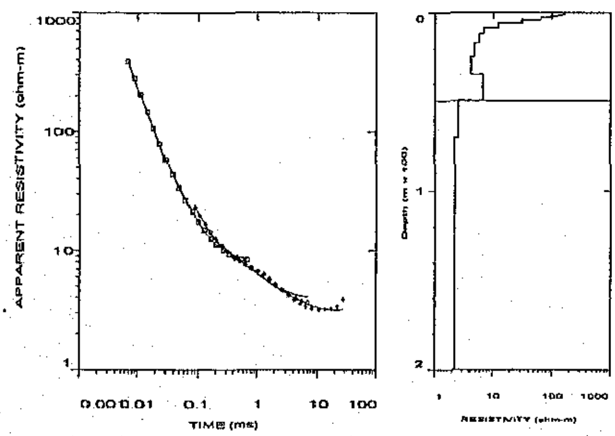
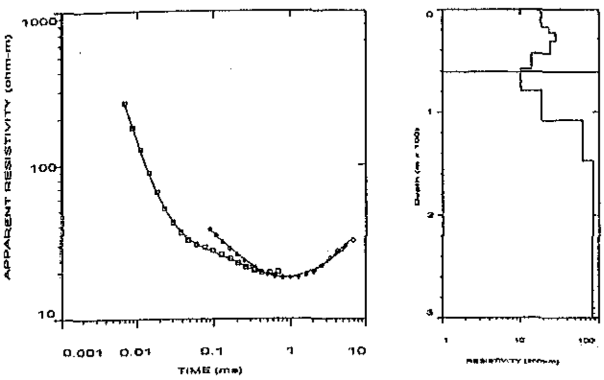


IKHET - SMOOTH INVERSION

IH-1370



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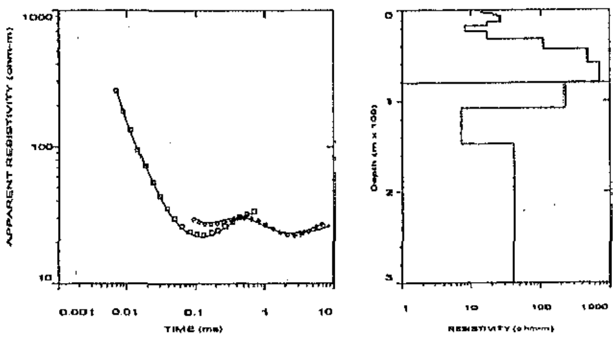

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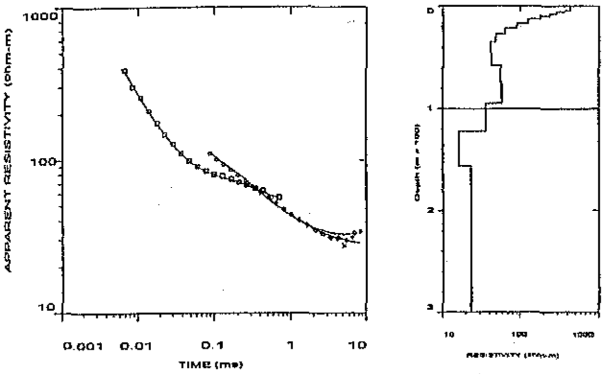

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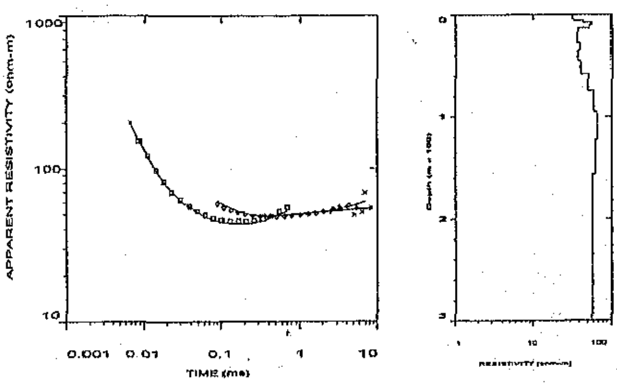

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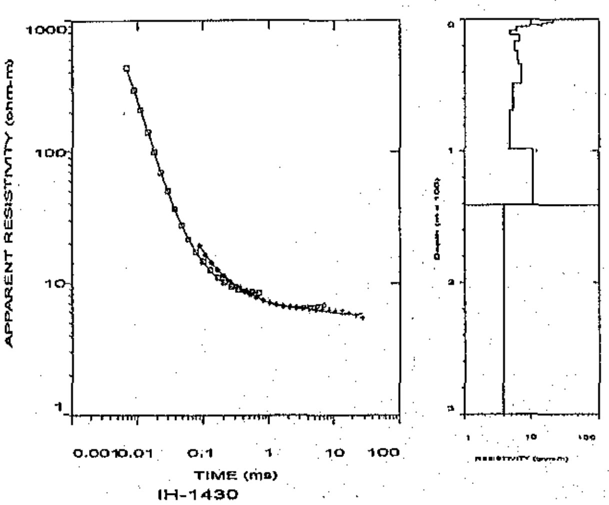

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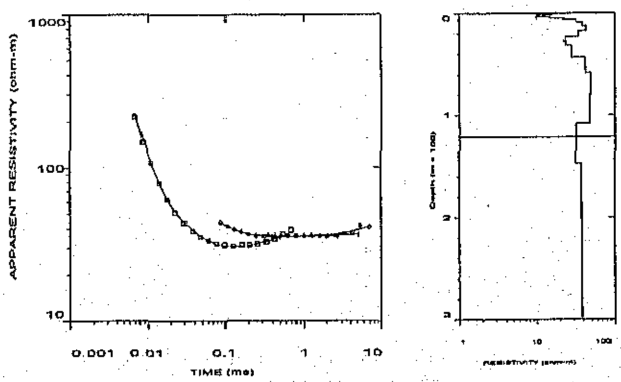

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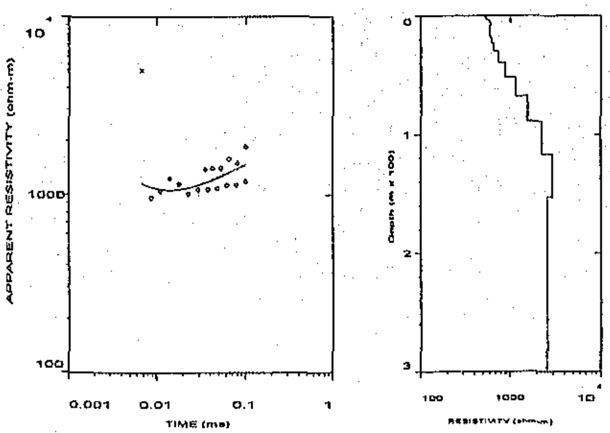

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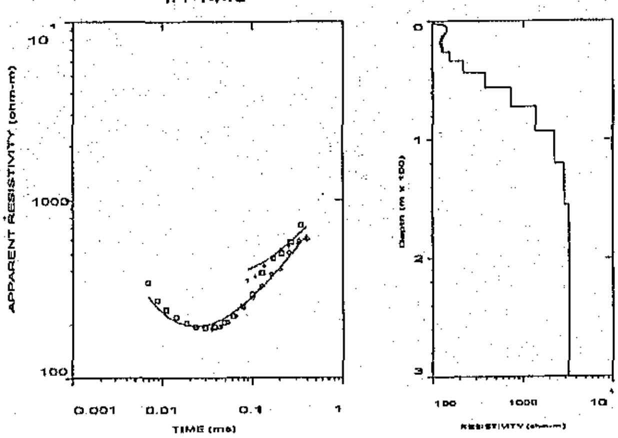
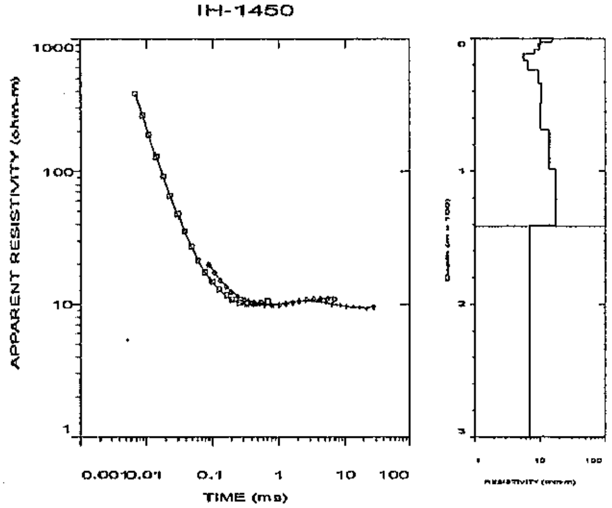
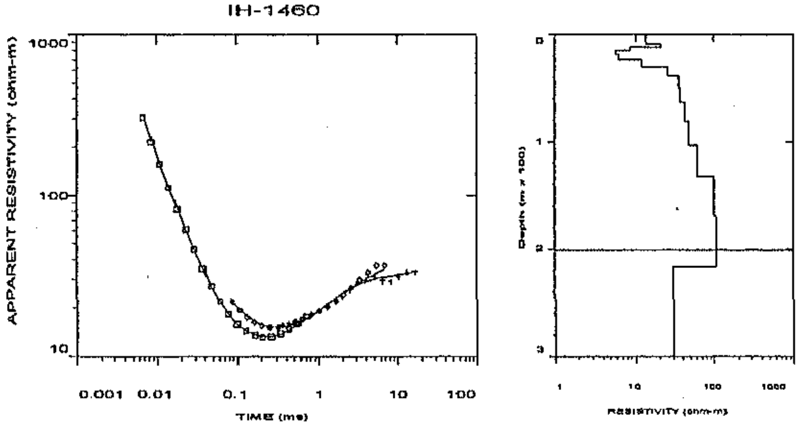


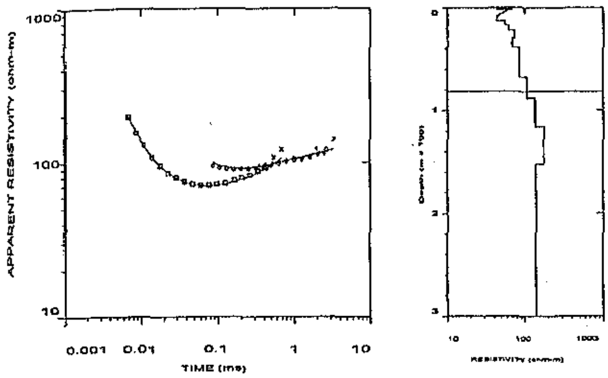
IKHET - SMOOTH INVERSION





KHATANBULAG - SMOOTH INVERSION

KT-560



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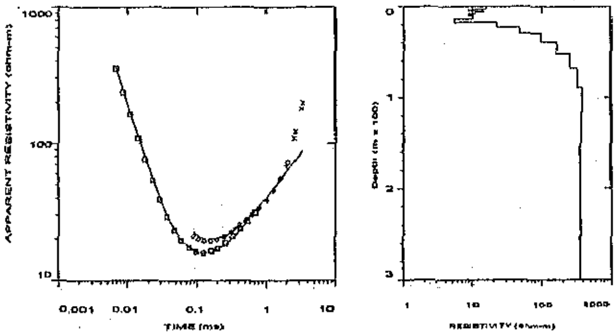

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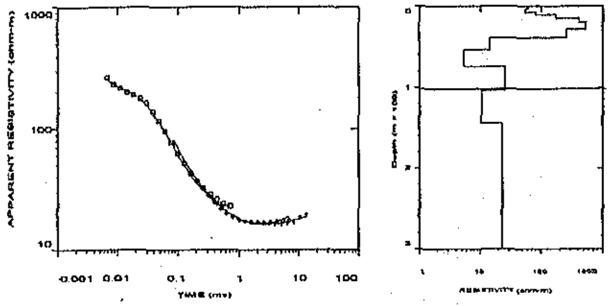

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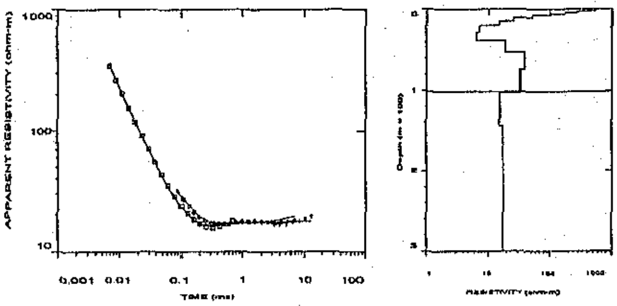

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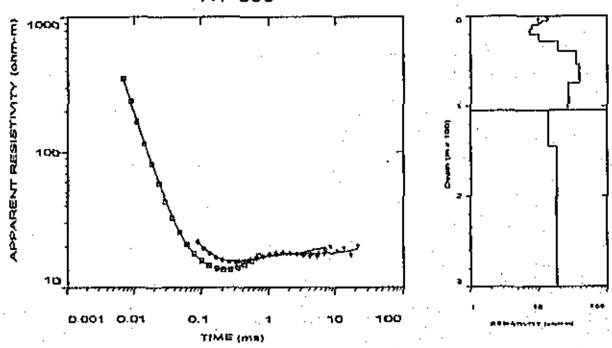

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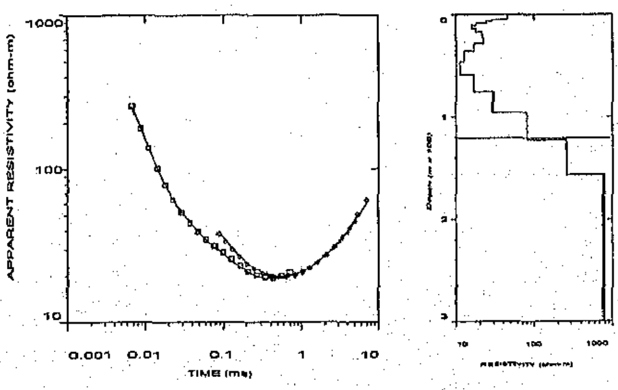

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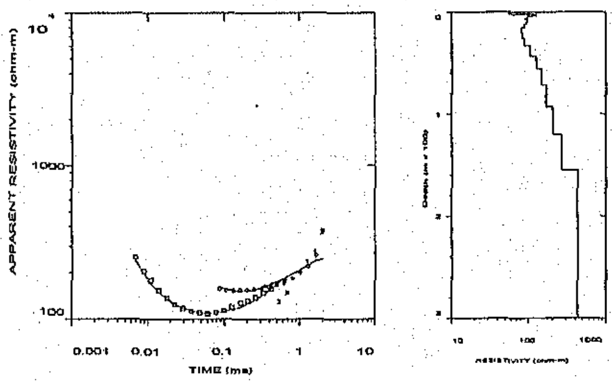

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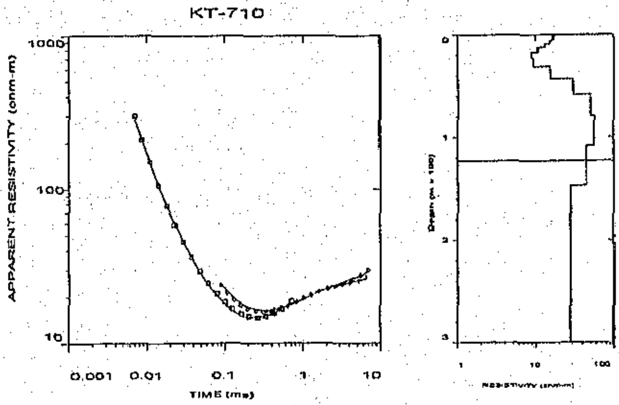
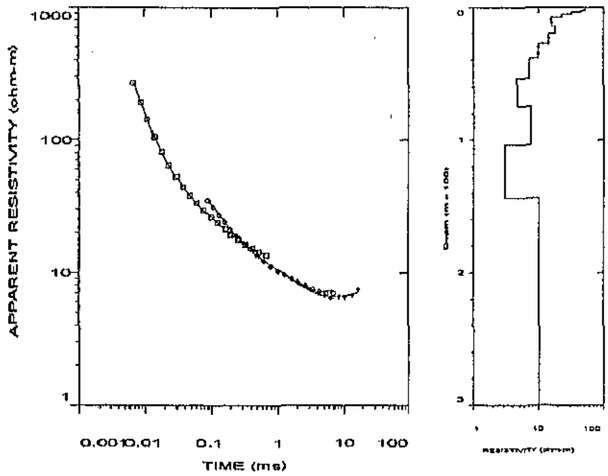


KHATANBULAG - SMOOTH INVERSION

KT-720



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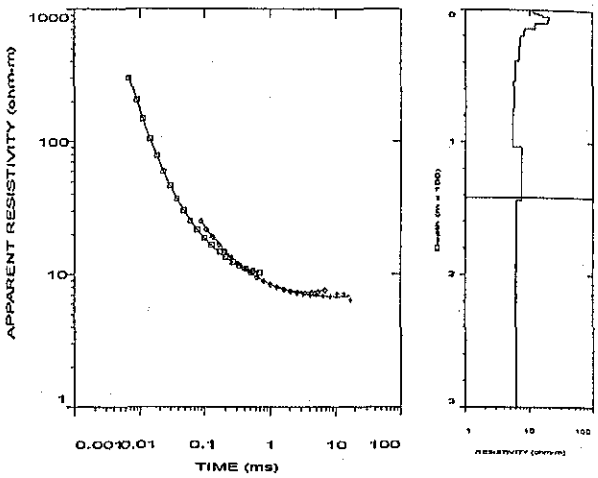

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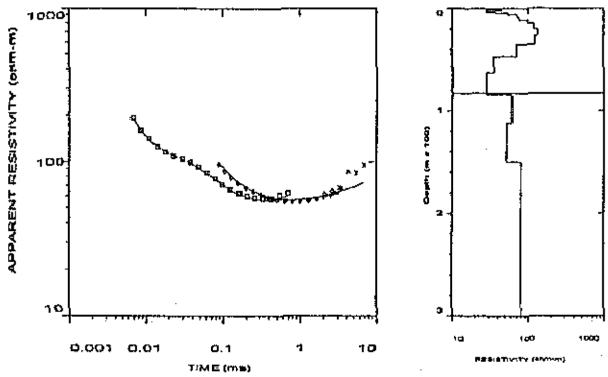
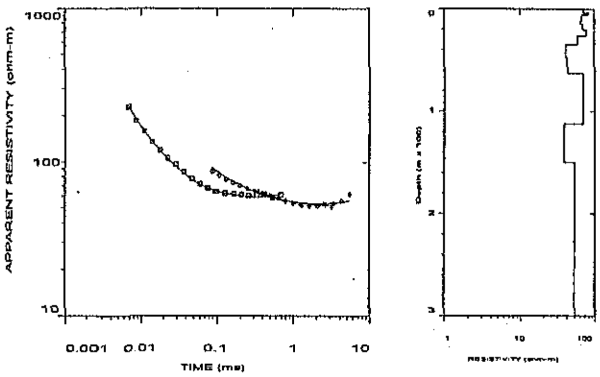


KT-750



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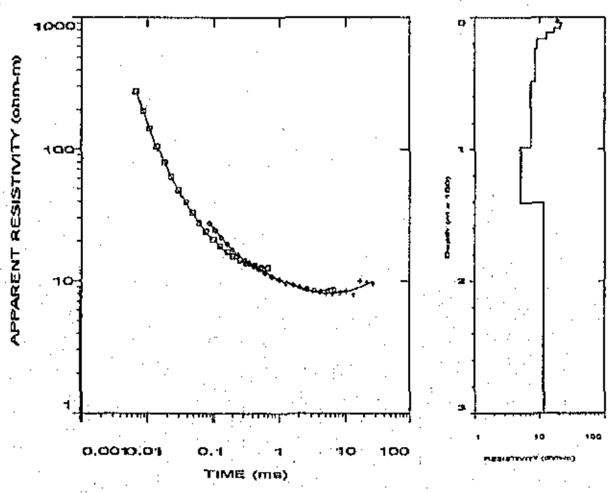

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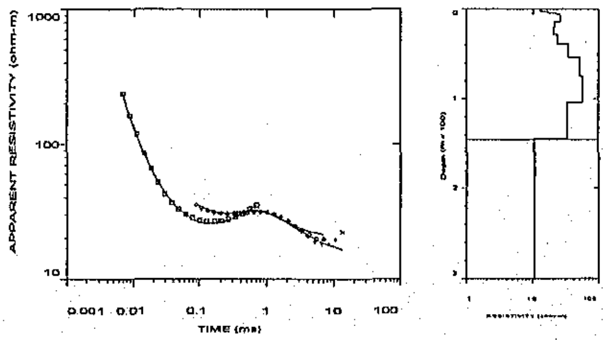
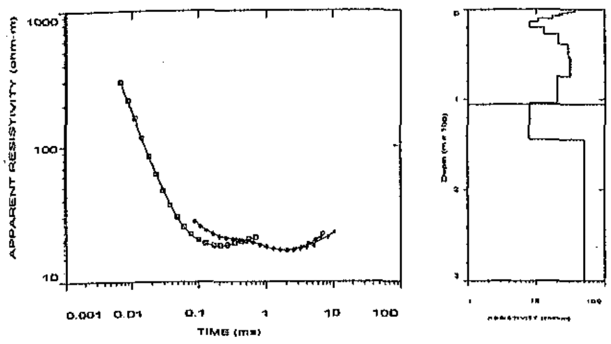


KHATANBULAG - SMOOTH INVERSION

KT-780



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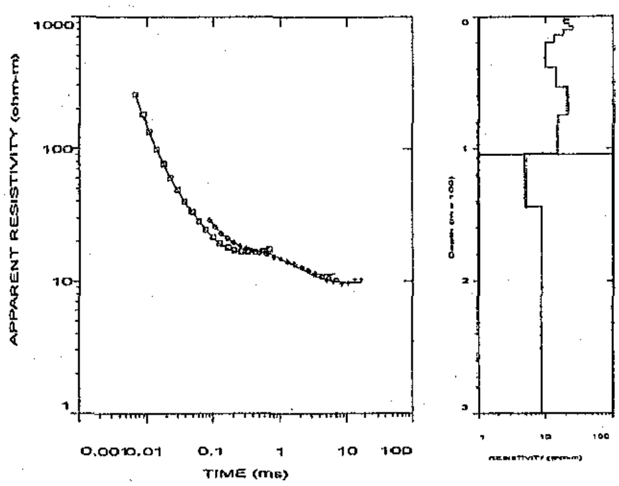
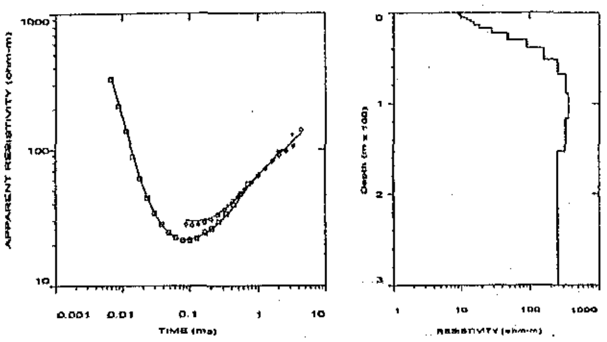
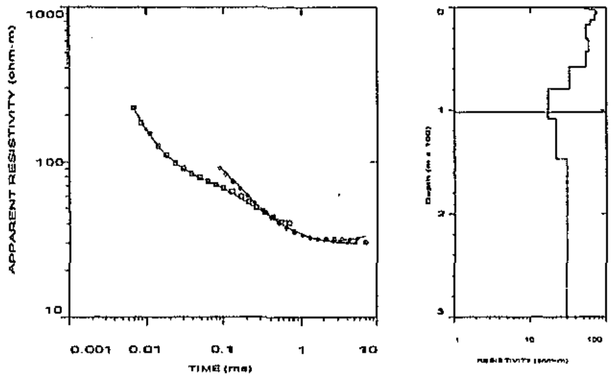


KT-800



KHUVSGUL - SMOOTH INVERSION

KV-0430



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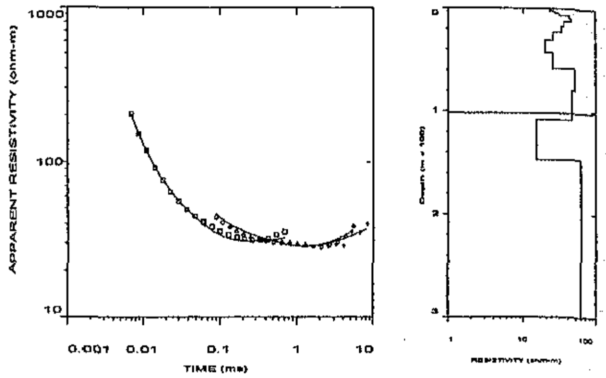

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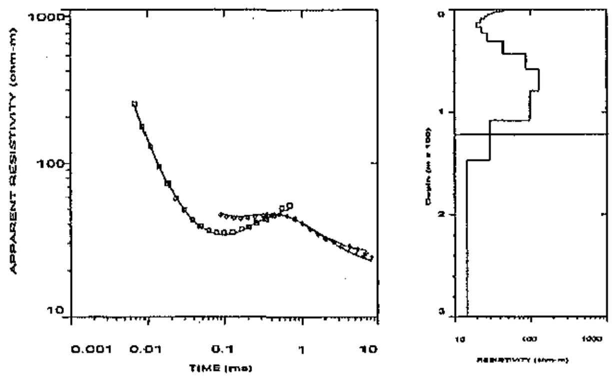

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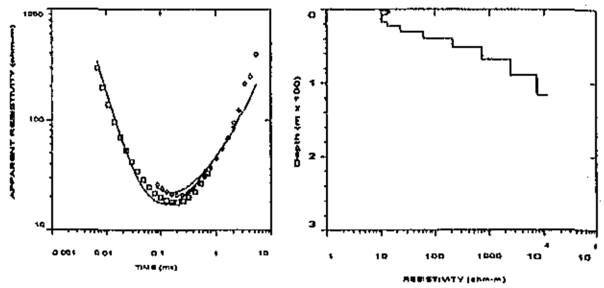

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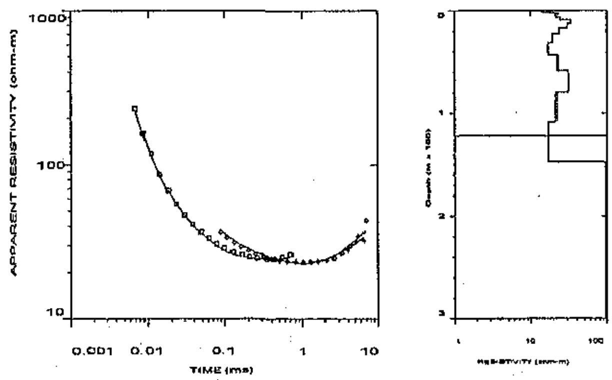

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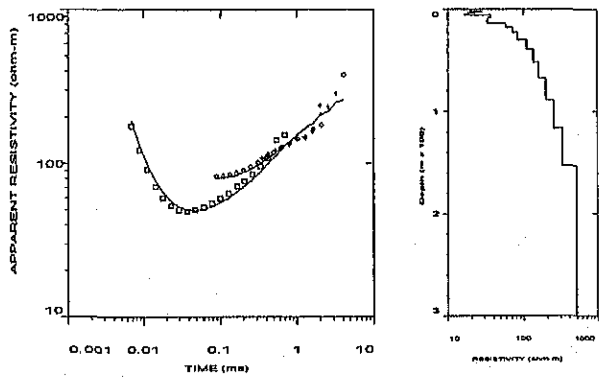

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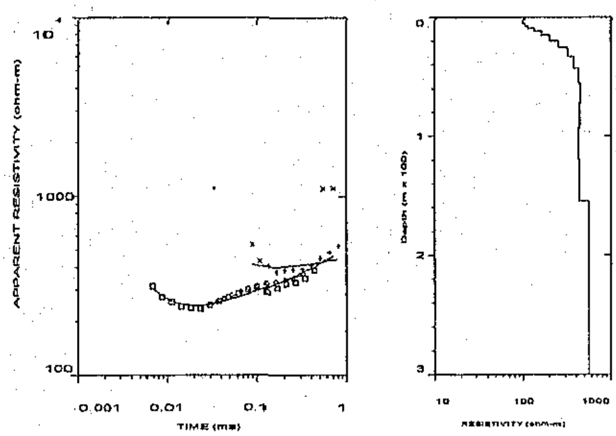

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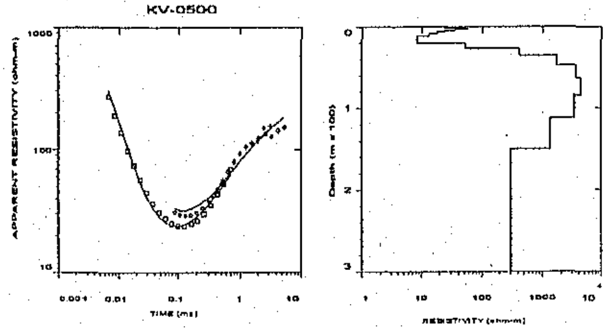
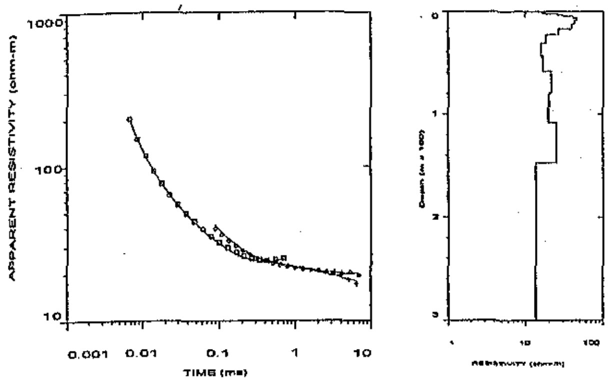


KHATANBULAG - SMOOTH INVERSION

KV-0510



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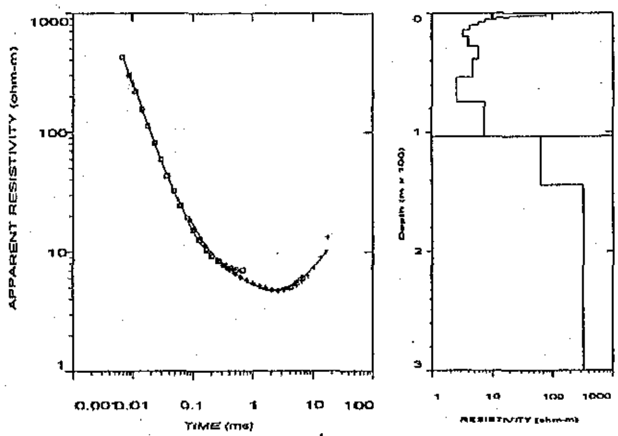

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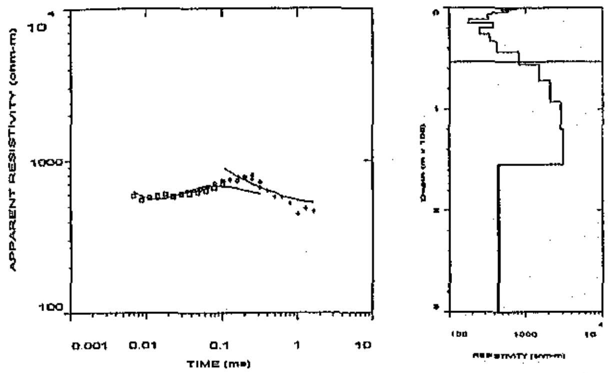

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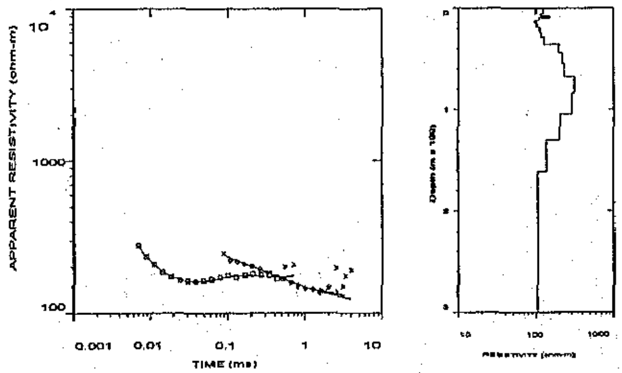

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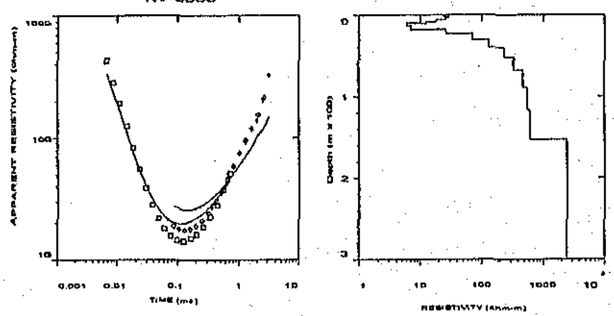

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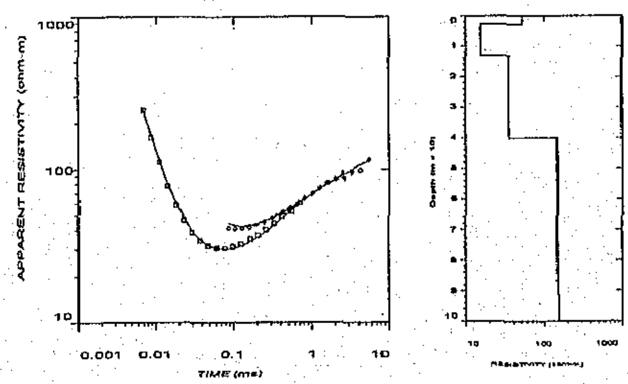

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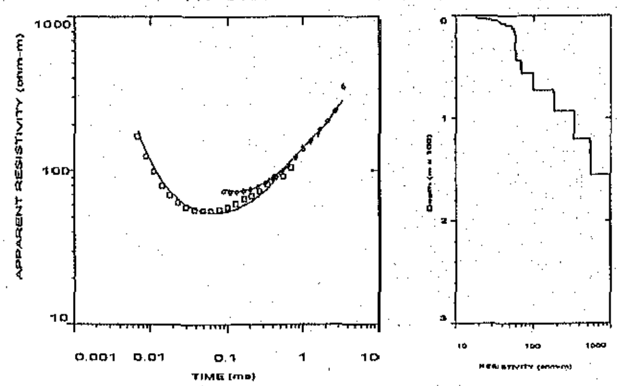

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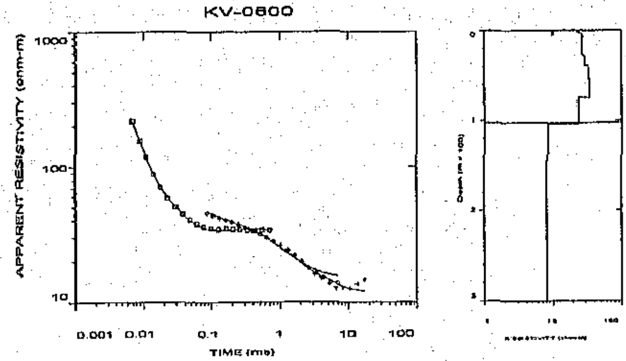
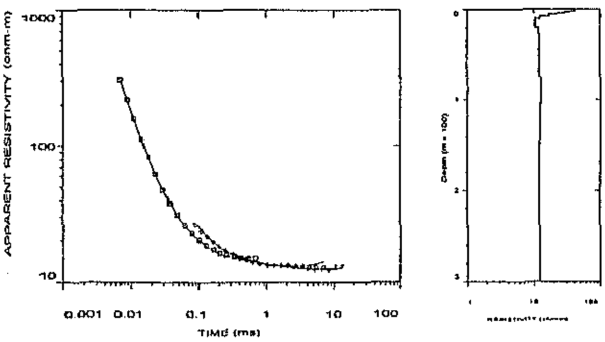


KHATANBULAG - SMOOTH INVERSION

KV-0610



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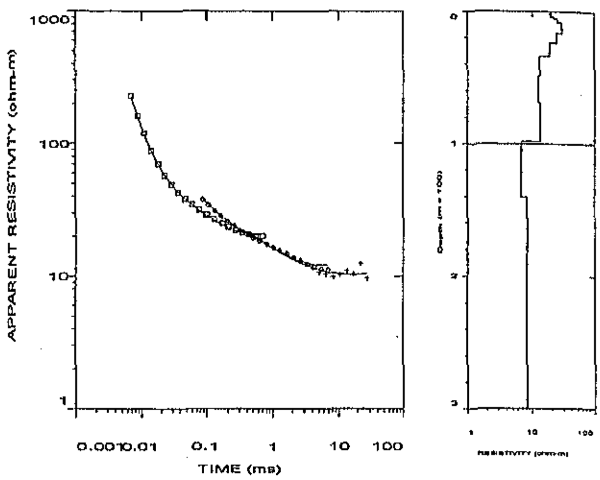

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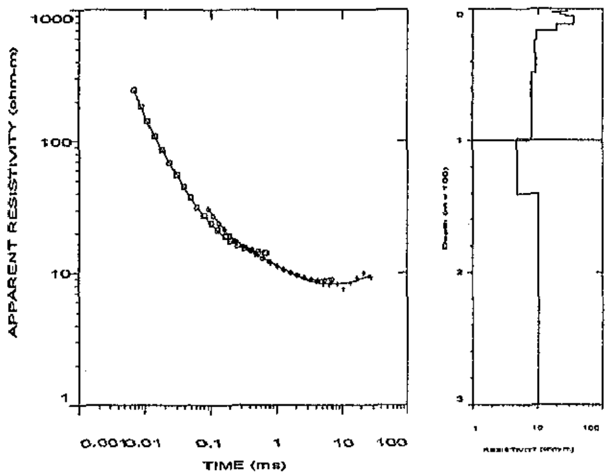

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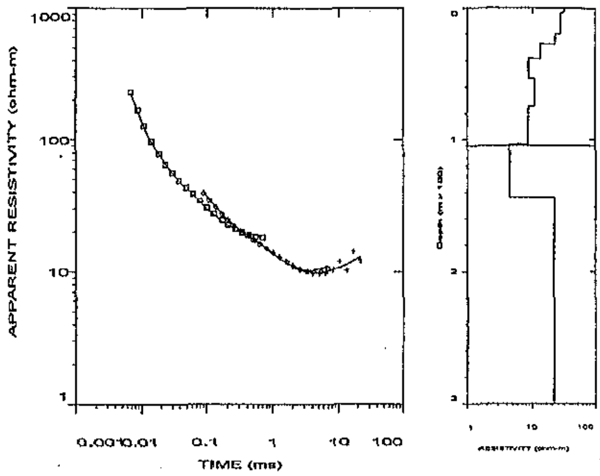

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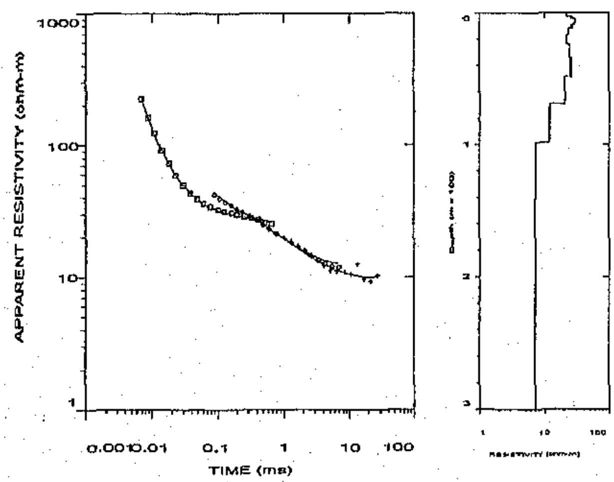
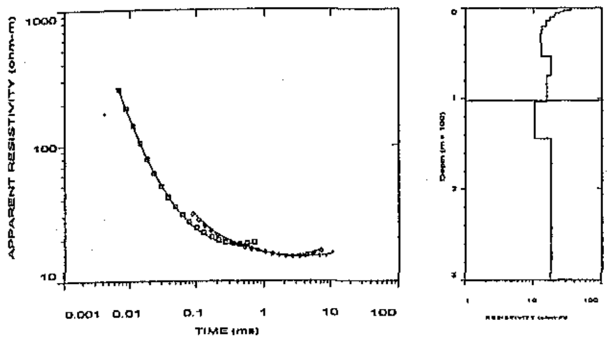
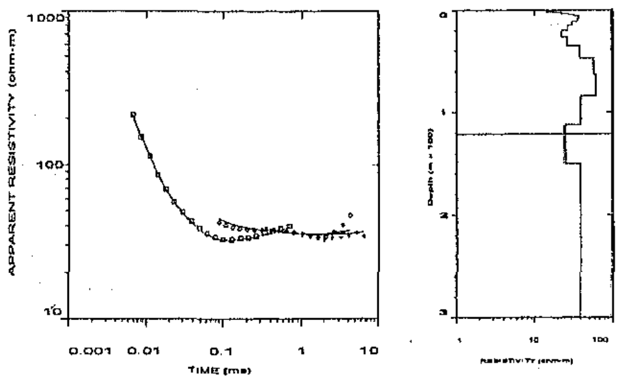


MANDAKH - SMOOTH INVERSION

MD-810



MD-820



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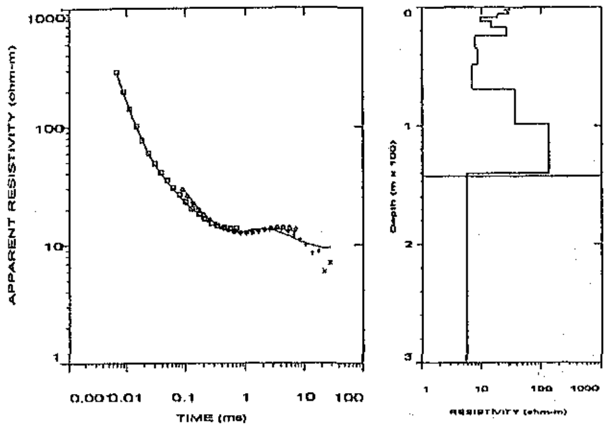

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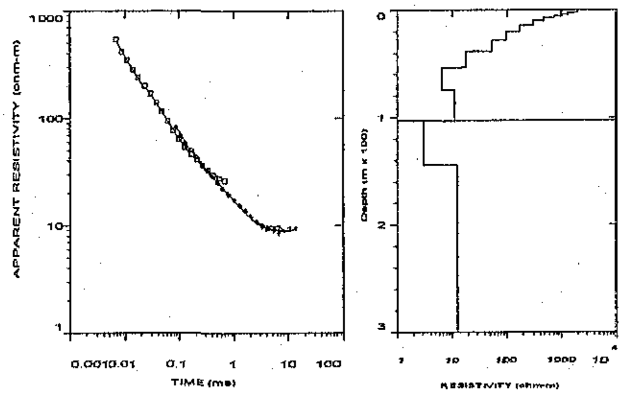

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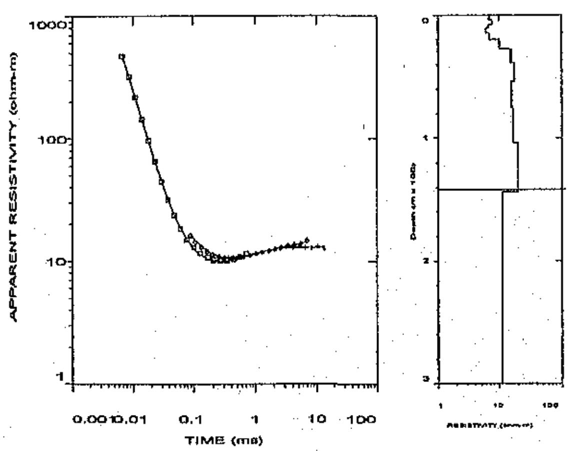

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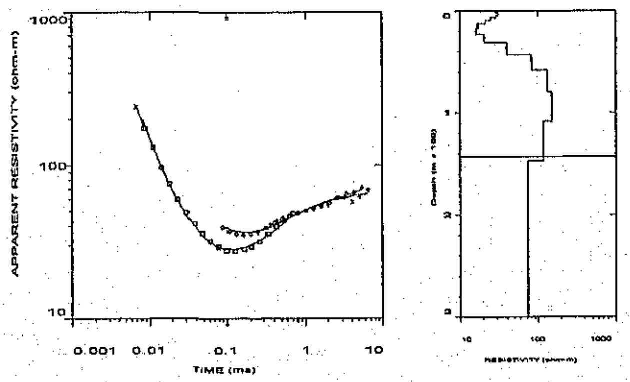

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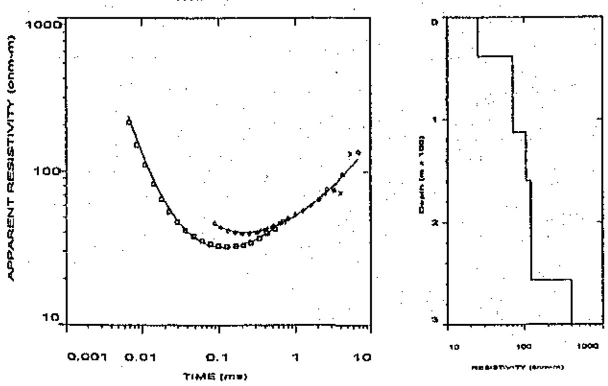

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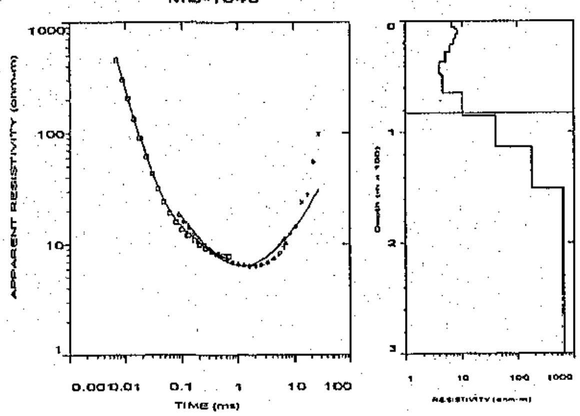
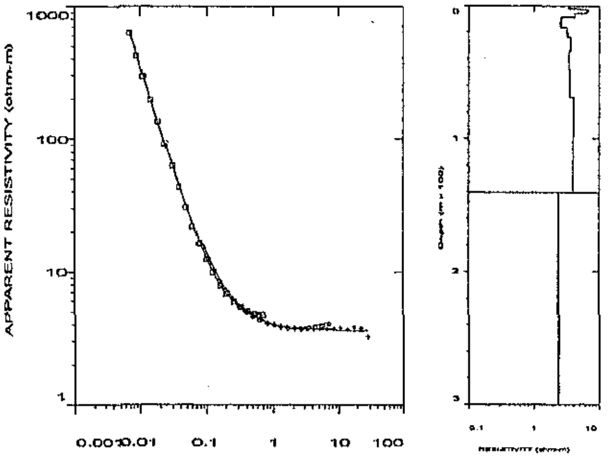


MANDAKH - SMOOTH INVERSION

MD-1050



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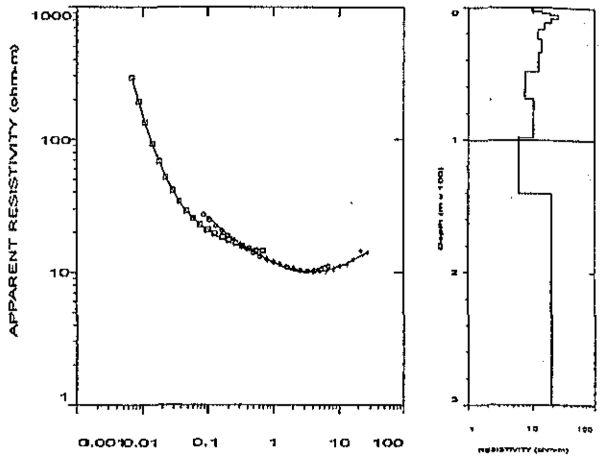

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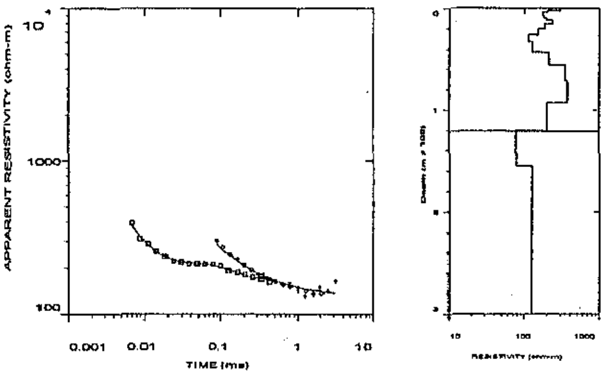

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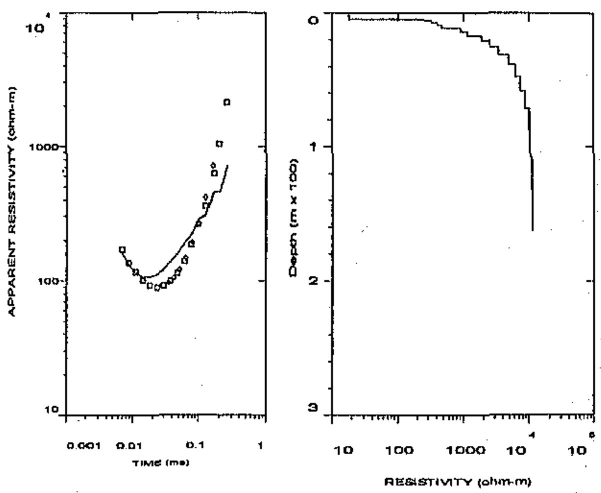

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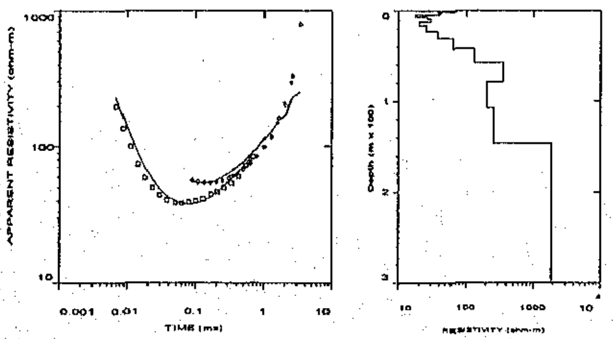

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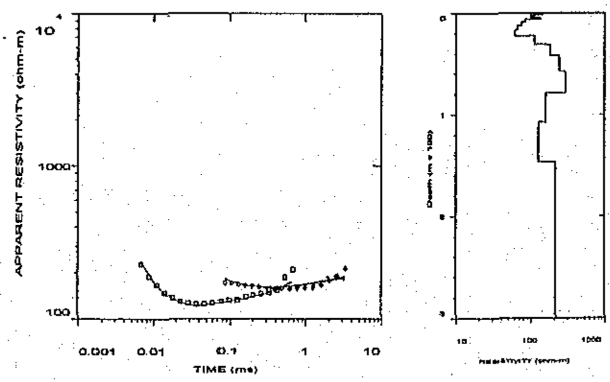
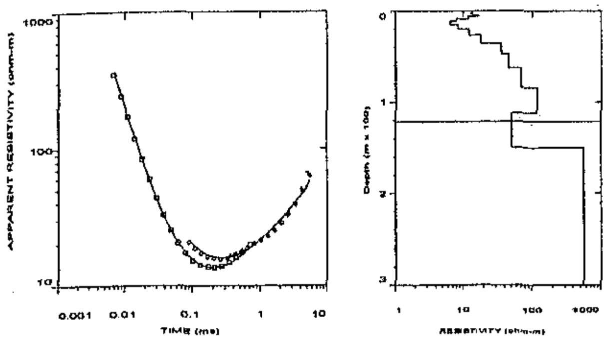


MANDAKH - SMOOTH INVERSION

MD-1110



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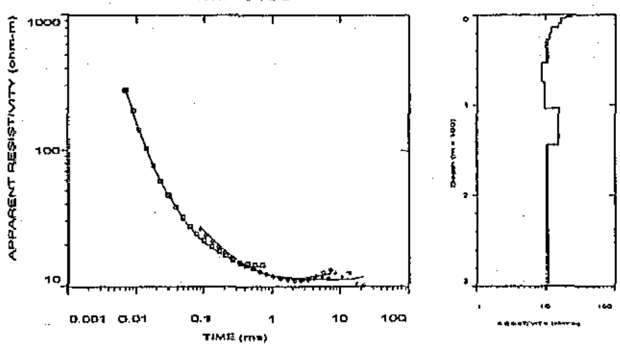

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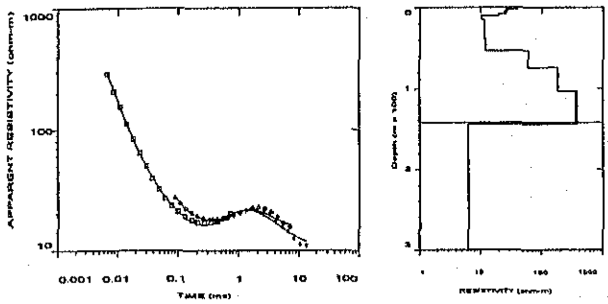

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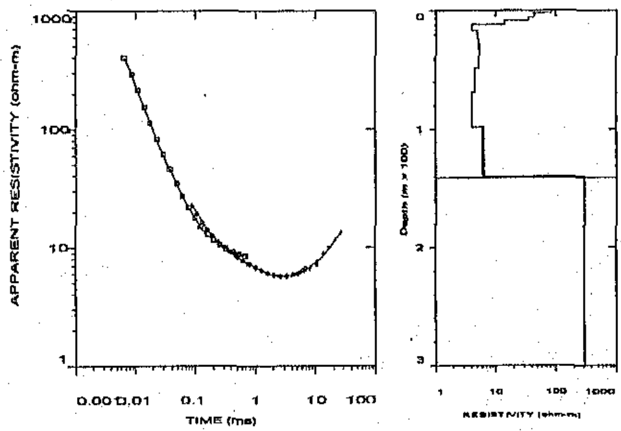
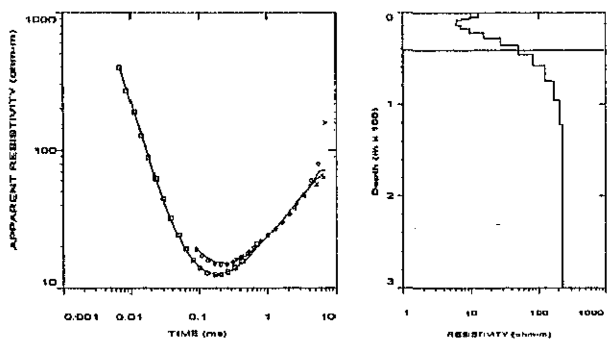
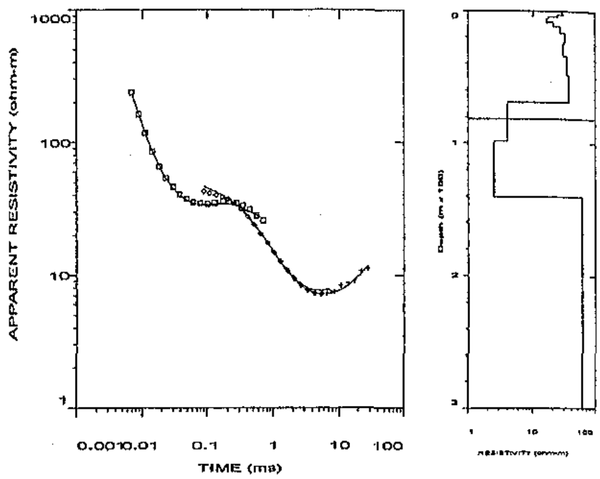


URGUN - SMOOTH INVERSION

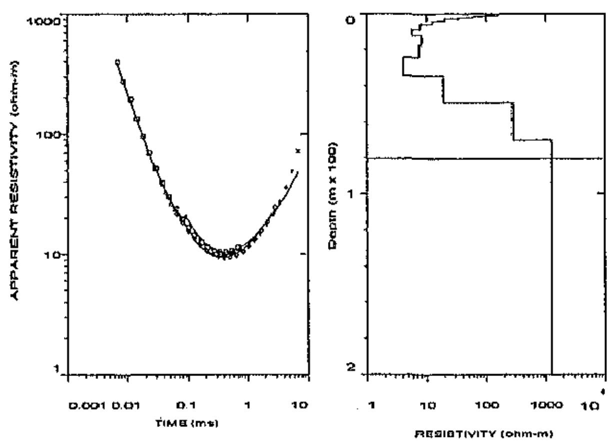
OR-870



OR-880



OR-900



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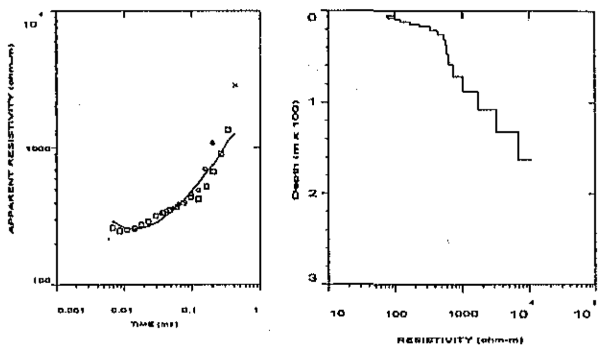

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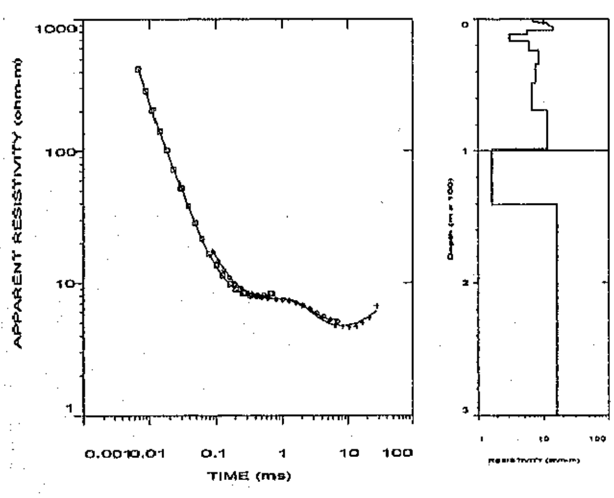

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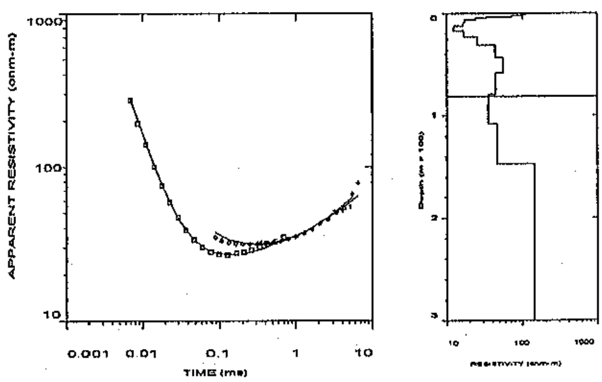

URGUN - SMOOTH INVERSION

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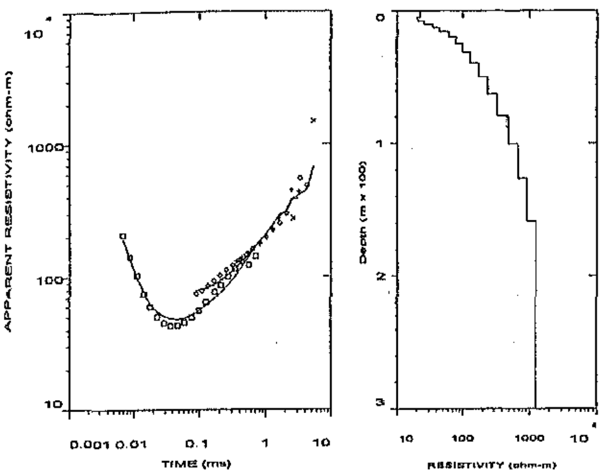

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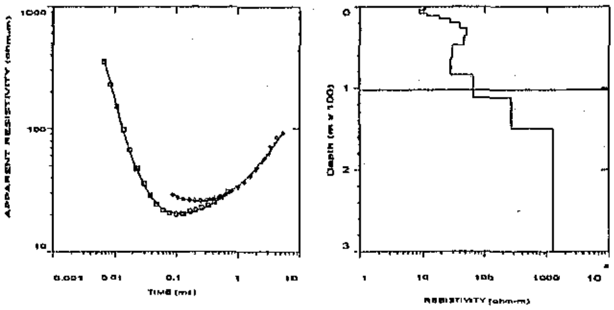

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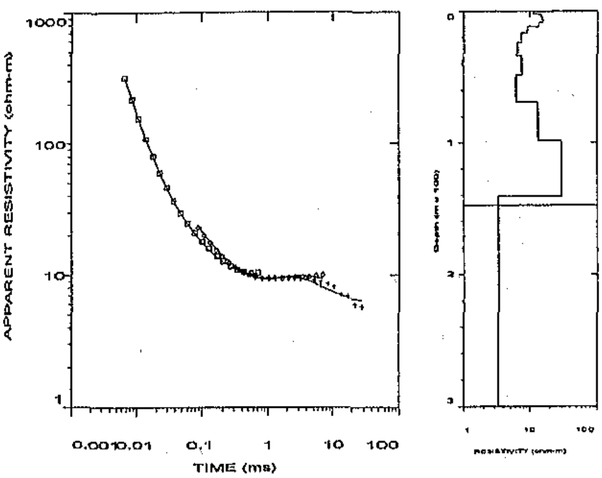

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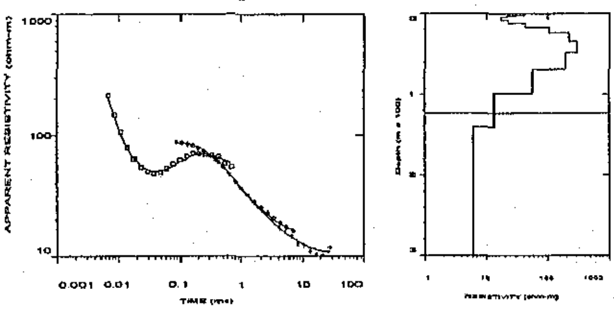

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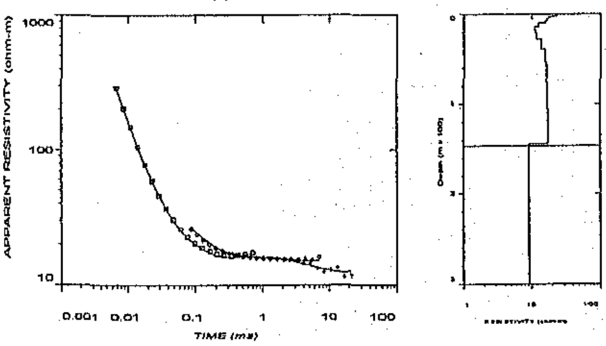

SAIHANDULAAN - SMOOTH INVERSION

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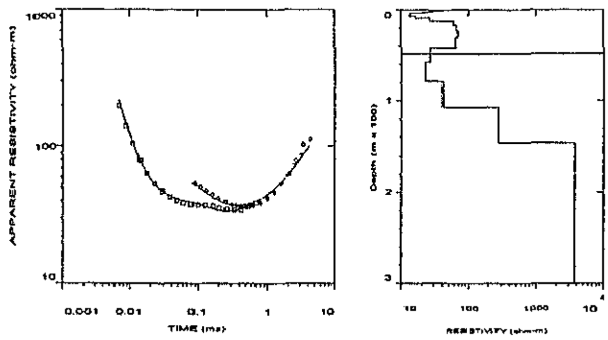

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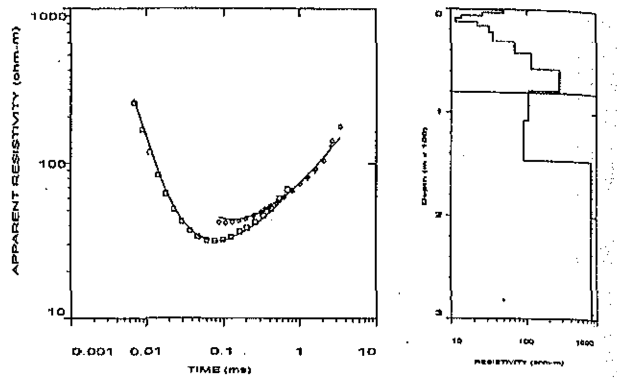

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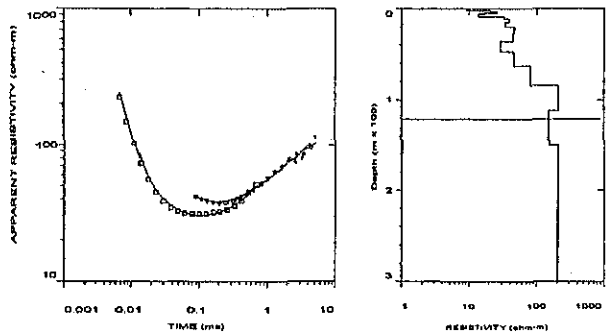

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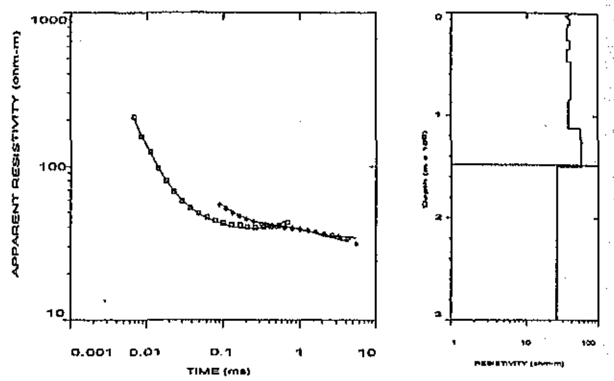

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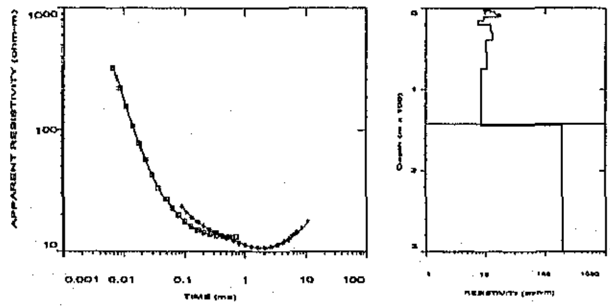

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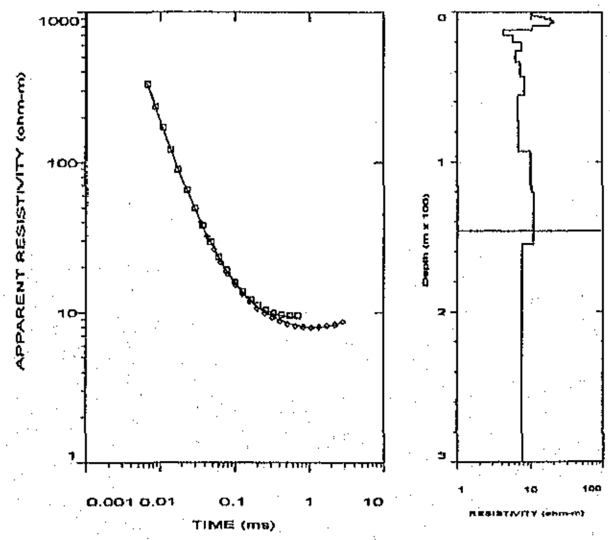

SAIHANDULAAN - SMOOTH INVERSION

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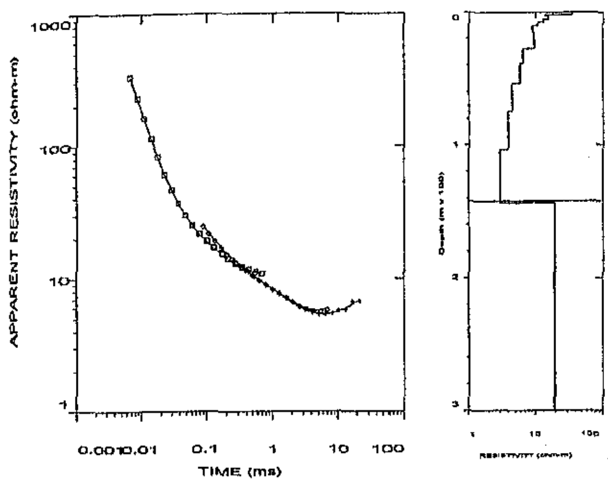

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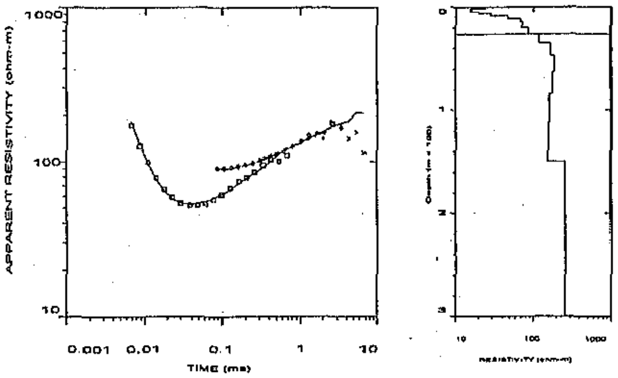

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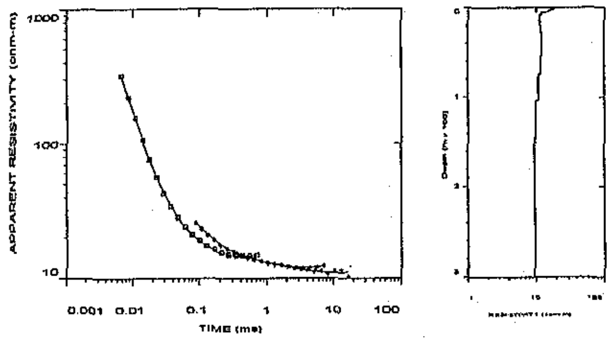

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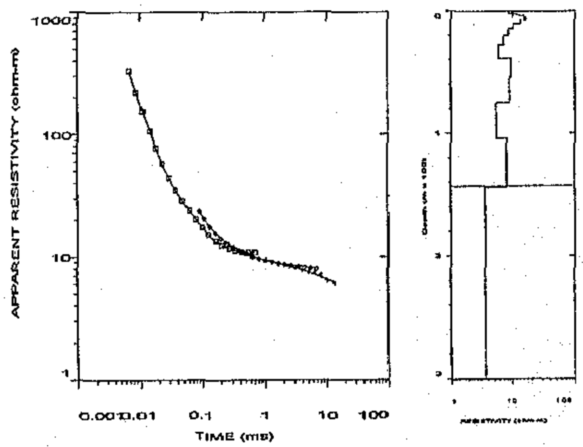

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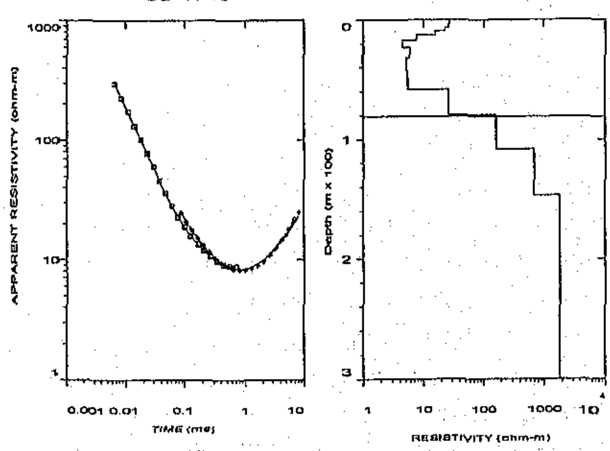

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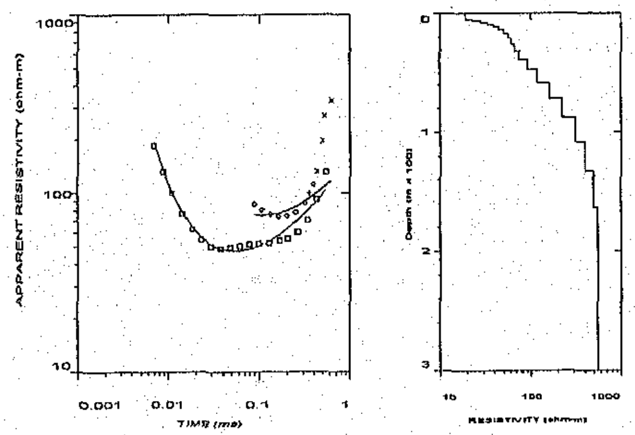

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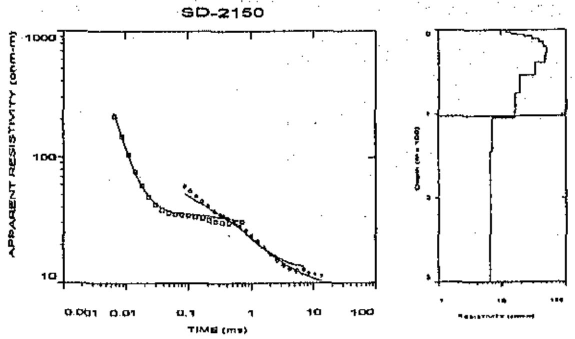
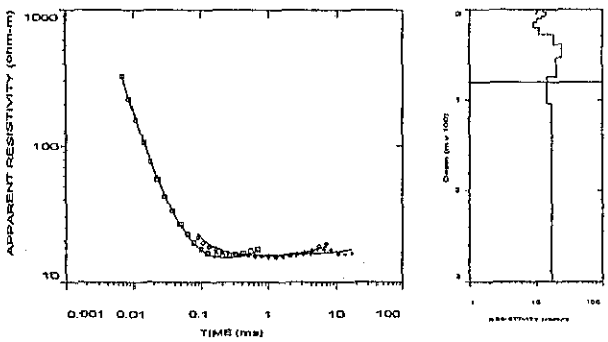


SAINSHAND - SMOOTH INVERSION

SS-240



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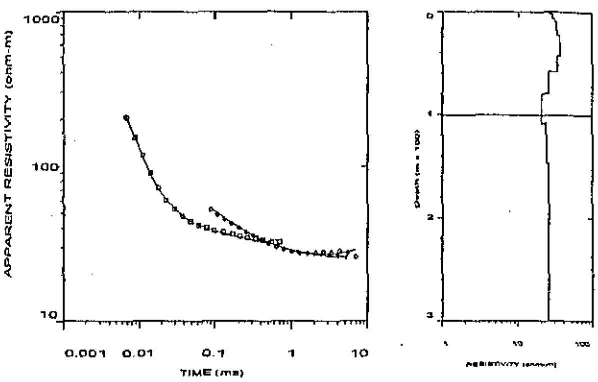

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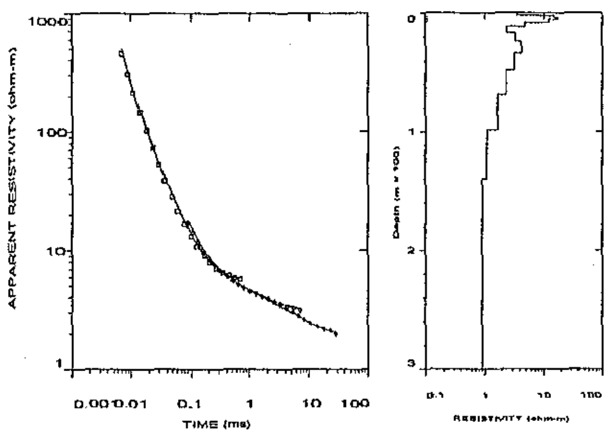

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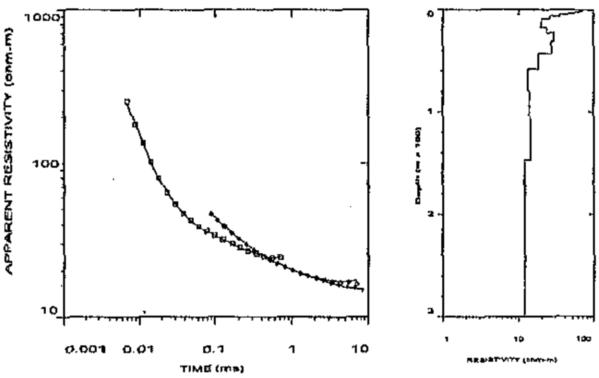

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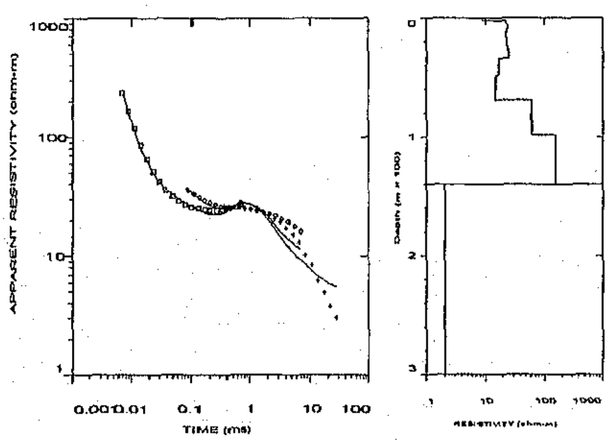

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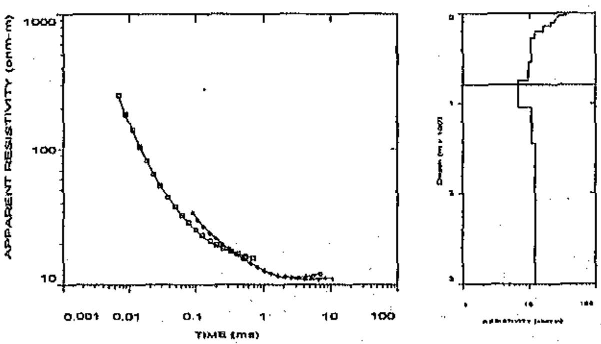
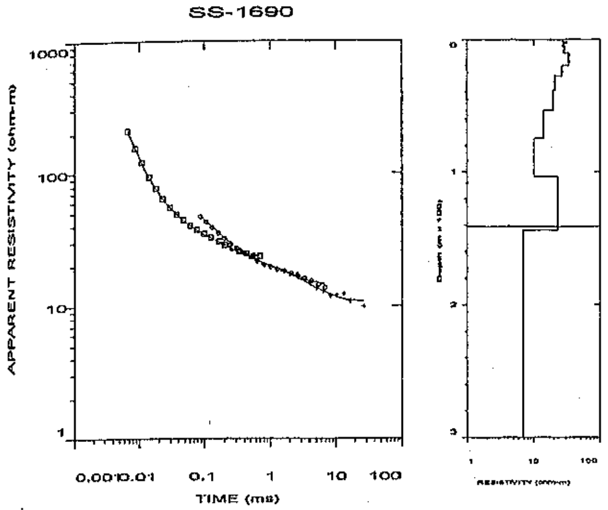
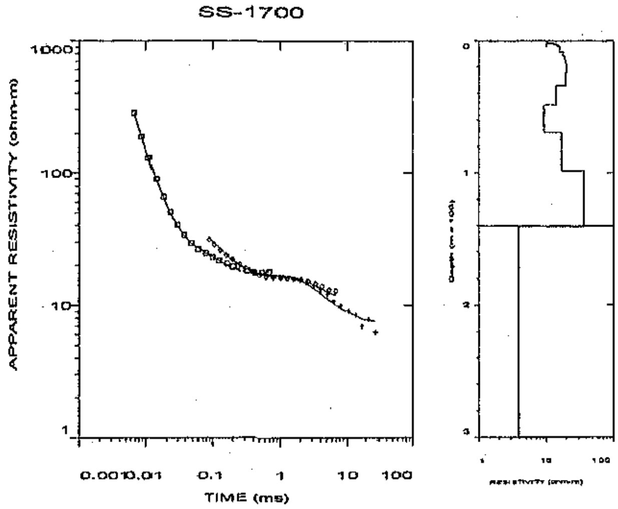
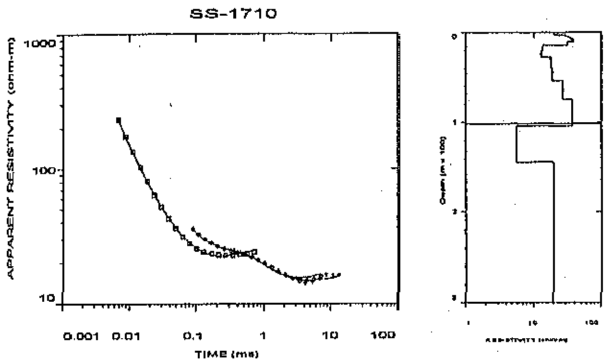


SAINSHAND - SMOOTH INVERSION

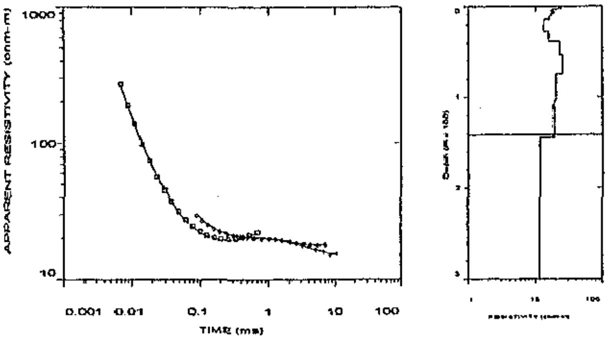






ULAANBADLAKH - SMOOTH INVERSION

UL-170



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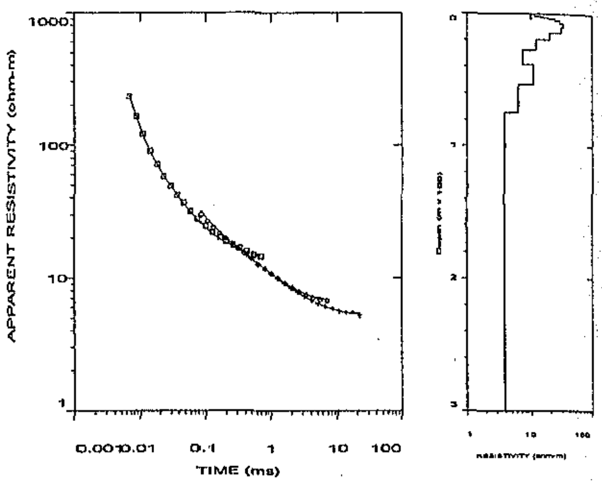

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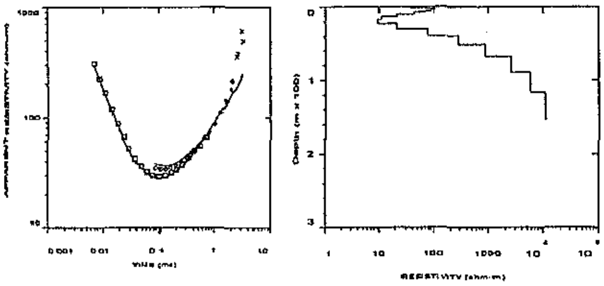

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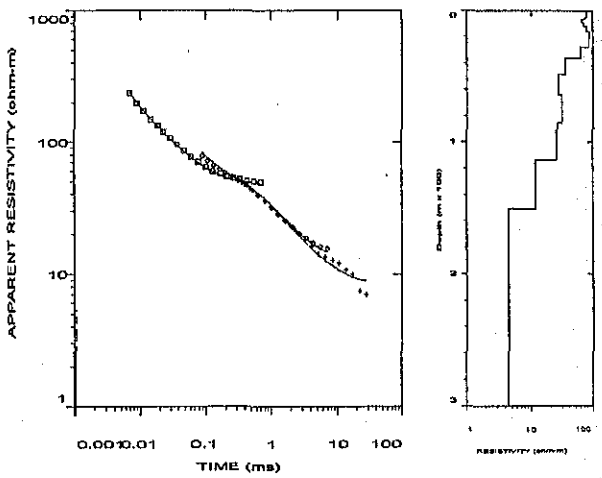

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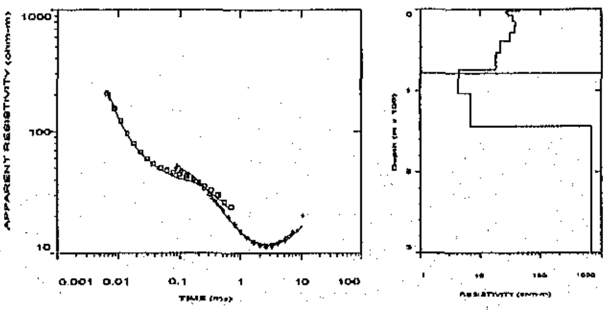

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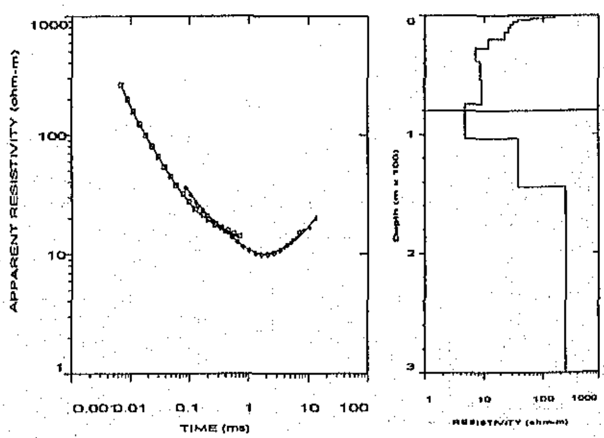
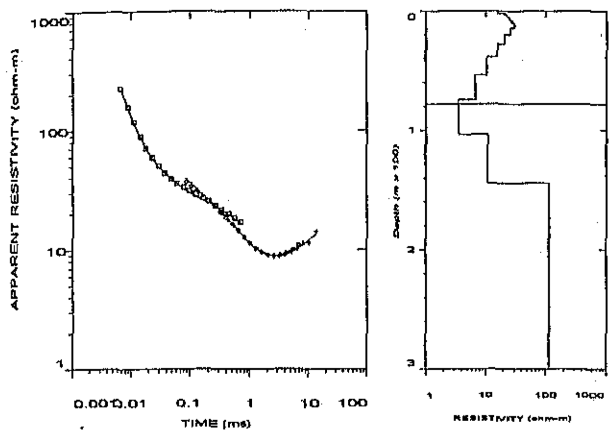


ULAANBADLAKH - SMOOTH INVERSION

UL-290



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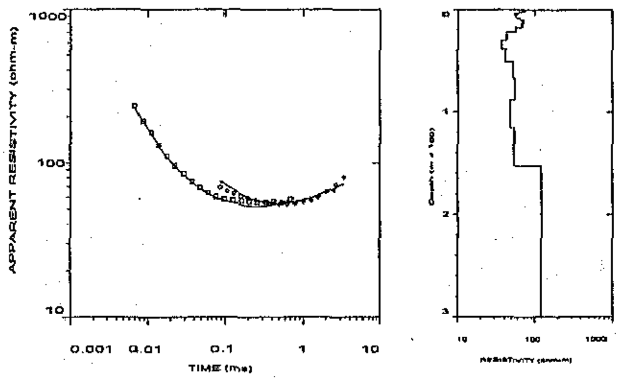

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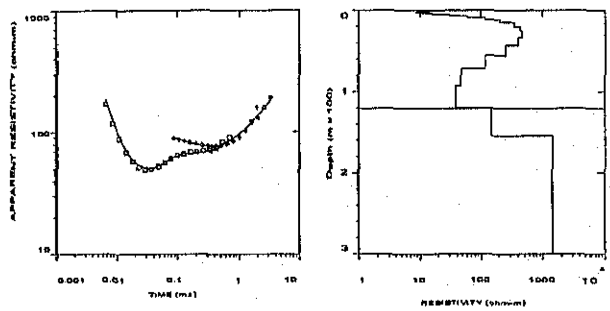

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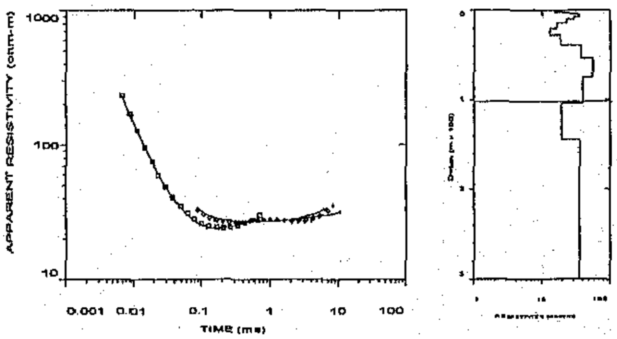

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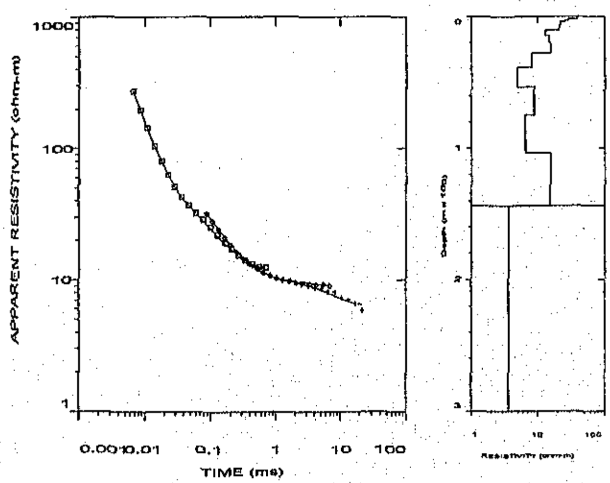

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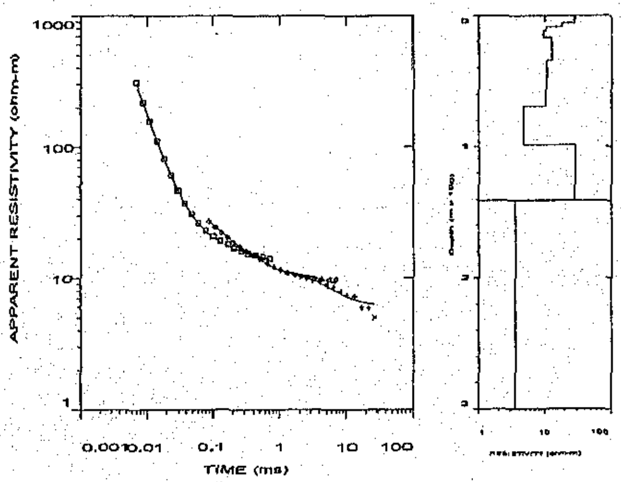

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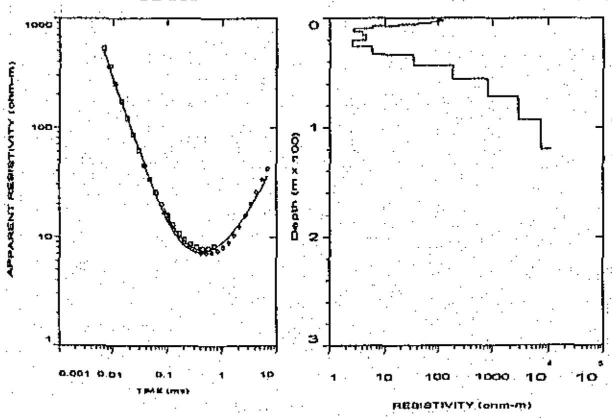

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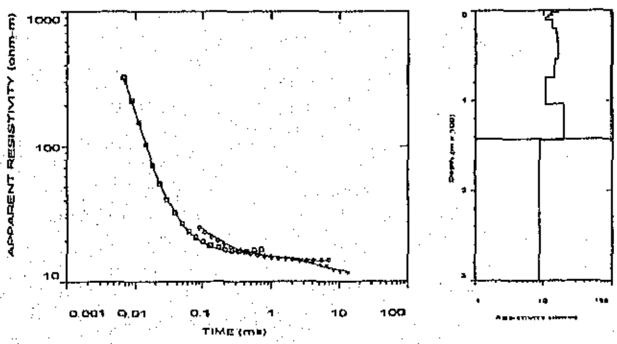

ULAANBADLAKH - SMOOTH INVERSION

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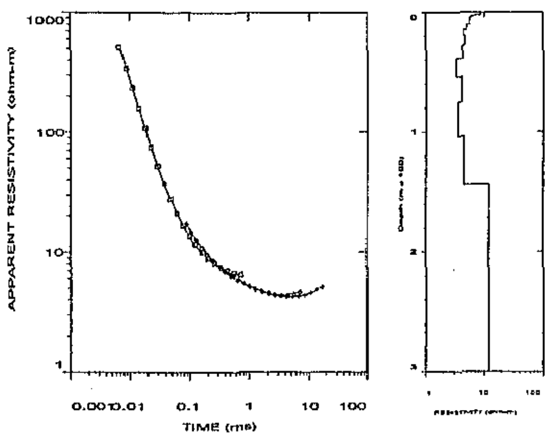

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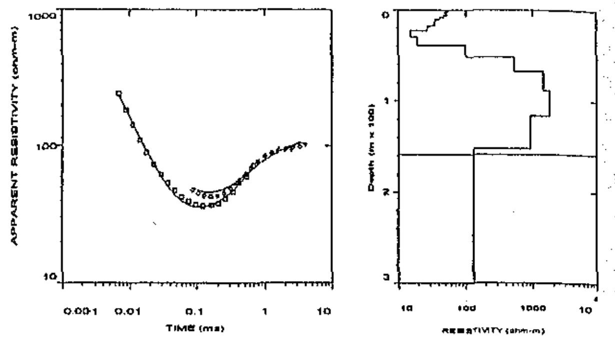

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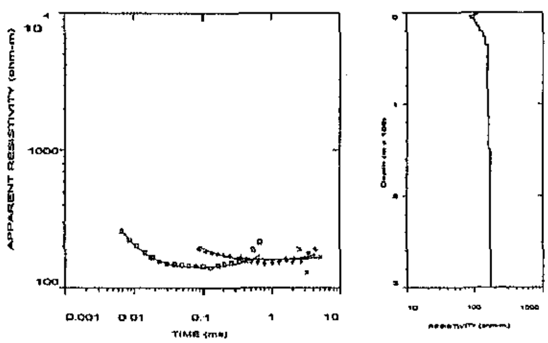

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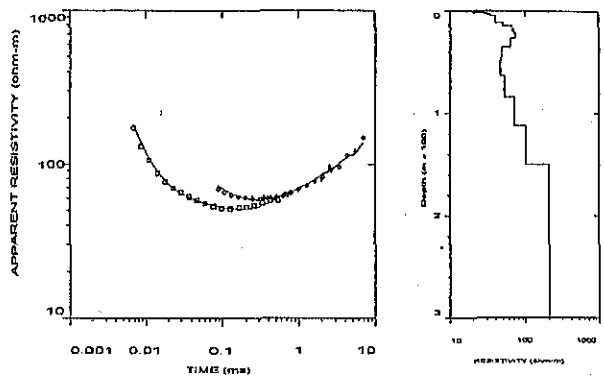

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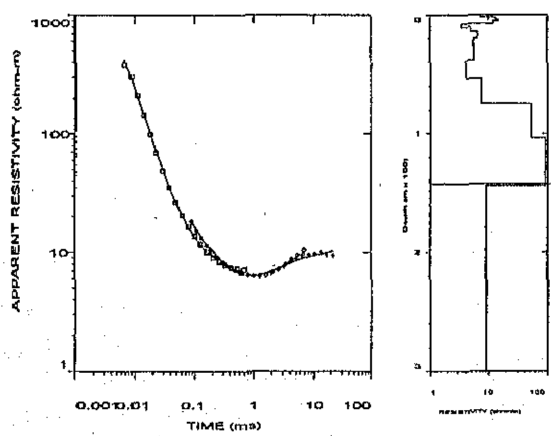

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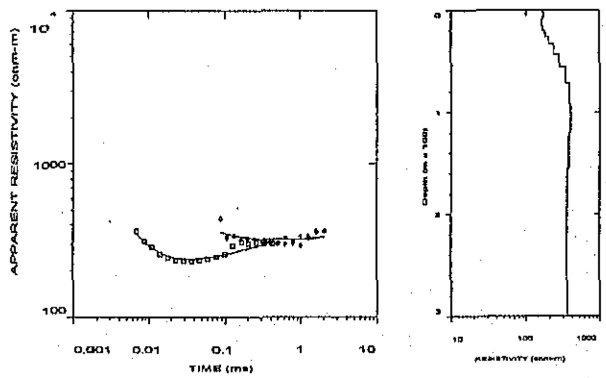

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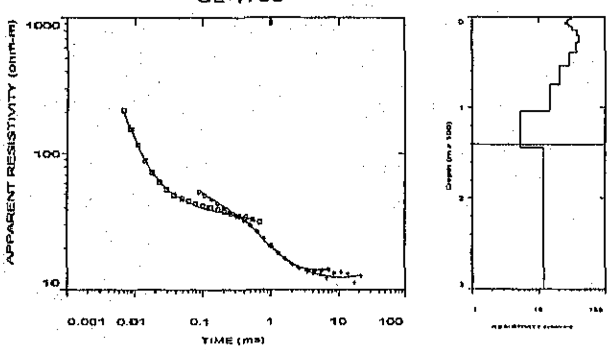

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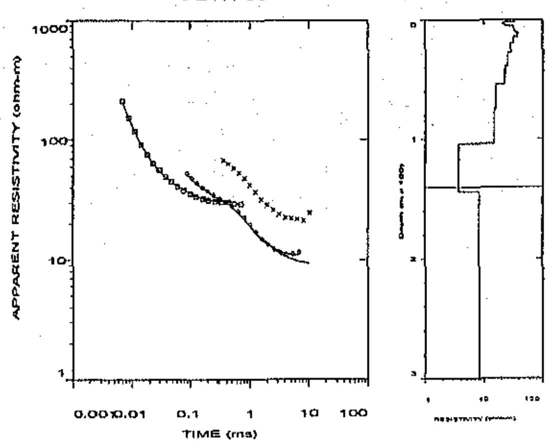

ULAANBADLAKH - SMOOTH INVERSION

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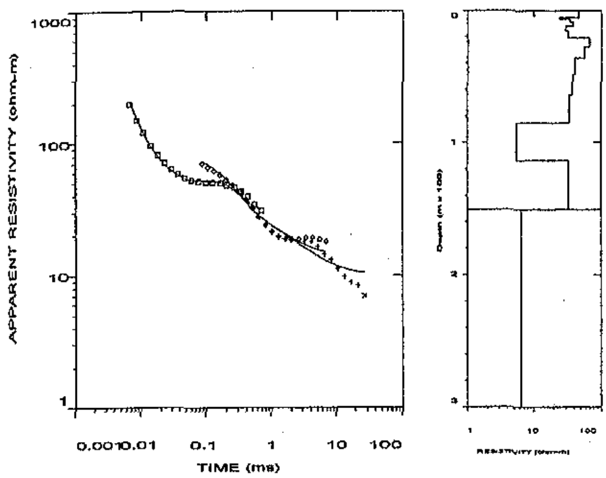

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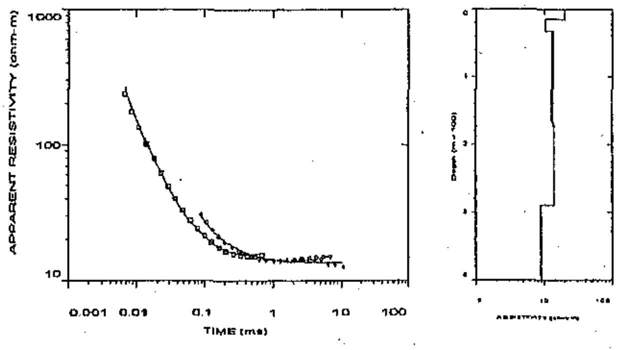

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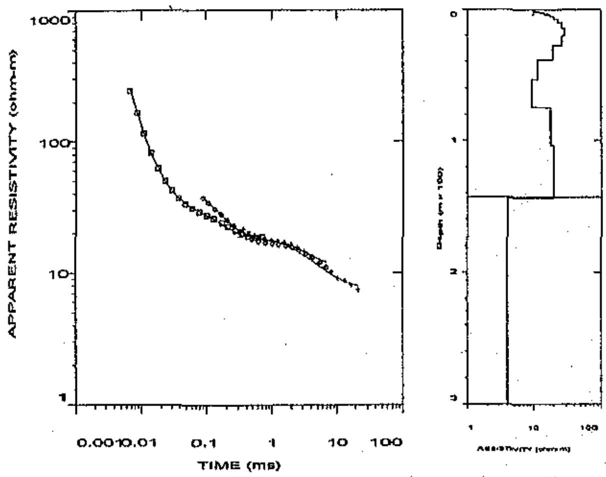

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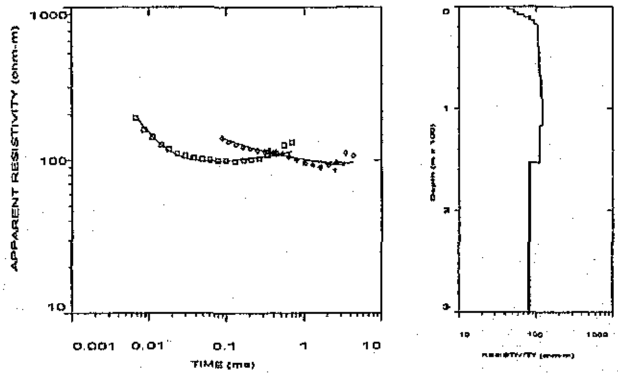

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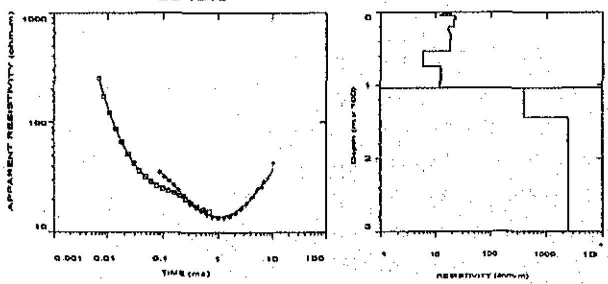

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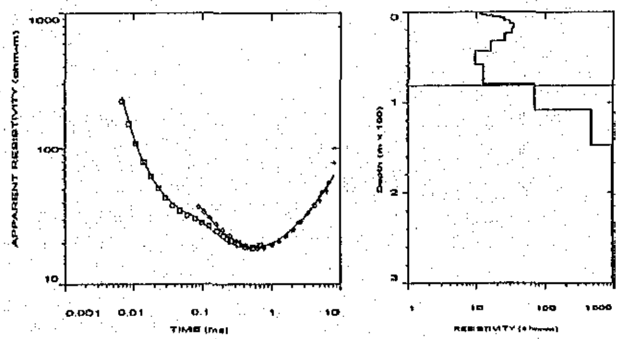

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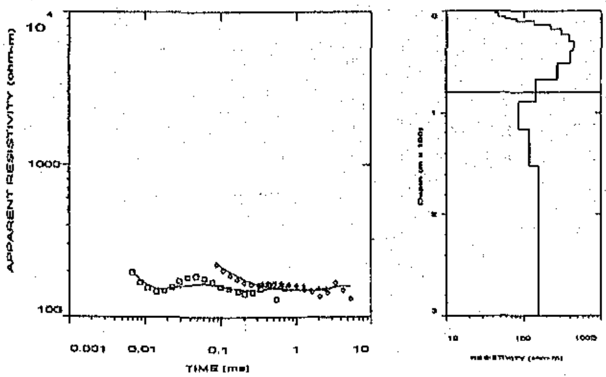

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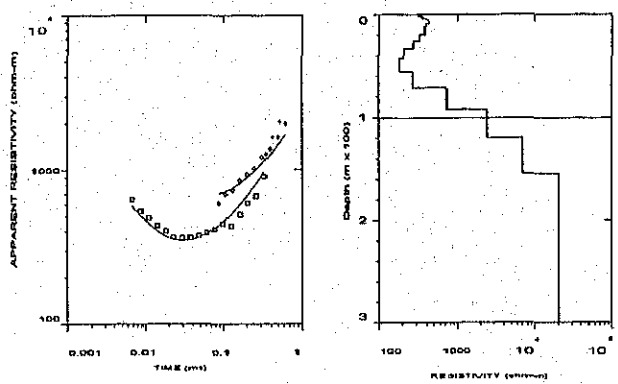

ULAANBADLAKH - SMOOTH INVERSION

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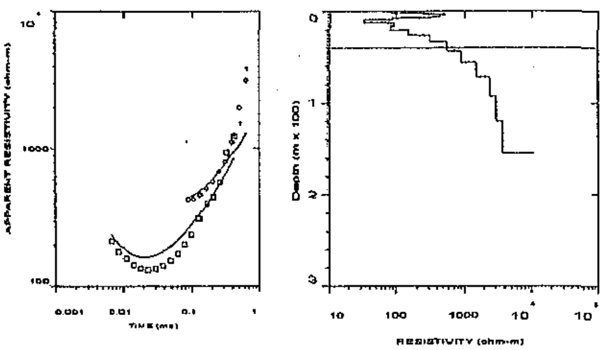

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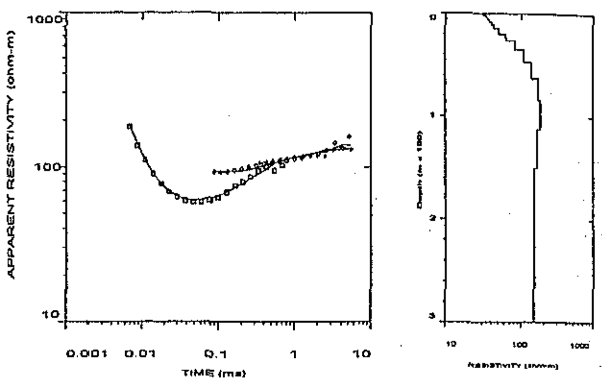

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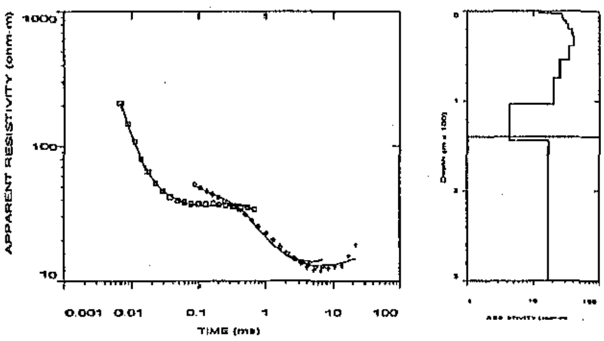

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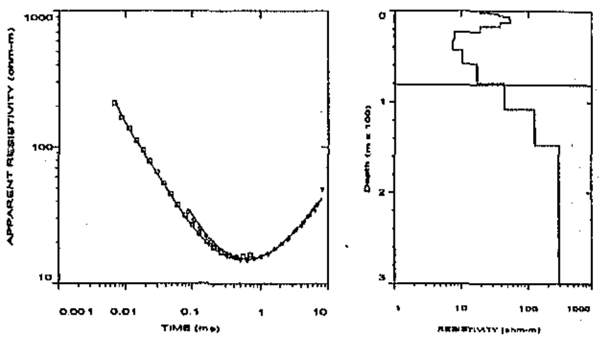

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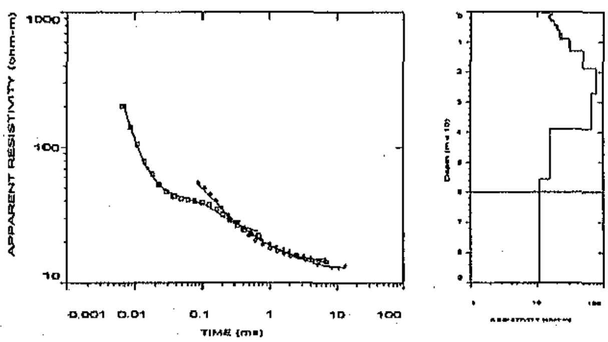

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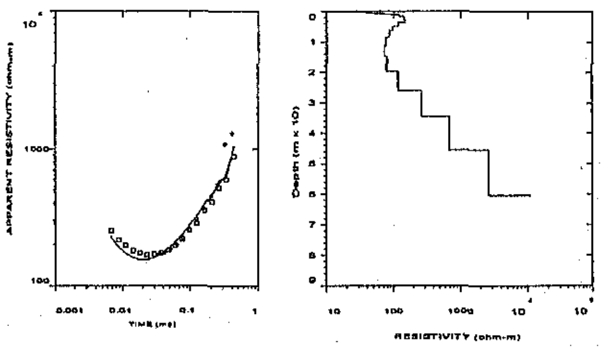

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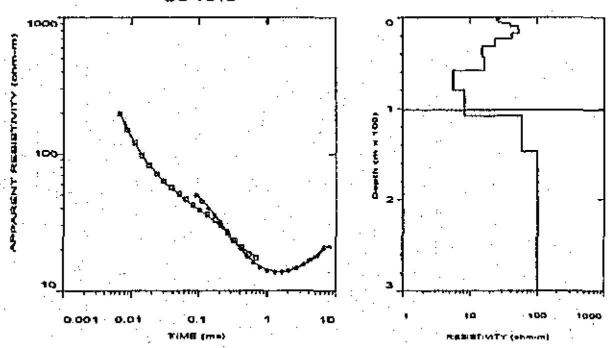

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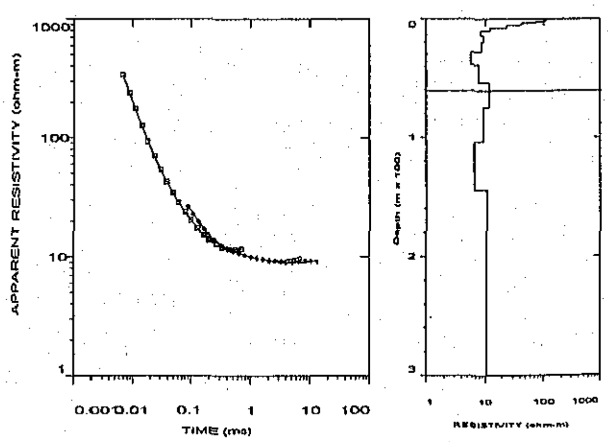
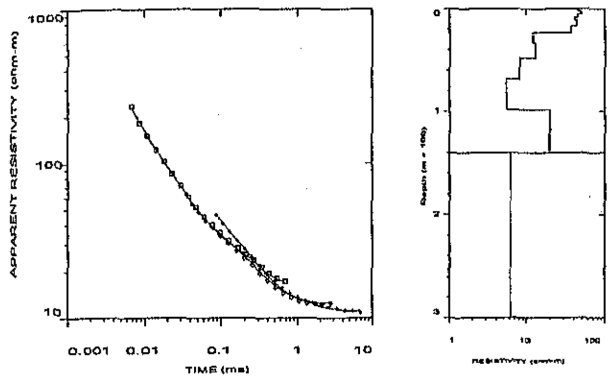


ZAMIN-UUD - SMOOTH INVERSION

ER-060



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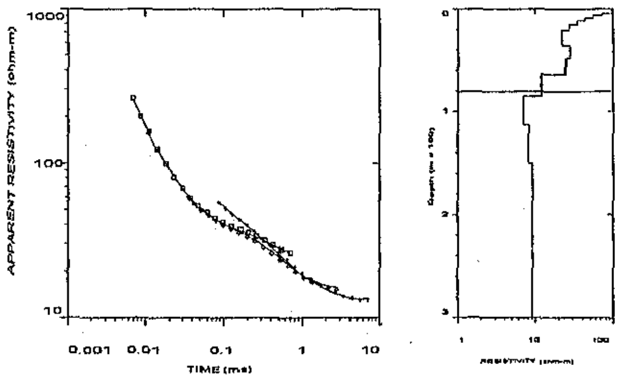

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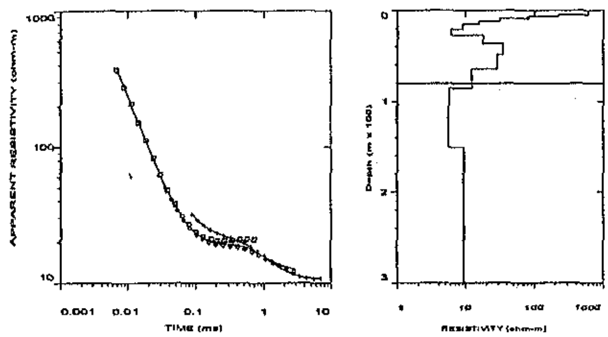

ANNEX E:
RESULTS OF WATER QUALITY SURVEY

Final Report
The Study for Improvement Plan of
Livestock Farming System in Rural Area

March, 2006

ANNEX E Results of Water Quality Survey

E.1 SAMPLES FOR WATER QUALITY ANALYSES

E.1.1 *The samples for water quality analyses*

The water samples were collected from 20 points in Erdene Soum, 18 points in Ulaanbadrakh Soum, 18 points in Khuvsgul Soum where are covered by the Pilot project and 4 points in each other 11 Soums (all together 100 watery points).

It was not possible to get same amount of water from every water points, due to different condition of each point. In other words, most of the engineering wells and other constructions in water points have been out of order and that made it impossible to get any sample.

Especially, there were very limited possibilities to get samples from the production wells, so had to get samples from those production wells which are in working order in settled areas and pastureland as well as other wells nearly.

In additionally above sampling, 27 water samples from constructed or rehabilitated wells in the Pilot project were also measured. Thus, total number of samples become 127.

E.1.2 The water quality analyses

These samples have been sent to the Chemical Institute, Science Academy of Mongolia for water quality analyses. Quantity of each sample was 2 liters from each point. However, the results of them are doubtful, for example all result of Chromium is over the WHO standard. Thus, all samples were analyzed in Japan again.

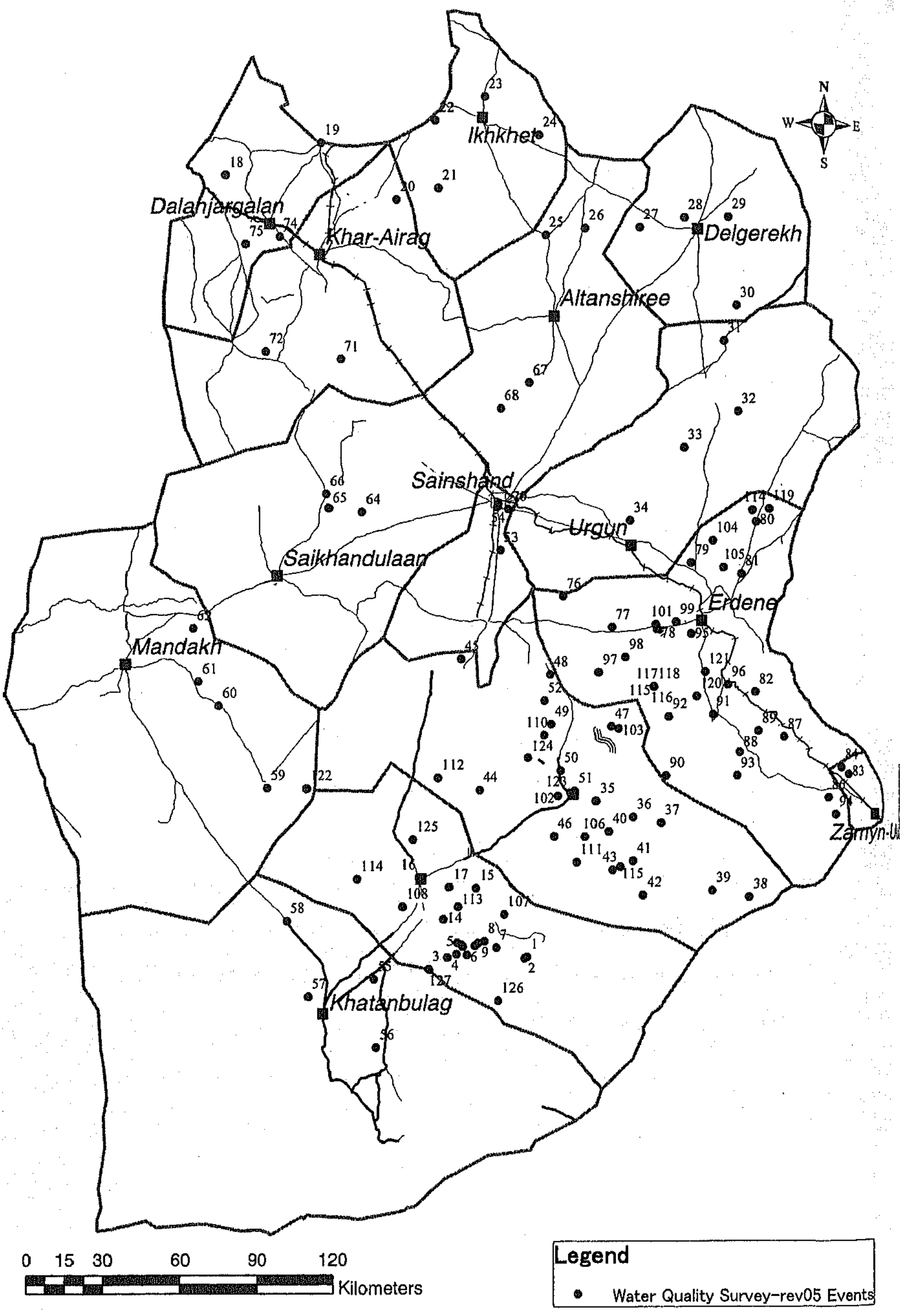

Fig E.1 Location of Water Sampling

Table E.1 Results of Groundwater Quality Analysis in Dornogobi Aimag

								1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25	26	27	28	29	30
Sample No.	Soum Name	Well Name	Well type	Well No.	Latitude	Longtitude	Altitude (m)	pH	Temp.	Odor	Taste	Color	Turbidity	Electric Conductivity	Hardness	Evaporated Residue	Nitrate	Ammonium	Chloride	Sulfate	Sodium	Potassium	Calcium	Magnesium	Copper	Iron	Manganese	Zinc	Lead	Chromium	Cadmium	Fluoride	Molybdenum	Beryllium	Aluminum	Arsenic
								-	°C	Dilution factor	Dilution factor	mg/Pt scale	NTU	μS/cm	mgCaCO3/	g/L	mg NO_3/L	mg NH_4/L	mg Cl/L	mg SO4/L	mg Na/L	mg K/L	mg Ca/L	mg Mg/L	mg Cu/L	mg Fe/L	mg Mn/L	mg Zn/L	mg Pb/L	mg Cr/L	mg Cd/L	mg F/L	mg Mo/L	mg Be/L	mg Al/L	mg As/L
1	Huvsgul	Suuj	D	66	43.31028	110.14222	1,125	7.9	19.5	Odorless	Bit salty	70	7.0	2040	250.22	1000	35.8	0.570	309.920	259.360	270.5	47.5	44.04	34.05	0.141	1.20	0.014	0.069	<0.01	<0.002	<0.002	4.0	0.000	0.168	0.367	0.031
2	Huvsgul	Suujiin huv	C	1305	43.30639	110.12944	1,128	7.7	19.5	Odorless	tasteless	18	7.0	1184	120.11	500	22.4	0.150	80.850	115.270	255.0	5.6	28.03	12.16	0.122	0.35	0.023	0.019	<0.01	<0.002	<0.002	7.6	0.000	0.505	0.000	0.036
3	Huvsgul	Tugrug	D	60	43.28917	109.66139	1,102	8.5	19.5	Odorless	tasteless	colorless	0.0	781	160.14	400	17.2	0.000	74.110	144.090	135.0	0.0	44.04	12.16	0.075	0.52	0.026	0.038	<0.01	<0.002	<0.002	1.6	0.000	0.252	0.000	0.011
4	Huvsgul	Toiron us	C	1107	43.32556	109.75333	1,152	7.9	19.7	Odorless	tasteless	colorless	2.0	686	140.13	350	11.4	0.000	60.640	105.670	120.0	0.0	36.04	12.16	0.215	0.43	0.028	0.031	<0.01	<0.002	<0.002	1.5	0.000	0.505	0.733	0.019
5	Huvsgul	Khar del	D	53	43.33528	109.79639	1,136	7.5	20.0	Odorless	tasteless	25	54.0	874	140.13	400	22.0	0.590	80.850	96.060	114.8	32.0	32.03	14.59	0.178	1.03	0.033	0.069	<0.01	<0.002	<0.002	2.2	0.000	0.757	0.733	0.017
6	Huvsgul	Salaa	D	63	43.33111	109.84583	1,138	7.7	19.4	Odorless	tasteless	colorless	0.0	649	140.13	300	15.0	0.240	53.900	76.850	82.0	0.0	36.04	12.16	0.187	0.35	0.042	0.075	<0.01	<0.002	<0.002	2.5	0.000	0.000	0.000	0.022
7	Huvsgul	Elst	C	8703	43.34972	109.99556	1,117	7.8	19.6	Odorless	tasteless	colorless	2.0	1493	170.15	800	28.2	0.360	168.440	192.120	338.0	15.4	36.04	19.46	0.112	0.52	0.300	0.019	<0.01	<0.002	<0.002	3.2	0.000	0.252	0.000	0.013
8	Huvsgul	Zuun suuj	D	49	43.37444	109.93750	1,118	7.8	19.6	Odorless	tasteless	colorless	0.0	752	80.07	300	23.0	0.150	40.420	96.060	104.0	0.0	16.02	9.73	0.112	0.52	0.035	0.031	<0.01	<0.002	<0.002	4.1	0.000	0.000	0.183	0.027
9	Huvsgul	Dund suuj	C	1098	43.36944	109.90556	1,125	7.9	19.1	Odorless	tasteless	colorless	3.0	1385	80.07	800	27.6	0.450	121.270	182.510	408.0	3.3	16.02	9.73	0.141	0.48	0.091	0.044	<0.01	<0.002	<0.002	6.8	0.000	0.084	1.100	0.028
10	Huvsgul	Baruun suuj	D	50	43.36028	109.88861	1,126	8.0	19.1	Odorless	Bit salty	15	2.0	2180	150.13	1300	44.6	0.240	235.810	374.630	379.0	2.5	24.02	21.89	0.244	0.52	0.016	0.094	<0.01	<0.002	<0.002	7.3	1.453	0.337	0.000	0.015
11	Huvsgul	Sukhait	C	1108	43.36056	109.82861	1,105	7.3	18.9	Odorless	tasteless	colorless	0.0	1134	320.29	550	63.4	0.360	134.750	96.060	142.0	4.1	76.08	31.62	0.094	0.52	1.255	0.008	<0.01	<0.002	<0.002	1.1	0.000	0.000	0.000	0.002
12	Huvsgul	Zadgait	C	1110	43.36667	109.82306	1,104	7.7	19.2	Odorless	tasteless	25	3.0	1327	110.10	600	91.8	0.460	107.800	124.880	262.0	19.2	24.02	12.16	0.244	0.69	0.033	0.019	<0.01	<0.002	<0.002	3.0	0.000	0.168	0.000	0.016
13	Huvsgul	Ulaan khad	C	1348	43.37500	109.80361	1,094	8.0	18.8	Odorless	tasteless	colorless	2.0	955	130.12	500	10.0	0.110	101.060	105.670	187.0	0.0	32.03	12.16	0.131	0.52	0.019	0.621	<0.01	<0.002	<0.002	2.0	0.109	0.000	0.000	0.011
14	Huvsgul	Mogoit	D	0	43.45917	109.74500	1,013	7.5	19.1	Odorless	tasteless	colorless	4.0	1585	140.13	900	29.4	0.360	242.550	201.730	378.0	1.6	20.02	21.89	0.272	0.53	0.021	0.008	<0.01	<0.002	<0.002	3.4	0.000	0.337	0.000	0.006
15	Huvsgul	Chandmani	C	567	43.56167	109.91028	985	7.6	18.8	Odorless	tasteless	colorless	1.0	1910	190.17	1100	64.6	0.780	242.550	288.180	465.0	0.0	28.03	29.18	0.187	0.69	0.026	0.232	<0.01	<0.002	<0.002	3.6	0.000	0.028	0.187	<0.001
16	Huvsgul	Khuvsgul sumiin tuv	A	2	43.61028	109.63472	992	8.1	18.6	Odorless	tasteless	colorless	1.0	843	100.09	400	36.6	0.360	67.370	57.640	195.0	0.0	24.02	9.73	0.562	0.69	0.030	0.138	<0.01	<0.002	<0.002	4.4	0.242	0.000	0.000	0.028
17	Huvsgul	Nudengiin sharga	C	1126	43.57083	109.78000	941	7.2	18.8	Odorless	tasteless	colorless	0.0	520	130.12	200	17.2	0.240	33.690	9.610	73.0	9.1	40.04	7.30	0.525	0.65	0.021	0.013	<0.01	<0.002	<0.002	0.9	0.484	0.000	0.000	0.006
18	Dalanjargalan	Sonor	C		46.09725	108.85119	1,310	7.6	18.5	Odorless	tasteless	colorless	1.0	1591	460.41	900	23.0	0.410	222.330	259.360	202.0	0.8	96.10	53.50	0.843	0.60	0.008	0.075	<0.01	<0.002	<0.002	2.9	0.485	0.168	0.000	<0.001
19	Dalanjargalan	Dalan turuu	A	3178	46.19111	109.34933	1,322	7.4	18.6	Odorless	tasteless	colorless	2.0	729	260.23	300	10.4	0.025	47.160	86.450	89.0	0.0	72.07	19.46	0.178	0.35	0.019	0.226	<0.01	<0.002	<0.002	2.6	0.000	0.000	0.000	0.001
20	Ayrag	Shine us	D		45.97914	109.71447	1,005	7.7	18.6	Odorless	tasteless	colorless	0.0	710	80.07	300	31.0	0.110	40.420	67.240	171.0	0.8	20.02	7.30	0.075	0.35	0.021	0.069	<0.01	<0.002	<0.002	3.3	0.000	0.000	0.000	0.020
21	Ikh het	Devreh	C	10622	46.00964	109.92792	1,103	8.1	18.4	Odorless	tasteless	colorless	0.0	1322	90.08	800	24.2	0.065	141.480	182.510	378.0	1.6	20.02	9.73	0.131	0.21	0.019	0.006	<0.01	<0.002	<0.002	3.6	0.242	0.000	0.000	0.008
22	Ikh het	Hashaat	D		46.24747	109.93350	1,071	7.6	18.4	Odorless	tasteless	colorless	0.0	1260	270.24	600	3.8	0.380	121.270	172.910	202.0	29.0	56.06	31.62	0.300	0.18	0.023	0.056	<0.01	<0.002	<0.002	3.3	0.000	0.000	0.000	0.027
23	Ikh het	Burheest	C		46.31950	110.19203	1,143	7.3	18.4	Odorless	tasteless	colorless	3.0	1130	400.36	600	18.4	0.430	74.110	278.570	66.0	21.4	104.10	34.05	0.375	0.18	0.254	0.357	0.01	<0.002	<0.002	1.7	0.878	0.000	0.000	0.004
24	Ikh het	Dartsagt	C	10622	46.17247	110.45464	1,047	7.7	18.5	Odorless	tasteless	colorless	0.0	1432	350.32	700	20.2	0.038	121.270	201.730	225.0	4.1	52.05	53.50	0.206	0.09	0.016	0.006	<0.01	<0.002	<0.002	6.4	0.780	0.000	0.000	0.001
25	Altanshiree	Toig	C		45.82219	110.45464	1,047	8.0	18.5	Odorless	Tasteless	Colorless	0.0	1352	70.06	700	63.4	0.000	141.480	153.700	338.0	0.0	16.02	7.30	0.056	0.04	0.033	0.025	<0.01	<0.002	<0.002	2.2	0.706	0.000	0.000	0.011
26	Altanshiree	Hailaast	B		45.83633	110.65831	1,073	7.5	18.5	Odorless	tasteless	colorless	9.0	528	200.18	200	6.0	0.360	33.690	48.030	43.0	1.6	56.06	14.59	0.112	0.18	0.156	3.071	<0.01	<0.002	<0.002	1.8	0.879	0.000	2.200	<0.001
27	Delgereh	Iher	C	7004	45.82600	110.92964	1,216	7.5	18.6	Odorless	tasteless	colorless	2.0	1137	290.26	600	29.4	0.360	114.540	192.120	187.0	0.8	52.05	38.91	0.037	0.18	0.040	0.013	<0.01	<0.002	<0.002	2.9	0.484	0.000	0.000	0.009
28	Delgereh	Huh ovoo	D		45.84828	111.15417	1,149	7.7	18.5	Odorless	Tasteless	colorless	0.0	977	200.18	500	46.3	0.150	53.900	105.670	195.0	5.0	36.04	26.75	0.047	0.06	0.019	0.056	<0.01	<0.002	<0.002	3.0	0.726	0.000	0.000	0.001
29	Delgereh	Den	C	6867	45.83883	111.37647	999	7.4	18.3	Odorless	Bit salty	colorless	3.0	2890	570.51	1500	4.0	0.500	309.920	518.720	510.0	2.5	60.06	102.14	0.103	0.18	0.040	0.006	<0.01	<0.002	<0.002	1.8	0.000	0.000	0.000	0.001
30	Delgereh	Gashuun hooloy	C	140	45.52989	111.38447	958	7.7	18.2	Odorless	Bit salty	Colorless	0.0	2910	570.51	1900	28.8	0.000	384.030	797.300	567.0	0.8	84.08	87.55	0.365	0.11	0.009	0.044	<0.01	<0.002	<0.002	3.6	0.726	0.000	0.000	<0.001
31	Urgun	Toosgont	D		45.41103	111.30706	934	7.5	18.3	Odorless	tasteless	colorless	2.0	631	250.22	300	27.0	0.240	33.690	105.670	58.0	3.3	72.07	17.02	0.253	0.11	0.019	0.038	<0.01	<0.002	<0.002	0.5	0.242	0.000	0.000	0.001
32	Urgun	Yagray	C	2612	45.16289	111.35144	922	7.6	18.4	Odorless	Tasteless	colorless	5.0	1190	310.28	600	12.8	0.000	94.320	220.940	119.0	2.5	88.09	21.89	0.103	0.18	0.007	0.019	<0.01	<0.002	<0.002	0.6	0.856	0.000	0.000	0.003
33	Urgun	Gashuun	C	1668	45.05214	111.07106	981	7.6	18.2	Odorless	Bit salty	colorless	2.0	2210	270.24	1400	10.9	0.240	208.860	614.780	433.0	1.6	56.06	31.62	0.768	0.18	0.016	0.063	<0.01	<0.002	<0.002	3.3	0.242	0.000	0.000	0.005
34	Urgun	Shuvuu huuvriin bulag	A		44.81181	110.78053	970	7.8	18.3	Odorless	Bit salty	colorless	3.0	2320	130.12	1000	2.8	0.240	208.860	585.970	157.0	9.1	36.04	9.73	0.337	0.69	0.065	0.150	<0.01	<0.002	<0.002	1.3	0.000	0.000	0.000	0.039
35	Ulaanbadrah	Khooloin gashuun	D	83	43.83872	110.52250	918	7.4	16.1	Odorless	Saline	Colorless	21.0	8460	2161.94	5300	17.0	0.370	862.390	1892.380	1860.0	24.4	376.38	296.70	0.468	0.04	0.019	0.087	<0.01	<0.002	<0.002	2.2	0.000	0.000	0.000	0.003
36	Ulaanbadrah	Suuj zahialsan	D	94	43.77417	110.69619	966	7.6	15.9	Odorless	Tasteless	Colorless	12.0	1787	160.14	1000	60.4	0.000	195.380	256.360	425.0	28.6	36.04	17.02	0.009	0.09	0.000	0.013	<0.01	<0.002	<0.002	4.6	0.726	0.337	0.000	0.003
37	Ulaanbadrah	Tseel zahialsan	D	91	43.74672	110.82883	974	7.6	16.7	Odorless	Bit salty	60	24.0	2280	200.18	1200	9.2	0.530	282.970	355.420	408.0	35.8	48.05	19.46	0.056	0.52	0.041	0.026	<0.01	<0.002	<0.002	4.0	0.000	0.000	0.000	0.005
38	Ulaanbadrah	Bayansain	D	131	43.46567	111.23664	1,168	7.3	15.8	Odorless	Bit salty	80	17.0	2530	620.56	1400	143.0	0.710	316.660	384.240	256.0	89.5	136.14	68.10	0.037	0.52	0.065	0.019	<0.01	<0.002	<0.002	1.8	0.000	0.337	0.000	0.008
39	Ulaanbadrah	Elsen doloon	D	130	43.49750	111.05606	1,043	7.4	16.1	Odorless	tasteless	400	81.0	1119	170.15	500	17.0	0.820	154.960	48.030	210.0	33.3	52.05	9.73	0.022	0.86	0.089	0.032	<0.01	<0.002	<0.002	1.0	0.484	0.168	0.000	0.005
40	Ulaanbadrah	Khuuvriin khudag	D	96	43.72931	110.57192	940	8.0	15.7	Odorless	Bit salty	100	23.0	2110	80.07	950	3.4	0.770	148.220	211.330	500.0	50.4	24.02	4.86	0.019	1.20	0.016	0.026	<0.01	<0.002	<0.002	9.1	0.000	0.421	0.367	0.006
41	Ulaanbadrah	Gun gashuun	C	1653	43.62064	110.68167	1,003	7.1	16.4	Odorless	Saline	colorless	14.0	4970	2702.43	3400	22.4	0.590	114.540	1901.990	556.0	19.7	424.42	398.85	0.028	0.02	0.016	0.032	<0.01	<0.002	<0.002	7.5	0.000	0.000	0.367	0.001
42	Ulaanbadrah	Khersnii	C	1141	43.49853	110.72131	1,105	7.7	15.5	Odorless	Bit salty	colorless	9.0	2810	450.40	1600	143.5	0.590	377.290	413.060	554.0	31.0	28.03	92.42	0.047	0.06	0.011	0.064	<0.01	<0.002	<0.002	7.8	0.000	0.000	0.000	0.004
43	Ulaanbadrah	Shine us	D	115	43.59403	110.57806	1,017	7.7	15.7	Odorless	tasteless	5	82.0	1083	270.24	500	43.2	0.420	101.060	86.450	99.6	31.0	84.08	14.59	0.028	0.15	0.130	0.013	<0.01	<0.002	<0.002	1.8	0.000	0.000	1.466	0.007
44	Ulaanbadrah	Khar khushuu(zahialsan)	C	1350	43.90356	109.95347	960	8.0	15.9	Odorless	tasteless	colorless	9.0	942	60.05	400	31.8	0.150	94.320	67.240	187.0	0.0	8.01	9.73	0.018	0.00	0.008	0.006	<0.01	<0.002	<0.002	3.3	0.000	0.000	0.000	0.008
45	Ulaanbadrah	Dund bayan(zahialsan)	C	1418	44.36717	109.89878	761	7.5	16.6	Odorless	tasteless	colorless	36.0	1678	80.07	900	37.8	0.380	276.230	182.510	364.0	2.5	20.02	7.30	0.019	1.06	0.024	0.026	<0.01	<0.002	<0.002	2.0	0.000	0.000	0.000	0.009
46	Ulaanbadrah	Khyar shand	D	156	43.72542	110.30639	1,009	7.9	15.7	Odorless	tasteless	colorless	9.0	705	150.14	300	29.4	0.065	60.640	38.420	112.0	0.0	32.03	17.02	0.028	0.42	0.011	0.096	<0.01	<0.002	<0.002	1.9	0.000	0.000	0.367	0.005
47	Ulaanbadrah	Bor tsaviin ar	C	1359	44.09642	110.61767	967	7.8	15.3	Odorless	Bit salty	colorless	181.0	2340	250.20	1400	15.0	0.450	114.540	624.390	561.0	8.0	44.04	34.05	0.028	0.18	0.146	0.089	<0.01	<0.002	<0.002	1.1	0.000	0.000	2.933	0.009
48	Ulaanbadrah	Oroin khar	A	5072	44.29261	110.33711	791	7.9	16.3	Odorless	tasteless	colorless	2.0	1142	170.15	600	19.6	0.200	175.170	76.850	225.0	1.6	40.04	17.02	0.019	0.00	0.002	0.026	<0.01	<0.002	<0.002	1.9	0.000	0.000	0.000	0.003
49	Ulaanbadrah	Tsagaan ereg	A	1687	44.11847	110.32603	855	8.0	16.1	Odorless	Bit salty	colorless	5.0	3870	520.47	1800	23.0	0.370	882.600	509.120	217.0	2.5	144.14	38.91	0.019	0.00	0.008	0.019	<0.01	<0.002	<0.002	2.3	0.000	0.000	0.000	<0.001
50	Ulaanbadrah	Zavagt	D	70	43.95383	110.35869	993	7.6	15.6	Odorless	tasteless	30	6.0	803	150.14	300	15.6	0.430	53.900	19.210	164.0	6.4	36.04	14.59	0.019	0.09	0.024	0.019	<0.01	<0.002	<0.002	3.8	0.000	0.000	0.550	0.005
51	Ulaanbadrah	Nuden	A	3840	43.87894	110.42292	985	7.9	15.6	Odorless	Tasteless	colorless	0.0	948	180.16	900	58.8	0.280	505.310	86.450	187.0	0.0	44.04	17.02	0.009	0.00	0.020	0.243	<0.01	<0.002	<0.002	1.3	0.000	0.000	0.000	0.001
52	Ulaanbadrah	Nuden	D	40	44.20278	110.29969	988	7.9	16.3	Odorless	Bit salty	5	254.0	2710	350.32	1100	31.0	0.400	94.320	317.000	498.0	5.6	84.08	34.05	0.187	0.11	0.113	0.039	<0.01	<0.002	<0.002	3.6	0.000	0.000	3.299	0.013
53	Sainsand	Uehii	D		44.73819	110.13003	855	7.1	17.9	Odorless	tasteless	colorless	7.0	1443	220.20	900	10.9	0.370	94.320	355.420	338.0	1.6	40.04	29.18	0.272	0.00	0.105	0.019	<0.01	<0.002	<0.002	2.8	0.000	0.000	0.000	0.003
54	Sainsand	Ofitser	A	7019	44.89056	110.12667	946	7.7	20.9	Odorless	Bit salty	colorless	4.0	2590	270.24	1500	44.1	0.370	437.930	422.660	485.0	2.3	60.06	29.18	0.009	0.18	0.008	0.160	<0.01	<0.002	<0.002	3.3	0.000	0.000	0.000	0.004
55	Hatanbulag	Bayan mod	C	5145	43.26489	109.39347	1,065	7.2	17.6	Odorless	Saline	Colorless	1.0	10380	1241.12	6300	31.5	0.400	2964.460	1143.110	1796.0	5.6	176.18	194.56	0.028	0.02	0.010	0.083	<0.01	<0.002	<0.001	5.2	0.000	0.000	0.000	0.003
56	Hatanbulag	Toli	A		43.02742	109.38725		7.9	17.7	Odorless	tasteless	colorless	1.0	700	200.18	300	17.2	0.025	53.900	67.240	97.0	0.0	32.03	29.18	0.009	0.00	0.011	0.019	<0.01	<0.002	<0.001	1.9	0.000	0.000	0.366	0.004
57	Hatanbulag	Jargalant	C	1579	43.21431	109.07389	1,101	7.4	17.7	Odorless	Saline	colorless	2.0	7150	940.85	5100	35.0	0.280	1158.830	1901.990	1700.0	4.1	184.18	116.74	0.028	0.00	0.000	0.026	<0.01	<0.002	<0.001	4.6	0.000	0.000	0.000	0.002
58	Hatanbulag	Gashuun	D		43.48164	108.98792	988	7.1	17.2	Odorless	Bit salty	70	19.0	4740	650.58	2400	12.0	0.580	1192.520	461.090	498.0	48.1	120.12	85.12	0.009	0.40	0.057	0.026	<0.01	<0.002	<0.001	2.9	0.000	0.000	0.000	0.002
59	Mandah	Tsagaan tsav	A	1412	43.95019	108.91969	804	7.9	17.5	Odorless	tasteless	colorless	3.0	958	150.14	500	17.9	0.025	94.320	192.120	187.0	0.0	36.04	14.59	0.086	0.00	0.008	0.045	<0.01	<0.002	<0.001	2.5	0.000	0.000	0.000	0.001
60	Mandah	Budar	C	1077	44.24758	108.69789	933	7.3	17.4	Odorless	tasteless	colorless	5.0	706	120.11	300	51.3	0.370	47.160	76.850	112.0	1.6	36.04	7.30	0.092	0.00	0.008	0.045	<0.01	<0.002	<0.001	2.6	0.000	0.000	0.000	0.006
61	Mandah	Dersen us	C	1067	44.33556	108.60639	1,030	7.5	17.2	Odorless	tasteless	colorless	2.0	1643	170.15	900	7.5	0.380	269.500	230.540	338.0	4.1	40.04	17.02	0.154	0.02	0.008	0.035	<0.01	0.003	<0.001	1.6	0.000	0.000	0.000	0.004
62	Mandah	Tsagaan am	D		44.52278	108.59222	1,147	7.5	17.2	Odorless	tasteless	colorless	4.0	1778	240.22	1150	67.0	0.400	202.120	336.210	473.0	3.3	36.04	36.48	0.148	0.02	0.008	0.019	<0.01	<0.002	<0.001	5.9	0.000	0.000	0.000	0.022
63	Saihandulaan	Uvsun ger	A		44.69161	109.01767	1,254	7.7	17.2	Odorless	tasteless	colorless	2.0	798	270.24	400	30.5	0.370	53.900	115.270	97.0	2.5	40.04	41.34	0.096	0.02	0.008	0.593	<0.01	<0.002	<0.001	1.4	0.000	0.000	0.513	<0.001
64	Saihandulaan	Azar teeg	C	8079	44.90072	109.45658	1,007	7.5	17.1	Odorless	tasteless	5	49.0	925	210.19	450	56.4	0.400	94.320	67.240	157.0	4.1	36.04	29.18	0.096	0.09	0.032	0.045	<0.01	<0.002	<0.001	0.6	0.242	0.168	0.532	0.009
65	Saihandulaan	Budargana	C	7797	44.91972	109.29250	1,028	7.7	17.2	Odorless	tasteless	50	49.0	1221	130.12	600	45.7	0.470	128.010	48.030	271.0	31.0	28.03	14.59	0.105	0.35	0.073	0.035	<0.01	<0.002	<0.001	0.5	0.000	0.000	0.733	0.002
66	Saihandulaan	Tsohio	D		44.96944	109.28417	1,016	7.3	17.5	Odorless	tasteless	colorless	9.0	1216	250.23	700	28.2	0.420	121.270	230.540	248.0	11.1	44.04	34.05	0.107	0.18	0.014	0.013	<0.01	<0.002	<0.001	7.3	0.000	0.000	0.365	0.004
67	Altanshiree	Hayaa	D		45.31617	110.32247	846	7.8	17.2	Odorless	tasteless	colorless	3.0	1474	170.15	800	15.0	0.280	175.170	268.970	263.0	0.8	24.02	26.75	0.123	0.02	0.007	0.002	<0.01	<0.002	<0.001	1.9	0.000	0.084	0.000	0.002
68	Altanshiree	Sain us	A		45.23289	110.17306	849	7.6	17.6	Odorless	tasteless	colorless	8.0	1585	110.10	900	15.0	0.150	242.550	211.330	400.0	2.5	20.02	14.59	0.157	0.18	0.008	0.013	<0.01	0.002	<0.001	2.5	0.000	0.000	0.000	0.005
69	Sainsand	Ganbaataryn hudag	A		44.90028	110.13389	972	7.6	21.0	Odorless	tasteless	colorless	2.0	1343	120.11	800	0.0	0.370	181.910	259.360	281.0	0.3	24.02	14.59	0.011	0.35	0.007	0.006	<0.01	<0.002	<0.001	3.7	0.000	0.000	0.000	<0.001
70	Sainsand	Zavilan	C		44.88000	110.18333	903	7.6	21.0	Odorless	tasteless	colorless	9.0	1531	130.12	800	0.0	0.730	141.480	355.420	299.0	1.2	24.02	17.02	0.011	0.52	0.027	0.070	<0.01	<0.002	<0.001	3.3	0.000	0.000	0.000	<0.001
71	Ayrag	Urd altgana	C		45.43625	109.38789	997	8.1	17.5	Odorless	Saline	Colorless	0.0	7380	790.71	4400	115.0	0.560	902.810	1901.990	1160.0	66.0	96.10	133.76	0.085	0.18	0.007	0.026	<0.01	<0.002	<0.001	7.5	0.000	0.084	0.000	0.125
72	Ayrag	Sain tsavuu	C		45.47636	109.01392	1,107	7.7	17.3	Odorless	tasteless	colorless	3.0	1266	280.25	700	31.8	0.390	121.270	211.330	217.0	5.0	28.03	51.07	0.074	0.18	0.008	0.019	<0.01	<0.002	<0.001	3.9	0.000	0.084	0.000	<0.001

Table E.1 Results of Groundwater Quality Analysis in Dornogobi Aimag

Sample No.	Soum Name	Well Name	Well type	Well No.	Latitude	Longitude	Altitude (m)	1 pH	2 Temp.	3 Odor	4 Taste	5 Color	6 Turbidity	7 Electric Conductivity	8 Hardness	9 Evaporated Residue	10 Nitrate	11 Ammonium	12 Chloride	13 Sulfate	14 Sodium	15 Potassium	16 Calcium	17 Magnesium	18 Copper	19 Iron	20 Manganese	21 Zinc	22 Lead	23 Chromium	25 Cadmium	26 Fluoride	27 Molybdenum	28 Beryllium	29 Aluminum	30 Arsenic
								-	°C	Dilution factor	Dilution factor	mg/Pt scale	NTU	µS/cm	mgCaCO3/	g/L	mg NO_3/L	mg NH_4/L	mg Cl/L	mg SO4/L	mg Na/L	mg K/L	mg Ca/L	mg Mg/L	mg Cu/L	mg Fe/L	mg Mn/L	mg Zn/L	mg Pb/L	mg Cr/L	mg Cd/L	mg F/L	mg Mo/L	mg Be/L	mg AL/L	mg As/L
73	Ayrag	Sum center	A		45.80150	109.31169	1,109	7.5	17.1	Odorless	tasteless	colorless	9.0	1671	300.27	900	8.0	0.150	208.860	211.330	350.0	5.0	52.05	41.34	0.062	0.35	0.007	0.022	<0.01	<0.002	<0.001	3.5	0.000	0.000	0.000	<0.001
74	Dalanjargalan	Hadmal	D		45.87303	109.11353	1,109	7.0	17.2	Odorless	tasteless	colorless	6.0	1083	270.24	500	54.9	0.450	114.540	115.270	149.0	20.0	56.06	31.62	0.064	0.52	0.072	0.013	<0.01	<0.002	<0.001	2.1	0.000	0.000	0.000	0.016
75	Dalanjargalan	Hoorond	C	1417	45.85350	108.93708	1,157	7.8	17.3	Odorless	tasteless	colorless	7.0	1900	170.15	1100	95.0	0.420	148.220	355.420	482.0	1.6	36.04	19.46	0.065	0.38	0.116	0.031	<0.01	<0.002	<0.001	3.6	0.000	0.000	0.000	0.001
76	Erdene	Zalaa	D	10	44.56303	110.42628	872	7.5	18.4	Odorless	tasteless	30	29.0	1560	230.21	700	0.0	0.420	121.270	96.060	370.0	16.8	56.06	21.89	0.118	0.86	0.057	0.038	<0.01	<0.002	<0.001	4.7	0.000	0.000	0.000	0.003
77	Erdene	Bulag shand	C	1378	44.44306	110.65433	921	7.3	18.4	Odorless	tasteless	40	178.0	729	140.13	500	8.0	0.680	87.590	144.090	148.0	29.3	40.04	9.73	0.097	1.53	0.130	0.019	<0.01	0.002	<0.001	0.2	0.000	0.000	6.232	0.003
78	Erdene	Bukhel-2	A	5051	44.42614	110.87517	1,006	7.6	18.3	Odorless	tasteless	Colorless	3.0	977	140.13	500	38.4	0.370	101.060	144.090	193.0	0.0	40.04	9.73	0.083	0.38	0.161	0.013	<0.01	<0.002	<0.001	1.8	0.000	0.000	0.365	0.006
79	Erdene	Dortsoglin us	D	158	44.64933	111.06386	976	7.2	18.4	Odorless	tasteless	5	50.0	376	140.13	200	6.3	0.450	33.690	28.820	51.0	1.2	40.04	9.73	0.074	0.52	0.000	0.013	<0.01	<0.002	<0.001	0.2	0.000	0.000	0.367	0.007
80	Erdene	Modongiin khudag	D	39	44.77556	111.40303	990	7.8	18.4	Odorless	tasteless	40	10.0	1213	180.16	800	34.0	0.500	74.110	268.970	308.0	7.5	44.04	17.02	0.041	0.69	0.081	0.013	<0.01	<0.002	<0.001	4.1	0.000	0.000	0.366	0.155
81	Erdene	Khokh tolgoi	C	599	44.59789	111.31111	969	7.8	18.4	Odorless	Tasteless	Colorless	3.0	1156	90.08	650	40.8	0.380	87.590	211.330	281.0	0.0	24.02	7.30	0.032	0.35	0.009	0.022	<0.01	<0.002	<0.001	1.6	0.000	0.000	0.000	0.040
82	Erdene	Daravgai	D	47	44.18064	111.33517	1,118	7.6	18.4	Odorless	Tasteless	Colorless	3.0	1202	260.23	650	55.4	0.380	134.750	153.700	200.0	20.8	48.05	34.05	0.031	0.40	0.014	0.038	<0.01	<0.002	<0.001	3.4	0.000	0.000	0.000	0.006
83	Zamyn Uud	Huuiten	D	109	43.86781	111.76731	995	7.8	18.5	Odorless	Tasteless	10	7.0	1948	120.11	1000	40.8	0.390	161.700	326.600	468.0	1.2	28.03	12.16	0.056	0.35	0.107	0.019	<0.01	<0.002	<0.001	7.7	0.000	0.000	0.367	0.006
84	Zamyn Uud	Sharga ovoo	D		43.89361	111.73214	1,041	7.7	18.5	Odorless	Bit salty	5	5.0	2950	310.28	1700	202.0	0.400	323.400	441.880	609.0	5.5	36.04	53.50	0.089	0.38	0.000	0.022	<0.01	<0.002	<0.001	4.1	0.000	0.000	0.367	0.001
85	Zamyn Uud	Zamyn Uud center	A	4	43.71953	111.89600	983	7.5	18.6	Odorless	Bit salty	Colorless	4.0	3020	430.39	1750	17.5	0.390	592.890	432.270	574.0	1.2	64.06	65.66	0.092	0.38	0.008	0.021	<0.01	<0.002	<0.001	1.9	0.000	0.000	0.367	0.005
86	Zamyn Uud	Gurvan durvilj	C	2890	43.79250	111.65492	984	7.6	18.7	Odorless	Bit salty	Colorless	3.0	2420	170.15	1300	16.0	0.420	464.880	240.150	522.0	1.2	36.04	19.46	0.061	0.52	0.002	0.125	<0.01	<0.002	<0.001	5.9	0.000	0.000	0.000	0.003
87	Erdene	Shine us	D	76	44.01583	111.45967	1,058	7.7	18.8	Odorless	Tasteless	Colorless	7.0	1191	190.17	650	47.0	0.400	87.590	192.120	263.0	0.0	28.03	29.18	0.079	0.52	0.008	0.013	<0.01	<0.002	<0.001	2.9	0.000	0.000	0.000	0.009
88	Erdene	Arnan us	D	103	43.97383	111.23792	1,058	7.4	18.5	Odorless	Tasteless	Colorless	4.0	887	150.14	500	65.0	0.420	47.160	163.300	184.0	26.1	32.03	17.02	0.032	0.52	0.008	0.019	<0.01	<0.002	<0.001	2.8	0.000	0.084	0.000	0.007
89	Erdene	Togrog	C	1140	44.04331	111.33631	1,060	7.7	19.4	Odorless	Bit salty	Colorless	6.0	2160	200.18	1100	30.0	0.430	242.550	192.130	485.0	41.7	44.04	21.89	0.032	0.52	0.008	0.019	<0.01	<0.002	<0.001	7.5	1.242	0.042	0.000	0.017
90	Erdene	Ekhen jargalant	D	93	43.91014	110.86817	1,047	7.8	19.7	Odorless	Tasteless	Colorless	8.0	944	150.14	650	52.0	0.390	60.640	297.790	174.0	12.7	36.04	14.59	0.042	0.52	0.008	0.013	<0.01	<0.002	<0.001	2.8	0.242	0.028	0.000	0.009
91	Erdene	Tokhomiin khondil	C	1680	44.11347	111.11661	1,094	7.7	18.6	Odorless	Tasteless	Colorless	5.0	582	130.12	300	13.8	0.370	40.420	57.640	130.0	0.0	12.01	24.32	0.046	0.35	0.002	0.013	<0.01	<0.002	<0.001	3.5	0.000	0.000	0.000	0.066
92	Erdene	Taliin boon	C	867	44.11658	110.90200	1,166	7.7	18.4	Odorless	Tasteless	15	7.0	905	60.05	400	10.4	0.550	53.900	105.670	236.0	0.0	12.01	7.30	0.035	0.52	0.009	0.006	<0.01	<0.002	<0.001	9.9	0.000	0.022	0.000	0.008
93	Erdene	Khoovor	D	100	43.89242	111.21642	1,052	7.3	18.2	Odorless	Tasteless	Colorless	0.0	498	110.10	200	7.5	0.370	26.950	48.030	95.0	0.0	24.02	12.16	0.055	0.35	0.014	0.013	<0.01	<0.002	<0.001	2.6	0.000	0.007	0.000	0.006
94	Erdene	Borkhoin chomogt khooloi	A	7006	43.73078	111.68489	968	7.5	18.3	Odorless	Bit salty	Colorless	4.0	2	140.13	1100	13.2	0.370	316.660	268.970	449.0	0.0	28.03	17.02	0.032	0.69	0.016	0.006	<0.01	<0.002	<0.001	6.6	0.000	0.000	0.000	<0.001
95	Erdene	Suuj	D		44.40047	111.03861	1,008	7.3	18.0	Odorless	Tasteless	Colorless	1.0	1064	340.31	800	21.9	0.380	67.370	422.660	200.0	0.0	48.05	53.50	0.032	0.35	0.163	0.044	<0.01	0.002	<0.001	2.7	0.000	0.000	0.000	0.017
96	Erdene	Tsagaan khad	D	51	44.21361	111.20297	1,079	7.2	18.2	Odorless	Tasteless	Colorless	2.0	1025	160.14	600	31.1	0.480	101.060	153.700	219.0	0.0	36.04	17.02	0.064	0.43	0.007	0.002	<0.01	<0.002	<0.001	2.8	0.000	0.000	0.000	0.008
97	Erdene	Tokhom	D		44.28839	110.57592	966	7.6	18.2	Odorless	Tasteless	Colorless	0.0	847	270.24	400	33.4	0.400	53.900	105.670	95.0	0.3	72.07	21.89	0.064	0.69	0.012	0.005	<0.01	<0.002	<0.001	1.5	0.484	0.000	0.000	0.009
98	Erdene	Shar mod	D		44.33503	110.71128	989	7.5	18.3	Odorless	Tasteless	Colorless	6.0	1795	190.17	1100	10.4	0.400	168.440	528.330	370.0	0.0	52.05	14.59	0.087	0.52	0.089	0.050	<0.01	<0.002	<0.001	0.9	0.000	0.000	0.000	0.014
99	Erdene	Bayu	D		44.44633	110.97017	1,001	7.6	18.1	Odorless	Tasteless	Colorless	8.0	854	160.14	500	17.9	0.450	74.110	134.480	174.0	12.7	48.05	9.73	0.054	0.52	0.089	0.006	<0.01	<0.002	<0.001	0.3	0.242	0.000	0.000	0.010
100	Huvsgul	Sukhait	C	52	43.36056	109.82861	1,105	7.4	18.1	Odorless	Tasteless	Colorless	3.0	1613	160.14	900	29.4	0.540	249.280	249.760	334.0	0.3	24.02	24.32	0.092	0.69	0.009	0.019	<0.01	<0.002	<0.001	5.2	0.000	0.000	0.366	0.022
101	Erdene.	Bukhel II	A	A3175	44.44222	110.87056		7.6	19.8	Odorless	Bit salty	Colorless	4.0	2300	390.35	1300	28.8	0.000	389.140	432.270	370.0	0.0	92.09	38.91	0.035	0.76	0.049	0.002	<0.01	<0.002	<0.001	1.0	0.000	0.000	0.000	<0.001
102	Ulaanbadrakh	Khukh am	A	A3180	43.86556	110.33722		8.1	19.4	Odorless	Bit salty	Colorless	6.0	2500	200.18	1500	25.4	0.000	455.090	451.480	522.0	0.0	44.04	21.89	0.035	0.57	0.091	0.006	<0.01	<0.002	<0.001	2.6	0.000	0.000	0.000	<0.001
103	Ulaanbadrakh	Tsaidam	A	A5154	44.08750	110.65361		8.3	19.4	Odorless	Bit salty	Colorless	21.0	2940	60.05	1400	0.0	0.670	428.710	220.940	698.0	0.0	12.01	7.30	0.035	0.77	0.021	0.019	<0.01	<0.002	<0.001	5.4	0.000	0.000	0.000	<0.001
104	Erdene.	Butin holoi	A	A6936	44.72056	111.18000		7.5	25.3	Sharp Chemical	Tasteless	1	1.0	1610	280.00	1100	45.0	0.090	180.000	310.000	270.0	2.2	60.00	32.00	0.002	0.03	0.003	0.018	0.001	0.001	0.005	1.0	0.005	0.001	0.001	0.001
105	Erdene.	Zuun khur	A	A5078	44.62417	111.22333		8.0	24.2	Faint fatty odor	Bit salty	<1	1.0	3250	290.00	2100	25.0	0.050	410.000	760.000	660.0	2.2	38.00	48.00	0.001	0.44	0.013	0.120	0.001	0.002	0.005	1.0	0.007	0.001	0.015	0.001
106	Ulaanbadrakh	Shuvuun	A	3185	43.71694	110.45833		7.7	24.2	Chemical odor	Saline	<1	10.0	12100	2100.00	10000	0.1	1.000	2100.000	4800.000	2600.0	8.7	400.00	260.00	0.001	0.46	0.330	0.060	0.001	0.001	0.005	1.1	0.012	0.001	0.004	0.001
107	Khuvsgul	Khayrst	A	3843	43.46361	110.04389		8.2	19.3	Odorless	Bit salty	Colorless	9.0	2560	350.31	1500	50.6	0.000	422.120	432.270	458.0	0.3	76.08	38.91	0.032	0.65	0.008	0.010	<0.01	<0.002	<0.001	2.2	0.000	0.000	0.000	<0.001
108	Khuvsgul	Tataliin gol	A	5151	43.51139	109.55222		7.4	25.2	Delicate soil odor	Bit salty	<1	1.0	3560	640.00	2300	84.0	0.050	870.000	420.000	550.0	4.3	130.00	73.00	0.001	1.00	0.200	0.086	0.001	0.004	0.005	1.1	0.002	0.001	0.064	0.001
109	Erdene	Burdene	A	JN-1	44.22583	110.84056		6.9	19.7	Odorless	Saline	20	49.0	5460	1771.59	3900	2.5	0.415	521.050	1892.380	898.0	9.6	384.38	196.99	0.035	2.21	0.122	0.137	<0.01	<0.002	<0.001	0.8	0.000	0.000	0.000	<0.001
110	Ulaanbadrakh	Hobgun Modoc	A	JN-3	44.08167	110.28639		8.1	23.9	Faint soil odor	Tasteless	1	3.0	1010	73.00	620	39.0	0.050	97.000	110.000	200.0	1.4	18.00	6.50	0.002	2.80	0.066	0.320	0.001	0.001	0.005	3.9	0.018	0.001	0.220	0.005
111	Ulaanbadrakh	Holoin hond	C	1354	43.62944	110.41028		8.8	19.7	Odorless	Tasteless	Colorless	4.0	1233	30.03	700	19.0	0.000	85.740	211.330	334.0	0.0	8.01	2.43	0.036	0.62	0.007	0.006	<0.01	0.004	<0.001	6.8	0.000	0.000	0.000	0.040
112	Khuvsgul	Taliin tsagaan	A	5149	43.95556	109.75472		7.5	25.1	Odorless	Tasteless	<1	9.0	2720	370.00	1700	14.0	0.050	500.000	480.000	490.0	2.7	85.00	38.00	0.001	0.44	0.007	0.048	0.001	0.005	0.005	1.8	0.008	0.001	0.038	0.001
113	Khuvsgul	Talyn dov	A	3173	43.50028	109.81667		7.7	25.0	Decicalte dried grass	Bit salty	<1	1.0	2850	310.00	1800	39.0	0.050	580.000	380.000	550.0	3.8	65.00	35.00	0.001	0.10	0.130	0.030	0.001	0.001	0.005	1.0	0.003	0.001	0.001	0.001
114	Erdene.	Durvuljin	C		44.81694	111.38889		8.2	20.4	Rotten	Tasteless	15	84.0	823	130.12	800	0.0	0.590	72.550	518.720	128.6	76.2	32.06	12.16	0.015	0.36	0.029	0.028	<0.01	<0.002	<0.001	3.1	0.000	0.000	0.000	0.004
115	Erdene	Burdene (Mixed)	C		44.22583	110.84056		6.9	25.4	Soil odor	Bit salty	※4 <1(320)	99.0	5950.00	1700.00	5300.0	0.05	0.700	590.000	2500.00	1000.0	8.20	350.00	190.000	0.001	34.000	0.310	7.500	0.001	0.001	0.005	0.7	0.0010	0.0010	0.0150	0.001
116	Erdene	Burdene (supernatant liquid)	C		44.22583	110.84056		7.0	25.5	Faint Soil odor	Bit salty	<1	1.0	5940.00	1700.00	5200.0	0.01	0.680	570.000	2400.00	1000.0	7.90	350.00	190.000	0.002	0.130	0.320	2.700	0.001	0.001	0.005	0.7	0.0010	0.0010	0.0010	0.001
117	Erdene	Burdene (purified)	C		44.22583	110.84056		6.9	25.4	Delicate soil odor	Tasteless	<1	1.0	<133.00	5.10	87.0	0.03	0.140	30.000	6.80	23.0	<0.30	1.10	0.550	0.001	0.045	0.005	0.220	0.001	0.001	0.005	0.1	0.0010	0.0010	0.0010	0.001
118	Erdene	Burdene (Spring)	D		44.22583	110.84056		7.5	25.5	faint fatty odor	Tasteless	3.0	1.0	887.0	290.00	590.0	120.00	0.050	39.000	76.00	92.0	5.4	72.00	26.000	0.001	0.180	0.540	0.075	0.001	0.001	0.005	1.3	0.0060	0.0010	0.0260	0.001
119	Erdene	Tsant	C		44.81667	111.47222		7.5	24.3	Odorless	Tasteless	<1	1.0	5830.0	720.00	4300.0	18.00	0.050	860.000	1600.00	1200.0	5.2	140.00	90.000	0.001	0.046	0.270	0.470	0.001	0.001	0.005	3.4	0.0220	0.0010	0.0030	0.001
120	Erdene	Khar del	D		44.18103	111.04331		7.2	24.1	grass odor	Tasteless	24.0	1.0	2020.0	650.00	1500.0	140.00	1.500	230.000	330.00	190.0	22.0	160.00	58.000	0.005	0.050	0.310	0.001	0.001	0.001	0.005	1.3	0.0330	0.0010	0.0020	0.012
121	Erdene	Khonkhorlin us	D		44.26444	111.09306		7.3	24.0	fatty odor	Saline	5.0	1.0	9520.0	2400.00	7500.0	11.00	0.850	2300.000	1700.00	1500.0	48.0	310.00	400.000	0.001	1.300	1.500	0.001	0.001	0.001	0.005	1.5	0.0040	0.0010	0.0770	0.021
122	Ulaanbadrakh	Taliin buuts	C		43.94139	109.11333		7.8	24.1	Odorless	Bit salty	<1	1.0	2350.0	160.00	1400.0	23.00	0.050	370.000	340.00	490.0	1.9	36.00	17.000	0.001	0.350	0.049	0.390	0.001	0.001	0.005	6.0	0.0470	0.0010	0.0360	0.001
123	Ulaanbadrakh	Nuden	D		43.87194	110.40139		7.5	24.6	grass odor	Tasteless	32.0	1.0	2050.0	320.00	1300.0	19.00	2.400	160.000	310.00	340.0	23.0	68.00	37.000	0.005	0.210	0.074	0.011	0.001	0.001	0.005	5.3	0.0320	0.0010	0.1500	0.006
124	Ulaanbadrakh	Khulsan	D		44.00689	110.20119		7.9	24.8	Faint soil odor	Tasteless	1.00	14.0	713.00	110.00	420.0	24.00	0.050	95.000	52.00	100.0	1.00	34.00	7.700	0.003	0.290	0.004	0.001	0.001	0.001	0.005	0.9	0.0040	0.0010	0.2700	0.006
125	Huvsgul	Yast	C		43.74472	109.61611		7.9	24.9	faint tarry odor	Tasteless	<1	1.0	1400.0	110.00	830.0	46.00	0.060	180.000	140.00	270.0	1.9	26.00	12.000	0.001	0.088	0.007	0.730	0.001	0.001	0.005	9.1	0.0440	0.0010	0.0960	0.002
126	Huvsgul	Gurvan shavagtal	D		43.16428	109.98928		7.4	25.4	Sharp night-soil odor	Tasteless	80.0	16.0	1050.0	110.00	750.0	0.08	0.370	50.000	120.00	200.0	9.5	29.00	10.000	0.004	0.110	0.160	0.004	0.003	0.001	0.005	4.4	0.0390	0.0010	0.0320	0.014
127	Huvsgul	Tugrug	D		43.28756	109.66325		7.7	25.5	Fatty odor	Tasteless	7.0	1.0	1840.0	200.00	1100.0	77.00	0.050	260.000	210.00	320.0	43.0	38.00	25.000	0.003	0.032	0.011	0.004	0.001	0.001	0.005	3.4	0.0280	0.0010	0.0230	0.023
										2	2	15	5		350.0	1,000	44.3	1.5	350	500.0	10000	10000	100	30.0	1.0	1.00	0.10	5.00	0.03	0.05	0.01	1.5	0.25	0.0002	0.50	0.05
Water Quality Standard								6.5-8.5	-	2	2	≤15	≤5	-	≤350	≤1000	≤44.3	≤1.5	≤350	≤500	-	-	≤100	≤30	≤1	≤1	≤0.1	≤5	≤0.03	≤0.05	≤0.01	≤1.5	≤0.25	NAD	≤0.5	≤0.01
No.of samples unsatisfied standard								1.0	-	0	0	17	50	-	27	45	29	1	27	20	-	-	16	46	0	9	24	1	0	0	0	96	15	25	12	3
Persentage of samples unsatisfired standard (%)								0.9	-	-	-	13.4	39.4	-	21.3	35.4	22.8	0.8	21.3	15.7	-	-	12.6	36.2	-	7.1	18.9	0.8	-	-	-	75.6	11.8	19.7	9.4	2.4