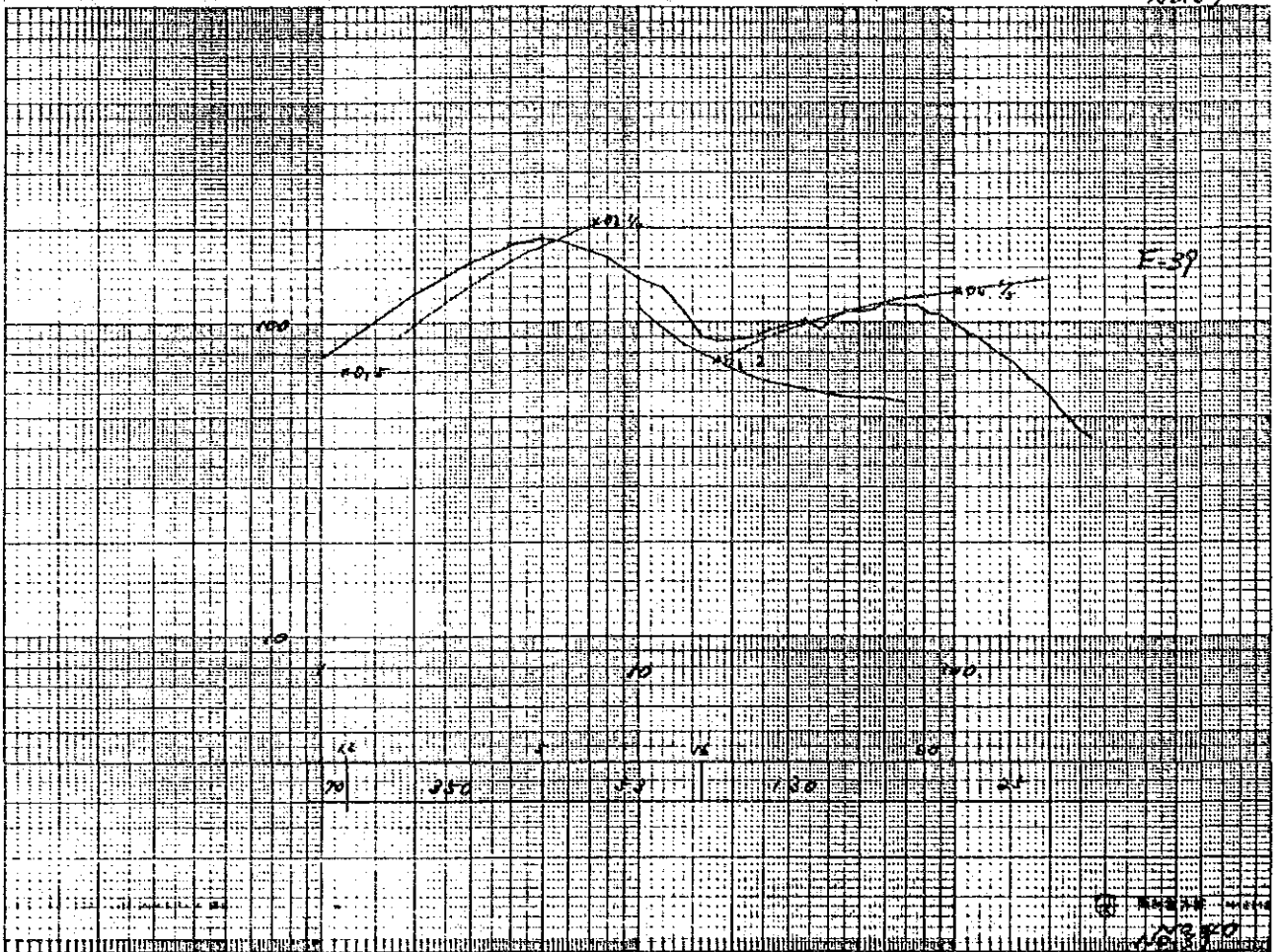


Fig. Result of Electrical Prospecting (ρ -a curve)

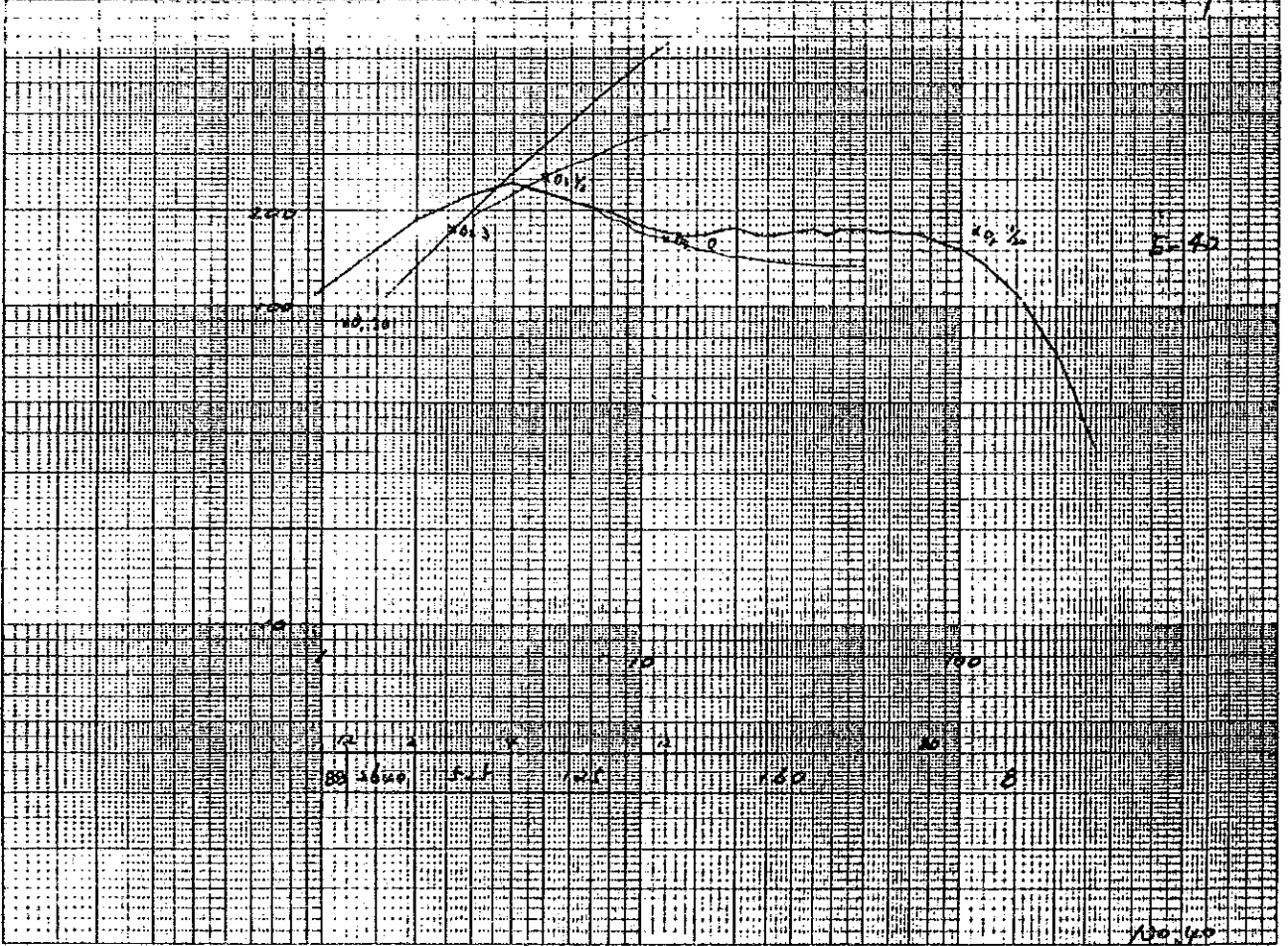
No. 39

E-39



No. 39

E-40



No. 40

Fig. Result of Electrical Prospecting (ρ -a curve)

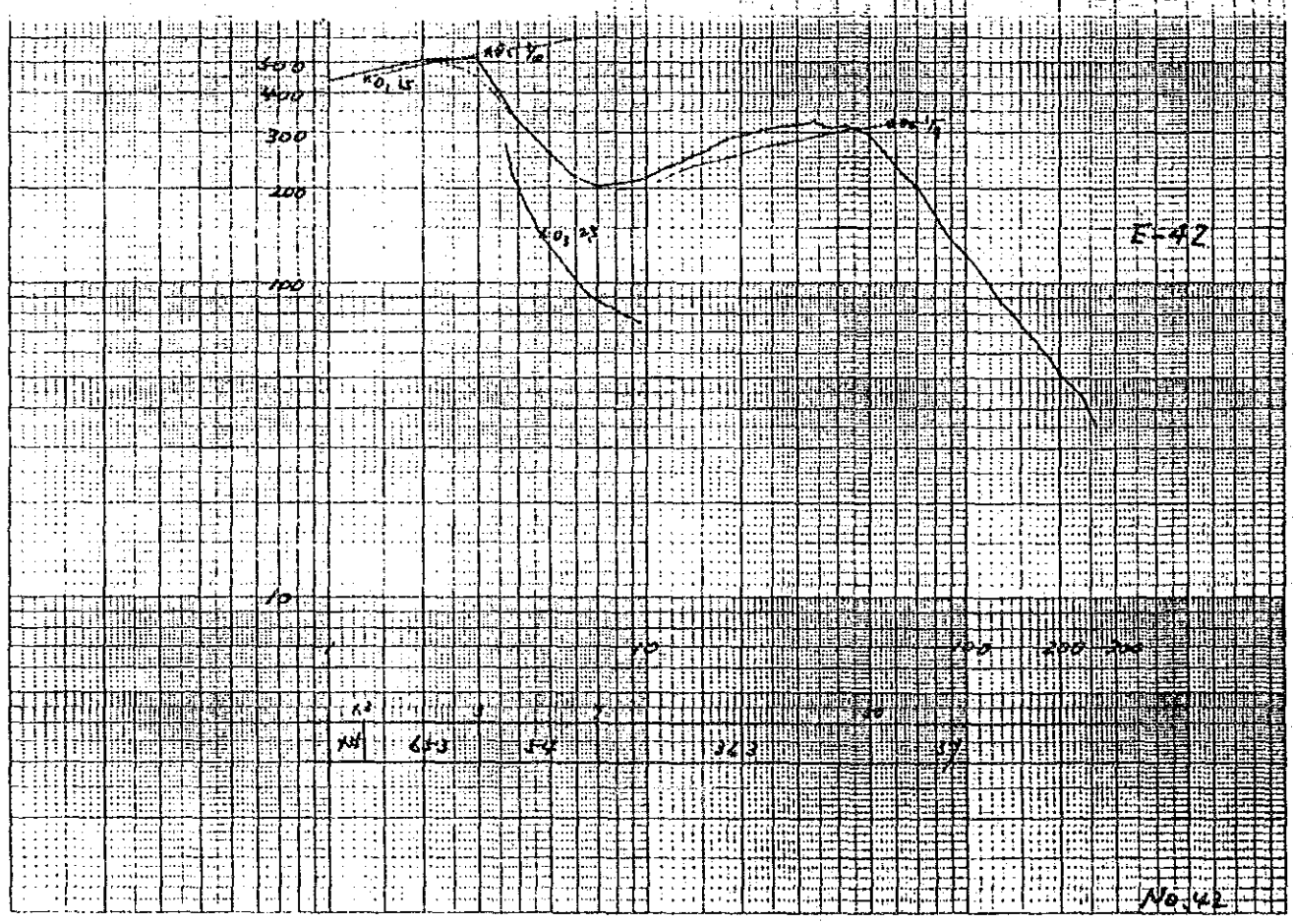
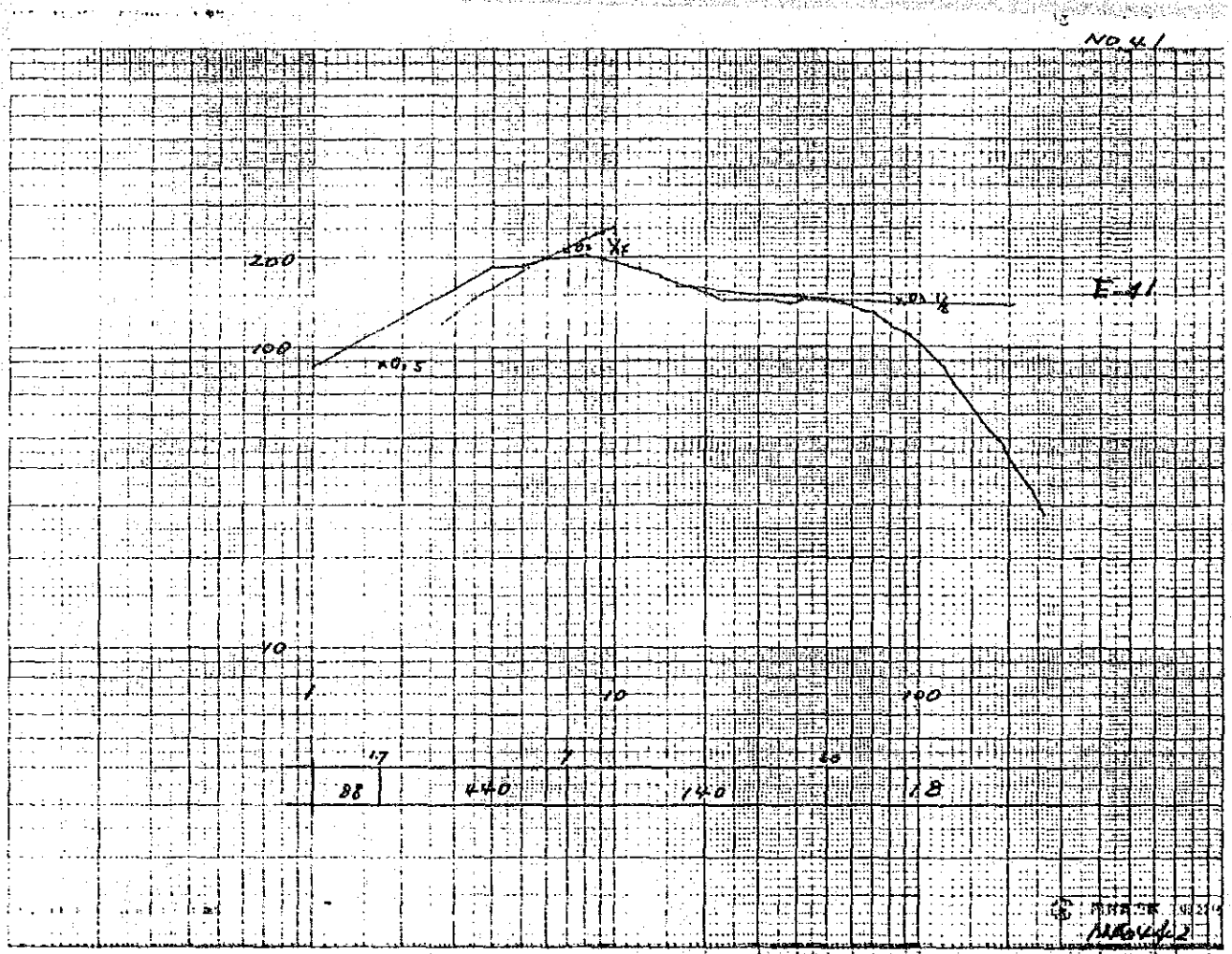


Fig. Result of Electrical Prospecting (ρ -a curve)

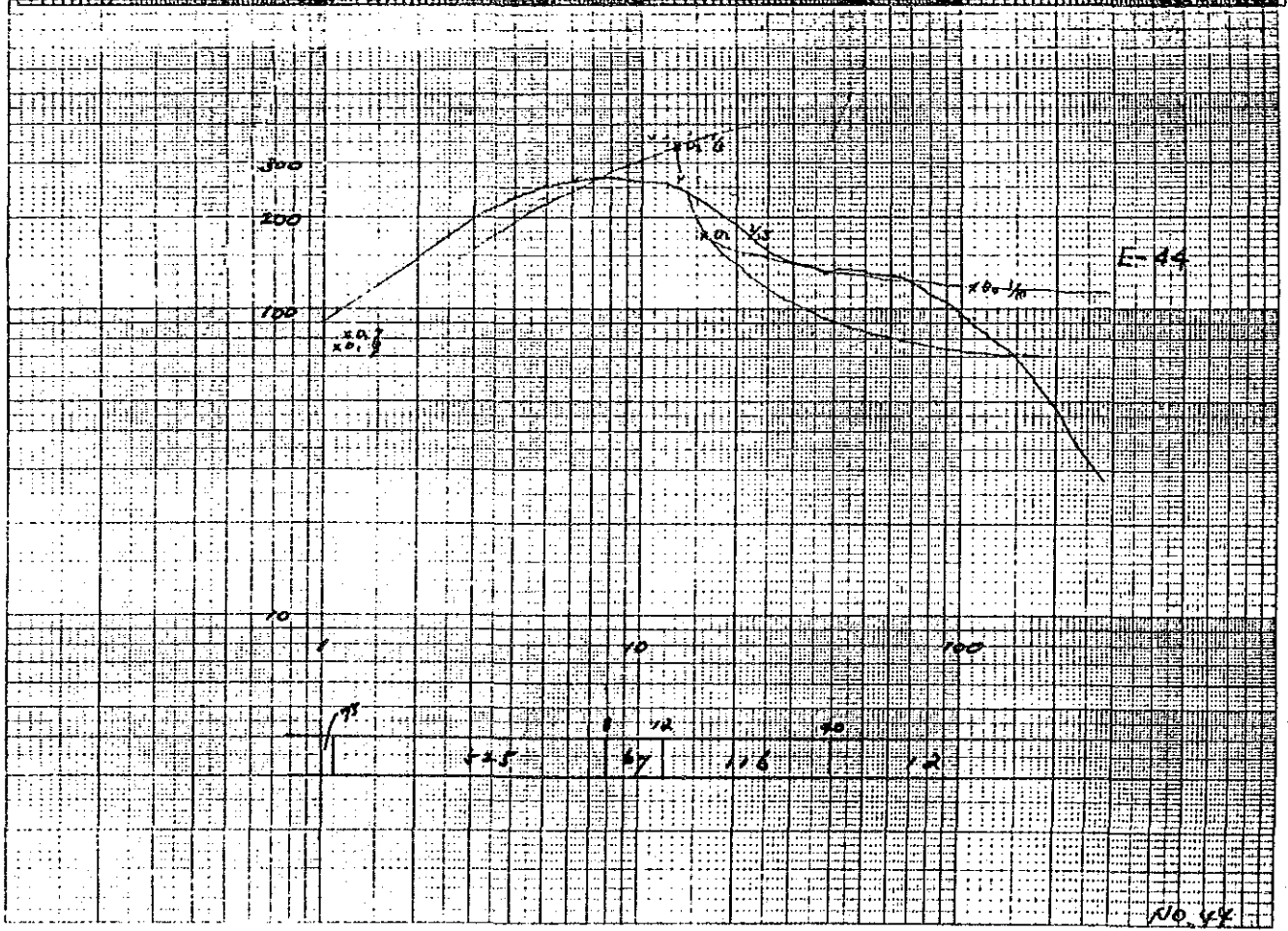
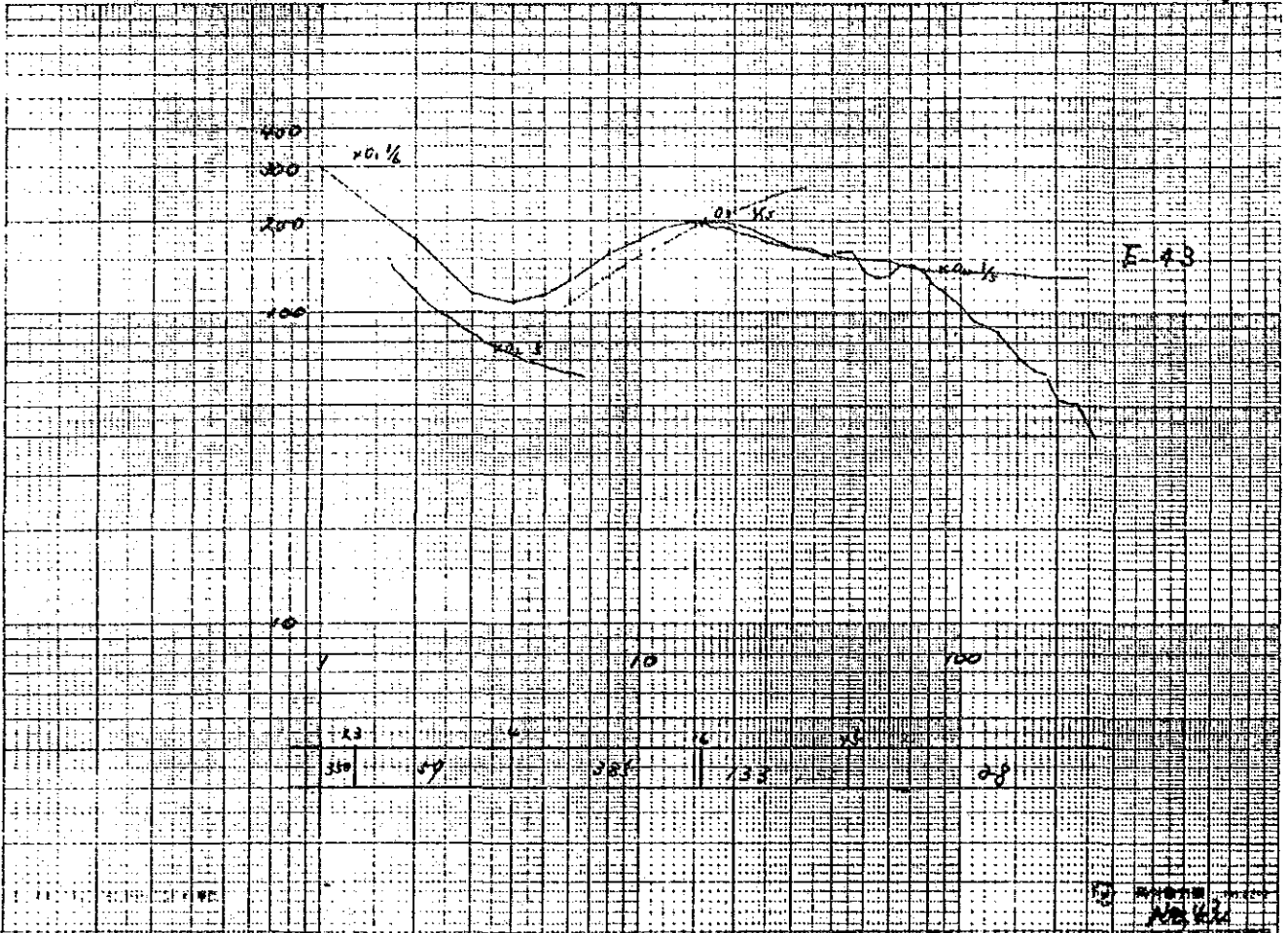


Fig. Result of Electrical Prospecting (ρ -a curve)

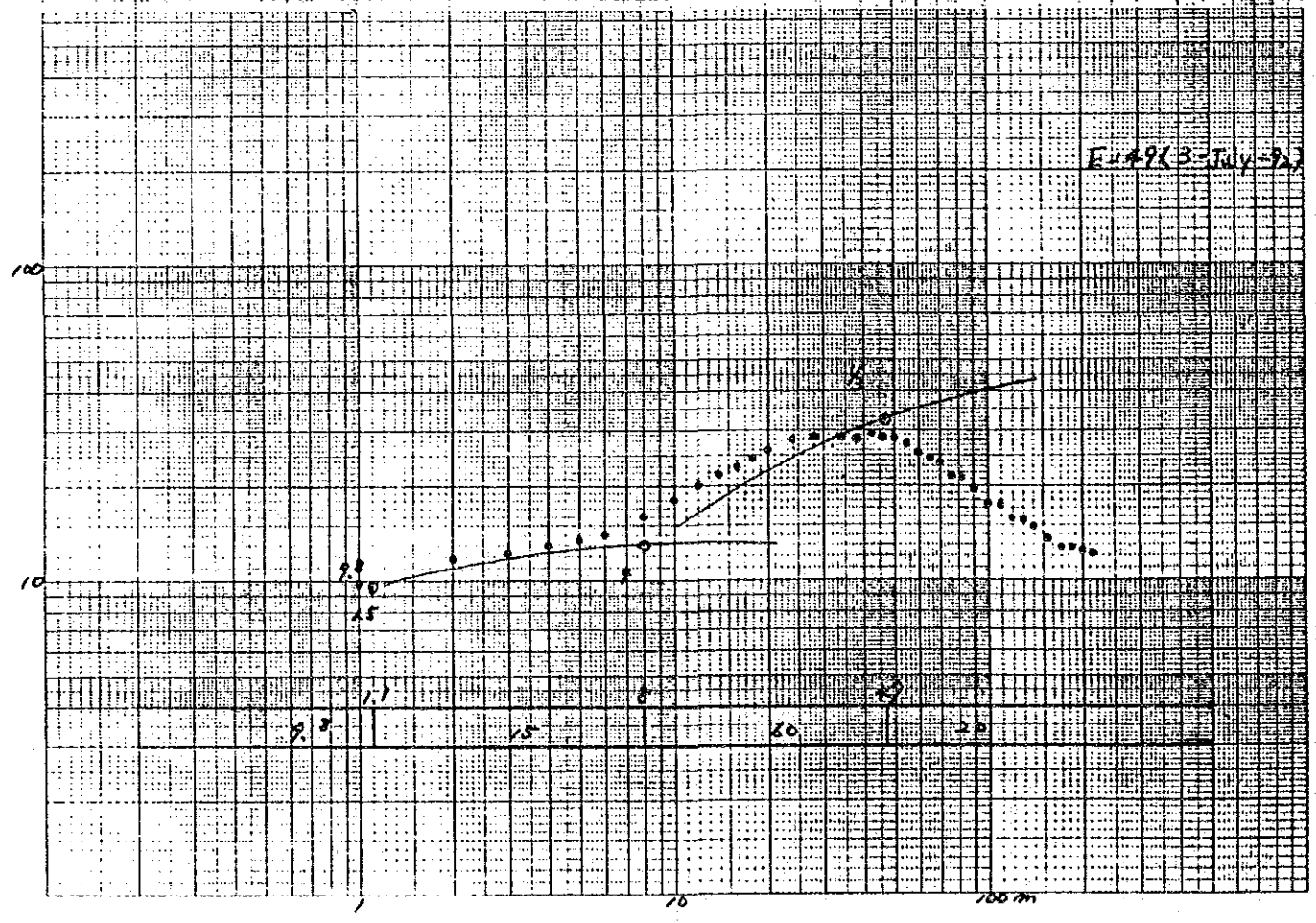
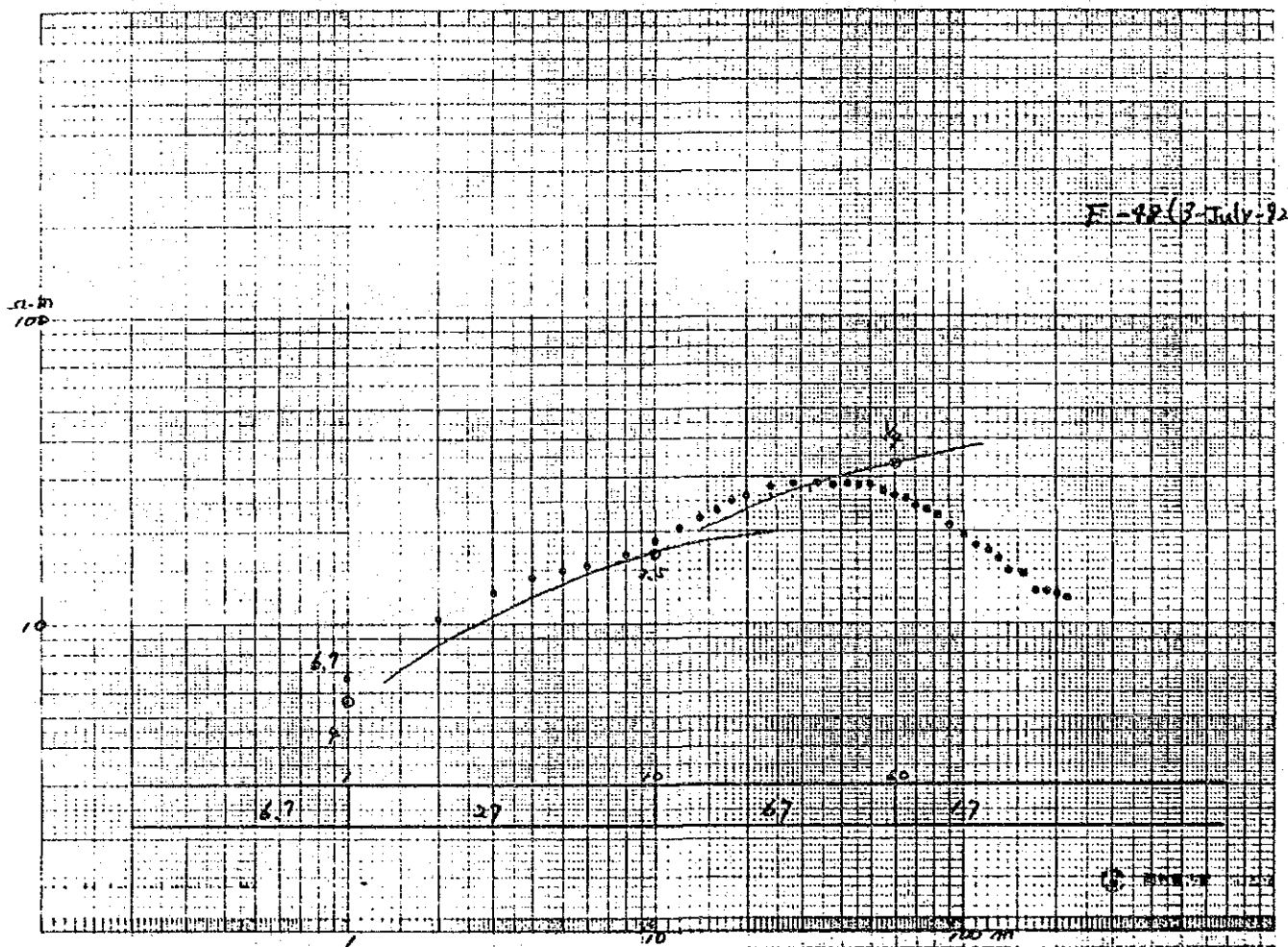


Fig. Result of Electrical Prospecting (ρ -a curve)

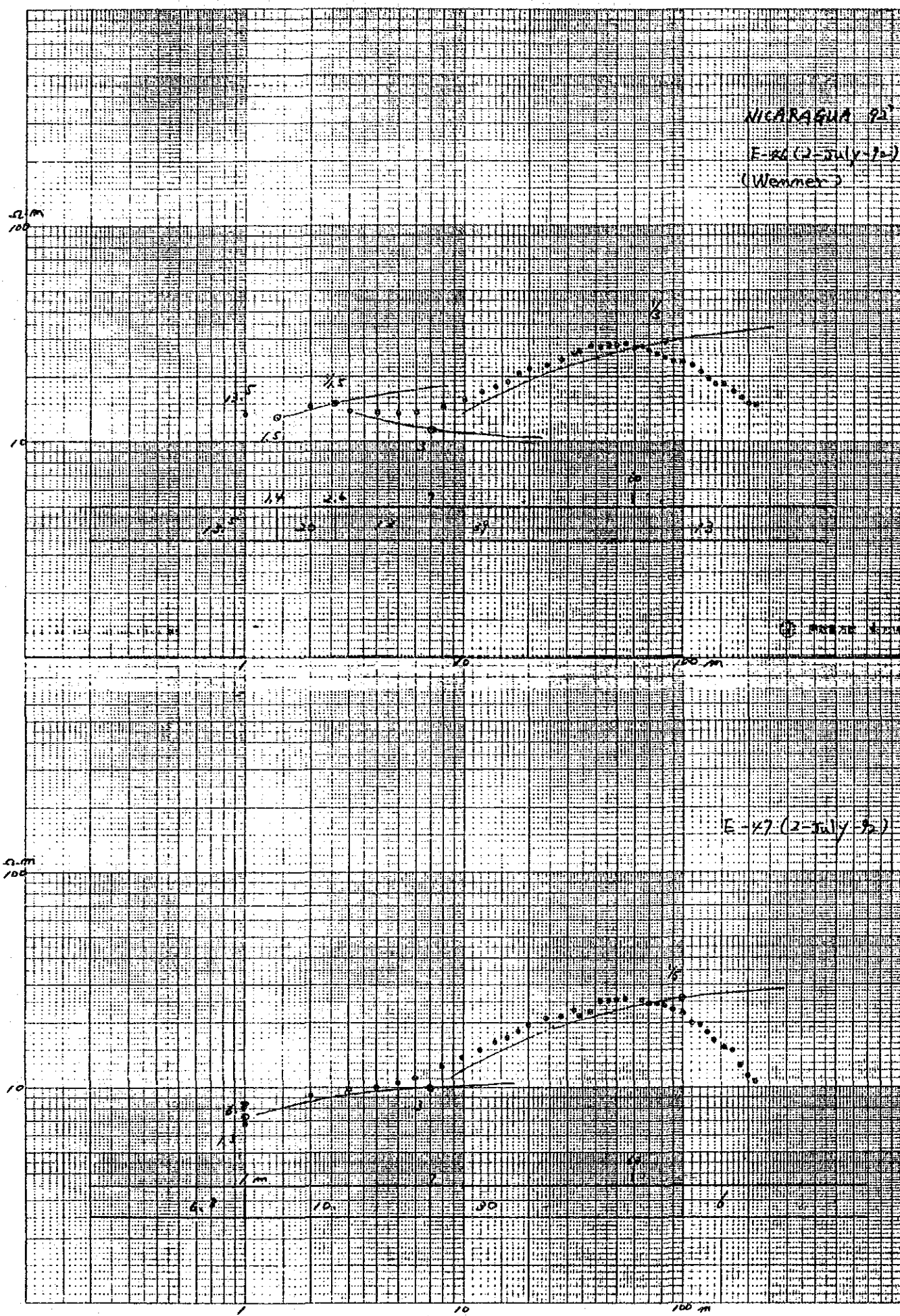
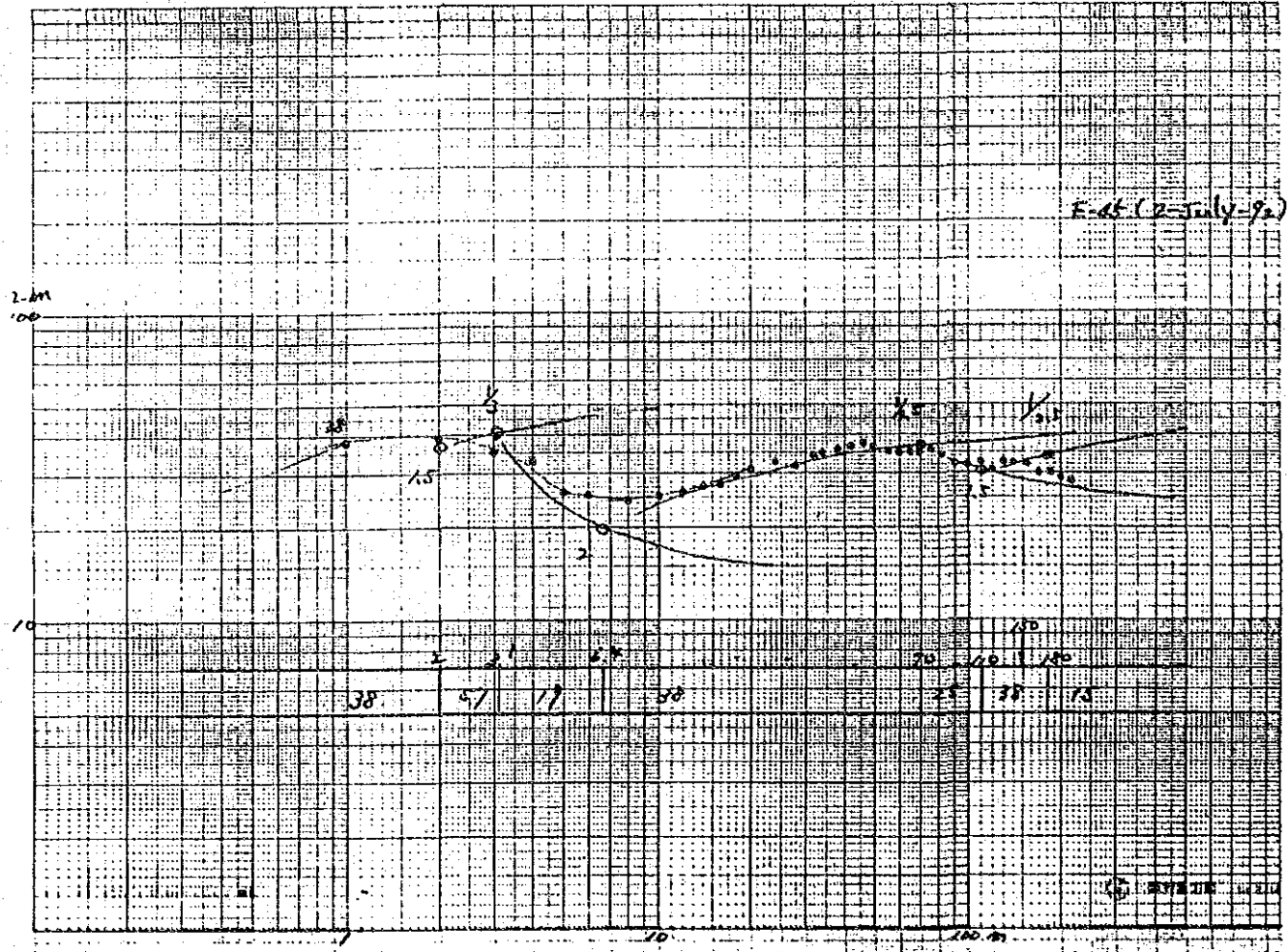


Fig. Result of Electrical Prospecting (ρ -a curve)

E-45 (12-July-92)



NICARAGUA
E-50 (15-July-92)
(WEMEX '92)

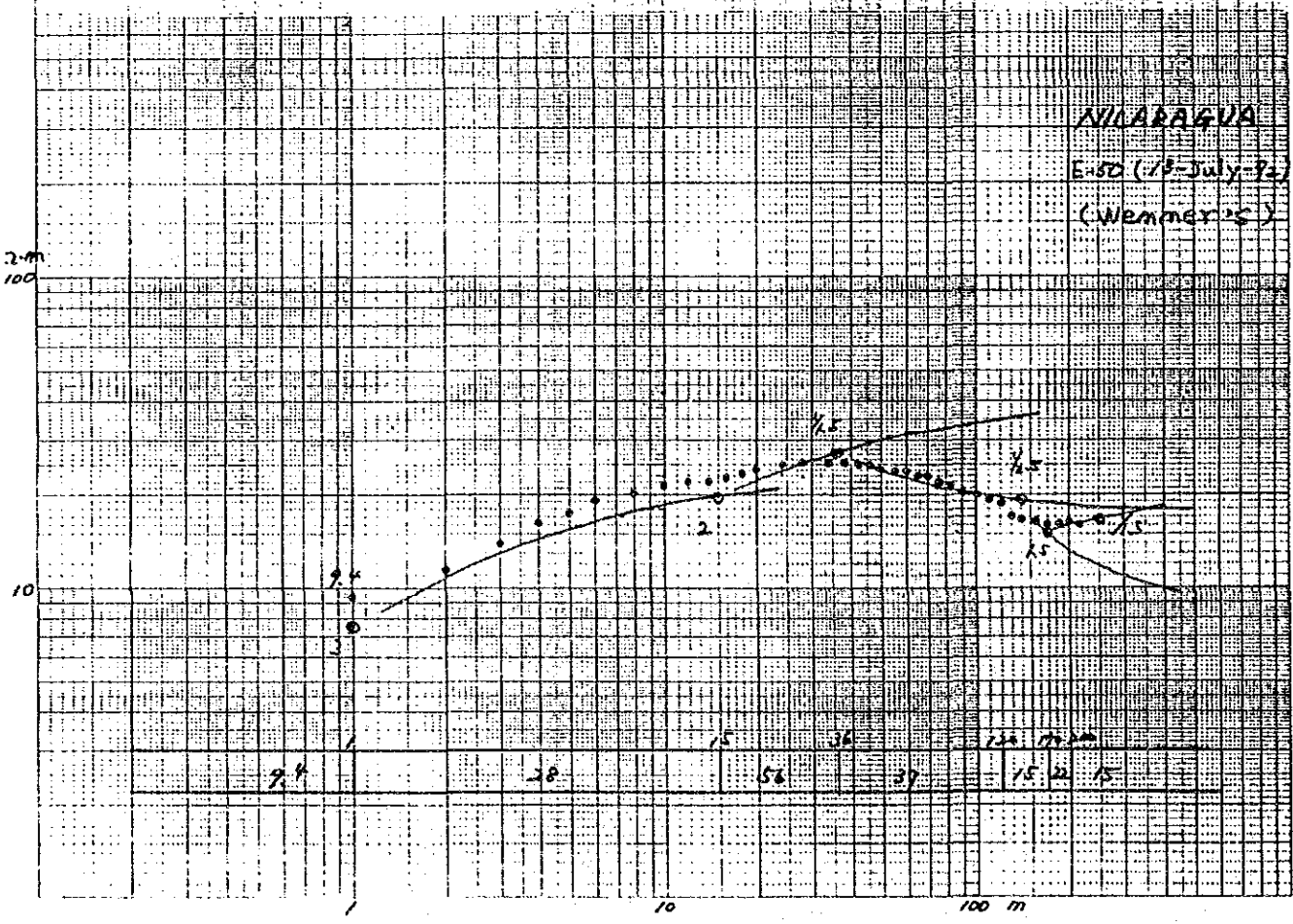


Fig. Result of Electrical Prospecting (ρ -a curve)

**RESULTS
OF PUMPING TEST**

JICA WELLS 1 - 5

JOAN RAMON ROBLES

EL PIQUE

Result of pumping test

JICA Well (JI-1)

Step Drawdown Test(Prueba de etapas sucesivas)

Date(Fecha):14 Nov.,1992

Site No.(Sitio o lugar): JICA No.1 (km 15 1/2 C.Masaya)

Depth(Profundidad): 300 m ,Diameter(Diametro):12 3/4 inches(pulgadas)

Static Water Level(Nivel estatico de agua): 104.24 m

Pump type(Tipo de bomba): 30-kw submersible pump

Inspector:Orlando Lopez Solis

Time (Hora)	Time sinse started Hora desde de bombeo t(min)	pumping comienzo Nivel de bombeo meter (metro)	Dynamic water level Nivel de bombeo meter (metro)	Drawdown Descenso meter (metro)	Notes Notas
6:00	0		104.24	0	
pm	1		104.24	0	h=6"
	2		"	0	Q=108 gpm
	3		"	0	Volt=400
	4		"	0	Amps=40
	5		"	0	kgf/cm2=10
	6		"	0	
	7		"	0	
	8		"	0	
	9		"	0	
	10		"	0	
	12		"	0	
	14		"	0	
	16		"	0	
	18		"	0	
	20		"	0	
	25		"	0	
	30		"	0	
	35		"	0	
	40		"	0	
	50		"	0	
	60		"	0	
	80		"	0	
	100		"	0	
8:00	120		"	0	
	1		104.24	0	h=13"
	2		"	0	Q=151 gpm
	3		"	0	kgf/cm2=7.5
	4		"	0	
	5		"	0	
	6		"	0	
	7		"	0	
	8		"	0	
	9		"	0	
	10		"	0	
	12		"	0	
	14		"	0	
	16		"	0	
	18		"	0	
	20		"	0	

	25	"	0	
	30	"	0	
	35	"	0	
	40	"	0	
	50	"	0	
	60	"	0	
	80	"	0	
10:00	100	"	0	
	120	"	0	
	1	104.265	0.025	h=23"
	2	"	"	Q=201 gpm
	3	"	"	kgf/cm2=5
	4	"	"	
	5	"	"	
	6	"	"	
	7	"	"	
	8	"	"	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	"	"	
	18	"	"	
	20	"	"	
	25	"	"	
	30	"	"	
	35	"	"	
	40	"	"	
	50	"	"	
	60	"	"	
	80	"	"	
12:00	100	"	"	
	120	"	"	
	1	104.316	0.076	h=42"
	2	"	"	Q=272 gpm
	3	"	"	kgf/cm2=0
	4	"	"	
	5	"	"	
	6	"	"	
	7	"	"	
	8	"	"	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	"	"	
	18	"	"	
	20	"	"	
	25	"	"	
	30	"	"	
	35	"	"	
	40	"	"	
	50	"	"	
	60	"	"	
	80	"	"	

100
02:00 am 120

"
"

Continuous Pumping Test (Prueba de bombeo a caudal constante)

Date (Fecha): 15 Nov., 1992

Site No. (Sitio o lugar): JICA No.1 Well

Time (hora)	Time sinse pumping started Hora desde comienzo de bombeo t(min)	Dynamic water level Nivel de bombeo meter (metro)	Drawdown Descenso meter (metro)	Notes Notas
08:00 am	0	104.24	0.00	
	1	104.316	0.076	h=23"
	2	"	"	Q=272 gpm
	3	"	"	Amps=40
	4	"	"	Volts=400
	5	"	"	kgf/cm2=0
	6	"	"	
	7	"	"	
	8	"	"	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	"	"	
	18	"	"	
	20	"	"	
	25	"	"	
	30	"	"	
	35	"	"	
	40	"	"	
	50	"	"	
	60	"	"	
	80	"	"	
	100	"	"	
	120	"	"	
	150	"	"	
	180	"	"	
	210	"	"	
	240	"	"	
	300	"	"	
	360	"	"	
	420	"	"	
	480	"	"	
	600	"	"	
	720	"	"	
	900	"	"	
	1,080	"	"	
	1,260	"	"	
	1,440	"	"	

Recovery Test(Prueba de recuperacio'n)

Date(Fecha):

Site No.(Sitio o lugar): JICA No.1 Well

Time	Time sinse pumping stopped	Time sinse pumping started	Rate	Water level Nivel de Agua meter (metro)	Residual Drawdown Descenso residual meter (metro)
Hora	Hora desde comienzo de recuperacio'n t'(min)	Hora desde comienzo de bombero t(min)	Razo'n t/t'		
	0	1,440	-	104.316	0.076
	1	1,441	1,441	104.24	0
	2	1,442	721	"	0
	3	1,443	481	"	0
	4	1,444	361	"	0
	5	1,445	289	"	0
	6	1,446	241	"	0
	7	1,447	207	"	0
	8	1,448	181	"	0
	9	1,449	161	"	0
	10	1,450	145	"	0
	12	1,452	121	"	0
	14	1,454	104	"	0
	16	1,456	91.0	"	0
	18	1,458	81.0	"	0
	20	1,460	73.0	"	0
	25	1,465	58.6	"	0
	30	1,470	49.0	"	0
	35	1,475	42.1	"	0
	40	1,480	37.0	"	0
	50	1,490	29.8	"	0
	60	1,500	25.0	"	0
	80	1,520	19.0	"	0
	100	1,540	15.4	"	0
	120	1,560	13.0	"	0
	150	1,590	10.6	"	0
	180	1,620	9.0	"	0
	210	1,650	7.9	"	0
	240	1,680	7.0	"	0
	300	1,740	5.8	"	0
	360	1,800	5.0	"	0
	420	1,860	4.4	"	0
	480	1,920	4.0	"	0

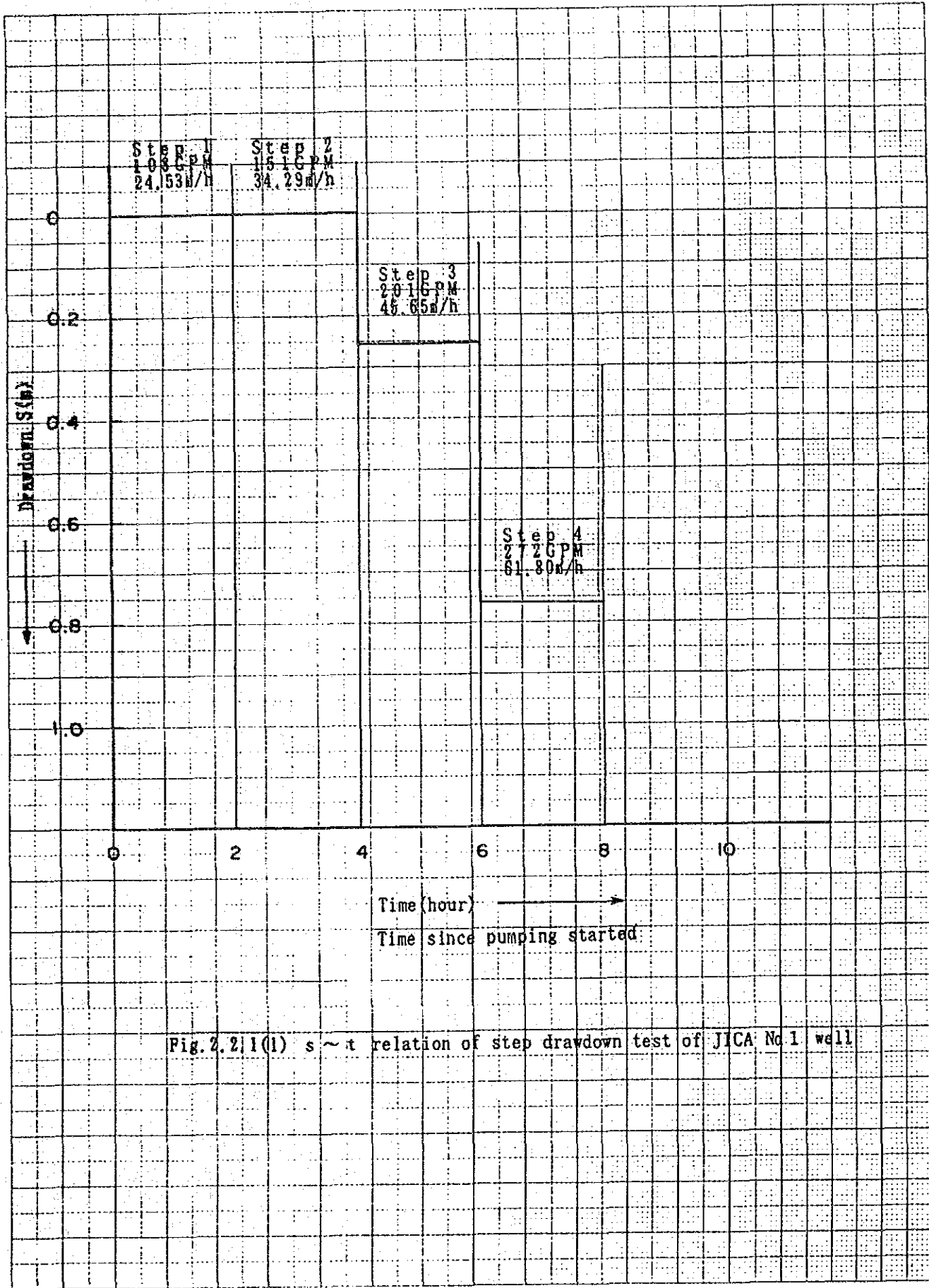


Fig. 2.2|1(1) s ~ t relation of step drawdown test of JICA No. 1 well

Q ₁ m ³ /h	Q ₂ G.P.W	Q ₃ I.P.M	S (m)	Q/S m ³ /h	S/Q ₁ g/m
24.53	108	408.8	0	-	0
34.29	151	571.5	0	-	0
45.65	201	760.8	0.254	179.7	0.00556
61.80	272	1,030	0.762	81.10	0.01233

Static Water level :

342' = 104.24m

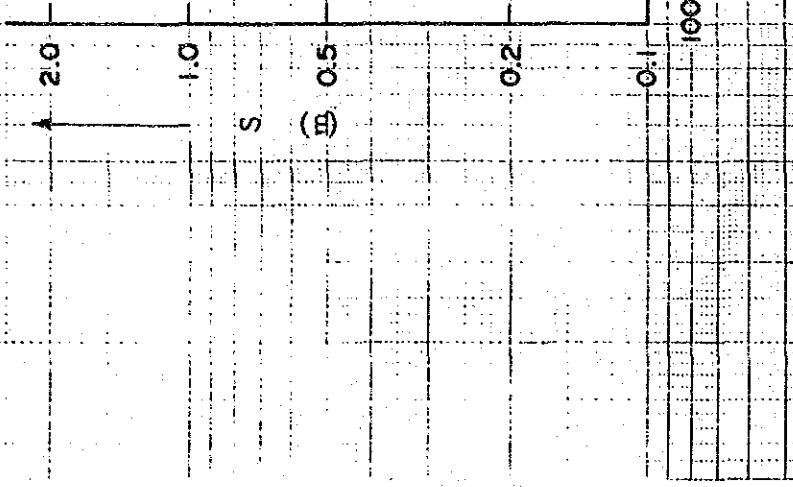


Fig. 2.2.1(2) Step drawdown test Analysis of JICA No.1 well.

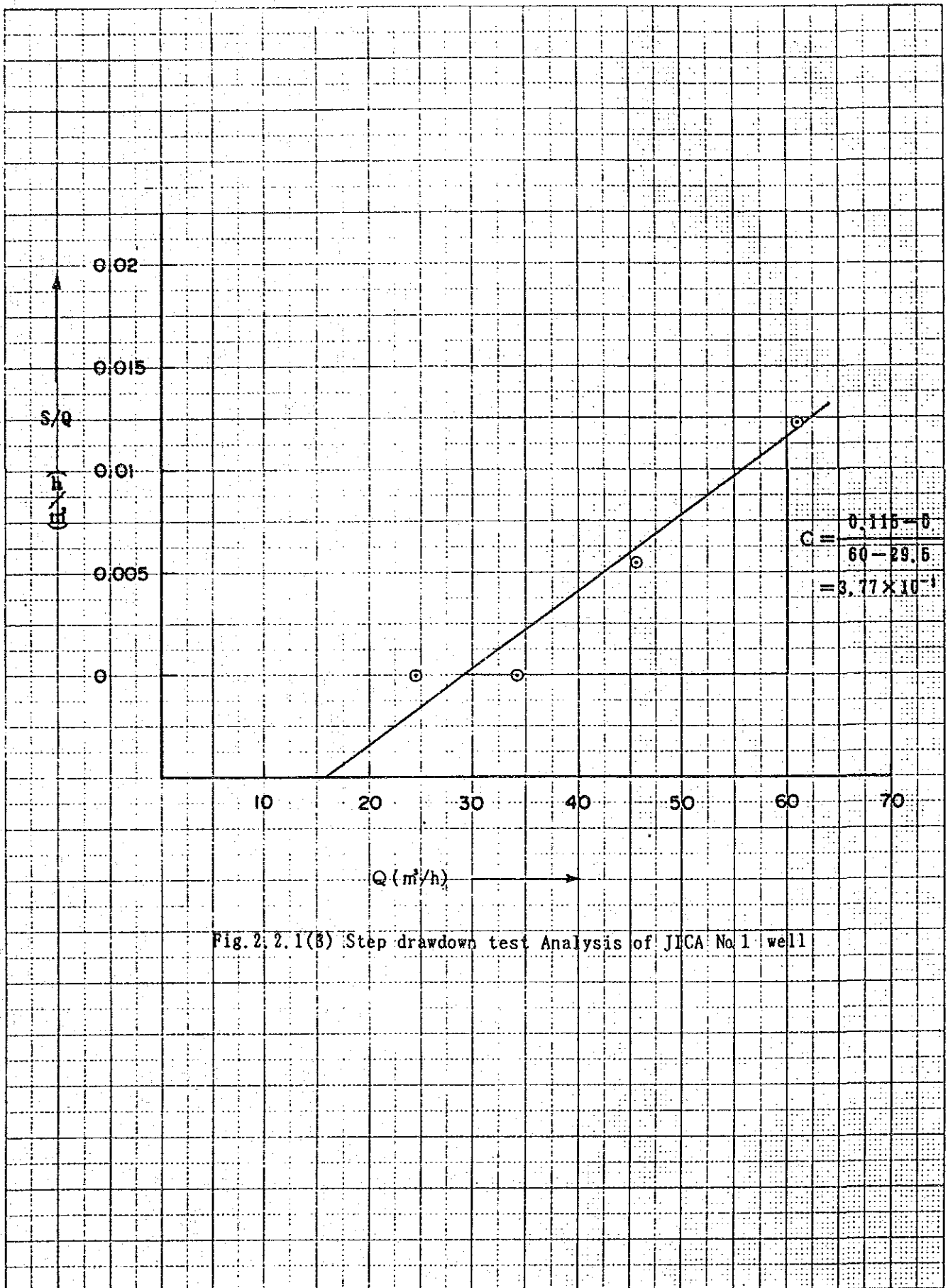


Fig. 2.2.1(B) Step drawdown test Analysis of JICA No.1 well

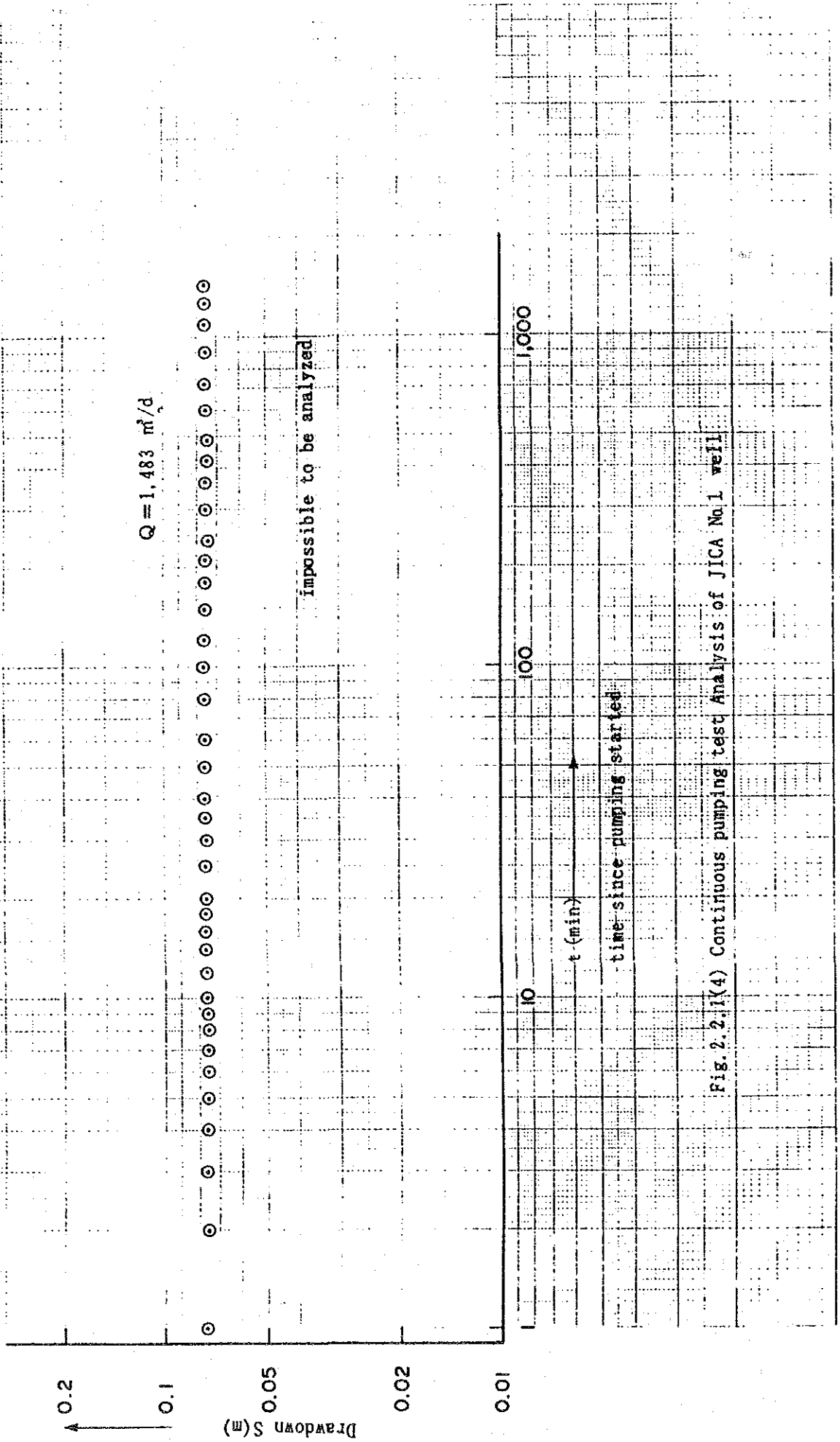


Fig. 2.2.1(4) Continuous pumping test Analysis of JICA No.1 well

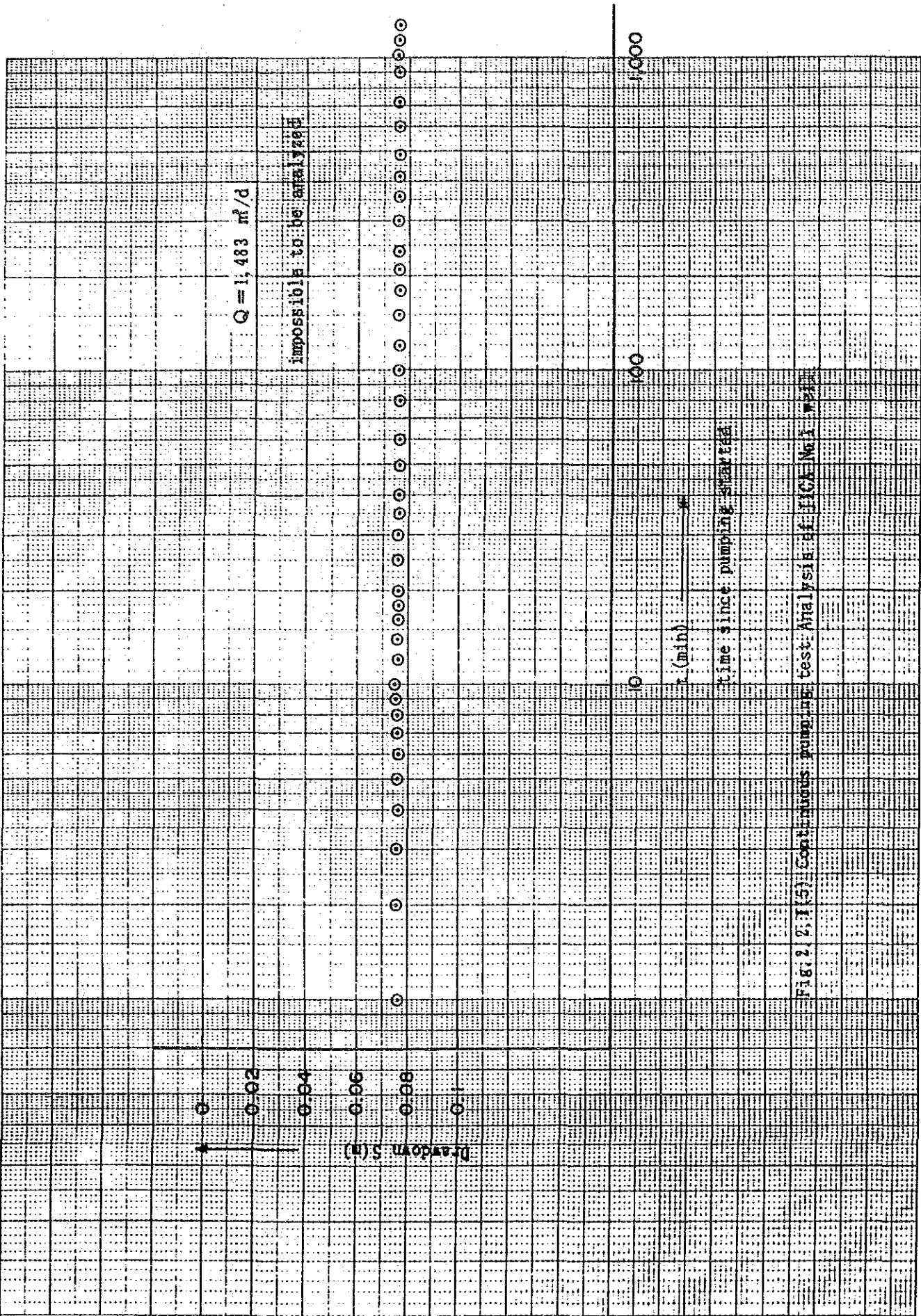


Fig. 2. I(5) Continuous pumping test: Analysis of IICK No. 1 well

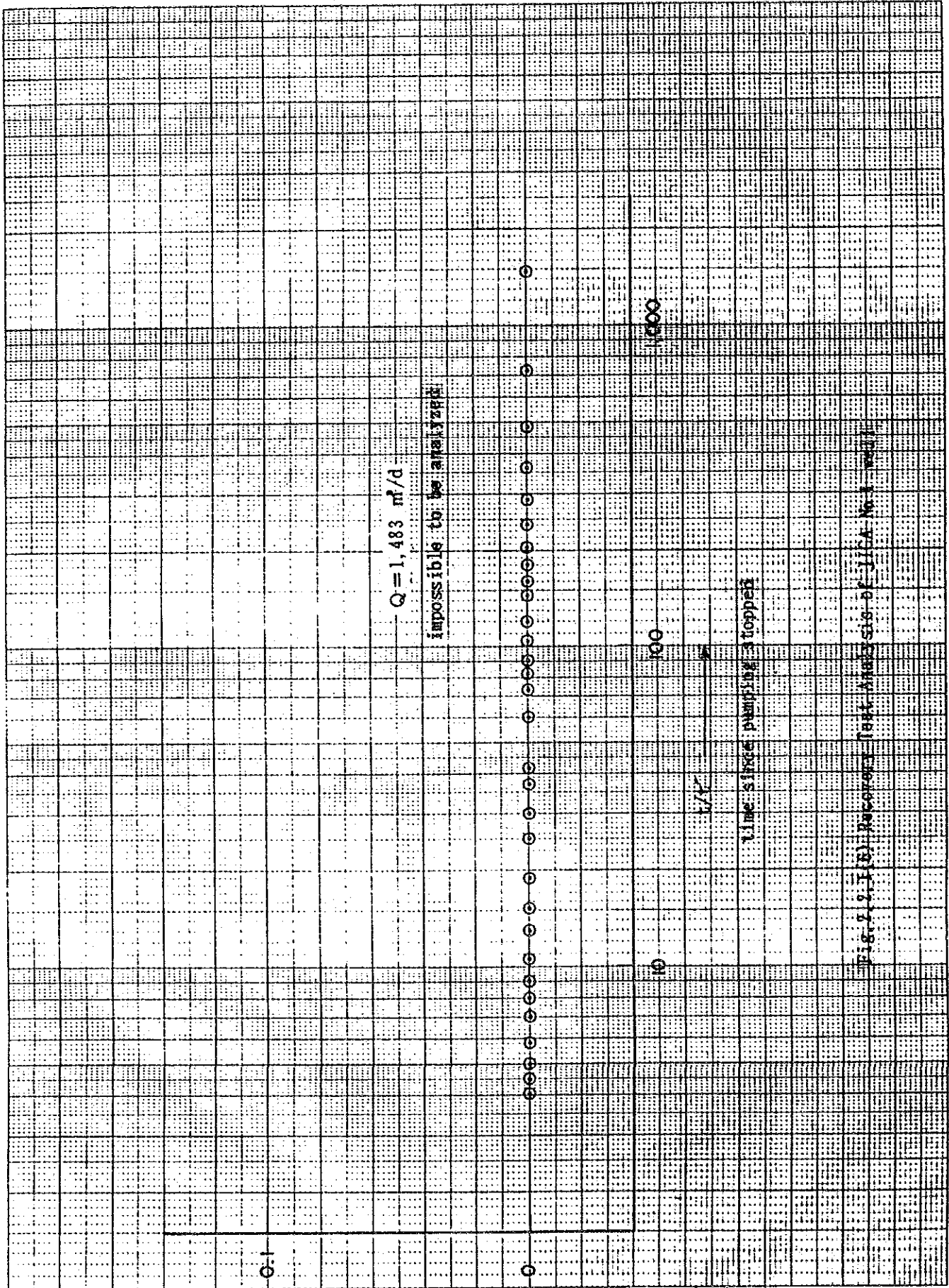


Fig. 9.1(b) Recovery Test Analysis of J16 No. 1 well

Result of pumping test

JICA Well (JI-2)

Step Drawdown Test(Prueba de etapas sucesivas)

Date(Fecha):16 Nov.,1992

Site No.(Sitio o lugar): JICA No.2

Depth(Profundidad): 200 m ,Diameter(Diametro):12 3/4 inches(pulgadas)

Static Water Level(Nivel estatico de agua): 43.47 m

Pump type(Tipo de bomba): 110-kw turbine pump

Inspector:Orlando Lopez Solis

Time (Hora)	Time sinse started Hora desde comienzo de bombeo t(min)	Dynamic water level Nivel de bombeo meter (metro)	Drawdown Descenso meter (metro)	Notes Notas
1:00	0	43.47	0.00	
am	1	44.80	1.33	h=5"
	2	45.00	1.53	Q=146 gpm
	3	45.02	1.55	
	4	45.08	1.61	
	5	45.13	1.66	
	6	45.19	1.72	
	7	45.22	1.75	
	8	"	"	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	"	"	
	18	"	"	
	20	"	"	
	25	"	"	
	30	"	"	
	35	"	"	
	40	"	"	
	50	"	"	
	60	"	"	
	80	"	"	
	100	"	"	
3:00	120	"	"	
pm	1	45.35	1.88	h=15"
	2	45.40	1.93	Q=250 gpm
	3	45.41	1.94	
	4	45.42	1.95	
	5	"	"	
	6	"	"	
	7	"	"	
	8	45.45	1.98	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	"	"	
	18	"	"	
	20	45.47	2.00	

	25	"	"	
	30	"	"	
	35	"	"	
	40	45.48	2.01	
	50	"	"	
	60	45.51	2.03	
	80	"	"	
	100	45.52	2.04	
	120	"	"	
05:00	1	45.65	2.185	h=31"
pm	2	46.15	2.68	Q=351 gpm
	3	46.16	2.69	
	4	"	"	
	5	"	"	
	6	46.19	2.72	
	7	"	"	
	8	"	"	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	"	"	
	18	"	"	
	20	"	"	
	25	"	"	
	30	46.20	2.73	
	35	"	"	
	40	"	"	
	50	"	"	
	60	"	"	
	80	"	"	
	100	"	"	
	120	"	"	
07:00	1	46.65	3.18	h=51"
pm	2	46.78	3.31	Q=453 gpm
	3	46.93	3.46	
	4	46.98	3.51	
	5	"	"	
	6	"	"	
	7	"	"	
	8	47.00	3.53	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	"	"	
	18	"	"	
	20	"	"	
	25	47.01	3.54	
	30	47.03	3.56	
	35	47.05	3.58	
	40	47.06	3.59	
	50	"	"	
	60	"	"	
	80	"	"	

09:00 pm 100
120

" "

Continuous Pumping Test(Prueba de bombeo a caudal constante)

Date(Fecha): 17 Nov.,1992

Site No.(Sitio o lugar): JICA No.2 Well

Time (hora)	Time sinse pumping started Hora desde comienzo de bombeo t(min)	Dynamic water level Nivel de bombeo meter (metro)	Drawdown Descenso meter (metro)	Notes Notas
09:10 am	0	43.63	0.00	
	1	46.65	3.02	h=51"
	2	46.77	3.14	Q=453 gpm
	3	46.83	3.20	
	4	46.86	3.23	
	5	46.88	3.25	
	6	"	"	
	7	"	"	
	8	"	"	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	"	"	
	18	"	"	
	20	"	"	cond. Temp.
	25	"	"	mS/cm C
	30	"	"	1.18 28.6
	35	"	"	
	40	"	"	
	50	"	"	
	60	46.90	3.27	
	80	46.91	3.28	1.20 27.5
	100	46.92	3.29	1.19 29.5
11:10 am	120	46.93	3.30	1.19 29.5
	150	"	"	1.18 29.7
	180	"	"	1.17 29.9
	210	"	"	1.16 30.8
13:10	240	"	"	1.15 31.2
	300	"	"	1.15 31.2
15:10	360	"	"	1.15 31.2
	420	"	"	1.16 30.2
17:10	480	"	"	1.17 30.2
19:10	600	"	"	1.24 26.2
21:10	720	"	"	1.25 26.4
00:10	900	"	"	1.25 26.6
03:10	1,080	"	"	1.24 26.9
06:10	1,260	"	"	1.23 27.1
09:10	1,440	"	"	

Recovery Test(Prueba de recuperacio'n)

Date(Fecha): 18 Nov.,1992

Site No.(Sitio o lugar): JICA No.2 Well

Time	Time since pumping stopped	Time since pumping started	Rate	Water level Nivel	Residual Drawdown
Hora	Hora desde comienzo de recuperacio'n t'(min)	Hora desde comienzo de bombeo t(min)	Razo'n t/t'	de Agua meter (metro)	Descenso residual meter (metro)
09:10 am	0	1,440	-	46.93	3.30
	1	1,441	1,441	43.18	0.45
	2	1,442	721	"	"
	3	1,443	481	"	"
	4	1,444	361	"	"
	5	1,445	289	"	"
	6	1,446	241	"	"
	7	1,447	207	"	"
	8	1,448	181	"	"
	9	1,449	161	"	"
	10	1,450	145	"	"
	12	1,452	121	"	"
	14	1,454	104	"	"
	16	1,456	91.0	"	"
	18	1,458	81.0	"	"
	20	1,460	73.0	"	"
	25	1,465	58.6	"	"
	30	1,470	49.0	"	"
	35	1,475	42.1	"	"
	40	1,480	37.0	"	"
	50	1,490	29.8	"	"
	60	1,500	25.0	"	"
	80	1,520	19.0	"	"
	100	1,540	15.4	"	"
	120	1,560	13.0	"	"
	150	1,590	10.6	"	"
	180	1,620	9.0	"	"
	210	1,650	7.9	"	"
	240	1,680	7.0	"	"
	300	1,740	5.8	"	"
	360	1,800	5.0	"	"
	420	1,860	4.4	"	"
	480	1,920	4.0	"	"

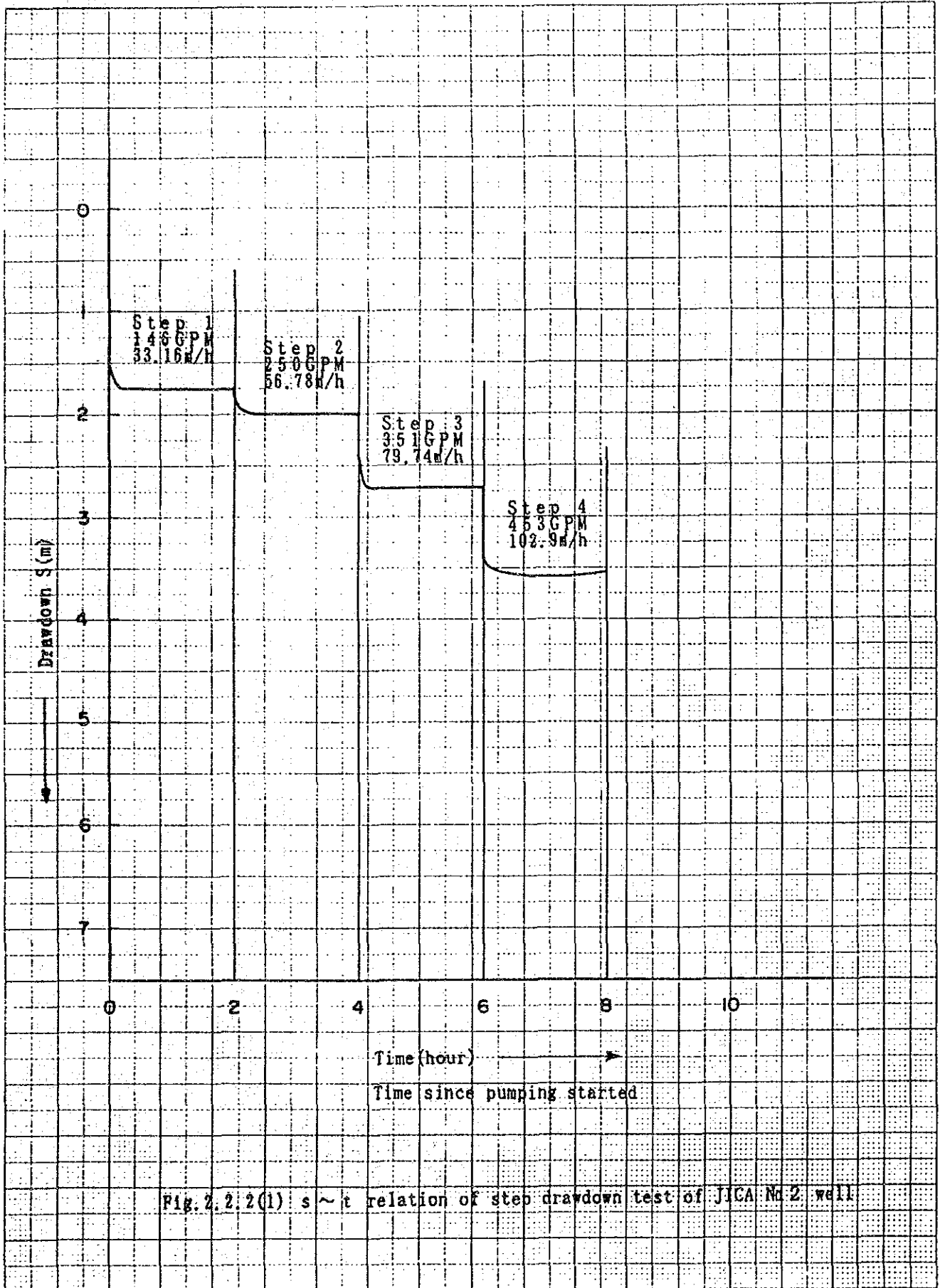


Fig. 2.2.2(1) s ~ t relation of step drawdown test of JICA No. 2 well

Q ₁ m ³ /h	Q ₁ G.P.M.	Q ₁ l.p.m.	S (m)	Q/S m ³ /h	S/Q m/m ³
33.16	146	552.6	1.75	18.95	0.0528
56.78	250	946.3	2.04	27.85	0.0359
79.74	351	1,329	2.73	29.21	0.0342
102.88	453	1,715	3.59	28.65	0.0349

Static Water Level : 43.47m (142.67')
(Nivel de Estático de Agua)

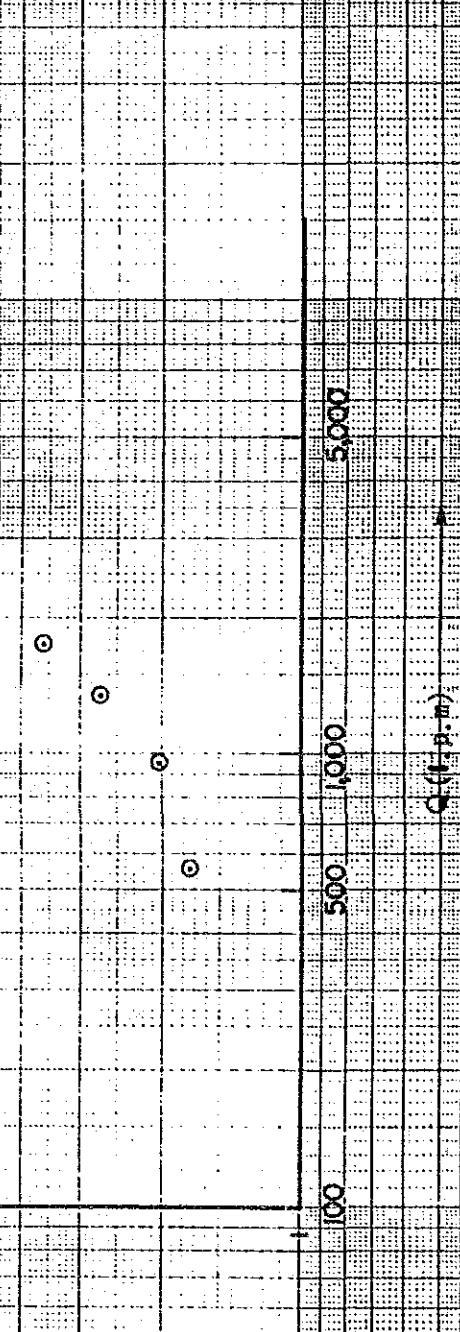


Fig. 2.7.1(2) Step Drawdown Test Analysis of JFH No. 2 Well

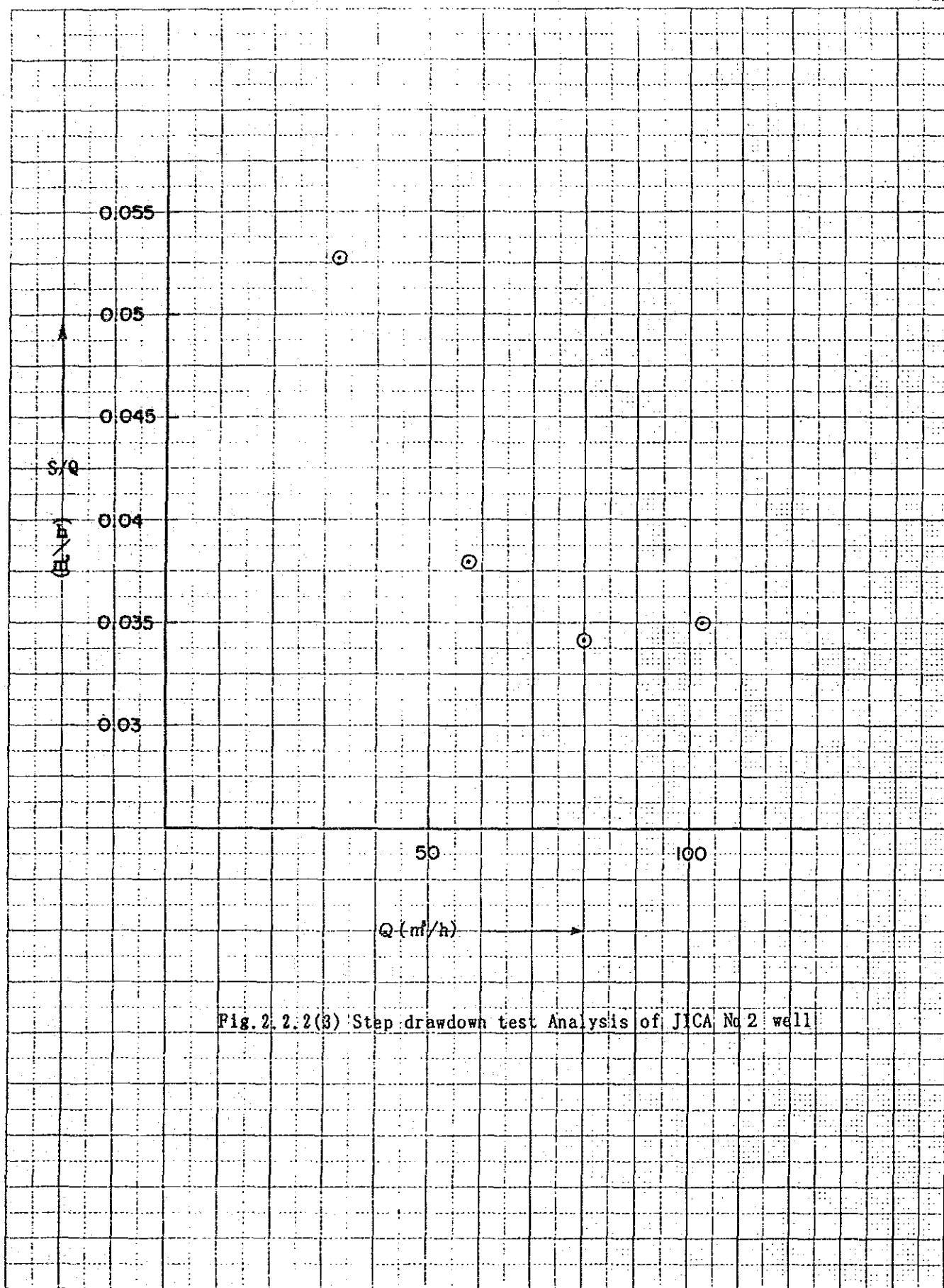


Fig. 2.2.2(3) Step drawdown test Analysis of JICA No 2 well

$$T = 0.0796QW(u)/S$$

$$S = 4Tb/r^2 (1/u)$$

$$Q = 1.715 \text{ l.p.m} = 2,470 \text{ m}^3/\text{day}$$

$$r = 0.177 \text{ m}$$

$$T = 0.0796 \times 2,470 \times 10^3 / 2.15$$

$$= 914.5 \text{ m}^2/\text{day}$$

$$S = 4 \times 914.5 \times 2.78 \times 10^{-3} / 0.177^2 \times 10^3$$

$$= 3.24 \times 10^{-3}$$

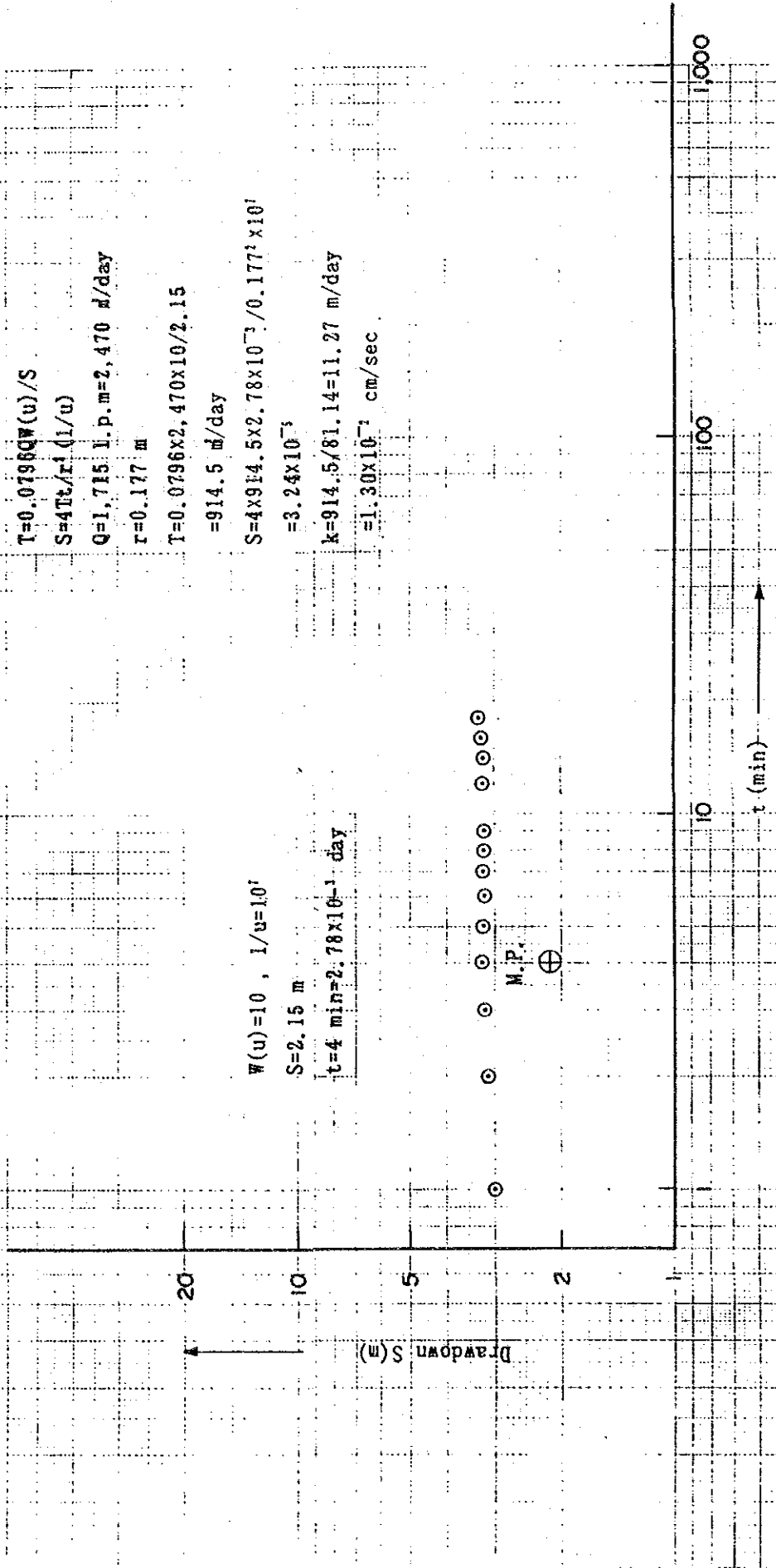
$$k = 914.5 / 81.14 = 11.27 \text{ m}^2/\text{day}$$

$$= 1.30 \times 10^{-3} \text{ cm}^2/\text{sec}$$

$$W(u) = 10, \quad 1/u = 10^4$$

$$S = 2.15 \text{ m}$$

$$t = 4 \text{ min} = 2.78 \times 10^{-3} \text{ day}$$



time since pumping started

Fig. 2.2.2(4) Continuous pumping test Analysis of JICA No 2 well

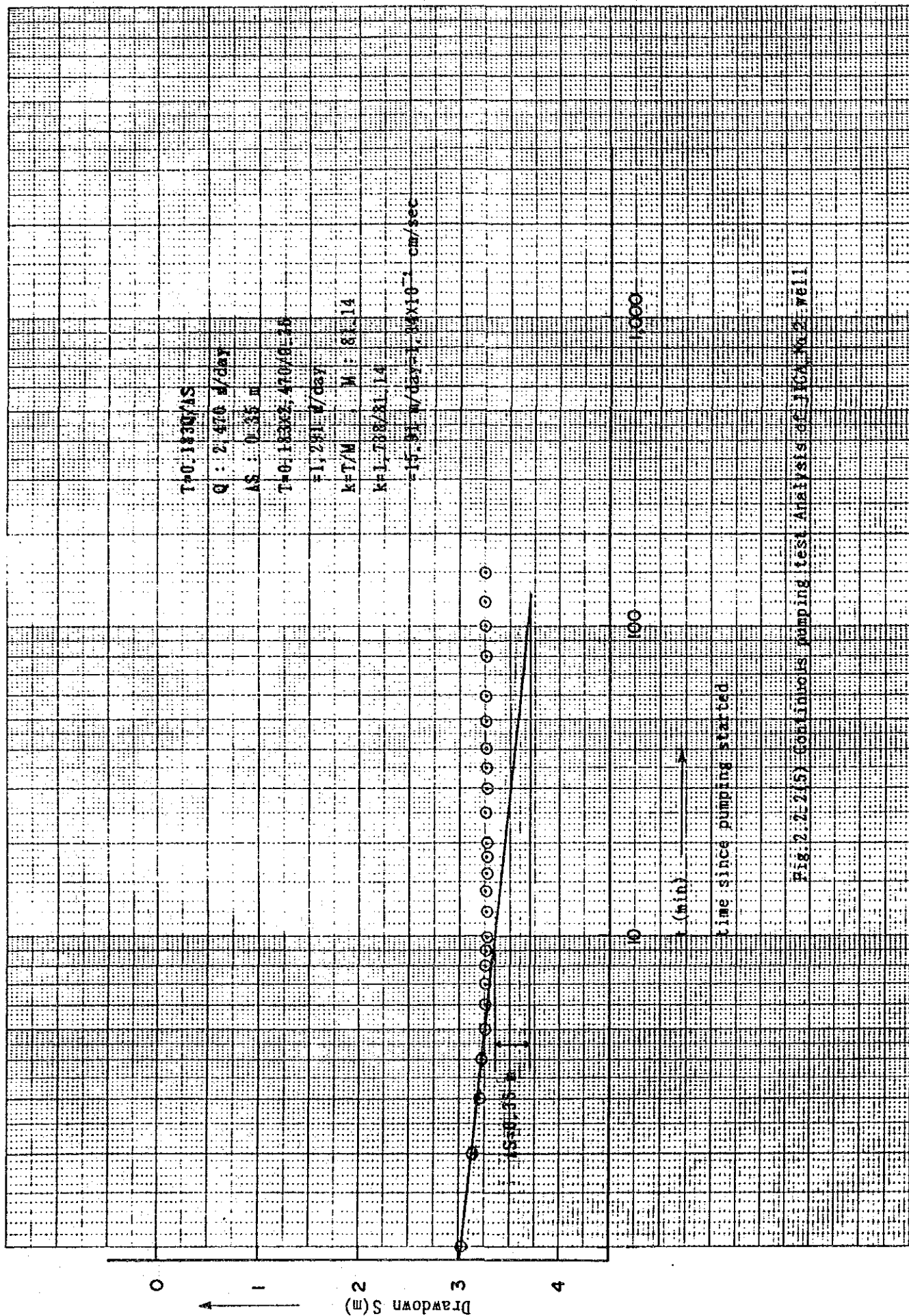


Fig. 2.2(5) Continuous pumping test Analysis of JICA No. 2 well

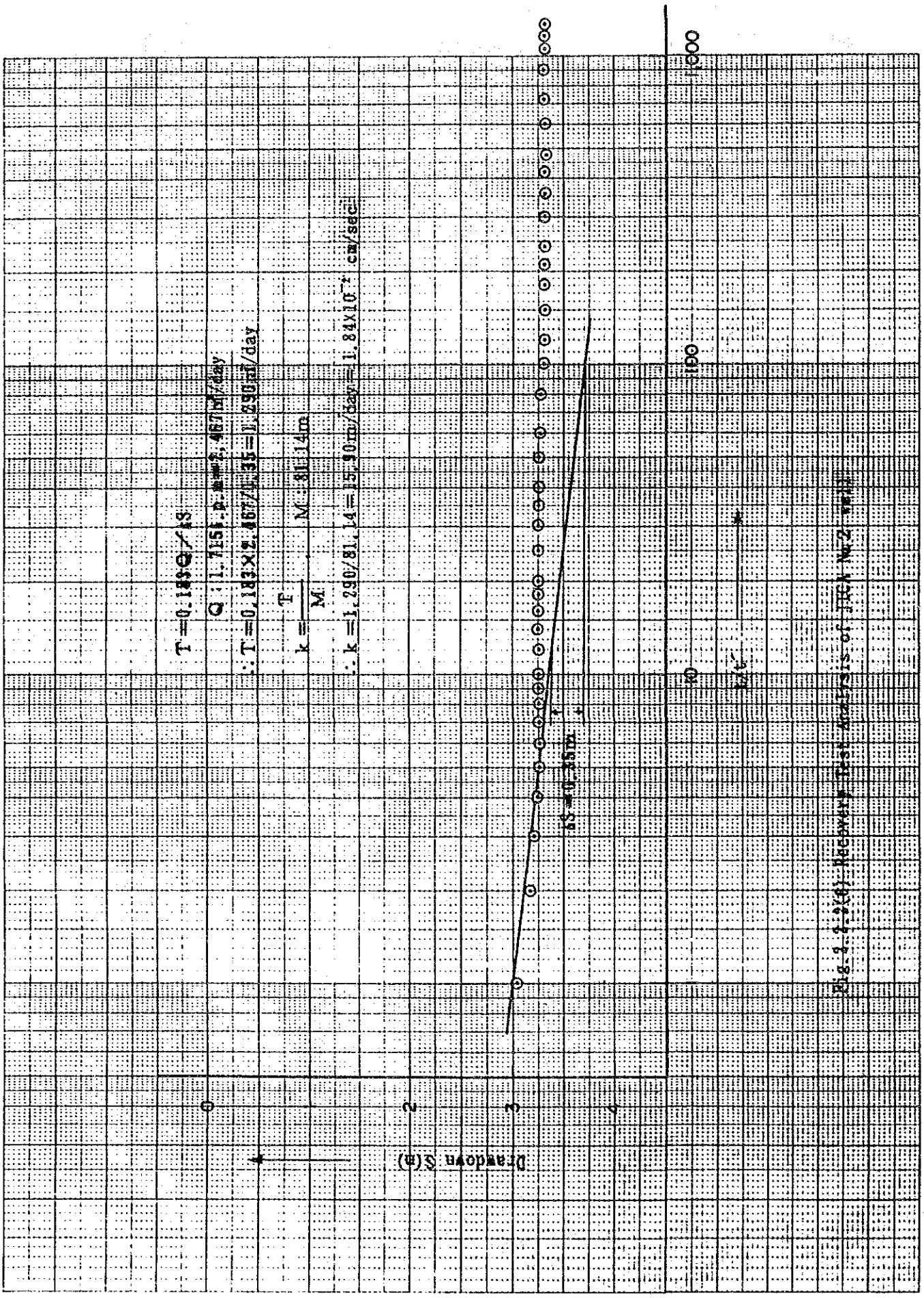


Fig. 1-10-61 Recovery Test Analysis of JICA No. 2-119V

Result of pumping test

JICA Well (JI-3)

Step Drawdown Test(Prueba de etapas sucesivas)

Date(Fecha): 12 Nov.,1992

Site No.(Sitio o lugar): JICA No.3

Depth(Profundidad): 283 m ,Diameter(Diametro):12 3/4 inches(pulgadas)

Static Water Level(Nivel estatico de agua): 14.52 m

Pump type(Tipo de bomba): 110-kw turbine pump

Inspector:Orlando Lopez Solis

Time (Hora)	Time sinse started Hora desde de bombeo t(min)	pumping comienzo	Dynamic water level Nivel de bombeo meter (metro)	Drawdown Descenso meter (metro)	Notes Notas
13:30	0		14.52	0.00	
	1		15.40	0.88	h=15"
	2		15.44	0.92	Q=250 gpm
	3		15.47	0.95	
	4		"	"	
	5		15.48	0.96	
	6		"	"	
	7		"	"	
	8		15.49	0.97	
	9		"	"	
	10		"	"	
	12		"	"	
	14		"	"	
	16		15.50	0.98	
	18		"	"	
	20		"	"	
	25		"	"	
	30		"	"	
	35		"	"	
	40		"	"	
	50		"	"	
	60		"	"	
	80		"	"	
	100		"	"	
15:30	120		"	"	
	1		15.90	1.38	h=31"
	2		15.98	1.46	Q=351 gpm
	3		16.00	1.48	
	4		16.01	1.49	
	5		16.02	1.50	
	6		"	"	
	7		"	"	
	8		16.03	1.91	
	9		"	"	
	10		16.04	1.52	
	12		"	"	
	14		16.05	1.53	
	16		"	"	
	18		"	"	
	20		16.06	1.54	

	25	"	"	
	30	"	"	
	35	"	"	
	40	"	"	
	50	"	"	
	60	"	"	
	80	16.07	1.55	
	100	16.08	1.56	
17:30	120	"	"	
	1	16.49	1.97	h=51"
	2	16.57	2.05	Q=453 gpm
	3	16.59	2.07	
	4	16.60	2.08	
	5	16.61	2.09	
	6	16.62	2.10	
	7	"	"	
	8	16.63	2.11	
	9	"	"	
	10	16.64	2.12	
	12	16.65	2.13	
	14	"	"	
	16	"	"	
	18	16.66	2.14	
	20	16.67	2.15	
	25	16.68	2.16	
	30	"	"	
	35	"	"	
	40	16.70	2.18	
	50	"	"	
	60	"	"	
	80	16.73	2.21	
	100	"	"	
19:30	120	"	"	
	1	16.85	2.33	h=76"
	2	16.90	2.38	Q=550 gpm
	3	17.14	2.62	
	4	"	"	
	5	17.15	2.63	
	6	"	"	
	7	17.16	2.64	
	8	"	"	
	9	"	"	
	10	"	"	
	12	"	"	
	14	"	"	
	16	17.17	2.65	
	18	"	"	
	20	"	"	
	25	17.18	2.66	
	30	"	"	
	35	17.19	2.67	
	40	"	"	
	50	"	"	
	60	17.20	2.68	
	80	"	"	

21:30 100
120

" "
" "

Continuous Pumping Test(Prueba de bombeo a caudal constante)

Date(Fecha): 13 Nov.,1992

Site No.(Sitio o lugar): JICA No.3 Well

Time	Time sinse pumping started	Dynamic water level	Drawdown	Notes
Hora	Hora desde comienzo de bombeo t(min)	Nivel de bombeo meter (metro)	Descenso meter (metro)	Notas
08:00 am	0	14.63	0.00	
	1	16.20	1.57	h=76"
	2	17.00	2.37	Q=550 gpm
	3	"	"	
	4	17.01	2.38	
	5	17.02	2.39	
	6	17.03	2.40	
	7	"	"	
	8	17.04	2.41	
	9	"	"	
	10	"	"	
	12	17.05	2.42	
	14	17.06	2.43	
	16	"	"	
	18	"	"	
	20	17.07	2.44	
	25	17.08	2.45	
	30	17.09	2.46	
	35	17.10	2.47	
	40	17.11	2.48	
	50	17.12	2.49	
	60	"	"	
	80	"	"	
	100	"	"	
10:00 am	120	17.14	2.51	
	150	17.16	2.53	
	180	17.19	2.56	
	210	17.21	2.58	
12:00	240	17.22	2.59	
	300	"	"	
14:00	360	17.24	2.61	Temp.33.5 C
	420	"	"	
16:00	480	"	"	
18:00	600	"	"	
20:00	720	"	"	
23:00	900	"	"	
02:00	1,080	"	"	
05:00	1,260	"	"	Temp.33.3 C
08:00	1,440	"	"	

Recovery Test(Prueba de recuperacio'n)

Date(Fecha): 14 Nov.,1992

Site No.(Sitio o lugar): JICA No.3 Well

Time	Time sinse pumping stopped	Time sinse pumping started	Rate	Water level Nivel	Residual Drawdown
Hora	Hora desde comienzo de recuperacio'n t'(min)	Hora desde comienzo de bombeo t(min)	Razo'n t/t'	de Agua meter (metro)	Descenso residual meter (metro)
08:00 am	0	1,440	-	17.24	2.46
	1	1,441	1,441	15.03	0.25
	2	1,442	721	14.99	0.21
	3	1,443	481	14.95	0.17
	4	1,444	361	14.92	0.14
	5	1,445	289	14.90	0.12
	6	1,446	241	14.89	0.11
	7	1,447	207	14.88	0.10
	8	1,448	181	14.87	0.09
	9	1,449	161	14.86	0.08
	10	1,450	145	14.85	0.07
	12	1,452	121	14.84	0.06
	14	1,454	104	14.83	0.05
	16	1,456	91.0	14.82	0.04
	18	1,458	81.0	"	"
	20	1,460	73.0	14.81	0.03
	25	1,465	58.6	14.80	0.02
	30	1,470	49.0	"	"
	35	1,475	42.1	14.79	0.01
	40	1,480	37.0	14.78	0.00
	50	1,490	29.8	"	"
	60	1,500	25.0	"	"
	80	1,520	19.0	"	"
	100	1,540	15.4	"	"
10:00	120	1,560	13.0	"	"
	150	1,590	10.6	"	"
	180	1,620	9.0	"	"
	210	1,650	7.9	"	"
12:00	240	1,680	7.6	"	"
	300	1,740	5.8	"	"
	360	1,800	5.0	"	"
	420	1,860	4.4	"	"
16:00	480	1,920	4.0	"	"

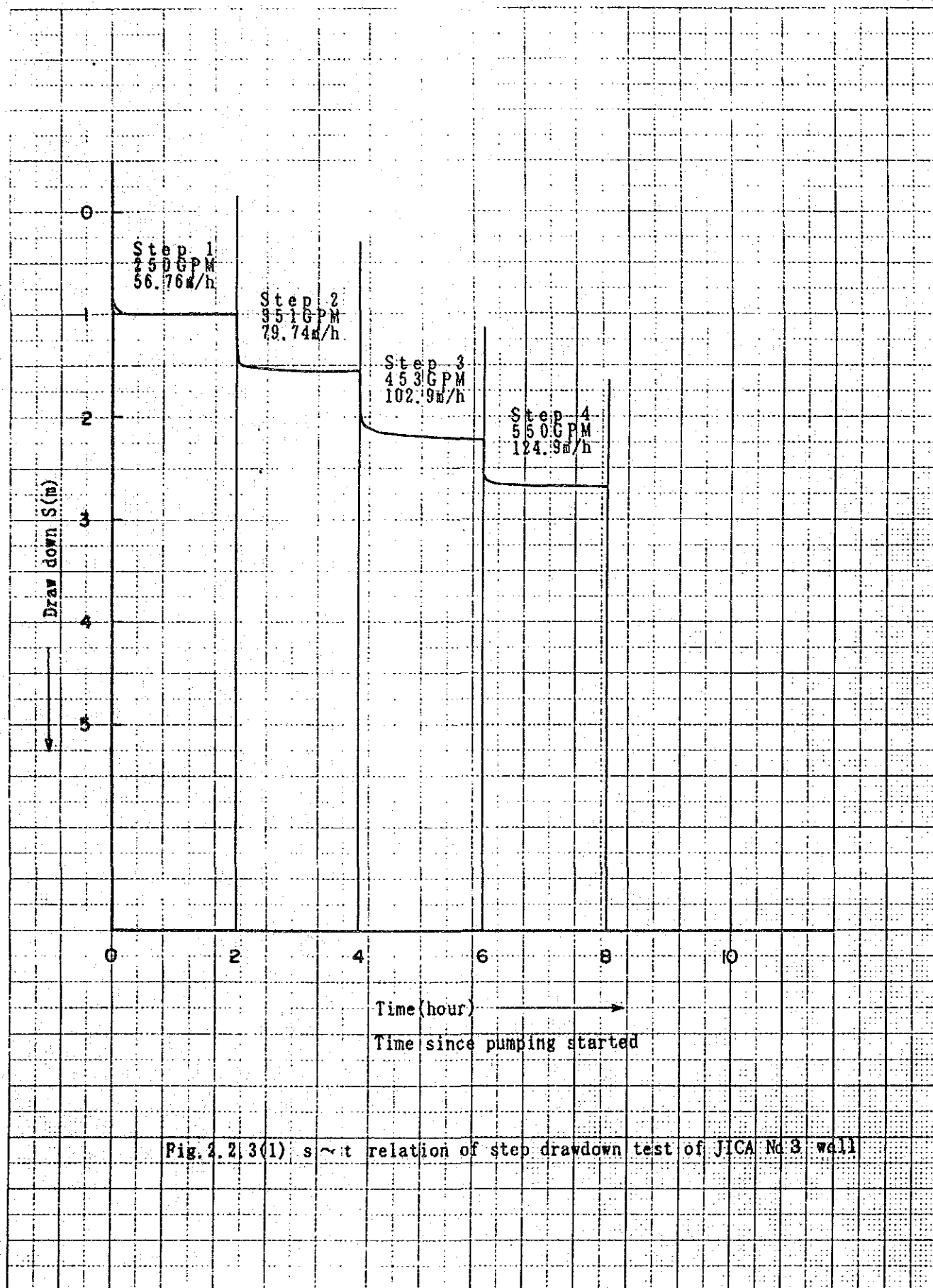


Fig. 2.2.3(1) s ~ t relation of step drawdown test of JICA No.3 well

Q ₁ m ³ /h	Q ₂ G.P.M	Q ₃ l.p.m	S (m)	Q/S m ³ /h	S/Q
56.76	250	946	0.98	57.92	0.01726
79.74	351	1,329	1.56	51.12	0.01956
102.90	453	1,715	2.21	46.55	0.02148
124.92	550	2,082	2.58	48.61	0.02145

static water level 14.52m

(Nivel de estatico de agua) (47.64)

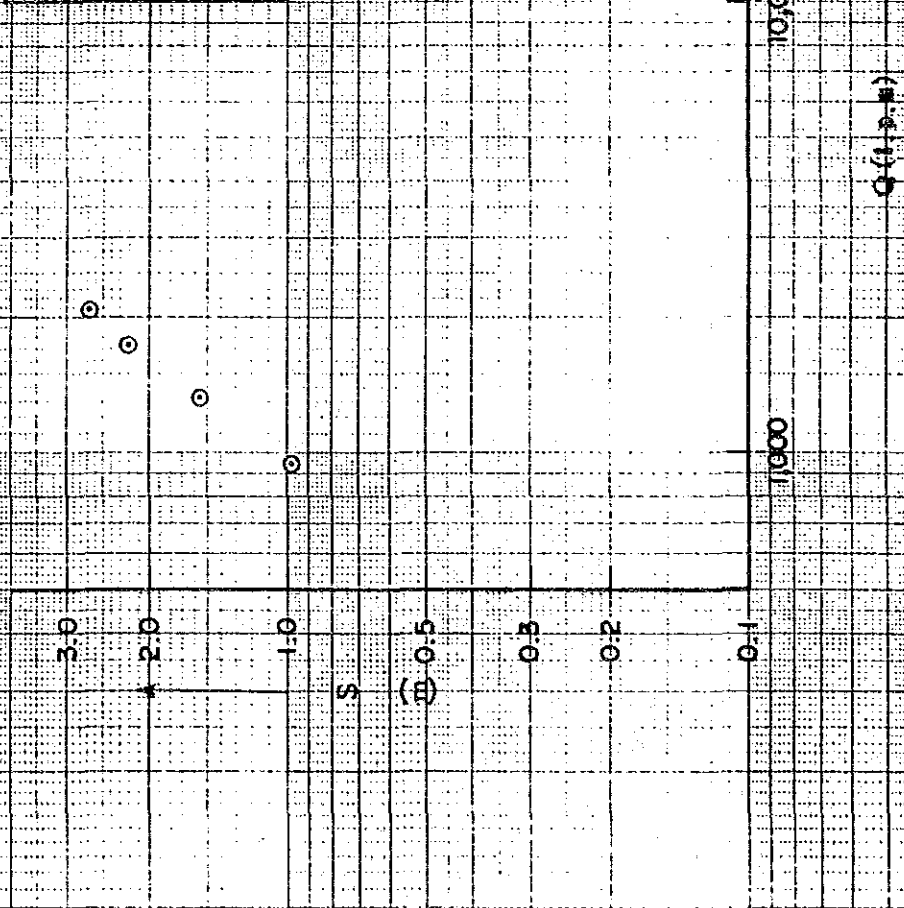


Fig. 2.2.3(2) Step drawdown test Analysis of JICA No.3 well

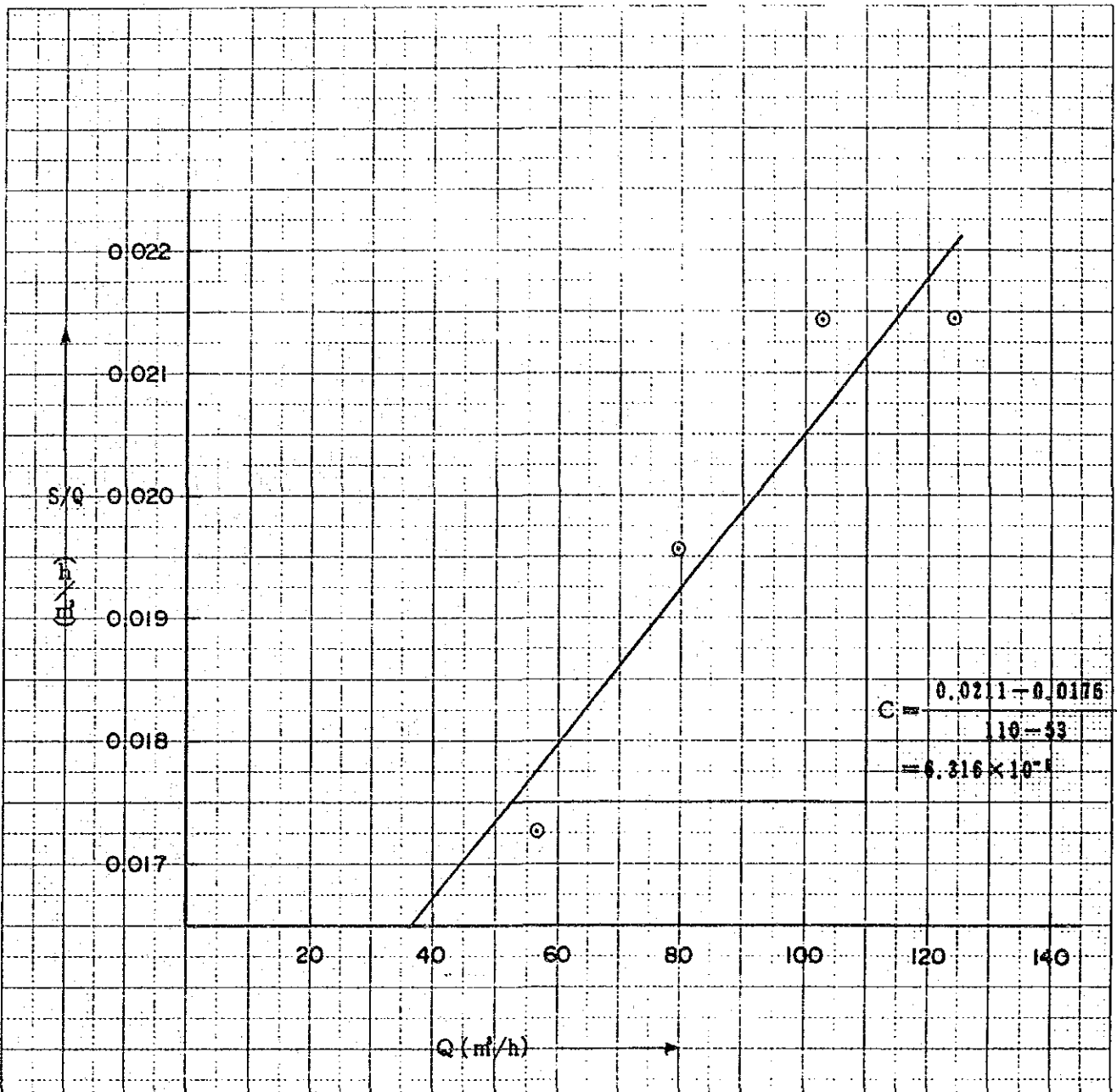


Fig. 2.2.3(3) Step drawdown test Analysis of JICA No 3 well

$$S = BQ + CQ^2$$

$$\frac{S}{Q} = B + CQ$$

$$B = 0.01417 \text{ h/m}^2$$

$$C = 6.316 \times 10^{-4} \text{ h}^2/\text{m}^3$$

$$\therefore S = 1.417 \times 10^{-1} Q + 6.316 \times 10^{-4} Q^2$$

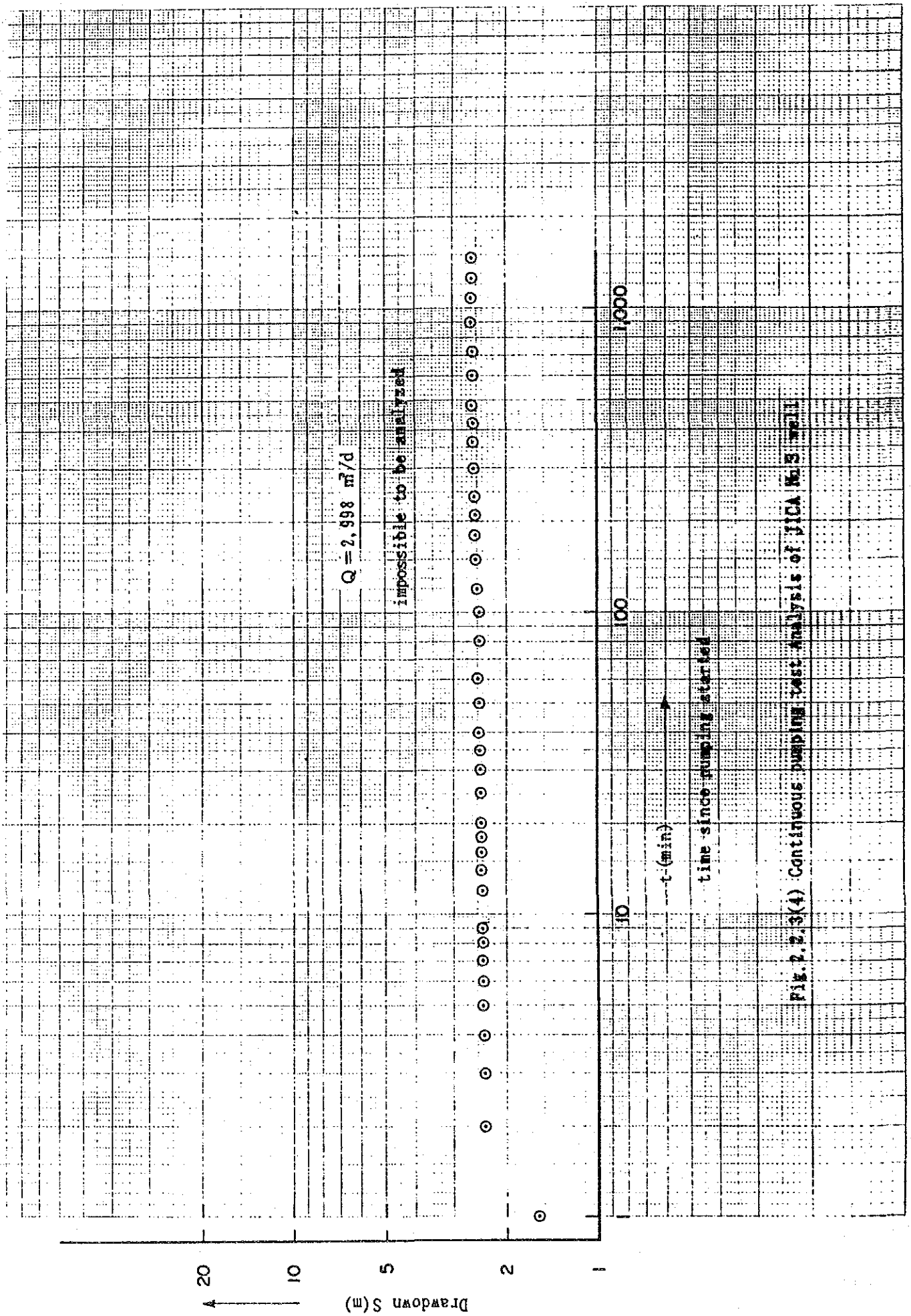


Fig. 2.2.3(4) Continuous pumping test analysis of JICA No. 3 well