DATA BOOK 3

DATA OF PUMPING TEST FOR THE MONITORING WELLS

Result of Pumping Test

Japan International Cooperation Agency

The Study on Water Supply System for Siem Reap Region

D3-1

Well No	Depth (m)	Position of Screen (m)	Static Water Level (GL- m)	Discharge (ℓ / min)	Dynamic Water Level (GL- m)	Specific Capacity (ℓ/min/m)	Ground-Water Temp. (℃)	pH	Electric Conductivity (μs／cm)	Fe^+ (mg / ℓ) (TONE/JICA)
WT-2	77.00	61.38 ～ 73.20								
WT-3	36.00	20.38 ～ 32.20	1.640	47.9	18.340	2.9	30.0	5.0	52.4	(＊ /1.2)
WT-4	29.00	13.38 ～ 25.20	0.855	443.6	6.315	81.2	29.7	8.0	34.5	(1.0/0.5)
WT-5	58.00	42.38 ～ 54.20	2.895	306.7	23.821	14.7	29.7	6.6	46.0	(1.7/1.5)
WT-6	29.00	13.38 ～ 25.20	1.800	306.7	8.490	45.8	29.7	5.2	30.2	(2.7/3.0)
WT-7	60.00	44.38 ～ 56.20	0.440	60.5	45.205	1.4	31.4	5.7	51.9	(＊ /0.2)
WT-8	83.00	67.38 ～ 79.20	4.900	－	－	－	29.9	10.7	630.0	(2.8/4.4)
WT-9	42.00	26.38 ～ 39.20	3.680	－	－	－	－	－	－	－
WT-10	43.00	27.38 ～ 39.20	－	－	－	－	－	－	－	－
WT-11	77.00	61.38 ～ 73.20	1.970	－	－	－	－	－	－	－
LTa-1	72.00	63.62 ～ 71.90	－	－	－	－	－	－	－	－
LTa-2	35.00	26.61 ～ 34.90	3.550	417.0	6.785	128.9	29.5	5.0	22.0	(10.0/＊)
LTb-1	73.00	64.61 ～ 72.90	3.319	8.6	18.197	0.6	30.1	10.6	418.0	(0.24/＊)
LTb-2	40.00	31.61 ～ 39.90	2.145	417.0	11.132	46.4	29.7	5.3	178.0	(0.48/＊)

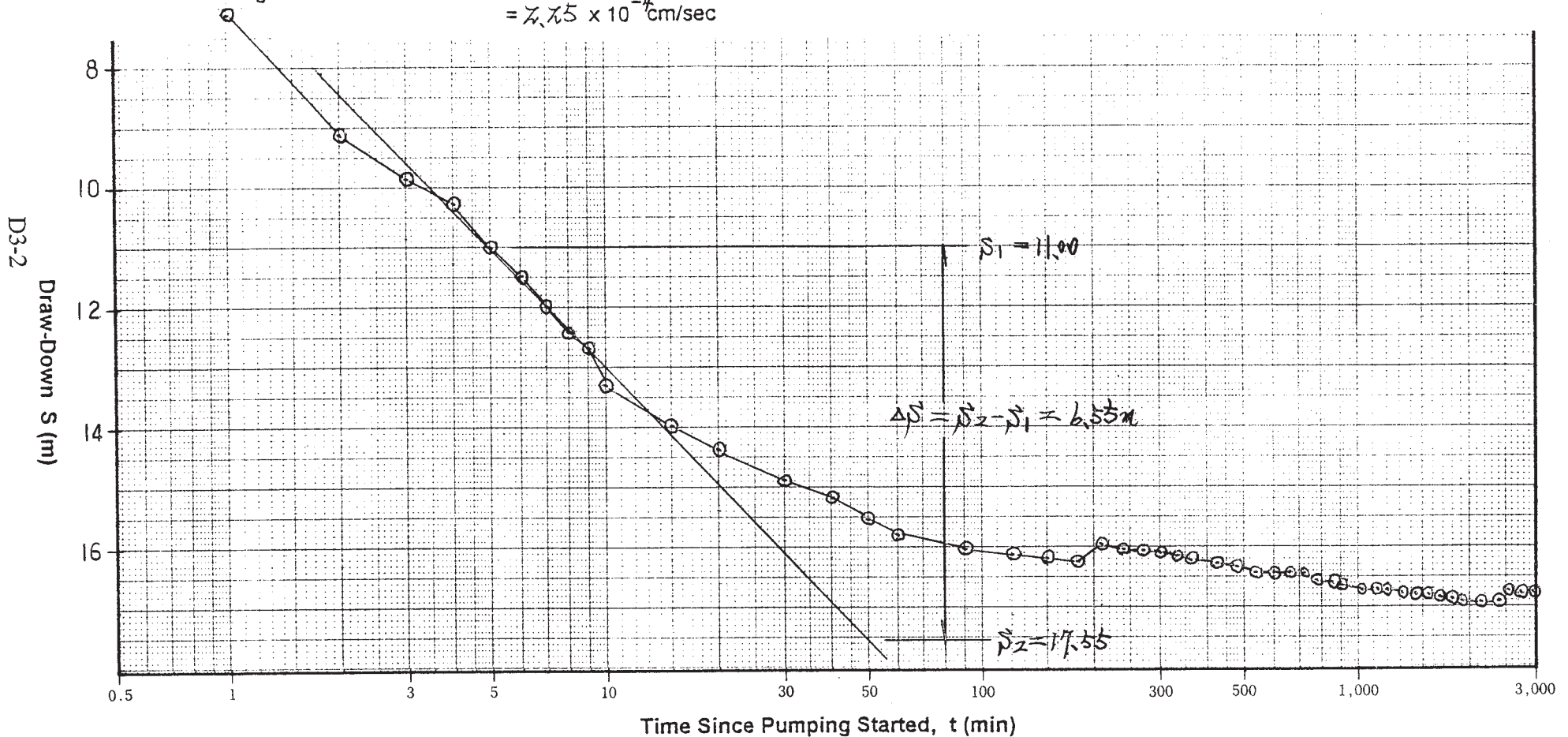# CONTINUOUS TEST (WT-3)

Method of Jacob.

Coefficient of Transmissibility

$$T = \frac{0.183 \times Q}{\Delta S} = \frac{0.183 \times 0.0479}{6.55 \times 60} = 2.23 \times 10^{-5} \, m^2/sec$$

Coefficient of Permea bility

$$K = \frac{T}{b} = \frac{2.23 \times 10^{-5}}{9.90} = 2.25 \times 10^{-6} \, m/sec$$
$$= 2.25 \times 10^{-4} \, cm/sec$$

Static Water Level	GL− 1.64 m
Discharge	Q = 47.9 l/min
Draw-Down of 1 cycle of log t	Δs = 6.55 m
Thickness of Aquifer	b = 9.90 m

$S_1 = 11.00$

$\Delta S = S_2 - S_1 = 6.55 m$

$S_2 = 17.55$

D3-2

Draw-Down S (m)

Time Since Pumping Started, t (min)

RECOVERY TEST (WT-3)

Method of Draw-up

Coefficient of Transmissibility

$$T = \frac{0.183 \times Q}{\Delta Sr} = \frac{0.183 \times 0.0479}{6.10 \times 60} = 2.40 \times 10^{-5} \; m^2/sec$$
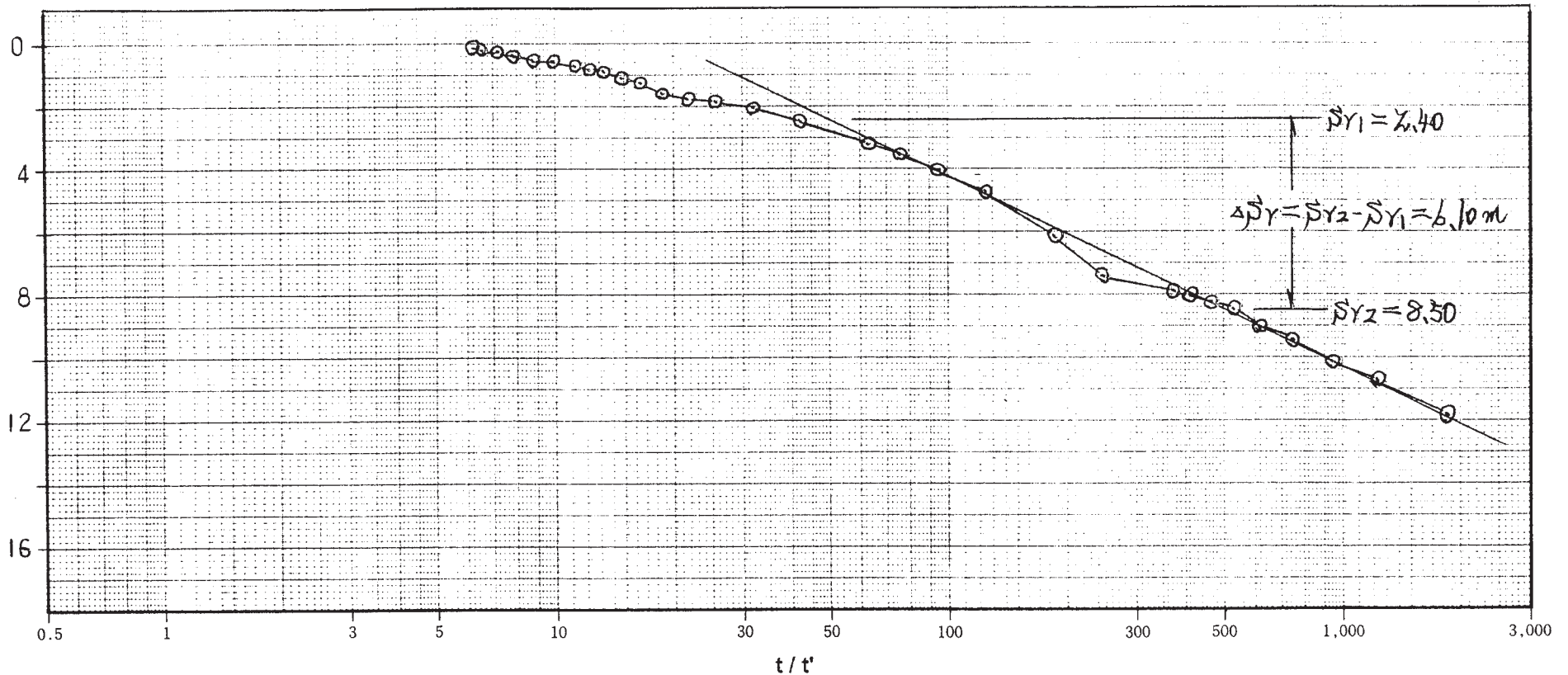
Coefficient of Permea bility

$$K = \frac{T}{b} = \frac{2.40 \times 10^{-5}}{9.90} = 2.42 \times 10^{-6} \; m/sec$$

$$= 2.42 \times 10^{-4} \; cm/sec$$

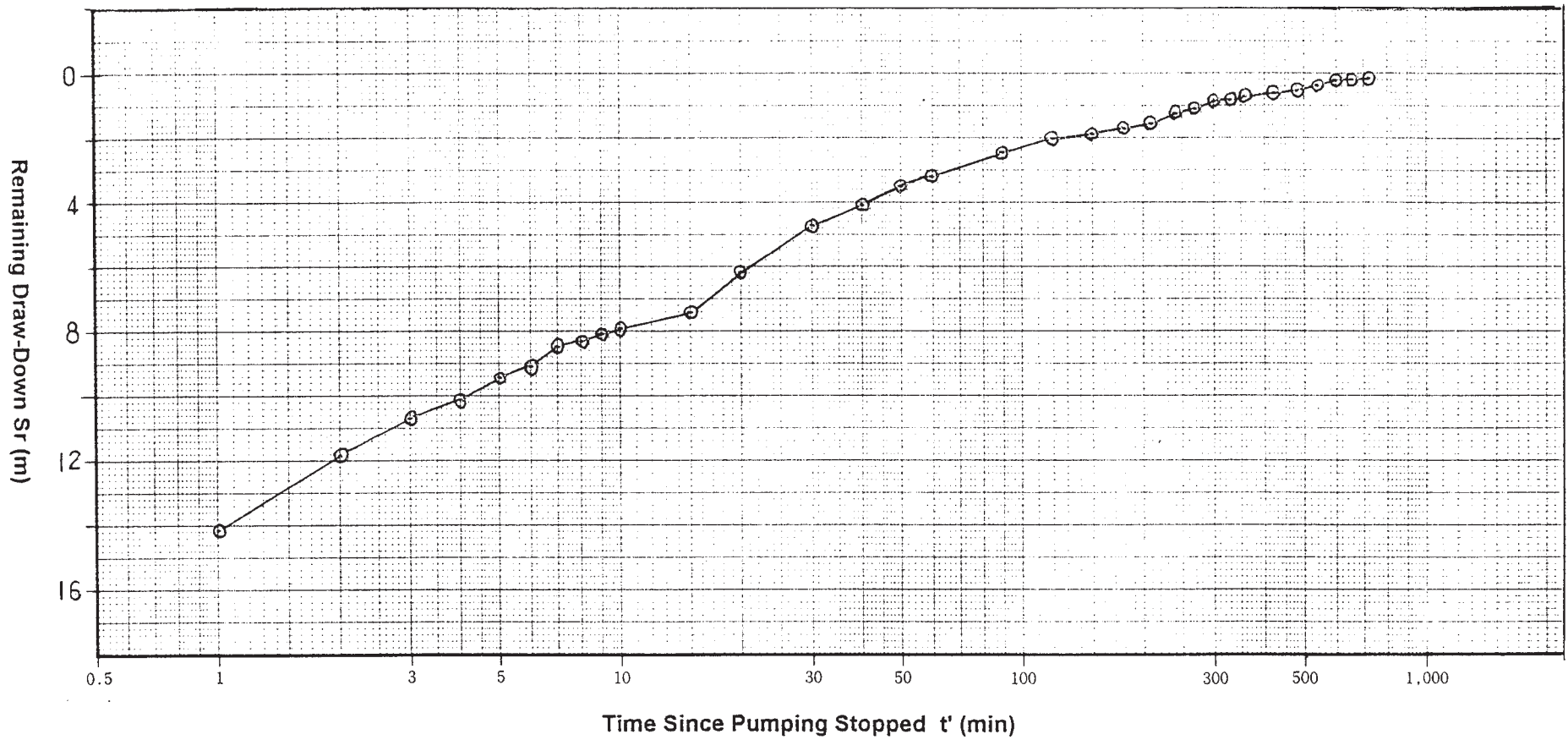|	
Static Water Level	GL- 1.64 m
Discharge before Pumping Stop	Q = 47.9 l/min
Draw-Dow of 1 cycle of log t / t'	Δ Sr = 6.10 m
Thickness of Aquifer	b = 9.90 m

Remaining Draw-Down Sr (m) vs t / t'

$Sr_1 = 2.40$

$\Delta Sr = Sr_2 - Sr_1 = 6.10 \, m$

$Sr_2 = 8.50$

RECOVERY TEST (WT-3)

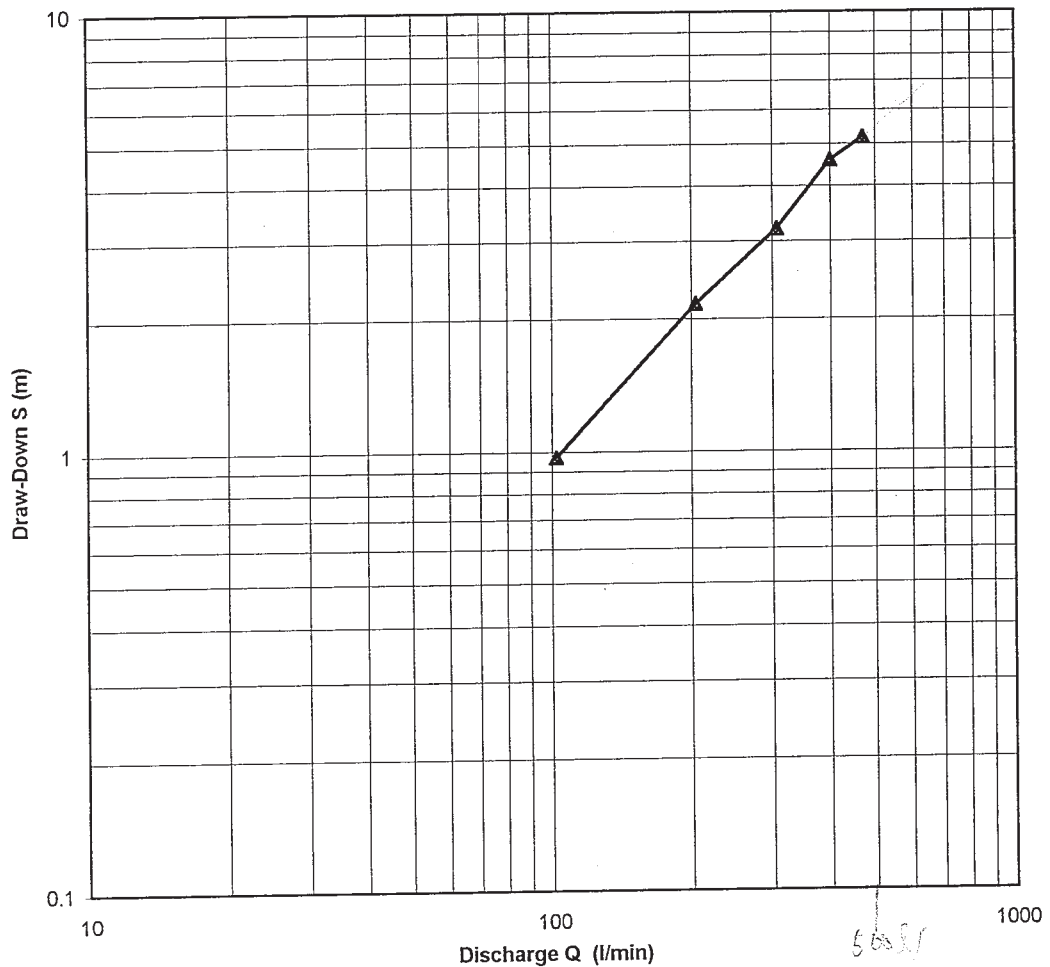| Static Water Level	GL- 1.64 m
Discharge before Pumping Stop	Q = 47.9 l/min
D. W. L. before Pumping Stop	GL - 13.340 m
Pumping Time before Pumping Stop	t = 3.720 min

Remaining Draw-Down Sr (m)

Time Since Pumping Stopped t' (min)

D3-4

Step Draw-Down Test

Items	Discharge Q		Water Level	Draw-Down	Remark
Unit	(1 / min)	(m^3 / hr)	GL - (m)	(m)	
step1	102.2	6.132	1.825	0.97	
step2	204.6	12.276	3.020	2.165	
step3	306.7	18.402	4.045	3.19	
step4	400.2	24.012	5.430	4.575	
step5	470.7	28.242	6.024	5.169	
step6					
step7					
Critical					
Aptitude					
S.W.L.	GL - 0.855	(m)			Static Water Level
Water temp.	29.7	(°C)			

CONTINUOUS TEST (WT-4)

Method of Jacob
Coefficient of Transmissibility

Static Water Level	GL - 0.855 m
Discharge	Q = 443.6 l/min
Draw-Down of 1 cycle of log t	Δ S = 0.73 m
Thickness of Aquifer	b = 9.90 m

$$T = \frac{0.183 \times Q}{\Delta S} = \frac{0.183 \times 0.4436}{0.73 \times 60} = 1.853 \times 10^{-3} \text{ m}^2/\text{sec}$$
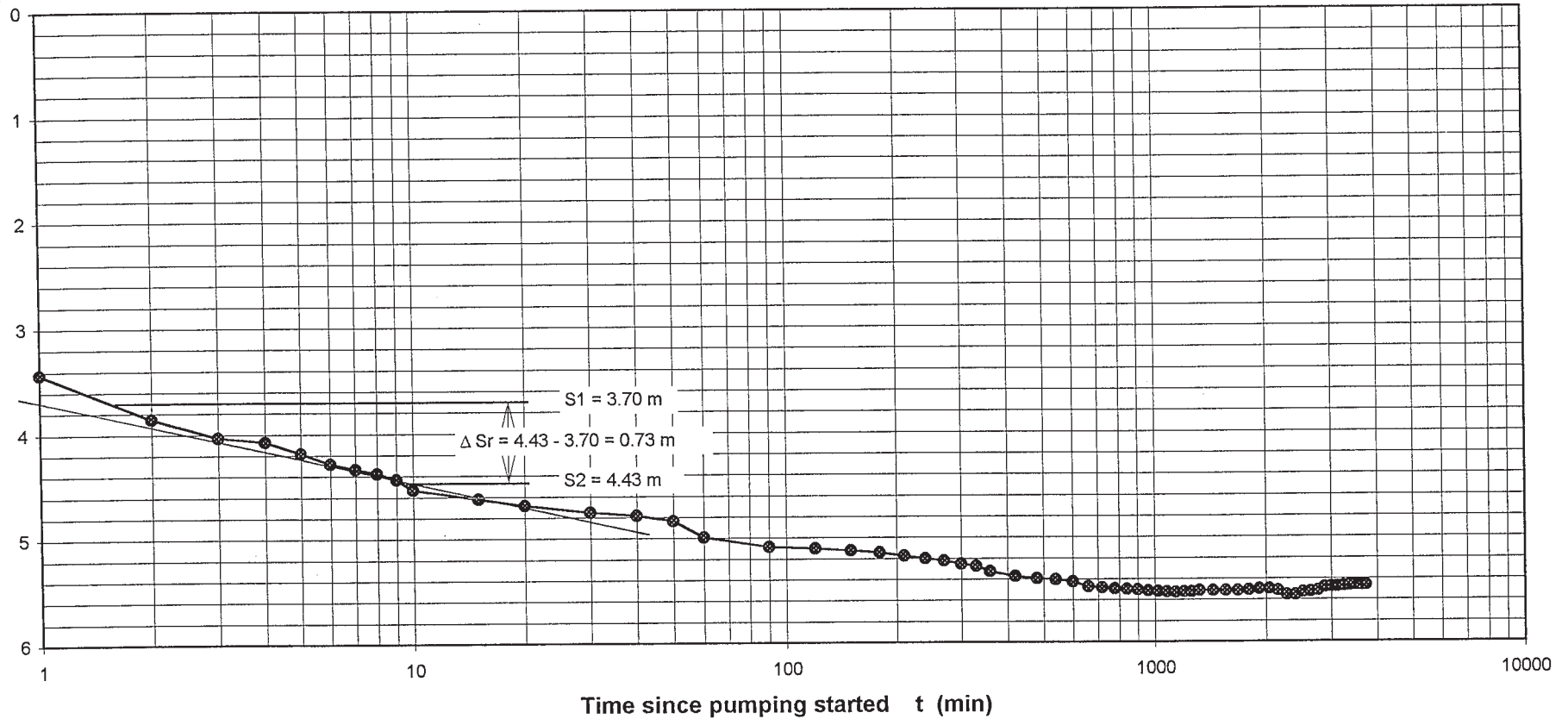
Coefficient of Permeability

$$K = \frac{T}{b} = \frac{1.853 \times 10^{-3}}{9.90} = 1.87 \times 10^{-4} \text{ m/sec}$$
$$= 1.87 \times 10^{-2} \text{ cm/sec}$$

S1 = 3.70 m

Δ Sr = 4.43 - 3.70 = 0.73 m

S2 = 4.43 m

Draw-Down S (m)

Time since pumping started   t (min)

RECOVERY TEST (WT-4)

Method of Draw-up
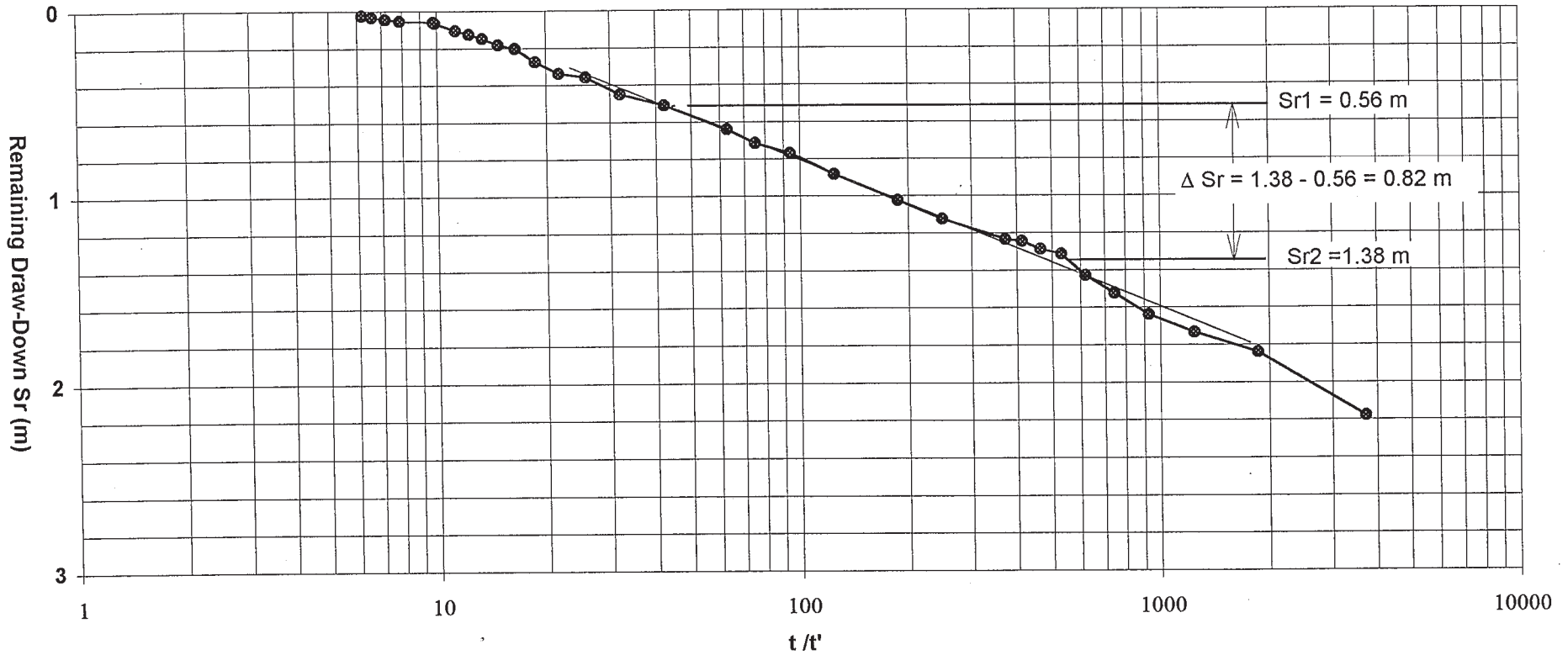Coefficient of Transmissibility

$$T = \frac{0.183 \times Q}{\Delta Sr} = \frac{0.183 \times 0.4436}{0.82 \times 60} = 1.65 \times 10^{-3} \, m^2 /sec$$

Coefficient of Permeanbility

$$K = \frac{T}{b} = \frac{1.65 \times 10^{-3}}{9.9} = 1.67 \times 10^{-4} \, m/sec = 1.67 \times 10^{-2} \, cm/sec = 1.67 \times 10^{-2} \, cm/sec$$

Static Water Level	GL - 0.855 m
Discharge before Pumping Stop	Q = 443.6 l/min
Draw-Down of 1 cycle of log t/t'	Δ Sr = 0.82 m
Thickness of Aquifer	b = 9.90 m

Chart: Remaining Draw-Down Sr (m) vs t /t'

Sr1 = 0.56 m
Δ Sr = 1.38 - 0.56 = 0.82 m
Sr2 = 1.38 m

RECOVERY TEST (WT- 4)

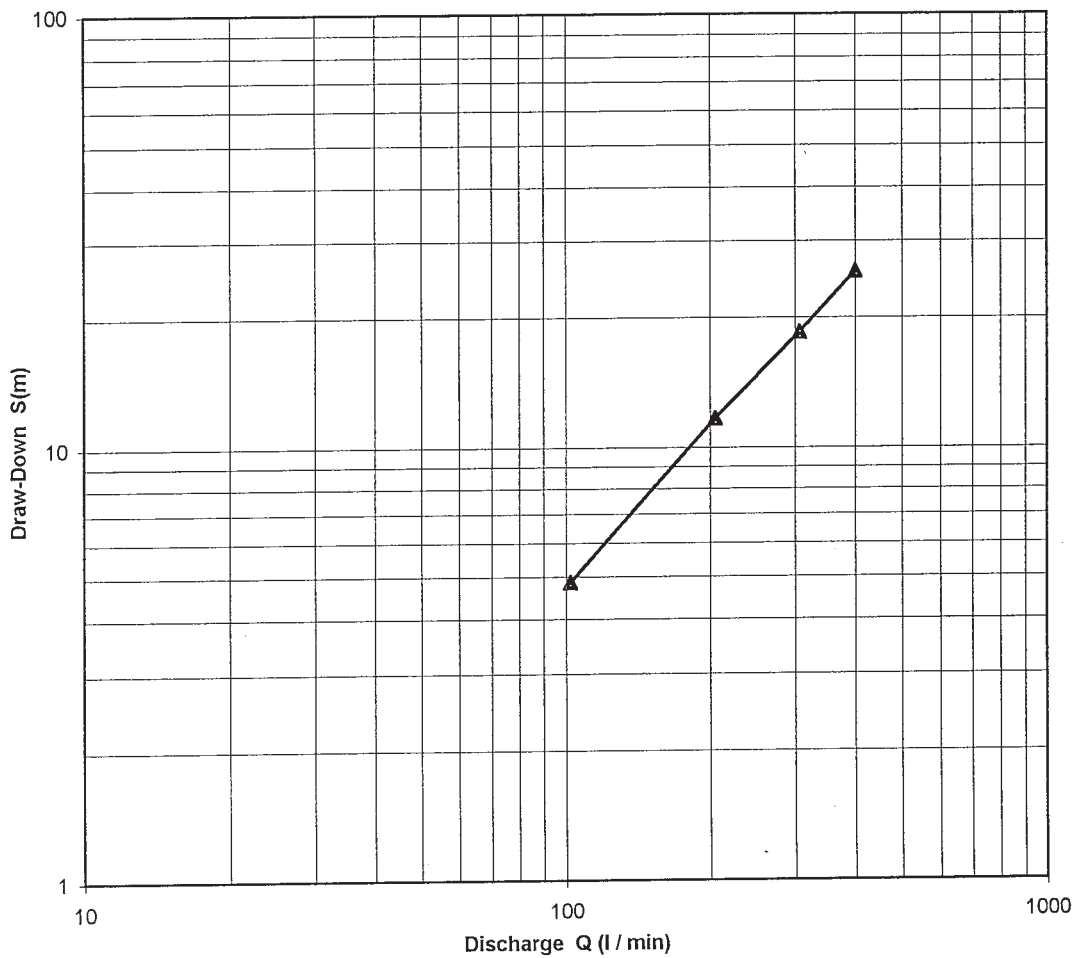| Static Water Level	GL- 0.855 m
Discharge before Pumping Stop	Q = 443.6 l/min
D, W, L, before Pumping Stop	GL - 6.315 m
Pumping Time before Pumping Stop	t = 3.720 min

Remaining Draw-Down Sr (m)

Time Since Pumping Stopped t' (min)
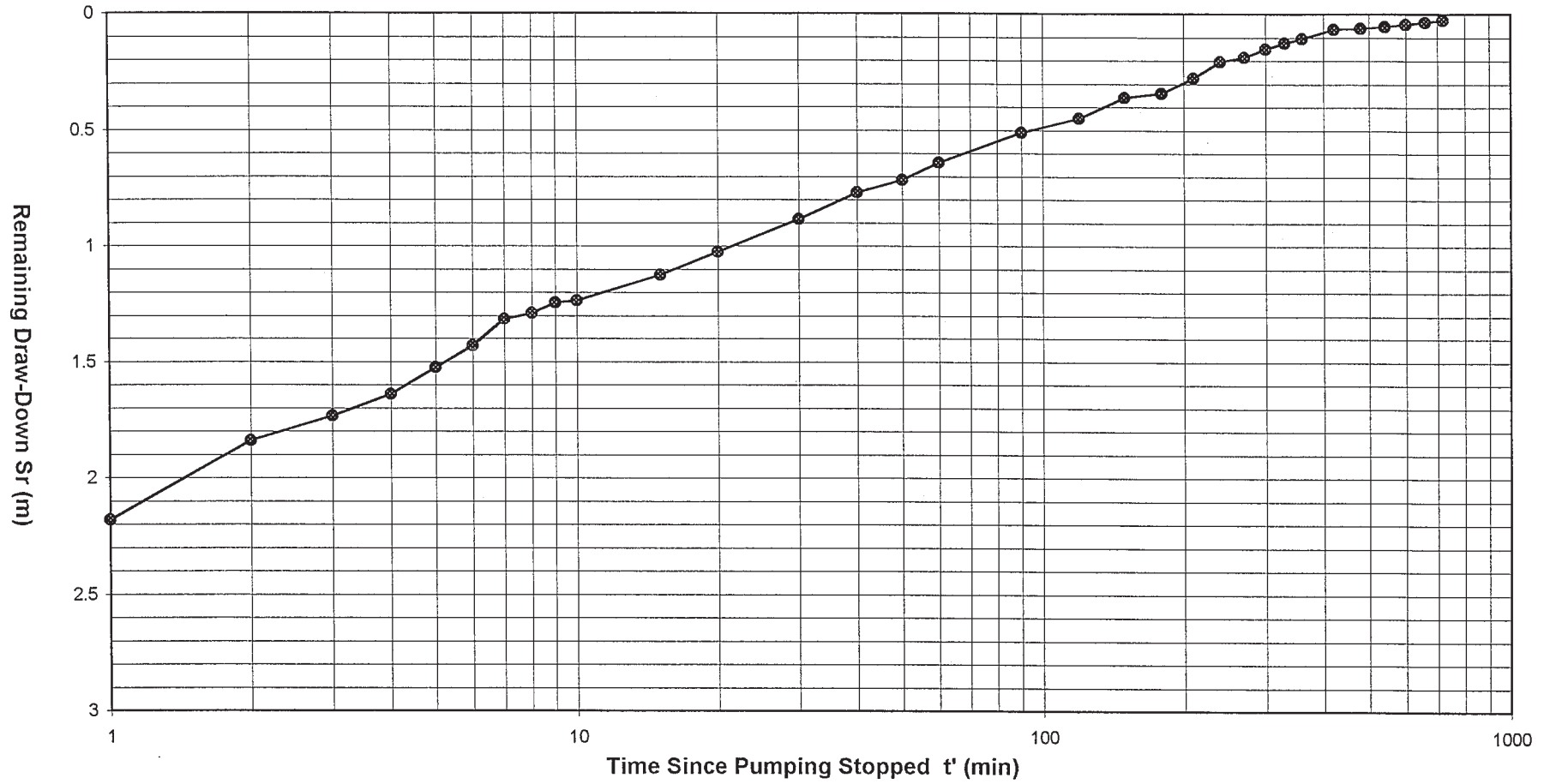
D3-8

Step Draw-Down Test

Date:30 /05 / 97
Well No: WT-5
Depth : 58.00 m

Items	Discharge Q		Water Level	Draw-Down	Remark
Unit	(1 / min)	(m^3/ hr)	GL - (m)	(m)	
step1	102.2	6.13	7.900	4.850	
step2	204.6	12.28	14.690	11.640	
step3	306.7	18.40	21.470	18.420	
step4	400.2	24.01	28.060	25.550	
step5					
step6					
step7					
Critical					
Aptitude					
S.W.L.	GL - 3.05	(m)			Static Water Level
Water temp.	29.7	(°C)			

CONTINUOUS TEST (WT-5)

Method of Jacob.

Coefficient of Transmissibility

$$T = \frac{0.183 \times Q}{\Delta S} = \frac{0.183 \times 0.3067}{6.20 \times 60} = 1.51 \times 10^{-4} \, m^2/sec$$

Coefficient of Permeability

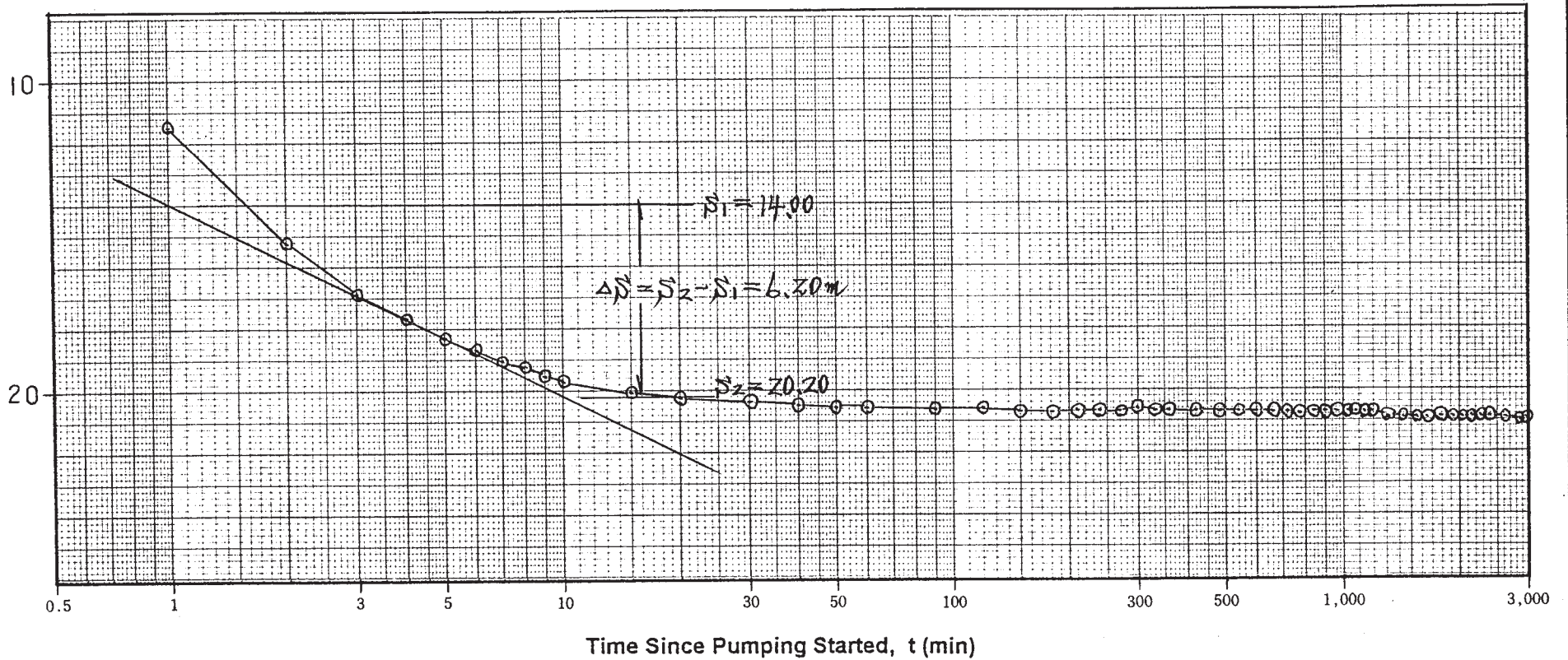$$K = \frac{T}{b} = \frac{1.51 \times 10^{-4}}{9.90} = 1.53 \times 10^{-5} \, m/sec$$
$$= 1.53 \times 10^{-3} \, cm/sec$$

Static Water Level	GL-2.895 m
Discharge	Q = 306.7 l/min
Draw-Down of 1 cycle of log t	Δs = 6.20 m
Thickness of Aquifer	b = 9.90 m

Draw-Down S (m)

Time Since Pumping Started, t (min)

$S_1 = 14.00$

$\Delta S = S_2 - S_1 = 6.20 m$

$S_2 = 20.20$

D3-10

RECOVERY TEST (WT-5)

Method of Draw-up
Coefficient of Transmissibility

$$T = \frac{0.183 \times Q}{\Delta Sr} = \frac{0.183 \times 0.3067}{8.60 \times 60} = 1.09 \times 10^{-4} \text{ m}^2/\text{sec}$$
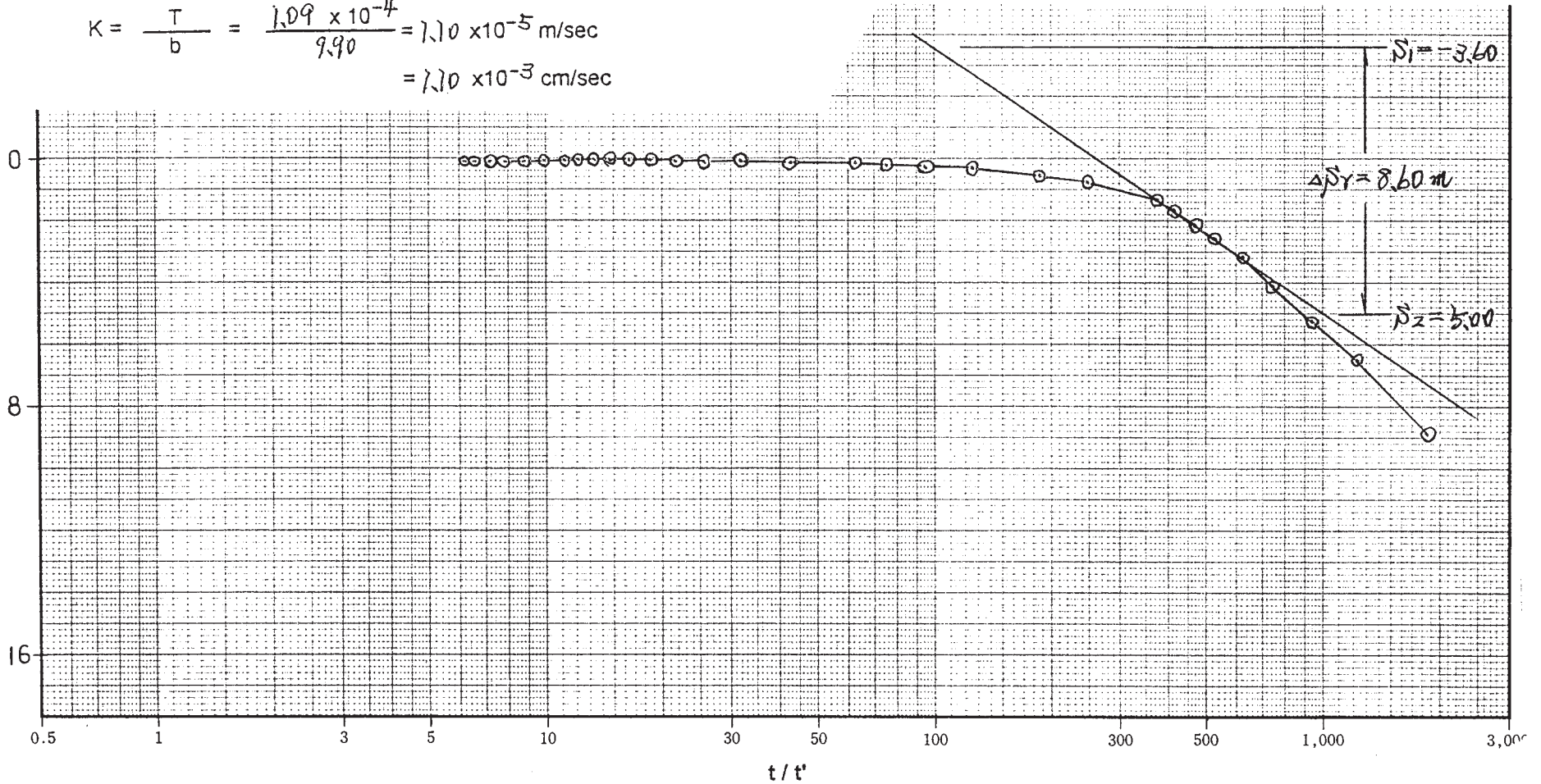
Coefficient of Permeability

$$K = \frac{T}{b} = \frac{1.09 \times 10^{-4}}{9.90} = 1.10 \times 10^{-5} \text{ m/sec}$$

$$= 1.10 \times 10^{-3} \text{ cm/sec}$$

Static Water Level	GL-7.896m
Discharge before Pumping Stop	Q = 306.7 l/min
Draw-Dow of 1 cycle of log t / t'	Δ Sr = 8.60 m
Thickness of Aquifer	b = 9.90 m

$S_1 = -3.60$

$\Delta Sr = 8.60 \, m$

$S_2 = 5.00$
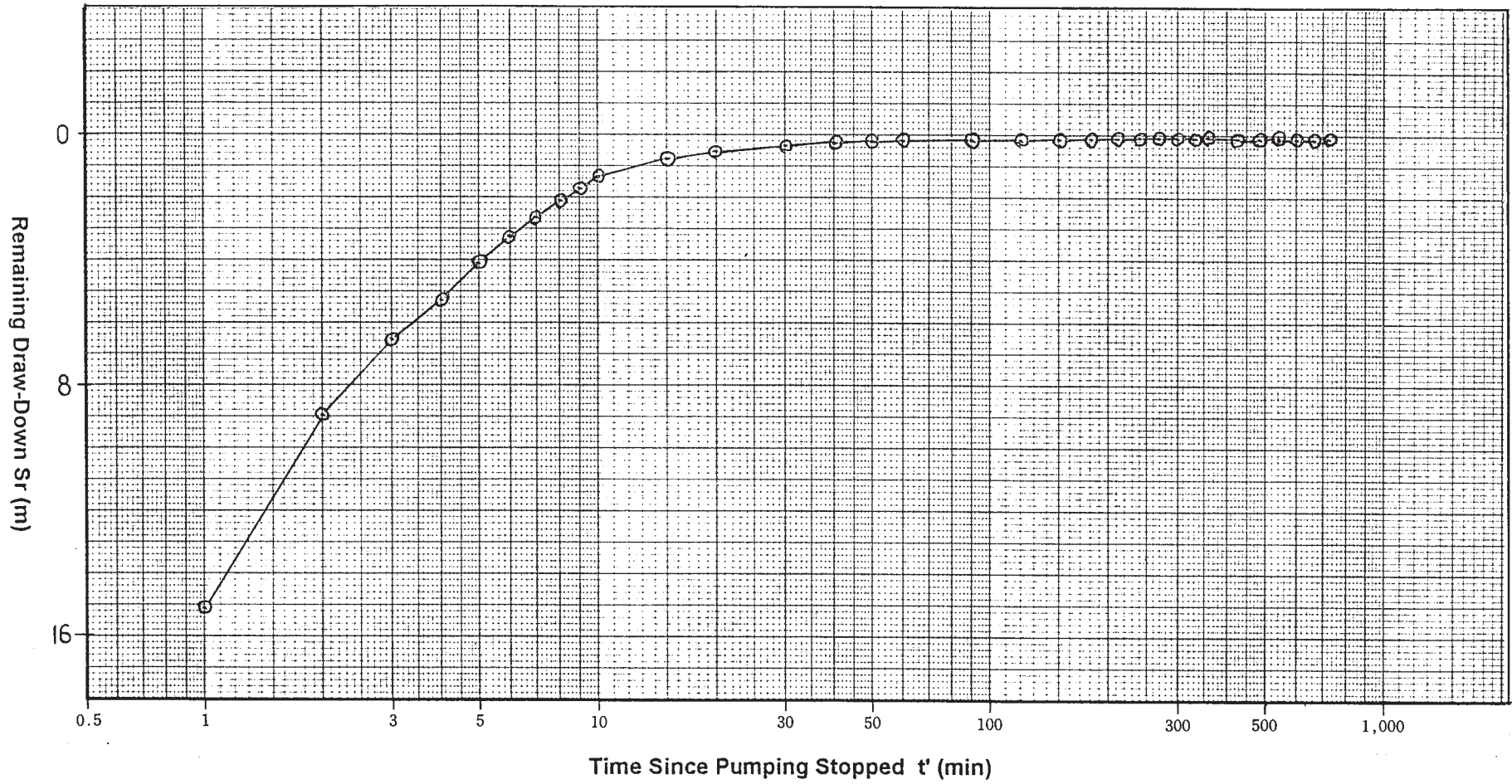
Remaining Draw-Down Sr (m)

t / t'

D3-11

RECOVERY TEST (WT-5)

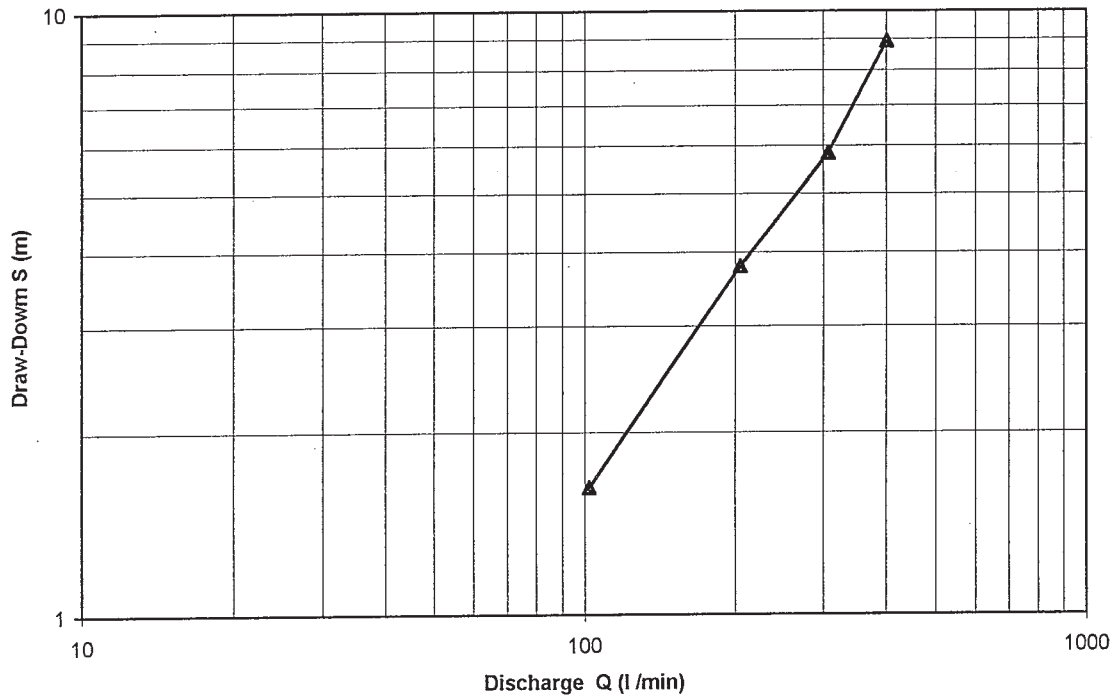| Static Water Level | GL-2.895 m |
Discharge before Pumping Stop	Q = 306.7 l/min
D, W, L, before Pumping Stop	GL -23.871 m
Pumping Time before Pumping Stop	t = 3.720 min

Remaining Draw-Down Sr (m)

Time Since Pumping Stopped t' (min)

Step Draw-Down Test

Items	Discharge Q		Water Level	Draw-Down	Remark
Unit	(1 / min)	(m³ / hr)	GL - (m)	(m)	
step1	102.2	6.13	3.380	1.620	
step2	204.6	12.28	5.545	3.785	
step3	306.7	18.40	7.600	5.840	
step4	400.2	24.01	10.680	8.920	
step5					
step6					
step7					
Critical					
Aptitude					
S.W.L.	GL - 1.78	(m)			Static Water Level
Water temp.	29.6	(°C)			

Draw-Dowm S (m) vs Discharge Q (l /min)

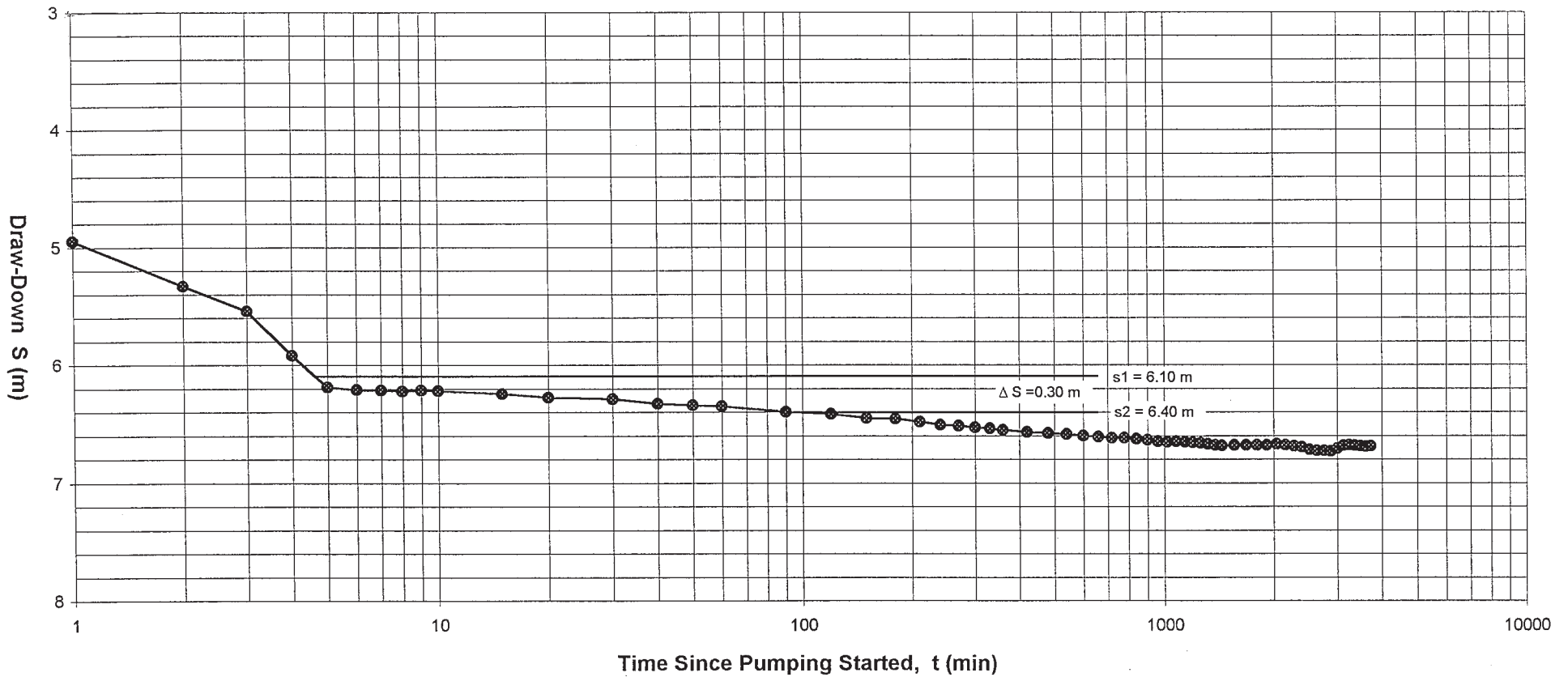# CONTINUOUS TEST (WT-6)

Method of Jacob.

Coefficient of Transmissibility

$$T = \frac{0.183 \times Q}{\Delta S} = \frac{0.183 \times 0.3067}{0.30 \times 60} = 3.12 \times 10^{-3} \; m^2/sec$$

Coefficient of Permeability

$$K = \frac{T}{b} = \frac{3.12 \times 10^{-3}}{9.9} = 3.15 \times 10^{-4} \; m/sec$$

$$= 3.15 \times 10^{-2} \; cm/sec$$

Static Water Level	GL - 1.80 m
Discharge	Q = 306.7 l/min
Draw-Down of 1 cycle of log t	Δs = 0.30 m
Thickness of Aquifer	b = 9.90 m

D3-14

Static Water Level	GL - 1.76 m
Discharge before Pumping Stop	Q = 306.7 l/min
Draw-Dow of 1 cycle of log t / t'	Δ Sr = 0.14 m
Thickness of Aquifer	b = 9.90 m

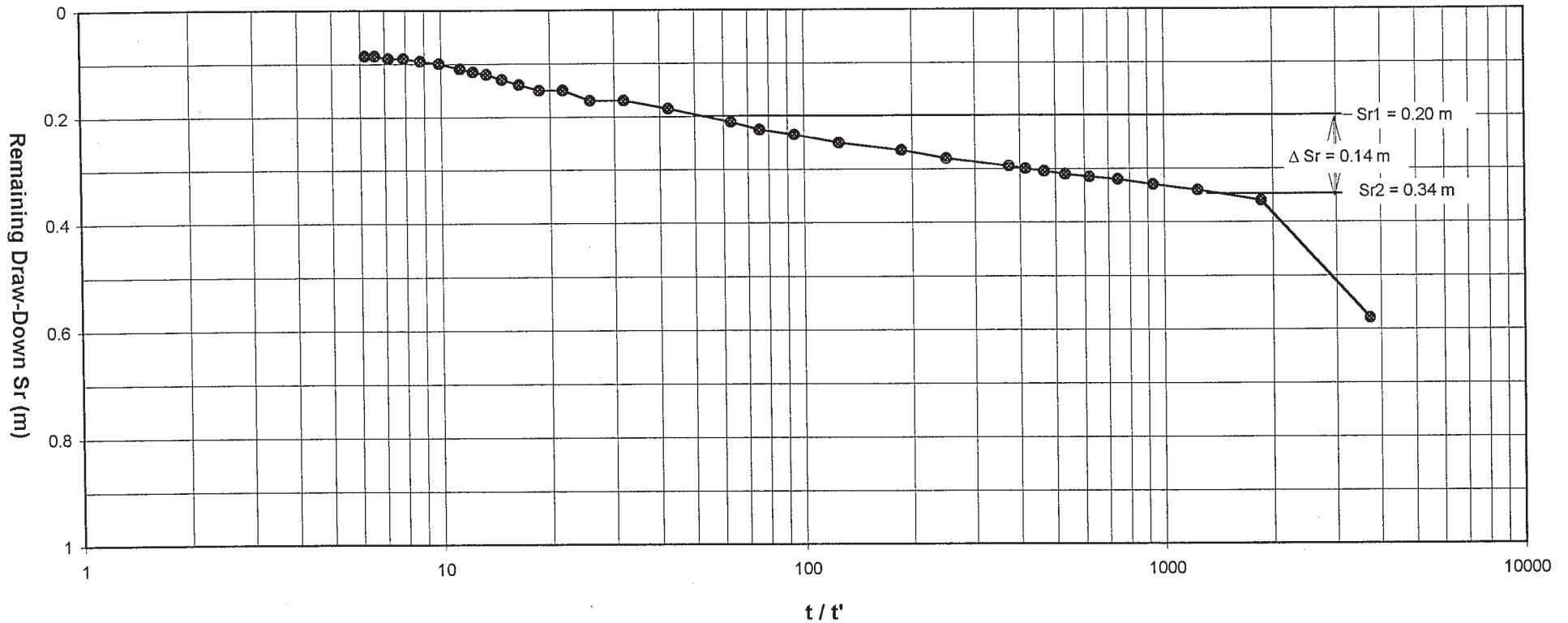## RECOVERY TEST (WT-6)

Method of Draw-up
Coefficient of Transmissibility

$$T = \frac{0.183 \times}{\Delta Sr} = \frac{0.183 \times 0.3067}{0.14 \times 60} = 6.68 \times 10^{-3} \ m^2/sec$$

Coefficient of Permea, bility

$$K = \frac{T}{b} = \frac{6.68 \times 10^{-3}}{9.9} = 6.75 \times 10^{-4} \ m/sec$$
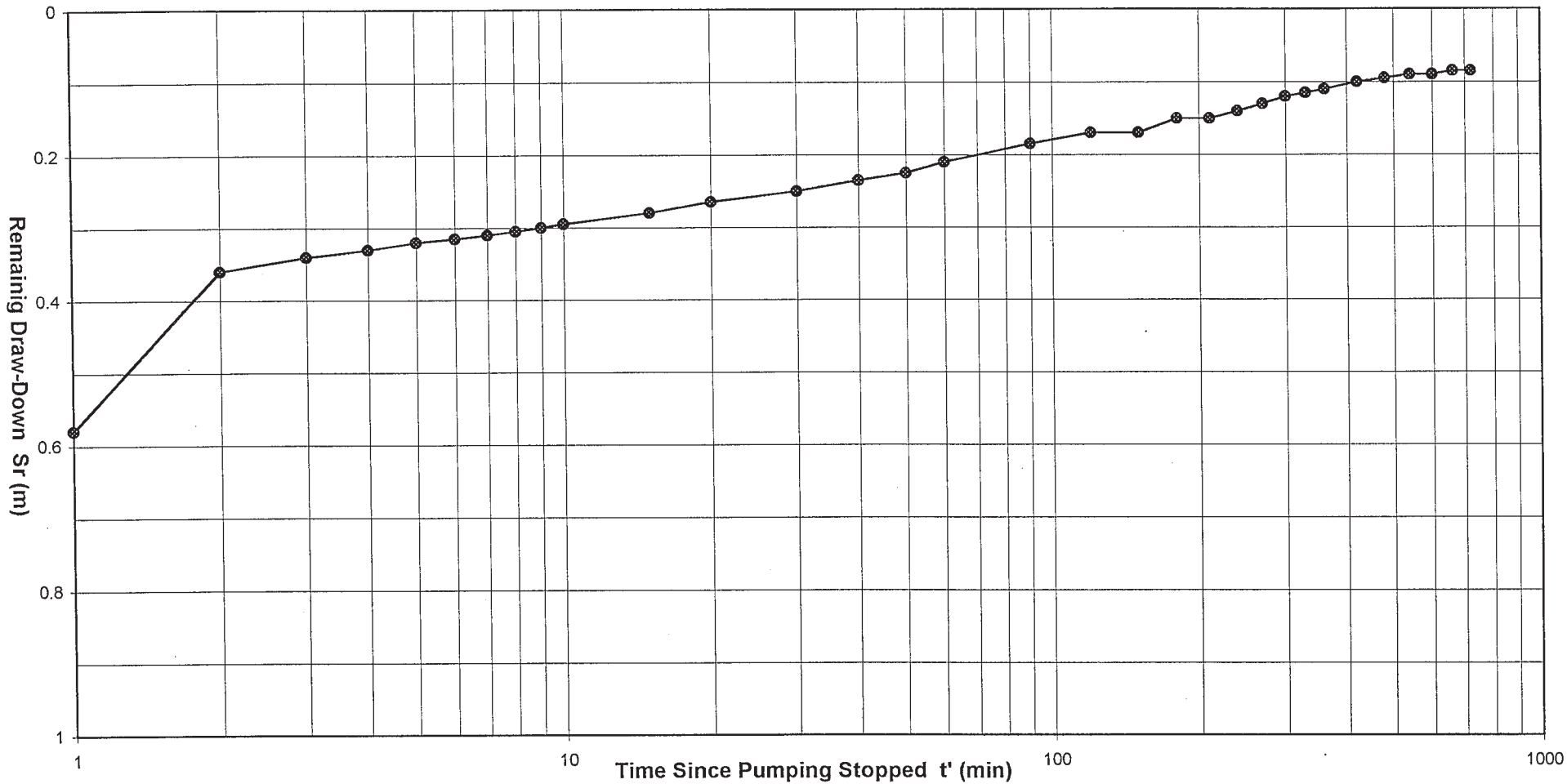
$$= 6.75 \times 10^{-2} \ cm/sec$$

Sr1 = 0.20 m
Δ Sr = 0.14 m
Sr2 = 0.34 m

Remaining Draw-Down Sr (m)

t / t'

RECOVERY TEST (WT-6)

Static Water Level	GL - 1.76 m
Discharge before Pumping stop	Q = 306.7 l/min
D, W, L, before Pumping Stop	GL - 8.490 m
Pumping Time before Pumping Stope	t = 3.720 min

Remainig Draw-Down Sr (m)

Time Since Pumping Stopped t' (min)

D3-16

CONTINUOUS TEST (WT-7)

Method of Jacob.

Coefficient of Transmissibility
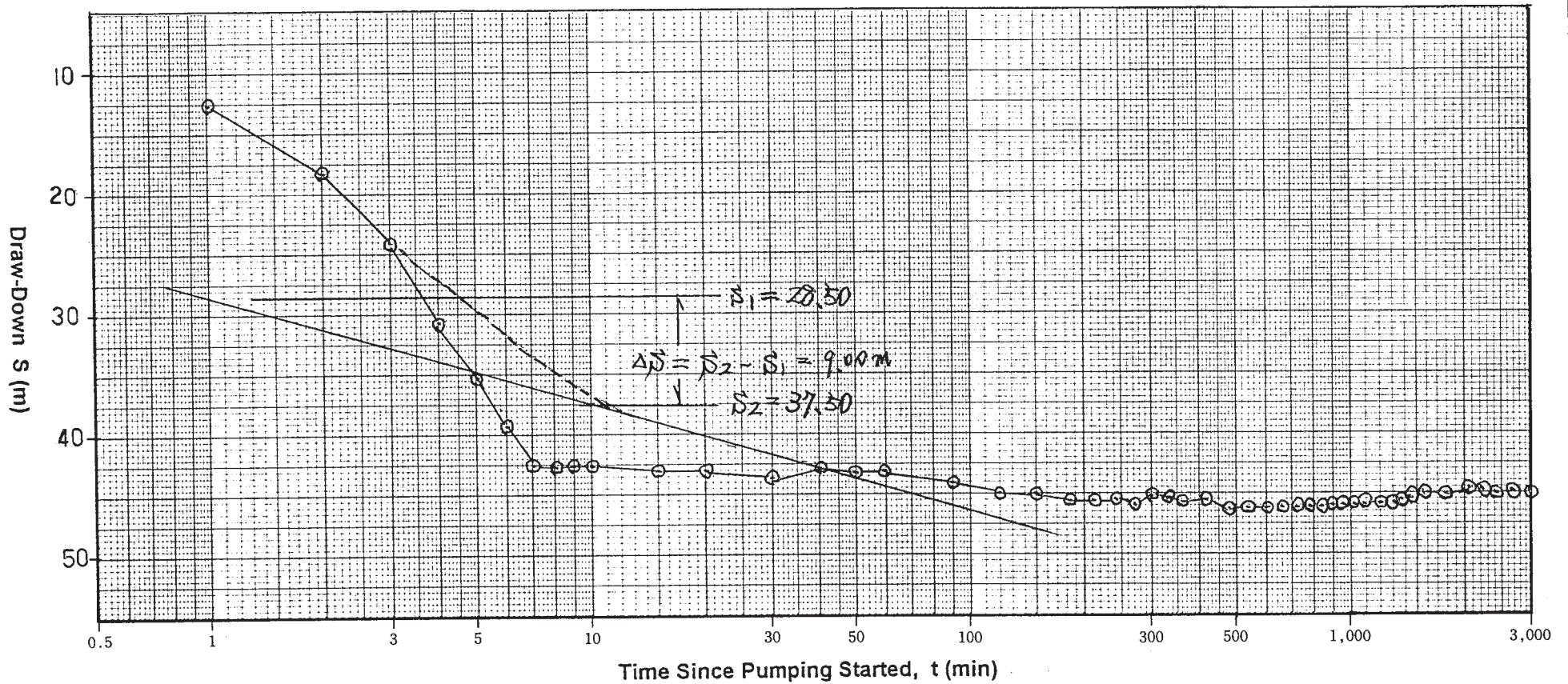
$$T = \frac{0.183 \times Q}{\Delta S} = \frac{0.183 \times 0.0605}{\times 60} = 2.05 \times 10^{-5} \, m^2/sec$$

Coefficient of Permea bility

$$K = \frac{T}{b} = \frac{2.05 \times 10^{-5}}{9.90} = 2.07 \times 10^{-6} \, m/sec$$
$$= 2.07 \times 10^{-4} \, cm/sec$$

|	
Static Water Level	GL- 0.44 m
Discharge	Q = 60.5 l/min
Draw-Down of 1 cycle of log t	Δs = 9.00 m
Thickness of Aquifer	b = 9.90 m

Plot of Draw-Down S (m) versus Time Since Pumping Started, t (min). Annotations: $S_1 = 28.50$; $\Delta S = S_2 - S_1 = 9.00 \, m$; $S_2 = 37.50$

RECOVERY TEST (WT-7)

Static Water Level	GL- 0.440 m
Discharge before Pumping Stop	Q = 60.5 l/min
D, W, L, before Pumping Stop	GL - 45.205 m
Pumping Time before Pumping Stop	t = 3.720 min

Remaining Draw-Down Sr (m)

Time Since Pumping Stopped t' (min)
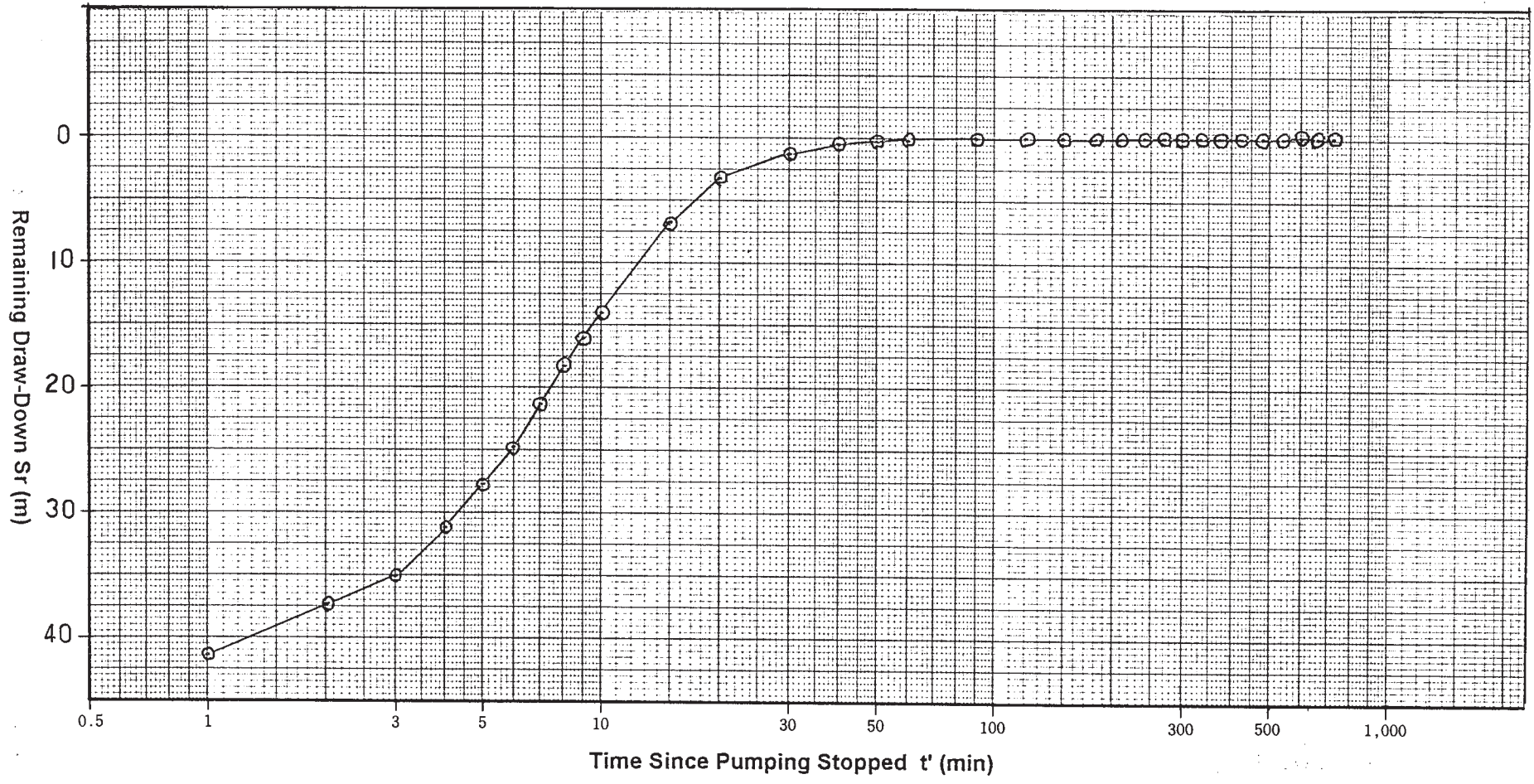
RECOVERY TEST (WT-7)

Method of Draw-up
Coefficient of Transmissibility

$$T = \frac{0.183 \times Q}{\Delta Sr} = \frac{0.183 \times 0.0605}{10.0 \times 60} = 1.85 \times 10^{-5} \text{ m}^2/\text{sec}$$

Coefficient of Permea bility

$$K = \frac{T}{b} = \frac{1.85 \times 10^{-5}}{9.90} = 1.87 \times 10^{-6} \text{ m/sec}$$

$$= 1.87 \times 10^{-4} \text{ cm/sec}$$

Static Water Level	GL- 0.44 m
Discharge before Pumping Stop	Q = 60.5 l/min
Draw-Dow of 1 cycle of log t / t'	Δ Sr = 10.00 m
Thickness of Aquifer	b = 9.90 m

D3-19

Remaining Draw-Down Sr (m)

t / t'

$Sr_1 = 0.50$

$\Delta Sr = 10.00 m$

$Sr_2 = 10.50$