

APPENDIX B

DRILLING RECORD

# WELL DIARY

PROJECT NAME	DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.
CLIENT	MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
CONSULTANT	JAPAN TECHNO CO., LTD.
CONTRACTOR	SIAM TONE CO., LTD.

Well No. : H-9A	Operator	Somsry
Location : B. May Phattana	Assistants(1)	Done keaw
Rig No. : Top-500	(2)	Lampin

Date	Time	Description
28/1/2000	14:30-15:20	Mobilization to H-9A (B. May Phattana)
	15:20-17:30	Set up drilling machine.
29/1/2000	8:35-12:26	Rotary drilling dia 311 mm. for installation surface casing from 0.00 m. to 15.00 m.
	15:30-18:36	DTH drilling dia 216 mm. from 15.00 m to 30.00 m.
30/1/2000	9:40-18:25	DTH drilling dia 165 mm. from 30.00 m to 55.50 m.
3/2/2000	12:23-14:43	DTH drilling dia 165 mm. from 55.50 m to 67.50 m.
		Abandon Hole, No water

Reported by  
Name Viengkhone  
Company Siam Tone Co., Ltd.

# Drilling Record

<b>PROJECT NAME</b>		DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.							
<b>CLIENT</b>		MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC							
<b>CONSULTANT</b>		JAPAN TECHNO CO., LTD.							
<b>CONTRACTOR</b>		SIAM TONE CO., LTD.							
<b>SUBCONTRACTOR</b>		SIAM TONE CO., LTD.							
Well No. H-9A					Water Level (Before start) : _____ m				
Location : B. May Phattana					(After stop) : _____ m				
Operator : Somsry					Drill Bit dia From 0.00 to 15.00 m ( 311 ) mm				
Date 29 / 1 / 2000					From 15.00 to 30.00 m ( 216 ) mm				
Rig No. : Top-500					Reference level : ground surface				
Time		Depth		Drill. rate	Formation Description	Sample No.	Method	Remark	
From hr:min	To hr:min	From m	To m						min/m
8:35	8:45	0.00	1.50	7	Clay, brownish yellow	1	Rotary		
8:55	9:05	1.50	3.00	7		2	Rotary		
9:05	9:15	3.00	4.50	7		3	Rotary		
9:15	9:20	4.50	6.00	3		4	Rotary		
10:22	10:30	6.00	7.50	5		5	Rotary		
10:40	10:47	7.50	9.00	5	Weathered Tuff, clay, reddish brown	6	Rotary		
10:47	11:08	9.00	10.50	14		7	Rotary		
11:08	11:18	10.50	12.00	7	Tuff, reddish brown, quartz mottled, highly weathered, weak	8	Rotary		
11:18	11:45	12.00	13.50	18		9	Rotary		
12:05	12:26	13.50	15.00	14		10	Rotary		
15:30	15:36	15.00	16.50	4	Tuff, reddish brown, quartz mottled, moderately hard	11	DTH		
15:36	15:46	16.50	18.00	7		12	DTH		
15:46	15:57	18.00	19.50	7		13	DTH		
16:52	16:57	19.50	21.00	3		14	DTH		
16:57	17:06	21.00	22.50	6		15	DTH		
17:06	17:37	22.50	24.00	21		16	DTH		
17:37	17:58	24.00	25.50	14		17	DTH		
18:14	18:25	25.50	27.00	7		18	DTH		
18:25	18:30	27.00	28.50	3		19	DTH		
18:30	18:36	28.50	30.00	4		20	DTH		
Recorded by Viengkhone					Verified by Taweesak				

## Drilling Record

**PROJECT NAME** DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
 SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.  
**CLIENT** MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
**CONSULTANT** JAPAN TECHNO CO., LTD.  
**CONTRACTOR** SIAM TONE CO., LTD.  
**SUBCONTRACTOR** SIAM TONE CO., LTD.

Well No. H-9A  
 Location : B. May Phattana  
 Operator : Somsry  
 Date 30 / 1 / 2000  
 Rig No. : Top-500

Water Level (Before start) : m  
 (After stop) : m  
 Drill Bit dia From 3.00 to 55.00 m ( 165 ) mm  
 From - to - m ( - ) mm  
 Reference level : ground surface

Time		Depth		Drill. rate min/m	Formation Description	Sample No.	Method	Remark
From hr:min	To hr:min	From m	To m					
9:40	9:51	30.00	31.50	7	Tuff, reddish brown, quartz mottled, moderately hard	21	DTH	
10:04	10:17	31.50	33.00	9		22	DTH	
10:17	10:30	33.00	34.50	9		23	DTH	
10:30	11:21	34.50	36.00	34		24	DTH	
11:21	11:30	36.00	37.50	6		25	DTH	
12:15	14:30	37.50	39.00	90		26	DTH	
15:05	15:10	39.00	40.50	3		27	DTH	
15:10	15:15	40.50	42.00	3		28	DTH	
15:15	15:22	42.00	43.50	5		29	DTH	
15:22	15:34	43.50	45.00	8		30	DTH	
15:45	15:53	45.00	46.50	5		31	DTH	
16:07	16:32	46.50	48.00	17		32	DTH	
16:32	16:55	48.00	49.50	15		33	DTH	
17:09	17:15	49.50	51.00	4		34	DTH	
17:15	17:24	51.00	52.50	6		35	DTH	
17:24	17:42	52.50	54.00	12		36	DTH	
17:42	18:25	54.00	55.50	29		37	DTH	

Recorded by Viengkhone

Verified by Taweesak

# Drilling Record

**PROJECT NAME** DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
 SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.  
**CLIENT** MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
**CONSULTANT** JAPAN TECHNO CO., LTD.  
**CONTRACTOR** SIAM TONE CO., LTD.  
**SUBCONTRACTOR** SIAM TONE CO., LTD.

Well No. H-9A  
 Location : B. May Phattana  
 Operator : Somsry  
 Date 2 / 2 / 2000  
 Rig No. : Top-500

Water Level (Before start) : m  
 (After stop) : m

Drill Bit dia From 55.50 to 67.50 m( 165 ) mm  
 From - to - m( - ) mm

Reference level : ground surface

Time		Depth		Drill. rate	Formation Description	Sample No.	Method	Remark	
From hr:min	To hr:min	From m	To m						min/m
12:23	12:30	55.50	57.00	5	Tuff, reddish brown, quartz mottled, moderately hard	38	DTH		
12:30	12:53	57.00	58.50	15		39	DTH		
12:53	13:20	58.50	60.00	15		40	DTH		
13:20	13:40	60.00	61.50	13		41	DTH		
13:55	14:02	61.50	63.00	5		42	DTH		
14:02	14:12	63.00	64.50	7		43	DTH		
14:12	14:19	64.50	66.00	5		44	DTH		
14:19	14:43	66.00	67.50	16		45	DTH		

Recorded by Viengkhone

Verified by Taweesak

# WELL DIARY

PROJECT NAME	DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.		
CLIENT	MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC		
CONSULTANT	JAPAN TECHNO CO., LTD.		
CONTRACTOR	SIAM TONE CO., LTD.		
Well No. : H-9B	Operator	Somsry	
Location : B. May Phattana	Assistants(1)	Lampin	
Rig No. : Top-500	(2)	Done keaw	
Date	Time	Description	
16/2/2000	9:15-10:10	Mobilization to H-9B (B. May Phattana)	
	10:10-10:40	Set up drilling machine.	
	13:10-16:15	Rotary drilling dia 311 mm. for installation surface casing	
17/2/2000	16:07-18:30	from 0.00 m. to 8.00 m.	
18/2/2000	9:50-12:55	Rotary drilling dia 216 mm. form 8.00 m to 24.00 m	
23/2/2000	11:35-19:40	Rotary drilling dia 216 mm. form 24.00 m to 39.00 m	
24/2/2000	7:20-15:55	Rotary drilling dia 216 mm. form 39.00 m to 47.00 m	
26/2/2000	7:30-9:15	Drilling depth measurement 47.00 m	
	10:00-10:50	Geophysical logging test	
	10:50-11:20	PVC pipes arrangement	
	11:20-12:00	PVC pipes installation	
		Casing 6" 3.95 m x 8 pcs = 31.60 m.	
		Screen 6" 3.95 m x 4 pcs = 15.80 m.	
		Total : 47.40 m.	
		PVC Balance 2.00 m.	
		Well depth 45.40 m.	
	14:00-14:50	Gravel pack from 45.40 m upto 10.75 m ~ 510 litre	
	14:50-15:50	Well development by air lifting .	
	15:50-16:20	Bentonite seal from 10.75 m upto 9.75 m ~ 15 litre	
27/2/2000	7:00-14:00	Well development by air lifting, estimate water volume 30 l/min.	
		conductivity 688 us, and water level 1.50 m	
	14:00-14:30	Back fill by drilled cutting from 9.75 m. upto 3.00 m ~ 140 litre.	
	14:30-15:10	Cement seal from 3.00 m upto ground surface, used cement 4 bags.	
		Mixing ratio 1.5 : 1 by weight ~ 344 litre.	
27/2/2000		Step draw-down test	
28/2/2000		Continuous pumping test and recovery test	
29/2/2000		Platform construction	
1/3/2000		Hand pump installation	
Reported by			
Name	Viengkhone		
Company	Siam Tone Co., Ltd.		



# Drilling Record

PROJECT NAME DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.

CLIENT MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

CONSULTANT JAPAN TECHNO CO., LTD.

CONTRACTOR SIAM TONE CO., LTD.

SUBCONTRACTOR SIAM TONE CO., LTD.

Well No. H-9B Water Level (Before start) : m  
Location : B. May Phattana (After stop) : m  
Operator : Somsry Drill Bit dia From 6.00 to 8.00 m( 311 ) mm  
Date 17 / 2 / 2000 From - to - m( - ) mm  
Rig No. : Top-500 Reference level : ground surface

Time		Depth		Drill. rate	Formation Description	Sample No.	Method	Remark
From	To	From	To					
16:07	17:00	6.00	7.50	35	Sand, reddish brown,	5	Rotary	
17:00	18:30	7.50	8.00	60	fine grain, weathered tuff	-	Rotary	

Recorded by Viengkhone Verified by Taweesak



# Drilling Record

<b>PROJECT NAME</b>		DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.							
<b>CLIENT</b>		MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC							
<b>CONSULTANT</b>		JAPAN TECHNO CO., LTD.							
<b>CONTRACTOR</b>		SIAM TONE CO., LTD.							
<b>SUBCONTRACTOR</b>		SIAM TONE CO., LTD.							
Well No. H-9B				Water Level (Before start) :					m
Location : B. May Phattana				(After stop) :					m
Operator : Somsy				Drill Bit dia From 8.00 to 24.00 m( 216 ) mm					
Date 18 / 2 / 2000				From - to - m( - ) mm					
Rig No. : Top-500				Reference level : ground surface					
Time		Depth		Drill. rate	Formation  Description	Sample  No.	Method	Remark	
From	To	From	To						min/m
hr:min	hr:min	m	m						
9:50	9:55	8.00	9.00	3	Tuff, reddish brown, quartz mottled, moderately weak	6	Rotary		
9:55	10:02	9.00	10.50	5		7	Rotary		
10:02	10:08	10.50	12.00	4		8	Rotary		
10:19	10:35	12.00	13.50	11		9	Rotary		
10:35	10:50	13.50	15.00	10		10	Rotary		
10:50	11:05	15.00	16.50	10		11	Rotary		
11:05	11:25	16.50	18.00	13		12	Rotary		
11:43	11:53	18.00	19.50	7		13	Rotary		
11:53	12:04	19.50	21.00	7		14	Rotary		
12:04	12:35	21.00	22.50	21		15	Rotary		
12:35	12:55	22.50	24.00	13		16	Rotary		
Recorded by Viengkhone						Verified by Taweesak			

## Drilling Record

**PROJECT NAME** DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
 SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.  
**CLIENT** MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
**CONSULTANT** JAPAN TECHNO CO., LTD.  
**CONTRACTOR** SIAM TONE CO., LTD.  
**SUBCONTRACTOR** SIAM TONE CO., LTD.

Well No. H-9B  
 Location : B. May Phattana  
 Operator : Somsry  
 Date 23 / 2 / 2000  
 Rig No. : Top-500

Water Level (Before start) : \_\_\_\_\_ m  
 (After stop) : \_\_\_\_\_ m  
 Drill Bit dia From 24.00 to 39.00 m ( 216 ) mm  
 From - to - m ( - ) mm  
 Reference level : ground surface

Time		Depth		Drill. rate	Formation Description	Sample No.	Method	Remark
From hr:min	To hr:min	From m	To m					
11:35	11:42	24.00	25.50	5	Tuff, reddish brown,	17	Rotary	
11:42	12:00	25.50	27.00	12	quartz mottled,	18	Rotary	
12:00	12:18	27.00	28.50	12	moderately weak	19	Rotary	
12:18	14:14	28.50	30.00	77	Tuff, reddish brown,	20	Rotary	
14:30	15:25	30.00	31.50	37	quartz mottled,	21	Rotary	
15:25	16:42	31.50	33.00	51	hard	22	Rotary	
16:42	17:27	33.00	34.50	30		23	Rotary	
17:27	18:08	34.50	36.00	27	Tuff, reddish brown,	24	Rotary	
18:20	18:43	36.00	37.50	15	quartz mottled,	25	Rotary	
18:43	19:40	37.50	39.00	38	moderately hard	26	Rotary	

Recorded by Viengkhone \_\_\_\_\_ Verified by Taweesak \_\_\_\_\_

# Drilling Record

**PROJECT NAME** DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
 SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.  
**CLIENT** MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
**CONSULTANT** JAPAN TECHNO CO., LTD.  
**CONTRACTOR** SIAM TONE CO., LTD.  
**SUBCONTRACTOR** SIAM TONE CO., LTD.

Well No. H-9B  
 Location : B. May Phattana  
 Operator : Somsry  
 Date 24 / 2 / 2000  
 Rig No. : Top-500

Water Level (Before start) : \_\_\_\_\_ m  
 (After stop) : \_\_\_\_\_ m  
 Drill Bit dia From 39.00 to 47.00 m ( 216 ) mm  
 From - to - m ( - ) mm  
 Reference level : ground surface

Time		Depth		Drill. rate	Formation Description	Sample No.	Method	Remark
From hr:min	To hr:min	From m	To m					
7:20	9:10	39.00	40.50	73	Tuff, reddish brown, quartz mottled, very hard	27	Rotary	
9:10	10:45	40.50	42.00	63		28	Rotary	
11:08	12:00	42.00	43.50	35		29	Rotary	
12:00	13:40	43.50	45.00	67		30	Rotary	
13:40	15:00	45.00	46.50	53		31	Rotary	
15:00	15:55	46.50	47.00	37		32	Rotary	

Recorded by Viengkhone
Verified by Taweesak

## LOGGING DATA

Well No. H-9B			reference level		ground surface		
Location B. May Phattana			Water level		12.20 m		
Test by Viengkhone			Type of drilling method		Rotary		
Date 26/2/2000			Bore hole diameter		8 1/2" (216 mm)		
Depth	Resistivity						SP
	Long Normal			Short Normal			mV
m	ohm	k	ohm-m	ohm	k	ohm-m	
5		18.85			6.25		
6							
7							
8							
9							
10							
11							
12							
13							
14							
15	2.6		49.01	3.9		24.38	-118
16	2.8		52.78	5		31.25	-119
17	3.2		60.32	4.8		30.00	-120
18	3.2		60.32	5.9		36.88	-122
19	3.5		65.98	5		31.25	-122
20	3.9		73.52	6.1		38.13	-123
21	3.6		67.86	5.4		33.75	-117
22	3.7		69.75	6.8		42.50	-117
23	4.1		77.29	6.2		38.75	-118
24	4.2		79.17	6		37.50	-118
25	4.3		81.06	6.7		41.88	-119
26	3.5		65.98	4.3		26.88	-119
27	3.3		62.21	5		31.25	-120
28	5.5		103.68	11		68.75	-122
29	9.5		179.08	13		81.25	-119
30	8		150.80	10		62.50	-109
31	6		113.10	8		50.00	-110
32	4.7		88.60	6.2		38.75	-112
33	2.3		43.36	2.5		15.63	-111
34	2.3		43.36	2.6		16.25	-102
35	2.7		50.90	4.2		26.25	-103
36	4.4		82.94	9.2		57.50	-103
37	9.5		179.08	14.5		90.63	-103
38	10		188.50	15		93.75	-105
39	8		150.80	10		62.50	-106
40	8.5		160.23	13		81.25	-106
41	12		226.20	11.5		71.88	-107
42	9.5		179.08	10		62.50	-109
43	11		207.35	13.5		84.38	-112
44	39		735.15	13.5		84.38	-116
45	44		829.40	13		81.25	-104
46							
47							
48							
49							
50							
51							

Recorded by Viengkhone

Verified by Taweesak

file: (DNW)Log.

**WELL DIARY**

PROJECT NAME	DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.		
CLIENT	MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC		
CONSULTANT	JAPAN TECHNO CO., LTD.		
CONTRACTOR	SIAM TONE CO., LTD.		
Well No. :	H-37	Operator	Somsry
Location :	B. Leang	Assistants(1)	Lampin
Rig No. :	Top-500	(2)	Done keaw
Date	Time	Description	
18/1/2000	12:00-14:00	Mobilization to H-37 (B. Leang)	
	14:00-14:45	Set up drilling machine.	
	14:45-16:55	Rotary drilling dia 311 mm. for installation surface casing from 0.00 m. to 3.00 m.	
19/1/2000	7:27-16:00	DTH drilling dia 216 mm. form 3.00 m to 25.50 m (Hole collapse drill bit lock at 22.00 m)	
23/1/2000	9:30-20:00	Rotary drilling dia 311 mm. for installation surface casing from 3.00 m to 13.00 m	
24/1/2000	17:58-19:15	Rotary drilling dia 216 mm. used polymer from 25.50 m to 31.50 m	
25/1/2000	8:40-18:51	Rotary drilling dia 216 mm. used polymer form 31.00 m to 60.00 m	
26/1/2000	13:10-13:15	Drilling depth measurement 60.00 m	
	13:15-14:00	Geophysical logging test	
	14:00-14:25	PVC pipes arrangement	
	14:25-16:20	PVC pipes installation	
		Casing 6" 3.95 m x 9 pcs = 35.50 m.	
		Screen 6" 3.95 m x 5 pcs = 19.75 m.	
		Total : 55.30 m.	
		PVC Balance 0.30 m.	
		Well depth 55.00 m.	
	16:20-18:40	Gravel pack from 55.00 m upto 17.40 m ~ 700 litre	
27/1/2000	8:40-17:05	Well development by air lifting .	
	17:05-18:10	Bentonite seal from 17.40 m upto 16.40 m ~ 15 litre	
28/1/2000	8:10-14:20	Well development by air lifting, estimate water volume 7 l/min. conductivity 465 us, and water level 7.50 m	
	14:20-16:00	Back fill by drilled cutting from 16.40 m. upto 3.00 m ~ 378 litre.	
31/1/2000	7:50-9:40	Cement seal from 3.00 m upto ground surface, used cement 4 bags. Mixing ratio 1.5 : 1 by weight ~ 344 litre.	
4/2/2000		Step draw-down test	
5/2/2000		Continuous pumping test and recovery test	
1/3/2000		Platform construction	
2/3/2000		Hand pump installation	
Reported by			
Name	Viengkhone		
Company	Siam Tone Co., Ltd.		

file: Welldia.N-W

# Drilling Record

**PROJECT NAME** DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.

**CLIENT** MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

**CONSULTANT** JAPAN TECHNO CO., LTD.

**CONTRACTOR** SIAM TONE CO., LTD.

**SUBCONTRACTOR** SIAM TONE CO., LTD.

Well No. H-37	Water Level (Before start) : m
Location : B. Leang	(After stop) : m
Operator : Somsry	Drill Bit dia From 0.00 to 3.00 m( 311 ) mm
Date 18 / 1 / 2000	From - to - m( - ) mm
Rig No. : Top-500	Reference level : ground surface

Time		Depth		Drill. rate	Formation Description	Sample No.	Method	Remark
From	To	From	To					
hr:min	hr:min	m	m					
14:45	15:20	0.00	1.50	23	Clayey sand, light yellowish	1	Rotary	
15:20	16:55	1.50	3.00	63	brown, fine to medium grain	2	Rotary	

Recorded by Viengkhone Verified by Taweesak

## Drilling Record

**PROJECT NAME**      DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
                                  SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.  
**CLIENT**                  MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
**CONSULTANT**              JAPAN TECHNO CO., LTD.  
**CONTRACTOR**             SIAM TONE CO., LTD.  
**SUBCONTRACTOR**        SIAM TONE CO., LTD.

Well No. H-37      Water Level (Before start) : \_\_\_\_\_ m  
 Location : B. Leang      (After stop) : \_\_\_\_\_ m  
 Operator : Somsry      Drill Bit dia From 3.00 to 25.00 m( 216 ) mm  
 Date 19 / 1 / 2000      From - to - m( - ) mm  
 Rig No. : Top-500      Reference level : ground surface

Time		Depth		Drill. rate min/m	Formation Description	Sample No.	Method	Remark	
From hr:min	To hr:min	From m	To m						
7:27	7:40	3.00	4.50	9	Weathered Tuff, brown, weak	3	DTH		
7:40	8:45	4.50	6.00	3		4	DTH		
8:45	9:05	6.00	7.50	13		5	DTH		
10:09	10:12	7.50	9.00	2		6	DTH		
10:12	10:15	9.00	10.50	2		7	DTH		
10:15	10:19	10.50	12.00	3		8	DTH		
10:19	10:40	12.00	13.50	14	Mudstone, grayish brown, moderately weak	9	DTH		
11:06	11:10	13.50	15.00	3		10	DTH		
11:10	11:16	15.00	16.50	4		11	DTH		
11:16	11:21	16.50	18.00	3		12	DTH		
11:21	11:27	18.00	19.50	4		13	DTH		
11:51	11:55	19.50	21.00	3		14	DTH		
11:55	12:05	21.00	22.50	7		15	DTH		
12:05	12:30	22.50	24.00	17		Clayey sand, brown, fine to medium grain	16	DTH	
12:30	16:00	24.00	25.50	20			17	DTH	

Recorded by Viengkhone Verified by Taweesak







## DRILLING RECORD

PROJECT NAME		DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH-WEST REGION, LAO P.D.R.						
CLIENT		MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC						
CONSULTANT		JAPAN TECHNO CO., LTD.						
CONTRACTOR		SIAM TONE CO., LTD.						
SUBCONTRACTOR		SIAM TONE CO., LTD.						
Well No. H-37					Water Level (Before start) : _____ m			
Location : B. Leang					(After stop) : _____ m			
Operator : Somsry					Drill Bit dia From 31.50 to 60.00 m( 216 ) mm			
Date 25 / 1 / 2000					From - to - m( - ) mm			
Rig No. : Top-500					Reference level : ground surface			
Time		Depth		Drill. rate	Formation	Sample	Method	Remark
From	To	From	To					
hr:min	hr:min	m	m	min/m	Description	No.		
8:40	9:10	31.50	33.00	33	Mudstone, light gray, moderately hard	22	Rotary use	polymer
9:10	9:26	33.00	34.50	11		23	Rotary use	polymer
9:26	9:52	34.50	36.00	17		24	Rotary use	polymer
9:52	10:07	36.00	37.50	10		25	Rotary use	polymer
10:28	10:40	37.50	39.00	8		26	Rotary use	polymer
10:40	10:57	39.00	40.50	11		27	Rotary use	polymer
10:57	11:20	40.50	42.00	15		28	Rotary use	polymer
11:20	11:45	42.00	43.50	17		29	Rotary use	polymer
12:07	12:22	43.50	45.00	10		30	Rotary use	polymer
12:22	12:47	45.00	46.50	17		31	Rotary use	polymer
12:47	13:20	46.50	48.00	22		32	Rotary use	polymer
13:20	13:52	48.00	49.50	21		33	Rotary use	polymer
14:15	14:40	49.50	51.00	17		34	Rotary use	polymer
14:40	15:08	51.00	52.50	19		35	Rotary use	polymer
15:08	15:45	52.50	54.00	25	Mudstone, light gray and greenish gray some alternated with reddish brown, hard	36	Rotary use	polymer
15:45	16:43	54.00	55.50	39		37	Rotary use	polymer
17:02	17:32	55.50	57.00	20		38	Rotary use	polymer
17:32	18:13	57.00	58.50	27		39	Rotary use	polymer
18:13	18:51	58.50	60.00	25		40	Rotary use	polymer
Recorded by Viengkhone					Verified by Taweesak			

APPENDIX C

PUMPING TEST DATA AND ANALYSIS

## CONTINUOUS PUMPING TEST

**PROJECT NAME :** DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
**SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.**  
**CLIENT :** MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
**CONSULTANT :** JAPAN TECHNO CO.,LTD.  
**CONTRACTO :** SIAM TONE CO.,LTD.

Well No. : H-3 1/2	Static Water level (m.) : 6.65
Location : Ban. Nam Ngao	Dynamic Water level (m.) : 6.93
Test by : Viengkhone	Well Depth (m.) : 8.00
Date : 08/02/00	Screen Depth (m.) : -

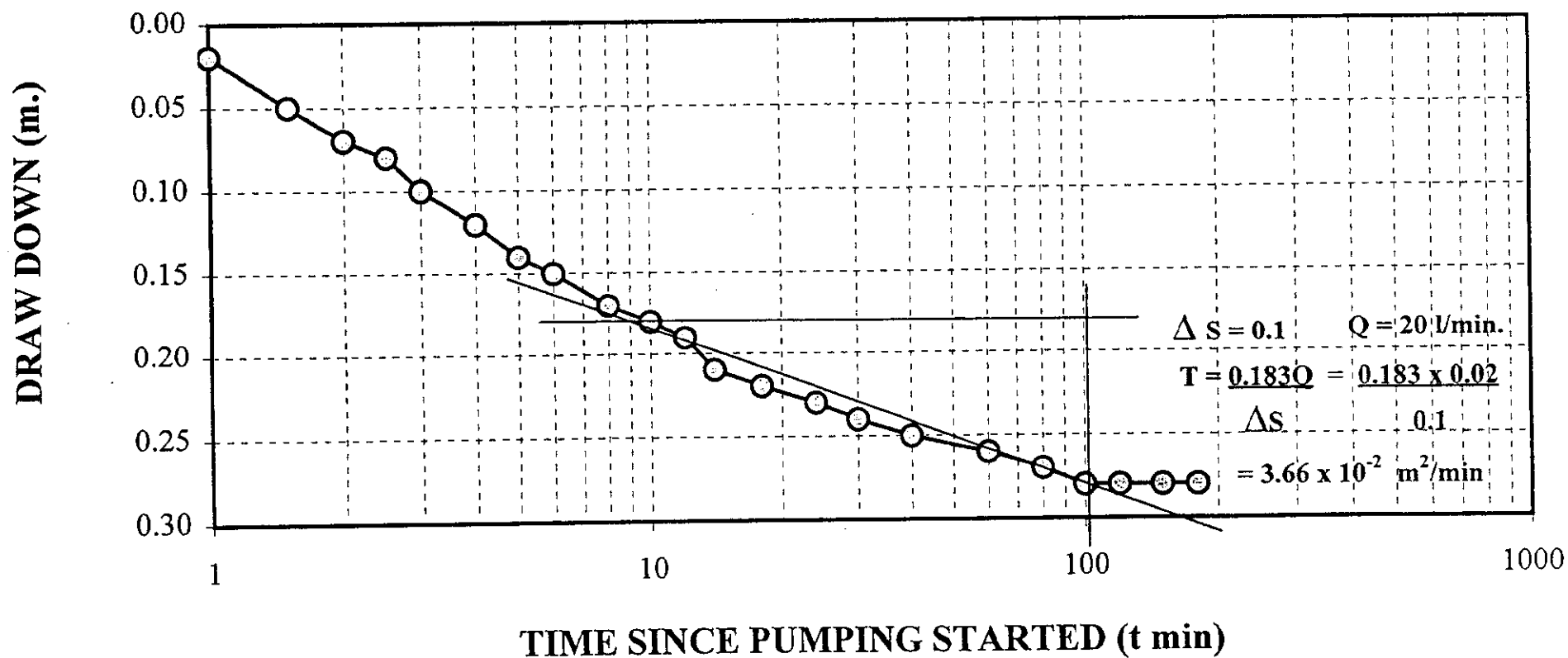
Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	6.67	0.02	20	210			
1.5	6.70	0.05	20	240			
2	6.72	0.07	20	300			
2.5	6.73	0.08	20	360			
3	6.75	0.10	20	420			
4	6.77	0.12	20	480			
5	6.79	0.14	20	540			
6	6.80	0.15	20	600			
8	6.82	0.17	20	660			
10	6.83	0.18	20	720			
12	6.84	0.19	20	780			
14	6.86	0.21	20	840			
18	6.87	0.22	20	900			
24	6.88	0.23	20	960			
30	6.89	0.24	20	1020			
40	6.90	0.25	20	1080			
60	6.91	0.26	20	1140			
80	6.92	0.27	20	1200			
100	6.93	0.28	20	1260			
120	6.93	0.28	20	1320			
150	6.93	0.28	20	1380			
180	6.93	0.28	20	1440			

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

# CONTINUOUS PUMPING TEST

WELL NO. H-3 1/2 (BAN NAM NGAO)

D4-117



## RECOVERY TEST

**PROJECT NAME :** DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
 SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.  
**CLIENT :** MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
**CONSULTANT :** JAPAN TECHNO CO.,LTD.  
**CONTRACTOR :** SIAM TONE CO.,LTD.

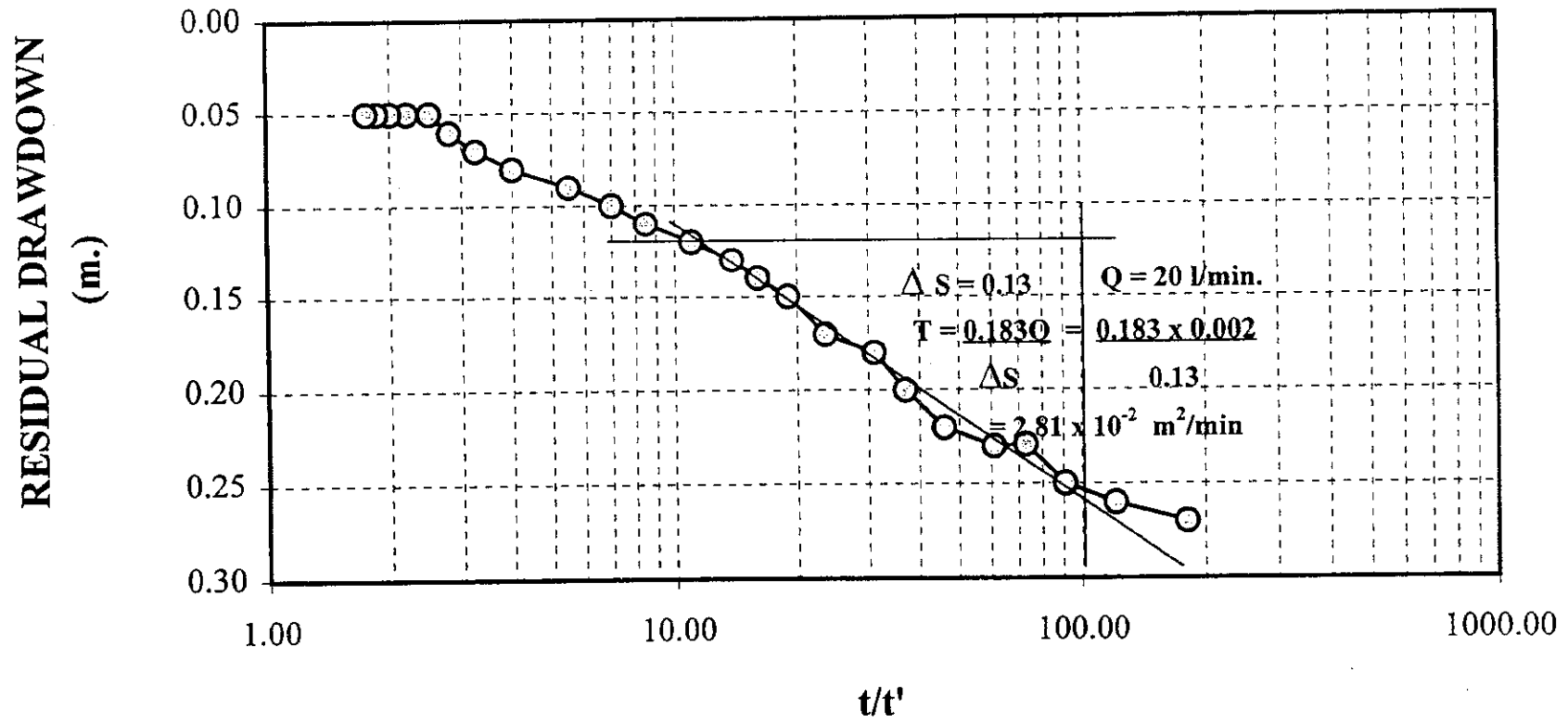
Well No. :	H-3 1/2	Static Water level (m.)	6.65
Location :	Ban. Nam Ngao	Dynamic Water level (m.)	6.93
Test by :	Viengkhone	Well Depth (m.)	8.00
Date :	08/02/00	Screen Depth (m.)	-

Time Since Pumping Started t, min	Time Since Pumping Stopped t, min	t/t'	Depth to Water Level m	Draw down m	Discharge Rate l/min
181	1	181.00	6.92	0.27	20
181.5	1.5	121.00	6.91	0.26	
182	2	91.00	6.90	0.25	
182.5	2.5	73.00	6.88	0.23	
183	3	61.00	6.88	0.23	
184	4	46.00	6.87	0.22	
185	5	37.00	6.85	0.20	
186	6	31.00	6.83	0.18	
188	8	23.50	6.82	0.17	
190	10	19.00	6.80	0.15	
192	12	16.00	6.79	0.14	
194	14	13.86	6.78	0.13	
198	18	11.00	6.77	0.12	
204	24	8.50	6.76	0.11	
210	30	7.00	6.75	0.10	
220	40	5.50	6.74	0.09	
240	60	4.00	6.73	0.08	
260	80	3.25	6.72	0.07	
280	100	2.80	6.71	0.06	
300	120	2.50	6.70	0.05	
330	150	2.20	6.70	0.05	
360	180	2.00	6.70	0.05	
390	210	1.86	6.70	0.05	
420	240	1.75	6.70	0.05	
	300				
	360				
	420				
	480				
	540				
	600				
	660				
	720				

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

# RECOVERY TEST

## WELL NO. H-3 1/2 (BAN NAM NGAO)



## CONTINUOUS PUMPING TEST

**PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.**  
**CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC**  
**CONSULTANT : JAPAN TECHNO CO.,LTD.**  
**CONTRACTOR : SIAM TONE CO.,LTD.**

Well No. : H-3 2/2 B	Static Water level (m.) : 6.41
Location : Ban. Nam Ngao	Dynamic Water level (m.) : 6.41
Test by : Viengkhone	Well Depth (m.) : 9.00
Date : 09/02/00	Screen Depth (m.) : -

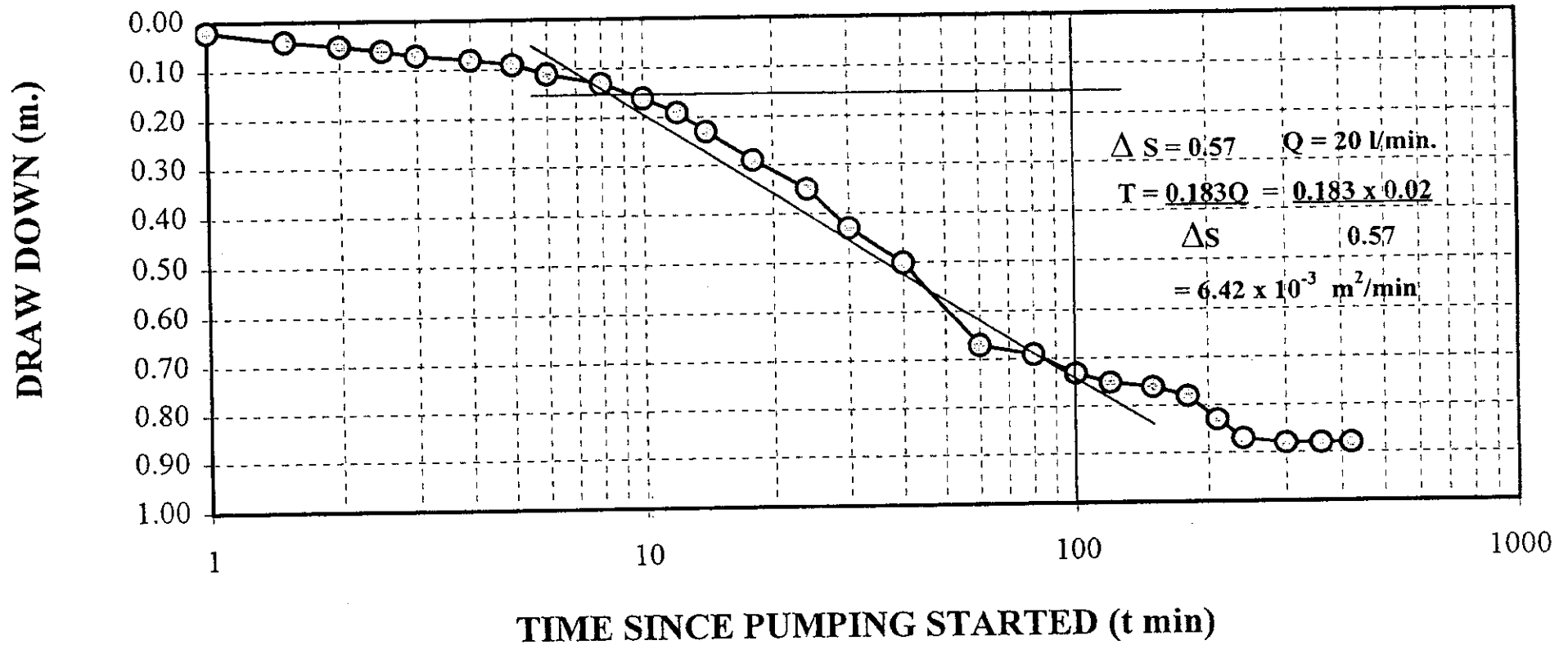
Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	6.43	0.02	20	210	7.24	0.83	20
1.5	6.45	0.04	20	240	7.28	0.87	20
2	6.46	0.05	20	300	7.29	0.88	20
2.5	6.47	0.06	20	360	7.29	0.88	20
3	6.48	0.07	20	420	7.29	0.88	20
4	6.49	0.08	20	480			
5	6.50	0.09	20	540			
6	6.52	0.11	20	600			
8	6.54	0.13	20	660			
10	6.57	0.16	20	720			
12	6.60	0.19	20	780			
14	6.64	0.23	20	840			
18	6.70	0.29	20	900			
24	6.76	0.35	20	960			
30	6.84	0.43	20	1020			
40	6.91	0.50	20	1080			
60	7.08	0.67	20	1140			
80	7.10	0.69	20	1200			
100	7.14	0.73	20	1260			
120	7.16	0.75	20	1320			
150	7.17	0.76	20	1380			
180	7.19	0.78	20	1440			

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak



# CONTINUOUS PUMPING TEST

## WELL NO. H-3 2/2 B (BAN NAM NGAO)



D4-121

## RECOVERY TEST

**PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.**  
**CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC**  
**CONSULTANT : JAPAN TECHNO CO.,LTD.**  
**CONTRACTOR : SIAM TONE CO.,LTD.**

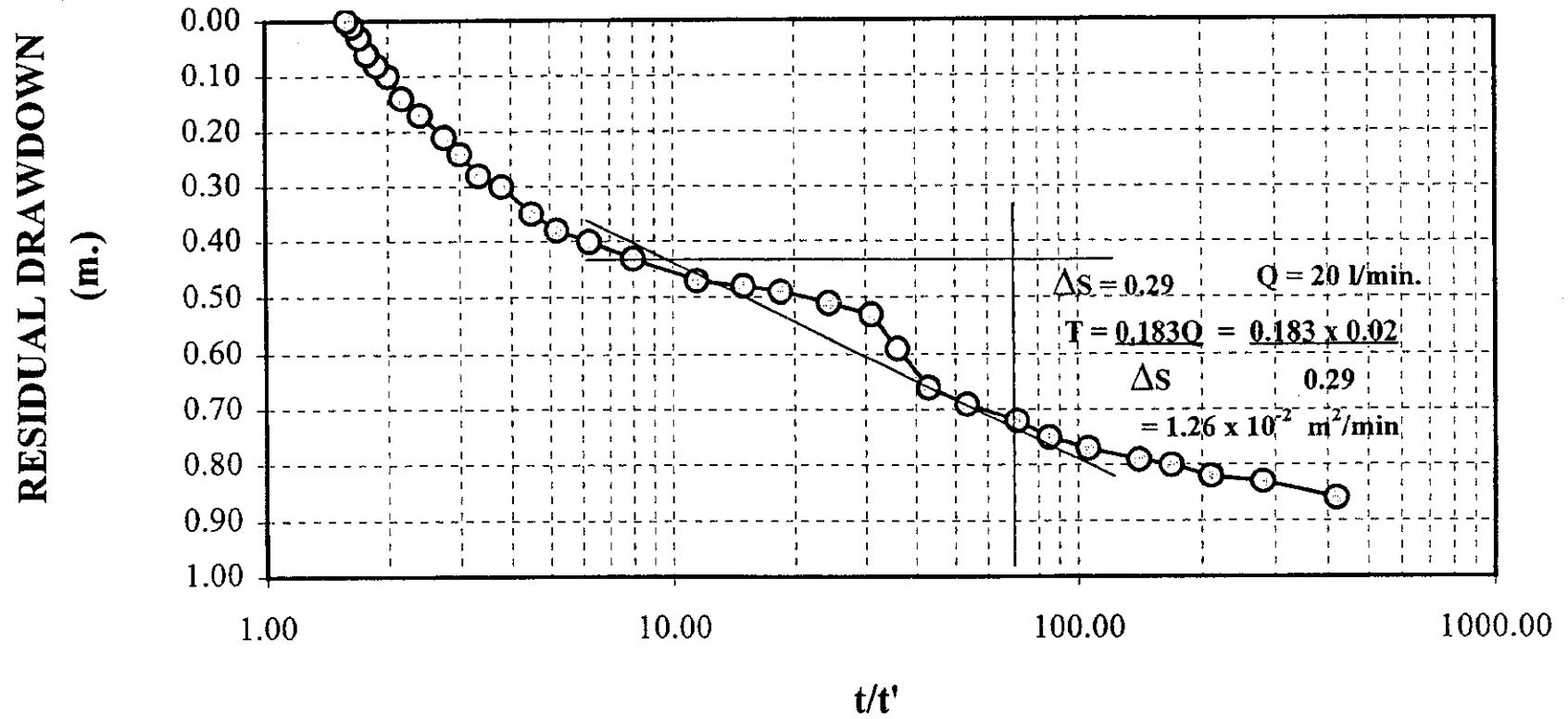
Well No. :	H-3 2/2 B	Static Water level (m.)	6.41
Location :	Ban. Nam Ngao	Dynamic Water level (m.)	7.29
Test by :	Viengkhone	Well Depth (m.)	9.00
Date :	09/02/00	Screen Depth (m.)	-

Time Since Pumping Started t min	Time Since Pumping Stopped t' min	v/t'	Depth to Water Level m	Draw down m	Discharge Rate l/min
421	1	421.00	7.27	0.86	7
421.5	1.5	281.00	7.24	0.83	
422	2	211.00	7.23	0.82	
422.5	2.5	169.00	7.21	0.80	
423	3	141.00	7.20	0.79	
424	4	106.00	7.18	0.77	
425	5	85.00	7.16	0.75	
426	6	71.00	7.13	0.72	
428	8	53.50	7.10	0.69	
430	10	43.00	7.07	0.66	
432	12	36.00	7.00	0.59	
434	14	31.00	6.94	0.53	
438	18	24.33	6.92	0.51	
444	24	18.50	6.90	0.49	
450	30	15.00	6.89	0.48	
460	40	11.50	6.88	0.47	
480	60	8.00	6.84	0.43	
500	80	6.25	6.81	0.40	
520	100	5.20	6.79	0.38	
540	120	4.50	6.76	0.35	
570	150	3.80	6.71	0.30	
600	180	3.33	6.69	0.28	
630	210	3.00	6.65	0.24	
660	240	2.75	6.62	0.21	
720	300	2.40	6.58	0.17	
780	360	2.17	6.55	0.14	
840	420	2.00	6.51	0.10	
900	480	1.88	6.49	0.08	
960	540	1.78	6.47	0.06	
1020	600	1.70	6.44	0.03	
1080	660	1.64	6.42	0.01	
1140	720	1.58	6.41	0.00	

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

# RECOVERY TEST

WELL NO. H-3 2/2 B (BAN NAM NGAO)



## STEP DRAWDOWN TEST

<b>PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.</b>							
<b>CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC</b>							
<b>CONSULTANT : JAPAN TECHNO CO.,LTD.</b>							
<b>CONTRACTOR : SIAM TONE CO.,LTD.</b>							
Well No. : H-9 B				Static Water level (m.) : 1.50			
Location : B. May Phattana				Dynamic Water level (m.) :			
Test by : Viengkhone				Well Depth (m.) : 45.50			
Date : 27/02/00				Screen Depth (m.) : 16.75-24.65, 28.60-32.55, 36.50-40.45			
Step No. 1				Step No. 2			
Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	2.00	0.50	10	1	4.15	2.65	12
1.5	2.54	1.04	10	1.5	4.36	2.86	12
2	2.65	1.15	10	2	4.45	2.95	12
2.5	2.73	1.23	10	2.5	4.52	3.02	12
3	2.79	1.29	10	3	4.58	3.08	12
4	2.84	1.34	10	4	4.63	3.13	12
5	2.88	1.38	10	5	4.67	3.17	12
6	2.91	1.41	10	6	4.70	3.20	12
8	2.93	1.43	10	8	4.74	3.24	12
10	2.94	1.44	10	10	4.77	3.27	12
12	2.94	1.44	10	12	4.79	3.29	12
14	2.94	1.44	10	14	4.80	3.30	12
18	2.94	1.44	10	18	4.80	3.30	12
24	2.94	1.44	10	24	4.80	3.30	12
30	2.94	1.44	10	30	4.80	3.30	12
40	2.94	1.44	10	40	4.80	3.30	12
60	2.94	1.44	10	60	4.80	3.30	12
80	2.94	1.44	10	80	4.80	3.30	12
100	2.94	1.44	10	100	4.80	3.30	12
120	2.94	1.44	10	120	4.80	3.30	12

Test by Mr. Viengkhone

Recorded by Mr. Viengkhone

Verified by Mr. Taweesak

## STEP DRAWDOWN TEST

PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.							
CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC							
CONSULTANT : JAPAN TECHNO CO.,LTD.							
CONTRACTOR : SIAM TONE CO.,LTD.							
Well No. : H-9 B				Static Water level (m.) : 1.50			
Location : B. May Phattana				Dynamic Water level (m.) :			
Test by : Viengkhone				Well Depth (m.) : 45.50			
Date : 27/02/00				Screen Depth (m.) : 16.75-24.65, 28.60-32.55, 36.50-40.45			
Step No. 3				Step No. 4			
Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	6.15	4.65	15	1	9.20	7.70	18
1.5	6.48	4.98	15	1.5	9.43	7.93	18
2	6.82	5.32	15	2	9.65	8.15	18
2.5	7.15	5.65	15	2.5	9.85	8.35	18
3	7.47	5.97	15	3	10.03	8.53	18
4	7.60	6.10	15	4	10.19	8.69	18
5	7.68	6.18	15	5	10.33	8.83	18
6	7.82	6.32	15	6	10.45	8.95	18
8	7.92	6.42	15	8	10.55	9.05	18
10	8.00	6.50	15	10	10.63	9.13	18
12	8.03	6.53	15	12	10.70	9.20	18
14	8.06	6.56	15	14	10.76	9.26	18
18	8.10	6.60	15	18	10.86	9.36	18
24	8.15	6.65	15	24	10.99	9.49	18
30	8.21	6.71	15	30	11.03	9.53	18
40	8.27	6.77	15	40	11.05	9.55	18
60	8.44	6.94	15	60	11.20	9.70	18
80	8.44	6.94	15	80	11.24	9.74	18
100	8.44	6.94	15	100	11.24	9.74	18
120	8.44	6.94	15	120	11.24	9.74	18

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

## STEP DRAWDOWN TEST

PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.  
CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC  
CONSULTANT : JAPAN TECHNO CO.,LTD.  
CONTRACTOR : SIAM TONE CO.,LTD.

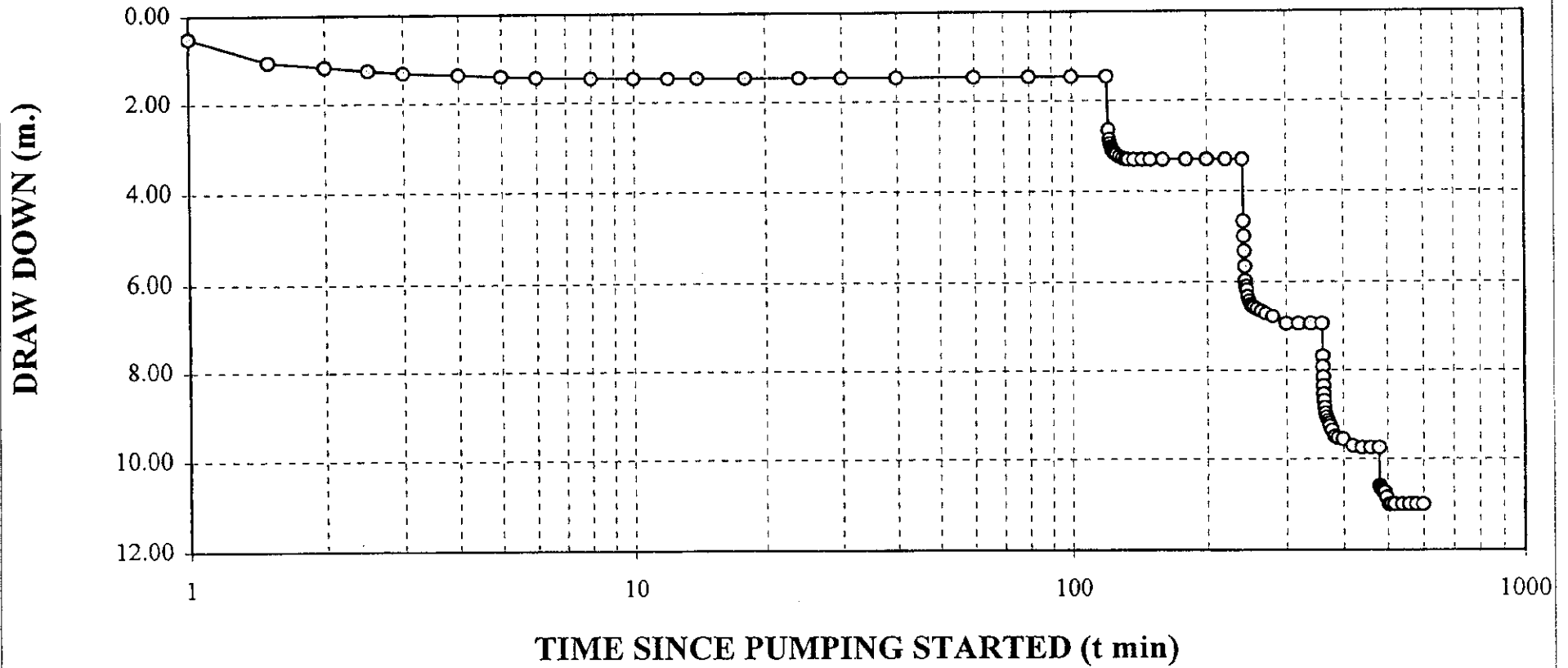
Well No. : H-9 B	Static Water level (m.) : 1.50
Location : B. May Phattana	Dynamic Water level (m.) :
Test by : Viengkhone	Well Depth (m.) : 45.50
Date : 27/02/00	Screen Depth (m.) : 16.75-24.65, 28.60-32.55, 36.50-40.45

Step No. 5							
Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	12.09	10.59	20	1			
1.5	12.10	10.60	20	1.5			
2	12.11	10.61	20	2			
2.5	12.13	10.63	20	2.5			
3	12.15	10.65	20	3			
4	12.16	10.66	20	4			
5	12.17	10.67	20	5			
6	12.19	10.69	20	6			
8	12.21	10.71	20	8			
10	12.22	10.72	20	10			
12	12.23	10.73	20	12			
14	12.25	10.75	20	14			
18	12.35	10.85	20	18			
24	12.50	11.00	20	24			
30	12.50	11.00	20	30			
40	12.50	11.00	20	40			
60	12.50	11.00	20	60			
80	12.50	11.00	20	80			
100	12.50	11.00	20	100			
120	12.50	11.00	20	120			

Test by Mr. Viengkhone  
Recorded by Mr. Viengkhone  
Verified by Mr. Taweesak

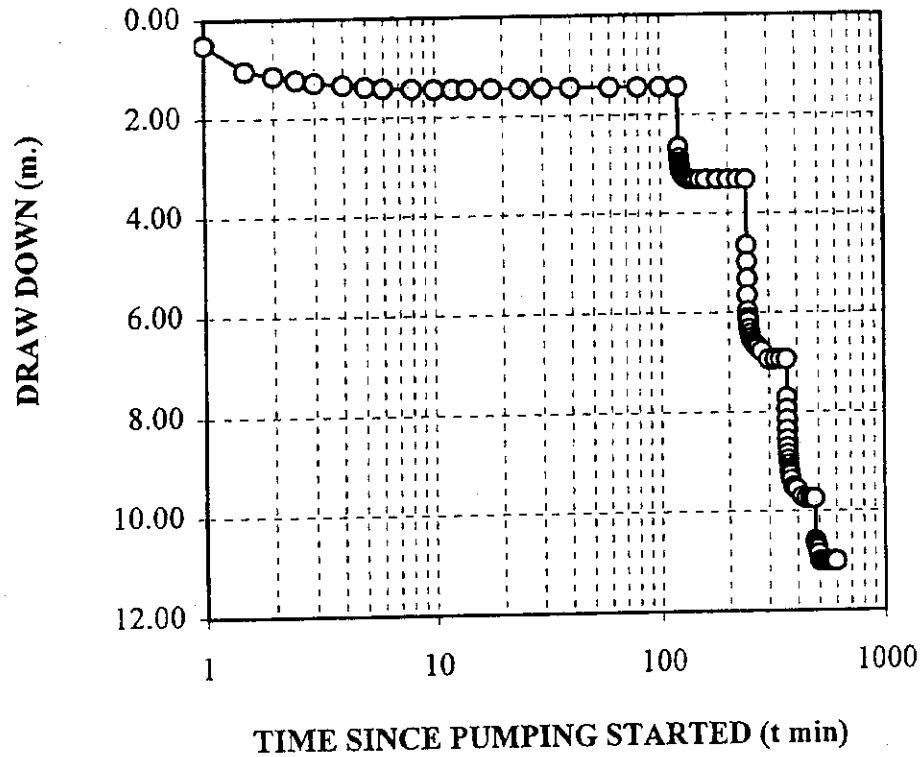
# STEP DRAWDOWN TEST

WELL NO. H-9 B (BAN MAY PHATTANA)



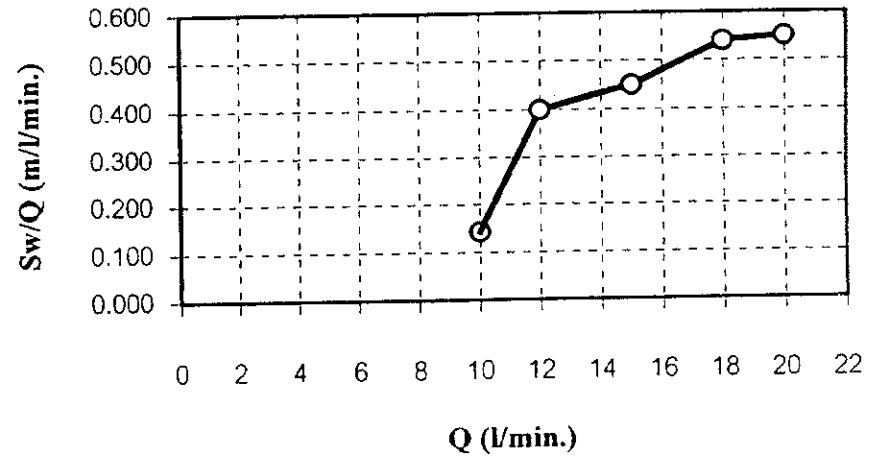
D4-127

**STEP DRAWDOWN TEST**  
**WELL NO. H-9 B (BAN MAY PHATTANA)**



**SPECIFIC CAPACITY**

Step	Q (l/min.)	Water Level (m.)	Draw Down (m.)	Sw/Q (m/l/min.)	Q/Sw (l/min/m.)
1	10	1.50	1.44	0.144	6.940
2	12	1.50	4.80	0.400	2.500
3	15	1.50	6.94	0.450	2.160
4	18	1.50	9.74	0.540	1.840
5	20	1.50	11.00	0.550	1.810





## CONTINUOUS PUMPING TEST

**PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.**  
**CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC**  
**CONSULTANT : JAPAN TECHNO CO.,LTD.**  
**CONTRACTOR : SIAM TONE CO.,LTD.**

Well No. : H-9 B	Static Water level (m.) : 1.50
Location : Ban. May Phattana	Dynamic Water level (m.) : 10.50
Test by : Viengkhone	Well Depth (m.) : 45.50
Date : 28/02/00	Screen Depth (m.) : 75.24-24.65, 28.60-32.55, 36.50-40.45

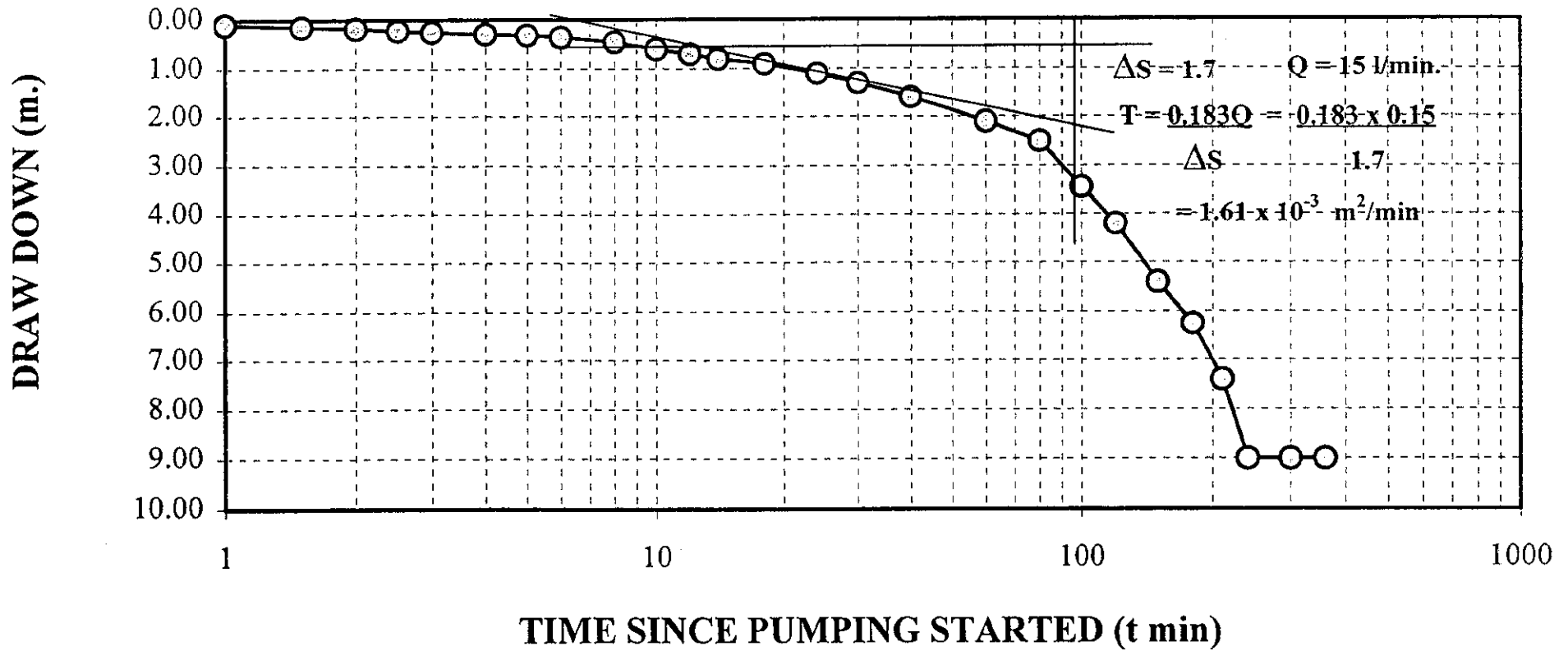
Time Since Pumping Started t: min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t: min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	1.59	0.09	15	210	8.90	7.40	15
1.5	1.64	0.14	15	240	10.50	9.00	15
2	1.68	0.18	15	300	10.50	9.00	15
2.5	1.72	0.22	15	360	10.50	9.00	15
3	1.75	0.25	15	420			
4	1.79	0.29	15	480			
5	1.81	0.31	15	540			
6	1.85	0.35	15	600			
8	1.95	0.45	15	660			
10	2.10	0.60	15	720			
12	2.20	0.70	15	780			
14	2.30	0.80	15	840			
18	2.40	0.90	15	900			
24	2.60	1.10	15	960			
30	2.80	1.30	15	1020			
40	3.10	1.60	15	1080			
60	3.60	2.10	15	1140			
80	4.00	2.50	15	1200			
100	4.95	3.45	15	1260			
120	5.70	4.20	15	1320			
150	6.90	5.40	15	1380			
180	7.75	6.25	15	1440			

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

# CONTINUOUS PUMPING TEST

## WELL NO. H-9 B (BAN MAY PHATTANA)

D4.130



## RECOVERY TEST

**PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND  
 SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.**  
**CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC**  
**CONSULTANT : JAPAN TECHNO CO.,LTD.**  
**CONTRACTOR : SIAM TONE CO.,LTD.**

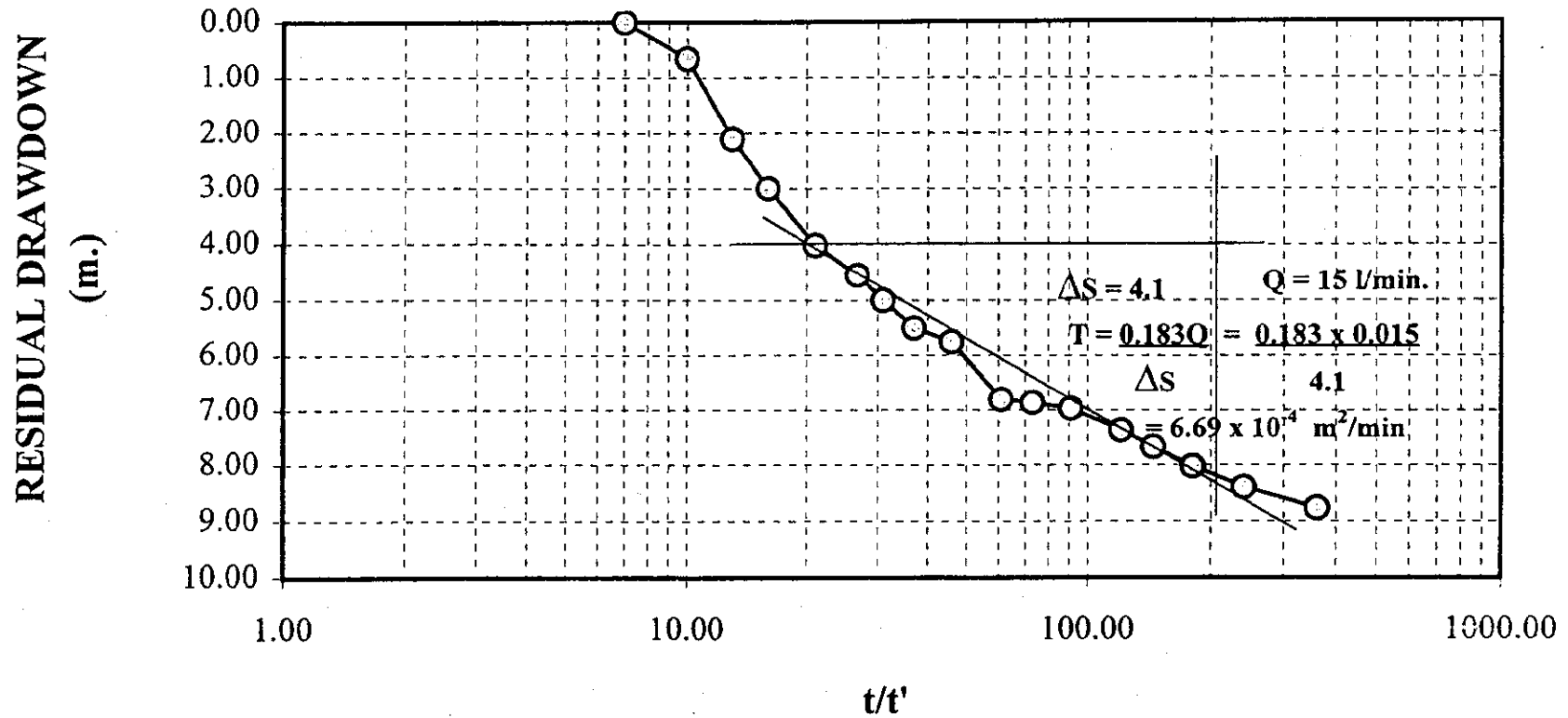
Well No. : H-9 B	Static Water level (m.) : 1.50
Location : Ban. May Phattana	Dynamic Water level (m.) : 10.50
Test by : Viengkhone	Well Depth (m.) : 45.50
Date : 28/02/00	Screen Depth (m.) : 16.75-24.65, 28.60-32.55, 36.50-40.45

Time Since Pumping Started t min	Time Since Pumping Stopped t' min	l/t'	Depth to Water Level m	Draw down m	Discharge Rate l/min
361	1	361.00	10.27	8.77	15
361.5	1.5	241.00	9.90	8.40	
362	2	181.00	9.52	8.02	
362.5	2.5	145.00	9.17	7.67	
363	3	121.00	8.87	7.37	
364	4	91.00	8.47	6.97	
365	5	73.00	8.36	6.86	
366	6	61.00	8.30	6.80	
368	8	46.00	7.25	5.75	
370	10	37.00	7.00	5.50	
372	12	31.00	6.50	5.00	
374	14	26.71	6.05	4.55	
378	18	21.00	5.51	4.01	
384	24	16.00	4.50	3.00	
390	30	13.00	3.60	2.10	
400	40	10.00	2.15	0.65	
420	60	7.00	1.50	0.00	
	80				
	100				
	120				
	150				
	180				
	210				
	240				
	300				
	360				
	420				
	480				
	540				
	600				
	660				
	720				

Test by : Mr. Viengkhone  
 Recorded by : Mr. Viengkhone  
 Verified by : Mr. Taweesak

# RECOVERY TEST

WELL NO. H-9 B (BAN MAY PHATTANA)



## STEP DRAWDOWN TEST

<b>PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.</b>							
<b>CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC</b>							
<b>CONSULTANT : JAPAN TECHNO CO.,LTD.</b>							
<b>CONTRACTO : SIAM TONE CO.,LTD.</b>							
Well No. : H-37				Static Water level (m.) : 7.50			
Location : B. Leang				Dynamic Water level (m.) :			
Test by : Viengkhone				Well Depth (m.) : 55.00			
Date : 04/02/00				Screen Depth (m.) : 23.40-31.30, 35.25-43.15, 47.10-51.05			
Step No. 1 5 l/min.				Step No. 2 7 l/min.			
Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	14.25	6.75	5	1	18.20	10.70	7
1.5	14.75	7.25	5	1.5	18.40	10.90	7
2	15.00	7.50	5	2	18.42	10.92	7
2.5	16.18	8.68	5	2.5	18.47	10.97	7
3	16.34	8.84	5	3	18.55	11.05	7
4	16.46	8.96	5	4	18.58	11.08	7
5	16.56	9.06	5	5	18.80	11.30	7
6	16.60	9.10	5	6	19.10	11.60	7
8	16.64	9.14	5	8	19.25	11.75	7
10	16.67	9.17	5	10	19.75	12.25	7
12	16.69	9.19	5	12	20.05	12.55	7
14	17.70	10.20	5	14	20.50	13.00	7
18	17.70	10.20	5	18	21.00	13.50	7
24	17.70	10.20	5	24	21.80	14.30	7
30	17.70	10.20	5	30	22.50	15.00	7
40	17.70	10.20	5	40	22.70	15.20	7
60	17.70	10.20	5	60	22.70	15.20	7
80	17.70	10.20	5	80	22.70	15.20	7
100	17.70	10.20	5	100	22.70	15.20	7
120	17.70	10.20	5	120	22.70	15.20	7

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

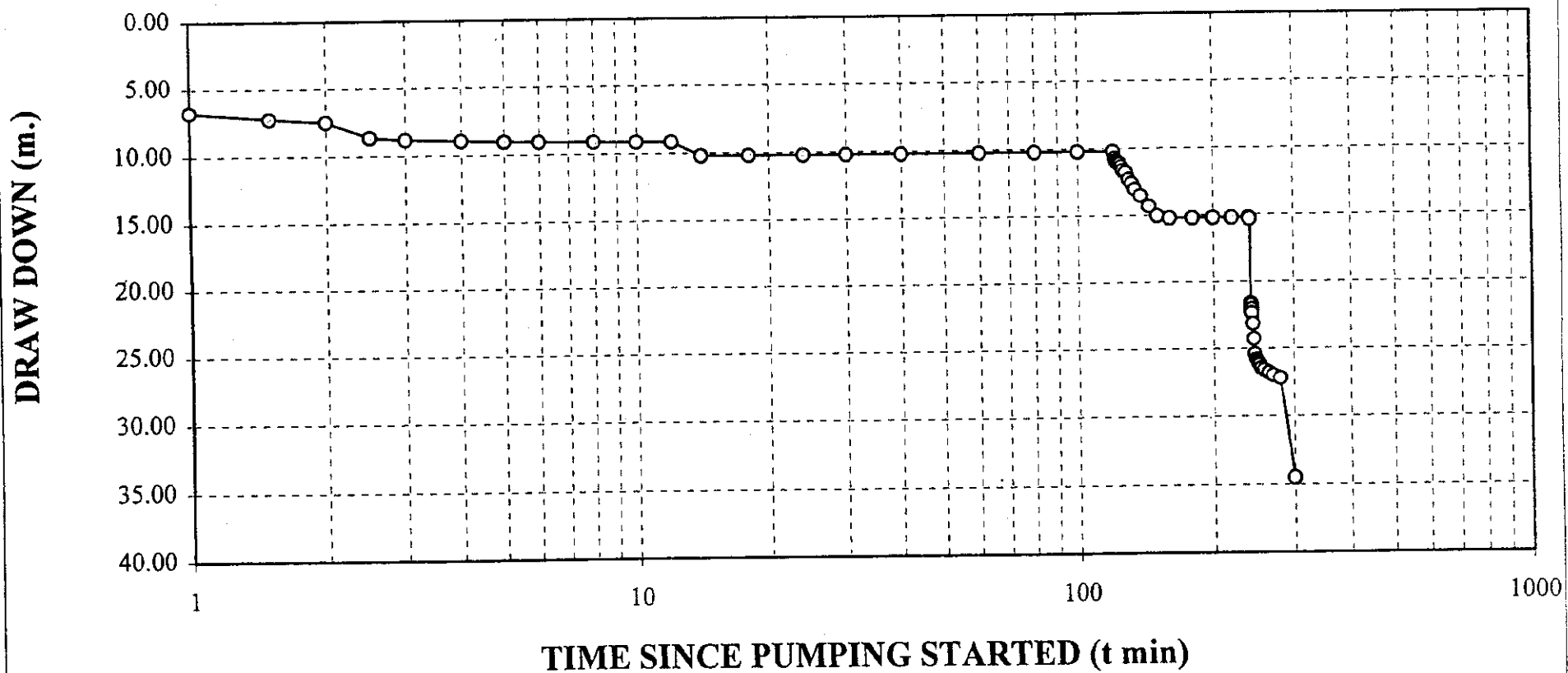
## STEP DRAWDOWN TEST

<b>PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.</b>							
<b>CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC</b>							
<b>CONSULTANT : JAPAN TECHNO CO.,LTD.</b>							
<b>CONTRACTO : SIAM TONE CO.,LTD.</b>							
Well No. : H-37				Static Water level (m.) : 7.50			
Location : B. Leang				Dynamic Water level (m.) :			
Test by : Viengkhone				Well Depth (m.) : 55.00			
Date : 04/02/00				Screen Depth (m.) : 23.40-31.30, 35.25-43.15, 47.10-51.05			
<b>Step No. 3 9 l/min.</b>							
Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	22.80	15.30	9	1			
1.5	29.10	21.60	9	1.5			
2	29.20	21.70	9	2			
2.5	29.50	22.00	9	2.5			
3	29.80	22.30	9	3			
4	30.60	23.10	9	4			
5	31.75	24.25	9	5			
6	32.90	25.40	9	6			
8	33.30	25.80	9	8			
10	33.50	26.00	9	10			
12	33.70	26.20	9	12			
14	33.95	26.45	9	14			
18	34.10	26.60	9	18			
24	34.30	26.80	9	24			
30	34.50	27.00	9	30			
40	34.70	27.20	9	40			
60	42.00	34.50	9	60			
80				80			
100				100			
120				120			

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

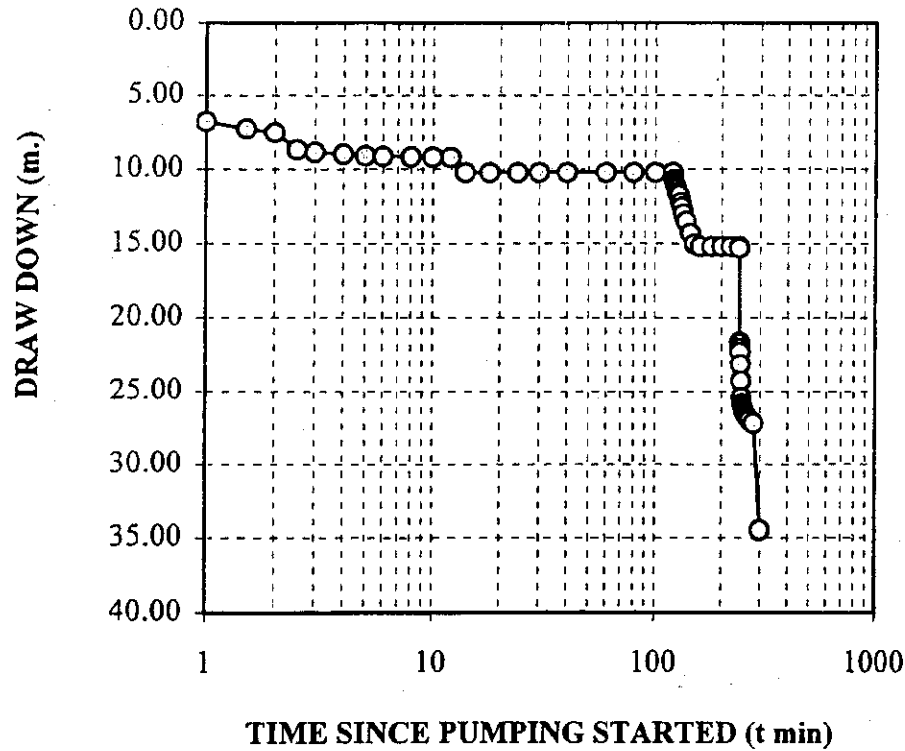
# STEP DRAWDOWN TEST

WELL NO. H-37 (BAN LEANG)



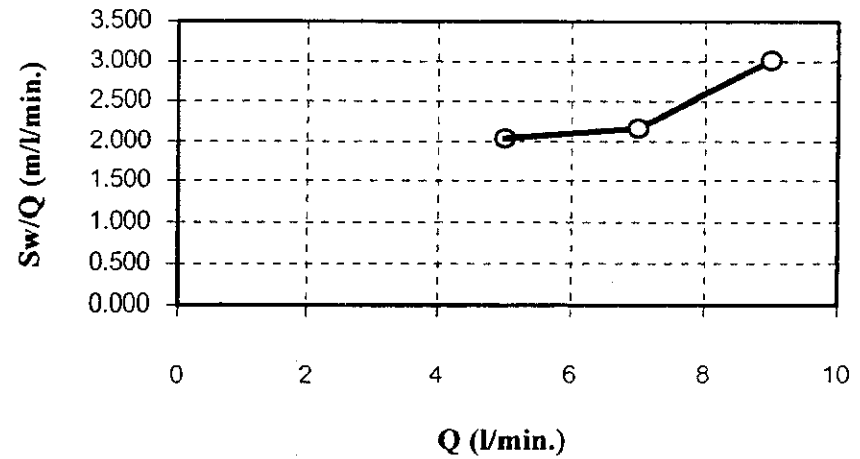
D4-135

**STEP DRAWDOWN TEST**  
**WELL NO. H-37 (BAN LEANG)**



**SPECIFIC CAPACITY**

Step	Q (l/min.)	Water Level (m.)	Draw Down (m.)	Sw/Q m/l/min.	Q/Sw (l/min/m.)
1	5	7.50	10.20	2.040	0.490
2	7	7.50	15.20	2.170	0.460
3	9	7.50	27.20	3.020	0.330





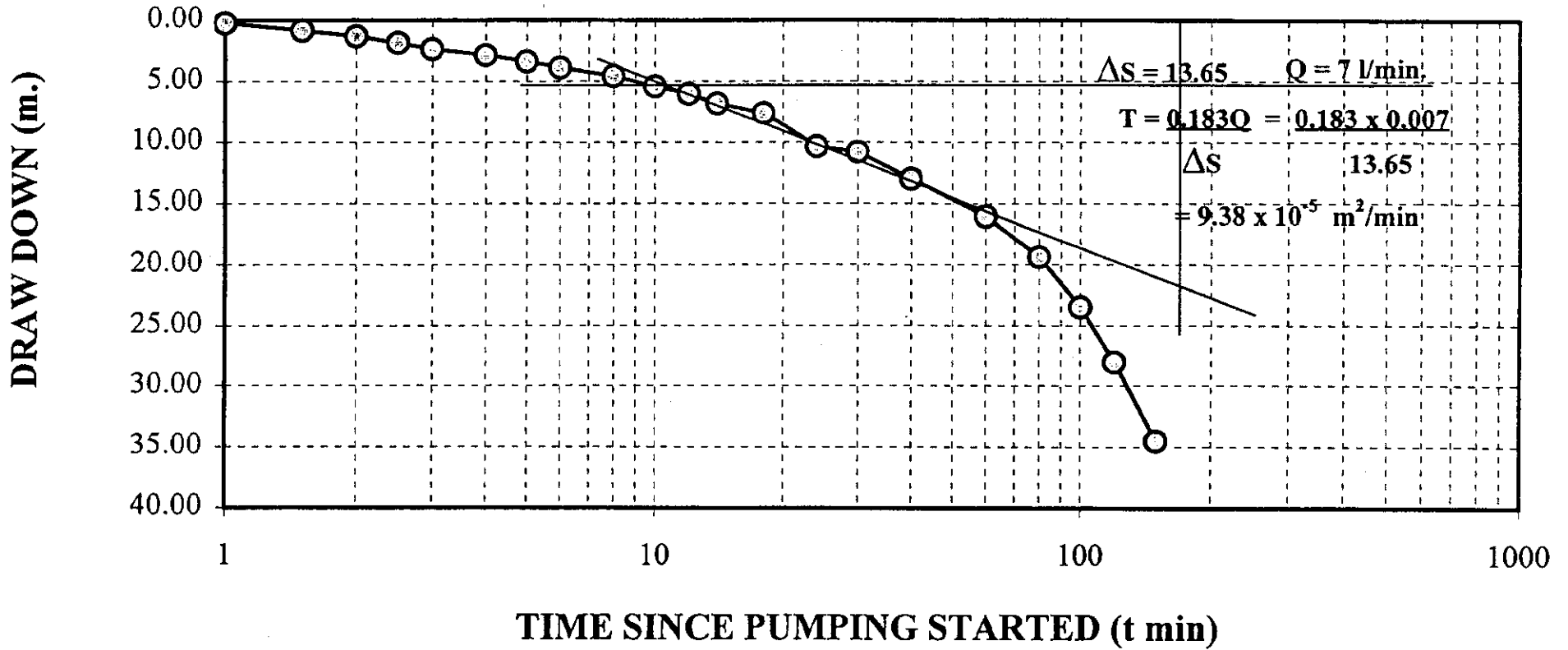
## CONTINUOUS PUMPING TEST

<b>PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.</b>							
<b>CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC</b>							
<b>CONSULTANT : JAPAN TECHNO CO.,LTD.</b>							
<b>CONTRACTO : SIAM TONE CO.,LTD.</b>							
Well No. : H37				Static Water level (m.) : 7.50			
Location : Ban. Leang				Dynamic Water level (m.) : 42.00			
Test by : Viengkhone				Well Depth (m.) : 55.00			
Date : 05/02/00				Screen Depth (m.) : 23.40-31.30, 35.25-43.15, 47.10-51.05			
Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min	Time Since Pumping Started t min	Depth to Water level m	Draw down m	Discharge Rate l/min
1	7.70	0.20	7	210			
1.5	8.30	0.80	7	240			
2	8.79	1.29	7	300			
2.5	9.30	1.80	7	360			
3	9.84	2.34	7	420			
4	10.34	2.84	7	480			
5	10.86	3.36	7	540			
6	11.36	3.86	7	600			
8	12.05	4.55	7	660			
10	12.90	5.40	7	720			
12	13.50	6.00	7	780			
14	14.30	6.80	7	840			
18	15.10	7.60	7	900			
24	17.85	10.35	7	960			
30	18.30	10.80	7	1020			
40	20.50	13.00	7	1080			
60	23.50	16.00	7	1140			
80	26.85	19.35	7	1200			
100	31.00	23.50	7	1260			
120	35.50	28.00	7	1320			
150	42.00	34.50	7	1380			
180				1440			

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

# CONTINUOUS PUMPING TEST

## WELL NO. H-37 (BAN LEANG)



D4-138

## RECOVERY TEST

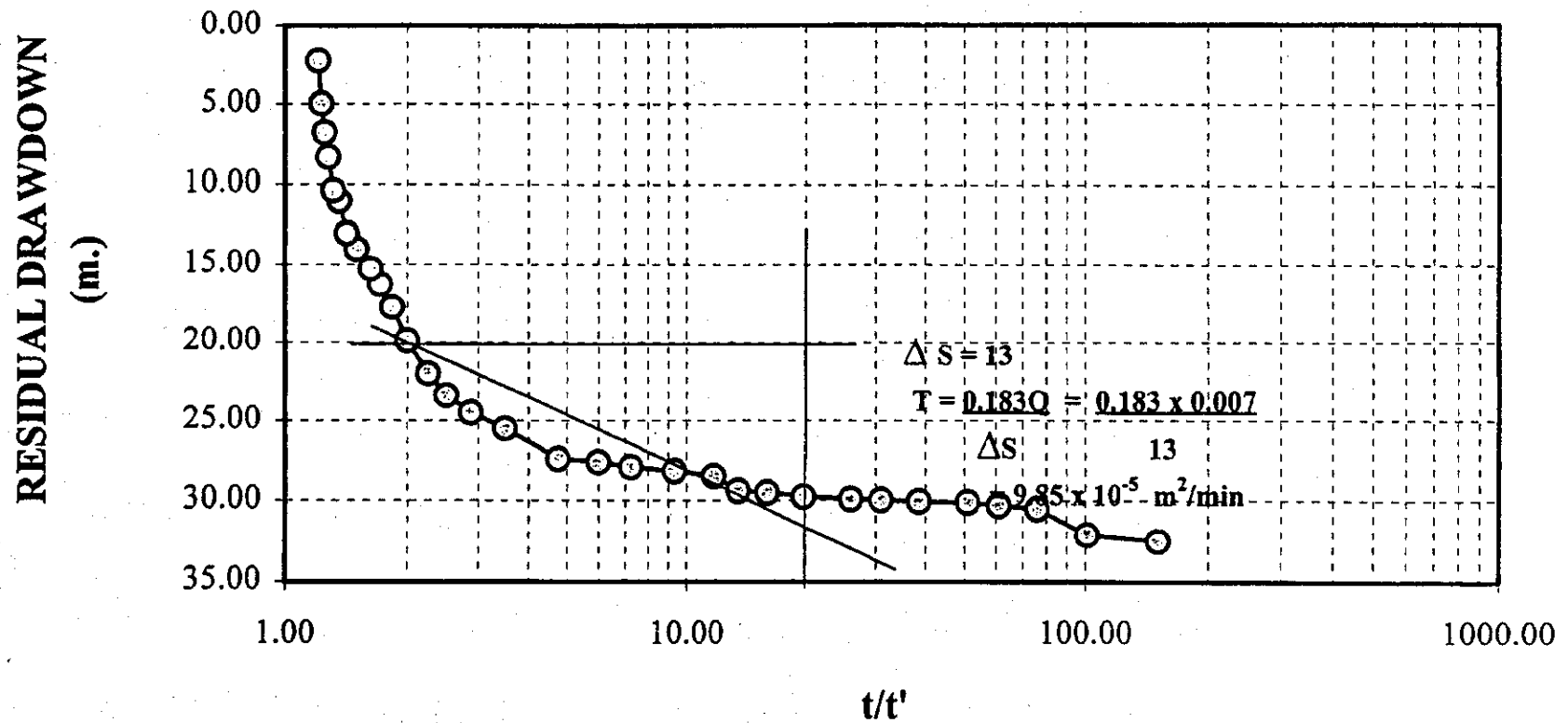
<b>PROJECT NAME : DRILLING WORK FOR THE STUDY ON RURAL WATER SUPPLY AND SANITATION IMPROVEMENT IN NORTH - WEST REGION, LAO P.D.R.</b>					
<b>CLIENT : MINISTRY OF HEALTH, THE LAO PEOPLE'S DEMOCRATIC REPUBLIC</b>					
<b>CONSULTANT : JAPAN TECHNO CO.,LTD.</b>					
<b>CONTRACTOR : SIAM TONE CO.,LTD.</b>					
Well No. : H-37			Static Water level (m.) 7.50		
Location : B. Leang			Dynamic Water level (m.) 42.00		
Test by : Mr. Viengkhone			Well Depth (m.) 55.00		
Date : 05/02/00			Screen Depth (m.) : 23.40-31.31, 35.25-43.15, 47.10-51.05		
Time Since Pumping Started t min	Time Since Pumping Stopped t' min	t/t'	Depth to Water Level m	Draw down m	Discharge Rate l/min
151	1	151.00	40.00	32.50	7
151.5	1.5	101.00	39.60	32.10	
152	2	76.00	38.00	30.50	
152.5	2.5	61.00	37.80	30.30	
153	3	51.00	37.60	30.10	
154	4	38.50	37.55	30.05	
155	5	31.00	37.45	29.95	
156	6	26.00	37.40	29.90	
158	8	19.75	37.25	29.75	
160	10	16.00	37.00	29.50	
162	12	13.50	36.90	29.40	
164	14	11.71	36.00	28.50	
168	18	9.33	35.70	28.20	
174	24	7.25	35.45	27.95	
180	30	6.00	35.15	27.65	
190	40	4.75	34.95	27.45	
210	60	3.50	33.00	25.50	
230	80	2.88	32.00	24.50	
250	100	2.50	30.90	23.40	
270	120	2.25	29.50	22.00	
300	150	2.00	27.40	19.90	
330	180	1.83	25.25	17.75	
360	210	1.71	23.75	16.25	
390	240	1.63	22.75	15.25	
450	300	1.50	21.50	14.00	
510	360	1.42	20.50	13.00	
570	420	1.36	18.50	11.00	
630	480	1.31	17.85	10.35	
690	540	1.28	15.78	8.28	
750	600	1.25	14.25	6.75	
810	660	1.23	12.45	4.95	
870	720	1.21	9.70	2.20	

Test by Mr. Viengkhone  
 Recorded by Mr. Viengkhone  
 Verified by Mr. Taweesak

D4-140

# RECOVERY TEST

## WELL NO. H-37 (BAN LEANG)



## APPENDIX D. GEOPHYSICAL SURVEY ANALYSIS

1. The following three villages in Houayxai were selected as sites for groundwater development.
  - H-3: Ban Nam Ngao (Dug Well)
  - H-9: Ban May Phattana (Borehole)
  - H-37: Ban Leang (Borehole)
2. Prior to the well drillings, geophysical surveys were conducted to select the drilling points and determine the drilling depths.
3. The following hydrogeological information is important for analyzing geophysical data. (Refer to Table-1 and Figure-1)
  - 1) The earth resistivity of aquifers normally range from 30 to 200  $\Omega$ -m.
  - 2) Figure-1 shows four general patterns of geoelectric prospecting curves. Curve (1) is the case for saline groundwater; curve (2) is the case for a hydrogeological basement (rock formation) where groundwater cannot be found; and curves (3) and (4) are patterns showing possible existence of groundwater.
4. Figure-2 depicts the village layout of H-3 Ban Nam Ngao, the candidate village for dug well construction. In general for construction of dug wells, digging is usually conducted without geophysical surveys. In the case of Bokeo Province, after digging down to depths of a few meters, rock formations were encountered, necessitating a number of changes in the digging points. In order to minimize the chances of these failures, it was decided to carry out a geophysical survey. As a result of survey at the five points from R-1 to R-5 marked on Figure-2, a well depth of 10 m and digging depth of 15 m were determined.
5. Figure 3 shows the geophysical curves for Nam Ngao. The curves for points R-1 and R-4 predicts saline water and rock formations. Therefore, the potential for good groundwater were presumed at points R-2, R-3 and R-5. Consequently, upon consideration of choosing points nearer to the center of the village, points R-3 and R-5 were selected and wells were dug with success.
6. At H-9 Ban May Phattana, geophysical surveys to depths of 100 m were made at four points from R-1 to R-4 as shown in Figure-4. According to the resistivity

curves plotted in Figure-5, the data for point R-3 gives a highly fluctuating curve implying low groundwater potential and in consequence, this point was rejected. Since points R-2 and R-4 show the highest potential for groundwater existence, analysis was conducted for these points.

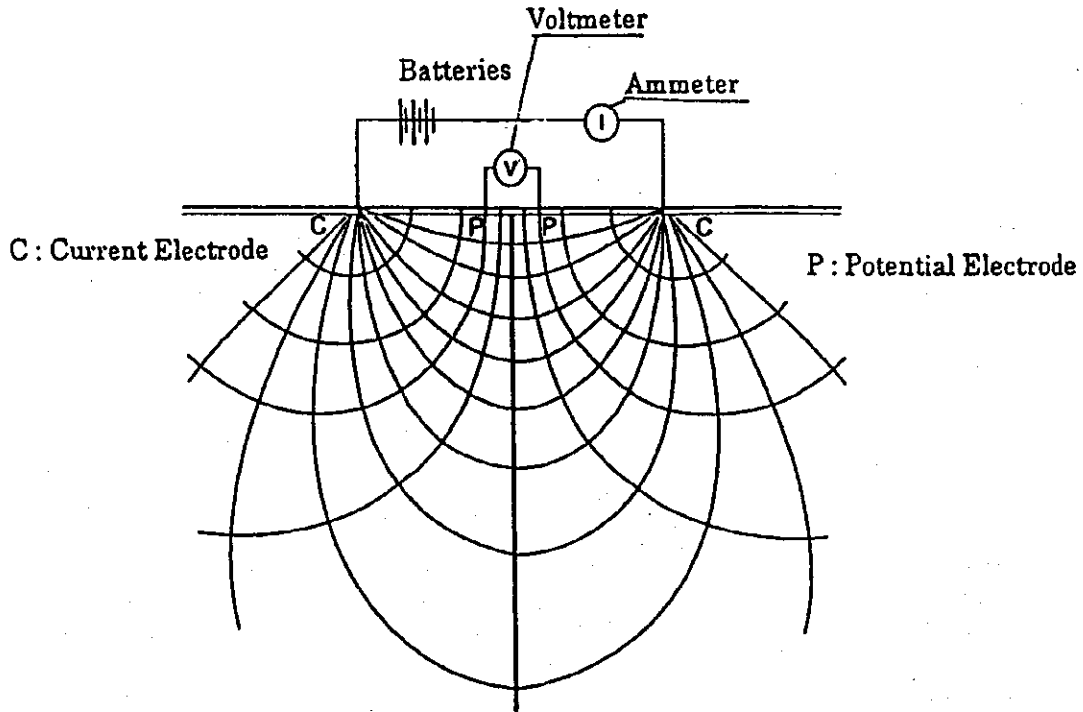
7. Data for R-2 and R-4 were plotted on a log-log graph as indicated in Figure-6. By the standard analysis method, analysis becomes impossible at depths of a few meters below the ground. Therefore, since a 4-electrode Wenner method was adopted as the geophysical survey method, the direct reading method will be used for analysis. According to the results shown in Figure-6, at point R-4, resistivities of 88 to 170  $\Omega$ -m at depths below 15 m imply existence of an aquifer layer there. On the other hand, at point R-2, an aquifer layer is anticipated at depths below 20 m where the resistivities range from 66 to 150  $\Omega$ -m, and the borehole was drilled at this point (see the geological column in Figure-5). However, when the borehole was drilled at this point, during the reaming process the well walls collapsed, making difficulties for removing the drill bit. Therefore, this well had to be abandoned, and a second drilling was attempted at a location parallel to this point with similar potential. When drilling the second borehole, hard rock formations were encountered at a depth of 4 m, causing a halt in drilling. Then the drilling point was moved about two or three meters away from the second point and drilling resumed. The third drilling was continued until a depth of 47 m, and pumping tests revealed low discharge, but enough for use by a handpump.
8. As illustrated in Figure-7 for H-37 Ban Leang, geophysical surveys of 100m depths were carried out at five points, R-1 to R-5, along the center of the village. As shown in Figure-8, data scattering is evident for point R-5 which means groundwater potential is low at this point giving reason for its exclusion. Predicting that points R-2 and R-4 have higher potential, analysis was made for these two points.
9. The analysis plot was made for R-2 and R-4 as depicted in Figure-9. Again, using the direct reading method, at depths below 10 m for point R-4, resistivity readings from 61 to 111  $\Omega$ -m predicts an aquifer layer. Then at point R-2, resistivity readings range from 42.5 to 140  $\Omega$ -m at depths below 10 m implying probable existence of an aquifer here as well, and the borehole was drilled near this point. The yield is not very high, but is sufficient for use by a handpump (Refer to the geological column in Figure-9).

**Table-1**  
**Earth Resistivities according to Lithology**

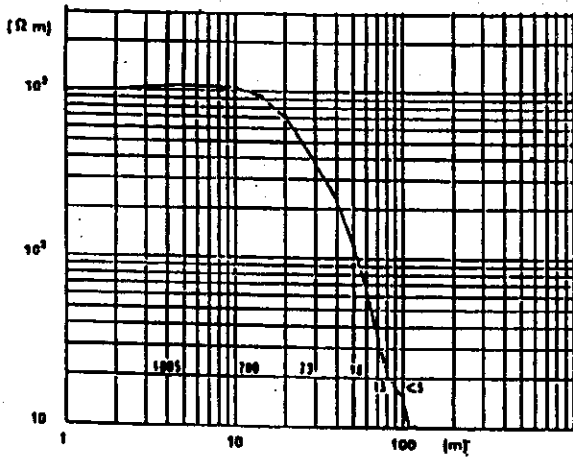
Layer	Resistivity ( $\Omega$ -m)		Experienced Resistivity ( $\Omega$ -m)
	Dry Layer	Wet Layer	
Gravel	1,000 – 15,000	200 – 10,000	<b>Aquifers</b> 30 – 200
Sand-gravel	1,000 – 7,000	200 – 5,000	
Sand	300 – 7,000	100 – 700	
Conglomerate	300 – 1,800	100 – 500	
Sandstone	200 – 2,500	100 – 500	
Loam	500 – 5,000	100 – 1,000	Aquiclude 200 – 500
Tuff	100 – 1,000		
Silt		Less than 100	Aquiclude 1 – 20
Clay		Less than 100	
Marl		Less than 100	
Shale		Less than about 100	
Granite	1,000 – 10,000		Fissure Water 50 – 300
Andesite	200 – 10,000		
Basalt	20,000		Rocks 300 – 50,000
Crystalline schist	200 – 20,000		
Gneiss	200 – 20,000		
Lava	1,000 – 20,000		
Limestone	60 – 500,000		
Sands, Clay, Silts	Saline Water 0-5		

Figure 1

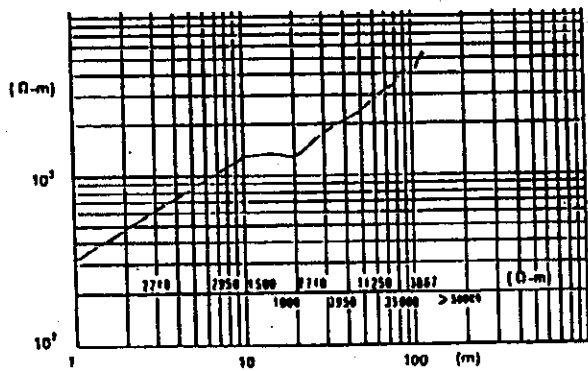
GEOELECTRIC PROSPECTING AND INTERPRETATION MODEL  
(WENNER METHOD)



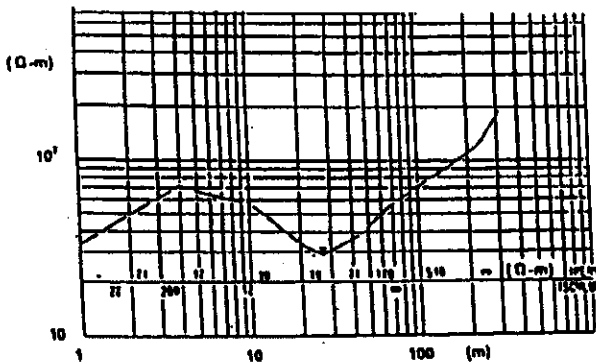
① Groundwater Saline Area



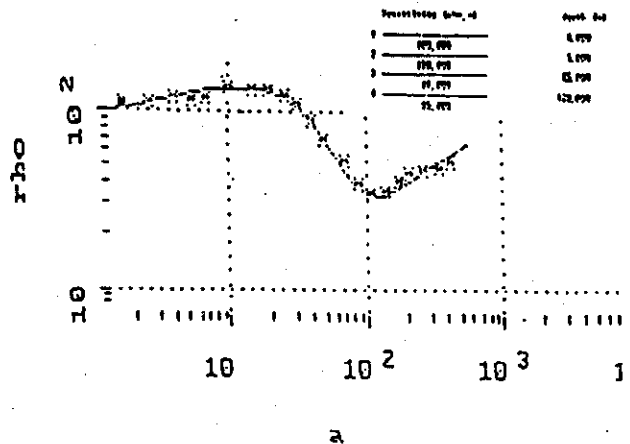
② Hydrogeological Basement Area



③ Groundwater Positive Area



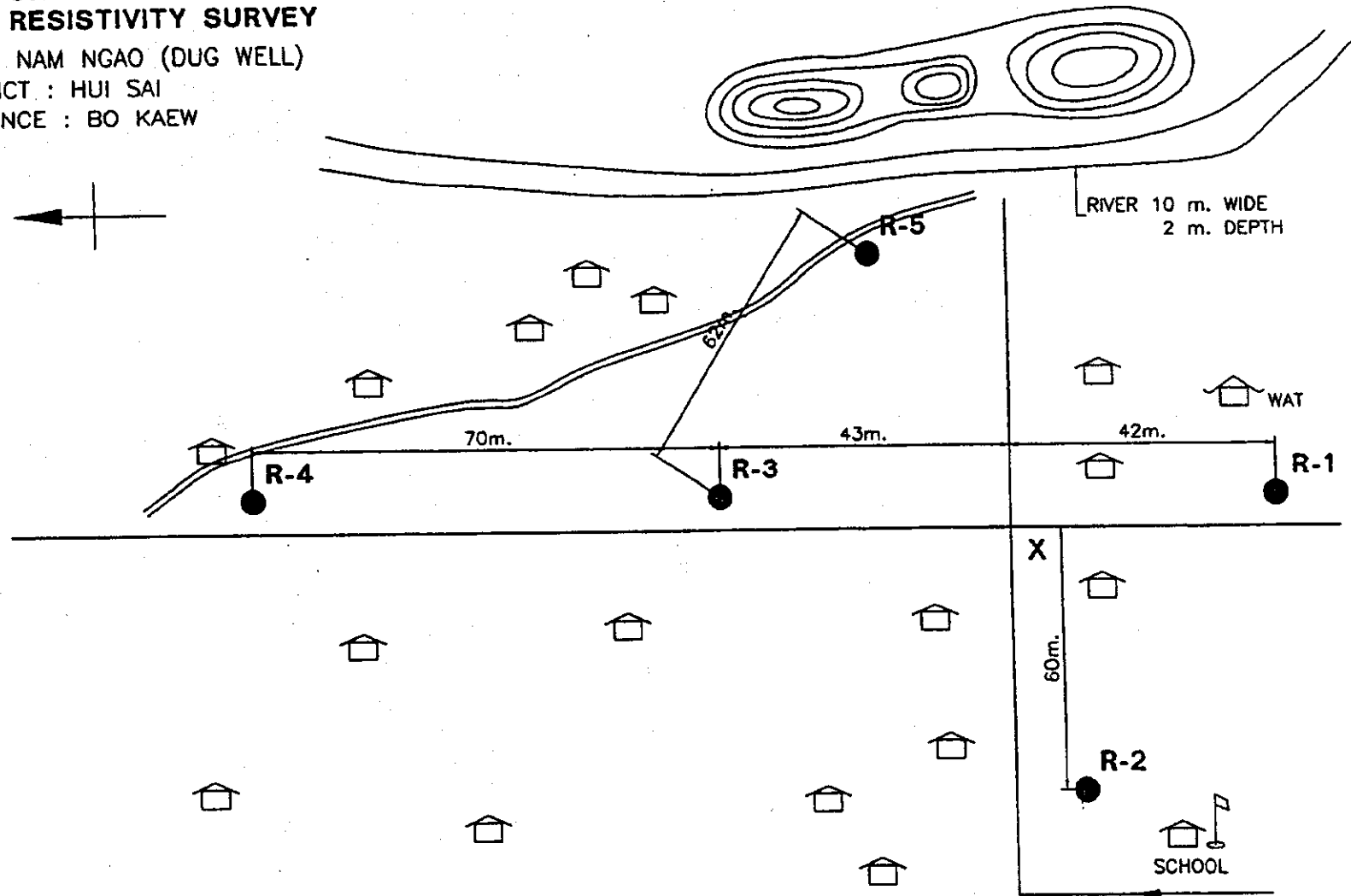
④ Groundwater Positive Area  
Interpreted by Software





**SKETCH VILLAGE MAP  
FOR RESISTIVITY SURVEY**

BAN : NAM NGAO (DUG WELL)  
DISTRICT : HUI SAI  
PROVINCE : BO KAEW



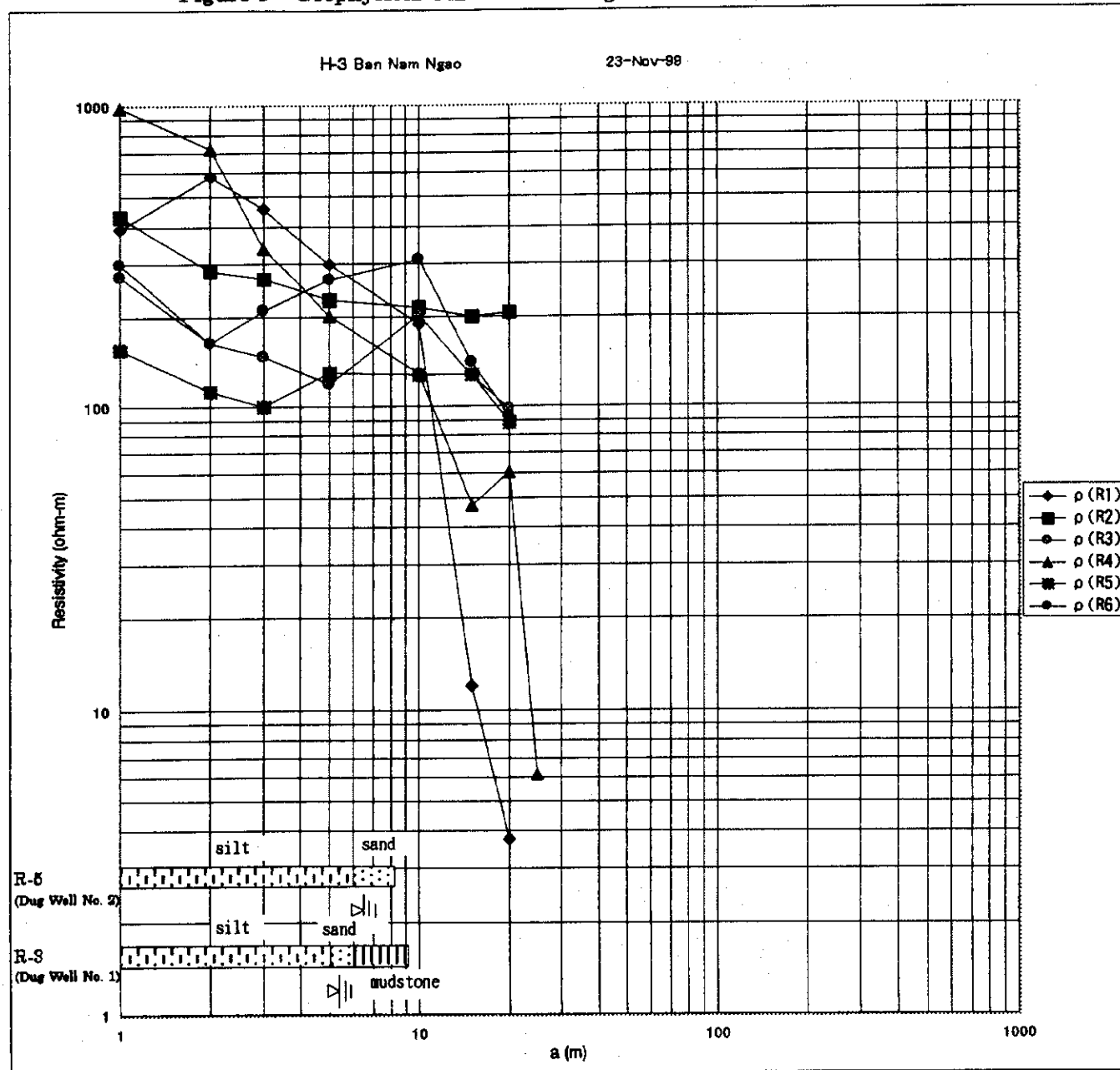
D4-145

JICA (Japan International Cooperation Agency)  
Nam Se-At (National Center for Environmental Health and Water Supply)  
Rural Water Supply and Sanitation Improvement

**PROJECT:**  
Phase II: Model Study-Groundwater Development

Figure 2 Geophysical Survey Points (Ban Nam Ngao)

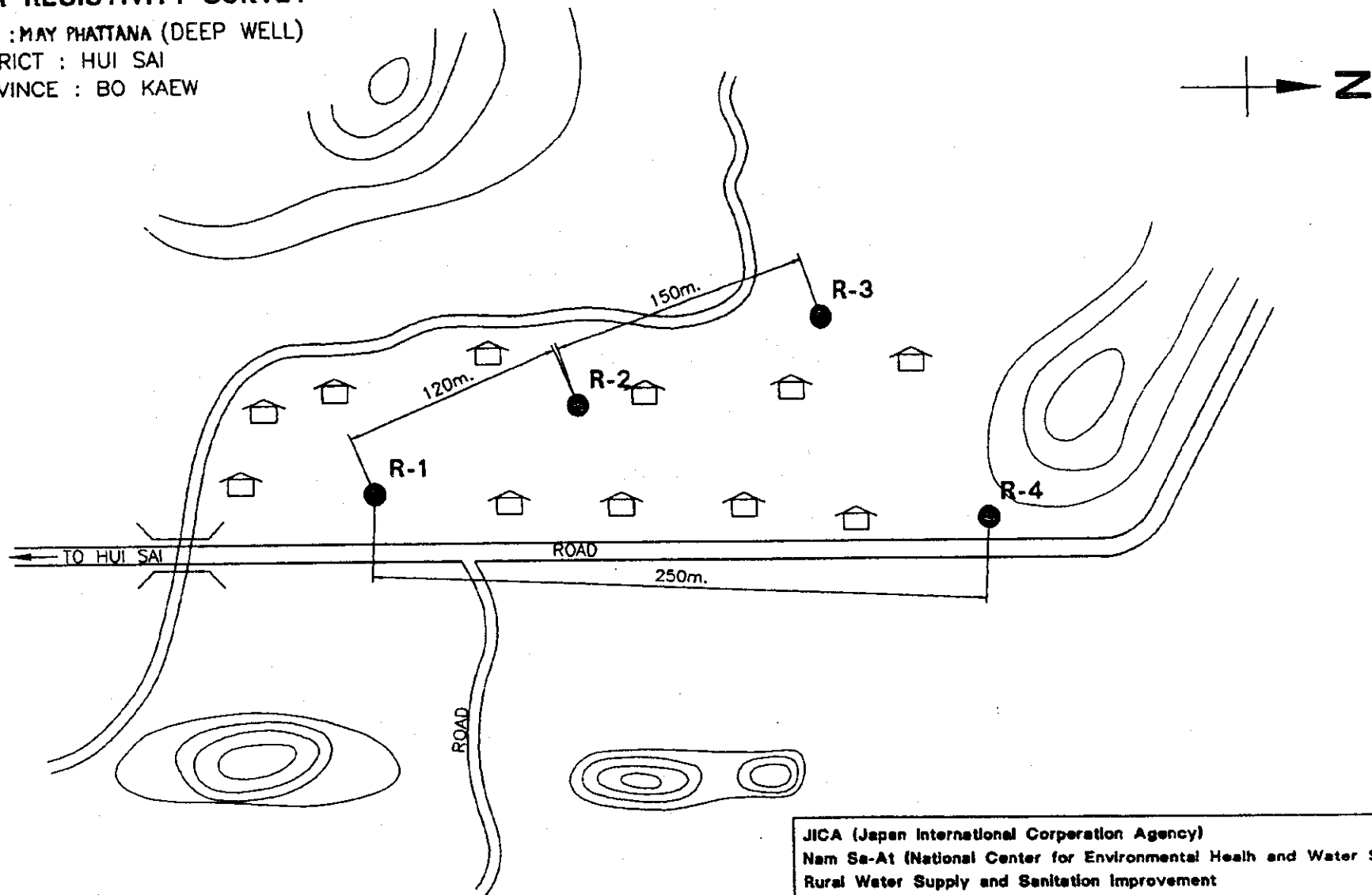
Figure 3 Geophysical Curve and Geological Column (Ban Nam Ngao)



D4-146

**SKETCH VILLAGE MAP  
FOR RESISTIVITY SURVEY**

BAN : MAY PHATTANA (DEEP WELL)  
DISTRICT : HUI SAI  
PROVINCE : BO KAEW



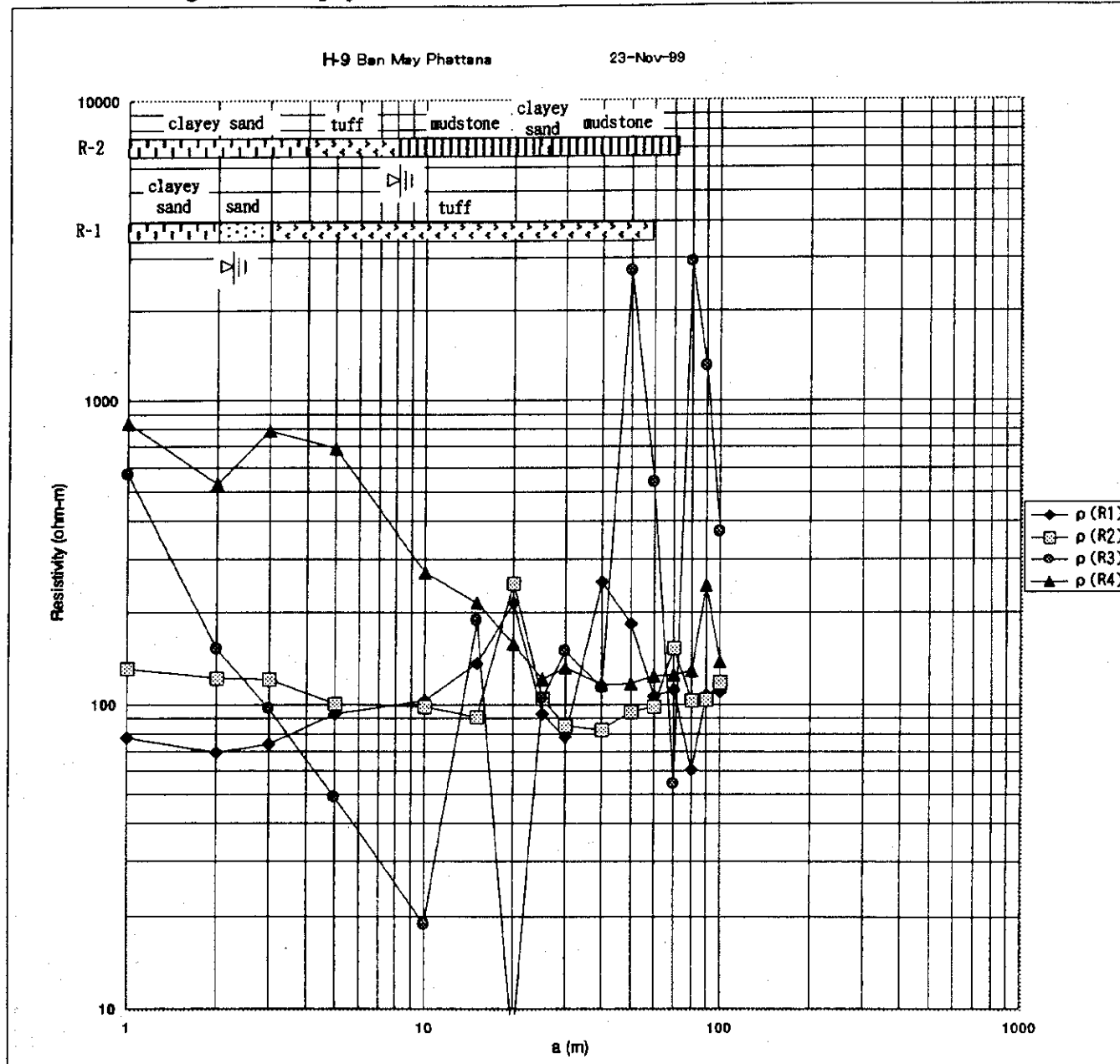
D4-147

Figure 4 Geophysical Survey Points (Ban May Phattana)

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Rural Water Supply and Sanitation Improvement

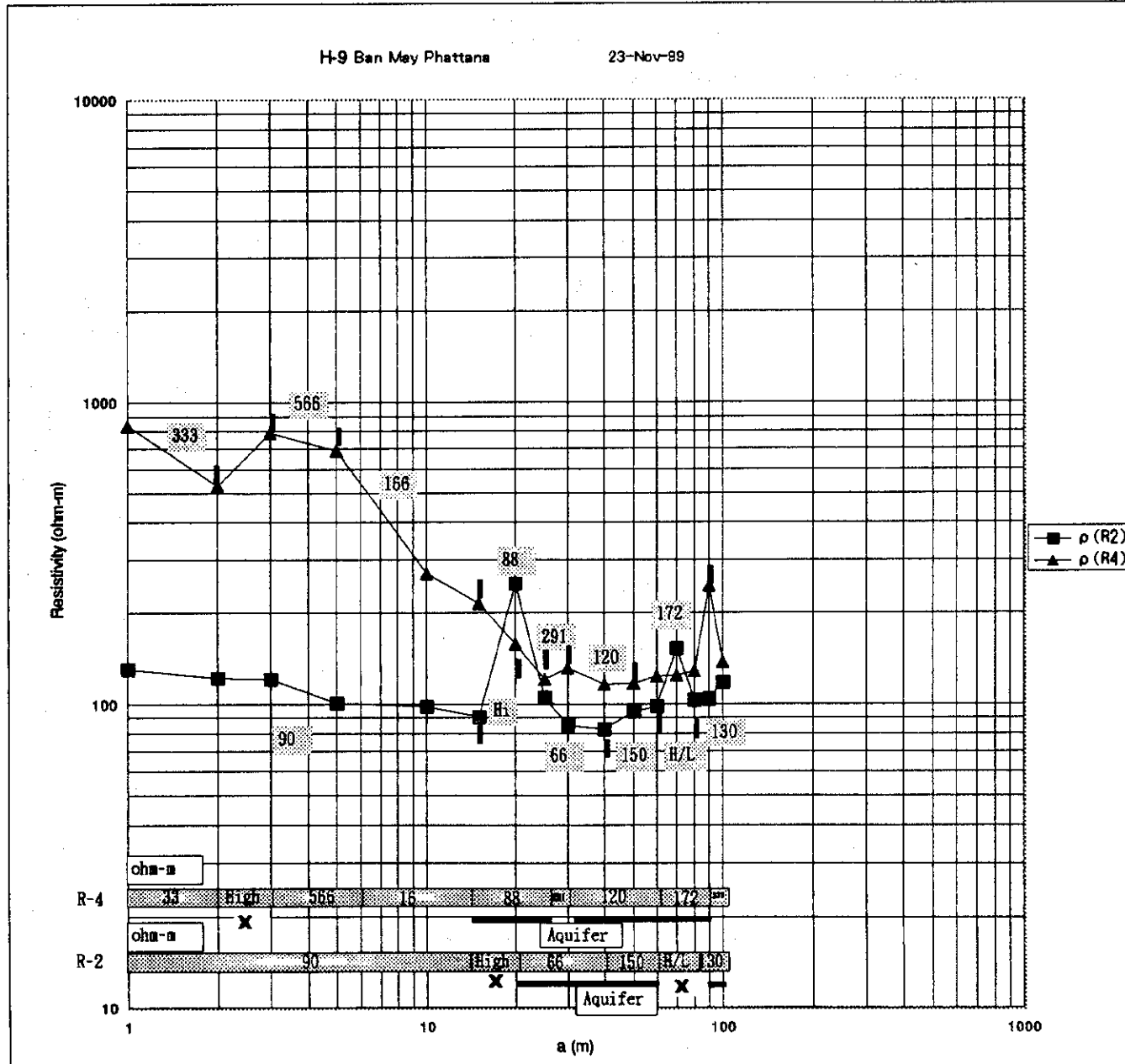
PROJECT:  
Phase II: Model Study-Groundwater Development

Figure 5 Geophysical Curve and Geological Column (Ban May Phattana)



D4-148

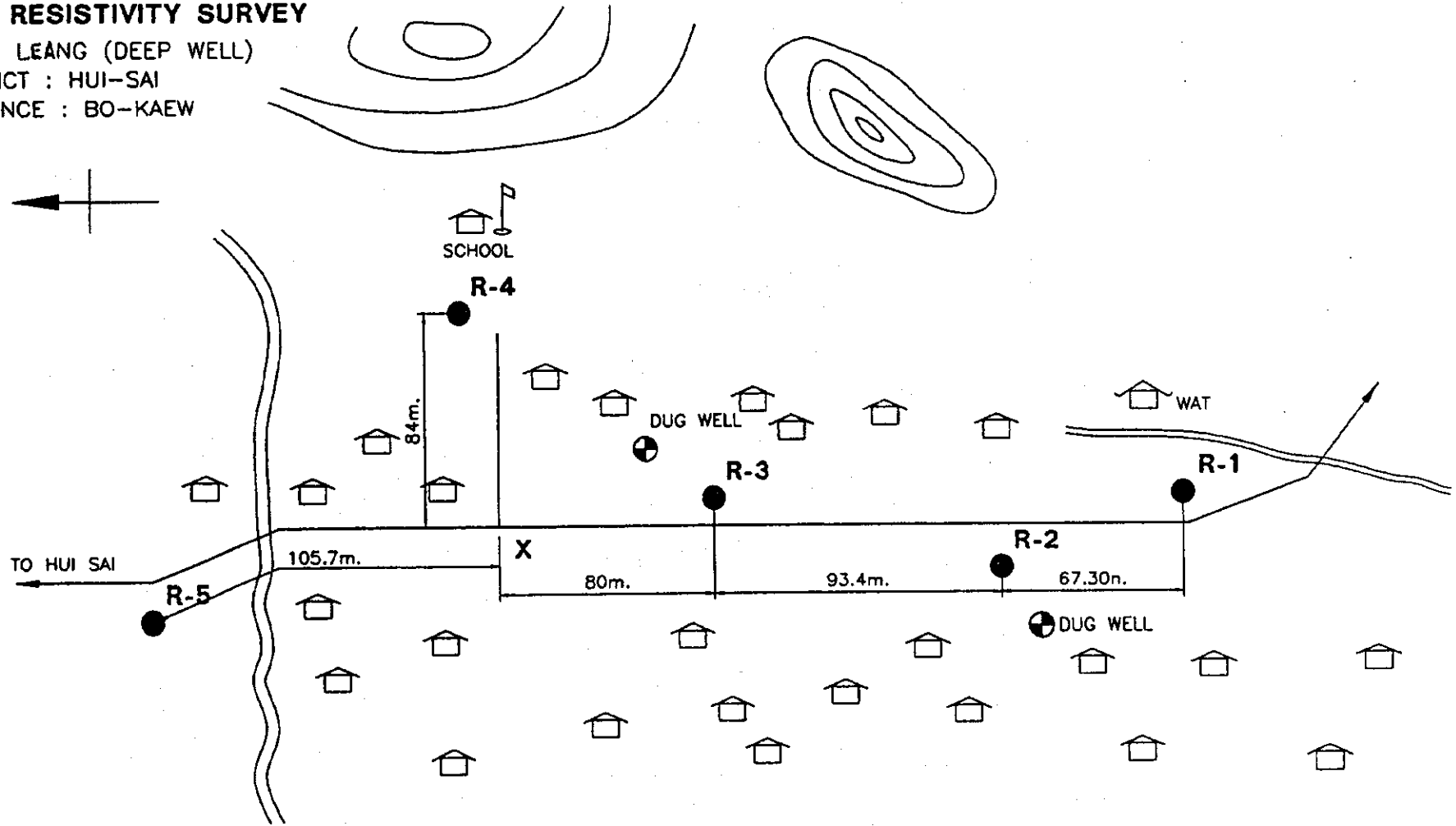
Figure 6 Resistivity Curve (Ban May Phattana)



D4-149

**SKETCH VILLAGE MAP  
FOR RESISTIVITY SURVEY**

BAN : LEANG (DEEP WELL)  
DISTRICT : HUI-SAI  
PROVINCE : BO-KAEW



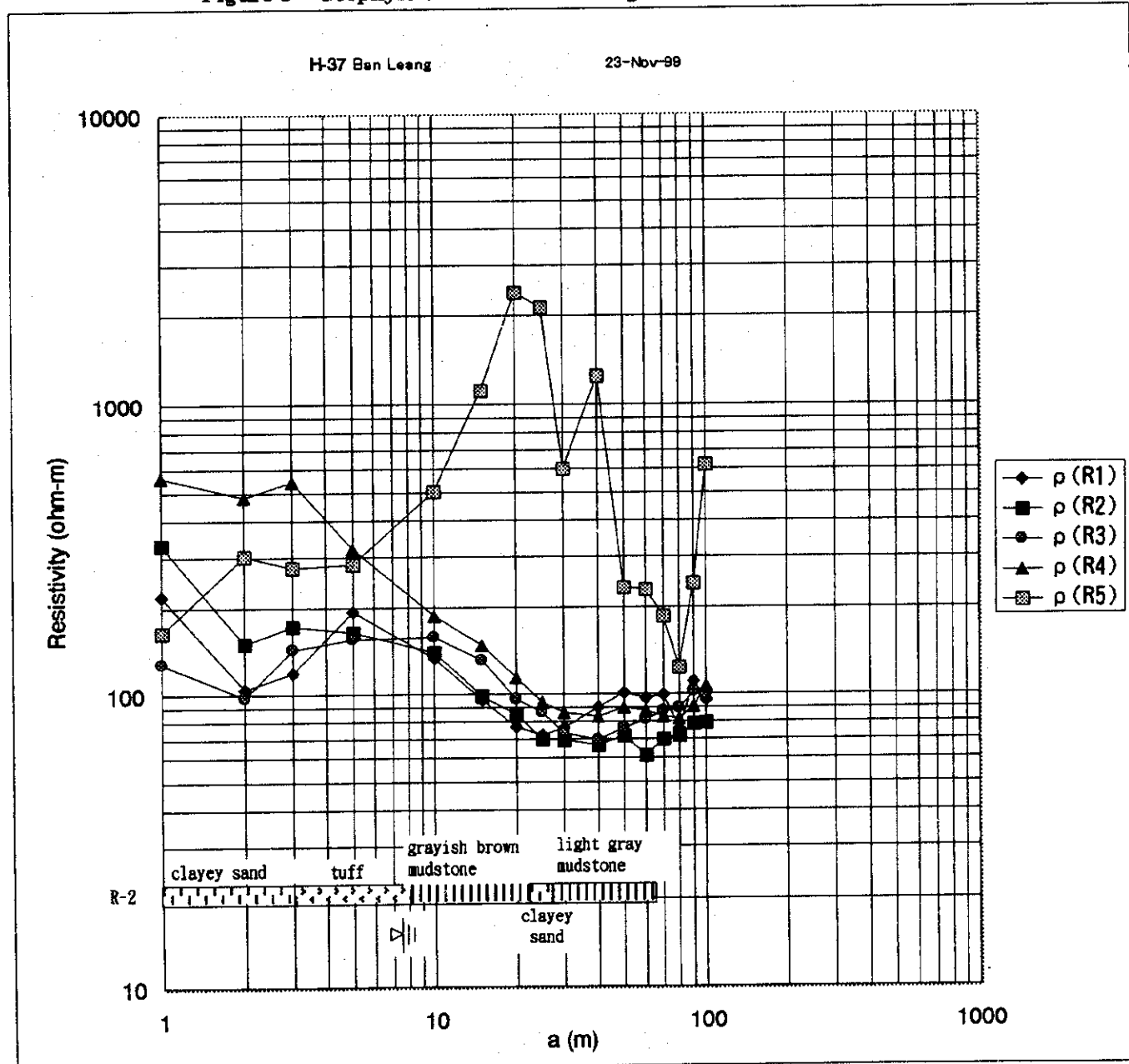
D4-150

JICA (Japan International Cooperation Agency)  
Nam Se-At (National Center for Environmental Health and Water Supply)  
Rural Water Supply and Sanitation Improvement

PROJECT:  
Phase II: Model Study-Groundwater Development

Figure 7 Geophysical Survey Points (Ban Leang)

Figure 8 Geophysical Curve and Geological Column (Ban Leang)

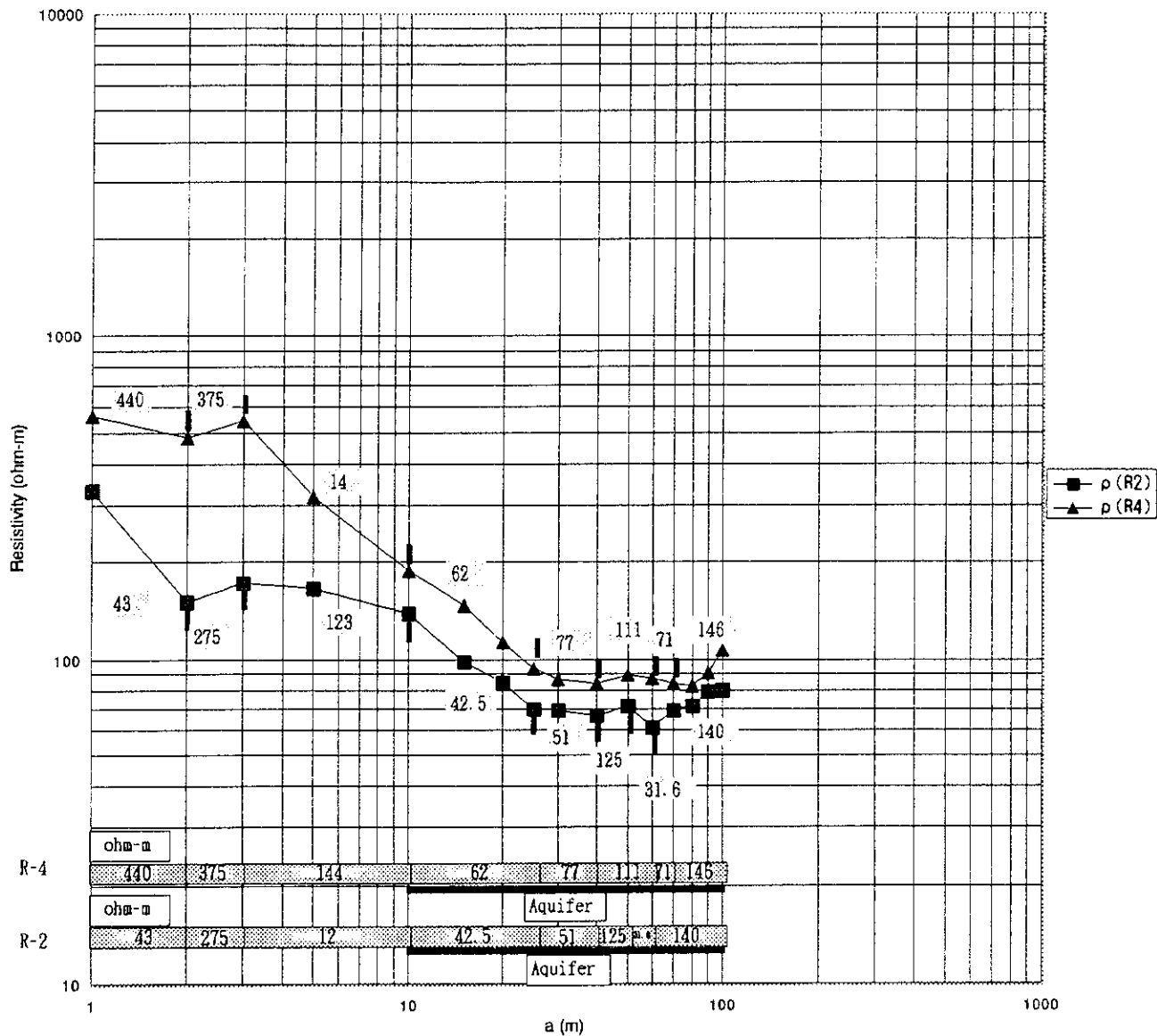


D4-151

Figure 9 Resistivity Curve (Ban Leang)

H-37 Ban Leang

23-Nov-99



D4-152