

3.2.3. Lugeon Test Result

PROJECT COREDRILLING AL DHAID		swissboring				
CLIENT: SANYU CONSULTANTS INC.						
Packer or Lugeon test Sheet 1		Site: AL MILHIA	Location: AL DHAID			
Depths below ground level to:		Job No: E-2145	Borehole No: BI			
(a) top of test section:	18.00 m	Date: 02.07.95	Sheet: 1 of 2			
(b) bottom of test section:	23.00 m	Ground level: m (Ordnance datum)	Crew/operator: JOHN			
(c) centre of test section:	20.50 m					
(d) bottom of hole at time of test:	200.00 m	Weather: hot, windy.				
(e) bottom of casing:	15.00 m	Packer pressure: 28 bar	Test No: 8			
(f) initial ground water level: (see NOTE 2)	16.10 m	Packer Type: Pneumatic 86 mm				
Length of test section	5.00 m	Dia. of hole in test area: 94 mm				
Gauge height above ground level:	0.90 m	Type of rock: CALCAREOUS MUDSTONE.				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 3	Flowmeter readings, Dipstick litres	30505.2	30507	30510	30513	0.49
	Water take, litres	2.1	2.9	2.4		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, Dipstick litres	30512.6	30516	30520	30524	0.79
	Water take, litres	3.5	4.2	4.1		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 5	Flowmeter readings, Dipstick litres	30524.4	30530	30535	30540	1.03
	Water take, litres	5.1	5.4	4.9		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, Dipstick litres	30539.8	30544	30548	30552	0.81
	Water take, litres	4.1	3.8	4.2		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 3	Flowmeter readings, Dipstick litres	30551.9	30554	30556	30558	0.43
	Water take, litres	1.8	2.4	2.2		
Remarks (to include details of pipework where relevant):						

<b>PROJECT:</b> CORE DRILLING AL DJHAID		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 2		Site: AL MILHIA	Location: AL DJHAID			
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section		Job No: E-2145	Borehole No: B1			
		Date: 02.07.95	Sheet: 2 of 2			
		Ground level: m (Ordnance datum)	Crew/operator JOHN			
Weather: hot, windy.		Test No: 8				
<b>Computation by:</b> GEORGE						
<b>Computation record</b>						
Data (from sheet 1)		Length of test section, <i>l</i> : 5.00 (m)				
Initial depth to ground water: 16.10 (i)		Gauge height above ground level 0.90 (m) (2)				
Period	Flow, <i>q</i> litres/min (3)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1) + (2) + (5) + (6) - (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.49	3	30	0.0002	0.0000	47.00
2nd	0.79	4	40	0.0005	0.0001	57.00
3rd	1.03	5	50	0.0008	0.0001	67.00
4th	0.81	4	40	0.0005	0.0001	57.00
5th	0.43	3	30	0.0001	0.0000	47.00

**Flow v. total head**

<b>Calculations:</b>		<b>Permeability Estimate:</b>			
Slope of graph = $q/h = 0.0291$		Q (l/min)	K (m/day)	K (cm/sec)	
$L = (100/l) * (q/h)$ in lugeon units = 1		Period 1	0.49	1.91E-03	2.21E-06
where <i>l</i> is the length of test section in metres		Period 2	0.79	2.51E-03	2.91E-06
1 lugeon = 5.03E-03 m <sup>2</sup> /day		Period 3	1.03	2.79E-03	3.23E-06
= 5.82E-06 cm/sec		Period 4	0.81	2.58E-03	2.98E-06
<b>Comments:</b>		Period 5	0.43	1.65E-03	1.91E-06

PROJECT COREDRILLING AL DHAID

swissboring

CLIENT: SANYU CONSULTANTS INC.

Packer or Lugeon test. Sheet 1	Site: AL MILIHA	Location: AL DHAID
Depths below ground level to:	Job No: E-2145	Borehole No: B1
(a) top of test section: 30.00 m	Date: 02.07.95	Sheet: 1 of 2
(b) bottom of test section: 35.00 m	Ground level: m	Crew/operator: JOHN
(c) centre of test section: 32.50 m	(Ordnance datum)	
(d) bottom of hole at time of test: 200.00 m	Weather: HOT, WINDY.	
(e) bottom of casing: 15.00 m	Packer pressure: 32	Test No: 7
(f) initial ground water level: (see NOTE 2) 16.10 m	Packer Type: Pneumatic 86 mm	
Length of test section: 5.00 m	Dia. of hole in test area: 94 mm	
Gauge height above ground level: 0.90 m	Type of rock: CALCAREOUS LIMESTONE	

Test record

1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 5	Flowmeter readings, litres	30422.3	30423	30423	30423	0.01
	Dipstick					
Water take, litres		0.2	0	0		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	30422.5	30425	30428	30429	0.45
	Dipstick					
Water take, litres		2.7	2.4	1.6		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 7	Flowmeter readings, litres	30429.2	30432	30435	30438	0.60
	Dipstick					
Water take, litres		2.9	3.1	3		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	30438.2	30440	30443	30445	0.43
	Dipstick					
Water take, litres		2.1	2.2	2.1		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 5	Flowmeter readings, litres	30444.6	30445	30446	30446	0.09
	Dipstick					
Water take, litres		0.7	0.6	0		

Remarks (to include details of pipework where relevant):

very low water intake.

PROJECT: CORE DRILLING AL DHAID.

# swissboring

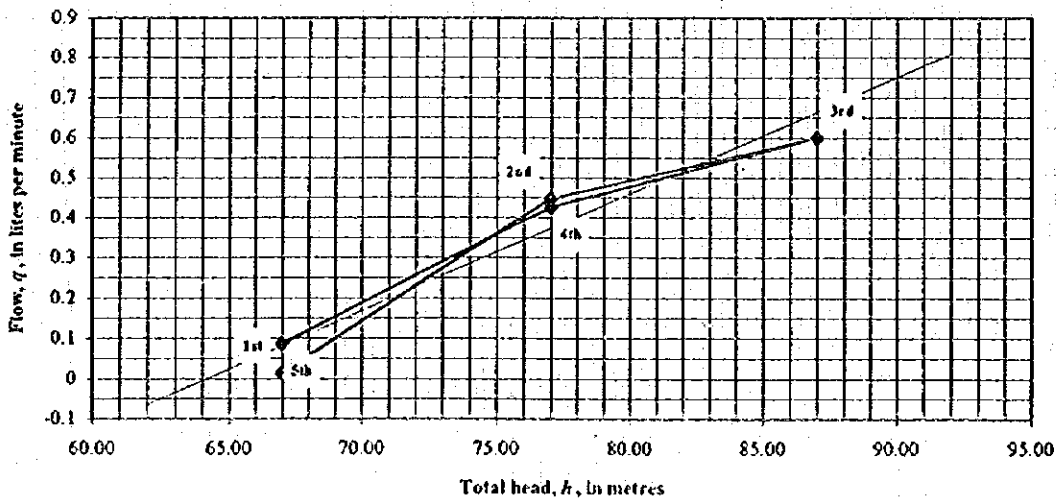
CLIENT: SANYU CONSULTANTS.

Packer or Lugeon test. Sheet 2	Site: AL MILIHA	Location: AL DHAID
NOTE 1. For test details, see sheet 1.	Job No: E-2145	Borehole No: B1
NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Date: 02.07.95	Sheet: 2 of 2
	Ground level: m (Ordnance datum)	Crew/operator JOHN
	Weather: HOT, WINDY.	
Computation by: GEORGE	Test No: 7	

Computation record	
Data (from sheet 1)	Length of test section, $l$ : 5.00 (m)
Initial depth to ground water: 16.10 (0)	Gauge height above ground level: 0.90 (m) (0)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, m		Total head, $h$ (1) + (2) + (5) - (6) - (7)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.01	5	50	0.0000	0.0000	67.00
2nd	0.45	6	60	0.0003	0.0000	77.00
3rd	0.60	7	70	0.0005	0.0000	87.00
4th	0.43	6	60	0.0002	0.0000	77.00
5th	0.09	5	50	0.0000	0.0000	67.00

Flow v. total head



Calculations:

Slope of graph =  $q/h = 0.0291$   
 $L = (100/l) * (q/h)$  in lugeon units = 1  
 where  $l$  is the length of test section in metres  
 1 lugeon =  $5.03E-03$  m/day  
 =  $5.82E-06$  cm/sec

Permeability Estimate:

	Q (l/min)	K (m/day)	K (cm/sec)
Period 1	0.01	3.62E-05	4.20E-08
Period 2	0.45	1.06E-03	1.22E-06
Period 3	0.60	1.26E-03	1.45E-06
Period 4	0.43	1.01E-03	1.17E-06
Period 5	0.09	2.36E-04	2.73E-07

Comments:

PROJECT COREDRILLING AL DHAID		swissboring					
CLIENT: SANYU CONSULTANTS INC.							
Packer or Lugeon test. Sheet 1				Site:	AL MILIHA	Location:	AL DHAID
Depths below ground level to:				Job No:	E-2145	Borehole No:	B1
(a) top of test section:	78.00	m	Date:	02.07.95	Sheet:	1 of 2	
(b) bottom of test section:	83.00	m	Ground level:		Crew/operator:	JOHN	
(c) centre of test section:	80.50	m	(Ordnance datum)				
(d) bottom of hole at time of test:	200.00	m	Weather:	HOT, WINDY.			
(e) bottom of casing:	15.00	m	Packer pressure:	32	Test No:	6	
(f) initial ground water level: (see NOTE 2)	16.10	m	Packer Type:	Pneumatic 86 mm			
Length of test section	5.00	m	Dia. of hole in test area:	94 mm			
Gauge height above ground level:	0.90	m	Type of rock:	CALCAREOUS LIMESTONE			
Test record							
1st period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	30356.1	30360	30363	30365		0.61
	Dipstick readings, litres						
	Water take, litres	3.5		2.9	2.7		
2nd period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 7	Flowmeter readings, litres	30365.2	30368	30372	30373		0.53
	Dipstick readings, litres						
	Water take, litres	2.9		3.6	1.5		
3rd period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	30373.2	30377	30380	30384		0.73
	Dipstick readings, litres						
	Water take, litres	3.5		3.6	3.8		
4th period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 7	Flowmeter readings, litres	30384.1	30387	30390	30393		0.62
	Dipstick readings, litres						
	Water take, litres	3.1		3	3.2		
5th period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	30393.4	30396	30399	30402		0.55
	Dipstick readings, litres						
	Water take, litres	2.8		2.7	2.7		
Remarks (to include details of pipework where relevant):							

PROJECT: CORE DRILLING AL DHAID.

# swissboring

CLIENT: SANYU CONSULTANTS.

Packer or Lugeon test. Sheet 2

Site: AL MILIHA

Location: AL DHAID

NOTE 1. For test details, see sheet 1.

Job No: E-2145

Borehole No: B1

NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section

Date: 02.07.95

Sheet: 2 of 2

Ground level: m  
(Ordnance datum)

Crew/operator JOHN

Weather: HOT, WINDY.

Computation by: GEORGE

Test No: 6

Computation record

Data (from sheet 1)

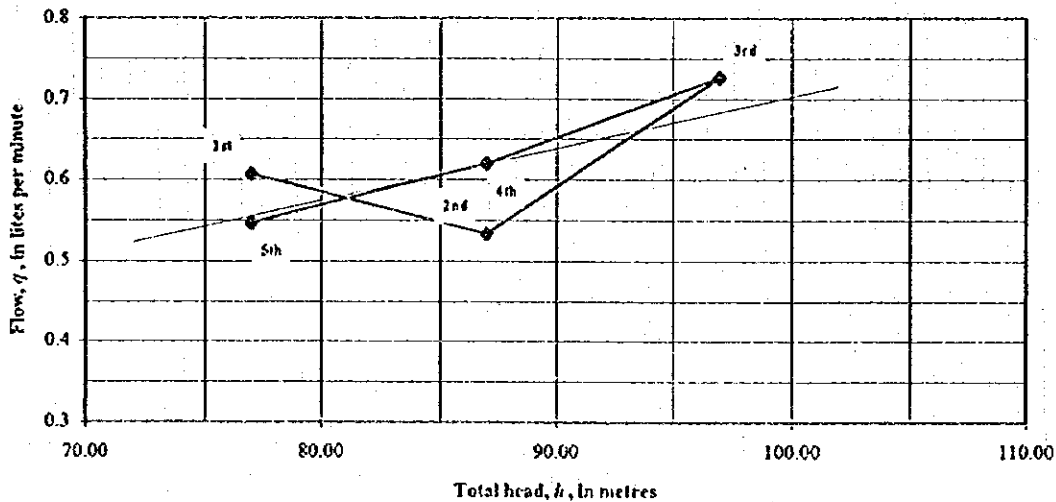
Length of test section,  $l$ : 5.00 (m)

Initial depth to ground water: 16.10 (1)

Gauge height above ground level 0.90 (m) (2)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, m		Total head, $h$ (4) + (2) + (5) + (6) - (7)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.61	6	60	0.0012	0.0000	77.00
2nd	0.53	7	70	0.0009	0.0000	87.00
3rd	0.73	8	80	0.0017	0.0000	97.00
4th	0.62	7	70	0.0012	0.0000	87.00
5th	0.55	6	60	0.0010	0.0000	77.00

Flow v. total head



Calculations:

Permeability Estimate:

Slope of graph =  $q/h = 0.0064$

$L = (100/l) * (q/h)$  in lugeon units = 0

where  $l$  is the length of test section in metres

0 lugeon = 1.11E-03 m/day

= 1.29E-06 cm/sec

Comments:

	Q (l/min)	K (m/day)	K (cm/sec)
Period 1	0.61	1.44E-03	1.66E-06
Period 2	0.53	1.12E-03	1.29E-06
Period 3	0.73	1.36E-03	1.58E-06
Period 4	0.62	1.30E-03	1.50E-06
Period 5	0.55	1.29E-03	1.50E-06

PROJECT COREDRILLING AL DHAID

swissboring

CLIENT: SANYU CONSULTANTS INC.

Packer or Lugeon test. Sheet 1		Site: AL MILHA	Location: AL DHAID.
Depths below ground level to:		Job No: E-2145	Borehole No: B1
(a) top of test section:	122.00 m	Date: 02.07.95	Sheet: 1 of 2
(b) bottom of test section:	127.00 m	Ground level: m	Crew/operator: JOHN
(c) centre of test section:	124.50 m	(Ordnance datum)	
(d) bottom of hole at time of test:	200.00 m	Weather: HOT, WINDY	
(e) bottom of casing:	15.00 m	Packer pressure: 32	Test No: 5
(f) initial ground water level: (see NOTE 2)	16.10 m	Packer Type: Pneumatic 86 mm	
Length of test section	5.00 m	Dia. of hole in test area:	94 mm
Gauge height above ground level:	0.90 m	Type of rock:	CONGLOMERATE

Test record							
1st period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 9	Flowmeter readings, litres	30037.3	30061	30078	30095		3.87
	Dipstick						
Water take, litres		23.5		16.9	17.6		
2nd period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	30095.3	30113	30134	30154		2.73
	Dipstick						
Water take, litres				20.3	20.7		
3rd period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 11	Flowmeter readings, litres	30154.2	30178	30200	30223		4.55
	Dipstick						
Water take, litres		23.3		22.6	22.4		
4th period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	30222.5	30243	30264	30283		4.05
	Dipstick						
Water take, litres		20.8		20.2	19.8		
5th period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 9	Flowmeter readings, litres	30283.3	30301	30320	30336		3.52
	Dipstick						
Water take, litres		18.1		18.4	16.3		

Remarks (to include details of pipework where relevant):

PROJECT: CORE DRILLING AL DHAID

# swissboring

CLIENT: SANYU CONSULTANTS

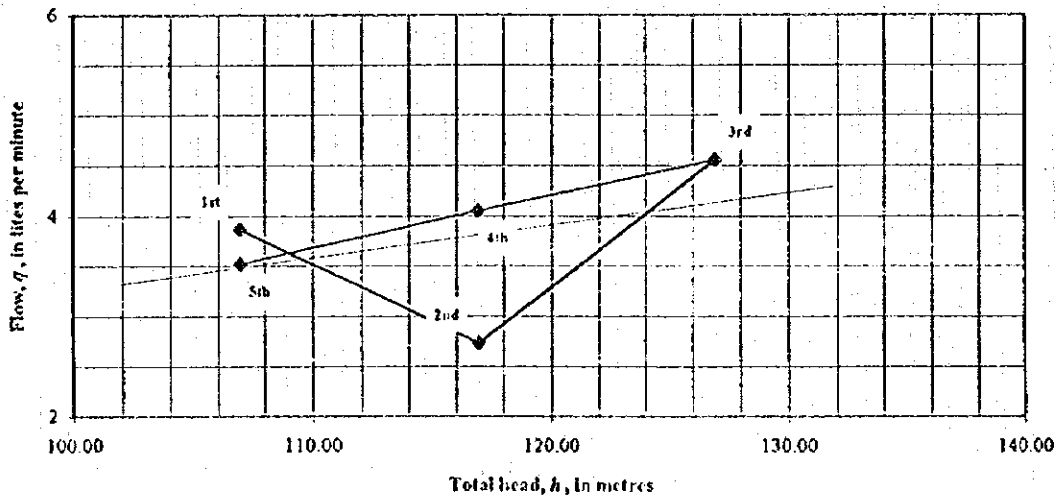
Packer or Lugeon test. Sheet 2	Site: AL MILIHA	Location: AL DHAID.
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: BJ
	Date: 02.07.95	Sheet: 2 of 2
	Ground level: m (Ordnance datum)	Crew/operator JOHN
	Weather: HOT, WINDY	
Computation by: George	Test No: 5	

Computation record

Data (from sheet 1)	Length of test section, $l$ : 5.00 (m)
Initial depth to ground water: 16.10 (i)	Gauge height above ground level 0.90 (m) (ii)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, m		Total head, $h$ (1) + (2) + (5) - (6) - (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	3.87	9	90	0.0571	0.0011	106.94
2nd	2.73	10	100	0.0300	0.0006	116.97
3rd	4.55	11	110	0.0773	0.0014	126.92
4th	4.05	10	100	0.0623	0.0012	116.94
5th	3.52	9	90	0.0480	0.0009	106.95

Flow v. total head



Calculations:

Slope of graph =  $q/h = 0.0325$   
 $L = (100/l)^2 (q/h)$  in lugeon units = 1  
 where  $l$  is the length of test section in metres  
 1 lugeon =  $5.61E-03$  m/day  
 =  $6.49E-06$  cm/sec

Permeability Estimate:

	Q (l/min)	K (m/day)	K (cm/sec)
Period 1	3.87	6.59E-03	7.62E-06
Period 2	2.73	4.26E-03	4.93E-06
Period 3	4.55	6.53E-03	7.56E-06
Period 4	4.05	6.31E-03	7.31E-06
Period 5	3.52	5.99E-03	6.94E-06

Comments:



PROJECT COREDRILLING AL DHAID

swissboring

CLIENT: SANYU CONSULTANTS INC.

Packer or Lugeon test. Sheet 1	Site: AL MILIHA	Location: AL DHAID.
Depths below ground level to:	Job No: E-2145	Borehole No: B3
(a) top of test section: 127.00 m	Date: 02.07.95	Sheet: 1 of 2
(b) bottom of test section: 132.00 m	Ground level: m	Crew/operator: JOHN
(c) centre of test section: 129.50 m	(Ordnance datum)	
(d) bottom of hole at time of test: 200.00 m	Weather: HOT, WINDY	
(e) bottom of casing: 15.00 m	Packer pressure: 32 BA	Test No: 4
(f) initial ground water level: (see NOTE 2) 16.10 m	Packer Type: Pneumatic 86 mm	
Length of test section: 5.00 m	Dia. of hole in test area: 94 mm	
Gauge height above ground level: 0.90 m	Type of rock: CONGLOMERATE/LIMESTONE	

Test record

1st period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 9	Flowmeter readings, litres	29856.6	29867	29877	29886		
	Dipstick						
	Water take, litres	10.5	9.6	9.6			1.98
2nd period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	29886.3	29896	29907	29917		
	Dipstick						
	Water take, litres	9.7	11.2	10			2.06
3rd period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 11	Flowmeter readings, litres	29917.2	29928	29940	29952		
	Dipstick						
	Water take, litres	11	11.8	12.4			2.35
4th period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	29952.4	29965	29977	29990		
	Dipstick						
	Water take, litres	12.4	12.4	12.9			2.51
5th period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar): 9	Flowmeter readings, litres	29990.1	30001	30013	30024		
	Dipstick						
	Water take, litres	11.1	11.7	10.9			2.25

Remarks (to include details of pipework where relevant):

PROJECT: CORE DRILLING AL DHAID

# swissboring

CLIENT: SANYU CONSULTANTS

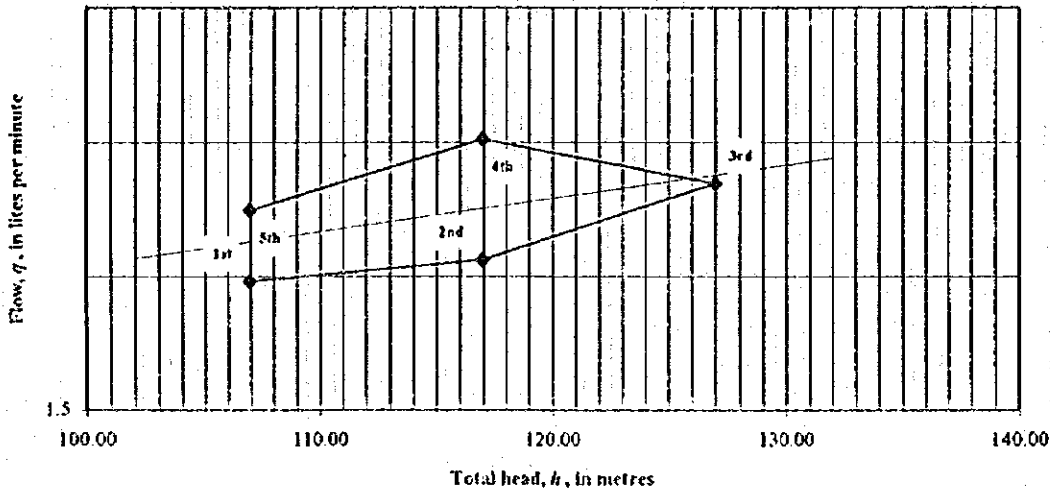
Packer or Lugeon test, Sheet 2	Site: AL MILJIA	Location: AL DHAID.
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: BJ
	Date: 02.07.95	Sheet: 2 of 2
	Ground level: (Ordnance datum)	Crew/operator: JOHN
	Weather: HOT, WINDY	
Computation by: George	Test No: 4	

Computation record

Data (from sheet 1)	Length of test section, $l$ : 5.00 (m)
Initial depth to ground water: 16.10 (1)	Gauge height above ground level: 0.90 (m) (2)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, m		Total head, $h$ (1) + (2) + (5) + (6) + (7)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	1.98	9	90	0.0172	0.0003	106.98
2nd	2.06	10	100	0.0185	0.0003	116.98
3rd	2.35	11	110	0.0236	0.0004	126.98
4th	2.51	10	100	0.0268	0.0005	116.97
5th	2.25	9	90	0.0217	0.0004	106.98

Flow v. total head



Calculations:	Permeability Estimate:
Slope of graph = $q/h = 0.0125$	$Q$ (l/min) $K$ (m/day) $K$ (cm/sec)
$L = (100/l) * (q/h)$ in lugeon units = 0	Period 1    1.98    3.37E-03    3.90E-06
where $l$ is the length of test section in metres	Period 2    2.06    3.21E-03    3.71E-06
0 lugeon = 2.15E-03 m/day	Period 3    2.35    3.37E-03    3.90E-06
= 2.49E-06 cm/sec	Period 4    2.51    3.91E-03    4.53E-06
Comments:	Period 5    2.25    3.83E-03    4.43E-06

PROJECT COREDRILLING AL DHAID

swissboring

CLIENT: SANYU CONSULTANTS INC.

Packer or Lugon test. Sheet 1		Site: AL MILHIA	Location: AL DHAID.			
Depths below ground level to:		Job No: E-2145	Borehole No: B1			
(a) top of test section:	140.00 m	Date: 01.07.95	Sheet: 1 of 2			
(b) bottom of test section:	145.00 m	Ground level: m	Crew/operator: JOHN			
(c) centre of test section:	142.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	200.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	15.00 m	Packer pressure: 32 BA	Test No: 3			
(f) initial ground water level: (see NOTE 2)	16.10 m	Packer Type: Pneumatic 86 mm				
Length of test section	5.00 m	Dia. of hole in test area:	94 mm			
Gauge height above ground level:	0.90 m	Type of rock: CALCAREOUS MUDSTONE				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	29823.8	29825	29826	29826	0.14
	Dipstick					
	Water take, litres	1.4	0.6	0.1		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 11	Flowmeter readings, litres	29825.9	29827	29828	29829	0.18
	Dipstick					
	Water take, litres	1	1.1	0.6		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 12	Flowmeter readings, litres	29828.6	29830	29832	29834	0.37
	Dipstick					
	Water take, litres	1.6	1.7	2.3		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 11	Flowmeter readings, litres	29834.2	29836	29838	29840	0.40
	Dipstick					
	Water take, litres	2.1	2	1.9		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	29840.2	29841	29842	29843	0.15
	Dipstick					
	Water take, litres	1.1	0.9	0.3		
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

# swissboring

CLIENT: SANYU CONSULTANTS

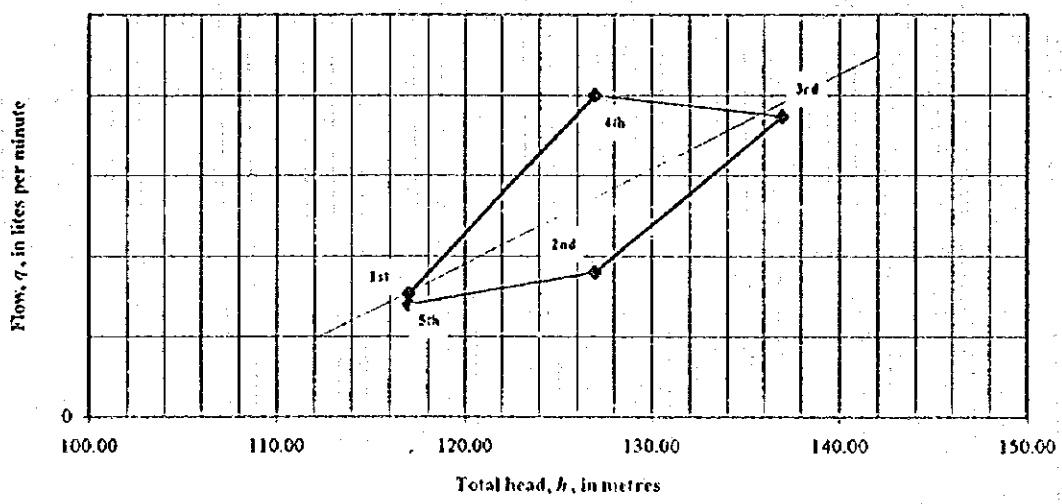
Packer or Lugeon test. Sheet 2	Site: AL MILIHA	Location: AL DHAID.
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: B1
	Date: 01.07.95	Sheet: 2 of 2
	Ground level: m (Ordnance datum)	Crew/operator JOHN
	Weather: HOT, WINDY	
Computation by: George	Test No: 3	

Computation record

Data (from sheet 1)	Length of test section, l: 5.00 (m)
Initial depth to ground water: 16.10 (0)	Gauge height above ground level 0.90 (m) (2)

Period	Flow, q litres/min (3)	Gauge pressure		Friction head loss, m		Total head, h (1) + (2) + (5) - (6) - (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.14	10	100	0.0001	0.0000	117.00
2nd	0.18	11	110	0.0002	0.0000	127.00
3rd	0.37	12	120	0.0009	0.0000	137.00
4th	0.40	11	110	0.0010	0.0000	127.00
5th	0.15	10	100	0.0002	0.0000	117.00

Flow v. total head



Calculations:	Permeability Estimate:			
Slope of graph = $q/h = 0.0118$	Q (l/min)	K (m/day)	K (cm/sec)	
$L = (100/l) * (q/h)$ in lugeon units = 0	Period 1	0.14	2.18E-04	2.52E-07
where l is the length of test section in metres	Period 2	0.18	2.58E-04	2.99E-07
0 lugeon = 2.03E-03 m/day	Period 3	0.37	4.96E-04	5.75E-07
= 2.35E-06 cm/sec	Period 4	0.40	5.74E-04	6.64E-07
Comments:	Period 5	0.15	2.39E-04	2.76E-07

PROJECT COREDRILLING AL DHAID

swissboring

CLIENT: SANYU CONSULTANTS INC.

Packer or Lugeon test. Sheet 1		Site: AL MILIHA	Location: AL DHAID.
Depths below ground level to:		Job No: E-2145	Borehole No: B1
(a) top of test section:	160.00 m	Date: 01.07.95	Sheet: 1 of 2
(b) bottom of test section:	165.00 m	Ground level: m	Crew/operator: JOHN
(c) centre of test section:	162.50 m	(Ordnance datum)	
(d) bottom of hole at time of test:	200.00 m	Weather: HOT, WINDY	
(e) bottom of casing:	15.00 m	Packer pressure: 32bar	Test No: 2
(f) initial ground water level: (see NOTE 2)	16.10 m	Packer Type: Pneumatic 86 mm	
Length of test section	5.00 m	Dia. of hole in test area:	94 mm
Gauge height above ground level:	0.90 m	Type of rock:	CALCAREOUS MUDSTONE

Test record

1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	29781.4	29784	29786	29788	0.46
	Dipstick litres					
Water take, litres		2.8	2.1	2		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 11	Flowmeter readings, litres	29788.3	29791	29794	29796	0.53
	Dipstick litres					
Water take, litres		3.1	2.3	2.6		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 12	Flowmeter readings, litres	29796.3	29799	29803	29806	0.65
	Dipstick litres					
Water take, litres		2.7	3.7	3.3		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 11	Flowmeter readings, litres	29806	29809	29811	29814	0.52
	Dipstick litres					
Water take, litres		2.6	2.6	2.6		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	29813.8	29816	29817	29819	0.36
	Dipstick litres					
Water take, litres		1.8	1.7	1.9		

Remarks (to include details of pipework where relevant):

PROJECT: CORE DRILLING AL DHAID

# swissboring

CLIENT: SANYU CONSULTANTS

Packer or Lugeon test. Sheet 2	Site: AL MILIHA	Location: AL DHAID.
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: B1
	Date: 01.07.95	Sheet: 2 of 2
	Ground level: m	Crew/operator JOHN
	(Ordnance datum)	
Weather: HOT, WINDY	Test No: 2	

Computation by: George

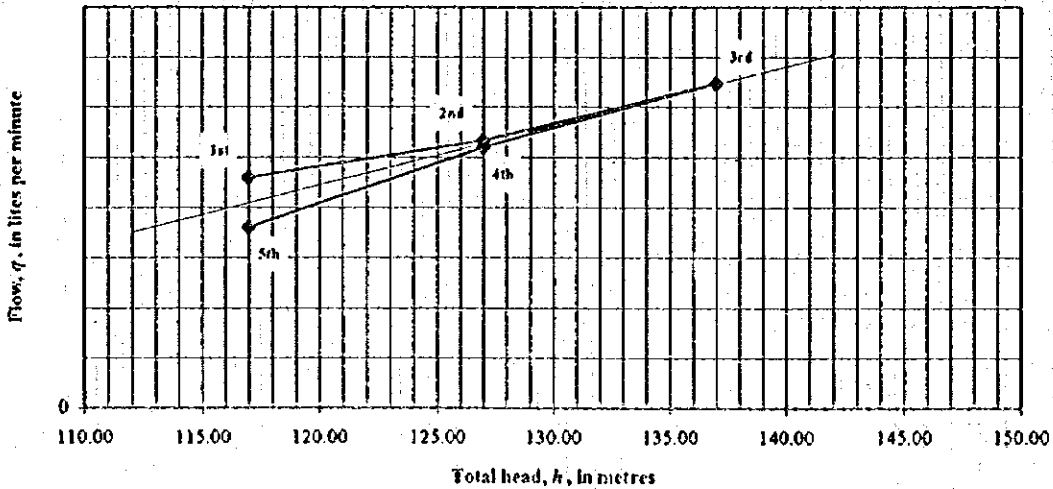
Computation record

Data (from sheet 1) Length of test section,  $l$ : 5.00 (m)

Initial depth to ground water: 16.10 (1) Gauge height above ground level: 0.90 (m) (2)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, $m$		Total head, $h$ (1) + (2) + (5) - (6) - (7)
		Gauge pressure (bars) (4)	Head of water, $m$ (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.46	10	100	0.0015	0.0000	117.00
2nd	0.53	11	110	0.0019	0.0000	127.00
3rd	0.65	12	120	0.0027	0.0000	137.00
4th	0.52	11	110	0.0018	0.0000	127.00
5th	0.36	10	100	0.0009	0.0000	117.00

Flow v. total head



Calculations:	Permeability Estimate:
Slope of graph = $q/h$ = 0.0118	$Q$ (l/min) $K$ (m/day) $K$ (cm/sec)
$L = (100/l) * (q/h)$ in lugeon units = 0	Period 1    0.46    7.16E-04    8.29E-07
where $l$ is the length of test section in metres	Period 2    0.53    7.65E-04    8.85E-07
0 lugeon = 2.04E-03 m/day	Period 3    0.65    8.60E-04    9.95E-07
= 2.36E-06 cm/sec	Period 4    0.52    7.46E-04    8.63E-07
Comments:	Period 5    0.36    5.60E-04    6.49E-07

PROJECT COREDRILLING AL DHAID				<b>swissboring</b>			
CLIENT: SANYU CONSULTANTS INC.							
Packer or Lugeon test. Sheet 1				Site:	AL MILHIA	Location:	AL DHAID.
Depths below ground level to:				Job No:	E-2145	Borehole No:	B1
(a) top of test section:	180.00	m		Date:	01.07.95	Sheet:	1 of 2
(b) bottom of test section:	185.00	m		Ground level:	m	Crew/operator:	JOHN
(c) centre of test section:	182.50	m		(Ordnance datum)			
(d) bottom of hole at time of test:	200.00	m		Weather:	HOT, WINDY		
(e) bottom of casing:	15.00	m		Packer pressure:	34bar	Test No:	1
(f) initial ground water level: (see NOTE 2)	16.10	m		Packer Type:	Pneumatic 86 mm		
Length of test section	5.00	m		Dia. of hole in test area:	94 mm		
Gauge height above ground level:	0.90	m		Type of rock:	CALCAREOUS MUDSTONE		
Test record							
1st period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	29713.7	29715	29718	29723		0.60
	Dipstick						
11	Water take, litres	1.2	3.4	4.4			
2nd period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	29724.8	29729	29734	29739		0.94
	Dipstick						
12	Water take, litres	4.5	4.3	5.3			
3rd period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	29738.9	29743	29747	29752		0.86
	Dipstick						
13	Water take, litres	3.6	4.8	4.5			
4th period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	29751.8	29756	29759	29763		0.74
	Dipstick						
12	Water take, litres	3.8	3.7	3.6			
5th period	Time, min	0	5	10	15		Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	29763.1	29766	29768	29770		0.47
	Dipstick						
11	Water take, litres	2.4	2.3	2.4			
Remarks (to include details of pipework where relevant):							

<b>PROJECT:</b> CORE DRILLING AL DHAID		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 2		Site: AL MILIHA	Location: AL DHAID.			
NOTE 1. For test details, see sheet 1.		Job No: E-2145	Borehole No: B1			
NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section		Date: 01.07.95	Sheet: 2 of 2			
		Ground level: (Ordnance datum)	Crew/operator JOHN			
		Weather: HOT, WINDY				
Computation by: George		Test No: 1				
<b>Computation record</b>						
Data (from sheet 1)		Length of test section, <i>l</i> :	5.00 (m)			
Initial depth to ground water: 16.10 (0)		Gauge height above ground level	0.90 (m) (7)			
Period	Flow, <i>q</i> litres/min (4)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1) + (2) + (5) + (6) + (7) (8)
		Gauge pressure (bars) (5)	Head of water, m (6)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.60	11	110	0.0027	0.0000	127.00
2nd	0.94	12	120	0.0061	0.0001	136.99
3rd	0.86	13	130	0.0052	0.0001	146.99
4th	0.74	12	120	0.0039	0.0001	137.00
5th	0.47	11	110	0.0017	0.0000	127.00

**Flow v. total head**

<b>Calculations:</b>		<b>Permeability Estimate:</b>				
Slope of graph = $q/h = 0.0182$			Q (l/min)	K (m <sup>2</sup> /day)	K (cm/sec)	
$L = (100/l) * (q * h)$ in lugeon units = 0			Period 1	0.60	8.61E-04	9.96E-07
where <i>l</i> is the length of test section in metres			Period 2	0.94	1.25E-03	1.45E-06
0 lugeon = 3.14E-03 m <sup>2</sup> /day			Period 3	0.86	1.07E-03	1.23E-06
= 3.64E-06 cm/sec			Period 4	0.74	9.84E-04	1.14E-06
<b>Comments:</b>			Period 5	0.47	6.79E-04	7.86E-07



<b>PROJECT:</b> CORE DRILLING AL AHAIID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site: AL MLIHA	Location: AL DHAID			
Depths below ground level to:		Job No: E-2145	Borehole No: B2			
(a) top of test section:	13.00 m	Date: 08.08.95	Sheet: 1 of 2			
(b) bottom of test section:	18.00 m	Ground level: 134 m	Crew/operator: VARGHESE			
(c) centre of test section:	15.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	0.00 m	Packer pressure: 30 BAR	Test No: 12			
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 86 mm				
Length of test section	5.00 m	Dia. of hole in test area: 140 mm				
Gauge height above ground level:	0.90 m	Type of rock: CONGLOMERATE/GRAVELS.				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	610	668	724	779	11.27
	Dipstick readings, litres					
2	Water take, litres	58	56	55		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	800	924	1042	1162	24.13
	Dipstick readings, litres					
3	Water take, litres	124	118	120		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	250	448	644	839	39.27
	Dipstick readings, litres					
4	Water take, litres	198	196	195		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	890	1026	1163	1299	27.27
	Dipstick readings, litres					
3	Water take, litres	136	137	136		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	420	494	549	622	13.47
	Dipstick readings, litres					
2	Water take, litres	74	55	73		
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

# swissboring

CLIENT: SANYU CONSULTANTS

Packer or Lugeon test. Sheet 2

Site: AL MILHA

Location: AL DHAID

NOTE 1. For test details, see sheet 1.

Job No: E-2145

Borehole No: B2

NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section.

Date: 08.08.95

Sheet: 2 of 2

Ground level: 154  
(Ordnance datum)

Crew/operator VARGHESE

Weather: HOT, WINDY.

Computation by: GEORGE

Test No: 12

**Computation record**

Data (from sheet 1)

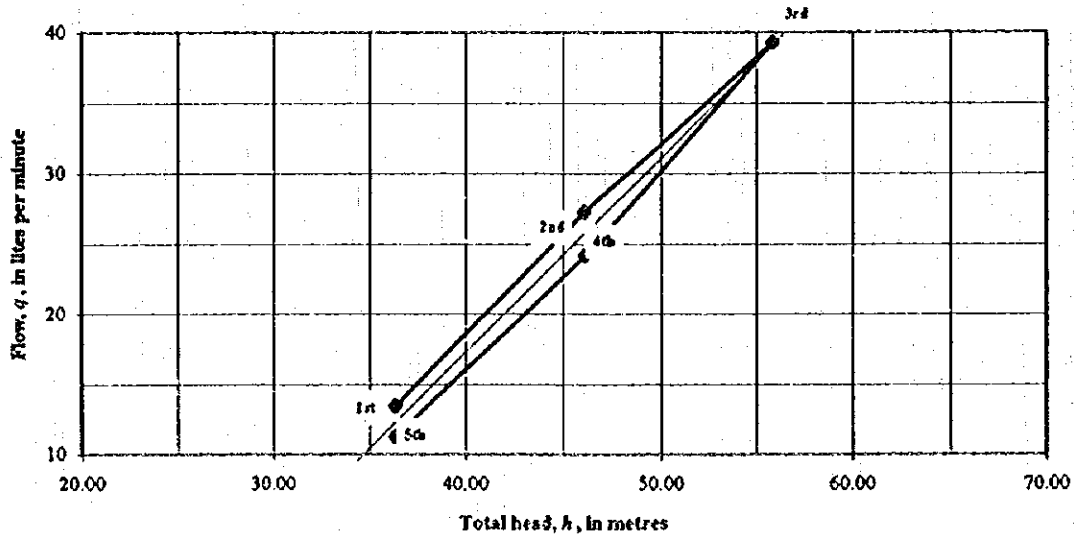
Length of test section,  $l$ : 5.00 (m)

Initial depth to ground water: 15.50 (m)

Gauge height above ground level 0.90 (m) (2)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, m		Total head, $h$ (1)+(2)+(3)-(6)-(7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	11.27	2	20	0.0468	0.0077	36.35
2nd	24.13	3	30	0.1918	0.0318	46.18
3rd	39.27	4	40	0.4723	0.0782	55.85
4th	27.27	3	30	0.2404	0.0398	46.12
5th	13.47	2	20	0.0651	0.0108	36.32

Flow v. total head



**Calculations:**

**Permeability Estimate:**

Slope of graph =  $q/h = 1.3751$

$L = (100/l) \cdot (q/h)$  in Lugeon units = 28

where  $l$  is the length of test section in metres

28 Lugeon = 2.38E-01 m/day

= 2.75E-04 cm/sec

	Q (l/min)	K (m/day)	K (cm/sec)
Period 1	11.27	5.08E-02	5.88E-05
Period 2	24.13	8.57E-02	9.91E-05
Period 3	39.27	1.15E-01	1.33E-04
Period 4	27.27	9.69E-02	1.12E-04
Period 5	13.47	6.08E-02	7.03E-05

Comments:

<b>PROJECT:</b> CORE DRILLING AL AJAID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test, Sheet 1		Site:	AL MILIHA	Location:	AL DHAJD	
Depths below ground level to:		Job No:	E-2145	Borehole No:	B2	
(a) top of test section:	32.00 m	Date:	04.08.95	Sheet:	1 of 2	
(b) bottom of test section:	37.00 m	Ground level:	154 m	Crew/operator:	VARGHESE	
(c) centre of test section:	34.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	30.00 m	Packer pressure:	30 BA	Test No:	11	
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 63mm				
Length of test section	5.00 m	Dia. of hole in test area: 94 mm				
Gauge height above ground level:	0.90 m	Type of rock: GRAVELS				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 3	Flowmeter readings, litres	350	456	567	681	22.07
	Dipstick readings, litres					
Water take, litres		106	111	114		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	740	902	1061	1218	31.87
	Dipstick readings, litres					
Water take, litres		162	159	157		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 5	Flowmeter readings, litres	330	531	739	939	40.60
	Dipstick readings, litres					
Water take, litres		201	208	200		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	0	168	334	503	33.53
	Dipstick readings, litres					
Water take, litres		168	166	169		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 3	Flowmeter readings, litres	570	711	847	985	27.67
	Dipstick readings, litres					
Water take, litres		141	136	138		
Remarks (to include details of pipework where relevant):						

<b>PROJECT:</b> CORE DRILLING AL DHAIID		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 2		Site: AL MILHA	Location: AL DHAIID			
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section		Job No: E-2145	Borehole No: B2			
		Date: 04.08.95	Sheet: 2 of 2			
		Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE			
		Weather: HOT, WINDY.				
Computation by: GEORGE		Test No: 11				
<b>Computation record</b>						
Data (from sheet 1)		Length of test section, <i>l</i> : 5.00 (m)				
Initial depth to ground water: 15.50 (1)		Gauge height above ground level 0.90 (m) (2)				
Period	Flow, <i>q</i> litres/min (3)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1)+(2)+(5)-(6)-(7)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	22.07	3	30	0.3845	0.0269	45.99
2nd	31.87	4	40	0.7594	0.0531	55.59
3rd	40.60	5	50	1.1893	0.0832	65.13
4th	33.53	4	40	0.8346	0.0584	55.31
5th	27.67	3	30	0.5846	0.0469	45.77

**Flow v. total head**

<p><b>Calculations:</b></p> <p>Slope of graph = <math>q/h = 0.8138</math></p> <p><math>L = (100/l) \cdot (q/h)</math> in lugeon units = 16</p> <p>where <i>l</i> is the length of test section in metres</p> <p>16 lugeon = 1.41E-01 m/day</p> <p>= 1.63E-04 cm/sec</p>	<p><b>Permeability Estimate:</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Q (l/min)</th> <th>K (m/day)</th> <th>K (cm/sec)</th> </tr> </thead> <tbody> <tr> <td>Period 1</td> <td>22.07</td> <td>8.74E-02</td> <td>1.01E-04</td> </tr> <tr> <td>Period 2</td> <td>31.87</td> <td>1.04E-01</td> <td>1.21E-04</td> </tr> <tr> <td>Period 3</td> <td>40.60</td> <td>1.14E-01</td> <td>1.31E-04</td> </tr> <tr> <td>Period 4</td> <td>33.53</td> <td>1.10E-01</td> <td>1.27E-04</td> </tr> <tr> <td>Period 5</td> <td>27.67</td> <td>1.10E-01</td> <td>1.27E-04</td> </tr> </tbody> </table>		Q (l/min)	K (m/day)	K (cm/sec)	Period 1	22.07	8.74E-02	1.01E-04	Period 2	31.87	1.04E-01	1.21E-04	Period 3	40.60	1.14E-01	1.31E-04	Period 4	33.53	1.10E-01	1.27E-04	Period 5	27.67	1.10E-01	1.27E-04
	Q (l/min)	K (m/day)	K (cm/sec)																						
Period 1	22.07	8.74E-02	1.01E-04																						
Period 2	31.87	1.04E-01	1.21E-04																						
Period 3	40.60	1.14E-01	1.31E-04																						
Period 4	33.53	1.10E-01	1.27E-04																						
Period 5	27.67	1.10E-01	1.27E-04																						
Comments:																									

<b>PROJECT:</b> CORE DRILLING AL AHAIID		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site: AL MILIHA	Location: AL DHAID			
Depths below ground level to:		Job No: E-2145	Borehole No: B2			
(a) top of test section:	70.00 m	Date: 04.08.95	Sheet: 1 of 2			
(b) bottom of test section:	75.00 m	Ground level: 154 m (Ordnance datum)	Crew/operator: VARGHESE			
(c) centre of test section:	72.50 m					
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	30.00 m	Packer pressur: 32 BAR	Test No: 10			
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 63mm				
Length of test section	5.00 m	Dia. of hole in test area: 94 mm				
Gauge height above ground level:	0.90 m	Type of rock: LIMESTONE/CONGLOMERATE				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 3	Flowmeter readings, litres	118	136.9	152.1	167.3	3.29
	Dipstick readings, litres					
	Water take, litres	18.9		15.2	15.2	
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 5	Flowmeter readings, litres	186	243.2	302.8	365.9	11.99
	Dipstick readings, litres					
	Water take, litres	57.2		59.6	63.1	
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	458	613.8	749.3	879	28.07
	Dipstick readings, litres					
	Water take, litres	155.8		135.5	129.7	
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 5	Flowmeter readings, litres	913	986.5	1049	1109	13.09
	Dipstick readings, litres					
	Water take, litres	73.5		62.5	60.3	
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 3	Flowmeter readings, litres	0	33.8	63.7	91.8	6.12
	Dipstick readings, litres					
	Water take, litres	33.8		29.9	28.1	
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

# swissboring

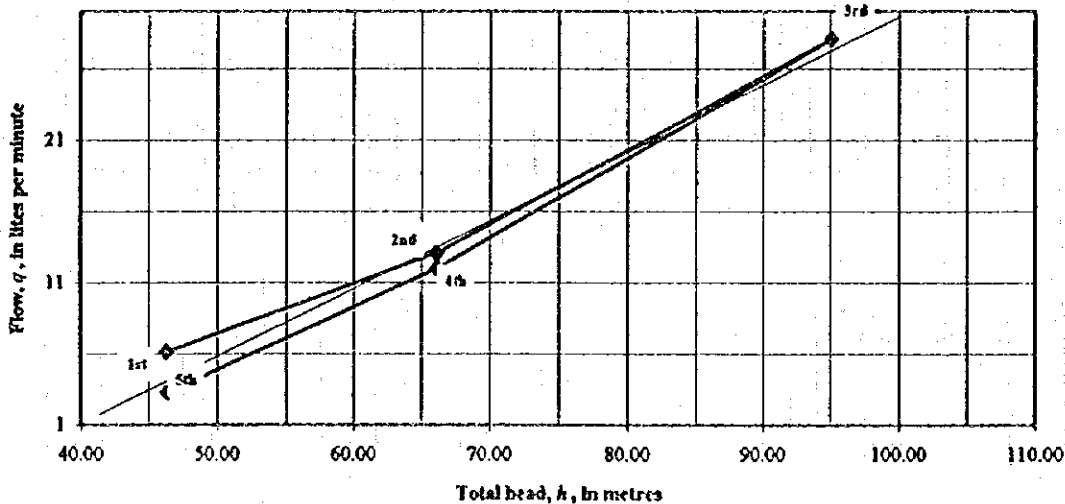
CLIENT: SANYU CONSULTANTS

Packer or Lugeon test. Sheet 2	Site: AL MILIHA	Location: AL DHAID
NOTE 1. For test details, see sheet 1.	Job No: E-2145	Borehole No: B2
NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Date: 04.08.95	Sheet: 2 of 2
	Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE
Computation by: GEORGE	Weather: HOT, WINDY.	
	Test No: 10	

Computation record	
Data (from sheet 1)	Length of test section, <i>l</i> : 5.00 (m)
Initial depth to ground water: 15.50 (1)	Gauge height above ground level 0.90 (m) (2)

Period	Flow, <i>q</i> litres/min (3)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1) + (2) + (5) + (6) + (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	3.29	3	30	0.0244	0.0008	46.37
2nd	11.99	5	50	0.2679	0.0087	66.12
3rd	28.07	8	80	1.2937	0.0420	95.06
4th	13.09	5	50	0.3149	0.0102	66.07
5th	6.12	3	30	0.0771	0.0025	46.32

Flow v. total head



Calculations:	Permeability Estimate:
Slope of graph = $q/h = 0.4752$	<i>Q</i> (l/min) <i>K</i> (m/day) <i>K</i> (cm/sec)
$L = (100/l)^2(q/h)$ in lugeon units = 10	Period 1    3.29    1.29E-02    1.49E-05
where <i>l</i> is the length of test section in metres	Period 2    11.99    3.30E-02    3.82E-05
10 lugeon = 8.21E-02 m/day	Period 3    28.07    5.38E-02    6.22E-05
= 9.50E-05 cm/sec	Period 4    13.09    3.61E-02    4.18E-05
Comments:	Period 5    6.12    2.41E-02    2.79E-05

<b>PROJECT:</b> CORE DRILLING AL AHAIID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site:	AL MILIHA	Location:	AL DHAID	
Depths below ground level to:		Job No:	E-2145	Borehole No:	B2	
(a) top of test section:	112.00 m	Date:	04.08.95	Sheet:	1 of 2	
(b) bottom of test section:	117.00 m	Ground level:	154 m	Crew/operator:	VARGHESE	
(c) centre of test section:	114.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	300.00 m	Weather:	HOT, WINDY			
(e) bottom of casing:	30.00 m	Packer pressur:	35 BAR	Test No:	9	
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type:	Pneumatic 63mm			
Length of test section	5.00 m	Dia. of hole in test area:	94 mm			
Gauge height above ground level:	0.90 m	Type of rock:	LIMESTONE			
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	812	816.8	821.6	826.3	0.95
	Dipstick readings, litres					
Water take, litres		4.8	4.8	4.7		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	829	835.7	842.6	849.5	1.37
	Dipstick readings, litres					
Water take, litres		6.7	6.9	6.9		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	857	866.2	886.3	908.8	3.45
	Dipstick readings, litres					
Water take, litres		9.2	20.1	22.5		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	918	937.8	957.2	976.7	3.91
	Dipstick readings, litres					
Water take, litres		19.8	19.4	19.5		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	984	1002	1019	1035	3.42
	Dipstick readings, litres					
Water take, litres		17.7	16.8	16.8		
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

# swissboring

CLIENT: SANYU CONSULTANTS

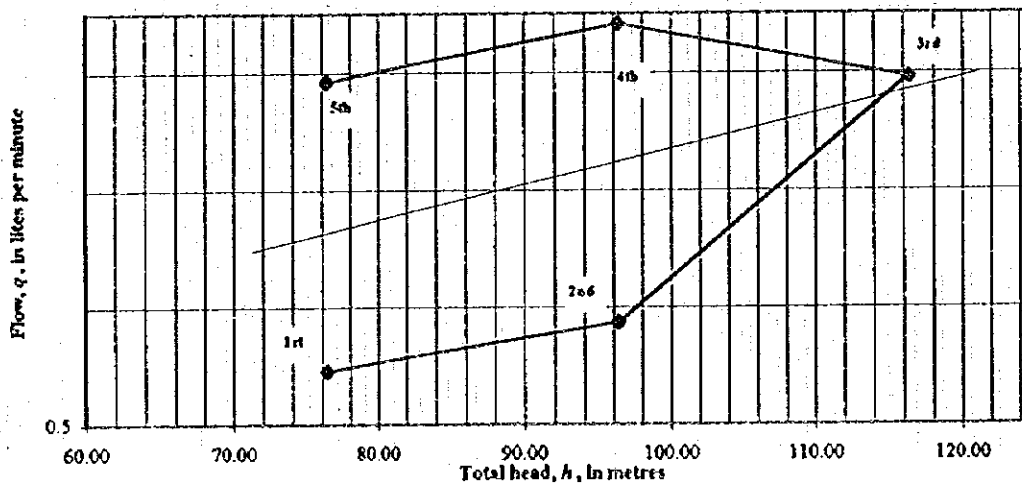
Packer or Lugeon test. Sheet 2	Site: AL MILHA	Location: AL DHAID
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: B2
	Date: 04.08.95	Sheet: 2 of 2
	Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE
	Weather: HOT, WINDY.	
Computation by: GEORGE	Test No: 9	

Computation record

Data (from sheet 1)	Length of test section, <i>l</i> : 5.00 (m)
Initial depth to ground water: 15.50 (1)	Gauge height above ground level 0.90 (m) (2)

Period	Flow, <i>q</i> litres/min (3)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1) + (2) + (5) - (6) - (7)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.95	6	60	0.0039	0.0001	76.40
2nd	1.37	8	80	0.0076	0.0002	96.39
3rd	3.45	10	100	0.0425	0.0009	116.36
4th	3.91	8	80	0.0336	0.0011	96.35
5th	3.42	6	60	0.0418	0.0009	76.36

Flow v. total head



Calculations:

Slope of graph =  $q/h = 0.0303$   
 $L = (100/l) * (q/h)$  in lugeon units = 1  
 where *l* is the length of test section in metres  
 1 lugeon =  $5.24E-03$  m/day  
 =  $6.06E-06$  cm/sec

Permeability Estimate:

	Q (l/min)	K (m/day)	K (cm/sec)
Period 1	0.95	2.27E-03	2.63E-06
Period 2	1.37	2.58E-03	2.99E-06
Period 3	3.45	5.41E-03	6.26E-06
Period 4	3.91	7.40E-03	8.56E-06
Period 5	3.42	8.16E-03	9.44E-06

Comments:



<b>PROJECT:</b> CORE DRILLING AL AHAID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site: AL MILHA	Location: AL DHAID			
Depths below ground level to:		Job No: E-2145	Borehole No: B2			
(a) top of test section:	158.00 m	Date: 04.08.95	Sheet: 1 of 2			
(b) bottom of test section:	163.00 m	Ground level: 154 m (Ordnance datum)	Crew/operator: VARGHESE			
(c) centre of test section:	160.50 m					
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	30.00 m	Packer pressure: 35 BAR	Test No: 8			
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 63mm				
Length of test section	5.00 m	Dia. of hole in test area: 94 mm				
Gauge height above ground level:	0.90 m	Type of rock: SANDSTONE/CONGLOMERATE				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	706	710.1	714.1	718.1	0.81
	Dipstick					
	Water take, litres	4.1	4	4		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	720	725.1	729.9	734.8	0.99
	Dipstick					
	Water take, litres	5.1	4.8	4.9		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	737.4	743.6	749.7	755.7	1.22
	Dipstick					
	Water take, litres	6.2	6.1	6		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	757.5	762.6	767.6	772.6	1.01
	Dipstick					
	Water take, litres	5.1	5	5		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	774.4	778.6	782.8	786.9	0.83
	Dipstick					
	Water take, litres	4.2	4.2	4.1		
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

swissboring

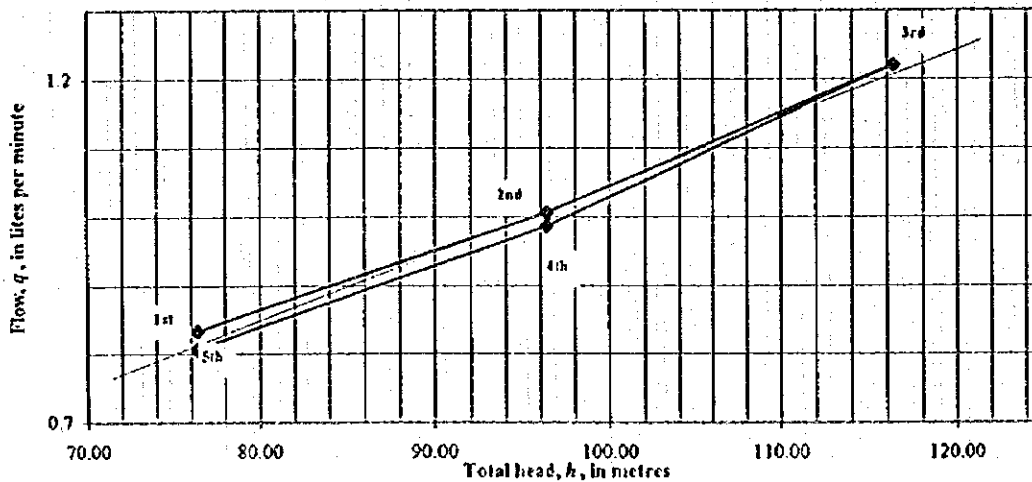
CLIENT: SANYU CONSULTANTS

Packer or Lugeon test, Sheet 2	Site: AL MILIHA	Location: AL DHAID
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: B2
	Date: 04.08.95	Sheet: 2 of 2
	Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE
	Weather: HOT, WINDY.	
Computation by: GEORGE	Test No: 8	

Computation record	
Data (from sheet 1)	Length of test section, $l$ : 5.00 (m)
Initial depth to ground water: 15.50 (l)	Gauge height above ground level: 0.90 (m) (l)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, m		Total head, $h$ (1) + (2) + (5) - (6) - (7)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.81	6	60	0.0043	0.0001	76.40
2nd	0.99	8	80	0.0059	0.0001	96.39
3rd	1.22	10	100	0.0087	0.0001	116.39
4th	1.01	8	80	0.0061	0.0001	96.39
5th	0.83	6	60	0.0043	0.0001	76.40

Flow v. total head



Calculations:	Permeability Estimate:
Slope of graph = $q/h$ = 0.0098	$Q$ (l/min) $K$ (m <sup>2</sup> /day) $K$ (cm/sec)
$L = (100/l)(q/h)$ in lugeon units = 0	Period 1    0.81    1.92E-03    2.23E-06
where $l$ is the length of test section in metres	Period 2    0.99    1.86E-03    2.16E-06
0 lugeon = 1.70E-03 m/day	Period 3    1.22    1.91E-03    2.21E-06
= 1.97E-06 cm/sec	Period 4    1.01    1.90E-03    2.20E-06
Comments:	Period 5    0.83    1.99E-03    2.30E-06

<b>PROJECT:</b> CORE DRILLING AL AHAID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site: AL MILIHA	Location: AL DHAID			
Depths below ground level to:		Job No: E-2145	Borehole No: B2			
(a) top of test section:	199.00 m	Date: 03.08.95	Sheet: 1 of 2			
(b) bottom of test section:	204.00 m	Ground level: 154 m (Ordnance datum)	Crew/operator: VARGHESE			
(c) centre of test section:	201.50 m					
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	195.00 m	Packer pressure: 40BAR	Test No: 7			
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 63mm				
Length of test section	5.00 m	Dia. of hole in test area:		94 mm		
Gauge height above ground level:	0.90 m	Type of rock: SANDSTONE				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	641	642.3	643.6	644.9	0.26
	Dipstick					
6	Water take, litres	1.3	1.3	1.3		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	649.2	650.8	652.4	653.9	0.31
	Dipstick					
8	Water take, litres	1.6	1.6	1.5		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	658.5	661	663.4	665.9	0.49
	Dipstick					
10	Water take, litres	2.5	2.4	2.5		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	670.5	672.7	674.7	676.6	0.41
	Dipstick					
8	Water take, litres	2.2	2	1.9		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar):	Flowmeter readings, litres	680	681.4	682.8	684.2	0.28
	Dipstick					
6	Water take, litres	1.4	1.4	1.4		
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

# swissboring

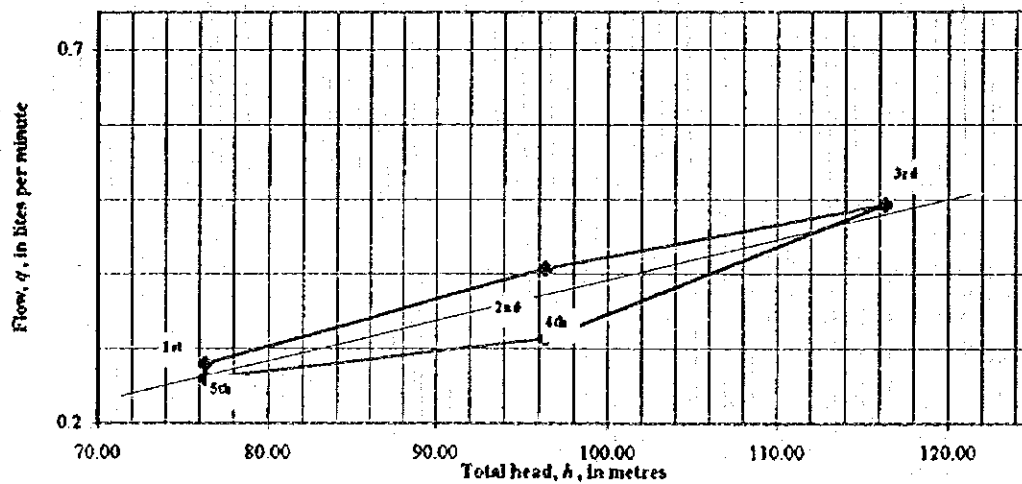
CLIENT: SANYU CONSULTANTS

Packer or Lugeon test. Sheet 2	Site: AL MLIHA	Location: AL DHAID
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: B2
	Date: 03.08.95	Sheet: 2 of 2
	Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE
	Weather: HOT, WINDY.	
Computation by: GEORGE	Test No: 7	

Computation record	
Data (from sheet 1)	Length of test section, l: 5.00 (m)
Initial depth to ground water: 15.50 (1)	Gauge height above ground level 0.90 (m) (2)

Period	Flow, q litres/min (3)	Gauge pressure		Friction head loss, m		Total head, h (1) + (2) + (5) - (6) - (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.26	6	60	0.0006	0.0000	76.40
2nd	0.31	8	80	0.0009	0.0000	96.40
3rd	0.49	10	100	0.0021	0.0000	116.40
4th	0.41	8	80	0.0014	0.0000	96.40
5th	0.28	6	60	0.0007	0.0000	76.40

Flow v. total head



Calculations:	Permeability Estimate:			
Slope of graph = $q/h = 0.0054$	Q (l/min)	K (m/day)	K (cm/sec)	
$L = (100/l) * (q/h)$ in lugeon units = 0	Period 1	0.26	6.20E-04	7.17E-07
where l is the length of test section in metres	Period 2	0.31	5.92E-04	6.85E-07
$\phi$ lugeon = 9.38E-04 m/day	Period 3	0.49	7.72E-04	8.94E-07
= 1.09E-06 cm/sec	Period 4	0.41	7.68E-04	8.89E-07
Comments:	Period 5	0.28	6.68E-04	7.73E-07

<b>PROJECT:</b> CORE DRILLING AL AHAID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site: AL MILIHA	Location: AL DHAID			
Depths below ground level to:		Job No: E-2145	Borehole No: B1			
(a) top of test section:	220.00 m	Date: 03.08.95	Sheet: 1 of 2			
(b) bottom of test section:	225.00 m	Ground level: 154 m	Crew/operator: VARGHESE			
(c) centre of test section:	223.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	195.00 m	Packer pressure 40 BAR	Test No: 6			
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 63mm				
Length of test section	5.00 m	Dia. of hole in test area:	94 mm			
Gauge height above ground level:	0.90 m	Type of rock: CONGLOMERATE				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	536.4	539.6	542.8	545.9	0.63
	Dipstick readings, litres					
	Water take, litres	3.2	3.2	3.1		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	548.5	552.1	555.8	559.6	0.74
	Dipstick readings, litres					
	Water take, litres	3.6	3.7	3.8		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	561.5	566.3	571.1	576.1	0.97
	Dipstick readings, litres					
	Water take, litres	4.8	4.8	5		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	577	580.4	584	587.2	0.68
	Dipstick readings, litres					
	Water take, litres	3.4	3.6	3.2		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	588.1	591	593.9	596.7	0.57
	Dipstick readings, litres					
	Water take, litres	2.9	2.9	2.8		
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

swissboring

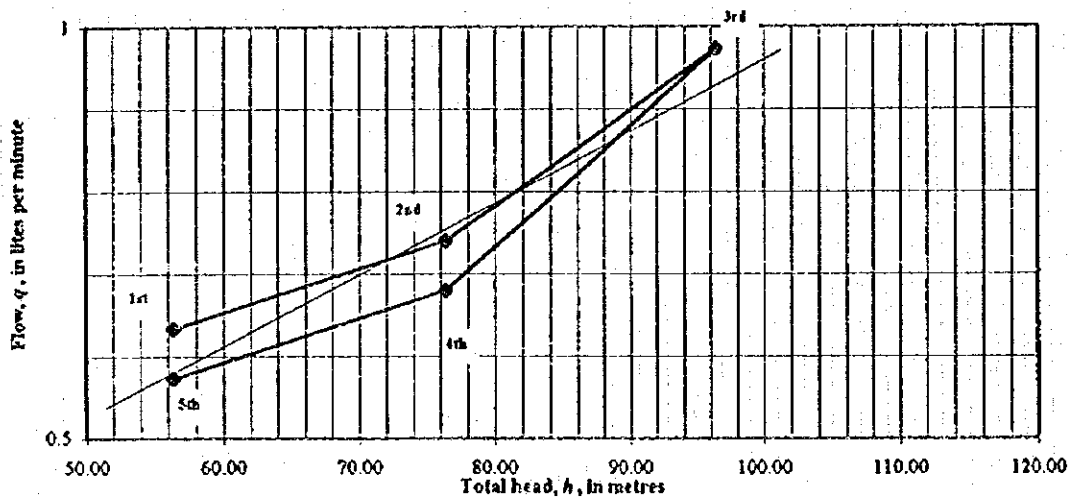
CLIENT: SANYU CONSULTANTS

Packer or Lugeon test. Sheet 2	Site: AL MILHA	Location: AL DHAID
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: B2
	Date: 03.08.95	Sheet: 2 of 2
	Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE
	Weather: HOT, WINDY.	
Computation by: GEORGE	Test No: 6	

Computation record	
Data (from sheet 1)	Length of test section, $l$ : 5.00 (m)
Initial depth to ground water: 15.50 (1)	Gauge height above ground level: 0.90 (m) (2)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, m		Total head, $h$ (1) + (2) + (5) + (6) - (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.63	4	40	0.0036	0.0000	56.40
2nd	0.74	6	60	0.0048	0.0001	76.40
3rd	0.97	8	80	0.0080	0.0001	96.39
4th	0.68	6	60	0.0041	0.0000	76.40
5th	0.57	4	40	0.0030	0.0000	56.40

Flow v. total head



Calculations:	Permeability Estimate:		
Slope of graph = $q/h$ = 0.0687	Q (l/min)	K (m/day)	K (cm/sec)
$L = (100/l)^2(qh)$ in lugeon units = 0	Period 1	2.05E-03	2.37E-06
where $l$ is the length of test section in metres	Period 2	1.76E-03	2.04E-06
0 lugeon = 1.50E-03 m/day	Period 3	1.84E-03	2.13E-06
= 1.74E-06 cm/sec	Period 4	1.62E-03	1.88E-06
Comments:	Period 5	1.85E-03	2.14E-06

PROJECT: CORE DRILLING AL AHAD.

# swissboring

CLIENT: SANYU CONSULTANTS

Packer or Lugeon test. Sheet 1	Site: AL MILIHA	Location: AL DHAID
Depths below ground level to:	Job No: E-2145	Borehole No: B2
(a) top of test section: 225.00 m	Date: 03.08.95	Sheet: 1 of 2
(b) bottom of test section: 230.00 m	Ground level: 154 m	Crew/operator: VARGHESE
(c) centre of test section: 227.50 m	(Ordnance datum)	
(d) bottom of hole at time of test: 300.00 m	Weather: HOT, WINDY	
(e) bottom of casing: 195.00 m	Packer pressur 40 BAR	Test No: 5
(f) initial ground water level: (see NOTE 2) 15.50 m	Packer Type: Pneumatic 63mm	
Length of test section: 5.00 m	Dia. of hole in test area: 94 mm	
Gauge height above ground level: 0.90 m	Type of rock: CONGLOMERATE	

Test record

1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	450.3	453.4	456.4	459.5	0.61
	Dipstick readings, litres					
	Water take, litres	3.1	3	3.1		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	462.4	465.7	468.8	472	0.64
	Dipstick readings, litres					
	Water take, litres	3.3	3.1	3.2		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	476	480.1	484.6	489.2	0.88
	Dipstick readings, litres					
	Water take, litres	4.1	4.5	4.6		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	493.2	496.7	500.2	503.7	0.70
	Dipstick readings, litres					
	Water take, litres	3.5	3.5	3.5		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	504.7	507.6	510.6	513.5	0.59
	Dipstick readings, litres					
	Water take, litres	2.9	3	2.9		

Remarks (to include details of pipework where relevant):

<b>PROJECT:</b> CORE DRILLING AL DHAIID		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 2		Site: AL MOLHA	Location: AL DHAIID			
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section		Job No: E-2145	Borehole No: B2			
		Date: 03.08.95	Sheet: 2 of 2			
		Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE			
		Weather: HOT, WINDY				
Computation by: GEORGE		Test No: 5				
<b>Computation record</b>						
Data (from sheet 1)		Length of test section, <i>l</i> : 5.00 (m)				
Initial depth to ground water: 15.50 (1)		Gauge height above ground level 0.90 (m) (2)				
Period	Flow, <i>q</i> litres/min (3)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1) + (2) + (3) + (6) + (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.61	4	40	0.0035	0.0000	56.40
2nd	0.64	6	60	0.0038	0.0000	76.40
3rd	0.88	8	80	0.0068	0.0001	96.39
4th	0.70	6	60	0.0044	0.0000	76.40
5th	0.59	4	40	0.0032	0.0000	56.40

**Flow v. total head**

<b>Calculations:</b>	<b>Permeability Estimate:</b>
Slope of graph = $q/h = 0.0065$	$Q$ (l/min) $K$ (m/day) $K$ (cm/sec)
$L = (100/l) * (q/h)$ in lugeon units = 0	Period 1    0.61    1.98E-03    2.29E-06
where <i>l</i> is the length of test section in metres	Period 2    0.64    1.53E-03    1.77E-06
0 lugeon = 1.12E-03 m/day	Period 3    0.88    1.66E-03    1.92E-06
= 1.30E-06 cm/sec	Period 4    0.70    1.67E-03    1.93E-06
<b>Comments:</b>	Period 5    0.59    1.89E-03    2.19E-06



<b>PROJECT:</b> CORE DRILLING AL AHAID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site: AL MILIHA	Location: AL DHAID			
Depths below ground level to:		Job No: E-2145	Borehole No: B2			
(a) top of test section:	230.00 m	Date: 03.08.95	Sheet: 1 of 2			
(b) bottom of test section:	235.00 m	Ground level: 154 m	Crew/operator: VARGHESE			
(c) centre of test section:	232.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	195.00 m	Packer pressure: 40 BAR	Test No: 4			
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 63mm				
Length of test section	5.00 m	Dia. of hole in test area: 94 mm				
Gauge height above ground level:	0.90 m	Type of rock: CONGLOMERATE/LIMESTONE				
<b>Test record</b>						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	338.5	341.6	344.8	348	0.63
	Dipstick readings, litres					
	Water take, litres	3.1	3.2	3.2		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	350.9	355.7	360	365.4	0.97
	Dipstick readings, litres					
	Water take, litres	4.8	4.3	5.4		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	370.8	378.3	385.6	392.8	1.47
	Dipstick readings, litres					
	Water take, litres	7.5	7.3	7.2		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	395.9	401.7	407.3	412.9	1.13
	Dipstick readings, litres					
	Water take, litres	5.8	5.6	5.6		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	415.4	420.1	424.7	429.2	0.92
	Dipstick readings, litres					
	Water take, litres	4.7	4.6	4.5		
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

swissboring

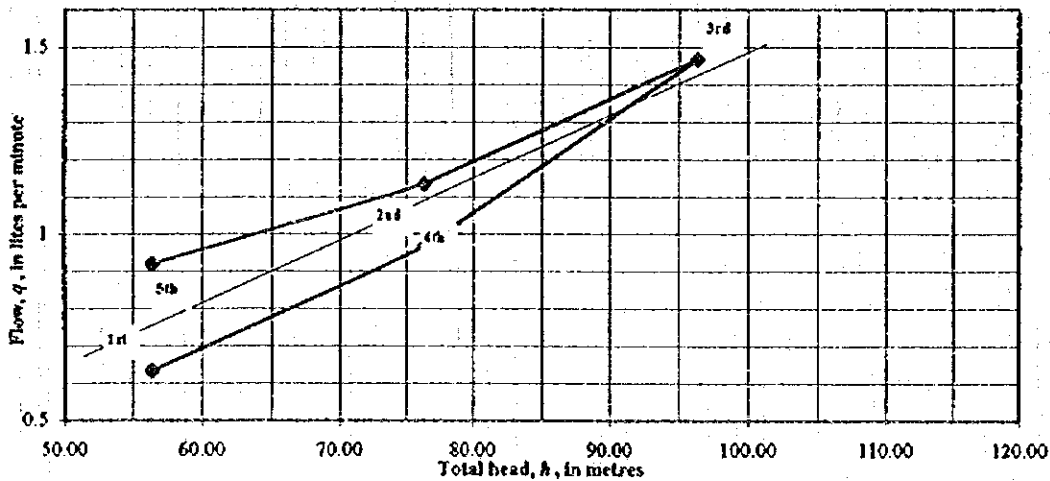
CLIENT: SANYU CONSULTANTS

Packer or Lugeon test. Sheet 2	Site: AL MILHA	Location: AL DHAID
NOTE 1. For test details, see sheet 1.	Job No: E-2145	Borehole No: B2
NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Date: 03.08.95	Sheet: 2 of 2
	Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE
	Weather: HOT, WINDY.	
Computation by: GEORGE	Test No: 4	

Computation record	
Data (from sheet 1)	Length of test section, $l$ : 5.00 (m)
Initial depth to ground water: 15.50 (1)	Gauge height above ground level 0.90 (m) (2)

Period	Flow, $q$ litres/min (3)	Gauge pressure		Friction head loss, m		Total head, $h$ (1) + (2) + (5) - (6) - (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.63	4	40	0.0038	0.0000	56.40
2nd	0.97	6	60	0.0082	0.0001	76.39
3rd	1.47	8	80	0.0178	0.0002	96.38
4th	1.13	6	60	0.0111	0.0001	76.39
5th	0.92	4	40	0.0075	0.0001	56.39

Flow v. total head



Calculations:

Permeability Estimate:

Slope of graph =  $q/h = 0.0167$   
 $L = (100/l) * (q/h)$  in lugeon units = 0  
 where  $l$  is the length of test section in metres  
 0 lugeon = 2.89E-03 m/day  
 = 3.35E-06 cm/sec

	Q (l/min)	K (m/day)	K (cm/sec)
Period 1	0.63	2.05E-03	2.37E-06
Period 2	0.97	2.30E-03	2.67E-06
Period 3	1.47	2.77E-03	3.21E-06
Period 4	1.13	2.70E-03	3.13E-06
Period 5	0.92	2.97E-03	3.44E-06

Comments:

<b>PROJECT:</b> CORE DRILLING AL AHAIID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site: AL MILHA	Location: AL DHAID			
Depth below ground level to:		Job No: E-2145	Borehole No: B2			
(a) top of test section:	235.00 m	Date: 02.08.95	Sheet: 1 of 2			
(b) bottom of test section:	240.00 m	Ground level: 154 m	Crew/operator: VARGHESE			
(c) centre of test section:	237.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	233.95 m	Packer pressure 48 BAR	Test No: 3			
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 63mm				
Length of test section	5.00 m	Dia. of hole in test area:		94 mm		
Gauge height above ground level:	0.90 m	Type of rock: LIMESTONE				
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	241.5	244.5	247.6	250.6	
	Dipstick readings, litres					
Water take, litres		3	3.1	3		0.61
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	261.7	263.3	268.7	272.2	
	Dipstick readings, litres					
Water take, litres		3.6	3.4	3.5		0.70
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 10	Flowmeter readings, litres	286.6	292.3	297.6	302.9	
	Dipstick readings, litres					
Water take, litres		5.7	5.3	5.3		1.09
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	305	309.6	314	318.2	
	Dipstick readings, litres					
Water take, litres		4.6	4.4	4.2		0.88
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	319.5	322.6	325.8	329	
	Dipstick readings, litres					
Water take, litres		3.1	3.2	3.2		0.63
Remarks (to include details of pipework where relevant):						

<b>PROJECT:</b> CORE DRILLING AL DHAID		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 2		Site: AL MILHA	Location: AL DHAID			
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section		Job No: E-2145	Borehole No: B2			
		Date: 02.08.95	Sheet: 2 of 2			
		Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE			
		Weather: HOT, WINDY.				
Computation by: GEORGE	Test No: 3					
<b>Computation record</b>						
Data (from sheet 1)		Length of test section, <i>l</i> :	5.00 (m)			
Initial depth to ground water: 15.50 (1)		Gauge height above ground level	0.90 (m) (2)			
Period	Flow, <i>q</i> litres/min (3)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1)+(2)+(5)-(6)-(7)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	0.61	6	60	0.0035	0.0000	76.40
2nd	0.70	8	80	0.0046	0.0000	96.40
3rd	1.09	10	100	0.0104	0.0001	116.39
4th	0.88	8	80	0.0071	0.0001	96.39
5th	0.63	6	60	0.0038	0.0000	76.40

**Flow v. total head**

<b>Calculations:</b>		<b>Permeability Estimate:</b>			
Slope of graph = $q/h = 0.0112$			Q (l/min)	K (m/day)	K (cm/sec)
$L = (100 \cdot l)^2 (q/h)$ in lugeon units = 0		Period 1	0.61	1.45E-03	1.67E-06
where <i>l</i> is the length of test section in metres		Period 2	0.70	1.32E-03	1.53E-06
0 lugeon =	1.94E-03 m/day	Period 3	1.09	1.70E-03	1.97E-06
	2.24E-06 cm/sec	Period 4	0.88	1.66E-03	1.92E-06
<b>Comments:</b>		Period 5	0.63	1.51E-03	1.75E-06

<b>PROJECT:</b> CORE DRILLING AL AHAIID.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site: AL MILIHA	Location: AL DHAIID			
Depths below ground level to:		Job No: E-2145	Borehole No: B2			
(a) top of test section:	244.00 m	Date: 02 08 95	Sheet: 1 of 2			
(b) bottom of test section:	249.00 m	Ground level: 154 m	Crew/operator: VARGHESE			
(c) centre of test section:	246.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	300.00 m	Weather: HOT, WINDY				
(e) bottom of casing:	233.95 m	Packer pressure: 40BAR	Test No: 2			
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type: Pneumatic 63mm				
Length of test section	5.00 m	Dia. of hole in test area: 94 mm				
Gauge height above ground level:	0.90 m	Type of rock: LIMESTONE				
<b>Test record</b>						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	977.2	984.8	991	997.2	
	Dipstick readings, litres					
Water take, litres		7.6		6.2	6.2	1.33
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	1	10.6	19.3	27.7	
	Dipstick readings, litres					
Water take, litres		9.6		8.7	8.4	1.78
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	40.5	54.2	68.6	82.5	
	Dipstick readings, litres					
Water take, litres		13.7		14.4	13.9	2.80
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	90	98.4	106.6	114.8	
	Dipstick readings, litres					
Water take, litres		8.4		8.2	8.2	1.65
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	117	123.1	129	134.9	
	Dipstick readings, litres					
Water take, litres		6.1		5.9	5.9	1.19
Remarks (to include details of pipework where relevant):						

PROJECT: CORE DRILLING AL DHAID

# swissboring

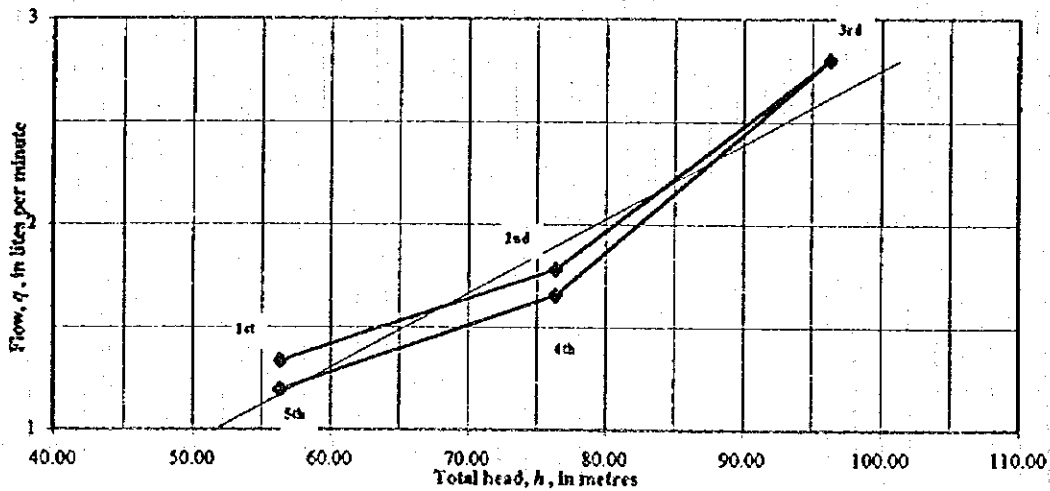
CLIENT: SANYU CONSULTANTS

Packer or Lugeon test. Sheet 2	Site: AL MILIHA	Location: AL DHAID
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section	Job No: E-2145	Borehole No: B2
	Date: 02 08 95	Sheet: 2 of 2
	Ground level: 154 (Ordnance datum)	Crew/operator VARGHESE
	Weather: HOT, WINDY.	
Computation by: GEORGE	Test No: 2	

Computation record	
Data (from sheet 1)	Length of test section, <i>l</i> : 5.00 (m)
Initial depth to ground water: 15.50 (1)	Gauge height above ground level 0.90 (m) (2)

Period	Flow, <i>q</i> litres/min (3)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1) + (2) + (5) - (6) - (7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	1.33	4	40	0.0158	0.0001	56.38
2nd	1.78	6	60	0.0270	0.0003	76.37
3rd	2.80	8	80	0.0626	0.0006	96.34
4th	1.65	6	60	0.0236	0.0002	76.38
5th	1.19	4	40	0.0129	0.0001	56.39

Flow v. total head



Calculations:

Slope of graph =  $q/h = 0.0362$   
 $L = (100/l)^2 (q/h)$  in lugeon units = 1  
 where *l* is the length of test section in metres  
 1 lugeon = 6.26E-03 m/day  
 = 7.24E-06 cm/sec

Permeability Estimate:

	Q (l/min)	K (m/day)	K (cm/sec)
Period 1	1.33	4.31E-03	4.99E-06
Period 2	1.78	4.25E-03	4.91E-06
Period 3	2.80	5.29E-03	6.13E-06
Period 4	1.65	3.94E-03	4.56E-06
Period 5	1.19	3.85E-03	4.46E-06

Comments:

<b>PROJECT:</b> CORE DRILLING AL AHAD.		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 1		Site:	AL MILHA	Location:	AL DHAID	
Depths below ground level to:		Job No:	E-2145	Borehole No:	B2	
(a) top of test section:	272.00 m	Date:	01.08.95	Sheet:	1 of 2	
(b) bottom of test section:	277.00 m	Ground level:	154 m	Crew/operator:	VARGHESE	
(c) centre of test section:	274.50 m	(Ordnance datum)				
(d) bottom of hole at time of test:	300.00 m	Weather:	HOT, WINDY			
(e) bottom of casing:	270.25 m	Packer pressure:	45 BAR	Test No.:	1	
(f) initial ground water level: (see NOTE 2)	15.50 m	Packer Type:	Pneumatic 63mm			
Length of test section	5.00 m	Dia. of hole in test area:	94 mm			
Gauge height above ground level:	0.90 m	Type of rock:	CONGLOMERATE/LIMESTONE			
Test record						
1st period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	776.5	784.5	793.2	801.5	1.67
	Dipstick readings, litres					
	Water take, litres	8	8.7	8.3		
2nd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	805	815	824.8	834.5	1.97
	Dipstick readings, litres					
	Water take, litres	10	9.8	9.7		
3rd period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 8	Flowmeter readings, litres	838.7	850.5	862.3	873.8	2.34
	Dipstick readings, litres					
	Water take, litres	11.8	11.8	11.5		
4th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 6	Flowmeter readings, litres	880.3	890.4	900.4	910.5	2.01
	Dipstick readings, litres					
	Water take, litres	10.1	10	10.1		
5th period	Time, min	0	5	10	15	Average flow q litres/min
Gauge pressure (bar): 4	Flowmeter readings, litres	917.4	925.4	933.8	942	1.64
	Dipstick readings, litres					
	Water take, litres	8	8.4	8.2		
Remarks (to include details of pipework where relevant):						

<b>PROJECT:</b> CORE DRILLING AL DHAID		<b>swissboring</b>				
<b>CLIENT:</b> SANYU CONSULTANTS						
Packer or Lugeon test. Sheet 2		Site: AL MILIHA	Location: AL DHAID			
NOTE 1. For test details, see sheet 1. NOTE 2. If ground water level unknown, or below test section, use depth to centre of test section		Job No: E-2145	Borehole No: B2			
		Date: 01.08.95	Sheet: 2 of 2			
		Ground level: 154 (Ordnance datum)	Crew/operator: VARGHESE			
Weather: HOT, WINDY.		Test No: 1				
<b>Computation by:</b> GEORGE						
<b>Computation record</b>						
Data (from sheet 1)		Length of test section, <i>l</i> : 5.00 (m)				
Initial depth to ground water: 15.50 (1)		Gauge height above ground level: 0.90 (m) (2)				
Period	Flow, <i>q</i> litres/min (3)	Gauge pressure		Friction head loss, m		Total head, <i>h</i> (1)+(2)+(5)+(6)+(7) (8)
		Gauge pressure (bars) (4)	Head of water, m (5)	in basic pipework (6)	in extra rods and pipes (7)	
1st	1.67	4	40	0.0267	0.0002	56.37
2nd	1.97	6	60	0.0362	0.0003	76.36
3rd	2.34	8	80	0.0500	0.0004	96.35
4th	2.01	6	60	0.0379	0.0003	76.36
5th	1.64	4	40	0.0259	0.0002	56.37

**Flow v. total head**

Period	Flow, <i>q</i> (l/min)	Total head, <i>h</i> (m)
1st	1.67	56.37
2nd	1.97	76.36
3rd	2.34	96.35
4th	2.01	76.36
5th	1.64	56.37

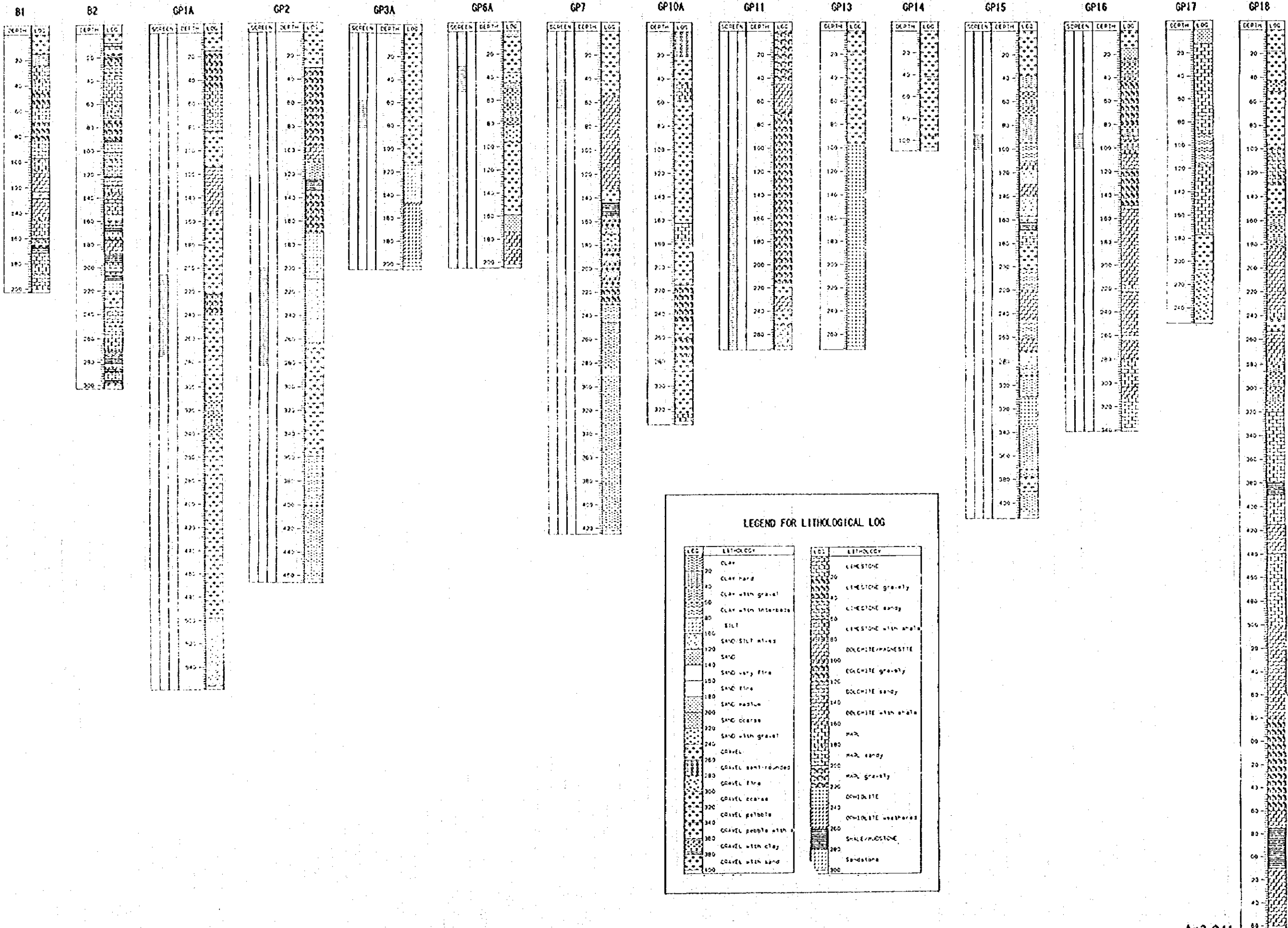
<b>Calculations:</b>	<b>Permeability Estimate:</b>		
Slope of graph = $q/h = 0.0171$	<b>Q (l/min)</b>	<b>K (m/day)</b>	<b>K (cm/sec)</b>
$L = (100/l)^2(q/h)$ in lugeon units = 0	Period 1	5.39E-03	6.23E-06
where <i>l</i> is the length of test section in metres	Period 2	4.69E-03	5.43E-06
0 lugeon = 2.96E-03 m/day	Period 3	4.42E-03	5.12E-06
= 3.43E-06 cm/sec	Period 4	4.80E-03	5.56E-06
	Period 5	5.30E-03	6.13E-06

**Comments:**



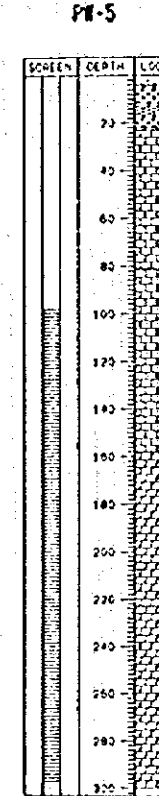
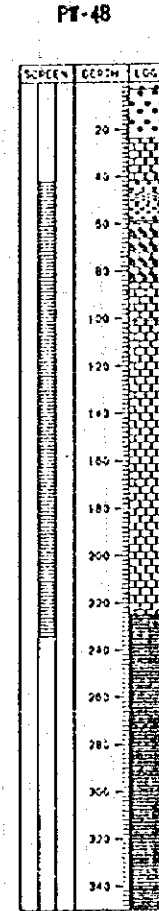
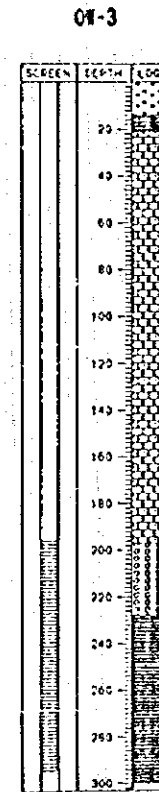
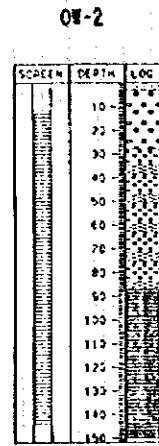
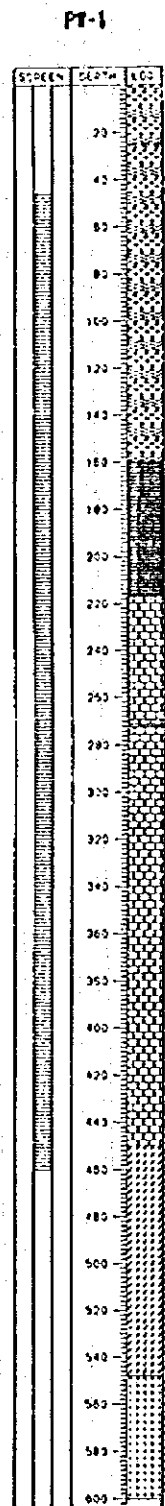
[The page contains extremely faint and illegible text, likely bleed-through from the reverse side of the document. No specific content can be transcribed.]

3.3. Test Well Drilling  
 3.3.1. Summary of Well Logs



LEGEND FOR LITHOLOGICAL LOG

LEG	LITHOLOGY	LEG	LITHOLOGY
10	CLAY	20	LIMESTONE
20	CLAY hard	30	LIMESTONE gravelly
30	CLAY with gravel	40	LIMESTONE sandy
40	CLAY with interbeds	50	LIMESTONE with shale
50	SILT	60	DOLCHITE/MAGNESTIE
60	SAND-SILT mixed	70	DOLCHITE gravelly
70	SAND	80	DOLCHITE sandy
80	SAND very fine	90	DOLCHITE with shale
90	SAND fine	100	MARL
100	SAND medium	110	MARL sandy
110	SAND coarse	120	MARL gravelly
120	SAND with gravel	130	CONCRETE
130	GRAVEL	140	CONCRETE weathered
140	GRAVEL semi-rounded	150	SHALE/MUDSTONE
150	GRAVEL fine	160	SANDSTONE
160	GRAVEL coarse		
170	GRAVEL pebbles		
180	GRAVEL pebbles with		
190	GRAVEL with clay		
200	GRAVEL with sand		



**LEGEND FOR LITHOLOGICAL LOG**

LITHOLOGY	LITHOLOGY
CLAY	LIMESTONE
CLAY hard	LIMESTONE gravelly
CLAY with gravel	LIMESTONE sandy
CLAY with interbeds	LIMESTONE with shale
SILT	DOLOMITE
SAND/SILT mixed	DOLOMITE/MARBLE
SAND	DOLOMITE gravelly
SAND very fine	DOLOMITE sandy
SAND fine	DOLOMITE with shale
SAND medium	MADE
SAND coarse	MADE sandy
SAND with gravel	MADE gravelly
GRAVEL	CONGLOMERATE
GRAVEL well-sorted	CONGLOMERATE weathered
GRAVEL fine	SHALE/MUDSTONE
GRAVEL coarse	SANDSTONE
GRAVEL pebbles	
GRAVEL pebbles with	
GRAVEL with clay	
GRAVEL with sand	



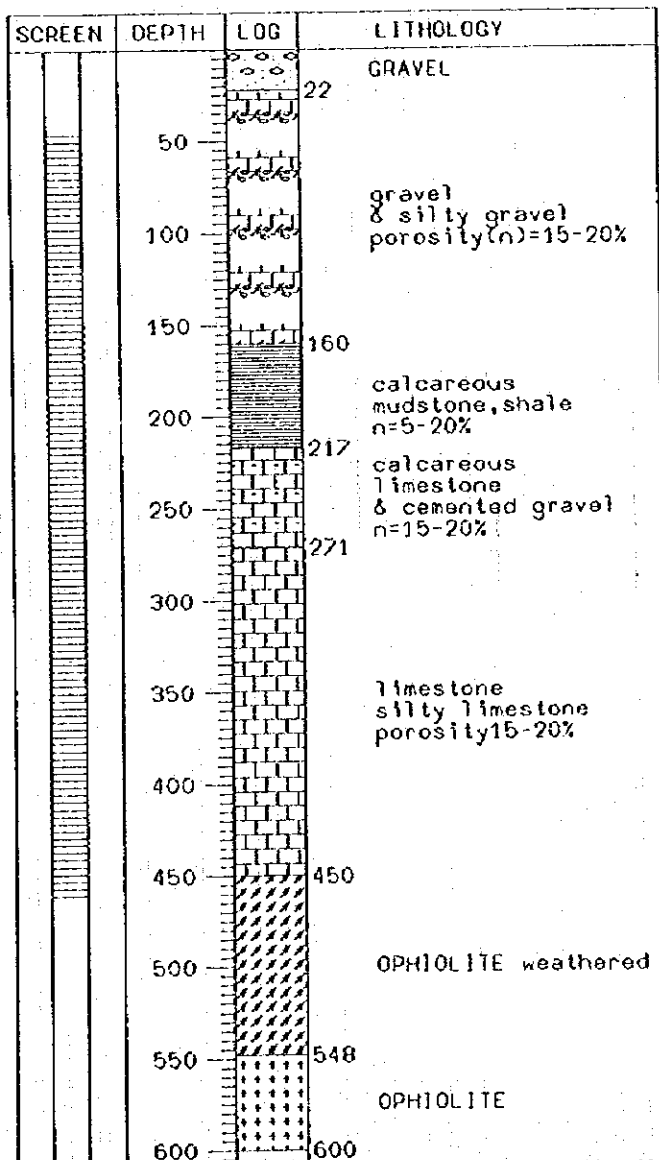
3.3.2. Well Logs  
(PW1, PW2/OW2, PW3/OW3, PW4b, OW5)

MASTERPLAN STUDY IN DHAID1995-96

JICA STUDY TEAM

Well No. PW1	Location: Dhaid East
Elevation: 182.60m	X = 397342      Y = 2793594
Method of Drilling: Rotary, Bentonite Mud	
Drilling Dates : - Jan-96	
Total Depth : 600.00	
Comments : PW1 (600m)	

WELL LOG



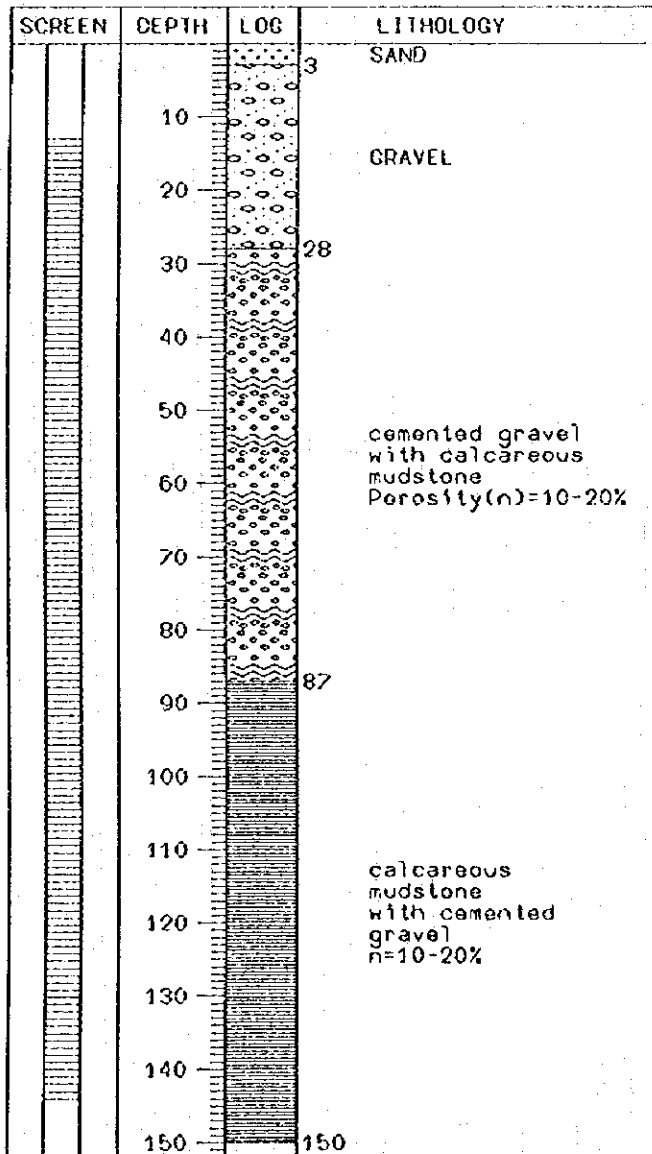
PUMPING TEST

Date: - Jan-96  
Capacity: 17.8 m<sup>3</sup>/hr  
Duration: 24 hrs  
Transmiss.: 8.2 m<sup>2</sup>/day  
SWL: GL -54.29 m  
DWL: GL -69.7 m

United Nations GW Software

Well No. <b>OW2/PW2</b>	Location: <b>Khuderah</b>
Elevation: <b>177.86m</b>	X = <b>394300</b> Y = <b>2785600</b>
Method of Drilling: <b>Rotary, Bentonite Mud</b>	
Drilling Dates	: <b>Jan-95</b>
Total Depth	: <b>150.00</b>
Comments : <b>OW2(150m),PW2(70m)</b>	

### W E L L   L O G



### PUMPING TEST

Date: **Jan-96**  
 Capacity: **5.1 m3/hr**  
 Duration: **24 hrs**  
 Transmiss.: **16.35 m2/day**  
 Stor.Coeff.: **0.002**  
 SWL: GL **-34.8m**  
 OWL: GL **-48.7m**

Pumped Well: **PW2**

United Nations GW Software

MASTERPLAN STUDY IN DHAID1995-96

JICA STUDY TEAM

Well No. OW3/PW3	Location: Khuderah
Elevation: 162.52m	X = 391000 Y = 2782369
Method of Drilling: OW3(Rotary,Airform),PW3(Rotary,Mud)	
Drilling Dates : Dec-95(OW3,PW3)	
Total Depth : 300.00	
Comments : OW3(300m),PW3(250m)	

W E L L L O G

SCREEN	DEPTH	LOG	LITHOLOGY
	0		alluvial sediment
	14		porosity(n)<30
	21		calcareous mudstone
	20		
	40		
	60		
	80		
	100		silty limestone & limestone n=7-20%
	120		
	140		
	160		
	180		
	200	197	GRAVEL semi-rounded
	220		
	228	228	
	240		
	260		calcareous mudstone n=10-15%
	280		
	300	300	

PUMPING TEST

Date: Dec-95  
 Capacity: 25.2 m<sup>3</sup>/hr  
 Duration: 24 hr  
 Transmiss.: 1.148 m<sup>2</sup>/day  
 Stor.Coeff.: 0.003  
 SWL: GL -34.9m  
 OWL: GL -64.9m

Pumping Well: Municipality Well

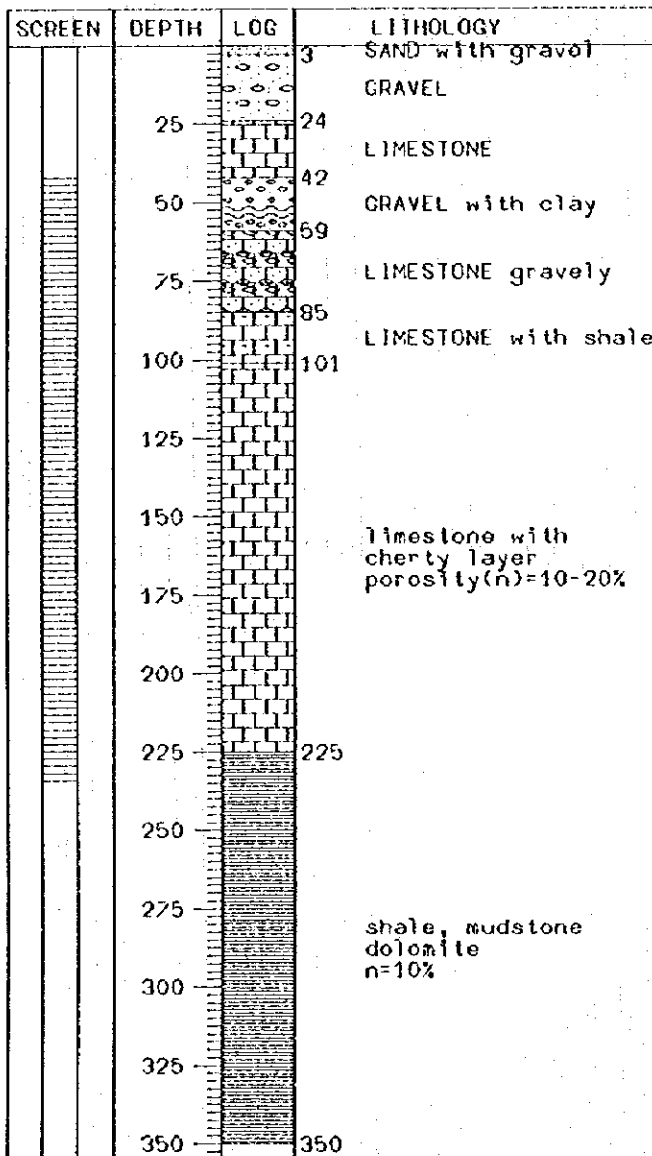
United Nations GW Software

MASTERPLAN STUDY IN DHAID1995-96

JICA STUDY TEAM

Well No. PW4b	Location: Manamah	
Elevation: 131.55m	X = 391257	Y = 2802981
Method of Drilling: Rotary, Bentonite Mud		
Drilling Dates : - Jan-96		
Total Depth : 350.00		
Comments : PWb4(350m)		

WELL LOG



PUMPING TEST

Date: - Jan96  
 Capacity: 79.2 m3/hr  
 Duration: 24 hrs  
 Transmiss.: 290 m2/day  
 SWL: GL -28.0m  
 DWL: G1 -79.2m

United Nations GW Software



MASTERPLAN STUDY IN DHAID1995-96

JICA STUDY TEAM

Well No. OW5	Location: Fill
Elevation: 178.10m	x = 387299      y = 2771060
Method of Drilling: Rotary, Bentonite Mud	
Drilling Dates	: Jan-96
Total Depth	: 300.00
Comments : OW5(300m)	

W E L L L O G

SCREEN	DEPTH	LOG	LITHOLOGY
	0	4	SAND/SILT mixed
	20	22	poorly cemented
	40		silty limestone
	60		calc. mudstone
	80	81	cemented gravel
	100		porosity(n)=10-20%
	120		alternation
	140		of limestone,
	160	158	calc. mudstone &
	180		cemented gravel
	200		n=10-20%
	220		limestone
	240		dolomite
	260		gravel
	280		n=10-20%
	300	300	

PUMPING TEST

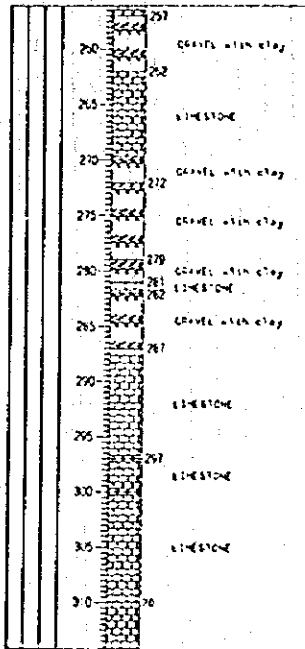
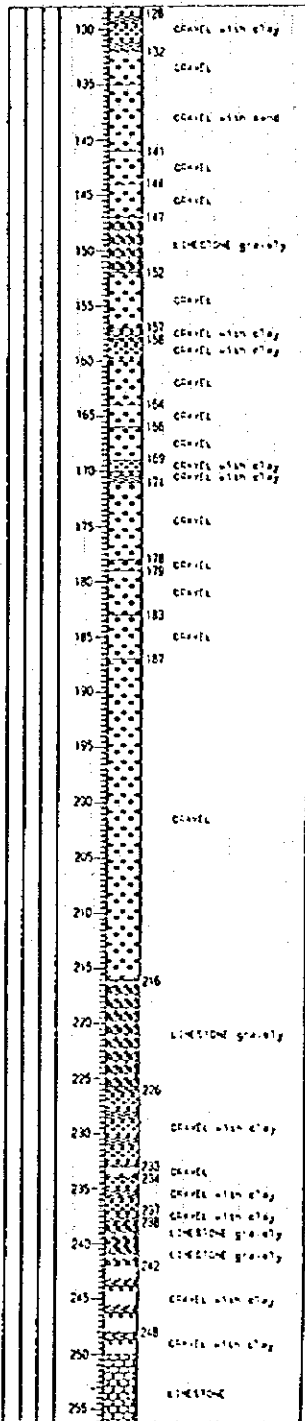
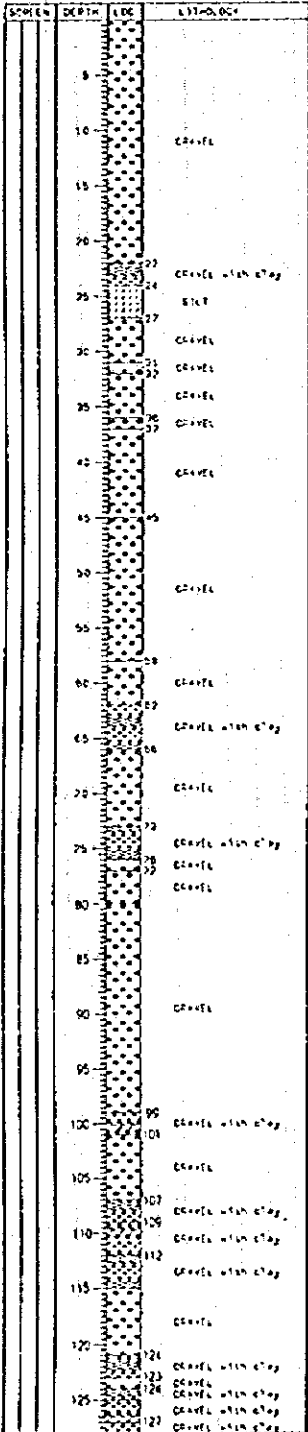
Date: Jan-96  
 Capacity: 18.9 m<sup>3</sup>/hr  
 Duration: 24 hrs  
 Transmiss.: 4.6 m<sup>2</sup>/day  
 SWL: GL -16.4m  
 OWL: GL -68.3m

United Nations CW Software

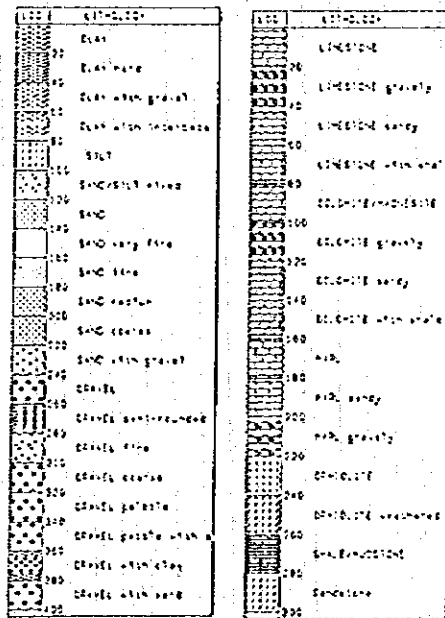
Well No. P-3	Location: Dnald East
Elevation: 182.60	S = 397342
Method of Drilling: Rotary, Bentonite Mud	T = 2763564
Drilling Date: 1 - Jan-55	
Total Depth: 1 600.00	
Comments: P-3(600)	

**PUMPING TEST**  
 Date: Jan-55  
 Capacity: 37.8 m<sup>3</sup>/hr  
 Duration: 26 hrs  
 Infiltration: 8.2 m<sup>2</sup>/day  
 SCL: -54.20 m  
 CML: -69.7 m

**WELL LOG**



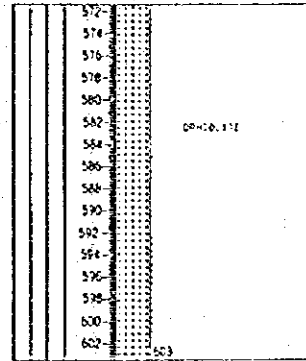
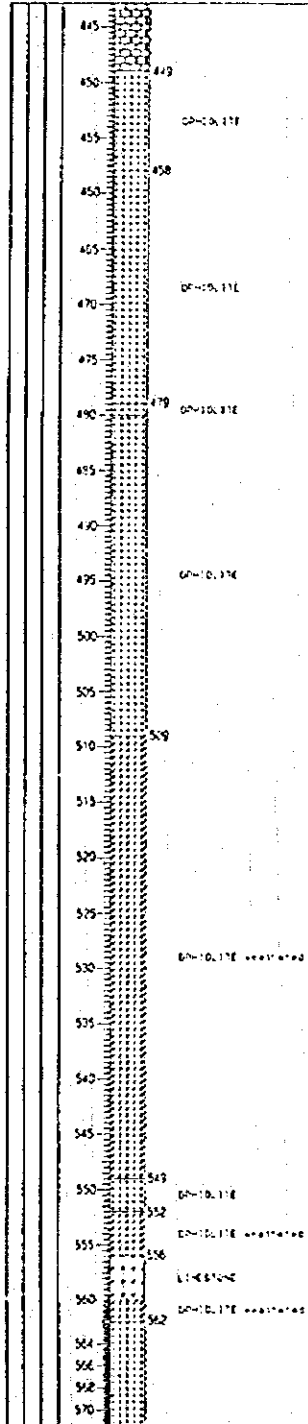
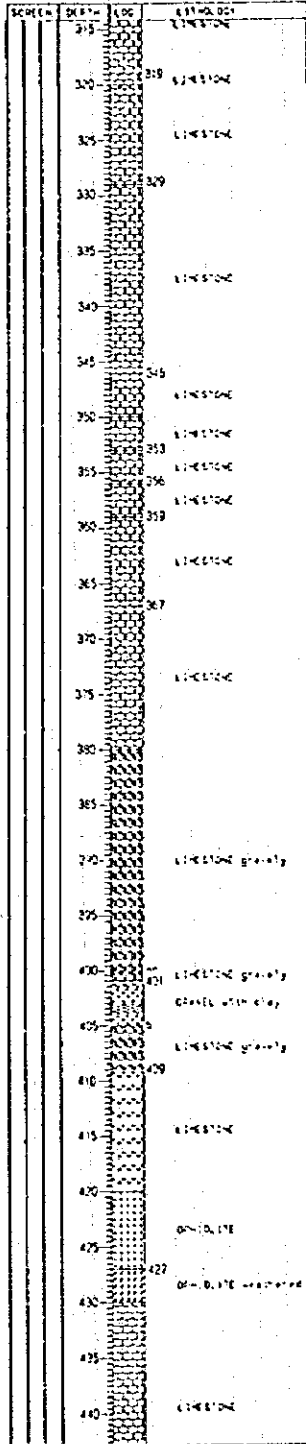
**LEGEND FOR LITHOLOGICAL LOG**



Well No. PWS	Location: Dnald East	
Elevation: 182.60	x = 297342	y = 2793554
Method of Drilling: Rotary, Bentonite Mud		
Drilling Date: 1 - Jan-55		
Total Depth: 1 600.00		
Comments: PWS(600)		

PUMPING TEST  
 Date: Jan-55  
 Capacity: 17.8 m<sup>3</sup>/hr  
 Duration: 24 hrs  
 Transmiss: 8.2 m<sup>2</sup>/day  
 Stor. Co. - 54.2%  
 Stor. Co. - 69.7%

WELL LOG

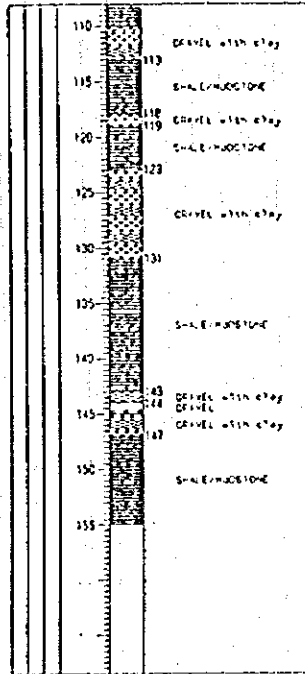
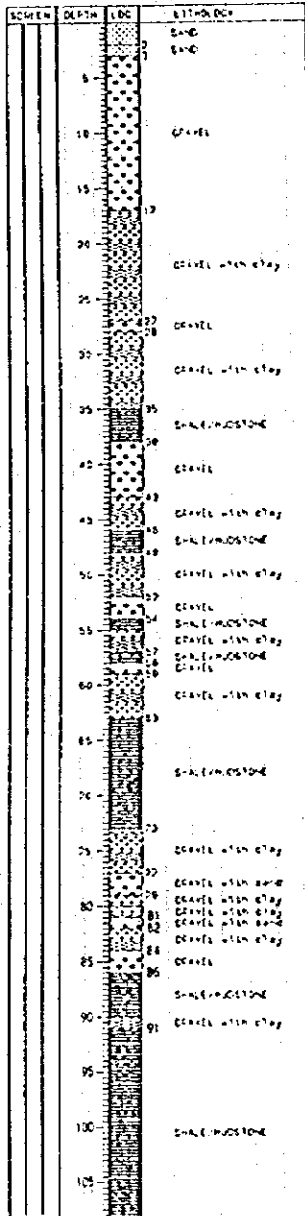


LEGEND FOR LITHOLOGICAL LOG

LOG	LITHOLOGY	LOG	LITHOLOGY
10	CLAY	20	LIMESTONE
20	CLAY SAND	30	LIMESTONE gravelly
30	CLAY WITH GRAVEL	40	LIMESTONE sandy
40	CLAY WITH INTERBEDS	50	LIMESTONE WITH SHALE
50	SILT	60	DOLomite-DIAGENESITE
60	SAND/SILT MUD	70	DOLomite gravelly
70	SAND	80	DOLomite sandy
80	SAND VERY FINE	90	DOLomite WITH SHALE
90	SAND FINE	100	SAND
100	SAND MEDIUM	110	SAND SANDY
110	SAND COARSE	120	SAND GRAVELLY
120	SAND WITH GRAVEL	130	DOLomite
130	GRAVEL	140	DOLomite weathered
140	GRAVEL SURROUNDED	150	SAND LIMESTONE
150	GRAVEL FINE	160	SANDSTONE
160	GRAVEL COARSE	170	
170	GRAVEL PEBBLES	180	
180	GRAVEL PEBBLES WITH SAND	190	
190	GRAVEL WITH CLAY	200	
200	GRAVEL WITH SAND	210	

Well No. Cw2/Pw2	Location: Khudrah	
Elevation: 127.80	N = 294300	E = 2765600
Method of Drilling: Rotary, Bentonite Mud		
Drilling Dates: Jan-95		
Total Depth: 150.00		
Comments: Cw2(150m), Pw2(70m)		

**WELL LOG**



United Nations Geoscience

**PUMPING TEST**

Date: Jan-95  
 Capacity: 5.4 m<sup>3</sup>/hr  
 Duration: 24 hrs  
 Transmiss: 18.35 m<sup>2</sup>/day  
 Stor. Coeff.: 0.002  
 S.W. CL = 34.8m  
 D.W. CL = 49.7m  
 Pumped water 240

**LEGEND FOR LITHOLOGICAL LOG**

CODE	LITHOLOGY	CODE	LITHOLOGY
10	CLAY	10	LIMESTONE
20	CLAY SAND	20	LIMESTONE GRAVELY
30	CLAY WITH GRAVEL	30	LIMESTONE SANDY
40	CLAY WITH SANDSTONE	40	LIMESTONE WITH SAND
50	SILT	50	DOLOMITE MUDSTONE
60	SANDSILTY CLAY	60	DOLOMITE GRAVELY
70	SAND	70	DOLOMITE SANDY
80	SAND VERY FINE	80	DOLOMITE WITH SAND
90	SAND FINE	90	MUD
100	SAND MEDIUM	100	MUD SANDY
110	SAND COARSE	110	MUD GRAVELY
120	SAND WITH GRAVEL	120	CONGLOMERATE
130	GRAVEL	130	CONGLOMERATE MUDSTONE
140	GRAVEL SANDSTONE	140	SAND MUDSTONE
150	GRAVEL FINE	150	LIMESTONE
160	GRAVEL COARSE		
170	GRAVEL RUBBLE		
180	GRAVEL SANDSTONE WITH SAND		
190	GRAVEL WITH CLAY		
200	GRAVEL WITH SAND		

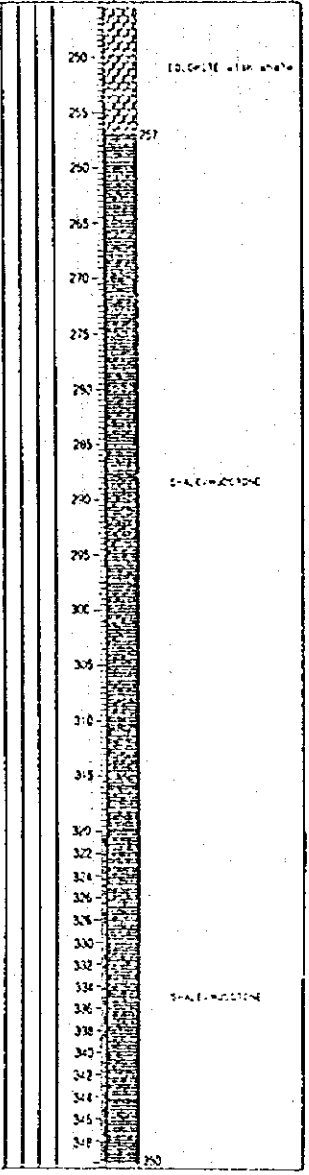
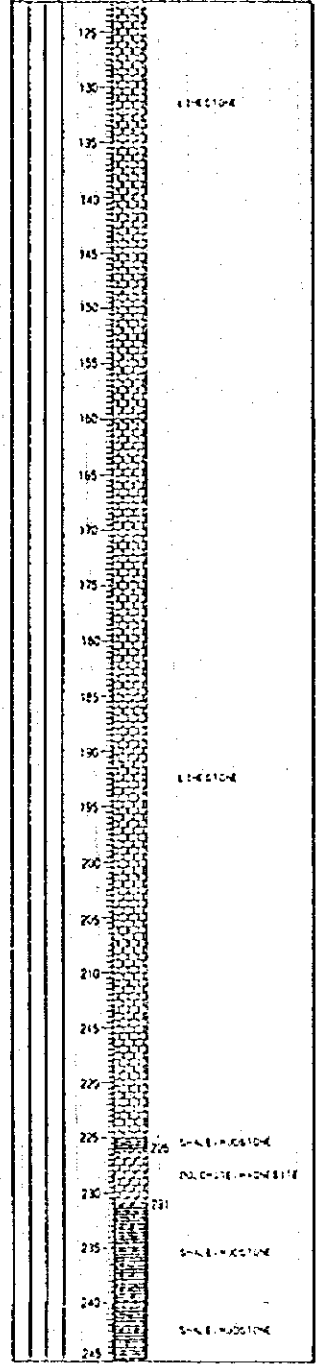


Well No. P480	Location: Manahā	
Elevation: 321.55	W = 302257	N = 2602981
Method of Drilling: Rotary, Bentonite Mud		
Drilling Date: Jan-55		
Total Depth: 350.00		
Comments: P48(350)		

**PUMPING TEST**  
 Date: Jan-55  
 Capacity: 29.2 m<sup>3</sup>/hr  
 Duration: 24 hrs  
 Transmiss: 280 m<sup>2</sup>/day  
 S<sub>w</sub>: 0.28, C<sub>w</sub>: 0.1  
 C<sub>w</sub>: 0.1, C<sub>w</sub>: 0.1

**WELL LOG**

SCREEN	DEPTH	LOG	LITHOLOGY
	0		Gravel with sand
	5		Sand
	10		Gravel with clay
	15		Gravel
	20		Gravel
	25		Gravel
	30		Limestone
	35		Limestone
	40		Limestone
	45		Gravel with clay
	50		Gravel
	55		Limestone
	60		Gravel
	65		Gravel with clay
	70		Limestone
	75		Limestone
	80		Gravel with clay
	85		Gravel
	90		Gravel
	95		Limestone
	100		Limestone
	105		Limestone
	110		Limestone
	115		Limestone
	120		Limestone



**LEGEND FOR LITHOLOGICAL LOG**

LOG	LITHOLOGY
0-10	LIMESTONE
10-20	LIMESTONE gravelly
20-30	LIMESTONE sandy
30-40	LIMESTONE with shale
40-50	DOLOMITE
50-60	DOLOMITE gravelly
60-70	DOLOMITE sandy
70-80	DOLOMITE with shale
80-90	SHALE
90-100	SHALE sandy
100-110	SHALE gravelly
110-120	DOLOMITE
120-130	DOLOMITE variegated
130-140	SHALE
140-150	SHALE
150-160	SHALE
160-170	SHALE
170-180	SHALE
180-190	SHALE
190-200	SHALE
200-210	SHALE
210-220	SHALE
220-230	SHALE
230-240	SHALE
240-250	SHALE

LOG	LITHOLOGY
250-260	SHALE
260-270	SHALE
270-280	SHALE
280-290	SHALE
290-300	SHALE
300-310	SHALE
310-320	SHALE
320-330	SHALE
330-340	SHALE
340-350	SHALE

Well No. CWS	Location: F111
Elevation: 378.26	N. 382289
Volume of Drilling: Rotary, Bentonite Mud	W. 2271660
Drilling Date: Jan-65	
Total Cost: 300.00	
Comments: CWS(1000')	

**PUMPING TEST**

Date: Jan-65  
 Capacity: 38.0 gpm  
 Duration: 24 hrs  
 Transmiss: 8.0 ft/day  
 S: 1.0  
 E: 1.0

**WELL LOG**

SCREEN	DEPTH	LOG	LITHOLOGY
	0		SANDSILT MUD
	5		CLAY
	6		CLAY WITH CLAY
	10		CLAY
	13		CLAY WITH CLAY
	15		CLAY WITH GRAVEL
	16		CLAY WITH CLAY
	18		CLAY WITH CLAY
	20		CLAY WITH CLAY
	21		CLAY WITH CLAY
	23		SHALE-MUDSTONE
	25		SHALE-MUDSTONE
	27		SHALE-MUDSTONE
	30		LIMESTONE
	31		SHALE-MUDSTONE
	32		SHALE-MUDSTONE
	35		GRAVEL
	38		SHALE-MUDSTONE
	40		CLAY WITH CLAY
	43		LIMESTONE
	46		SHALE-MUDSTONE
	48		LIMESTONE
	50		GRAVEL
	55		GRAVEL
	60		LIMESTONE
	65		SHALE-MUDSTONE
	67		LIMESTONE
	70		LIMESTONE
	72		LIMESTONE
	75		LIMESTONE GRAVELY
	80		LIMESTONE GRAVELY
	81		LIMESTONE GRAVELY
	85		SHALE-MUDSTONE
	86		SHALE-MUDSTONE
	90		GRAVEL
	91		LIMESTONE GRAVELY
	93		LIMESTONE GRAVELY
	95		SHALE-MUDSTONE
	99		SHALE-MUDSTONE
	101		LIMESTONE GRAVELY
	102		LIMESTONE GRAVELY
	104		CLAY WITH CLAY
	108		SHALE-MUDSTONE
	110		SHALE-MUDSTONE
	112		CLAY
	113		CLAY
	115		SHALE-MUDSTONE
	116		LIMESTONE
	117		LIMESTONE GRAVELY
	118		LIMESTONE GRAVELY
	120		CLAY WITH CLAY
	125		SHALE-MUDSTONE
	127		CLAY

130	SHALE-MUDSTONE
134	SHALE-MUDSTONE
138	LIMESTONE
140	LIMESTONE
142	LIMESTONE
145	SHALE-MUDSTONE
148	SHALE-MUDSTONE
150	SHALE-MUDSTONE
155	SHALE-MUDSTONE
158	LIMESTONE GRAVELY
162	LIMESTONE GRAVELY
165	LIMESTONE
170	LIMESTONE
175	LIMESTONE
179	LIMESTONE
183	LIMESTONE
185	LIMESTONE
190	LIMESTONE
195	SHALE-MUDSTONE
197	SHALE-MUDSTONE
201	SHALE-MUDSTONE
202	SHALE-MUDSTONE
205	LIMESTONE
210	LIMESTONE
214	LIMESTONE
221	LIMESTONE GRAVELY
223	LIMESTONE
225	LIMESTONE
226	LIMESTONE
230	LIMESTONE
235	LIMESTONE
237	LIMESTONE
242	LIMESTONE
244	LIMESTONE
245	LIMESTONE
247	LIMESTONE
254	LIMESTONE
256	LIMESTONE
258	CLAY

260	LIMESTONE
262	LIMESTONE
264	LIMESTONE
266	LIMESTONE
268	LIMESTONE
270	LIMESTONE
272	LIMESTONE
274	LIMESTONE
276	LIMESTONE
278	LIMESTONE
280	LIMESTONE GRAVELY
282	LIMESTONE GRAVELY
284	LIMESTONE GRAVELY
286	LIMESTONE GRAVELY
288	LIMESTONE GRAVELY
290	LIMESTONE GRAVELY
292	LIMESTONE GRAVELY
294	LIMESTONE GRAVELY
296	LIMESTONE GRAVELY
298	LIMESTONE GRAVELY
300	LIMESTONE GRAVELY

**LEGEND FOR LITHOLOGICAL LOG**

LOG #	LITHOLOGY	LOG #	LITHOLOGY
10	CLAY	100	LIMESTONE
20	CLAY SAND	110	LIMESTONE GRAVELY
30	CLAY WITH GRAVEL	120	LIMESTONE GRAVELY
40	CLAY WITH INTERLARS	130	LIMESTONE SANDY
50	SILT	140	LIMESTONE WITH SAND
60	SANDSILT MUD	150	LIMESTONE WITH SAND
70	SAND	160	CLAYSTONE
80	SAND VERY FINE	170	CLAYSTONE GRAVELY
90	SAND FINE	180	CLAYSTONE SANDY
100	SAND MEDIUM	190	CLAYSTONE WITH SAND
110	SAND COARSE	200	SILT
120	SAND WITH GRAVEL	210	SILT, SANDY
130	GRAVEL	220	SILT, GRAVELY
140	GRAVEL SANDSTONE	230	CONGLOMERATE
150	GRAVEL FINE	240	CONGLOMERATE SANDSTONE
160	GRAVEL COARSE	250	SHALE-MUDSTONE
170	GRAVEL GRAVELY	260	SANDSTONE
180	GRAVEL SANDS WITH SAND		
190	GRAVEL WITH CLAY		
200	GRAVEL WITH SAND		