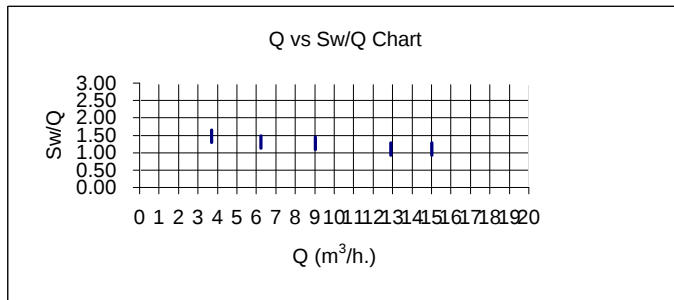


Appendix G

Pumping Test Data of JICA Well

Sheet 1. Analysis of Step Drawdown Test in BH No. WW39839 (J1A)

Chart 1. Discharge Rate vs Sw/Q



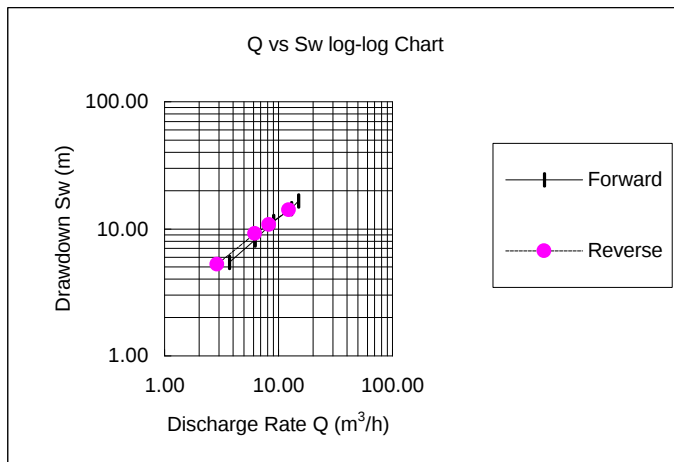
I. Test Well Data

JICA Ref. No.	: J1A
Well No.	: WW39839
Farm Name	: Cristiana
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 30.55 m
Transmissibility (T)	: 25.2 m³/day/m
Storage Coefficient (S)	: 1.00E-05
Permeability (K)	: 3.90E-04 cm/sec
Static Water Level (SWL)	: 56.53 mbgl
Pump Setting Depth (PH)	: 82.98 mbgl

II. Well Efficiency

by Chart I.	
(Sw/Q)"	= 1.12
(Sw/Q)'	= 1.58
Q value of (Sw/Q)"	= 13.00 m³/h
Well Loss (C)	
= (Sw/Q)" - (Sw/Q)'/Q	= 0.039
Aquifer Loss (B) = (Sw/Q)₀	= 0.79

Chart 2. Discharge Rate vs Drawdown



Well Efficiency (E _w)		= BQ/BQ+CQ ^c	
Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
30.00	40.31	5.00	80.20
25.00	44.76	4.50	81.82
20.00	50.32	4.00	83.51
18.00	52.95	3.50	85.27
16.00	55.87	3.00	87.10
14.00	59.13	2.50	89.01
12.00	62.80	2.00	91.01
10.00	66.95	2.50	89.01
8.00	71.69	2.00	91.01
6.00	77.15	1.50	93.11

III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	60	3.70	61.96	5.43	84.56
2	60	6.23	64.70	8.17	76.48
3	60	9.00	67.94	11.41	69.24
4	60	12.90	70.87	14.34	61.09
5	60	15.00	73.10	16.57	57.45
6	60	12.30	70.60	14.07	62.22
7	60	8.20	67.26	10.73	71.18
8	60	6.20	65.69	9.16	76.57
9	60	2.90	61.79	5.26	87.48

Auifer Boundary

None flow boundary type

it seems to exist none flow boundary or barrier due to ;
 - fault, buried valley
 - impermeable barrier
 - the formation with conspicuous lowered permeability

IV. Area of Influence

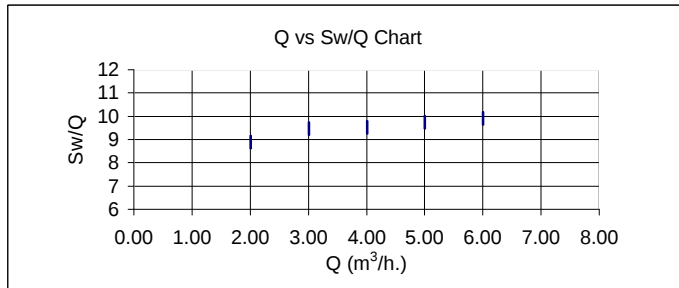
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	25.00	14.00	6.00	5.00
Well	Wu=	0.0052752	0.00942	0.02198
Function :	u=	3.70	3.30	2.70

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	25.00	14.00	6.00	5.00
3600	1		1,247	1,177	1,065	1,025
21600	6		3,054	2,884	2,608	2,510
43200	12		4,318	4,078	3,689	3,550
72000	20		5,575	5,265	4,762	4,583
86,400	24	1	6,107	5,767	5,217	5,020
864,000	240	10	19,312	18,238	16,497	15,875
2,592,000	720	30	33,450	31,590	28,574	27,495
#####	8,760	365	116,675	110,188	99,669	95,906

Sheet 2. Analysis of Step Drawdown Test in BH No. WW39840 (J2A)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J2A
Well No.	: WW39840
Farm Name	: Olifants water-west
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 26.41 m
Transmissibility (T)	: 3.42 m³/day/m
Storage Coefficient (S)	: 1.00E-05
Permeability (K)	: 1.60E-04 cm/sec
Static Water Level (SWL)	: 16.94 mbgl
Pump Setting Depth (PH)	: 93.90 mbgl

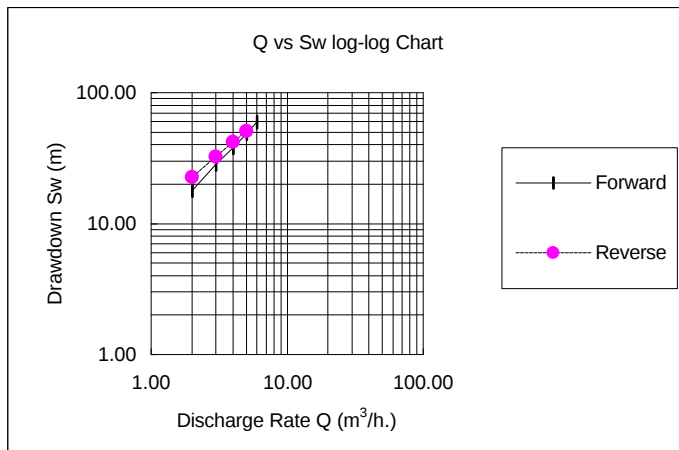
II. Well Efficiency

by Chart I.	=	9.85
(Sw/Q)''	=	8.96
(Sw/Q)'	=	6.00 m³/h
Q value of (Sw/Q)''	=	
Well Loss (C)	=	0.41
Aquifer Loss (B) = (Sw/Q)₀	=	3.55

Well Efficiency (E_w) = BQ/BQ+CQ'

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
15.00	36.60	5.00	63.39
14.00	38.21	4.50	65.80
13.00	39.98	4.00	68.40
12.00	41.91	3.50	71.21
11.00	44.04	3.00	74.27
10.00	46.41	2.50	77.60
9.00	49.03	2.00	81.24
8.00	51.98	1.50	85.23
7.00	55.30	1.00	89.65
6.00	59.07	0.50	94.54

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	90	2.00	33.54	17.78	81.24
2	90	3.00	44.13	28.37	74.27
3	90	4.00	53.82	38.06	68.40
4	90	5.00	64.53	48.77	63.39
5	90	6.00	75.26	59.50	59.07
6	90	5.00	66.88	51.12	63.39
7	90	4.00	57.65	41.89	68.40
8	90	3.00	48.13	32.37	74.27
9	90	2.00	38.31	22.55	81.24

Auifer Boundary

None flow boundary type

it seems to exist none flow boundary or barrier due to ;
 - fault, buried valley
 - impermeable barrier
 - the formation with conspicuous lowered permeability

IV. Area of Influence

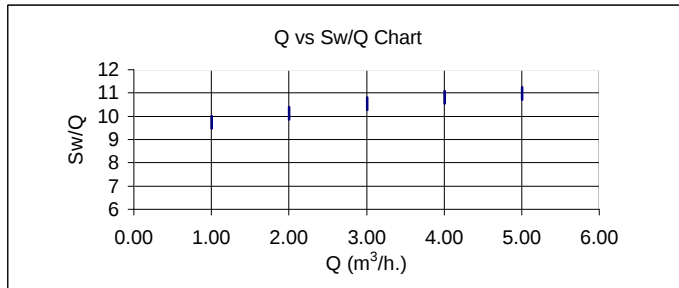
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	10.00	6.00	3.00	2.00
Well Wu=	0.0017898	0.002983	0.005966	0.008949
Function : u=	4.65	4.25	3.65	3.30

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	10.00	6.00	3.00	2.00
3600	1		515	492	456	434
21600	6		1,261	1,206	1,117	1,062
43200	12		1,783	1,705	1,580	1,502
72000	20		2,302	2,201	2,040	1,940
86,400	24	1	2,522	2,411	2,235	2,125
864,000	240	10	7,976	7,625	7,066	6,719
2,592,000	720	30	13,814	13,207	12,239	11,638
#####	8,760	365	48,185	46,066	42,691	40,593

Sheet 3. Analysis of Step Drawdown Test in BH No. WW39841 (J2N)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J2N
Well No.	: WW39841
Farm Name	: Olifants water-west
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 23.4 m
Transmissibility (T)	: 2.94 m ² /day/m
Storage Coefficient (S)	: 5.00E-06
Permeability (K)	: 1.40E-04 cm/sec
Static Water Level (SWL)	: 39.53 mbgl
Pump Setting Depth (PH)	: 101.55 mbgl

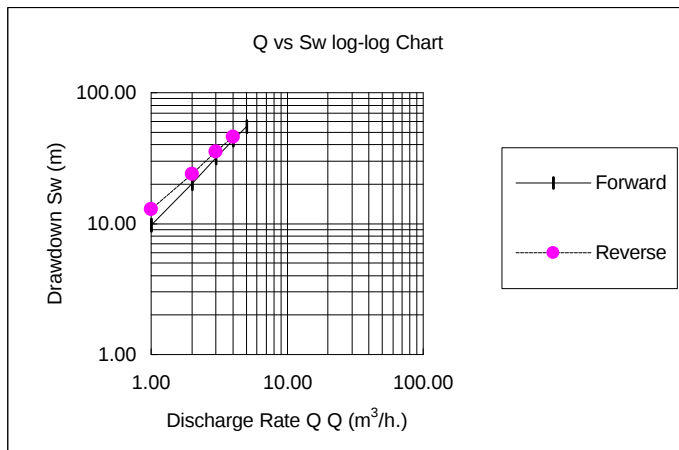
II. Well Efficiency

by Chart I.	=	11.00
(Sw/Q)''	=	9.56
(Sw/Q)'	=	5.00 m ³ /h
Well Loss (C)	=	0.29
Aquifer Loss (B) = (Sw/Q) ₀	=	9.56

Well Efficiency (E_w) = BQ/BQ+CQ^c

Discharge Rate Q (m ³ /h)	Ew ratio (%)	Discharge Rate Q (m ³ /h)	Ew ratio (%)
50.00	39.90	14.00	70.34
40.00	45.35	12.00	73.45
30.00	52.53	10.00	76.85
28.00	54.24	9.00	78.67
26.00	56.08	8.00	80.58
24.00	58.04	7.00	82.58
22.00	60.14	6.00	84.69
20.00	62.40	5.00	86.91
18.00	64.84	4.00	89.25
16.00	67.48	3.00	91.71

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m ³ /h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	90	1.00	49.27	9.74	97.08
2	90	2.00	59.76	20.23	94.32
3	90	3.00	71.14	31.61	91.71
4	90	4.00	82.76	43.23	89.25
5	90	5.00	94.49	54.96	86.91
6	90	4.00	85.70	46.17	89.25
7	90	3.00	74.96	35.43	91.71
8	90	2.00	63.56	24.03	94.32
9	90	1.00	52.38	12.85	97.08

Auifer Boundary

None flow boundary type

it seems to exist none flow boundary or barrier due to ;
 - fault, buried valley
 - impermeable barrier
 - the formation with conspicuous lowered permeability

IV. Area of Influence

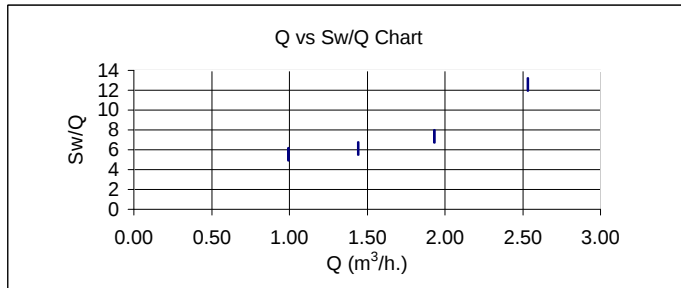
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m ³ /h)	40.00	22.00	10.00	7.00
Well Wu=	0.00038465	0.000699364	0.0015386	0.002198
Function : u=	5.95	5.45	4.80	4.50

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m ³ /h) of			
Sec.	Hour	Date	40.00	22.00	10.00	7.00
3600	1		764	731	686	664
21600	6		1,870	1,790	1,680	1,627
43200	12		2,645	2,532	2,376	2,300
72000	20		3,415	3,268	3,067	2,970
86,400	24	1	3,741	3,580	3,360	3,253
864,000	240	10	11,830	11,322	10,625	10,288
2,592,000	720	30	20,490	19,610	18,403	17,819
#####	8,760	365	71,470	68,401	64,193	62,154

Sheet 4. Analysis of Step Drawdown Test in BH No. WW39842 (J3K)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J3K
Well No.	: WW39842
Farm Name	: Olifants water-west
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 17.52 m
Transmissibility (T)	: 6.42 m³/day/m
Storage Coefficient (S)	: 1.00E-06
Permeability (K)	: 1.50E-04 cm/sec
Static Water Level (SWL)	: 19.34 mbgl
Pump Setting Depth (PH)	: 68.85 mbgl

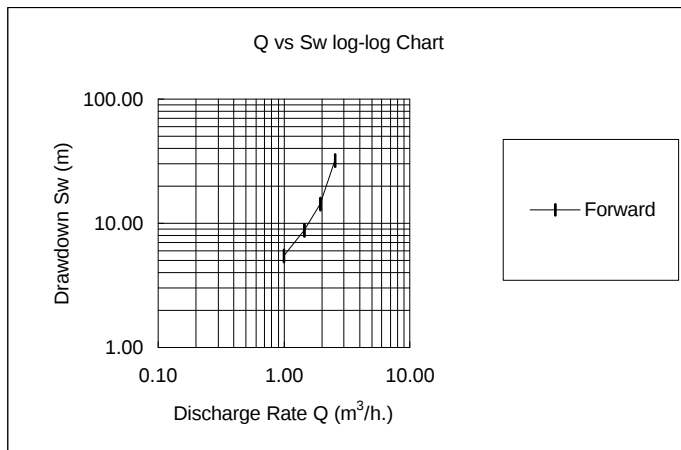
II. Well Efficiency

by Chart I.	=	8.30
(Sw/Q)''	=	3.50
Q value of (Sw/Q)''	=	0.50 m³/h
Well Loss (C)		
= (Sw/Q)'' - (Sw/Q)'/Q	=	0.59
Aquifer Loss (B) = (Sw/Q)₀	=	5.30

Well Efficiency (E_w) = $BQ/BQ+CQ^C$

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
20.00	30.99	2.50	78.23
15.00	37.46	2.00	81.79
10.00	47.32	1.80	83.31
9.00	49.95	1.60	84.88
8.00	52.89	1.40	86.52
7.00	56.20	1.20	88.22
6.00	59.95	1.00	89.98
5.00	64.24	0.80	91.82
4.00	69.19	0.60	93.74
3.00	74.96	0.40	95.74

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	90	0.99	24.81	5.47	90.07
2	90	1.44	28.15	8.81	86.18
3	90	1.93	33.56	14.22	82.31
4	90	2.53	51.20	31.86	78.02
5					
6					
7					
8					
9					

Auifer Boundary

N.A.

IV. Area of Influence

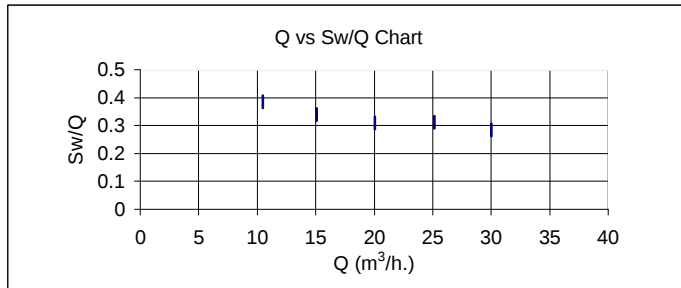
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	10.00	6.00	3.00	2.00
Well Wu=	0.0033598	0.005599667	0.011199333	0.016799
Function : u=	4.10	3.65	3.10	2.85

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	10.00	6.00	3.00	2.00
3600	1		2,095	1,976	1,821	1,746
21600	6		5,130	4,841	4,461	4,277
43200	12		7,256	6,846	6,309	6,049
72000	20		9,367	8,838	8,145	7,810
86,400	24	1	10,261	9,682	8,922	8,555
864,000	240	10	32,448	30,616	28,215	27,053
2,592,000	720	30	56,202	53,028	48,870	46,858
31,536,000	8,760	365	196,036	184,965	170,461	163,443

Sheet 5. Analysis of Step Drawdown Test in BH No. WW39843 (J3A)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J3A
Well No.	: 39843
Farm Name	: Steynsrus
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 32.15 m
Transmissibility (T)	: 194 m ² /day/m
Storage Coefficient (S)	: 1.00E-05
Permeability (K)	: 6.60E-03 cm/sec
Static Water Level (SWL)	: 14.62 mbgl
Pump Setting Depth (PH)	: 101.55 mbgl

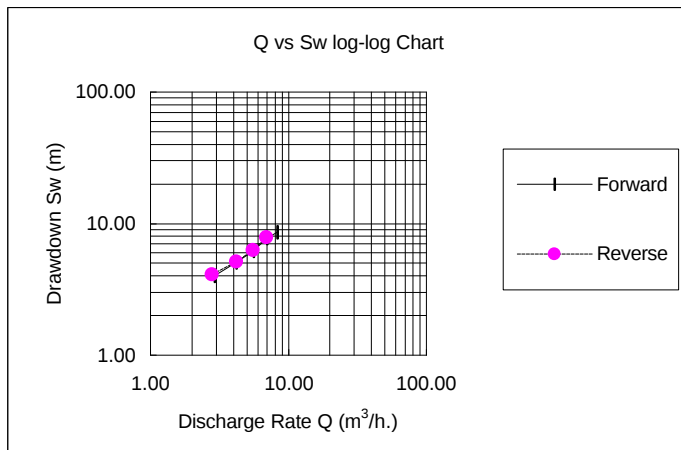
II. Well Efficiency

by Chart I.	=	3.81
(Sw/Q)''	=	2.88
(Sw/Q)'	=	30.00 m ³ /h
Q value of (Sw/Q)''	=	
Well Loss (C)	=	0.03
Aquifer Loss (B) = (Sw/Q) ₀	=	2.88

Well Efficiency (E_w) = BQ/BQ+CQ²

Discharge Rate Q (m ³ /h)	Ew ratio (%)	Discharge Rate Q (m ³ /h)	Ew ratio (%)
100.00	48.16	15.00	86.10
90.00	50.79	10.00	90.28
80.00	53.73	9.00	91.17
70.00	57.03	8.00	92.07
60.00	60.76	7.00	92.99
50.00	65.01	6.00	93.93
40.00	69.90	5.00	94.89
30.00	75.59	4.00	95.87
25.00	78.80	3.00	96.87
20.00	82.29	2.00	97.89

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m ³ /h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	10.44	18.64	4.02	89.90
2	120	15.06	19.72	5.10	86.05
3	120	20.05	20.84	6.22	82.25
4	120	25.09	22.42	7.80	78.74
5	120	30.00	23.17	8.55	75.59
6	120	25.00	22.46	7.84	78.80
7	120	20.00	20.91	6.29	82.29
8	120	15.00	19.78	5.16	86.10
9	120	10.00	18.71	4.09	90.28

Auifer Boundary

Constant head boundary type

- relatively high permeability
- relatively high storage
- recharging by the surface water
- induced recharge

IV. Area of Influence

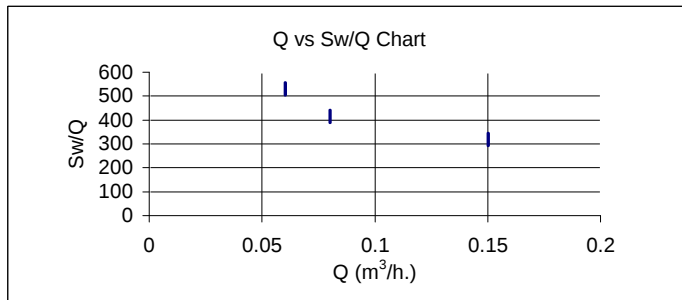
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m ³ /h)	100.00	40.00	30.00	15.00
Well	Wu=	0.010152667	0.025381667	0.033842222
Function :	u=	3.20	2.50	2.30

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m ³ /h) of			
Sec.	Hour	Date	100.00	40.00	30.00	15.00
3600	1		3,217	2,843	2,727	2,379
21600	6		7,879	6,964	6,680	5,827
43200	12		11,143	9,849	9,447	8,240
72000	20		14,385	12,715	12,196	10,638
86,400	24	1	15,758	13,928	13,360	11,653
864,000	240	10	49,832	44,045	42,247	36,851
2,592,000	720	30	86,311	76,289	73,174	63,828
31,536,000	8,760	365	301,059	266,101	255,236	222,636

Sheet 6. Analysis of Step Drawdown Test in BH No. WW39844 (J3N)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	:	J3N
Well No.	:	39844
Farm Name	:	Steynsrus
Radius of Casing Pipe (r)	:	0.081 m
Thickness of Aquifer (h)	:	14.6 m
Transmissibility (T)	:	1.3 m³/day/m
Storage Coefficient (S)	:	2.00E-05
Permeability (K)	:	1.03E-04 cm/sec
Static Water Level (SWL)	:	-25.00 mbgl
Pump Setting Depth (PH)	:	N.A. mbgl

II. Well Efficiency

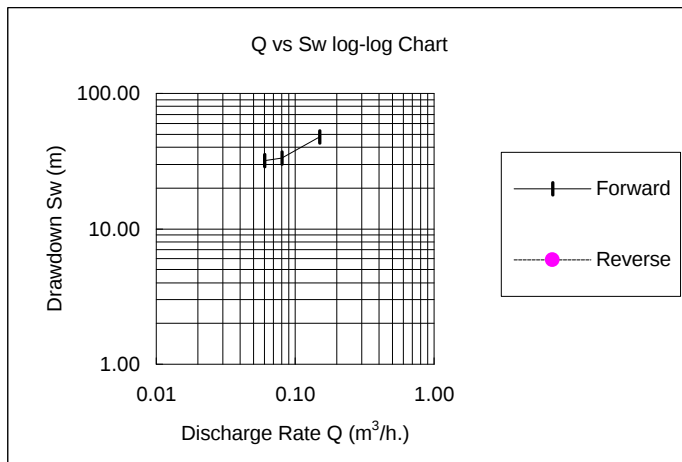
by Chart I.		
$(Sw/Q)''$	=	530.00
$(Sw/Q)'$	=	321.00
Q value of $(Sw/Q)''$	=	0.15 m³/h

Well Loss (C) = $(Sw/Q)'' - (Sw/Q)'/Q = 125.00$
 Aquifer Loss (B) = $(Sw/Q)_0 = 113.47$

Well Efficiency (E_w) = $BQ/BQ + CQ^2$

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
5.00	15.37	0.40	69.41
4.00	18.50	0.30	75.16
3.00	23.23	0.20	81.95
2.00	31.22	0.10	90.08
1.00	47.58	0.09	90.98
0.90	50.21	0.08	91.90
0.80	53.16	0.07	92.84
0.70	56.46	0.06	93.80
0.60	60.21	0.05	94.78
0.50	64.48	0.04	95.78

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	0.06	6.86	31.86	93.80
2	120	0.08	8.22	33.22	91.90
3	120	0.15	22.68	47.68	85.82
4					
5					
6					
7					
8					
9					

Auifer Boundary

N.A.

IV. Area of Influence

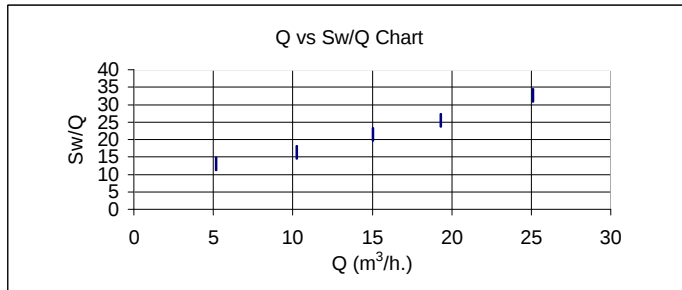
Well Efficiency of:		less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)		1.00	0.60	0.30	0.10
Well	Wu=	0.006803333	0.011338889	0.022677778	0.068033333
Function :	u=	3.56	3.10	2.60	1.50

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	1.00	0.60	0.30	0.10
3600	1		196	183	168	127
21600	6		481	449	411	312
43200	12		680	635	581	442
72000	20		878	820	751	570
86,400	24	1	962	898	822	624
864,000	240	10	3,042	2,839	2,600	1,975
2,592,000	720	30	5,270	4,917	4,503	3,421
#####	8,760	365	18,381	17,152	15,708	11,931

Sheet 7. Analysis of Step Drawdown Test in BH No. WW39846 (J4A)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J4A
Well No.	: 39846
Farm Name	: Okanjama Aminuis
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 56.05 m
Transmissibility (T)	: 87.6 m³/day/m
Storage Coefficient (S)	: 2.00E-03
Permeability (K)	: 1.00E-05 cm/sec
Static Water Level (SWL)	: 53.83 mbgl
Pump Setting Depth (PH)	: 108.50 mbgl

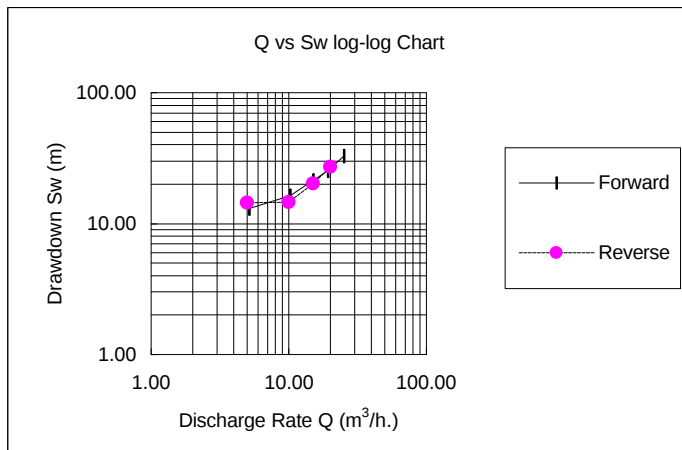
II. Well Efficiency

by Chart I.	=	26.47
(Sw/Q)''	=	8.38
(Sw/Q)'	=	20.00 m³/h
Q value of (Sw/Q)''	=	
Well Loss (C)	=	(Sw/Q)'' - (Sw/Q)'/Q = 0.90
Aquifer Loss (B) = (Sw/Q)₀	=	8.38

Well Efficiency (E_w) = BQ/BQ+CQ²

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
30.00	23.60	4.50	67.31
25.00	27.04	4.00	69.84
20.00	31.66	3.50	72.58
15.00	38.18	3.00	75.54
10.00	48.09	2.50	78.75
9.00	50.72	2.30	80.11
8.00	53.66	2.00	82.25
7.00	56.96	1.50	86.07
6.00	60.69	1.00	90.26
5.00	64.95	0.50	94.88

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	5.15	66.89	13.06	64.27
2	120	10.21	70.21	16.38	47.57
3	120	15.01	75.27	21.44	38.17
4	120	19.30	79.25	25.42	32.43
5	120	25.10	86.46	32.63	26.96
6	120	19.96	80.79	26.96	31.70
7	120	15.00	74.12	20.29	38.18
8	120	10.00	68.46	14.63	48.09
9	120	5.00	68.28	14.45	64.95

Auifer Boundary

Constant head boundary type

- relatively high permeability
- relatively high storage
- recharging by the surface water
- induced recharge

IV. Area of Influence

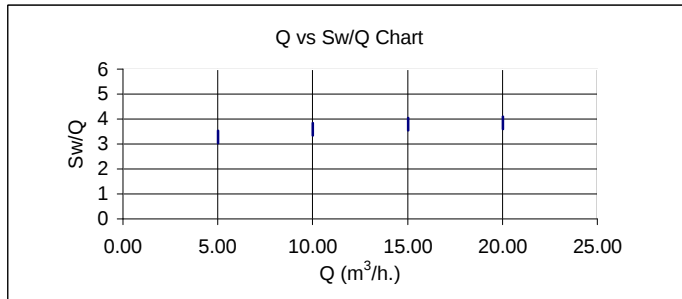
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	10.00	6.00	3.00	2.00
Well Wu=	0.045844	0.076406667	0.152813333	0.22922
Function : u=	2.05	1.70	1.25	1.05

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	10.00	6.00	3.00	2.00
3600	1		122	111	96	88
21600	6		300	273	234	214
43200	12		424	386	331	303
72000	20		547	498	427	392
86,400	24	1	599	546	468	429
864,000	240	10	1,895	1,726	1,480	1,356
2,592,000	720	30	3,282	2,989	2,563	2,349
31,536,000	8,760	365	11,450	10,426	8,941	8,194

Sheet 8. Analysis of Step Drawdown Test in BH No. WW39847 (J4N)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J4N
Well No.	: WW39847
Farm Name	: Okanyama Aminuis
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 23.35 m
Transmissibility (T)	: 7.01 m³/day/m
Storage Coefficient (S)	: 5.00E-05
Permeability (K)	: 1.60E-04 cm/sec
Static Water Level (SWL)	: 10.00 mbgl
Pump Setting Depth (PH)	: mbgl

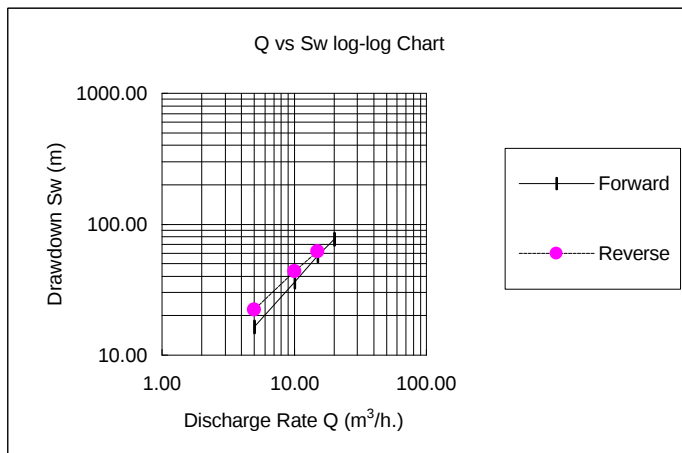
II. Well Efficiency

by Chart I.	=	
(Sw/Q)"	=	37.17
(Sw/Q)'	=	31.73
Q value of (Sw/Q)"	=	15.00 m³/h
Well Loss (C)		
= (Sw/Q)" - (Sw/Q)'/Q	=	0.36
Aquifer Loss (B) = (Sw/Q)₀	=	31.73

Well Efficiency (E_w) = $BQ/BQ+CQ^2$

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
100.00	46.66	25.00	77.78
90.00	49.29	20.00	81.39
80.00	52.24	15.00	85.36
70.00	55.55	10.00	89.74
60.00	59.32	9.00	90.67
50.00	63.63	8.00	91.62
45.00	66.04	7.00	92.59
40.00	68.63	6.00	93.58
35.00	71.43	5.00	94.59
30.00	74.47	4.00	95.63

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	90	5.00	25.95	16.36	94.59
2	90	10.00	45.51	35.92	89.74
3	90	15.00	66.65	57.06	85.36
4	90	20.00	86.71	77.12	81.39
5	90	15.00	71.67	62.08	85.36
6	90	10.00	53.08	43.49	89.74
7	90	5.00	31.87	22.28	94.59

Auifer Boundary

None flow boundary type

it seems to exist none flow boundary or barrier due to ;
 - fault, buried valley
 - impermeable barrier
 - the formation with conspicuous lowered permeability

IV. Area of Influence

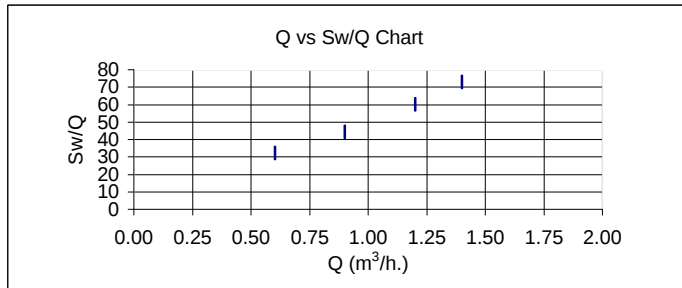
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	90.00	60.00	30.00	15.00
Well	Wu=	0.000407619	0.000611428	0.001222856
Function :	u=	5.90	5.55	4.95

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m) at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	90.00	60.00	30.00	15.00
3600	1		371	360	340	319
21600	6		909	882	833	781
43200	12		1,286	1,247	1,178	1,104
72000	20		1,661	1,610	1,521	1,426
86,400	24	1	1,819	1,764	1,666	1,562
864,000	240	10	5,752	5,579	5,269	4,939
2,592,000	720	30	9,963	9,663	9,126	8,555
31,536,000	8,760	365	34,752	33,705	31,831	29,840

Sheet 9. Analysis of Step Drawdown Test in BH No. WW39848) (J5N)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J5N
Well No.	: WW39848
Farm Name	: Moritzville
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 20.46 m
Transmissibility (T)	: 1.2 m³/day/m
Storage Coefficient (S)	: 3.00E-05
Permeability (K)	: 5.50E-05 cm/sec
Static Water Level (SWL)	: -20.00 mbgl
Pump Setting Depth (PH)	: 93.90 mbgl

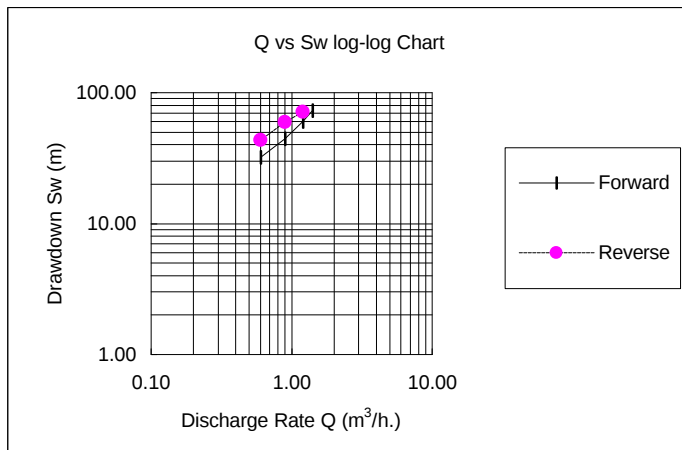
II. Well Efficiency

by Chart I.	=	61.17
(Sw/Q)''	=	4.41
(Sw/Q)'	=	1.25 m³/h
Q value of (Sw/Q)''	=	
Well Loss (C)	=	45.41
Aquifer Loss (B) = (Sw/Q)₀	=	4.41

Well Efficiency (E_w) = BQ/BQ+CQ²

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
2.00	4.63	0.07	58.11
1.50	6.08	0.06	61.81
1.00	8.85	0.05	66.01
0.80	10.83	0.04	70.83
0.60	13.93	0.03	76.40
0.40	19.54	0.02	82.92
0.20	32.69	0.01	90.66
0.10	49.27	0.0090	91.52
0.09	51.90	0.0080	92.39
0.08	54.83	0.0070	93.28

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	0.60	12.17	32.17	13.93
2	120	0.90	24.54	44.54	9.74
3	120	1.20	40.04	60.04	7.49
4	120	1.40	53.03	73.03	6.49
5	120	1.20	51.31	71.31	7.49
6	120	0.90	39.81	59.81	9.74
7	120	0.60	23.35	43.35	13.93
8					
9					

Auifer Boundary

None flow boundary type

it seems to exist none flow boundary or barrier due to ;
 - fault, buried valley
 - impermeable barrier
 - the formation with conspicuous lowered permeability

IV. Area of Influence

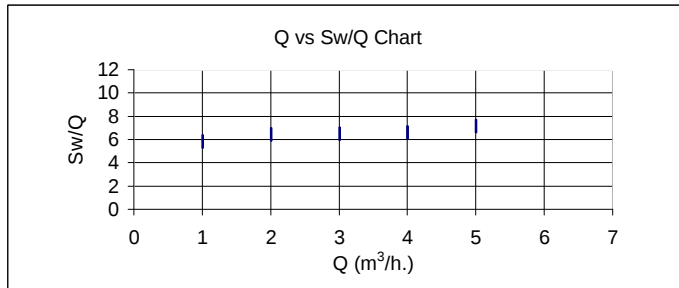
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	0.10	0.06	0.03	0.02
Well Wu=	0.06280	0.10467	0.20933	0.31400
Function : u=	3.60	1.50	1.10	0.80

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	0.10	0.06	0.03	0.02
3600	1		155	100	86	73
21600	6		379	245	210	179
43200	12		537	346	297	253
72000	20		693	447	383	327
86,400	24	1	759	490	420	358
864,000	240	10	2,400	1,549	1,327	1,131
2,592,000	720	30	4,157	2,683	2,298	1,960
31,536,000	8,760	365	14,500	9,359	8,015	6,835

Sheet 10. Analysis of Step Drawdown Test in BH No. WW39849 (J6K)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	:	J6K
Well No.	:	39849
Farm Name	:	Cobra
Radius of Casing Pipe (r)	:	0.081 m
Thickness of Aquifer (h)	:	17.5 m
Transmissibility (T)	:	6.23 m³/day/m
Storage Coefficient (S)	:	5.00E-05
Permeability (K)	:	1.40E-04 cm/sec
Static Water Level (SWL)	:	101.93 mbgl
Pump Setting Depth (PH)	:	148.00 mbgl

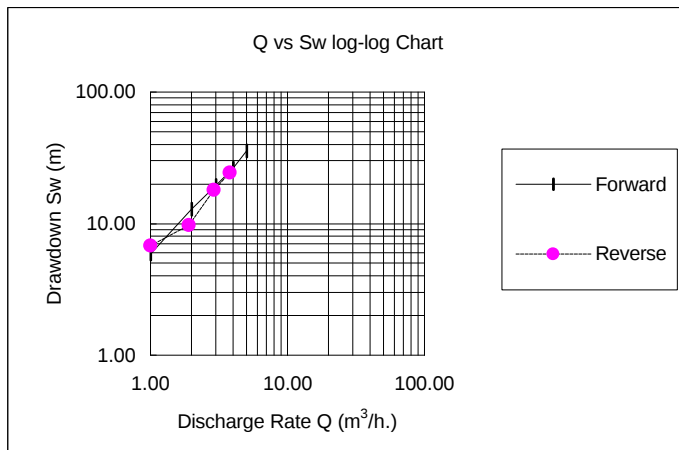
II. Well Efficiency

by Chart I.	=	6.53
(Sw/Q)''	=	4.74
(Sw/Q)'	=	5.00 m³/h
Well Loss (C)	=	0.36
Aquifer Loss (B) = (Sw/Q)₀	=	4.74

Well Efficiency (E_w) = $\frac{BQ}{BQ+CQ^c}$

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
20.00	39.83	3.50	79.09
15.00	46.88	3.00	81.53
13.00	50.46	2.50	84.12
12.00	52.46	2.00	86.88
11.00	54.62	1.50	89.82
10.00	56.97	1.00	92.98
9.00	59.53	0.90	93.64
8.00	62.34	0.80	94.30
6.00	68.82	0.40	97.07
4.00	76.80	0.20	98.51

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	1.00	107.83	5.85	92.98
2	120	2.00	114.82	12.84	86.88
3	120	3.00	121.49	19.51	81.53
4	120	4.00	128.48	26.50	76.80
5	120	5.00	137.72	35.74	72.59
6	120	3.80	126.30	24.32	77.70
7	120	2.90	119.94	17.96	82.03
8	120	1.90	111.72	9.74	87.45
9	120	1.00	108.75	6.77	92.98

Auifer Boundary

Constant head boundary type

- relatively high permeability
- relatively high storage
- recharging by the surface water
- induced recharge

IV. Area of Influence

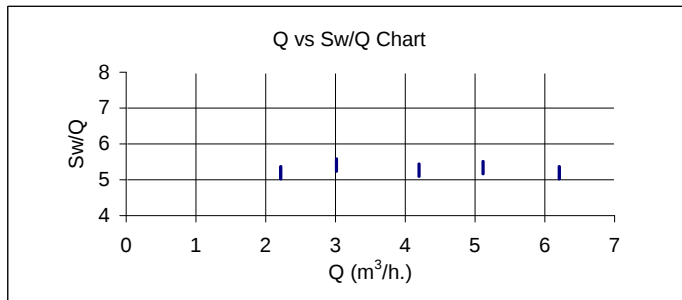
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	15.00	8.00	4.00	2.00
Well Wu=	0.002173578	0.004075458	0.008150917	0.016301833
Function : u=	4.50	3.95	3.35	2.85

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	15.00	8.00	4.00	2.00
3600	1		306	286	264	243
21600	6		749	702	646	596
43200	12		1,059	992	914	843
72000	20		1,367	1,281	1,180	1,088
86,400	24	1	1,498	1,403	1,292	1,192
864,000	240	10	4,736	4,437	4,086	3,769
2,592,000	720	30	8,203	7,685	7,077	6,528
#####	8,760	365	28,612	26,806	24,686	22,770

Sheet 11. Analysis of Step Drawdown Test in BH No. WW39850 (J6A)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J6A
Well No.	: 39850
Farm Name	: Cobra
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 26.1 m
Transmissibility (T)	: 8.44 m²/day/m
Storage Coefficient (S)	: 3.00E-09
Permeability (K)	: 3.30E-04 cm/sec
Static Water Level (SWL)	: 104.41 mbgl
Pump Setting Depth (PH)	: 148.00 mbgl

II. Well Efficiency

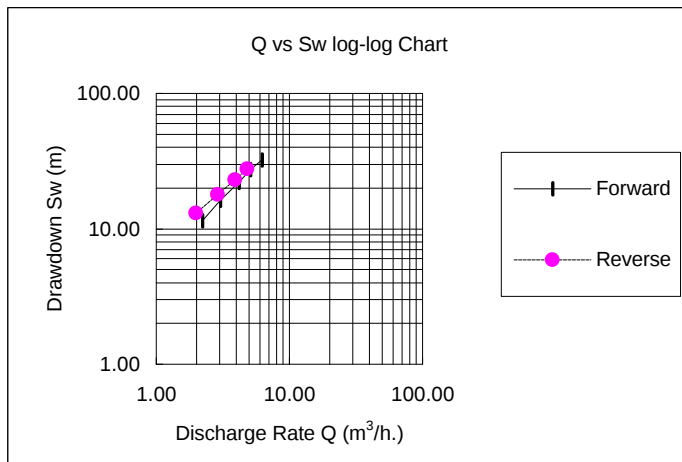
by Chart I.	=	5.36
(Sw/Q)''	=	5.06
(Sw/Q)'	=	5.00 m³/h

Well Loss (C) = (Sw/Q)'' - (Sw/Q)'/Q = **0.06**
 Aquifer Loss (B) = (Sw/Q)₀ = **3.83**

Well Efficiency (E_w) = BQ/BQ+CQ' =

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
70.00	47.70	14.00	82.01
60.00	51.55	12.00	84.18
50.00	56.08	10.00	86.46
40.00	61.48	9.00	87.64
35.00	64.59	8.00	88.86
30.00	68.03	7.00	90.12
25.00	71.86	6.00	91.41
20.00	76.14	5.00	92.74
18.00	78.00	4.00	94.10
16.00	79.96	3.00	95.51

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	2.21	114.52	11.47	96.65
2	120	3.01	119.35	16.30	95.50
3	120	4.19	125.14	22.09	93.84
4	120	5.11	130.32	27.27	92.59
5	120	6.20	135.30	32.25	91.15
6	120	4.82	130.78	27.73	92.98
7	120	3.90	125.95	22.90	94.24
8	120	2.89	120.96	17.91	95.67
9	120	1.99	116.05	13.00	96.98

Auifer Boundary

None flow boundary type

it seems to exist none flow boundary or barrier due to ;
 - fault, buried valley
 - impermeable barrier
 - the formation with conspicuous lowered permeability

IV. Area of Influence

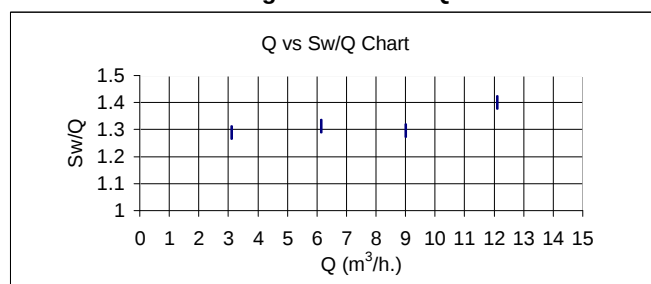
Well Efficiency of:		less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)		70.00	40.00	20.00	10.00
Well	Wu=	0.00063099	0.001104233	0.002208467	0.004416933
Function :	u=	5.50	5.00	4.45	3.85

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m) at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	70.00	40.00	20.00	10.00
3600	1		50,783	48,419	45,679	42,488
21600	6		124,392	118,603	111,890	104,074
43200	12		175,917	167,730	158,236	147,182
72000	20		227,107	216,538	204,282	190,012
86,400	24	1	248,784	237,206	223,780	208,147
864,000	240	10	786,723	750,111	707,653	658,220
2,592,000	720	30	1,362,644	1,299,231	1,225,692	1,140,070
#####	8,760	365	4,753,006	4,531,813	4,275,304	3,976,650

Sheet 12. Analysis of Step Drawdown Test in BH No. WW39852 (J7K)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	:	J7K
Well No.	:	39852
Farm Name	:	Jakkalsdraai
Radius of Casing Pipe (r)	:	0.081 m
Thickness of Aquifer (h)	:	23.4 m
Transmissibility (T)	:	30 m²/day/m
Storage Coefficient (S)	:	2.00E-04
Permeability (K)	:	1.20E-03 cm/sec
Static Water Level (SWL)	:	9.89 mbgl
Pump Setting Depth (PH)	:	46.00 mbgl

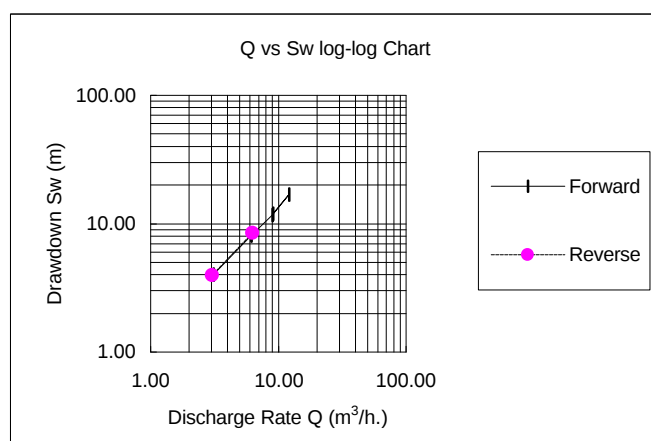
II. Well Efficiency

by Chart I.	=	1.40
(Sw/Q)''	=	1.23
(Sw/Q)'	=	9.00 m³/h
Q value of (Sw/Q)''	=	
Well Loss (C)		
$C = (Sw/Q)'' - (Sw/Q)'/Q$	=	0.02
Aquifer Loss (B) = (Sw/Q)₀	=	1.23

Well Efficiency (E_w) = $BQ/BQ + CQ^2$

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
80.00	44.87	15.00	81.28
70.00	48.19	10.00	86.69
60.00	52.05	9.00	87.86
50.00	56.57	8.00	89.06
45.00	59.13	7.00	90.29
40.00	61.95	6.00	91.56
35.00	65.04	5.00	92.87
30.00	68.46	4.00	94.21
25.00	72.26	3.00	95.60
20.00	76.50	2.00	97.02

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	3.10	13.89	4.00	95.45
2	120	6.13	17.94	8.05	91.40
3	120	9.00	21.55	11.66	87.86
4	120	12.10	26.85	16.96	84.33
5	120	9.03	21.83	11.94	87.82
6	120	6.30	18.33	8.44	91.18
7	120	3.03	13.87	3.98	95.56
8					
9					

Auifer Boundary

Constant head boundary type

- relatively high permeability
- relatively high storage
- recharging by the surface water
- induced recharge

IV. Area of Influence

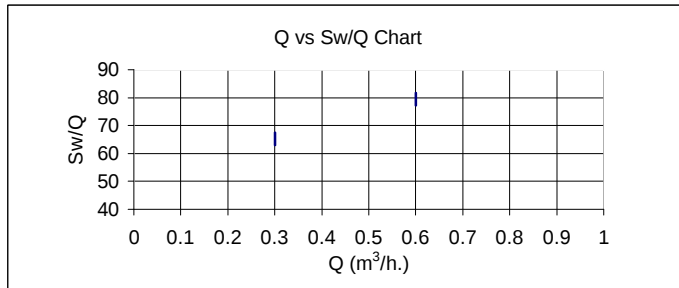
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	70.00	40.00	20.00	10.00
Well Wu=	0.002242857	0.003925	0.00785	0.0157
Function : u=	4.45	3.95	3.45	2.90

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	70.00	40.00	20.00	10.00
3600	1		334	314	294	269
21600	6		817	770	719	660
43200	12		1,155	1,089	1,017	933
72000	20		1,492	1,405	1,313	1,204
86,400	24	1	1,634	1,539	1,439	1,319
864,000	240	10	5,167	4,868	4,550	4,171
2,592,000	720	30	8,950	8,432	7,880	7,225
#####	8,760	365	31,218	29,412	27,487	25,201

Sheet 13. Analysis of Step Drawdown Test in BH No. WW39853 (J7N)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J7N
Well No.	: 39853
Farm Name	: Jackalsdraai
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 14.5 m
Transmissibility (T)	: 0.01 m³/day/m
Storage Coefficient (S)	: 8.00E-04
Permeability (K)	: 6.80E-07 cm/sec
Static Water Level (SWL)	: 24.50 mbgl
Pump Setting Depth (PH)	: 100.00 mbgl

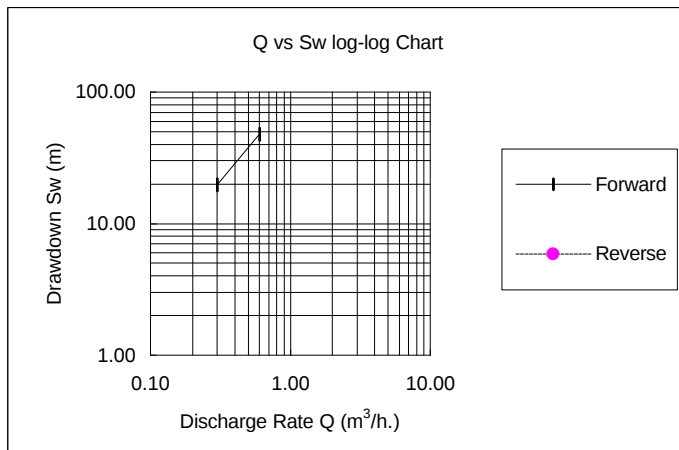
II. Well Efficiency

by Chart I.	=	84.07
(Sw/Q)''	=	50.90
(Sw/Q)'	=	0.70 m³/h
Well Loss (C)	=	47.39
Aquifer Loss (B) = (Sw/Q)₀	=	50.90

Well Efficiency (E_w) = BQ/BQ+CQ²

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
10.00	9.70	0.60	64.16
8.00	11.84	0.50	68.24
6.00	15.18	0.45	70.48
4.00	21.17	0.40	72.87
2.00	34.94	0.35	75.42
1.50	41.73	0.30	78.17
1.00	51.79	0.25	81.12
0.90	54.41	0.20	84.30
0.80	57.31	0.15	87.75
0.70	60.54	0.10	91.48

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	0.30	44.10	19.60	78.17
2	120	0.60	72.19	47.69	64.16
3					
4					
5					
6					
7					
8					
9					

Auifer Boundary

N.A.

IV. Area of Influence

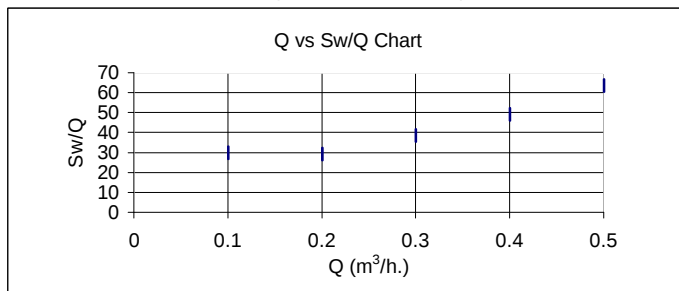
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	1.50	0.70	0.35	0.25
Well Wu=	0.00003489	0.000074762	0.000149524	0.000209333
Function : u=	8.10	7.40	6.80	6.50

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	1.50	0.70	0.35	0.25
3600	1		4	4	4	4
21600	6		10	10	9	9
43200	12		14	14	13	13
72000	20		18	18	17	16
86,400	24	1	20	19	18	18
864,000	240	10	64	61	58	57
2,592,000	720	30	110	105	101	99
#####	8,760	365	384	367	352	344

Sheet 14. Analysis of Step Drawdown Test in BH No. WW39854 (J8K)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	:	J8K
Well No.	:	39854
Farm Name	:	Tweeriver
Radius of Casing Pipe (r)	:	0.081 m
Thickness of Aquifer (h)	:	23.4 m
Transmissibility (T)	:	0.132 m³/day/m
Storage Coefficient (S)	:	5.00E-03
Permeability (K)	:	5.10E-06 cm/sec
Static Water Level (SWL)	:	60.31 mbgl
Pump Setting Depth (PH)	:	101.00 mbgl

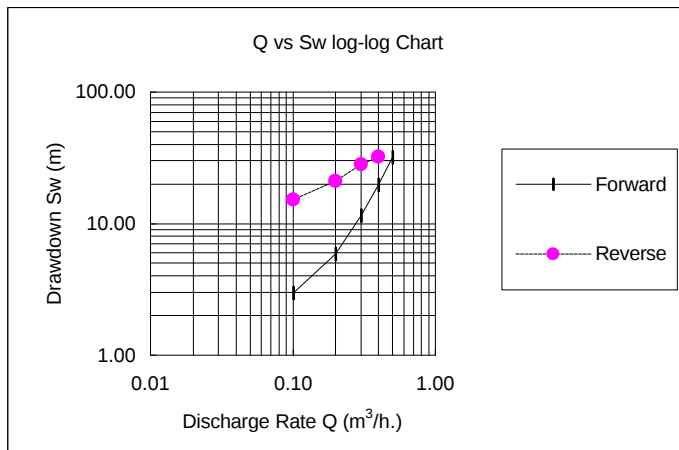
II. Well Efficiency

by Chart I.	=	
(Sw/Q)''	=	48.98
(Sw/Q)'	=	10.00
Q value of (Sw/Q)''	=	0.40 m³/h
Well Loss (C)	=	
= (Sw/Q)'' - (Sw/Q)'/Q	=	97.45
Aquifer Loss (B) = (Sw/Q)₀	=	10.00

Well Efficiency (E_w) = BQ/BQ+CQ²

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
0.5	17.03	0.04	71.95
0.4	20.42	0.03	77.38
0.3	25.49	0.028	78.56
0.2	33.91	0.026	79.78
0.1	50.65	0.024	81.05
0.09	53.28	0.022	82.35
0.08	56.19	0.02	83.69
0.07	59.45	0.018	85.08
0.06	63.10	0.016	86.51
0.05	67.24	0.014	87.99

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	0.10	62.84	2.98	50.65
2	120	0.20	65.73	5.87	33.91
3	120	0.30	71.40	11.54	25.49
4	120	0.40	79.51	19.65	20.42
5	120	0.50	91.65	31.79	17.03
6	120	0.40	91.95	32.09	20.42
7	120	0.30	87.96	28.10	25.49
8	120	0.20	80.87	21.01	33.91
9	120	0.10	75.01	15.15	50.65

Auifer Boundary

None flow boundary type

it seems to exist none flow boundary or barrier due to ;
 - fault, buried valley
 - impermeable barrier
 - the formation with conspicuous lowered permeability

IV. Area of Influence

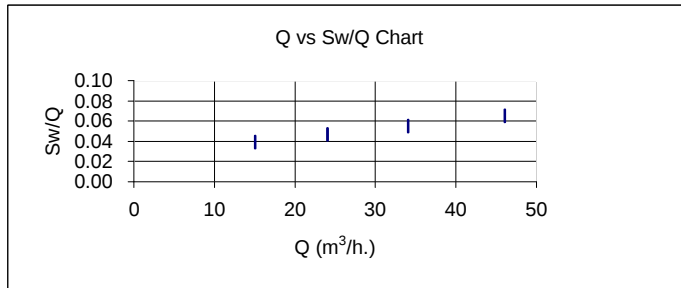
Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	0.20	0.06	0.04	0.02
Well Wu=	0.003454	0.011513333	0.019737143	0.03454
Function : u=	4.10	3.10	2.90	2.30

When drawdown (s) > 0.01m

Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	0.20	0.06	0.04	0.02
3600	1		4	4	4	3
21600	6		10	9	9	8
43200	12		15	13	12	11
72000	20		19	17	16	14
86,400	24	1	21	18	17	16
864,000	240	10	66	57	55	49
2,592,000	720	30	114	99	96	85
#####	8,760	365	398	346	334	298

Sheet 15. Analysis of Step Drawdown Test in BH No. WW39857 (J9A)

Chart 1. Discharge Rate vs Sw/Q



I. Test Well Data

JICA Ref. No.	: J9A
Well No.	: WW39857
Farm Name	: Klein swat modder
Radius of Casing Pipe (r)	: 0.081 m
Thickness of Aquifer (h)	: 69.9 m
Transmissibility (T)	: 1240 m³/day/m
Storage Coefficient (S)	: 3.00E-04
Permeability (K)	: 1.90E-02 cm/sec
Static Water Level (SWL)	: 2.24 mbgl
Pump Setting Depth (PH)	: 82.98 mbgl

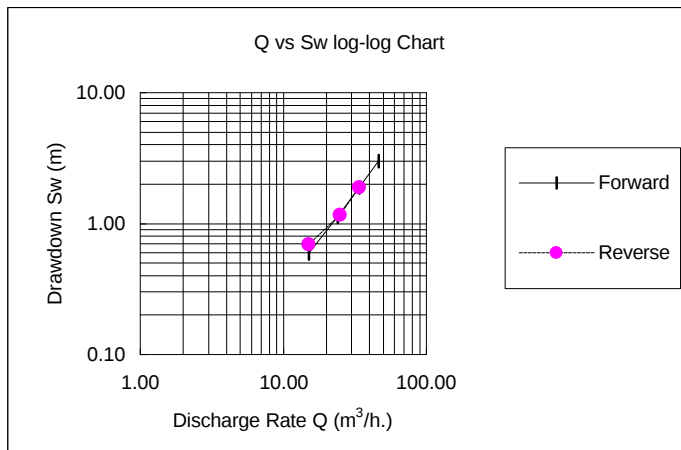
II. Well Efficiency

by Chart I.	=	0.06
(Sw/Q)''	=	0.0265
(Sw/Q)'	=	40.00 m³/h
Well Loss (C)	=	0.0008375
Aquifer Loss (B) = (Sw/Q)₀	=	0.03

$$\text{Well Efficiency (E}_w\text{)} = \frac{BQ}{BQ + CQ^2}$$

Discharge Rate Q (m³/h)	Ew ratio (%)	Discharge Rate Q (m³/h)	Ew ratio (%)
50.00	38.76	12.00	72.50
45.00	41.29	10.00	75.99
40.00	44.17	9.00	77.86
35.00	47.48	8.00	79.82
30.00	51.33	7.00	81.88
25.00	55.86	6.00	84.06
20.00	61.27	5.00	86.35
18.00	63.74	4.00	88.78
16.00	66.42	3.00	91.34
14.00	69.33	2.00	94.06

Chart 2. Discharge Rate vs Drawdown



III. Discharge Rate and Draw Down

(see Chart 2.)

Step NO.	Time Interval (min)	Discharge Rate Q (m³/h)	Water Level (m.bgl)	Draw Down Sw (m)	Well Efficiency (%)
1	120	15.00	2.83	0.59	67.84
2	120	24.00	3.37	1.13	56.87
3	120	34.00	4.12	1.88	48.20
4	120	46.00	5.23	2.99	40.75
5	120	34.00	4.13	1.89	48.20
6	120	25.00	3.41	1.17	55.86
7	120	15.00	2.93	0.69	67.84
8					
9					

Auifer Boundary

Constant head boundary type

- relatively high permeability
- relatively high storage
- recharging by the surface water
- induced recharge

IV. Area of Influence

Well Efficiency of:	less than 50%	50% to 70%	70% to 80%	more than 80%
Pumping Rate (m³/h)	40.00	20.00	10.00	7.00
Well	Wu=	0.162233333	0.324466667	0.648933333
Function :	u=	1.20	0.79	0.43

When drawdown (s) > 0.01m

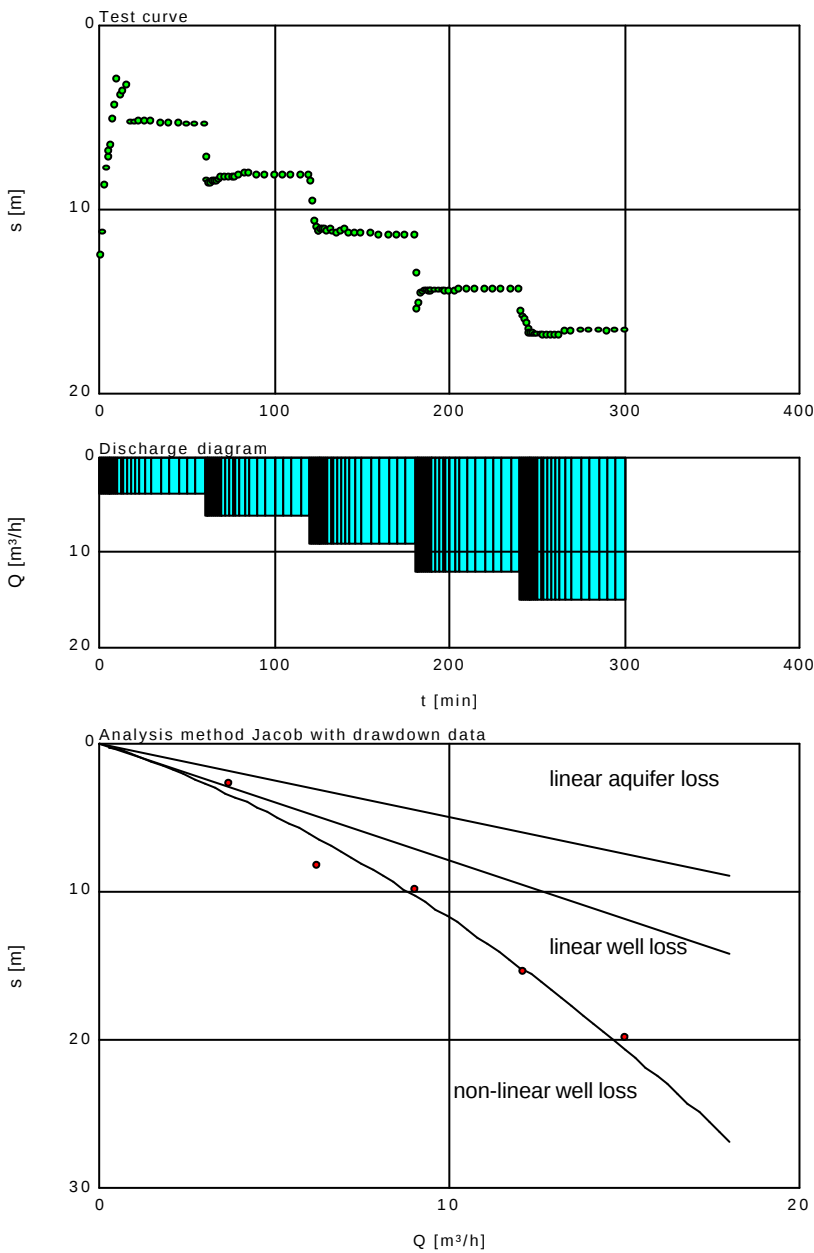
Pumping Duration			Area of Influence (m)			
			at each Pumping Rate (m³/h) of			
Sec.	Hour	Date	40.00	20.00	10.00	7.00
3600	1		909	738	544	447
21600	6		2,227	1,807	1,333	1,095
43200	12		3,150	2,556	1,885	1,548
72000	20		4,066	3,299	2,434	1,999
86,400	24	1	4,454	3,614	2,666	2,190
864,000	240	10	14,085	11,429	8,432	6,924
2,592,000	720	30	24,397	19,795	14,604	11,993
31,536,000	8,760	365	85,098	69,046	50,940	41,834

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Step test analysis

Pumped well J1-A



Borehole, well & aquifer

Drilled:	
Latitude:	
Longitude:	
Elevation:	1100 [m]
Depth:	256 [m]
Stick up:	0.00 [m]
Bh. radius:	0.125 [m]
Casing radius:	0.081 [m]
RWL:	57.11 [m]
max.drawdown:	16.85 [m]
Aq.type:	confined
Aq.thickness:	75.00 [m]
Stratigraphy:	Auob Sandstone
Lithology:	Sandstone

Test running

Start:	05/06/2000 13:56:44
Dis.dur.:	300 [min]
Av.dis.:	9.2 [m³/h]
Max.dis.:	15 [m³/h]
Min.dis.:	3.7 [m³/h]
Total dis.:	46 [m³]
Crew:	Metzger_PM
Supervisor:	PCI

Results

Well performance:

$s: (B1+B2)*Q+C*Q^2$

Linear aquifer loss B1: 0.50

Linear well loss B2: 0.29

Non-linear well loss C: 3.9E-2

	Q [m³/h]	s [m]	Eff [%]
Step 1:	3.70	2.69	53.4
Step 2:	6.23	8.26	48.3
Step 3:	9.00	9.85	43.7
Step 4:	12.1	15.4	39.5
Step 5:	15.0	19.8	36.3

Linear skin factor: 1.83 [-]

Non-linear skin factor: 5.88 [d/m³]

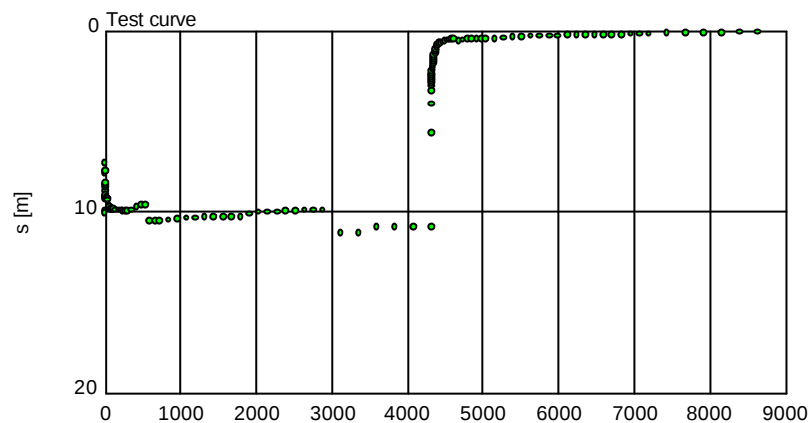
Effective well radius: 5.1E-4 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

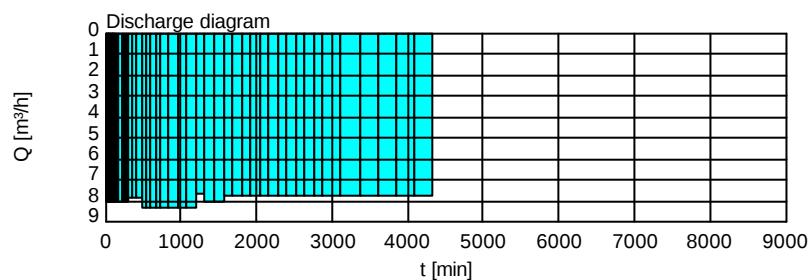
Test pumping analysis

Pumped well J1-A



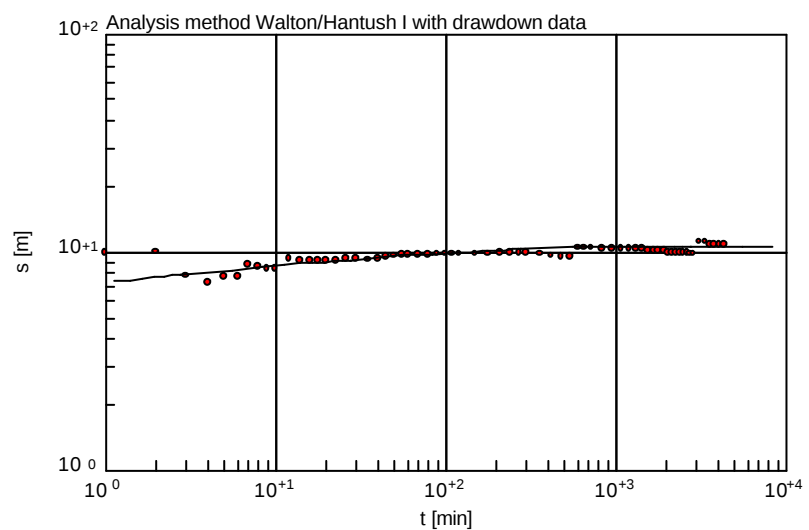
Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 1100 [m]
Depth: 256 [m]
Stick up: 0.00 [m]
Bh. radius: 0.125 [m]
Casing radius: 0.081 [m]
RWL: 58.07 [m]
max.drawdown:16.85 [m]
Aq.type: confined
Aq.thickness: 75.00 [m]
Stratigraphy: Auob Sandstone
Lithology: Sandstone



Test running

Start:05/06/2000 14:20:39
Dis.dur.: 4320 [min]
Av.dis.: 7.91 [m³/h]
Max.dis.: 8.3 [m³/h]
Min.dis.: 7.7 [m³/h]
Total dis.: 570 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

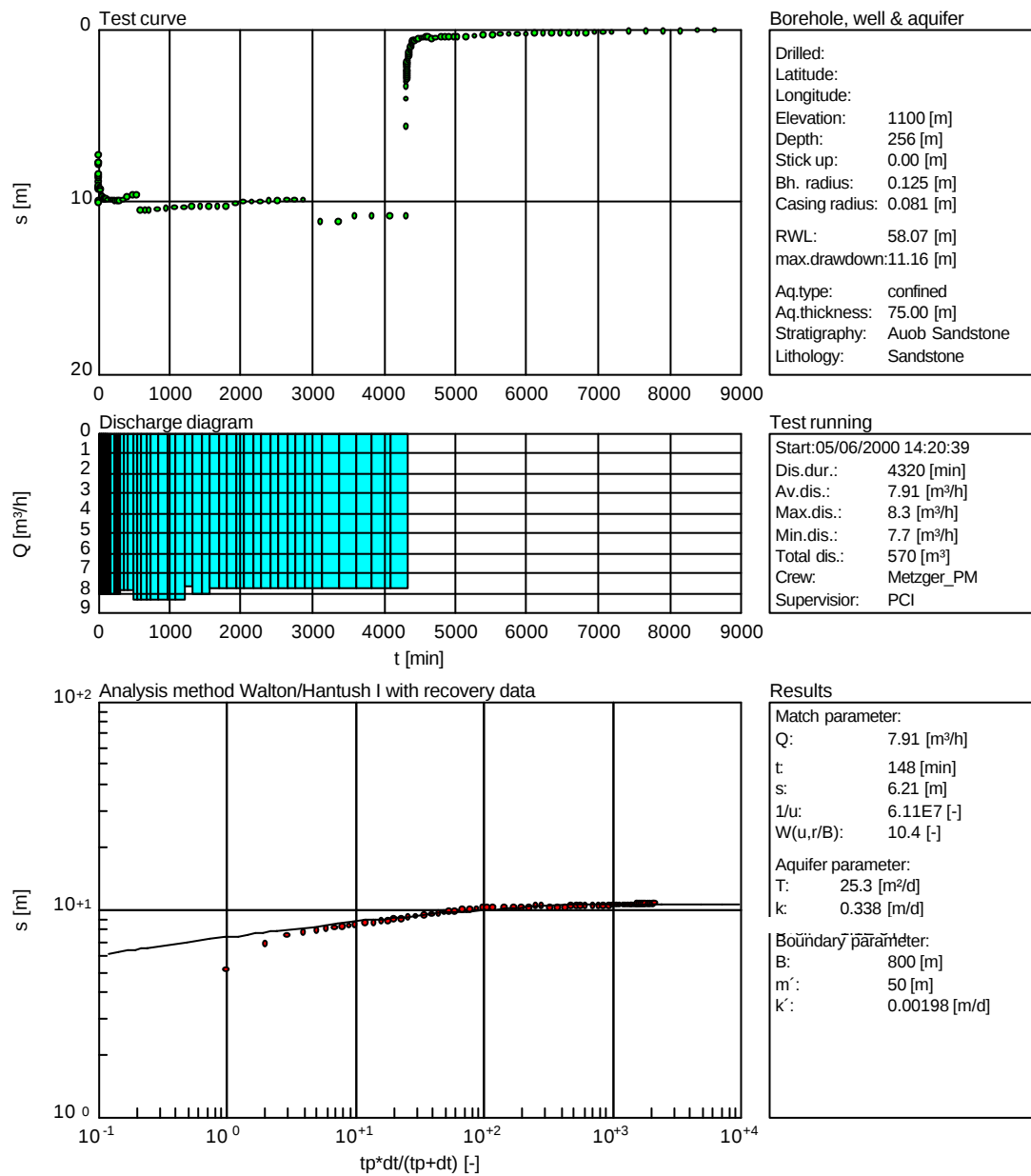
Match parameter:
Q: 7.91 [m³/h]
t: 100 [min]
s: 5.53 [m]
1/u: 3.6E7 [-]
W(u,r/B): 9.24 [-]
Aquifer parameter:
T: 25.2 [m²/d]
k: 0.337 [m/d]
Boundary parameter:
B: 800 [m]
m': 50 [m]
K': 0.00197 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J1-A

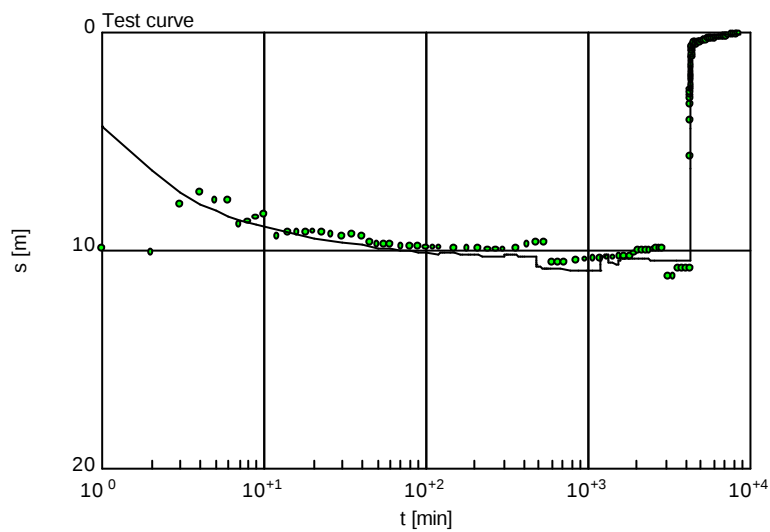


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

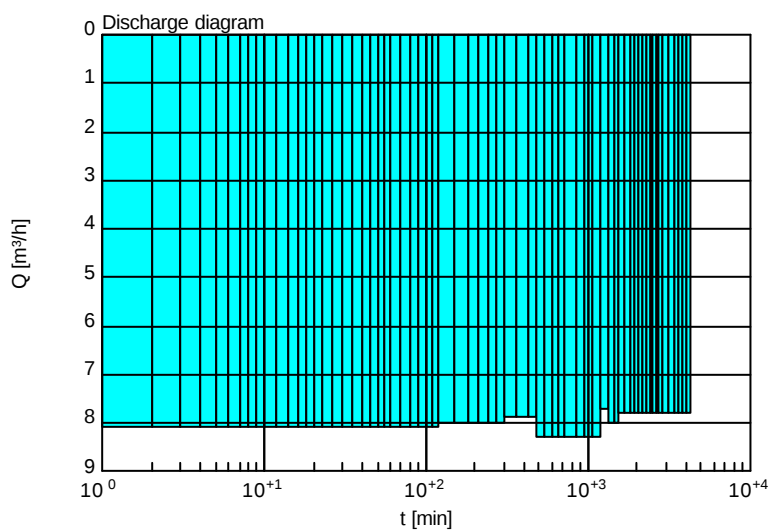
Pumped well J1-A



Remarks

Simulation of actual draw down using the Hantush model for leaky conditions.

Poor correlation between pumping rates and water level e.g. water level rises during abstraction.



Discharge info

Dis.dur.:4320 [min]
tcorr: 4397 [min]

Av.dis.: 7.91 [m³/h]
max.dis.:8.30 [m³/h]
min.dis.:7.70 [m³/h]
Qn: 7.80 [m³/h]

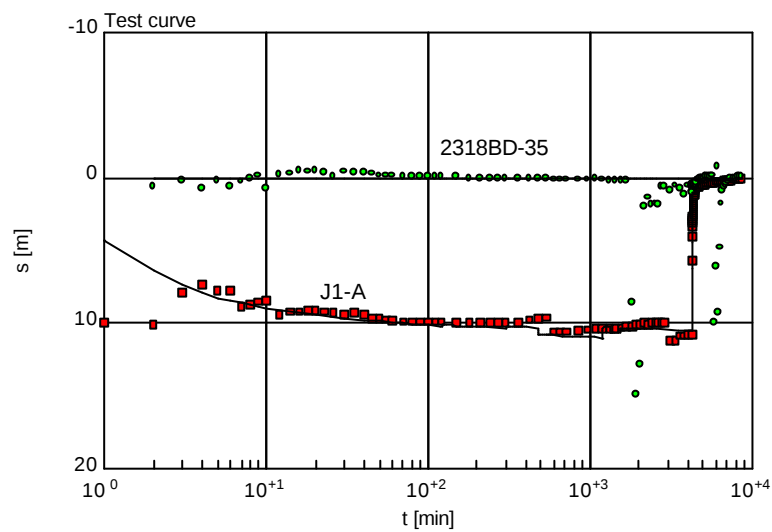
Dis.sum: 570 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

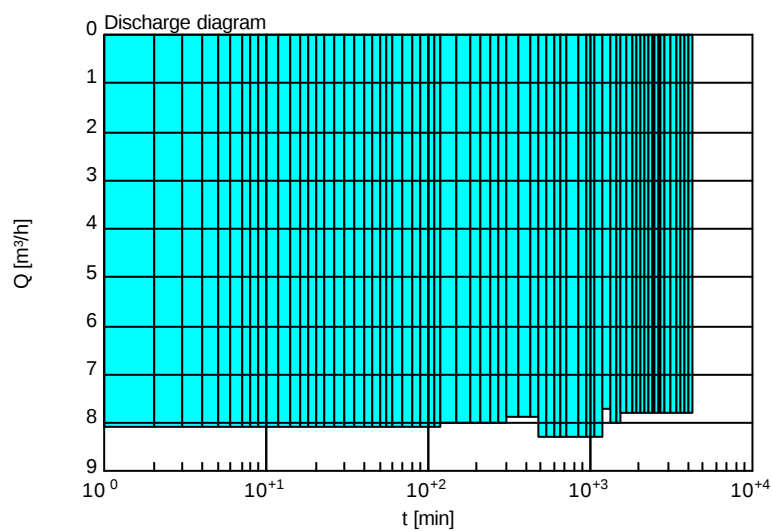
Test pumping diagnosis

Pumped well J1-A



Remarks

Abstraction have no real influence on the observation borehole due to its distance from the abstraction borehole. Should avoid pumping from observation borehole during entire test. Due to the pumping of the observation borehole, the data is not reliable for evaluation.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4397 [min]

Av.dis.: 7.91 [m³/h]
max.dis.: 8.30 [m³/h]
min.dis.: 7.70 [m³/h]
Qn: 7.80 [m³/h]

Dis.sum: 570 [m³]

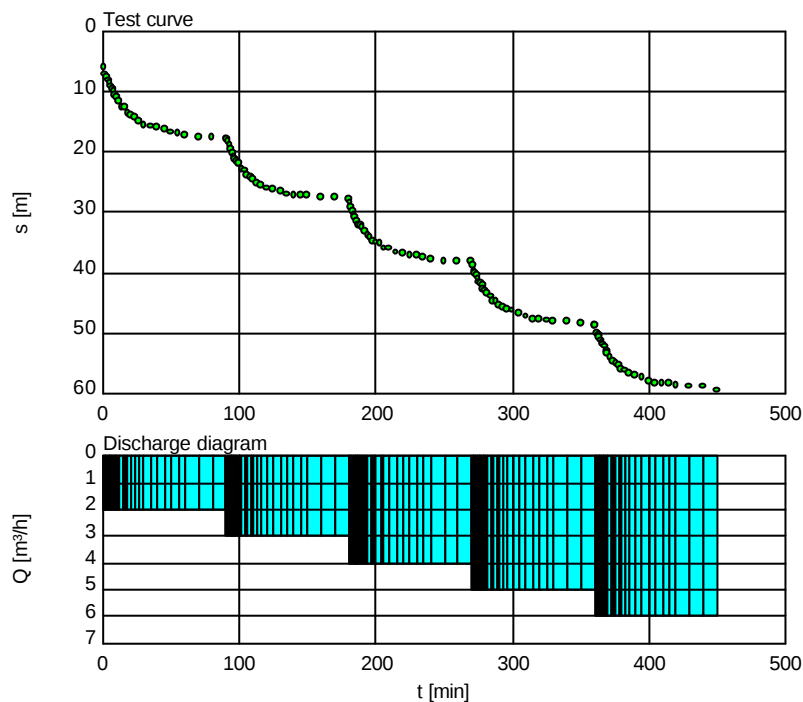
Distance to observation borehole: 2318BD-35 = 400 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Step test analysis

Pumped well J2-A



Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 1100 [m]
Depth:
Stick up: 0.00 [m]
Bh. radius: 0.100 [m]
Casing radius: 0.075 [m]
RWL: 16.41 [m]
max.drawdown: 59.50 [m]
Aq.type: confined
Aq.thickness: 100.00 [m]
Stratigraphy: Aoub Sandstone
Lithology: Sandstone

Test running

Start:03/07/2000 20:44:09
Dis.dur.: 450 [min]
Av.dis.: 4 [m³/h]
Max.dis.: 6 [m³/h]
Min.dis.: 2 [m³/h]
Total dis.: 30 [m³]
Crew: Metzger_PM
Supervisor: PCI

Results

Well performance:

$s: (B1+B2)*Q+C*Q^2$
Linear aquifer loss B1: 3.79
Linear well loss B2: -2.4E-01
Non-linear well loss C: 0.41

	Q [m³/h]	s [m]	Eff [%]
Step 1:	2.00	8.10	86.6
Step 2:	3.00	15.1	79.1
Step 3:	4.00	22.1	72.8
Step 4:	5.00	27.5	67.4
Step 5:	6.00	35.3	62.8

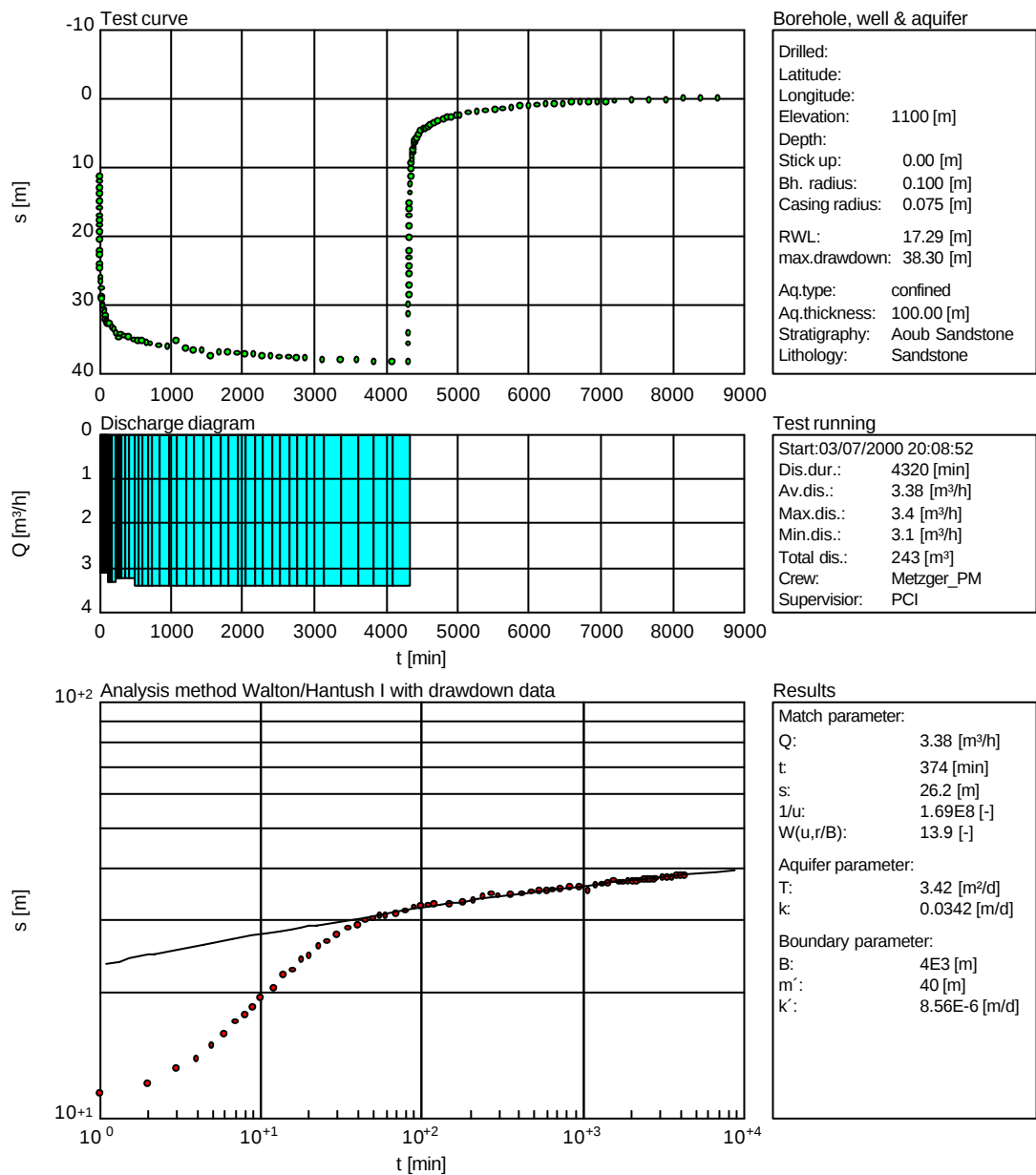
Linear skin factor: -0.22 [-]
Non-linear skin factor: 8.86 [d/m³]
Effective well radius: 1.4E-2 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J2-A

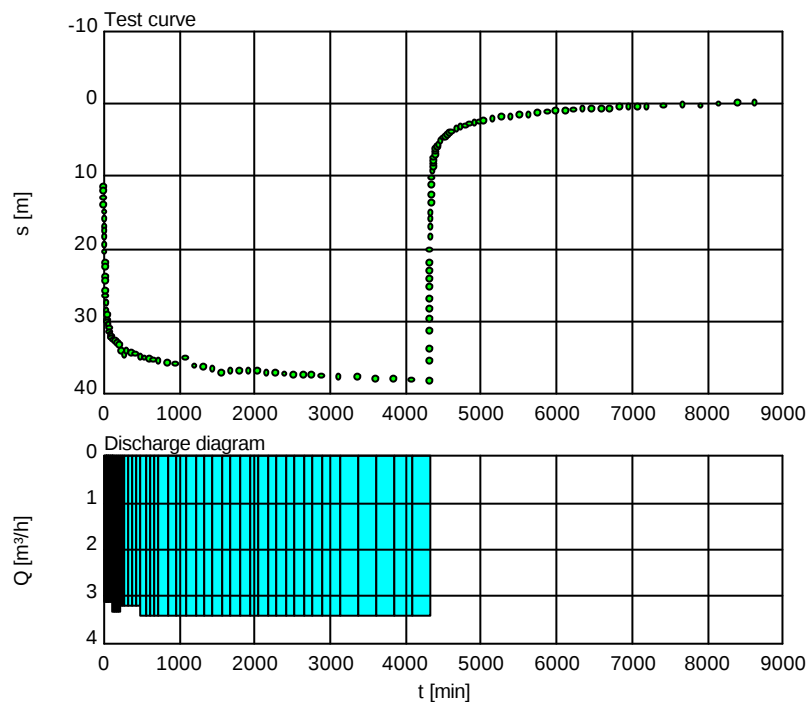


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J2-A

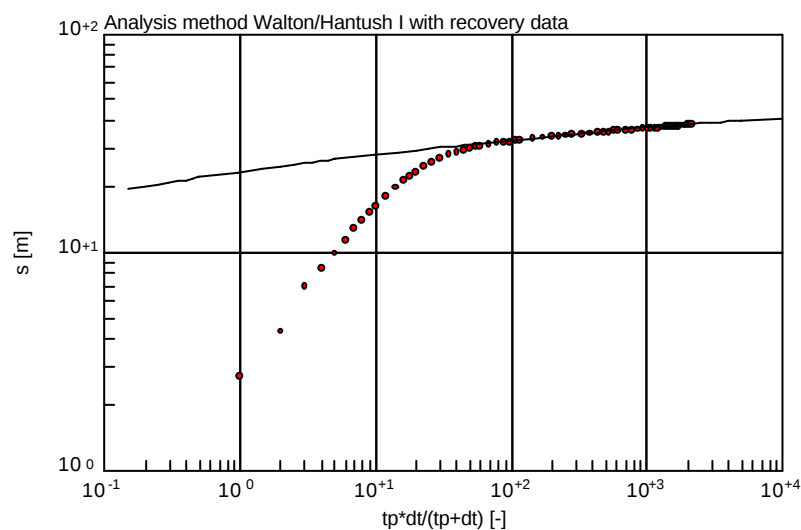


Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 1100 [m]
Depth:
Stick up: 0.00 [m]
Bh. radius: 0.100 [m]
Casing radius: 0.075 [m]
RWL: 17.29 [m]
max.drawdown: 38.30 [m]
Aq.type: confined
Aq.thickness: 100.00 [m]
Stratigraphy: Aoub Sandstone
Lithology: Sandstone

Test running

Start:03/07/2000 20:08:52
Dis.dur.: 4320 [min]
Av.dis.: 3.38 [m³/h]
Max.dis.: 3.4 [m³/h]
Min.dis.: 3.1 [m³/h]
Total dis.: 243 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

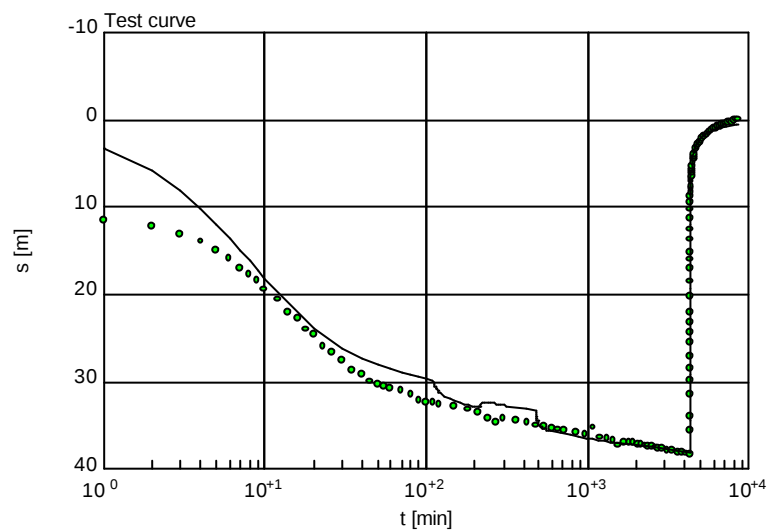
Match parameter:
Q: 3.38 [m³/h]
t: 456 [min]
s: 12 [m]
1/u: 9.29E7 [-]
W(u,r/B): 5.99 [-]
Aquifer parameter:
T: 3.22 [m²/d]
k: 0.0322 [m/d]
Boundary parameter:
B: 4E3 [m]
m': 40 [m]
K': 8.06E-6 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

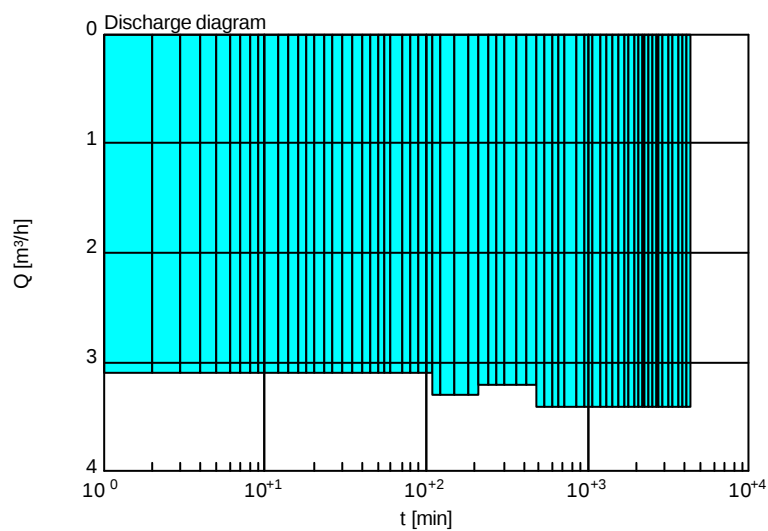
Test pumping diagnosis

Pumped well J2-A



Remarks

Simulation of the actual recorded draw down during the constant discharge test applying the Hantush model for leaky aquifers.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4290 [min]

Av.dis.: 3.38 [m³/h]
max.dis.: 3.40 [m³/h]
min.dis.: 3.10 [m³/h]
Qn: 3.40 [m³/h]

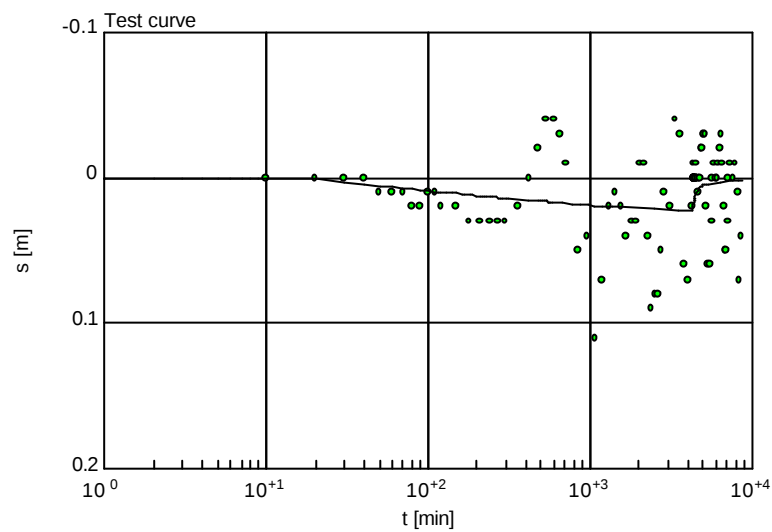
Dis.sum: 243 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

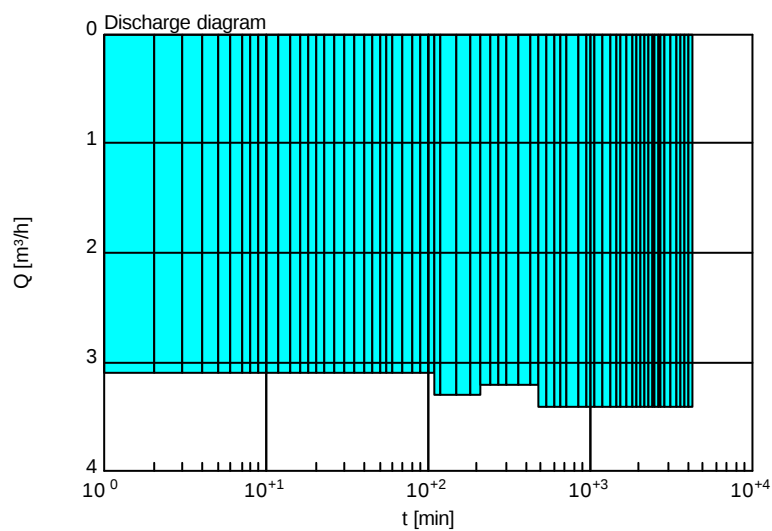
Test pumping diagnosis

Observation well J2-A



Remarks

Data from observation borehole J2-N could not be used to calculate aquifer parameters due to the fact that the borehole is not located in the pumped aquifer



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4290 [min]

Av.dis.: 3.38 [m³/h]
max.dis.: 3.40 [m³/h]
min.dis.: 3.10 [m³/h]
Qn: 3.40 [m³/h]

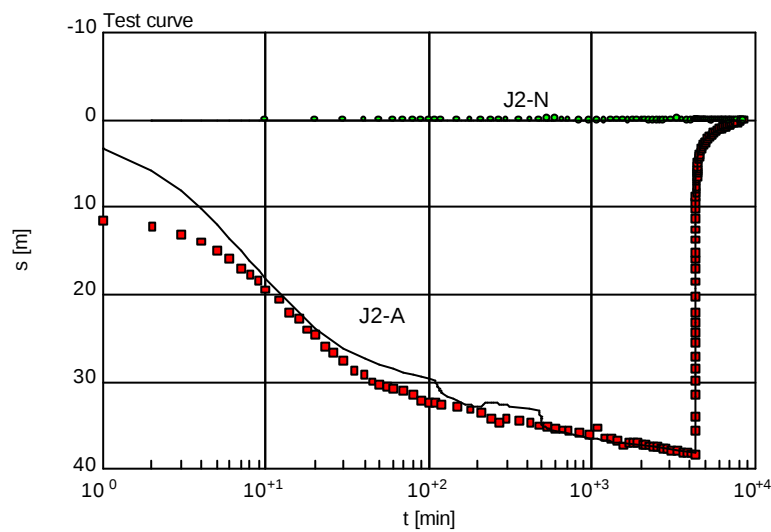
Dis.sum: 243 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

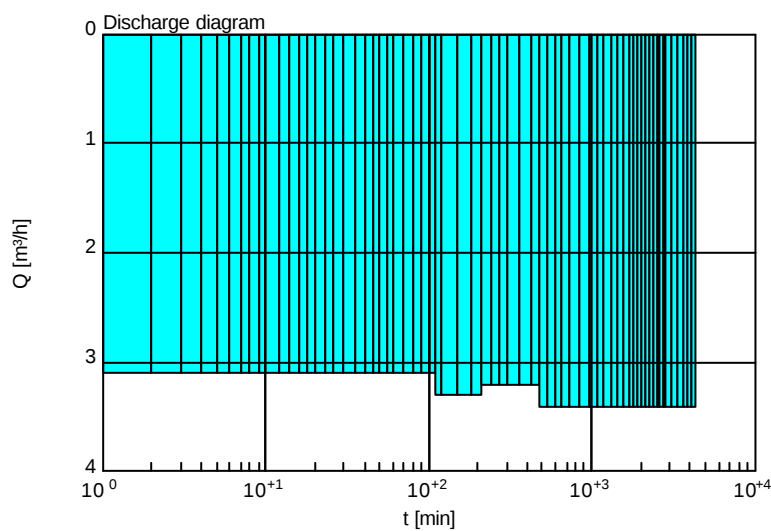
Test pumping diagnosis

Pumped well J2-A



Remarks

Merged draw down data from observation borehole J2-N and abstraction borehole J2-A.



Discharge info

Dis.dur.:4320 [min]
tcorr: 4290 [min]

Av.dis.: 3.38 [m³/h]
max.dis.:3.40 [m³/h]
min.dis.:3.10 [m³/h]
Qn: 3.40 [m³/h]

Dis.sum: 243 [m³]

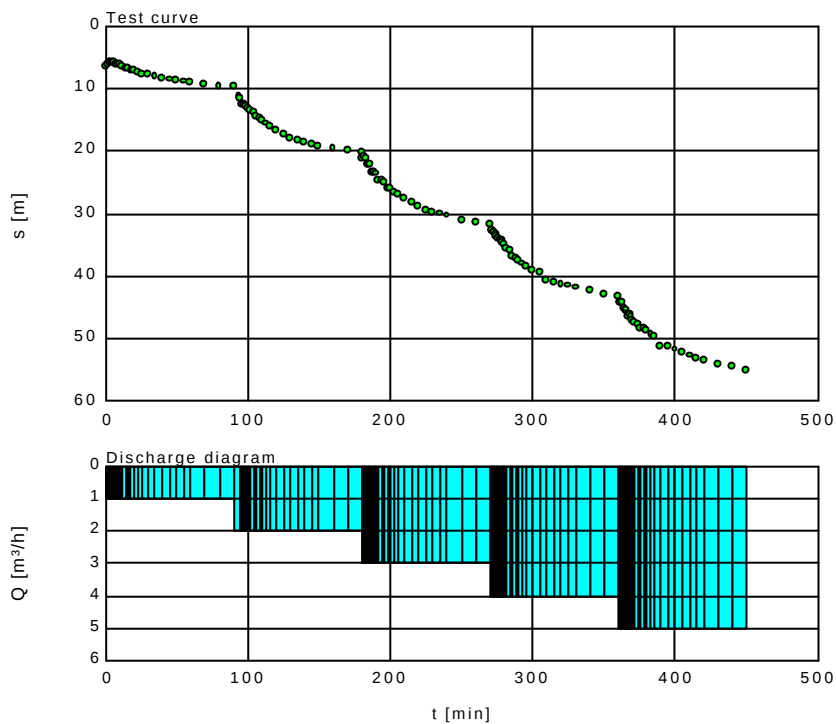
Distance to observation borehole: J2-N = 71.2 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

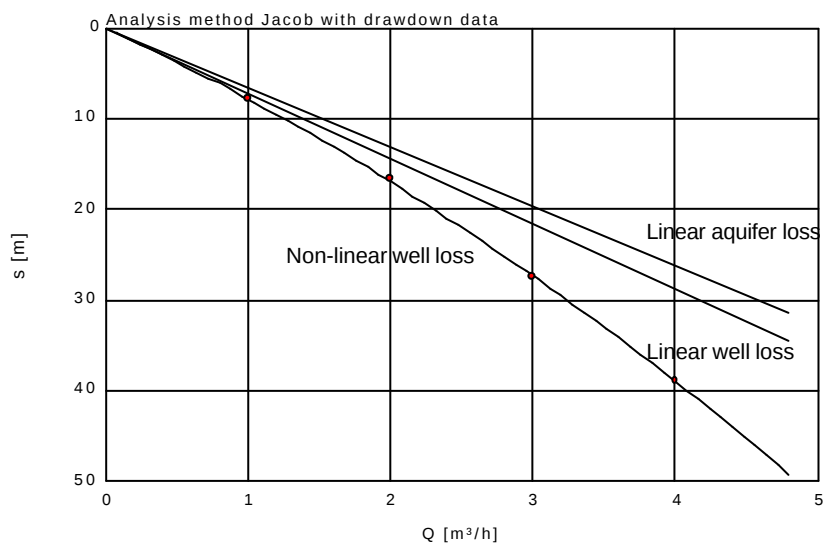
Step test analysis

Pumped well J2-N



Borehole, well & aquifer	
Drilled:	
Latitude:	
Longitude:	
Elevation:	1100 [m]
Depth:	
Stick up:	0.00 [m]
Bh. radius:	0.125 [m]
Casing radius:	
RWL:	40.17 [m]
max.drawdown:	54.96 [m]
Aq.type:	confined
Aq.thickness:	25.00 [m]
Stratigraphy:	Nossob Sandstone
Lithology:	Sandstone

Test running	
Start:	02/07/2000 16:45:43
Dis.dur.:	450 [min]
Av.dis.:	3 [m³/h]
Max.dis.:	5 [m³/h]
Min.dis.:	1 [m³/h]
Total dis.:	22.5 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



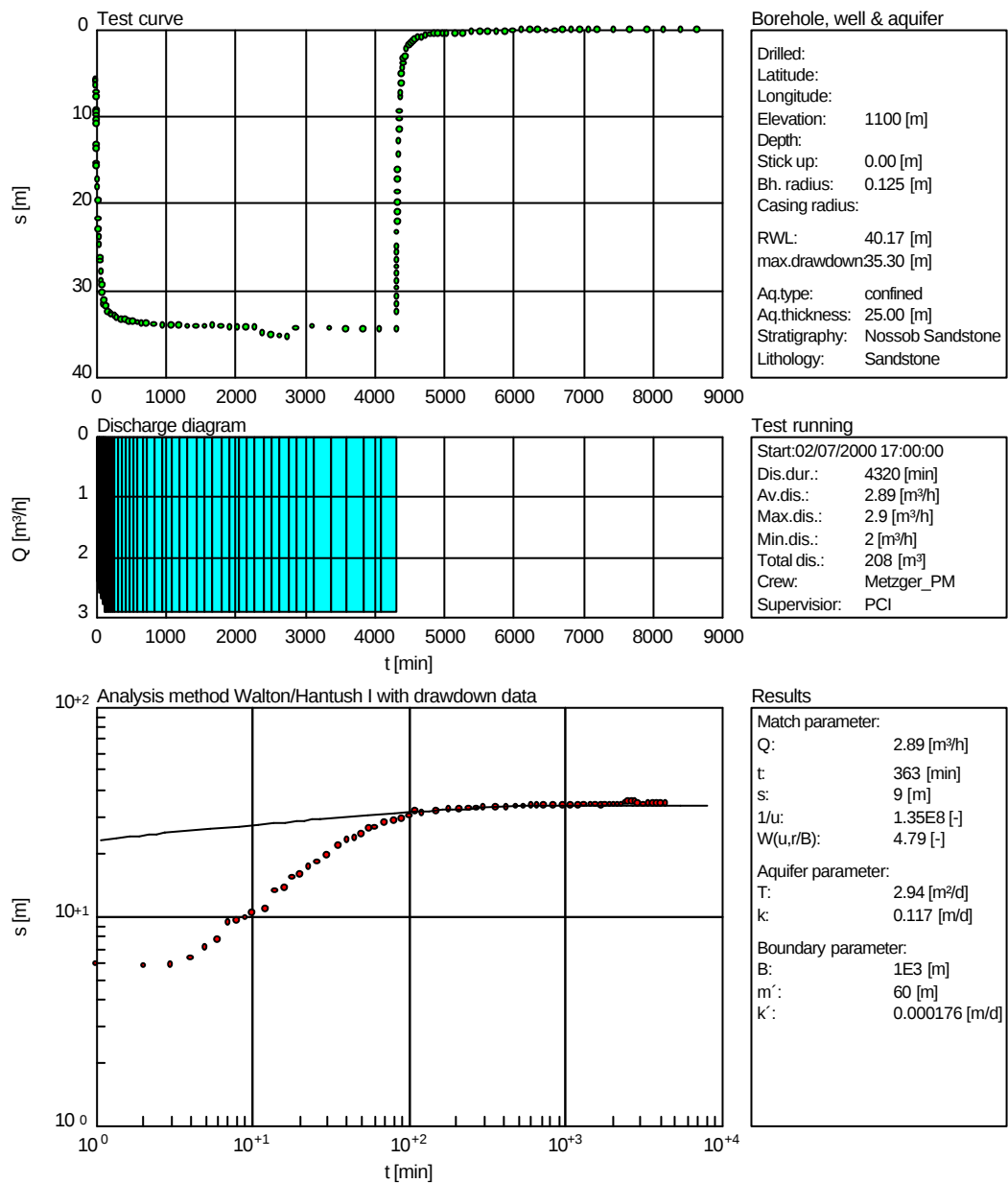
Results	
Well performance:	
$s: (B1+B2)*Q+C*Q^2$	
Linear aquifer loss B1: 5.91	
Linear well loss B2: 1.27	
Non-linear well loss C: 0.64	
Q [m³/h]	s [m]
Step 1: 1.00	7.89
Step 2: 2.00	16.6
Step 3: 3.00	27.5
Step 4: 4.00	39.0
	Eff [%]
Step 1: 1.00	83.8
Step 2: 2.00	77.5
Step 3: 3.00	72.0
Step 4: 4.00	67.3
Linear skin factor: 0.99 [-]	
Non-linear skin factor: 12.0 [d/m³]	
Effective well radius: 6.2E-3 [m]	

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J2-N

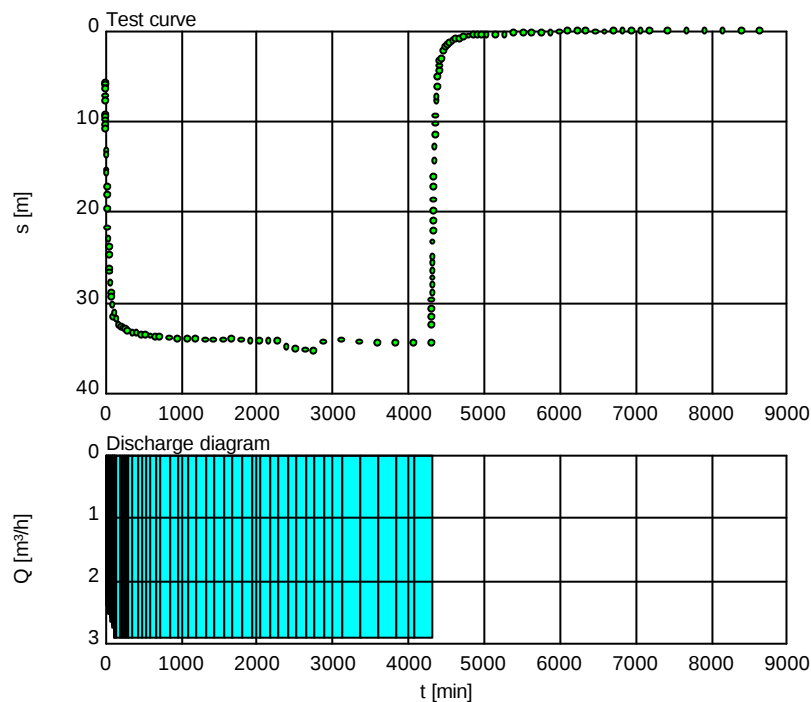


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J2-N

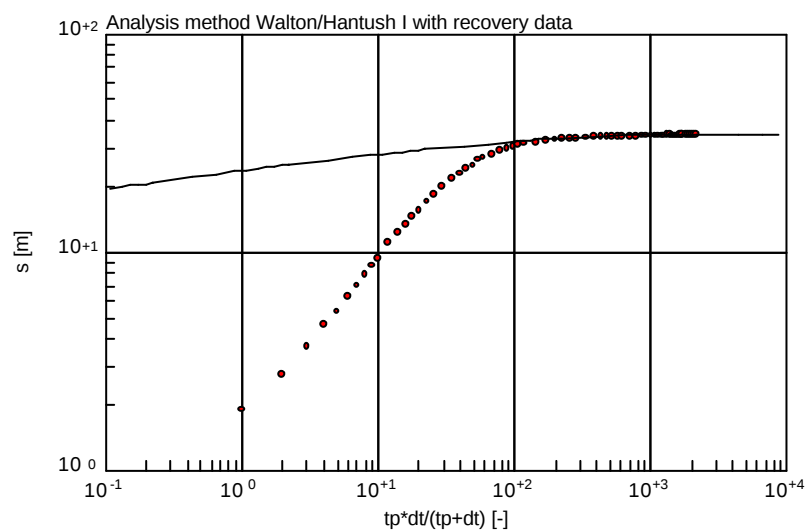


Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 1100 [m]
Depth:
Stick up: 0.00 [m]
Bh. radius: 0.125 [m]
Casing radius:
RWL: 40.17 [m]
max.drawdown:35.30 [m]
Aq.type: confined
Aq.thickness: 25.00 [m]
Stratigraphy: Nossob Sandstone
Lithology: Sandstone

Test running

Start:02/07/2000 17:00:00
Dis.dur.: 4320 [min]
Av.dis.: 2.89 [m³/h]
Max.dis.: 2.9 [m³/h]
Min.dis.: 2 [m³/h]
Total dis.: 208 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

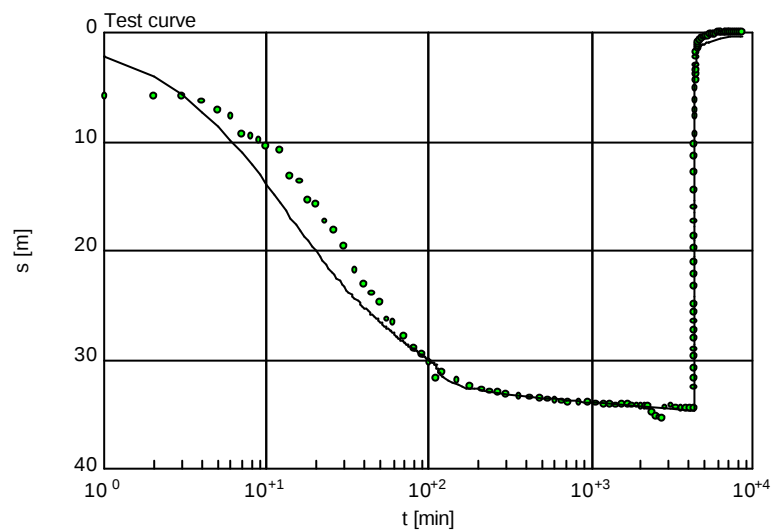
Match parameter:
Q: 2.89 [m³/h]
t: 506 [min]
s: 18.1 [m]
1/u: 2.33E8 [-]
W(u,r/B): 9.49 [-]
Aquifer parameter:
T: 2.9 [m²/d]
k: 0.116 [m/d]
Boundary parameter:
B: 1E3 [m]
m': 60 [m]
k': 0.000174 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

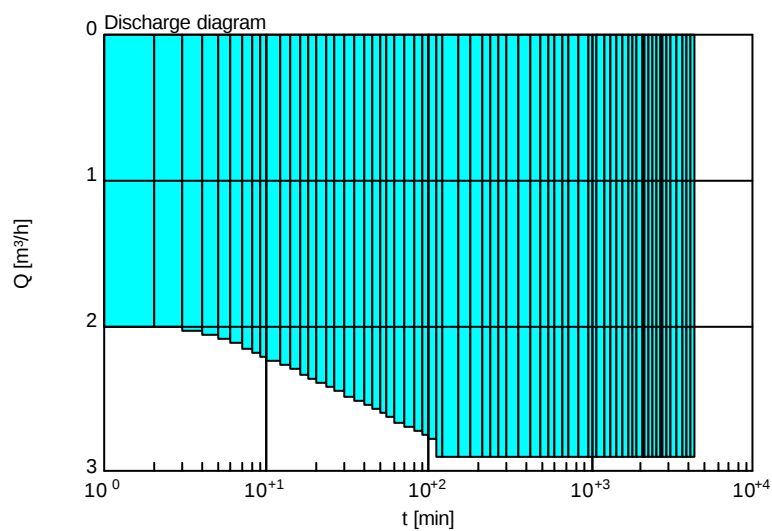
Test pumping diagnosis

Pumped well J2-N



Remarks

Simulation of the actual draw down during constant discharge test using the Hantush model for leaky aquifers.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4307 [min]

Av.dis.: 2.89 [m³/h]
max.dis.: 2.90 [m³/h]
min.dis.: 2.00 [m³/h]
Qn: 2.90 [m³/h]

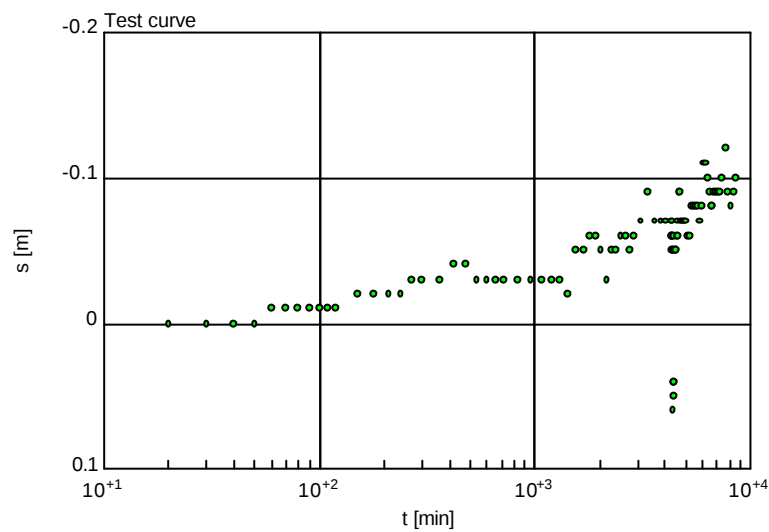
Dis.sum: 208 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Observation well J2-N

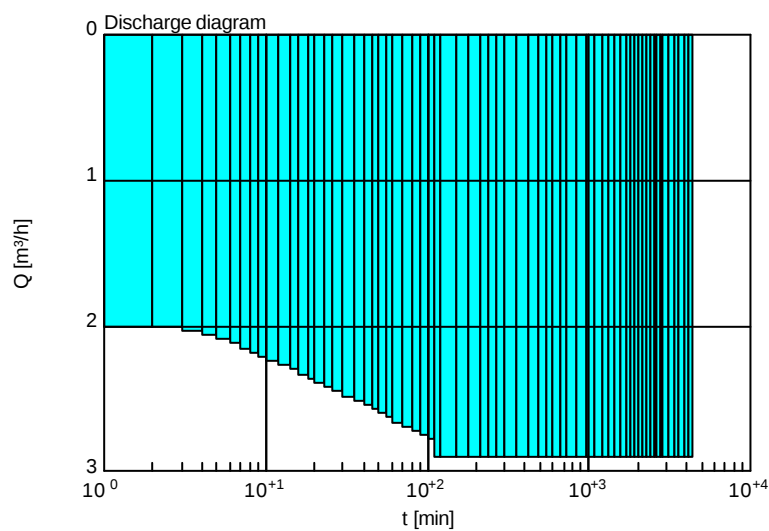


Remarks

Data from observation borehole J2-A could not be used for analysis of storativity or transmissivity.

Borehole does not penetrate the pumped aquifer system.

Recovery observed during the entire pumping test.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4307 [min]

Av.dis.: 2.89 [m³/h]
max.dis.: 2.90 [m³/h]
min.dis.: 0 [m³/h]
Qn: 0.00E+00 [m³/h]

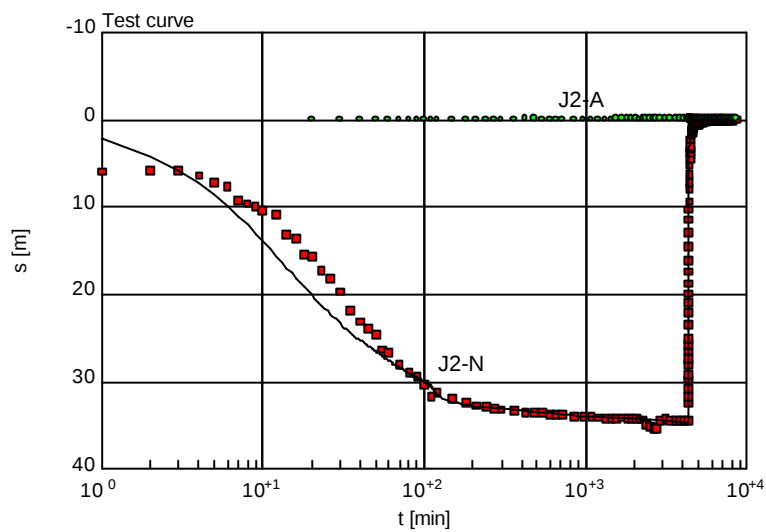
Dis.sum: 208 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

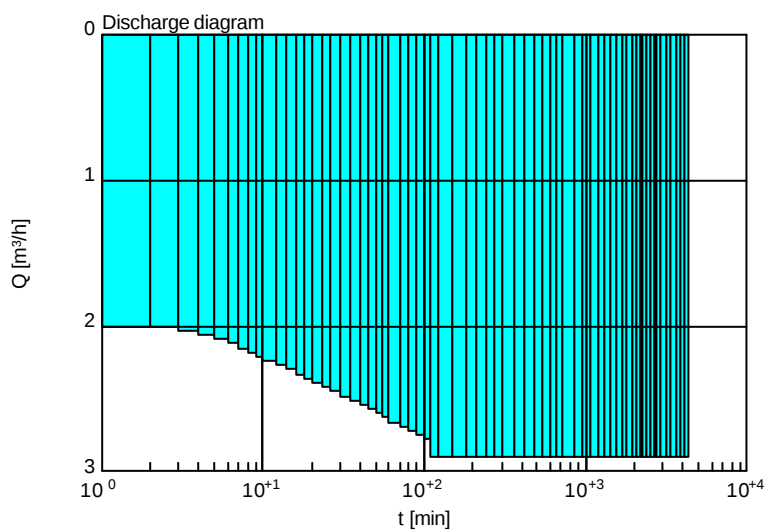
Test pumping diagnosis

Pumped well J2-N



Remarks

Merged data from observation borehole J2-A and abstraction borehole J2-N.



Borehole observation points

Dis.dur.: 4320 [min]
tcorr: 4307 [min]

Av.dis.: 2.89 [m³/h]
max.dis.: 2.90 [m³/h]
min.dis.: 2.00 [m³/h]
Qn: 2.90 [m³/h]

Dis.sum: 208 [m³]

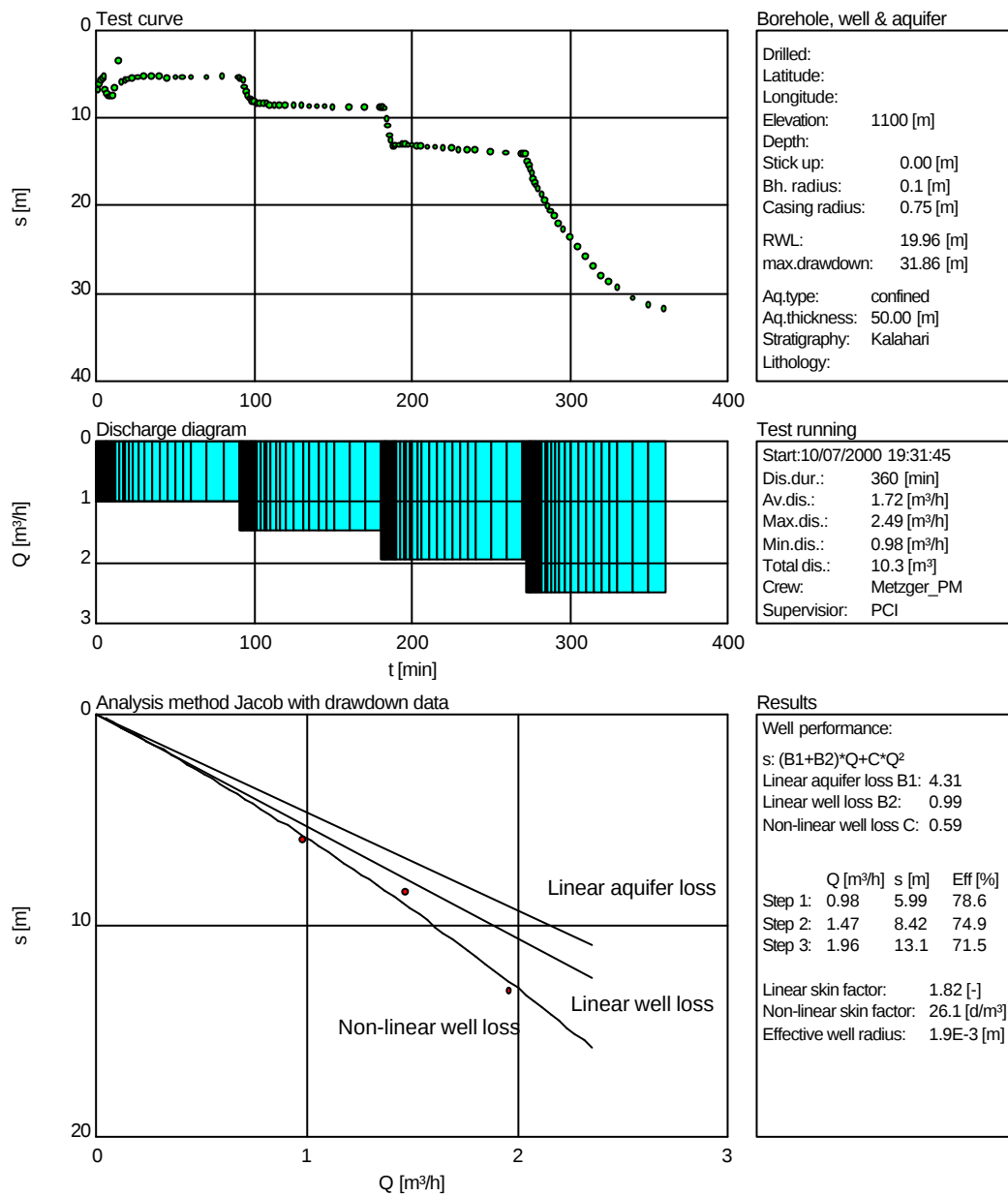
Distance to observation borehole: J2-A = 71.2 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Step test analysis

Pumped well J3-K

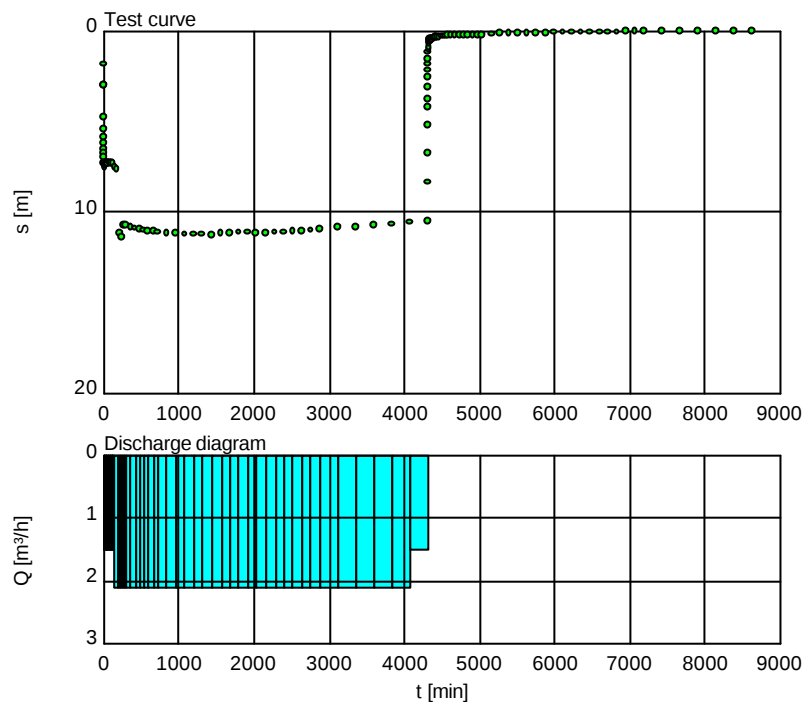


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J3-K

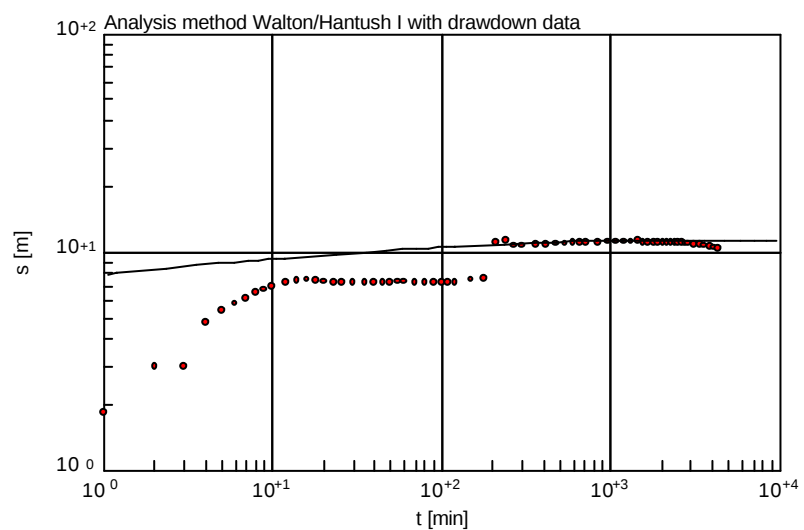


Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 1100 [m]
Depth:
Stick up: 0.00 [m]
Bh. radius: 0.1 [m]
Casing radius: 0.75 [m]
RWL: 19.96 [m]
max.drawdown: 11.33 [m]
Aq.type: confined
Aq.thickness: 50.00 [m]
Stratigraphy: Kalahari
Lithology:

Test running

Start:10/07/2000 19:38:15
Dis.dur.: 4320 [min]
Av.dis.: 2.05 [m³/h]
Max.dis.: 2.1 [m³/h]
Min.dis.: 1.5 [m³/h]
Total dis.: 147 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

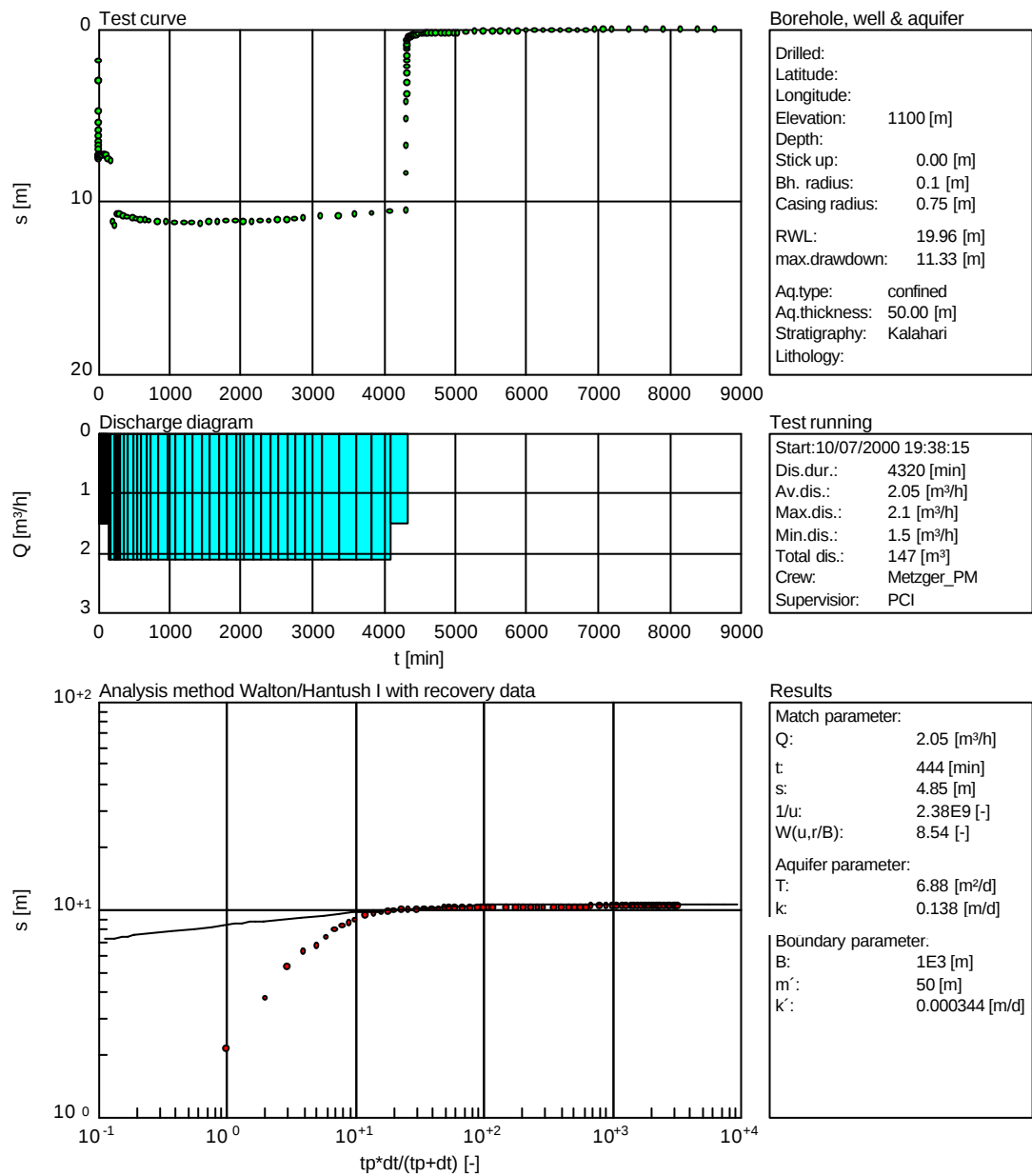
Match parameter:
Q: 2.05 [m³/h]
t: 2.57E3 [min]
s: 5.62 [m]
1/u: 2.16E9 [-]
W(u,r/B): 9.24 [-]
Aquifer parameter:
T: 6.42 [m²/d]
k: 0.128 [m/d]
Boundary parameter:
B: 1E3 [m]
m': 50 [m]
k': 0.000321 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J3-K

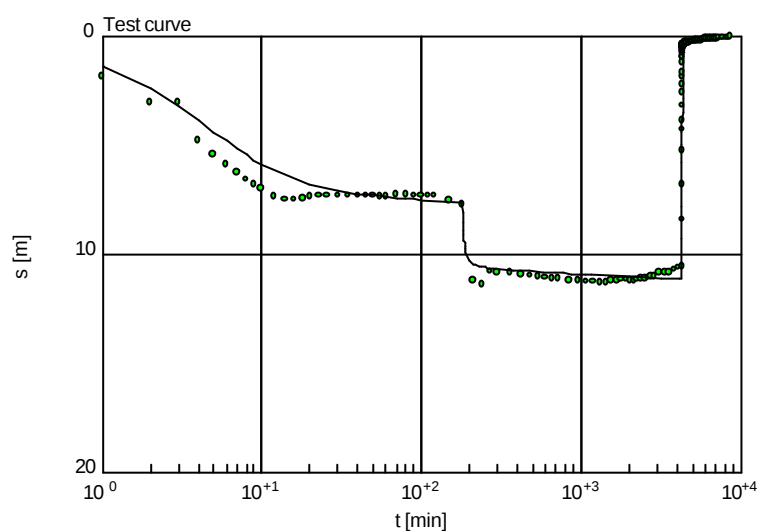


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

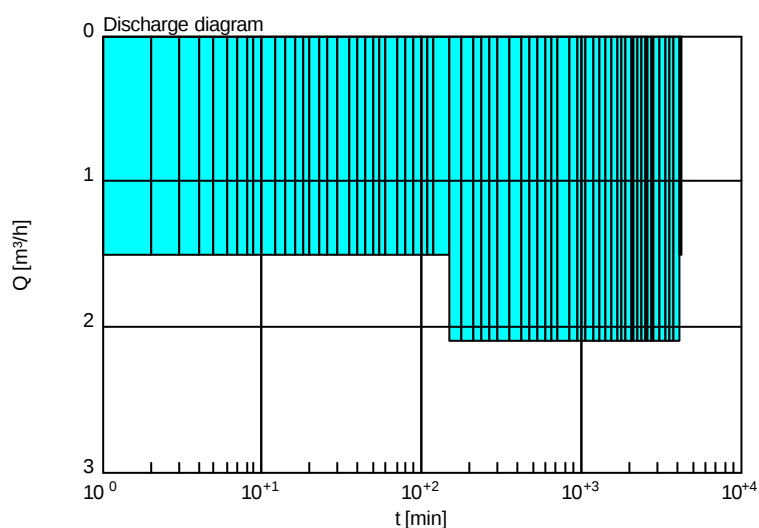
Pumped well J3-K



Remarks

Hantush model for leaky leaky aquifers used to the simulate the actual data.

Initial well loss due to well bore storage is in the order of 2,4 m.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 13533 [min]

Av.dis.: 2.05 [m³/h]
max.dis.: 2.10 [m³/h]
min.dis.: 1.50 [m³/h]
Qn: 1.50 [m³/h]

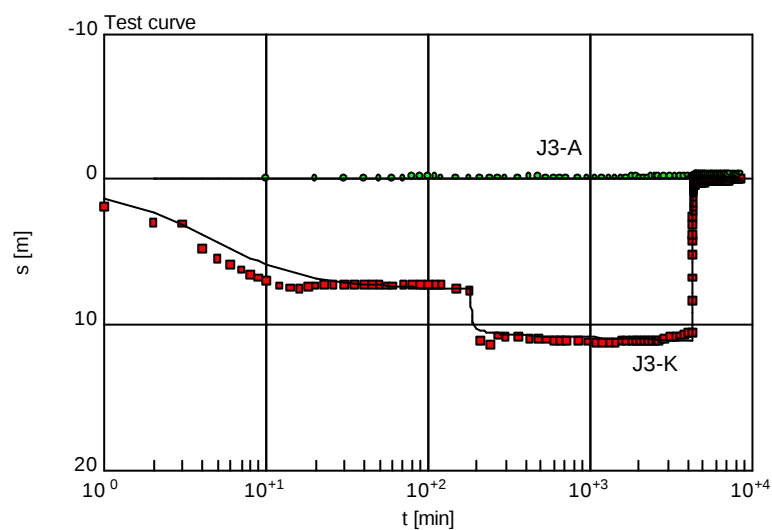
Dis.sum: 147 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

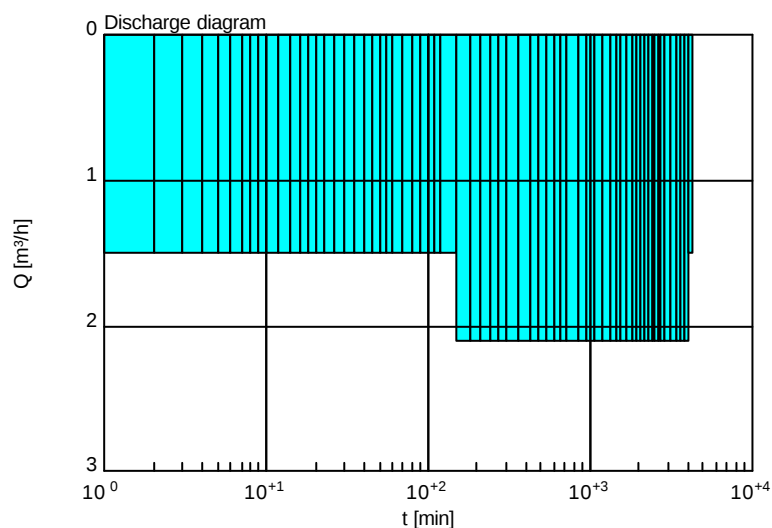
Test pumping diagnosis

Pumped well J3-K



Remarks

Merged data from observation borehole J3-A and abstraction borehole J3-K



Discharge info

Dis.dur.: 4320 [min]
tcorr: 13533 [min]

Av.dis.: 2.05 [m³/h]
max.dis.: 2.10 [m³/h]
min.dis.: 1.50 [m³/h]
Qn: 1.50 [m³/h]

Dis.sum: 147 [m³]

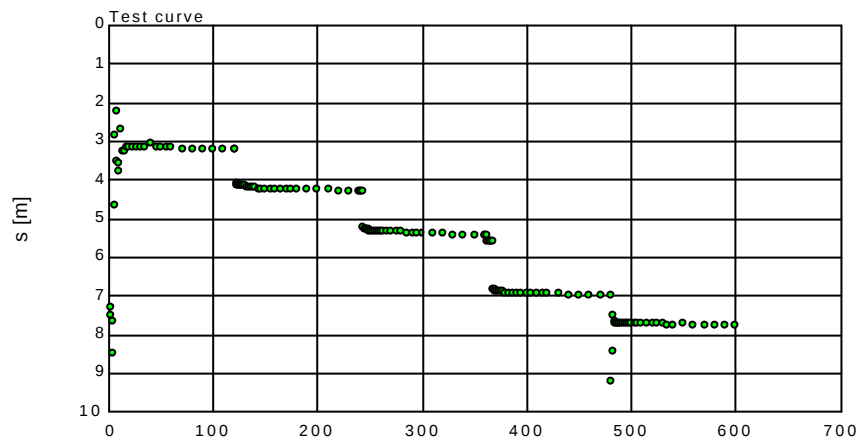
Distance to observation borehole: J3-A = 216 m

Groundwater Study in the Stampriet Artesian Basin

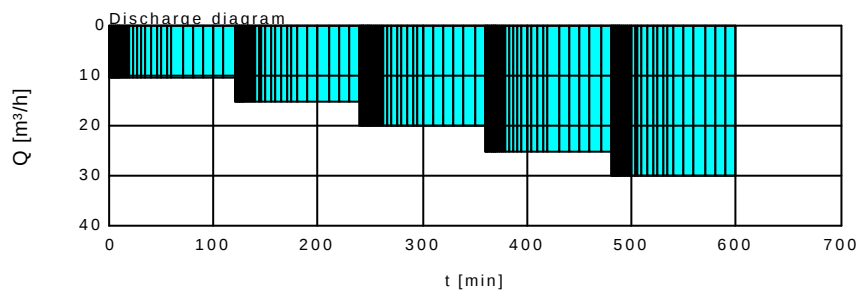
Evaluation of Test Pumping Data

Step test analysis

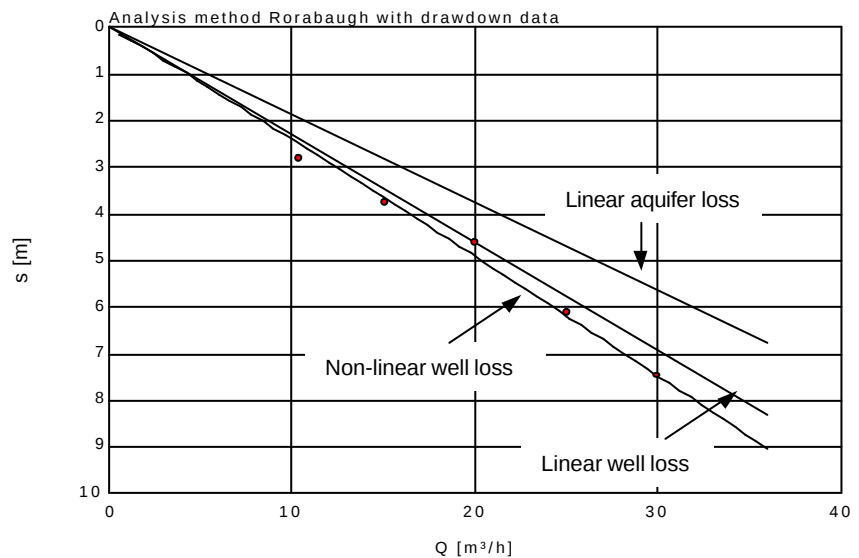
Pumped well J3_A



Borehole, well & aquifer	
Drilled:	
Latitude:	24.04792
Longitude:	18.79312
Elevation:	1205 [m]
Depth:	253 [m]
Stick up:	0.80 [m]
Bh. radius:	0.1255 [m]
Casing radius:	0.084 [m]
RWL:	15.42 [m]
max.drawdown:	9.20 [m]
Aq.type:	confined
Aq.thickness:	34.00 [m]
Stratigraphy:	Auob Sandstone
Lithology:	sandstone + shale



Test running	
Start:	04/07/2000 08:10:00
Dis.dur.:	600 [min]
Av.dis.:	20.1 [m³/h]
Max.dis.:	30 [m³/h]
Min.dis.:	10.4 [m³/h]
Total dis.:	201 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



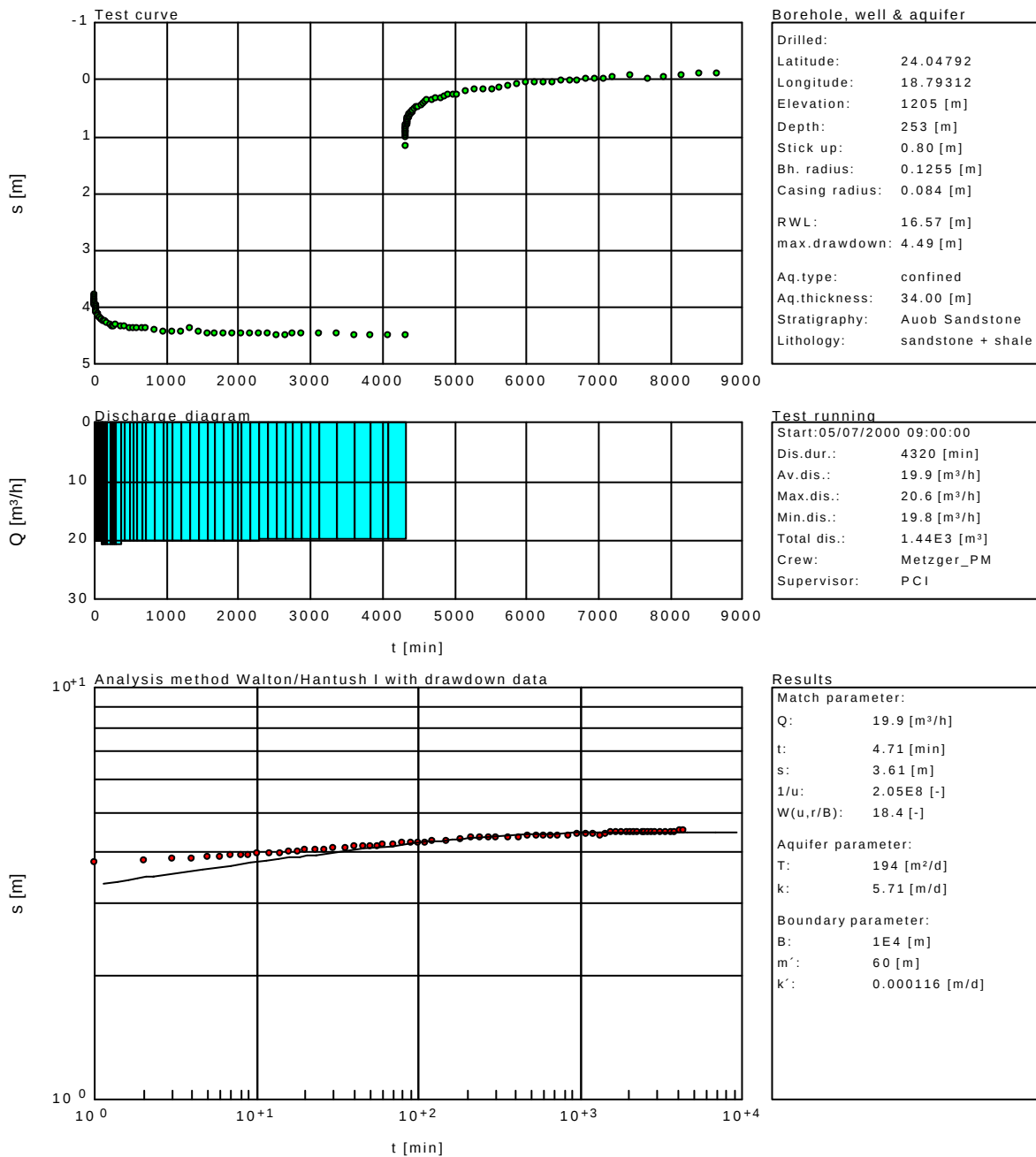
Results	
Well performance:	
$s: (B1+B2)*Q+C*Q^P$	
Linear aquifer loss B1: 0.24	
Linear well loss B2: -8.7E-03	
Non-linear well loss C: 2.3E-3	
Exponent P: 1.61	
Q [m³/h]	s [m] Eff [%]
Step 1: 10.4	2.82 77.9
Step 2: 15.1	3.78 77.1
Step 3: 20.1	4.63 76.4
Step 4: 25.1	6.12 75.8
Step 5: 30.0	7.47 75.2
Linear skin factor: -0.45 [-]	
Non-linear skin factor: 2.92 [d/m³]	
Effective well radius: 5.1E-3 [m]	

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J3_A

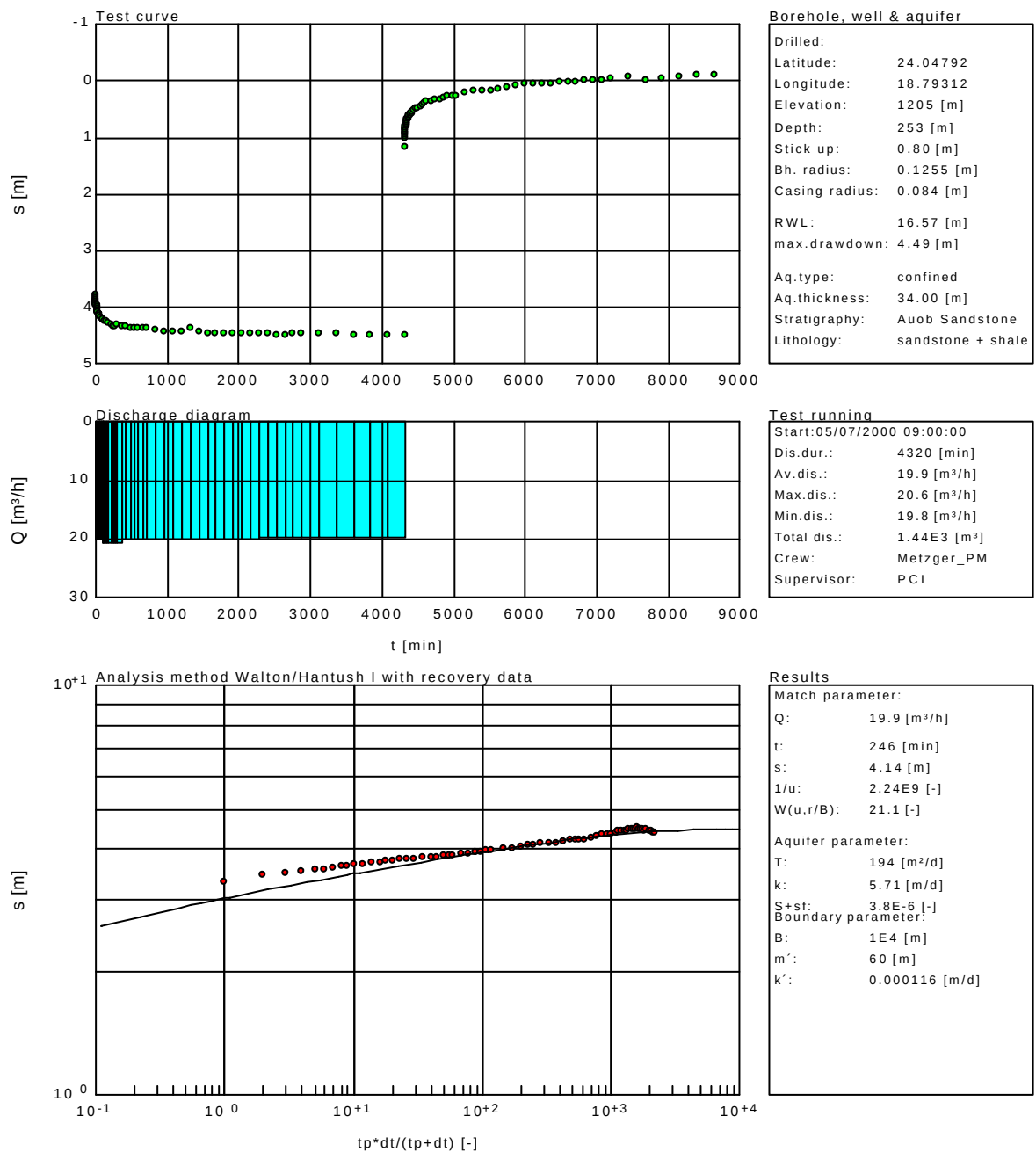


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J3_A

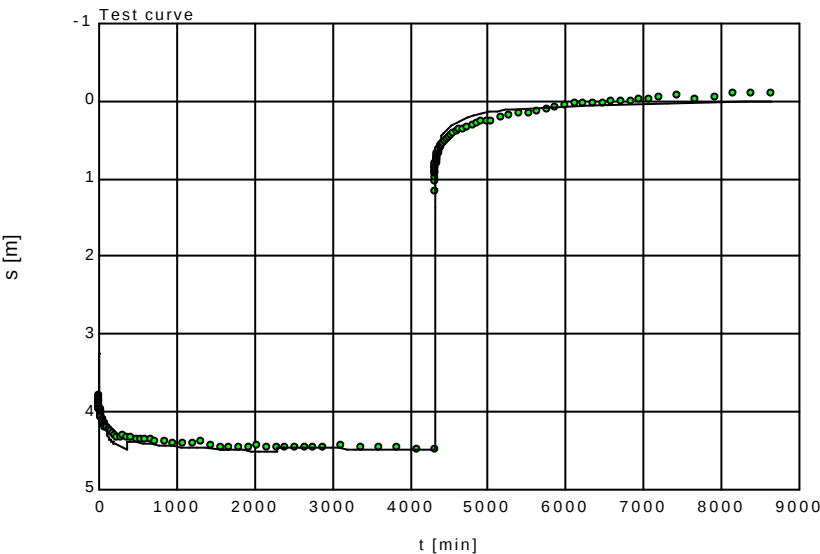


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

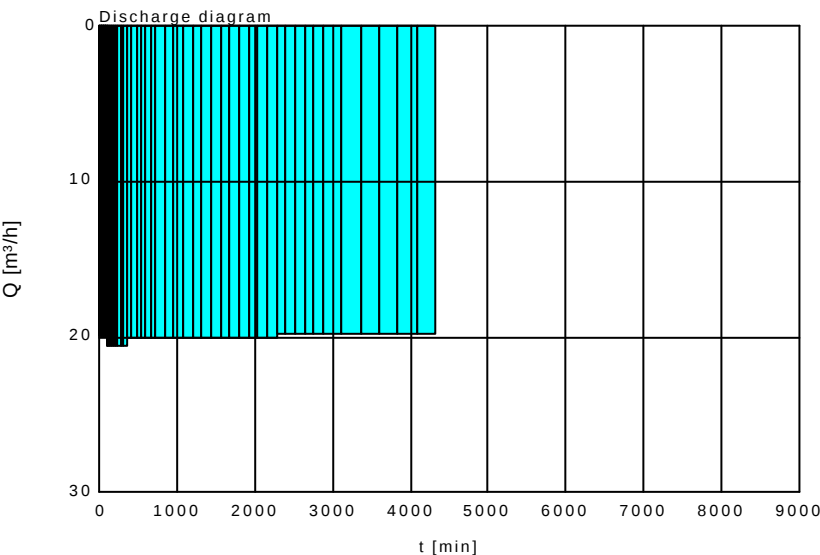
Pumped well J3_A



Remarks

The Walton / Hantush I method for leaky aquifers was used to simulate the actual pumping test data.

Simulation parameters were derived from the pumping test evaluations.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4317 [min]

Av.dis.: 3.97 [m^3/h]
max.dis.: 4.11 [m^3/h]
min.dis.: 3.95 [m^3/h]
Qn: 3.96 [m^3/h]

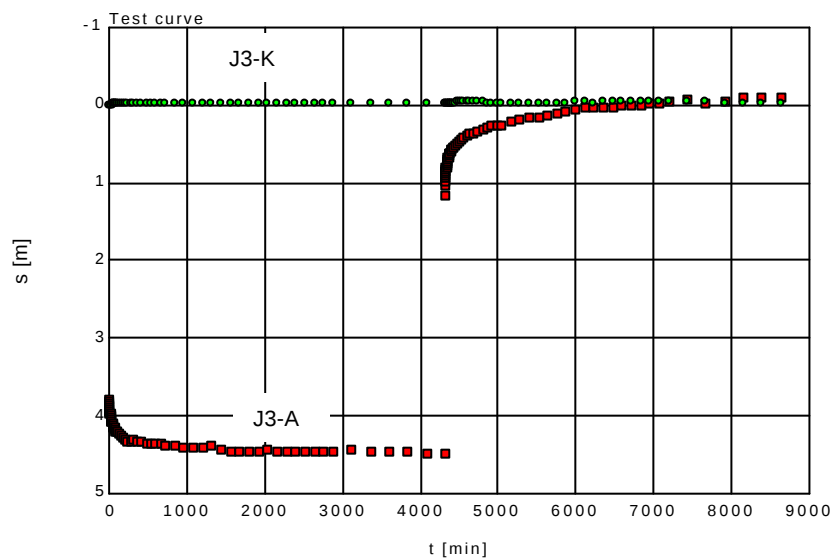
Dis.sum: 285 [m^3]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

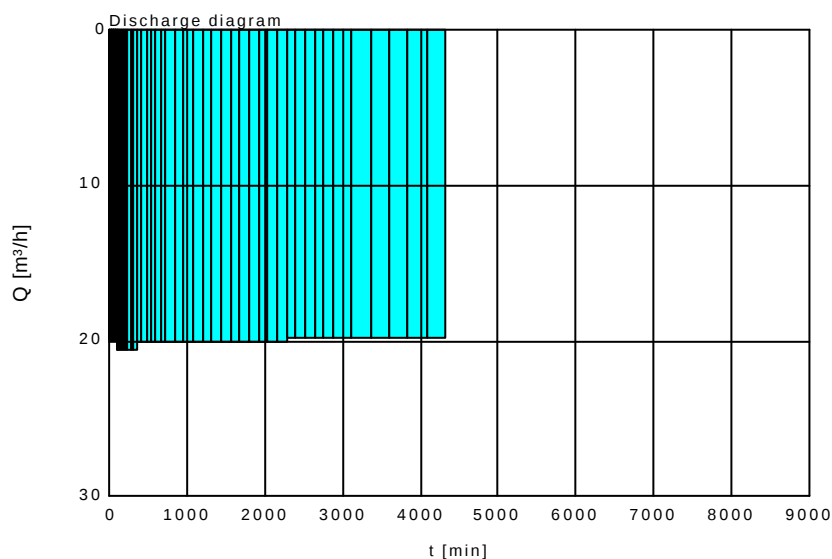
Pumped well J3_A



Remarks

Merged data from observation borehole J3-K and pumping borehole J3-A.

Pumping from the Auob sandstone aquifer (J3-A) did not have any influence on the water level in the Kalahari aquifer borehole (J3-K).



Discharge info

Dis.dur.: 4320 [min]

tcorr: 4317 [min]

Av.dis.: 3.97 [m³/h]

max.dis.: 4.11 [m³/h]

min.dis.: 3.95 [m³/h]

Qn: 3.96 [m³/h]

Dis.sum: 285 [m³]

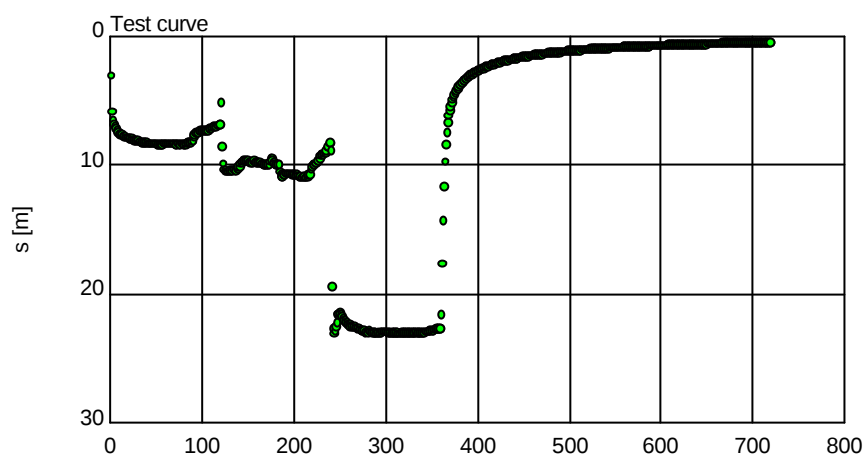
Distance to observation borehole J3-K = 215.9 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

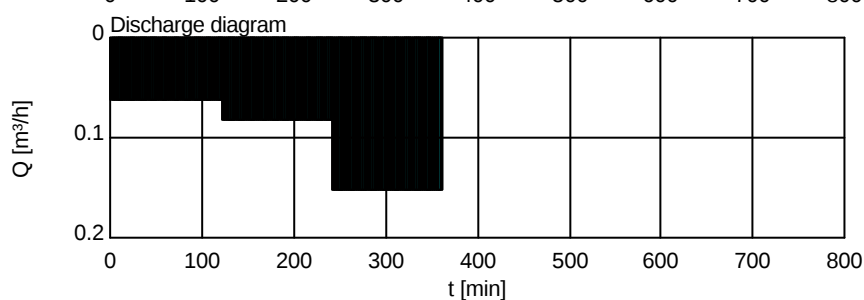
Pressure probe step test analysis

Tested well J3_N



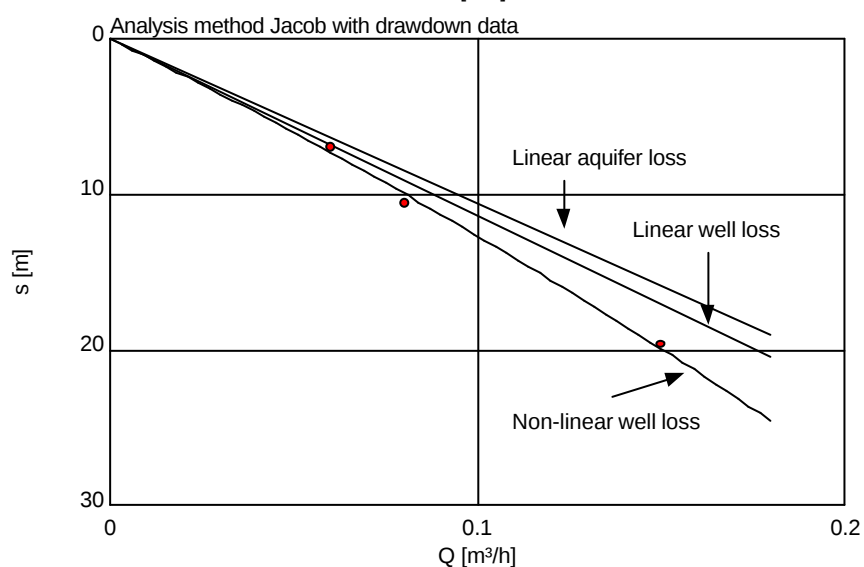
Borehole, well & aquifer

Drilled: 3.6.2000
Latitude: 24.04858
Longitude: 18.79614
Elevation: 1205 [m]
Depth: 409 [m]
Stick up: 1.00 [m]
Bh. radius: 0.1 [m]
Casing radius: 0.076 [m]
RWL: 0.00 [m]
max.drawdown: 23.08 [m]
Aq.type: confined
Aq.thickness: 30.00 [m]
Stratigraphy: Nossob
Lithology: Sandstone



Test running

Start:07/09/2000 07:00:00
Dis.dur.: 360 [min]
Av.dis.: 0.0964 [m³/h]
Max.dis.: 0.15 [m³/h]
Min.dis.: 0.06 [m³/h]
Total dis.: 0.578 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

Well performance:

$s: (B1+B2)*Q+C*Q^2$
Linear aquifer loss B1: 105
Linear well loss B2: 8.47
Non-linear well loss C: 125

	Q [m³/h]	s [m]	Eff [%]
Step 1:	0.06	6.90	86.8
Step 2:	0.08	10.6	85.1
Step 3:	0.15	19.6	79.4

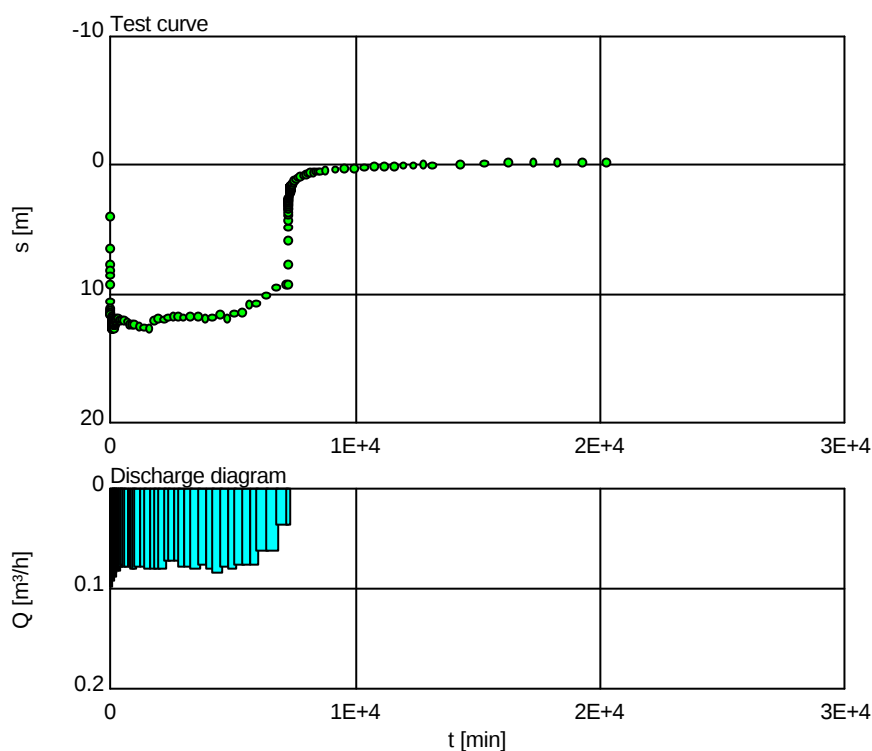
Linear skin factor: 0.31 [-]
Non-linear skin factor: 110 [d/m³]
Effective well radius: 3.7E-2 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Pressure probe constant discharge test

Tested well J3_N

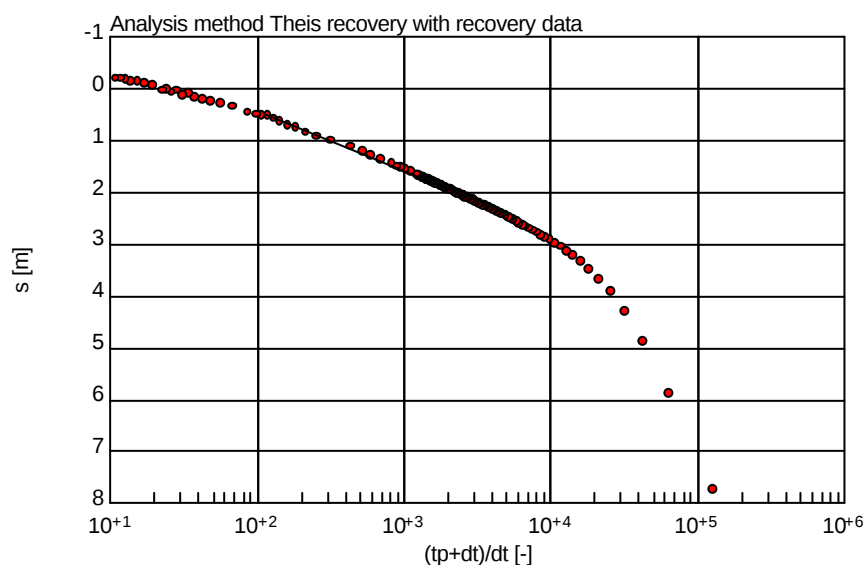


Borehole, well & aquifer

Drilled: 3.6.2000
Latitude: 24.04858
Longitude: 18.79614
Elevation: 1205 [m]
Depth: 409 [m]
Stick up: 1.00 [m]
Bh. radius: 0.1 [m]
Casing radius: 0.076 [m]
RWL: 0.00 [m]
max.drawdown: 12.72 [m]
Aq.type: confined
Aq.thickness: 30.00 [m]
Stratigraphy: Nossob
Lithology: Sandstone

Test running

Start:08/09/2000 08:00:00
Dis.dur.: 7276 [min]
Av.dis.: 0.0717 [m³/h]
Max.dis.: 0.106 [m³/h]
Min.dis.: 0.034 [m³/h]
Total dis.: 8.69 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

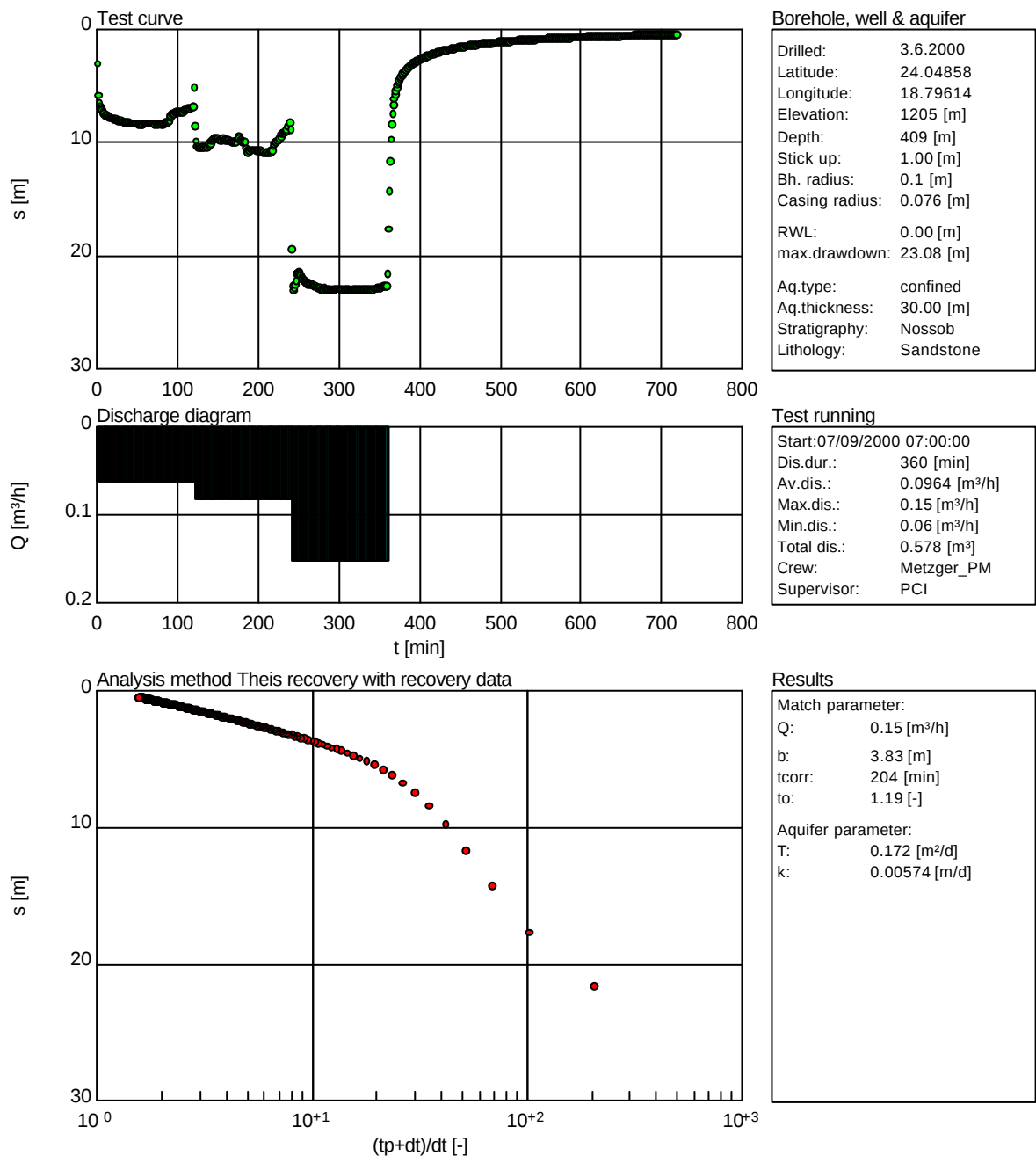
Match parameter:
Q: 0.034 [m³/h]
b: 1.15 [m]
tcorr: 127299 [min]
to: 43.2 [-]
Aquifer parameter:
T: 0.13 [m²/d]
k: 0.00435 [m/d]
est.S: 0.005 [-]
Well performance:
Skin factor: 2.74 [-]
Skin loss: 2.73 [m]
Efficiency index: 0.71 [-]
Clogging index: 4.89 [-]
Clogging factor: 0.294 [-]
Effective well radius: 0.00643 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Step test recovery analysis

Tested well J3_N

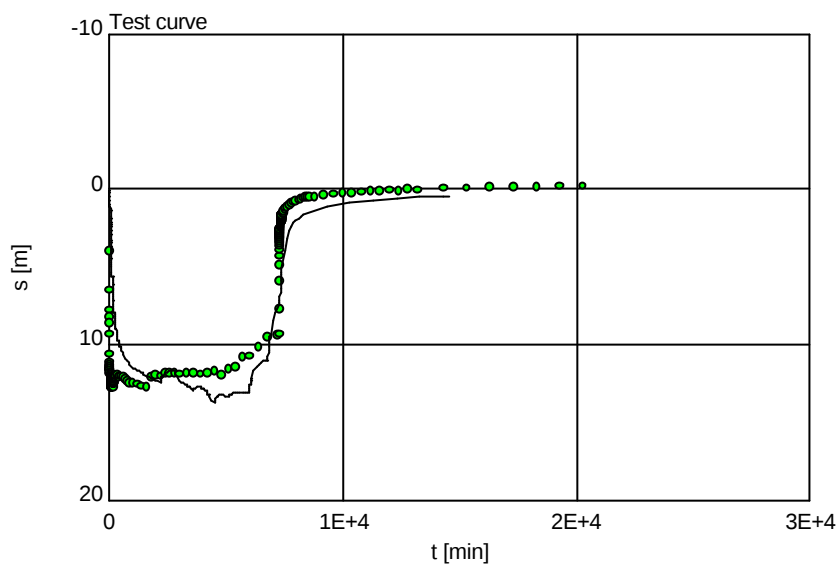


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Constant discharge test diagnosis

Tested well J3_N

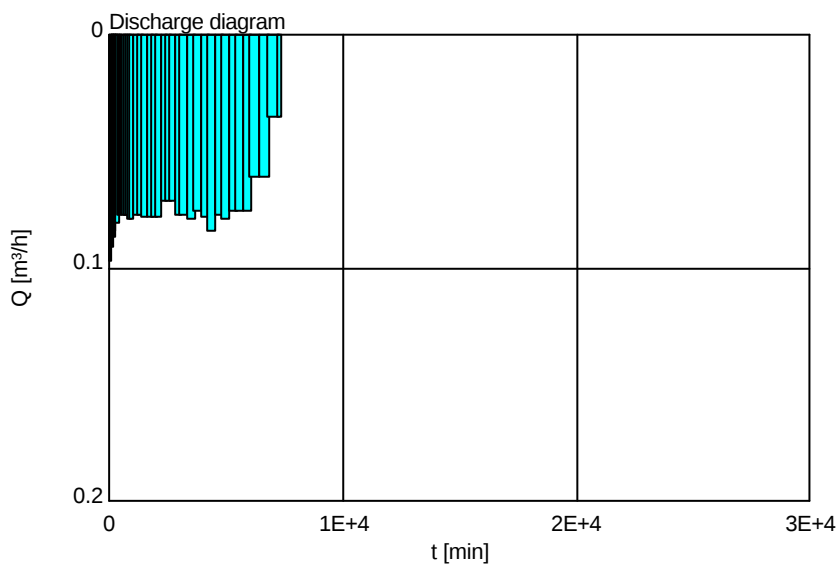


Remarks

Simulated draw down / recovery curve applying the Theis method for confined aquifers.

$T = 1.7 \text{ m}^2/\text{day}$

$S = 0.00002$



Discharge info

Dis.dur.: 7276 [min]
tcorr: 127299 [min]

Av.dis.: $7.17\text{E-}02 \text{ [m}^3/\text{h]}$
max.dis.: $0.11 \text{ [m}^3/\text{h]}$
min.dis.: $3.40\text{E-}02 \text{ [m}^3/\text{h]}$
Qn: $3.40\text{E-}02 \text{ [m}^3/\text{h]}$

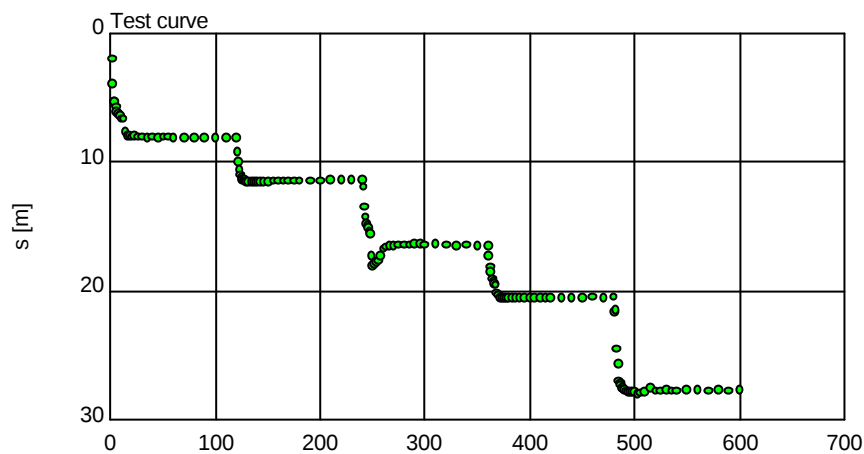
Dis.sum: $8.69 \text{ [m}^3]$

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

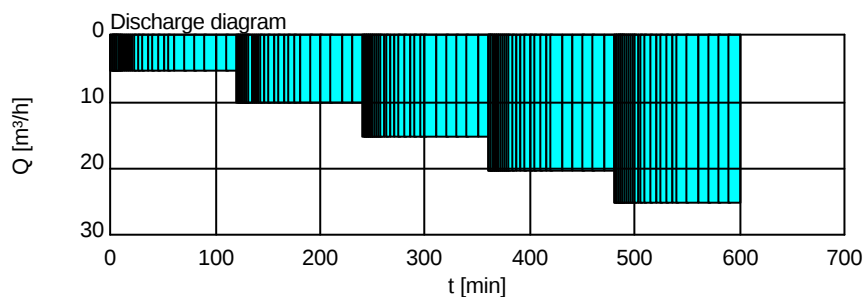
Step test analysis

Pumped well J4_A



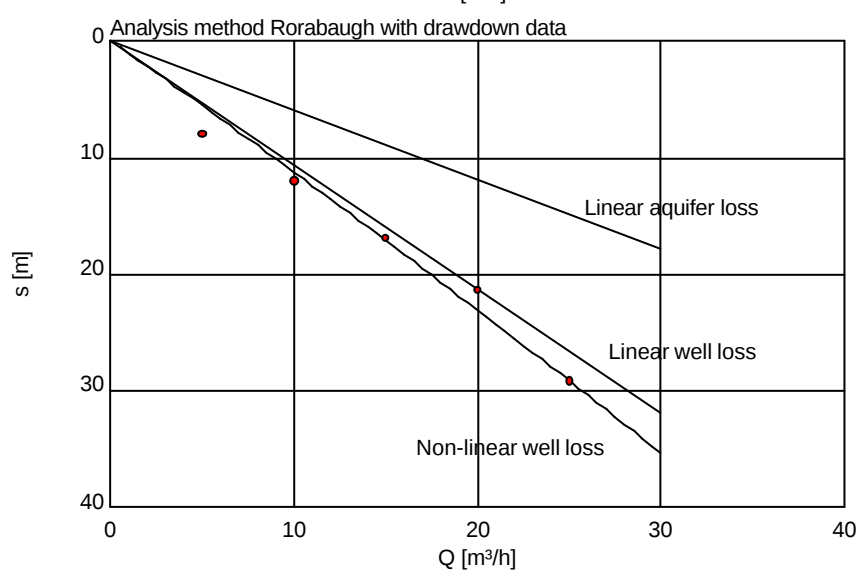
Borehole, well & aquifer

Drilled:	04/00
Latitude:	23.40049
Longitude:	19.62577
Elevation:	1253 [m]
Depth:	273 [m]
Stick up:	1.00 [m]
Bh. radius:	0.1255 [m]
Casing radius:	0.084 [m]
RWL:	59.83 [m]
max.drawdown:	27.91 [m]
Aq.type:	confined
Aq.thickness:	50.00 [m]
Stratigraphy:	Auob Sandstone
Lithology:	Sandstone



Test running

Start:	07/09/2000 07:00:00
Dis.dur.:	600 [min]
Av.dis.:	15 [m³/h]
Max.dis.:	25 [m³/h]
Min.dis.:	5 [m³/h]
Total dis.:	150 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

Well performance:

$$s: (B1+B2)*Q+C*Q^P$$

Linear aquifer loss B1: 0.84

Linear well loss B2: 0.23

Non-linear well loss C: 1.4E-2

Exponent P: 1.62

Q [m³/h]	s [m]	Eff [%]
Step 1: 5.00	7.94	53.8
Step 2: 10.0	12.0	52.9
Step 3: 15.0	16.9	52.1
Step 4: 20.0	21.3	51.4
Step 5: 25.0	29.1	50.9

Linear skin factor: 4.77 [-]

Non-linear skin factor: 6.94 [d/m³]

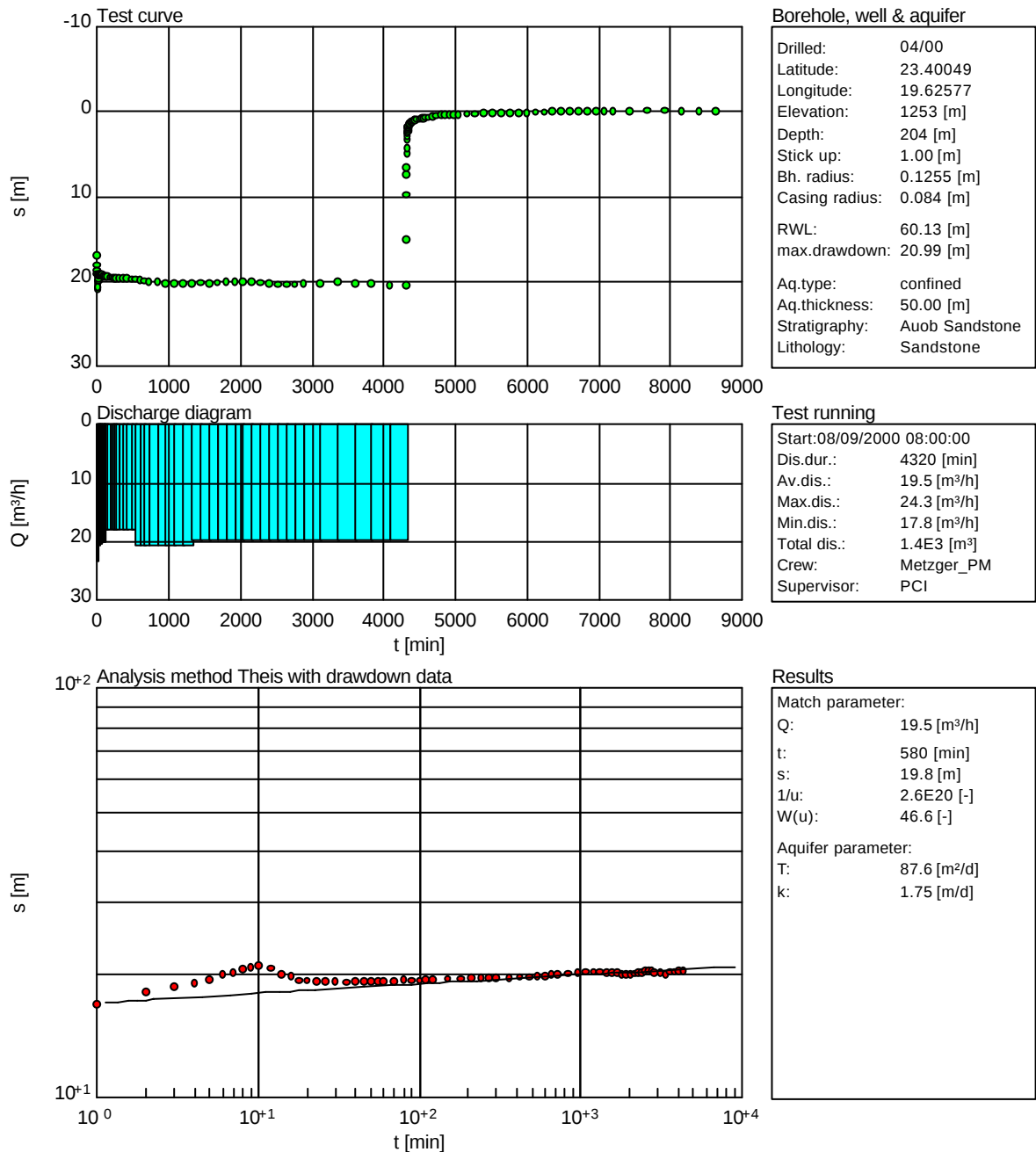
Effective well radius: 7.7E-7 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J4_A

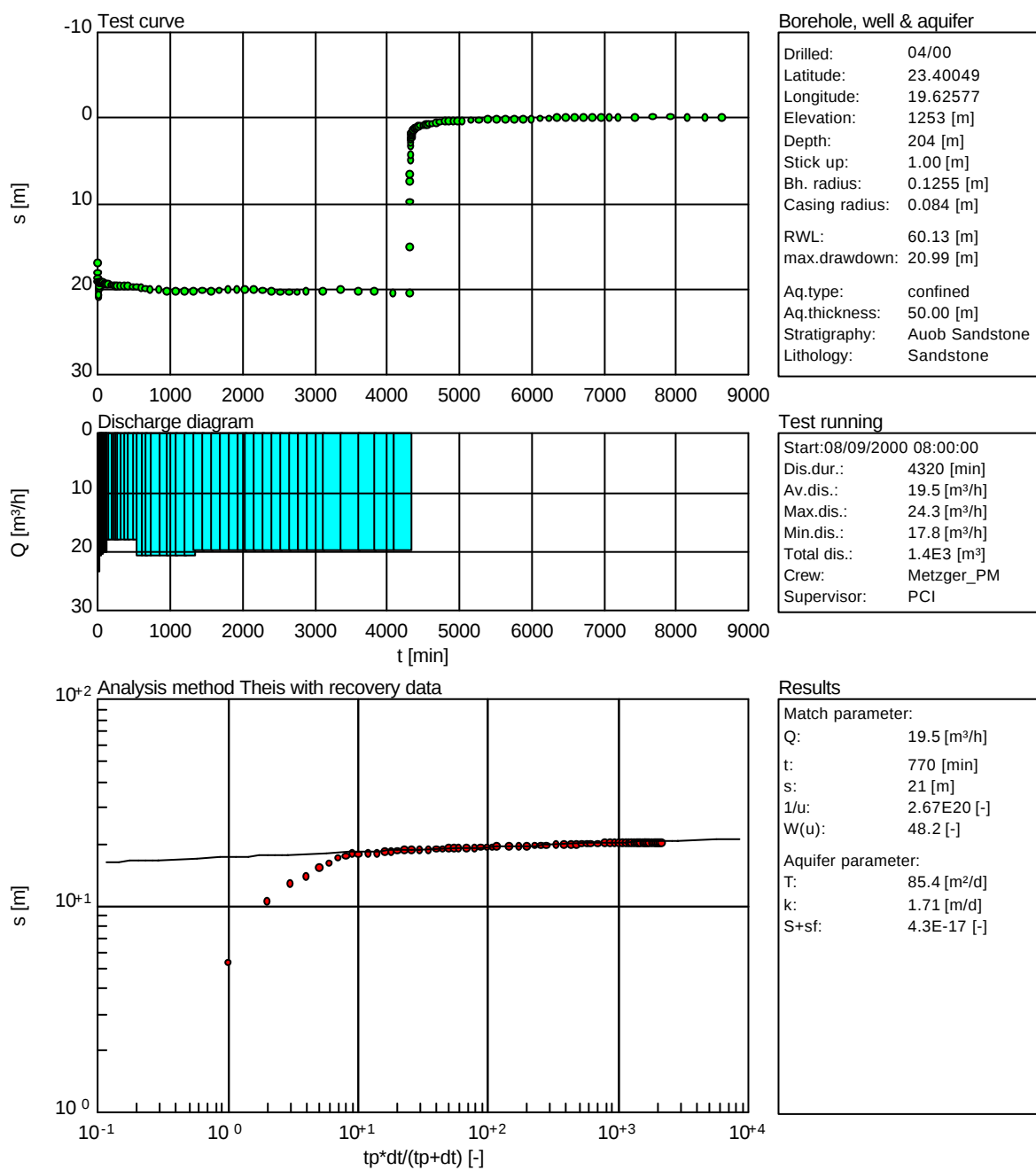


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J4_A

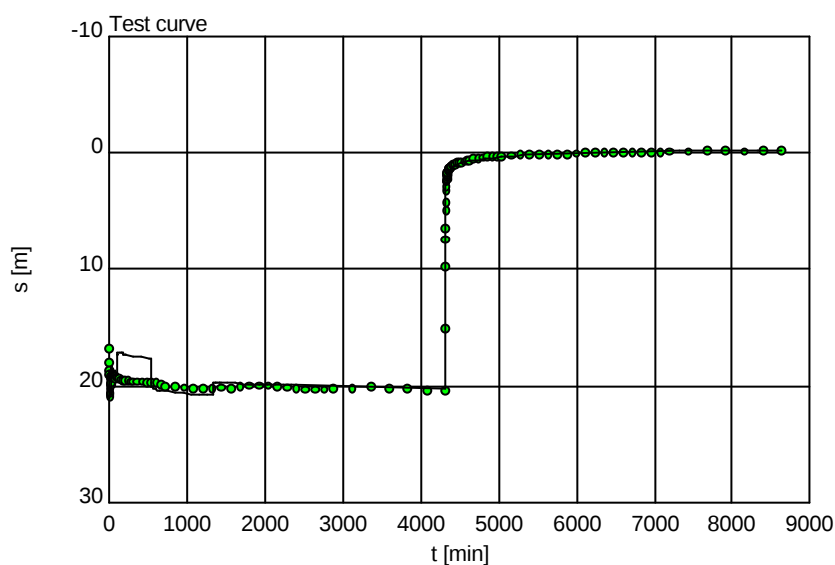


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

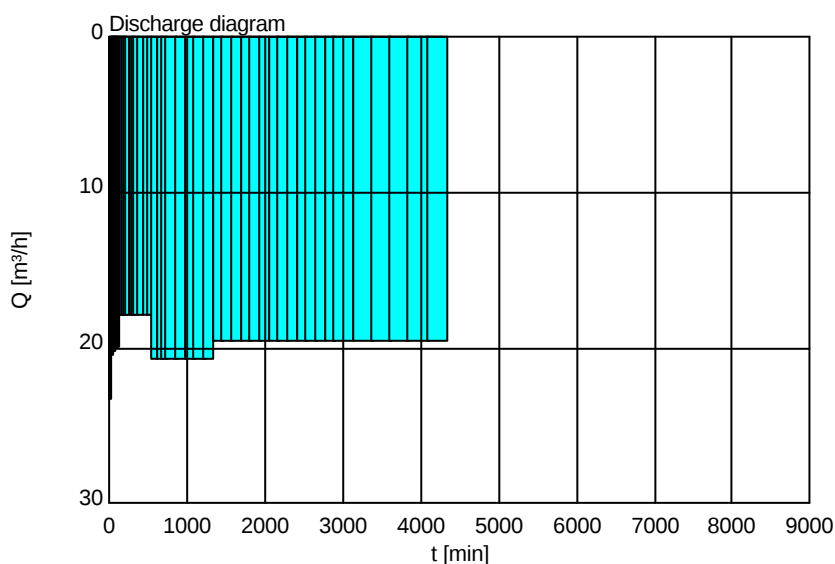
Test pumping diagnosis

Pumped well J4_A



Remarks

Simulation of the actual recorded draw down during the constant discharge test applying the Theis model for confined aquifers



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4342 [min]

Av.dis.: 19.47 [m^3/h]
max.dis.: 24.32 [m^3/h]
min.dis.: 17.76 [m^3/h]
Qn: 19.41 [m^3/h]

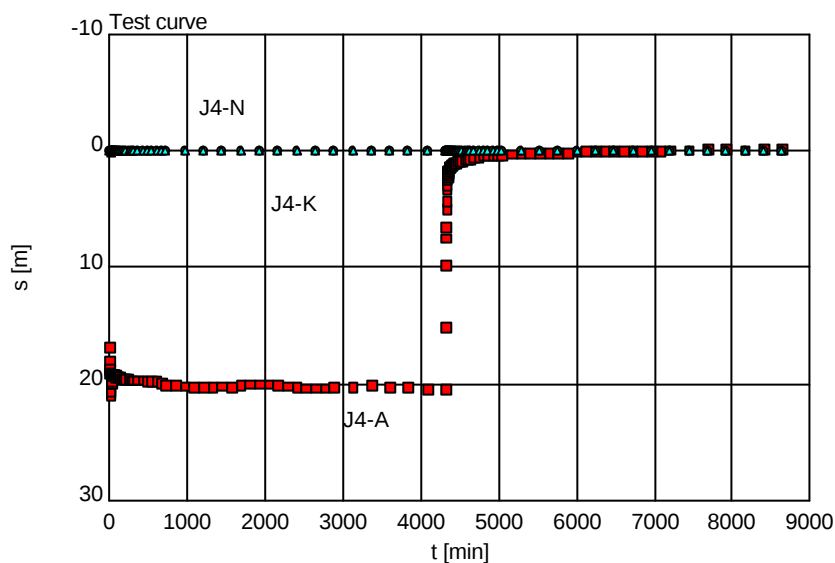
Dis.sum: 1402 [m^3]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Pumped well J4_A

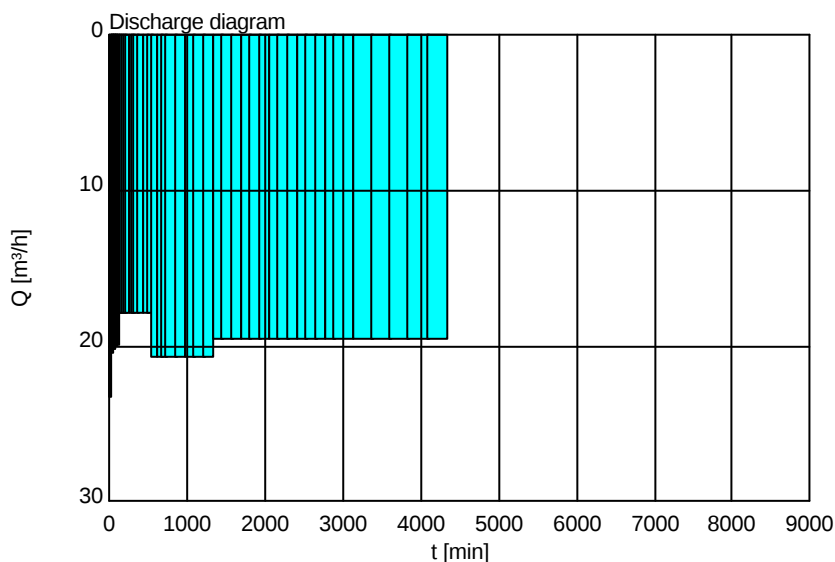


Remarks

Merged draw down data from observation and abstraction boreholes.

The water levels of the observation boreholes J4_N and J4_K were not influenced by the abstraction from J4_A.

No storativity could be calculated.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4342 [min]

Av.dis.: 19.47 [m^3/h]
max.dis.: 24.32 [m^3/h]
min.dis.: 17.76 [m^3/h]
Qn: 19.41 [m^3/h]

Dis.sum: 1402 [m^3]

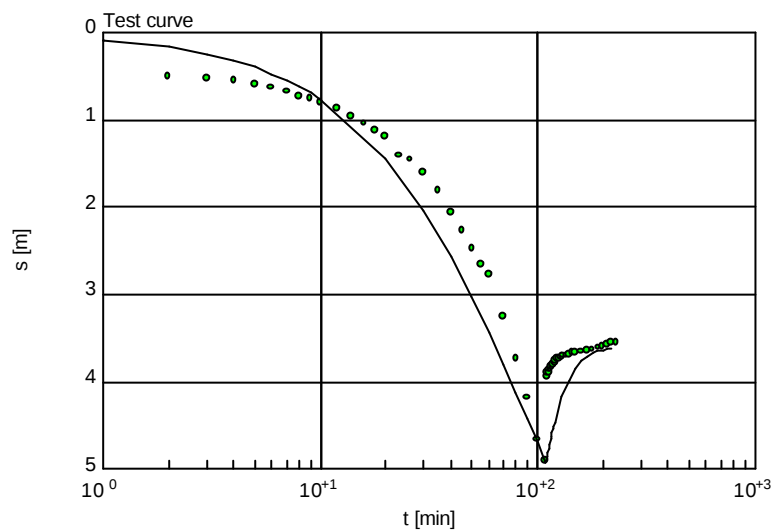
Distance to observation boreholes: J4-N = 80 m, J4-K = 80 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

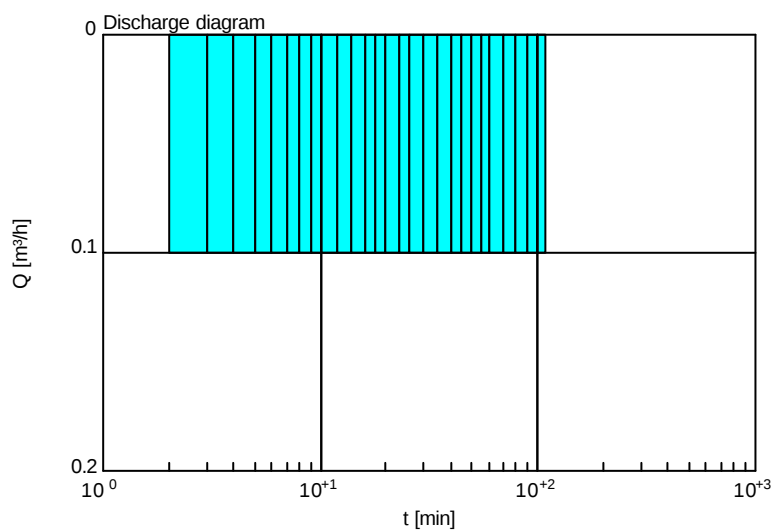
Test pumping diagnosis

Pumped well J4-K



Remarks

Transmissivity of the Karoo Formation is very low, in the order of $0,5 \text{ m}^2/\text{day}$ and can be regarded as an aquitard. The borehole is virtually dry and water is only pumped from storage in the aquifer. Only a slight recovery in the water level is observed.



Discharge info

Dis.dur.: 110 [min]
tcorr: 109 [min]

Av.dis.: 0.10 [m³/h]
max.dis.: 0.10 [m³/h]
min.dis.: 0.10 [m³/h]
Qn: 0.10 [m³/h]

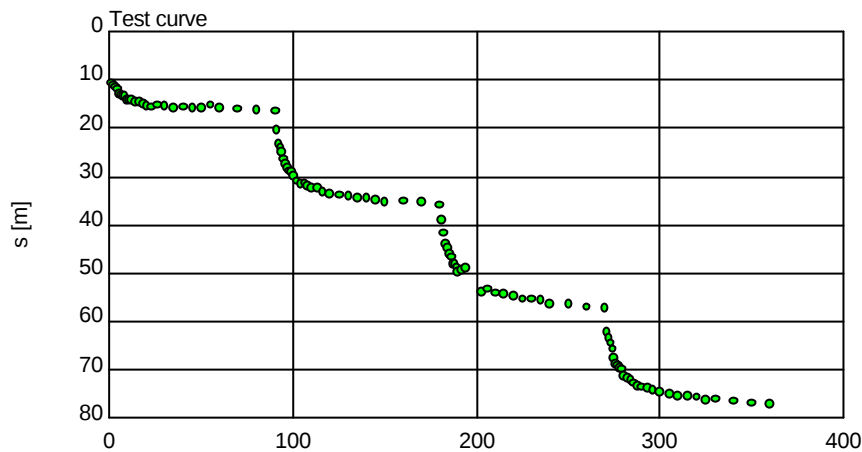
Dis.sum: 0.18 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

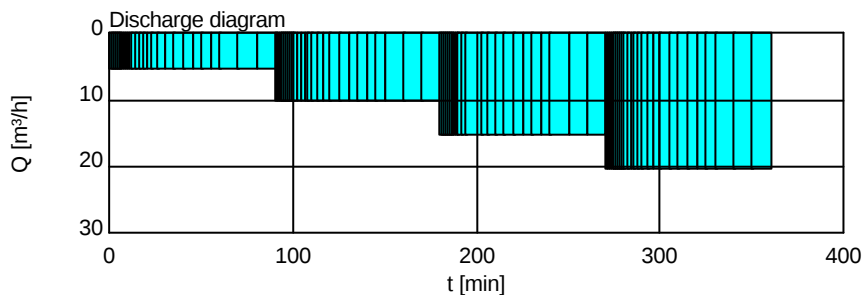
Step test analysis

Pumped well J4-N



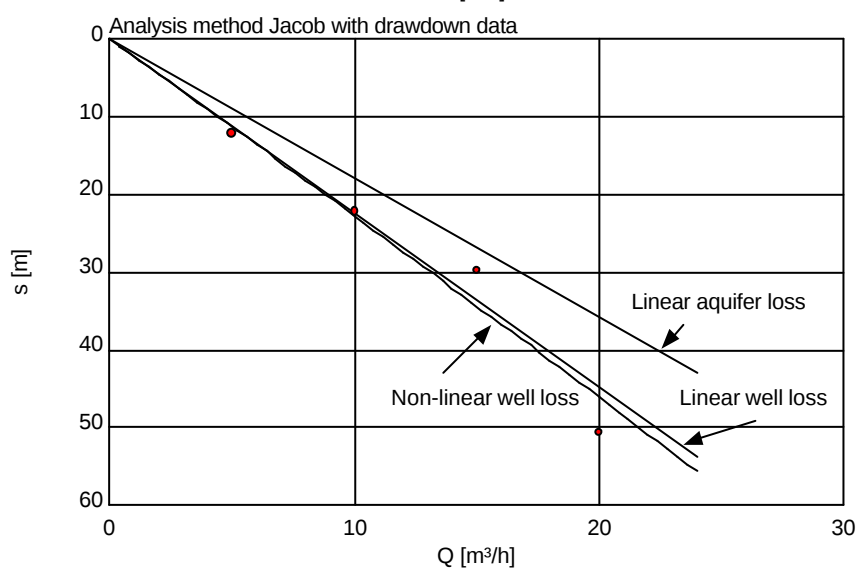
Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 1100 [m]
Depth:
Stick up: 0.00 [m]
Bh. radius: 0.1 [m]
Casing radius: 0.075 [m]
RWL: 10.22 [m]
max.drawdown: 77.12 [m]
Aq.type: confined
Aq.thickness: 50.00 [m]
Stratigraphy: Nossob Sandstone
Lithology: Sandstone



Test running

Start:10/07/2000 21:05:11
Dis.dur.: 360 [min]
Av.dis.: 12.5 [m³/h]
Max.dis.: 20 [m³/h]
Min.dis.: 5 [m³/h]
Total dis.: 75 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

Well performance:

$s: (B1+B2)*Q+C*Q^2$
Linear aquifer loss B1: 1.79
Linear well loss B2: 0.44
Non-linear well loss C: 3.5E-3

	Q [m³/h]	s [m]	Eff [%]
Step 1:	5.00	12.0	79.7
Step 2:	10.0	22.0	79.1
Step 3:	15.0	29.7	78.5
Step 4:	20.0	50.6	77.9

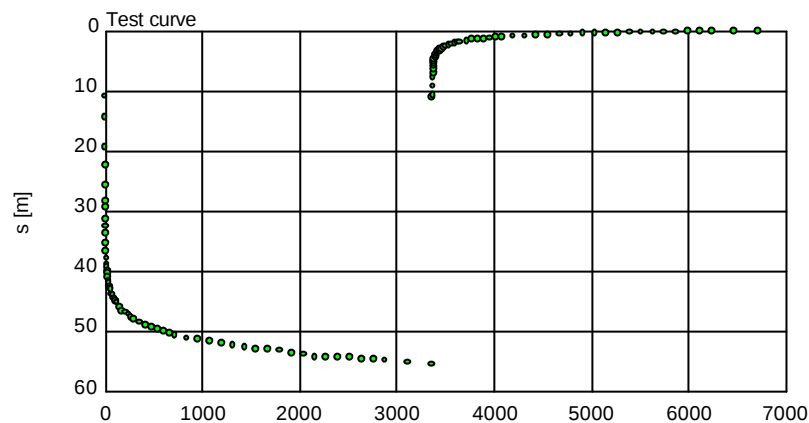
Linear skin factor: 0.86 [-]
Non-linear skin factor: 0.16 [d/m³]
Effective well radius: 3.7E-2 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

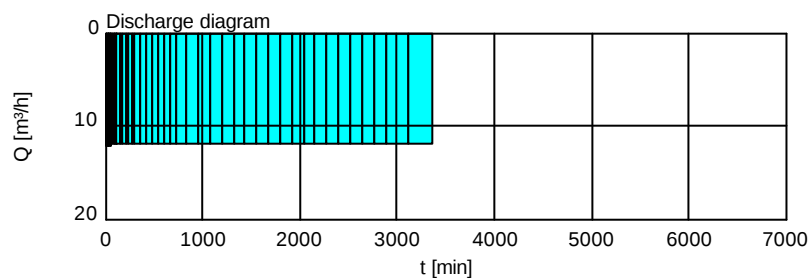
Test pumping analysis

Pumped well J4-N



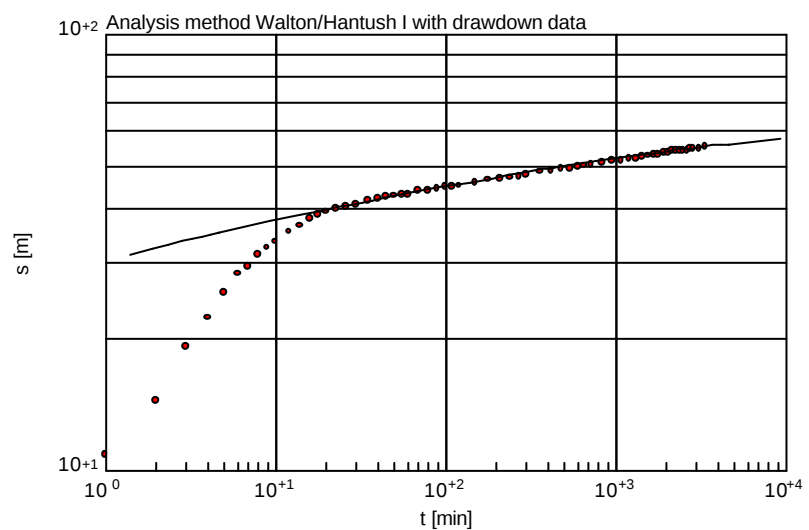
Borehole, well & aquifer

Drilled:	
Latitude:	
Longitude:	
Elevation:	1100 [m]
Depth:	
Stick up:	0.00 [m]
Bh. radius:	0.1 [m]
Casing radius:	0.075 [m]
RWL:	10.63 [m]
max.drawdown:	77.12 [m]
Aq.type:	confined
Aq.thickness:	50.00 [m]
Stratigraphy:	Nossob Sandstone
Lithology:	Sandstone



Test running

Start:	10/07/2000 21:15:23
Dis.dur.:	3360 [min]
Av.dis.:	11.8 [m³/h]
Max.dis.:	12 [m³/h]
Min.dis.:	11.8 [m³/h]
Total dis.:	661 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

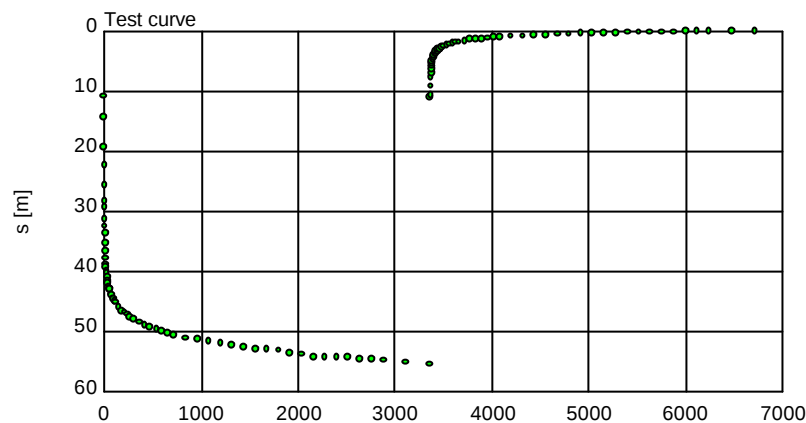
Match parameter:	
Q:	11.8 [m³/h]
t:	407 [min]
s:	41.1 [m]
1/u:	8.67E6 [-]
W(u,r/B):	12.8 [-]
Aquifer parameter:	
T:	7.01 [m²/d]
k:	0.14 [m/d]
Boundary parameter:	
B:	800 [m]
m':	50 [m]
K':	0.000548 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

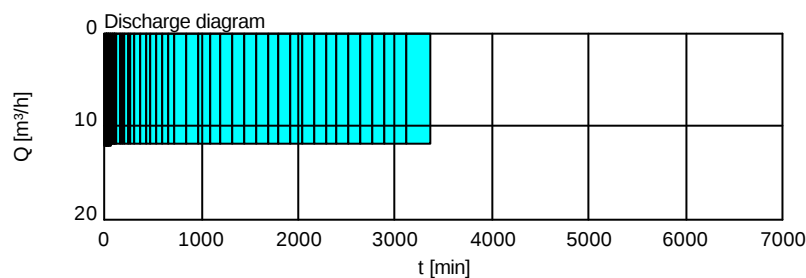
Test pumping analysis

Pumped well J4-N



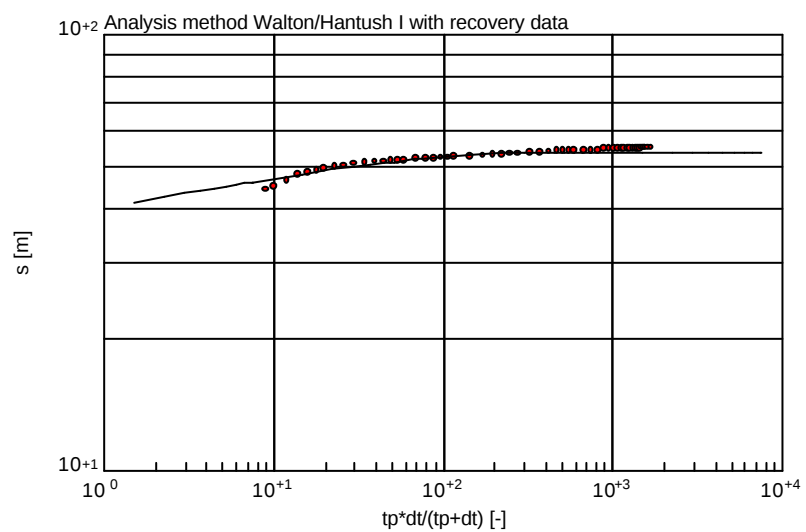
Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 1100 [m]
Depth:
Stick up: 0.00 [m]
Bh. radius: 0.1 [m]
Casing radius: 0.075 [m]
RWL: 10.63 [m]
max.drawdown: 55.31 [m]
Aq.type: confined
Aq.thickness: 50.00 [m]
Stratigraphy: Nossob Sandstone
Lithology: Sandstone



Test running

Start:10/07/2000 21:15:23
Dis.dur.: 3360 [min]
Av.dis.: 11.8 [m³/h]
Max.dis.: 12 [m³/h]
Min.dis.: 11.8 [m³/h]
Total dis.: 661 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

Match parameter:
Q: 11.8 [m³/h]
t: 593 [min]
s: 31.4 [m]
1/u: 7.98E8 [-]
W(u,r/B): 10.6 [-]

Aquifer parameter:
T: 7.6 [m²/d]
k: 0.152 [m/d]

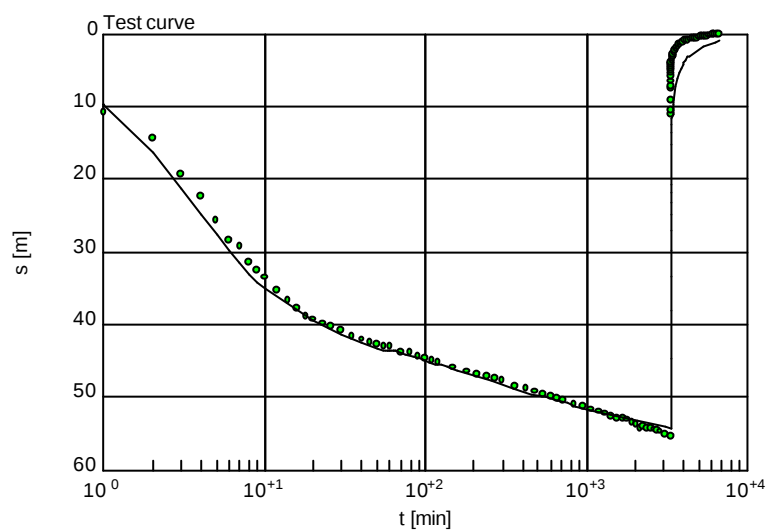
Boundary parameter:
B: 800 [m]
m': 50 [m]
K': 0.000594 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

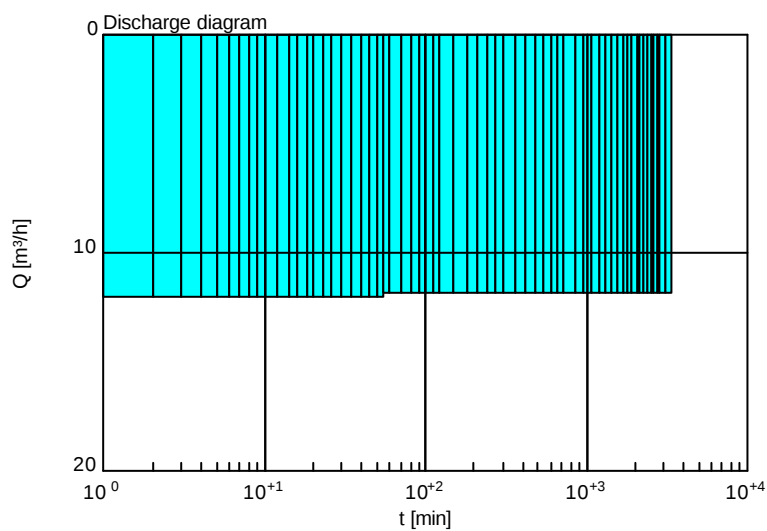
Test pumping diagnosis

Pumped well J4-N



Remarks

Simulation of the actual recorded draw down using the Hantush model for leaky aquifers.



Discharge info

Dis.dur.: 3360 [min]
tcorr: 3361 [min]

Av.dis.: 11.80 [m³/h]
max.dis.: 12.00 [m³/h]
min.dis.: 11.80 [m³/h]
Qn: 11.80 [m³/h]

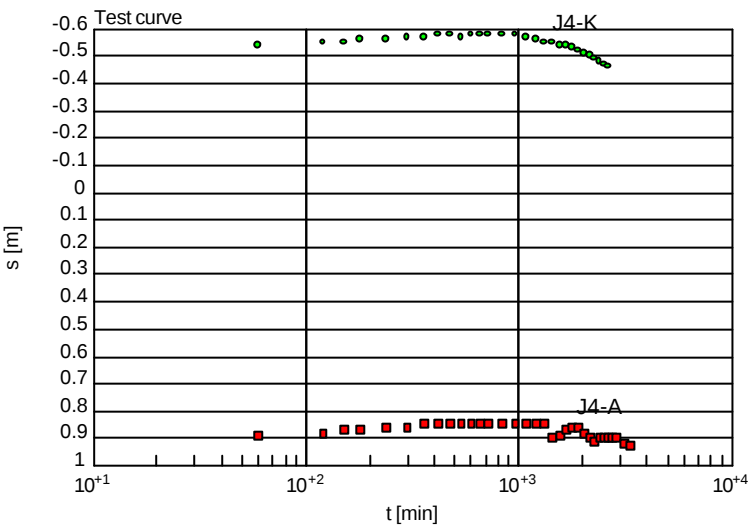
Dis.sum: 661 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

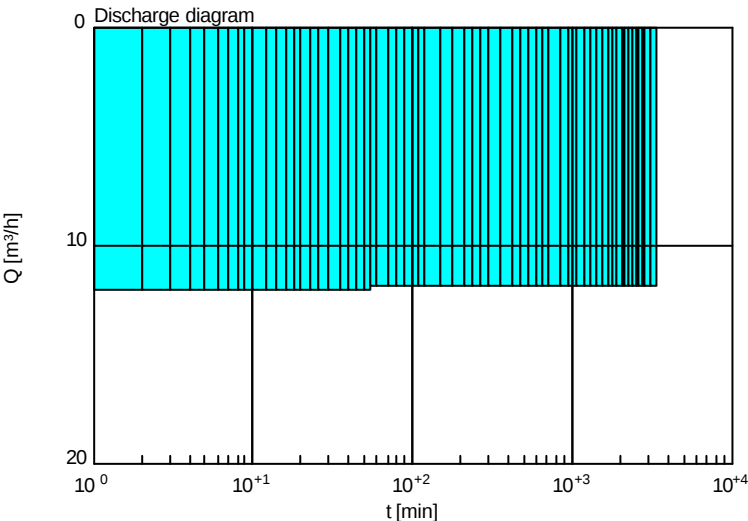
Test pumping diagnosis

Pumped well J4-N



Remarks

Both observation boreholes J4-A and J4-K are situated within different aquifers and none of the boreholes are directly influenced by abstraction. A drop in the late time water levels can however be observed. This could be due to leakage or natural oscillations in the groundwater table.



Discharge info

Dis.dur.:3360 [min]
tcorr: 3361 [min]

Av.dis.: 11.80 [m³/h]
max.dis.:12.00 [m³/h]
min.dis.:0 [m³/h]
Qn: 0.00E+00 [m³/h]

Dis.sum: 661 [m³]

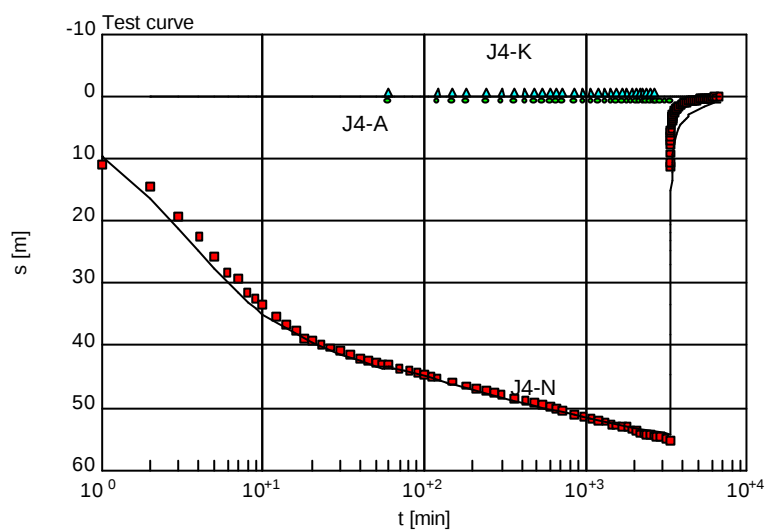
Distance to observation borehole: J4-A = 69 m; J4-K = 129 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

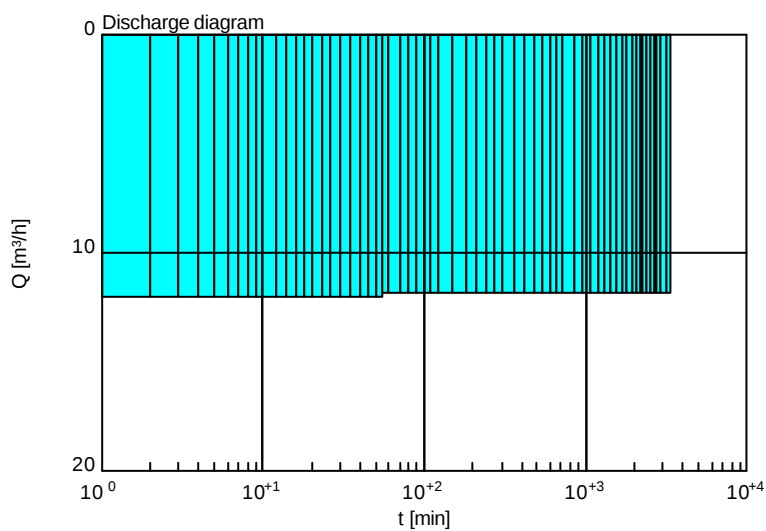
Step test diagnosis

Pumped well J4-N



Remarks

Merged data of abstraction borehole J4-N and observation boreholes J4-A and J4-K.



Discharge info

Dis.dur.: 360 [min]
tcorr: 200 [min]

Av.dis.: 12.50 [m³/h]
max.dis.: 20.00 [m³/h]
min.dis.: 5.00 [m³/h]
Qn: 20.00 [m³/h]

Dis.sum: 75.00 [m³]

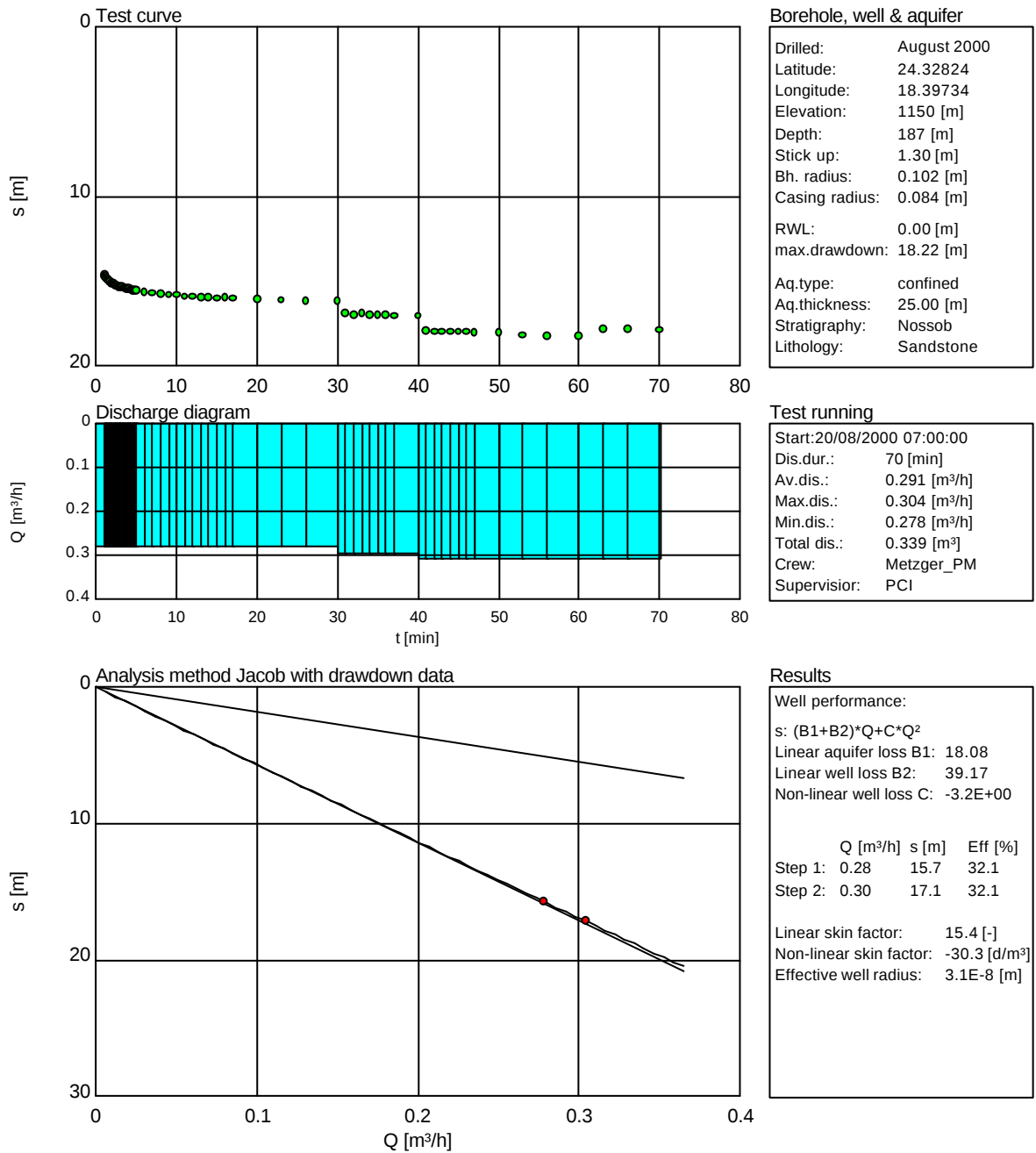
Distance to observation borehole: J4-A = 69 m; J4-K = 129 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Pressure probe step test analysis

Pumped well J5-N

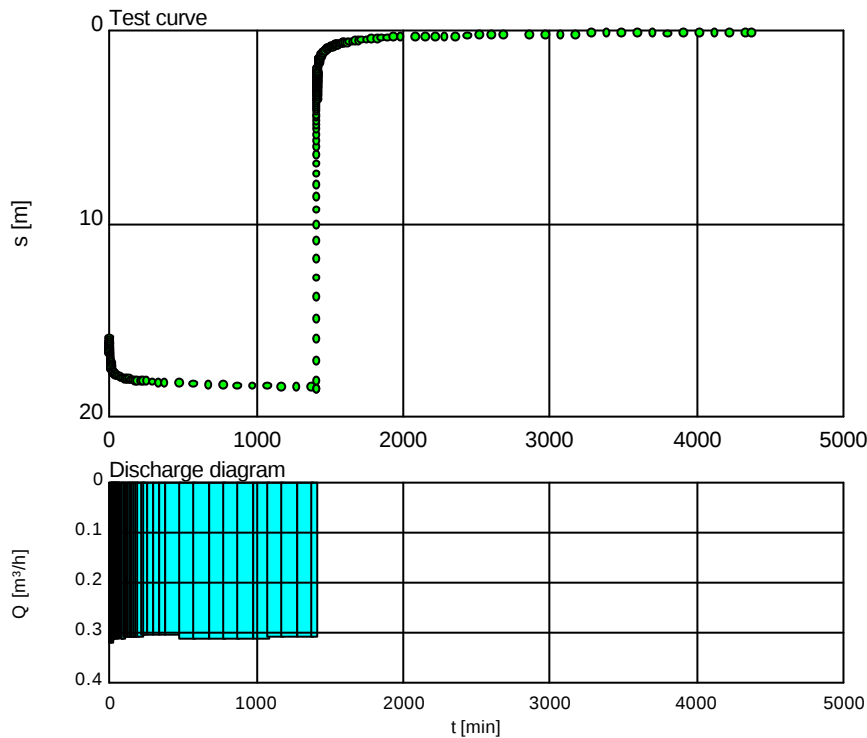


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Constant discharge test analysis

Pumped well J5-N

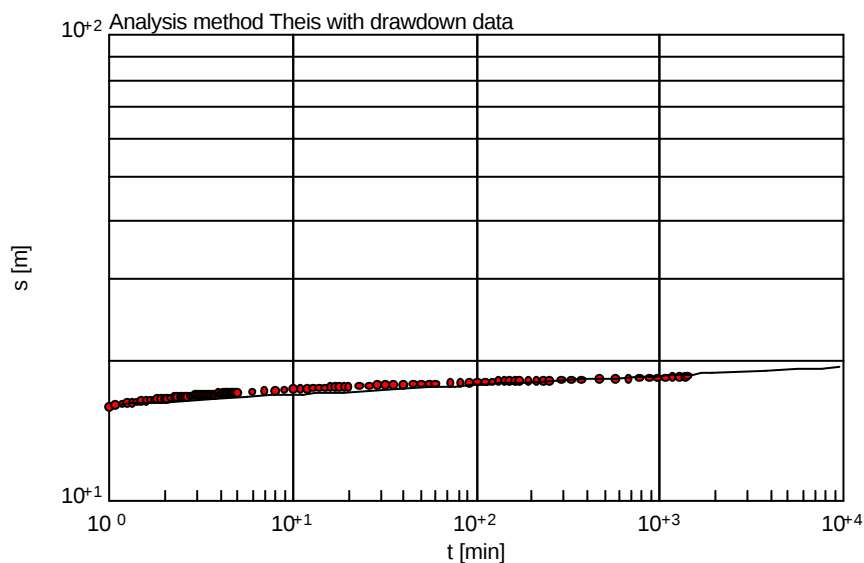


Borehole, well & aquifer

Drilled: August 2000
Latitude: 24.32824
Longitude: 18.39734
Elevation: 1150 [m]
Depth: 187 [m]
Stick up: 1.30 [m]
Bh. radius: 0.102 [m]
Casing radius: 0.084 [m]
RWL: 0.00 [m]
max.drawdown: 18.56 [m]
Aq.type: confined
Aq.thickness: 25.00 [m]
Stratigraphy: Nossob
Lithology: Sandstone

Test running

Start: 21/08/2000 07:00:00
Dis.dur.: 1409 [min]
Av.dis.: 0.305 [m³/h]
Max.dis.: 0.318 [m³/h]
Min.dis.: 0.302 [m³/h]
Total dis.: 7.17 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

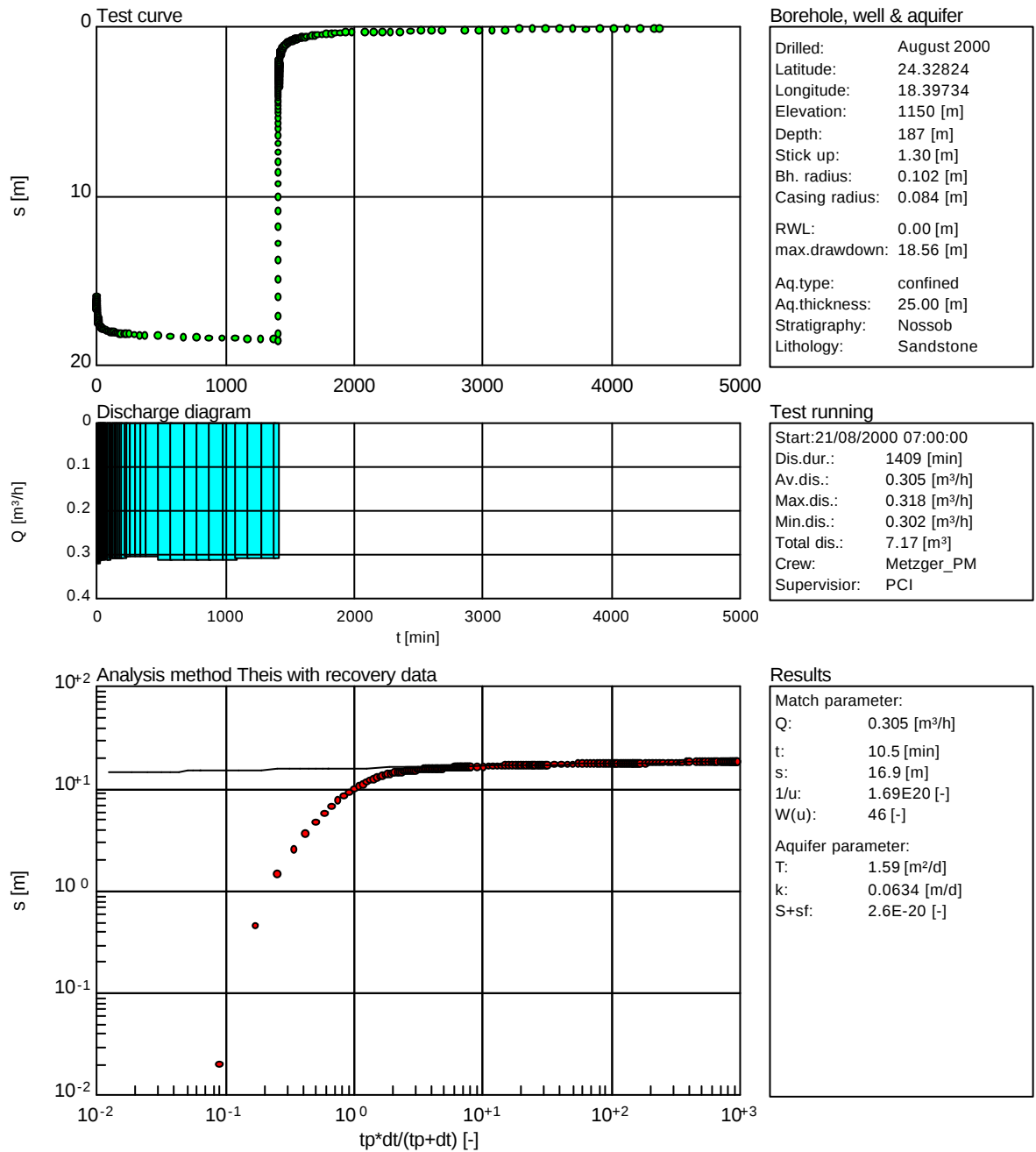
Match parameter:
Q: 0.305 [m³/h]
t: 287 [min]
s: 18.2 [m]
1/u: 1.52E22 [-]
W(u): 50.6 [-]
Aquifer parameter:
T: 1.62 [m²/d]
k: 0.0649 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Constant discharge test analysis

Pumped well J5-N

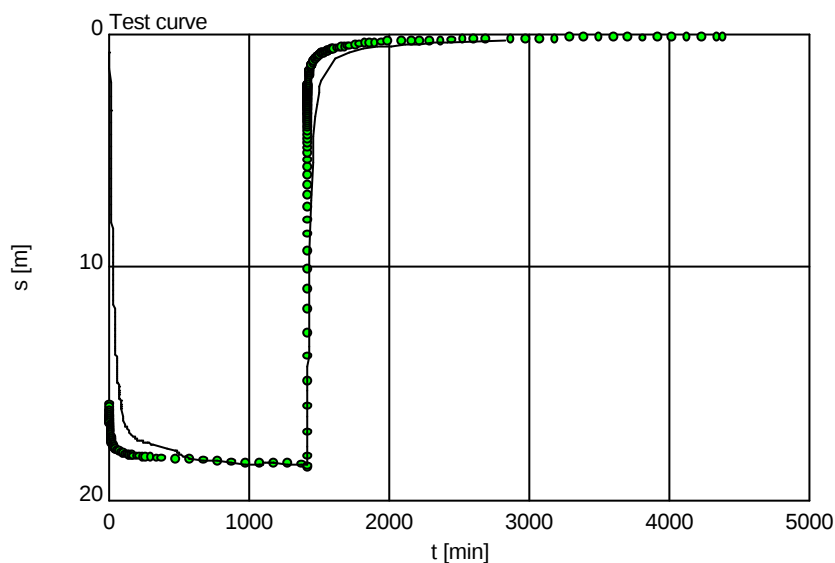


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

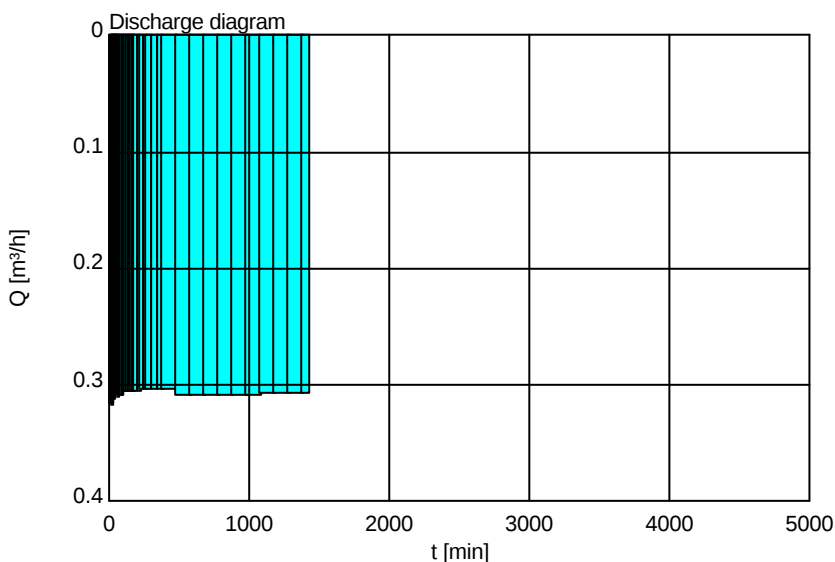
Constant discharge test diagnosis

Pumped well J5-N



Remarks

Simulation of the actual draw down and recovery during the constant discharge test using the Theis model for confined aquifers. The borehole is artesian and the piezometric level above ground level was calculated by a pressure probe test. For technical reasons the piezometric level of -27.01 m b.s.u. had to be calibrated to 0.0 m b.s.u.



Discharge info

Dis.dur.:1409 [min]
tcorr: 1415 [min]

Av.dis.: 0.31 [m³/h]
max.dis.:0.32 [m³/h]
min.dis.:0.30 [m³/h]
Qn: 0.30 [m³/h]

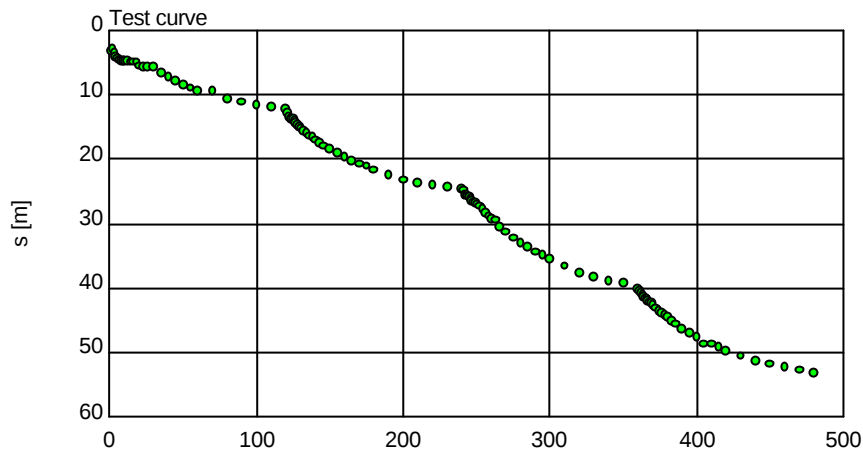
Dis.sum: 7.17 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

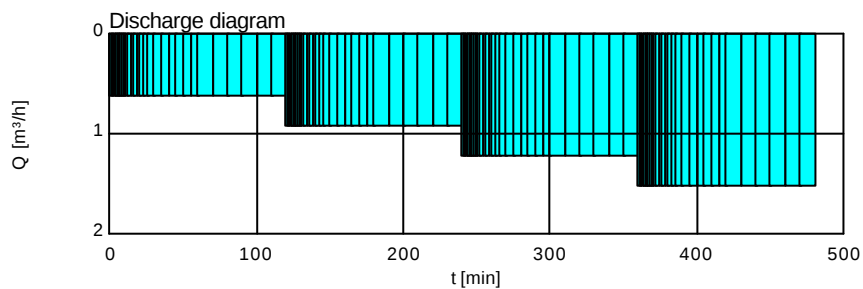
Step test analysis

Pumped well J5-N



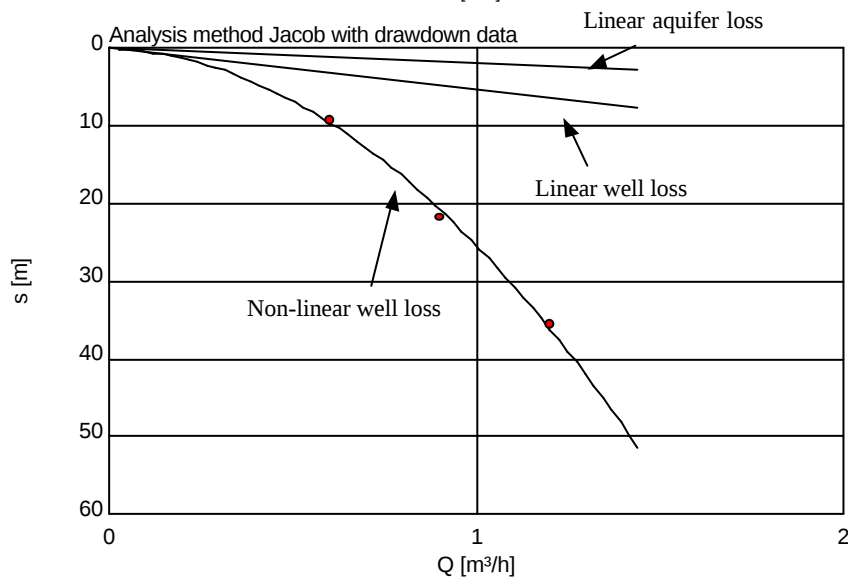
Borehole, well & aquifer

Drilled:	August 2000
Latitude:	24.32824
Longitude:	18.39734
Elevation:	1150 [m]
Depth:	187 [m]
Stick up:	1.30 [m]
Bh. radius:	0.102 [m]
Casing radius:	0.084 [m]
RWL:	0.00 [m]
max.drawdown:	53.03 [m]
Aq.type:	confined
Aq.thickness:	25.00 [m]
Stratigraphy:	Nossob
Lithology:	Sandstone



Test running

Start:	20/08/2000 07:00:00
Dis.dur.:	480 [min]
Av.dis.:	1.05 [m³/h]
Max.dis.:	1.5 [m³/h]
Min.dis.:	0.6 [m³/h]
Total dis.:	8.4 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

Well performance:

s:	$(B1+B2)*Q+C*Q^2$
Linear aquifer loss B1:	-1.7E+00
Linear well loss B2:	3.56
Non-linear well loss C:	23.56

	Q [m³/h]	s [m]	Eff [%]
Step 1:	0.60	9.28	33.5
Step 2:	0.90	21.7	23.2
Step 3:	1.20	35.5	17.8

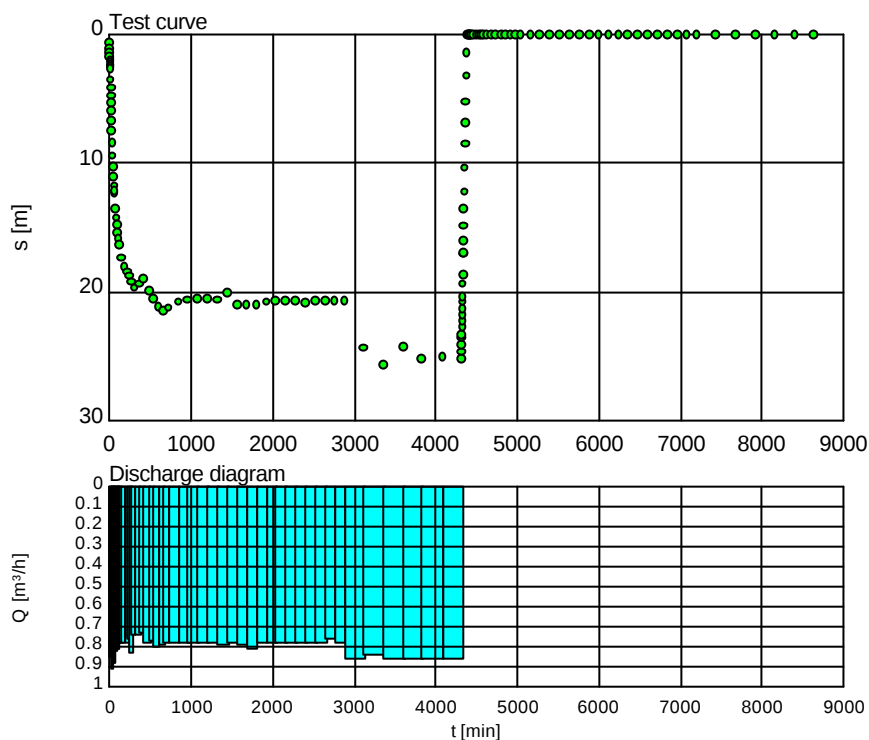
Linear skin factor:	1.12 [-]
Non-linear skin factor:	178 [d/m³]
Effective well radius:	4.6E-6 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J5-N

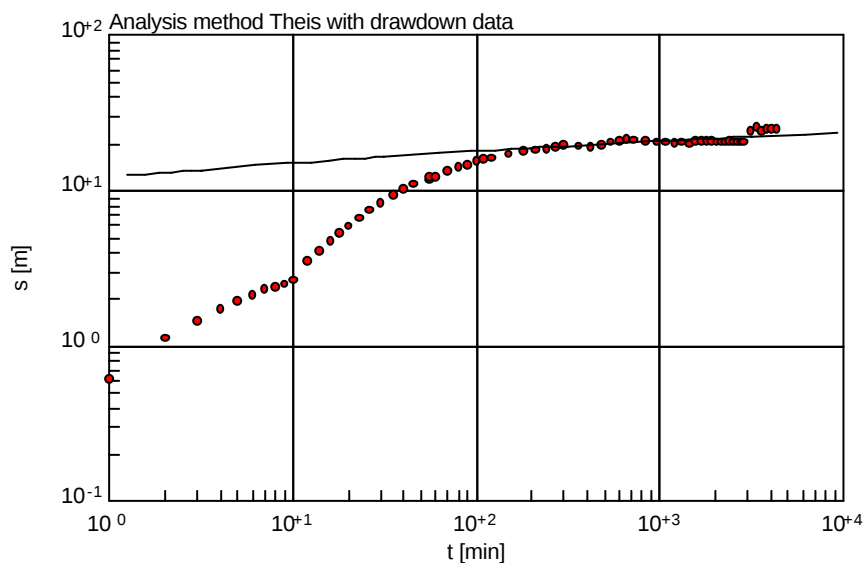


Borehole, well & aquifer

Drilled: August 2000
Latitude: 24.32824
Longitude: 18.39734
Elevation: 1150 [m]
Depth: 187 [m]
Stick up: 1.30 [m]
Bh. radius: 0.102 [m]
Casing radius: 0.084 [m]
RWL: 0.00 [m]
max.drawdown: 25.65 [m]
Aq.type: confined
Aq.thickness: 25.00 [m]
Stratigraphy: Nossob
Lithology: Sandstone

Test running

Start: 21/08/2000 07:00:00
Dis.dur.: 4320 [min]
Av.dis.: 0.794 [m³/h]
Max.dis.: 0.929 [m³/h]
Min.dis.: 0.61 [m³/h]
Total dis.: 57.1 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

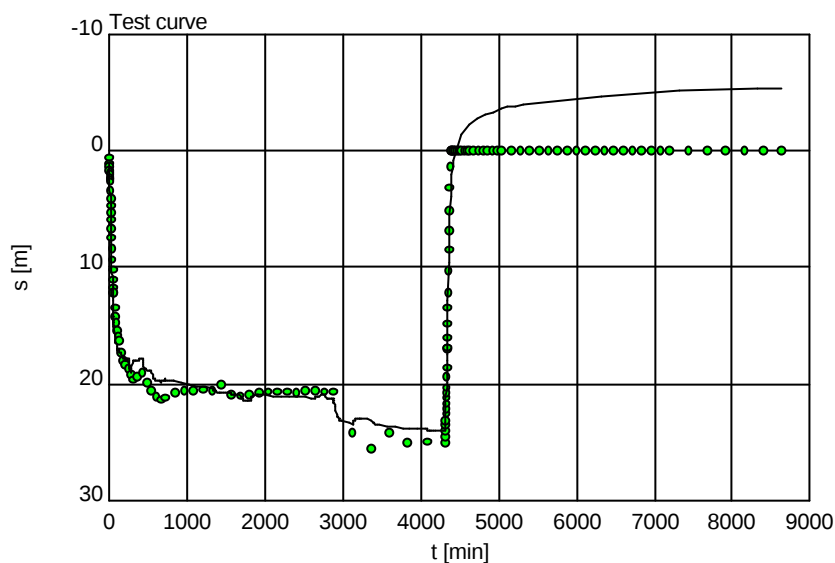
Match parameter:
Q: 0.794 [m³/h]
t: 2.46E3 [min]
s: 22.8 [m]
1/u: 7.84E7 [-]
W(u): 18.2 [-]
Aquifer parameter:
T: 1.21 [m²/d]
k: 0.0485 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

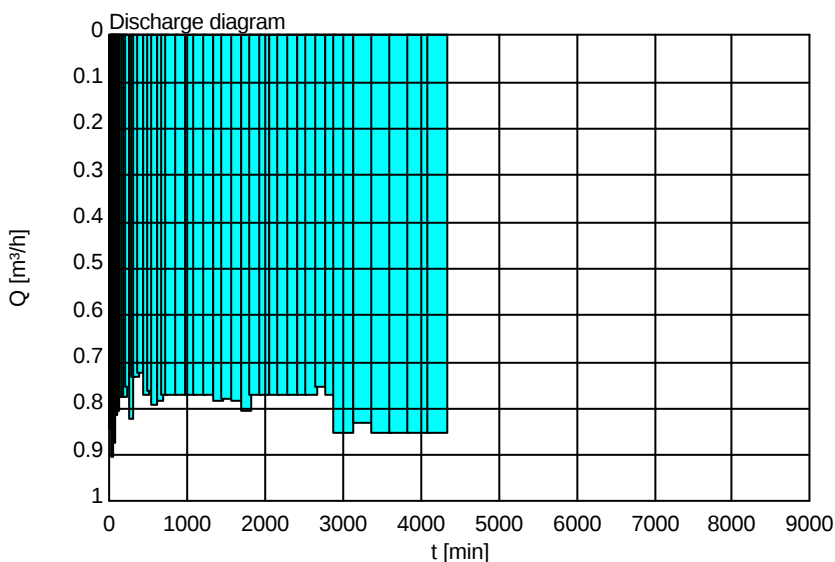
Pumped well J5-N



Remarks

Simulation of the actual draw down during the constant discharge test using the Theis model for confined aquifers.

The borehole is artesian and the piezometric level above ground level was not measured. The simulation is therefore only valid for the draw down curve below ground level.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 3841 [min]

Av.dis.: 0.79 [m^3/h]
max.dis.: 0.93 [m^3/h]
min.dis.: 0.61 [m^3/h]
Qn: 0.85 [m^3/h]

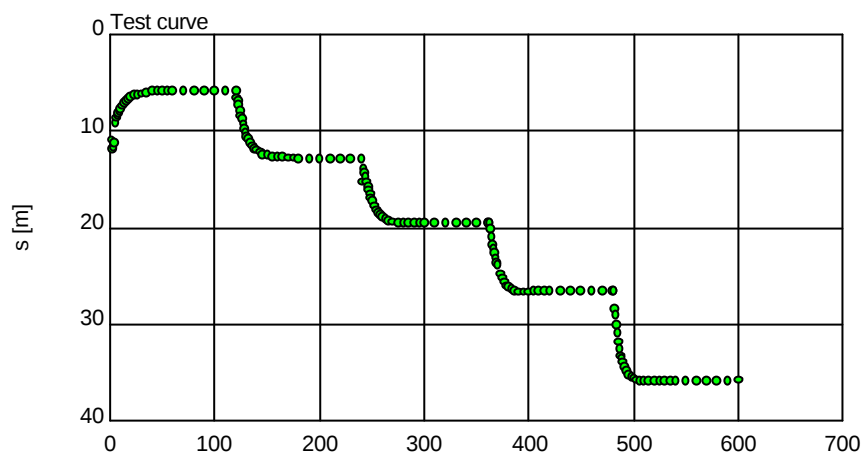
Dis.sum: 57.14 [m^3]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

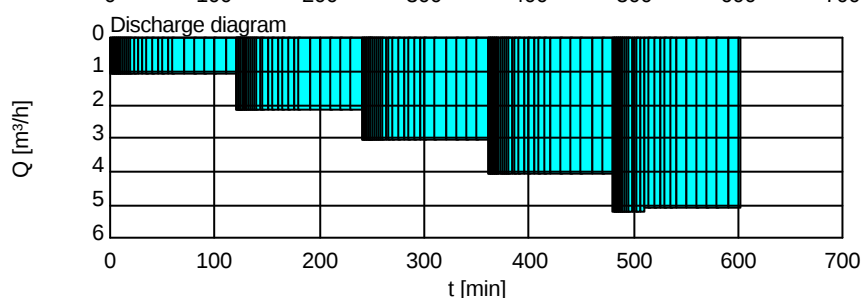
Step test analysis

Pumped well J6_K



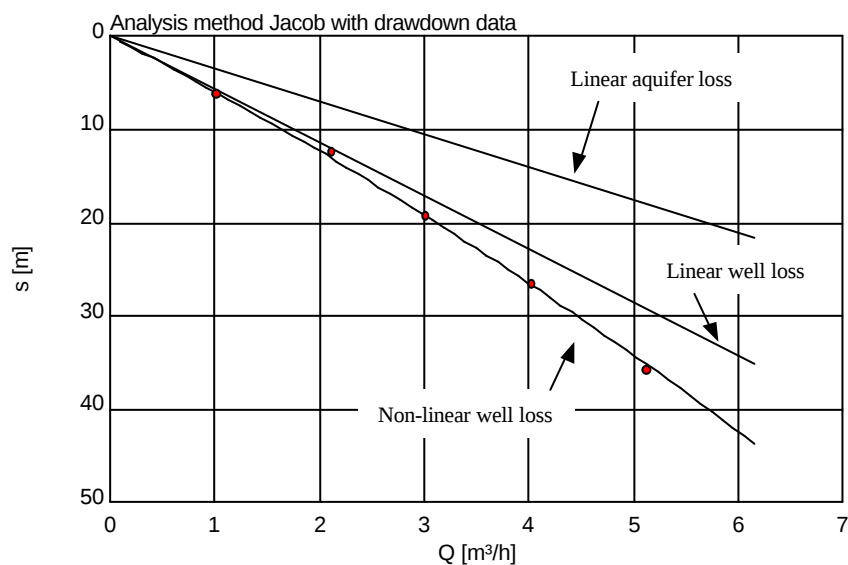
Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 300 [m]
Depth: 168.4 [m]
Stick up: 0.70 [m]
Bh. radius: 0.1555 [m]
Casing radius: 0.075 [m]
RWL: 102.68 [m]
max.drawdown: 35.88 [m]
Aq.type: confined
Aq.thickness: 50.00 [m]
Stratigraphy: Kalahari
Lithology:



Test running

Start: 05/08/2000 14:41:42
Dis.dur.: 600 [min]
Av.dis.: 3.04 [m³/h]
Max.dis.: 5.13 [m³/h]
Min.dis.: 1.01 [m³/h]
Total dis.: 30.4 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

Well performance:

$$s: (B1+B2)*Q+C*Q^2$$

Linear aquifer loss B1: 3.53

Linear well loss B2: 2.18

Non-linear well loss C: 0.23

	Q [m³/h]	s [m]	Eff [%]
Step 1:	1.01	6.24	59.1
Step 2:	2.11	12.4	56.7
Step 3:	3.01	19.3	54.9
Step 4:	4.03	26.5	53.0
Step 5:	5.13	35.8	51.1

Linear skin factor: 3.59 [-]

Non-linear skin factor: 8.94 [d/m³]

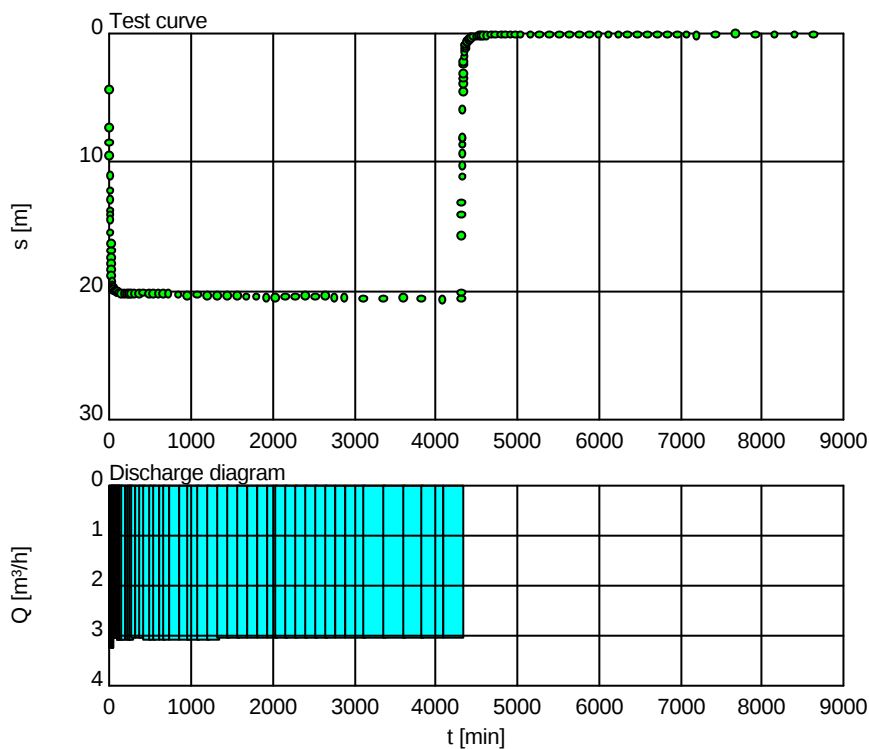
Effective well radius: 6.4E-4 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J6_K

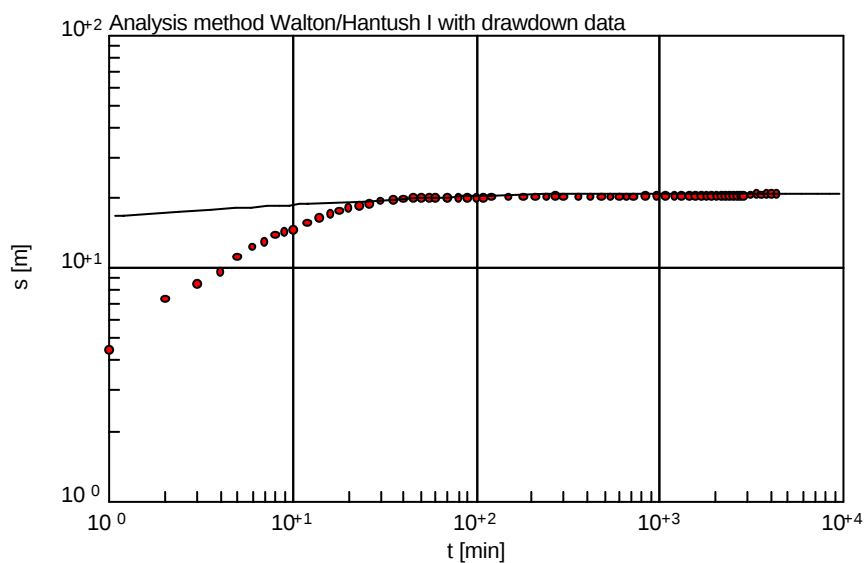


Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 300 [m]
Depth: 168.4 [m]
Stick up: 0.70 [m]
Bh. radius: 0.1555 [m]
Casing radius: 0.075 [m]
RWL: 102.69 [m]
max.drawdown 20.73 [m]
Aq.type: confined
Aq.thickness: 50.00 [m]
Stratigraphy: Kalahari
Lithology:

Test running

Start: 05/08/2000 14:40:18
Dis.dur.: 4320 [min]
Av.dis.: 3.05 [m³/h]
Max.dis.: 3.24 [m³/h]
Min.dis.: 3.01 [m³/h]
Total dis.: 219 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

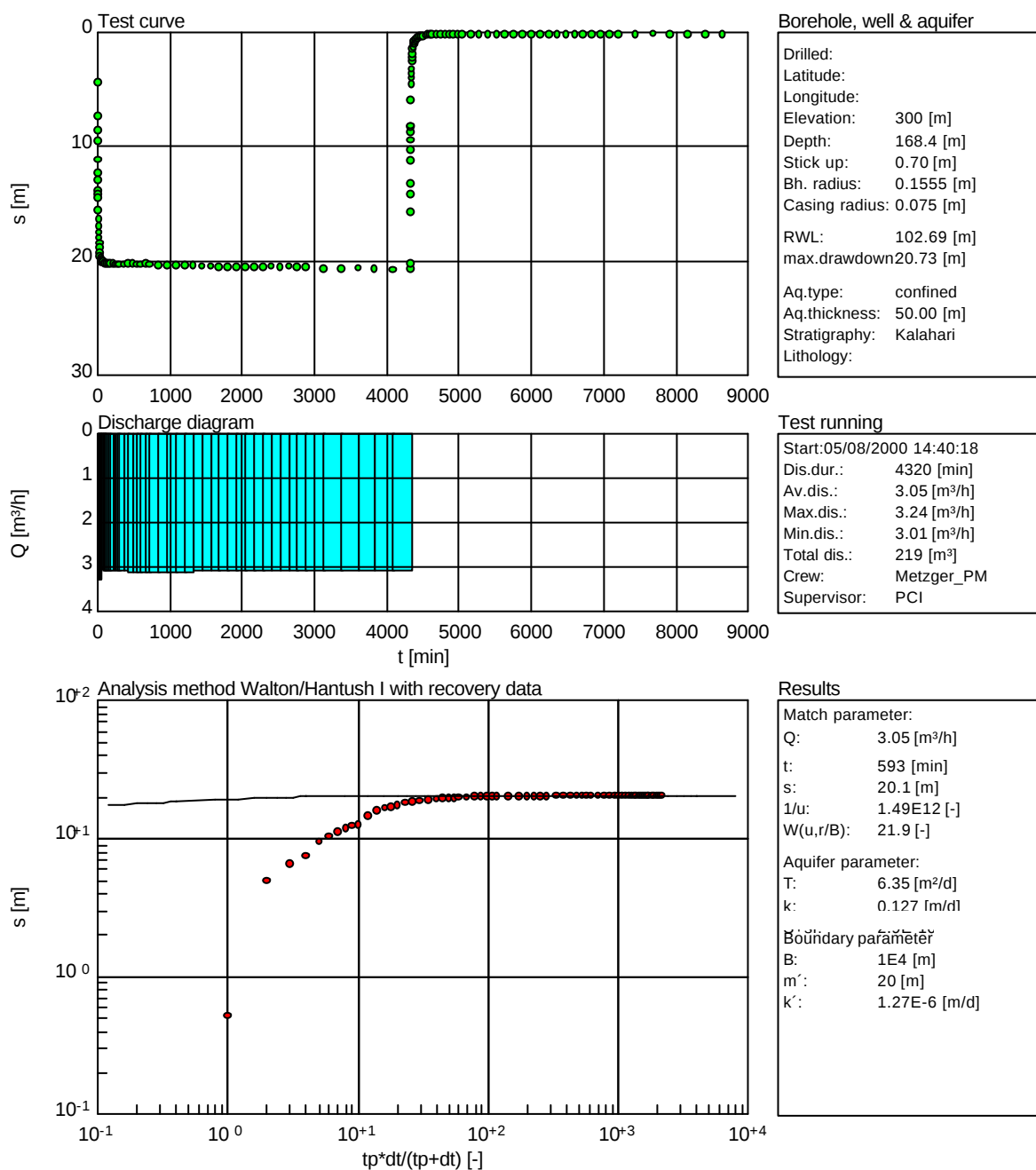
Match parameter:
Q: 3.05 [m³/h]
t: 8.34 [min]
s: 17.7 [m]
1/u: 6.98E8 [-]
W(u,r/B): 18.9 [-]
Aquifer parameter:
T: 6.23 [m²/d]
k: 0.125 [m/d]
Boundary parameter:
B: 1E4 [m]
m': 20 [m]
k': 1.25E-6 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J6_K

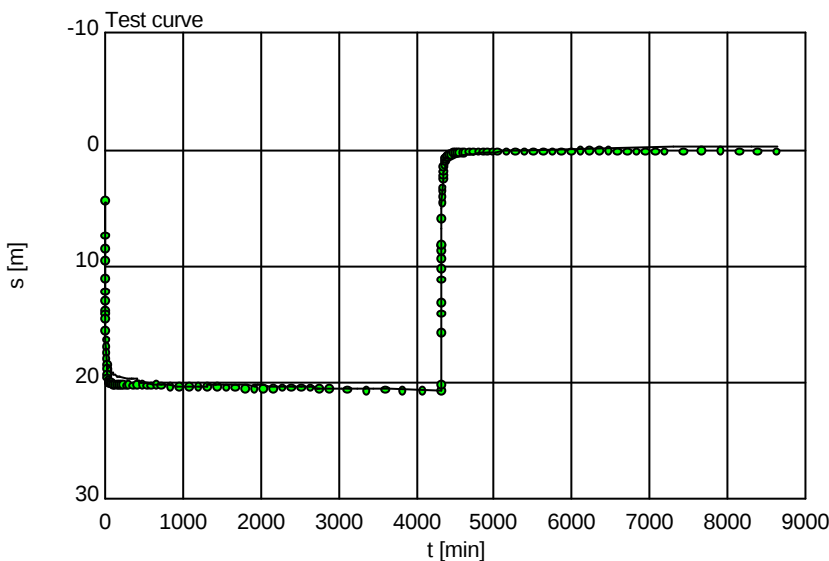


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

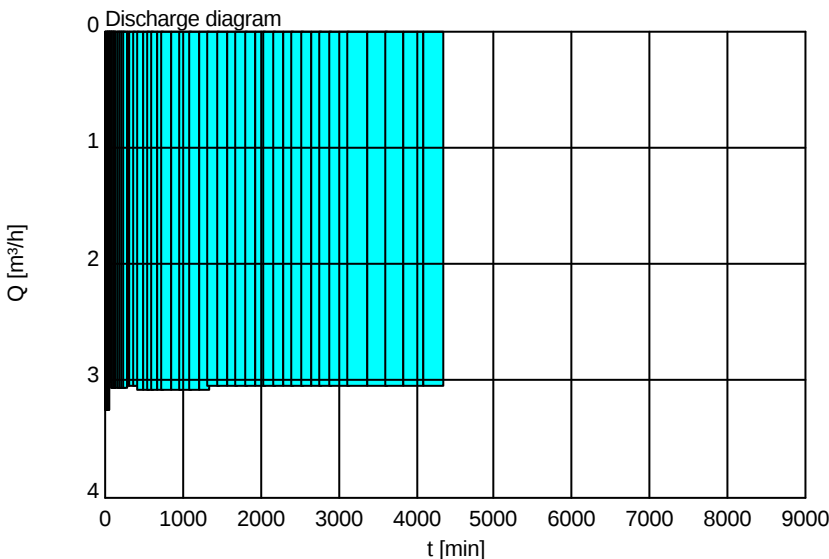
Test pumping diagnosis

Pumped well J6_K



Remarks

Simulation of the actual draw down during the constant discharge test using the Hantush model for leaky aquifers



Discharge info

Dis.dur.:4320 [min]
tcorr: 4327 [min]

Av.dis.: 3.05 [m^3/h]
max.dis.:3.24 [m^3/h]
min.dis.:3.01 [m^3/h]
Qn: 3.04 [m^3/h]

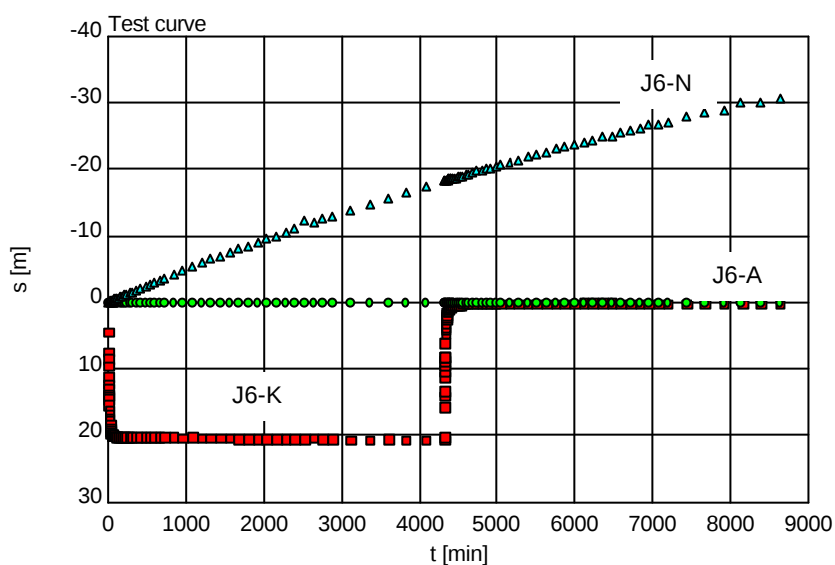
Dis.sum: 219 [m^3]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Pumped well J6_K

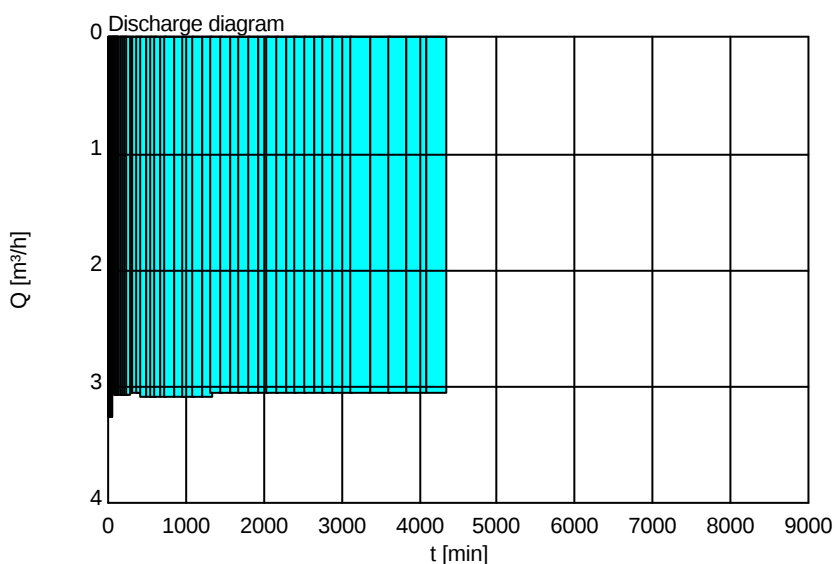


Remarks

Merged data from observation boreholes J6_A and J6_N and abstraction borehole J6_K

Both observation boreholes are not influenced by the pumping of J6_K

The water level of J6_N rises 30 m during the test



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4327 [min]

Av.dis.: 3.05 [m^3/h]
max.dis.: 3.24 [m^3/h]
min.dis.: 3.01 [m^3/h]
Qn: 3.04 [m^3/h]

Dis.sum: 219 [m^3]

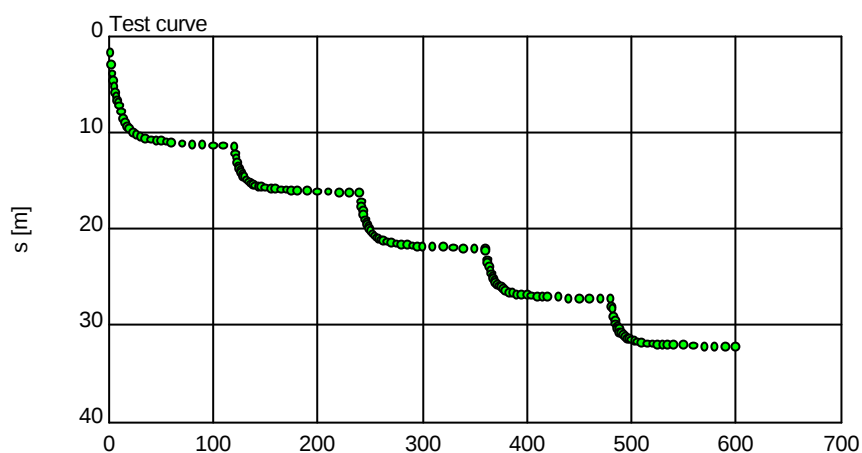
Distance of observation boreholes: J6-A = 63.5 m; J6-N = 58.5 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

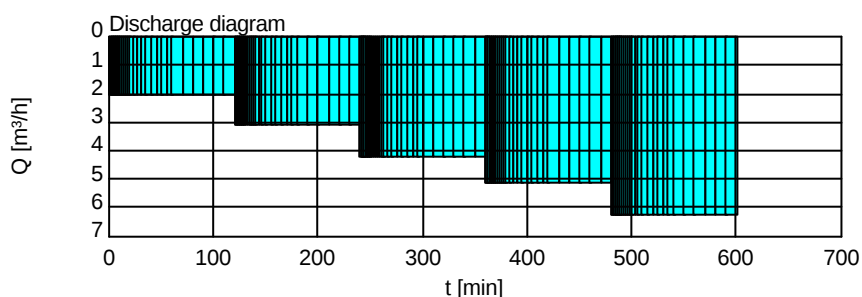
Step test analysis

Pumped well J6_A



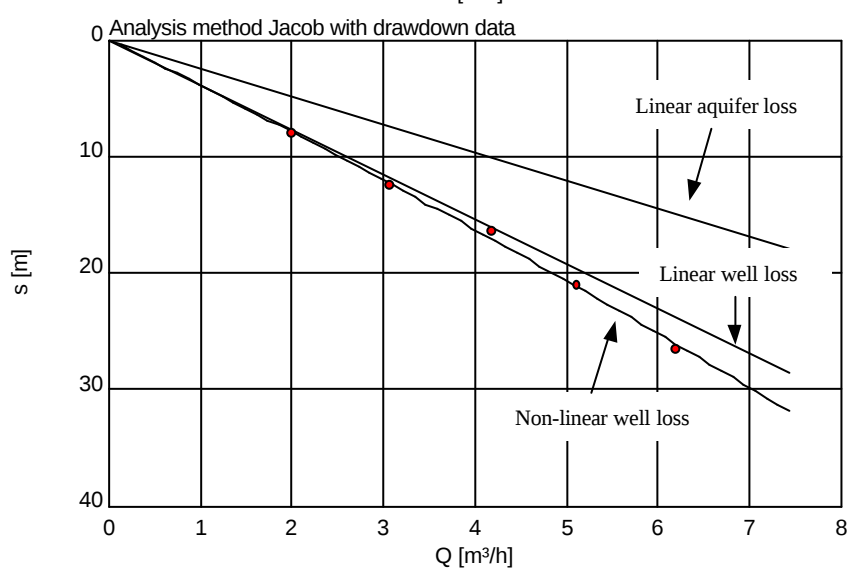
Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 300 [m]
Depth: 273 [m]
Stick up: 0.90 [m]
Bh. radius: 0.1255 [m]
Casing radius: 0.084 [m]
RWL: 103.95 [m]
max.drawdown: 32.25 [m]
Aq.type: confined
Aq.thickness: 30.00 [m]
Stratigraphy: Auob Sandstone
Lithology:



Test running

Start:31/07/2000 07:06:00
Dis.dur.: 600 [min]
Av.dis.: 4.11 [m³/h]
Max.dis.: 6.2 [m³/h]
Min.dis.: 2 [m³/h]
Total dis.: 41.1 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

Well performance:

$$s: (B1+B2)*Q+C*Q^2$$

Linear aquifer loss B1: 2.41

Linear well loss B2: 1.42

Non-linear well loss C: 0.06

	Q [m³/h]	s [m]	Eff [%]
Step 1:	2.00	7.97	61.0
Step 2:	3.06	12.5	60.0
Step 3:	4.19	16.5	59.0
Step 4:	5.11	21.1	58.2
Step 5:	6.20	26.6	57.3

Linear skin factor: 3.15 [-]

Non-linear skin factor: 3.28 [d/m³]

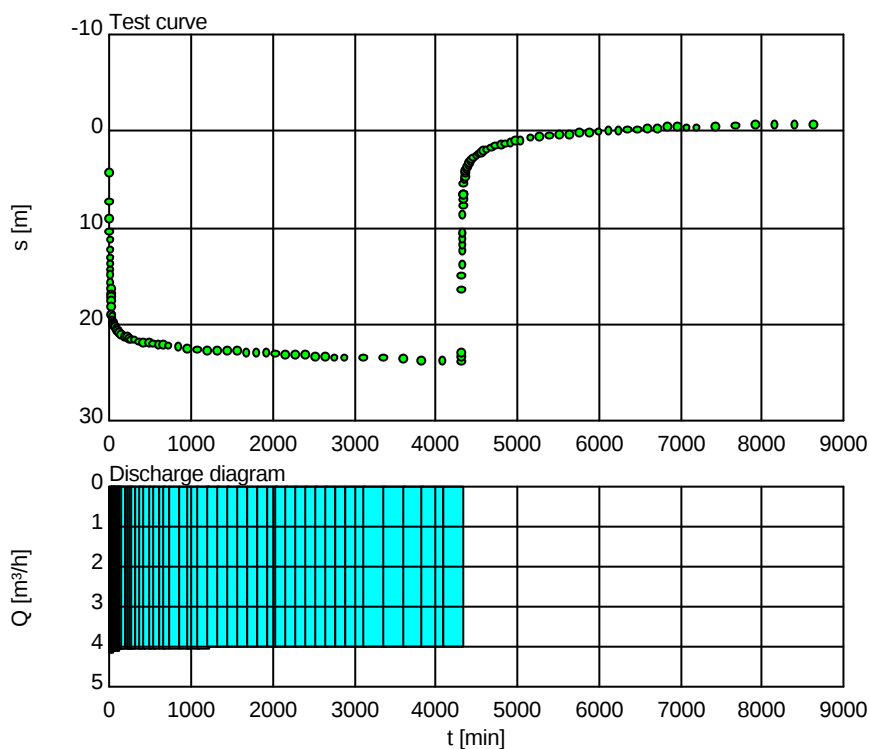
Effective well radius: 2.3E-3 [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J6_A

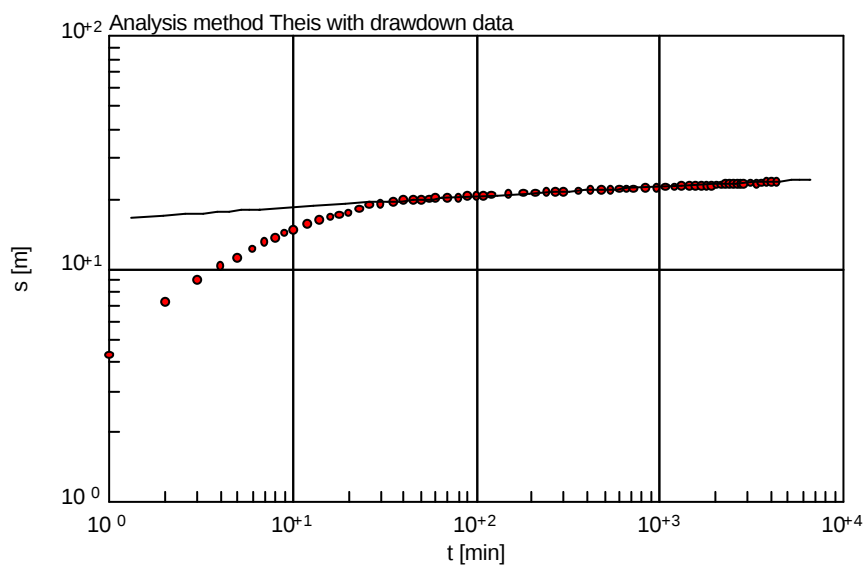


Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 300 [m]
Depth: 273 [m]
Stick up: 0.90 [m]
Bh. radius: 0.1255 [m]
Casing radius: 0.084 [m]
RWL: 105.31 [m]
max.drawdown: 23.88 [m]
Aq.type: confined
Aq.thickness: 30.00 [m]
Stratigraphy: Auob Sandstone
Lithology:

Test running

Start:01/08/2000 08:00:00
Dis.dur.: 4320 [min]
Av.dis.: 3.97 [m³/h]
Max.dis.: 4.11 [m³/h]
Min.dis.: 3.95 [m³/h]
Total dis.: 285 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

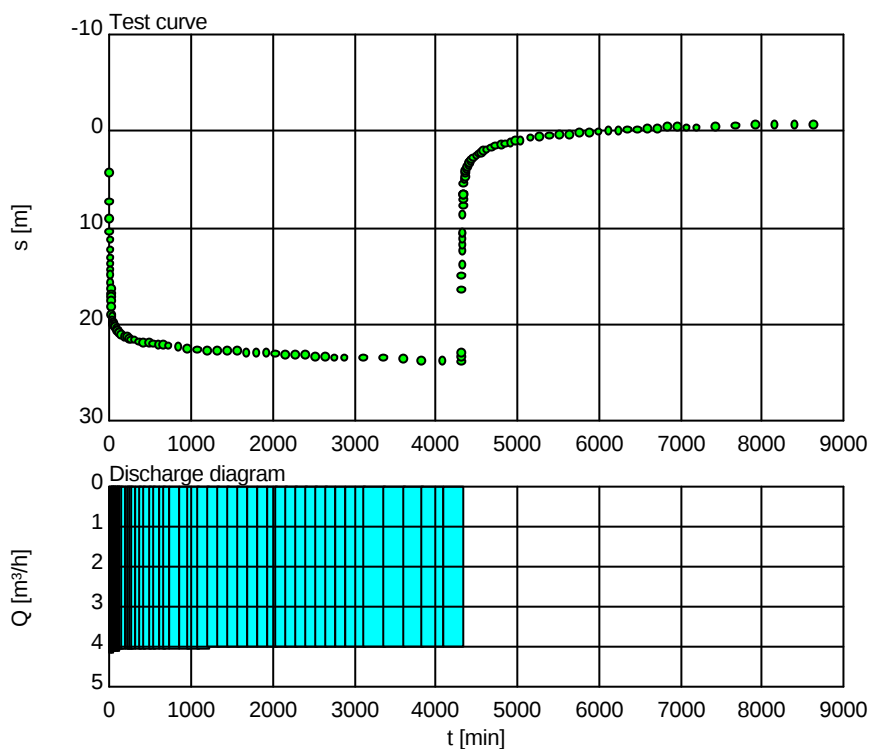
Match parameter:
Q: 3.97 [m³/h]
t: 1.18E3 [min]
s: 22.4 [m]
1/u: 1.83E11 [-]
W(u): 25 [-]
Aquifer parameter:
T: 8.44 [m²/d]
k: 0.281 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J6_A

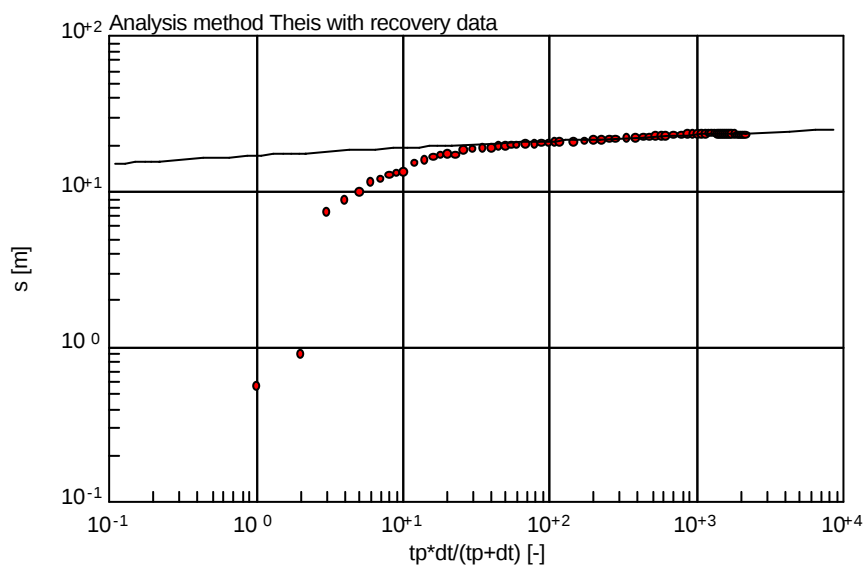


Borehole, well & aquifer

Drilled:
Latitude:
Longitude:
Elevation: 300 [m]
Depth: 273 [m]
Stick up: 0.90 [m]
Bh. radius: 0.1255 [m]
Casing radius: 0.084 [m]
RWL: 105.31 [m]
max.drawdown: 23.88 [m]
Aq.type: confined
Aq.thickness: 30.00 [m]
Stratigraphy: Auob Sandstone
Lithology:

Test running

Start:01/08/2000 08:00:00
Dis.dur.: 4320 [min]
Av.dis.: 3.97 [m³/h]
Max.dis.: 4.11 [m³/h]
Min.dis.: 3.95 [m³/h]
Total dis.: 285 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

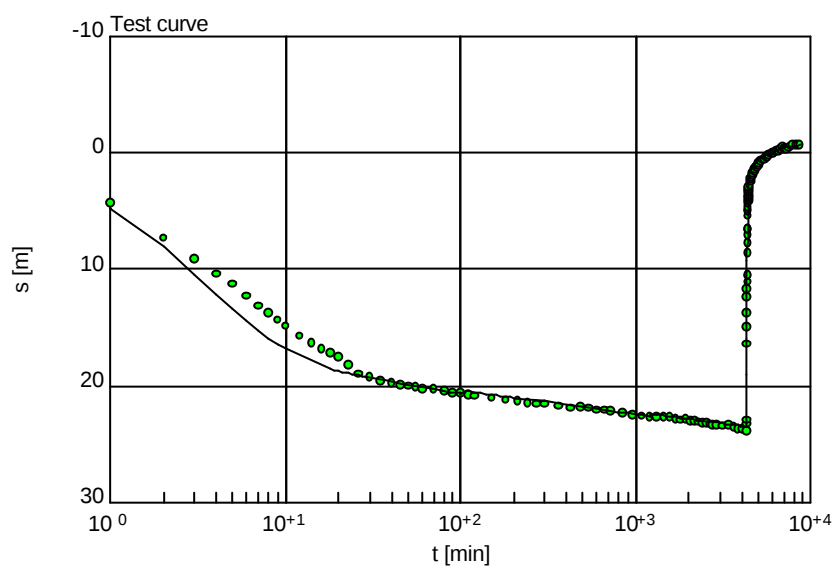
Match parameter:
Q: 3.97 [m³/h]
t: 36 [min]
s: 20.1 [m]
1/u: 1.67E10 [-]
W(u): 22.8 [-]
Aquifer parameter:
T: 8.6 [m²/d]
k: 0.287 [m/d]
S+sf: 3.3E-9 [-]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

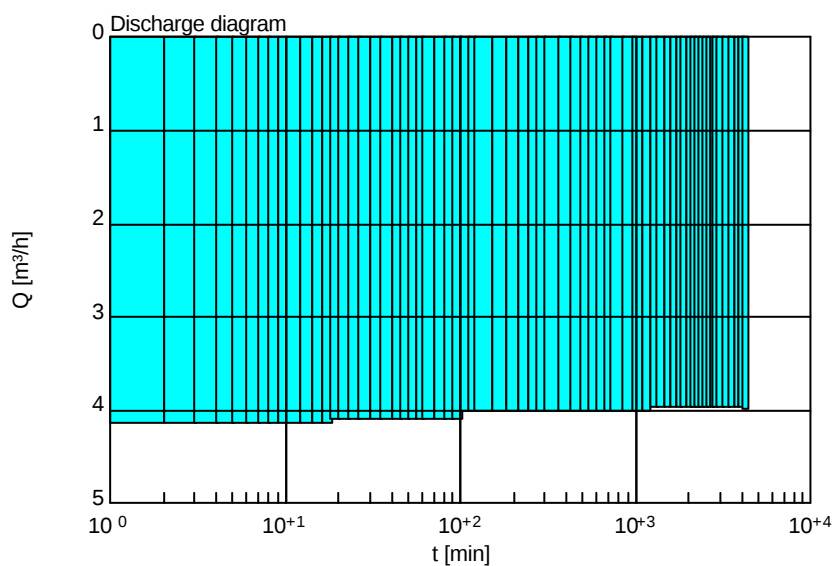
Test pumping diagnosis

Pumped well J6_A



Remarks

Simulation of the actual recorded draw down during the constant discharge test applying the Theis model for confined aquifers.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4317 [min]

Av.dis.: 3.97 [m³/h]
max.dis.: 4.11 [m³/h]
min.dis.: 3.95 [m³/h]
Qn: 3.96 [m³/h]

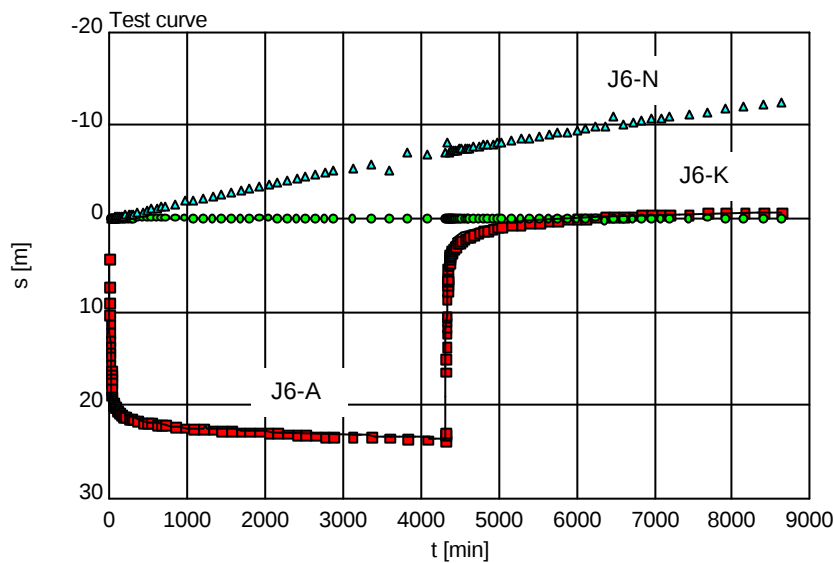
Dis.sum: 285 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Pumped well J6_A



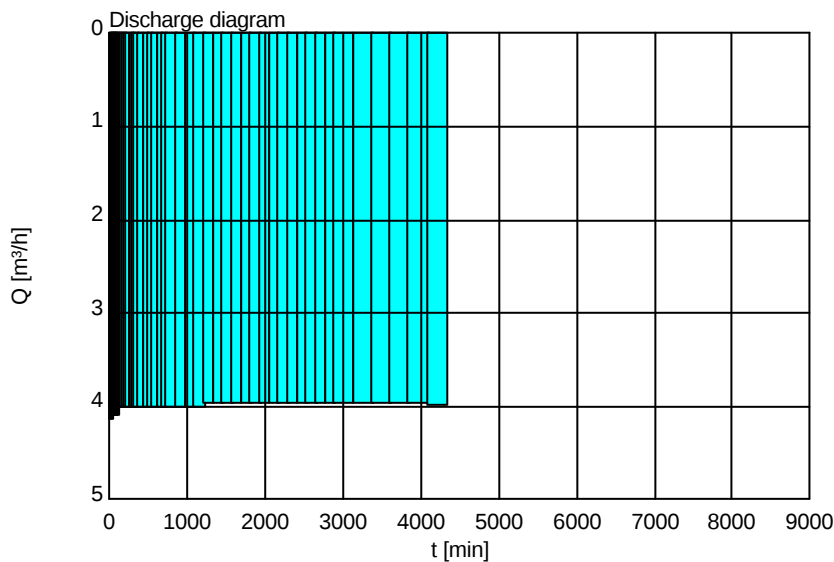
Remarks

Merged draw down data from observation borehole J6_K and J6_N.

The farm borehole was pumped during the test.

The observation boreholes don't penetrate the same aquifer.

The WL of J6_K is stable while the WL of J6_N rises during the test.
No storativity can be evaluated.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4317 [min]

Av.dis.: 3.97 [m³/h]
max.dis.: 4.11 [m³/h]
min.dis.: 3.95 [m³/h]
Qn: 3.96 [m³/h]

Dis.sum: 285 [m³]

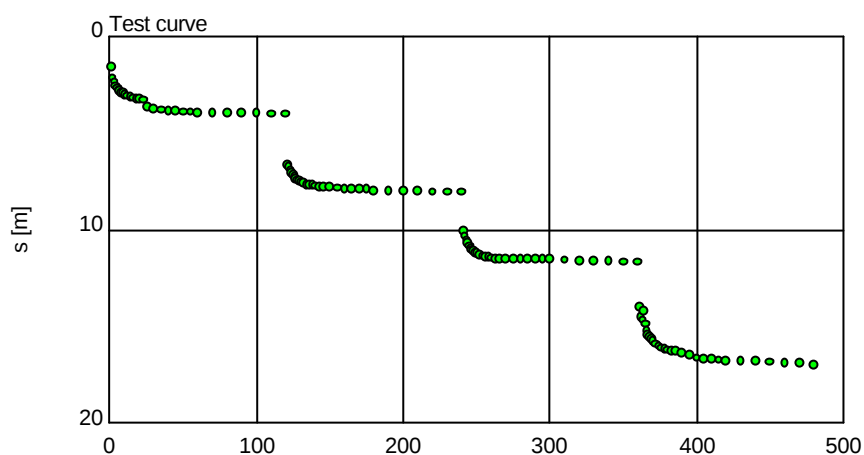
Distance of observation boreholes: J6-K = 63.5 m; J6-N = 58.5 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

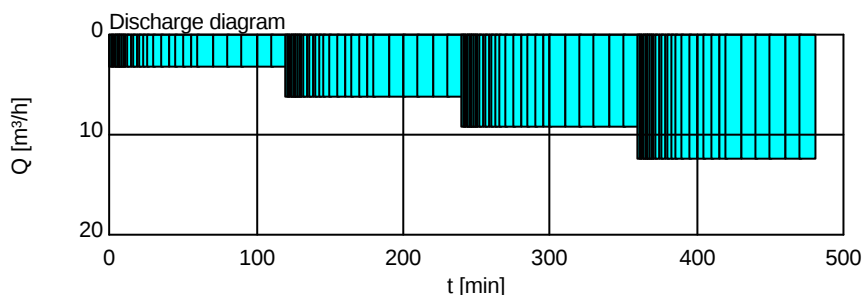
Step test analysis

Pumped well J7_K



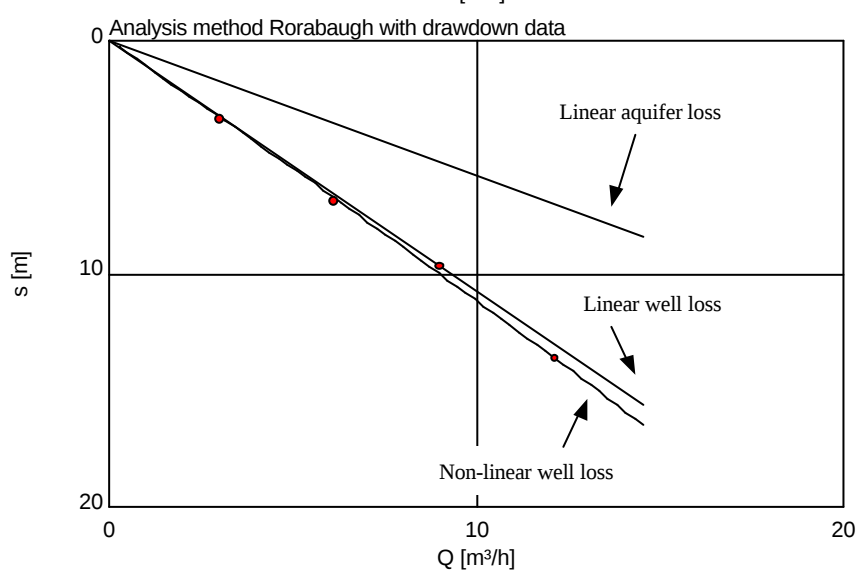
Borehole, well & aquifer

Drilled:	21.07.2000
Latitude:	25.29149
Longitude:	18.41784
Elevation:	1150 [m]
Depth:	55 [m]
Stick up:	0.70 [m]
Bh. radius:	0.1555 [m]
Casing radius:	0.084 [m]
RWL:	10.59 [m]
max.drawdown:	16.96 [m]
Aq.type:	confined
Aq.thickness:	30.00 [m]
Stratigraphy:	Kalahari
Lithology:	sandstone



Test running

Start:	21/08/2000 07:01:00
Dis.dur.:	480 [min]
Av.dis.:	7.56 [m³/h]
Max.dis.:	12.1 [m³/h]
Min.dis.:	3 [m³/h]
Total dis.:	60.5 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

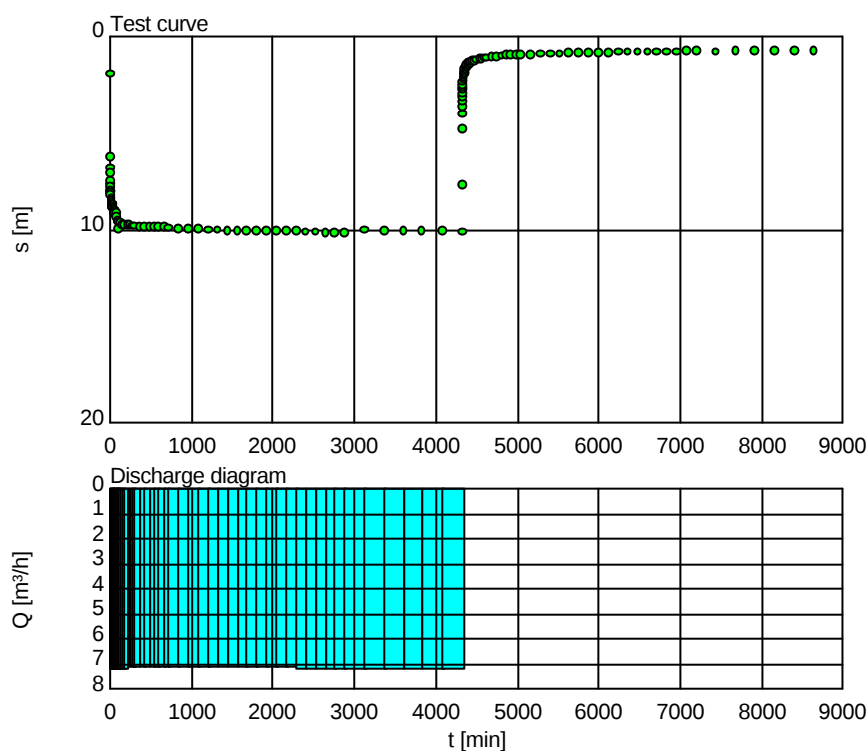
Well performance:			
$s: (B1+B2)*Q+C*Q^P$			
Linear aquifer loss B1: 0.57			
Linear well loss B2: 0.50			
Non-linear well loss C: 3.8E-3			
Exponent P: 2.05			
Q [m³/h]	s [m]	Eff [%]	
Step 1: 3.00	3.36	53.2	
Step 2: 6.10	6.82	52.6	
Step 3: 9.00	9.63	52.0	
Step 4: 12.1	13.6	51.3	
Linear skin factor: 4.58 [-]			
Non-linear skin factor: 0.83 [d/m³]			
Effective well radius: 1.0E-3 [m]			

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J7_K

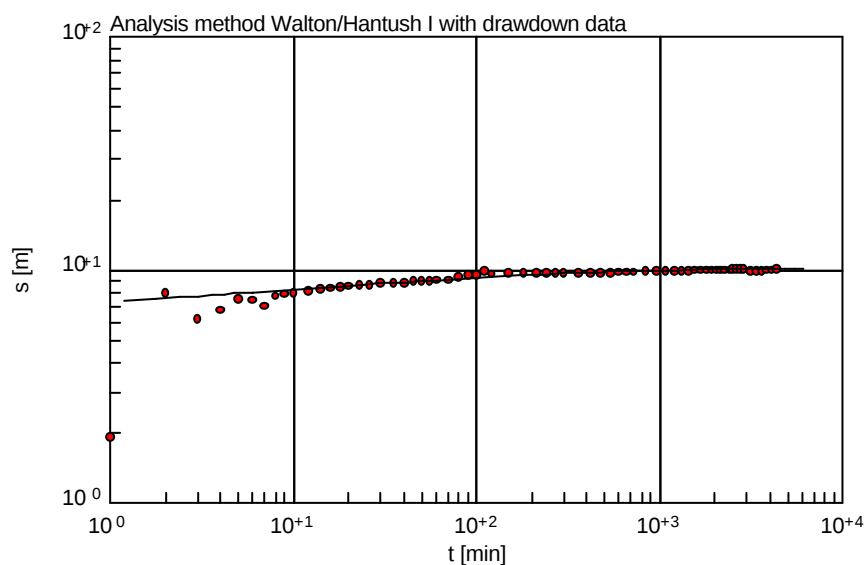


Borehole, well & aquifer

Drilled:	21.07.2000
Latitude:	25.29149
Longitude:	18.41784
Elevation:	1150 [m]
Depth:	55 [m]
Stick up:	0.70 [m]
Bh. radius:	0.1555 [m]
Casing radius:	0.084 [m]
RWL:	10.04 [m]
max.drawdown:	10.14 [m]
Aq.type:	confined
Aq.thickness:	30.00 [m]
Stratigraphy:	Kalahari
Lithology:	sandstone

Test running

Start:	22/08/2000 07:01:00
Dis.dur.:	4320 [min]
Av.dis.:	7.11 [m³/h]
Max.dis.:	7.15 [m³/h]
Min.dis.:	7.07 [m³/h]
Total dis.:	512 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

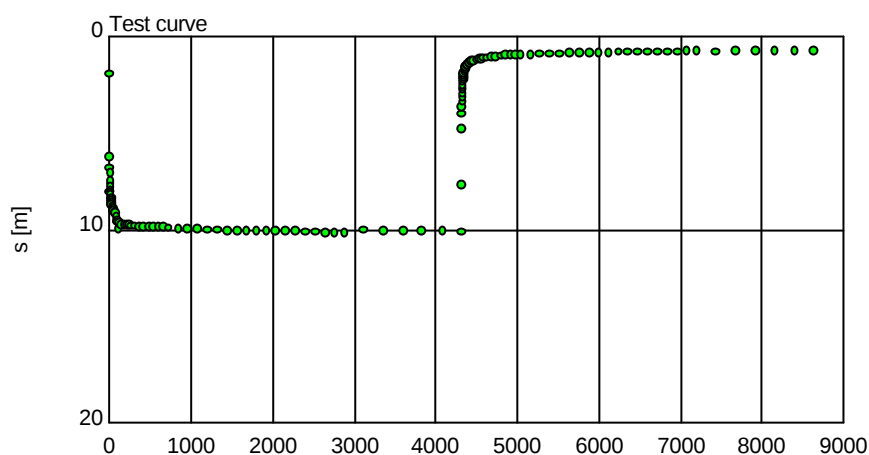
Match parameter:	
Q:	7.11 [m³/h]
t:	302 [min]
s:	9.87 [m]
1/u:	5.03E9 [-]
W(u,r/B):	21.7 [-]
Aquifer parameter:	
T:	29.9 [m²/d]
k:	0.997 [m/d]
Boundary parameter:	
B:	1E4 [m]
m':	20 [m]
k':	5.98E-6 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

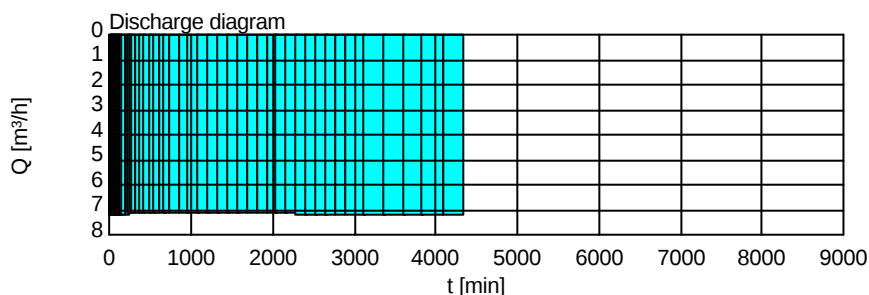
Test pumping analysis

Pumped well J7_K



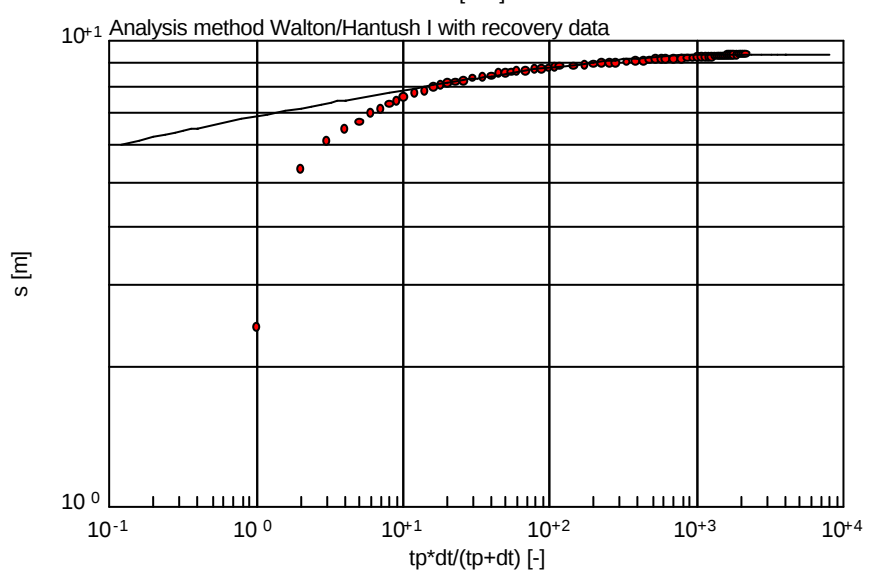
Borehole, well & aquifer

Drilled:	21.07.2000
Latitude:	25.29149
Longitude:	18.41784
Elevation:	1150 [m]
Depth:	55 [m]
Stick up:	0.70 [m]
Bh. radius:	0.1555 [m]
Casing radius:	0.084 [m]
RWL:	10.04 [m]
max.drawdown:	10.14 [m]
Aq.type:	confined
Aq.thickness:	30.00 [m]
Stratigraphy:	Kalahari
Lithology:	sandstone



Test running

Start:	22/08/2000 07:01:00
Dis.dur.:	4320 [min]
Av.dis.:	7.11 [m³/h]
Max.dis.:	7.15 [m³/h]
Min.dis.:	7.07 [m³/h]
Total dis.:	512 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

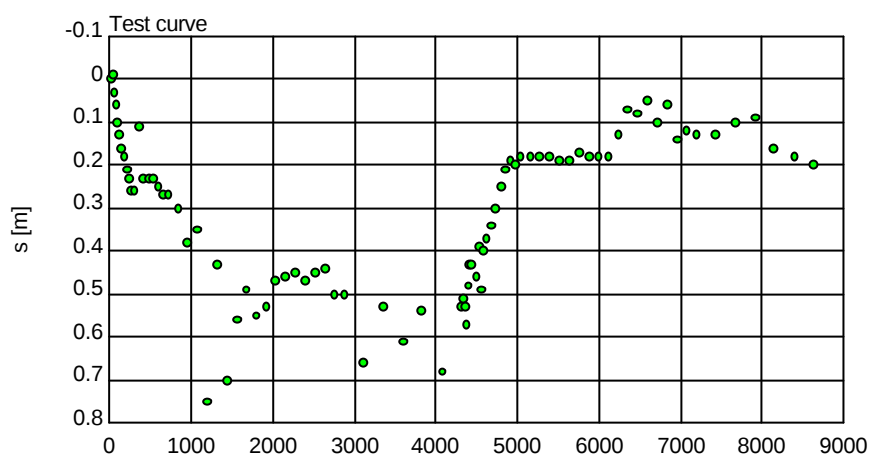
Match parameter:	
Q:	7.11 [m³/h]
t:	262 [min]
s:	8.88 [m]
1/u:	6.58E9 [-]
W(u,r/B):	21.2 [-]
Aquifer parameter:	
T:	32.4 [m²/d]
k:	1.08 [m/d]
Boundary parameter:	
B:	1E4 [m]
m':	20 [m]
k':	6.47E-6 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

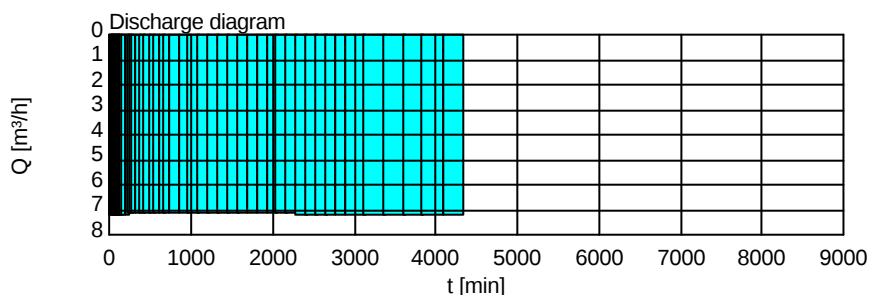
Test pumping analysis

Observation well J7Huis



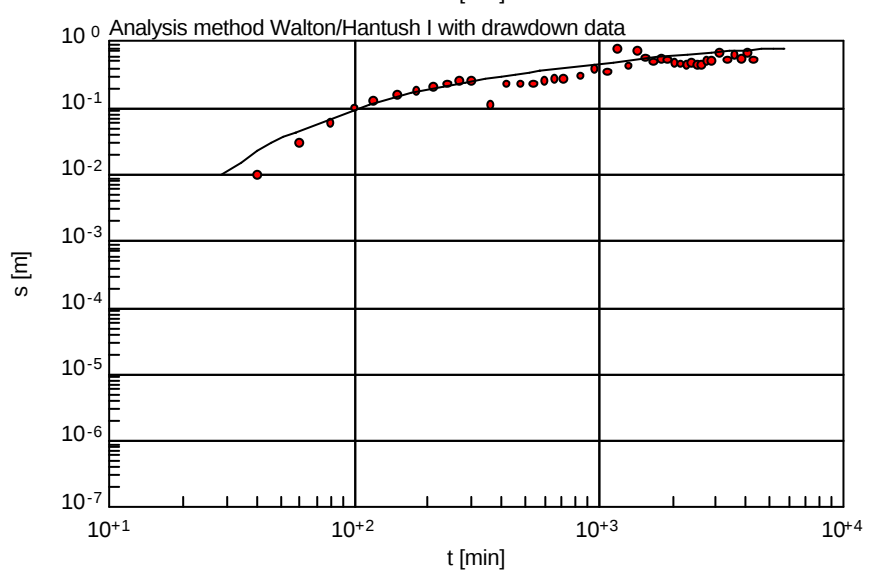
Borehole, well & aquifer

Drilled:	22.07.2000
Latitude:	25.46148
Longitude:	19.43324
Elevation:	1150 [m]
Depth:	346 [m]
Stick up:	0.48 [m]
Well distance:	230.00 [m]
RWL:	10.77 [m]
max.drawdown:	10.14 [m]
Aq.type:	confined
Aq.thickness:	-75.00 [m]
Stratigraphy:	Kalahari
Lithology:	sandstone



Test running

Start:	22/08/2000 07:01:00
Dis.dur.:	4320 [min]
Av.dis.:	7.11 [m³/h]
Max.dis.:	7.15 [m³/h]
Min.dis.:	7.07 [m³/h]
Total dis.:	512 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

Match parameter:

Q:	7.11 [m³/h]
t:	196 [min]
s:	0.166 [m]
1/u:	3.42 [-]
W(u,r/B):	0.832 [-]

Aquifer parameter:

T:	68 [m²/d]
----	-----------

S:

S:	0.0002 [-]
----	------------

Boundary parameter:

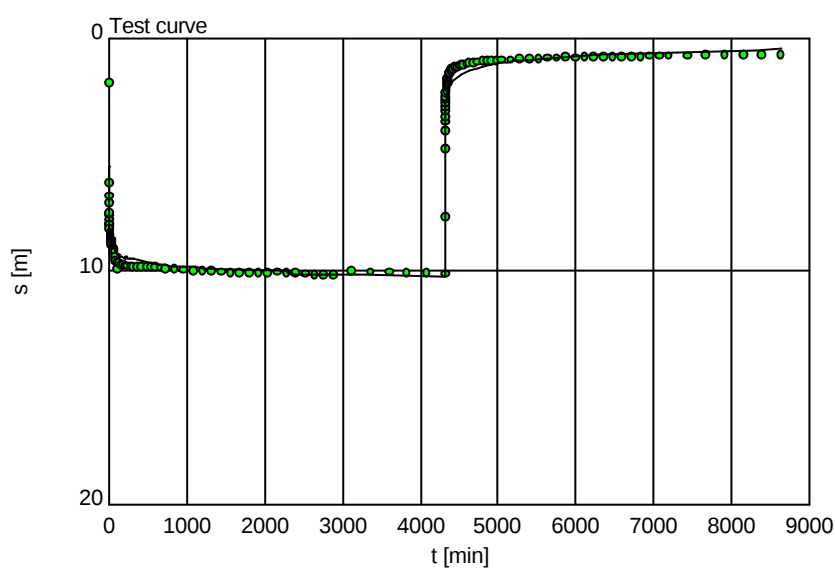
B:	1E4 [m]
m':	20 [m]
k':	1.36E-5 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

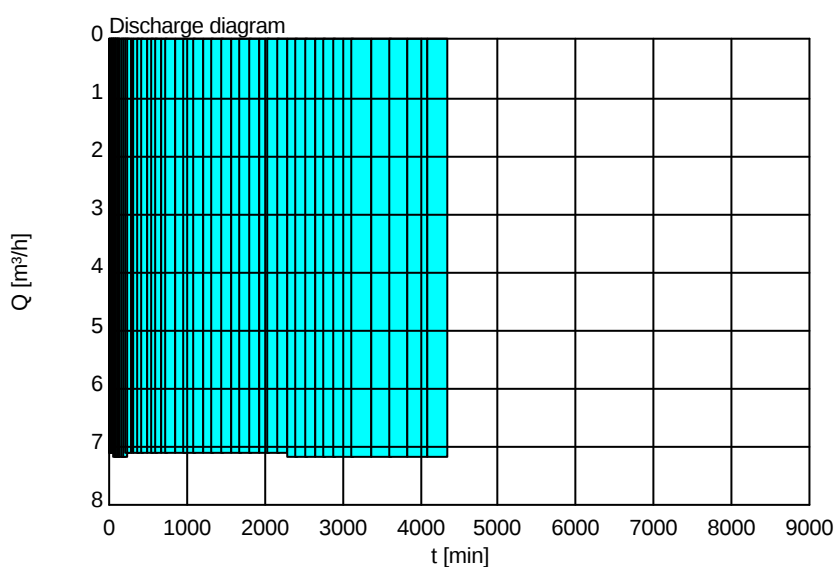
Test pumping diagnosis

Pumped well J7_K



Remarks

Simulation of the actual draw down during the constant discharge test using the Walton/Hantush I model for leaky aquifers



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4283 [min]

Av.dis.: 7.11 [m^3/h]
max.dis.: 7.15 [m^3/h]
min.dis.: 7.07 [m^3/h]
Qn: 7.15 [m^3/h]

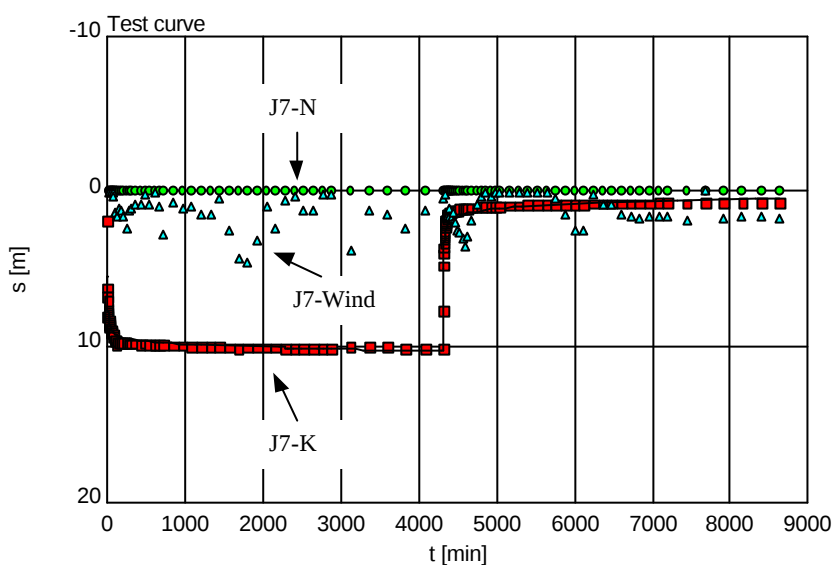
Dis.sum: 512 [m^3]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Pumped well J7_K

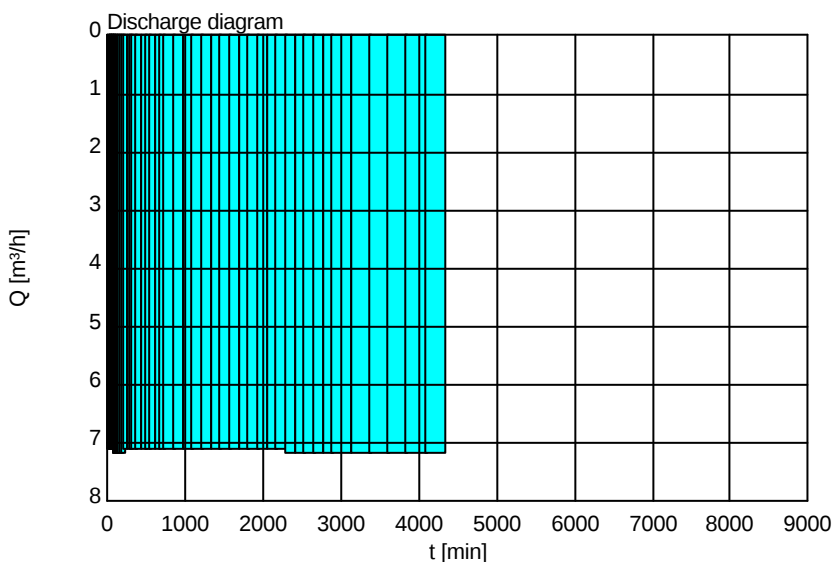


Remarks

Merged data of J7_K and observation boreholes J7_N (56.2 m distance) and J7_Wind (320 m distance).

J7_Wind is installed with a wind pump and was pumped during the test.

J7_N was not influenced by the pumping from J7_K.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4283 [min]

Av.dis.: 7.11 [m³/h]
max.dis.: 7.15 [m³/h]
min.dis.: 7.07 [m³/h]
Qn: 7.15 [m³/h]

Dis.sum: 512 [m³]

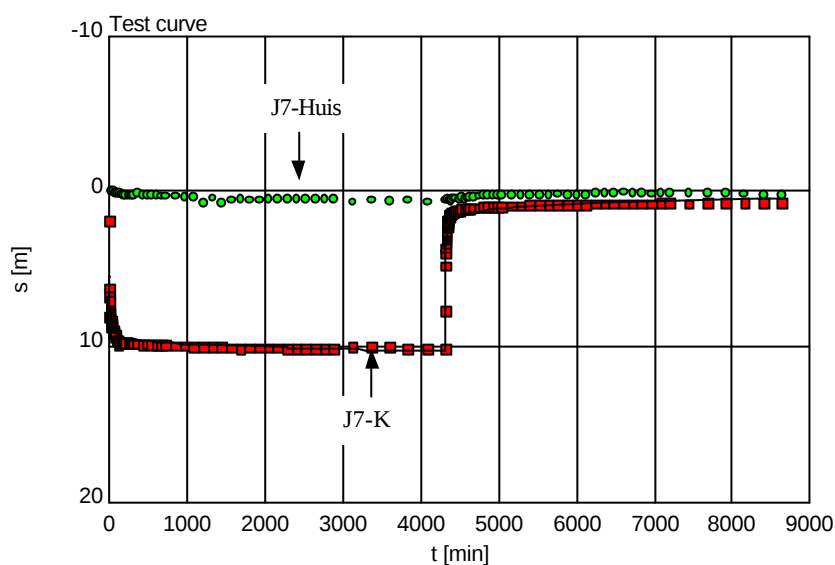
Distance of observation boreholes: JK-N = 56.2 m; Jk-Wind = 320 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Pumped well J7_K

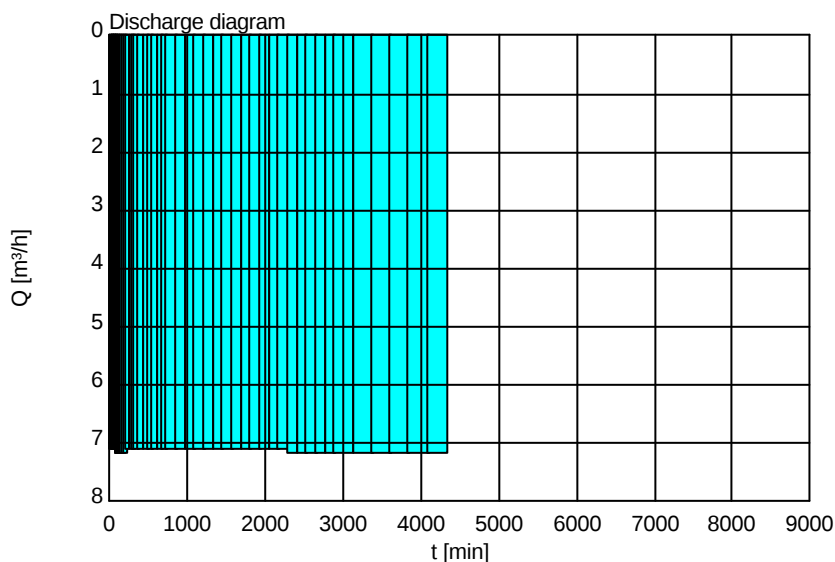


Remarks

Merged data of J7_K and observation borehole J7_Huis (230 m distance).

J7_Huis penetrates the same aquifer as J7_K and the water level was influenced by the abstraction.

Transmissivity and storativity values were calculated from the J7_Huis data (See Annex 3.1).



Discharge info

Dis.dur.: 4320 [min]

tcorr: 4283 [min]

Av.dis.: 7.11 [m^3/h]

max.dis.: 7.15 [m^3/h]

min.dis.: 7.07 [m^3/h]

Qn: 7.15 [m^3/h]

Dis.sum: 512 [m^3]

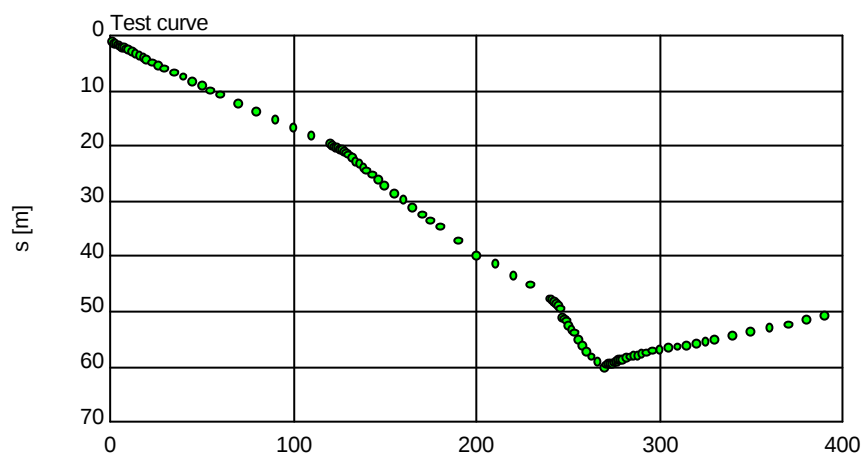
Distance of observation borehole: JK-Huis = 230 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

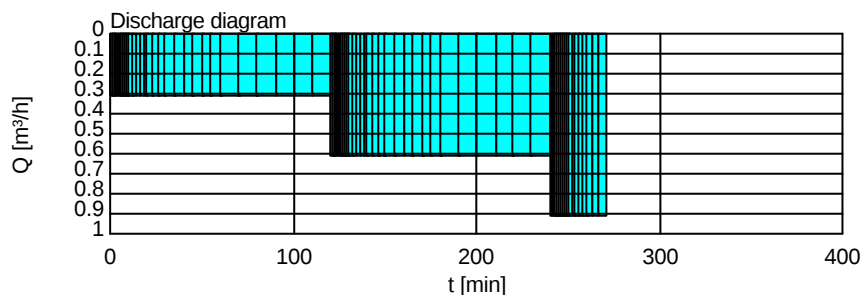
Step test analysis

Pumped well J7_N



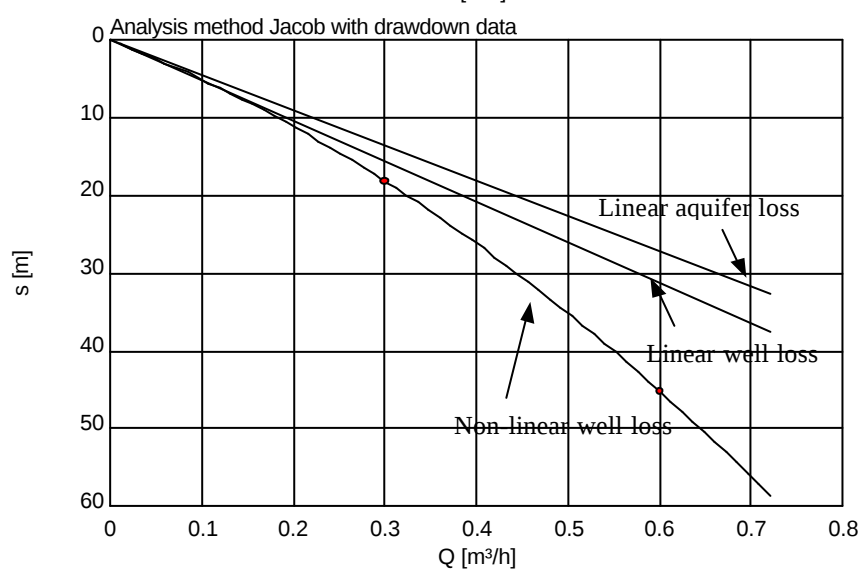
Borehole, well & aquifer

Drilled:	05/08/00
Latitude:	25.29107
Longitude:	18.41756
Elevation:	1100 [m]
Depth:	250 [m]
Stick up:	1.00 [m]
Bh. radius:	0.100 [m]
Casing radius:	0.076 [m]
RWL:	24.91 [m]
max.drawdown:	60.17 [m]
Aq.type:	confined
Aq.thickness:	17.00 [m]
Stratigraphy:	Nossob
Lithology:	Sandstone



Test running

Start:	30/08/2000 07:00:00
Dis.dur.:	270 [min]
Av.dis.:	0.5 [m³/h]
Max.dis.:	0.9 [m³/h]
Min.dis.:	0.3 [m³/h]
Total dis.:	2.25 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

Well performance:

s:	$(B1+B2)*Q+C*Q^2$
Linear aquifer loss B1:	37.07
Linear well loss B2:	8.06
Non-linear well loss C:	50.22

	Q [m³/h]	s [m]	Eff [%]
Step 1:	0.30	18.1	86.6
Step 2:	0.60	45.2	69.3

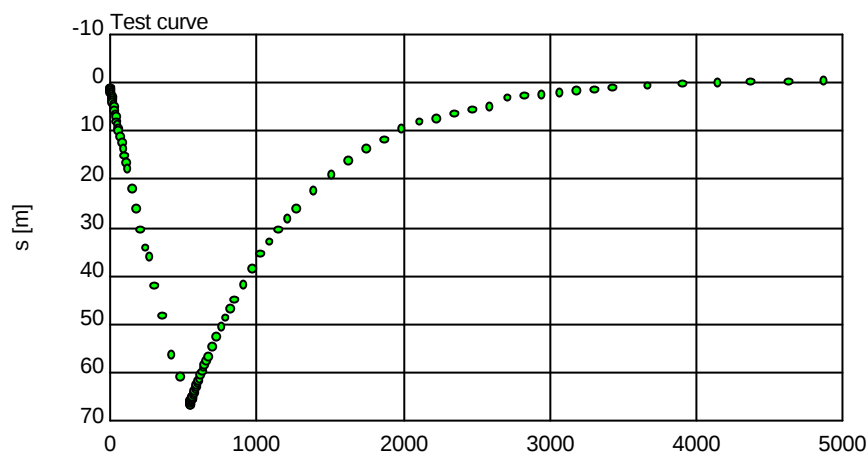
Linear skin factor:	$2.1E-2$ [-]
Non-linear skin factor:	3.16 [d/m³]
Effective well radius:	$9.0E-2$ [m]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

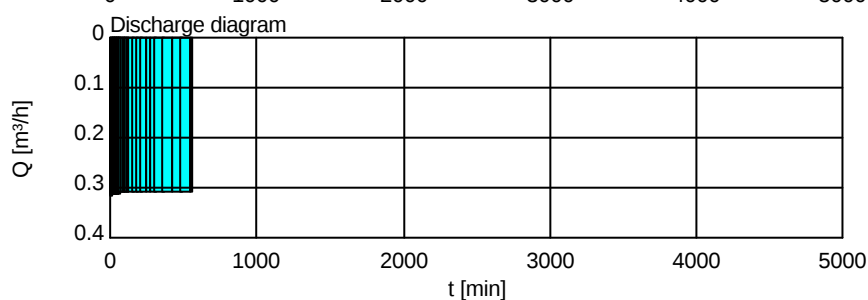
Test pumping analysis

Pumped well J7_N



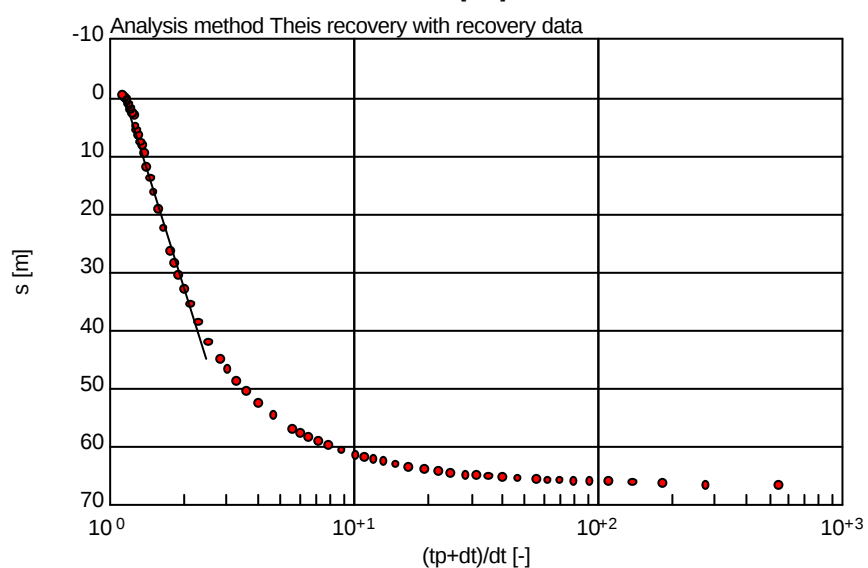
Borehole, well & aquifer

Drilled:	05/08/00
Latitude:	25.29107
Longitude:	18.41756
Elevation:	1100 [m]
Depth:	250 [m]
Stick up:	1.00 [m]
Bh. radius:	0.100 [m]
Casing radius:	0.076 [m]
RWL:	22.99 [m]
max.drawdown:	66.61 [m]
Aq.type:	confined
Aq.thickness:	17.00 [m]
Stratigraphy:	Nossob
Lithology:	Sandstone



Test running

Start:	01/09/2000 12:00:00
Dis.dur.:	547 [min]
Av.dis.:	0.305 [m³/h]
Max.dis.:	0.311 [m³/h]
Min.dis.:	0.303 [m³/h]
Total dis.:	2.78 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

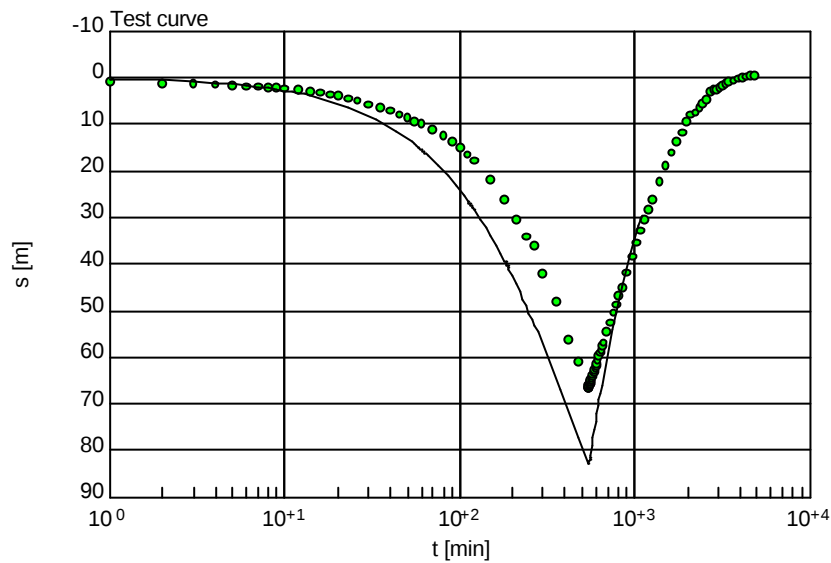
Match parameter:	
Q:	0.305 [m³/h]
b:	133 [m]
tcorr:	547 [min]
to:	1.14 [-]
Aquifer parameter:	
T:	0.0101 [m²/d]
k:	0.000592 [m/d]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Step test diagnosis

Pumped well J7_N



Remarks

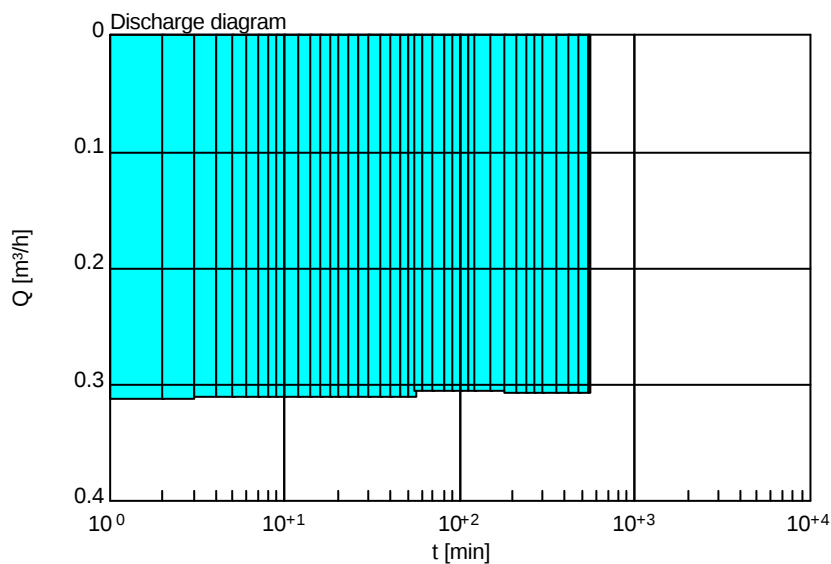
Simulation of the draw down/recovery curve applying the Theis model for confined aquifers.

The following parameters were used:

$T = 0.04 \text{ m}^2/\text{day}$

$S = 0.0008$

Linear skin $s = 0.1$



Discharge info

Dis.dur.: 547 [min]

tcorr: 547 [min]

Av.dis.: 0.30 [m³/h]

max.dis.: 0.31 [m³/h]

min.dis.: 0.30 [m³/h]

Qn: 0.30 [m³/h]

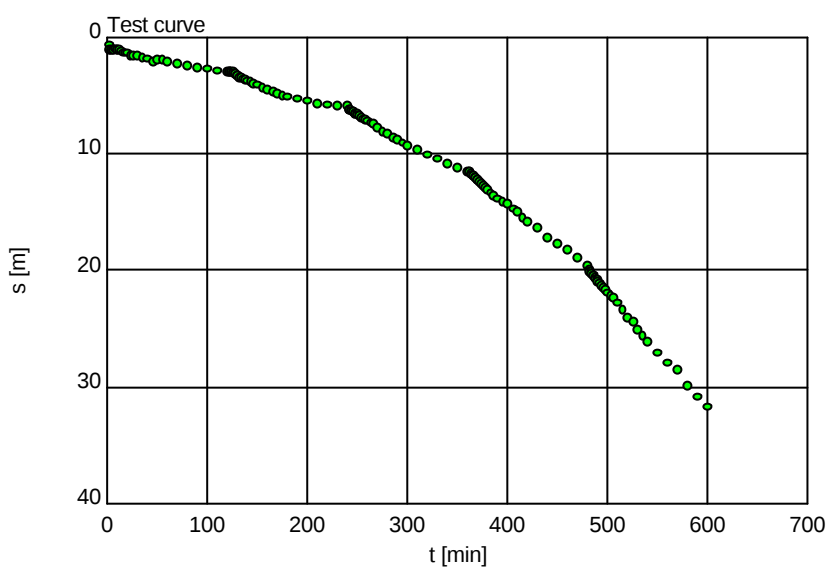
Dis.sum: 2.78 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

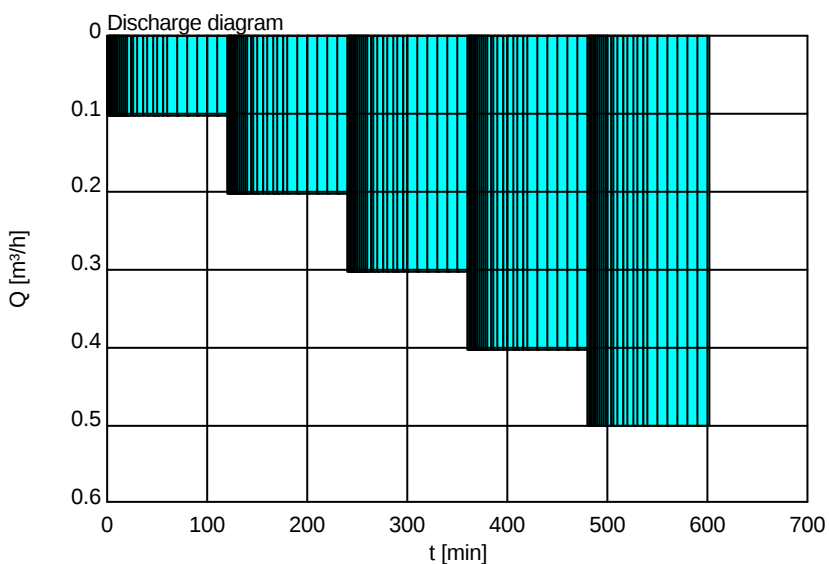
Test pumping diagnosis

Pumped well J8_K



Remarks

At these very low abstraction rates the well efficiency cannot be determined with the available evaluation methods



Discharge info

Dis.dur.: 600 [min]
tcorr: 314 [min]

Av.dis.: 0.30 [m³/h]
max.dis.: 0.50 [m³/h]
min.dis.: 0.10 [m³/h]
Qn: 0.50 [m³/h]

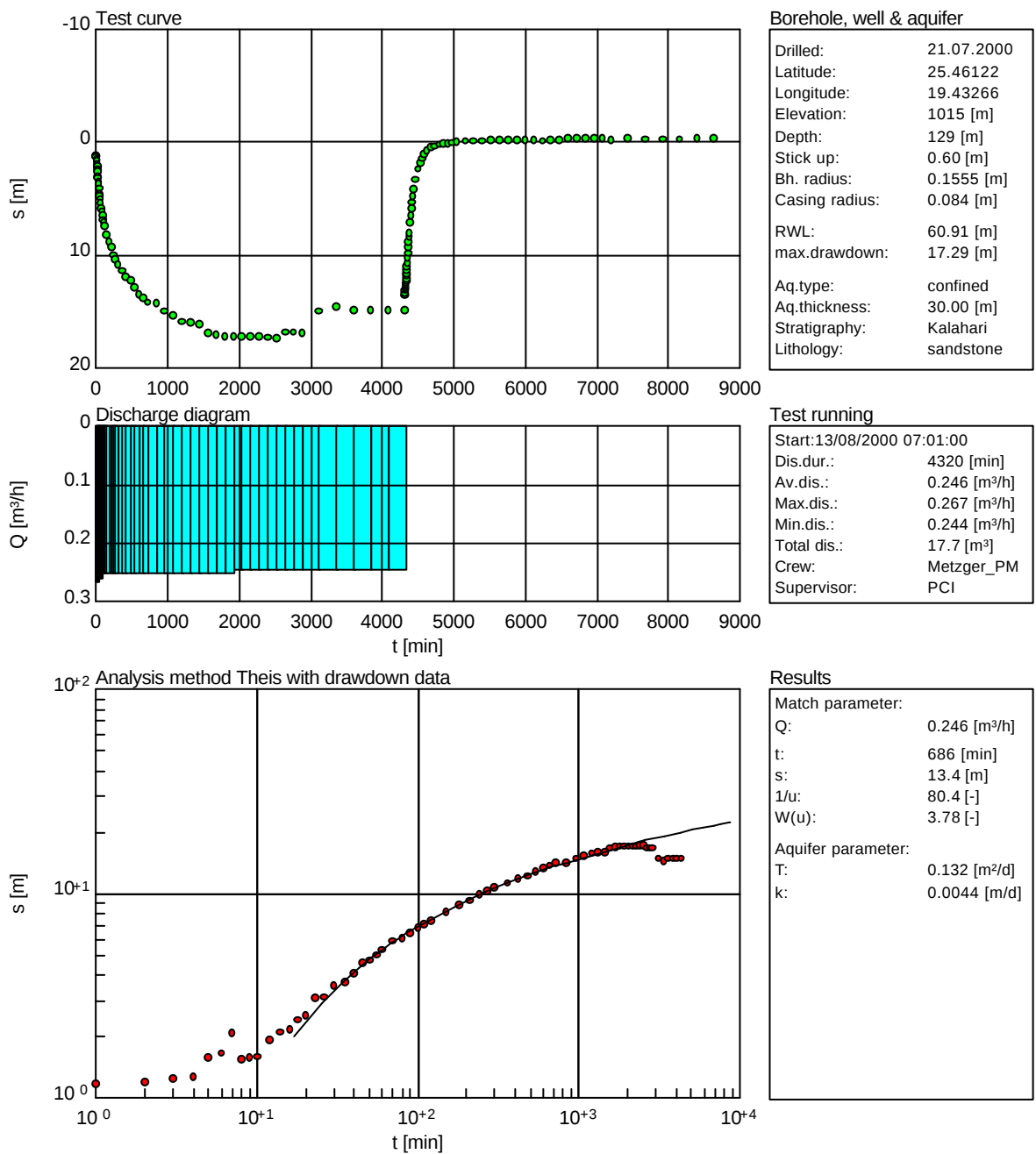
Dis.sum: 3.00 [m³]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J8_K

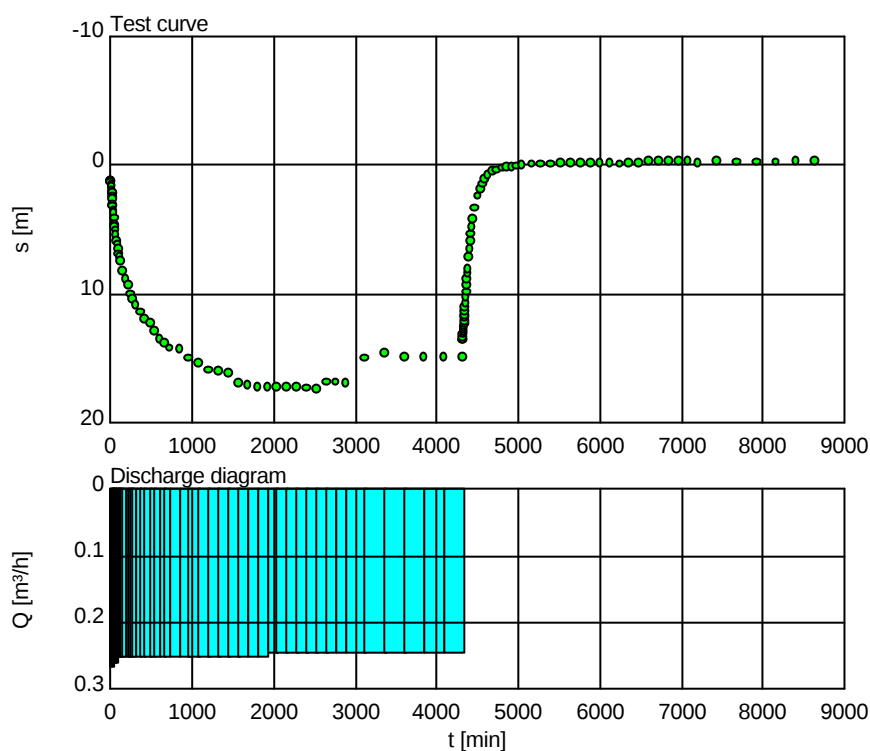


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J8_K

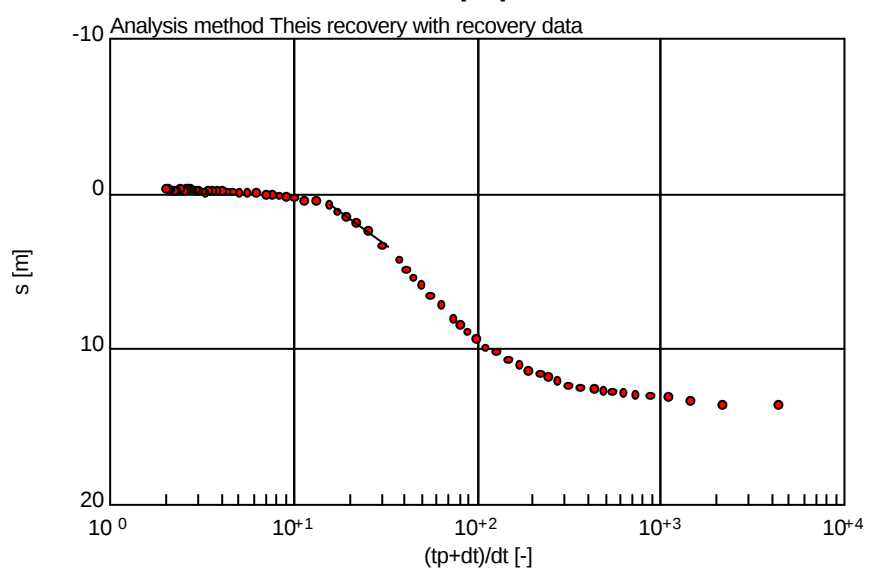


Borehole, well & aquifer

Drilled:	21.07.2000
Latitude:	25.46122
Longitude:	19.43266
Elevation:	1015 [m]
Depth:	129 [m]
Stick up:	0.60 [m]
Bh. radius:	0.1555 [m]
Casing radius:	0.084 [m]
RWL:	60.91 [m]
max.drawdown:	17.29 [m]
Aq.type:	confined
Aq.thickness:	30.00 [m]
Stratigraphy:	Kalahari
Lithology:	sandstone

Test running

Start:	13/08/2000 07:01:00
Dis.dur.:	4320 [min]
Av.dis.:	0.246 [m³/h]
Max.dis.:	0.267 [m³/h]
Min.dis.:	0.244 [m³/h]
Total dis.:	17.7 [m³]
Crew:	Metzger_PM
Supervisor:	PCI



Results

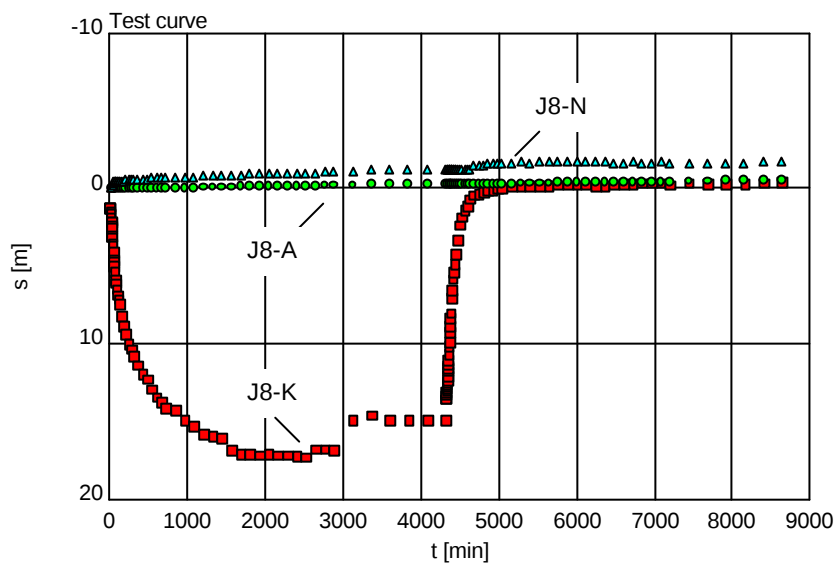
Match parameter:	
Q:	0.244 [m³/h]
b:	8.77 [m]
tcorr:	4372 [min]
to:	13.4 [-]
Aquifer parameter:	
T:	0.122 [m²/d]
k:	0.00408 [m/d]
est.S:	0.005 [-]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Pumped well J8_K

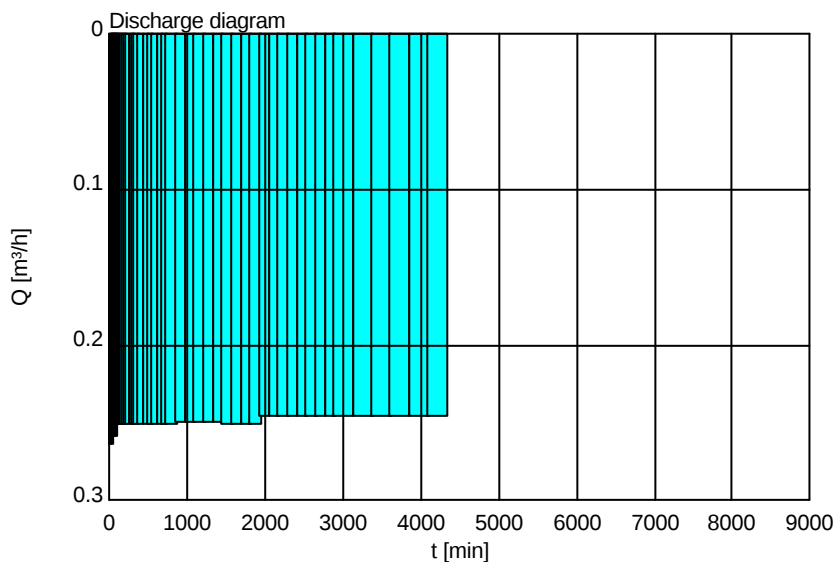


Remarks

Merged data from abstraction borehole J8_K and observation boreholes J8_A and J8_N.

The water levels of observation boreholes are rising during the test.

Although pumping at a very low rate the draw down and recovery curves of J8_K are reasonably good and the data were evaluated for T and kf.



Discharge info

Dis.dur.: 600 [min]
tcorr: 314 [min]

Av.dis.: 0.30 [m³/h]
max.dis.: 0.50 [m³/h]
min.dis.: 0.10 [m³/h]
Qn: 0.50 [m³/h]

Dis.sum: 3.00 [m³]

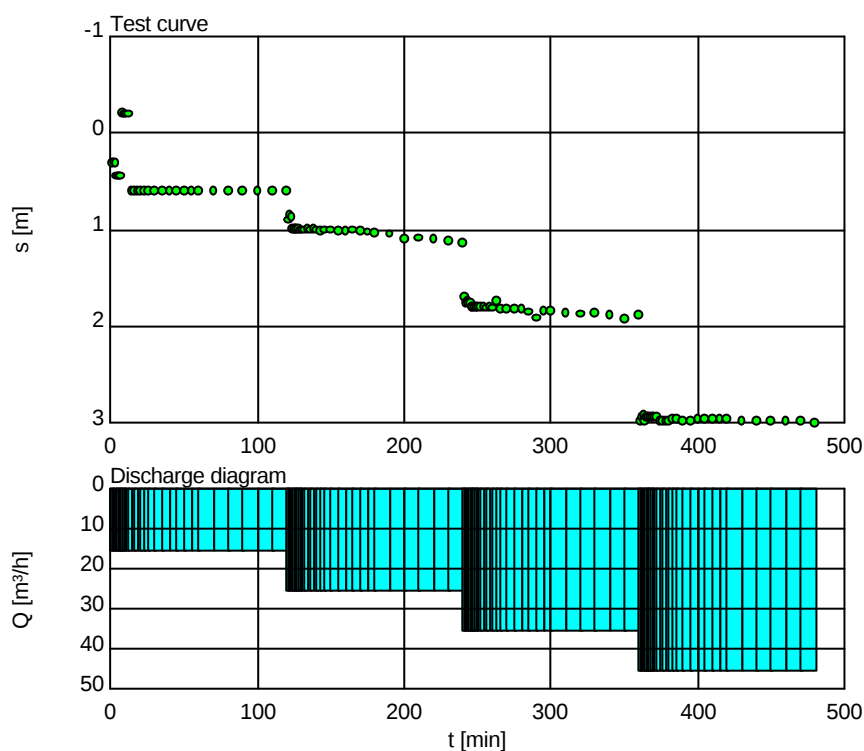
Distance of observation boreholes: J8-A = 121.7 m; J8-N = 61.4 m

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Step test analysis

Pumped well J9_A

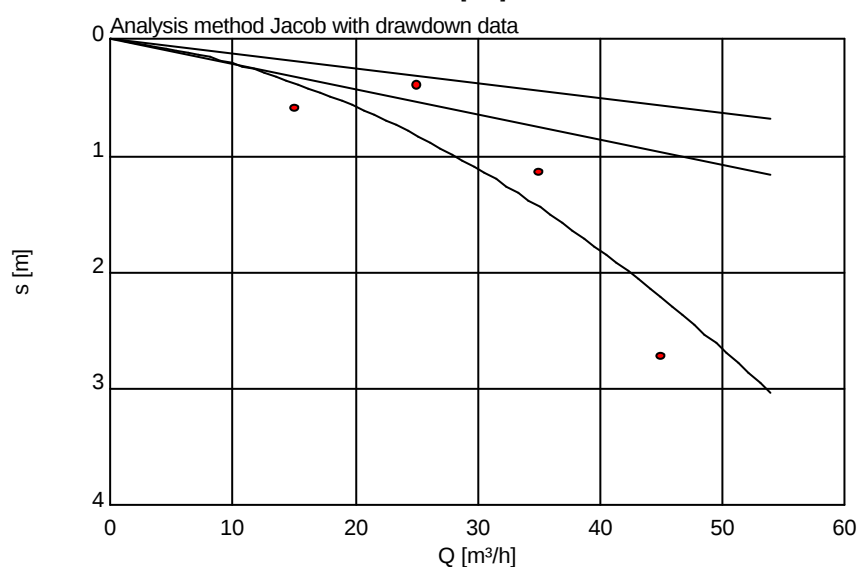


Borehole, well & aquifer

Drilled: 08/00
Latitude: 24.00125
Longitude: 18.21638
Elevation: 1209 [m]
Depth: 142 [m]
Stick up: 0.70 [m]
Bh. radius: 0.100 [m]
Casing radius: 0.076 [m]
RWL: 3.22 [m]
max.drawdown: 2.99 [m]
Aq.type: confined
Aq.thickness: 75.00 [m]
Stratigraphy: Auob
Lithology: Sandstone

Test running

Start:29/08/2000 11:00:00
Dis.dur.: 480 [min]
Av.dis.: 30 [m³/h]
Max.dis.: 45 [m³/h]
Min.dis.: 15 [m³/h]
Total dis.: 240 [m³]
Crew: Metzger_PM
Supervisor: PCI



Results

Well performance:

$s: (B1+B2)*Q+C*Q^2$
Linear aquifer loss B1: $2.1E-2$
Linear well loss B2: $-8.6E-03$
Non-linear well loss C: $8.1E-4$

	Q [m³/h]	s [m]	Eff [%]
Step 1:	15.0	0.59	85.9
Step 2:	25.0	0.39	64.8
Step 3:	35.0	1.14	52.1
Step 4:	45.0	2.72	43.5

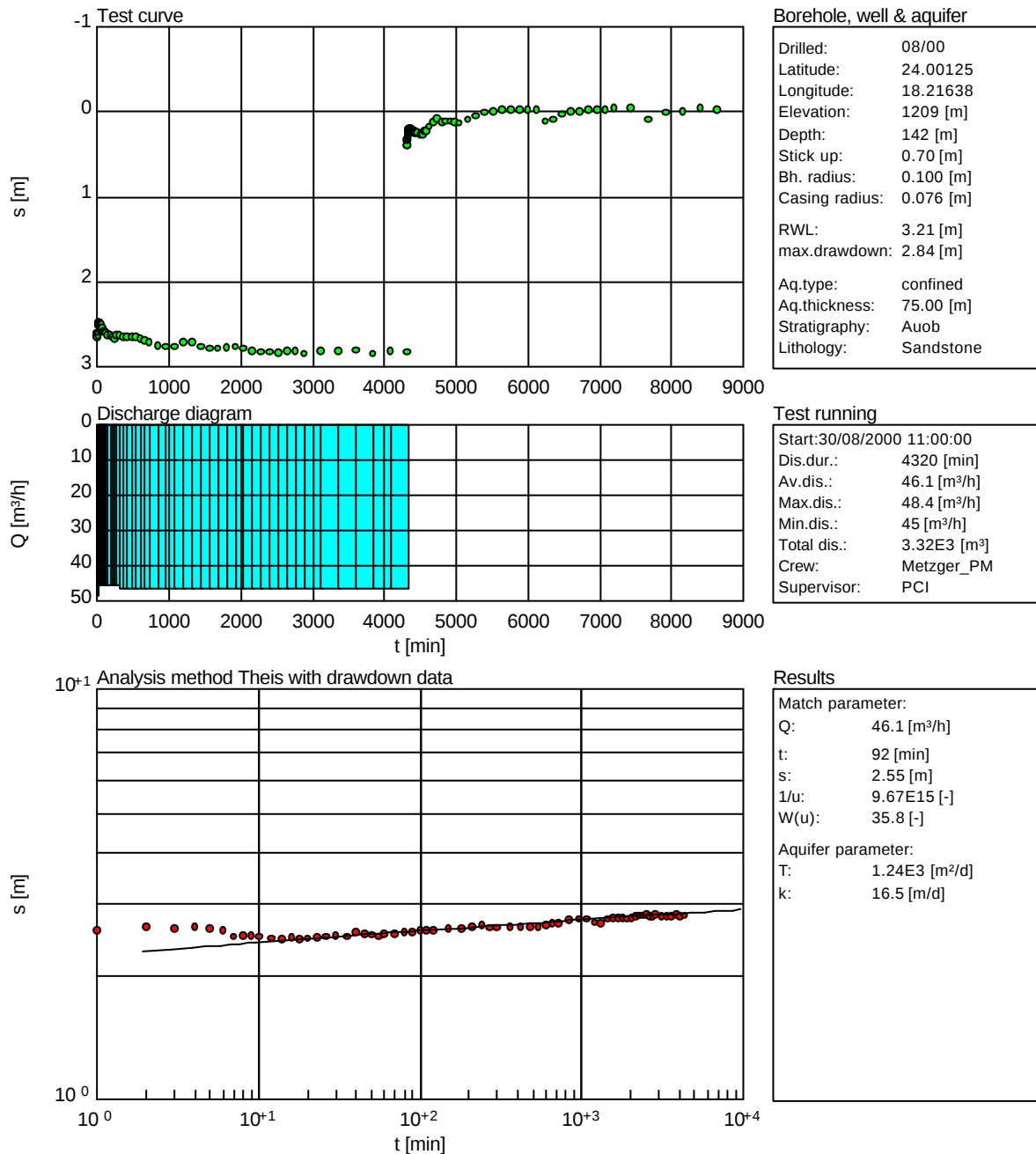
Linear skin factor: $-2.80 [-]$
Non-linear skin factor: $6.29 [d/m^3]$
Effective well radius: $1.2E-5 [m]$

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J9_A

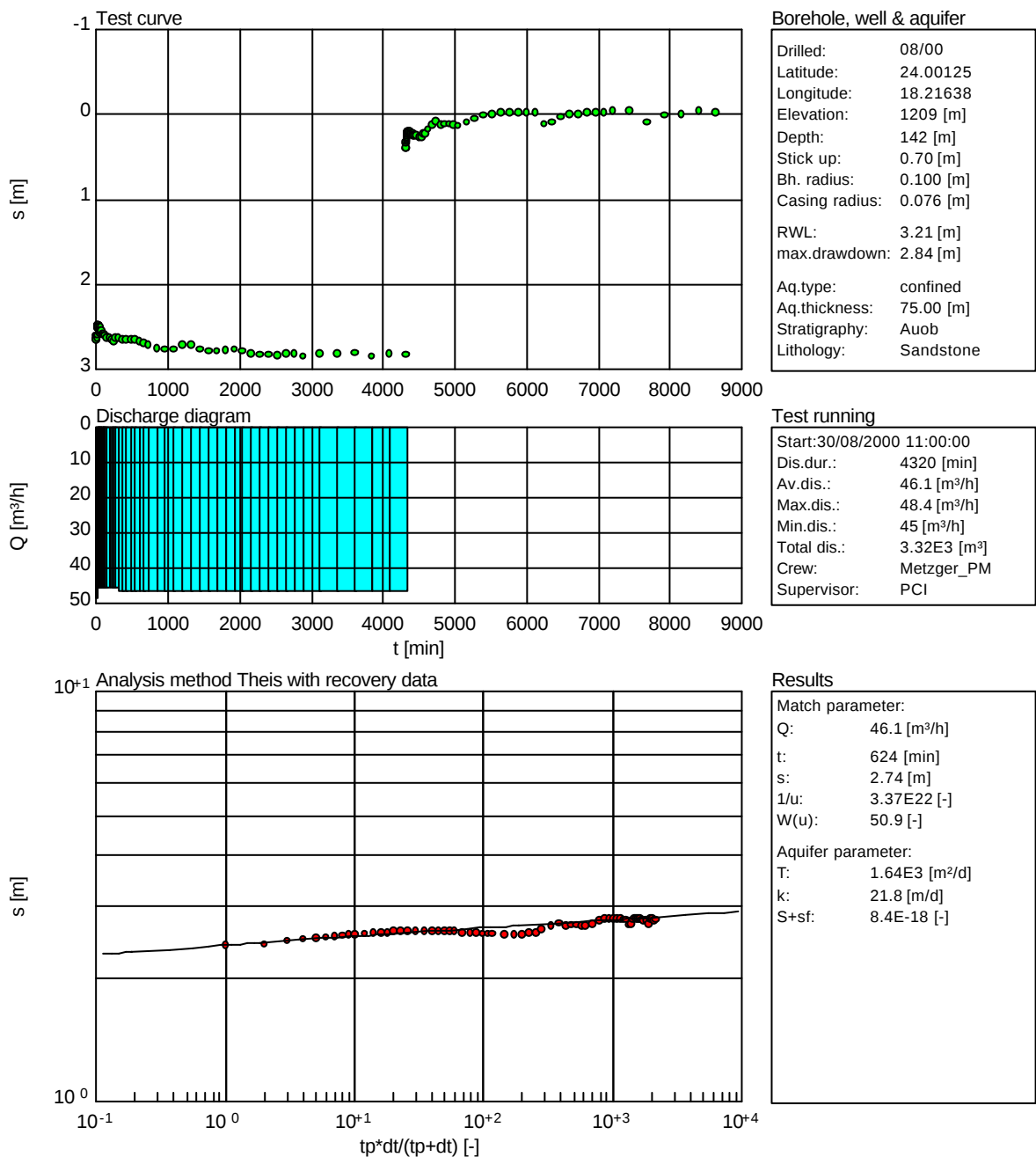


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Pumped well J9_A

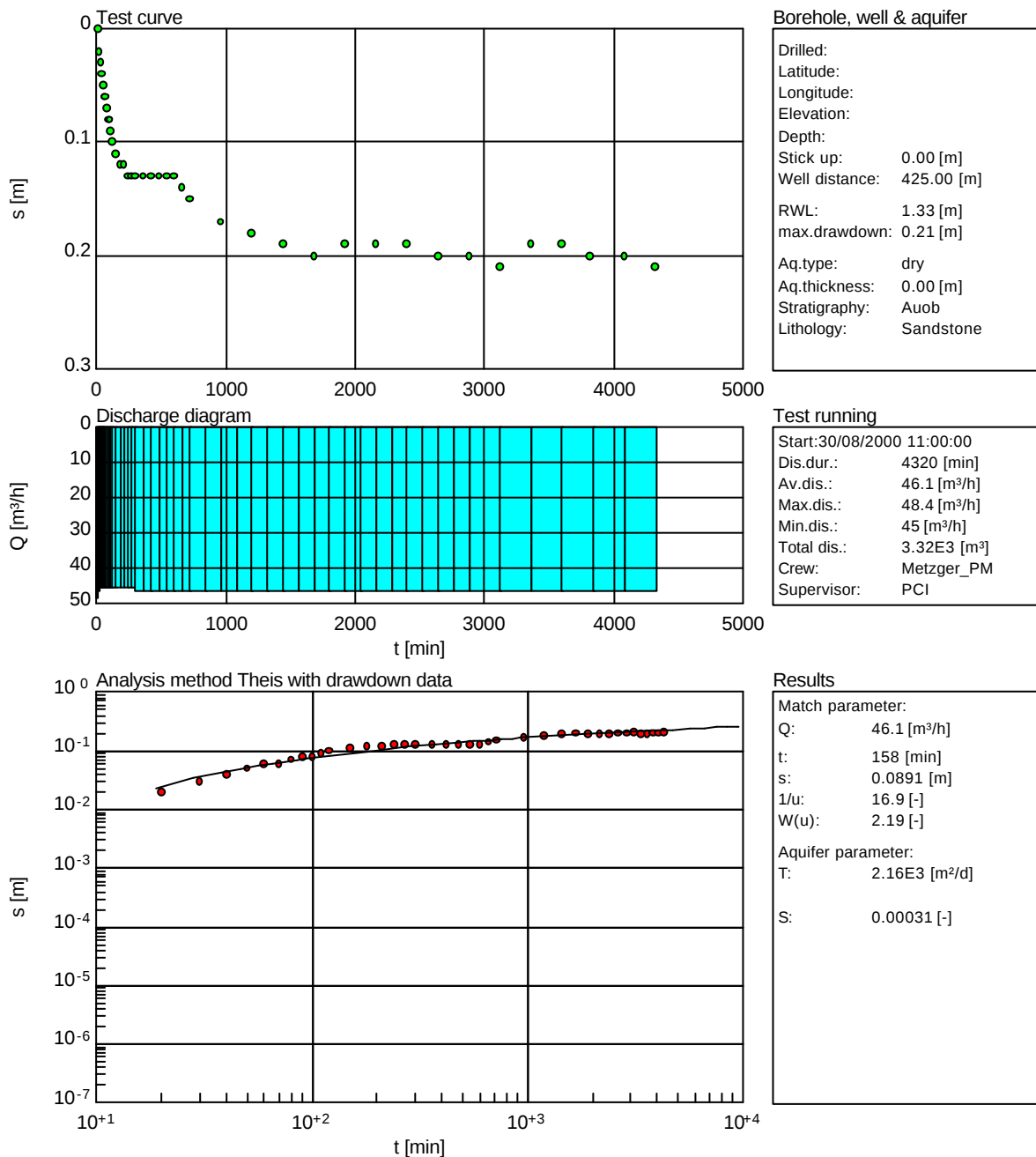


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping analysis

Observation well WW31759

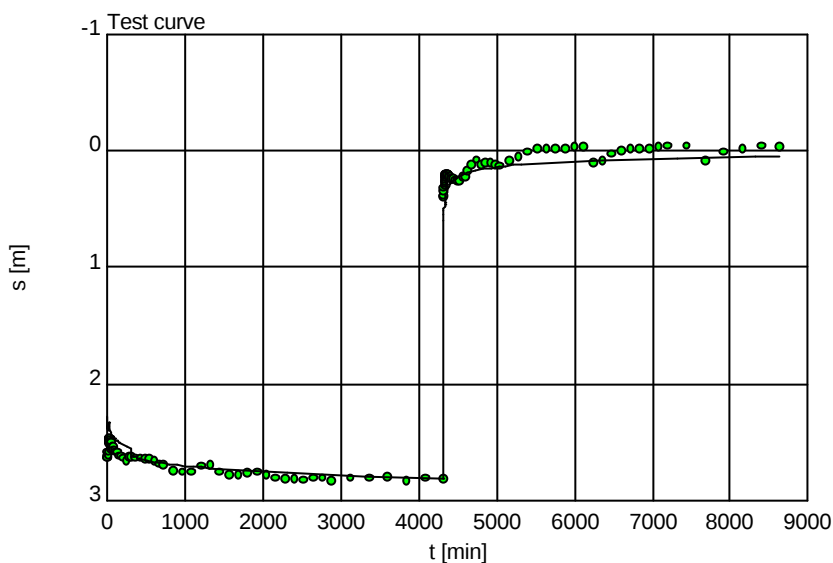


Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Pumped well J9_A

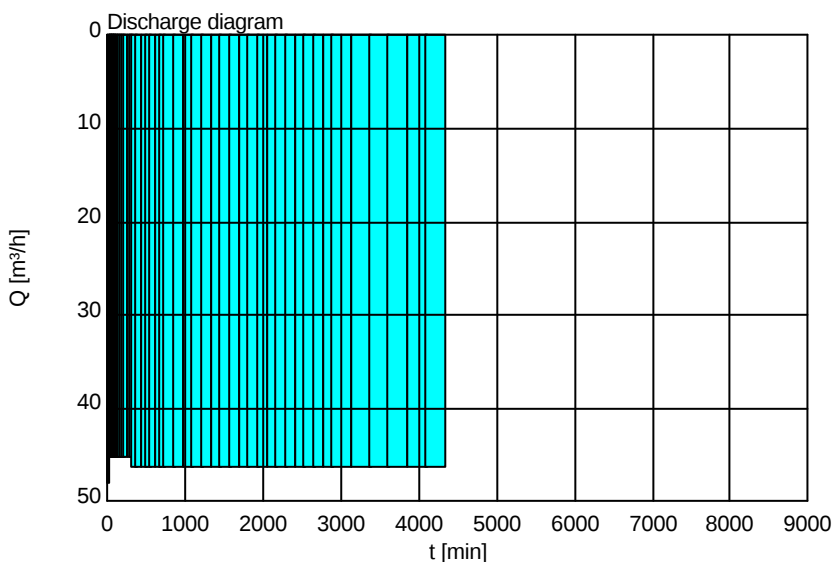


Remarks

Simulated draw down / recovery curve applying the Theis model for confined aquifers.

The simulated curve fits the actual data using the following aquifer parameter:

Confined aquifer
 $T = 1240 \text{ m}^2/\text{day}$
 $S = 0.00005$
Linear skin $s = 8.0$



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4312 [min]

Av.dis.: 46.13 [m^3/h]
max.dis.: 48.38 [m^3/h]
min.dis.: 45.02 [m^3/h]
Qn: 46.21 [m^3/h]

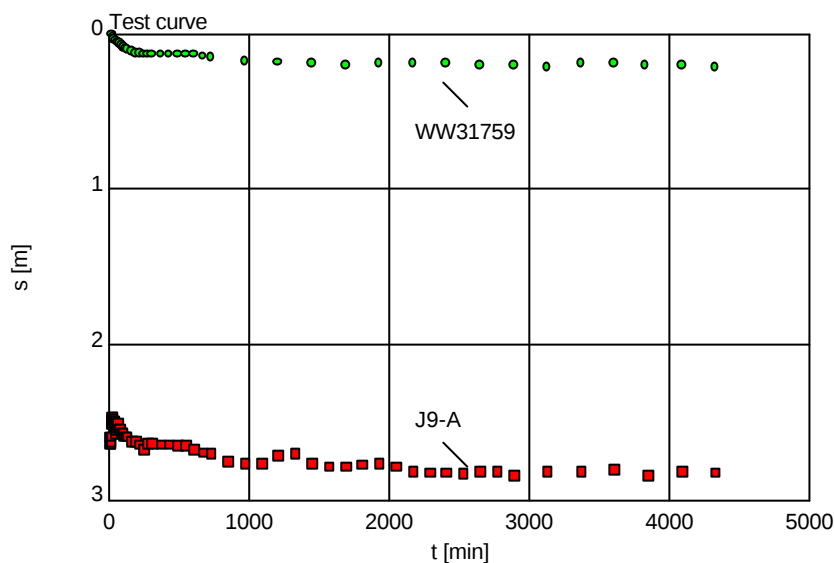
Dis.sum: 3322 [m^3]

Groundwater Study in the Stampriet Artesian Basin

Evaluation of Test Pumping Data

Test pumping diagnosis

Pumped well J9_A

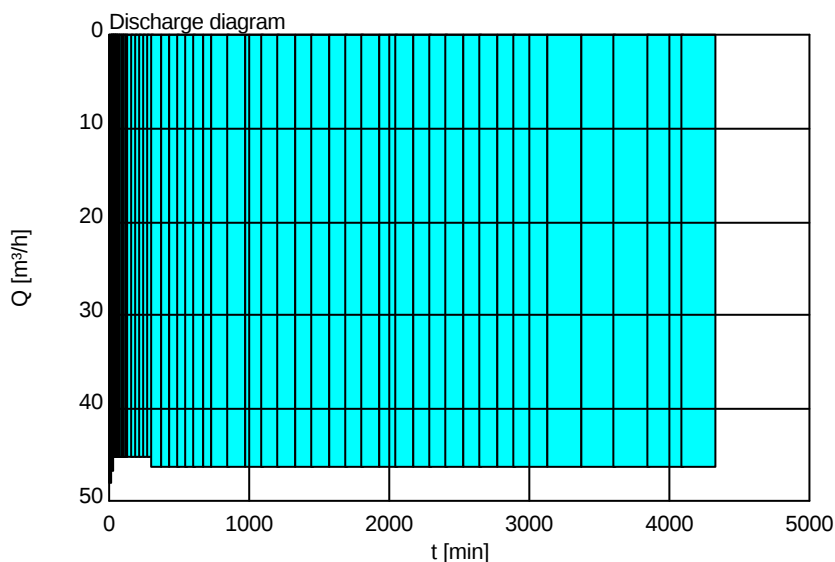


Remarks

Merged draw down data of pumped borehole J9_A and observation borehole WW31759.

Although at 425 m distance there is a clear draw down observed in WW31759 during pumping.

The data of the observation borehole was evaluated for transmissivity and storativity.



Discharge info

Dis.dur.: 4320 [min]
tcorr: 4312 [min]

Av.dis.: 46.13 [m³/h]
max.dis.: 48.38 [m³/h]
min.dis.: 45.02 [m³/h]
Qn: 46.21 [m³/h]

Dis.sum: 3322 [m³]

Distance to observation borehole WW31759 = 425 m