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Hydraulic interference test with borehole HFM33 used as pumping borehole, November of 2007

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Abstract

An interference test was performed during November 2007 at Forsmark with borehole HFM33 used as pumping borehole. HFM33 is situated just south-west of drill site 11, north of the candidate area on the same peninsula where SFR is located. It is approximately 140 m long and inclined c. 59° with a dip-direction of approximately 220 degrees from local north. The tests were performed in order to increase the understanding of the hydraulic conditions in the north-western part of the candidate area at Forsmark. The main purpose of the interference tests was to document how different fracture zones are connected hydraulically, to quantify their hydraulic properties and to clarify whether there are any hydraulic boundaries in the area.

The interference test was performed by pumping in HFM33 and at the same time monitoring pressure responses in different observation sections in surrounding boreholes. All boreholes monitored for potential responses are part of the HMS, the Hydro Monitoring System at Forsmark. In total, 148 observation sections in 40 observation boreholes were included in the interference test. 22 of the 40 boreholes are core-drilled and have 103 sections included in the interference test. 18 boreholes are percussion-drilled with a total of 45 sections.

The flow period in the interference test lasted for approximately two weeks and the subsequent recovery was measured for about seven days. The pumping flow rate in HFM33 was relatively constant at c. 232 L/min during the flow period, resulting in a final drawdown in the pumping borehole of about 16 m. These values indicate a specific capacity (~transmissivity) of c. $2 \cdot 10^{-4}$ m^2/s which is a high value.

Out of the 148 observation sections included in the interference test, 86 did not respond at all to pumping in HFM33 or responded very weakly. During the end of the flow period the groundwater level raised significantly, presumably the consequence of the precipitation that was measured in the area during the flow period. This fact is likely to lead to an underestimation of calculated drawdowns in the observation sections.

No sections clearly display both a short response time lag and a large drawdown. Section HFM38: 24–41 m exhibits the fastest response. Since the total drawdown is likely to be somewhat underestimated, this section may have a response distinct enough to be characterised as a potential zone response between HFM33 and the actual section. KFM06C: 531–540 m responds most strongly of all observation sections.

Four observation sections, KFM06A: 341–362 m, KFM01D: 0–153 m, HFM21: 107–202 m and HFM01: 46–200 m, as well as the pumping borehole were evaluated quantitatively using methods for transient evaluation. For the pumping borehole, HFM33, the transmissivity from the transient evaluation was estimated at $2.6 \cdot 10^{-4}$ m^2/s. Due to the long distances from, and/or relatively bad hydraulic connection to the pumping borehole, the results from the transient evaluation of the observation sections are uncertain. It is possible that the evaluated transmissivity values reflect the hydraulic conditions close to the pumping borehole rather than the conditions around the evaluated observation boreholes. However, the estimated hydraulic diffusivity based on the response times for the selected sections was in relatively good agreement with the corresponding estimates from the performed transient analysis. Also, the estimated transmissivities from two of the evaluated observation sections, HFM21: 107–202 m and HFM01: 46–200 m, correlate fairly well with the results from previous investigations.

During the tests, several observation sections were influenced by so called tidal effects, and probably to some extent also by changes of the sea level. Primarily due to the tidal effects the pressure data from certain observation sections exhibit an oscillating behaviour.

Sammanfattning

Ett interferenstest har under november 2007 genomförts i Forsmark med borrhål HFM33 som pumphål. HFM33 är beläget strax sydväst om borrplats 11, norr om kandidatområdet på samma halvö där SFR ligger. Borrhålet är ca 140 m långt och lutar ca 59° i riktningen 220 grader från norr. Testet genomfördes för att få ökad förståelsen för de hydrauliska förhållanden som råder i den norra delen av kandidatområdet. Huvudsyftet med de utförda interferenstesterna är att dokumentera hur spricksystemen hänger ihop hydrauliskt, att kvantifiera deras hydrauliska egenskaper, samt att klargöra om det finns några hydrauliska gränser inom området.

Interferenstesterna utfördes genom att en tryckavsänkning skapades i HFM33 samtidigt som tryckresponser registrerades i olika observationssektioner i ett flertal omgivande borrhål. Alla borrhål som övervakades ingår i SKB:s hydromoniteringssystem i Forsmark, HMS. Totalt övervakades 40 borrhål och sammanlagt 148 observationssektioner ingick i interfenstestet. 22 av de 40 hålen är kärnborrhål med sammanlagt 103 observationssektioner, medan 18 är hammarborrhål med sammanlagt 45 observationssektioner.

Pumpfasen pågick under ca två veckor och den påföljande återhämtningen registrerades i ungefär sju dagar. Pumpflödet från HFM33 låg relativt konstant runt 232 L/min under pumpfasen och resulterade i en slutlig avsänkning i pumpborrhålet av ca 16 m. Dessa värden indikerar en specifik kapacitet (~transmissivitet) av $2 \cdot 10^{-4}$ m^2/s, vilket är ett högt värde.

Av de 148 observationssektioner som ingick i interferenstestet reagerade 86 sektioner inte alls eller bara mycket svagt på avsänkningen i HFM33. Under slutet av flödesperioden steg grundvattennivån, troligen en konsekvens av den nederbörd som registrerats i området under flödesperioden. Detta leder sannolikt till en underskattning av beräknade avsänkningar i flera observationssektioner

Ingen observationssektion uppvisar tydligt såväl kort responstid som stor avsänkning. Sektion HFM38: 24–41 uppvisar den snabbaste responsen. Eftersom den totala avsänkningen i observationshålet troligtvis underskattas något, är det möjligt att den här sektionen har en respons som är distinkt nog att kunna karaktäriseras som en potentiell hög-transmissiv zonrespons mellan HFM33 och borrhålssektionen. KFM06C: 531–540 är den observationssektion som reagerar starkast på pumpningen.

Fyra observationssektioner, KFM06A: 341–362 m, KFM01D: 0–153 m, HFM21: 107–202 m och HFM01: 46–200 m, samt pumpborrhålet utvärderades kvantitativt med metoder för transient utvärdering. För pumpborrhålet, HFM33, gav den transienta utvärderingen ett värde för transmissiviteten på $2.6 \cdot 10^{-4}$ m^2/s. På grund av de långa avstånden till, och/eller relativt dålig hydraulisk kontakt med pumphålet, är resultaten från den transienta utvärderingen av de utvalda observationshålen osäkra. Det är möjligt att de utvärderade transmissiviteterna återspeglar de hydrauliska förhållandena i närheten av pumphålet snarare än förhållandena runt de utvärderade observationshålen. Trots detta stämde den uppskattade hydrauliska diffusiviteten, baserad på responstiderna för de utvalda sektionerna, väl överens med de korresponderande uppskattningarna från den utförda transienta analysen. Även uppskattningen av transmissiviteter från två av de utvärderade sektionerna: HFM21: 107–202 m and HFM01: 46–200 m, korrelerar relativt väl med resultaten från tidigare utförda undersökningar.

Under interferenstestet påverkades många observationssektioner av så kallade tidaleffekter, samt troligen även av effekter orsakade av ett föränderligt havsvattenstånd. Framförallt på grund av tidaleffekterna uppvisar vissa berörda sektioner ett oscillerande beteende.

Contents

1 Introduction

This report documents the results from a hydraulic interference test performed within the site investigation at Forsmark. It was performed in order to study how different fracture zones are connected hydraulically in the north-western part of the candidate area at Forsmark, to quantify their hydraulic properties and to clarify whether there are any major hydraulic boundaries in the area. The locations of the boreholes involved in the interference tests are shown in Figure 1-1. The test was conducted during November of 2007. The test was carried out by Geosigma AB.

The open percussion drilled borehole HFM33 was used as pumping borehole for the tests and 40 surrounding boreholes served as observation wells.

The interference tests were conducted in accordance with activity plan AP PF 400-07-030. In Table 1-1, controlling documents for the performance of this activity are listed. Both the activity plan and method descriptions are internal controlling documents of SKB.

From pumping tests and flow logging, /1/, performed prior to the interference tests, the total transmissivity of the pumping borehole, HFM33, was estimated at c. $4.7 \cdot 10^{-4}$ m²/s.

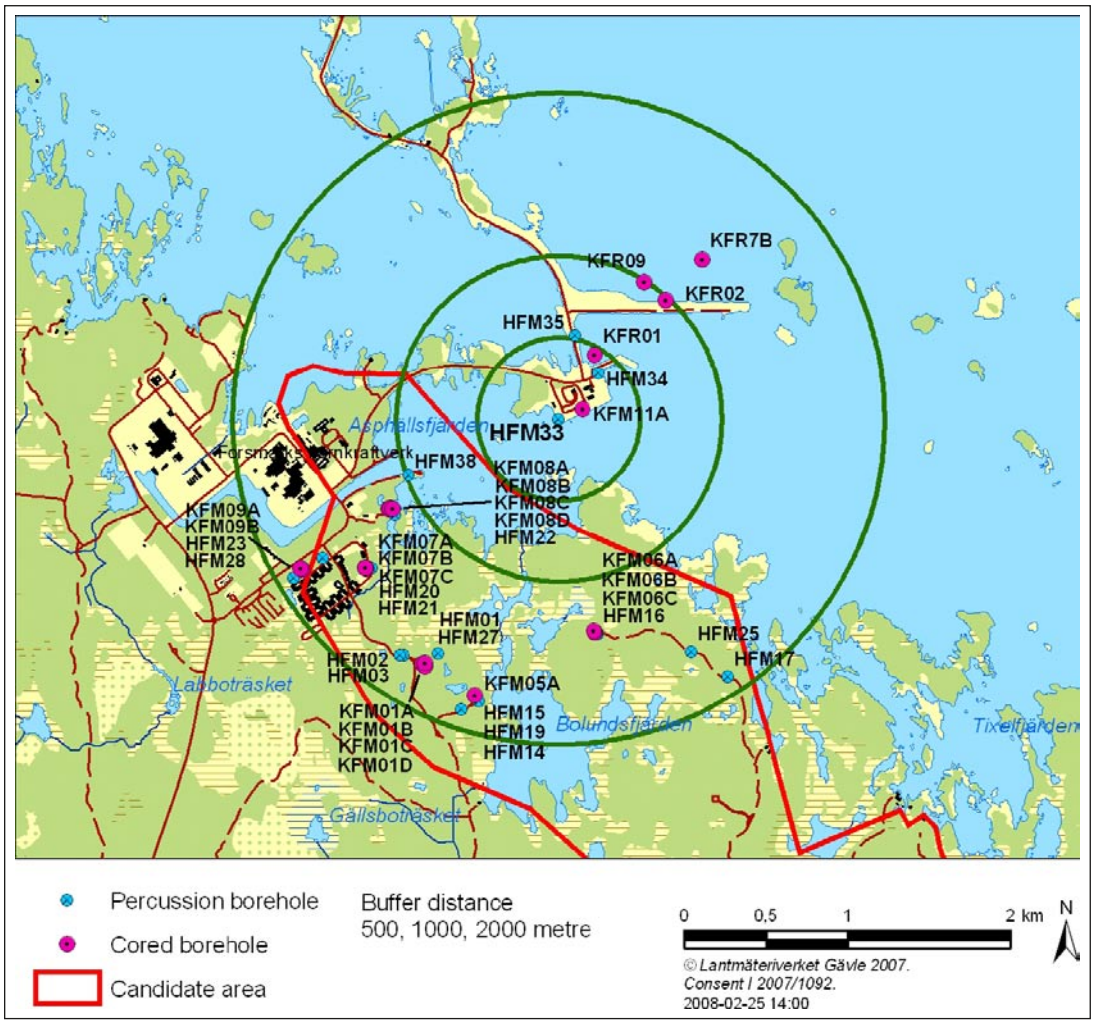


Figure 1-1. *The investigation area at Forsmark including part of the candidate area selected for more detailed investigations. The positions of the boreholes included in the interference tests are displayed as well as the areas corresponding to radii of 500 m, 1,000 m and 2,000 m from HFM33, respectively.*

Table 1-1. Controlling documents for performance of the activity.

Activity Plan	Number	Version
Hydrauliskt interferenstest med hammarborrhål HFM14 och HFM33 som pumphål.	AP PF 400-07-030	1.0
Method documents	**Number**	**Version**
Instruktion för analys av injektions- och enhålspumptester	SKB MD 320.004	1.0
Metodbeskrivning för interferenstester	SKB MD 330.003	1.0

Original data from the reported activity are stored in the primary database Sicada, where they are traceable by the Activity Plan number (AP PF 400-07-030). Only data in SKB:s databases are accepted for further interpretation and modelling. The data presented in this report are regarded as copies of the original data. Data in the databases may be revised, if needed. Such revisions will not necessarily result in a revision of the P-report, although the normal procedure is that major data revisions entail a revision of the P-report. Minor data revisions are normally presented as supplements, available at www.skb.se.

2 Objectives

The main aim of hydraulic interference tests is to get support for interpretations of geologic structures in regard to their hydraulic and geometric properties deduced from single-hole tests. Furthermore, an interference test may provide information about the hydraulic connectivity and hydraulic boundary conditions within the tested area. Finally, interference tests make up the basis for calibration of numerical models of the area.

The interference test, with borehole HFM33 as pumping borehole, was performed in order to increase the understanding of the hydraulic conditions in the northern part of the candidate area at Forsmark. The primary aim of the interference test was to document how different fracture zones are connected hydraulically, to quantify their hydraulic properties and to clarify whether there are any major hydraulic boundaries in the area.

The interference test was performed by pumping in the open percussion drilled borehole HFM33 and monitoring pressure responses in different observation sections in surrounding boreholes. All boreholes monitored for responses are part of the Forsmark HMS, the Hydro Monitoring System. In total, 148 observation sections in 40 observation boreholes were included in the interference test.

3 Scope

3.1 Boreholes tested

Technical data of the boreholes tested are presented in Table 3-1. In this report boreholes are presented in order of distance from the pumping borehole, i.e. the borehole closest to HFM33 is presented first and the borehole furthest away from HFM33 is presented last. There is one exception to this rule; in Section 6.2 the borehole HFM14 is presented last because the data from this borehole came in just before the finishing of this report. The reference point in the boreholes is always top of casing (ToC). The Swedish National coordinate system (RT90 2.5 gon V 0:-15) is used in the x-y-direction together with RHB70 in the z-direction. For the boreholes located inside the SFR-tunnel, however, an older local coordinate system is used (SFR T-U). The coordinates of the boreholes at ground surface (or ToC) are shown in Table 3-2. All section positions are given as length along the borehole (not vertical distance from ToC).

The boreholes selected to be included in this test were all situated within a radius of 2,000 m from the pumping borehole, HFM33, cf. Figure 1-1. Obviously this does not imply that boreholes outside of this perimeter are all unaffected by the pumping in HFM33. It means, however, that no in-depth analyses of possible responses in these distant boreholes have been performed within the scope of this test.

3.2 Tests performed

The borehole sections involved in the interference test in HFM33 are listed in Table 3-3. The times referred to in Table 3-3 are the chosen start and stop times of the compiled HMS data files used for evaluation. Alternatively, for the pumping borehole, the times referred to are the relevant times included in the original file produced by the data logger. The amount of data extracted from HMS, the Hydro Monitoring System, from the observation boreholes was chosen so as to receive an appropriate amount of data that would correspond to available data from the pumping borehole, HFM33, as well as giving adequate information about the pressure conditions prior to as well as after the performed interference test. HMS is registering pressure continuously.

The column “Test section” in Table 3-3 reports the nominal section length. It should be noted, however, that the upper part of the upper section in most boreholes are cased to some depth. The casing length of each borehole can be found in Table 3-1. The hydraulically active section, used for instance when calculating the point of application, is, as a consequence of this, shorter than the nominal length which would explain the apparent discrepancy between reported section length and “Test section” mentioned in different parts of this report.

The test performance was according to the Geosigma quality plan (“Kvalitetsplan för SKB uppdrag – Hydrauliskt interferenstest med hammarborrhål HFM14 och HFM33 som pumphål, K/587071, Kristoffer Gokall-Norman, 2007-06-08”, Geosigma and SKB internal controlling document) and according to the methodology description for interference tests, SKB MD 330.003. However, no response matrix was prepared since only one interference test was performed.

Table 3-1. Pertinent technical data of the tested boreholes. (From Sicada).

Borehole data Bh ID	Elevation of top of casing (ToC) [1] (m.a.s.l.)	Borehole interval from ToC (m)	Casing/ Bh-diam. (m)	Inclination-top of bh (from horizontal plane) (°)	Dip-direction-top of borehole (from local N) (°)	Remarks	Drilling finished Date (YYYY-MM-DD)
HFM33	2.62	0.30–12.35	0.18	–58.97	220.03	Borehole	2006-05-03
		12.35–122.20	0.14			Borehole	
		122.20–140.20	0.139			Borehole	
		0.00–11.95	0.16			Casing ID	
		11.95–12.04	0.143			Casing ID	
KFM11A	2.95	0.30–12.30	0.34	–60.86	40.25	Borehole	2007-04-02
		12.30–71.00	0.242			Borehole	
		71.00–71.06	0.16			Borehole	
		71.06–72.81	0.086			Borehole	
		72.81–851.21	0.077			Borehole	
		497.30–501.00	0.084			Borehole	
		521.45–523.65	0.084			Borehole	
		0.00–64.77	0.200			Casing ID	
		64.77–70.77	0.200			Casing ID	
HFM34	2.45	0.35–12.08	0.180	–58.65	30.50	Borehole	2006-06-02
		12.08–92.25	0.138			Borehole	
		92.25–200.75	0.137			Borehole	
		0.00–11.99	0.160			Casing ID	
		11.99–12.08	0.143			Casing ID	
KFR01	451.20	0.00–62.30	–	–65.00	234.00		1984-11-13
HFM35	–0.68	0.30–12.04	0.180	–59.19	32.96	Borehole	2006-06-14
		12.04–122.25	0.138			Borehole	
		122.25–200.75	0.136			Borehole	
		0.00–11.95	0.160			Casing ID	
		11.95–12.04	0.143			Casing ID	
HFM38	2.21	0.35–9.05	0.180	–54.45	93.62	Borehole	2006-06-22
		9.05–122.25	0.139			Borehole	
		122.25–200.75	0.136			Borehole	
		0.00–8.96	0.160			Casing ID	
		8.96–9.05	0.143			Casing ID	
KFR09	422.45	0.00–80.24	0.056	–5.00	299.99	Borehole	1985-10-02
KFR02	414.17	0.00–116.80	0.056	–90.00	0.00	Borehole	1987-03-03
		116.80–170.33	0.056			Borehole	
KFM08C	2.47	0.19–12.06	0.339	–60.46	35.88	Borehole	2006-05-09
		12.06–74.00	0.193			Borehole	
		74.00–100.44	0.191			Borehole	
		100.44–100.48	0.161			Borehole	
		100.48–102.23	0.086			Borehole	
		102.23–951.08	0.077			Borehole	
		0.00–12.06	0.200			Casing ID	
KFM08D	2.61	0.30–5.60	0.343	–55.00	99.98	Borehole	2007-02-10
		5.60–58.99	0.253			Borehole	
		58.99–59.04	0.157			Borehole	

Borehole data							
Bh ID	**Elevation of top of casing (ToC) [1] (m.a.s.l.)**	**Borehole interval from ToC (m)**	**Casing/ Bh-diam. (m)**	**Inclination-top of bh (from horizontal plane) (°)**	**Dip-direction-top of borehole (from local N) (°)**	**Remarks**	**Drilling finished Date (YYYY-MM-DD)**
		59.04–60.80	0.086			Borehole	
		60.80–942.30	0.077			Borehole	
		0.30–5.52	0.310			Casing ID	
		5.52–5.60	0.281			Casing ID	
		5.60–58.77	0.200			Casing ID	
		58.77–58.80	0.170			Casing ID	
HFM22	1.54	0.00–12.03	0.180	–58.85	90.08	Borehole	2004-09-10
		12.03–222.00	0.136			Borehole	
		0.00–11.94	0.160			Casing ID	
		11.94–12.03	0.147			Casing ID	
KFM08A	2.49	0.00–9.14	0.343	–60.89	321.00	Borehole	2005-03-31
		9.14–97.14	0.249			Borehole	
		97.14–102.40	0.086			Borehole	
		102.40–1,001.19	0.077			Borehole	
		0.00–100.15	0.200			Casing ID	
		0.23–9.14	0.310			Casing ID	
		100.15–100.20	0.170			Casing ID	
KFM08B	2.25	0.00–5.58	0.093	–58.85	270.45	Borehole	2005-01-26
		5.58–200.54	0.076			Borehole	
		0.00–5.58	0.077			Casing ID	
KFM06C	4.09	0.00–12.14	0.339	–60.12	26.07	Borehole	2005-06-30
		12.14–18.00	0.260			Borehole	
		18.00–100.35	0.339			Borehole	
		100.35–100.40	0.162			Borehole	
		100.40–102.08	0.086			Borehole	
		102.08–1,000.43	0.077			Borehole	
		0.00–100.07	0.200			Casing ID	
		0.20–12.00	0.280			Casing ID	
		100.07–100.12	0.170			Casing ID	
KFM06A	4.10	0.00–2.12	0.415	–60.25	300.92	Borehole	2004-09-21
		2.12–12.30	0.333			Borehole	
		12.30–100.59	0.243			Borehole	
		100.59–100.64	0.164			Borehole	
		100.64–102.19	0.086			Borehole	
		102.19–1,000.64	0.077			Borehole	
		0.00–100.35	0.200			Casing ID	
		0.19–2.12	0.392			Casing ID	
		0.19–12.30	0.309			Casing ID	
		100.35–100.40	0.170			Casing ID	
KFR7B	366.51	0.00–21.10	0.056	–2.00	150.30	Borehole	1985-08-27
KFM06B	4.13	0.00–3.88	0.116	–83.52	296.96	Borehole	2003-06-08
		3.88–4.61	0.101			Borehole	
		4.61–6.33	0.086			Borehole	
		6.33–100.33	0.077			Borehole	
		0.00–4.61	0.078			Casing ID	

Borehole data Bh ID	Elevation of top of casing (ToC) [1] (m.a.s.l.)	Borehole interval from ToC (m)	Casing/ Bh-diam. (m)	Inclination-top of bh (from horizontal plane) (°)	Dip-direction-top of borehole (from local N) (°)	Remarks	Drilling finished Date (YYYY-MM-DD)
HFM16	3.21	0.00–12.02	0.195	–84.22	327.96	Borehole	2003-11-11
		12.02–82.00	0.140			Borehole	
		82.00–132.50	0.139			Borehole	
		0.00–12.02	0.160			Casing ID	
KFM01D	2.95	0.23–11.61	0.339	–54.90	35.04	Borehole	2006-02-18
		11.61–89.72	0.245			Borehole	
		89.77–91.48	0.086			Borehole	
		91.48–800.24	0.076			Borehole	
		0.00–83.26	0.200			Casing ID	
		0.23–11.53	0.310			Casing ID	
		83.26–89.46	0.200			Casing ID	
		89.46–89.51	0.170			Casing ID	
HFM21	3.98	0.00–12.03	0.185	–58.48	88.81	Borehole	2004-06-07
		12.03–148.00	0.139			Borehole	
		148.00–202.00	0.137			Borehole	
		0.00–11.94	0.160			Casing ID	
		11.94–12.03	0.147			Casing ID	
KFM07B	3.36	0.00–5.18	0.116	–53.71	134.35	Borehole	2005-10-18
		5.18–65.69	0.096			Borehole	
		65.69–298.93	0.076			Borehole	
		0.00–65.29	0.077			Casing ID	
KFM07C	3.35	0.15–6.23	0.339	–85.40	142.71	Borehole	2006-08-08
		6.23–85.15	0.157			Borehole	
		85.15–98.42	0.086			Borehole	
		98.42–500.34	0.076			Borehole	
		428.20–430.40	0.084			Borehole	
		0.00–84.79	0.200			Casing ID	
KFM07A	3.33	0.00–9.14	0.346	–59.22	261.47	Borehole	2004-12-09
		9.14–100.35	0.251			Borehole	
		9.14–100.40	0.252			Borehole	
		100.35–100.40	0.164			Borehole	
		100.40–101.95	0.086			Borehole	
		101.95–1,001.55	0.077			Borehole	
		0.00–100.05	0.200			Casing ID	
		0.00–8.94	0.311			Casing ID	
		0.20–8.94	0.310			Casing ID	
		100.05–100.10	0.170			Casing ID	
HFM01	1.73	0.00–31.93	0.204	–77.51	34.06	Borehole	2002-05-03
		31.93–200.20	0.140			Borehole	
		0.00–31.93	0.160			Casing ID	
HFM25	3.86	0.00–9.10	0.178	–57.81	140.84	Borehole	2005-09-08
		9.10–187.50	0.139			Borehole	
		0.00–8.94	0.168			Casing ID	
		8.94–9.04	0.168			Casing ID	

Borehole data

Bh ID	Elevation of top of casing (ToC) [1] (m.a.s.l.)	Borehole interval from ToC (m)	Casing/ Bh-diam. (m)	Inclination-top of bh (from horizontal plane) (°)	Dip-direction-top of borehole (from local N) (°)	Remarks	Drilling finished Date (YYYY-MM-DD)
HFM20	2.97	0.00–12.30	0.185	–85.45	354.42	Borehole	2004-06-01
		12.30–112.70	0.139			Borehole	
		112.70–250.00	0.138			Borehole	
		250.00–301.00	0.135			Borehole	
		0.00–11.94	0.160			Casing ID	
		11.94–12.03	0.147			Casing ID	
KFM01B	3.09	0.15–9.17	0.150	–79.04	267.59	Borehole	2004-01-15
		9.17–15.56	0.101			Borehole	
		15.56–500.52	0.076			Borehole	
		0.00–15.53	0.078			Casing ID	
		0.05–9.05	0.130			Casing ID	
		8.99–9.09	0.115			Casing ID	
KFM01A	3.13	0.00–12.00	0.440	–84.73	318.35	Borehole	2002-10-28
		12.00–29.40	0.358			Borehole	
		29.40–100.48	0.251			Borehole	
		100.48–100.52	0.164			Borehole	
		100.52–102.13	0.086			Borehole	
		102.13–1,001.49	0.076			Borehole	
		0.00–100.40	0.200			Casing ID	
		0.00–29.40	0.265			Casing ID	
		97.33–97.33	0.195			Casing ID	
		101.99–101.99	0.080			Casing ID	
KFM01C	2.91	0.00–6.15	0.151	–49.61	165.35	Borehole	2005-11-29
		6.15–11.96	0.092			Borehole	
		11.96–450.02	0.076			Borehole	
		0.00–11.96	0.077			Casing ID	
HFM27	2.45	0.00–12.03	0.180	–67.83	337.26	Borehole	2005-11-10
		12.03–110.00	0.140			Borehole	
		110.00–127.50	0.139			Borehole	
		0.00–11.94	0.160			Casing ID	
		11.94–12.03	0.143			Casing ID	
HFM03	3.15	0.00–13.10	0.204	–87.28	264.53	Borehole	2002-05-28
		13.10–26.00	0.136			Borehole	
		0.00–13.10	0.160			Casing ID	
HFM02	3.05	0.00–25.40	0.204	–87.79	6.52	Borehole	2002-05-21
		25.40–100.00	0.137			Borehole	
		0.00–25.40	0.160			Casing ID	
KFM05A	5.53	0.00–12.25	0.340	–59.80	80.90	Borehole	2004-05-05
		12.25–100.30	0.244			Borehole	
		100.30–100.35	0.164			Borehole	
		100.35–110.10	0.086			Borehole	
		110.10–1,002.71	0.077			Borehole	
		0.00–100.02	0.200			Casing ID	

Borehole data Bh ID	Elevation of top of casing (ToC) [1] (m.a.s.l.)	Borehole interval from ToC (m)	Casing/ Bh-diam. (m)	Inclination-top of bh (from horizontal plane) (°)	Dip-direction-top of borehole (from local N) (°)	Remarks	Drilling finished Date (YYYY-MM-DD)
		0.00–12.25	0.310			Casing ID	
		0.19–12.25	0.309			Casing ID	
		100.02–100.07	0.170			Casing ID	
HFM14	3.91	0.00–3.10	0.235	–59.81	331.75	Borehole	2003-10-09
		3.10–6.00	0.189			Borehole	
		6.00–101.30	0.138			Borehole	
		101.30–150.50	0.136			Borehole	
		0.10–3.10	0.209			Casing ID	
		0.00–6.00	0.160			Casing ID	
HFM15	3.88	0.00–6.00	0.176	–43.70	314.31	Borehole	2003-10-15
		6.00–99.50	0.139			Borehole	
		0.00–6.00	0.160			Casing ID	
KFM09B	4.30	0.00–9.12	0.151	–55.08	140.83	Borehole	2005-12-19
		9.12–616.45	0.0773			Borehole	
		0.00–9.12	0.0773			Casing ID	
KFM09A	4.29	0.00–7.23	0.116	–59.46	200.08	Borehole	2005-10-27
		7.23–7.79	0.096			Borehole	
		7.79–799.67	0.077			Borehole	
		0.00–7.79	0.077			Casing ID	
HFM19	3.66	0.00–12.04	0.180	–58.10	280.92	Borehole	2003-12-18
		12.04–185.20	0.137			Borehole	
		0.00–12.04	0.160			Casing ID	
HFM17	3.75	0.00–8.00	0.180	–84.19	318.58	Borehole	2003-12-08
		8.00–120.50	0.137			Borehole	
		120.50–210.65	0.136			Borehole	
		0.00–8.00	0.160			Casing ID	
HFM28	4.27	12.10–117.90	0.137	–84.76	146.78	Borehole	2005-09-14
		117.90–151.20	0.135			Borehole	
		0.00–11.94	0.160			Casing ID	
		11.94–12.03	0.142			Casing ID	
HFM23	4.25	0.00–20.80	0.182	–58.48	324.35	Borehole	2005-09-01
		20.80–115.00	0.136			Borehole	
		115.00–211.50	0.134			Borehole	
		0.00–20.71	0.168			Casing ID	
		20.71–20.80	0.168			Casing ID	

[1] An older local coordinate system is used for the boreholes located inside the SFR-tunnel.

Table 3-2. Coordinates of the tested boreholes. (From Sicada).

Borehole data Bh ID	Northing (m)	Easting (m)
HFM33	6701042.57	1632222.99
KFM11A	6701103.82	1632366.75
HFM34	6701325.06	1632470.21
KFR01 [1)]	3901.70	1644.60
HFM35	6701555.86	1632320.51
HFM38	6700701.28	1631301.71
KFR09 [1)]	3385.10	1797.70
KFR02 [1)]	3353.88	3353.88
KFM08C	6700495.88	1631187.57
KFM08D	6700491.67	1631199.16
HFM22	6700456.2	1631217.6
KFM08A	6700494.5	1631197.1
KFM08B	6700492.8	1631173.3
KFM06C	6699741	1632437
KFM06A	6699732.9	1632442.5
KFR7B [1)]	3025.25	1676.98
KFM06B	6699732.2	1632446.4
HFM16	6699721.1	1632466.2
KFM01D	6699542.1	1631404.5
HFM21	6700125.6	1631074.1
KFM07B	6700123.6	1631036.8
KFM07C	6700125.61	1631034.45
KFM07A	6700127.1	1631031.6
HFM01	6699605.2	1631484.6
HFM25	6699616.2	1633039.4
HFM20	6700187.5	1630776.7
KFM01B	6699539.4	1631387.7
KFM01A	6699529.8	1631397.2
KFM01C	6699526.1	1631403.8
HFM27	6699595.3	1631245.9
HFM03	6699592.8	1631272.6
HFM02	6699593.2	1631268.7
KFM05A	6699344.9	1631710.8
HFM14	6699313.1	1631734.6
HFM15	6699312.4	1631733.1
KFM09B	6700119.9	1630638.8
KFM09A	6700115	1630647.5
HFM19	6699257.6	1631626.9
HFM17	6699462	1633261.3
HFM28	6700068.8	1630597.2
HFM23	6700067.7	1630595.4

[1)] An older local coordinate system is used for the boreholes located inside the SFR-tunnel.

Table 3-3. Borehole sections involved in the interference test in HFM33, see Figure 1-1.

Bh ID	Test section (m)	Test type[1)]	Test config.	Test start date and time (YYYY-MM-DD tt:mm)	Test stop date and time (YYYY-MM-DD tt:mm)
HFM33	0–140	1B	Open borehole	2007-11-01 09:12	2007-11-22 00:00
KFM11A	0–130	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	131–360	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	361–445	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	446–456	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	457–689	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	690–710	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	711–850	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM34	0–21	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	22–90	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	91–201	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFR01	11–43.5	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	44.5–62.3	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM35	0–33	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	34–150	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	151–181	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	182–201	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM38	0–23	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	24–41	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	42–200.75	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFR09	0–0	2	Open borehole	2007-10-15 00:00	2007-11-22 00:00
KFR02	81–118	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	119–136	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	137–170.2	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM08C	0–145	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	146–310	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	311–610	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	611–760	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	761–950	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM08D	0–160	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	161–330	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	331–659	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	660–680	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	681–824	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	825–835	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	836–950	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM22	0–222	2	Open borehole	2007-10-15 00:00	2007-11-22 00:00
KFM08A	0–161	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	162–215	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	216–264	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	265–280	2	Between packers	2007-10-15 00:00	2007-11-22 00:00

Bh ID	Test section (m)	Test type[1)]	Test config.	Test start date and time (YYYY-MM-DD tt:mm)	Test stop date and time (YYYY-MM-DD tt:mm)
	281–473	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	474–503	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	504–683	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	684–694	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	695–1,001.19	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM08B	0–70	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	71–112	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	113–200	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM06C	0–186	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	187–280	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	281–350	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	351–401	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	402–530	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	531–540	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	541–646	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	647–666	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	667–872	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	873–1,000.91	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM06A	0–150	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	151–246	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	247–340	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	341–362	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	363–737	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	738–748	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	749–826	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	827–1,000.64	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFR7B	8–21	2	Open borehole	2007-10-15 00:00	2007-11-22 00:00
KFM06B	0–26	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	27–50	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	51–100	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM16	0–53	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	54–67	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	68–132	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM01D	0–153	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	154–252	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	253–310	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	311–321	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	322–428	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	429–438	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	439–800.24	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM21	0–21	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	22–32	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	33–106	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	107–202	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00

Bh ID	Test section (m)	Test type[1)]	Test config.	Test start date and time (YYYY-MM-DD tt:mm)	Test stop date and time (YYYY-MM-DD tt:mm)
KFM07B	0–74	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	75–202	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	203–300	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM07C	0–110	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	111–160	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	161–301	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	302–500	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM07A	0–148	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	149–190	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	191–225	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	226–961	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	962–972	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	973–1,001.55	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM01	0–32.5	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	33.5–45.5	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	46.5–200.2	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM25	0–188	2	Open borehole	2007-10-15 00:00	2007-11-22 00:00
HFM20	0–48	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	49–100	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	101–130	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	131–301	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM01B	0–100	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	101–141	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	142–500	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM01A	0–108	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	109–130	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	131–204	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	205–373	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	374–430	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	431–1,001.49	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM01C	0–58	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	59–237	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	238–450	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM27	0–24	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	25–45	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	46–58	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	59–128	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM03	0–18	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	19–26	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM02	0–37	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	38–48	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	49–100	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00

Bh ID	Test section (m)	Test type[1)]	Test config.	Test start date and time (YYYY-MM-DD tt:mm)	Test stop date and time (YYYY-MM-DD tt:mm)
KFM05A	0–114	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	115–253	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	254–272	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	273–489	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	490–698	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	699–1,002.44	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM14	0–150	2	Open borehole	2007-10-15 00:00	2007-11-22 00:00
HFM15	0–84	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	85–95	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
KFM09B	0–200	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	201–450	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	451–616.45	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
KFM09A	0–300	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	301–550	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	551–799.67	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM19	0–103	2	Above packer	2007-10-15 00:00	2007-11-22 00:00
	104–167	2	Between packers	2007-10-15 00:00	2007-11-22 00:00
	168–182	2	Below Packer	2007-10-15 00:00	2007-11-22 00:00
HFM17	0–211	2	Open borehole	2007-10-15 00:00	2007-11-22 00:00
HFM28	0–151	2	Open borehole	2007-10-15 00:00	2007-11-22 00:00
HFM23	0–212	2	Open borehole	2007-10-15 00:00	2007-11-22 00:00

[1)] 1B: Pumping test-submersible pump, 2: Interference test.

The interpreted points of application, see explanation below, and lengths of the borehole sections involved in the interference test together with their estimated transmissivities from previous investigations (/1–31/) are presented in Table 3-4. No transmissivity values from the boreholes inside the SFR-tunnel have been found. The distances between the pumping borehole and the observation borehole sections are shown in Table 3-5. The distances between the hydraulic points of application in the boreholes were calculated. It should be pointed out that the calculated distances between HFM33 and the different borehole sections located inside the SFR-tunnel are somewhat uncertain. The accuracy of the methods used to calculate distances between points in the different coordinate systems has been debated.

The estimations of the points of application in the pumping borehole and in the different observation borehole sections respectively were made in one of two ways. If it was obvious that a certain flow anomaly, identified from e.g. flow logging, contributed to the major part of the transmissivity in one section, the position of that anomaly was chosen as the point of application. Alternatively, if no evident part of the section could be chosen with regard to transmissivity, either the midpoint of the section was selected or, if several parts of the section have comparable values of transmissivity, a point of balance calculation was made to estimate the point of application. Also in the cases where no transmissivity values were available, the midpoint of the section was used.

Table 3-4. Points of application and lengths of the test sections in the interference test in HFM33 as well as their estimated transmissivities from previous investigations /1–31/.

Bh ID	Test section (m)	Point of application (m below TOC)	Section length (m)	Transmissivity (m^2/s)
HFM33	0–140	136	128	$4.7 \cdot 10^{-4}$
KFM11A	0–130	65	59	$3.2 \cdot 10^{-5}$
	131–360	245.5	229	$2.8 \cdot 10^{-7}$
	361–445	403.0	84	$1.1 \cdot 10^{-6}$
	446–456	451.0	10	$2.9 \cdot 10^{-8}$
	457–689	573.0	232	$2.5 \cdot 10^{-7}$
	690–710	700.0	20	$7.6 \cdot 10^{-7}$
	711–850	780.5	139	$2.4 \cdot 10^{-6}$
HFM34	0–21	10.5	9	$8.9 \cdot 10^{-4}$
	22–90	56.0	68	$8.0 \cdot 10^{-5}$
	91–201	143.0	104	$1.3 \cdot 10^{-4}$
KFR01	11–43.5	27.3	33	–
	44.5–62.3	53.4	18	–
HFM35	0–33	16.5	21	–
	34–150	92.0	116	$2.8 \cdot 10^{-5}$
	151–181	166.0	30	$3.2 \cdot 10^{-5}$
	182–201	191.5	19	$4.2 \cdot 10^{-5}$
HFM38	0–23	12	14	–
	24–41	29	17	$8.3 \cdot 10^{-5}$
	42–200.75	188	159	$4.8 \cdot 10^{-5}$
KFR09	2–80	40.12	78	–
KFR02	81–118	99.5	37	–
	119–136	127.5	17	–
	137–170.2	153.6	33	–
KFM08C	0–145	72.5	133	$1.8 \cdot 10^{-10}$
	146–310	228.0	164	$4.0 \cdot 10^{-8}$
	311–610	460.5	299	$4.5 \cdot 10^{-7}$
	611–760	685.5	149	$1.2 \cdot 10^{-8}$
	761–950	855.5	189	$5.2 \cdot 10^{-10}$
KFM08D	0–160	80.0	101	$1.8 \cdot 10^{-5}$
	161–330	245.5	169	$9.0 \cdot 10^{-8}$
	331–659	495.0	328	$1.2 \cdot 10^{-7}$
	660–680	670.0	20	$1.8 \cdot 10^{-7}$
	681–824	752.5	143	$1.9 \cdot 10^{-8}$
	825–835	830.0	10	$2.9 \cdot 10^{-8}$
	836–950	893.0	114	–
HFM22	0–222	62	210	$1.6 \cdot 10^{-4}$
KFM08A	0–161	81	61	$4.3 \cdot 10^{-7}$
	162–215	189	53	$2.1 \cdot 10^{-5}$
	216–264	240	48	$1.2 \cdot 10^{-7}$
	265–280	273	15	$6.1 \cdot 10^{-6}$
	281–473	377	192	$8.8 \cdot 10^{-8}$
	474–503	489	29	$3.2 \cdot 10^{-7}$
	504–683	594	179	$3.3 \cdot 10^{-7}$

Bh ID	Test section (m)	Point of application (m below TOC)	Section length (m)	Transmissivity (m^2/s)
	684–694	689	10	$3.0 \cdot 10^{-5}$
	695–1,001.19	848	306	$9.8 \cdot 10^{-10}$
KFM08B	0–70	26	64	$3.9 \cdot 10^{-5}$
	71–112	92	41	$3.9 \cdot 10^{-7}$
	113–200	174	87	$6.0 \cdot 10^{-7}$
KFM06C	0–186	144	86	$6.6 \cdot 10^{-5}$
	187–280	214	93	$1.8 \cdot 10^{-6}$
	281–350	316	69	$1.4 \cdot 10^{-6}$
	351–401	395	50	$8.3 \cdot 10^{-6}$
	402–530	422	128	$8.2 \cdot 10^{-8}$
	531–540	536	9	$1.1 \cdot 10^{-6}$
	541–646	593	105	$1.0 \cdot 10^{-9}$
	647–666	658	19	$9.5 \cdot 10^{-8}$
	667–872	770	205	$1.0 \cdot 10^{-8}$
	873–1,000.91	927	129	$1.3 \cdot 10^{-8}$
KFM06A	0–150	130	50	$6.0 \cdot 10^{-5}$
	151–246	215	95	$2.7 \cdot 10^{-5}$
	247–340	267	93	$7.5 \cdot 10^{-5}$
	341–362	357	21	$6.8 \cdot 10^{-6}$
	363–737	392	374	$3.1 \cdot 10^{-7}$
	738–748	743	10	$1.2 \cdot 10^{-7}$
	749–826	775	77	$1.9 \cdot 10^{-8}$
	827–1,000.64	913	174	$1.3 \cdot 10^{-9}$
KFR7B	8–21	14.5	13	–
KFM06B	0–26	11	21	$2.8 \cdot 10^{-6}$
	27–50	45	23	$2.9 \cdot 10^{-4}$
	51–100	56	49	$2.4 \cdot 10^{-4}$
HFM16	0–53	41	42	$1.2 \cdot 10^{-4}$
	54–67	58	13	$3.5 \cdot 10^{-4}$
	68–132	69	64	$5.7 \cdot 10^{-5}$
KFM01D	0–153	123	63	$2.8 \cdot 10^{-5}$
	154–252	163	98	$1.6 \cdot 10^{-7}$
	253–310	303	57	$7.3 \cdot 10^{-6}$
	311–321	316	10	$1.8 \cdot 10^{-5}$
	322–428	370	106	$2.2 \cdot 10^{-6}$
	429–438	434	9	$1.0 \cdot 10^{-7}$
	439–800.24	564	361	$3.3 \cdot 10^{-8}$
HFM21	0–21	20	9	–
	22–32	27	10	$1.0 \cdot 10^{-4}$
	33–106	98	73	$3.7 \cdot 10^{-4}$
	107–202	160	95	$2.1 \cdot 10^{-4}$
KFM07B [1)]	0–74	70	9 (0)	–
	75–202	138	127 (0)	–
	203–300	236	91 (25)	$4.9 \cdot 10^{-8}$
KFM07C	0–110	98	25	$4.8 \cdot 10^{-5}$
	111–160	157	49	$4.7 \cdot 10^{-5}$

Bh ID	Test section (m)	Point of application (m below TOC)	Section length (m)	Transmissivity (m^2/s)
	161–301	194	140	$8.6 \cdot 10^{-8}$
	302–500	401	198	–
KFM07A	0–148	137	48	$1.2 \cdot 10^{-4}$
	149–190	178	41	$1.7 \cdot 10^{-5}$
	191–225	208	34	–
	226–961	261	735	$9.3 \cdot 10^{-8}$
	962–972	967	10	–
	973–1,001.55	987	28	–
HFM01	0–32.5	16	1	–
	33.5–45.5	39	12	$4.5 \cdot 10^{-5}$
	46.5–200.2	64	154	$1.8 \cdot 10^{-5}$
HFM25	0–188	99	179	$3.8 \cdot 10^{-7}$
HFM20	0–48	25	36	$5.7 \cdot 10^{-5}$
	49–100	77	51	$1.8 \cdot 10^{-6}$
	101–130	118	29	$1.0 \cdot 10^{-5}$
	131–301	215	170	–
KFM01B	0–100	54	91	–
	101–141	121	40	–
	142–500	321	358	–
KFM01A	0–108	105	6	–
	109–130	118	21	$1.1 \cdot 10^{-7}$
	131–204	148	73	$1.6 \cdot 10^{-7}$
	205–373	285	168	$1.9 \cdot 10^{-8}$
	374–430	402	56	$9.5 \cdot 10^{-10}$
	431–1,001.49	715	570	$5.5 \cdot 10^{-9}$
KFM01C	0–58	38	46	$7.1 \cdot 10^{-4}$
	59–237	85	178	$2.4 \cdot 10^{-4}$
	238–450	436	212	$1.8 \cdot 10^{-8}$
HFM27	0–24	20	24	$1.3 \cdot 10^{-5}$
	25–45	28	20	$2.3 \cdot 10^{-5}$
	46–58	54	12	$4.0 \cdot 10^{-5}$
	59–128	119	57	$6.7 \cdot 10^{-6}$
HFM03	0–18	15	5	–
	19–26	21	7	$4.2 \cdot 10^{-4}$
HFM02	0–37	31	12	–
	38–48	43	10	$5.9 \cdot 10^{-4}$
	49–100	74	51	–
KFM05A	0–114	109	14	$1.2 \cdot 10^{-3}$
	115–253	145	138	$5.3 \cdot 10^{-6}$
	254–272	256	18	$2.2 \cdot 10^{-8}$
	273–489	292	216	$5.1 \cdot 10^{-9}$
	490–698	594	208	$1.2 \cdot 10^{-9}$
	699–1,002.44	850	303	$1.2 \cdot 10^{-10}$
HFM14	0–150	20	144	$4.7 \cdot 10^{-4}$

Bh ID	Test section (m)	Point of application (m below TOC)	Section length (m)	Transmissivity (m^2/s)
HFM15	0–84	50	78	$2.2 \cdot 10^{-4}$
	85–95	89	10	$1.0 \cdot 10^{-4}$
KFM09B	0–200	46	191	$4.3 \cdot 10^{-5}$
	201–450	254	249	$9.2 \cdot 10^{-7}$
	451–616.45	564	165	$3.5 \cdot 10^{-8}$
KFM09A	0–300	160	292	$2.1 \cdot 10^{-6}$
	301–550	436	249	$9.1 \cdot 10^{-7}$
	551–799.67	685	249	$4.8 \cdot 10^{-8}$
HFM19	0–103	101	91	$4.0 \cdot 10^{-5}$
	104–167	150	63	$2.2 \cdot 10^{-5}$
	168–182	176	14	$2.7 \cdot 10^{-4}$
HFM17	0–211	31	203	$3.9 \cdot 10^{-5}$
HFM28	0–151	82	139	$9.0 \cdot 10^{-6}$
HFM23	0–212	30	291	$4.3 \cdot 10^{-6}$

[1)] This borehole is grouted to 209 m.

Table 3-5. Calculated distances from the pumping borehole HFM33 to the observation borehole sections involved in the interference test in HFM33.

Pumping section in HFM33 (m)	Observation sections			Distance to HFM33@136 m (m)
	Borehole ID	Section (m)	Point of Application	
0–140	KFM11A	0–130	65	268.1
		131–360	245.5	361.7
		361–445	403.0	489.2
		446–456	451.0	531.9
		457–689	573.0	644.6
		690–710	700.0	766.3
		711–850	780.5	844.6
0–140	HFM34	0–21	10.5	470.1
		22–90	56.0	485.9
		91–201	143.0	529.7
0–140	KFR01	11–43.5	27.3	532.8
		44.5–62.3	53.4	535.6
0–140	HFM35	0–33	16.5	600.7
		34–150	92.0	636.9
		151–181	166.0	685.6
		182–201	191.5	703.9
0–140	HFM38	0–23	12	906.0
		24–41	29	895.2
		42–200.75	188	799.9
0–140	KFR09	2–80	40.12	1,009.9
0–140	KFR02	81–118	99.5	1,063.2
		119–136	127.5	1,065.7
		137–170.2	153.6	1,068.6

Pumping section in HFM33 (m)	Observation sections Borehole ID	Section (m)	Point of Application	Distance to HFM33@136 m (m)
0–140	KFM08C	0–145	72.5	1,061.8
		146–310	228.0	992.6
		311–610	460.5	914.7
		611–760	685.5	884.3
		761–950	855.5	894.3
0–140	KFM08D	0–160	80.0	1,050.0
		161–330	245.5	981.2
		331–659	495.0	922.6
		660–680	670.0	915.3
		681–824	752.5	922.7
		825–835	830.0	935.6
		836–950	893.0	950.1
0–140	HFM22	0–222	62	1,059.3
0–140	KFM08A	0–161	81	1,095.9
		162–215	189	1,114.9
		216–264	240	1,126.8
		265–280	273	1,135.3
		281–473	377	1,167.6
		474–503	489	1,209.4
		504–683	594	1,252.6
		684–694	689	1,294.4
		695–1,001	848	1,366.4
0–140	KFM08B	0–70	26	1,122.1
		71–112	92	1,149.5
		113–200	174	1,188.2
0–140	KFM06C	0–186	144	1,246.9
		187–280	214	1,201.4
		281–350	316	1,175.3
		351–401	395	1,163.8
		402–530	422	1,161.7
		531–540	536	1,163.6
		541–646	593	1,172.1
		647–666	658	1,187.1
		667–872	770	1,223.9
		873–1,000.91	927	1,296.3
0–140	KFM06A	0–150	130	1,249.5
		151–246	215	1,223.5
		247–340	267	1,208.9
		341–362	357	1,186.9
		363–737	392	1,179.7
		738–748	743	1,138.3
		749–826	775	1,137.7
		827–1,000.64	913	1,140.0
0–140	KFR7B	8–21	14.5	1,406.5
0–140	KFM06B	0–26	11	1,296.3
		27–50	45	1,291.7
		51–100	56	1,290.3

Pumping section in HFM33 (m)	Observation sections Borehole ID	Section (m)	Point of Application	Distance to HFM33@136 m (m)
0–140	HFM16	0–53	41	1,308.1
		54–67	58	1,307.7
		68–132	69	1,307.9
0–140	KFM01D	0–153	123	1,566.4
		154–252	163	1,543.6
		253–310	303	1,466.5
		311–321	316	1,459.4
		322–428	370	1,430.5
		429–438	434	1,397.6
		439–800.24	564	1,335.0
0–140	HFM21	0–21	20	1,385.3
		22–32	27	1,382.0
		33–106	98	1,354.2
		107–202	160	1,340.4
0–140	KFM07B [2)]	0–74	70	1,417.2
		75–202	138	1,413.2
		203–300	236	1,413.2
0–140	KFM07C	0–110	98	1,422.7
		111–160	157	1,424.7
		161–301	194	1,427.1
		302–500	401	1,457.6
0–140	KFM07A	0–148	137	1,484.2
		149–190	178	1,503.1
		191–225	208	1,517.4
		226–961	261	1,543.7
		962–972	967	1,969.4
		973–1,001.55	987	1,982.4
0–140	HFM01	0–32.5	16	1,543.5
		33.5–45.5	39	1,538.2
		46.5–200.2	64	1,533.0
0–140	HFM25	0–188	99	1,693.5
0–140	HFM20	0–48	25	1,602.5
		49–100	77	1,599.1
		101–130	118	1,598.7
		131–301	215	1,606.1
0–140	KFM01B	0–100	54	1,653.0
		101–141	121	1,659.2
		142–500	321	1,697.7
0–140	KFM01A	0–108	105	1,648.1
		109–130	118	1,648.0
		131–204	148	1,648.1
		205–373	285	1,655.3
		374–430	402	1,669.4
		431–1,001.49	715	1,745.3

Pumping section in HFM33 (m)	Observation sections Borehole ID	Section (m)	Point of Application	Distance to HFM33@136 m (m)
0–140	KFM01C	0–58	38	1,671.3
		59–237	85	1,693.1
		238–450	436	1,886.9
0–140	HFM27	0–24	20	1,668.9
		25–45	28	1,666.8
		46–58	54	1,660.4
		59–128	119	1,647.9
0–140	HFM03	0–18	15	1,661.5
		19–26	21	1,661.3
0–140	HFM02	0–37	31	1,660.8
		38–48	43	1,659.7
		49–100	74	1,657.4
0–140	KFM05A	0–114	109	1,688.2
		115–253	145	1,682.0
		254–272	256	1,667.6
		273–489	292	1,664.5
		490–698	594	1,680.7
		699–1,002.44	850	1,757.7
0–140	HFM14	0–150	20	1,728.8
0–140	HFM15	0–84	50	1,720.2
		85–95	89	1,711.4
		96–100	98	1,709.8
0–140	KFM09B	0–200	46	1,751.9
		201–450	254	1,736.8
		451–616.45	564	1,766.5
0–140	KFM09A	0–300	160	1,818.2
		301–550	436	1,977.3
		551–799.67	685	2,167.3
0–140	HFM19	0–103	101	1,826.4
		104–167	150	1,833.8
		168–182	176	1,838.4
0–140	HFM17	0–211	31	1,885.2
0–140	HFM28	0–151	82	1,817.8
0–140	HFM23	0–212	30	1,822.0

3.3 Equipment check

An equipment check was performed at the Geosigma engineering workshop in Uppsala as well as at the site as a simple and fast test to establish the operating status of sensors and other equipment. In addition, calibration constants were implemented and checked.

To check the function of the pressure sensors, the pressure in air was recorded and found to be as expected. Submerged in water, the pressure coincided well with the total head of water, while lowering.

4 Description of equipment

4.1 Overview

The temporary test system used for the interference test is described in Geosigma quality plan ("Kvalitetsplan för SKB uppdrag – Hydrauliskt interferenstest med hammarborrhål HFM14 och HFM33 som pumphål, K587071, Kristoffer Gokall-Norman, 2007-06-08", Geosigma and SKB internal controlling document). The equipment in the pumping borehole, HFM33, consisted primarily of the following parts:

- A dual 4" submersible pump with submarine contact and steel pipe to the ground surface.
- Plastic hose and pipe for transporting the pumped water into the sea.
- 1 pressure transducer in the borehole.
- Flow meter at the surface.
- Data logger to sample data from the flow meter and the pressure transducer.
- Flow rate control valve at the surface.
- PC to visualize the data.

All the observation sections included in the interference test are part of the SKB hydro monitoring system (HMS), where pressure is recorded continuously.

The estimated lower and upper practical measurement limits for the actual equipment used for the interference test, expressed in terms of specific flow (Q/s), are $Q/s–L = 2 \cdot 10^{-6}$ m^2/s and $Q/s–U = 2 \cdot 10^{-2}$ m^2/s, respectively.

4.2 Measurement sensors

Technical data of the sensors used together with estimated data specifications of the test system for pumping tests are given in Table 4-1.

Table 4-1. Technical data of measurement sensors used as well as estimated data specifications of the test system for pumping tests (based on current laboratory and field experiences).

Technical specification					
Parameter		Unit	Sensor	Test system	Comments
P-absolute	Output signal	mA	4–20		Depending on uncertainties of the sensor position
	Meas. range	kPa kPa	0–1,500		
	Resolution	kPa	0.05		
	Accuracy		± 1.5 *	± 10	
Flow rate (surface)	Output signal	mA	4–20		Passive
	Meas. range	L/min	1–500	1–c. 500	Pumping tests
	Resolution	L/min	0.1	1	
	Accuracy	% o.r.**	± 0.5	± 0.5	

* Includes hysteresis, linearity and repeatability.
** Maximum error in % of actual reading (% o.r.).

Table 4-2 shows the type and position for each transducer used in the test. Positions are given in metre from reference point, i.e. top of casing (ToC). In the case of the boreholes that are located inside the SFR-tunnel, the transducers are positioned outside the boreholes and are not given a position in Table 4-2.

Table 4-2. Type and position of pressure sensors (position from ToC) used in the interference test in HFM33.

Borehole information				Sensors	
ID	Test interval (m)	Test configuration	Test type[1)]	Type	Position (m b ToC)
HFM33	0–140	Open borehole	1B	P-absolute	23.5
KFM11A	0–130	Above packer	2	HMS	39.3
	131–360	Between packers	2	HMS	39.3
	361–445	Between packers	2	HMS	39.3
	446–456	Between packers	2	HMS	39.3
	457–689	Between packers	2	HMS	39.3
	690–710	Between packers	2	HMS	39.3
	711–850	Below Packer	2	HMS	39.3
HFM34	0–21	Above packer	2	HMS	18.8
	22–90	Between packers	2	HMS	18.8
	91–201	Below Packer	2	HMS	18.8
KFR01	11–43.5	Above packer	2	HMS	–
	44.5–62.3	Below Packer	2	HMS	–
HFM35	0–33	Above packer	2	HMS	29.8
	34–150	Between packers	2	HMS	29.8
	151–181	Between packers	2	HMS	29.8
	182–201	Below Packer	2	HMS	29.8
HFM38	0–23	Above packer	2	HMS	21.3
	24–41	Between packers	2	HMS	21.3
	42–200.75	Below Packer	2	HMS	21.3
KFR09	2–80	Open borehole	2	HMS	–
KFR02	81–118	Above packer	2	HMS	–
	119–136	Between packers	2	HMS	–
	137–170.2	Below Packer	2	HMS	–
KFM08C	0–145	Above packer	2	HMS	39.3
	146–310	Between packers	2	HMS	39.3
	311–610	Between packers	2	HMS	39.3
	611–760	Between packers	2	HMS	39.3
	761–950	Below Packer	2	HMS	39.3
KFM08D	0–160	Above packer	2	HMS	39.3
	161–330	Between packers	2	HMS	39.3
	331–659	Between packers	2	HMS	39.3
	660–680	Between packers	2	HMS	39.3
	681–824	Between packers	2	HMS	39.3
	825–835	Between packers	2	HMS	39.3
	836–950	Below Packer	2	HMS	39.3

Borehole information				Sensors	
ID	Test interval (m)	Test configuration	Test type[1)]	Type	Position (m b ToC)
HFM22	0–222	Open borehole	2	HMS	15
KFM08A	0–161	Above packer	2	HMS	39.3
	162–215	Between packers	2	HMS	39.3
	216–264	Between packers	2	HMS	39.3
	265–280	Between packers	2	HMS	39.3
	281–473	Between packers	2	HMS	39.3
	474–503	Between packers	2	HMS	39.3
	504–683	Between packers	2	HMS	39.3
	684–694	Between packers	2	HMS	39.3
	695–1,001.19	Below Packer	2	HMS	39.3
KFM08B	0–70	Above packer	2	HMS	29.8
	71–112	Between packers	2	HMS	29.8
	113–200	Below Packer	2	HMS	29.8
KFM06C	0–186	Above packer	2	HMS	39.3
	187–280	Between packers	2	HMS	39.3
	281–350	Between packers	2	HMS	39.3
	351–401	Between packers	2	HMS	39.3
	402–530	Between packers	2	HMS	39.3
	531–540	Between packers	2	HMS	39.3
	541–646	Between packers	2	HMS	39.3
	647–666	Between packers	2	HMS	39.3
	667–872	Between packers	2	HMS	39.3
	873–1,000.91	Below Packer	2	HMS	39.3
KFM06A	0–150	Above packer	2	HMS	39.3
	151–246	Between packers	2	HMS	39.3
	247–340	Between packers	2	HMS	39.3
	341–362	Between packers	2	HMS	39.3
	363–737	Between packers	2	HMS	39.3
	738–748	Between packers	2	HMS	39.3
	749–826	Between packers	2	HMS	39.3
	827–1,000.64	Below Packer	2	HMS	39.3
KFR7B	8–21	Open borehole	2	HMS	–
KFM06B	0–26	Above packer	2	HMS	23.8
	27–50	Between packers	2	HMS	23.8
	51–100	Below Packer	2	HMS	23.8
HFM16	0–53	Above packer	2	HMS	39.3
	54–67	Between packers	2	HMS	39.3
	68–132	Below Packer	2	HMS	39.3
KFM01D	0–153	Above packer	2	HMS	39.3
	154–252	Between packers	2	HMS	39.3
	253–310	Between packers	2	HMS	39.3
	311–321	Between packers	2	HMS	39.3
	322–428	Between packers	2	HMS	39.3

Borehole information				Sensors	
ID	Test interval (m)	Test configuration	Test type[1)]	Type	Position (m b ToC)
	429–438	Between packers	2	HMS	39.3
	439–800.24	Below Packer	2	HMS	39.3
HFM21	0–21	Above packer	2	HMS	18.8
	22–32	Between packers	2	HMS	18.8
	33–106	Between packers	2	HMS	18.8
	107–202	Below Packer	2	HMS	18.8
KFM07B	0–74	Above packer	2	HMS	39.3
	75–202	Between packers	2	HMS	39.3
	203–300	Below Packer	2	HMS	39.3
KFM07C	0–110	Above packer	2	HMS	39.3
	111–160	Between packers	2	HMS	39.3
	161–301	Between packers	2	HMS	39.3
	302–500	Below Packer	2	HMS	39.3
KFM07A	0–148	Above packer	2	HMS	39.3
	149–190	Between packers	2	HMS	39.3
	191–225	Between packers	2	HMS	39.3
	226–961	Between packers	2	HMS	39.3
	962–972	Between packers	2	HMS	39.3
	973–1,001.55	Below Packer	2	HMS	39.3
HFM01	0–32.5	Above packer	2	HMS	29.8
	33.5–45.5	Between packers	2	HMS	29.8
	46.5–200.2	Below Packer	2	HMS	29.8
HFM25	0–188	Open borehole	2	HMS	–
HFM20	0–48	Above packer	2	HMS	39.3
	49–100	Between packers	2	HMS	39.3
	101–130	Between packers	2	HMS	39.3
	131–301	Below Packer	2	HMS	39.3
KFM01B	0–100	Above packer	2	HMS	29.3
	101–141	Between packers	2	HMS	29.3
	142–500	Below Packer	2	HMS	29.3
KFM01A	0–108	Above packer	2	HMS	39.3
	109–130	Between packers	2	HMS	39.3
	131–204	Between packers	2	HMS	39.3
	205–373	Between packers	2	HMS	39.3
	374–430	Between packers	2	HMS	39.3
	431–1,001.49	Below Packer	2	HMS	39.3
KFM01C	0–58	Above packer	2	HMS	29.8
	59–237	Between packers	2	HMS	29.8
	238–450	Below Packer	2	HMS	29.8
HFM27	0–24	Above packer	2	HMS	21.8
	25–45	Between packers	2	HMS	21.8
	46–58	Between packers	2	HMS	21.8
	59–128	Below Packer	2	HMS	21.8

Borehole information				Sensors	
ID	**Test interval (m)**	**Test configuration**	**Test type[1)]**	**Type**	**Position (m b ToC)**
HFM03	0–18	Above packer	2	HMS	29.3
	19–26	Below Packer	2	HMS	29.3
HFM02	0–37	Above packer	2	HMS	29.3
	38–48	Between packers	2	HMS	29.3
	49–100	Below Packer	2	HMS	29.3
KFM05A	0–114	Above packer	2	HMS	39.3
	115–253	Between packers	2	HMS	39.3
	254–272	Between packers	2	HMS	39.3
	273–489	Between packers	2	HMS	39.3
	490–698	Between packers	2	HMS	39.3
	699–1,002.44	Below Packer	2	HMS	39.3
HFM14	0–150	Open borehole	2	HMS	10
HFM15	0–84	Above packer	2	HMS	29.8
	85–95	Between packers	2	HMS	29.8
	96–100	Below Packer	2	HMS	29.8
KFM09B	0–200	Above packer	2	HMS	29.8
	201–450	Between packers	2	HMS	29.8
	451–616.45	Below Packer	2	HMS	29.8
KFM09A	0–300	Above packer	2	HMS	29.8
	301–550	Between packers	2	HMS	29.8
	551–799.67	Below Packer	2	HMS	29.8
HFM19	0–103	Above packer	2	HMS	29.8
	104–167	Between packers	2	HMS	29.8
	168–182	Below Packer	2	HMS	29.8
HFM17	0–211	Open borehole	2	HMS	10
HFM28	0–151	Open borehole	2	HMS	10
HFM23	0–212	Open borehole	2	HMS	15

[1)] 1B: Pumping test-submersible pump, 2: Interference test (observation borehole during pumping in another borehole).

5 Execution

5.1 Preparations

A simple two point calibration of the pressure transducer that was used in the pumping borehole was conducted in June of 2006. The flow meter was calibrated in the Geosigma workshop prior to the installation of the equipment in HFM14 in June of 2007. The equipment had just been used in HFM14 where its function was observed to be satisfactory. Before the tests, function checks and cleaning of equipment were performed according to the Activity Plan.

5.2 Procedure

The interference test in HFM33 was carried out as a constant flow rate test followed by a subsequent pressure recovery period. The pressure interference was recorded in totally 148 sections in 40 observation boreholes, both cored and percussion drilled boreholes, all part of the HMS (Hydro Monitoring System). The flow rate in the pumping borehole was chosen based on the results from previous investigations conducted in HFM33. In conjunction with the installation of equipment the week before the start of pumping, a short capacity test was performed in order to check the status of the equipment and to get even more information about the drawdown characteristics of the pumping borehole. The results from the capacity test showed quite a large discrepancy compared to the results from previously performed tests. As a result, the flow rate used during the interference test was significantly lower than was at first proposed. The flow rate was manually adjusted by a control valve and monitored by an electromagnetic flow meter. The data logger sampled data at a suitable frequency determined by the operator, see Table 5-1. Pumping in HFM33 was carried out using two coupled 4″ submersible pumps during a period of c. 14 days. The subsequent pressure recovery was measured for c. 7 days.

The discharged water from the pumping borehole was led into the sea approximately 20 m south of HFM33.

In HFM33, the absolute pressure transducer connected to the data-logger was attached to the pump pipe approximately 23.5 m below top of casing. The transducers were connected directly to the data logger via cables. In the observation boreholes the hydro monitoring system was utilized for pressure registration.

Approximate sampling intervals for flow rate and pressure in the pumping borehole HFM33 are presented in Table 5-1. During the first hours of pumping the sampling frequency was adjusted manually and Table 5-1 reflects only the character of the changes of frequency intervals. At the time of pumping stop, the sampling frequency was automatically changed in accordance with Table 5-1.

The observation boreholes are either fitted with removable miniTroll transducers equipped with an attached logger or with stationary equipment for measuring pressure in the different sections. The miniTroll transducers were logging a pressure value with the standard frequency of one reading every two hours. In addition, a value was logged in case there was a pressure change of at least 0.1 m since the last logging. The logging intervals of the stationary installations are given in Table 5-2. The standard condition for change induced logging is the same as for the miniTroll transducers.

Table 5-1. Approximate sampling intervals used for pressure registration in HFM33 during the interference test in HFM33.

Time interval (s) from start/stop of pumping	Sampling interval (s)
1–300	1
301–600	10
601–3,600	60
> 3,600	300
> 3,600 [1)]	600

[1)] The 600 s sampling interval was used during recovery instead of the 300 s interval.

Table 5-2. Logging schedule for the observation boreholes during the interference test in HFM33.

Time before or after start/stop of pumping	Scan interval	Log Interval
1 h. before	10 s.	10 s.
30 min. after	1 min.	1 min.
4 h. after	5 min.	5 min.
6 h. after	5 min.	10 min.
24 h. after	5 min.	30 min.

5.3 Data handling

Flow and pressure data from the pumping borehole, HFM33, were downloaded from the logger (Campbell CR 5000) to a laptop running the program PC9000 and are, already in the logger, transformed to engineering units. All files are comma-separated (*.DAT) when copied to a computer. A list of the data files from the data logger is shown in Appendix 1.

5.4 Analyses and interpretation

When performed, both qualitative and quantitative analyses have been carried out in accordance with the methodology descriptions for interference tests, SKB MD 330.003, and are reported in Chapter 6 below. Methods for constant-flow rate tests in an equivalent porous medium were used by the analyses and interpretation of the tests.

The main objective of the interference test was to document how different fracture zones are connected hydraulically, to quantify their hydraulic properties and to clarify whether there are any major hydraulic boundaries in the area. Quantitative evaluation of four selected observation sections was also included in the commission. The following sections: KFM06A: 341–362 m, KFM01D: 0–153 m, HFM21: 107–202 m and HFM01: 46–200 m were chosen for analyses with regard to transmissivity and storativity. Other borehole sections included in the interference tests were only qualitatively analysed, mainly by means of the response analysis reported in Section 6.3 below.

Data from all available observation sections were used in the primary qualitative analyses. The qualitative analysis of the responses in the interference test in HFM33 was primarily based on time versus pressure diagrams together with response diagrams. Linear diagrams of pressure versus time for all test sections are presented in Chapter 6 for each borehole included in the test.

For the four selected observation sections the dominating flow regimes (pseudo-linear, pseudo-radial and pseudo-spherical flow, respectively) and possible outer boundary conditions were identified. In particular, pseudo-radial flow is reflected by a constant (horizontal) derivative in the diagrams, whereas no-flow- and constant head boundaries are characterized by rapid increase and decrease of the derivative, respectively.

Different values were applied on the filter coefficient (step length) by the calculation of the pressure derivative to investigate the effect of this coefficient on the derivative. It is desired to achieve maximum smoothing of the derivative without altering the original shape of the data.

Quantitative evaluation was only undertaken of the responses in the four above mentioned selected observation sections, KFM06A: 341–362 m, KFM01D: 0–153 m, HFM21: 107–202 m and HFM01: 46–200 m. The sections were selected in agreement with the Activity Leader. In addition, the response in the pumping borehole HFM33 was evaluated as a single-hole pumping test according to the methods described in /32/.

The quantitative transient analysis was performed by the test analysis software AQTESOLV that enables both visual and automatic type curve matching. The transient evaluation of the observation sections was carried out as an iterative process of type curve matching and automatic non-linear regression. The transient interpretation of the hydraulic parameters (mainly transmissivity and storativity) is in most cases based on the identified pseudo-radial flow regime during the tests using both log-log and lin-log data diagrams. The pseudo-radial flow regime is often transitioning to pseudo-spherical (leaky) flow by the end of the test.

For the single-hole pumping test in HFM33 the storativity was calculated using an empirical regression relationship between storativity and transmissivity, see Equation. (5-1), SKB (2006) /33/.

$$S=0.0007 \cdot T^{0.5} \qquad (5\text{-}1)$$

S = storativity (–)
T = transmissivity (m^2/s)

5.5 Nonconformities

- At one point during the flow period the flow rate suddenly drops without explanation. The flow rate is relatively constant after this.
- For a short time in the early part of the flow period the drawdown was too large and the pressure transducer was hanging in air. It is believed that the water level was just below the pressure transducer. Only a minor adjustment of the flow rate had to be made for the water level to rise to an appropriate level.
- Due to the precipitation that fell primarily during the flow period, it is not possible to use results from the response analysis for comparison with other similar interference tests. It is likely that rising ground water pressures, presumably a consequence to the precipitation, may lead to an underestimation of the drawdown in observation boreholes and conversely to an overestimation of the recovery in some borehole sections.

6 Results

6.1 Nomenclature and symbols

The nomenclature and symbols used for the results of the single-hole and interference test are according to the Instruction for analysis of single-hole injection- and pumping tests (SKB MD 320.004) and the methodology description for interference tests (SKB MD 330.003), respectively (both are SKB internal controlling documents). Additional symbols used are explained in the text.

6.2 Interference test in HFM33

The start and stop of pumping occurred on November, 1 and November 15, respectively. The test stop in the transient analysis is at November 22nd. The exact start and stop times are shown in the tables below.

During the interference test the pressure was registered in a number of cored boreholes and percussion boreholes in rock. The pressure responses in all monitored observation sections in the rock are presented in Figures 6-2 through 6-46. All observation boreholes included in the test and their approximate distances to the pumping borehole HFM33 are marked in Figure 1-1.

The boreholes selected to be included in this test were all situated within a radius of 2,000 m from the pumping borehole, HFM33, cf. Figure 1-1. It is quite possible that boreholes outside of this perimeter may also be affected by the pumping in HFM33, even though their possible responses are not evaluated in this report. When making a brief review of responses in boreholes outside of the 2,000 m radius area, some boreholes indicate being influenced by the pumping in HFM33. For example: HFM13, HFM32 and KFM10A.

Visual inspection of the pressure responses in the observation sections, presented in Figures 6-2 through 6-46, indicates that significant responses were registered in c. 34% of the 148 observation sections included in the interference test. 86 sections were considered as completely unaffected or so weakly affected by the pumping that any conclusive assumptions regarding possible responses could not be made. Notable is that 11 sections were believed to be affected by the pumping in HFM33 even though the final drawdown in these sections was negative. This is explained by natural causes discussed further down in this section.

The measured drawdowns (s_p) at the end of the flow period and the estimated response time lags (dt_L) in all of the observation sections are shown in Tables 6-148 and 6-149, respectively. However, as discussed below, due to the heavy precipitation during the later part of the flow period, the measured drawdown at the end of the flow period may not be representative in this case, particularly for the uppermost sections in the boreholes. In such cases, the maximal drawdown before start of the period with heavy precipitation is considered as more representative. This adjustment is however not performed in this report. The response time is defined as the time lag after start of pumping until a drawdown response of 0.01 m was observed in the actual observation section.

All pressure data presented in this report have been corrected for atmospheric pressure changes by subtracting the latter pressure from the measured (absolute) pressure. This is also true for the data received from the HMS. It should be observed that no further corrections of the measured drawdown have been made, e.g. due to natural trends, precipitation, tidal effects etc, as discussed below. All times presented are Swedish normal times.

During the interference test, approximately 38 mm of total precipitation (almost all of it during the later part of the flow period) was reported from a station in the vicinity of the boreholes included in the test, see Figure A2-9. In the figure the start and stop times of the interference test and flow period are marked. During the flow period only four days were rain free. It is plausible that the rainfall is a contributing factor to the trend of rising groundwater pressure observed during a major part of the flow period (next paragraph). In the figure also the air pressure together with the sea-water level from one station in the vicinity of the investigation area are included. Data of sea-water-level are not covering more than the beginning of the test period. It is apparent however that the sea-water-level is rising in conjunction to the first major rain fall during the flow period.

A natural trend of increasing groundwater pressure occurred during the major part of the hydraulic interference test. See for instance Figure 6-5, where an assumed unaffected borehole from the pumping is depicted. The pressure is rising and falling erratically during the flow period but an average trend appears to exist, leading to an increase of about 10–20 cm in some sections during the flow period. Due to this trend it is likely that the drawdown in some of the sections has been underestimated. It is believed that the comparison between sections included in this test is still relevant since they presumably have all been influenced by the trend in a similar fashion. Comparison of numerical values from this test and other similar interference tests is however not advised.

Also, due to the above mentioned trend of increasing ground waterpressure, some sections that are believed to be responding still exhibit a negative total drawdown. The general shape of the pressure curves associated with these borehole sections does however suggest that they are in fact responding to the pumping in HFM33. There are clear signs of the section being affected by the pumping in conjunction with the start and stop of pumping, cf. Figure 6-21, section HFM21: 22–32. These sections are not included in the different response diagrams in Section 6.3. They are however still included in the tables in Section 6.3 to emphasize that they are believed to be responding.

No correction for the probable increasing pressure trend has been done in the preliminary qualitative response analysis described in this report.

The pressure in several of the observation sections included in the interference test was displaying an oscillating behaviour. This is believed to be naturally caused by so called tidal fluctuations or earth tides in combination with changes of the sea water level. These phenomena have, to some extent, been investigated previously in /34/. This effect, which can be observed, for instance, in many sections in borehole KFM06A, Figure 6-16, will not be further commented on in every section in which it appears. Only on some occasions where it is unusually strong or if it affects the analysis will it be referred to.

In the transient evaluation of the responses in the pumping borehole and selected observation sections, the models described in /35–38/ were used. Due to the variable flow rate during the first c. 2 hours of pumping and then again about two days into the flow period, the test sections were analysed as variable flow rate tests by the transient evaluation.

6.2.1 Pumping borehole HFM33: 0–140 m

General test data for the pumping test in HFM33 are presented in Table 6-1. According to Table 3-1, the borehole is cased to 12.0 m. The uncased interval of this section is thus c. 12–140 m.

Table 6-1. General test data for the pumping test in HFM33: 0–140 m.

General test data				
Pumping borehole		HFM33		
Test type[1)]		Constant Rate withdrawal and recovery test		
Test section (open borehole/packed-off section):		open borehole		
Test No		1		
Field crew		(GEOSIGMA AB)		
Test equipment system				
General comment		Interference test		
	Nomenclature	**Unit**	**Value**	
Borehole length	L	m	140.20	
Casing length	L_c	m	12.04	
Test section- secup	Secup	m	12.04	
Test section- seclow	Seclow	m	140.20	
Test section length	L_w	m	132.16	
Test section diameter[2)]	$2 \cdot r_w$	mm	139–140	
Test start (start of pressure registration)		yymmdd hh:mm	071101 09:12	
Packer expanded		yymmdd hh:mm:ss		
Start of flow period		yymmdd hh:mm:ss	071101 09:44:03	
Stop of flow period		yymmdd hh:mm:ss	071115 10:00:17	
Test stop (stop of pressure registration)		yymmdd hh:mm	071122 00:00	
Total flow time	t_p	min	20,176	
Total recovery time	t_F	min	9,480	
Pressure data				
Relative pressure in test section before start of flow period	p_i	kPa	167.56	
Relative pressure in test section before stop of flow period	p_p	kPa	7.53	
Relative pressure in test section at stop of recovery period	p_F	kPa	168.45	
Pressure change during flow period (p_i–p_p)	dp_p	kPa	160.03	
Flow data				
Flow rate from test section just before stop of flow period	Q_p	m^3/s	0.00379	
Mean (arithmetic) flow rate during flow period	Q_m	m^3/s	0.00386	
Total volume discharged during flow period	V_p	m^3	4,676	
Manual groundwater level measurements in HFM33 (12.0–140.2 m)	**GW level**			
Date YYYY-MM-DD	**Time tt:mm**	**Time (min)**	**(m b. ToC)**	**(m.a.s.l.)**
2007-10-25	13:10	–9,842	3.01	0.04

[1)] Constant Head injection and recovery or Constant Rate withdrawal and recovery.
[2)] Nominal diameter.

Comments on the test

The test was performed as a constant-flow rate pumping test. The mean flow rate was c. 232 L/min and the duration of the flow period was c. 14 days. The flow is slowly decreasing during the first day. Approximately 5 days into the flow period the flow rate suddenly drops unexpectedly. This can be clearly observed in Figure 6-1. This may be due to formation properties or it could be equipment related although no real explanation has been found. The final drawdown in HFM33 was approximately 16 m. The pressure recovery was measured for almost 7 days. Overviews

of the flow rate and pressure responses in HFM33 are presented in Figure 6-1. The pressure responses in log-log and lin-log diagrams during the flow period are presented in Figures A2-1 and A2-2 in Appendix 2. In Figures A2-3 and A2-4, log-log and lin-log diagrams of the recovery period are shown.

Interpreted flow regimes

During the flow period, a pseudo-linear (fracture) flow regime is indicated during the first c. 70 seconds, although the data are scattered. Between approximately 100 and 1,500 s, a pseudo-radial flow regime is occurring until the decrease in flow rate. This flow regime is then re-established between c. 2,500–10^5 s. From c. 10^5 s and throughout the flow period pseudo-spherical (slightly leaky) flow is dominating.

After an initial pseudo-linear (fracture) flow regime during the first c. 60 s of the recovery period, an approximate PRF occurs between c. 2,000 and 20,000 s. After this time, a transition into a PSF lasting until the end of the flow period is observed.

Interpreted parameters

Transient, quantitative interpretation of the flow period is shown in log-log and lin-log diagrams in Figures A2-1 and A2-2 and of the recovery period in Figures A2-3 and A2-4, all in Appendix 2. The results from the transient evaluation of the single-hole pumping test in HFM33 are summarized in Table 6-154 and in the Test Summary Sheet.

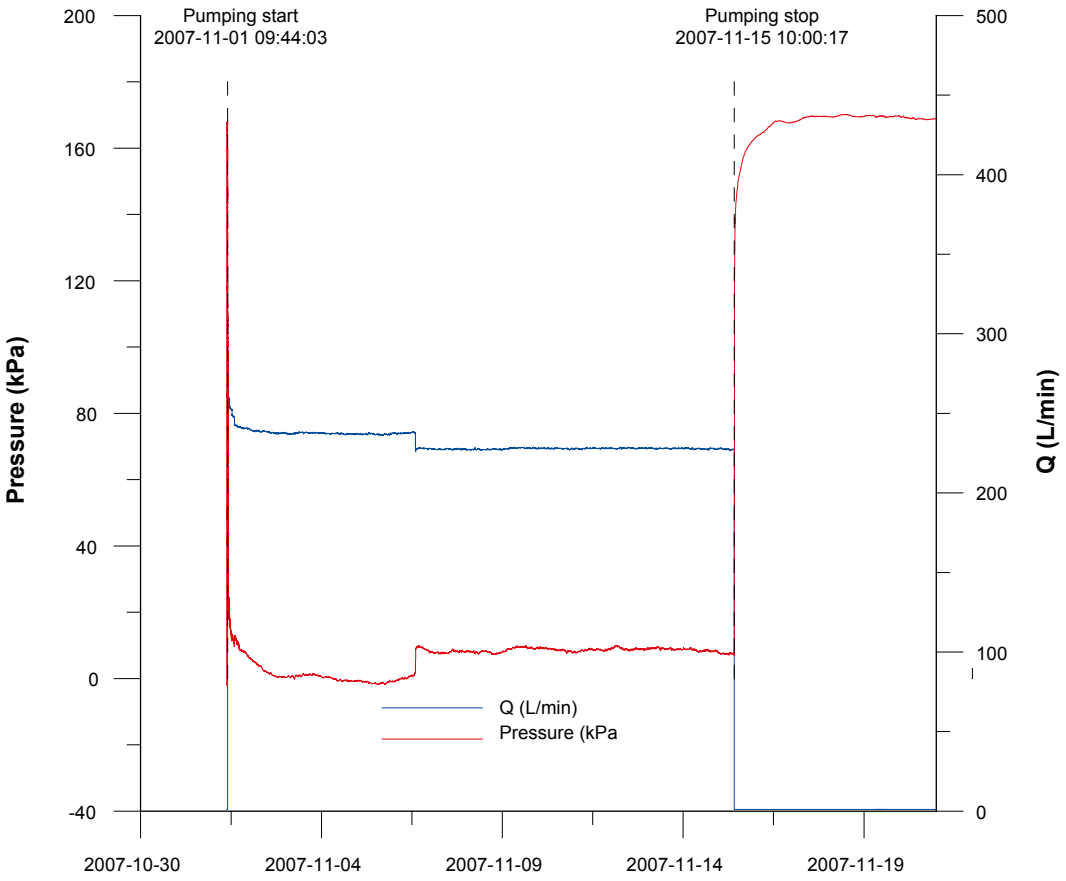


Figure 6-1. *Linear plot of flow rate and pressure versus time in the pumping borehole HFM33 during the interference test.*

6.2.2 Observation section KFM11A: 0–130 m

In Figure 6-2 an overview of the pressure responses in observation borehole KFM11A is shown. General test data from the observation section KFM11A, 0–130 m, are presented in Table 6-2. According to Table 3-1, the borehole is cased to 70.77 m. The uncased interval of this section is thus c. 71–130 m.

Comments on the test

No response to the pumping in HFM33 was detected in this section. There is a negative total drawdown during the flow period.

6.2.3 Observation section KFM11A: 131–360 m

In Figure 6-2 an overview of the pressure responses in observation borehole KFM11A is shown. General test data from the observation section KFM11A, 131–360 m, are presented in Table 6-3.

Comments on the test

No response to the pumping in HFM33 was detected in this section. There is a negative total drawdown during the flow period.

6.2.4 Observation section KFM11A: 361–445 m

In Figure 6-2 an overview of the pressure responses in observation borehole KFM11A is shown. General test data from the observation section KFM11A, 361–445 m, are presented in Table 6-4.

Comments on the test

No response to the pumping in HFM33 was detected in this section. At the end of the flow period the pressure in the test section is the same as it was prior to the start of pumping.

Table 6-2. General test data from the observation section KFM11A: 0-130 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–3.00
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–2.95
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–2.98
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.06

Table 6-3. General test data from the observation section KFM11A: 131–360 during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–1.68
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–1.57
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–1.66
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.11

Table 6-4. General test data from the observation section KFM11A: 361–445 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–2.97
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–2.96
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–3.02
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.00

6.2.5 Observation section KFM11A: 446–456 m

In Figure 6-2 an overview of the pressure responses in observation borehole KFM11A is shown. General test data from the observation section KFM11A, 446–456 m, are presented in Table 6-5.

Comments on the test

No response to the pumping in HFM33 was detected in this section. There is a slight negative total drawdown at the end of the flow period.

6.2.6 Observation section KFM11A: 457–689 m

In Figure 6-2 an overview of the pressure responses in observation borehole KFM11A is shown. General test data from the observation section KFM11A, 457–689 m, are presented in Table 6-6.

Comments on the test

No response to the pumping in HFM33 was detected in this section. There is a negative total drawdown during the flow period.

Table 6-5. General test data from the observation section KFM11A: 446–456 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–3.11
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–3.10
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–3.16
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.01

Table 6-6. General test data from the observation section KFM11A: 457–689 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–5.38
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–5.34
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–5.41
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.04

6.2.7 Observation section KFM11A: 690–710 m

In Figure 6-2 an overview of the pressure responses in observation borehole KFM11A is shown. General test data from the observation section KFM11A, 690–710 m, are presented in Table 6-7.

Comments on the test

No response to the pumping in HFM33 was detected in this section. There is a slight negative total drawdown at the end of the flow period.

6.2.8 Observation section KFM11A: 711–850 m

In Figure 6-2 an overview of the pressure responses in observation borehole KFM11A is shown. General test data from the observation section KFM11A, 711–850 m, are presented in Table 6-8.

Comments on the test

No response to the pumping in HFM33 was detected in this section. There is a negative total drawdown during the flow period.

Table 6-7. General test data from the observation section KFM11A: 690–710 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–6.65
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–6.63
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l	–6.69
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.02

Table 6-8. General test data from the observation section KFM11A: 711–850 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–3.31
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–3.32
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–3.38
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.00

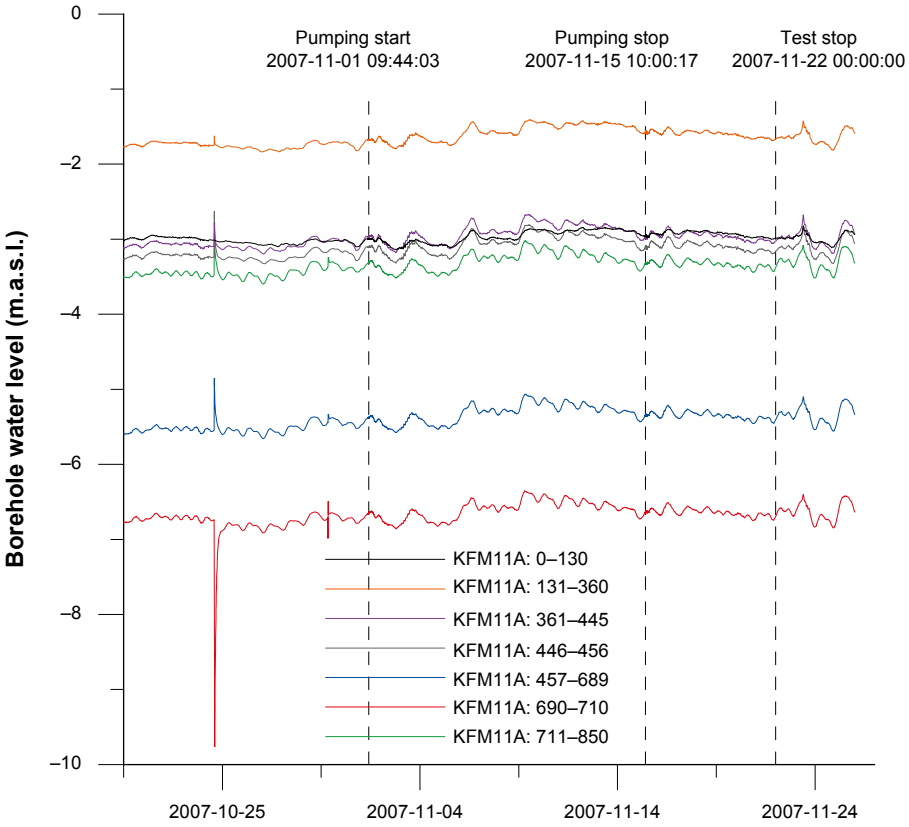


Figure 6-2. *Linear plot of pressure versus time in the observation sections in KFM11A during the interference test in HFM33.*

6.2.9 Observation section HFM34: 0–21 m

In Figure 6-3 an overview of the pressure responses in observation borehole HFM34 is shown. General test data from the observation section HFM34, 0–21 m, are presented in Table 6-9. According to Table 3-1, the borehole is cased to 12.08 m. The uncased interval of this section is thus c. 12–21 m.

Comments on the test

There are no indications to show that this section was influenced by the pumping in HFM33. At the end of the flow period there is a negative total drawdown and the pressure is dropping in the test section during the recovery period.

Table 6-9. General test data from the observation section HFM34: 0–21 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.73
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.65
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.76
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

6.2.10 Observation section HFM34: 22–90 m

In Figure 6-3 an overview of the pressure responses in observation borehole HFM34 is shown. General test data from the observation section HFM34, 22–90 m, are presented in Table 6-10.

Comments on the test

There are no available data from this test section from the time of the interference test.

6.2.11 Observation section HFM34: 91–201 m

In Figure 6-3 an overview of the pressure responses in observation borehole HFM34 is shown. General test data from the observation section HFM34, 91–201 m, are presented in Table 6-11.

Comments on the test

There are no indications to show that this section was influenced by the pumping in HFM33. At the end of the flow period there is a negative total drawdown and the pressure is dropping in the test section during the recovery period.

Table 6-10. General test data from the observation section HFM34: 22–90 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–3.04
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–2.94
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–3.06
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.10

Table 6-11. General test data from the observation section HFM34: 91–201 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–

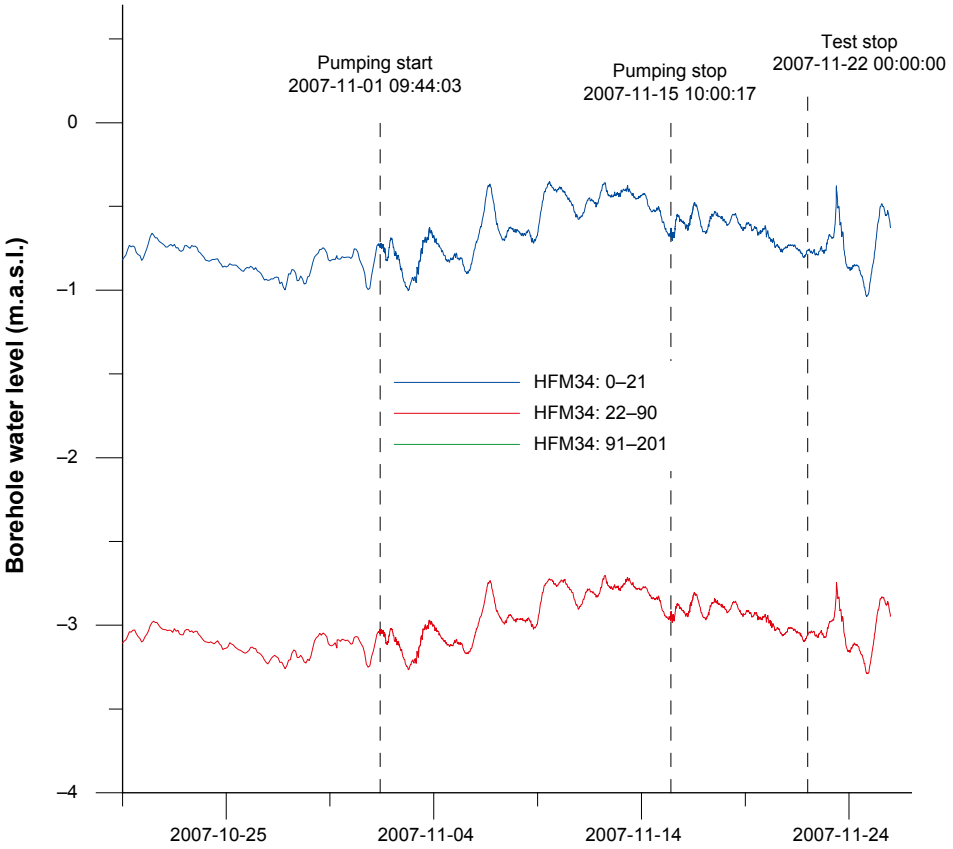


Figure 6-3. *Linear plot of pressure versus time in the observation sections in HFM34 during the interference test in HFM33.*

6.2.12 Observation section KFR01: 11–43.5 m

In Figure 6-4 an overview of the pressure responses in observation borehole KFR01 is shown. General test data from the observation section KFR01, 11–43.5 m, are presented in Table 6-12.

Comments on the test

There are no signs to suggest that this section is affected by the pumping in HFM33. There is a negative drawdown registered from the pumping period.

Table 6-12. General test data from the observation section KFR01: 11–43.5 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Pressure in test section before start of flow period	P_i	kPa	326.24
Pressure in test section before stop of flow period	P_p	kPa	327.13
Pressure in test section at stop of recovery period	P_F	kPa	326.69
Pressure change during flow period (P_i–P_p)	dP_p	kPa	–0.89

6.2.13 Observation section KFR01: 44.5–62.3 m

In Figure 6-4 an overview of the pressure responses in observation borehole KFR01 is shown. General test data from the observation section KFR01, 44.5–62.3 m, are presented in Table 6-13.

Comments on the test

This section is most likely unaffected by the pumping in HFM33. There is a negative drawdown registered from the pumping period.

Table 6-13. General test data from the observation section KFR01: 44.5–62.3 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Pressure in test section before start of flow period	P_i	kPa	244.08
Pressure in test section before stop of flow period	P_p	kPa	245.76
Pressure in test section at stop of recovery period	P_F	kPa	245.49
Pressure change during flow period (P_i–P_p)	dP_p	kPa	–1.68

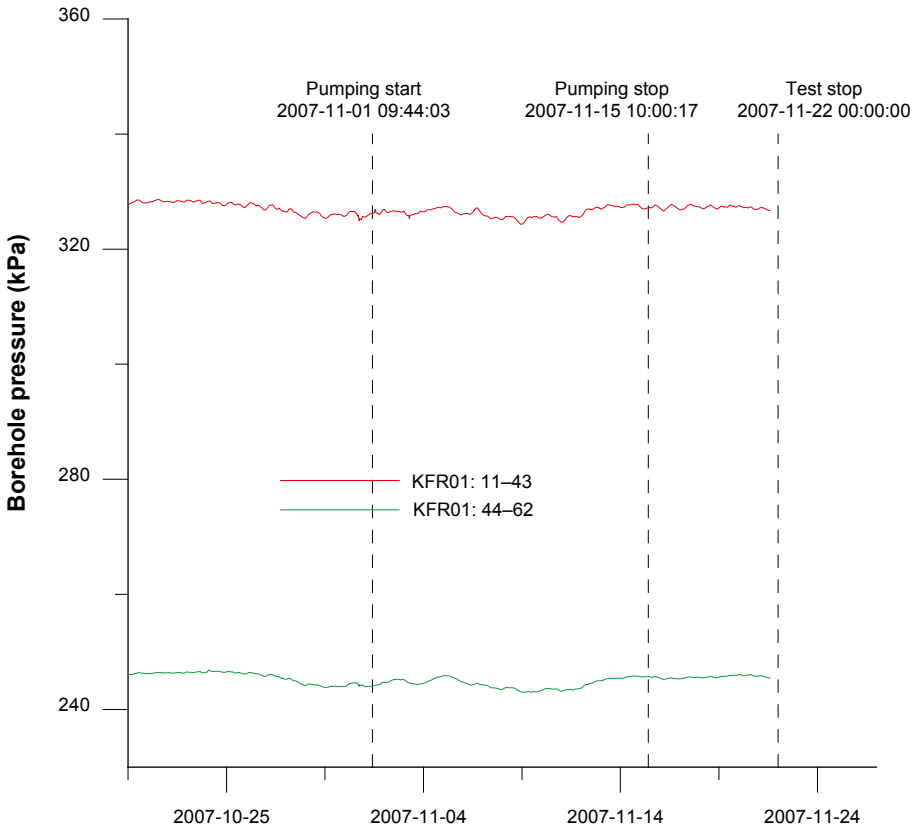


Figure 6-4. *Linear plot of pressure versus time in the observation sections in KFR01 during the interference test in HFM33.*

6.2.14 Observation section HFM35: 0–33 m

In Figure 6-5 an overview of the pressure responses in observation borehole HFM35 is shown. General test data from the observation section HFM35, 0–33 m, are presented in Table 6-14. According to Table 3-1, the borehole is cased to 12.04 m. The uncased interval of this section is thus c. 12–33 m.

Comments on the test

This section is clearly unaffected by the pumping in HFM33. At the end of the flow period the pressure in the observation section has increased compared to the pressure prior to the start of pumping. Also the recorded recovery is negative.

6.2.15 Observation section HFM35: 34–150 m

In Figure 6-5 an overview of the pressure responses in observation borehole HFM35 is shown. General test data from the observation section HFM35, 34–150 m, are presented in Table 6-15.

Comments on the test

This section is clearly unaffected by the pumping in HFM33. At the end of the flow period the pressure in the observation section has increased compared to the pressure prior to the start of pumping. Also the recorded recovery is negative.

6.2.16 Observation section HFM35: 151–181 m

In Figure 6-5 an overview of the pressure responses in observation borehole HFM35 is shown. General test data from the observation section HFM35, 151–181 m, are presented in Table 6-16.

Comments on the test

This section is clearly unaffected by the pumping in HFM33. At the end of the flow period the pressure in the observation section has increased compared to the pressure prior to the start of pumping. Also the recorded recovery is negative.

Table 6-14. General test data from the observation section HFM35: 0–33 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.43
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.33
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.45
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

Table 6-15. General test data from the observation section HFM35: 34–150 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–5.56
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–5.42
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–5.55
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.14

Table 6-16. General test data from the observation section HFM35: 151–181m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–5.51
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–5.36
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–5.49
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.15

6.2.17 Observation section HFM35: 182–201 m

In Figure 6-5 an overview of the pressure responses in observation borehole HFM35 is shown. General test data from the observation section HFM35, 182–201 m, are presented in Table 6-17.

Comments on the test

This section is clearly unaffected by the pumping in HFM33. At the end of the flow period the pressure in the observation section has increased compared to the pressure prior to the start of pumping. Also the recorded recovery is negative.

Table 6-17. General test data from the observation section HFM35: 182–201 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–5.41
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–5.26
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–5.39
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.15

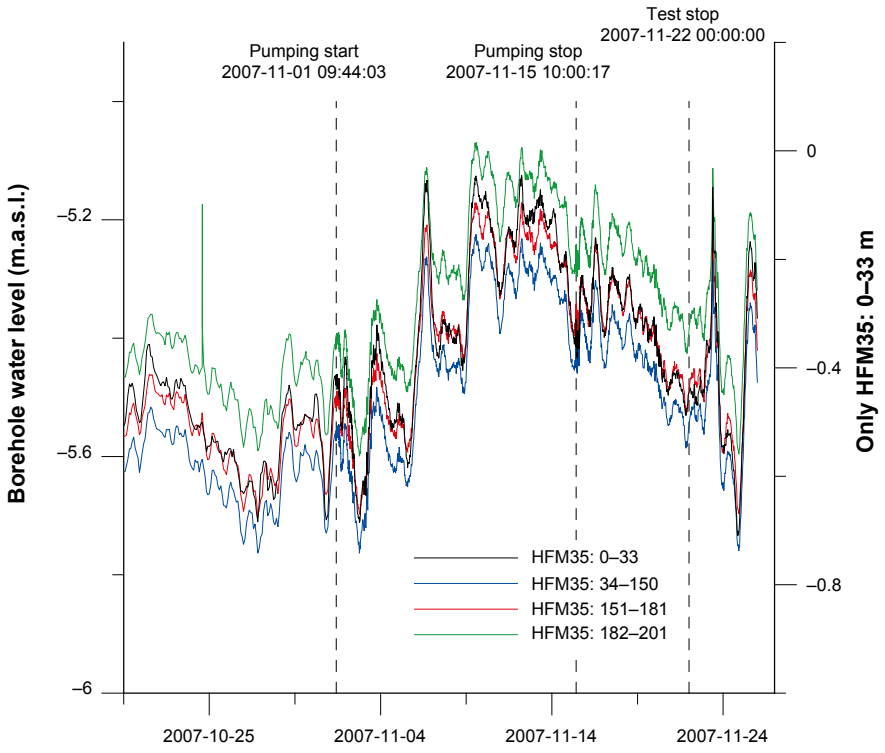


Figure 6-5. *Linear plot of pressure versus time in the observation sections in HFM35 during the interference test in HFM33.*

6.2.18 Observation section HFM38: 0–23 m

In Figure 6-6 an overview of the pressure responses in observation borehole HFM38 is shown. General test data from the observation section HFM38, 0–23 m, are presented in Table 6-18. According to Table 3-1, the borehole is cased to 9.05 m. The uncased interval of this section is thus c. 9–23 m.

Comments on the test

This section appears to be slightly affected by the pumping in HFM33. There is a total drawdown of 0.2 m during the flow period and a 0.01 m drawdown was reached approximately 10 hours into the pumping period. There was a total recovery of c. 0.2 m during the recovery period lasting for approximately one week.

6.2.19 Observation section HFM38: 24–41 m

In Figure 6-6 an overview of the pressure responses in observation borehole HFM38 is shown. General test data from the observation section HFM38, 24–41 m, are presented in Table 6-19.

Comments on the test

This section appears to be slightly affected by the pumping in HFM33. There is a total drawdown of 0.5 m during the flow period and a 0.01 m drawdown was reached about 80 minutes into the pumping period. There was a total recovery of c. 0.5 m during the recovery period lasting for approximately one week.

Table 6-18. General test data from the observation section HFM38: 0–23 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.04
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.24
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.07
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.20

Table 6-19. General test data from the observation section HFM38: 24–41 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.03
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.49
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.00
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.52

6.2.20 Observation section HFM38: 42–201 m

In Figure 6-6 an overview of the pressure responses in observation borehole HFM38 is shown. General test data from the observation section HFM38, 42–201 m, are presented in Table 6-20.

Comments on the test

This section is not at all or very slightly affected by the pumping in HFM33. There is a negative drawdown as well as negative recovery observed in this section during the pumping period and recovery period respectively.

Table 6-20. General test data from the observation section HFM38: 42–201 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.23
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.10
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.14
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.13

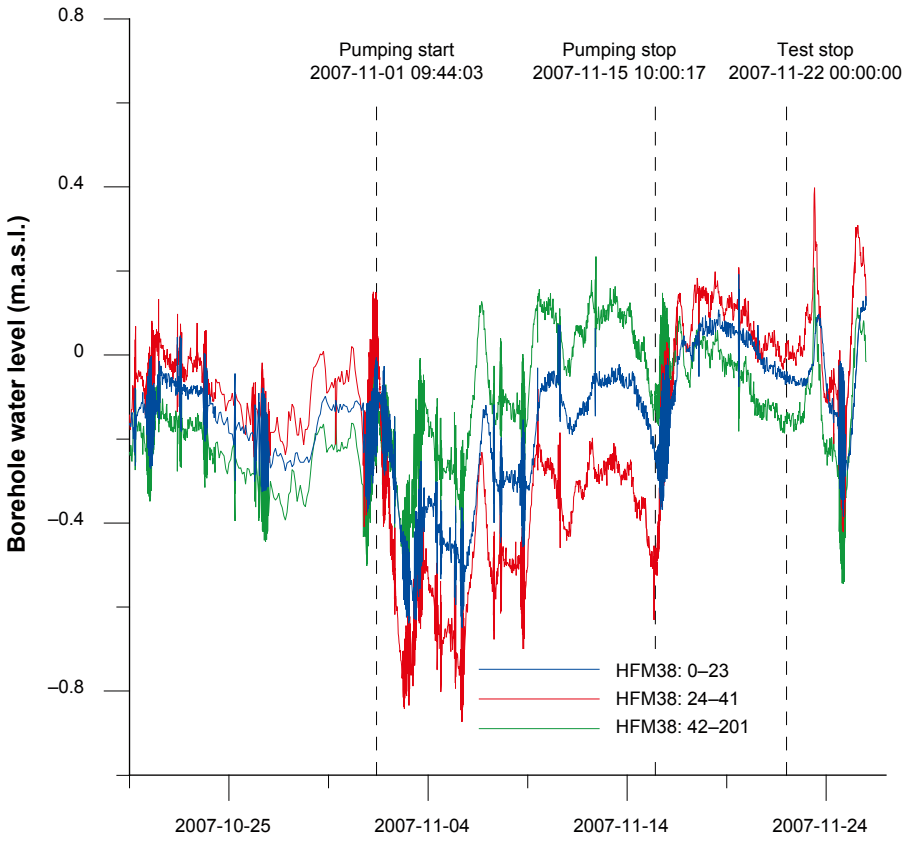


Figure 6-6. *Linear plot of pressure versus time in the observation sections in HFM38 during the interference test in HFM33.*

6.2.21 Observation section KFR09: 2–80 m

In Figure 6-7 an overview of the pressure responses in observation borehole KFR09 is shown. General test data from the observation section KFR09, 2–80 m, are presented in Table 6-21.

Comments on the test

This observation section appears to be completely unaffected by the pumping in HFM33. The drawdown as well as the recovery display negative values.

Table 6-21. General test data from the observation section KFR09: 2–80 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Pressure in test section before start of flow period	P_i	kPa	841.91
Pressure in test section before stop of flow period	P_p	kPa	843.63
Pressure in test section at stop of recovery period	P_F	kPa	842.92
Pressure change during flow period (P_i–P_p)	dP_p	kPa	–1.72

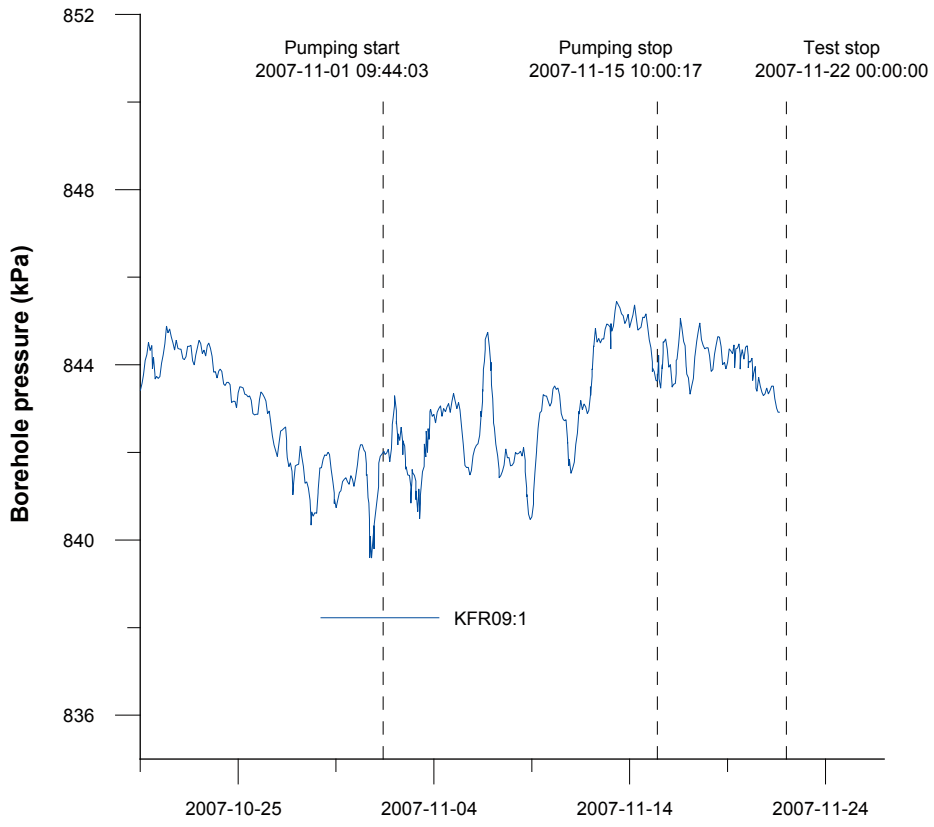


Figure 6-7. *Linear plot of pressure versus time in the observation sections in KFR09 during the interference test in HFM33.*

6.2.22 Observation section KFR02: 81–118 m

In Figure 6-8 an overview of the pressure responses in observation borehole KFR02 is shown. General test data from the observation section KFR02, 81–118 m, are presented in Table 6-22.

Comments on the test

This observation section appears to be unaffected by the pumping in HFM33. Even though there is some drawdown recorded, it does not seem likely that it is connected to the pumping in HFM33 due to the very long delay between start of pumping and the pressure response in this section. The recovery is negative.

6.2.23 Observation section KFR02: 119–136 m

In Figure 6-8 an overview of the pressure responses in observation borehole KFR02 is shown. General test data from the observation section KFR02, 119–136 m, are presented in Table 6-23.

Comments on the test

This observation section appears to be unaffected by the pumping in HFM33. Even though there is some drawdown recorded, it does not seem likely that it is connected to the pumping in HFM33 due to the very long delay between start of pumping and the pressure response in this section. There is almost no recovery during the recovery period.

Table 6-22. General test data from the observation section KFR02: 81–118 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Pressure in test section before start of flow period	P_i	kPa	333.42
Pressure in test section before stop of flow period	P_p	kPa	330.32
Pressure in test section at stop of recovery period	P_F	kPa	330.18
Pressure change during flow period (P_i–P_p)	dP_p	kPa	3.11

Table 6-23. General test data from the observation section KFR02: 119–136 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Pressure in test section before start of flow period	P_i	kPa	527.32
Pressure in test section before stop of flow period	P_p	kPa	526.41
Pressure in test section at stop of recovery period	P_F	kPa	526.42
Pressure change during flow period (P_i–P_p)	dP_p	kPa	0.91

6.2.24 Observation section KFR02: 137–170 m

In Figure 6-8 an overview of the pressure responses in observation borehole KFR02 is shown. General test data from the observation section KFR02, 137–170 m, are presented in Table 6-24.

Comments on the test

This observation section appears to be unaffected by the pumping in HFM33. Even though there is some drawdown recorded, it does not seem likely that it is connected to the pumping in HFM33 due to the very long delay between start of pumping and the pressure response in this section. The recovery is negative.

Table 6-24. General test data from the observation section KFR02: 137–170 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Pressure in test section before start of flow period	P_i	kPa	310.87
Pressure in test section before stop of flow period	P_p	kPa	307.38
Pressure in test section at stop of recovery period	P_F	kPa	307.35
Pressure change during flow period (P_i–P_p)	dP_p	kPa	3.50

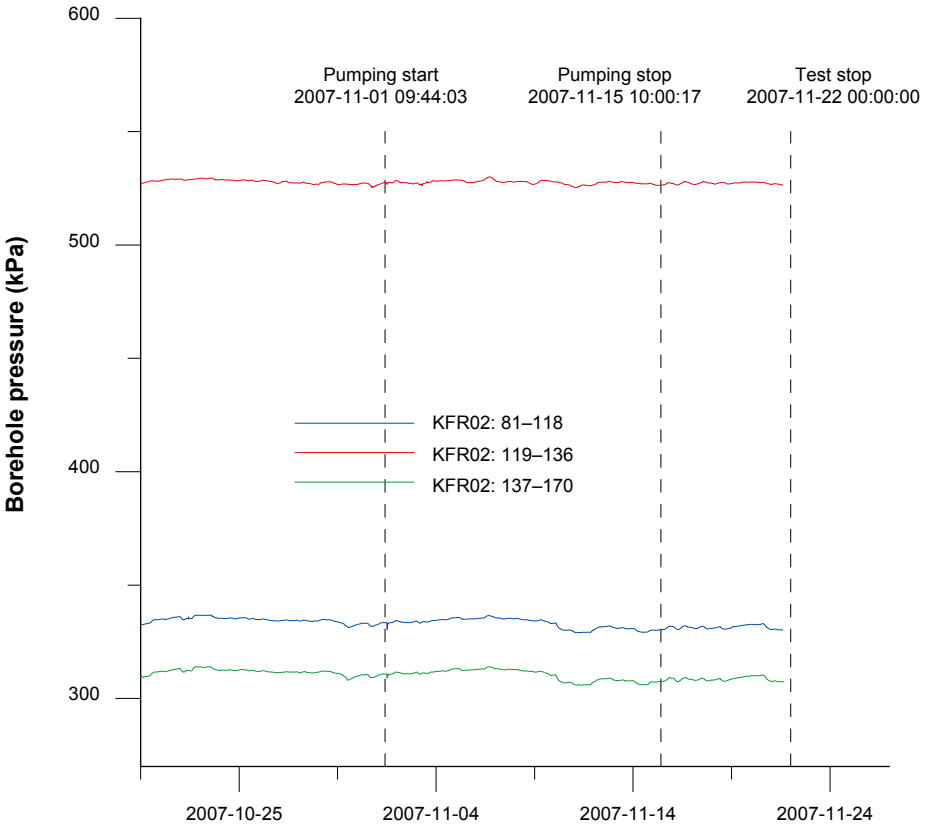


Figure 6-8. *Linear plot of pressure versus time in the observation sections in KFR02 during the interference test in HFM33.*

6.2.25 Observation section KFM08C: 0–145 m

In Figure 6-9 an overview of the pressure responses in observation borehole KFM08C is shown. General test data from the observation section KFM08C, 0–145 m, are presented in Table 6-25. According to Table 3-1, the borehole is cased to 12.06 m. The uncased interval of this section is thus c. 12–145 m.

Comments on the test

A relatively clear response to pumping is indicated in this section. The total drawdown during the flow period was c. 0.2 m. A drawdown of 0.01 m was reached approximately 5 hours after start of pumping in HFM33. There was a total recovery of c. 0.2 m during the recovery period lasting for approximately one week.

6.2.26 Observation section KFM08C: 146–310 m

In Figure 6-9 an overview of the pressure responses in observation borehole KFM08C is shown. General test data from the observation section KFM08C, 146–310 m, are presented in Table 6-26.

Comments on the test

This observation section is probably not influenced by the pumping in HFM33. The drawdown as well as the recovery show negative values.

Table 6-25. General test data from the observation section KFM08C: 0–145 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.03
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.17
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.07
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.20

Table 6-26. General test data from the observation section KFM08C: 146–310 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.02
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.08
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.02
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.06

6.2.27 Observation section KFM08C: 311–610 m

In Figure 6-9 an overview of the pressure responses in observation borehole KFM08C is shown. General test data from the observation section KFM08C, 311–610 m, are presented in Table 6-27.

Comments on the test

This section appears to be unaffected by the pumping. There is only a slight and much delayed drawdown and there is no recovery recorded during the 7 days recovery period.

6.2.28 Observation section KFM08C: 611–760 m

In Figure 6-9 an overview of the pressure responses in observation borehole KFM08C is shown. General test data from the observation section KFM08C, 611–760 m, are presented in Table 6-28.

Comments on the test

This section appears to be unaffected by the pumping. There is only a slight and much delayed drawdown and there is no recovery recorded during the 7 days recovery period.

6.2.29 Observation section KFM08C: 761–950 m

In Figure 6-9 an overview of the pressure responses in observation borehole KFM08C is shown. General test data from the observation section KFM08C, 761–950 m, are presented in Table 6-29.

Comments on the test

This section appears to be unaffected by the pumping. There is only a negative drawdown and no recovery is recorded during the 7 days recovery period.

Table 6-27. General test data from the observation section KFM08C: 311–610 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.07
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.05
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.01
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.02

Table 6-28. General test data from the observation section KFM08C: 611–760 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.13
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.11
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.05
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.02

Table 6-29. General test data from the observation section KFM08C: 761–950 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l	0.02
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.16
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.16
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.14

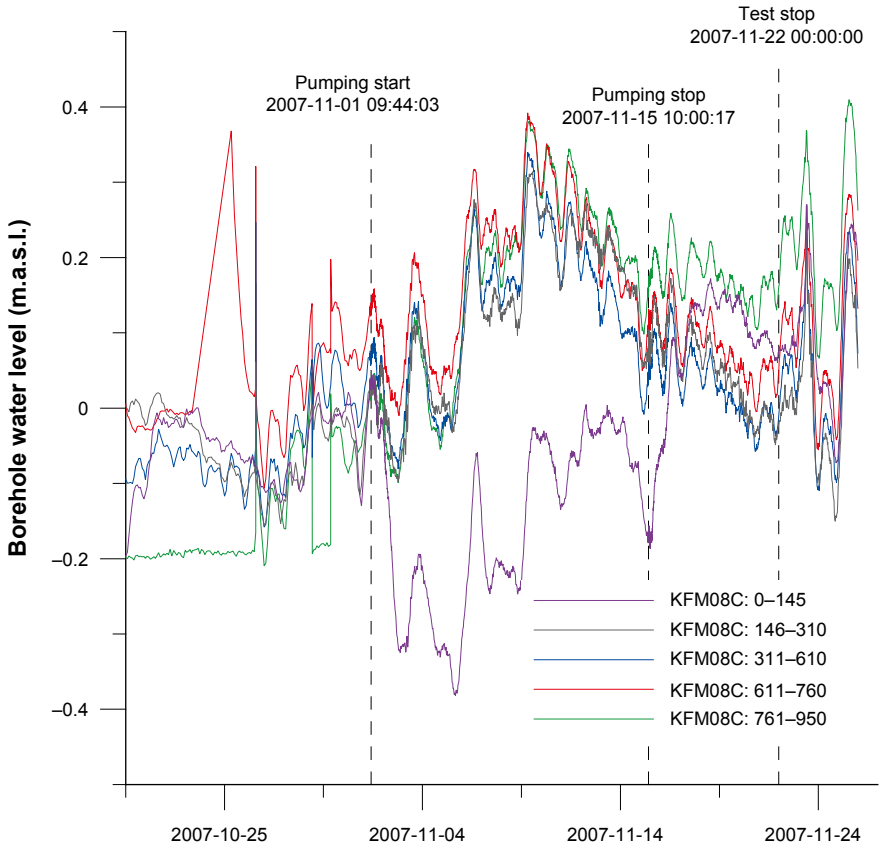


Figure 6-9. *Linear plot of pressure versus time in the observation sections in KFM08C during the interference test in HFM33.*

6.2.30 Observation section KFM08D: 0–160 m

In Figure 6-10 an overview of the pressure responses in observation borehole KFM08D is shown. General test data from the observation section KFM08D, 0–160 m, are presented in Table 6-30. According to Table 3-1, the borehole is cased to 58.80 m. The uncased interval of this section is thus c. 59–160 m.

Comments on the test

A fairly distinct response to pumping is indicated in this section. The total drawdown during the flow period was c. 0.2 m. A drawdown of 0.01 m was reached approximately 6 hours after start of pumping in HFM33. There was a total recovery of c. 0.4 m during the recovery period lasting for approximately 7 days.

6.2.31 Observation section KFM08D: 161–330 m

In Figure 6-10 an overview of the pressure responses in observation borehole KFM08D is shown. General test data from the observation section KFM08D, 161–330 m, are presented in Table 6-31.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating a weak recovery. However, there are no similar indications of a drawdown. Still, there may be a response hidden behind a naturally rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-30. General test data from the observation section KFM08D: 0–160 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.16
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.09
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.27
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.25

Table 6-31. General test data from the observation section KFM08D: 161–330 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.06
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.06
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.13
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.01

6.2.32 Observation section KFM08D: 331–659 m

In Figure 6-10 an overview of the pressure responses in observation borehole KFM08D is shown. General test data from the observation section KFM08D, 331–659 m, are presented in Table 6-32.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating a weak recovery. However there are no similar indications of a drawdown. Still, there may be a response hidden behind a naturally rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

6.2.33 Observation section KFM08D: 660–680 m

In Figure 6-10 an overview of the pressure responses in observation borehole KFM08D is shown. General test data from the observation section KFM08D, 660–680 m, are presented in Table 6-33.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating a weak recovery. However there are no similar indications of a drawdown. Still, there may be a response hidden behind a naturally rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-32. General test data from the observation section KFM08D: 331–659 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.51
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.78
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.72
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.27

Table 6-33. General test data from the observation section KFM08D: 660–680 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.04
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.09
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.07
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.06

6.2.34 Observation section KFM08D: 681–824 m

In Figure 6-10 an overview of the pressure responses in observation borehole KFM08D is shown. General test data from the observation section KFM08D, 681–824 m, are presented in Table 6-34.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating a weak recovery. However there are no similar indications of a drawdown. Still, there may be a response hidden behind a naturally rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

6.2.35 Observation section KFM08D: 825–835 m

In Figure 6-10 an overview of the pressure responses in observation borehole KFM08D is shown. General test data from the observation section KFM08D, 825–835 m, are presented in Table 6-35.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating a weak recovery. However there are no similar indications of a drawdown. Still, there may be a response hidden behind a naturally rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-34. General test data from the observation section KFM08D: 681–824 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.12
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.18
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.19
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.06

Table 6-35. General test data from the observation section KFM08D: 825–835 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–1.72
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–1.80
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–1.81
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.09

6.2.36 Observation section KFM08D: 836–950 m

In Figure 6-10 an overview of the pressure responses in observation borehole KFM08D is shown. General test data from the observation section KFM08D, 836–950 m, are presented in Table 6-36.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating a weak recovery. However there are no similar indications of a drawdown. Still, there may be a response hidden behind a naturally rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-36. General test data from the observation section KFM08D: 836–950 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–2.03
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–2.08
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–2.11
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.05

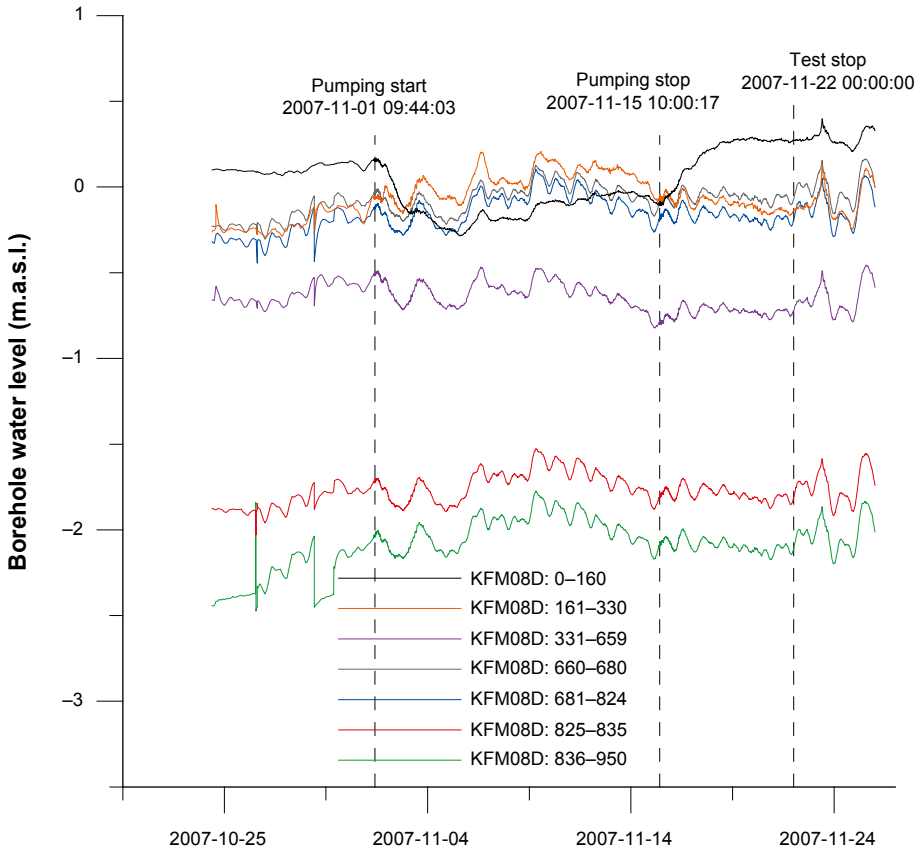


Figure 6-10. *Linear plot of pressure versus time in the observation sections in KFM08D during the interference test in HFM33.*

6.2.37 Observation section HFM22: 0-222 m

In Figure 6-11 an overview of the pressure responses in observation borehole HFM22 is shown. General test data from the observation section HFM22, 0–222 m, are presented in Table 6-37. According to Table 3-1, the borehole is cased to 12.03 m. The uncased interval of this section is thus c. 12–222 m.

Comments on the test

There are not data available for most of the test period for this observation section. Nothing can be deducted about possible responses to pumping in HFM33.

Table 6-37. General test data from the observation section HFM22: 0–222 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–

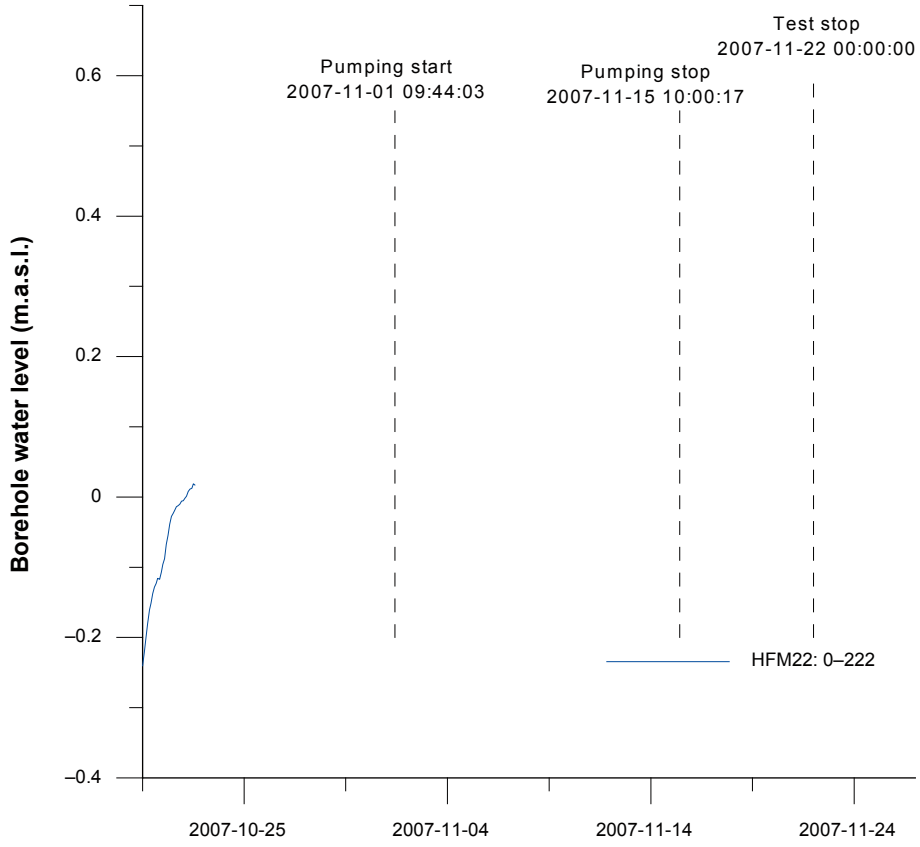


Figure 6-11. *Linear plot of pressure versus time in the observation section in HFM22 during the interference test in HFM33.*

6.2.38 Observation section KFM08A: 0–161 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 0–161 m, are presented in Table 6-38. According to Table 3-1, the borehole is cased to 100.20 m. The uncased interval of this section is thus c. 100–161 m.

Comments on the test

This section does not appear to be affected by the pumping in HFM33.

6.2.39 Observation section KFM08A: 162–215 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 162–215 m, are presented in Table 6-39.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating the presence of a weak recovery. However, there are no similar indications of a drawdown. Still, there may be a response hidden behind a natural, rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-38. General test data from the observation section KFM08A: 0–161 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.11
Hydraulic head in test section before stop of flow period	h_p	m	–0.01
Hydraulic head in test section at stop of recovery period	h_F	m	–0.05
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

Table 6-39. General test data from the observation section KFM08A: 162–215 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.23
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.26
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.22
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.03

6.2.40 Observation section KFM08A: 216–264 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 216–264 m, are presented in Table 6-40.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating the presence of a weak recovery. However, there are no similar indications of a drawdown. Still, there may be a response hidden behind a natural, rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

6.2.41 Observation section KFM08A: 265–280 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 265–280 m, are presented in Table 6-41.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating the presence of a weak recovery. However, there are no similar indications of a drawdown. Still, there may be a response hidden behind a naturally rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-40. General test data from the observation section KFM08A: 216–264 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.39
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.42
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.38
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.03

Table 6-41. General test data from the observation section KFM08A: 265–280 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.61
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.59
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.63
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.02

6.2.42 Observation section KFM08A: 281–473 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 281–473 m, are presented in Table 6-42.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating the presence of a weak recovery. However, there are no similar indications of a drawdown. Still, there may be a response hidden behind a natural, rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

6.2.43 Observation section KFM08A: 474–503 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 474–503 m, are presented in Table 6-43.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating the presence of a weak recovery. However, there are no similar indications of a drawdown. Still, there may be a response hidden behind a natural, rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-42. General test data from the observation section KFM08A: 281–473 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.64
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.65
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.68
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.01

Table 6-43. General test data from the observation section KFM08A: 474–503 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.63
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.57
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.60
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.06

6.2.44 Observation section KFM08A: 504–683 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 504–683 m, are presented in Table 6-44.

Comments on the test

This section does not appear to be affected by the pumping in HFM33.

6.2.45 Observation section KFM08A: 684–694 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 684–694 m, are presented in Table 6-45.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating the presence of a weak recovery. However, there are no similar indications of a drawdown. Still, there may be a response hidden behind a natural, rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-44. General test data from the observation section KFM08A: 504–683 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–5.63
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–2.77
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–2.11
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–2.86

Table 6-45. General test data from the observation section KFM08A: 684–694 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.01
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.15
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.14
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.14

6.2.46 Observation section KFM08A: 695–1,001 m

In Figure 6-12 an overview of the pressure responses in observation borehole KFM08A is shown. General test data from the observation section KFM08A, 695–1,001 m, are presented in Table 6-46.

Comments on the test

This section does not appear to be affected by the pumping in HFM33. There is slight change in the slope of the pressure curve at the time of stop of pumping, indicating the presence of a weak recovery. However, there are no similar indications of a drawdown. Still, there may be a response hidden behind a rising pressure trend. But even if there is a slight response, it is weak and possibly secondary.

Table 6-46. General test data from the observation section KFM08A: 695–1,001 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.24
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.41
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.41
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.17

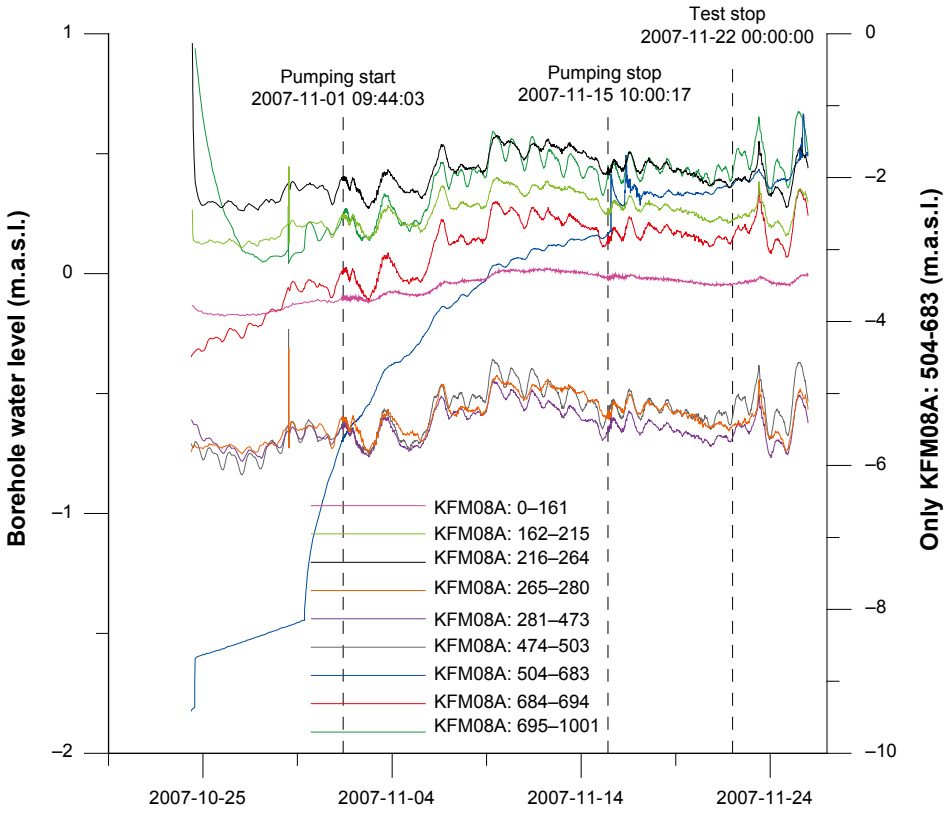


Figure 6-12. *Linear plot of pressure versus time in the observation sections in KFM08A during the interference test in HFM33.*

6.2.47 Observation section KFM08B: 0–70 m

In Figure 6-13 an overview of the pressure responses in observation borehole KFM08B is shown. General test data from the observation section KFM08B, 0–70 m, are presented in Table 6-47. According to Table 3-1, the borehole is cased to 5.58 m. The uncased interval of this section is thus c. 6–70 m.

Comments on the test

This section is likely to be influenced by the pumping in HFM33. The response is not very strong but changes in the pressure are evident in connection to start and stop of pumping. A total drawdown of c. 0.1 m was registered during the flow period and a drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.2 m during the recovery period that lasted for approximately 7 days.

6.2.48 Observation section KFM08B: 71–112 m

In Figure 6-13 an overview of the pressure responses in observation borehole KFM08B is shown. General test data from the observation section KFM08B, 71–112 m, are presented in Table 6-48.

Comments on the test

No response to pumping is detected in this section. It is unlikely that this section is influenced by pumping in HFM33.

Table 6-47. General test data from the observation section KFM08B: 0–70 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.04
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.06
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.10
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.09

Table 6-48. General test data from the observation section KFM08B: 71–112 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.02
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.04
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.07
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.06

6.2.49 Observation section KFM08B: 113–200 m

In Figure 6-13 an overview of the pressure responses in observation borehole KFM08B is shown. General test data from the observation section KFM08B, 113–200 m, are presented in Table 6-49.

Comments on the test

No clear response to pumping is detected in this section. This section is probably not influenced by pumping in HFM33.

Table 6-49. General test data from the observation section KFM08B: 113–200 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.40
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.43
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.40
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.03

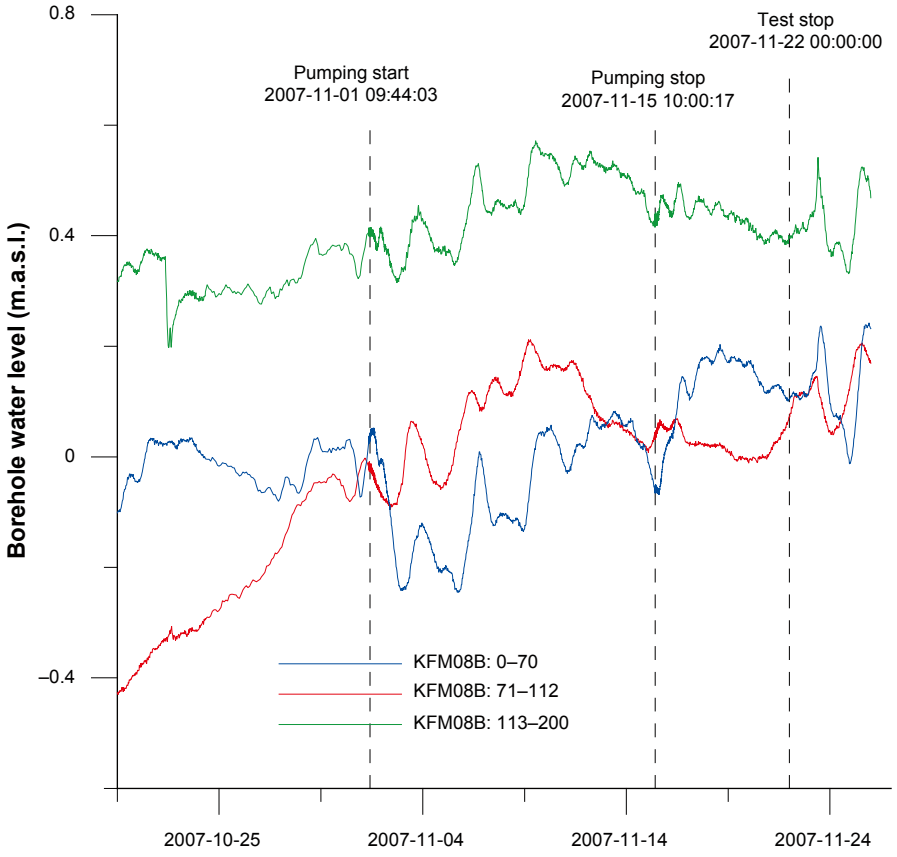


Figure 6-13. *Linear plot of pressure versus time in the observation sections in KFM08B during the interference test in HFM33.*

6.2.50 Observation section KFM06C: 0–186 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 0–186 m, are presented in Table 6-50. According to Table 3-1, the borehole is cased to 100.12 m. The uncased interval of this section is thus c. 100–186 m.

Comments on the test

A clear but rather delayed response to pumping in HFM33 was registered in this section. The total drawdown during the flow period was c. 0.3 m and a drawdown of 0.01 m was reached in about 9 hours. There was a total recovery of approximately 0.4 m during the recovery period lasting for c. 7 days.

6.2.51 Observation section KFM06C: 187–280 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 187–280 m, are presented in Table 6-51.

Comments on the test

A clear but rather delayed response to pumping in HFM33 was registered in this section. The total drawdown during the flow period was c. 0.3 m and a drawdown of 0.01 m was reached in about 11 hours. There was a total recovery of approximately 0.4 m during the recovery period lasting for c. 7 days.

Table 6-50. General test data from the observation section KFM06C: 0–186 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.04
Hydraulic head in test section before stop of flow period	h_p	m	–0.31
Hydraulic head in test section at stop of recovery period	h_F	m	0.10
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.27

Table 6-51. General test data from the observation section KFM06C: 187–280 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.04
Hydraulic head in test section before stop of flow period	h_p	m	–0.31
Hydraulic head in test section at stop of recovery period	h_F	m	0.08
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.27

6.2.52 Observation section KFM06C: 281–350 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 281–350 m, are presented in Table 6-52.

Comments on the test

A clear but rather delayed response to pumping in HFM33 was registered in this section. The total drawdown during the flow period was c. 0.4 m and a drawdown of 0.01 m was reached in about 15 hours. There was a total recovery of approximately 0.5 m during the recovery period lasting for c. 7 days.

6.2.53 Observation section KFM06C: 351–401 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 351–401 m, are presented in Table 6-53.

Comments on the test

A clear but rather delayed response to pumping in HFM33 was registered in this section. The total drawdown during the flow period was c. 0.7 m and a drawdown of 0.01 m was reached in about 6 hours. There was a total recovery of approximately 0.8 m during the recovery period lasting for c. 7 days.

Table 6-52. General test data from the observation section KFM06C: 281–350 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.14
Hydraulic head in test section before stop of flow period	h_p	m	–0.58
Hydraulic head in test section at stop of recovery period	h_F	m	–0.08
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.44

Table 6-53. General test data from the observation section KFM06C: 351–401 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.22
Hydraulic head in test section before stop of flow period	h_p	m	–0.93
Hydraulic head in test section at stop of recovery period	h_F	m	–0.15
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.71

6.2.54 Observation section KFM06C: 402–530 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 402–530 m, are presented in Table 6-54.

Comments on the test

A clear but rather delayed response to pumping in HFM33 was registered in this section. The total drawdown during the flow period was c. 0.7 m and a drawdown of 0.01 m was reached in about 9 hours. There was a total recovery of approximately 0.7 m during the recovery period lasting for c. 7 days.

6.2.55 Observation section KFM06C: 531–540 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 531–540 m, are presented in Table 6-55.

Comments on the test

A clear but rather delayed response to pumping in HFM33 was registered in this section. The total drawdown during the flow period was c. 1.0 m and a drawdown of 0.01 m was reached in about 6 hours. There was a total recovery of approximately 1.0 m during the recovery period lasting for c. 7 days.

Table 6-54. General test data from the observation section KFM06C: 402–530 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.00
Hydraulic head in test section before stop of flow period	h_p	m	–0.68
Hydraulic head in test section at stop of recovery period	h_F	m	0.04
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.68

Table 6-55. General test data from the observation section KFM06C: 531–540 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.06
Hydraulic head in test section before stop of flow period	h_p	m	–0.99
Hydraulic head in test section at stop of recovery period	h_F	m	0.03
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	1.05

6.2.56 Observation section KFM06C: 541–646 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 541–646 m, are presented in Table 6-56.

Comments on the test

A clear but rather delayed response to pumping in HFM33 was registered in this section. The total drawdown during the flow period was c. 0.6 m and a drawdown of 0.01 m was reached in about 6 hours. There was a total recovery of approximately 0.4 m during the recovery period lasting for c. 7 days.

6.2.57 Observation section KFM06C: 647–666 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 647–666 m, are presented in Table 6-57.

Comments on the test

A clear but rather delayed response to pumping in HFM33 was registered in this section. The total drawdown during the flow period was c. 0.5 m and a drawdown of 0.01 m was reached in about 7 hours. There was a total recovery of approximately 0.4 m during the recovery period lasting for c. 7 days.

Table 6-56. General test data from the observation section KFM06C: 541–646 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.39
Hydraulic head in test section before stop of flow period	h_p	m	–0.98
Hydraulic head in test section at stop of recovery period	h_F	m	–0.58
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.60

Table 6-57. General test data from the observation section KFM06C: 647–666 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.22
Hydraulic head in test section before stop of flow period	h_p	m	–0.30
Hydraulic head in test section at stop of recovery period	h_F	m	0.05
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.52

6.2.58 Observation section KFM06C: 667–872 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 667–872 m, are presented in Table 6-58.

Comments on the test

There are indications suggesting a weak response in this section. At the time of start of recovery, the slope of the pressure curve is changing slightly. No similar effect can however be observed from the drawdown period, but it is possible that this affect is hidden behind natural changes in the pressure. The response is a lot weaker than in all the sections above this one, and the signs are not strong enough to exclude natural pressure changes. If there is indeed a response to pumping in HFM33, it is likely to be secondary.

6.2.59 Observation section KFM06C: 873–1,001 m

In Figures 6-14 and 6-15 an overview of the pressure responses in observation borehole KFM06C is shown. General test data from the observation section KFM06C, 873–1,001 m, are presented in Table 6-59.

Comments on the test

The appearance of the pressure curve from this section reminds much of the pressure curve from the section just above, only weaker. There are indications suggesting a weak response in this section. At the time of start of recovery, the slope of the pressure curve is changing slightly. No similar effect can however be observed from the drawdown period, but it is possible that this affect is hidden behind natural changes in the pressure. The response is a lot weaker than in all the other sections but one, and the signs are not strong enough to exclude natural pressure changes. If there is indeed a response to pumping in HFM33, it is likely to be secondary.

Table 6-58. General test data from the observation section KFM06C: 667–872 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.31
Hydraulic head in test section before stop of flow period	h_p	m	–0.48
Hydraulic head in test section at stop of recovery period	h_F	m	–0.45
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.17

Table 6-59. General test data from the observation section KFM06C: 873–1,001 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.09
Hydraulic head in test section before stop of flow period	h_p	m	0.14
Hydraulic head in test section at stop of recovery period	h_F	m	0.13
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.06

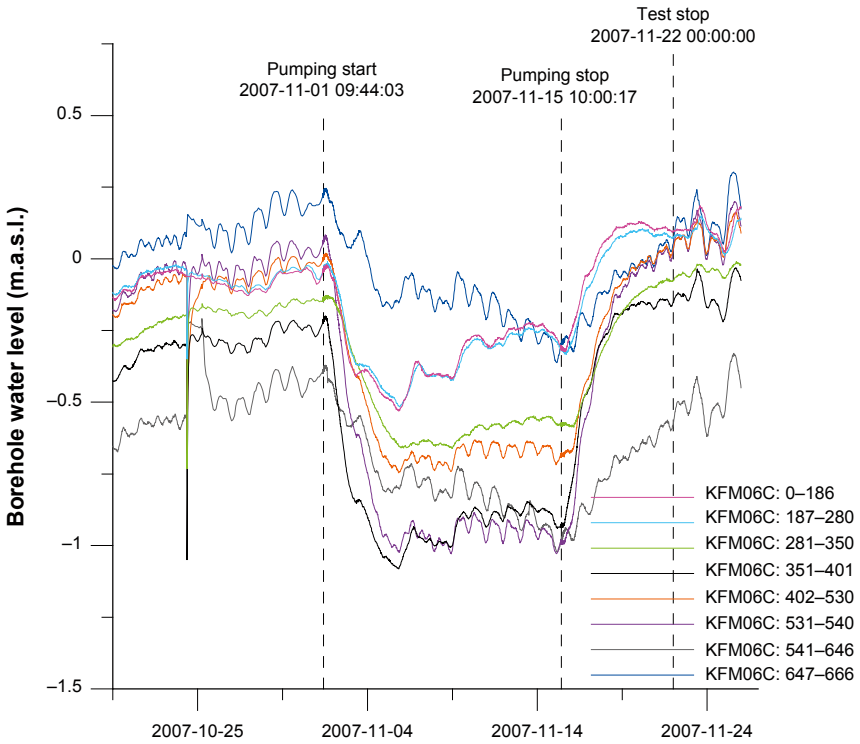


Figure 6-14. *Linear plot of pressure versus time in the observation sections in KFM06C during the interference test in HFM33.*

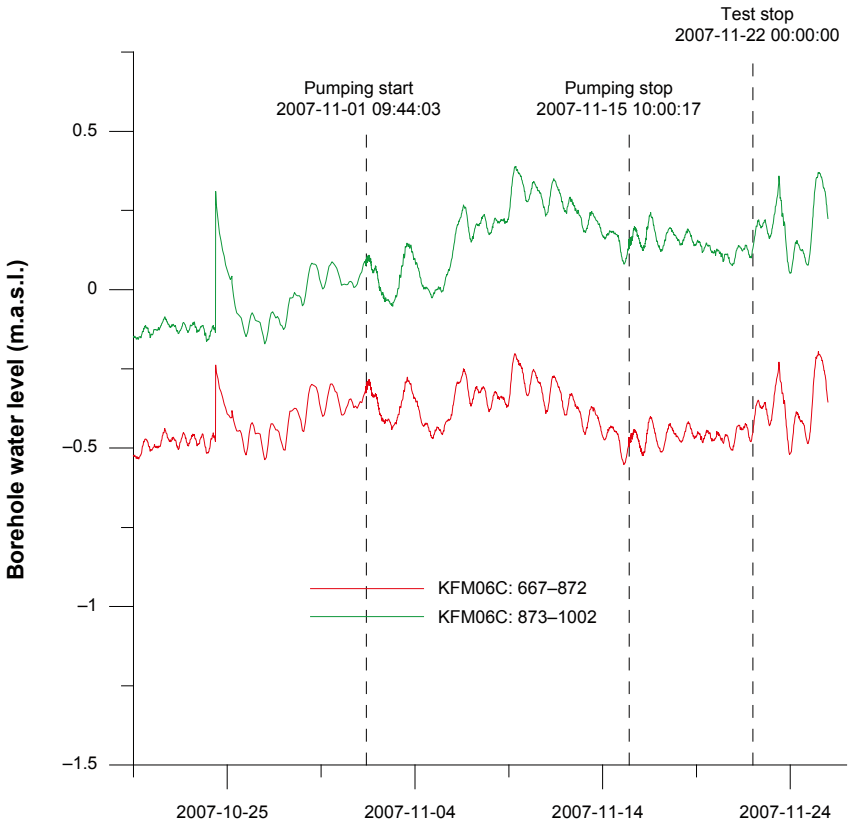


Figure 6-15. *Linear plot of pressure versus time in the observation sections in KFM06C during the interference test in HFM33.*

6.2.60 Observation section KFM06A: 0–150 m

In Figure 6-16 an overview of the pressure responses in observation borehole KFM06A is shown. General test data from the observation section KFM06A, 0–150 m, are presented in Table 6-60. According to Table 3-1, the borehole is cased to 100.40 m. The uncased interval of this section is thus c. 100–150 m.

Comments on the test

It seems apparent that this section is influenced by pumping in HFM33. The total drawdown during the flow period was c. 0.3 m. A drawdown of 0.01 m was reached approximately 9 hours after the pumping started. The total recovery during the recovery period of about 7 days was measured at c. 0.4 m.

6.2.61 Observation section KFM06A: 151–246 m

In Figure 6-16 an overview of the pressure responses in observation borehole KFM06A is shown. General test data from the observation section KFM06A, 151–246 m, are presented in Table 6-61.

Comments on the test

A clear effect from pumping was observed in this observation section. The total drawdown at the end of the flow period was c. 0.3 m and a drawdown of 0.01 m was reached approximately 10 hours after the pumping started. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

Table 6-60. General test data from the observation section KFM06A: 0–150 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.12
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.18
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.22
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.30

Table 6-61. General test data from the observation section KFM06A: 151–246 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.05
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.31
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.06
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.26

6.2.62 Observation section KFM06A: 247–340 m

In Figure 6-16 an overview of the pressure responses in observation borehole KFM06A is shown. General test data from the observation section KFM06A, 247–340 m, are presented in Table 6-62.

Comments on the test

A clear effect from pumping was observed in this observation section. The total drawdown at the end of the flow period was c. 0.2 m and a drawdown of 0.01 m was reached approximately 10 hours after the pumping started. There was a total recovery of c. 0.3 m during the recovery period of approximately 7 days.

6.2.63 Observation section KFM06A: 341–362 m

In Figure 6-16 an overview of the pressure responses in observation borehole KFM06A is shown. General test data from the observation section KFM06A, 341–362 m, are presented in Table 6-63.

Comments on the test

This section clearly responds to pumping in HFM33. The total drawdown at the end of the flow period was c. 0.4 m. A drawdown of 0.01 m was reached approximately 13 hours into the flow period. There was a total recovery of c. 0.4 m during the recovery period of approximately 7 days.

Table 6-62. General test data from the observation section KFM06A: 247–340 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.25
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.05
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.37
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.20

Table 6-63. General test data from the observation section KFM06A: 341–362 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.03
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.37
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.02
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.40

6.2.64 Observation section KFM06A: 363–737 m

In Figure 6-16 an overview of the pressure responses in observation borehole KFM06A is shown. General test data from the observation section KFM06A, 363–737 m, are presented in Table 6-64.

Comments on the test

This section clearly responds to pumping in HFM33. The total drawdown at the end of the flow period was c. 0.4 m. A drawdown of 0.01 m was reached approximately 16 hours into the flow period. There was a total recovery of c. 0.4 m during the recovery period of approximately 7 days.

6.2.65 Observation section KFM06A: 738–748 m

In Figure 6-16 an overview of the pressure responses in observation borehole KFM06A is shown. General test data from the observation section KFM06A, 738–748 m, are presented in Table 6-65.

Comments on the test

This observation section may be slightly affected by the pumping in HFM33. There is a weak indication of small recovery although there is no sign of a corresponding drawdown response. In addition, the tidal effects have a significant impact on the pressure data from this section.

Table 6-64. General test data from the observation section KFM06A: 363–737 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.26
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.64
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.27
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.38

Table 6-65. General test data from the observation section KFM06A: 738–748 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.72
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.80
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.75
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.08

6.2.66 Observation section KFM06A: 749–826 m

In Figure 6-16 an overview of the pressure responses in observation borehole KFM06A is shown. General test data from the observation section KFM06A, 749–826 m, are presented in Table 6-66.

Comments on the test

This observation section may be slightly affected by the pumping in HFM33. There is a weak indication of small recovery although there is no sign of a corresponding drawdown response. In addition, the tidal effects have a significant impact on the pressure data from this section.

6.2.67 Observation section KFM06A: 827–1,001 m

In Figure 6-16 an overview of the pressure responses in observation borehole KFM06A is shown. General test data from the observation section KFM06A, 827–1,001 m, are presented in Table 6-67.

Comments on the test

This section appears to be almost completely unaffected by the pumping in HFM33. Possible signs of responses are so weak that it is not possible to exclude natural causes.

Table 6-66. General test data from the observation section KFM06A: 749–826 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.26
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.33
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.30
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.07

Table 6-67. General test data from the observation section KFM06A: 827–1,001 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.42
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.42
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.38
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.01

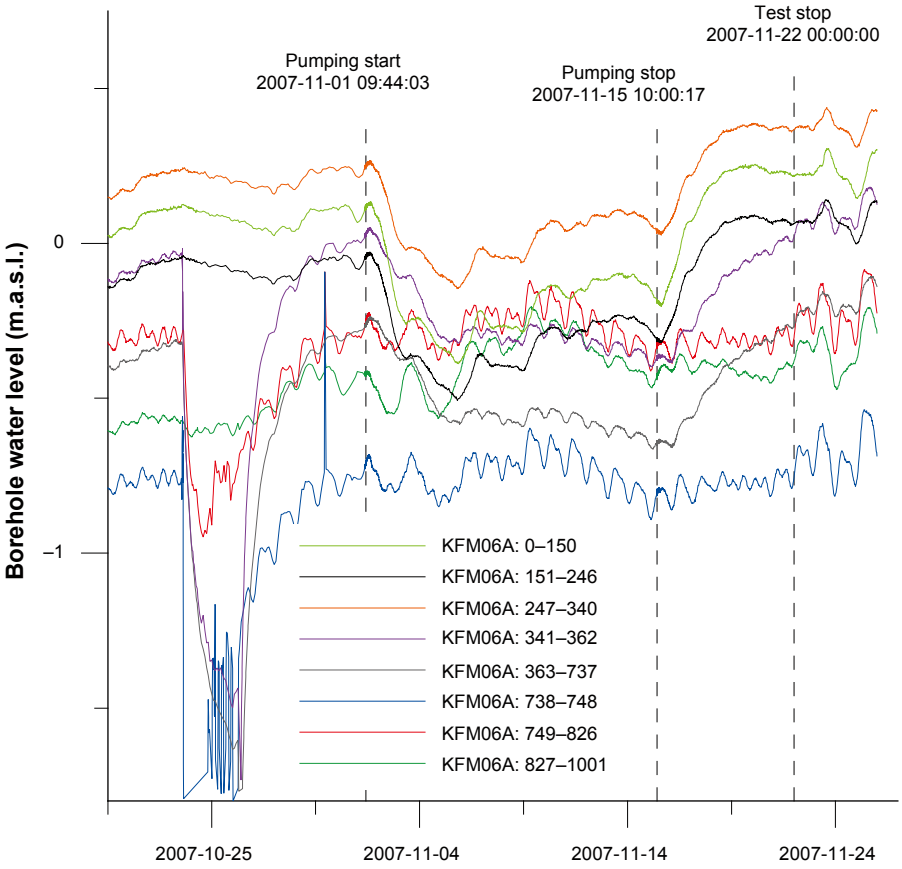


Figure 6-16. *Linear plot of pressure versus time in the observation sections in KFM06A during the interference test in HFM33.*

6.2.68 Observation section KFR7B: 8–21 m

In Figure 6-17 an overview of the pressure responses in observation borehole KFR7B is shown. General test data from the observation section KFR7B, 8–21 m, are presented in Table 6-68.

Comments on the test

This observation section does not appear to be responding to the pumping in HFM33.

Table 6-68. General test data from the observation section KFR7B: 8–21 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Pressure in test section before start of flow period	P_i	kPa	1,077.48
Pressure in test section before stop of flow period	P_p	kPa	1,078.51
Pressure in test section at stop of recovery period	P_F	kPa	1,077.86
Pressure change during flow period (P_i–P_p)	dP_p	kPa	–1.03

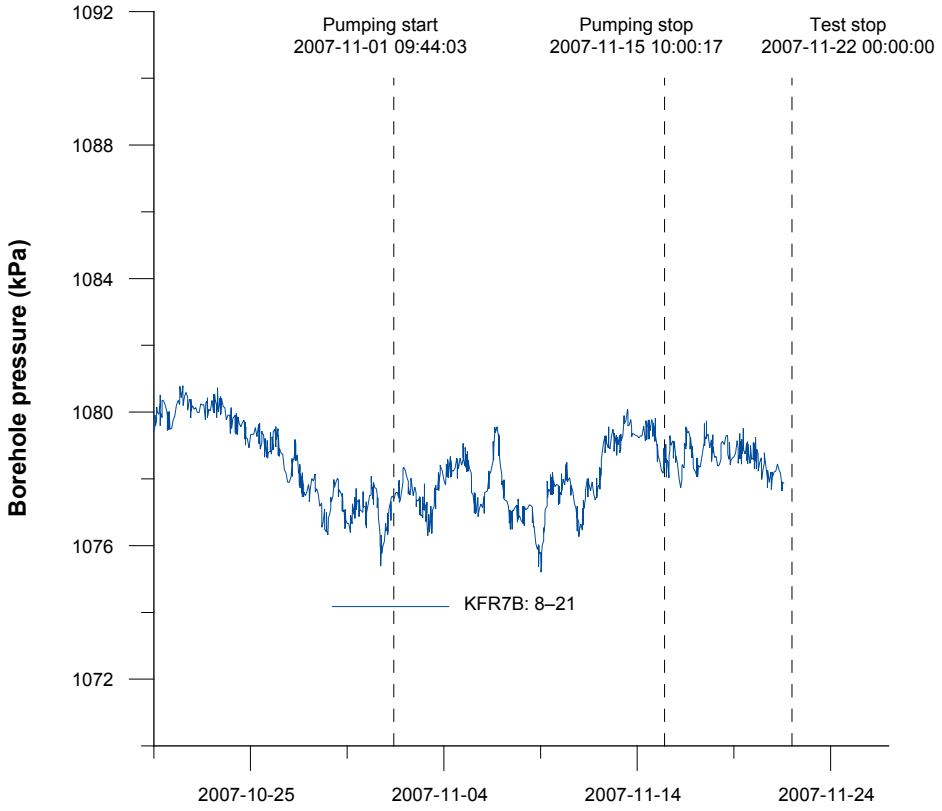


Figure 6-17. *Linear plot of pressure versus time in the observation sections in KFR7B during the interference test in HFM33.*

6.2.69 Observation section KFM06B: 0–26 m

In Figure 6-18 an overview of the pressure responses in observation borehole KFM06B is shown. General test data from the observation section KFM06B, 0–26 m, are presented in Table 6-69. According to Table 3-1, the borehole is cased to 4.61 m. The uncased interval of this section is thus c. 5–26 m.

Comments on the test

Even though there is a slight change of slope in the pressure curve in conjunction with the start and stop of pumping, it is difficult to say if this section is responding to pumping in HFM33. The drawdown is clearly negative and it is likely that this section is unaffected or very weakly affected by the pumping.

Table 6-69. General test data from the observation section KFM06B: 0–26 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.53
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.74
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.76
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.21

6.2.70 Observation section KFM06B: 27–50 m

In Figure 6-18 an overview of the pressure responses in observation borehole KFM06B is shown. General test data from the observation section KFM06B, 27–50 m, are presented in Table 6-70.

Comments on the test

Even though there is a slight change of slope in the pressure curve in conjunction with the start and stop of pumping, it is difficult to say if this section is responding to pumping in HFM33. The drawdown is clearly negative and it is likely that this section is unaffected or very weakly affected by the pumping.

6.2.71 Observation section KFM06B: 51–100 m

In Figure 6-18 an overview of the pressure responses in observation borehole KFM06B is shown. General test data from the observation section KFM06B, 51–100 m, are presented in Table 6-71.

Comments on the test

Even though there is a slight change of slope in the pressure curve in conjunction with the start and stop of pumping, it is difficult to say if this section is responding to pumping in HFM33. The drawdown is clearly negative and it is likely that this section is unaffected or very weakly affected by the pumping.

Table 6-70. General test data from the observation section KFM06B: 27–50 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.51
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.61
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.67
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.10

Table 6-71. General test data from the observation section KFM06B: 51–100 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.53
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.62
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.68
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

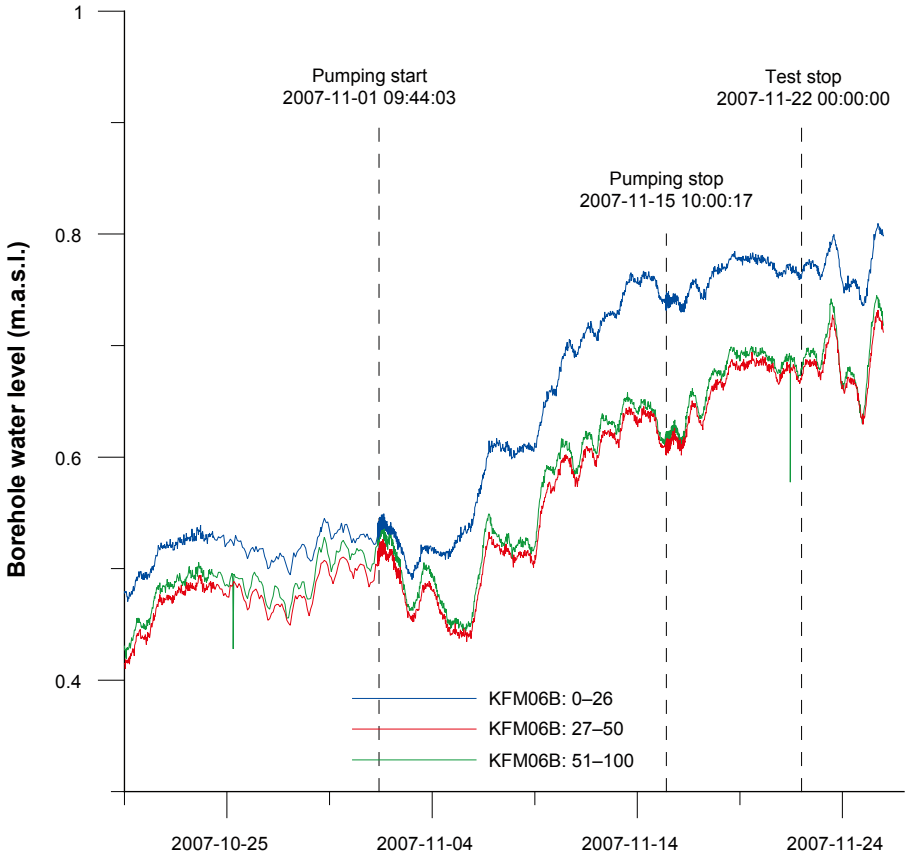


Figure 6-18. *Linear plot of pressure versus time in the observation sections in KFM06B during the interference test in HFM33.*

6.2.72 Observation section HFM16: 0–53 m

In Figure 6-19 an overview of the pressure responses in observation borehole HFM16 is shown. General test data from the observation section HFM16, 0–53 m, are presented in Table 6-72. According to Table 3-1, the borehole is cased to 12.02 m. The uncased interval of this section is thus c. 12–53 m.

Comments on the test

Even though there is a slight change of slope in the pressure curve in conjunction with the start and stop of pumping, it is difficult to say if this section is responding to pumping in HFM33. The drawdown is clearly negative and it is likely that this section is unaffected or very weakly affected by the pumping.

Table 6-72. General test data from the observation section HFM16: 0–53 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.47
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.57
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.63
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.10

6.2.73 Observation section HFM16: 54–67 m

In Figure 6-19 an overview of the pressure responses in observation borehole HFM16 is shown. General test data from the observation section HFM16, 54–67 m, are presented in Table 6-73.

Comments on the test

Even though there is a slight change of slope in the pressure curve in conjunction with the start and stop of pumping, it is difficult to say if this section is responding to pumping in HFM33. The drawdown is clearly negative and it is likely that this section is unaffected or very weakly affected by the pumping.

6.2.74 Observation section HFM16: 68–132 m

In Figure 6-19 an overview of the pressure responses in observation borehole HFM16 is shown. General test data from the observation section HFM16, 68–132 m, are presented in Table 6-74.

Comments on the test

Even though there is a slight change of slope in the pressure curve in conjunction with the start and stop of pumping, it is difficult to say if this section is responding to pumping in HFM33. The drawdown is clearly negative and it is likely that this section is unaffected or very weakly affected by the pumping.

Table 6-73. General test data from the observation section HFM16: 54–67 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.51
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.60
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.66
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

Table 6-74. General test data from the observation section HFM16: 68–132 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.48
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.57
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.57
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

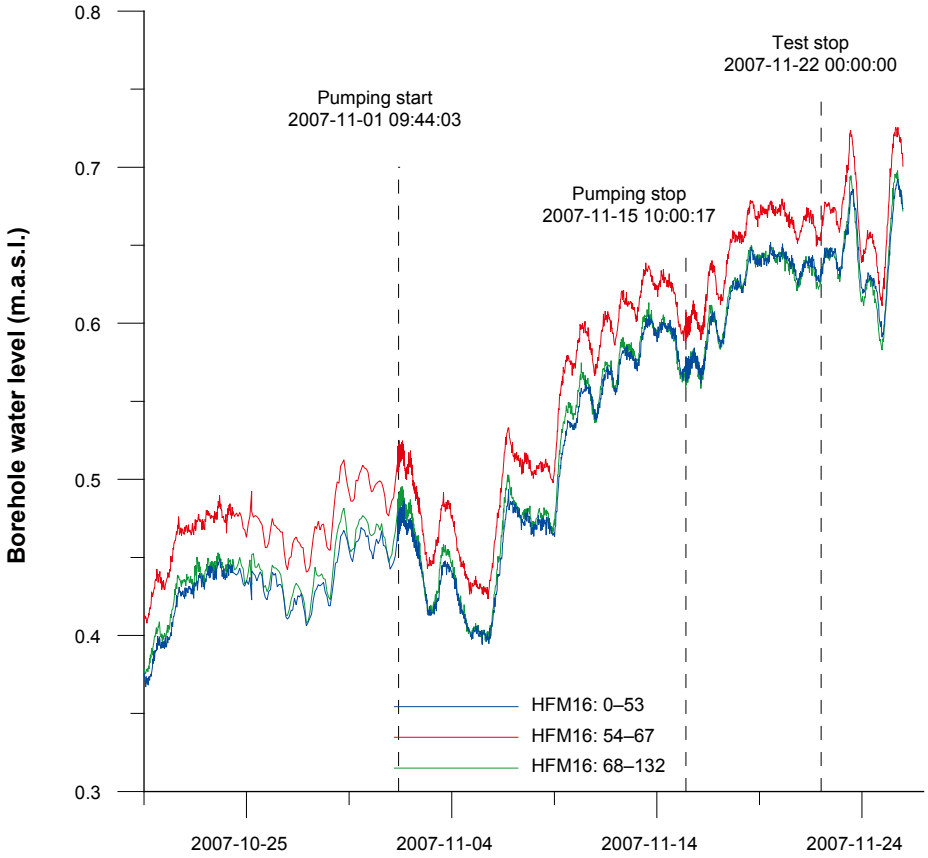


Figure 6-19. *Linear plot of pressure versus time in the observation sections in HFM16 during the interference test in HFM33.*

6.2.75 Observation section KFM01D: 0–153 m

In Figure 6-20 an overview of the pressure responses in observation borehole KFM01D is shown. General test data from the observation section KFM01D, 0–153 m, are presented in Table 6-75. According to Table 3-1, the borehole is cased to 89.51 m. The uncased interval of this section is thus c. 90–153 m.

Comments on the test

A clear response to pumping in HFM33 is registered in this section. The total drawdown during the flow period was c. 0.2 m and a drawdown of 0.01 m was reached in about 7 hours. There was a total recovery of approximately 0.4 m during the recovery period lasting for c. 7 days.

Table 6-75. General test data from the observation section KFM01D: 0–153 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.25
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.49
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.08
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.24

6.2.76 Observation section KFM01D: 154–252 m

In Figure 6-20 an overview of the pressure responses in observation borehole KFM01D is shown. General test data from the observation section KFM01D, 154–252 m, are presented in Table 6-76.

Comments on the test

A clear response to pumping in HFM33 is registered in this section. The total drawdown during the flow period was c. 0.1 m and a drawdown of 0.01 m was reached in about 8 hours. There was a total recovery of approximately 0.2 m during the recovery period lasting for c. 7 days.

6.2.77 Observation section KFM01D: 253–310 m

In Figure 6-20 an overview of the pressure responses in observation borehole KFM01D is shown. General test data from the observation section KFM01D, 253–310 m, are presented in Table 6-77.

Comments on the test

No effects of pumping can be seen in this section. It seems likely that the section is influenced by something other than the pumping though, considering the appearance of the pressure curve, possibly interference caused by equipment or service. If so, the possibility that this section is in fact responding can not be eliminated.

Table 6-76. General test data from the observation section KFM01D: 154–252 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.33
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.47
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.22
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.14

Table 6-77. General test data from the observation section KFM01D: 253–310 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–1.14
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.86
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.87
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.27

6.2.78 Observation section KFM01D: 311–321 m

In Figure 6-20 an overview of the pressure responses in observation borehole KFM01D is shown. General test data from the observation section KFM01D, 311–321 m, are presented in Table 6-78.

Comments on the test

No effects of pumping can be seen in this section. It seems likely that the section is influenced by something other than the pumping though, considering the appearance of the pressure curve, possibly interference caused by equipment or service. If so, the possibility that this section is in fact responding can not be eliminated.

6.2.79 Observation section KFM01D: 322–428 m

In Figure 6-20 an overview of the pressure responses in observation borehole KFM01D is shown. General test data from the observation section KFM01D, 322–428 m, are presented in Table 6-79.

Comments on the test

No effects of pumping can be seen in this section. It seems likely that the section is influenced by something else than the pumping though, considering the appearance of the pressure curve, possibly interference caused by equipment or service. If so, the possibility that this section is in fact responding can not be eliminated.

Table 6-78. General test data from the observation section KFM01D: 311–321 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–1.21
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.94
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.94
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.27

Table 6-79. General test data from the observation section KFM01D: 322–428 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–1.30
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–1.01
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.98
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.29

6.2.80 Observation section KFM01D: 429–438 m

In Figure 6-20 an overview of the pressure responses in observation borehole KFM01D is shown. General test data from the observation section KFM01D, 429–438 m, are presented in Table 6-80.

Comments on the test

No effects of pumping can be seen in this section. It seems likely that the section is influenced by something other than the pumping though, considering the appearance of the pressure curve, possibly interference caused by equipment or service. If so, the possibility that this section is in fact responding can not be eliminated.

6.2.81 Observation section KFM01D: 439–800 m

In Figure 6-20 an overview of the pressure responses in observation borehole KFM01D is shown. General test data from the observation section KFM01D, 439–800 m, are presented in Table 6-81.

Comments on the test

This section may possibly be slightly affected by the pumping. The signs are, however, so weak, that it is not possible to say with any degree of certainty.

Table 6-80. General test data from the observation section KFM01D: 429–438 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–1.25
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.95
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.92
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.30

Table 6-81. General test data from the observation section KFM01D: 439–800 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.66
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.64
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.65
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.02

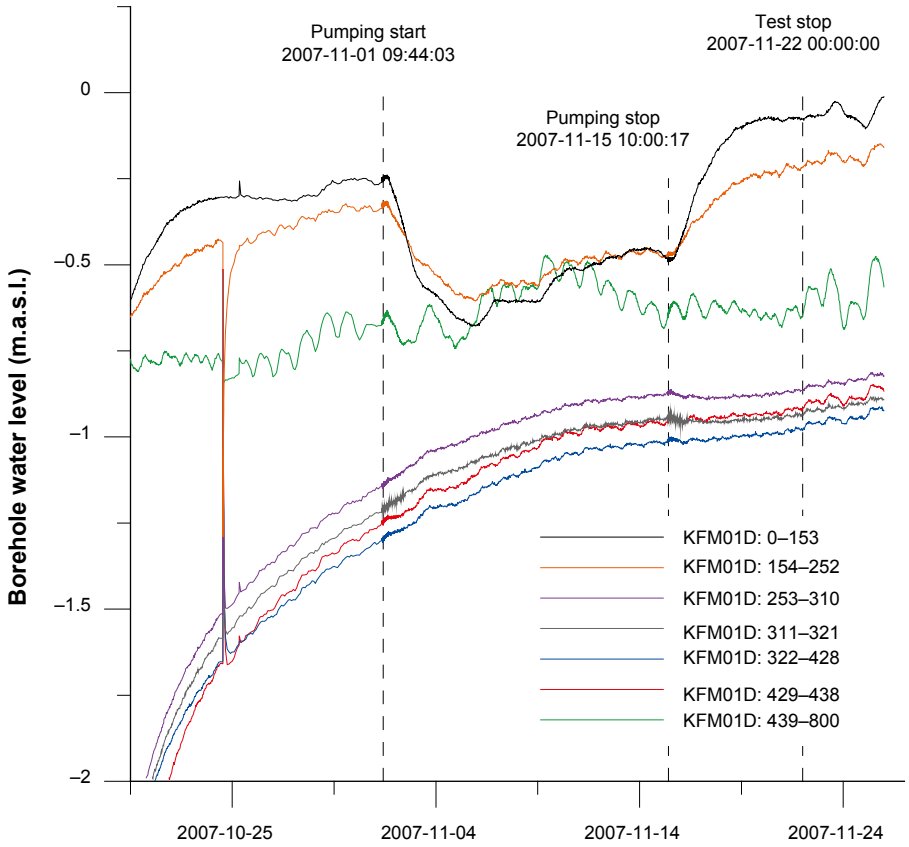


Figure 6-20. *Linear plot of pressure versus time in the observation sections in KFM01D during the interference test in HFM33.*

6.2.82 Observation section HFM21: 0–21 m

In Figure 6-21 an overview of the pressure responses in observation borehole HFM21 is shown. General test data from the observation section HFM21, 0–21 m, are presented in Table 6-82. According to Table 3-1, the borehole is cased to 12.03 m. The uncased interval of this section is thus c. 12–21 m.

Comments on the test

No signs of responding to the pumping in HFM33 can be observed in this section.

Table 6-82. General test data from the observation section HFM21: 0–21 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.28
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.34
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.44
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.06

6.2.83 Observation section HFM21: 22–32 m

In Figure 6-21 an overview of the pressure responses in observation borehole HFM21 is shown. General test data from the observation section HFM21, 22–32 m, are presented in Table 6-83.

Comments on the test

This section is clearly responding to the pumping in HFM33. Even though the total drawdown is negative, the appearance of the pressure curve clearly indicates a response. The strength of the response seems to be partly cloaked by a naturally rising pressure. A drawdown of 0.01 m was reached approximately 18 hours after the pumping started in HFM33. There was a total recovery of c. 0.1 m during the recovery period that lasted for approximately 7 days.

6.2.84 Observation section HFM21: 33–106 m

In Figure 6-21 an overview of the pressure responses in observation borehole HFM21 is shown. General test data from the observation section HFM21, 33–106 m, are presented in Table 6-84.

Comments on the test

This section is clearly responding to the pumping in HFM33. A total drawdown of c. 0.2 m was registered during the flow period and a drawdown of 0.01 m was reached approximately 6 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-83. General test data from the observation section HFM21: 22–32 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.32
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.33
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.48
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.01

Table 6-84. General test data from the observation section HFM21: 33–106 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.40
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.19
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.54
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.21

6.2.85 Observation section HFM21: 107–202 m

In Figure 6-21 an overview of the pressure responses in observation borehole HFM21 is shown. General test data from the observation section HFM21, 107–202 m, are presented in Table 6-85.

Comments on the test

The pumping in HFM33 is clearly causing this section to respond. A total drawdown of c. 0.2 m was registered during the flow period and a drawdown of 0.01 m was reached approximately 6 hours after the pumping started in HFM33. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

Table 6-85. General test data from the observation section HFM21: 107–202 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.26
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.02
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.42
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.23

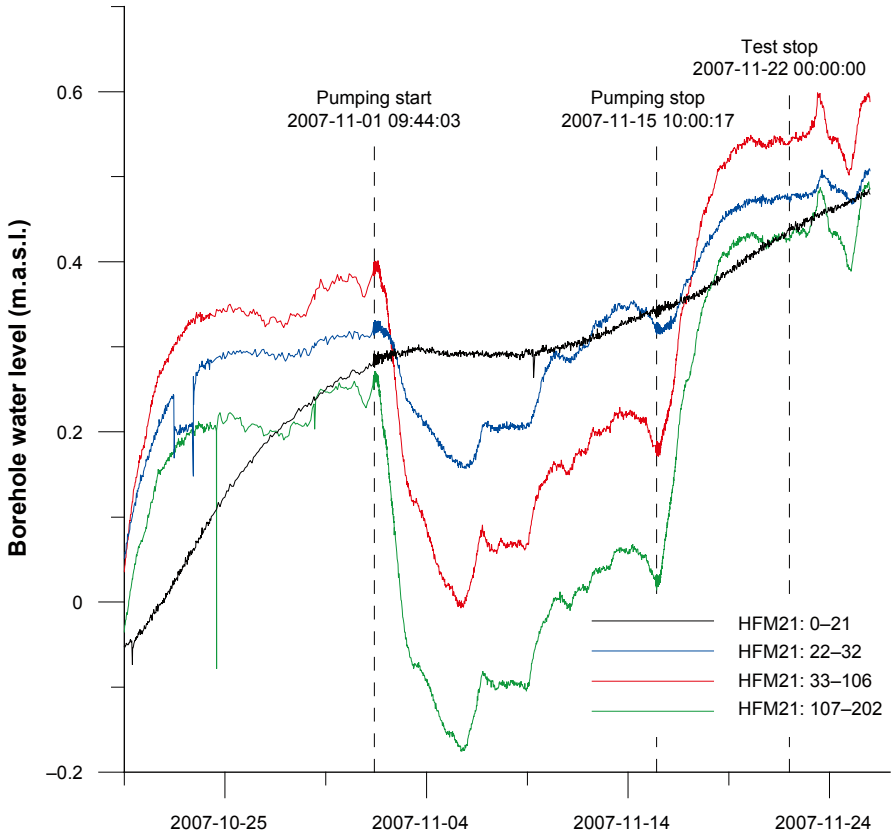


Figure 6-21. *Linear plot of pressure versus time in the observation sections in HFM21 during the interference test in HFM33.*

6.2.86 Observation section KFM07B: 0–74 m

In Figure 6-22 an overview of the pressure responses in observation borehole KFM07B is shown. General test data from the observation section KFM07B, 0–74 m, are presented in Table 6-86. According to Table 3-1, the borehole is cased to 65.29 m. The uncased interval of this section is thus c. 65–74 m.

Comments on the test

It appears the pressure transducer in this observation section is out of order. Nothing can be said about any possible response in this section.

6.2.87 Observation section KFM07B: 75–202 m

In Figure 6-22 an overview of the pressure responses in observation borehole KFM07B is shown. General test data from the observation section KFM07B, 75–202 m, are presented in Table 6-87.

Comments on the test

A clear response to pumping was recorded in this observation section. A total drawdown of c. 0.2 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

Table 6-86. General test data from the observation section KFM07B: 0–74 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.16
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.16
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.16
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.00

Table 6-87. General test data from the observation section KFM07B: 75–202 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.20
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.00
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.36
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.21

6.2.88 Observation section KFM07B: 203–300 m

In Figure 6-22 an overview of the pressure responses in observation borehole KFM07B is shown. General test data from the observation section KFM07B, 203–300 m, are presented in Table 6-88.

Comments on the test

A clear response to pumping was recorded in this observation section. A total drawdown of c. 0.2 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 6 hours after the pumping started in HFM33. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

Table 6-88. General test data from the observation section KFM07B: 203–300 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.12
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.31
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.05
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.19

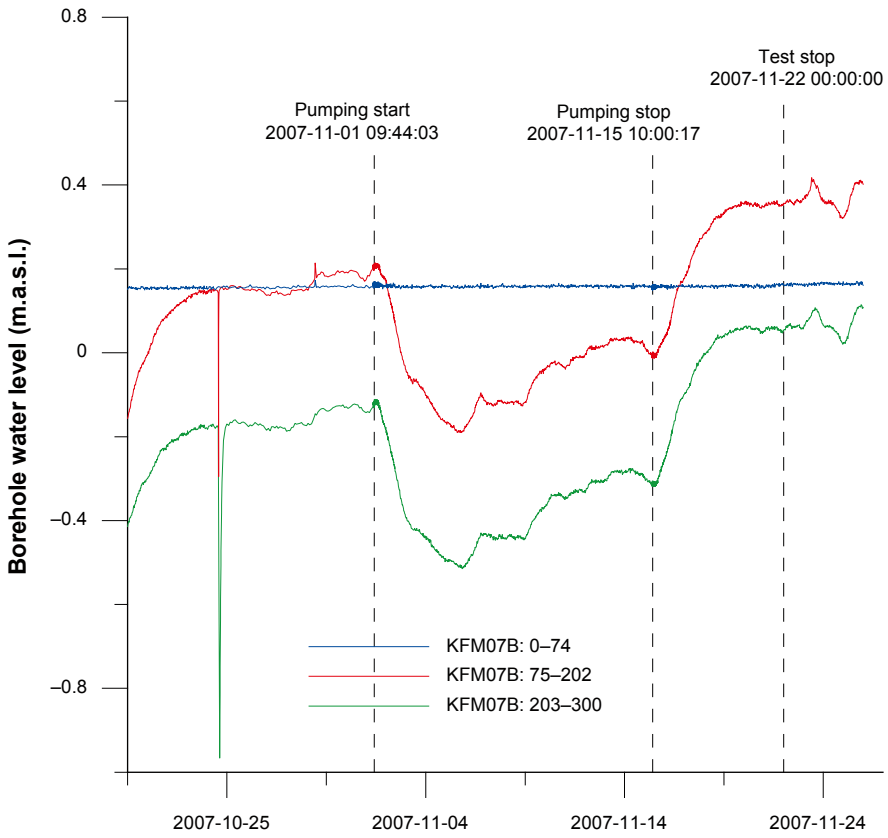


Figure 6-22. *Linear plot of pressure versus time in the observation sections in KFM07B during the interference test in HFM33.*

6.2.89 Observation section KFM07C: 0–110 m

In Figure 6-23 an overview of the pressure responses in observation borehole KFM07C is shown. General test data from the observation section KFM07C, 0–110 m, are presented in Table 6-89. According to Table 3-1, the borehole is cased to 84.79 m. The uncased interval of this section is thus c. 85–110 m.

Comments on the test

A clear response to pumping was recorded in this observation section. A total drawdown of c. 0.2 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 9 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.90 Observation section KFM07C: 111–160 m

In Figure 6-23 an overview of the pressure responses in observation borehole KFM07C is shown. General test data from the observation section KFM07C, 111–160 m, are presented in Table 6-90.

Comments on the test

A clear response to pumping was recorded in this observation section. A total drawdown of c. 0.2 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 6 hours after the pumping started in HFM33. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

Table 6-89. General test data from the observation section KFM07C: 0–110 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.27
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.08
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.43
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.19

Table 6-90. General test data from the observation section KFM07C: 111–160 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.00
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.24
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.16
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.24

6.2.91 Observation section KFM07C: 161–301 m

In Figure 6-23 an overview of the pressure responses in observation borehole KFM07C is shown. General test data from the observation section KFM07C, 161–301 m, are presented in Table 6-91.

Comments on the test

A rather weak response to pumping was recorded in this observation section. A total drawdown of c. 0.1 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 8 hours after the pumping started in HFM33. There was a total recovery of c. 0.2 m during the recovery period that lasted for approximately 7 days.

6.2.92 Observation section KFM07C: 302–500 m

In Figure 6-23 an overview of the pressure responses in observation borehole KFM07C is shown. General test data from the observation section KFM07C, 302–500 m, are presented in Table 6-92.

Comments on the test

This section may possibly be slightly affected by the pumping in HFM33. The pressure curve changes its slope in conjunction with the stop of pumping, indicating a weak recovery. The response is not strong enough to clearly indicate that the section is affected by the pumping in HFM33.

Table 6-91. General test data from the observation section KFM07C: 161–301 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.14
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.21
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.01
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.07

Table 6-92. General test data from the observation section KFM07C: 302–500 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.48
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.48
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.48
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.00

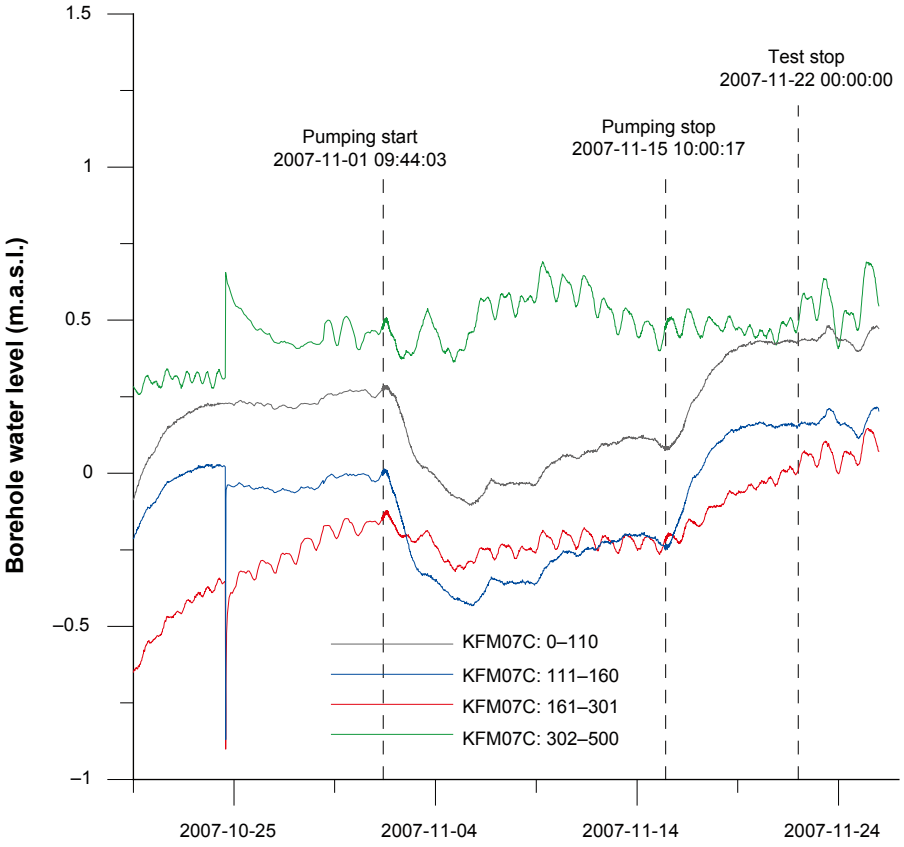


Figure 6-23. *Linear plot of pressure versus time in the observation section in KFM07C during the interference test in HFM33.*

6.2.93 Observation section KFM07A: 0–148 m

In Figures 6-24, 6-25 and 6-26 an overview of the pressure responses in observation borehole KFM07A is shown. General test data from the observation section KFM07A, 0–148 m, are presented in Table 6-93. According to Table 3-1, the borehole is cased to 100.10 m. The uncased interval of this section is thus c. 100–148 m.

Comments on the test

This observation section is clearly responding to the pumping in HFM33. There was a total drawdown measured at approximately 0.2 m and a drawdown of 0.01 metres was reached c. 9 hours into the flow period. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-93. General test data from the observation section KFM07A: 0–148 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.12
Hydraulic head in test section before stop of flow period	h_p	m	–0.07
Hydraulic head in test section at stop of recovery period	h_F	m	0.27
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.18

6.2.94 Observation section KFM07A: 149–190 m

In Figures 6-24, 6-25 and 6-26 an overview of the pressure responses in observation borehole KFM07A is shown. General test data from the observation section KFM07A, 149–190 m, are presented in Table 6-94.

Comments on the test

This observation section is clearly responding to the pumping in HFM33. There was a total drawdown measured at approximately 0.2 m and a drawdown of 0.01 m was reached c. 7 hours into the flow period. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.95 Observation section KFM07A: 191–225 m

In Figures 6-24, 6-25 and 6-26 an overview of the pressure responses in observation borehole KFM07A is shown. General test data from the observation section KFM07A, 191–225 m, are presented in Table 6-95.

Comments on the test

This observation section may be responding slightly to the pumping in HFM33. It is hard to say for certain due to a strong increasing pressure trend prior to the start of pumping. There is however a change of slope in the pressure curve in conjunction with start and stop of pumping indicating that the section is at least to some extent influenced by the pumping. The response may be secondary.

Table 6-94. General test data from the observation section KFM07A: 149–190 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.21
Hydraulic head in test section before stop of flow period	h_p	m	–0.40
Hydraulic head in test section at stop of recovery period	h_F	m	–0.05
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.19

Table 6-95. General test data from the observation section KFM07A: 191–225 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.69
Hydraulic head in test section before stop of flow period	h_p	m	–0.66
Hydraulic head in test section at stop of recovery period	h_F	m	–0.54
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.04

6.2.96 Observation section KFM07A: 226–961 m

In Figures 6-24, 6-25 and 6-26 an overview of the pressure responses in observation borehole KFM07A is shown. General test data from the observation section KFM07A, 226–961 m, are presented in Table 6-96.

Comments on the test

This observation section may be responding slightly to the pumping in HFM33. It is hard to say for certain due to a strong increasing pressure trend prior to the start of pumping. There is however a change of slope in the pressure curve in conjunction with start and stop of pumping indicating that the section is at least to some extent influenced by the pumping. The response may be secondary.

6.2.97 Observation section KFM07A: 962–972 m

In Figures 6-24, 6-25 and 6-26 an overview of the pressure responses in observation borehole KFM07A is shown. General test data from the observation section KFM07A, 962–972 m, are presented in Table 6-97.

Comments on the test

This section appears to be unaffected or very weakly affected by the pumping in HFM33.

6.2.98 Observation section KFM07A: 973–1,001 m

In Figures 6-24, 6-25 and 6-26 an overview of the pressure responses in observation borehole KFM07A is shown. General test data from the observation section KFM07A, 973–1,001 m, are presented in Table 6-98.

Comments on the test

This section appears to be unaffected or very weakly affected by the pumping in HFM33.

Table 6-96. General test data from the observation section KFM07A: 226–961 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.88
Hydraulic head in test section before stop of flow period	h_p	m	–0.79
Hydraulic head in test section at stop of recovery period	h_F	m	–0.70
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

Table 6-97. General test data from the observation section KFM07A: 962–972 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–4.39
Hydraulic head in test section before stop of flow period	h_p	m	–4.36
Hydraulic head in test section at stop of recovery period	h_F	m	–4.46
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.03

Table 6-98. General test data from the observation section KFM07A: 973–1,001 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–4.26
Hydraulic head in test section before stop of flow period	h_p	m	–4.24
Hydraulic head in test section at stop of recovery period	h_F	m	–4.30
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.02

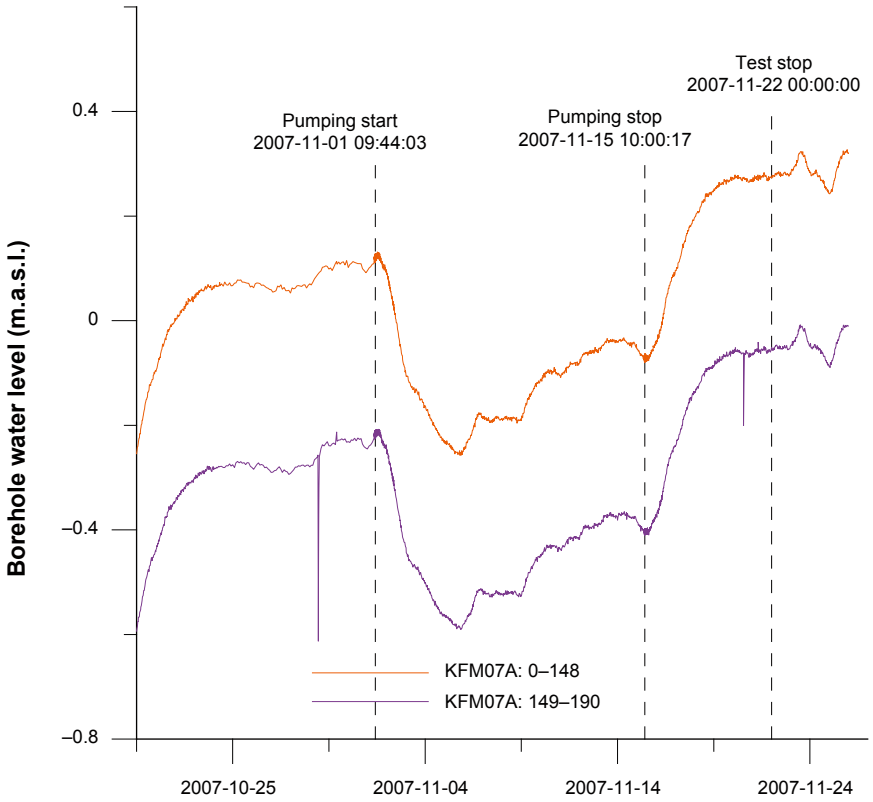


Figure 6-24. *Linear plot of pressure versus time in some of the observation sections in KFM07A during the interference test in HFM33.*

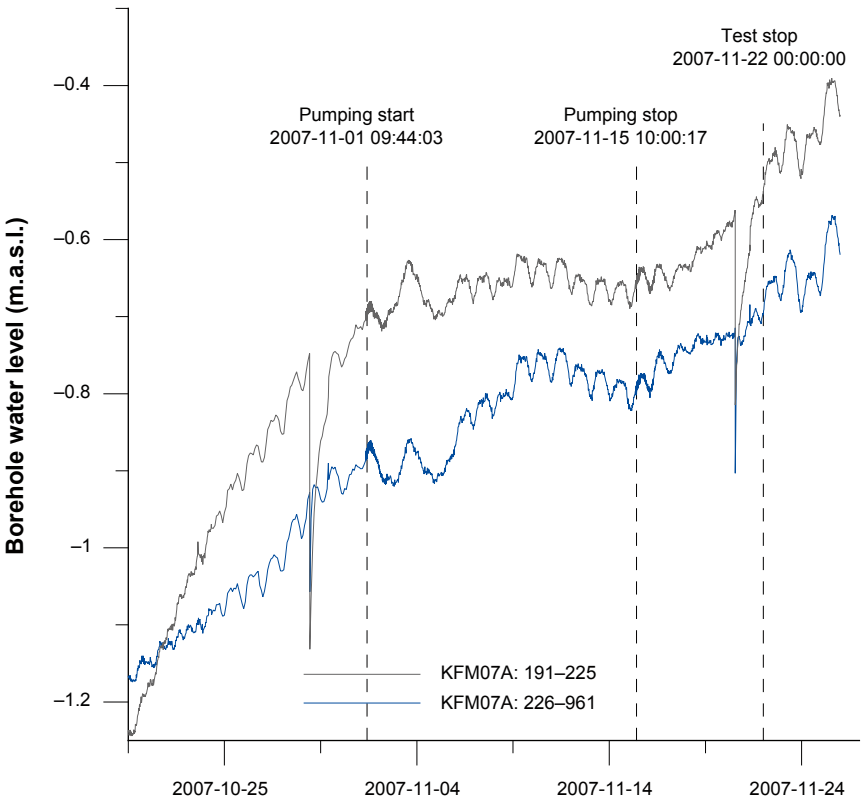


Figure 6-25. *Linear plot of pressure versus time in some of the observation sections in KFM07A during the interference test in HFM33.*

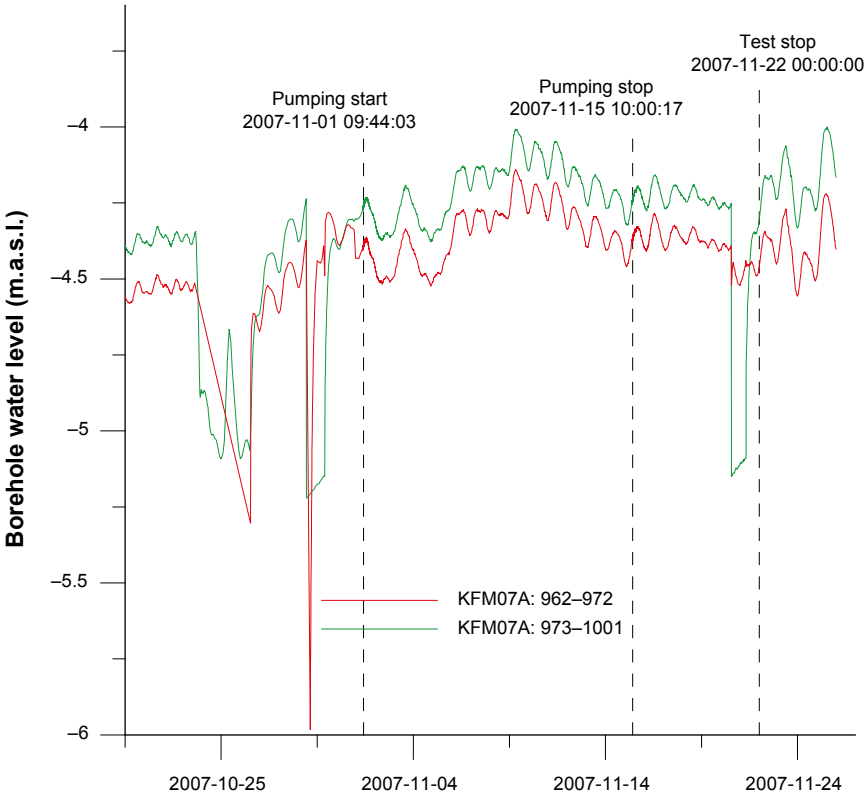


Figure 6-26. *Linear plot of pressure versus time in some of the observation sections in KFM07A during the interference test in HFM33.*

6.2.99 Observation section HFM01: 0–32.5 m

In Figure 6-27 an overview of the pressure responses in observation borehole HFM01 is shown. General test data from the observation section HFM01, 0–32.5 m, are presented in Table 6-99. According to Table 3-1, the borehole is cased to 31.93 m. The uncased interval of this section is thus c. 32–32.5 m.

Comments on the test

The pressure response to pumping in HFM33 is clearly observed in this observation section. The total drawdown during the flow period was c. 0.1 m. A drawdown of 0.01 m was reached approximately 12 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.100 Observation section HFM01:33.5–45.5 m

In Figure 6-27 an overview of the pressure responses in observation borehole HFM01 is shown. General test data from the observation section HFM01, 33.5–45.5 m, are presented in Table 6-100.

Comments on the test

The pressure response to pumping in HFM33 is clearly observed in this observation section. The total drawdown during the flow period was c. 0.1 m. A drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-99. General test data from the observation section HFM01: 0–32.5 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.25
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.15
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.47
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.10

Table 6-100. General test data from the observation section HFM01: 33.5–45.5 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.26
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.13
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.46
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.13

6.2.101 Observation section HFM01:46.5–200 m

In Figure 6-27 an overview of the pressure responses in observation borehole HFM01 is shown. General test data from the observation section HFM01, 46.5–200 m, are presented in Table 6-101.

Comments on the test

The pressure response to pumping in HFM33 is clearly observed in this observation section. The total drawdown during the flow period was c. 0.2 m. A drawdown of 0.01 m was reached approximately 5 hours after the pumping started in HFM33. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

Table 6-101. General test data from the observation section HFM01: 46.5–200 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.23
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.01
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.41
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.23

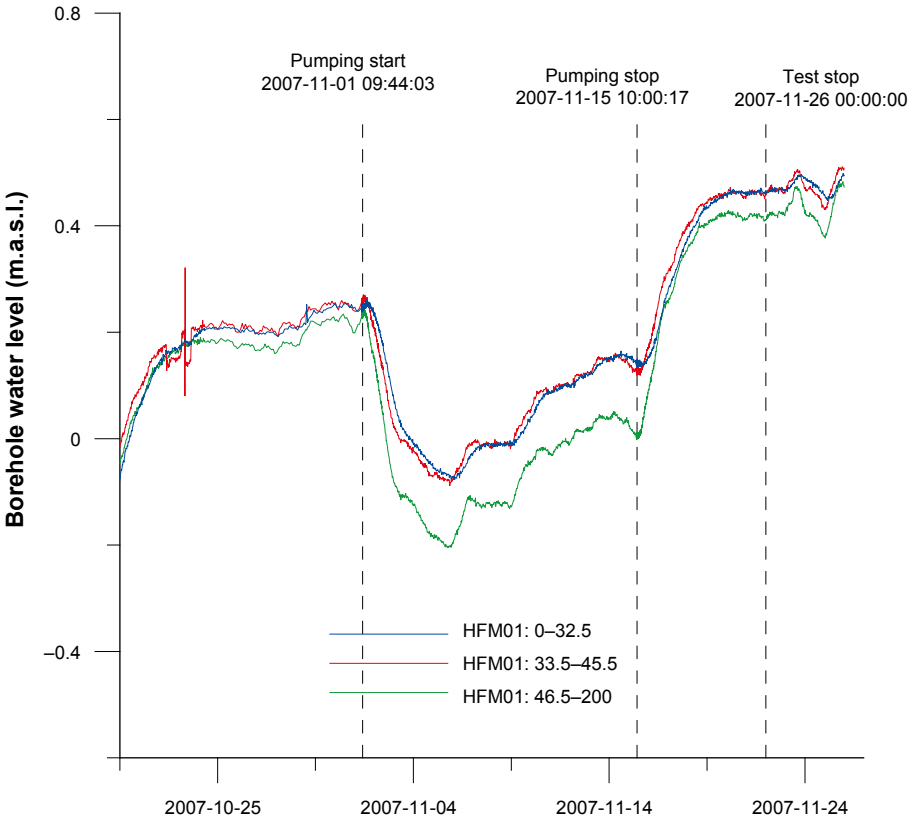


Figure 6-27. *Linear plot of pressure versus time in the observation sections in HFM01 during the interference test in HFM33.*

6.2.102 Observation section HFM25: 0–188 m

In Figure 6-28 an overview of the pressure responses in observation borehole HFM25 is shown. General test data from the observation section HFM25, 0–188 m, are presented in Table 6-102. According to Table 3-1, the borehole is cased to 9.04 m. The uncased interval of this section is thus c. 9–188 m.

Comments on the test

This section appears to be unaffected by the pumping in HFM33.

Table 6-102. General test data from the observation section HFM25: 0–188 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.17
Hydraulic head in test section before stop of flow period	h_p	m	0.41
Hydraulic head in test section at stop of recovery period	h_F	m	0.37
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.24

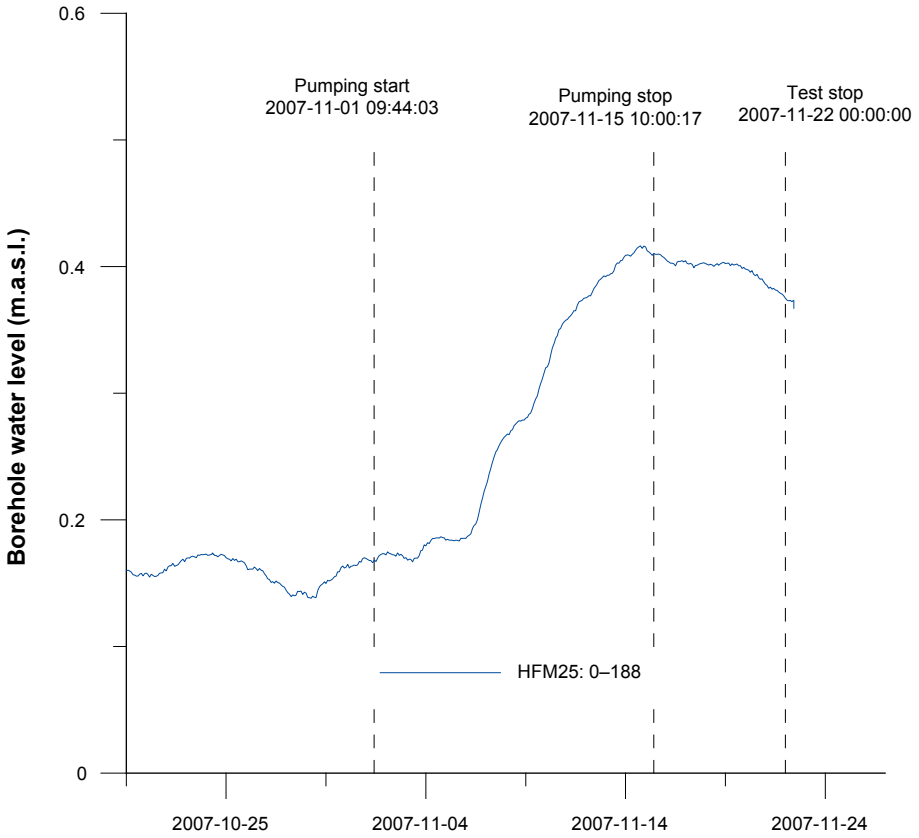


Figure 6-28. *Linear plot of pressure versus time in the observation section in HFM25 during the interference test in HFM33.*

6.2.103 Observation section HFM20: 0–48 m

In Figure 6-29 an overview of the pressure responses in observation borehole HFM20 is shown. General test data from the observation section HFM20, 0–48 m, are presented in Table 6-103. According to Table 3-1, the borehole is cased to 12.03 m. The uncased interval of this section is thus c. 12–48 m.

Comments on the test

In this section a change of slope in the pressure curve can be observed at the times of start and stop of pumping. This may indicate a weak, probably secondary, response to pumping. In addition, the trend of rising pressure, observed in all sections of this borehole, is effectively cloaking a possible response in this section.

6.2.104 Observation section HFM20: 49–100 m

In Figure 6-29 an overview of the pressure responses in observation borehole HFM20 is shown. General test data from the observation section HFM20, 49–100 m, are presented in Table 6-104.

Comments on the test

A clear response to pumping was recorded in this observation section. A total drawdown of c. 0.1 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 14 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days. A trend of increasing pressure may probably lead to an underestimation of the drawdown and an overestimation of the recovery for this section.

Table 6-103. General test data from the observation section HFM20: 0–48 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.57
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.77
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.87
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.20

Table 6-104. General test data from the observation section HFM20: 49–100 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.60
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.55
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.80
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.05

6.2.105 Observation section HFM20: 101–130 m

In Figure 6-29 an overview of the pressure responses in observation borehole HFM20 is shown. General test data from the observation section HFM20, 101–130 m, are presented in Table 6-105.

Comments on the test

A clear response to pumping was recorded in this observation section. A total drawdown of c. 0.2 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 9 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days. An ongoing trend of increasing pressure may probably lead to an underestimation of the drawdown and an overestimation of the recovery for this section.

6.2.106 Observation section HFM20: 131–301 m

In Figure 6-29 an overview of the pressure responses in observation borehole HFM20 is shown. General test data from the observation section HFM20, 131–301 m, are presented in Table 6-106.

Comments on the test

A clear response to pumping was recorded in this observation section. A total drawdown of c. 0.2 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 13 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days. An ongoing trend of increasing pressure may probably lead to an underestimation of the drawdown and an overestimation of the recovery for this section.

Table 6-105. General test data from the observation section HFM20: 101–130 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.62
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.48
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.79
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.15

Table 6-106. General test data from the observation section HFM20: 131–301 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.71
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.53
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.86
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.18

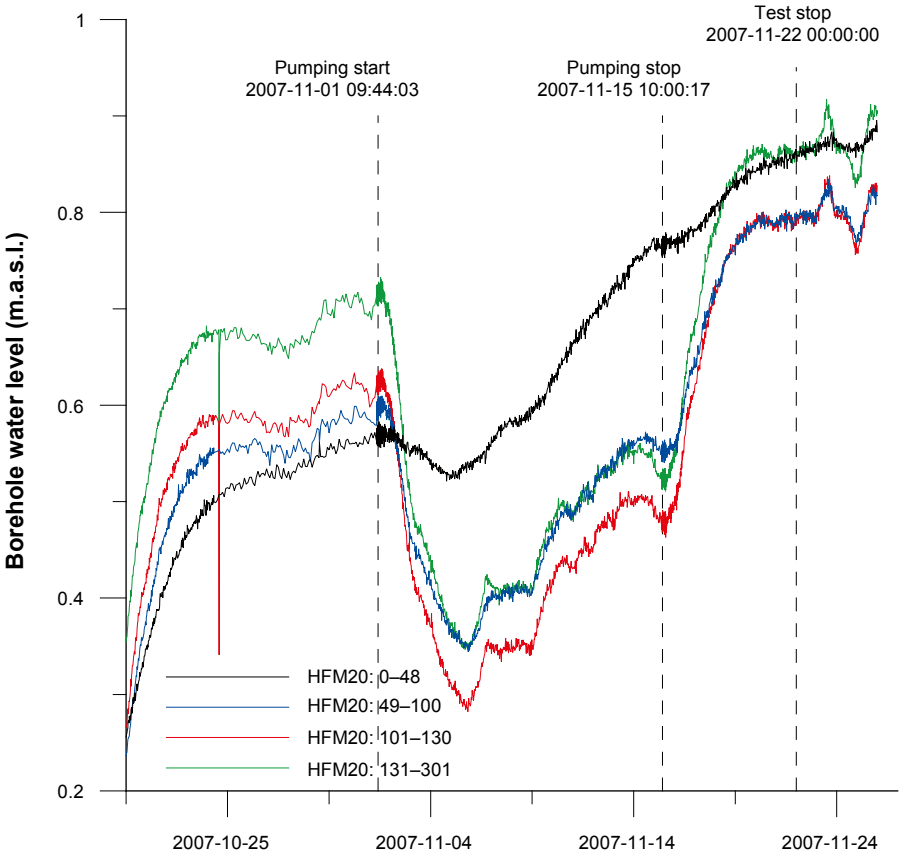


Figure 6-29. *Linear plot of pressure versus time in the observation sections in HFM20 during the interference test in HFM33.*

6.2.107 Observation section KFM01B: 0–100 m

In Figure 6-30 an overview of the pressure responses in observation borehole KFM01B is shown. General test data from the observation section KFM01B, 0–100 m, are presented in Table 6-107. According to Table 3-1, the borehole is cased to 9.09 m. The uncased interval of this section is thus c. 9–100 m.

Comments on the test

The change of slope in the pressure curves for this section suggests that it is slightly affected by the pumping in HFM33 even though the total drawdown during the flow period is negative. A drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-107. General test data from the observation section KFM01B: 0–100 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.30
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.79
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	1.07
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.49

6.2.108 Observation section KFM01B: 101–141 m

In Figure 6-30 an overview of the pressure responses in observation borehole KFM01B is shown. General test data from the observation section KFM01B, 101–141 m, are presented in Table 6-108.

Comments on the test

A clear response to pumping was recorded in this section. The total drawdown during the flow period was c. 0.1 m. A drawdown of 0.01 m was reached approximately 6 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.109 Observation section KFM01B: 142–500 m

In Figure 6-30 an overview of the pressure responses in observation borehole KFM01B is shown. General test data from the observation section KFM01B, 142–500 m, are presented in Table 6-109.

Comments on the test

A clear response to pumping was recorded in this section. The total drawdown during the flow period was c. 0.2 m. A drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

Table 6-108. General test data from the observation section KFM01B: 101–141 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.08
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.05
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.28
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.13

Table 6-109. General test data from the observation section KFM01B: 142–500 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.10
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.08
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.30
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.18

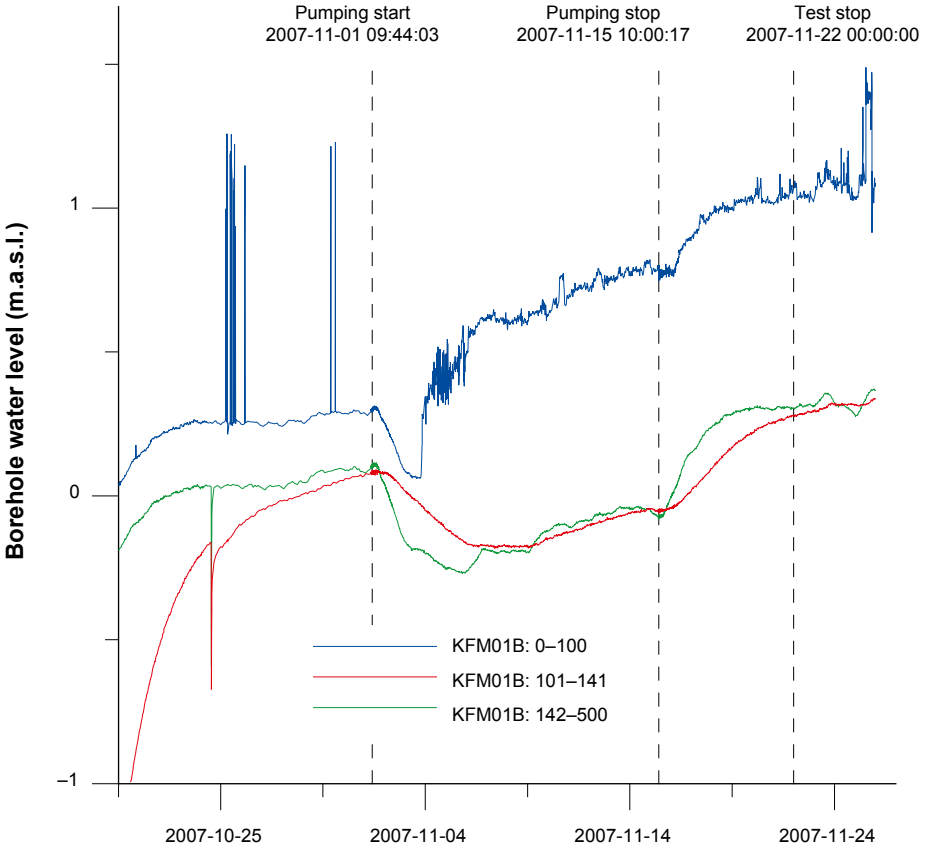


Figure 6-30. *Linear plot of pressure versus time in the observation sections in KFM01B during the interference test in HFM33.*

6.2.110 Observation section KFM01A: 0–108 m

In Figures 6-31 and 6-32 an overview of the pressure responses in observation borehole KFM01A is shown. General test data from the observation section KFM01A, 0–108 m, are presented in Table 6-110. According to Table 3-1, the borehole is cased to 101.99 m. The uncased interval of this section is thus c. 102–108 m.

Comments on the test

There is nothing to indicate that this section is responding to the pumping in HFM33. The appearance of the pressure curve does however seem unnatural and there is a possibility that the pressure transducer is just not providing reliable data.

Table 6-110. General test data from the observation section KFM01A: 0–108 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–1.24
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.95
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.80
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.29

6.2.111 Observation section KFM01A: 109–130 m

In Figures 6-31 and 6-32 an overview of the pressure responses in observation borehole KFM01A is shown. General test data from the observation section KFM01A, 109–130 m, are presented in Table 6-111.

Comments on the test

The pressure response to pumping in HFM33 can be clearly observed in this observation section. The total drawdown during the flow period was c. 0.2 m. A drawdown of 0.01 m was reached approximately 18 hours after the pumping started in HFM33. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

6.2.112 Observation section KFM01A: 131–204 m

In Figures 6-31 and 6-32 an overview of the pressure responses in observation borehole KFM01A is shown. General test data from the observation section KFM01A, 131–204 m, are presented in Table 6-112.

Comments on the test

The pressure response to pumping in HFM33 can be clearly observed also in this observation section. The total drawdown during the flow period was c. 0.2 m. A drawdown of 0.01 m was reached approximately 7 hours after the pumping started. There was a total recovery of c. 0.4 m during the recovery period that lasted for approximately 7 days.

Table 6-111. General test data from the observation section KFM01A: 109–130 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.09
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.24
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.11
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.15

Table 6-112. General test data from the observation section KFM01A: 131–204 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.05
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.23
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.14
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.18

6.2.113 Observation section KFM01A: 205–373 m

In Figures 6-31 and 6-32 an overview of the pressure responses in observation borehole KFM01A is shown. General test data from the observation section KFM01A, 205–373 m, are presented in Table 6-113.

Comments on the test

This section appears to be unaffected by the pumping in HFM33.

6.2.114 Observation section KFM01A: 374–430 m

In Figures 6-31 and 6-32 an overview of the pressure responses in observation borehole KFM01A is shown. General test data from the observation section KFM01A, 374–430 m, are presented in Table 6-114.

Comments on the test

This section appears to be virtually unaffected by the pumping in HFM33.

6.2.115 Observation section KFM01A: 431–1,002 m

In Figures 6-31 and 6-32 an overview of the pressure responses in observation borehole KFM01A is shown. General test data from the observation section KFM01A, 431–1,002 m, are presented in Table 6-115.

Comments on the test

This section appears to be unaffected by the pumping in HFM33.

Table 6-113. General test data from the observation section KFM01A: 205–373 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.04
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.00
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.01
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.04

Table 6-114. General test data from the observation section KFM01A: 374–430 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.93
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.95
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.92
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.01

Table 6-115. General test data from the observation section KFM01A: 431–1,002 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	5.70
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	5.99
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	6.05
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.29

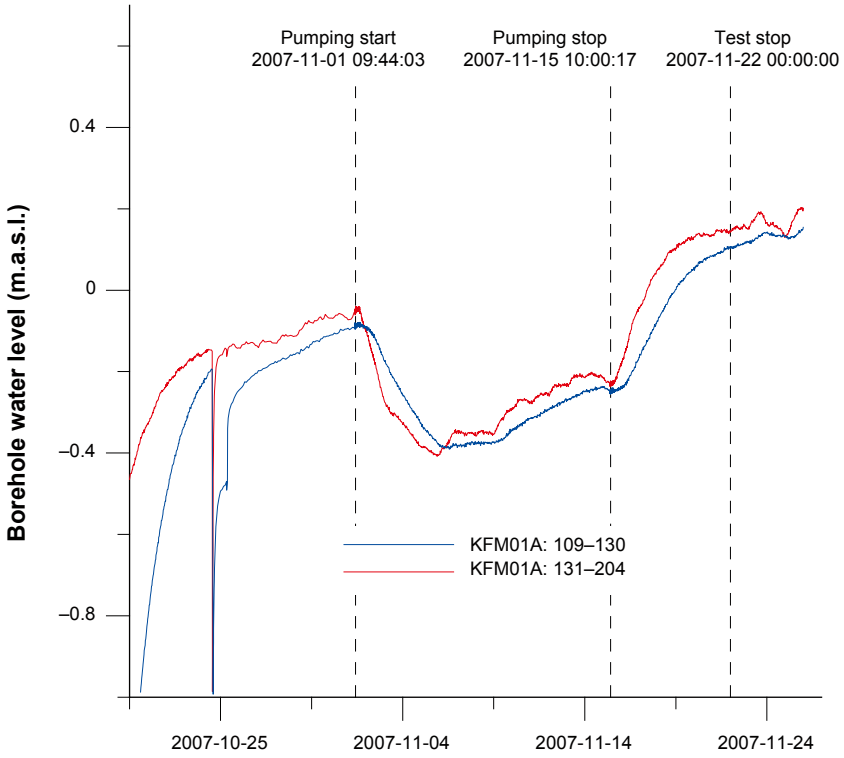


Figure 6-31. *Linear plot of pressure versus time in the observation sections in KFM01A during the interference test in HFM33.*

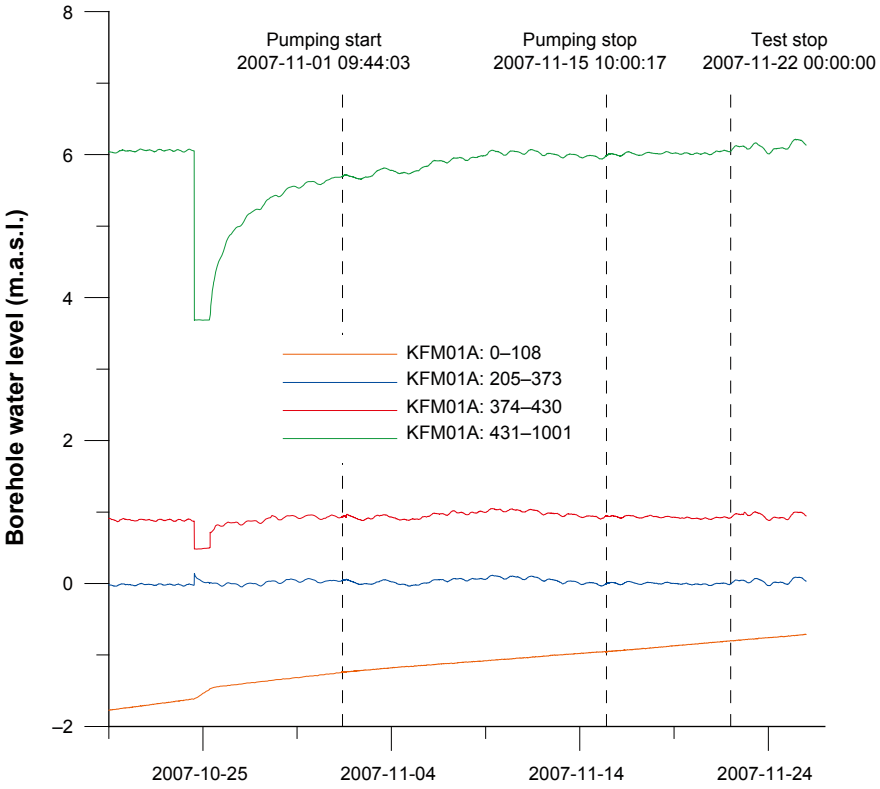


Figure 6-32. *Linear plot of pressure versus time in the observation sections in KFM01A during the interference test in HFM33.*

6.2.116 Observation section KFM01C: 0–58 m

In Figure 6-33 an overview of the pressure responses in observation borehole KFM01C is shown. General test data from the observation section KFM01C, 0–58 m, are presented in Table 6-116. According to Table 3-1, the borehole is cased to 11.96 m. The uncased interval of this section is thus c. 12–58 m.

Comments on the test

The pumping in HFM33 caused a clear response in this section. The total drawdown during the flow period was c. 0.1 m. A drawdown of 0.01 m was reached approximately 8 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-116. General test data from the observation section KFM01C: 0–58 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.01
Hydraulic head in test section before stop of flow period	h_p	m	–0.10
Hydraulic head in test section at stop of recovery period	h_F	m	0.21
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.09

6.2.117 Observation section KFM01C: 59–237 m

In Figure 6-33 an overview of the pressure responses in observation borehole KFM01C is shown. General test data from the observation section KFM01C, 59–237 m, are presented in Table 6-117.

Comments on the test

The pumping in HFM33 caused a clear response in this section. The total drawdown during the flow period was c. 0.1 m. A drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.118 Observation section KFM01C: 238–450 m

In Figure 6-33 an overview of the pressure responses in observation borehole KFM01C is shown. General test data from the observation section KFM01C, 238–450 m, are presented in Table 6-118.

Comments on the test

This section may possibly be weakly affected by the pumping in HFM33 as is indicated by the minor change in slope of the pressure curve at the point of pumping stop. It seems however just as likely that it is not responding and the change of pressure is only a consequence of natural pressure variations.

Table 6-117. General test data from the observation section KFM01C: 59–237 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.07
Hydraulic head in test section before stop of flow period	h_p	m	–0.19
Hydraulic head in test section at stop of recovery period	h_F	m	0.13
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.11

Table 6-118. General test data from the observation section KFM01C: 238–450 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.76
Hydraulic head in test section before stop of flow period	h_p	m	–0.65
Hydraulic head in test section at stop of recovery period	h_F	m	–0.64
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.10

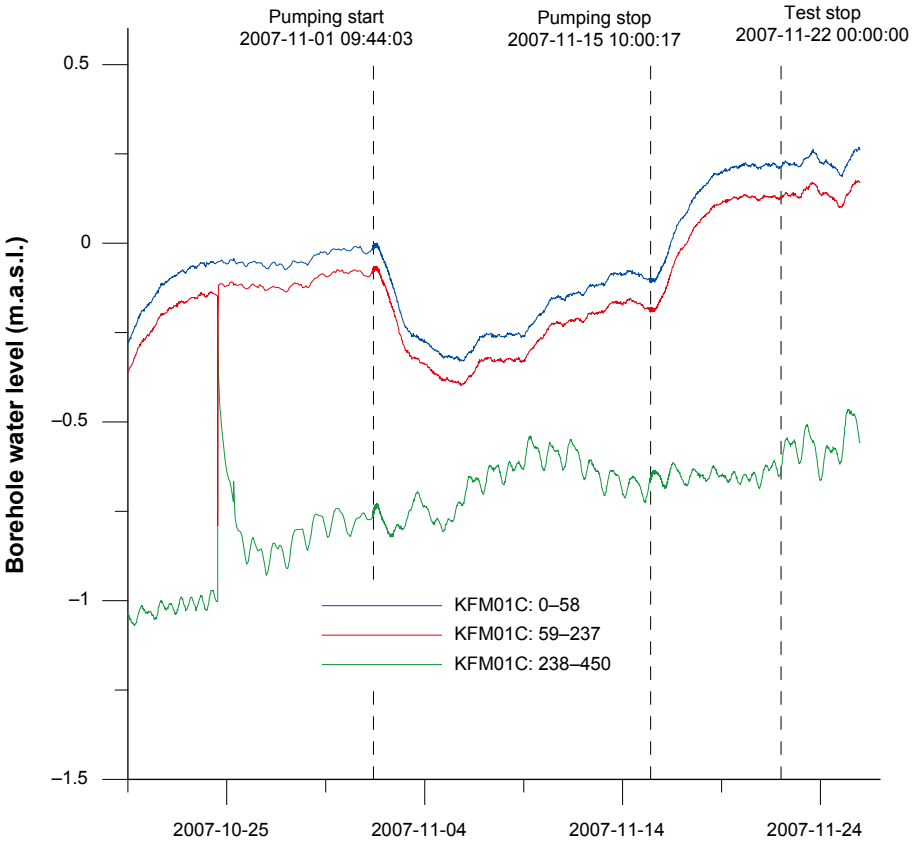


Figure 6-33. *Linear plot of pressure versus time in the observation sections in KFM01C during the interference test in HFM33.*

6.2.119 Observation section HFM27: 0–24 m

In Figure 6-34 an overview of the pressure responses in observation borehole HFM27 is shown. General test data from the observation section HFM27, 0–24 m, are presented in Table 6-119. According to Table 3-1, the borehole is cased to 12.03 m. The uncased interval of this section is thus c. 12–24 m.

Comments on the test

This section shows a clear response to pumping in HFM33. A total drawdown during the flow period of c. 0.1 m was registered and a drawdown of 0.01 m was reached approximately 8 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-119. General test data from the observation section HFM27: 0–24 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.36
Hydraulic head in test section before stop of flow period	h_p	m	0.31
Hydraulic head in test section at stop of recovery period	h_F	m	0.59
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.05

6.2.120 Observation section HFM27: 25–45 m

In Figure 6-34 an overview of the pressure responses in observation borehole HFM27 is shown. General test data from the observation section HFM27, 25–45 m, are presented in Table 6-120.

Comments on the test

This section is also demonstrating a clear response to pumping in HFM33. A total drawdown during the flow period of c. 0.1 m was registered and a drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.121 Observation section HFM27: 46–58 m

In Figure 6-34 an overview of the pressure responses in observation borehole HFM27 is shown. General test data from the observation section HFM27, 46–58 m, are presented in Table 6-121.

Comments on the test

Also this section is displaying a clear response to pumping in HFM33. A total drawdown during the flow period of c. 0.1 m was registered and a drawdown of 0.01 m was reached approximately 6 hours after the pumping started. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.122 Observation section HFM27: 59–128 m

In Figure 6-34 an overview of the pressure responses in observation borehole HFM27 is shown. General test data from the observation section HFM27, 59–128 m, are presented in Table 6-122.

Comments on the test

A clear response to pumping was found in this section. A total drawdown during the pumping period of c. 0.1 m was registered. A drawdown of 0.01 m was reached approximately 13 hours after the pumping started. There was a total recovery of about 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-120. General test data from the observation section HFM27: 25–45 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.34
Hydraulic head in test section before stop of flow period	h_p	m	0.24
Hydraulic head in test section at stop of recovery period	h_F	m	0.54
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.11

Table 6-121. General test data from the observation section HFM27: 46–58 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.25
Hydraulic head in test section before stop of flow period	h_p	m	0.13
Hydraulic head in test section at stop of recovery period	h_F	m	0.45
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.12

Table 6-122. General test data from the observation section HFM27: 59–128 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	0.31
Hydraulic head in test section before stop of flow period	h_p	m	0.21
Hydraulic head in test section at stop of recovery period	h_F	m	0.51
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.10

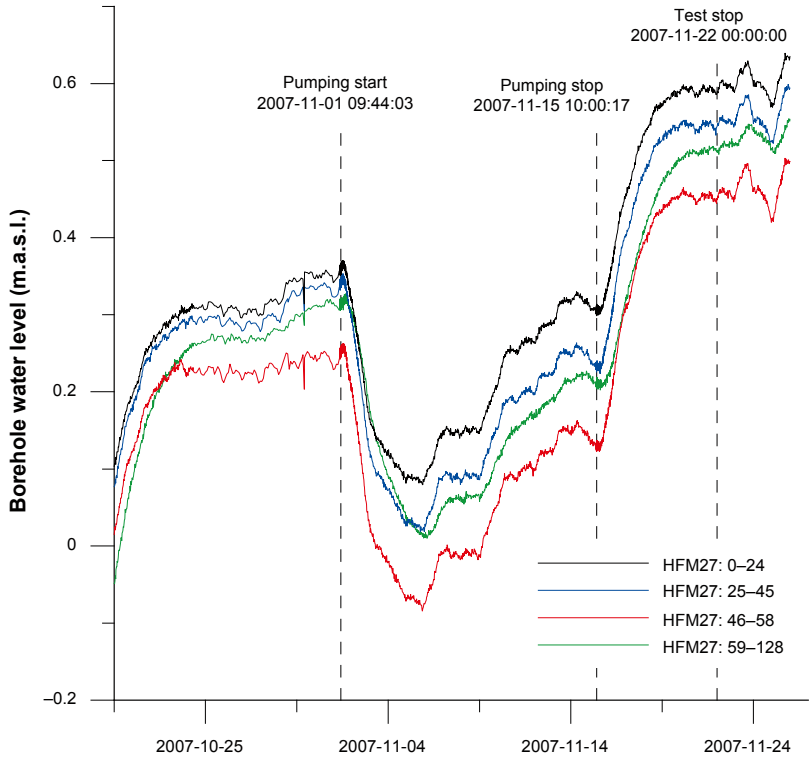


Figure 6-34. *Linear plot of pressure versus time in the observation sections in HFM27 during the interference test in HFM33.*

6.2.123 Observation section HFM03: 0–18 m

In Figure 6-35 an overview of the pressure responses in observation borehole HFM03 is shown. General test data from the observation section HFM03, 0–18 m, are presented in Table 6-123. According to Table 3-1, the borehole is cased to 13.1 m. The uncased interval of this section is thus c. 13–18 m.

Comments on the test

The pressure response to pumping in HFM33 is clearly observed in this observation section. Even if there was almost no total drawdown registered from the flow period, the shape of the pressure curve clearly shows that this section was responding. The response is to some extent cloaked under a trend of rising pressure. A drawdown of 0.01 m was reached approximately 11 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.124 Observation section HFM03: 19–26 m

In Figure 6-35 an overview of the pressure responses in observation borehole HFM03 is shown. General test data from the observation section HFM03, 19–26 m, are presented in Table 6-124.

Comments on the test

A clear response to pumping was recorded in this section. The total drawdown during the flow period was c. 0.1 m. This is likely to be an underestimate of the real drawdown caused by a natural trend of rising pressure during the flow period. A drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-123. General test data from the observation section HFM03: 0–18 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.34
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.30
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.59
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.04

Table 6-124. General test data from the observation section HFM03: 19–26 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.37
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.29
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.59
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.09

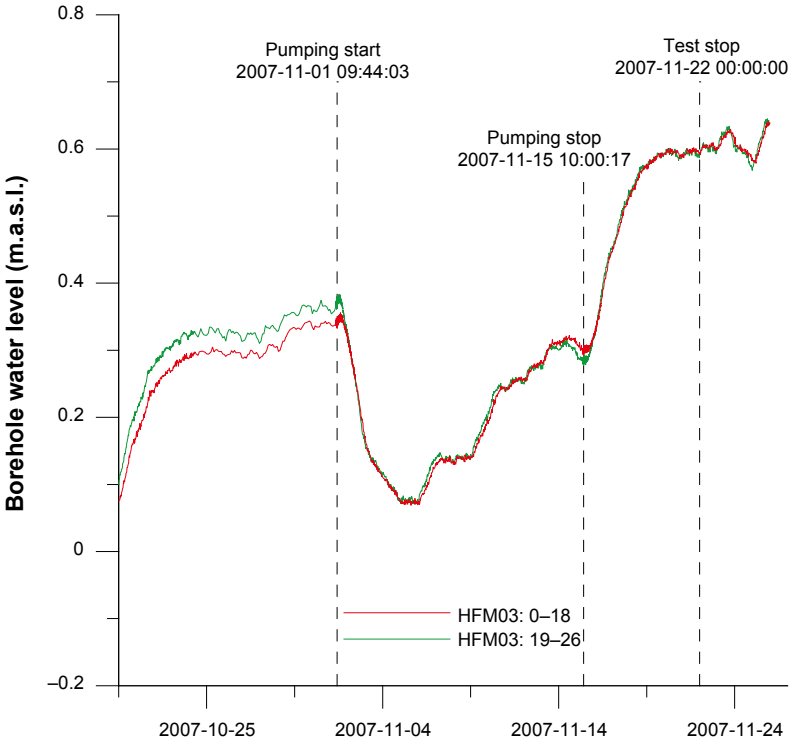


Figure 6-35. *Linear plot of pressure versus time in the observation sections in HFM03 during the interference test in HFM33.*

6.2.125 Observation section HFM02: 0–37 m

In Figure 6-36 an overview of the pressure responses in observation borehole HFM02 is shown. General test data from the observation section HFM02, 0–37 m, are presented in Table 6-125. According to Table 3-1, the borehole is cased to 25.4 m. The uncased interval of this section is thus c. 25–37 m.

Comments on the test

A clear response to pumping was recorded in this section. The total drawdown during the flow period was c. 0.12 m. A drawdown of 0.01 m was reached approximately 8 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-125. General test data from the observation section HFM02: 0–37 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.28
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.16
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.48
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.12

6.2.126 Observation section HFM02: 38–48 m

In Figure 6-36 an overview of the pressure responses in observation borehole HFM02 is shown. General test data from the observation section HFM02, 38–48 m, are presented in Table 6-126.

Comments on the test

A clear response to pumping was recorded in this section. The total drawdown during the flow period was c. 0.1 m. A drawdown of 0.01 m was reached approximately 7 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

6.2.127 Observation section HFM02: 49–100 m

In Figure 6-36 an overview of the pressure responses in observation borehole HFM02 is shown. General test data from the observation section HFM02, 49–100 m, are presented in Table 6-127.

Comments on the test

A clear response to pumping was recorded in this section. The total drawdown during the flow period was c. 0.1 m. A drawdown of 0.01 m was reached approximately 8 hours after the pumping started in HFM33. There was a total recovery of c. 0.3 m during the recovery period that lasted for approximately 7 days.

Table 6-126. General test data from the observation section HFM02: 38–48 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.34
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.21
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.54
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.12

Table 6-127. General test data from the observation section HFM02: 49–100 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.36
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.27
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.58
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.10

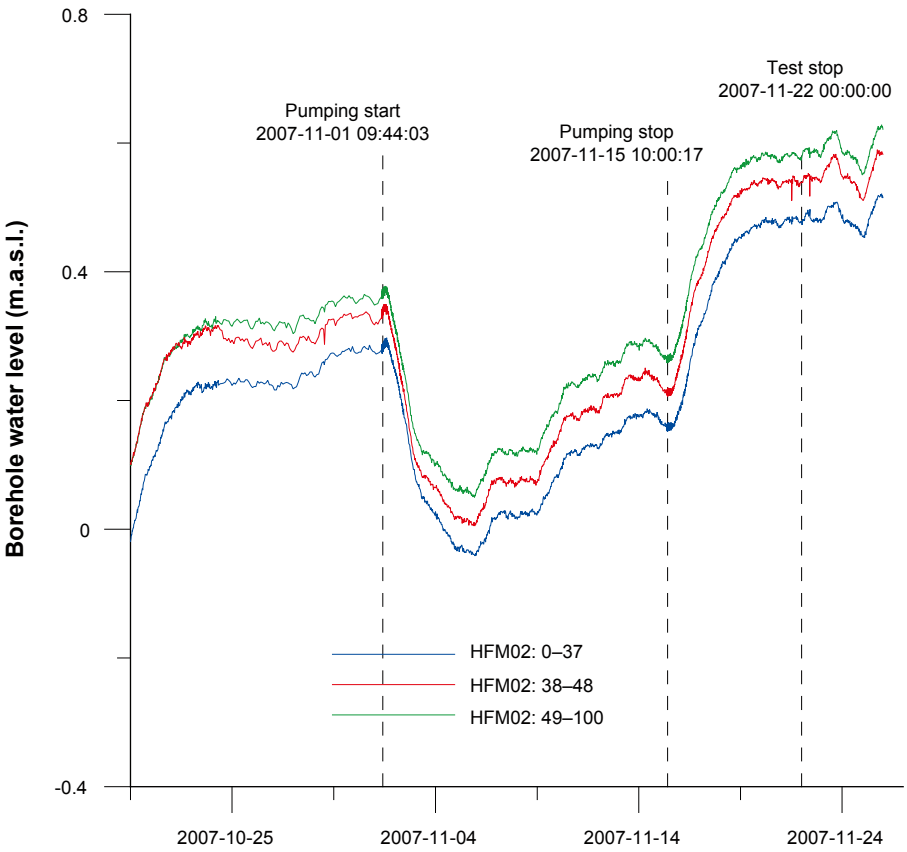


Figure 6-36. *Linear plot of pressure versus time in the observation sections in HFM02 during the interference test in HFM33.*

6.2.128 Observation section KFM05A: 0–114 m

In Figures 6-37 and 6-38 an overview of the pressure responses in observation borehole KFM05A is shown. General test data from the observation section KFM05A, 0–114 m, are presented in Table 6-128. According to Table 3-1, the borehole is cased to 100.07 m. The uncased interval of this section is thus c. 100–114 m.

Comments on the test

A weak but relatively clear response to pumping was recorded in this section. Even though the total drawdown during the flow period was negative, the general appearance of the pressure curve indicates that the section was in fact affected by the pumping in HFM33. An ongoing trend of rising pressure during the flow period is believed to be neutralising the drawdown. A drawdown of 0.01 m was reached approximately 15 hours after the pumping started in HFM33. There was a total recovery of c. 0.1 m during the recovery period lasting for approximately 7 days.

Table 6-128. General test data from the observation section KFM05A: 0–114 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.32
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.37
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.51
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.05

6.2.129 Observation section KFM05A: 115–253 m

In Figures 6-37 and 6-38 an overview of the pressure responses in observation borehole KFM05A is shown. General test data from the observation section KFM05A, 115–253 m, are presented in Table 6-129.

Comments on the test

A weak but relatively clear response to pumping was recorded in this section. Even though the total drawdown during the flow period was negative, the general appearance of the pressure curve indicates that the section was in fact affected by the pumping in HFM33. An ongoing trend of rising pressure during the flow period is believed to be neutralising the drawdown. A drawdown of 0.01 m was reached approximately 14 hours after the pumping started in HFM33. There was a total recovery of c. 0.1 m during the recovery period lasting for approximately 7 days.

6.2.130 Observation section KFM05A: 254–272 m

In Figures 6-37 and 6-38 an overview of the pressure responses in observation borehole KFM05A is shown. General test data from the observation section KFM05A, 254–272 m, are presented in Table 6-130.

Comments on the test

There are no signs indicating that this section was responding to the pumping in HFM33.

6.2.131 Observation section KFM05A: 273–489 m

In Figures 6-37 and 6-38 an overview of the pressure responses in observation borehole KFM05A is shown. General test data from the observation section KFM05A, 273–489 m, are presented in Table 6-131.

Comments on the test

There are no signs indicating that this section was responding to the pumping in HFM33.

Table 6-129. General test data from the observation section KFM05A: 115–253 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.16
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.23
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.35
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.07

Table 6-130. General test data from the observation section KFM05A: 254–272 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–0.27
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–0.14
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–0.13
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.13

Table 6-131. General test data from the observation section KFM05A: 273–489 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	2.84
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	2.86
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	2.82
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.03

6.2.132 Observation section KFM05A: 490–698 m

In Figures 6-37 and 6-38 an overview of the pressure responses in observation borehole KFM05A is shown. General test data from the observation section KFM05A, 490–698 m, are presented in Table 6-132.

Comments on the test

No effects of pumping can be seen in this section. It is improbable that this section is influenced by pumping in HFM33.

6.2.133 Observation section KFM05A: 699–1,002 m

In Figures 6-37 and 6-38 an overview of the pressure responses in observation borehole KFM05A is shown. General test data from the observation section KFM05A, 699–1,002 m, are presented in Table 6-133.

Comments on the test

There are no signs indicating that this section was responding to the pumping in HFM33.

Table 6-132. General test data from the observation section KFM05A: 490–698 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	1.61
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	1.70
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	1.69
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

Table 6-133. General test data from the observation section KFM05A: 699–1,002 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.49
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.50
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.49
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.01

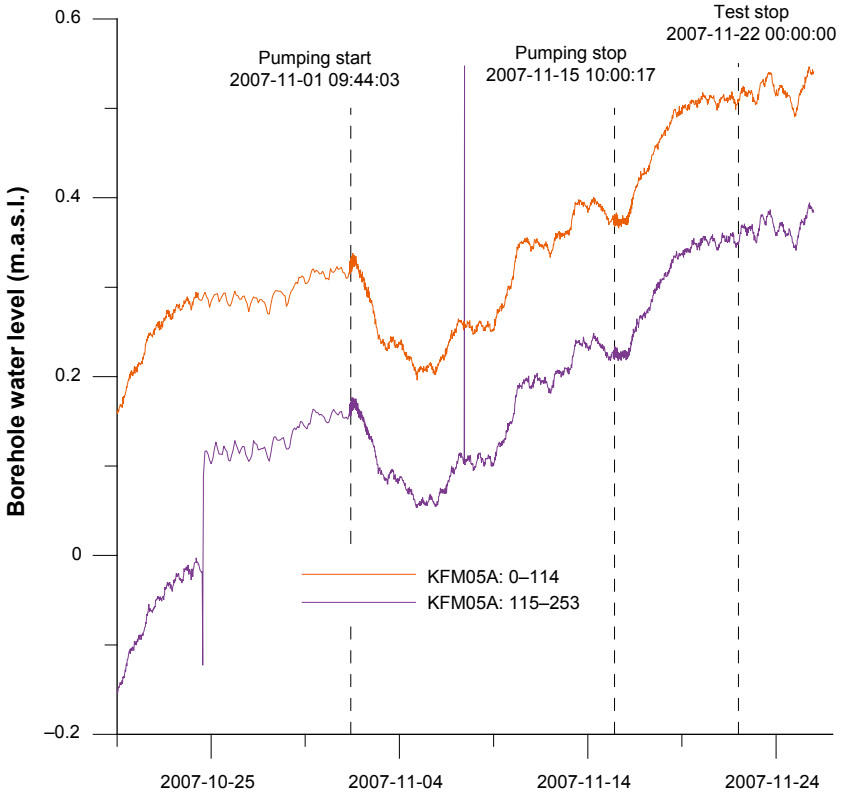


Figure 6-37. *Linear plot of pressure versus time in the observation sections in KFM05A during the interference test in HFM33.*

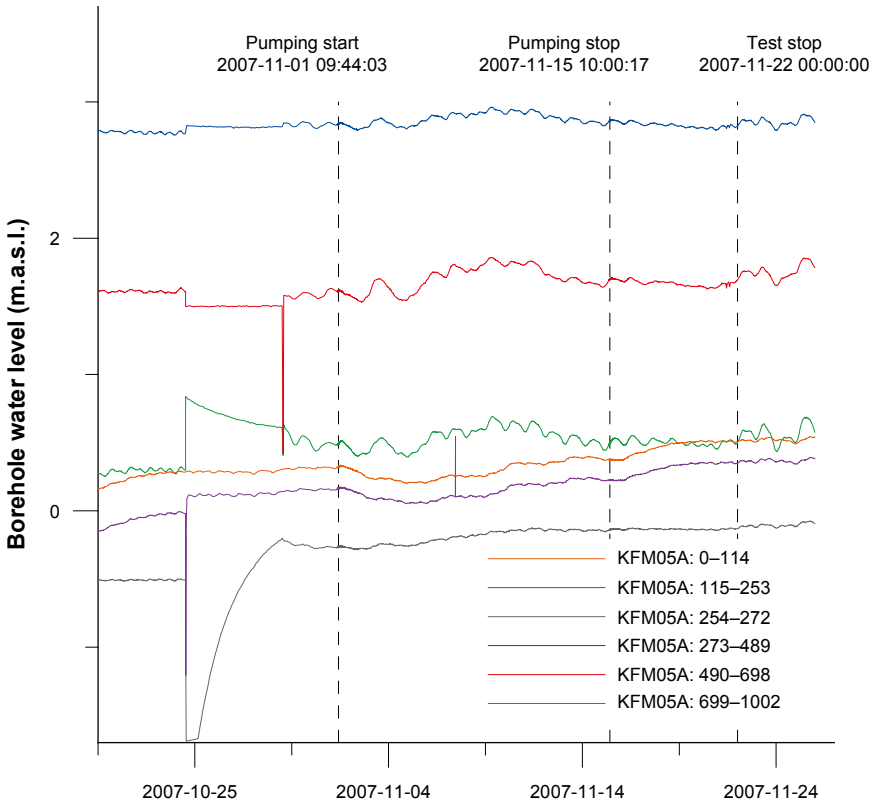


Figure 6-38. *Linear plot of pressure versus time in the observation sections in KFM05A during the interference test in HFM33.*

6.2.134 Observation section HFM15: 0–84 m

In Figure 6-39 an overview of the pressure responses in observation borehole HFM15 is shown. General test data from the observation section HFM15, 0–84 m, are presented in Table 6-134. According to Table 3-1, the borehole is cased to 6.0 m. The uncased interval of this section is thus c. 6–84 m.

Comments on the test

Even though the total drawdown during the pumping period is negative in this section, the general shape of the pressure curve still suggests that this section is responding to the pumping in HFM33. A drawdown of 0.01 m was reached approximately 8 hours after the start of pumping in HFM33. There was a total recovery of c. 0.1 m during the recovery period lasting for approximately 7 days.

6.2.135 Observation section HFM15: 85–95 m

In Figure 6-39 an overview of the pressure responses in observation borehole HFM15 is shown. General test data from the observation section HFM15, 85–95 m, are presented in Table 6-135.

Comments on the test

Even though the total drawdown during the pumping period is negative in this section, the general profile of the pressure curve still suggests that this section is responding to the pumping in HFM33. A drawdown of 0.01 m was reached approximately 8 hours after the start of pumping in HFM33. There was a total recovery of c. 0.1 m during the recovery period lasting for approximately 7 days.

Table 6-134. General test data from the observation section HFM15: 0–84 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.47
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.56
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.70
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

Table 6-135. General test data from the observation section HFM15: 85–89 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.48
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.53
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.68
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.05

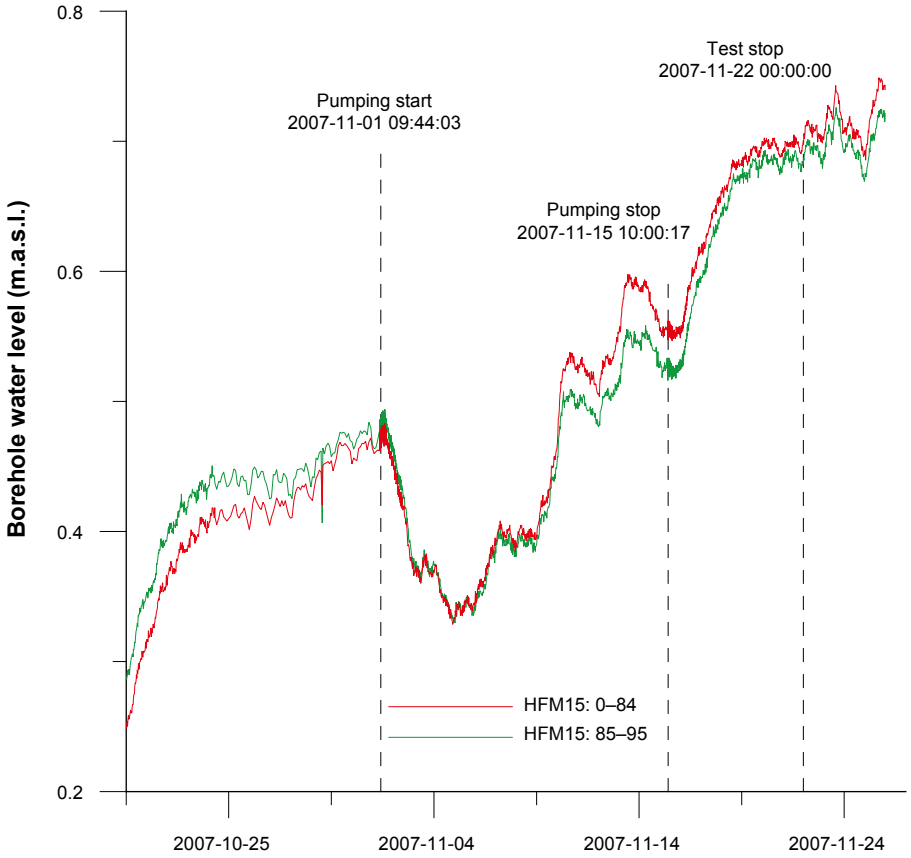


Figure 6-39. *Linear plot of pressure versus time in the observation sections in HFM15 during the interference test in HFM33.*

6.2.136 Observation section KFM09B: 0–200 m

In Figure 6-40 an overview of the pressure responses in observation borehole KFM09B is shown. General test data from the observation section KFM09B, 0–200 m, are presented in Table 6-136. According to Table 3-1, the borehole is cased to 9.120 m. The uncased interval of this section is thus c. 9–200 m.

Comments on the test

Even though the total drawdown during the pumping period is negative in this section, the general appearance of the pressure curve still indicates that this section is responding to the pumping in HFM33. A drawdown of 0.01 m was reached approximately 17 hours after the start of pumping in HFM33. There was a total recovery of c. 0.2 m during the recovery period lasting for approximately 7 days.

Table 6-136. General test data from the observation section KFM09B: 0–200 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.23
Hydraulic head in test section before stop of flow period	h_p	m	–0.19
Hydraulic head in test section at stop of recovery period	h_F	m	–0.01
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.05

6.2.137 Observation section KFM09B: 201–450 m

In Figure 6-40 an overview of the pressure responses in observation borehole KFM09B is shown. General test data from the observation section KFM09B, 201–450 m, are presented in Table 6-137.

Comments on the test

A clear response to pumping was recorded in this observation section. A total drawdown of c. 0.1 m was measured during the flow period. A drawdown of 0.01 m was reached approximately 25 hours after the pumping started in HFM33. There was a total recovery of c. 0.2 m during the recovery period that lasted for approximately 7 days.

6.2.138 Observation section KFM09B: 451–616 m

In Figure 6-40 an overview of the pressure responses in observation borehole KFM09B is shown. General test data from the observation section KFM09B, 451–616 m, are presented in Table 6-138.

Comments on the test

This section does not appear to respond to the pumping in HFM33.

Table 6-137. General test data from the observation section KFM09B: 201–450 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.11
Hydraulic head in test section before stop of flow period	h_p	m	–0.20
Hydraulic head in test section at stop of recovery period	h_F	m	0.04
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	0.10

Table 6-138. General test data from the observation section KFM09B: 451–616 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–0.40
Hydraulic head in test section before stop of flow period	h_p	m	–0.29
Hydraulic head in test section at stop of recovery period	h_F	m	–0.26
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.11

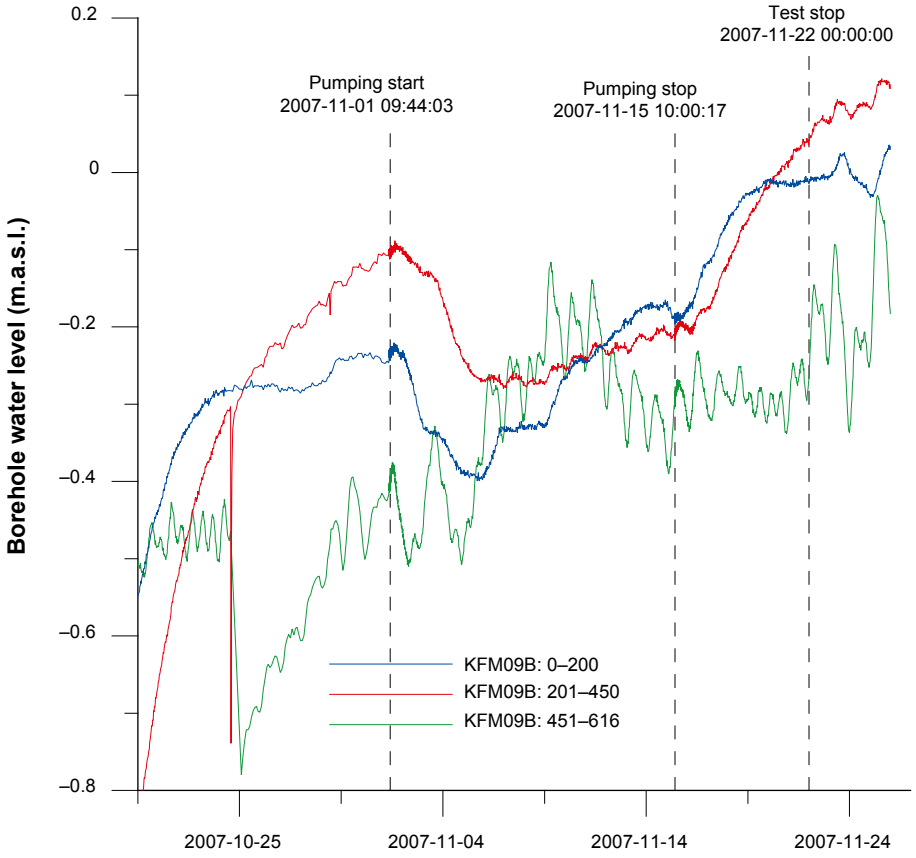


Figure 6-40. *Linear plot of pressure versus time in the observation sections in KFM09B during the interference test in HFM33.*

6.2.139 Observation section KFM09A: 0–300 m

In Figure 6-41 an overview of the pressure responses in observation borehole KFM09A is shown. General test data from the observation section KFM09A, 0–300 m, are presented in Table 6-139. According to Table 3-1, the borehole is cased to 7.79 m. The uncased interval of this section is thus c. 8–300 m.

Comments on the test

This section is not likely to be responding to the pumping in HFM33.

Table 6-139. General test data from the observation section KFM09A: 0–300 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	1.28
Hydraulic head in test section before stop of flow period	h_p	m	1.62
Hydraulic head in test section at stop of recovery period	h_F	m	1.63
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.33

6.2.140 Observation section KFM09A: 301–550 m

In Figure 6-41 an overview of the pressure responses in observation borehole KFM09A is shown. General test data from the observation section KFM09A, 301–550 m, are presented in Table 6-140.

Comments on the test

This section is not likely to be responding to the pumping in HFM33.

6.2.141 Observation section KFM09A: 551–800 m

In Figure 6-41 an overview of the pressure responses in observation borehole KFM09A is shown. General test data from the observation section KFM09A, 551–800 m, are presented in Table 6-141.

Comments on the test

This section is not likely to be responding to the pumping in HFM33.

Table 6-140. General test data from the observation section KFM09A: 301–550 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	1.03
Hydraulic head in test section before stop of flow period	h_p	m	1.07
Hydraulic head in test section at stop of recovery period	h_F	m	1.08
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.04

Table 6-141. General test data from the observation section KFM09A: 551–800 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m	–3.03
Hydraulic head in test section before stop of flow period	h_p	m	–2.99
Hydraulic head in test section at stop of recovery period	h_F	m	–2.99
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.04

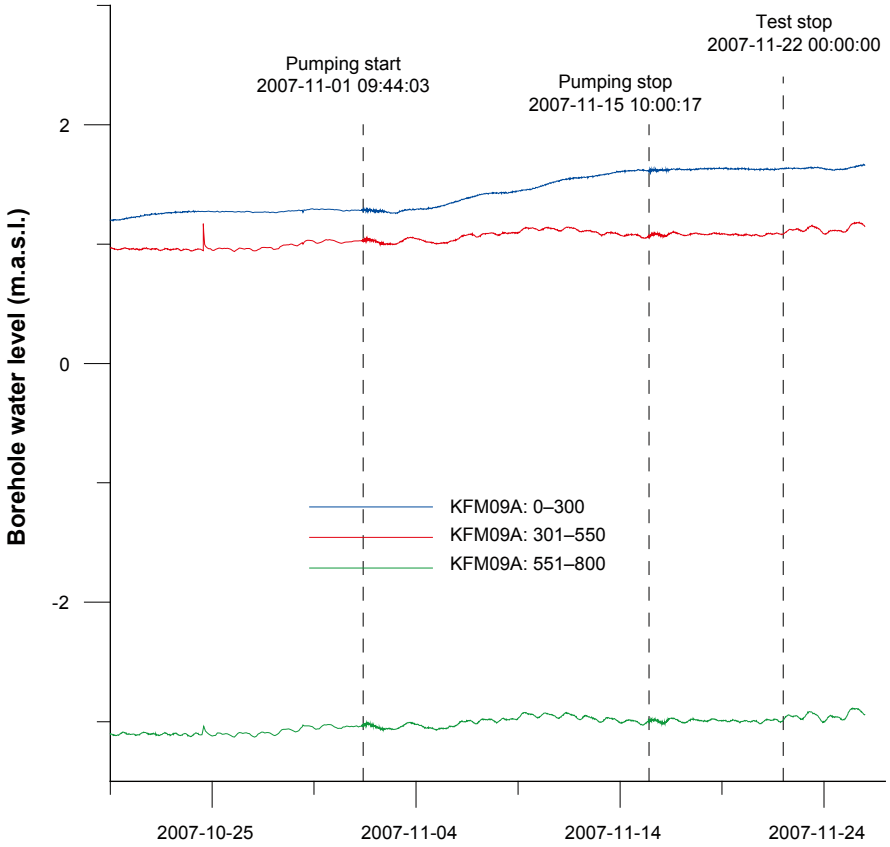


Figure 6-41. *Linear plot of pressure versus time in the observation sections in KFM09A during the interference test in HFM33. Make notice of the different axis scales.*

6.2.142 Observation section HFM19: 0–103 m

In Figure 6-42 an overview of the pressure responses in observation borehole HFM19 is shown. General test data from the observation section HFM19, 0–103 m, are presented in Table 6-142. According to Table 3-1, the borehole is cased to 12.04 m. The uncased interval of this section is thus c. 12–103 m.

Comments on the test

A weak but relatively clear response to pumping was recorded in this section. Even though the total drawdown during the flow period was negative, the general appearance of the pressure curve indicates that the section was in fact affected by the pumping in HFM33. An ongoing trend of rising pressure during the flow period is believed to be neutralising the drawdown. A drawdown of 0.01 m was reached approximately 9 hours after the pumping started in HFM33. There was a total recovery of c. 0.2 m during the recovery period lasting for approximately 7 days.

Table 6-142. General test data from the observation section HFM19: 0–103 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.65
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.70
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.87
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.05

6.2.143 Observation section HFM19: 104–167 m

In Figure 6-42 an overview of the pressure responses in observation borehole HFM19 is shown. General test data from the observation section HFM19, 104–167 m, are presented in Table 6-143.

Comments on the test

A weak but relatively clear response to pumping was recorded in this section. Even though the total drawdown during the flow period was negative, the general shape of the pressure curve indicates that the section was in fact affected by the pumping in HFM33. An ongoing trend of rising pressure during the flow period is believed to be neutralising the drawdown. A drawdown of 0.01 m was reached approximately 10 hours after the pumping started in HFM33. There was a total recovery of c. 0.2 m during the recovery period lasting for approximately 7 days.

6.2.144 Observation section HFM19: 168–182 m

In Figure 6-42 an overview of the pressure responses in observation borehole HFM19 is shown. General test data from the observation section HFM19, 168–182 m, are presented in Table 6-144.

Comments on the test

A weak but relatively clear response to pumping was recorded in this section. Even though the total drawdown during the flow period was negative, the general appearance of the pressure curve suggests that the section was in fact affected by the pumping in HFM33. An ongoing trend of rising pressure during the flow period is believed to be neutralising the drawdown. A drawdown of 0.01 m was reached approximately 8 hours after the pumping started in HFM33. There was a total recovery of c. 0.2 m during the recovery period lasting for approximately 7 days.

Table 6-143. General test data from the observation section HFM19: 104–167 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.55
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.58
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.76
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.02

Table 6-144. General test data from the observation section HFM19: 168–182 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.01
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.03
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.22
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.02

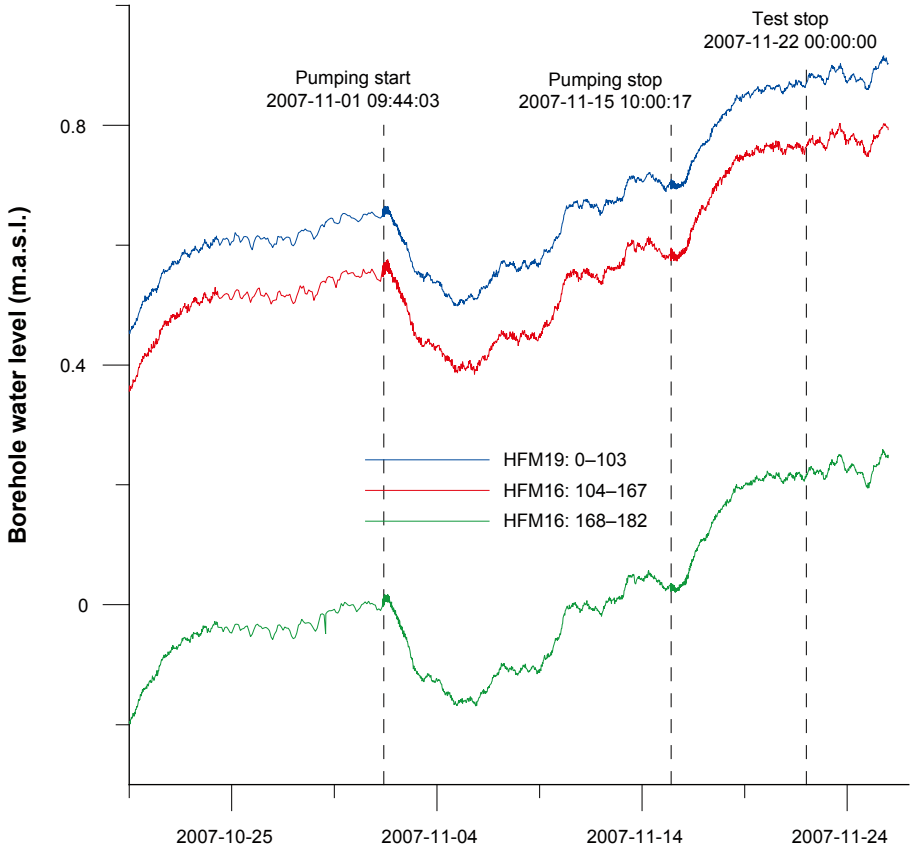


Figure 6-42. *Linear plot of pressure versus time in the observation sections in HFM19 during the interference test in HFM33.*

6.2.145 Observation section HFM17: 0–211 m

In Figure 6-43 an overview of the pressure responses in observation borehole HFM17 is shown. General test data from the observation section HFM17, 0–211 m, are presented in Table 6-145. According to Table 3-1, the borehole is cased to 8.00 m. The uncased interval of this section is thus c. 8–211 m.

Comments on the test

There are not data covering all of the test period available for this section. The available data do however indicate that this section is probably not affected, or rather weakly affected by the pumping in HFM33.

Table 6-145. General test data from the observation section HFM17: 0–211 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	–
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	–
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	–
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–

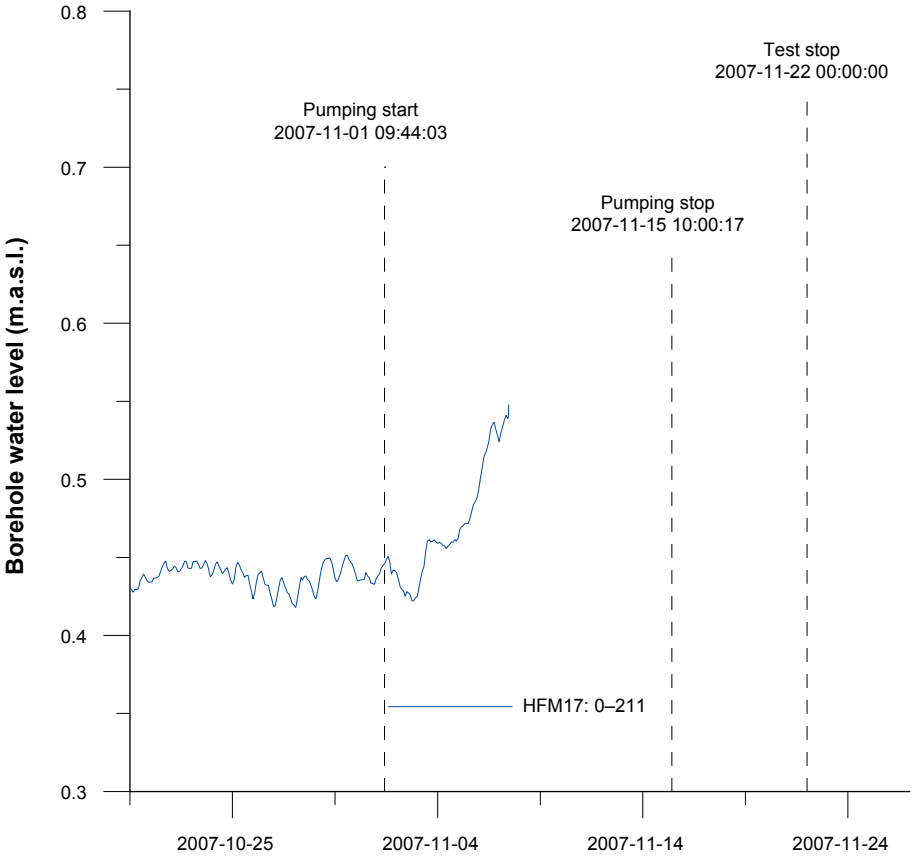


Figure 6-43. *Linear plot of pressure versus time in the observation section in HFM17 during the interference test in HFM33.*

6.2.146 Observation section HFM28: 0–151 m

In Figure 6-44 an overview of the pressure responses in observation borehole HFM28 is shown. General test data from the observation section HFM28, 0–151 m, are presented in Table 6-146. According to Table 3-1, the borehole is cased to 12.03 m. The uncased interval of this section is thus c. 12–151 m.

Comments on the test

This section may possibly be slightly affected by the pumping in HFM33, as would be suggested by the change of slope of the pressure curve in conjunction with the stop of pumping. These signs are however not strong enough to say with any certainty that the section was in fact responding.

Table 6-146. General test data from the observation section HFM28: 0–151 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	1.43
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	1.76
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	1.76
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.33

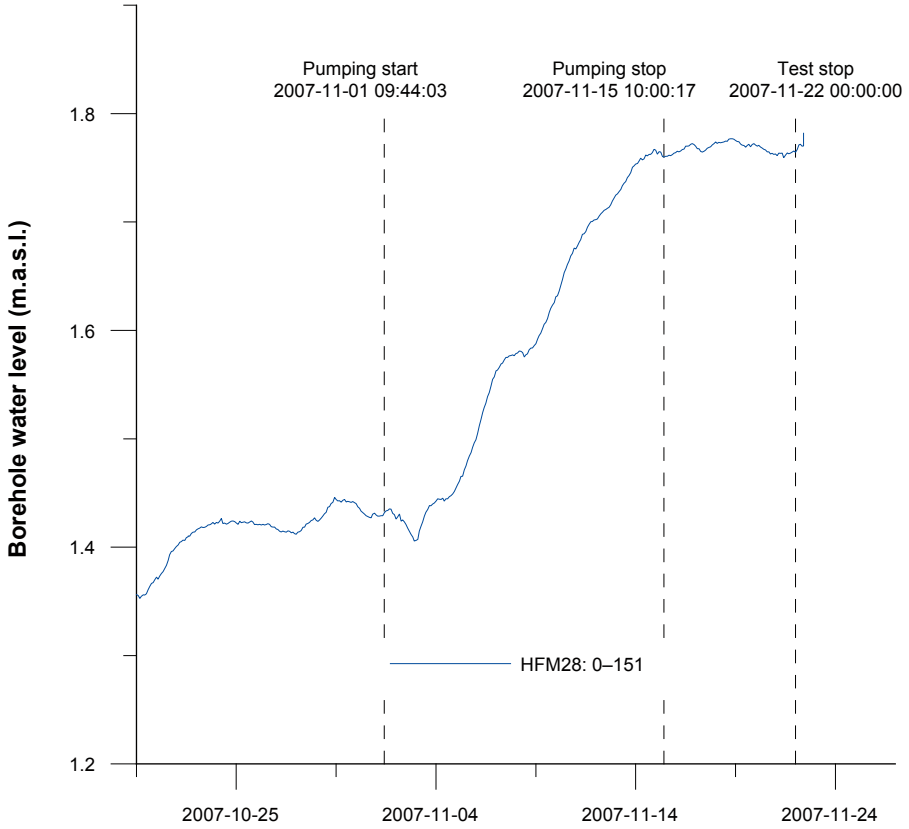


Figure 6-44. *Linear plot of pressure versus time in the observation section in HFM28 during the interference test in HFM33.*

6.2.147 Observation section HFM23: 0–212 m

In Figure 6-45 an overview of the pressure responses in observation borehole HFM23 is shown. General test data from the observation section HFM23, 0–212 m, are presented in Table 6-147. According to Table 3-1, the borehole is cased to 20.80 m. The uncased interval of this section is thus c. 21–212 m.

Comments on the test

This section may possibly be slightly affected by the pumping in HFM33, as would be suggested by the change of slope of the pressure curve in conjunction with the stop of pumping. These signs are however not strong enough to say with any certainty that the section was in fact responding.

Table 6-147. General test data from the observation section HFM23: 0–212 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	1.20
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	1.52
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	1.51
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.32

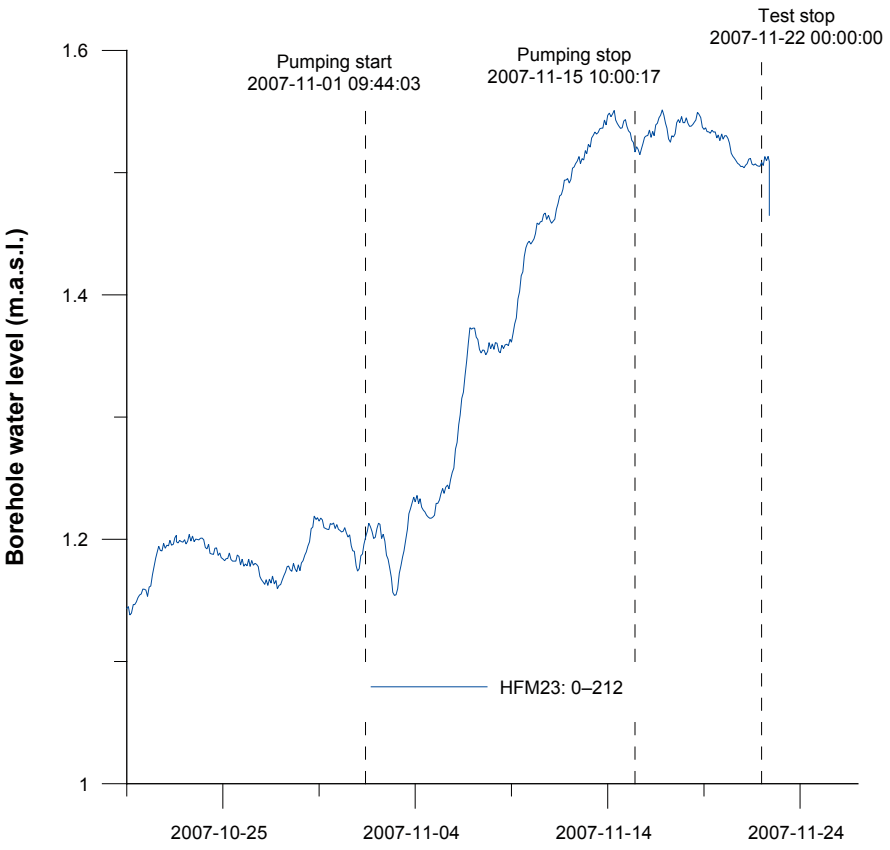


Figure 6-45. *Linear plot of pressure versus time in the observation section in HFM23 during the interference test in HFM33.*

6.2.148 Observation section HFM14: 0–150 m

In Figure 6-46 an overview of the pressure responses in observation borehole HFM14 is shown. General test data from the observation section HFM14, 0–150 m, are presented in Table 6-148. According to Table 3-1, the borehole is cased to 6.00 m. The uncased interval of this section is thus c. 6–150 m.

Comments on the test

This section show indications of being slightly affected by the pumping in HFM33, as would be suggested by the change of slope of the pressure curve in conjunction with the start and stop of pumping. So even though the total drawdown during the flow period is negative, it is proposed that this section to some degree is responding to the pumping in HFM33.

Table 6-148. General test data from the observation section HFM14: 0–150 m during the interference test in HFM33.

Pressure data	Nomenclature	Unit	Value
Hydraulic head in test section before start of flow period	h_i	m.a.s.l.	0.35
Hydraulic head in test section before stop of flow period	h_p	m.a.s.l.	0.44
Hydraulic head in test section at stop of recovery period	h_F	m.a.s.l.	0.58
Hydraulic head change during flow period (h_i–h_p)	dh_p	m	–0.09

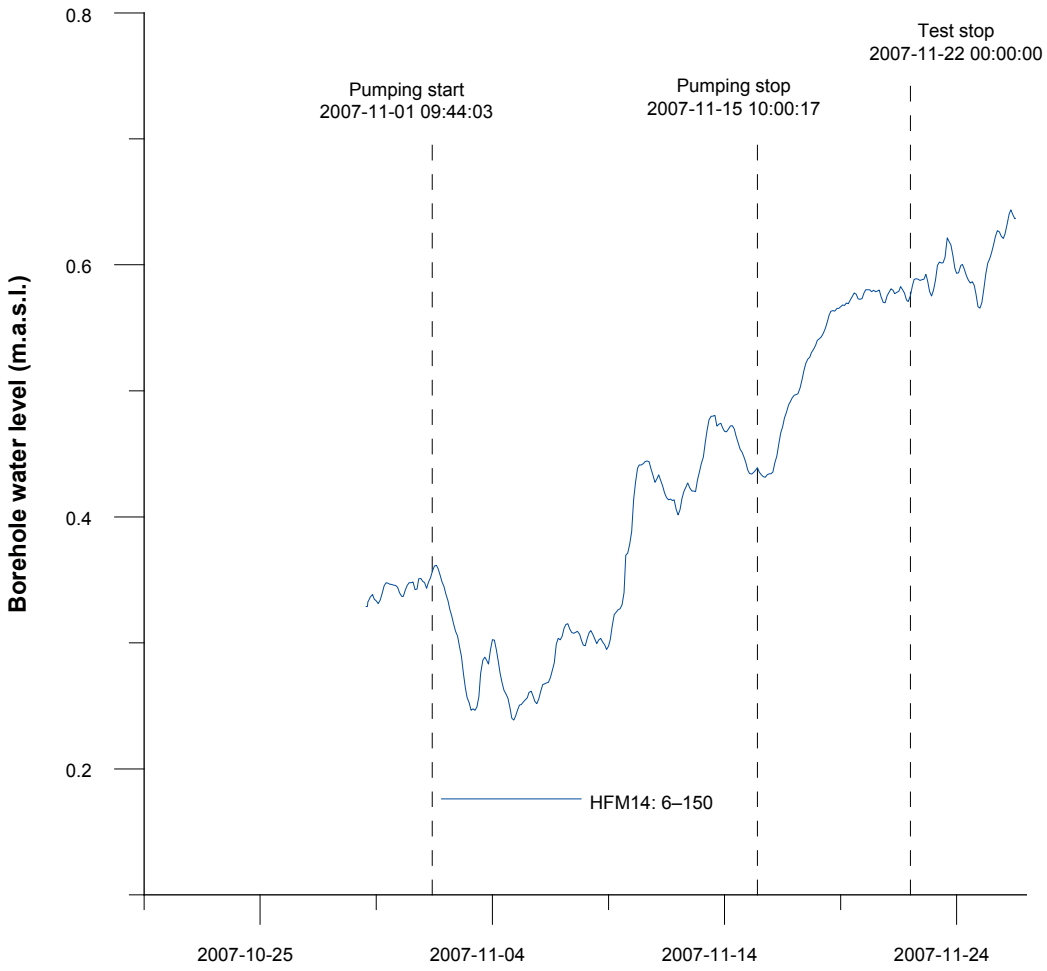


Figure 6-46. *Linear plot of pressure versus time in the observation section in HFM14 during the interference test in HFM33.*

6.3 Response analysis

A response analysis according to the methodology description for interference tests was made. However, because there was only one test performed, no response matrix was prepared. The response time lags (dt_L) in the observation sections during pumping in HFM33 are shown in Table 6-149. The lag times were derived from the uncorrected drawdown curves in the observation borehole sections at an actual drawdown of 0.01 m. No corrections of the drawdown for the increasing natural trend during the interference tests or other corrections of drawdown have been made. Because of the oscillating behaviour of the measured pressure in many of the observation sections, see for instance Figure 6-19, it was difficult to determine the exact time to reach a 0.01 m drawdown. It was possible, however, to make an approximate estimate from the drawdown curves.

Only observation sections in which an assumed, relatively clear, pressure response was recorded are included in the response analysis. Due to a naturally increasing pressure trend by the end of the flow period due to precipitation, some of the observation sections demonstrate a higher pressure at the end of the flow period than the pressure prior to the start of pumping, cf. HFM21: 22–32 m, Figure 6-21. This is true even for some sections where it seems evident that they are influenced by the pumping in HFM33. In Tables 6-149 and 6-150 sections included in the response analysis are presented. In addition, also the sections that display an apparent negative drawdown are included in the tables if it seems likely that they still are affected by the pumping in HFM33. However, the latter sections are not included in the response diagrams.

Table 6-149. Calculated response lag times and normalized response time lags for the responding observation sections included in the interference test in HFM33.

Pumping borehole	Observation borehole	Section (m)	dt_L[s=0.01 m] (s)	r_s (m)	dt_L[s=0.01 m]/r_s^2 (s/m^2)	r_s^2/dt_L[s=0.01 m] (m^2/s)
HFM33	HFM38	0–23	34,557	906	4.21E–02	2.38E+01
	HFM38	24–41	4,627	895	5.77E–03	1.73E+02
HFM33	KFM08C	0–145	17,157	1,062	1.52E–02	6.57E+01
HFM33	KFM08D	0–160	20,757	1,050	1.88E–02	5.31E+01
HFM33	KFM08B	0–70	24,357	1,122	1.93E–02	5.17E+01
HFM33	KFM06C	0–186	33,957	1,247	2.18E–02	4.58E+01
	KFM06C	187–280	40,557	1,201	2.81E–02	3.56E+01
	KFM06C	281–350	52,557	1,175	3.80E–02	2.63E+01
	KFM06C	351–401	20,757	1,164	1.53E–02	6.53E+01
	KFM06C	402–530	33,357	1,162	2.47E–02	4.05E+01
	KFM06C	531–540	22,857	1,164	1.69E–02	5.92E+01
	KFM06C	541–646	19,857	1,172	1.45E–02	6.92E+01
	KFM06C	647–666	24,657	1,187	1.75E–02	5.72E+01
HFM33	KFM06A	0–150	33,957	1,250	2.17E–02	4.60E+01
	KFM06A	151–246	34,557	1,224	2.31E–02	4.33E+01
	KFM06A	247–340	36,357	1,209	2.49E–02	4.02E+01
	KFM06A	341–362	47,757	1,187	3.39E–02	2.95E+01
	KFM06A	363–737	58,557	1,180	4.21E–02	2.38E+01
HFM33	KFM01D	0–153	26,157	1,566	1.07E–02	9.38E+01
	KFM01D	154–252	29,757	1,544	1.25E–02	8.01E+01
HFM33	HFM21	22–32	64,557	1,382	3.38E–02	2.96E+01
	HFM21	33–106	20,757	1,354	1.13E–02	8.83E+01
	HFM21	107–202	20,757	1,340	1.16E–02	8.66E+01
HFM33	KFM07B	75–202	24,357	1,413	1.22E–02	8.20E+01
	KFM07B	203–300	20,757	1,413	1.04E–02	9.62E+01
HFM33	KFM07C	0–110	33,357	1,423	1.65E–02	6.07E+01
	KFM07C	111–160	20,757	1,425	1.02E–02	9.78E+01
	KFM07C	161–301	29,757	1427	1.46E–02	6.84E+01
HFM33	KFM07A	0–148	31,557	1,484	1.43E–02	6.98E+01
	KFM07A	149–190	26,157	1,503	1.16E–02	8.64E+01
HFM33	HFM01	0–32.5	42,357	1,544	1.78E–02	5.62E+01
	HFM01	33.5–45.5	24,357	1,538	1.03E–02	9.71E+01
	HFM01	46.5–200.2	17,157	1,533	7.30E–03	1.37E+02
HFM33	HFM20	49–100	51,957	1,599	2.03E–02	4.92E+01
	HFM20	101–130	33,957	1,599	1.33E–02	7.53E+01
	HFM20	131–301	45,357	1,606	1.76E–02	5.69E+01
HFM33	KFM01B	0–100	26,157	1,653	9.57E–03	1.04E+02
	KFM01B	101–141	20,757	1,659	7.54E–03	1.33E+02
	KFM01B	142–500	26,157	1,698	9.08E–03	1.10E+02

Pumping borehole	Observation borehole	Section (m)	dt_L[s=0.01 m] (s)	r_s (m)	dt_L[s=0.01 m]/r_s^2 (s/m^2)	r_s^2/dt_L[s=0.01 m] (m^2/s)
HFM33	KFM01A	109–130	64,557	1,648	2.38E–02	4.21E+01
	KFM01A	131–204	24,357	1,648	8.97E–03	1.12E+02
HFM33	KFM01C	0–58	27,957	1,671	1.00E–02	9.99E+01
	KFM01C	59–237	26,157	1,693	9.12E–03	1.10E+02
HFM33	HFM27	0–24	29,757	1,669	1.07E–02	9.36E+01
	HFM27	25–45	24,357	1,667	8.77E–03	1.14E+02
	HFM27	46–58	22,557	1,660	8.18E–03	1.22E+02
	HFM27	59–128	47,757	1,648	1.76E–02	5.69E+01
HFM33	HFM03	0–18	39,357	1,662	1.43E–02	7.01E+01
	HFM03	19–26	26,157	1,661	9.48E–03	1.06E+02
HFM33	HFM02	0–37	30,357	1,661	1.10E–02	9.09E+01
	HFM02	38–48	26,157	1,660	9.50E–03	1.05E+02
	HFM02	49–100	29,757	1,657	1.08E–02	9.23E+01
HFM33	KFM05A	0–114	54,357	1,688	1.91E–02	5.24E+01
	KFM05A	115–253	51,357	1,682	1.82E–02	5.51E+01
HFM33	HFM14	0–150	44,157	1,729	1.48E–02	6.77E+01
HFM33	HFM15	0–84	27,357	1,720	9.25E–03	1.08E+02
	HFM15	85–95	33,957	1,711	1.16E–02	8.63E+01
HFM33	KFM09B	0–200	61,557	1,752	2.01E–02	4.99E+01
	KFM09B	201–450	90,957	1,737	3.02E–02	3.32E+01
HFM33	HFM19	0–103	32,757	1,826	9.82E–03	1.02E+02
	HFM19	104–167	36,957	1,834	1.10E–02	9.10E+01
	HFM19	168–182	27,957	1,838	8.27E–03	1.21E+02

Table 6-150. Drawdown and normalized drawdown for the responding observation sections included in the interference test in HFM33.

Pumping borehole	Flow rate Q_p (m^3/s)	Observation borehole	Section (m)	s_p (m)	s_p/Q_p (s/m^2)
HFM33	0.003863	HFM38	0–23	0.20	5.2480E+01
	0.003863	HFM38	24–41	0.52	1.3381E+02
HFM33	0.003863	KFM08C	0–145	0.20	5.0632E+01
HFM33	0.003863	KFM08D	0–160	0.25	6.4412E+01
HFM33	0.003863	KFM08B	0–70	0.09	2.4518E+01
HFM33	0.003863	KFM06C	0–186	0.27	6.8920E+01
	0.003863	KFM06C	187–280	0.27	7.0710E+01
	0.003863	KFM06C	281–350	0.44	1.1342E+02
	0.003863	KFM06C	351–401	0.71	1.8450E+02
	0.003863	KFM06C	402–530	0.68	1.7633E+02
	0.003863	KFM06C	531–540	1.05	2.7090E+02
	0.003863	KFM06C	541–646	0.60	1.5444E+02

Pumping borehole	Flow rate Q_p (m^3/s)	Observation borehole	Section (m)	s_p (m)	s_p/Q_p (s/m^2)
	0.003863	KFM06C	647–666	0.52	1.3389E+02
HFM33	0.003863	KFM06A	0–150	0.30	7.7014E+01
	0.003863	KFM06A	151–246	0.26	6.7546E+01
	0.003863	KFM06A	247–340	0.20	5.2291E+01
	0.003863	KFM06A	341–362	0.40	1.0228E+02
	0.003863	KFM06A	363–737	0.38	9.8844E+01
HFM33	0.003863	KFM01D	0–153	0.24	6.1297E+01
	0.003863	KFM01D	154–252	0.14	3.5478E+01
	0.003863	HFM21	22–32	–0.01	-1.7124E+00
	0.003863	HFM21	33–106	0.21	5.4052E+01
	0.003863	HFM21	107–202	0.23	6.0319E+01
	0.003863	KFM07B	75–202	0.21	5.3841E+01
	0.003863	KFM07B	203–300	0.19	4.9492E+01
HFM33	0.003863	KFM07C	0–110	0.19	4.9405E+01
	0.003863	KFM07C	111–160	0.24	6.2213E+01
	0.003863	KFM07C	161–301	0.07	1.7704E+01
HFM33	0.003863	KFM07A	0–148	0.18	4.7742E+01
	0.003863	KFM07A	149–190	0.19	4.7972E+01
HFM33	0.003863	HFM01	0–32.5	0.10	2.6193E+01
	0.003863	HFM01	33.5–45.5	0.13	3.3722E+01
	0.003863	HFM01	46.5–200.2	0.23	5.8700E+01
	0.003863	HFM20	49–100	0.05	1.2836E+01
	0.003863	HFM20	101–130	0.15	3.7606E+01
	0.003863	HFM20	131–301	0.18	4.5907E+01
HFM33	0.003863	KFM01B	0–100	–0.49	–1.2647E+02
	0.003863	KFM01B	101–141	0.13	3.2882E+01
	0.003863	KFM01B	142–500	0.18	4.5698E+01
	0.003863	KFM01A	109–130	0.15	3.9978E+01
	0.003863	KFM01A	131–204	0.18	4.7200E+01
HFM33	0.003863	KFM01C	0–58	0.09	2.2880E+01
	0.003863	KFM01C	59–237	0.11	2.9528E+01
HFM33	0.003863	HFM27	0–24	0.05	1.2123E+01
	0.003863	HFM27	25–45	0.11	2.7213E+01
	0.003863	HFM27	46–58	0.12	3.1341E+01
	0.003863	HFM27	59–128	0.10	2.6145E+01
HFM33	0.003863	HFM03	0–18	0.04	1.0144E+01
	0.003863	HFM03	19–26	0.09	2.2009E+01
HFM33	0.003863	HFM02	0–37	0.12	3.1030E+01
	0.003863	HFM02	38–48	0.12	3.1705E+01
	0.003863	HFM02	49–100	0.10	2.5271E+01

Pumping borehole	Flow rate Q_p (m^3/s)	Observation borehole	Section (m)	s_p (m)	s_p/Q_p (s/m^2)
HFM33	0.003863	KFM05A	0–114	–0.05	–1.3708E+01
	0.003863	KFM05A	115–253	–0.07	–1.7155E+01
HFM33	0.003863	HFM14	0–150	–0.09	–2.2659E+01
HFM33	0.003863	HFM15	0–84	–0.09	–2.2068E+01
	0.003863	HFM15	85–95	–0.05	–1.2238E+01
HFM33	0.003863	KFM09B	0–200	–0.05	–1.2627E+01
	0.003863	KFM09B	201–450	0.10	2.5540E+01
HFM33	0.003863	HFM19	0–103	–0.05	–1.2768E+01
	0.003863	HFM19	104–167	–0.02	–6.3862E+00
	0.003863	HFM19	168–182	–0.02	–5.9900E+00

It is important to remember that the numerical values of the response parameters from the response analysis of this interference test can not be used for comparison to the results of other interference tests. This is due to the rising pressure trend that is observed in most test sections probably caused by heavy rain fall during the latter part of the flow period. An alternative analysis where the maximal drawdown is used, instead of the drawdown at stop of pumping, would probably provide results more comparable with similar interference tests. As it is now, the drawdown at stop of pumping is significantly underestimated in many observation sections.

The normalized response time with respect to the distance to the pumping borehole was calculated. This time is inversely related to the hydraulic diffusivity (T/S) of the formation. Also the inverse of the above mentioned parameter was calculated since it is directly related to the hydraulic diffusivity. In addition, the normalized drawdown at stop of pumping with respect to flow rate was calculated and presented in Table 6-150.

In Figure 6-47 a response diagram, showing the responses of presumptive responding observation sections, is presented. In this figure the observation sections are represented by different symbols. In the response diagram, observation sections represented by data points lying to the left generally indicate a better connectivity and a higher hydraulic diffusivity regarding the pumping borehole section, than sections represented by data points further to the right in the diagram.

The following parameters are used in Tables 6-149 and 6-150 as well as in Figures 6-47–6-49:

$dt_L[s = 0.01\ m] / r_s$ = normalized response time with respect to the distance r_s (s/m^2)

$dt_L[s = 0.01\ m]$ = time after start of pumping (s) at a drawdown s = 0.01 m in the observation section

r_s = 3D-distance between the hydraulic point of application (hydr. p.a.) in the pumping borehole and observation borehole (m)

s_p/Q_p = normalized drawdown at stop of pumping with respect to the pumping flow rate (s/m^2)

s_p = drawdown at stop of pumping in the actual observation borehole/section (m)

Q_p = pumping flow rate by the end of the flow period (m^3/s)

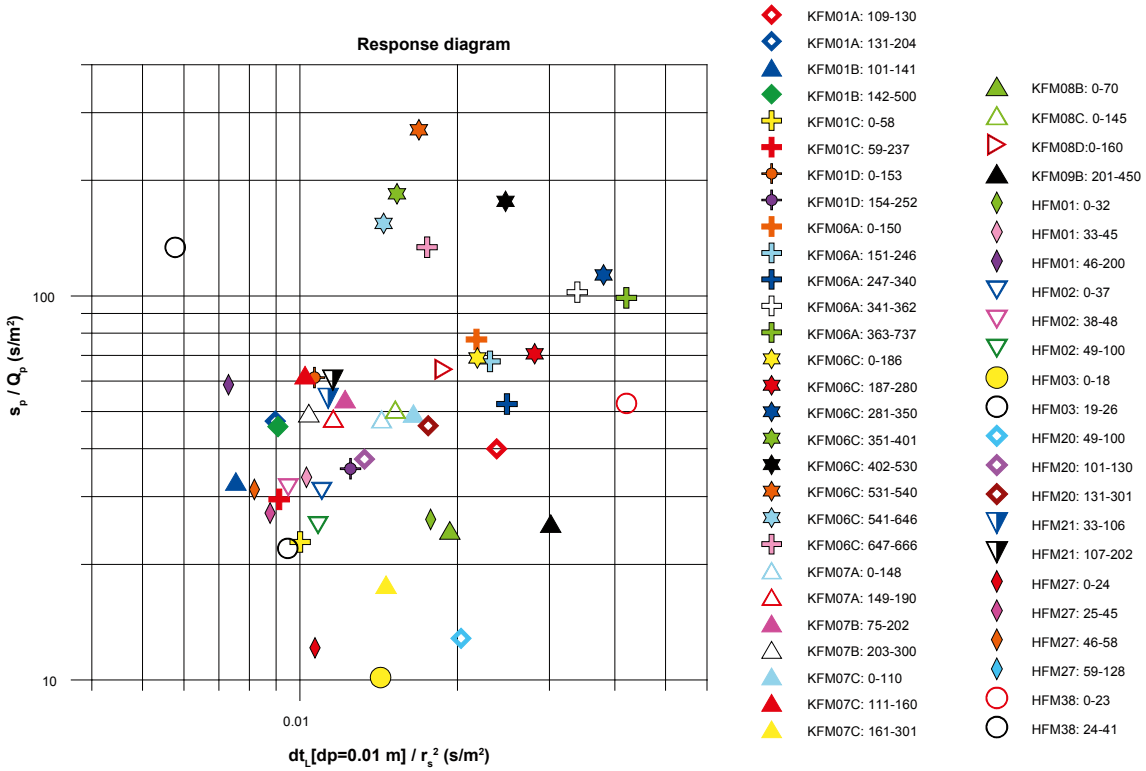


Figure 6-47. *Response diagram showing the responses in the presumed responding observation sections during the interference test in HFM33.*

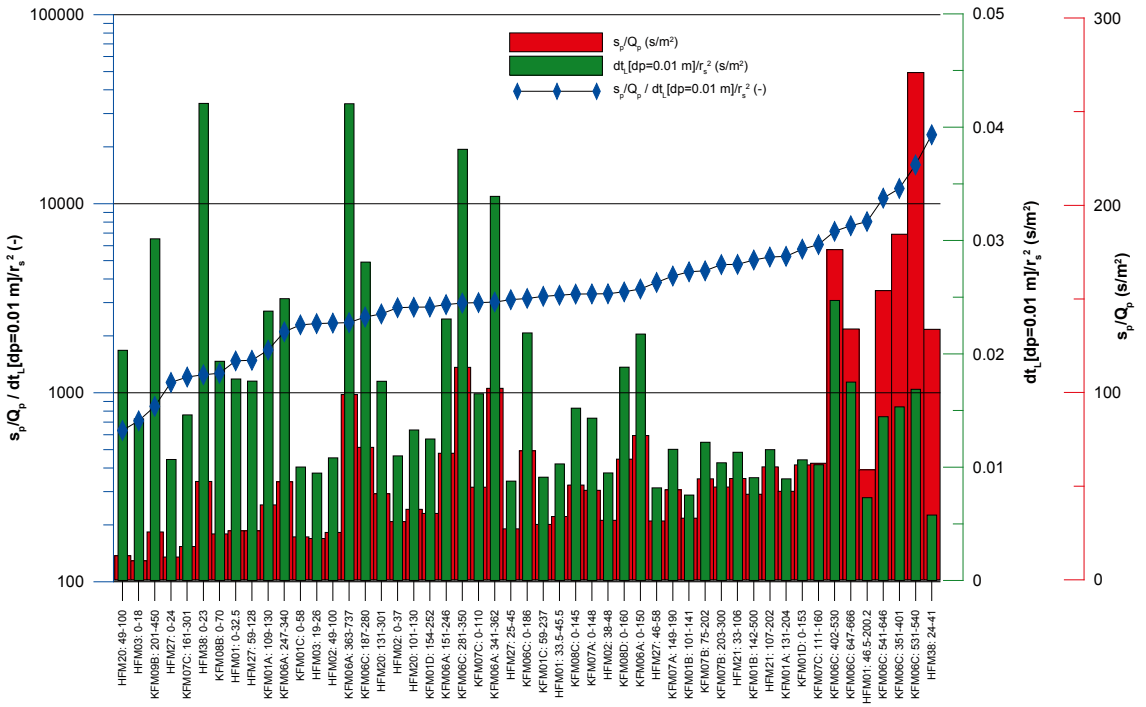


Figure 6-48. *Diagram showing normalized drawdown, normalized response time and the ratio between the two parameters for the responding sections in the interference test in HFM33. The observation sections are sorted by the magnitude of the ratio.*

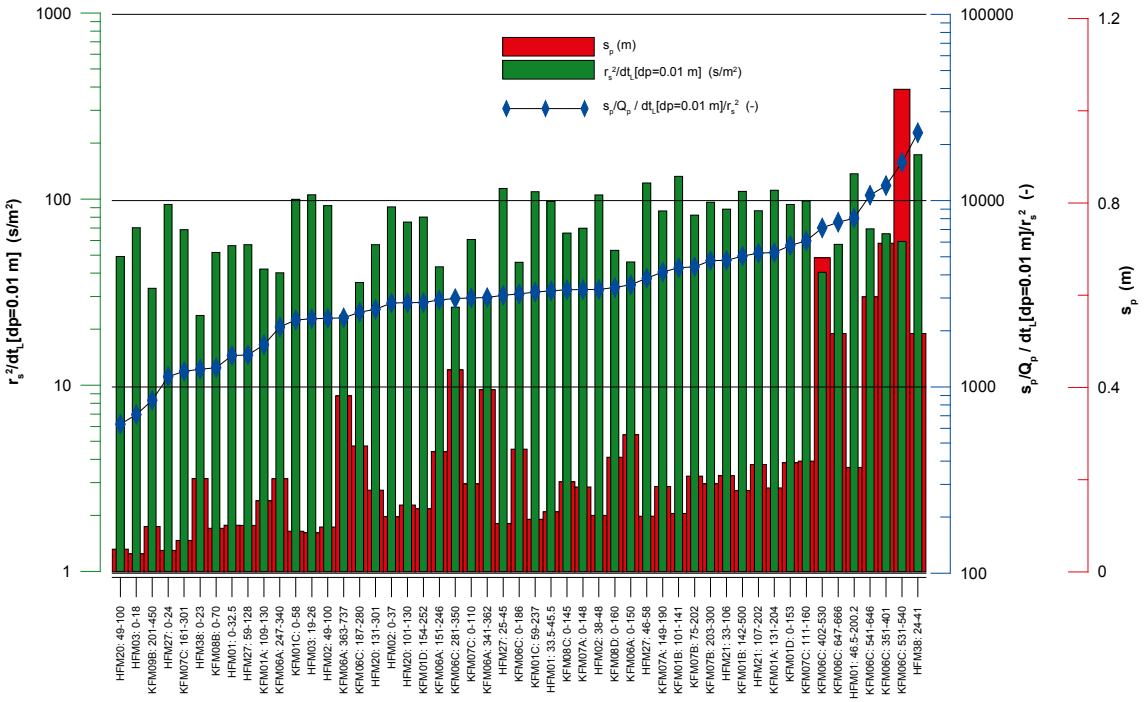


Figure 6-49. *Diagram showing drawdown, the inverse of the normalized response time and the same ratio that was previously presented in Figure 6-46, for the responding sections in the interference test in HFM33. The observation sections are sorted by the magnitude of the ratio.*

The (normalized) response time lag for many of the responding observation sections included in the interference test must be considered as rough estimates. The main reason for this is the difficulty to make an estimate of the response time lag due to the oscillating pressure and to some extent also to the presence of a natural trend during the interference test.

The response diagram in Figure 6-47 together with diagrams 6-48 and 6-49 may be used to group observation sections by the strength and time lags of their responses and so the observation sections with the most distinct responses can be identified. Figure 6-47 indicates that the largest response was found in section KFM06C: 531–540 m and the weakest response in section HFM03: 0–18 m. However, it should be noted that the responses are underestimated due to precipitation as discussed above. The most delayed responses occurred in sections KFM06A: 363–737 m and HFM38 0–23 m.

There are no sections that clearly display both a short response time lag and a large drawdown. Still, at least some of the sections that are found towards the upper left part of Figure 6-47 are likely to represent sections with more or less direct responses along fracture zones between borehole HFM33 and the actual observations sections.

Figure 6-48 displays the same parameters as in the response diagram but in a different type of diagram. In this diagram a third response index is also displayed, i.e. the ratio between the two indices in the response diagram. Clearly, sections with higher ratios correspond to sections which are hydraulically well connected to the pumping borehole. In the diagram, all observation sections that responded clearly to pumping in HFM33 are included with the exception of those showing a negative drawdown, as mentioned before. All sections are ranked so that sections showing the weakest responses are located to the left in the diagram and observation sections with stronger responses are located to the right.

Another version of Figure 6-48 is displayed in Figure 6-49. The units on the axes are somewhat different even though this figure is indicating the same phenomenon as is shown in Figure 6-48.

The maps displayed in Figure 6-50 (also in Appendix 2, A2-x through A2-x) are an attempt at illustrating the progression of the response both spatially and in time. There are three maps to make up the third dimension, depth, which is divided into three layers. The time dimension is illustrated by the colour of the dots marking the different drill sites. Each drill site included in the test is represented by the one borehole, located on that drill site, which exhibits the quickest response. Obviously, not nearly all sections included in the interference test are represented in this series of figures. It is only an approximation of the way the response propagates in time.

There are no sections that clearly display both a short response time lag and a large drawdown. Still, section HFM38: 24–41 m exhibits the fastest response. Since the total drawdown is also likely to be somewhat underestimated, this section may possibly have a response distinct enough to be characterised as a potential zone response between HFM33 and the actual section. KFM06C: 531–540 m responds most strongly of the observation sections but the response is not very fast.

6.4 Evaluation of responses in selected sections

Transient evaluation was made for four selected observation sections, decided upon in consultation with the activity leader. The transient analysis was in most cases based on the first part of the flow period before the period of heavy precipitation

In all observation sections the drawdown continued (up to c. 17 h in KFM06A:341–362 m) after stop of pumping in HFM33, most likely due to the long distances of the selected observation sections from the pumping borehole (between c. 1,200–1,600 m). Due to this fact the transient analysis is made on the combined flow and recovery period as one test sequence in this case. In addition, a separate analysis was made on the recovery period but is not reported here.

Furthermore, estimation of the hydraulic diffusivity of the selected observation sections was made from the response time lags. The time lags were estimated from the drawdown curves. Comparison was made of the estimated hydraulic diffusivity from the time lags and from the transient test evaluation, respectively.

Abbreviations of flow regimes and hydraulic boundaries that may appear in the text:

WBS = Wellbore storage

PRF = Pseudo-radial Flow regime

PLF = Pseudo-linear flow regime

PSF = Pseudo-spherical flow regime

PSS = Pseudo-stationary flow regime

NFB = No-flow boundary

CHB = Constant –head boundary

6.4.1 Observation section KFM06A: 341–362 m

Interpreted flow regimes

The drawdown period is strongly affected by precipitation and shows a slightly deviating behaviour compared to the other selected observation sections. At intermediate times the drawdown decreased due to precipitation but at the end of the period the drawdown increased again. This makes the interpretation of flow regimes difficult in this case. However, in the transient analysis, a dominating pseudo-spherical (leaky) flow regime is assumed. Due to the continued drawdown after stop of pumping the analysis is shown for the combined drawdown and recovery period as one test sequence.

Figure 6-50. *Each of the maps show responses in (from left to right) sections located between 0-300 m, 301-500 m and below 500 m along the boreholes. Each symbol represents the borehole, at a specific drill site, which shows the quickest response. Some boreholes are represented in the maps only to show the location of a drill site.*

Interpreted parameters

Transient evaluation of the flow period was chosen as the most representative and only results from this period are presented in this report. The transient evaluation was performed using the Hantush-Jacob model for confined leaky aquifers. Transient interpretation of the combined drawdown and recovery period is shown in a log-log diagram in Figure A2-5, Appendix 2. The results from the transient evaluation are summarized in Table 6-155.

According to Table 6-149 the section has a relatively good hydraulic connection to the pumping borehole HFM33. However, due to the long distance to the pumping borehole the evaluation is uncertain and may not be representative of the formation close to the observation section. It is likely that the estimated transmissivity and storativity more reflect the conditions close to the pumping borehole HFM33 rather than in the vicinity of the observation section.

6.4.2 Observation section KFM01D: 0–153 m

Interpreted flow regimes

The drawdown period is strongly affected by precipitation. The dominating flow regime during the flow period is interpreted to be pseudo-spherical (leaky). The transient analysis is shown for the combined drawdown and recovery period.

Interpreted parameters

The transient evaluation is based on the period before the heavy precipitation. The transient evaluation of the flow period was chosen as the most representative and only results from this period are presented in this report. The transient evaluation was performed using the Hantush-Jacob model for confined leaky aquifers. The transient interpretation for the combined flow and recovery period is shown in a log-log diagram in Figure A2-6, Appendix 2. The results from the transient evaluation are summarized in Table 6-155.

The section has a rather good hydraulic connection to the pumping borehole HFM33, cf. Figure 6-47. However, due to the long distance to the pumping borehole the estimated hydraulic parameters may not be representative of the formation close to the observation section. It is likely that the estimated transmissivity and storativity more reflect the conditions close to the pumping borehole HFM33 rather than in the vicinity of the observation section.

6.4.3 Observation section HFM21: 107–202 m

Interpreted flow regimes

The drawdown period is strongly affected by precipitation. The dominating flow regime during the flow period is interpreted to be pseudo-spherical (leaky). The transient analysis is shown for the combined drawdown and recovery period.

Interpreted parameters

The transient evaluation of the flow period was chosen as the most representative and only results from this period are presented in this report. The transient evaluation was performed using the Hantush-Jacob model for confined leaky aquifers, applied to the flow period prior to the heavy precipitation. The transient interpretation for the combined flow and recovery period is shown in a log-log diagram in Figure A2-7, Appendix 2. The results from the transient evaluation are summarized in Table 6-155.

The section has a good hydraulic connection to the pumping borehole HFM33, cf. Figure 6-47. However, due to the long distance to the pumping borehole the estimated hydraulic parameters may not necessarily be representative of the formation close to the observation section.

6.4.4 Observation section HFM01: 46.5–200.2 m

Interpreted flow regimes

The drawdown period is strongly affected by precipitation. The dominating flow regime during the flow period is interpreted to be pseudo-spherical (leaky). The transient analysis is shown for the combined drawdown and recovery period.

Interpreted parameters

The transient evaluation is based on the period before the heavy precipitation. Results from the transient evaluation of the flow period were chosen as the most representative and only these are presented in this report. The transient evaluation was performed using the Hantush-Jacob model for confined leaky aquifers. Transient interpretation for the combined flow and recovery period is shown in a log-log diagram in Figure A2-8, Appendix 2. The results from the transient evaluation are summarized in Table 6-155.

The section has a good hydraulic connection to the pumping borehole HFM33, cf. Figure 6-47. However, due to the long distance to the pumping borehole the estimated hydraulic parameters may not necessarily be representative of the formation close to the observation section.

6.4.5 Estimation of the hydraulic diffusivity of the sections

The hydraulic diffusivity of observation sections can be estimated from the response time lag in the section according to Streltsova (1988):

$$T/S = r_s^2 / [4 \cdot dt_L \cdot (1 + dt_L/t_p) \cdot \ln(1 + t_p/dt_L)] \quad (6\text{-}1)$$

The time lag dt_L is based on a drawdown s = 0.01 m in the observation section. The estimated time lags based on the drawdown in the selected sections are shown in Table 6-151 together with the corresponding hydraulic diffusivity T/S of the sections. For comparison, the ratio of the estimated transmissivity and storativity T_o/S_o from the transient evaluation of the responses in these sections during the interference tests are also presented.

Table 6-151 shows that there is a good agreement between the estimated hydraulic diffusivity of the sections based on the response time lags and from the results of the transient evaluation, respectively, also at long distances from the pumping borehole. This is also illustrated in Figure 6-51.

Table 6-151. Estimated response lag times and hydraulic diffusivity for the selected observation sections from the interference tests in HFM33 at Forsmark.

Pumping borehole	Observation borehole	Section (m)	dt_L[s=0.01 m] (s)	r_s (m)	T/S (m^2/s)	T_o /S_o (m^2/s)
HFM33	KFM06A	341–362	47,757	1,187	2.2E+00	2.5E+00
HFM33	KFM01D	0–153	26,157	1,566	6.0E+00	5.6E+00
HFM33	HFM21	107–202	20,757	1,340	5.2E+00	6.2E+00
HFM33	HFM01	46.5–200	17,157	1,533	7.9E+00	2.9E+00

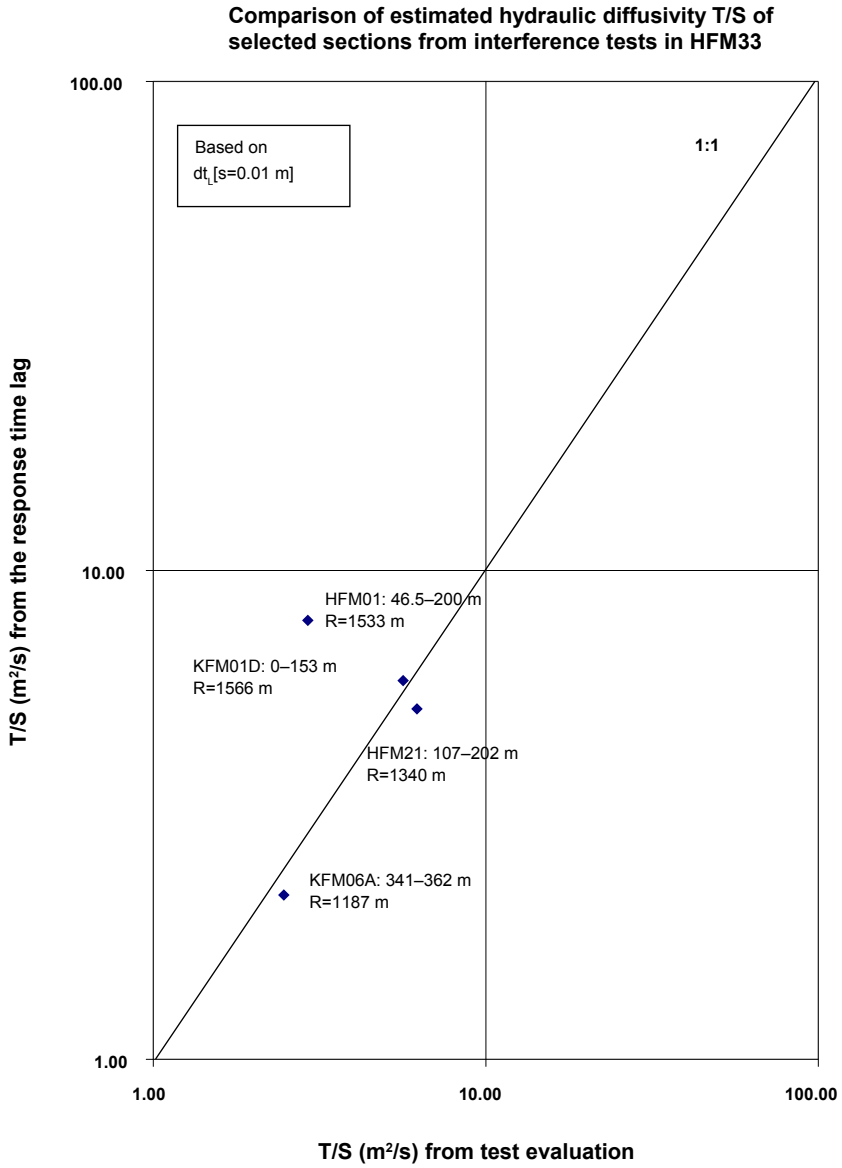


Figure 6-51. *Comparison of estimated hydraulic diffusivity of selected observation sections from the interference tests in HFM33 at Forsmark.*

6.5 Summary of the results of the interference test

A compilation of measured test data from the interference test in HFM33 is shown in Tables 6-152 and 6-153. In Tables 6-154 and 6-155 calculated hydraulic parameters for the pumping borehole and four observation sections selected for quantitative evaluation are presented.

Table 6-152. Summary of test data from the pumping borehole during the interference test performed in HFM33 in the Forsmark area.

Pumping borehole ID	Section (m)	Test type[1)]	h_i (m)	h_p (m)	h_F (m)	Q_p (m^3/s)	Q_m (m^3/s)	V_p (m^3)
HFM33	12–140	1B	17.07	0.77	17.17	0.00379	0.00386	4,676

[1)] 1B: Pumping test-submersible pump, 2: Interference test (observation borehole during pumping in another borehole).

Table 6-153. Summary of test data from the observation sections involved in the interference tests performed in HFM33 in the Forsmark area.

Pumping borehole ID	Borehole ID	Section (m)	Test type[1)]	h_i (m)	h_p (m)	h_F (m)
HFM33	KFM11A	0–130	2	–3.00	–2.95	–2.98
		131–360	2	–1.68	–1.57	–1.66
		361–445	2	–2.97	–2.96	–3.02
		446–456	2	–3.11	–3.10	–3.16
		457–689	2	–5.38	–5.34	–5.41
		690–710	2	–6.65	–6.63	–6.69
		711–850	2	–3.31	–3.32	–3.38
HFM33	HFM34	0–21	2	–0.73	–0.65	–0.76
		22–90	2	–3.04	–2.94	–3.06
		91–201	2			
HFM33	KFR01	11–43.5	2	326.24	327.13	326.69
		44.5–62.3	2	244.08	245.76	245.49
HFM33	HFM35	0–33	2	–0.43	–0.33	–0.45
		34–150	2	–5.56	–5.42	–5.55
		151–181	2	–5.51	–5.36	–5.49
		182–201	2	–5.41	–5.26	–5.39
HFM33	HFM38	0–23	2	–0.04	–0.24	–0.07
		24–41	2	0.03	–0.49	0.00
		42–200.75	2	–0.23	–0.10	–0.14
HFM33	KFR09	2–80	2	841.91	843.63	842.92
HFM33	KFR02	81–118	2	333.42	330.32	330.18
		119–136	2	527.32	526.41	526.42
		137–170.2	2	310.87	307.38	307.35
HFM33	KFM08C	0–145	2	0.03	–0.17	0.07
		146–310	2	0.02	0.08	–0.02
		311–610	2	0.07	0.05	–0.01
		611–760	2	0.13	0.11	0.05
		761–950	2	0.02	0.16	0.16
HFM33	KFM08D	0–160	2	0.16	–0.09	0.27
		161–330	2	–0.06	–0.06	–0.13
		331–659	2	–0.51	–0.78	–0.72
		660–680	2	–0.04	–0.09	–0.07
		681–824	2	–0.12	–0.18	–0.19
		825–835	2	–1.72	–1.80	–1.81
		836–950	2	–2.03	–2.08	–2.11
HFM33	HFM22	0–222	2			
HFM33	KFM08A	0–161	2	–0.11	–0.01	–0.05
		162–215	2	0.23	0.26	0.22
		216–264	2	0.39	0.42	0.38
		265–280	2	–0.61	–0.59	–0.63
		281–473	2	–0.64	–0.65	–0.68
		474–503	2	–0.63	–0.57	–0.60
		504–683	2	–5.63	–2.77	–2.11
		684–694	2	0.01	0.15	0.14
		695–1,001.19	2	0.24	0.41	0.41

Pumping borehole ID	Borehole ID	Section (m)	Test type[1)]	h_i (m)	h_p (m)	h_F (m)
HFM33	KFM08B	0–70	2	0.04	–0.06	0.10
		71–112	2	–0.02	0.04	0.07
		113–200	2	0.40	0.43	0.40
HFM33	KFM06C	0–186	2	–0.04	–0.31	0.10
		187–280	2	–0.04	–0.31	0.08
		281–350	2	–0.14	–0.58	–0.08
		351–401	2	–0.22	–0.93	–0.15
		402–530	2	0.00	–0.68	0.04
		531–540	2	0.06	–0.99	0.03
		541–646	2	–0.39	–0.98	–0.58
		647–666	2	0.22	–0.30	0.05
		667–872	2	–0.31	–0.48	–0.45
		873–1,000.91	2	0.09	0.14	0.13
HFM33	KFM06A	0–150	2	0.12	–0.18	0.22
		151–246	2	–0.05	–0.31	0.06
		247–340	2	0.25	0.05	0.37
		341–362	2	0.03	–0.37	0.02
		363–737	2	–0.26	–0.64	–0.27
		738–748	2	–0.72	–0.80	–0.75
		749–826	2	–0.26	–0.33	–0.30
		827–1,000.64	2	–0.42	–0.42	–0.38
HFM33	KFR7B	8–21	2	1,077.48	1,078.51	1077.86
HFM33	KFM06B	0–26	2	0.53	0.74	0.76
		27–50	2	0.51	0.61	0.67
		51–100	2	0.53	0.62	0.68
HFM33	HFM16	0–53	2	0.47	0.57	0.63
		54–67	2	0.51	0.60	0.66
		68–132	2	0.48	0.57	0.57
HFM33	KFM01D	0–153	2	–0.25	–0.49	–0.08
		154–252	2	–0.33	–0.47	–0.22
		253–310	2	–1.14	–0.86	–0.87
		311–321	2	–1.21	–0.94	–0.94
		322–428	2	–1.30	–1.01	–0.98
		429–438	2	–1.25	–0.95	–0.92
		439–800.24	2	–0.66	–0.64	–0.65
HFM33	HFM21	0–21	2	0.28	0.34	0.44
		22–32	2	0.32	0.33	0.48
		33–106	2	0.40	0.19	0.54
		107–202	2	0.26	0.02	0.42
HFM33	KFM07B	0–74	2	0.16	0.16	0.16
		75–202	2	0.20	0.00	0.36
		203–300	2	–0.12	–0.31	0.05
HFM33	KFM07C	0–110	2	0.27	0.08	0.43
		111–160	2	0.00	–0.24	0.16
		161–301	2	–0.14	–0.21	0.01
		302–500	2	0.48	0.48	0.48
HFM33	KFM07A	0–148	2	0.12	–0.07	0.27
		149–190	2	–0.21	–0.40	–0.05

Pumping borehole ID	Borehole ID	Section (m)	Test type[1)]	h_i (m)	h_p (m)	h_F (m)
		191–225	2	–0.69	–0.66	–0.54
		226–961	2	–0.88	–0.79	–0.70
		962–972	2	–4.39	–4.36	–4.46
		973–1,001.55	2	–4.26	–4.24	–4.30
HFM33	HFM01	0–32.5	2	0.25	0.15	0.47
		33.5–45.5	2	0.26	0.13	0.46
		46.5–200.2	2	0.23	0.01	0.41
HFM33	HFM25	0–188	2	0.17	0.41	0.37
HFM33	HFM20	0–48	2	0.57	0.77	0.87
		49–100	2	0.60	0.55	0.80
		101–130	2	0.62	0.48	0.79
		131–301	2	0.71	0.53	0.86
HFM33	KFM01B	0–100	2	0.30	0.79	1.07
		101–141	2	0.08	–0.05	0.28
		142–500	2	0.10	–0.08	0.30
HFM33	KFM01A	0–108	2	–1.24	–0.95	–0.80
		109–130	2	–0.09	–0.24	0.11
		131–204	2	–0.05	–0.23	0.14
		205–373	2	0.04	0.00	–0.01
		374–430	2	0.93	0.95	0.92
		431–1,001.49	2	5.70	5.99	6.05
HFM33	KFM01C	0–58	2	–0.01	–0.10	0.21
		59–237	2	–0.07	–0.19	0.13
		238–450	2	–0.76	–0.65	–0.64
HFM33	HFM27	0–24	2	0.36	0.31	0.59
		25–45	2	0.34	0.24	0.54
		46–58	2	0.25	0.13	0.45
		59–128	2	0.31	0.21	0.51
HFM33	HFM03	0–18	2	0.34	0.30	0.59
		19–26	2	0.37	0.29	0.59
HFM33	HFM02	0–37	2	0.28	0.16	0.48
		38–48	2	0.34	0.21	0.54
		49–100	2	0.36	0.27	0.58
HFM33	KFM05A	0–114	2	0.32	0.37	0.51
		115–253	2	0.16	0.23	0.35
		254–272	2	–0.27	–0.14	–0.13
		273–489	2	2.84	2.86	2.82
		490–698	2	1.61	1.70	1.69
		699–1,002.44	2	0.49	0.50	0.49
HFM33	HFM14	0–150	2	0.35	0.44	0.58
HFM33	HFM15	0–84	2	0.47	0.56	0.70
		85–95	2	0.48	0.53	0.68
HFM33	KFM09B	0–200	2	–0.23	–0.19	–0.01
		201–450	2	–0.11	–0.20	0.04
		451–616.45	2	–0.40	–0.29	–0.26

Pumping borehole ID	Borehole ID	Section (m)	Test type[1)]	h_i (m)	h_p (m)	h_F (m)
HFM33	KFM09A	0–300	2	1.28	1.62	1.63
		301–550	2	1.03	1.07	1.08
		551–799.67	2	–3.03	–2.99	–2.99
HFM33	HFM19	0–103	2	0.65	0.70	0.87
		104–167	2	0.55	0.58	0.76
		168–182	2	0.01	0.03	0.22
HFM33	HFM17	0–211	2	–	–	–
HFM33	HFM28	0–151	2	1.43	1.76	1.76
HFM33	HFM23	0–212	2	1.20	1.52	1.51

[1)] 1B: Pumping test-submersible pump, 2: Interference test (observation borehole during pumping in another borehole).

Table 6-154. Summary of calculated hydraulic parameters from the interference test in HFM33 in the Forsmark area.

Pumping borehole ID	Section (m)	Test type	Q/s (m^2/s)	T_M (m^2/s)	T_T (m^2/s)	ξ (–)	C (m^3/Pa)	S* (–)
HFM33	12–140	1B	$2.4\cdot10^{-4}$	$3.0\cdot10^{-4}$	$2.6\cdot10^{-4}$	–3.4	$2.2\cdot10^{-6}$	$1.12\cdot10^{-5}$

Table 6-155. Summary of calculated hydraulic parameters from the interference test in HFM33 in the Forsmark area.

Pumping borehole ID	Observation borehole ID	Section (m)	Test type	T_o (m^2/s)	S_o (–)	T_o/S_o (m^2/s)	K'/b' (s^{-1})
HFM33	KFM06A	341–362	2	$4.2\cdot10^{-4}$	$1.7\cdot10^{-4}$	$2.5\cdot10^{0}$	$5.1\cdot10^{-10}$
HFM33	KFM01D	0–153	2	$2.2\cdot10^{-4}$	$3.9\cdot10^{-5}$	$5.6\cdot10^{0}$	$2.9\cdot10^{-10}$
HFM33	HFM21	107–202	2	$3.6\cdot10^{-4}$	$5.8\cdot10^{-5}$	$6.2\cdot10^{0}$	$3.8\cdot10^{-10}$
HFM33	HFM01	46.5–200.2	2	$7.0\cdot10^{-5}$	$2.4\cdot10^{-5}$	$2.9\cdot10^{0}$	$2.7\cdot10^{-10}$

Q/s = specific flow for the pumping/injection borehole
T_M = steady state transmissivity from Moye´s equation
T_T = transmissivity from transient evaluation of single-hole test
T_o = transmissivity from transient evaluation of interference test
S_o = storativity from transient evaluation of interference test
T_o/S_o = hydraulic diffusivity (m^2/s)
K'/b' = leakage coefficient from transient evaluation of interference test
S* = assumed storativity by the estimation of the skin factor in single hole tests
C = wellbore storage coefficient
ξ = skin factor

Out of the 148 observation sections included in the interference test, 86 did not respond at all to pumping in HFM33 or responded very weakly. Notably, 11 sections are believed to have been affected by the pumping in HFM33 even though the final drawdown in these sections was apparantly negative, cf. HFM21: 22–32 m, Figure 6-21. This is explained by naturally increasing groundwater levels, presumably the consequence of the precipitation that was measured in the area during the flow period, cf. Figure A2-9.

Because of the natural, increasing groundwater levels during the flow period, the numerical results from this response analysis can not be used for comparison to the results of other interference tests performed in this area.

There are no sections that clearly display both a short response time lag and a large drawdown. Section HFM38: 24–41 m exhibits the fastest response. Since the total drawdown is also likely to be somewhat underestimated, this section may have a response distinct enough to be characterised as a potential zone response between HFM33 and the actual section. KFM06C: 531–540 m responded most strongly of the observation sections, but the response was not very fast.

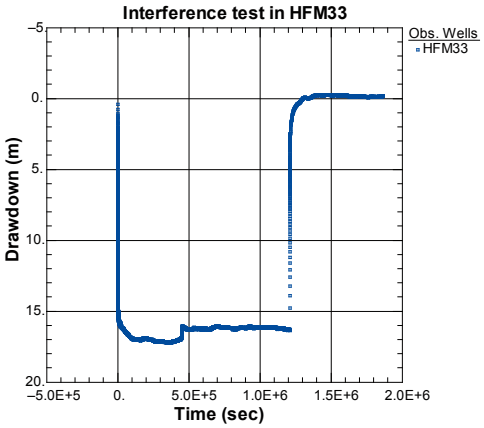
The estimated T-value for HFM33 in Table 6-154 from transient evaluation is in good agreement with that ($T = 4.7 \cdot 10^{-4}$ m^2/s) from the previous single-hole pumping test and flow logging in this borehole, /1/. The estimated transmissivities from observation sections HFM21: 107–202 m and HFM01: 46–200 m correlate fairly well to the results from previous investigations, cf. Table 3-4. The estimated T-values from sections KFM06A: 341–362 m and KFM01D: 0–153 m, however, are significantly higher than the T-values obtained from single-hole tests from previous investigations, cf. Table 3-4. This fact may possibly be due to that the calculated T-values from the interference tests are more weighted towards the hydraulic properties close to the pumping borehole HFM33 because of the long distances between the boreholes. In addition, the estimated transmissivity in the observation sections may be overestimated from the interference test due to poor hydraulic connection to the pumping borehole, cf. Figures 6-47, 6-48 and 6-49.

The results of the interference tests show a rather good agreement between the estimated hydraulic diffusivity of the sections based on the response time lags and from the results of the transient evaluation, respectively, also at long distances from the pumping borehole. However, as discussed above, some of the estimated transmissivities from the interference tests differ significantly from the results of the previous single-hole tests in these sections. This fact may indicate that transmissivity and storativity cannot always be estimated individually but only the hydraulic diffusivity T/S from interference tests in heterogeneous formations, particularly at long distances from the pumping borehole. Representative values on transmissivity and storativity can probably only be separated for observation sections having good hydraulic connection to the pumping borehole, relatively close to the pumping borehole.

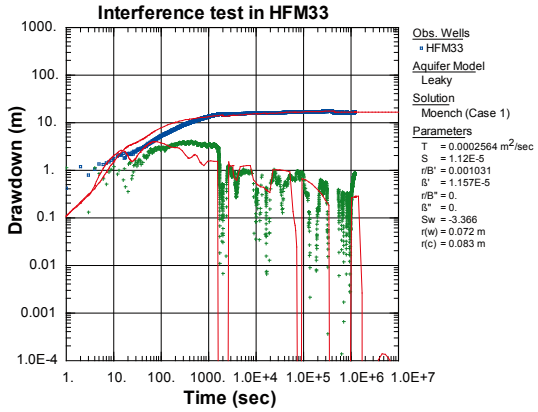
Test Summary Sheet – Pumping section HFM33: 12–140 m

Project:	PLU	Test type:	1B
Area:	Forsmark	Test no:	–
Borehole ID:	HFM33	Test start:	2007-11-01 09:12
Test section (m):	12-140	Responsible for test perform-ance:	GEOSIGMA AB K Gokall-Norman
Section diameter, 2·rw (m):	0.140	Responsible for test evaluation:	GEOSIGMA AB J-E Ludvigson

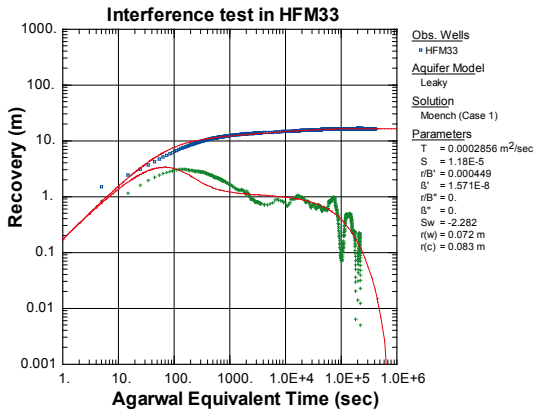
Linear plot pressure – Entire test period



Log-Log plot incl. derivate – Flow period



Log-Log plot incl. derivative – Recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa)			
p_i (kPa)	167.56		
p_p(kPa)	7.53	p_F (kPa)	168.45
Q_p (m^3/s)	0.00386		
tp (s)	1210574	t_F (s)	568783
S*	$1.1\cdot10^{-5}$	S*	$1.2\cdot10^{-5}$
EC_w (mS/m)			
Te_w(gr C)			
Derivative fact.	0.2	Derivative fact.	0.2
Results		Results	
Q/s (m^2/s)	$2.4\cdot10^{-4}$		
T_{Moye}(m^2/s)	$3.0\cdot10^{-4}$		
Flow regime:	PRF→PSF	Flow regime:	PRF→PSF
t_1 (s)	2,500	dt_{e1} (s)	2000
t_2 (s)	100,000	dt_{e2} (s)	20000
T_w (m^2/s)	$2.6\cdot10^{-4}$	T_w (m^2/s)	$2.9\cdot10^{-4}$
S_w (–)		S_w (–)	
K_{sw} (m/s)		K_{sw} (m/s)	
S_{sw} (1/m)		S_{sw} (1/m)	
C (m^3/Pa)	$2.2\cdot10^{-6}$	C (m^3/Pa)	$2.2\cdot10^{-6}$
C_D (–)		C_D (–)	
ξ (–)	–3.4	ξ (–)	–2.3
T_{GRF}(m^2/s)		T_{GRF}(m^2/s)	
S_{GRF}(–)		S_{GRF}(–)	
D_{GRF} (–)		D_{GRF} (–)	

Interpreted formation and well parameters.

Flow regime:	PRF→PSF	C (m^3/Pa)	
t_1 (s)	2500	C_D (–)	
t_2 (s)	100000	ξ (–)	–3.4
T_T (m^2/s)	$2.6\cdot10^{-4}$		
S (–)			
K_s (m/s)			
S_s (1/m)			

Comments: The test was analysed as a variable flow rate test. During the first c. 70 s of the flow period a PLF (fracture) flow regime is indicated. Between c. 100–1,500 s a first PRF occurs until the decrease in flow rate. A second PRF is then re-established between c. 2,500–10^5s. After this time pseudo-spherical (slightly leaky) flow is dominating. After an initial PLF (fracture) flow regime during the first c. 60 s of the recovery period, an approximate PRF occurs between c. 2,000 and 20,000 s. After this time, a PSF lasting until the end of the period is observed.

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Appendix 1

List of data files

Files are named: Interferenstest_Pumphål_"BhID"_"YYYYMMDD"_"hhmm"_"File Type". Interferenstest_Pumphål is just an internal marker. "BhID" is the name of the borehole, after that the datafile start time is given. Pumpin and Ref_Da are parts of the original file names produced by the HTHB data logger. Ref_Da contains constants of calibration and background data. Pumpin contains data from pumping tests (no combined flow logging).

Bh ID	Test section (m)	Test type[1]	Test no	Test start Date, time YYYY-MM-DD tt:mm:ss	Test stop Date, time YYYY-MM-DD tt:mm:ss	Datafile, start Date, time YYYY-MM-DD tt:mm:ss	Datafile, stop Date, time YYYY-MM-DD tt:mm:ss	Data files of raw and primary data	Con-tent (parameters)[2]	Comments
HFM33	12-140	1B		20071101 09:12:27	20071122 00:00:00	20071101 09:08:15	20071126 08:58:43	Interferenstest_Pumphål_HFM33_20071101_0908_Pumpin00.DAT	P, Q	Pressure and flow registration in HFM33 for interference.
HFM33	12-140	1B		20071101 09:12:27	20071122 00:00:00	20070319 16:15:07	20071127 08:20:11	Interferenstest_Pumphål_HFM33_20070319_1615_Ref_Da00.DAT	C, R	

[1)] 1B: Pumping test-submersible pump, 2: Interference test (observation borehole during pumping in another borehole)
[2)] P =Pressure, Q =Flow, Te =Temperature, EC =El. conductivity. SPR =Single Point Resistance, C =Calibration file, R =Reference file, Sp= Spinner rotations

Appendix 2

Test diagrams

Nomenclature for AQTESOLV:

T = transmissivity (m^2/s)
S = storativity (-)
K_Z/K_r = ratio of hydraulic conductivities in the vertical and radial direction (set to 1)
Sw = skin factor
r(w) = borehole radius (m)
r(c) = effective casing radius (m)
r/B = leakage coefficient (s^{-1})
b = thickness of formation (m)

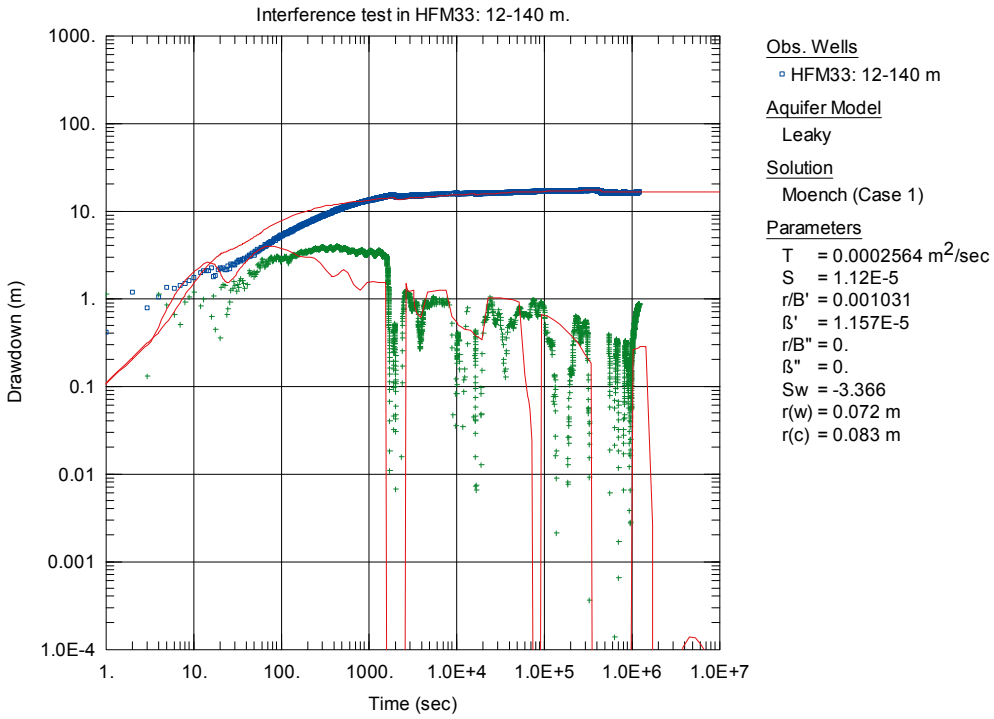

Figure A2-1. *Log-log plot of drawdown (▫) and drawdown derivative, ds/d(ln t) (+), versus time in HFM33 during the interference test in HFM33.*

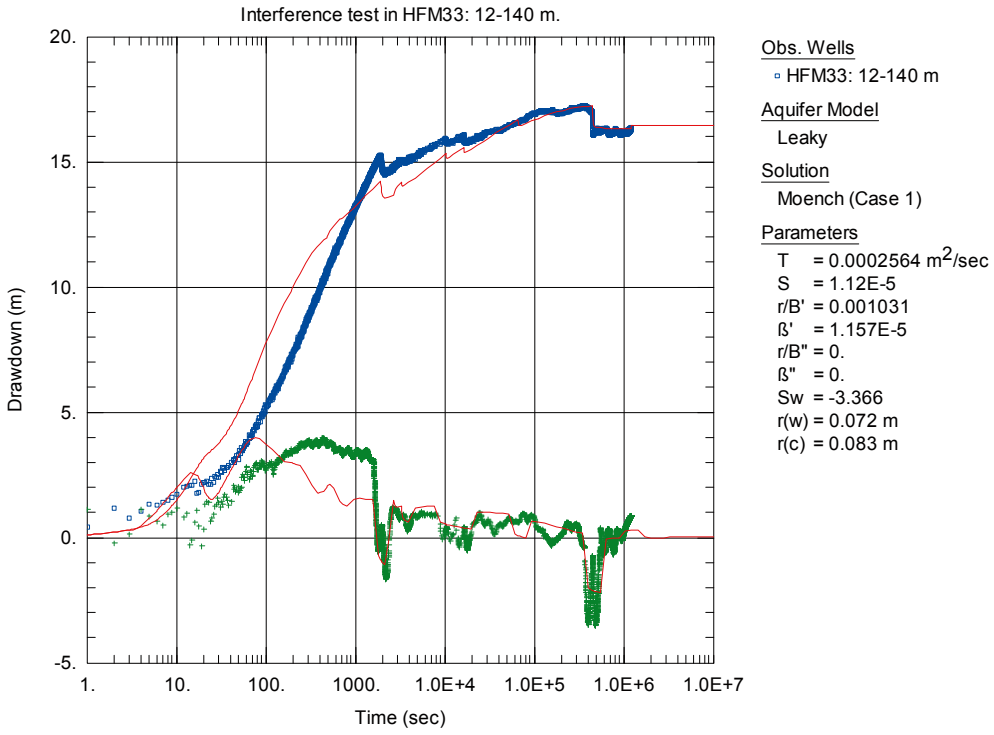

Figure A2-2. *Lin-log plot of drawdown (▫) and drawdown derivative, ds/d(ln t) (+), versus time in HFM33 during the interference test in HFM33.*

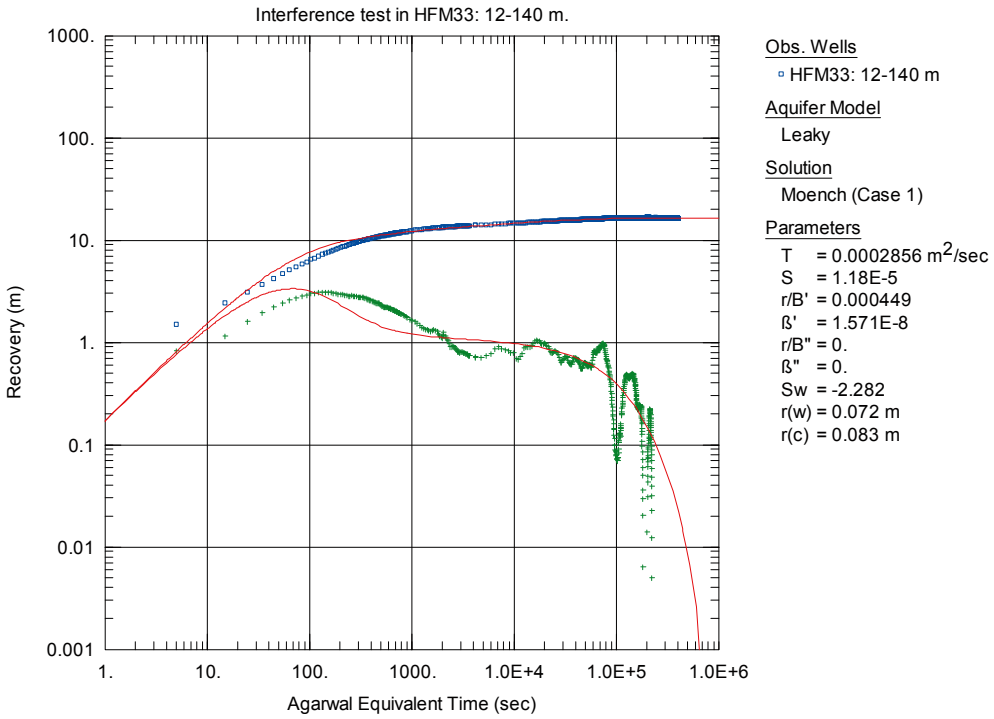

Figure A2-3. *Log-log plot of pressure recovery (▫) and derivative, dsp/d(ln dte) (+), versus equivalent time in HFM33 during the interference test in HFM33.*

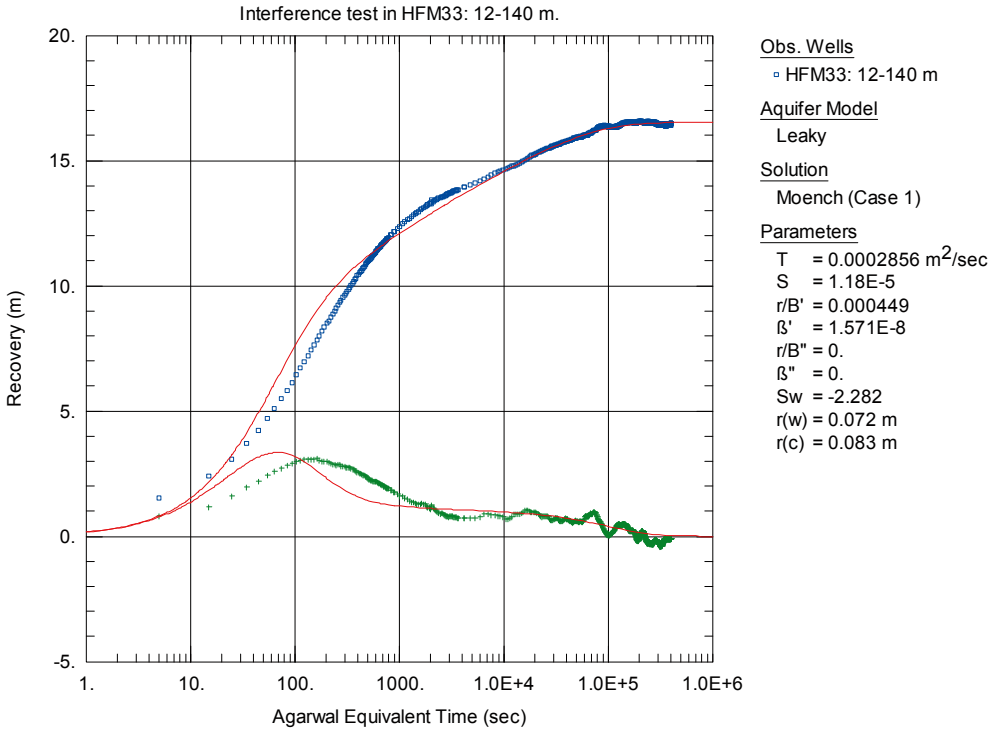

Figure A2-4. *Lin-log plot of pressure recovery (▫) and derivative, dsp/d(ln dte) (+), versus equivalent time in HFM33 during the interference test in HFM33.*

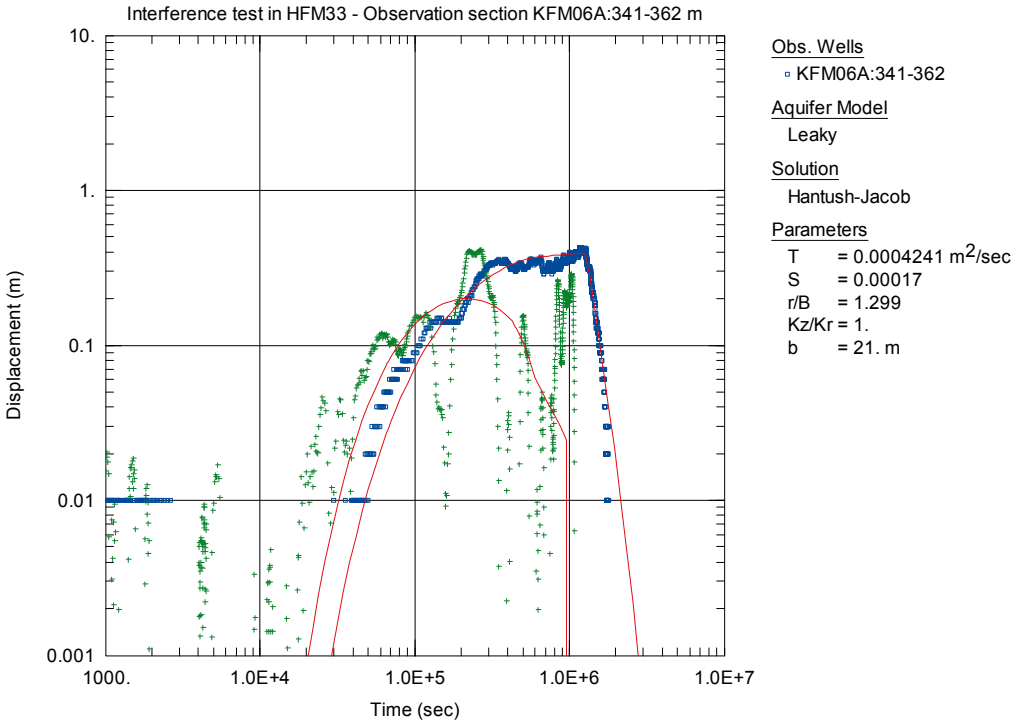

Figure A2-5. *Log-log plot of displacement (▫) and displacement derivative, ds/d(ln t) (+), versus time in observation section KFM06A: 341-362 m during the interference test in HFM33.*

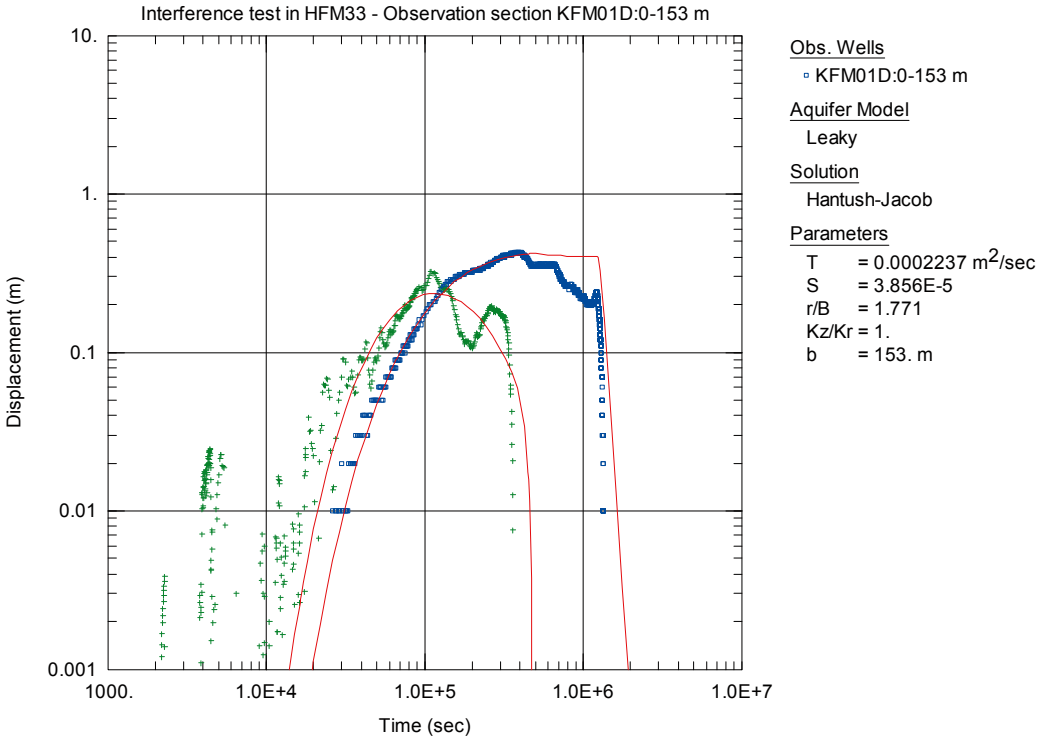

Figure A2-6. *Log-log plot of displacement (▫) and displacement derivative, ds/d(ln t) (+), versus time in observation section KFM01D: 0-153 m during the interference test in HFM33.*

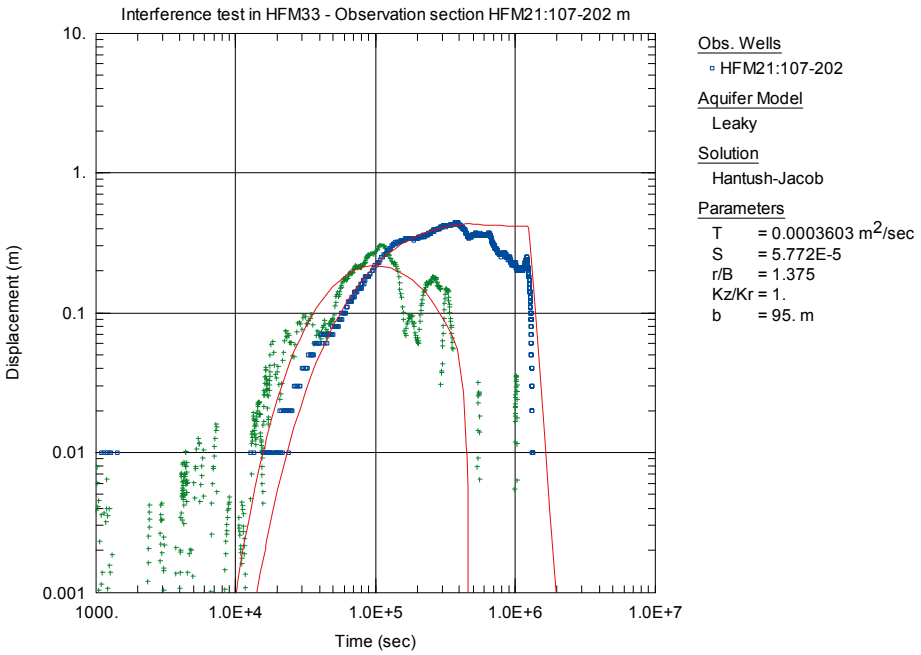

Figure A2-7. *Log-log plot of displacement (▫) and displacement derivative, ds/d(ln t) (+), versus time in observation section HFM21: 107-202 m during the interference test in HFM33.*

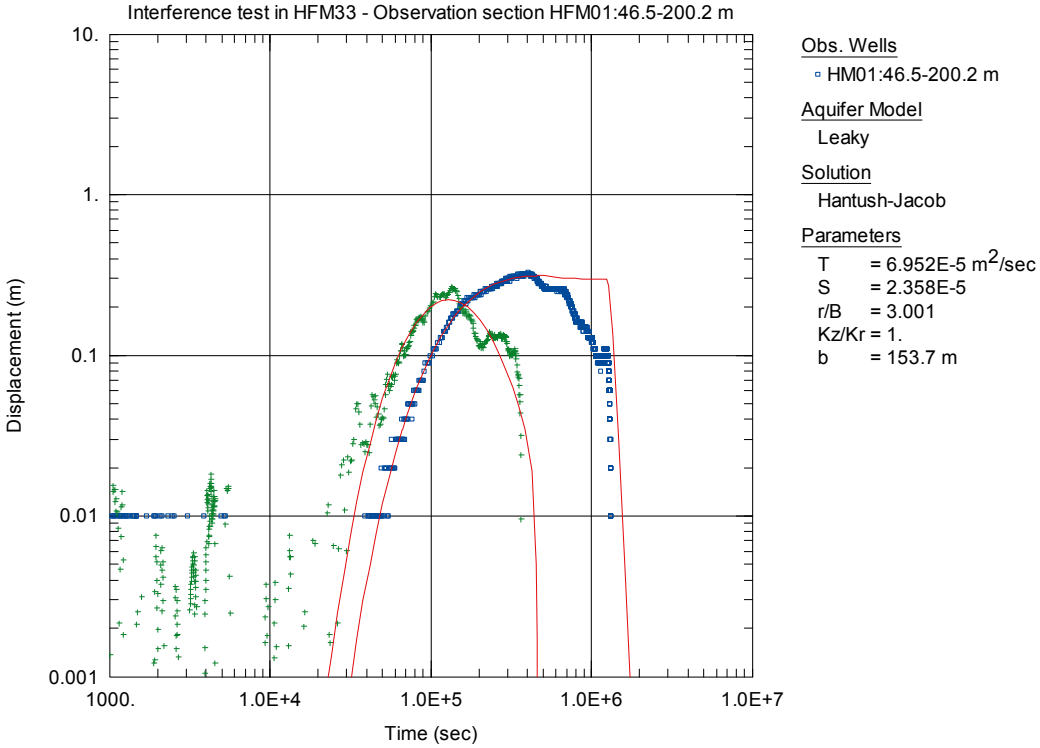

Figure A2-8. *Log-log plot of displacement (▫) and displacement derivative, ds/d(ln t) (+), versus time in observation section HFM01: 46.5-200.2 m during the interference test in HFM33.*

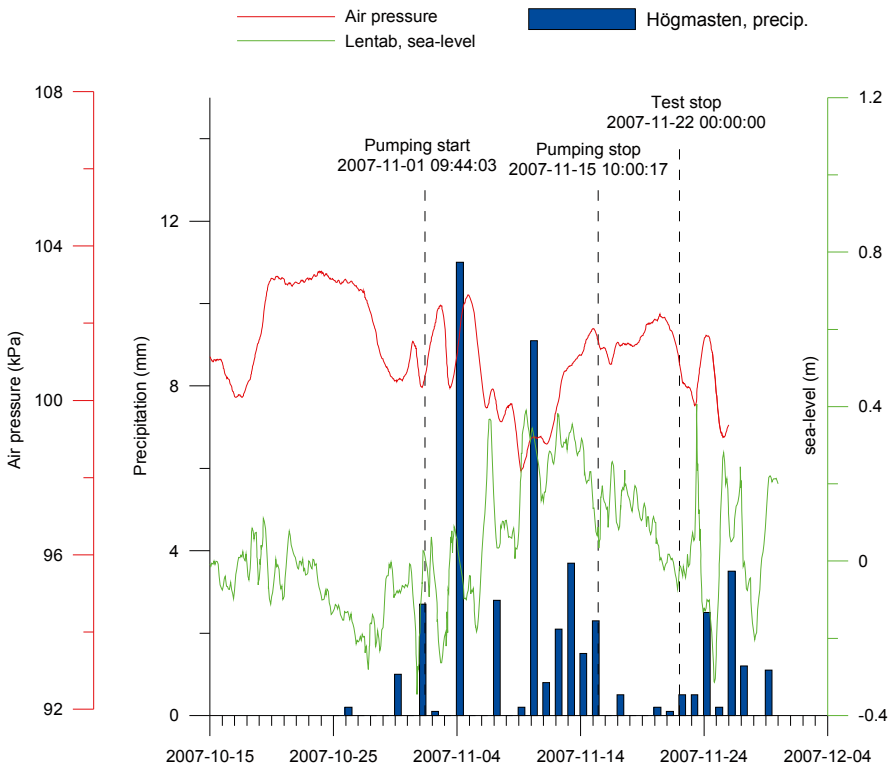

Figure A2-9. *24 hours summed precipitation in the Forsmark area during the interference test in HFM33. Also air-pressure and sea-level is included in the diagram.*

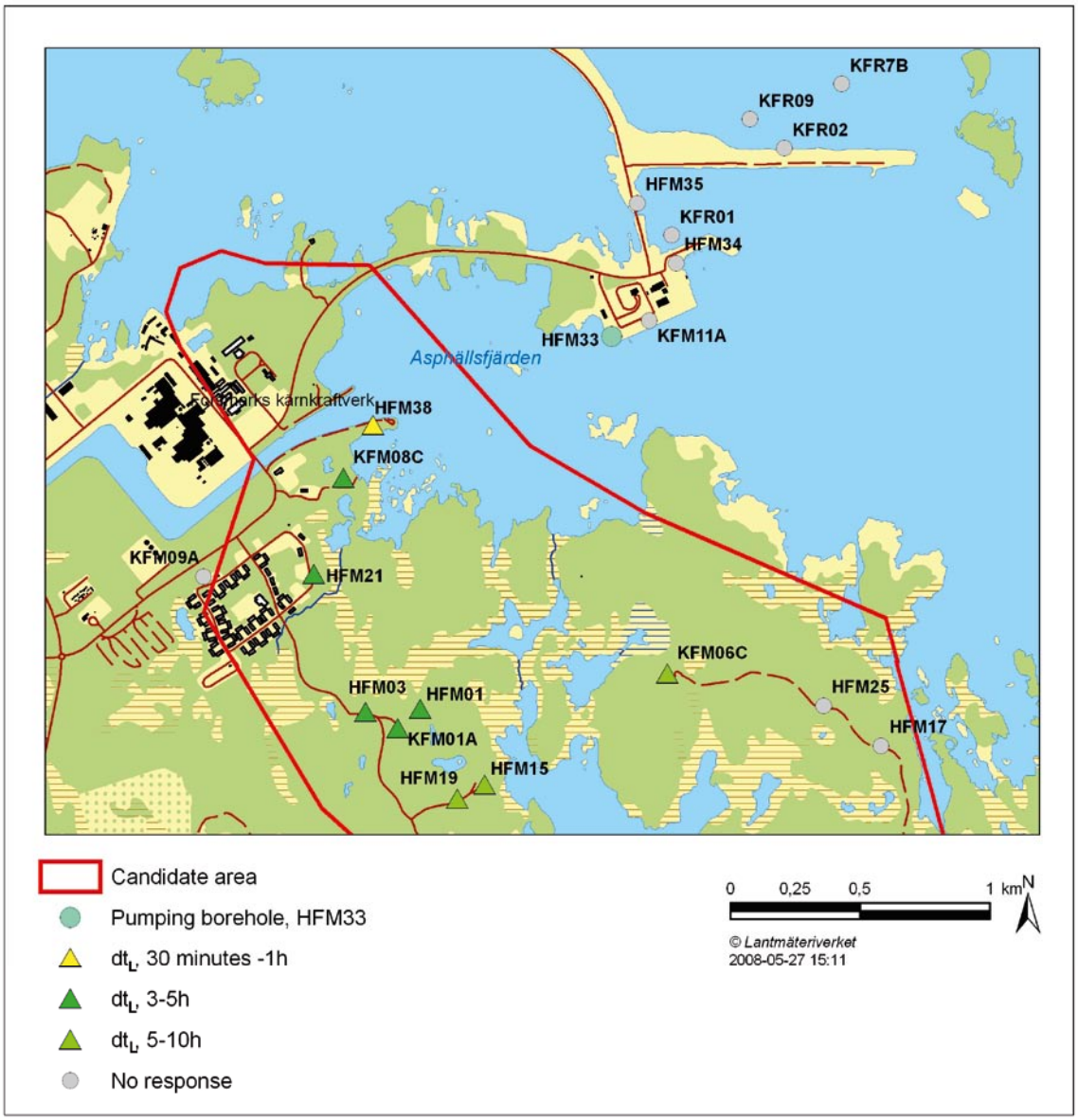

Figure A2-10. *Symbols in this diagram represent the borehole section, at a specific drill site, which has the quickest response. This map displays responses recorded in sections located between 0 and 300 m along the boreholes.*

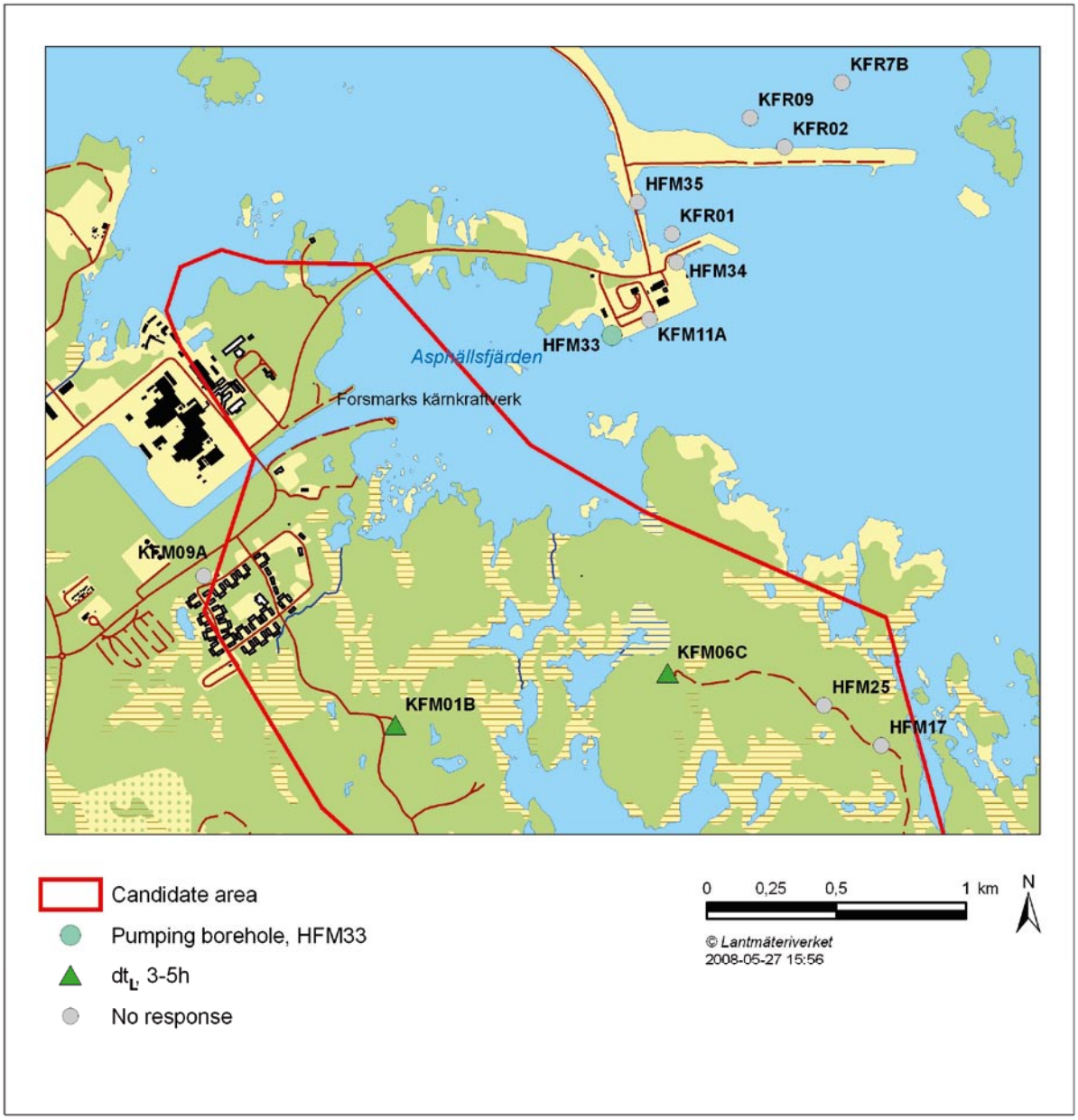

Figure A2-11. *Symbols in this diagram represent the borehole section, at a specific drill site, which has the quickest response. This map displays responses recorded in sections located between 301 and 500 m along the boreholes. Some boreholes are represented in the map only to show the location of a drill site.*

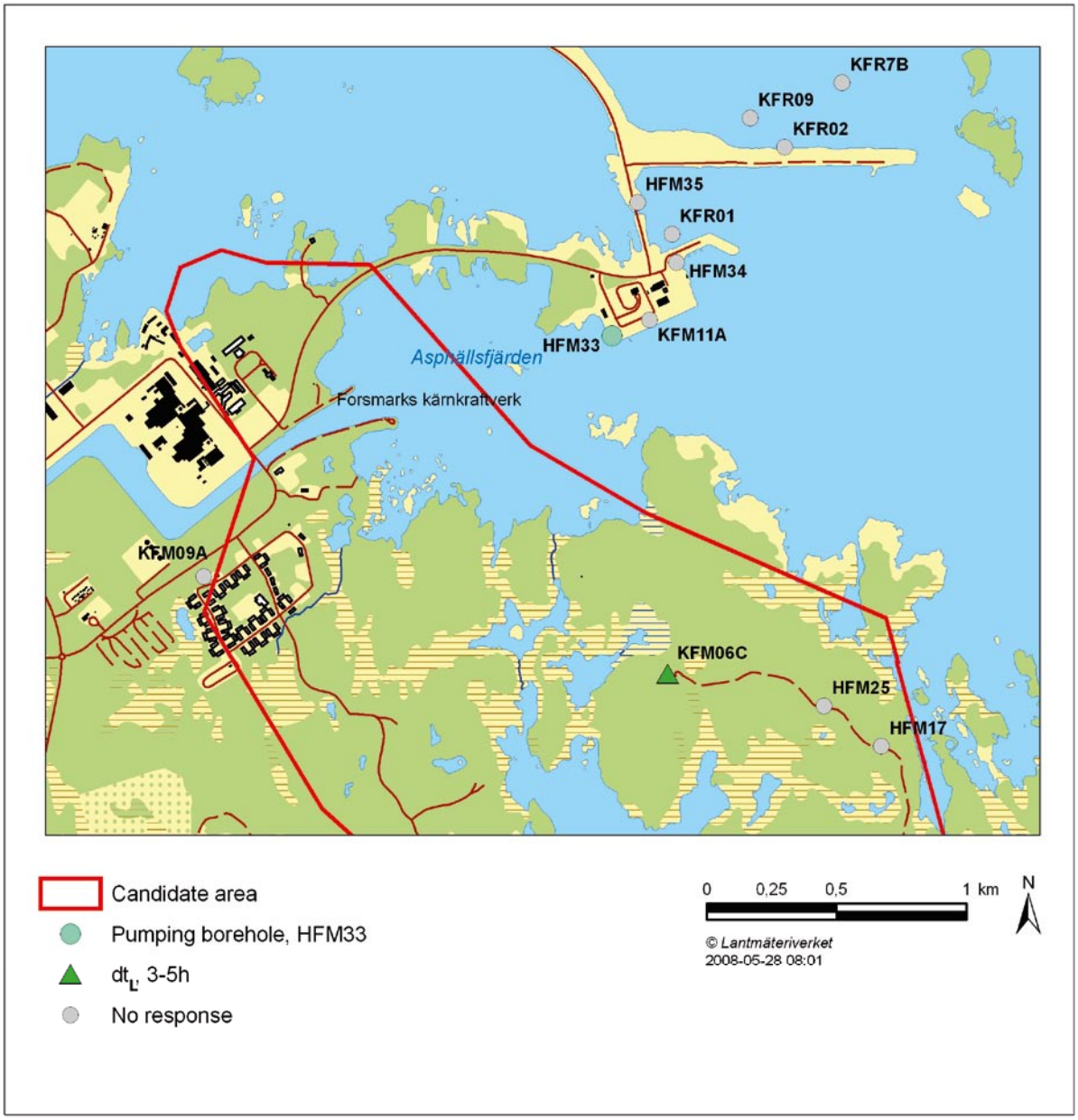

Figure A2-12. *Symbols in this diagram represent the borehole section, at a specific drill site, which has the quickest response. This map displays responses recorded in sections located below 501 m along the boreholes. Some boreholes are represented in the map only to show the location of a drill site.*

Sicada tables

Result tables to Sicada from the single hole test in HFM33

plu_s_hole_test_d

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	start_flow_period (YYYY-MM-DD hh:mm:ss)	stop_flow_period (YYYY-MM-DD hh:mm:ss)
HFM33	2007-11-01 09:12	2007-11-22 00:00	12.00	140.00		1B	1	2007-11-01 09:44:03	2007-11-15 10:00:17

cont.

flow_rate_end_qp (m**3/s)	value_type_qp	mean_flow_rate_qm (m**3/s)	q_measl__l (m**3/s)	q_measl__u (m**3/s)	tot_volume_vp (m**3)	dur_flow_phase_tp (s)	dur_rec_phase_tf (s)	initial_head_hi (m)	head_at_flow_end_hp (m)
3.7884E-03	0	3.8630E-03			4.6764E+03	1210574.00	568783.00	17.07	0.77

cont.

final_head_hf (m)	initial_press_pi (kPa)	press_at_flow_end_pp (kPa)	final_press_pf (kPa)	fluid_temp_tew (oC)	fluid_elcond_ecw (mS/m)	fluid_salinity_tdsw (mg/l)	fluid_salinity_tdswm (mg/l)	reference	comments (no_unit)	lp (m)
17.17										

Sicada - description of plu_s_hole_test_d

PLU Injection and Pumping tests. General information

Sicada Header	Header	Unit	Explanation
Idcode	Borehole		ID for borehole
Secup	Borehole secup	(m)	Length coordinate along the borehole for the upper limit of the test section
Seclow	Borehole seclow	(m)	Length coordinate along the borehole for the lower limit of the test section
Test_type	Test type (1- 7)	(-)	1A: Pumping test - wireline eq., 1B:Pumping test-submersible pump, 1C: Pumpingtest-airlift pumping, 2: Interference test, 3: Injection test, 4: Slug test, 4B: Pulse test 5A: Difference flow logging-PFL-DIFF-sequential, 5B: Difference flow logging-PFL-DIFF-overlapping, 6:Flow logging_Impeller,7:Grain size analysis
start_date	Date for test start	YYYY-MM-DD hh::mm	Date for the start of the pumping or injection test (YYYY-MM-DD hh:mm)
start_flow_period	Start flow / injection	YYYY-MM-DD hh::mm:ss	Date and time for the start of the pumping or injection period (YYYY-MM-DD hh:mm:ss)
stop_flow_period	Start flow / injection	YYYY-MM-DD hh::mm:ss	Date and time for the end of the pumping or injection period (YYYY-M-M DD hh:mm:ss)
mean_flow_rate_qm	Q_m	(m^3/s)	Arithmetric mean flow rate during flow (pumping/injection) period.
flow_rate_end_qp	Q_p	(m^3/s)	Flow rate at the end of the flow (pumping/injection) period.
value_type_qp			Code for Q_p-value; -1 means Q_p<lower measurement limit, 0 means measured value, 1 means Q_p> upper measurement value of flowrate
q_measl_l	Qmeasl_L	(m^3/s)	Estimated lower measurement limit for flow rate
q_measl_u	Qmeasl_U	(m^3/s)	Estimated upper measurement limit for flow rate
total_volume_vp	V_p	(m^3)	Total volume pumped or injected water during the flow period.
dur_flow_phase_tp	t_p	(s)	Duration of the flow period.
dur_rec_phase_tf	t_F	(s)	Duration of the recovery period.
initial_head_hi	h_i	(m)	Hydraulic head in test section at start of the flow period.
head_at_flow_end_hp	h_p	(m)	Hydraulic head in test section at stop of the flow period.
final_head_hf	h_F	(m)	Hydraulic head in test section at stop of the recovery period..
initial_press_pi	p_i	(kPa)	Ground water pressure in test section at start of the flow period.
press_at_flow_end_pp	p_p	(kPa)	Ground water pressure in test section at stop of the flow period.
final_press_pf	p_F	(kPa)	Ground water pressure in test section at stop of the recovery period.
fluid_temp_tew	Te_w	(C^o)	Measured borehole fluid temperature in the test section (representative for evaluated parameters, in general the last temperature value)

Sicada Header	Header	Unit	Explanation
fluid_elcond_ecw	EC_w	(mS/m)	Measured electric conductivity of the borehole fluid in the test section (representative for evaluated parameters, in general the last EC value)
fluid_salinity_tdsw	TDS_w	(mg/L)	Calculated total dissolved solids of the borehole fluid in the test section, based on EC-measurement
fluid_salinity_tdswn	TDS_{wn}	(mg/L)	Measured total dissolved solids of the borehole fluid in the test section, based on water sampling and chemical analysis
reference	references		SKB report No for reports describing data and evaluation
comments	comments		Short comment to data

plu_s_hole_test_ed1

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	lp (m)	seclen_class (m)
HFM33	2007-11-01 09:12	2007-11-22 00:00	12.00	140.00		1B	1	136.00	

cont.

spec_capacity_q_s (m**2/s)	value_type_q_s	transmissivity_tq (m**2/s)	value_type_tq	bc_tq	transmissivity_moye (m**2/s)	value_type_tm	bc_tm	hydr_cond_moye (m/s)	formation_width_b (m)
2.40E-04	0				3.00E-04	0	0	2.34E-06	128.00

cont.

width_of_channel_b (m)	tb (m**3/s)	l_measl_tb (m**3/s)	u_measl_tb (m**3/s)	sb (m)	assumed_sb (m)	leakage_factor_lf (m)	transmissivity_tt (m**2/s)	value_type_tt	bc_tt
							2.60E-04	0	1

cont.

l_measl_q_s (m**2/s)	u_measl_q_s (m**2/s)	storativity_s	assumed_s	s_bc	ri (m)	ri_index	leakage_coeff (1/s)	hydr_cond_ksf (m/s)	value_type_ksf
2.00E-06	2.00E-02		1.12E-05						

cont.

(m/s)	(m/s)	(1/m)	(1/m)	(m**3/pa)			(s)	(s)	(s)
l_measl_ksf	**u_measl_ksf**	**spec_storage_ssf**	**assumed_ssf**	**c**	**cd**	**skin**	**dt1**	**dt2**	**t1**
				2.20E-06		- 3.40E+00			2500.00

cont.

(s)	(s)	(s)	(kPa)	(m**2/s)				(m**3/pa)	
t2	**dte1**	**dte2**	**p_horner**	**transmissivity_t_nlr**	**storativity_s_nlr**	**value_type_t_nlr**	**bc_t_nlr**	**c_nlr**	**cd_nlr**
100000.00	2000.00	20000.00							

cont.

	(m**2/s)					
skin_nlr	**transmissivity_t_grf**	**value_type_t_grf**	**bc_t_grf**	**storativity_s_grf**	**flow_dim_grf**	**comment**

Sicada - description of plu_s_hole_test_ed1

PLU Single hole tests, pumping and injection. Basic evaluation

Sicada Header	Header	Unit	Explanation
idcode	Borehole		ID for borehole
secup	Borehole secup	m	Length coordinate along the borehole for the upper limit of the test section
seclow	Borehole seclow	(m)	Length coordinate along the borehole for the lower limit of the test section
test_type	Test type (1- 7)	(-)	1A: Pumpingtest-wireline eq., 1B: Pumpingtest-submersible pump, 1C: Pumpingtest-airlift pumping, 2: Interference test, 3: Injection test, 4: Slug test, 4B: Pulse Test, 5A: Flowlogging-PFL-DIFF_sequential, 5B: Flowlogging-PFL-DIFF_overlapping, 6: Flowlogging-Impeller, 7: Grain size analysis
formation_type	Formation type	(-)	1: Rock, 2: Soil (Superficial deposits)
seclen_class		(m)	Planned ordinary test interval during a test campaign when a great part of a borehole is tested. The test interval length might differ due to border conditions (e.g borehole end) but is still considered to be included in the same section length class.
start_date		YYYY-MM-DD hh:mm	Date for the start of the test (YYYY-MM-DD hh:mm)
lp	L_p	(m)	Hydraulic point of application for a test section, based on the geometric midpoint of test section or the main point of transmissivity distribution in test section
spec_capacity_q_s	Q/s	m^2/s	Specific capacity, generally estimated from Q_p, s_p or dh_p
value_type_q_s			Code for Q/s; -1 means Q/s< lower measurement limit, 0 means measured value,-1 means Q/s>upper measurement limit.
transmissivity_tq	T_Q	m^2/s	Transmissivity, based on Q/s and a function T = f(Q/s), see e.g. Rhén et al (1997) s. 190. The function used should be refered to in ”Comments”.
transmissivity_moye	T_M	m^2/s	Transmissivity (T_M)based on Moye (1967)
value_type_tm			Code for T_M; -1 means T_M < lower measurement limit, 0 means measured value,-1 means T_M >upper measurement limit.
formation_width_b	b	m	Representative aquifer thickness for inferred transmissivity, generally estimated as test section length L_w
width_of_channel_b	B	m	Inferred width of formation for evaluated TB
tb	TB	m^3/s	Flow capacity in 1D formation of width B and transmissivity T based on transient evaluation. Considered best estimate from transient evaluation of flow period or recovery period.
l_measl_tb	TB-measl-L	m^3/s	Estimated lower measurement limit for evaluated TB.
u_measl_tb	TB-measl-L	m^3/s	Estimated upper measurement limit for evaluated TB.
sb	SB	m	Storage capacity of 1D formation of width B and storativity S based on transient evaluation. Considered best estimate from transient evaluation of flow period or recovery period.

Sicada Header	Header	Unit	Explanation
assumed_sb	SB*	m	Assumed storage capacity of 1D formation of width B and storativity S based on transient evaluation.
ri_index	ri-index		**ri-index= 0**: Pressure response indicates that the size of the hydraulic feature is greater than radius of influence based on time for last pressure response measured (tp=t2). Size of hydraulic feature greater than radius of influence based on t2. **ri-index= 1**: Pressure response indicates that the hydraulic feature assigned the representative transmissivity is connected to hydraulic feature with less transmissivity or barrier boundary. Size of hydraulic feature estimated as radius of influence based on t2. (Size of feature somewhat under estimated using t2- but error considered as small.) **ri-index= -1**: Pressure response indicates that the hydraulic feature assigned the representative transmissivity is connected to hydraulic feature with greater transmissivity or a constant head boundary. Size of hydraulic feature estimated as radius of influence based on t2. (Size of feature somewhat under estimated using t2- but error considered as small.)
bc_s	S-BC		Calculated by using S if S=value or S=f(T) if S*=value
leakage_factor_lf	L_f	m	Leakage factor. $L_f = (K \cdot b \cdot c_f)^{0.5}$ where K represents the aquifer conditions. $c_f = b´/K´$ based on 1D linear flow model. Considered best estimate from transient evaluation of flow period or recovery period.
transmissivity_tt	T_T	m^2/s	Transmissivity (T) of formation, based on 2D radial flow model. Considered best estimate from transient evaluation of flow period or recovery period.
value_type_tt			Code for T_T; -1 means T_T < lower measurement limit, 0 means measured value,-1 means T_T >upper measurement limit.
l_measl_q_s	Q/s-measl-L	m^2/s	Estimated measurement limit for evaluated T (T_T, T_Q, T_M). If estimated T equals Q/s-measl in the table actual T is considered to be equal or less than Q/s-measl
u_measl_q_s	Q/s-measl-U	m^2/s	Estimated measurement limit for evaluated T (T_T, T_Q, T_M). If estimated T equals Q/s-measl in the table actual T is considered to be equal or grater than Q/s-measl
storativity_s	S	(-)	Storativity (Storage coefficient) of formation based on 2D radial flow model. Considered best estimate from transient evaluation of flow period or recovery period.
assumed_s	S*		Assumed storativity of formation based on 2D radial flow model.
leakage_koeff	K´/b´	(1/s)	Leakage coefficient evaluated from 2D radial flow model. K´= hydraulic conductivity across the aquitard, b´ = water saturated thickness of aquitard (leaky formation). Considered best estimate from transient evaluation of flow period or recovery period.
hydr_kond_ksf	K_{sf}	m/s	Hydraulic conductivity of formation, based on 3D spherical flow model. Considered best estimate from transient evaluation of flow period or recovery period.
value_type_ksf			Code for K_{Sf}; -1 means K_{Sf} < lower measurement limit, 0 means measured value,-1 means K_{Sf} >upper measurement limit.
l_measl_ksf	K_S-measl-L	m/s	Estimated lower measurement limit for evaluated K_{sf}.
u_measl_ksf	K_S-measl-U	m/s	Estimated upper measurement limit for evaluated K_{sf}.
spec_storage_ss	S_{sf}	1/m	Specific storage of formation based on 3D spherical flow model. Considered best estimate from transient evaluation of flow period or recovery period.
assumed_ss	S_{sf}*	1/m	Assumed specific storage of formation based on 3D spherical flow model.
c	C	(m^3/Pa)	Wellbore storage coefficient. Considered best estimate from transient evaluation of flow period or recovery period.
cd	C_D	(-)	Dimensionless wellbore storage coefficient, $C_D = C \cdot \rho_w g /(2\pi \cdot S \cdot r_w^2)$.
skin	ξ		Skin factor. Considered best estimate from transient evaluation of flow period or recovery period.

Sicada Header	Header	Unit	Explanation
dt1	dt_1	s	Estimated start time after pump/injection start or recovery start, for the period used for the evaluated parameter
dt1	dt_2	s	Estimated stop time after pump/injection start or recovery start, for the period used for the evaluated parameter
dte1	dt_{e1}		Start time for evaluated parameter from start of recovery period.
dte2	dt_{e2}		Stop time for evaluated parameter from start of recovery period.
t1	t_1		Start time for evaluated parameter from start of flow period.
t2	t_2		Stop time for evaluated parameter from start of flow period.
p_horner	p*		Horner extrapolated pressure (used as an estimation of natural pressure of the test section)
transmissivity_t_nlr	T_{ILR}	m^2/s	Transmissivity, based on Non Linear Regression of the entire test sequence.
storativity_s_nlr	S_{ILR}	(-)	Storativity, based on Non Linear Regression of the entire test sequence.
c_nlr	C_{ILR}	(m^3/Pa)	Wellbore storage coefficient, based on Non Linear Regression of entire test sequence.
cd_nlr	$C_{D,ILR}$		Dimensionless wellbore storage coefficient, based on Non Linear Regression of entire test sequence.
skin_nlr	ξ_{NLR}		Skin factor, based on Non Linear Regression of entire test sequence.
transmissivity_t_grf	T_{GRF}	m^2/s	Transmissivity, based on the Generalized Radial Flow model (Baker, 1988). Considered best estimate from transient evaluation of flow period or recovery period.
storativity_s_grf	S_{GRF}	(-)	Storativity, based on Generalised Radial Flow model. Considered best estimate from transient evaluation of flow period or recovery period.
flow_dim_grf	D_{GRF}	(-)	Inferred flow dimension, based on the Generalized Radial Flow model (Barker, 1988). Considered best estimate from transient evaluation of flow period or recovery period.
comment	comment		comments on the test

Result table to Sicada from the interference test in HFM14

plu_inf_test_obs_d

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	start_flow_period (YYYY-MM-DD hh:mm:ss)	stop_flow_period (YYYY-MM-DD hh:mm:ss)
KFM11A	2007-10-15 00:00	2007-11-22 00:00	0.00	130.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM11A	2007-10-15 00:00	2007-11-22 00:00	131.00	360.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM11A	2007-10-15 00:00	2007-11-22 00:00	361.00	445.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM11A	2007-10-15 00:00	2007-11-22 00:00	446.00	456.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM11A	2007-10-15 00:00	2007-11-22 00:00	457.00	689.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM11A	2007-10-15 00:00	2007-11-22 00:00	690.00	710.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM11A	2007-10-15 00:00	2007-11-22 00:00	711.00	850.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM34	2007-10-15 00:00	2007-11-22 00:00	0.00	21.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM34	2007-10-15 00:00	2007-11-22 00:00	22.00	90.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM34	2007-10-15 00:00	2007-11-22 00:00	91.00	195.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFR01	2007-10-15 00:00	2007-11-22 00:00	11.00	43.50		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFR01	2007-10-15 00:00	2007-11-22 00:00	44.50	62.30		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM35	2007-10-15 00:00	2007-11-22 00:00	0.00	33.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM35	2007-10-15 00:00	2007-11-22 00:00	34.00	150.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM35	2007-10-15 00:00	2007-11-22 00:00	151.00	181.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM35	2007-10-15 00:00	2007-11-22 00:00	182.00	201.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM38	2007-10-15 00:00	2007-11-22 00:00	0.00	23.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM38	2007-10-15 00:00	2007-11-22 00:00	24.00	41.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM38	2007-10-15 00:00	2007-11-22 00:00	42.00	200.75		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFR09	2007-10-15 00:00	2007-11-22 00:00	2.00	80.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	start_flow_period (YYYY-MM-DD hh:mm:ss)	stop_flow_period (YYYY-MM-DD hh:mm:ss)
KFR02	2007-10-15 00:00	2007-11-22 00:00	81.00	118.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFR02	2007-10-15 00:00	2007-11-22 00:00	119.00	136.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFR02	2007-10-15 00:00	2007-11-22 00:00	137.00	170.20		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08C	2007-10-15 00:00	2007-11-22 00:00	0.00	145.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08C	2007-10-15 00:00	2007-11-22 00:00	146.00	310.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08C	2007-10-15 00:00	2007-11-22 00:00	311.00	610.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08C	2007-10-15 00:00	2007-11-22 00:00	611.00	760.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08C	2007-10-15 00:00	2007-11-22 00:00	761.00	950.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08D	2007-10-15 00:00	2007-11-22 00:00	0.00	160.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08D	2007-10-15 00:00	2007-11-22 00:00	161.00	330.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08D	2007-10-15 00:00	2007-11-22 00:00	331.00	659.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08D	2007-10-15 00:00	2007-11-22 00:00	660.00	680.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08D	2007-10-15 00:00	2007-11-22 00:00	681.00	824.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08D	2007-10-15 00:00	2007-11-22 00:00	825.00	835.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08D	2007-10-15 00:00	2007-11-22 00:00	836.00	950.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM22	2007-10-15 00:00	2007-11-22 00:00	0.00	222.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08A	2007-10-15 00:00	2007-11-22 00:00	0.00	161.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08A	2007-10-15 00:00	2007-11-22 00:00	162.00	215.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08A	2007-10-15 00:00	2007-11-22 00:00	216.00	264.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08A	2007-10-15 00:00	2007-11-22 00:00	265.00	280.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08A	2007-10-15 00:00	2007-11-22 00:00	281.00	473.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08A	2007-10-15 00:00	2007-11-22 00:00	474.00	503.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08A	2007-10-15 00:00	2007-11-22 00:00	504.00	683.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08A	2007-10-15 00:00	2007-11-22 00:00	684.00	694.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	start_flow_period (YYYY-MM-DD hh:mm:ss)	stop_flow_period (YYYY-MM-DD hh:mm:ss)
KFM08A	2007-10-15 00:00	2007-11-22 00:00	695.00	1001.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08B	2007-10-15 00:00	2007-11-22 00:00	0.00	70.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08B	2007-10-15 00:00	2007-11-22 00:00	71.00	112.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM08B	2007-10-15 00:00	2007-11-22 00:00	113.00	200.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	0.00	186.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	187.00	280.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	281.00	350.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	351.00	401.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	402.00	530.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	531.00	540.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	541.00	646.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	647.00	666.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	667.00	872.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06C	2007-10-15 00:00	2007-11-22 00:00	873.00	1001.64		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06A	2007-10-15 00:00	2007-11-22 00:00	0.00	150.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06A	2007-10-15 00:00	2007-11-22 00:00	151.00	246.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06A	2007-10-15 00:00	2007-11-22 00:00	247.00	340.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06A	2007-10-15 00:00	2007-11-22 00:00	341.00	362.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06A	2007-10-15 00:00	2007-11-22 00:00	363.00	737.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06A	2007-10-15 00:00	2007-11-22 00:00	738.00	748.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06A	2007-10-15 00:00	2007-11-22 00:00	749.00	826.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06A	2007-10-15 00:00	2007-11-22 00:00	827.00	1000.64		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFR7B	2007-10-15 00:00	2007-11-22 00:00	8.00	21.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	start_flow_period (YYYY-MM-DD hh:mm:ss)	stop_flow_period (YYYY-MM-DD hh:mm:ss)
KFM06B	2007-10-15 00:00	2007-11-22 00:00	0.00	26.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06B	2007-10-15 00:00	2007-11-22 00:00	27.00	50.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM06B	2007-10-15 00:00	2007-11-22 00:00	51.00	100.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM16	2007-10-15 00:00	2007-11-22 00:00	0.00	53.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM16	2007-10-15 00:00	2007-11-22 00:00	54.00	67.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM16	2007-10-15 00:00	2007-11-22 00:00	68.00	132.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01D	2007-10-15 00:00	2007-11-22 00:00	0.00	153.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01D	2007-10-15 00:00	2007-11-22 00:00	154.00	252.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01D	2007-10-15 00:00	2007-11-22 00:00	253.00	310.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01D	2007-10-15 00:00	2007-11-22 00:00	311.00	321.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01D	2007-10-15 00:00	2007-11-22 00:00	322.00	428.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01D	2007-10-15 00:00	2007-11-22 00:00	429.00	438.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01D	2007-10-15 00:00	2007-11-22 00:00	439.00	800.24		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM21	2007-10-15 00:00	2007-11-22 00:00	0.00	21.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM21	2007-10-15 00:00	2007-11-22 00:00	22.00	32.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM21	2007-10-15 00:00	2007-11-22 00:00	33.00	106.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM21	2007-10-15 00:00	2007-11-22 00:00	107.00	202.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07B	2007-10-15 00:00	2007-11-22 00:00	0.00	74.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07B	2007-10-15 00:00	2007-11-22 00:00	75.00	202.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07B	2007-10-15 00:00	2007-11-22 00:00	203.00	300.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07C	2007-10-15 00:00	2007-11-22 00:00	0.00	110.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07C	2007-10-15 00:00	2007-11-22 00:00	111.00	160.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07C	2007-10-15 00:00	2007-11-22 00:00	161.00	301.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	start_flow_period (YYYY-MM-DD hh:mm:ss)	stop_flow_period (YYYY-MM-DD hh:mm:ss)
KFM07C	2007-10-15 00:00	2007-11-22 00:00	302.00	500.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07A	2007-10-15 00:00	2007-11-22 00:00	0.00	148.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07A	2007-10-15 00:00	2007-11-22 00:00	149.00	190.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07A	2007-10-15 00:00	2007-11-22 00:00	191.00	225.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07A	2007-10-15 00:00	2007-11-22 00:00	226.00	961.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07A	2007-10-15 00:00	2007-11-22 00:00	962.00	972.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM07A	2007-10-15 00:00	2007-11-22 00:00	973.00	1001.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM01	2007-10-15 00:00	2007-11-22 00:00	0.00	32.50		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM01	2007-10-15 00:00	2007-11-22 00:00	33.50	45.50		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM01	2007-10-15 00:00	2007-11-22 00:00	46.50	200.20		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM25	2007-10-15 00:00	2007-11-22 00:00	0.00	188.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM20	2007-10-15 00:00	2007-11-22 00:00	0.00	48.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM20	2007-10-15 00:00	2007-11-22 00:00	49.00	100.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM20	2007-10-15 00:00	2007-11-22 00:00	101.00	130.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM20	2007-10-15 00:00	2007-11-22 00:00	131.00	301.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01B	2007-10-15 00:00	2007-11-22 00:00	0.00	100.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01B	2007-10-15 00:00	2007-11-22 00:00	101.00	141.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01B	2007-10-15 00:00	2007-11-22 00:00	142.00	500.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01A	2007-10-15 00:00	2007-11-22 00:00	0.00	108.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01A	2007-10-15 00:00	2007-11-22 00:00	109.00	130.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01A	2007-10-15 00:00	2007-11-22 00:00	131.00	204.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01A	2007-10-15 00:00	2007-11-22 00:00	205.00	373.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	start_flow_period (YYYY-MM-DD hh:mm:ss)	stop_flow_period (YYYY-MM-DD hh:mm:ss)
KFM01A	2007-10-15 00:00	2007-11-22 00:00	374.00	430.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01A	2007-10-15 00:00	2007-11-22 00:00	431.00	1001.49		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01C	2007-10-15 00:00	2007-11-22 00:00	0.00	58.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01C	2007-10-15 00:00	2007-11-22 00:00	59.00	237.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM01C	2007-10-15 00:00	2007-11-22 00:00	238.00	450.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM27	2007-10-15 00:00	2007-11-22 00:00	0.00	24.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM27	2007-10-15 00:00	2007-11-22 00:00	25.00	45.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM27	2007-10-15 00:00	2007-11-22 00:00	46.00	58.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM27	2007-10-15 00:00	2007-11-22 00:00	59.00	128.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM03	2007-10-15 00:00	2007-11-22 00:00	0.00	18.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM03	2007-10-15 00:00	2007-11-22 00:00	19.00	26.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM02	2007-10-15 00:00	2007-11-22 00:00	0.00	37.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM02	2007-10-15 00:00	2007-11-22 00:00	38.00	48.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM02	2007-10-15 00:00	2007-11-22 00:00	49.00	100.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM05A	2007-10-15 00:00	2007-11-22 00:00	0.00	114.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM05A	2007-10-15 00:00	2007-11-22 00:00	115.00	253.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM05A	2007-10-15 00:00	2007-11-22 00:00	254.00	272.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM05A	2007-10-15 00:00	2007-11-22 00:00	273.00	489.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM05A	2007-10-15 00:00	2007-11-22 00:00	490.00	698.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM05A	2007-10-15 00:00	2007-11-22 00:00	699.00	1002.44		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM14	2007-10-15 00:00	2007-11-22 00:00	0.00	150.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_type	formation_type	start_flow_period (YYYY-MM-DD hh:mm:ss)	stop_flow_period (YYYY-MM-DD hh:mm:ss)
HFM15	2007-10-15 00:00	2007-11-22 00:00	0.00	84.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM15	2007-10-15 00:00	2007-11-22 00:00	85.00	95.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM15	2007-10-15 00:00	2007-11-22 00:00	96.00	100.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM09B	2007-10-15 00:00	2007-11-22 00:00	0.00	200.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM09B	2007-10-15 00:00	2007-11-22 00:00	201.00	450.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM09B	2007-10-15 00:00	2007-11-22 00:00	451.00	616.45		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM09A	2007-10-15 00:00	2007-11-22 00:00	0.00	300.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM09A	2007-10-15 00:00	2007-11-22 00:00	301.00	550.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
KFM09A	2007-10-15 00:00	2007-11-22 00:00	551.00	799.67		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM19	2007-10-15 00:00	2007-11-22 00:00	0.00	103.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM19	2007-10-15 00:00	2007-11-22 00:00	104.00	167.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM19	2007-10-15 00:00	2007-11-22 00:00	168.00	182.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM17	2007-10-15 00:00	2007-11-22 00:00	0.00	211.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM28	2007-10-15 00:00	2007-11-22 00:00	0.00	151.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17
HFM23	2007-10-15 00:00	2007-11-22 00:00	0.00	212.00		2	1	2007-11-01 09:44:03	2007-11-15 10:00:17

cont.

test_borehole	(m) test_secup	(m) test_seclow	(m) lp	(m) radial_distance_rs	(m) shortest_distance_rt	(s) time_lag_press_dtl	(m) initial_head_hi	(m) head_at_flow_end_hp	(m) final_head_hf	(kPa) initial_press_pi	(kPa) press_at_flow_end_pp	(kPa) final_press_pf
HFM33	0.00	140.00	65.00	268.10			-3.00	-2.95	-2.98			
HFM33	0.00	140.00	245.50	361.70			-1.68	-1.57	-1.66			
HFM33	0.00	140.00	403.00	489.20			-2.97	-2.96	-3.02			
HFM33	0.00	140.00	451.00	531.90			-3.11	-3.10	-3.16			
HFM33	0.00	140.00	573.00	644.60			-5.38	-5.34	-5.41			
HFM33	0.00	140.00	700.00	766.30			-6.65	-6.63	-6.69			
HFM33	0.00	140.00	780.50	844.60			-3.31	-3.32	-3.38			
HFM33	0.00	140.00	10.50	470.10			-0.73	-0.65	-0.76			
HFM33	0.00	140.00	56.00	485.90			-3.04	-2.94	-3.06			
HFM33	0.00	140.00	143.00	529.70								
HFM33	0.00	140.00	27.25	532.80						326.24	327.13	326.69
HFM33	0.00	140.00	53.40	535.60						244.08	245.76	245.49
HFM33	0.00	140.00	16.50	600.70			-0.43	-0.33	-0.45			
HFM33	0.00	140.00	92.00	636.90			-5.56	-5.42	-5.55			
HFM33	0.00	140.00	166.00	685.60			-5.51	-5.36	-5.49			
HFM33	0.00	140.00	191.50	703.90			-5.41	-5.26	-5.39			
HFM33	0.00	140.00	12.00	906.00		34557.00	-0.04	-0.24	-0.07			
HFM33	0.00	140.00	29.00	895.20		4627.00	0.03	-0.49	0.00			
HFM33	0.00	140.00	188.00	799.90			-0.23	-0.10	-0.14			
HFM33	0.00	140.00	40.12	1009.90						841.91	843.63	842.92
HFM33	0.00	140.00	99.50	1063.20						333.42	330.32	330.18

test_borehole	(m) test_secup	(m) test_seclow	(m) lp	(m) radial_distance_rs	(m) shortest_distance_rt	(s) time_lag_press_dtl	(m) initial_head_hi	(m) head_at_flow_end_hp	(m) final_head_hf	(kPa) initial_press_pi	(kPa) press_at_flow_end_pp	(kPa) final_press_pf
HFM33	0.00	140.00	127.50	1065.70						527.32	526.41	526.42
HFM33	0.00	140.00	153.60	1068.60						310.87	307.38	307.35
HFM33	0.00	140.00	72.50	1061.80		17157.00	0.03	-0.17	0.07			
HFM33	0.00	140.00	228.00	992.60			0.02	0.08	-0.02			
HFM33	0.00	140.00	460.50	914.70			0.07	0.05	-0.01			
HFM33	0.00	140.00	685.50	884.30			0.13	0.11	0.05			
HFM33	0.00	140.00	855.50	894.30			0.02	0.16	0.16			
HFM33	0.00	140.00	80.00	1050.00		20757.00	0.16	-0.09	0.27			
HFM33	0.00	140.00	245.50	981.20			-0.06	-0.06	-0.13			
HFM33	0.00	140.00	495.00	922.60			-0.51	-0.78	-0.72			
HFM33	0.00	140.00	670.00	915.30			-0.04	-0.09	-0.07			
HFM33	0.00	140.00	752.50	922.70			-0.12	-0.18	-0.19			
HFM33	0.00	140.00	830.00	935.60			-1.72	-1.80	-1.81			
HFM33	0.00	140.00	893.00	950.10			-2.03	-2.08	-2.11			
HFM33	0.00	140.00	62.00	1059.30								
HFM33	0.00	140.00	80.50	1095.90			-0.11	-0.01	-0.05			
HFM33	0.00	140.00	188.50	1114.90			0.23	0.26	0.22			
HFM33	0.00	140.00	240.00	1126.80			0.39	0.42	0.38			
HFM33	0.00	140.00	272.50	1135.30			-0.61	-0.59	-0.63			
HFM33	0.00	140.00	377.00	1167.60			-0.64	-0.65	-0.68			
HFM33	0.00	140.00	488.50	1209.40			-0.63	-0.57	-0.60			
HFM33	0.00	140.00	593.50	1252.60			-5.63	-2.77	-2.11			
HFM33	0.00	140.00	689.00	1294.40			0.01	0.15	0.14			
HFM33	0.00	140.00	848.00	1366.40			0.24	0.41	0.41			

test_borehole	test_secup (m)	test_seclow (m)	lp (m)	radial_distance_rs (m)	shortest_distance_rt (m)	time_lag_press_dtl (s)	initial_head_hi (m)	head_at_flow_end_hp (m)	final_head_hf (m)	initial_press_pi (kPa)	press_at_flow_end_pp (kPa)	final_press_pf (kPa)
HFM33	0.00	140.00	26.00	1122.10		24357.00	0.04	-0.06	0.10			
HFM33	0.00	140.00	92.00	1149.50			-0.02	0.04	0.07			
HFM33	0.00	140.00	174.00	1188.20			0.40	0.43	0.40			
HFM33	0.00	140.00	144.00	1246.90		33957.00	-0.04	-0.31	0.10			
HFM33	0.00	140.00	214.00	1201.40		40557.00	-0.04	-0.31	0.08			
HFM33	0.00	140.00	316.00	1175.30		52557.00	-0.14	-0.58	-0.08			
HFM33	0.00	140.00	395.00	1163.80		20757.00	-0.22	-0.93	-0.15			
HFM33	0.00	140.00	422.00	1161.70		33357.00	0.00	-0.68	0.04			
HFM33	0.00	140.00	536.00	1163.60		22857.00	0.06	-0.99	0.03			
HFM33	0.00	140.00	593.00	1172.10		19857.00	-0.39	-0.98	-0.58			
HFM33	0.00	140.00	658.00	1187.10		24657.00	0.22	-0.30	0.05			
HFM33	0.00	140.00	770.00	1223.90			-0.31	-0.48	-0.45			
HFM33	0.00	140.00	927.00	1296.30			0.09	0.14	0.13			
HFM33	0.00	140.00	130.00	1249.50		33957.00	0.12	-0.18	0.22			
HFM33	0.00	140.00	215.00	1223.50		34557.00	-0.05	-0.31	0.06			
HFM33	0.00	140.00	267.00	1208.90		36357.00	0.25	0.05	0.37			
HFM33	0.00	140.00	357.00	1186.90		47757.00	0.03	-0.37	0.02			
HFM33	0.00	140.00	392.00	1179.70		58557.00	-0.26	-0.64	-0.27			
HFM33	0.00	140.00	743.00	1138.30			-0.72	-0.80	-0.75			
HFM33	0.00	140.00	775.00	1137.70			-0.26	-0.33	-0.30			
HFM33	0.00	140.00	913.00	1140.00			-0.42	-0.42	-0.38			
HFM33	0.00	140.00	14.50	1406.50						1077.48	1078.51	1077.86
HFM33	0.00	140.00	11.00	1296.30			0.53	0.74	0.76			

test_borehole	(m) test_secup	(m) test_seclow	(m) lp	(m) radial_distance_rs	(m) shortest_distance_rt	(s) time_lag_press_dtl	(m) initial_head_hi	(m) head_at_flow_end_hp	(m) final_head_hf	(kPa) initial_press_pi	(kPa) press_at_flow_end_pp	(kPa) final_press_pf
HFM33	0.00	140.00	45.00	1291.70			0.51	0.61	0.67			
HFM33	0.00	140.00	56.00	1290.30			0.53	0.62	0.68			
HFM33	0.00	140.00	41.00	1308.10			0.47	0.57	0.63			
HFM33	0.00	140.00	58.00	1307.70			0.51	0.60	0.66			
HFM33	0.00	140.00	69.00	1307.90			0.48	0.57	0.57			
HFM33	0.00	140.00	123.00	1566.40		26157.00	-0.25	-0.49	-0.08			
HFM33	0.00	140.00	163.00	1543.60		29757.00	-0.33	-0.47	-0.22			
HFM33	0.00	140.00	303.00	1466.50			-1.14	-0.86	-0.87			
HFM33	0.00	140.00	316.00	1459.40			-1.21	-0.94	-0.94			
HFM33	0.00	140.00	370.00	1430.50			-1.30	-1.01	-0.98			
HFM33	0.00	140.00	434.00	1397.60			-1.25	-0.95	-0.92			
HFM33	0.00	140.00	564.00	1335.00			-0.66	-0.64	-0.65			
HFM33	0.00	140.00	20.00	1385.30			0.28	0.34	0.44			
HFM33	0.00	140.00	27.00	1382.00		64557.00	0.32	0.33	0.48			
HFM33	0.00	140.00	98.00	1354.20		20757.00	0.40	0.19	0.54			
HFM33	0.00	140.00	160.00	1340.40		20757.00	0.26	0.02	0.42			
HFM33	0.00	140.00	70.00	1417.20			0.16	0.16	0.16			
HFM33	0.00	140.00	138.00	1413.20		24357.00	0.20	0.00	0.36			
HFM33	0.00	140.00	236.00	1413.20		20757.00	-0.12	-0.31	0.05			
HFM33	0.00	140.00	98.00	1422.70		33357.00	0.27	0.08	0.43			
HFM33	0.00	140.00	157.00	1424.70		20757.00	0.00	-0.24	0.16			
HFM33	0.00	140.00	194.00	1427.10		29757.00	-0.14	-0.21	0.01			
HFM33	0.00	140.00	401.00	1457.60			0.48	0.48	0.48			

test_borehole	test_secup (m)	test_seclow (m)	lp (m)	radial_distance_rs (m)	shortest_distance_rt (m)	time_lag_press_dtl (s)	initial_head_hi (m)	head_at_flow_end_hp (m)	final_head_hf (m)	initial_press_pi (kPa)	press_at_flow_end_pp (kPa)	final_press_pf (kPa)
HFM33	0.00	140.00	137.00	1484.20		31557.00	0.12	-0.07	0.27			
HFM33	0.00	140.00	178.00	1503.10		26157.00	-0.21	-0.40	-0.05			
HFM33	0.00	140.00	208.00	1517.40			-0.69	-0.66	-0.54			
HFM33	0.00	140.00	261.00	1543.70			-0.88	-0.79	-0.70			
HFM33	0.00	140.00	967.00	1969.40			-4.39	-4.36	-4.46			
HFM33	0.00	140.00	987.00	1982.40			-4.26	-4.24	-4.30			
HFM33	0.00	140.00	16.00	1543.50		42357.00	0.25	0.15	0.47			
HFM33	0.00	140.00	39.00	1538.20		24357.00	0.26	0.13	0.46			
HFM33	0.00	140.00	64.00	1533.00		17157.00	0.23	0.01	0.41			
HFM33	0.00	140.00	99.00	1693.50			0.17	0.41	0.37			
HFM33	0.00	140.00	25.00	1602.50			0.57	0.77	0.87			
HFM33	0.00	140.00	77.00	1599.10		51957.00	0.60	0.55	0.80			
HFM33	0.00	140.00	118.00	1598.70		33957.00	0.62	0.48	0.79			
HFM33	0.00	140.00	215.00	1606.10		45357.00	0.71	0.53	0.86			
HFM33	0.00	140.00	54.00	1653.00		26157.00	0.30	0.79	1.07			
HFM33	0.00	140.00	121.00	1659.20		20757.00	0.08	-0.05	0.28			
HFM33	0.00	140.00	321.00	1697.70		26157.00	0.10	-0.08	0.30			
HFM33	0.00	140.00	105.00	1648.10			-1.24	-0.95	-0.80			
HFM33	0.00	140.00	118.00	1648.00		64557.00	-0.09	-0.24	0.11			
HFM33	0.00	140.00	148.00	1648.10		24357.00	-0.05	-0.23	0.14			
HFM33	0.00	140.00	285.00	1655.30			0.04	0.00	-0.01			
HFM33	0.00	140.00	402.00	1669.40			0.93	0.95	0.92			

test_borehole	test_secup (m)	test_seclow (m)	lp (m)	radial_distance_rs (m)	shortest_distance_rt (m)	time_lag_press_dtl (s)	initial_head_hi (m)	head_at_flow_end_hp (m)	final_head_hf (m)	initial_press_pi (kPa)	press_at_flow_end_pp (kPa)	final_press_pf (kPa)
HFM33	0.00	140.00	715.00	1745.30			5.70	5.99	6.05			
HFM33	0.00	140.00	38.00	1671.30		27957.00	-0.01	-0.10	0.21			
HFM33	0.00	140.00	85.00	1693.10		26157.00	-0.07	-0.19	0.13			
HFM33	0.00	140.00	436.00	1886.90			-0.76	-0.65	-0.64			
HFM33	0.00	140.00	20.00	1668.90		29757.00	0.36	0.31	0.59			
HFM33	0.00	140.00	28.00	1666.80		24357.00	0.34	0.24	0.54			
HFM33	0.00	140.00	54.00	1660.40		22557.00	0.25	0.13	0.45			
HFM33	0.00	140.00	119.00	1647.90		47757.00	0.31	0.21	0.51			
HFM33	0.00	140.00	15.00	1661.50		39357.00	0.34	0.30	0.59			
HFM33	0.00	140.00	21.00	1661.30		26157.00	0.37	0.29	0.59			
HFM33	0.00	140.00	31.00	1660.80		30357.00	0.28	0.16	0.48			
HFM33	0.00	140.00	43.00	1659.70		26157.00	0.34	0.21	0.54			
HFM33	0.00	140.00	74.00	1657.40		29757.00	0.36	0.27	0.58			
HFM33	0.00	140.00	109.00	1688.20		54357.00	0.32	0.37	0.51			
HFM33	0.00	140.00	145.00	1682.00		51357.00	0.16	0.23	0.35			
HFM33	0.00	140.00	256.00	1667.60			-0.27	-0.14	-0.13			
HFM33	0.00	140.00	292.00	1664.50			2.84	2.86	2.82			
HFM33	0.00	140.00	594.00	1680.70			1.61	1.70	1.69			
HFM33	0.00	140.00	850.00	1757.70			0.49	0.50	0.49			
HFM33	0.00	140.00	20.00	1728.80		44157.00	0.35	0.44	0.58			
HFM33	0.00	140.00	50.00	1720.20		27357.00	0.47	0.56	0.70			

test_borehole	(m) test_secup	(m) test_seclow	(m) lp	(m) radial_distance_rs	(m) shortest_distance_rt	(s) time_lag_press_dtl	(m) initial_head_hi	(m) head_at_flow_end_hp	(m) final_head_hf	(kPa) initial_press_pi	(kPa) press_at_flow_end_pp	(kPa) final_press_pf
HFM33	0.00	140.00	89.00	1711.40		33957.00	0.48	0.53	0.68			
HFM33	0.00	140.00	98.00	1709.80								
HFM33	0.00	140.00	46.00	1751.90			-0.23	-0.19	-0.01			
HFM33	0.00	140.00	254.00	1736.80		90957.00	-0.11	-0.20	0.04			
HFM33	0.00	140.00	564.00	1766.50			-0.40	-0.29	-0.26			
HFM33	0.00	140.00	160.00	1818.20			1.28	1.62	1.63			
HFM33	0.00	140.00	436.00	1977.30			1.03	1.07	1.08			
HFM33	0.00	140.00	685.00	2167.30			-3.03	-2.99	-2.99			
HFM33	0.00	140.00	101.00	1826.40		32757.00	0.65	0.70	0.87			
HFM33	0.00	140.00	150.00	1833.80		36957.00	0.55	0.58	0.76			
HFM33	0.00	140.00	176.00	1838.40		27957.00	0.01	0.03	0.22			
HFM33	0.00	140.00	31.00	1885.20			-	-	-			
HFM33	0.00	140.00	82.00	1817.80			1.43	1.76	1.76			
HFM33	0.00	140.00	30.00	1822.00			1.20	1.52	1.51			

cont.

fluid_temp_teo (oC)	fluid_elcond_eco (mS/m)	fluid_salinity_tdso (mg/l)	fluid_salinity_tdsom (mg/l)	drawdown_sp (m)	reference	comment
						dtl is for 0.01 m change
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(oC)	(mS/m)	(mg/l)	(mg/l)	(m)		
fluid_temp_teo	**fluid_elcond_eco**	**fluid_salinity_tdso**	**fluid_salinity_tdsom**	**drawdown_sp**	**reference**	**comment**
						dtl is for 0.01 m change
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						dtl is for 0.01 m change
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(oC)	(mS/m)	(mg/l)	(mg/l)	(m)		
fluid_temp_teo	**fluid_elcond_eco**	**fluid_salinity_tdso**	**fluid_salinity_tdsom**	**drawdown_sp**	**reference**	**comment**
						dtl is for 0.01 m change
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fluid_temp_teo (oC)	fluid_elcond_eco (mS/m)	fluid_salinity_tdso (mg/l)	fluid_salinity_tdsom (mg/l)	drawdown_sp (m)	reference	comment
						dtl is for 0.01 m change
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(oC)	(mS/m)	(mg/l)	(mg/l)	(m)		
fluid_temp_teo	**fluid_elcond_eco**	**fluid_salinity_tdso**	**fluid_salinity_tdsom**	**drawdown_sp**	**reference**	**comment**
						dtl is for 0.01 m change
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(oC)	(mS/m)	(mg/l)	(mg/l)	(m)		
fluid_temp_teo	**fluid_elcond_eco**	**fluid_salinity_tdso**	**fluid_salinity_tdsom**	**drawdown_sp**	**reference**	**comment**
						dtl is for 0.01 m change
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(oC)	(mS/m)	(mg/l)	(mg/l)	(m)		
fluid_temp_teo	**fluid_elcond_eco**	**fluid_salinity_tdso**	**fluid_salinity_tdsom**	**drawdown_sp**	**reference**	**comment**
						dtl is for 0.01 m change
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Sicada - description of plu_inf_test_obs_d

PLU interference tests, Observation section data

Sicada Header	Header	Unit	Explanation
idcode	ID Obs Borehole		ID for observation borehole
secup	Borehole secup	(m)	Length coordinate along the borehole for the upper limit of observation section
seclow	Borehole seclow	(m)	Length coordinate along the borehole for the lower limit of observation section
start_date	Date for test start	YYYY-M M-DD hh:mm	Date for the start of the pumping/injection test (YYYY-MM-DD hh:mm)
stop_date	Date for test stop	YYYY-M M-DD hh:mm	Date for the stop of the pumping/injection test (YYYY-MM-DD hh:mm)
test_type	Test type (1- 7)	(-)	1A:Pumping test-wireline eq.,1B: Pumping test-submersible pump, 1C: Pumping test-airlift pumping. 2: Interference test.3: Injection test. 4: Slug test., 4B: Pulse test. 5A: Flowlogging-PFL-DIFF_sequential. 5B Flowlogging-PFL-DIFF_overlapping. 6: Flowlogging Impeller. 7: Grain size analysis
test_borehole	ID. pumped Borehole	(-)	ID for pumped or injected borehole
test_secup	Test secup	(m)	Length coordinate along the borehole for the upper limit of pumped or injected section
test_seclow	Test seclow	(m)	Length coordinate along the borehole for the lower limit of pumped or injected section
start_flow_period	Start flow	YYYY-MM-DD hh:mm:ss	Time for the start of the pumping/injection period (YYYY-MM-DD hh:mm:ss)
stop_flow_period	Stop flow	YYYY-MM-DD hh:mm:ss	Time for the stop of the pumping/injection period (YYYY-MM-DD hh:mm:ss)
lp	Lp	(m)	Hydraulic point of application for a test section, based on the geometric midpoint of test section or the main point of transmissivity distribution in test section
radial_distance_rs	rs	(m)	Geometrical distance from point of application in test section to point of application in observation section.
shortest_distance_rt	rt	(m)	Representative hydraulic distance from point of application in test section to point of application in observation section via inferred major conductive features. The actual structural model version shall be reported.
time_lag_press_dtl	dtL	(s)	Time lag for pressure response to reach observation section after start/stop of pumping or injection, based on the first significant response in the observation section.
initial_head_hi	hi	(m)	Hydraulic head in observation section at start of flow period
head_at_flow_end_hp	hp	(m)	Hydraulic head in observation section at stop of flow period
final_head_hf	hF	(m)	Hydraulic head in observation section at stop of recovery period

Sicada Header	Header	Unit	Explanation
initial_press_pi	pi	(kPa)	Groundwater pressure in observation section at start of flow period
press_at_flow_end_pp	pp	(kPa)	Groundwater pressure in observation section at stop of flow period
final_press_pf	pF	(kPa)	Groundwater pressure in observation section at stop of recovery period
fluid_temp_teo	Teo	(Co)	Measured borehole fluid temperature in the observation section (representative for evaluated parameters)
fluid_elcond_eco	ECo	(mS/m)	Measured electric conductivity of the borehole fluid in the observation section (representative for evaluated parameters)
fluid_salinity_tdso	TDSo	(mg/L)	Calculated total dissolved solids of the borehole fluid in the observation section, based on EC-measurement
fluid_salinity_tdso	TDSom	(mg/L)	Measured total dissolved solids of the borehole fluid in the observation section, based on water sampling and chemical analysis
reference	References		SKB report No for reports describing data and evaluation
comment	Comments		Short comment to the evaluated parameters (Optional)

Index o Observation borehole or observation section (o short for observation)

plu_inf_test_obs_ed

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	test_borehole	test_secup (m)	test_seclow (m)
KFM06A	2007-10-15 00:00	2007-11-22 00:00	341.00	362.00		HFM33	0.00	140.00
KFM01D	2007-10-15 00:00	2007-11-22 00:00	0.00	153.00		HFM33	0.00	140.00
HFM21	2007-10-15 00:00	2007-11-22 00:00	107.00	202.00		HFM33	0.00	140.00
HFM01	2007-10-15 00:00	2007-11-22 00:00	46.00	200.00		HFM33	0.00	140.00

cont.

formation_width_b (m)	lp (m)	width_of_channel_b (m)	tbo (m**3/s)	l_measl_tbo (m**3/s)	u_measl_tbo (m**3/s)	sbo (m)	leakage_factor_lof (m)	transmissivity_to (m**2/s)
21.00	357.00							4.20E-04
63.50	123.00							2.20E-04
95.00	160.00							3.60E-04
154.00	64.00							7.00E-05

cont.

value_type_to	l_measl_to (m**2/s)	u_measl_to (m**2/s)	storativity_so	leakage_coeff_o (1/s)	hydr_cond_kosf (m/s)	l_measl_kosf (m/s)	u_measl_kosf (m/s)	spec_storage_sosf (1/m)	dt1 (s)	dt2 (s)	t1 (s)	t2 (s)
			1.70E-04	5.10E-10								
			3.90E-05	2.90E-10								
			5.80E-05	3.80E-10								
			2.40E-05	2.70E-10								

cont.

(s) dte1	(s) dte2	(m**2/s) index_1	(s/m**2) index_2	(s/m**2) index_2_new	(m**2/s) diffusivity	(m**2/s) transmissivity_to_nlr	value_type_to_nlr	storativity_so_nlr	(m**2/s) transmissivity_to_grf	value_type_to_grf	storativity_so_grf	flow_dim_grf_o	comments
		29.50	102.28	724.08	2.47E+00								
		93.80	61.30	450.93	5.64E+00								
		86.56	60.32	434.34	6.21E+00								
		136.98	58.70	430.57	2.92E+00								

Sicada - description of plu_inf_test_obs_ed

PLU interference test, evaluated data of observation sections

Sicada Header	Header	Unit	Explanation
idcode	ID Obs. Borehole		ID for obsevation borehole
secup	Borehole secup	m	Length coordinate along the borehole for the upper limit of the observation section
seclow	Borehole seclow	(m)	Length coordinate along the borehole for the lower limit of the observation section
start_date	Date for test start	YYYY-MM-DD hh:mm	Date for the start of the interference test (YYYY-MM-DD hh:mm)
stop_date	Date for test stop	YYYY-MM-DD hh:mm	Date for the stop of the interference test (YYYY-MM-DD hh:mm)
test_borehole	ID- Pumped borehole	(-)	ID for pumped or injected borehole
test_secup		(m)	Length coordinate along the borehole for the upper limit of pumped or injected section
test_seclow		(m)	Length coordinate along the borehole for the lower limit of pumped or injected section
formation_width_b	b	m	b:Representative aquifer thickness for inferred transmissivity, generally estimated as observation section length L_o
width_of_channel_b	B	m	B:Inferred width of formation for evaluated TB
lp	L_p		Hydraulic point of application for a test section, based on the geometric midpoint of test section or the main point of transmissivity distribution in test section
tbo	TB_o	m^3/s	Flow capacity in 1D formation of width B and transmissivity T based on transient evaluation in observation section. Considered best estimate from transient evaluation of flow period or recovery period.
l_meas_limit_tbo	TB-measl-L	m^3/s	Estimated lower measurement limit for evaluated TB in observation section.
u_meas_limit_tbo	TB-measl-U	m^3/s	Estimated upper measurement limit for evaluated TB in observation section.
sbo	SB_o	m	SB_o: Storage capacity of 1D formation of width B and storativity S based on transient evaluation in observation section. Considered best estimate from transient evaluation of flow period or recovery period.
leakage_factor_lof	L_{of}	m	Leakage coefficient in observation section evaluated from 2D radial flow model. K´ = hydraulic conductivity across the aquitard, b´ = water saturated thickness of aquitard (leaky formation). Considered best estimate from transient evaluation of flow period or recovery period.
transmissivity_to	T_o	m^2/s	Transmissivity of formation in observation section, based on 2D radial flow model. Considered best estimate from transient evaluation of flow period or recovery period.
l_measl_to	$T_{o\text{-}measl\text{-}L}$	m^2/s	Estimated lower measurement limit for evaluated T_o in observation section
u_measl_to	$T_{o\text{-}measl\text{-}U}$	m^2/s	Estimated upper measurement limit for evaluated T_o in observation section
storativity_so	S_o	(-)	Storativity (Storage coefficient) of formation in observation section based on 2D radial flow model. Considered best estimate from transient evaluation of flow period or recovery period.

Sicada Header	Header	Unit	Explanation
leakage_coeff_o	$(K'/b')_o$	(l/s)	Leakage coefficient in observation section evaluated from 2D radial flow model. K´ = hydraulic conductivity across the aquitard, b´ = water saturated thickness of aquitard (leaky formation). Considered best estimate from transient evaluation of flow period or recovery period.
hydr_kond_kosf	K_{osf}	m/s	Hydraulic conductivity of formation in observation section, based on 3D spherical flow model. Considered best estimate from transient evaluation of flow period or recovery period.
l_measl_kosf	$K_{osf\text{-}measl\text{-}L}$	m/s	Estimated lower measurement limit for evaluated K_{osf} in observation section.
u_measl_kosf	$K_{osf\text{-}measl\text{-}U}$	m/s	Estimated upper measurement limit for evaluated K_{osf} in observation section.
spec_storage_sosf	S_{osf}	1/m	Specific Storage of formation in observation section, based on 3D spherical flow. Considered best estimate from transient evaluation of flow period or recovery period.
dt1	dt_1	s	Estimated start time after pump/injection start or recovery start, for the period used for the evaluated parameter
dt2	dt_2	s	Estimated stop time after pump/injection start or recovery start, for the period used for the evaluated parameter
t1	t_1	s	Start time for evaluated parameter from start of flow period.
t2	t_2	s	Stop time for evaluated parameter from start of flow period.
dte1	dt_{e1}	s	Start time for evaluated parameter from start of recovery period.
dte2	dt_{e2}	s	Stop time for evaluated parameter from start of recovery period.
transmissivity_to_nlr	T_{oNLR}	m^2/s	Transmissivity in observation section, based on Non Linear Regression of the entire test sequence.
storativity_so_nlr	S_{oNLR}	(-)	Storativity in observation section, based on Non Linear Regression of the entire test sequence.
transmissivity_to_grf	T_{oGRF}	m^2/s	Transmissivity in observation section, based on the Generalised Radial Flow model (Baker, 1988). Considered best estimate from transient evaluation of flow period or recovery period.
storativity_so_grf	S_{oGRF}	(-)	Storativity in observation section, based on Generalised Radial Flow model. Considered best estimate from transient evaluation of flow period or recovery period.
flow_dim_grf_o	D_{oGRF}	(-)	Inferred flow dimension in observation section, based on the Generalised Radial Flow model (Barker, 1988). Considered best estimate from transient evaluation of flow period or recovery period.
Comments	Comments		Short comment to the evaluated parameters (Optional)