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Hydrochemical groundwater monitoring

Results from water sampling in the Forsmark area 2017–2019

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Key words: Water sampling series, Chemical analyses, Percussion boreholes, Core drilled boreholes, Circulation section.

This report concerns a study which was conducted for Svensk Kärnbränslehantering AB (SKB). The conclusions and viewpoints presented in the report are those of the author. SKB may draw modified conclusions, based on additional literature sources and/or expert opinions.

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Summary

The present report documents the hydrochemical monitoring of deep groundwaters in the Forsmark area including the Spent Nuclear Fuel Repository Project as well as the SFR Extension Project. The sampling includes a varying number out of the 41 borehole sections within the monitoring program, 15 sections in 2017, 37 sections in 2018 and 40 sections in 2019.

Sampling was conducted in series of three samples collected on three different occasions during continuous pumping i.e. varying the purged volume prior to sampling. In 2017 an additional sample was taken in several sections. All standpipes connected to the sections were, with a few (recorded) exceptions, cleaned before sampling.

Many different parameters were analysed during the sampling in 2017–2019. Measured values for a big group of major and minor constituents as well as trace elements and isotopes are presented in the appendices. The relative charge balance is within the acceptable limits for most samples, with some few exceptions. As observed in previous sampling campaigns high pH values were also recorded in some of the monitored boreholes sections in 2017–2019. Especially in 2019 there are several samples with pH values above 10. The agreement between pH and electrical conductivity measured in the field and in the lab are in general good. According to the chloride concentrations, the groundwater composition in the sampled sections is generally stable from year to year and no significant changes occur.

The focus on pH stabilization in 2017 gave no clear conclusion, but in 2018 and 2019 the pumping volumes were adjusted and increased to volumes larger than plug-flow volumes, in additional sections compared to before 2017.

Sammanfattning

Denna rapport dokumenterar hydrokemisk övervakning av djupt grundvatten inom Forsmarksområdet där Projekt Kärnbränsleförvaret samt Projekt SFR-Utbyggnad ingår. Provtagningen inkluderar ett varierande antal av de 41 borrhålssektionerna inom övervakningsprogrammet; 15 sektioner 2017, 37 sektioner 2018 samt 40 sektioner 2019.

Provtagningen gjordes i serier med 3 prov, tagna vid tre olika tillfällen under tiden som kontinuerlig pumpning pågick d.v.s. de omsatta volymerna innan provuttaget varierades. Under 2017 togs ett extra prov i flertalet sektioner. Med några få dokumenterade undantag spolades alla vattenståndsror, som är kopplade till sektionerna, innan provtagningen.

Många olika parametrar analyserades under provtagning 2017–2019. Uppmätta värden för huvudsakliga ämnen, ämnen av mindre betydelse, spårämnen och isotoper presenteras i rapportens appendix. Den relativa laddningsbalansen ligger med några få undantag inom acceptabla gränser för de flesta prov. Som observerats under tidigare mätkampanjer förekommer höga uppmätta pH-värden i ett par borrhålssektioner under 2017–2019. Speciellt under 2019 förekom värden högre än pH 10. Överensstämmelsen mellan pH och elektrisk konduktivitet uppmätt i fält och på laboratorium är generellt bra. Med hänsyn till kloridkoncentrationerna är grundvattensammansättningen i de provtagna sektionerna generellt stabila från år till år och inga signifikanta förändringar har observerats.

2017 års extra fokus på pH stabilisering gav inga klara slutsatser, men under 2018 och 2019 justerades och ökades pumpvolymerna i ytterligare ett par sektioner jämfört med innan 2017 till volymer större än pluggflöden.

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1 Introduction

1.1 General

This report includes results from hydrochemical groundwater monitoring in boreholes included in the Spent Nuclear Fuel Repository Project as well as the SFR Extension Project in the Forsmark area during the years of 2017 to 2019. The long-term hydrochemical monitoring programme for percussion-drilled and core-drilled boreholes aims at creating long time series of data that will provide a base-line in order to facilitate evaluation of possible future impacts on the groundwater situation from the construction and the operation of the two facilities. The sizes of natural variations are important information in order to identify possible future changes in water composition. Since the two study sites overlap, each project benefit from the increased amount of information about the hydrochemical conditions.

The controlling documents for the hydrochemical monitoring activities are listed in Table 1-1. Both activity plans and method descriptions are SKB:s internal controlling documents. Original data from the reported activities are stored in the primary database Sicada. Data are traceable in Sicada by the activity plan numbers (AP SFK-17-002, AP SFK-18-021 and AP SFK-19-007). Only data in the database are accepted for further interpretation and modelling. The data presented in this report are regarded as copies of the original data. Data in the database may be revised, if needed. However, such revision of the database will not necessarily result in a revision of this report.

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

Activity plan	Number	Version
Hydrokemisk monitoring i hammar- och kärnborrhål 2017	AP SFK-17-002	1.0
Hydrokemiskt monitoring i hammar- och kärnborrhål 2018	AP SFK-18-021	1.0
Hydrokemiskt övervakningsprogram av hammar- och kärnborrhål 2019	AP SFK 19-007	1.0
Method descriptions	Number	Version
Metodbeskrivning för hydrogeokemisk provtagning i ytborrhål med fasta manschettinstallationer	SKB MD 425.001	2.0
Metodbeskrivning för hydrokemisk provtagning i tunnelborrhål med fasta manschettinstallationer	SKB MD 425.002	1.0
Mätsystembeskrivning (MSB) – Handhavandedel; System för hydrologisk och meteorologisk datainsamling. Vattenprovtagning och utspädningsmätning i observationshål.	SKB MD 368.010	2.0
Provtagning och provhantering	SKBdoc 1063531	3.0, 12.0 and 13.0
Kvalitetsparametrar för kemianalyser – SKB:s kemiklasser, aktuella detektions-, rapporteringsgränser samt mätosäkerheter	SKBdoc 1494275	1.0

The field work was in 2017 entirely planned and performed by SKB. In spring in 2018 field work was planned by SKB and performed mainly by Geosigma. In autumn 2018 and 2019 Geosigma both planned and performed the field campaign, as done earlier before the campaign in 2017. For more detailed information of the division of tasks see Activity plans (AP), in Table 1-1.

1.2 Background

The monitoring program for groundwater has been on-going since 2005 (SKB 2005) and was initiated during the site investigations for a final repository of spent nuclear fuel (SKB 2001) and continued after the completion of the site investigation in 2007. The current monitoring program is developed from the program in R-07-34 (SKB 2007) and since 2012 boreholes drilled during the site investigations for the SFR extension project (SKB 2008) are incorporated in the monitoring program for the Forsmark area. During the years, the program has been modified concerning sampling techniques and analytical protocol. The monitoring history is presented in Appendix 1.

1.3 Boreholes and borehole sections

A total of 41 borehole sections, representing 20 core drilled boreholes and 10 percussion drilled boreholes, are included in the hydrochemical monitoring program of groundwater in the bedrock, Figure 1-1 and Table 1-2. One new section, KFR01:1, was added to the program during 2016.

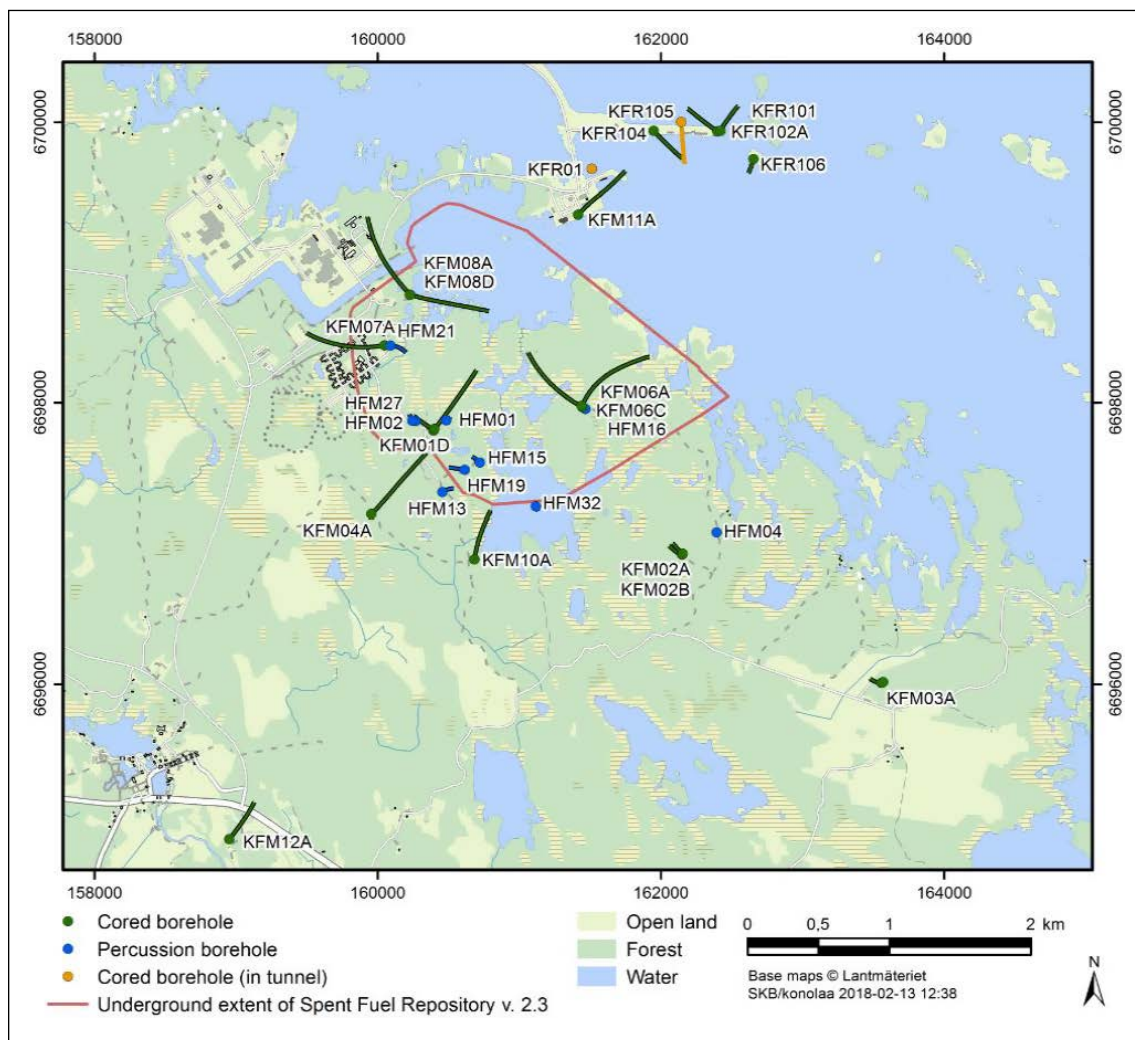


Figure 1-1. General overview of the Forsmark area and the boreholes included in the hydrochemical monitoring program for groundwater. The (telescopic) cored boreholes and the percussion boreholes within the monitoring program are marked with green and blue filled circles, respectively. Tunnel boreholes are marked with orange filled circles.

In order to evaluate the results of groundwater analyses and observed trends in the groundwater chemistry, it is important to have information about previous investigations in each borehole and to understand the implications of these activities on the groundwater chemistry. Investigations likely to affect subsequent water sampling include hydraulic pumping and injection tests, tracer tests, SWIW tests (*Single Well Injection and Withdrawal-tests*) and tracer dilution tests.

In 2018 interference tests (withdrawal-tests) have been performed in five new percussion boreholes (Table 1-2). The concerned boreholes are not included in the monitoring program, but the tests in these boreholes could influence the water or pressure in other boreholes included in the monitoring program. Also the drilling of these boreholes and of HFM47 (Table 1-3) could possibly have an effect on the results in the monitoring program. Other activities in the area during the year 2017–2019 could be found in Sicada.

Table 1-2. Interference tests in 2018

Borehole	Period for pumping
HFM43	2018-06-28 – 2018-07-19
HFM45	2018-08-29 – 2018-09-12
HFM33	2018-09-27 – 2018-10-11
HFM44	2018-10-22 – 2018-11-05
HFM46	2018-11-21 – 2018-12-06

Table 1-3. Drilling of new boreholes in 2018

Borehole	Period for interference test
HFM42 – HFM46	April – May 2018
HFM47	September – October 2018

Early activities in the area for the Spent Nuclear Fuel Repository Project that may have affected, for example, the Uranine or trace metal concentrations are presented in Nilsson (2010). After 2009 Amino-G was used as tracer instead of Uranine for dilution tests, except for in HFM15 and KFM05A where Uranine has been used as a tracer even later on, for example during the dilution tests performed in 2013 (Wass 2015).

In KFM07A no sampling was performed in 2017–2019 due to CCC measurements in 2017 and lifted equipment and re-installation during 2018–2019.

Table 1-4. Boreholes and borehole sections included in the monitoring programme for percussion- and core-drilled boreholes, corresponding transmissivity values and comments to sections and sampling.

Borehole [Idcode: section no.]	Section [mbl] ¹⁾	Elevation secmid [m.b.s.l] ²⁾	Transmissivity [m ² /s]	Comments
KFM01A:5	109.0–130.0	115.6	1.0 E-7 ³⁾	
KFM01D:2	429.0–438.0	343.1	8.0 E-7 ³⁾	7)
KFM01D:4	311.0–321.0	252.5	2.0 E-7 ³⁾	7)
KFM02A:3	490.0–518.0	495.0	2.1 E-6 ³⁾	Section of interest for the Uranium project
KFM02A:5	411.0–442.0	417.8	2.5 E-6 ³⁾	
KFM02B:2	491.0–506.0	483.8	3.0 E-5 ⁴⁾	
KFM02B:4	410.0–431.0	407.1	2.0 E-5 ⁴⁾	
KFM03A:1	969.5–994.5	969.1	5.5 E-7 ³⁾	Suspected leakage to section ²⁾
KFM03A:4	633.5–650.0	631.1	2.4 E-6 ³⁾	Section of interest for the Uranium project
KFM04A:4	230.0–245.0	199.7	2.0 E-5 ³⁾	
KFM06A:3	738.0–748.0	622.8	1.2 E-7 ³⁾	Mixed water, marine/not-marine
KFM06A:5	341.0–362.0	298.5	3.5 E-6 ³⁾	
KFM06C:3	647.0–666.0	527.1	5.3 E-8 ³⁾	
KFM06C:5	531.0–540.0	434.9	1.1 E-6 ³⁾	
KFM07A:2	962.0–972.0	795.6	5.0 E-7 ³⁾	Not sampled 2017–2019 ⁶⁾
KFM08A:2	684.0–694.0	550.6	1.0 E-6 ³⁾	
KFM08A:6	265.0–280.0	127.8	1.0 E-6 ³⁾	
KFM08D:2	825.0–835.0	622.6	2.4 E-8 ³⁾	8)
KFM08D:4	660.0–680.0	538.1	2.0 E-7 ³⁾	8)
KFM10A:2	430.0–440.0	299.8	3.0 E-5 ³⁾	Zone A2
KFM11A:2	690.0–710.0	593.8	1.0 E-6 ³⁾	Section through Singö zone
KFM11A:4	446.0–456.0	389.6	6.0 E-7 ³⁾	Section through Singö zone
KFM12A:3	270.0–280.0	226.7	1.0 E-6 ³⁾	
HFM01:2	33.5–45.5	37.0	4.0 E-5 ⁵⁾	
HFM02:2	38.0–48.0	39.9	5.9 E-4 ⁵⁾	
HFM04:2	57.9–65.9	57.9	7.9 E-5 ⁵⁾	
HFM13:1	159.0–173.0	138.6	2.9 E-4 ⁵⁾	
HFM15:1	85.0–95.0	59.1	1.0 E-4 ⁵⁾	
HFM16:2	54.0–67.0	57.2	3.5 E-4 ⁵⁾	
HFM19:1	168.0–182.0	136.2	2.7 E-4 ⁵⁾	
HFM21:3	22.0–32.0	18.8	4.0 E-5 ⁵⁾	
HFM27:2	46.0–58.0	45.6	4.0 E-5 ⁵⁾	
HFM32:3	26.0–31.0	27.5	2.3 E-4 ⁵⁾	
KFR101:1	279.5–341.8	240.2	5.8 E-6 ³⁾	9)
KFR102A:2	423.0–443.0	389.0	1.6 E-6 ³⁾	
KFR102A:5	214.0–219.0	194.6	3.6 E-7 ³⁾	
KFR104:1	333.0–454.6	306.5	6.5 E-8 ³⁾	9)
KFR105:1	265.0–306.8	153.6	6.1 E-8 ³⁾	Tunnel borehole.
KFR106:1	260.0–300.1	261.0	1.0 E-5 ³⁾	10)
KFR106:2	143.0–259.0	187.2	3.3 E-5 ³⁾	10)
KFR01:1	44.65–62.3	94.3	–	Tunnel borehole

¹⁾ mbl = metres borehole length.

²⁾ m.b.s.l. = metres below sea level [RHB 70 = the national levelling system].

³⁾ From differential flow logging.

⁴⁾ From injection tests.

⁵⁾ From flow logging.

⁶⁾ Due to CCC measurements in 2017 and lifted borehole equipment in 2018–2019.

⁷⁾ Equipment lifted and reinstalled before the sampling in 2016. No changes in equipment.

⁸⁾ Equipment lifted and reinstalled in 2013–2014. PEEK-equipment was installed.

⁹⁾ Section in bottom of borehole. Extremely low salinity. No dummy in section.

¹⁰⁾ Section of interest for the Uranium project. No dummy in section.

2 Equipment

2.1 Installations in a borehole test section with connected standpipe

The monitored boreholes are divided into sections sealed off by inflated rubber packers. The ground-water pressure is measured on-line in standpipes hydraulically connected to each section and transmitted to HMS (*Hydro Monitoring System*), i.e. SKB's hard- and software system for processing and interim storage of hydrological, hydrogeological and meteorological data. Most of the sampled sections are so called circulation sections and are also hydraulically connected to wider standpipes, in which the pump fits. The fixed equipment (packers, tubing, standpipes etc.) remains in the borehole from year to year. An overview of the installation equipment is seen in Figure 2-1.

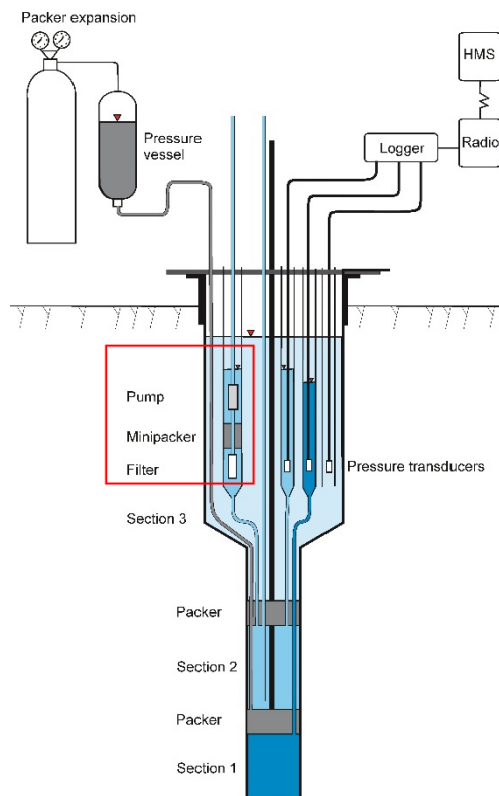


Figure 2-1. Installations in a borehole test section with connected standpipes and monitoring equipment. The installation is permanent in the borehole, except for the pump and filter (marked with the red box), which are used in the standpipe at the pumping/sampling occasions.

2.2 Cleaning equipment for standpipes

The cleaning is conducted using a specially designed nozzle combined with a pressure washer, Figure 2-2. The nozzle is designed to direct the jet in an upward direction in the standpipe in order to flush any flakes out of the standpipe. In order to lift the litter out of the standpipe more efficiently, a tube delivering nitrogen gas was mounted just above the nozzle to achieve a gas-lift pumping effect in the standpipe. A more detailed description of the cleaning equipment can be found in Lindquist et al. (2012).



Figure 2-2. Cleaning equipment used to clean the standpipes prior to pumping and sampling.

2.3 Sampling equipment

Several identical pumping equipment set-ups (GEOPUMP UV45) were used to retrieve the water samples from the sampled sections, Figure 2-3. The sampling equipment is identical to what was used in previous campaigns and is further described in Lindquist et al. (2012). When using this equipment, a mini-packer is expanded in the standpipe above the inlet to the filter and pump so that only water from the section and lowest part of the standpipe is pumped. In some sections, dissolved gas is released as pressure decreases. The gas accumulates under the mini-packer and causes pump stops. To avoid such problems, a special evacuation tube is used, allowing the gas to evacuate.

The equipment in borehole KFM08D has had problems with corrosion during the past years. In 2013 the equipment (packers etc.) was lifted and then reinstalled in 2014. The upper part of the installation was replaced by equipment in the material PEEK. Because of this, no mini-packers are used in the standpipes, instead there are O-ring sealed plugs which were removed during the sampling. To allow pumping directly from the section (and avoid contaminating water from the standpipe) a special docking unit was used, Figure 2-4, similar to the one used in a few sections in 2015 (Lindquist and Ragvald 2015). The unit is working together with the normal pump (GEOPUMP UV45) but instead of expanding the mini-packer in the standpipe, the docking unit docks on and tightens around the top of the tube leading directly to the section (located at the bottom of the standpipe).



Figure 2-3. The pumping equipment (GEOPUMP UV-45) used for pumping in wide standpipes. The equipment consists of a filter and a pump connected to the mini-packer. The small diameter plastic hose is used for expanding the packer and the plastic hose connected to the pump is the pumping hose (enclosed picture right lower corner).



Figure 2-4. The docking unit, which is used together with the pump (GEOPUMP UV-45). Instead of using the mini-packer to isolate the lower part of the standpipe with the pump, the unit is tightly fitted to the tube in the bottom of the standpipe. The photo shows the docking unit used in normally equipped boreholes. The one used in KFM08D is modified to match with the special equipment in PEEK, but is very similar to the one in the photo.

In the borehole sections lacking wide standpipes for sampling, sampling was performed in the standpipes for pressure measurements. Due to the smaller diameter of these standpipes, the sections were pumped using gas-lift pumping (with nitrogen). The function of this pump is briefly described in Lindquist and Nilsson (2013) and the sampling equipment is also further described by Sandström et al. (2011). Figure 2-5 shows a photo of the equipment. The sampling conditions caused by gas-lift pumping are different from the conventional pumping generally used in the hydrogeochemical monitoring programme. The more effective (intermittent) pump action might affect the borehole walls (microbe coating, mineral particles etc.), and thus have an impact on the water composition. Especially, constituents such as hydrogen sulphide, TOC, DOC and trace metals may be affected.

In tunnel boreholes, no pumping equipment is needed due to the pressure gradient. When the valve is opened, water flows out from the section.



Figure 2-5. The equipment used for gas-lift pumping. On the left, the tubing lowered down the standpipe (the more narrow tube for sample water and the wider for gas) on a bobbin to simplify the lowering. To the upper right the control unit for the pumping/gas supply and lower right the end of the gas-lift pump.

3 Performance

3.1 General

The sampling includes a varying number out of the 41 borehole sections within the monitoring program, 15 sections in 2017, 37 sections in 2018 and 40 sections in 2019. Monitored boreholes each year, borehole sections and pumping technique at each sampling location are presented in Table 3-1.

Table 3-1. Boreholes, borehole sections and pumping technique within the monitoring program 2017–2019.

Borehole [Idcode:section no.]	Section [mbl]	Year	Comments	Used pumping technique ¹⁾
KFM01A:5	109.0–130.0	2018, 2019		A
KFM01D:2	429.0–438.0	2018, 2019		A
KFM01D:4	311.0–321.0	2018, 2019		A
KFM02A:3	490.0–518.0	2018, 2019		A
KFM02A:5	411.0–442.0	2018, 2019		A
KFM02B:2	491.0–506.0	2018, 2019		A
KFM02B:4	410.0–431.0	2018, 2019		A
KFM03A:1	969.5–994.5	2018, 2019	Gas evacuation	A
KFM03A:4	633.5–650.0	2018, 2019		A
KFM04A:4	230.0–245.0	2017, 2018, 2019		A
KFM06A:3	738.0–748.0	2017, 2018, 2019	Gas evacuation	A
KFM06A:5	341.0–362.0	2017, 2018, 2019	Gas evacuation	A
KFM06C:3	647.0–666.0	2017, 2018, 2019	Gas evacuation	A
KFM06C:5	531.0–540.0	2017, 2018, 2019	Gas evacuation	A
KFM07A:2	962.0–972.0	–	Gas evacuation	A
KFM08A:2	684.0–694.0	2017, 2018, 2019		A
KFM08A:6	265.0–280.0	2017, 2018, 2019		A
KFM08D:2	825.0–835.0	2017, 2018, 2019	Gas evacuation	D
KFM08D:4	660.0–680.0	2017, 2018, 2019	Gas evacuation	D
KFM10A:2	430.0–440.0	2017, 2018, 2019		A
KFM11A:2	690.0–710.0	2017, 2018, 2019	Gas evacuation	A
KFM11A:4	446.0–456.0	2017, 2018, 2019	Gas evacuation	A
KFM12A:3	270.0–280.0	2017, 2018, 2019	Gas evacuation	A
HFM01:2	33.5–45.5	2018, 2019		A
HFM02:2	38.0–48.0	2018, 2019		A
HFM04:2	57.9–65.9	2018, 2019		A
HFM13:1	159.0–173.0	2018, 2019		A
HFM15:1	85.0–95.0	2018, 2019		A
HFM16:2	54.0–67.0	2018, 2019		A
HFM19:1	168.0–182.0	2018, 2019		A
HFM21:3	22.0–32.0	2018, 2019		A
HFM27:2	46.0–58.0	2018, 2019		A
HFM32:3	26.0–31.0	2018, 2019		A
KFR101:1	279.5–341.8	2018, 2019		B
KFR102A:2	423.0–443.0	2018, 2019		A
KFR102A:5	214.0–219.0	2018, 2019		A
KFR104:1	333.0–454.6	2018, 2019		B
KFR105:1	265.0–306.8	2017, 2018, 2019		C
KFR106:1	260.0–300.1	2018, 2019		B
KFR106:2	143.0–259.0	2018, 2019		B
KFR01:1	44.65–62.3	2017, 2018 ²⁾ , 2019		C

¹⁾ A = UV45 pump, B = nitrogen lifting pump (in standpipe for pressure measurements), C = valve opening (no pump) and D = docking unit

²⁾ In 2018 no sampling series was collected, only one single sample sampled within the control program for the SFR facility. Data from this sample are only presented in appendices and not in the main report.

3.2 Water sample treatment and analyses

The constituents included in the different SKB chemistry classes are listed in Table 3-2. Sample treatment (filtration, conservation, storage etc.) of samples for internal analyses as well as for analyses by consulted laboratories generally follows standard procedures. An overview of sample treatment and analysis routines/methods for major constituents, minor anions, organic carbon, trace metals and isotopes are given in “Kvalitetsparametrar för kemianalyser – SKB:s kemiklasser; aktuella detektions-, rapporteringsgränser samt mätosäkerheter” see Table 1-1. The routines are applicable independently of sampling method or sampling object.

Table 3-2. Content of analyses within sampling series within the monitoring programme of deep groundwater 2017–2019 in Forsmark¹⁾

Constituent	Bottle ²⁾ /Volume	Preparation	Comment
pH_F, EC_F, temperature	–	–	On-line measurement in the field.
pH_L, EC_L, alkalinity	250–500 mL	–	Analysis within 24h
Cl ⁻ , SO ₄ ²⁻ , Br ⁻ , F ⁻	250 mL	Filtered with 0.4 µm filter	–
Na, K, Ca, Mg, SO ₄ -S, Si, Fe, Mn, Li, Sr, Th and U	Acid washed, 60 mL	Filtered with 0.4 µm filter Conserved with 1 mL HNO ₃	Suprapure acid is used for conservation
δ ² H, δ ¹⁸ O ³⁾	100 mL	–	–
Uranine	60 mL, Dark bottle	–	–
HS	2 × 120 mL glass Winkler bottles	Conserved with 0.5 mL 1 M ZnAc and 0.5 mL 1M NaOH in the field Bottle volume exchanged 2 times	Not included in sections where nitrogen lifting is used as pump method i.e. in sections KFR101:1, KFR104:1, KFR106:1 and KFR106:2
TOC	100 mL	–	Stored in freezer
DOC	100 mL	Filtered with 0.4 µm filter	Stored in freezer
Archive	2 × 250 mL	Filtered with 0.4 µm filter	–
Archive	3 × 60 mL	Filtered with 0.4 µm filter Conserved with 1 mL HNO ₃	Suprapure acid is used for conservation
Archive	1 000 mL	–	–
³ H	500 mL	Bottle volume exchanged 3 times	–
Br ⁻ / I ⁻⁴⁾	100 mL	–	–
Fe (II), Fe-tot	250 mL plastic Winkler bottles	Filtered with 0.4 µm filter Conserved with 2.5 mL HCl	Analysis within 20 h. Suprapure acid is used for conservation. Not always included in sections where nitrogen lifting is used as pump method i.e. in sections KFR101:1, KFR104:1, KFR106:1 and KFR106:2
NH ₄ -N, NO ₂ -N-N+NO ₃ and PO ₄ -P	250 mL	Filtered with 0.4 µm filter	Do not store sample together with bottles containing HNO ₃
NH ₄ -N	100 mL	–	–
Al, Ba, Cd, Co, Cr, Cu, Hg, Mo, Ni, P, Pb, V, Zn, (U, Th)	60 mL	Filtered with 0.4µm filter	U and Th only included for samples in sections KFM02A:3, KFM02A:5, KFR106:1 and KFR106:2.
U/Th-isotopes	1 000 mL	–	–
³⁶ Cl	100–500 mL	–	Some selected sections
pmC/ ¹³ C organic phase	2 × 500 mL, Dark glass bottle	–	Some selected sections

¹⁾ Constituents determined in the different SKB chemistry classes.

Class I: Constituents in brown cells are included in the class I

Class II: Constituents in brown and green cells are included in the class II

Class II+: Constituents in brown, green and grey cells are included in the class II+

Class III: Constituents in brown, green, grey and purple cells are included in the class III

Class III+: Constituents in brown, green, grey, purple and orange cells are included in the class III+

Blue cells contain additional constituents as complement to class III in some selected sections.

²⁾ Plastic bottles are used if nothing else is mentioned.

³⁾ In 2017 d²H and d¹⁸O belonged to class III and were not part of class II or class II+.

⁴⁾ Br⁻ / I⁻ was added to class III in 2019.

3.3 Cleaning of standpipes

A special cleaning procedure was performed in most of the standpipes connected to the borehole sections prior to the sampling campaign in each year of 2017 to 2019. Some sections were not cleaned for different reasons; HFM32:3 because the locations of the borehole make it difficult to transport the cleaning equipment, KFR106:1 and KFR106:2 because of the location and the late arrival spring 2018 and 2019, KFM08D due to risk of damage on borehole equipment. The tunnel boreholes KFR105 and KFR01 are not connected to standpipes, so no cleaning is needed.

After cleaning, the water in the standpipes was evacuated with gas (mammoth pumping) so that the standpipe filled up from underneath with section water. This was done to remove cleaning water from the standpipe and avoid cleaning water in the samples. The mammoth pumping was done twice in each standpipe. The groundwater in the standpipes and the borehole sections was then allowed to settle for a period of at least 3 weeks before the pumping and sample collection started. The time between cleaning of the standpipes and start of pumping for collection samples in each section is given for the years 2017, 2018 and 2019 in Table 3-4, Table 3-6 and Table 3-8, respectively.

3.4 Water sampling in series and field measurements

Sampling in series was performed in all sampled borehole sections. During earlier sampling campaigns in 2011–2016, each series consisted of three samples distributed with respect to pumped “plug-flow volumes” (including also the volume of the tube connecting to the section). The term “plug-flow volume” refers to the theoretical volume that has to be withdrawn in order to remove the exchangeable water present in the borehole section and get samples with close to 100 % formation water (water originating directly from water bearing fractures in the surrounding rock). As the theoretical plug-flow volume may be underestimated due to laminar flow effects, 100 % formation water is assumed at minimum 1.5 times the calculated plug-flow volume. The plug-flow volume varies from section to section depending on the distribution of water-yielding fractures along the section and their hydraulic transmissivities. This concept is further described in Nilsson (2010) and Lindquist et al. (2012). With some exceptions 1.5, 3 and 5 plug-flow volumes were removed before sampling in 2011–2016. Corresponding litre for each plug-flow volumes are listed in Appendix 7.

Due to time constraints, the adequate water volumes according to the plug-flow calculations were not always removed. In KFR101:1, KFR102A:2, KFR104:1 and KFR106:2 the plug-flow volumes were based on less than 100 % formation water. The volumes and percent formation water for each of these borehole sections are presented in Appendix 2 (Table A2-3).

During 2017–2019, the number of samples in each sampling series and the planned pumping volumes were changed in several sections. The reason for these changes is an objective to further investigate pH stabilization in sections where high pH values and increasing pH values that were observed during monitoring in previous years. The sample procedures for each year are described in Section 3.4.1 to 3.4.3.

In order to rule out factors in the sampling procedure that could affect for example the sulphide concentrations, the discharge flow rate from each borehole section was set to the same flow rate as used during previous years. An exception is KFM03A:1 where the planned discharge flow rate according to the Activity Plan (AP) was increased from 55 to 60 mL/min between 2018 and 2019. In sections with low hydraulic transmissivity, where a low flow rate has to be used, all three samples in the series could not be collected during the working hours of a day. The collected samples and the removed water volumes prior to each sample are presented in Appendix 2. The discrepancy between actually removed volumes and those prescribed is partly due to practical reasons (sampling could not be performed in the middle of the night). The total removed volumes were calculated from the readings in the field protocols, where date, time and flow rates for the discharge periods and sampling occasions were noted.

Sample portions intended for analysis of major constituents and trace metals (by ICP technique), DOC, anions, iron (by spectrometry) and nutrient salts were filtered on-line in the field. Disposable 0.4 µm filters were fitted directly to the 8/6 mm polyamide-tube leading the pumped water from the borehole section. During the entire sampling, laboratory gloves were used to minimize the risk of contaminating the samples.

In addition to sampling of groundwater, field measurements of temperature, electrical conductivity (EC) and pH were conducted. The water from the borehole was led through a measurement cell on the ground surface with probes and electrodes as well as a temperature sensor for measurements of field pH (pH_F), field electrical conductivity (EC_F) and groundwater temperature. The results are given in chapter 4 and in Appendices 3, 5 and 6.

The pumped water was, where needed, collected in tanks to prevent saline water from affecting the surroundings of the boreholes. The water was then discharged to the Baltic Sea.

The pressure in the borehole sections is continuously monitored by HMS, also during sampling. Pressure diagrams for each borehole and sampling occasion are given in Appendix 4. Possible short-circuiting, indicated by pressure responses in one or more sections other than the sampled ones, can be observed in several boreholes, see Appendix 4. However, observation of pressure propagation does not necessary mean that water is transported between the sections. Information on flow rates, removed volumes and pressure responses are reported in Appendix 2. In the boreholes sampled from the small diameter standpipes where gas-lift pumping was used, the pressure transducers had to be lifted and the pressure in the pumped section could not be monitored during pumping.

3.4.1 Sampling in 2017

During sampling in previous years high pH values or increasing pH values within the sampling campaign were noticed in several sections. In 2017 the sampling campaign was conducted with focus on following the evolution of pH values in these sections and to investigate an assumed stabilization with increased pumping volumes. Thus, a smaller number of sections were included in the sampling campaign in 2017 and several of the sampling series this year consisted of four samples. In the case of four samples, the second sample was planned when pH reached a stable level at or below a section specific limit. In most sections the third and fourth sample were planned after additional 1 and 2 plug-flow volumes after the second sample, see Table 3-3. Collected samples and analyses classes are listed in Table 3-4.

Generally, sampling was carried out successfully with the exception of a too early pump start in KFM06A:3 and a pump stop in KFM11A:2. In the section with pump stop, the pumped volume prior to the next sample was measured from the new pump start, but the total pumped volume include all pumping periods. For more comments on nonconformities in 2017, see Section 3.5.1. For most sections it was not possible to obtain a stable pH value before the second sample, too long pumping periods and/or risk for pump stop and decision was made to sample prior to stability of pH.

Table 3-3. Planned pumped volumes for sampling campaign in 2017.

Borehole [Idcode: section no.]	Sample 1	Field measurements until stable pH value at or below ⁴⁾	Sample 2	Sample 3	Sample 4
KFM04A:4	1.5 pf ^{1) 5)}	–	3 pf	5 pf	–
KFM06A:3	1.5 pf	7.6	At stable pH	+1 pf	+1 pf
KFM06A:5	1.5 pf	7.6	At stable pH	+1 pf	+1 pf
KFM06C:3	100 L ³⁾	7.6	At stable pH	+50 L	+50 L
KFM06C:5	45 L	7.6	At stable pH	+45 L	+45 L
KFM08A:2	1.5 pf	8.0	At stable pH	+1 pf	+1 pf
KFM08A:6	1.5 pf	8.0	At stable pH	+1 pf	+1 pf
KFM08D:2	1.5 pf	8.0	At stable pH	+1 pf	+1 pf
KFM08D:4	1.5 pf	8.4	At stable pH	+1 pf	+1 pf
KFM10A:2	1.5 pf ⁵⁾	–	3 pf	5 pf	–
KFM11A:2	70 L	8.0	At stable pH	+70L	+240L
KFM11A:4	1.5 pf	8.0	At stable pH	+1 pf	+1 pf
KFM12A:3	1.5 sv ²⁾	7.6	At stable pH	+1 sv ²⁾	+1 sv ²⁾
KFR01:1	3 sv ²⁾	–	5 sv	7 sv	–
KFR105:1	1.5 pf ⁵⁾	–	3 pf	5 pf	–

¹⁾ pf = plug-flow volumes. Corresponding volume in litre for each section are found in Appendix 7.

²⁾ sv = Section volumes. Corresponding volume in litre for each section are found in Appendix 7.

³⁾ L = Litre

⁴⁾ Desirable limit value for each section. Could be altered if stable values at a higher pH continues after large volumes of water have been removed.

⁵⁾ Volumes same as in 2016.

Table 3-4. Collected samples, pumping technique and analyses performed within the monitoring program 2017.

Borehole [Idcode: section no.]	Days between cleaning and pump start	Sample No in series.	Analyses ¹⁾ Class			
			Sample 1	Sample 2	Sample 3	Sample 4
KFM04A:4	22	31041–31043	II,b+	II,b+	III, b–d, h	–
KFM06A:3	24	31064–31066	II,b	II,b+	II,b+	III, b–d, h
KFM06A:5	27	31060–31062	II,b	II,b+	II,b+	III, b–d, h
KFM06C:3	21	31052–31054	II,b	II,b+	II,b+	III, b–d, h
KFM06C:5	22	31047–31049	II,b	II,b+	II,b+	III, b–d, h
KFM08A:2	31	31077–31079	II,b	II,b+	II,b+	III, b–d, h
KFM08A:6	37	31082–31084	II,b	II,b+	II,b+	III, b–d, h
KFM08D:2	–	31056–31058	II,b	II,b+	II,b+	III, b–d, h
KFM08D:4	–	31103–31105	II,b	II,b+	II,b+	III, b–d, h
KFM10A:2	22	31044–31046	II,b+	II,b+	III, b–d, h	–
KFM11A:2	28	31068–31070	II,b	II,b+	II,b+	III, b–d, h
KFM11A:4	30	31073–31075	II,b	II,b+	II,b+	III, b–d, h
KFM12A:3	35	31086–31088	II,b	II,b+	II,b+	III, b–d, h
KFR105:1	–	31110–31112	II,b+	II,b+	III, b–d, h	–
KFR01:1	–	31107–31109	II,b+	II,b+	III, b–d, h	–

3.4.2 Sampling in 2018

In 2018 each series again, as in 2011–2016, consisted of three samples. In 2018 sampling were conducted in almost all boreholes and borehole sections included in the monitoring program. KFM07A was omitted due to lifted borehole equipment, HFM19 due to inflated borehole packers and HFM32 due to unstable and unsafety ice conditions during the sampling in the percussion boreholes in the late autumn. In KFR01 no sampling series was collected, only one single sample sampled within the control program for the SFR facility. Data from this sample are only presented in appendices and not in the report. In KFR105 no sampling was performed due to lack of time and other obstructive activities in the SFR tunnel.

During the campaign in 2018, mainly 1.5, 3 and 5 plug-flow volumes were planned to be removed before sampling. As in 2017 the sampling campaign this year had extra focus on sections which did not reach stable pH after the standard pumping volumes. In totally nine sections larger volumes were planned to be removed before sampling due to high or increasing pH values that were observed during monitoring previous years, see Table 3-5. Collected samples and analyses classes are listed in Table 3-6.

Generally, sampling was carried out successfully with the exception of pump stops in KFR101:1 and KFR106:2. In the sections where a pump stop occurred, the pumped volume prior to the next sample was measured from the new pump start, but the total pumped volume include all pumping periods. In several sections pump start occurred earlier or later than planned which affects used pump volumes, for this and for more comments on nonconformities in 2018, see Section 3.5.2.

Table 3-5. Sections where planned pumped volumes in sampling campaign in 2018 differs from normally used 1.5, 3 and 5 pf.

Borehole [Idcode: section no.]	Sample 1	Sample 2	Sample 3
KFM06A:3	400 L ³⁾	+1 pf ¹⁾	+1 pf
KFM06A:5	500 L	+1 pf	+1 pf
KFM06C:3	450 L	500L	550 L
KFM06C:5	45 L	90 L	135 L
KFM08A:2	400 L	+1 pf	+1 pf
KFM08D:2	400 L	+1 pf	+1 pf
KFM08D:4	800 L	+1 pf	+1 pf
KFM11A:2	300 L	450 L	600 L
KFR01:1	3 sv ²⁾	5 sv	7 sv

¹⁾ pf = plug-flow volumes. Corresponding volume in litre for each section are found in Appendix 7.

²⁾ sv = Section volumes. Corresponding volume in litre for each section are found in Appendix 7.

³⁾ L = Litre

Table 3-6. Collected samples, pumping technique and analyses performed within the monitoring program 2018.

Borehole [Idcode: section no.]	Days between cleaning and pump start	Sample No in series	Analyses Class		
			Sample 1	Sample 2	Sample 3
KFM01A:5	25	31337–31339	II,b+	II,b+	III, b–d, h
KFM01D:2	41	31397–31399	II,b+	II,b+	III, b–d, h
KFM01D:4	23	31328–31330	II,b+	II,b+	III, b–d, h
KFM02A:3	35	31364–31366	II,b+	II,b+	III, b–d, h, f ²⁾
KFM02A:5	33	31376–31378	II,b+	II,b+	III, b–d, h, f ²⁾
KFM02B:2	37	31373–31375	II,b+	II,b+	III, b–d, h
KFM02B:4	37	31379–31381	II,b+	II,b+	III, b–d, h
KFM03A:1	38	31385–31387	II,b+	II,b+	III, b–d, h
KFM03A:4	20	31382–31384	II,b+	II,b+	III, b–d, h
KFM04A:4	49	31322–31324	II,b+	II,b+	III, b–d, h
KFM06A:3	18	31409–31411	II,b+	II,b+	III, b–d, h
KFM06A:5	17	31313–31315	II,b+	II,b+	III, b–d, h
KFM06C:3	40	31370–31372	II,b+	II,b+	III, b–d, h
KFM06C:5	23	31319–31321	II,b+	II,b+	III, b–d, h
KFM08A:2	20	31358–31360	II,b+	II,b+	III, b–d, h
KFM08A:6	25	31331–31333	II,b+	II,b+	III, b–d, h
KFM08D:2	–	31367–31369	II,b+	II,b+	III, b–d, h
KFM08D:4	–	31334–31336	II,b+	II,b+	III, b–d, h
KFM10A:2	26	31355–31357	II,b+	II,b+	III, b–d, h
KFM11A:2	26	31361–31363	II,b+	II,b+	III, b–d, h
KFM11A:4	17	31316–31318	II,b+	II,b+	III, b–d, h
KFM12A:3	15	31325–31327	II,b+	II,b+	III, b–d, h
HFM01:2	94	31529–31531 ¹⁾	II,b+	II,b+	III, b–d, h
HFM02:2	91	31520–31522 ¹⁾	II,b+	II,b+	III, b–d, h
HFM04:2	90	31535–31537 ¹⁾	II,b+	II,b+	III, b–d, h
HFM13:1	93	31523–31525 ¹⁾	II,b+	II,b+	III, b–d, h
HFM15:1	97	31526–31528 ¹⁾	II,b+	II,b+	III, b–d, h
HFM16:2	98	31541–31543 ¹⁾	II,b+	II,b+	III, b–d, h
HFM21:3	99	31532–31534 ¹⁾	II,b+	II,b+	III, b–d, h
HFM27:2	91	31538–31540 ¹⁾	II,b+	II,b+	III, b–d, h
KFR101:1	45	31394–31396	II,b+	II,b+	III, b–d, h ³⁾
KFR102A:2	36	31391–31393	II,b+	II,b+	III, b–d, h
KFR102A:5	37	31388–31390	II,b+	II,b+	III, b–d, h
KFR104:1	40	31400–31402	II,b+	II,b+	III, b–d, h ³⁾
KFR106:1	–	31403–31405	II,b+	II,b+	III, b–d, h, f ²⁾³⁾
KFR106:2	–	31406–31408	II,b+	II,b+	III, b–d, h, f ²⁾³⁾
KFR01:1	–	31554	II,b+	II,b+	III, b–d, h ³⁾

¹⁾ Sampling during autumn 2018

²⁾ Only U/Th isotopes from option f

³⁾ No HS[–] or Fe²⁺ analyses due to pumping technique

3.4.3 Sampling in 2019

With some exceptions 1.5, 3 and 5 plug-flow volumes were planned to be removed before sampling 2019. The exceptions are KFM06A:3, KFM06C:3, KFM11A:2 and KFR01:1 where larger volumes were planned to be removed before sampling due to that high pH values were observed during monitoring previous years, see Table 3-7. Collected samples and analyses classes are listed in Table 3-8.

Generally, sampling was carried out successfully with the exception of pump stops in KFM08A:6 and KFR101:1. In these sections where pump stop occurred, the pumped volume prior to the next sample was measured from the new pump start, but the total pumped volume include all pumping periods. During the sampling in June, repeated pumping stops occurred in KFM08D:4 and no sampling could be performed. New attempts of pumping and sampling were carried out during the autumn. Sampling in KFR03A:4 was also repeated in autumn due to missed uranium sample in spring. For more comments on nonconformities in 2019, see Section 3.5.3.

Table 3-7. Sections where planned pumped volumes in sampling campaign in 2019 differs from normally used 1.5, 3 and 5 pf.

Borehole [Idcode: section no.]	Sample 1	Sample 2	Sample 3
KFM06A:3	3 pf ¹⁾	5 pf	7 pf
KFM06C:3	115 L	215 L	315 L
KFM11A:2	300 L	450 L	600 L
KFR01:1	3 sv ²⁾	5 sv	7 sv

¹⁾ pf = plug-flow volumes. Corresponding volume in litre for each section are found in Appendix 7.

²⁾ sv = Section volumes. Corresponding volume in litre for each section are found in Appendix 7.

³⁾ L = Litre

Table 3-8. Collected samples, pumping technique and analyses performed within the monitoring program 2019.

Borehole [Idcode: section no.]	Days between cleaning and pump start	Sample No in series.	Analyses Class		
			Sample 1	Sample 2	Sample 3
KFM01A:5	39	66687, 66740, 66741	II,b+	II,b+	III, b-d, h
KFM01D:2	44	66982-66984	II,b+	II,b+	III, b-d, h
KFM01D:4	46	66988-66990	II,b+	II,b+	III, b-d, h
KFM02A:3	38	66282-66284	II,b+	II,b+	III, b-d, h, f ²⁾
KFM02A:5	36	66279-66281	II,b+	II,b+	III, b-d, h, f ²⁾
KFM02B:2	42	66539, 66625, 66681	II,b+	II,b+	III, b-d, h
KFM02B:4	42	66628, 66667, 66683	II,b+	II,b+	III, b-d, h
KFM03A:1	48	66973-66975	II,b+	II,b+	III, b-d, h
KFM03A:4	49 (spring) 191 (autumn)	66956-66958 71429-71431 ¹⁾	II,b+	II,b+	III, b-d, h
KFM04A:4	55	67342-67344	II,b+	II,b+	III, b-d, h
KFM06A:3	35	66273-66275	II,b+	II,b+	III, b-d, h
KFM06A:5	35	66264-66266	II,b+	II,b+	III, b-d, h
KFM06C:3	31	66270-66272	II,b+	II,b+	III, b-d, h
KFM06C:5	35	66267-66269	II,b+	II,b+	III, b-d, h
KFM08A:2	81	67531-67533	II,b+	II,b+	III, b-d, h
KFM08A:6	62	67534-67536	II,b+	II,b+	III, b-d, h
KFM08D:2	—	67537-67539	II,b+	II,b+	III, b-d, h
KFM08D:4	—	67540-67542 ¹⁾	II,b+	II,b+	III, b-d, h
KFM10A:2	40	66689, 66742, 66743	II,b+	II,b+	III, b-d, h
KFM11A:2	52	67339-67341	II,b+	II,b+	III, b-d, h
KFM11A:4	76	67543-67545	II,b+	II,b+	III, b-d, h
KFM12A:3	80	67546-67548	II,b+	II,b+	III, b-d, h
HFM01:2	41	66979-66981	II,b+	II,b+	III, b-d, h
HFM02:2	39	66684, 66688, 66745	II,b+	II,b+	III, b-d, h
HFM04:2	48	66976-66978	II,b+	II,b+	III, b-d, h
HFM13:1	37	66682, 66746, 66955	II,b+	II,b+	III, b-d, h
HFM15:1	48	66985-66987	II,b+	II,b+	III, b-d, h
HFM16:2	34	66276-66278	II,b+	II,b+	III, b-d, h
HFM19:1	38	66685, 66686, 66744	II,b+	II,b+	III, b-d, h
HFM21:3	72	67549-67551	II,b+	II,b+	III, b-d, h
HFM27:2	73	67552-67554	II,b+	II,b+	III, b-d, h
HFM32:3	—	67345-67347	II,b+	II,b+	III, b-d, h
KFR101:1	60	67555-67557	II,b+	II,b+	III, b-d, h ³⁾
KFR102A:2	61	67558-67560	II,b+	II,b+	III, b-d, h
KFR102A:5	61	67561-67563	II,b+	II,b+	III, b-d, h
KFR104:1	62	67564-67566	II,b+	II,b+	III, b-d, h ³⁾
KFR105:1	—	74127-74129 ¹⁾	II,b+	II,b+	III, b-d, h
KFR106:1	—	67567-67569	II,b+	II,b+	III, b-d, h, f ^{2) 3)}
KFR106:2	—	67570-67572	II,b+	II,b+	III, b-d, h, f ^{2) 3)}
KFR01:1	—	74124-74126 ¹⁾	II,b+	II,b+	III, b-d, h ³⁾

¹⁾ Sampling during autumn 2019

²⁾ Only U/Th isotopes from option f

³⁾ No HS⁻ or Fe²⁺ analyses due to pumping technique

3.5 Nonconformities

3.5.1 Nonconformities 2017

The hydrochemical monitoring of deep groundwater has been conducted according to the SKB internal controlling document AP SFK-17-002 with the following nonconformities.

Pumping procedures

- Only KFM11A:2 was affected by a pump stop between the different samples. Pump stop occurred in KFM11A:2 between the third and fourth sample. A new pump start was planned 2017-05-18 but during the following days the pump stopped and started twice by itself without being noticed in the field. As the pressure recovered completely during this time, 2017-05-16 must be counted as start time for the second pump period containing the fourth sample. This affects the pumping volume and less water was removed before the fourth sample than planned.
- In 2017 the measurement campaign had extra focus on pH values. During the field work it turned out to be hard to obtain a stable pH value in a reasonable time span before the second sample as planned in the AP. Most samples were collected at higher pH than planned, see Table 3-9.
- For sections with the second sample planned at stable pH the third and fourth sample were planned at specific pump volumes after the second sample. In most of these sections, samples were taken with significant either smaller or larger volume than planned. KFM06A:3 third sample, KFM08A:2 third and fourth sample and KFM11A:2 were taken at planned pump volume (differ less than +10 %). KFM08D:4 third and fourth sample, KFM11A:2 fourth sample were taken at slightly smaller volumes than planned (differs less than -10 %). And the rest were taken at larger pumped volumes than planned, some at much larger pump volumes than planned (e.g. KFM06A:3 fourth sample, KFM06C:3 third and fourth sample, KFM08A:6 third and fourth sample, KFM11A:4 third and fourth sample).
- For some samples the pumped volume was lower than planned (see Appendix 2) due to slightly lower pump flow. This applies to KFM06A:5 first sample, KFM06C:3 first sample, KFM08D:4 first sample, KFR01:1 second sample and KFR105:1 all samples. In KFR01:1 the last sample had a significantly larger volume than planned due to high flow and extended pumping time since no samplings are performed during night.
- For KFM06A:3 the pump was planned to start on 2017-05-07. The pressure reveals that the pump had started already in 2017-05-05 which leads to greater pumped volume than planned for the first sample (+450 %). The second sample was planned at stable pH and for that reason the early pump start did not affect the pumped volume for the other samples.
- In some sections major changes in flow rate occurred during the pumping period. In KFM08D:2 the flow was adjusted and increased between first and second sample. In KFR105:1 a major flow decrease was made after the second sample before the weekend, 2017-06-23 to 2017-06-25 (Midsummer). The change was probably done to adjust pump volumes for a delayed third sample, although the magnitude of change was a little bit too large giving a slightly smaller pumping volume for the third sample.

Analyses

- The relative charge balance (RCB) could not be calculated for most samples in 2017 (e.g. KFM04A:4, KFM06A:3 and KFM06A:5) due to inaccuracies in the analysed values from the external lab, see Appendix 3. When this fact was discovered, the samples were already discarded and for that reason re-analysis was not possible. For these sections, values for Na, K, Ca, Mg, SO₄-S, Si, Fe, Mn, Li and Sr are missing. For the last sample in each section the existing archive samples, could be used for reanalysis and made it possible to calculate RCB for at least one sample in each section.
- No I⁻ samples were analyzed in 2017

Table 3-9. Planned and measured pH and second sample in 2017.

Borehole [Idcode: section no.]	Second sample 2017		
	Planned pH	Sampled pH_F	pH_L
KFM06A:3	7.6	8.87	8.80
KFM06A:5	7.6	8.28	7.94
KFM06C:3	7.6	8.69	9.02
KFM06C:5	7.6	8.03	7.80
KFM08A:2	8.0	8.34	8.42
KFM08A:6	8.0	8.10	7.69
KFM08D:2	8.0	9.00	9.44
KFM08D:4	8.4	8.62	8.72
KFM11A:2	8.0	8.55	8.63
KFM11A:4	8.0	8.46	8.52
KFM12A:3	7.6	7.93	7.95

3.5.2 Nonconformities 2018

The hydrochemical monitoring of deep groundwater has been conducted according to the SKB internal controlling document AP SFK-18-021 with the following nonconformities.

Pumping procedures

- In two sections pump stops occurred between the planned samples. In KFR101:1 between the second and third sample and in KFR106:2 also between the second and third sample. For both sections the stops occurred as the gas-lifting pump ran out of gas.
- For several sections the pumped volume for one or several samples was lower than planned (see Appendix 2) because of slightly lower pump flow. This applies for example in some of the samples in KFM04A:4, KFM102A:5, KFM06A:5 and KFR102A:2. In other sections, the lower pumped volume cannot only be explained by lower pump flow and were probably planned slightly too early (e.g. KFM12A:3, HFM13:1, HFM21:3, HFM27:2, KFR106:2).
- Flow rates are difficult to adjust when gas-lift pumping is used. Therefore, pumped volumes are higher or lower than planned for some of the sections pumped with this kind of pump.
- In KFM01D:4 all samples had been taken after much larger removed pump volumes, at 250–630 % compared to planned volumes. Time for pump start is missing in the field notes but could with good precision be estimated from pressure data. It is likely that pump start occurred earlier than scheduled.
- In KFM01D section 2 and 4 should not be pumped and sampled parallel due suspected connection between the sections. KFM01D:2 was sampled in the end of May and KFM01D:4 in the middle of May. But during the sampling of KFM01D:4 also KFM01D:2 was pumped although no samples were taken in section 2.
- In section KFM06A:3 pump start was planned to 2018-06-02. During the next three days the pump stopped and started twice by itself without being noticed in the field. As the pressure recovered completely during this time, 2018-06-05 must be counted as the start time. This affects the pumping volumes and only 35–48 % of the planned volume was removed when samples were taken in this section.
- KFM06C:3 was pumped during a period of 19 days starting on 2018-05-05. Between 2018-05-07 and 2018-05-21 no flow measurements were performed and during this period the flow decreased significantly. The calculation of pumped volume assumes that a flow change has occurred in the middle of the time span between two flow measurements. According to pressure data there are multiple times where the flow change could have occurred. One of the bigger pressure changes occurred on 2018-05-19 which could imply that the actual pumped volume is bigger than calculated.

- According to the AP, the first sample in KFM08A:2 should in 2018 be taken after much larger pump volumes compared to other years of sampling. Instead of according to AP first sample at 400 L and the second and third sample each after further +1 pf (+22 L), the sampling seems to have occurred at pump volumes consistent with the plan for 2015 or 2019 at 1.5, 3 and 5 pf. The other section with special pump volumes in 2018 seems to be planned regarding to volumes in AP.
- For KFM08A:6, KFM08D:2 and KFM08D:4 the pump started 24 hours later than planned regarding to the field notes. For KFM08D:2 and KFM08D:4, it was probably due to inaccurate starting weekday in the timer. This leads to smaller pumped volume than planned for all samples in these sections. KFM08D:2 54–60 % and for KFM08D:4 36–55 %. For KFM08A:6 the pumped volumes do not differ from the planned volume. It is possible that they started as originally planned but that the date has been incorrectly noted in the field notes.
- In HMS there are notes about if the correct PEEK-docking equipment has been used in KFM08D. The field note does not give any answers about use of docking equipment but contains notes about mini packers although there are no mini packers in KFM08D. A sign that there could have been some problems with the docking units, for example that they are not used or not connected, is the appearance of the drawdown curve in KFM08D:2. The pressure curve in KFM08D:2 usually contains lots of disturbances during sampling, but this year it was exceptional with at least two pump stops and starts each day. If the docking unit has not been used properly it is possible that the pump only removed water standing in the standpipe. As the water level fell, the pump stopped until water slowly leaked into the pipe, the water level recovered, and the pump started again. The pumping curve in KFM08D:4 has a more normal appearance compared to other years, but there are field notes about lots of gas bubbles.

Sampling

- Warm weather during sampling in spring have affected temperature measurements in the field.
- The pH-probe did not work when measuring the first sample in KFR03A:1 and for the first sample in KFM02A:5 no field value was registered as the value oscillated between pH 10 and 11.
- KFM07A:2 was not available for sampling due to lifted borehole equipment. The re-installation of the equipment was not started during the monitoring period this spring.
- No sampling was performed in HFM19:1 during the pumping period. The borehole packer pressure in HFM19 was released in December 2017 when the borehole equipment would be lifted for renovation. However, the packers seem to be stuck and still sealed, as no obvious influence in section pressure data can be seen. In 2018 sampling was performed although the situation is the same as in 2017.
- In KFR01 no sampling series was collected, only one single sample sampled within the control program for the SFR facility. Data from this sample are only presented in appendices and not in the main report.
- In KFR105 no sampling was performed due to lack of time and other obstructive activities in the SFR tunnel.

Analyses

- For some samples collected in larger plastic bottles, no Fe-analysis were performed due to long sampling time (e.g. some samples in KFM06C:3, KFM08D:2 and KFR104:1).
- No I^- samples were analyzed in 2018.
- In KFR106:1 and KFR106:2 there were no analyses of Uranine in 2018.
- HS^- is missing for the first sample in KFM06A:3.

3.5.3 Nonconformities 2019

The hydrochemical monitoring of deep groundwater has been conducted according to the SKB internal controlling document AP SFK 19-007 with the following nonconformities.

Pumping procedures

- Pump stops occurred in two sections, in KFM08A:6 between the second and the third sample and in KFR101:1 between the first and the second sample.
- Repeated pumping stops in FKM08D:4 led to that no sampling could be performed during the spring. Sampling was conducted in the autumn.
- For some sections (e.g. KFM06A:5, KFM06C:3, KFM08A:2, KFM08D:2 and KFM11A:2) the pumped volume before the first sample was lower than planned (see Appendix 2) because the pump started with a lower flow than planned (the first flow measurement after pump start took place when the first sample was collected but the flow was probably lower already from start). In KFM06C:3 a big decrease in pressure could be seen when pump flow was increased after appr. four days of pumping.
- For KFM10A:2 the pumped volume before the first sample was larger than planned (see Appendix 2) because the pump started with a higher flow rate than planned.
- Flow rates are difficult to adjust when gas-lift pumping is used. Therefore, pumped volumes are higher or lower than planned for some of the sections pumped with this kind of pump.
- Due to changing of sampling schedule, HFM27 was pumped by mistake during long time (18 days) before the actual pumping period. Before the planned pumping start there was a recovery non-pumping period of two days.
- In KFR105:1 a much larger flow volume was removed before collecting all samples (320–260 % more than planned). The reason is mainly that a higher water flow out of the borehole was used, between 600–1 300 mL/min compared to planned 480 ml/min according to the AP. The change in flow from 1 300 to 6 000 mL/min after two days could not be seen in the pressure data for KFR105:1.

Sampling

- KFM07A:2 was not available for sampling due to lifted borehole equipment. The re-installation of the equipment was not started during the monitoring period this spring.
- During the samplings in spring there was no analysis of uranium in KFM03A:4 due to mistake in the AP. Sampling and pumping were repeated in autumn and uranium was analyzed.
- Differing from 2018, sampling was performed in HFM19:1 during 2019 although the borehole packer pressure was still released. The borehole packer pressure in HFM19 was released in December 2017 when the borehole equipment would be lifted for renovation. However, the packers seem to be stuck and still sealed, as no obvious influence in section pressure data can be seen.
- In KFR106:2 and KFR106:1 there are no iron analyses, as a major general power failure occurred in the whole area during the end of the last sample. All other samples were taken before the power loss started.

Pressure measurements

- Pressure data for HFM02:1 is not available during the end of the pumping period in HFM02:2 due to problems with the pressure transducer.
- Pressure data for HFM19 during the pumping period in HFM19:1 consist of unreliable data as borehole packers were deflated.
- Pressure data for KFM03A is not available during the end of the pumping period in KFM03A:4 in October 2019 due to problems with an electrical fuse in the data collecting system.

Analyses

- Tritium is missing for HFM01:2, KFR01:1 and KFR105:1.

4 Results

4.1 Water analysis and measurements

The results from analyses and field measurements are presented in Appendix 3. The first table for each year includes the major constituents Na, K, Ca, Mg, HCO_3^- , Cl^- , SO_4^{2-} , $\text{SO}_4\text{-S}$, Br^- , F^- , Si, Fe, Mn, Li and Sr as well as minor constituents like HS^- , NO_2^- , NO_3^- , NH_4^+ , PO_4^{3-} , TOC and DOC from all sampled boreholes. Furthermore, this table contains laboratory data and field measurement data on pH, electrical conductivity (EC) and the water temperature recorded in the field.

The relative charge balance (RCB) provides an indication of the quality and uncertainty of the analyses of major constituents and, the charge balance errors were calculated for all samples. Relative errors within $\pm 5\%$ are considered acceptable.

$$\text{rel error}(\%) = 100 \times \frac{\sum \text{cation}(\text{equivalents}) - \sum \text{anion}(\text{equivalents})}{\sum \text{cation}(\text{equivalents}) + \sum \text{anion}(\text{equivalents})}$$

The relative charge balances were for most samples within the acceptable limit of $\pm 5\%$. The exceptions are KFM02A:5 third sample 2018, HFM02:2 third sample in 2019, KFM02A:5 third sample in 2018, KFM06A:3 sample fourth in 2017 and sample first in 2018, which all have slightly larger errors. Due to inaccuracies in the analysed values from the external lab, charge balances could not be calculated for the original samples in 2017. For the last sample in each section archive samples, which could be used for reanalysis, made it possible to calculate RCB for at least one sample in each section.

Trace elements and the isotopes d^2H , d^{18}O and ^3H were determined in the last sample in each series (see Appendix 3). In 2019 analysis of Ag, As, B, Nb, Rb, Zr, Sb, Cs and Nd were added in some sections.

Furthermore, the uranium and thorium element concentrations and isotopes (^{238}U , ^{235}U , ^{234}U , ^{232}Th and ^{230}Th) were determined in 2018 and 2019 in the last sample from sections KFM02A:3, KFM02A:5, KFR106:1 and KFR106:2 (see Appendix 3). In 2019, also the last sample in KFM03A:4 was analysed for these isotopes.

The laboratory measurements and field measurements of pH and EC are compared in Figure 4-1 and Figure 4-2 respectively. In Figure 4-3 and Figure 4-4 detailed plots of each year are presented.

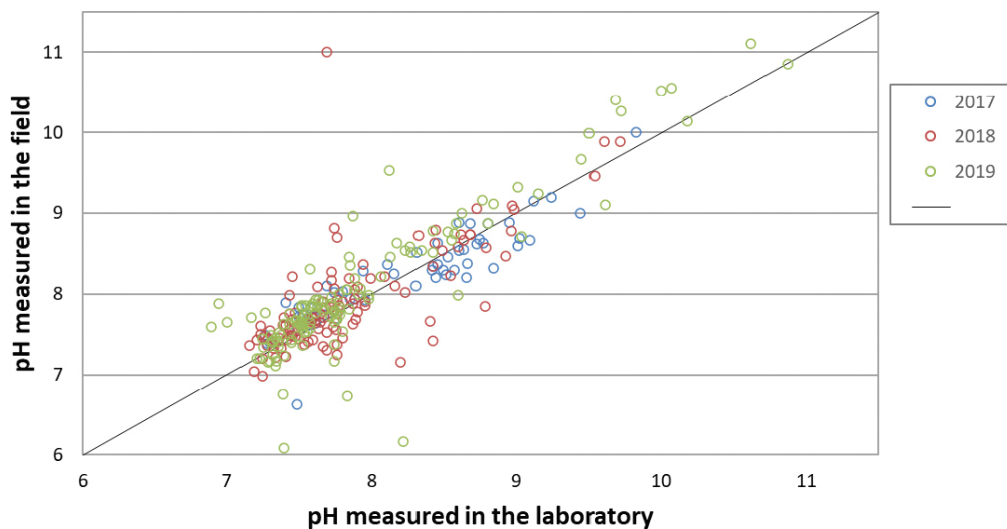


Figure 4-1. Comparison between laboratory measurements and field measurements of pH. The laboratory measurements are performed at 25 °C and the field measurements are performed at the actual water temperature. For more details see Figure 4-3.

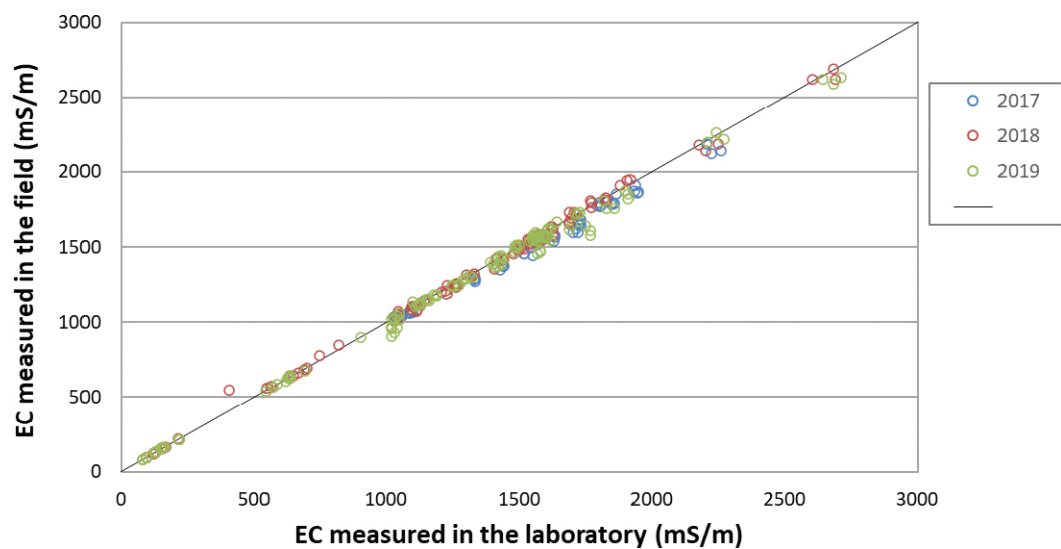


Figure 4-2. Comparison between laboratory measurements and field measurements of EC. All values are corrected to the conductivity at 25 °C. For more details see Figure 4-4.

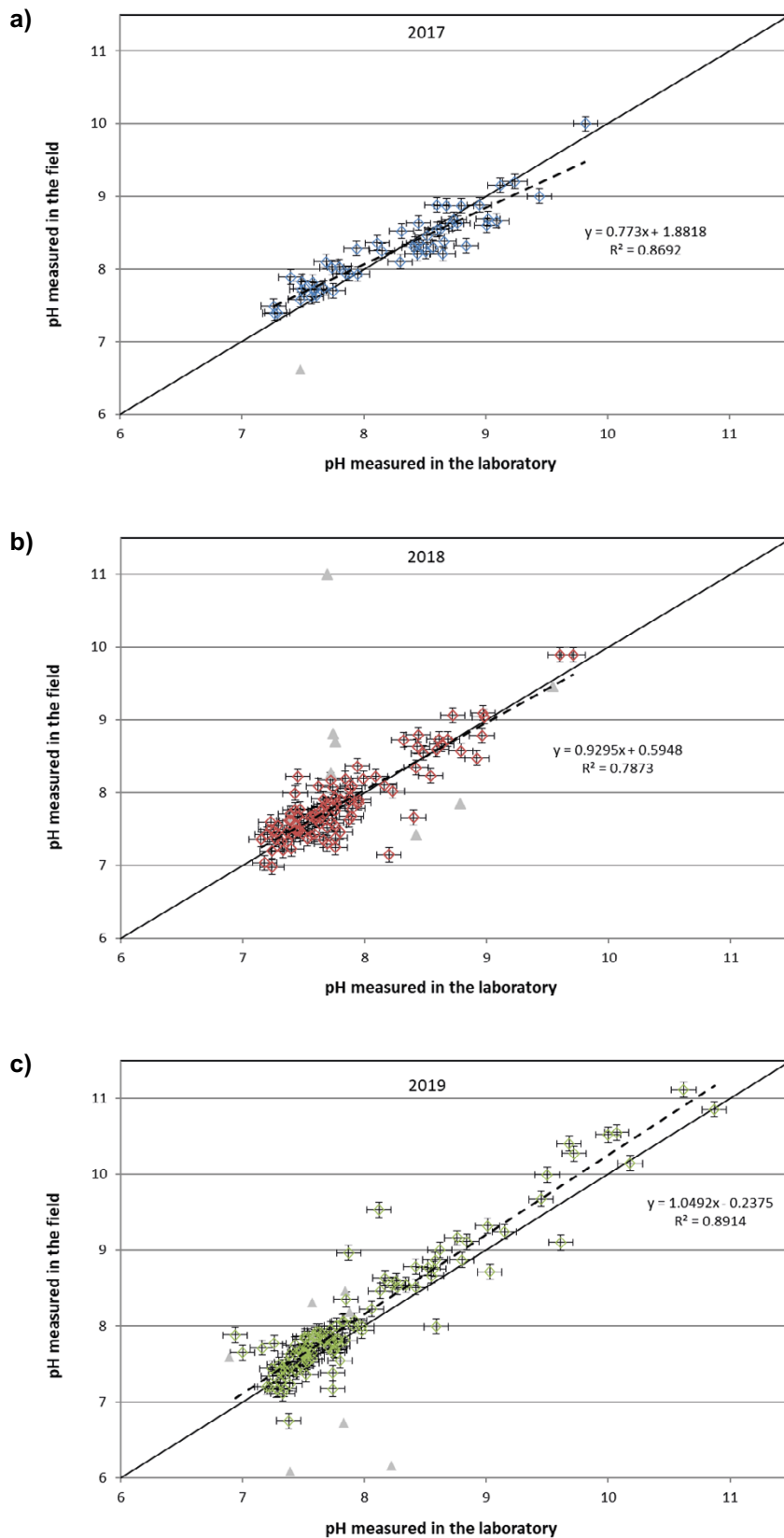


Figure 4-3. For each year, comparison between laboratory measurements and field measurements of pH. The laboratory measurements are performed at 25 °C and the field measurements are performed at the actual water temperature. The dashed line is the linear fit. Grey triangular points are points where either field or lab value are clearly incorrect or significant differs compared to other pH measurements in each section. These outliers are not included in the calculation of the linear fit.

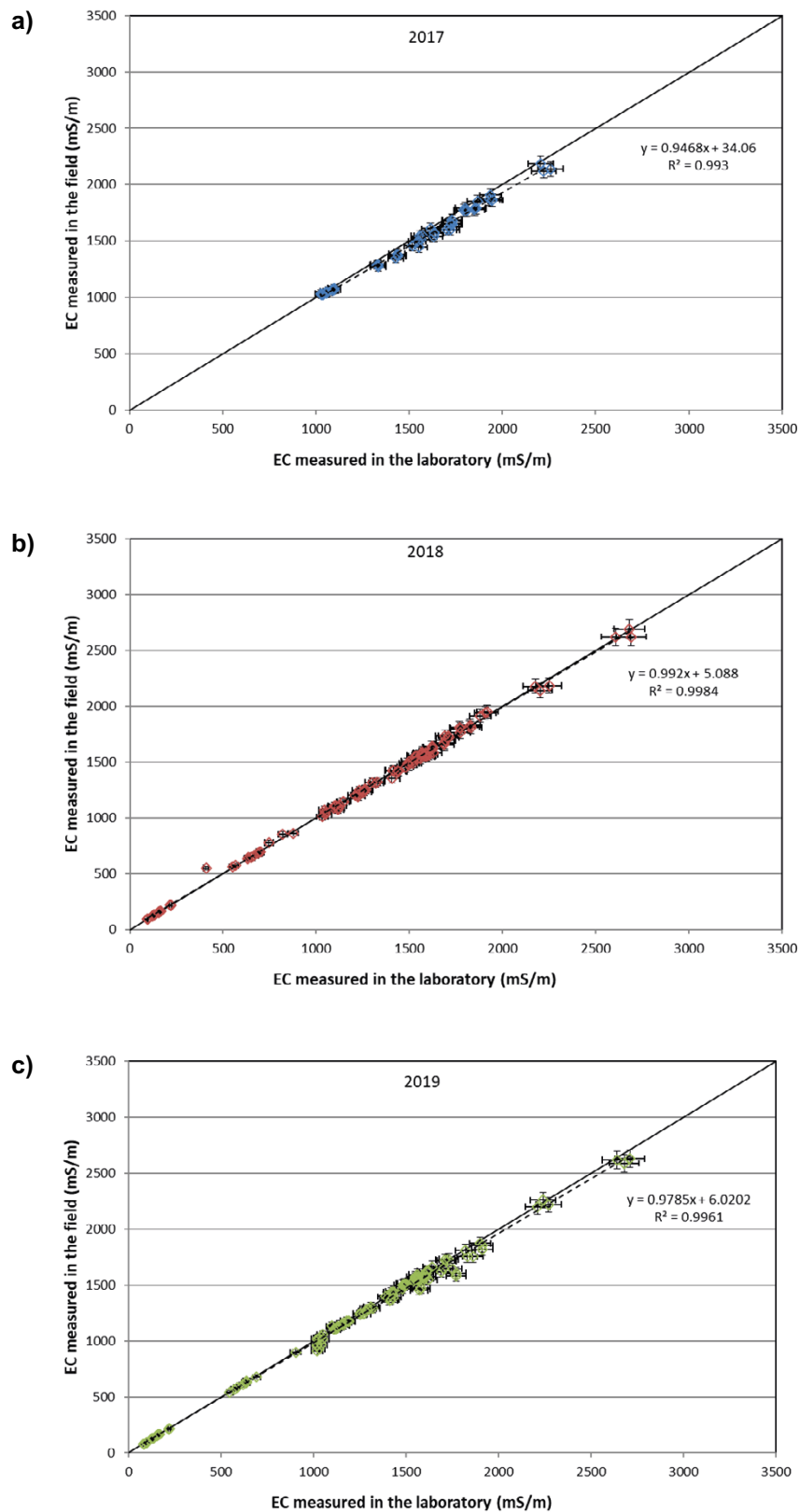


Figure 4-4. For each year, comparison between laboratory measurements and field measurements of EC. All values are corrected to the conductivity at 25 °C. The dashed line is the linear fit.

The agreement between the different pH values are in general good but there are several samples where the compared pH values deviate more than the measurement, which may be due to temperature and pressure differences and/or time delay. For some samples each year there are larger discrepancies between laboratory and field pH measurements. For many of these, the field value differs significantly compared to other pH measurements in the same section and mistakes during field measurement is the most plausible reason. These points are marked in Figure 4-3.

As previously observed in some of the monitored boreholes (see e.g. Ragvald 2016, 2018), high pH values were also recorded in 2017–2019. Especially in 2019 there are several samples with pH values above 10. Diagrams of pH values during the years in sections with elevated pH values are presented in Appendix 5. The issue with elevated pH values is discussed in Nilsson and Sandberg (2017). In some sections the measured pH value continues to increase each year. In other sections the earlier increase seems to have ceased or at least be less obvious and the measured pH values seem to have stabilized during the last years of sampling.

In 2017 the measurement campaign had extra focus on pH values and only a few sections were sampled. As pH is increasing in some boreholes over the years and was not stable during the sample series within the monitoring program, an attempt to pump water until pH values measured at the CCC campaigns, when the boreholes were newly drilled, was conducted. Diagrams of pH values compared to pumped volumes for each sample in 2015–2019, in selected sections (see Table 3-3) are presented in Appendix 6. In general, no clear trends can be seen and it is difficult to draw any conclusions about the connection between the year, pumped volumes and pH.

As shown in Figure 4-2 and Figure 4-4, the agreement between the EC values from field and lab is very good, and the dispersion between different years is small. The lack of EC-value under 1 000 mS/m in 2017 is due to that no HFM- or surface KFR-borehole sections were measured this year.

4.2 Chloride

Figure 4-5 to Figure 4-11 present chloride concentrations in collected samples from hydrochemical monitoring these years (2017–2019) together with data from hydrochemical monitoring earlier years. The analytical uncertainty ($\pm 5\%$) is shown as error bars in the diagrams. For some of the core drilled boreholes, data from the initial complete chemical characterisation (CCC) in corresponding borehole sections (Lindquist et al. 2012; SKB Database Sicada) are also presented. The CCC data are shown as dots on the y-axes (not corresponding to date on the x-axis). In the cases of sample series (after October 2009 and onwards), the value from the last sample in the series is presented in the diagrams. For boreholes included in the SFR Extension Project, the hydrochemical monitoring program started in 2012, but the diagrams of chloride concentrations (Figure 4-10 and Figure 4-11) also include data from earlier studies.

Within each sample series (increasing plug-flow volumes), the chloride concentrations were generally quite stable. The exceptions are KFR104:1, and KFR106:1 where the chloride concentrations increase with pumped volumes.

In 2016 the detected lower chloride concentration in KFR106:1 and KFR104:1 was supposed to be due to smaller pumping volumes (Ragvald 2018). The last years values in KFR106:1 varies from year to year. In KFR104:1 the decrease continues, but with a slight increase in 2019. Comparing chloride concentrations and pumping volumes for 2014–2019 indicates that it in these sections they might be correlated to each other.

In KFM08D:2 and KFM08D:4 higher chloride concentrations have been detected since the measurements continued in 2015 after reinstallation in 2014.

The chloride concentration in KFM11A:4 increased significantly between 2015 and 2017. In the following years (2018 and 2019) the concentrations have decreased each year but in 2019, it is still higher than in 2017.

In both sections in KFM06C the chloride concentrations in 2018 differs from the other years, both before and compared to 2019. The reason is unclear.

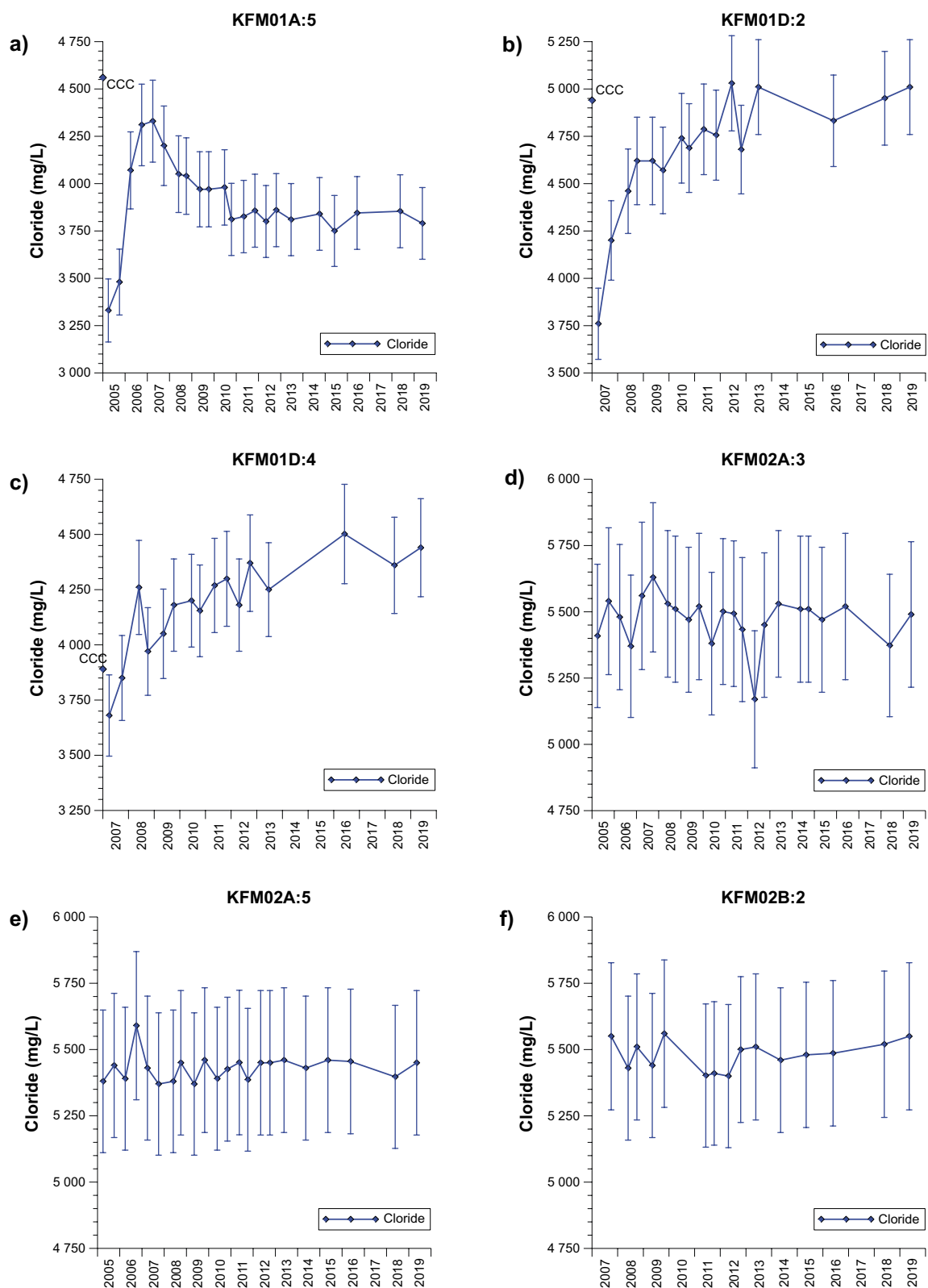


Figure 4-5. Chloride concentrations in collected samples from hydrochemical monitoring 2005 to 2019 and from the initial complete chemical characterisation (CCC). The data points for CCC are placed on the y-axes with no correlation to date on x-axis.

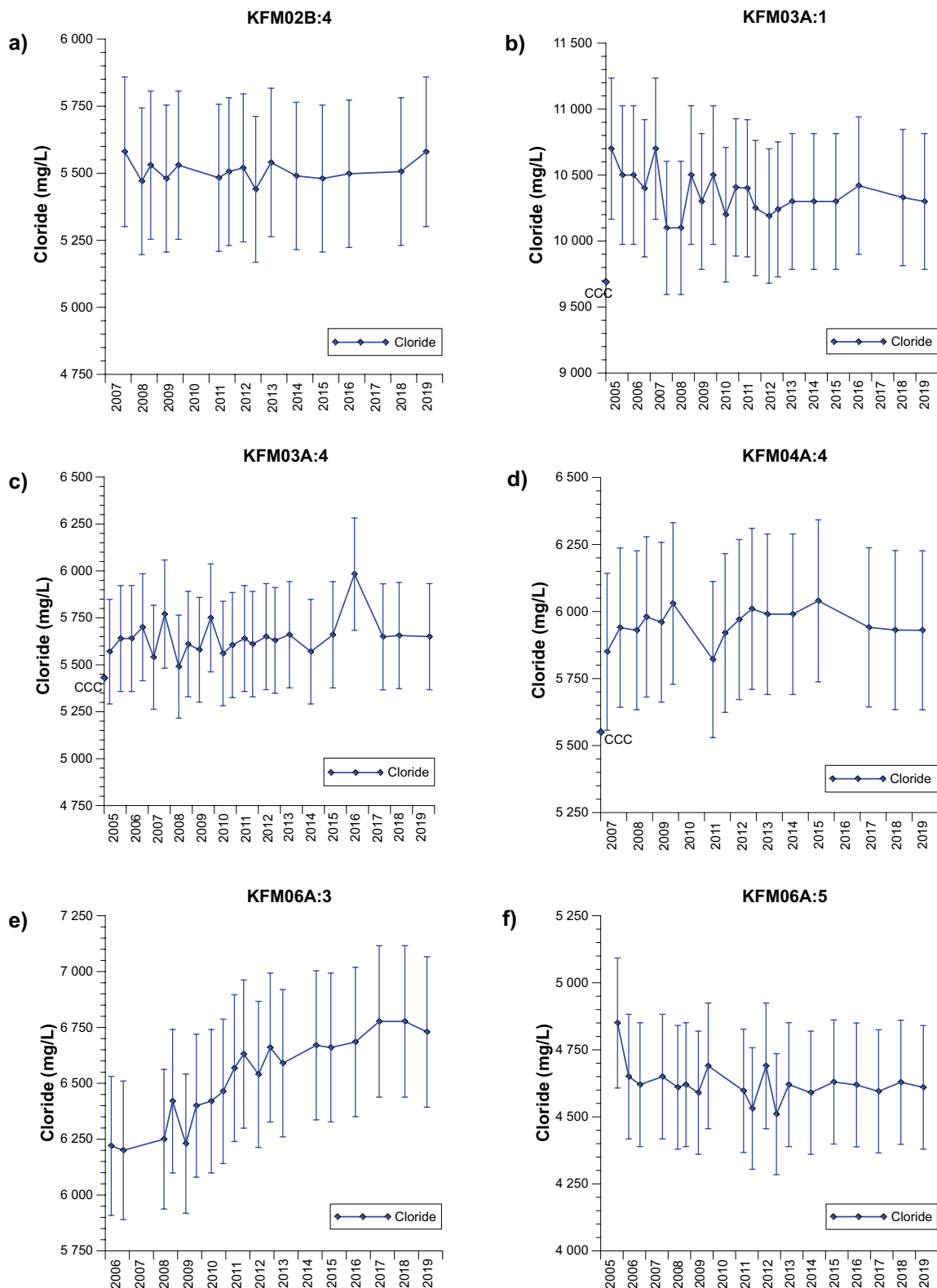


Figure 4-6. Chloride concentrations in collected samples from hydrochemical monitoring 2005 to 2019 and from the initial complete chemical characterisation (CCC). The points for CCC are placed on the y-axes with no correlation to date on x-axis.

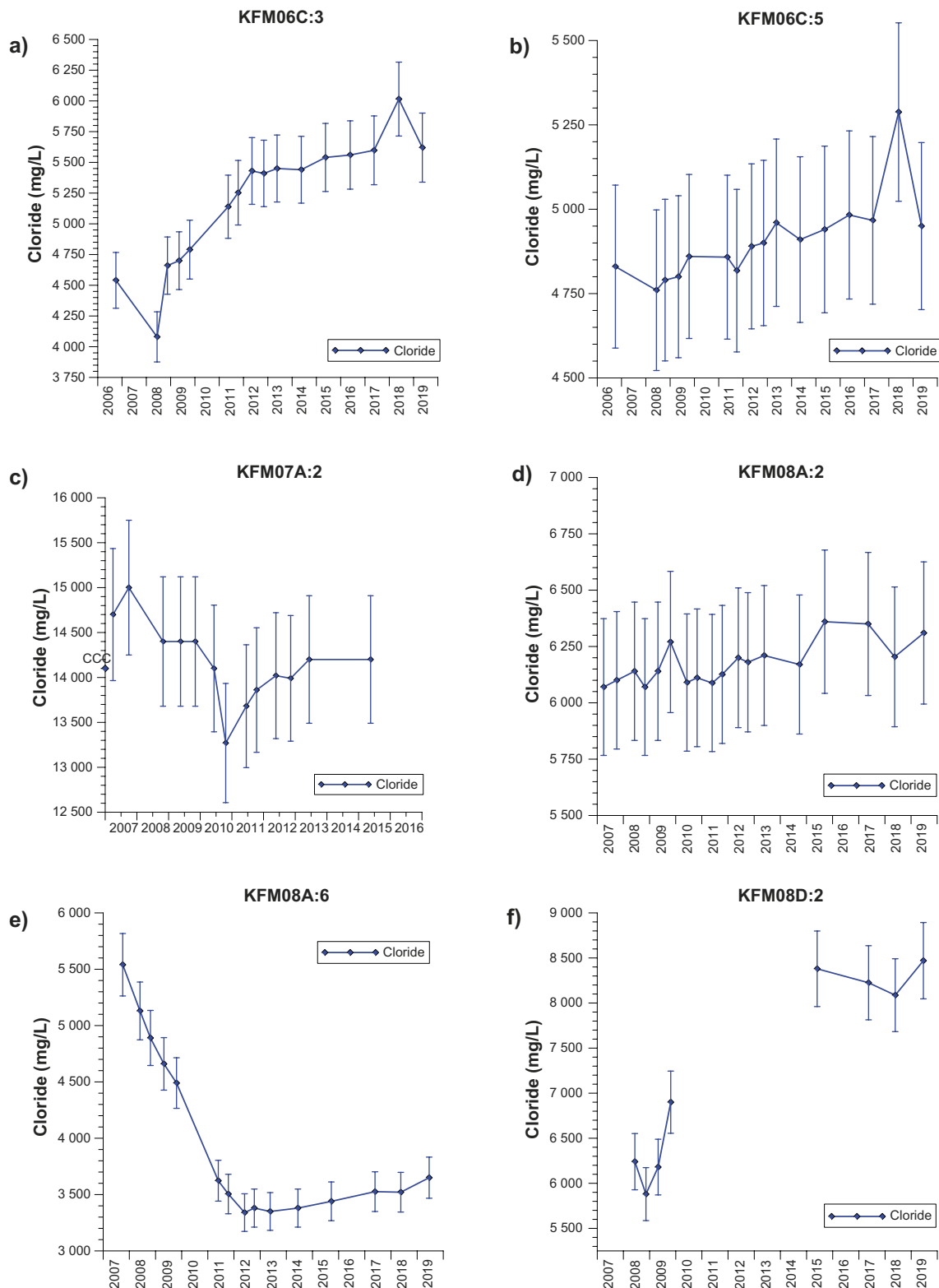


Figure 4-7. Chloride concentrations in collected samples from hydrochemical monitoring 2005 to 2019 and from the initial complete chemical characterisation (CCC). The points for CCC are placed on the y-axes with no correlation to date on x-axis.

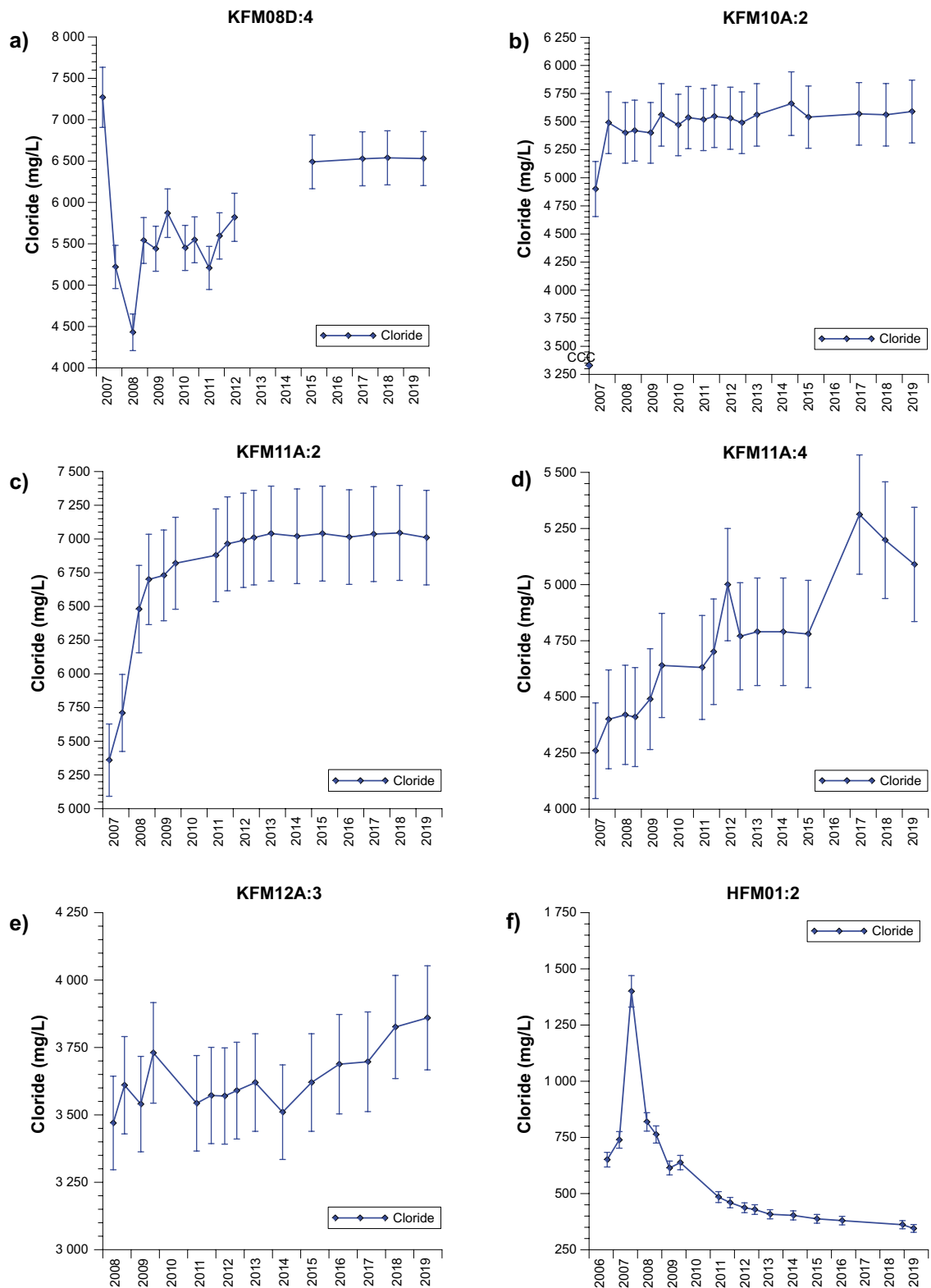


Figure 4-8. Chloride concentrations in collected samples from hydrochemical monitoring 2005 to 2019 and from the initial complete chemical characterisation (CCC). The data points for CCC are placed on the y-axes with no correlation to date on x-axis.

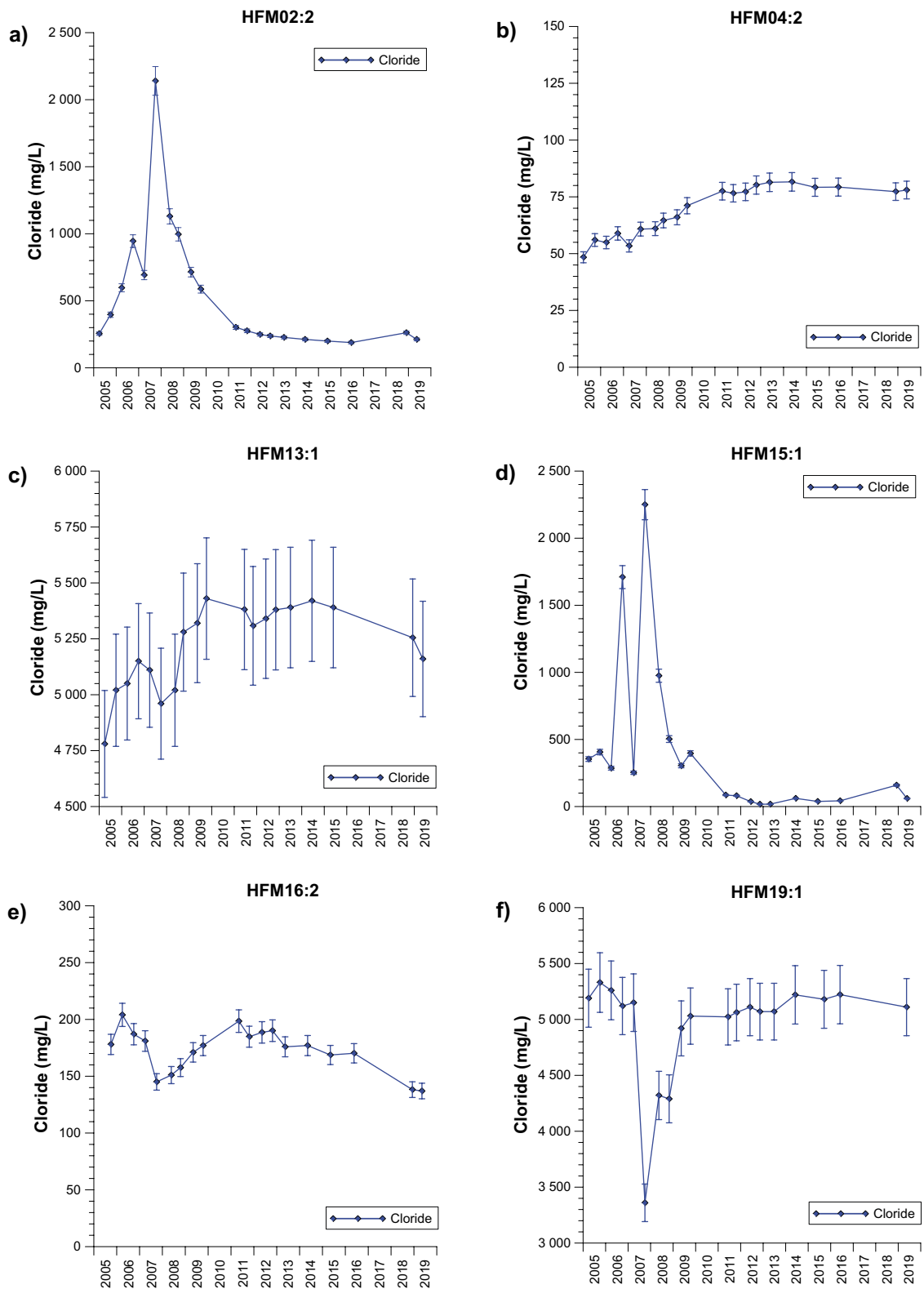


Figure 4-9. Chloride concentrations in collected samples from hydrochemical monitoring 2005 to 2019.

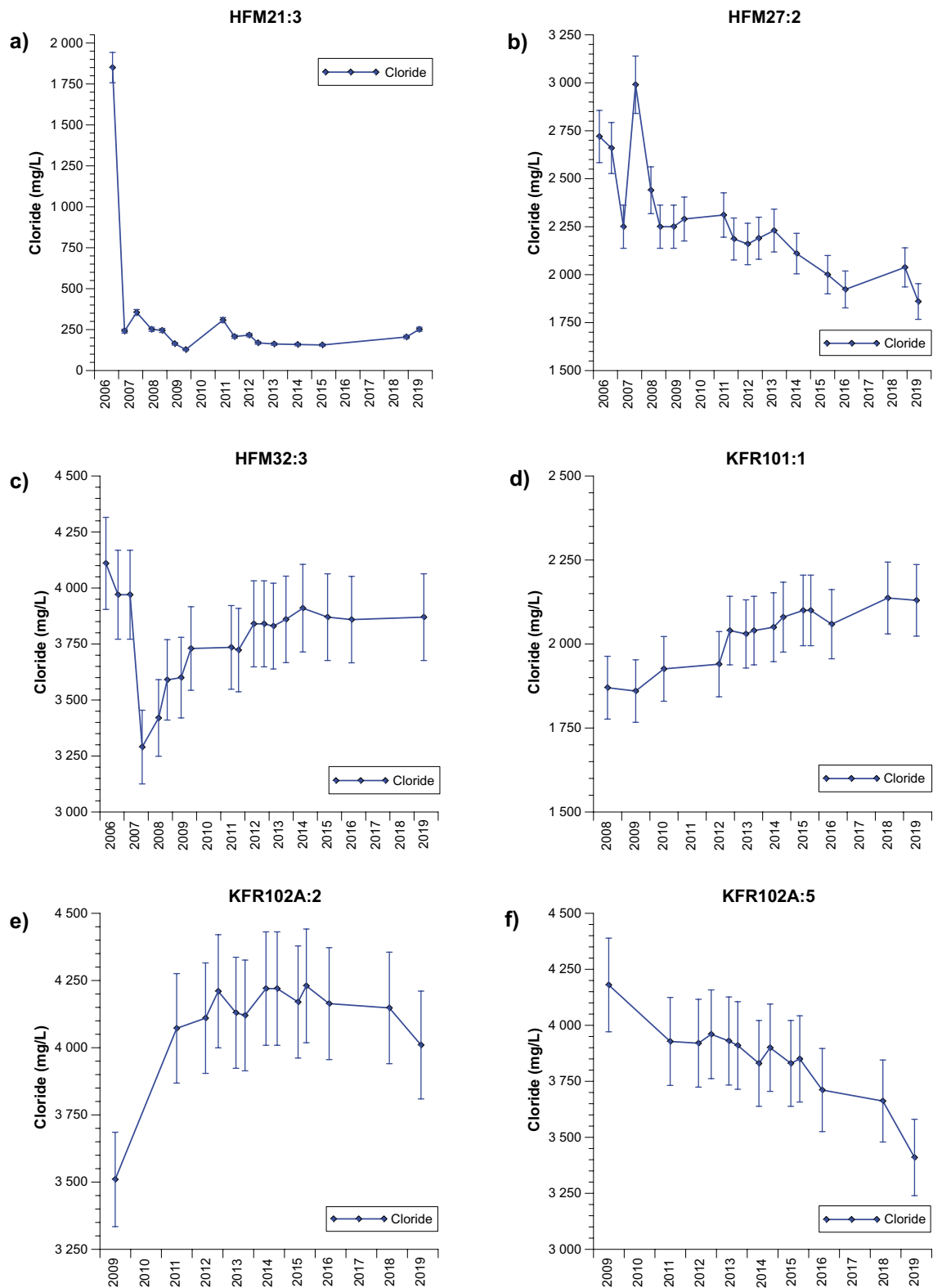


Figure 4-10. Chloride concentrations in collected samples from hydrochemical monitoring 2005 to 2019.

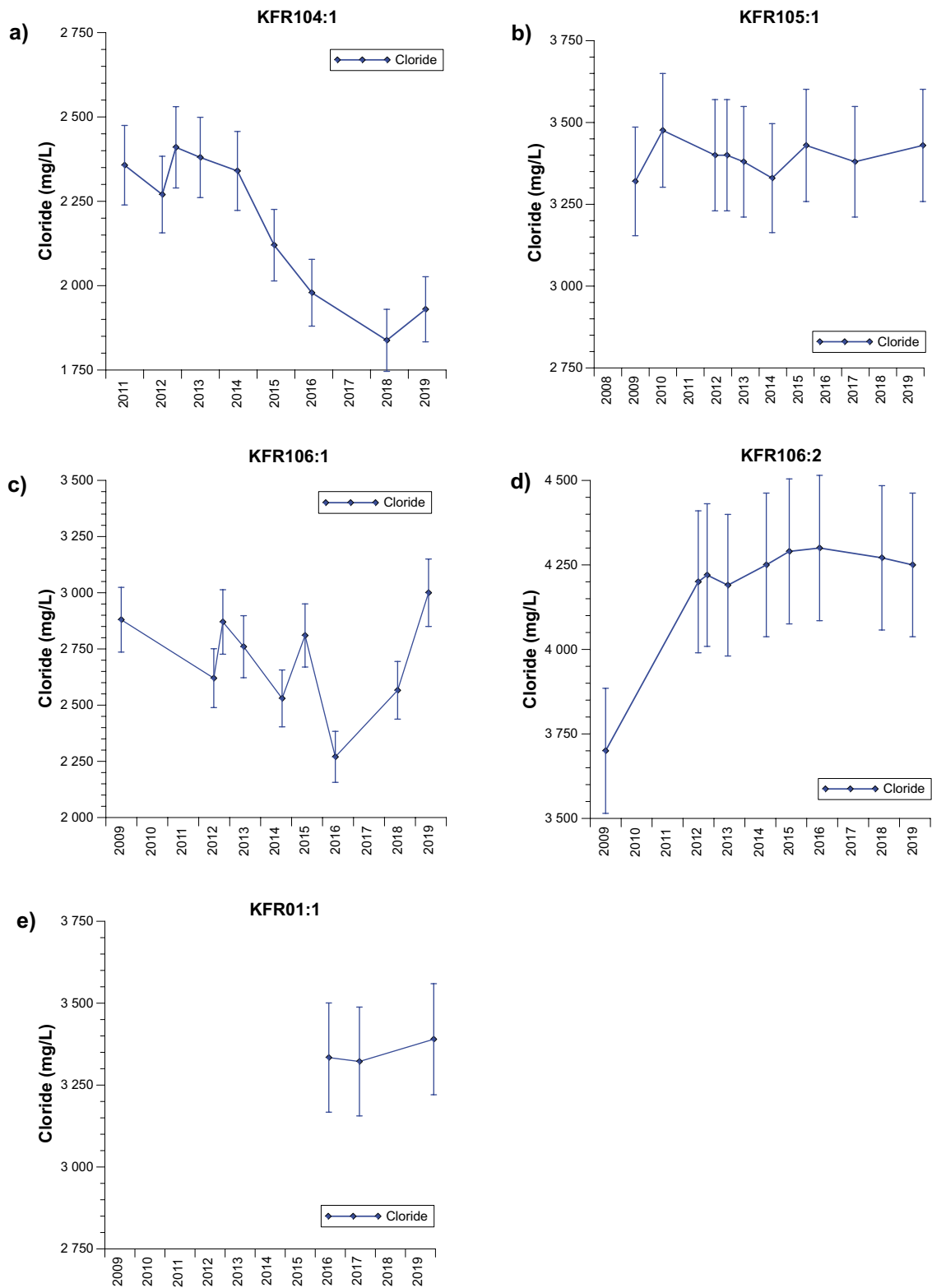


Figure 4-11. Chloride concentrations in collected samples from hydrochemical monitoring 2005 to 2019.

5 Summary and discussions

A varying number of borehole sections included in the monitoring program were sampled during 2017 to 2019; 15 sections in 2017, 37 sections in 2018 and 40 sections in 2019.

In 2017, the sampling campaign was conducted with focus to follow the stabilization of pH values in these sections. Thus, a less numerous amount of sections were included in the sampling campaign in 2017 and several of the sampling series this year consisted of four samples. In 2018 and 2019, most sections in the monitoring program were sampled, except for a few sections due to re-installation or deflated borehole packers. In total, five pump stops occurred, one in 2017 and two each year in 2018 and 2019. Gas evacuation was used in the same sections compared with previous years, which probably helped to avoid pump stops.

According to chloride concentrations, the groundwater compositions in the sampled sections are generally stable and no significant changes occur. The changes and variations in chloride concentration in KFR104:1 and KFR 106:1 might be due to different pumped volumes each year.

With large enough purging prior to sampling, the contribution from influenced section water present in the borehole section decreased as well as the pH, and more representative groundwater samples were obtained. During the last years, the pumped volumes have been increased in several sections with elevated pH values. The focus on pH stabilization in 2017 gave no clear conclusion, but before pumping in 2018 and 2019 the pumping volumes were adjusted and increased to volumes bigger than plug-flow volumes in in additional some sections compared to measurements before 2017.

References

SKB's (Svensk Kärnbränslehantering AB) publications can be found at www.skb.com/publications. SKBdoc documents will be submitted upon request to document@skb.se.

Lindquist A, Nilsson A-C, 2013. Hydrochemical groundwater monitoring. Results from water sampling at the SFR-site, spring and autumn 2012. SKBdoc 1413843 ver 1.0, Svensk Kärnbränslehantering AB.

Lindquist A, Ragvald J, 2015. Hydrochemical groundwater monitoring. Results from water sampling in the Forsmark area 2014. SKBdoc 1420576 ver 1.0, Svensk Kärnbränslehantering AB.

Lindquist A, Nilsson K, Jönsson S, 2012. Hydrochemical monitoring of groundwaters. Results from water sampling in the Forsmark area, spring and autumn 2010. SKBdoc 1334697 ver 1.0, Svensk Kärnbränslehantering AB.

Nilsson A-C, Sandberg B, 2017. Elevated pH values in groundwater. Observations from SKB investigations 1976–2014 and possible causes. SKB R-16-04, Svensk Kärnbränslehantering AB.

Nilsson A-C (ed), Berg C, Harrström J, Jönsson S, Thur P, Borgiel M, Qvarfordt S, 2010. Forsmark site investigation. Hydrochemical monitoring of groundwaters and surface waters. Results from water sampling in the Forsmark area, January–December 2009. SKB P-10-40, Svensk Kärnbränslehantering AB.

Ragvald J, 2016. Hydrochemical groundwater monitoring. Results from water sampling in the Forsmark area 2015. SKBdoc 1542091 ver 1.0, Svensk Kärnbränslehantering AB.

Ragvald J, 2018. Hydrochemical groundwater monitoring Results from water sampling in the Forsmark area 2016. SKB P-18-11, Svensk Kärnbränslehantering AB.

Sandström B, Nilsson K, Tullborg E-L, 2011. Site investigation SFR. Fracture mineralogy including identification of uranium phases and hydrochemical characterisation of groundwater in borehole KFR106. SKP P-11-41, Svensk Kärnbränslehantering AB.

SKB, 2001. Site investigations. Investigation methods and general execution programme. SKB TR-01-29, Svensk Kärnbränslehantering AB.

SKB, 2005. Forsmark site investigation. Programme for further investigations of geosphere and biosphere. SKB R-05-14, Svensk Kärnbränslehantering AB.

SKB, 2007. Programme for long-term observations of geosphere and biosphere after completed site investigations. SKB R-07-34, Svensk Kärnbränslehantering AB.

SKB, 2008. Geovetenskapligt undersökningsprogram för utbyggnad av SFR. SKB R-08-67, Svensk Kärnbränslehantering AB. (In Swedish.)

Wass E, 2015. Groundwater flow measurements in permanently installed boreholes, test campaign no. 9, 2013. SKBdoc 1384642 ver 1.0, Svensk Kärnbränslehantering AB.

Overview of the monitoring programmes 2005–2019

Table A1-1. Overview of the monitoring program in the Forsmark area 2005–2011.

Year	Number of sections included		Sampling programme		Analyses of sulphide (HS ⁻)		Analyses of Uranium (U)		Cleaning	Exchange of water prior to sampling		Analytical protocol (general)
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn		Ordinary	Series	
2005	8	10	One sample/section	One sample/section	No	Yes	No	Yes	No	At least 3 section volumes	-	Spring: Class 3 Autumn: Class 5
2006	15	17	One sample/section	One sample/section	No	Yes	No	Yes	No	At least 3 section volumes	-	Spring: Class 3 Autumn: Class 5
2007	21	28	One sample/section	Series of 3 samples in 2 sections. One sample/section in the others	No	Yes	No	Yes	No	At least 3 section volumes	1 tube vol., 1 section vol., 3 section vol.	Spring: Class 3, some class 5 Autumn: Mainly class 5, some class 4
2008	33	33	One sample/section	One sample/section	In class 5	Yes	In class 5	In class 5	No	At least 3 section volumes	-	Spring: Class 5 (in 7 sections) and class 3. Autumn: Mainly class 5, some class 4
2009	33	33(13)	One sample/section	Series of 5 samples in 13 sections. One sample/section in the others	In class 4	All samples in series. Not in single samples.	No	All samples in series. Not in single samples.	Rinse pumping in 13 selected sections. No measure in other sections.	At least 5 section volumes	1 tube vol., 1 section vol., 2, 3, 5 section vol.	Spring: Class 3 and 4 (in 7 sections) Autumn: Class 3 for single samples. For series 4, 4+ and 5+)
2010	12	12	Series of 5 samples in 12 sections.	Series of 3 samples in 12 sections.	In all samples	Last sample in each series	All samples.	In last sample in series in 4 sections.	Cleaning ¹⁾ in all 12 sections both spring and autumn.	-	Plug-flow vol. spring: (<1, 2, 3, 4, 5) autumn: (3, 4, 5-6)	Spring: Class 5 Autumn: Class 3 and 4
2011	32 ²⁾	32 ²⁾	Series of 3 samples from all sections	Series of 3 samples from all sections	In all samples	In all samples	Last sample in series in KFM02A:2 and KFM03A:4.	Last sample in series in KFM02A:2 and KFM03A:4.	Cleaning ¹⁾ in all sections either in spring or in autumn.	-	Plug-flow volumes (1.5, 3, 5)	Spring: Class 4 Autumn: Class 4

¹⁾ High pressure cleaning and rinse pumping.²⁾ KFM08D:2 was omitted.

Table A1-2. Overview of the monitoring program in the Forsmark area 2012–2016.

Year	Number of sections included		Sampling programme		Analyses of sulphide (HS ⁻)		Analyses of Uranium (U)		Cleaning	Exchange of water prior to sampling series	Use of docking unit	Analytical protocol (general)
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn				
2012	32 ³⁾	31 ⁴⁾	Series of 3 samples from all sections	Series of 3 samples from all sections	In all samples	No	Last sample in series in KFM02A:2 and KFM03A:4.	Last sample in series in KFM02A:2 and KFM03A:4.	Cleaning ¹⁾ in all sections in spring	Plug-flow volumes (1.5, 3, 5)	-	Spring: Class 4 Autumn: Class 3
2013	31 ⁴⁾	1	Series of 3 samples from all sampled sections	Series of 3 samples from all sampled sections	In all samples	In all samples	Last sample in series in KFM02A:2 and KFM03A:4.	No	Cleaning ¹⁾ in all sections in spring	Plug-flow volumes (1.5, 3, 5)	-	Spring: Class 4 Autumn: Class 4
2014	24 ⁵⁾	5	Series of 3 samples from all sampled sections	Series of 3 samples from all sampled sections	In all samples	In all samples	Last sample in series in KFM02A:2 and KFM03A:4.	No	Cleaning ¹⁾ in all sections except HFM32:3 either in spring or in autumn.	Plug-flow volumes (1.5, 3, 5)	1 section in spring	Spring: Class 4 Autumn: Class 4
2015	27 ⁶⁾	4	Series of 3 samples from all sampled sections	Series of 3 samples from all sampled sections	In all samples	In all samples	Last sample in series in KFM02A:2 and KFM03A:4.	No	Cleaning ¹⁾ or cleaning ²⁾ in all sections except HFM32:3 and KFM08D:2 and 4 either in spring or in autumn.	Plug-flow volumes (1.5, 3, 5)	KFM08D:2 and 4 (borehole equipment in PEEK)	Spring: Class 4 Autumn: Class 4
2016	23 ⁷⁾	0	Series of 3 samples from all sampled sections	No sampling performed during autumn	In all samples	-	Last sample in series in KFM02A:3	No	Cleaning ²⁾ in most sections ⁹⁾	Plug-flow volumes (1.5, 3, 5) in all sections except KFM06A:3, KFM06C:3 and KFM11A:2 ¹⁰⁾	-	Spring: Class 4 Autumn: -

¹⁾ High pressure cleaning and rinse pumping.

²⁾ High pressure cleaning and gas lift pumping (2 gas blows).

³⁾ KFM08D:2 was omitted.

⁴⁾ KFM08D:2 and KFM08D:4 were omitted.

⁵⁾ KFM01D:2, KFM01D:4, KFM07A:2, KFM08D:2 and KFM08D:4 were omitted this year.

⁶⁾ KFM01D:2 and KFM01D:4 were omitted.

⁷⁾ KFM03A:4, KFM07A:2, KFM08A:6, KFM08A:2, KFM08D:4, KFM08D:2, KFM10A:2, KFM11A:4, HFM13:1 and HFM21:3 were omitted.

⁸⁾ KFM07A:2 was omitted.

⁹⁾ No cleaning in KFM03A:1, KFM11A:2, HFM01:2 and HFM32:3 due to various reasons.

¹⁰⁾ Due to high pH values during earlier years, the plug-flow volumes were increased during 2016.

Table A1-3. Overview of the monitoring program in the Forsmark area 2017-2019.

Year	Number of sections included		Sampling programme		Analyses of sulphide (HS ⁻)		Analyses of Uranium (U)		Cleaning	Exchange of water prior to sampling series	Use of docking unit	Analytical protocol (general)
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn				
2017	13 ⁵⁾	0	Series of 3 or 4 samples from all sampled sections ⁴⁾	No sampling performed during autumn	In most samples, except 1 st sample in series	-	No	-	Cleaning ²⁾ in most sections ³⁾	Plug-flow volumes (1.5, 3, 5) in all sections except some sections. ⁷⁾	KFM08D:2 and 4 (borehole equipment in PEEK)	Spring: Class II, b+ and III, d-h, h Autumn: -
2018	22 ⁶⁾	8	Series of 3 samples from all sampled sections	Series of 3 samples from all sampled sections	In all samples	In all samples	Last sample in series in KFM02A:3, KFM02A:5	-	Cleaning ²⁾ in most sections ⁹⁾	Plug-flow volumes (1.5, 3, 5) in all sections except some sections. ⁸⁾	KFM08D:2 and 4 (borehole equipment in PEEK)	Spring: Class II, b+ and III, d-h, h Autumn: Class II, b+ and III, d-h, h
2019	30 ⁸⁾	2	Series of 3 samples from all sampled sections	Series of 3 samples from all sampled sections	In all samples	In all samples	Last sample in series in KFM02A:3, KFM02A:5	Last sample in series in KFM03A:4	Cleaning ²⁾ in most sections ⁹⁾	Plug-flow volumes (1.5, 3, 5) in all sections except KFM06A:3, KFM06C:3 and KFM11A:2 ¹⁰⁾	KFM08D:2 and 4 (borehole equipment in PEEK)	Spring: Class II, b+ and III, d-h, h Autumn: Class II, b+ and III, d-h, h

¹⁾ High pressure cleaning and rinse pumping.

²⁾ High pressure cleaning and gas lift pumping (2 gas blows).

³⁾ No cleaning in HFM32, KFM08D due to various reasons.

⁴⁾ 4 samples in: KFM06A:3, KFM06A:5, KFM06C:3, KFM06C:5, KFM08A:2, KFM08A:6, KFM08D:2, KFM08D:4, KFM11A:2, KFM11A:4, KFM12A:3. Second sample by stable pH value.

⁵⁾ KFM01A:5, KFM01D:2, KFM01D:4, KFM02A:3, KFM02A:5, KFM02B:2, KFM02B:4, KFM03A:1, KFM03A:4, HFM01:2, HFM02:2, HFM04:2, HFM13:1, HFM15:1, HFM16:2, HFM19:1, HFM21:3, HFM27:2, HFM32:3 were omitted.

⁶⁾ HFM32:3, HFM19:1, KFM07A:2 were omitted.

⁷⁾ Changed pump volume in KFM06A:5, KFM06A:3, KFM06C:5, KFM06C:3, KFM08A:6, KFM08A:2, KFM08D:4, KFM08D:2, KFM11A:4, KFM11A:2, KFM12A:3.

⁸⁾ Changed pump volume in KFM06A:5, KFM06A:3, KFM06C:5, KFM06C:3, KFM08A:2, KFM08D:4, KFM08D:2, KFM11A:2.

⁹⁾ No cleaning in KFM08D.

¹⁰⁾ Changed pump volume in KFM06A:3, KFM06C:3, KFM11A:2.

Table A1-4. Overview of the monitoring program at the SFR-site 2012–2016.

Year	Number of sections included		Sampling programme		Analyses of sulphide (HS ⁻)		Analyses of Uranium (U)		Cleaning	Exchange of water prior to sampling series	Analytical protocol (general)
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn			
2012	7	7	Series of 3 samples from all sections	Series of 3 samples from all sections	In KFR102A (2 sect.)	No	Last sample in series in KFR106:1 and KFR106:2	Last sample in series in KFR106:1 and KFR106:2	Cleaning ¹⁾ in all sections in spring.	Plug-flow volumes (1.5, 3, 5)	Spring: Class 4 Autumn: Class 3
2013	7	3	Series of 3 samples from sampled sections	Series of 3 samples from sampled sections	In KFR102A (2 sect.) and KFR105	No	Last sample in series in KFR106:1 and KFR106:2	No	Cleaning ¹⁾ in all sections in spring.	Plug-flow volumes (1.5, 3, 5)	Spring: Class 4 Autumn: Class 3
2014	5	5	Series of 3 samples from sampled sections	Series of 3 samples from sampled sections	In KFR102A (2 sect.) and KFR105	No	No	Last sample in series in KFR106:1 and KFR106:2	Cleaning ¹⁾ in all sections in spring.	Plug-flow volumes (1.5, 3, 5)	Spring: Class 4 Autumn: Class 3
2015	6	4	Series of 3 samples from sampled sections	Series of 3 samples from sampled sections	In KFR102A (2 sect.)	KFR105	Last sample in series in KFR106:1 and KFR106:2	No	Cleaning ²⁾ in all sections except KFR105 in spring.	Plug-flow volumes (1.5, 3, 5)	Spring: Class 4 Autumn: Class 3
2016	7 ³⁾	0	Series of 3 samples from sampled sections	No sampling performed during autumn	in KFR102A (2 sect.) and KFR01	-	Last sample in series in KFR106:1 and KFR106:2	-	Cleaning ²⁾ in section KFR102A:5 and KFR102A:2	Plug-flow volumes (1.5, 3, 5)	Spring: Class 4 Autumn: -
2017	2 ⁴⁾	0	Series of 3 samples from all sampled sections	No sampling performed during autumn	In all samples	-	No	-	No	Plug-flow volumes (1.5, 3, 5) except KFR01:1.	Spring: Class II, b+ and III, d-h, h Autumn: -
2018	7 ⁵⁾	0	Series of 3 samples from all sampled sections	No sampling performed during autumn	In all except in KFR01	-	Last sample in series in KFR106:1 and KFR106:2	-	Cleaning ²⁾ in all sections except KFR01, KFR106.	Plug-flow volumes (1.5, 3, 5) except KFR01:1.	Spring: Class II, b+ and III, d-h, h Autumn: -
2019	6	2	Series of 3 samples from all sampled sections	Series of 3 samples from sampled sections	In all samples	In all samples	Last sample in series in KFR106:1 and KFR106:2	-	Cleaning ²⁾ in all sections except KFR01, KFR105 KFR106.	Plug-flow volumes (1.5, 3, 5) except KFR01:1.	Spring: Class II, b+ and III, d-h, h Autumn: Class II, b+ and III, d-h, h

¹⁾ High pressure cleaning and rinse pumping.²⁾ High pressure cleaning and gas lift pumping (2 gas blows).³⁾ KFR01:1 was added to the monitoring program. KFR105:1 was not available during the sampling period due to hydraulic injection test.⁴⁾ KFR101:1, KFR102A.2, KFR102A:5, KFR104:1, KFR106:1, KFR106:2 were omitted.⁵⁾ KFR105:1 were omitted.

Sampling information

Table A2-1. Sampling information in 2017.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFM04A:4	6.8	18.7	0 days 7 h 35 min	200		91	-	-	No
					24	24	2017-05-03	31041	
					48	48	2017-05-03	31042	
					80	82	2017-05-03	31043	
KFM06A:3	21.1	13.6	10 days 3 h 33 min	56		815	-	-	Yes
					42	231	2017-05-08	31064	
					- ⁴⁾	461	2017-05-11	31065	
					489	540	2017-05-12	31066	
					517	805	2017-05-15	31067	
KFM06A:5	9.9	22.4	3 days 8 h 8 min	152		730	-	-	Yes
					39	35	2017-05-08	31060	
					- ⁴⁾	526	2017-05-10	31061	
					552	694	2017-05-11	31062	
					578	721	2017-05-11	31063	
KFM06C:3	18.5	23.5	21 days 16 h 45 min	23		706	-	-	Yes
					100	81	2017-05-05	31052	
					- ⁴⁾	315	2017-05-12	31053	
					365	412	2017-05-15	31054	
					415	459	2017-05-17	31055	
KFM06C:5	15.3	11.1	2 days 4 h 22 min	179		564	-	-	Yes
					45	52	2017-05-03	31047	
					- ⁴⁾	328	2017-05-04	31048	
					373	511	2017-05-05	31049	
					418	555	2017-05-05	31050	

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ Second sample planned at stable pH value.

Table A2-1. Sampling information in 2017, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the bore- hole (if yes, see Appendix 4) /Comments
KFM08A:2	19.6	13.9	1 day 3 h 40 min	297	33 - ⁴⁾ 437 459	493 45 415 460 486	- 2017-05-11 2017-05-12 2017-05-12 2017-05-12	- 31077 31078 31079 31080	No
KFM08A:6	7.7	16.3	9 days 0 h 46 min	231	389 - ⁴⁾ 1032 1291	2415 441 773 1699 2036	- 2017-05-18 2017-05-19 2017-05-22 2017-05-23	- 31082 31083 31084 31085	Yes
KFM08D:2	0	0	12 days 23 h 35 min	26	50 - ⁴⁾ 356 389	482 61 323 438 478	- 2017-05-05 2017-05-12 2017-05-15 2017-05-16	- 31056 31057 31058 31059	Yes
KFM08D:4	18.9	22	7 days 3 h 37 min	122	353 - ⁴⁾ 1085 1320	1256 318 850 1055 1249	- 2017-05-19 2017-05-22 2017-05-23 2017-05-24	- 31103 31104 31105 31106	Yes
KFM10A:2	12.4	13.9	2 days 8 h 7 min	209	188 375 625	702 201 409 692	- 2017-05-03 2017-05-04 2017-05-05	- 31044 31045 31046	No

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ Second sample planned at stable pH value.

Table A2-1. Sampling information in 2017, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFM11A:2	19.8	25.2	10 days 9 h 30 min	184	70	1480	-	-	No One pump stop occurred between the third and fourth sample in the series
					- ⁴⁾	82	2017-05-09	31068	
					633	563	2017-05-11	31069	
					873	641	2017-05-11	31070	
						815	2017-05-19	31071	
KFM11A:4	12.9	12.3	2 days 3 h 41 min	240	32	746	-	-	Yes
					- ⁴⁾	33	2017-05-10	31073	
					491	470	2017-05-11	31074	
					512	703	2017-05-12	31075	
						738	2017-05-12	31076	
KFM12A:3	7.9	13.6	1 day 5 h 18 min	250	35	462	-	-	Yes
					- ⁴⁾	42	2017-05-16	31086	
					350	327	2017-05-17	31087	
					373	406	2017-05-17	31088	
						432	2017-05-17	31089	
KFR01:1	0.8	39.6	0 days 23 h 37 min	598	121	848	-	-	No
					202	133	2017-06-20	31107	
					283	198	2017-06-20	31108	
						833	2017-06-21	31109	
KFR105:1	13.3	179	6 days 21 h 3 min	317	1 044 ⁵⁾	3 140	-	-	No
					2 088 ⁵⁾	1 006	2017-06-21	31110	
					3 480 ⁵⁾	1 577	2017-06-22	31111	
						3 130	2017-06-26	31112	

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ Second sample planned at stable pH value.

⁵⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-3 in main report.

Table A2-2. Sampling information in 2018.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFM01A:5	1.4	18	1 day 17 h 30 min	185		461	-	-	Yes
					140	142	2018-05-16	31337	
					279	223	2018-05-16	31338	
					465	450	2018-05-17	31339	
KFM01D:2	3.3	24.5	0 days 16 h 20 min	73		72	-	-	Yes
					24	30	2018-05-31	31397	
					48	43	2018-05-31	31398	
					80	65	2018-05-31	31399	
KFM01D:4	9	12.3	0 days 19 h 10 min	200		230	-	-	Yes
					27	169	2018-05-14	31328	
					54	192	2018-05-14	31329	
					90	222	2018-05-14	31330	
KFM02A:3	14.1	33.4	1 day 11 h 0 min	127		267	-	-	No
					63	69	2018-05-22	31364	
					126	114	2018-05-22	31365	
					210	254	2018-05-23	31366	
KFM02A:5	11.9	31.8	3 days 5 h 57 min	188		879	-	-	No
					273	233	2018-05-21	31376	
					546	517	2018-05-22	31377	
					910	867	2018-05-23	31378	
KFM02B:2	12.8	15	1 day 5 h 32 min	302		535	-	-	No
					90	115	2018-05-23	31373	
					180	173	2018-05-23	31374	
					300	524	2018-05-24	31375	

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

Table A2-2. Sampling information in 2018, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFM02B:4	10.5	21	1 day 10 h 29 min	491	287 573 955	1016 311 521 1004	- 2018-05-24 2018-05-24 2018-05-25	- 31379 31380 31381	No
KFM03A:1	27.7	31.5	4 days 0 h 39 min	61	119 237 395	351 160 266 341	- 2018-05-28 2018-05-29 2018-05-30	- 31385 31386 31387	Yes
KFM03A:4	18.2	18.6	0 days 13 h 12 min	203	44 87 145	161 66 95 150	- 2018-05-24 2018-05-24 2018-05-24	- 31382 31383 31384	No
KFM04A:4	6.8	18.7	0 days 7 h 18 min	188	24 48 80	82 29 47 70	- 2018-05-08 2018-05-08 2018-05-08	- 31322 31323 31324	No
KFM06A:3	21.1	13.6	2 days 20 h 10 min	57	400 ⁴⁾ 428 ⁴⁾ 456 ⁴⁾	231 139 160 218	- 2018-06-07 2018-06-07 2018-06-08	- 31409 31410 31411	Yes
KFM06A:5	9.9	22.4	2 days 14 h 32 min	135	500 526 552	507 451 477 499	- 2018-05-07 2018-05-07 2018-05-07	- 31313 31314 31315	Yes

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-5 in main report.

Table A2-2. Sampling information in 2018, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFM06C:3	18.5	23.5	19 days 14 h 13 min	18		498	-	-	Yes
					450 ⁴⁾	374	2018-05-21	31370	
					500 ⁴⁾	426	2018-05-23	31371	
					550 ⁴⁾	490	2018-05-25	31372	
KFM06C:5	15.3	11.1	0 days 17 h 47 min	159		169	-	-	Yes
					45 ⁴⁾	87	2018-05-29	31319	
					90 ⁴⁾	104	2018-05-29	31320	
					135 ⁴⁾	160	2018-05-29	31321	
KFM08A:2	19.6	13.9	0 days 7 h 40 min	305		140	-	-	No
					400 ⁴⁾	31	2018-05-17	31358	
					422 ⁴⁾	64	2018-05-17	31359	
					444 ⁴⁾	124	2018-05-17	31360	
KFM08A:6	7.7	16.3	3 days 22 h 25 min	261		1479	-	-	Yes
					389	404	2018-05-15	31331	
					777	823	2018-05-16	31332	
					1295	1464	2018-05-18	31333	
KFM08D:2	0	0	17 days 2 h 30 min	23		577	-	-	No
					400 ⁴⁾	217	2018-05-21	31367	
					433 ⁴⁾	241	2018-05-22	31368	
					466 ⁴⁾	281	2018-05-23	31368	
KFM08D:4	18.9	22	3 days 15 h 7 min	148		774	-	-	No
					800 ⁴⁾	284	2018-05-14	31334	
					1035 ⁴⁾	546	2018-05-15	31335	
					1270 ⁴⁾	696	2018-05-16	31336	

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-5 in main report.

Table A2-2. Sampling information in 2018, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFM10A:2	12.4	13.9	2 days 10 h 40 min	200	188 375 625	704 198 396 692	- 2018-05-16 2018-05-17 2018-05-18	- 31355 31356 31357	No
KFM11A:2	19.8	25.2	2 days 6 h 40 min	195	300 ⁴⁾ 450 ⁴⁾ 600 ⁴⁾	638 316 512 627	- 2018-05-17 2018-05-18 2018-05-18	- 31361 31362 31363	No
KFM11A:4	12.9	12.3	0 days 8 h 43 min	244	32 63 105	128 31 71 117	- 2018-05-07 2018-05-07 2018-05-07	- 31316 31317 31318	Yes
KFM12A:3	7.9	13.6	0 days 8 h 34 min	251	35 69 115	129 27 67 117	- 2018-05-09 2018-05-09 2018-05-09	- 31325 31326 31327	Yes
HFM01:2	1.5	36.5	4 days 2 h 31 min	289	459 918 1530	1709 514 971 1695	- 2018-12-04 2018-12-05 2018-12-07	- 31529 31530 31531	Yes
HFM02:2	1.6	31.3	2 days 21 h 27 min	273	357 714 1 190	1 137 347 684 1 127	- 2018-11-27 2018-11-28 2018-11-29	- 31520 31521 31522	No

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-5 in main report.

Table A2-2. Sampling information in 2018, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
HFM04:2	2.2	26.1	1 day 10 h 20 min	307	155 309 515	633 184 310 615	- 2018-11-27 2018-11-27 2018-11-28	- 31535 31536 31537	No
HFM13:1	5	45.6	7 days 21 h 49 min	222	773 1545 2575	2524 713 1643 2513	- 2018-11-30 2018-12-03 2018-12-06	- 31523 31524 31525	No
HFM15:1	2.9	31.8	2 days 8 h 56 min	213	174 348 580	726 212 420 715	- 2018-12-03 2018-12-04 2018-12-05	- 31526 31527 31528	Pressure increases in HFM15:2 during pumping.
HFM16:2	2	39	2 days 21 h 40 min	994	1260 2520 4200	4153 1262 2633 4098	- 2018-12-05 2018-12-06 2018-12-07	- 31541 31542 31543	No
HFM21:3	1.5	30.8	2 days 8 h 42 min	218	201 402 670	743 173 411 728	- 2018-12-04 2018-12-05 2018-12-06	- 31532 31533 31534	No
HFM27:2	2	36.5	3 days 19 h 41 min	230	333 666 1110	1263 307 678 1248	- 2018-11-27 2018-11-28 2018-11-30	- 31538 31539 31540	No

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

Table A2-2. Sampling information in 2018, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFR101:1	3.51	80.1	4 days 2 h 3 min	145	110 ⁵⁾ 219 ⁵⁾ 365 ⁵⁾	658 202 244 405	- 2018-06-08 2018-06-08 2018-06-11	- 31394 31395 31396	No One pump stop occurred between the second and third samples in the series
KFR102A:2	12	25.6	1 day 17 h 29 min	303	291 ⁵⁾ 582 ⁵⁾ 970 ⁵⁾	755 233 385 741	- 2018-05-30 2018-05-30 2018-05-31	- 31391 31392 31393	Yes
KFR102A:5	6.05	7.97	1 day 5 h 54 min	206	78 156 260	370 80 174 358	- 2018-05-30 2018-05-30 2018-05-31	- 31388 31389 31390	Yes
KFR104:1	9.42	199	5 days 7 h 7 min	53	90 ⁵⁾ 180 ⁵⁾ 300 ⁵⁾	406 117 179 397	- 2018-06-04 2018-06-05 2018-06-07	- 31400 31401 31402	Yes
KFR106:1	7.35	174	1 day 9 h 20 min	135	24 48 80	270 37 61 260	- 2018-06-04 2018-06-04 2018-06-05	- 31403 31404 31405	No
KFR106:2	4.04	490	3 days 5 h 40 min	154	83 ⁵⁾ 165 ⁵⁾ 275 ⁵⁾	646 69 296 330	- 2018-06-04 2018-06-05 2018-06-07	- 31406 31407 31408	No One pump stop occurred between the second and third samples in the series

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁵⁾ Plug-flow volume representing < 100 % formation water, see Table A8-2.

Table A2-2. Sampling information in 2018, continued.

Idcode: section	Tube volume	Section volume	Length of pumping period	Medium flow rate¹⁾	Planned removed volume²⁾	Pumped volume³⁾	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
	[L]	[L]		[mL/min]	[L]	[L]			
KFR01:1	0.8	39.6	0 days 23 h 22 min	620	121 ⁴⁾	869 861	- 2018-12-12	- 31554	KFR01:1

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-5 in main report.

Table A2-3. Sampling information in 2019.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, se Appendix 4) /Comments
KFM01A:5	1.4	18	1 day 17 h 30 min	186	140 279 465	463 138 399 455	- 2019-05-15 2019-05-16 2019-05-16	- 66687 66740 66741	Yes
KFM01D:2	3.3	24.5	1 day 7 h 9 min	80	24 48 80	149 33 50 136	- 2019-05-22 2019-05-22 2019-05-23	- 66982 66983 66984	Yes
KFM01D:4	9	12.3	0 days 7 h 12 min	224	27 54 90	97 32 53 86	- 2019-05-24 2019-05-24 2019-05-24	- 66988 66989 66990	Yes
KFM02A:3	14.1	33.4	1 day 8 h 50 min	131	63 126 210	258 75 215 247	- 2019-05-09 2019-05-10 2019-05-10	- 66282 66283 66284	No
KFM02A:5	11.9	31.8	3 days 4 h 50 min	225	273 546 910	1037 315 684 1022	- 2019-05-08 2019-05-09 2019-05-10	- 66279 66280 66281	No
KFM02B:2	12.8	15	1 day 5 h 49 min	303	90 180 300	542 102 183 528	- 2019-05-13 2019-05-13 2019-05-14	- 66539 66625 66681	No

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

Table A2-3. Sampling information in 2019, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, se Appendix 4) /Comments
KFM02B:4	10.5	21	1 day 8 h 38 min	512	287 573 955	1002 299 839 985	- 2019-05-13 2019-05-14 2019-05-14	- 66628 66667 66683	No
KFM03A:1	27.7	31.5	4 days 15 h 0 min	70	119 237 395	467 129 332 458	- 2019-05-20 2019-05-22 2019-05-23	- 66973 66974 66975	Yes
KFM03A:4	18.2	18.6	1 day 5 h 39 min	209	44 87 145	372 61 110 359	- 2019-05-20 2019-05-20 2019-05-21	- 66956 66957 66958	No
KFM03A:4	18.2	18.6	0 days 13 h 0 min	205	43.50 87.00 145.00	525 55 84 141	- 2019-10-09 2019-10-09 2019-10-09	- 71429 71430 71431	No Sampling repeated in autumn due to missed uranium sample.
KFM04A:4	6.8	18.7	0 days 7 h 48 min	209	24 48 80	98 33 52 86	- 2019-05-27 2019-05-27 2019-05-27	- 67342 67343 67344	No
KFM06A:3	21.1	13.6	3 days 0 h 56 min	53	84 ⁴⁾ 140 ⁴⁾ 196 ⁴⁾	233 77 149 225	- 2019-05-07 2019-05-08 2019-05-09	- 66273 66274 66275	Yes

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-7 in main report.

Table A2-3. Sampling information in 2019, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, se Appendix 4) /Comments
KFM06A:5	9.9	22.4	1 day 5 h 26 min	164	39 78 130	289 35 68 277	- 2019-05-06 2019-05-06 2019-05-07	- 66264 66265 66266	Yes
KFM06C:3	18.5	23.5	11 days 3 h 0 min	19	115 ⁴⁾ 215 ⁴⁾ 315 ⁴⁾	305 91 216 295	- 2019-05-06 2019-05-10 2019-05-13	- 66270 66271 66272	Yes
KFM06C:5	15.3	11.1	1 day 7 h 15 min	140	42 83 139	263 53 86 253	- 2019-05-06 2019-05-06 2019-05-07	- 66267 66268 66269	Yes
KFM08A:2	19.6	13.9	0 days 6 h 41 min	298	33 66 110	120 32 62 107	- 2019-06-28 2019-06-28 2019-06-28	- 67531 67532 67533	No
KFM08A:6	7.7	16.3	9 days 2 h 24 min	272	389 777 1295	2670 402 827 1495	- 2019-06-10 2019-06-11 2019-06-18	- 67534 67535 67536	Yes One pump stop occurred between the second and third sample in the series.
KFM08D:2	0	0	4 days 2 h 25 min	22	50 99 165	129 40 88 123	- 2019-06-17 2019-06-19 2019-06-20	- 67537 67538 67539	No

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-7 in main report.

Table A2-3. Sampling information in 2019, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFM08D:4	18.9	22	6 days 10 h 18 min	128	353 705 1 175	1 184 437 794 1 175	- 2019-10-07 2019-10-09 2019-10-11	- 67540 67541 67542	Yes
KFM10A:2	12.4	13.9	2 days 11 h 30 min	215	188 375 625	767 243 490 757	- 2019-05-15 2019-05-16 2019-05-17	- 66689 66742 66743	No
KFM11A:2	19.8	25.2	2 days 8 h 35 min	174	300 ⁴⁾ 450 ⁴⁾ 600 ⁴⁾	591 288 537 579	- 2019-05-27 2019-05-28 2019-05-28	- 67339 67340 67341	No
KFM11A:4	12.9	12.3	0 days 8 h 5 min	236	32 63 105	114 30 64 103	- 2019-06-19 2019-06-19 2019-06-19	- 67543 67544 67545	Yes
KFM12A:3	7.9	13.6	0 days 8 h 30 min	250	35 69 115	127 33 70 115	- 2019-06-27 2019-06-27 2019-06-27	- 67546 67547 67548	Yes
HFM01:2	1.5	36.5	4 days 2 h 25 min	287	459 918 1 530	1 696 484 871 1 683	- 2019-05-21 2019-05-22 2019-05-24	- 66979 66980 66981	Yes

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-7 in main report.

Table A2-3. Sampling information in 2019, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, se Appendix 4) /Comments
HFM02:2	1.6	31.3	2 days 22 h 50 min	285	357 714 1 190	1 211 368 714 1 200	- 2019-05-14 2019-05-15 2019-05-16	- 66684 66688 66745	No
HFM04:2	2.2	26.1	1 day 5 h 49 min	321	155 309 515	575 195 519 561	- 2019-05-20 2019-05-21 2019-05-21	- 66976 66977 66978	No
HFM13:1	5	45.6	8 days 15 h 18 min	227	773 1 545 2 575	2 822 900 1 797 2 808	- 2019-05-14 2019-05-17 2019-05-20	- 66682 66746 66955	No
HFM15:1	2.9	31.8	2 days 5 h 20 min	201	174 348 580	642 346 395 634	- 2019-05-23 2019-05-23 2019-05-24	- 66985 66986 66987	No
HFM16:2	2	39	2 days 23 h 7 min	995	1 260 2 520 4 200	4 245 1 341 2 644 4 204	- 2019-05-07 2019-05-08 2019-05-09	- 66276 66277 66278	No
HFM19:1	3.9	42.3	2 days 11 h 5 min	315	305 609 1 015	1 116 351 670 1 102	- 2019-05-14 2019-05-15 2019-05-16	- 66685 66686 66744	No

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

Table A2-3. Sampling information in 2019, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
HFM21:3	1.5	30.8	2 days 3 h 48 min	215	201 402 670	667 261 574 657	- 2019-06-17 2019-06-18 2019-06-18	- 67549 67550 67551	No
HFM27:2	2	36.5	4 days 1 h 2 min	216	333 666 1 110	6 897 390 704 1 234	- 2019-06-17 2019-06-18 2019-06-20	- 67552 67553 67554	No Due to mistake a longer pumping phase Occurred before pumping for sampling.
HFM32:3	1.4	18	0 days 7 h 42 min	343	44 87 145	158 46 81 148	- 2019-05-29 2019-05-29 2019-05-29	- 67345 67346 67347	No
KFR101:1	3.51	80.1	6 days 15 h 1 min	143	110 ⁵⁾ 219 ⁵⁾ 365 ⁵⁾	837 123 193 357	- 2019-06-13 2019-06-17 2019-06-18	- 67555 67556 67557	No One pump stop occurred between the first and second sample in the series
KFR102A:2	12	25.6	2 days 12 h 5 min	323	291 582 970	1 165 315 705 1 147	- 2019-06-10 2019-06-11 2019-06-12	- 67558 67559 67560	Yes
KFR102A:5	6.05	7.97	1 day 11 h 50 min	208	78 ⁵⁾ 157 ⁵⁾ 261 ⁵⁾	446 128 196 434	- 2019-06-10 2019-06-10 2019-06-11	- 67561 67562 67563	Yes

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁵⁾ Plug-flow volume representing < 100 % formation water, see Table A8-2.

Table A2-3. Sampling information in 2019, continued.

Idcode: section	Tube volume [L]	Section volume [L]	Length of pumping period	Medium flow rate ¹⁾ [mL/min]	Planned removed volume ²⁾ [L]	Pumped volume ³⁾ [L]	Sampling date	Sample no.	Responses observed in other sections in the borehole (if yes, see Appendix 4) /Comments
KFR104:1	9.42	199	7 days 2 h 45 min	45	90 ⁵⁾ 180 ⁵⁾ 300 ⁵⁾	457 134 265 449	- 2019-06-12 2019-06-14 2019-06-17	- 67564 67565 67566	Yes
KFR105:1	13.3	179	6 days 20 h 6 min	959	1044 2088 3480	9442 3918 6664 9419	2019-12-11 2019-12-13 2019-12-16	74127 74128 74129	No
KFR106:1	7.35	174	1 day 3 h 55 min	141	24 47 79	237 25 52 229	- 2019-06-04 2019-06-04 2019-06-05	- 67567 67568 67569	No
KFR106:2	4.04	490	1 day 7 h 20 min	154	83 ⁵⁾ 165 ⁵⁾ 275 ⁵⁾	289 84 247 281	- 2019-06-04 2019-06-05 2019-06-05	- 67570 67571 67572	No
KFR01:1	0.8	39.6	1 day 0 h 45 min	612	121 ⁴⁾ 202 ⁴⁾ 282 ⁴⁾	909 141 239 893	- 2019-12-10 2019-12-10 2019-12-11	- 74124 74125 74126	Yes

¹⁾ The pumping period may contain pump stops. Medium flow rate and pumped volume is calculated from periods of actual pumping.

²⁾ The first sample is planned to be collected after 1,5 plug-flow, the second after 3 and third and last sample in each series after 5 plug-flow volumes.

³⁾ Pump stop has occurred causing restart of pumping during the pumping period for some sections. Volume written by each sample number represent volume pumped since restart in those cases, but total pumped volume include all pumping.

⁴⁾ The planned volumes are higher than the normal plug-flow volumes due to high pH values, see Table 3-7 in main report.

⁵⁾ Plug-flow volume representing < 100 % formation water, see Table A8-2.

Water Composition

Table A3-1. Water Composition - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br ⁻ mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFM04A	230.00	245.00	4	31041	2017-05-03	-	-	-	-	-	101	5960	470	-	28.2	0.99	-	-	-	-	-	-
KFM04A	230.00	245.00	4	31042	2017-05-03	-	-	-	-	-	101	5960	476	-	28.6	1.00	-	-	-	-	-	-
KFM04A	230.00	245.00	4	31043	2017-05-03	3.0	2100	26.4	1570	248	99.3	5940	466	172	27.6	0.98	6.69	2.36	2.22	2.19	3.24	0.0733
KFM06A	341.00	362.00	5	31060	2017-05-08	-	-	-	-	-	26.5	4610	117	-	29.5	1.02	-	-	-	-	-	-
KFM06A	341.00	362.00	5	31061	2017-05-10	-	-	-	-	-	27.9	4590	97.0	-	29.9	1.23	-	-	-	-	-	-
KFM06A	341.00	362.00	5	31062	2017-05-11	-	-	-	-	-	23.4	4610	90.2	-	29.2	1.27	-	-	-	-	-	-
KFM06A	341.00	362.00	5	31063	2017-05-11	4.6	1680	10.4	1370	41.8	28.0	4600	91.8	37.1	29.7	1.23	3.91	0.475	0.46	0.47	0.266	0.0619
KFM06A	738.00	748.00	3	31064	2017-05-08	-	-	-	-	-	13.8	6670	98.5	-	50.0	1.28	-	-	-	-	-	-
KFM06A	738.00	748.00	3	31065	2017-05-11	-	-	-	-	-	14.7	6690	84.1	-	49.2	1.37	-	-	-	-	-	-
KFM06A	738.00	748.00	3	31066	2017-05-12	-	-	-	-	-	14.5	6770	73.8	-	44.2	1.39	-	-	-	-	-	-
KFM06A	738.00	748.00	3	31067	2017-05-15	6.3	2110	10.3	2530	15.8	11.3	6780	84.5	36.1	48.8	1.45	6.77	0.061	0.13	0.13	0.183	0.0541
KFM06C	531.00	540.00	5	31047	2017-05-03	-	-	-	-	-	36.0	4930	225	-	24.8	0.84	-	-	-	-	-	-
KFM06C	531.00	540.00	5	31048	2017-05-04	-	-	-	-	-	44.5	4950	246	-	26.1	0.92	-	-	-	-	-	-
KFM06C	531.00	540.00	5	31049	2017-05-05	-	-	-	-	-	48.8	4980	252	-	26.2	0.94	-	-	-	-	-	-
KFM06C	531.00	540.00	5	31050	2017-05-05	2.4	1840	13.9	1320	88.7	48.4	4970	251	88.9	26.0	0.95	5.01	0.323	0.32	0.30	0.695	0.0551
KFM06C	647.00	666.00	3	31052	2017-05-05	-	-	-	-	-	28.2	5500	66.8	-	43.3	1.12	-	-	-	-	-	-
KFM06C	647.00	666.00	3	31053	2017-05-12	-	-	-	-	-	16.0	5600	58.0	-	43.1	1.27	-	-	-	-	-	-
KFM06C	647.00	666.00	3	31054	2017-05-15	-	-	-	-	-	15.0	5610	56.7	-	42.7	1.32	-	-	-	-	-	-
KFM06C	647.00	666.00	3	31055	2017-05-17	1.9	1610	5.27	1890	17.5	14.9	5600	52.9	22.1	41.5	1.32	3.74	0.023	0.02	0.02	0.0820	0.0370
KFM08A	265.00	280.00	6	31082	2017-05-18	0.1	1280	13.7	880	51.7	59.9	3520	177	60.0	18.2	1.24	6.83	1.11	-	-	0.561	0.0342
KFM08A	265.00	280.00	6	31083	2017-05-19	1.3	1330	13.8	882	53.2	60.2	3510	175	61.5	18.0	1.14	6.78	1.16	-	-	0.577	0.0355
KFM08A	265.00	280.00	6	31084	2017-05-22	2.8	1370	14.3	928	57.1	59.0	3540	184	66.6	17.8	1.26	6.91	1.26	-	-	0.613	0.0375
KFM08A	265.00	280.00	6	31085	2017-05-23	-0.3	1280	12.8	869	54.0	58.6	3530	179	62.8	17.3	1.17	6.41	1.20	1.21	1.11	0.576	0.0347
KFM08A	684.00	694.00	2	31077	2017-05-11	-	-	-	-	-	16.1	6160	62.8	-	46.6	1.29	-	-	-	-	-	-
KFM08A	684.00	694.00	2	31078	2017-05-12	-	-	-	-	-	9.9	6250	63.7	-	46.1	1.28	-	-	-	-	-	-
KFM08A	684.00	694.00	2	31079	2017-05-12	-	-	-	-	-	9.9	6280	62.0	-	45.3	1.27	-	-	-	-	-	-
KFM08A	684.00	694.00	2	31080	2017-05-12	0.1	1780	10.9	2060	10.5	9.9	6350	66.7	24.8	46.7	1.31	4.15	0.139	0.15	0.16	0.108	0.0242

RCB % = Rel. charge balance error % - = Not analysed < "value" = value below reporting limit

Table A3-1. Water Composition, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br ⁻ mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFM08D	660.00	680.00	4	31103	2017-05-19	2.7	1910	7.74	2200	9.65	11.5	6440	66.1	26.5	49.1	1.22	5.69	<0.1	-	-	0.0885	0.0260
KFM08D	660.00	680.00	4	31104	2017-05-22	0.4	1810	6.96	2160	6.96	10.0	6520	65.4	24.8	47.7	1.34	4.94	<0.1	-	-	0.0875	0.0253
KFM08D	660.00	680.00	4	31105	2017-05-23	3.0	1930	7.00	2260	6.96	9.1	6520	65.6	25.3	51.2	1.26	5.03	<0.1	-	-	0.0940	0.0267
KFM08D	660.00	680.00	4	31106	2017-05-24	3.4	1910	6.94	2310	8.35	8.5	6530	60.8	25.6	48.7	1.35	5.02	0.028	0.03	<0.02	0.0966	0.0286
KFM08D	825.00	835.00	2	31056	2017-05-05	-	-	-	-	-	38.5	8340	132	-	68.1	1.26	-	-	-	-	-	-
KFM08D	825.00	835.00	2	31057	2017-05-12	-	-	-	-	-	13.0	8250	116	-	63.9	1.40	-	-	-	-	-	-
KFM08D	825.00	835.00	2	31058	2017-05-15	-	-	-	-	-	10.6	8240	120	-	65.6	1.41	-	-	-	-	-	-
KFM08D	825.00	835.00	2	31059	2017-05-16	0.8	2110	3.85	2860	2.44	10.1	8230	120	45.3	65.6	1.38	3.92	0.005	<0.02	<0.02	0.0159	0.0294
KFM10A	430.00	440.00	2	31044	2017-05-03	-	-	-	-	-	94.0	5560	546	-	19.7	1.23	-	-	-	-	-	-
KFM10A	430.00	440.00	2	31045	2017-05-04	-	-	-	-	-	99.2	5570	567	-	20.3	1.26	-	-	-	-	-	-
KFM10A	430.00	440.00	2	31046	2017-05-05	4.1	2360	32.0	1260	239	100	5570	540	-	19.5	1.25	7.95	3.72	3.34	3.35	1.81	0.0770
KFM11A	446.00	456.00	4	31073	2017-05-10	-	-	-	-	-	9.4	6110	154	-	40.6	1.24	-	-	-	-	-	-
KFM11A	446.00	456.00	4	31074	2017-05-11	-	-	-	-	-	6.5	5450	205	-	29.8	1.36	-	-	-	-	-	-
KFM11A	446.00	456.00	4	31075	2017-05-12	-	-	-	-	-	6.4	5320	210	-	27.9	1.31	-	-	-	-	-	-
KFM11A	446.00	456.00	4	31076	2017-05-12	2.8	1630	6.08	1820	23.7	6.3	5310	202	81.3	27.2	1.31	3.09	0.056	0.06	0.07	0.0728	0.0604
KFM11A	690.00	710.00	2	31068	2017-05-09	-	-	-	-	-	15.2	7060	85.1	-	52.2	1.34	-	-	-	-	-	-
KFM11A	690.00	710.00	2	31069	2017-05-11	-	-	-	-	-	9.5	6940	84.1	-	51.2	1.33	-	-	-	-	-	-
KFM11A	690.00	710.00	2	31070	2017-05-11	-	-	-	-	-	9.5	7030	83.5	-	50.8	1.36	-	-	-	-	-	-
KFM11A	690.00	710.00	2	31071	2017-05-19	0.7	2000	7.13	2310	15.0	8.0	7040	94.0	33.6	53.9	1.26	4.35	0.153	0.14	0.14	0.0650	0.0523
KFM12A	270.00	280.00	3	31086	2017-05-16	2.0	1050	7.07	1320	34.3	30.0	3840	52.2	21.4	25.6	0.90	3.97	0.107	-	-	0.372	0.0471
KFM12A	270.00	280.00	3	31087	2017-05-17	2.4	1060	6.70	1300	37.3	36.7	3800	50.8	21.1	25.6	0.83	3.94	0.130	-	-	0.463	0.0481
KFM12A	270.00	280.00	3	31088	2017-05-17	2.8	1030	6.51	1290	37.4	37.5	3700	50.1	20.5	25.8	0.81	3.94	0.137	-	-	0.475	0.0490
KFM12A	270.00	280.00	3	31089	2017-05-17	1.1	1000	5.88	1240	36.3	37.4	3700	48.6	19.9	25.1	0.82	3.82	0.126	0.13	0.12	0.467	0.0456

RCB % = Rel. charge balance error %

- = Not analysed

< "value" = value below reporting limit

Table A3-1. Water Composition, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br ⁻ mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFR01	44.65	62.30	1	31107	2017-06-20	2.0	1580	8.15	593	113	105	3340	365	121	12.2	1.13	4.22	0.432	-	-	0.610	0.0554
KFR01	44.65	62.30	1	31108	2017-06-20	4.4	1650	8.87	637	121	105	3340	359	130	11.8	1.17	4.62	0.458	-	-	0.660	0.0588
KFR01	44.65	62.30	1	31109	2017-06-21	2.0	1570	8.60	590	114	106	3320	355	123	11.5	1.17	4.35	0.436	0.44	0.43	0.635	0.0526
KFR105	265.00	306.81	1	31110	2017-06-21	-0.5	1310	5.75	709	92.5	85.7	3350	255	83.2	12.1	1.22	4.53	0.672	-	-	1.37	0.0550
KFR105	265.00	306.81	1	31111	2017-06-22	2.1	1390	6.08	748	96.5	85.9	3360	260	86.7	12.6	1.21	4.64	0.695	-	-	1.44	0.0582
KFR105	265.00	306.81	1	31112	2017-06-26	2.1	1400	6.26	749	97.7	86.1	3380	262	88.5	12.6	1.26	4.68	0.701	0.74	0.74	1.46	0.0582

RCB % = Rel. charge balance error %

- = Not analysed

< "value" = value below reporting limit

Table A3-1. Water Composition, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFM04A	230.00	245.00	4	31041	2017-05-03	-	-	7.29	7.40	-	-	0.264	2.0	1720	1600	-	-	-	-
KFM04A	230.00	245.00	4	31042	2017-05-03	-	-	7.27	7.39	1.1	1.4	0.190	2.1	1700	1600	-	-	-	-
KFM04A	230.00	245.00	4	31043	2017-05-03	15.7	-	7.26	7.49	1.3	1.3	0.156	2.7	1720	1620	0.0004	<0.0003	1.55	0.0005
KFM06A	341.00	362.00	5	31060	2017-05-08	-	-	8.60	8.88	-	-	-	19.5	1330	1290	-	-	-	-
KFM06A	341.00	362.00	5	31061	2017-05-10	-	-	7.94	8.28	-	-	0.043	16.0	1330	1290	-	-	-	-
KFM06A	341.00	362.00	5	31062	2017-05-11	-	-	8.31	8.52	1.1	1.1	0.059	15.4	1330	1270	-	-	-	-
KFM06A	341.00	362.00	5	31063	2017-05-11	15.4	-	8.11	8.36	1.1	1.2	0.047	15.4	1330	1290	<0.0002	0.0003	0.176	0.0004
KFM06A	738.00	748.00	3	31064	2017-05-08	-	-	8.68	8.87	-	-	-	28.6	1850	1780	-	-	-	-
KFM06A	738.00	748.00	3	31065	2017-05-11	-	-	8.80	8.87	-	-	0.098	28.5	1860	1790	-	-	-	-
KFM06A	738.00	748.00	3	31066	2017-05-12	-	-	8.84	8.32	1.0	1.1	<0.019	17.4	1850	1790	-	-	-	-
KFM06A	738.00	748.00	3	31067	2017-05-15	27.1	-	8.44	8.21	1.0	1.0	0.073	18.7	1870	1850	<0.0002	0.0005	0.148	0.0006
KFM06C	531.00	540.00	5	31047	2017-05-03	-	-	8.15	8.25	-	-	-	48.5	1430	1350	-	-	-	-
KFM06C	531.00	540.00	5	31048	2017-05-04	-	-	7.80	8.03	-	-	0.082	44.8	1440	1370	-	-	-	-
KFM06C	531.00	540.00	5	31049	2017-05-05	-	-	7.75	7.70	1.4	1.5	0.077	46.7	1430	1390	-	-	-	-
KFM06C	531.00	540.00	5	31050	2017-05-05	13.4	-	7.74	8.02	1.5	1.4	0.080	47.6	1440	1370	<0.0002	<0.0003	0.439	0.0002
KFM06C	647.00	666.00	3	31052	2017-05-05	-	-	9.82	10.00	-	-	-	16.6	1550	1440	-	-	-	-
KFM06C	647.00	666.00	3	31053	2017-05-12	-	-	9.02	8.69	-	-	0.045	5.9	1560	1520	-	-	-	-
KFM06C	647.00	666.00	3	31054	2017-05-15	-	-	8.74	8.68	1.0	0.9	0.062	11.0	1560	1540	-	-	-	-
KFM06C	647.00	666.00	3	31055	2017-05-17	20.7	-	8.66	8.38	0.7	0.7	0.079	5.8	1570	1550	<0.002	0.0005	0.109	0.0005
KFM08A	265.00	280.00	6	31082	2017-05-18	9.48	-	7.60	7.72	-	-	-	9.0	1060	1040	-	-	-	-
KFM08A	265.00	280.00	6	31083	2017-05-19	9.56	-	7.69	8.10	-	-	0.087	8.8	1060	1050	-	-	-	-
KFM08A	265.00	280.00	6	31084	2017-05-22	9.95	-	7.67	7.74	1.4	1.4	0.080	8.9	1060	1050	-	-	-	-
KFM08A	265.00	280.00	6	31085	2017-05-23	9.30	-	7.57	7.62	1.5	1.5	0.076	8.3	1060	1040	0.0014	<0.0003	0.306	0.0015
KFM08A	684.00	694.00	2	31077	2017-05-11	-	-	9.12	9.15	-	-	-	11.4	1730	1680	-	-	-	-
KFM08A	684.00	694.00	2	31078	2017-05-12	-	-	8.42	8.34	-	-	0.047	11.6	1730	1690	-	-	-	-
KFM08A	684.00	694.00	2	31079	2017-05-12	-	-	8.41	8.30	0.9	0.9	0.041	11.4	1730	1660	-	-	-	-
KFM08A	684.00	694.00	2	31080	2017-05-12	21.4	-	8.45	8.63	0.8	0.8	0.031	11.8	1730	1650	<0.0002	0.0000	0.0765	<0.0003

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-1. Water Composition, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFM08D	660.00	680.00	4	31103	2017-05-19	23.4	-	8.77	8.63	-	-	-	23.4	1790	1770	-	-	-	-
KFM08D	660.00	680.00	4	31104	2017-05-22	23.2	-	8.72	8.62	-	-	<0.019	23.2	1800	1790	-	-	-	-
KFM08D	660.00	680.00	4	31105	2017-05-23	24.0	-	8.65	8.21	0.7	0.8	<0.019	24.0	1800	1770	-	-	-	-
KFM08D	660.00	680.00	4	31106	2017-05-24	24.5	-	8.57	8.30	0.7	0.7	<0.019	24.5	1810	1770	<0.0002	<0.0003	0.0773	<0.0003
KFM08D	825.00	835.00	2	31056	2017-05-05	-	-	-	10.70	-	-	-	-	2260	2140	-	-	-	-
KFM08D	825.00	835.00	2	31057	2017-05-12	-	-	9.44	9.00	-	-	<0.019	-	2220	2120	-	-	-	-
KFM08D	825.00	835.00	2	31058	2017-05-15	-	-	9.09	8.66	0.7	0.8	<0.019	-	2230	1280	-	-	-	-
KFM08D	825.00	835.00	2	31059	2017-05-16	29.6	-	9.01	8.60	0.7	0.7	0.025	29.6	2210	2190	<0.0002	0.0048	0.0077	0.0049
KFM10A	430.00	440.00	2	31044	2017-05-03	-	-	7.40	7.89	-	-	0.109	-	1630	1540	-	-	-	-
KFM10A	430.00	440.00	2	31045	2017-05-04	-	-	7.52	7.74	1.8	1.7	0.115	-	1630	1570	-	-	-	-
KFM10A	430.00	440.00	2	31046	2017-05-05	11.8	-	7.49	7.83	1.5	1.7	0.119	11.8	1630	1580	0.0003	0.0006	1.29	0.0009
KFM11A	446.00	456.00	4	31073	2017-05-10	-	-	8.95	8.88	-	-	-	-	1730	1650	-	-	-	-
KFM11A	446.00	456.00	4	31074	2017-05-11	-	-	8.52	8.46	-	-	0.192	-	1540	1500	-	-	-	-
KFM11A	446.00	456.00	4	31075	2017-05-12	-	-	8.45	8.36	1.0	1.0	0.187	-	1520	1460	-	-	-	-
KFM11A	446.00	456.00	4	31076	2017-05-12	21.6	-	8.49	8.30	1.0	1.5	0.171	21.6	1520	1460	<0.0002	0.0000	0.0311	<0.0003
KFM11A	690.00	710.00	2	31068	2017-05-09	-	-	9.24	9.20	-	-	-	-	1950	1860	-	-	-	-
KFM11A	690.00	710.00	2	31069	2017-05-11	-	-	8.63	8.55	-	-	0.150	-	1940	1860	-	-	-	-
KFM11A	690.00	710.00	2	31070	2017-05-11	-	-	8.60	8.54	0.6	0.7	0.156	-	1930	1870	-	-	-	-
KFM11A	690.00	710.00	2	31071	2017-05-19	27.8	-	8.51	8.24	0.5	0.4	0.146	27.8	1940	1910	<0.0002	0.0003	0.0628	0.0003
KFM12A	270.00	280.00	3	31086	2017-05-16	17.8	-	8.30	8.10	-	-	-	17.8	1100	1080	-	-	-	-
KFM12A	270.00	280.00	3	31087	2017-05-17	17.6	-	7.95	7.93	-	-	0.098	17.6	1090	1060	-	-	-	-
KFM12A	270.00	280.00	3	31088	2017-05-17	17.3	-	7.88	7.94	0.9	1.1	0.088	17.3	1100	1070	-	-	-	-
KFM12A	270.00	280.00	3	31089	2017-05-17	16.8	-	7.85	7.94	0.9	0.9	0.089	16.8	1090	1070	<0.0002	<0.0003	0.0434	<0.0003
KFM08D	660.00	680.00	4	31103	2017-05-19	23.4	-	8.77	8.63	-	-	-	23.4	1790	1770	-	-	-	-
KFM08D	660.00	680.00	4	31104	2017-05-22	23.2	-	8.72	8.62	-	-	<0.019	23.2	1800	1790	-	-	-	-
KFM08D	660.00	680.00	4	31105	2017-05-23	24.0	-	8.65	8.21	0.7	0.8	<0.019	24.0	1800	1770	-	-	-	-
KFM08D	660.00	680.00	4	31106	2017-05-24	24.5	-	8.57	8.30	0.7	0.7	<0.019	24.5	1810	1770	<0.0002	<0.0003	0.0773	<0.0003

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-1. Water Composition, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFR01	44.65	62.30	1	31107	2017-06-20	7.84	-	7.48	6.62	1.4	1.4	<0.019	1.5	1040	1030	-	-	-	-
KFR01	44.65	62.30	1	31108	2017-06-20	8.39	-	7.49	7.72	1.4	1.4	<0.019	1.5	1040	1030	-	-	-	-
KFR01	44.65	62.30	1	31109	2017-06-21	7.70	-	7.48	7.58	1.4	1.4	<0.019	1.6	1030	1020	<0.0002	<0.0002	0.218	<0.0003
KFR105	265.00	306.81	1	31110	2017-06-21	9.77	-	7.58	7.82	0.8	0.9	<0.019	1.7	1030	1020	-	-	-	-
KFR105	265.00	306.81	1	31111	2017-06-22	10.3	-	7.59	7.71	0.8	0.8	<0.019	1.2	1030	1020	-	-	-	-
KFR105	265.00	306.81	1	31112	2017-06-26	10.3	-	7.61	7.64	0.8	1.6	<0.019	1.6	1030	1030	<0.0002	<0.0002	0.0117	<0.0003

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-1. Water Composition, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	PO₄-P mg/L	PO₄-P² mg/L	P mg/L	Temp_F
KFM04A	230.00	245.00	4	31041	2017-05-03	-	-	-	9.3
KFM04A	230.00	245.00	4	31042	2017-05-03	-	-	-	9.4
KFM04A	230.00	245.00	4	31043	2017-05-03	<0.0005	<0.0005	<0.04	8.6
KFM06A	341.00	362.00	5	31060	2017-05-08	-	-	-	6.4
KFM06A	341.00	362.00	5	31061	2017-05-10	-	-	-	8.7
KFM06A	341.00	362.00	5	31062	2017-05-11	-	-	-	6.9
KFM06A	341.00	362.00	5	31063	2017-05-11	<0.0005	<0.0005	<0.005	8.4
KFM06A	738.00	748.00	3	31064	2017-05-08	-	-	-	6.4
KFM06A	738.00	748.00	3	31065	2017-05-11	-	-	-	6.9
KFM06A	738.00	748.00	3	31066	2017-05-12	-	-	-	10.7
KFM06A	738.00	748.00	3	31067	2017-05-15	<0.0005	0.0007	<0.04	6.2
KFM06C	531.00	540.00	5	31047	2017-05-03	-	-	-	9.4
KFM06C	531.00	540.00	5	31048	2017-05-04	-	-	-	10.2
KFM06C	531.00	540.00	5	31049	2017-05-05	-	-	-	7.5
KFM06C	531.00	540.00	5	31050	2017-05-05	<0.0005	<0.0005	<0.005	11.7
KFM06C	647.00	666.00	3	31052	2017-05-05	-	-	-	17.9
KFM06C	647.00	666.00	3	31053	2017-05-12	-	-	-	10.9
KFM06C	647.00	666.00	3	31054	2017-05-15	-	-	-	5.6
KFM06C	647.00	666.00	3	31055	2017-05-17	0.0009	0.0010	<0.005	10.5
KFM08A	265.00	280.00	6	31082	2017-05-18	-	-	-	10.5
KFM08A	265.00	280.00	6	31083	2017-05-19	-	-	-	11.6
KFM08A	265.00	280.00	6	31084	2017-05-22	-	-	-	10.4
KFM08A	265.00	280.00	6	31085	2017-05-23	<0.0005	0.0010	<0.005	9.7
KFM08A	684.00	694.00	2	31077	2017-05-11	-	-	-	8.1
KFM08A	684.00	694.00	2	31078	2017-05-12	-	-	-	6.7
KFM08A	684.00	694.00	2	31079	2017-05-12	-	-	-	9.2
KFM08A	684.00	694.00	2	31080	2017-05-12	-	-	-	9.3

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-1. Water Composition, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	PO₄-P mg/L	PO₄-P² mg/L	P mg/L	Temp_F
KFM08D	660.00	680.00	4	31103	2017-05-19	<0.0005	0.0010	<0.04	10.4
KFM08D	660.00	680.00	4	31104	2017-05-22	-	-	-	12.6
KFM08D	660.00	680.00	4	31105	2017-05-23	-	-	-	12.0
KFM08D	660.00	680.00	4	31106	2017-05-24	-	-	-	12.9
KFM08D	825.00	835.00	2	31056	2017-05-05	<0.0005	0.0009	<0.04	14.2
KFM08D	825.00	835.00	2	31057	2017-05-12	-	-	-	14.5
KFM08D	825.00	835.00	2	31058	2017-05-15	-	-	-	13.2
KFM08D	825.00	835.00	2	31059	2017-05-16	-	-	-	5.8
KFM10A	430.00	440.00	2	31044	2017-05-03	<0.0005	0.0007	<0.04	17.0
KFM10A	430.00	440.00	2	31045	2017-05-04	-	-	-	8.4
KFM10A	430.00	440.00	2	31046	2017-05-05	-	-	-	6.9
KFM11A	446.00	456.00	4	31073	2017-05-10	0.0016	0.0033	<0.04	6.5
KFM11A	446.00	456.00	4	31074	2017-05-11	-	-	-	6.0
KFM11A	446.00	456.00	4	31075	2017-05-12	-	-	-	8.3
KFM11A	446.00	456.00	4	31076	2017-05-12	-	-	-	7.5
KFM11A	690.00	710.00	2	31068	2017-05-09	<0.0005	<0.0005	<0.04	10.0
KFM11A	690.00	710.00	2	31069	2017-05-11	-	-	-	6.4
KFM11A	690.00	710.00	2	31070	2017-05-11	-	-	-	7.6
KFM11A	690.00	710.00	2	31071	2017-05-19	-	-	-	9.3
KFM12A	270.00	280.00	3	31086	2017-05-16	<0.0005	0.0008	<0.04	15.5
KFM12A	270.00	280.00	3	31087	2017-05-17	-	-	-	10.4
KFM12A	270.00	280.00	3	31088	2017-05-17	-	-	-	7.9
KFM12A	270.00	280.00	3	31089	2017-05-17	-	-	-	8.9
KFM08D	660.00	680.00	4	31103	2017-05-19	<0.0005	<0.0005	<0.005	10.8
KFM08D	660.00	680.00	4	31104	2017-05-22	<0.0005	0.0010	<0.04	10.4
KFM08D	660.00	680.00	4	31105	2017-05-23	-	-	-	12.6
KFM08D	660.00	680.00	4	31106	2017-05-24	-	-	-	12.0

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-1. Water Composition, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	PO₄-P mg/L	PO₄-P² mg/L	P mg/L	Temp_F
KFR01	44.65	62.30	1	31107	2017-06-20	-	-	-	-
KFR01	44.65	62.30	1	31108	2017-06-20	-	-	-	9.3
KFR01	44.65	62.30	1	31109	2017-06-21	<0.0005	<0.0005	-	9.7
KFR105	265.00	306.81	1	31110	2017-06-21	-	-	-	10.9
KFR105	265.00	306.81	1	31111	2017-06-22	-	-	-	11.1
KFR105	265.00	306.81	1	31112	2017-06-26	<0.0005	<0.0005	-	11.4

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-2. Trace elements - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Ag µg/L	Al µg/L	As µg/L	B µg/L	Ba µg/L	Cd µg/L	Cr µg/L	Cu µg/L	Co µg/L	Hg µg/L	Ni µg/L	Mo µg/L	Nb µg/L
KFM04A	230.00	245.00	4	31043	2017-05-03	-	3.83	-	-	104	<0.05	0.684	<0.5	3.27	<0.002	0.768	43.6	-
KFM06A	341.00	362.00	5	31063	2017-05-11	-	2.20	-	-	237	0.0623	0.271	<0.2	0.256	<0.002	0.424	189	-
KFM06A	738.00	748.00	3	31067	2017-05-15	-	2.27	-	-	415	0.146	0.251	<0.5	<0.05	<0.002	<0.5	392	-
KFM06C	531.00	540.00	5	31050	2017-05-05	-	2.93	-	-	106	0.0441	0.381	0.219	<0.02	<0.002	0.681	49.0	-
KFM06C	647.00	666.00	3	31055	2017-05-17	-	1.47	-	-	363	0.0801	0.645	0.332	0.0602	<0.002	0.470	27.6	-
KFM08A	265.00	280.00	6	31085	2017-05-23	-	2.48	-	-	505	0.0462	0.195	0.473	0.0760	<0.002	0.261	9.31	-
KFM08A	684.00	694.00	2	31080	2017-05-12	-	4.52	-	-	373	<0.05	0.740	<0.5	<0.05	0.0098	0.612	36.0	-
KFM08D	660.00	680.00	4	31106	2017-05-24	-	2.60	-	-	547	0.136	0.253	0.625	0.117	<0.002	0.797	36.3	-
KFM08D	825.00	835.00	2	31059	2017-05-16	-	2.70	-	-	221	0.205	0.247	0.824	0.101	<0.002	1.02	41.5	-
KFM10A	430.00	440.00	2	31046	2017-05-05	-	3.09	-	-	69.1	<0.05	0.437	<0.5	<0.05	<0.002	<0.5	3.15	-
KFM11A	446.00	456.00	4	31076	2017-05-12	-	2.83	-	-	124	<0.05	<0.1	<0.5	<0.05	<0.002	<0.5	14.3	-
KFM11A	690.00	710.00	2	31071	2017-05-19	-	2.77	-	-	246	0.106	0.922	0.660	0.0982	<0.002	<0.5	28.8	-
KFM12A	270.00	280.00	3	31089	2017-05-17	-	3.68	-	-	546	0.0534	0.232	0.253	0.157	<0.002	0.337	11.8	-
KFR01	44.65	62.30	1	31109	2017-06-21	-	2.08	-	-	57.0	0.151	<0.04	<0.2	0.0304	<0.002	4.80	<0.2	-
KFR105	265.00	306.81	1	31112	2017-06-26	-	3.15	-	-	108	<0.02	0.0445	0.273	<0.02	<0.002	2.49	<0.2	-

- = Not analysed

< "value" = value below reporting limit

Table A3-2. Trace elements, continued - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Pb µg/L	Pd µg/L	Se µg/L	Sn µg/L	V µg/L	Zn µg/L
KFM04A	230.00	245.00	4	31043	2017-05-03	<0.3	-	-	-	<0.05	3.93
KFM06A	341.00	362.00	5	31063	2017-05-11	<0.1	-	-	-	<0.03	2.32
KFM06A	738.00	748.00	3	31067	2017-05-15	<0.3	-	-	-	<0.05	51.7
KFM06C	531.00	540.00	5	31050	2017-05-05	<0.1	-	-	-	0.0519	2.03
KFM06C	647.00	666.00	3	31055	2017-05-17	<0.1	-	-	-	0.164	3.42
KFM08A	265.00	280.00	6	31085	2017-05-23	<0.1	-	-	-	0.215	4.22
KFM08A	684.00	694.00	2	31080	2017-05-12	<0.3	-	-	-	<0.05	8.36
KFM08D	660.00	680.00	4	31106	2017-05-24	<0.3	-	-	-	0.157	7.81
KFM08D	825.00	835.00	2	31059	2017-05-16	<0.3	-	-	-	0.213	4.91
KFM10A	430.00	440.00	2	31046	2017-05-05	<0.3	-	-	-	<0.05	<2
KFM11A	446.00	456.00	4	31076	2017-05-12	<0.3	-	-	-	<0.05	7.48
KFM11A	690.00	710.00	2	31071	2017-05-19	<0.3	-	-	-	0.131	5.16
KFM12A	270.00	280.00	3	31089	2017-05-17	<0.1	-	-	-	0.267	4.13
KFR01	44.65	62.30	1	31109	2017-06-21	<0.1	-	-	-	0.175	1.17
KFR105	265.00	306.81	1	31112	2017-06-26	<0.1	-	-	-	0.191	<0.8

- = Not analysed

< "value" = value below reporting limit

Table A3-4. Isotopes I (H- O- and C-isotopes) - 2017

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	$\delta^2\text{H}$ dev SMOW	^3H TU	$\delta^{18}\text{O}$ dev SMOW
KFM04A	230.00	245.00	4	31043	2017-05-03	-69.4	<0.8	-9.28
KFM06A	341.00	362.00	5	31063	2017-05-11	-88.4	<0.8	-12.31
KFM06A	738.00	748.00	3	31067	2017-05-15	-81.8	<0.8	-12.00
KFM06C	531.00	540.00	5	31050	2017-05-05	-80.6	0.9	-11.10
KFM06C	647.00	666.00	3	31055	2017-05-17	-91.0	1.0	-13.00
KFM08A	265.00	280.00	6	31085	2017-05-23	-99.4	0.9	-13.70
KFM08A	684.00	694.00	2	31080	2017-05-12	-90.8	<0.8	-13.15
KFM08D	660.00	680.00	4	31106	2017-05-24	-79.6	<0.8	-12.29
KFM08D	825.00	835.00	2	31059	2017-05-16	-80.7	<0.8	-12.15
KFM10A	430.00	440.00	2	31046	2017-05-05	-63.5	<0.8	-8.48
KFM11A	446.00	456.00	4	31076	2017-05-12	-89.2	<0.8	-12.41
KFM11A	690.00	710.00	2	31071	2017-05-19	-85.6	<0.8	-12.08
KFM12A	270.00	280.00	3	31089	2017-05-17	-112.9	1.3	-15.43
KFR01	44.65	62.30	1	31109	2017-06-21	-72.9	3.4	-10.75
KFR105	265.00	306.81	1	31112	2017-06-26	-101.6	1.2	-13.58

< "value" = result less than reporting limit

Table A3-5. Water Composition - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
HFM01	33.50	45.50	2	31529	2018-12-04	0.8	427	13.7	46.2	14.6	484	364	168	60.3	1.45	2.40	5.91	0.289	-	-	0.0799	0.0142
HFM01	33.50	45.50	2	31530	2018-12-05	0.6	424	13.5	45.7	14.4	481	362	166	59.9	1.43	2.39	5.85	0.291	-	-	0.0788	0.0141
HFM01	33.50	45.50	2	31531	2018-12-07	-0.8	409	13.2	44.8	14.1	483	362	167	58.2	1.44	2.37	5.70	0.292	0.30	0.30	0.0771	0.0138
HFM02	38.00	48.00	2	31520	2018-11-27	2.1	302	12.9	50.3	15.8	426	286	67.1	23.1	1.08	1.73	6.21	0.331	-	-	0.0978	0.0133
HFM02	38.00	48.00	2	31521	2018-11-28	3.8	298	13.4	53.2	16.6	428	267	63.8	22.9	1.23	1.72	6.57	0.367	-	-	0.105	0.0144
HFM02	38.00	48.00	2	31522	2018-11-29	3.3	292	13.1	52.7	16.5	432	262	63.8	22.3	1.04	1.67	6.51	0.361	0.35	0.36	0.105	0.0143
HFM04	58.00	66.00	2	31535	2018-11-27	2.9	182	7.26	33.3	8.62	411	77.3	39.6	14.0	0.43	1.74	6.76	0.392	-	-	0.0915	0.0110
HFM04	58.00	66.00	2	31536	2018-11-27	3.5	185	7.32	33.1	8.60	410	77.5	39.8	14.0	0.45	1.75	6.79	0.384	-	-	0.0905	0.0106
HFM04	58.00	66.00	2	31537	2018-11-28	2.0	179	7.06	31.8	8.24	410	77.3	40.0	13.7	0.44	1.76	6.58	0.367	0.37	0.37	0.0864	0.0104
HFM13	159.00	173.00	1	31523	2018-11-30	1.4	1930	23.9	1210	214	110	5190	447	160	21.0	1.30	6.83	3.87	-	-	2.35	0.063
HFM13	159.00	173.00	1	31524	2018-12-03	1.0	1940	24.0	1210	215	117	5240	462	163	21.9	1.32	6.89	3.76	-	-	2.39	0.064
HFM13	159.00	173.00	1	31525	2018-12-06	0.9	1950	23.8	1200	214	117	5260	457	160	21.8	1.33	6.91	3.71	3.92	3.91	2.36	0.063
HFM15	85.00	95.00	1	31526	2018-12-03	2.9	171	8.63	87.2	12.5	419	157	42.4	15.4	0.86	1.03	7.43	1.28	-	-	0.265	0.085
HFM15	85.00	95.00	1	31527	2018-12-04	3.3	172	8.65	88.0	12.5	417	158	43.0	15.5	0.67	0.95	7.46	1.30	-	-	0.268	0.0917
HFM15	85.00	95.00	1	31528	2018-12-05	1.6	166	8.31	84.2	12.0	416	159	42.6	15.0	0.87	1.04	7.19	1.28	1.31	1.30	0.257	0.0897
HFM16	54.00	67.00	2	31541	2018-12-05	2.9	260	7.22	36.5	8.69	473	135	71.1	25.3	0.83	2.19	6.50	0.536	-	-	0.0992	0.0123
HFM16	54.00	67.00	2	31542	2018-12-06	2.7	266	7.11	35.3	8.41	477	137	75.4	26.7	0.84	2.24	6.40	0.516	-	-	0.0953	0.0122
HFM16	54.00	67.00	2	31543	2018-12-07	1.6	262	6.83	33.8	8.00	477	138	77.2	26.7	0.84	2.29	6.21	0.489	0.51	0.50	0.0904	0.0117
HFM21	22.00	32.00	3	31532	2018-12-04	4.2	287	15.0	59.1	17.6	489	196	97.6	36.1	0.97	1.39	7.50	0.702	-	-	0.151	0.0189
HFM21	22.00	32.00	3	31533	2018-12-05	2.9	280	14.7	59.8	17.7	486	206	98.1	35.1	0.99	1.38	7.28	0.701	-	-	0.153	0.0184
HFM21	22.00	32.00	3	31534	2018-12-06	1.6	274	14.1	55.0	16.4	484	205	98.0	33.7	1.00	1.41	7.00	0.657	0.66	0.65	0.139	0.0178
HFM27	46.00	58.00	2	31538	2018-11-27	1.0	1050	31.7	335	93.8	289	2070	287	98.6	6.98	1.44	5.76	2.130	-	-	0.637	0.0378
HFM27	46.00	58.00	2	31539	2018-11-28	1.4	1050	31.8	334	93.6	289	2050	283	97.3	6.92	1.55	5.80	2.090	-	-	0.628	0.0389
HFM27	46.00	58.00	2	31540	2018-11-30	0.6	1020	31.1	326	92.4	292	2040	279	95.0	6.86	1.57	5.75	2.050	2.15	2.15	0.614	0.0345
KFM01A	109.00	130.00	5	31337	2018-05-16	2.6	1770	19.7	710	107	69.3	3870	238	84.0	15.7	1.45	8.11	0.232	-	-	0.513	0.0470
KFM01A	109.00	130.00	5	31338	2018-05-16	-0.3	1630	19.9	696	105	69.3	3870	234	81.7	15.7	1.53	8.13	0.285	-	-	0.525	0.0393
KFM01A	109.00	130.00	5	31339	2018-05-17	-1.1	1610	19.4	672	101	70.3	3850	238	79.2	15.8	1.40	8.10	0.333	0.36	0.34	0.514	0.0374

RCB % = Rel. charge balance error %

- = Not analysed

< "value" = value below reporting limit

Table A3-5. Water Composition, continued - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br ⁻ mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFM01D	311.00	321.00	4	31328	2018-05-14	1.6	1790	14.7	1030	63.8	31.7	4450	207	71.9	22.2	1.35	10.8	0.555	-	-	0.308	0.0440
KFM01D	311.00	321.00	4	31329	2018-05-14	2.8	1810	14.6	1030	63.0	30.9	4370	204	71.0	22.2	1.37	10.7	0.554	-	-	0.307	0.0436
KFM01D	311.00	321.00	4	31330	2018-05-14	2.6	1790	14.4	1030	62.0	29.7	4360	202	69.6	22.30	1.37	10.7	0.554	0.59	0.59	0.303	0.0431
KFM01D	429.00	438.00	2	31397	2018-05-31	0.5	1730	12.4	1330	35.5	29.7	4940	118	54.7	31.4	1.21	10.4	<0.1	-	-	0.120	0.0320
KFM01D	429.00	438.00	2	31398	2018-05-31	0.1	1680	12.1	1320	35.5	27.1	4920	116	41.3	30.0	1.21	10.4	<0.1	-	-	0.124	0.0312
KFM01D	429.00	438.00	2	31399	2018-05-31	1.0	1720	12.1	1350	35.3	28.0	4950	119	38.2	30.8	1.21	10.5	0.015	<0.02	<0.02	0.120	0.0366
KFM02A	411.00	442.00	5	31376	2018-05-21	0.1	2000	23.6	1180	199	90.4	5400	420	143	21.8	1.39	7.01	0.696	-	-	1.62	0.655
KFM02A	411.00	442.00	5	31377	2018-05-22	0.0	1980	23.4	1190	198	92.7	5390	415	144	22.8	1.30	7.02	0.685	-	-	1.67	0.654
KFM02A	411.00	442.00	5	31378	2018-05-23	-9.9	1650	18.3	935	156	93.6	5400	415	113	21.9	1.40	5.63	0.565	0.74	0.72	1.33	0.474
KFM02A	490.00	518.00	3	31364	2018-05-22	0.0	2260	40.9	944	234	113	5440	478	166	19.8	1.48	6.61	0.844	-	-	1.60	0.0461
KFM02A	490.00	518.00	3	31365	2018-05-22	0.0	2290	40.1	950	234	120	5490	483	168	20.6	1.44	6.55	1.24	-	-	1.80	0.0474
KFM02A	490.00	518.00	3	31366	2018-05-23	0.7	2260	39.4	958	235	124	5370	482	171	20.3	1.46	6.50	1.33	1.65	1.62	1.95	0.0514
KFM02B	410.00	431.00	4	31379	2018-05-24	-0.1	2110	26.7	1090	213	104	5440	447	154	21.9	1.40	8.21	1.86	-	-	1.90	0.0922
KFM02B	410.00	431.00	4	31380	2018-05-24	-0.1	2100	26.6	1100	213	104	5440	488	154	22.5	1.40	8.19	1.95	-	-	1.93	0.0935
KFM02B	410.00	431.00	4	31381	2018-05-25	-0.2	2100	26.6	1130	216	105	5510	444	156	20.8	1.50	8.19	1.71	2.05	2.07	1.99	0.0996
KFM02B	491.00	506.00	2	31373	2018-05-23	0.3	2320	40.4	921	239	124	5450	525	173	20.4	1.57	7.72	4.29	-	-	1.99	0.0564
KFM02B	491.00	506.00	2	31374	2018-05-23	0.2	2280	40.5	931	241	125	5410	501	175	20.4	1.60	7.82	4.34	-	-	2.01	0.0567
KFM02B	491.00	506.00	2	31375	2018-05-24	-0.8	2280	40.1	924	240	124	5520	494	174	19.8	1.49	7.59	3.70	2.66	2.70	2.00	0.0558
KFM03A	633.50	650.00	4	31382	2018-05-24	1.0	1920	16.9	1550	54.8	17.9	5600	193	65.3	34.0	1.48	6.45	0.430	-	-	0.314	0.0295
KFM03A	633.50	650.00	4	31383	2018-05-24	1.4	1940	16.4	1540	53.9	17.5	5570	192	65.2	33.8	1.51	6.23	0.427	-	-	0.304	0.0295
KFM03A	633.50	650.00	4	31384	2018-05-24	0.8	1930	16.2	1560	53.9	16.8	5660	196	65.9	33.9	1.63	6.22	0.417	0.43	0.44	0.299	0.0294
KFM03A	969.50	994.50	1	31385	2018-05-28	-0.4	2350	8.94	3680	7.60	6.8	10200	55.8	15.9	96.0	1.45	4.89	<0.1	-	-	0.0279	0.0253
KFM03A	969.50	994.50	1	31386	2018-05-29	0.8	2400	9.25	3790	7.85	6.1	10200	53.5	16.3	96.0	1.37	4.88	<0.1	-	-	0.0295	0.0274
KFM03A	969.50	994.50	1	31387	2018-05-30	-1.2	2310	8.89	3700	7.68	6.1	10300	58.3	15.9	99.6	1.34	4.69	0.053	0.06	0.06	0.0280	0.0265
KFM04A	230.00	245.00	4	31322	2018-05-08	1.9	2070	26.1	1490	238	101	5870	472	168	28.1	1.06	6.41	1.88	-	-	2.93	0.0650
KFM04A	230.00	245.00	4	31323	2018-05-08	1.5	2070	26.3	1490	239	100	5930	470	168	27.9	1.08	6.42	2.01	-	-	2.95	0.0650
KFM04A	230.00	245.00	4	31324	2018-05-08	1.7	2090	26.4	1490	239	101	5930	473	169	27.9	1.10	6.45	2.03	2.00	1.94	2.95	0.0650

RCB % = Rel. charge balance error %

- = Not analysed

< "value" = value below reporting limit

Table A3-5. Water Composition, continued - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFM06A	341.00	362.00	5	31313	2018-05-07	3.2	1660	9.11	1330	39.6	26.6	4630	102	36.2	30.8	1.16	5.02	0.421	-	-	0.242	4630
KFM06A	341.00	362.00	5	31314	2018-05-07	2.8	1640	9.00	1320	39.2	26.6	4620	104	35.6	30.8	1.17	4.99	0.420	-	-	0.242	4620
KFM06A	341.00	362.00	5	31315	2018-05-07	3.2	1660	8.92	1330	39.5	26.9	4630	102	35.9	30.9	1.14	4.96	0.424	0.42	0.41	0.241	4630
KFM06A	738.00	748.00	3	31409	2018-05-07	6.0	2120	10.9	2410	18.0	11.5	6640	102	37.0	48.9	1.32	6.91	0.130	-	-	0.185	6640
KFM06A	738.00	748.00	3	31410	2018-06-07	-1.5	1860	9.39	2150	15.7	10.9	6860	97.7	32.8	49.3	1.32	6.09	0.113	-	-	0.165	6860
KFM06A	738.00	748.00	3	31411	2018-06-08	1.1	1940	9.73	2240	16.0	10.6	6780	99.8	34.2	49.1	1.35	6.29	0.130	-	-	0.163	6780
KFM06C	531.00	540.00	5	31319	2018-05-29	0.4	1750	15.0	1280	81.9	43.4	4960	250	86.0	25.7	0.92	4.99	0.258	-	-	0.584	4960
KFM06C	531.00	540.00	5	31320	2018-05-29	0.8	1760	15.0	1290	83.1	45.0	4960	255	86.4	25.8	0.95	5.05	0.267	-	-	0.601	4960
KFM06C	531.00	540.00	5	31321	2018-05-29	-2.7	1750	14.9	1280	82.6	46.5	5290	254	86.6	26.1	0.98	5.01	0.286	0.31	0.30	0.624	5290
KFM06C	647.00	666.00	3	31370	2018-05-21	0.4	1610	6.36	1830	15.5	14.9	5660	63.2	21.2	45.8	1.25	3.60	<0.1	-	-	0.0723	5660
KFM06C	647.00	666.00	3	31371	2018-05-23	2.1	1620	6.44	1850	15.7	14.3	5530	66.3	21.7	43.6	1.24	3.71	<0.1	-	-	0.0840	5530
KFM06C	647.00	666.00	3	31372	2018-05-25	-2.3	1620	6.25	1840	15.0	13.7	6020	64.6	21.0	44.2	1.26	3.62	0.034	-	-	0.0885	6020
KFM08A	265.00	280.00	6	31331	2018-05-15	2.1	1410	14.3	873	54.6	59.4	3550	185	65.1	17.3	1.30	6.98	1.02	-	-	0.547	3550
KFM08A	265.00	280.00	6	31332	2018-05-16	2.5	1400	14.4	882	56.4	59.2	3520	191	66.0	17.4	1.30	6.91	1.12	-	-	0.576	3520
KFM08A	265.00	280.00	6	31333	2018-05-18	1.6	1380	14.4	857	56.1	57.5	3520	203	66.5	17.9	1.30	6.62	1.12	1.13	1.11	0.570	3520
KFM08A	684.00	694.00	2	31358	2018-05-17	0.7	1770	11.5	2030	10.0	15.2	6210	77.7	24.6	48.9	1.33	4.57	<0.1	-	-	0.0548	6210
KFM08A	684.00	694.00	2	31359	2018-05-17	0.8	1790	11.9	2020	10.1	13.4	6210	76.2	24.7	48.8	1.36	5.24	<0.1	-	-	0.0760	6210
KFM08A	684.00	694.00	2	31360	2018-05-17	0.3	1760	11.5	2010	10.1	11.9	6200	75.2	24.9	50.6	1.23	5.45	0.074	0.08	0.08	0.0899	6200
KFM08D	660.00	680.00	4	31334	2018-05-14	2.7	2010	7.66	2150	8.91	9.6	6510	71.5	25.4	49.8	1.37	5.62	<0.1	-	-	0.0765	6510
KFM08D	660.00	680.00	4	31335	2018-05-15	2.8	2010	7.28	2160	8.50	8.5	6510	70.5	25.3	50.0	1.37	5.29	<0.1	-	-	0.0792	6510
KFM08D	660.00	680.00	4	31336	2018-05-16	2.5	2000	7.14	2160	8.29	8.2	6540	72.0	25.3	50.5	1.36	5.18	0.047	0.04	0.03	0.0798	6540
KFM08D	825.00	835.00	2	31367	2018-05-21	1.2	2220	5.48	2810	2.48	12.1	8100	141	45.4	64.5	1.48	3.92	<0.1	-	-	<0.02	8100
KFM08D	825.00	835.00	2	31368	2018-05-22	0.9	2200	5.85	2810	2.53	12.7	8110	142	46.1	65.4	1.42	3.91	<0.1	-	-	0.0154	8110
KFM08D	825.00	835.00	2	31369	2018-05-23	0.5	2170	5.23	2780	2.39	11.3	8090	138	45.3	65.7	1.43	3.89	<0.004	-	-	0.0091	8090
KFM10A	430.00	440.00	2	31355	2018-05-16	-0.1	2230	31.1	1140	219	93.6	5640	630	197	21.9	1.28	7.36	2.72	-	-	1.25	5640
KFM10A	430.00	440.00	2	31356	2018-05-17	0.5	2230	31.1	1140	218	98.8	5560	572	197	20.0	1.38	7.36	2.99	-	-	1.33	5560
KFM10A	430.00	440.00	2	31357	2018-05-18	-0.4	2180	29.9	1120	214	96.5	5560	574	195	20.0	1.39	7.13	2.58	2.61	3.08	1.35	5560

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< "value" = value below reporting limit

Table A3-5. Water Composition, continued - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br ⁻ mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFM11A	446.00	456.00	4	31316	2018-05-07	2.9	1700	5.79	1730	23.8	9.1	5260	226	80.8	27.9	1.20	3.65	<0.1	-	-	0.0630	0.0558
KFM11A	446.00	456.00	4	31317	2018-05-07	3.1	1690	5.64	1730	23.6	7.6	5220	224	80.8	27.9	1.19	3.84	<0.1	-	-	0.0699	0.0550
KFM11A	446.00	456.00	4	31318	2018-05-07	3.0	1670	5.59	1730	23.6	7.2	5200	230	81.6	27.8	1.20	3.84	0.055	0.06	0.06	0.0701	0.0554
KFM11A	690.00	710.00	2	31361	2018-05-17	-0.9	2050	9.00	2280	15.2	11.2	7300	108	34.3	52.5	1.38	4.53	<0.1	-	-	0.0528	0.0494
KFM11A	690.00	710.00	2	31362	2018-05-18	1.5	2050	8.52	2250	15.1	9.6	6910	103	33.5	53.3	1.30	4.43	<0.1	-	-	0.0555	0.0488
KFM11A	690.00	710.00	2	31363	2018-05-18	0.3	2020	8.44	2260	14.9	9.4	7050	104	34.0	51.6	1.42	4.47	0.082	0.09	0.09	0.0561	0.0507
KFM12A	270.00	280.00	3	31325	2018-05-09	2.2	1100	6.66	1280	34.1	27.6	3830	60.8	20.8	26.5	0.92	3.77	<0.1	-	-	0.350	0.0464
KFM12A	270.00	280.00	3	31326	2018-05-09	2.3	1100	6.55	1280	35.1	30.0	3830	58.0	20.8	26.7	0.92	3.78	0.104	-	-	0.382	0.0478
KFM12A	270.00	280.00	3	31327	2018-05-09	2.3	1100	6.40	1280	36.5	31.8	3830	59.4	20.8	26.5	0.94	3.83	0.115	0.11	0.11	0.418	0.0464
KFR101	279.50	341.76	1	31394	2018-06-08	3.3	900	5.56	448	34.4	61.2	2050	64.9	23.5	10.7	1.41	5.00	0.299	-	-	0.498	0.0374
KFR101	279.50	341.76	1	31395	2018-06-08	3.8	905	5.66	458	35.0	61.1	2050	65.9	24.1	10.6	1.41	5.00	0.309	-	-	0.505	0.0377
KFR101	279.50	341.76	1	31396	2018-06-11	3.8	952	5.91	469	37.3	64.0	2140	69.5	26.4	10.7	1.42	5.16	0.319	-	-	0.551	0.0387
KFR102A	214.00	219.00	5	31388	2018-05-30	0.0	1600	9.41	678	101	91.8	3680	313	106	14.3	1.23	4.71	0.505	-	-	0.493	0.0500
KFR102A	214.00	219.00	5	31389	2018-05-30	-0.7	1580	9.36	672	102	92.0	3700	304	105	14.0	1.23	4.78	0.530	-	-	0.504	0.0480
KFR102A	214.00	219.00	5	31390	2018-05-31	0.3	1600	9.31	675	102	92.9	3660	304	104	14.4	1.26	4.75	0.558	0.58	0.57	0.515	0.0490
KFR102A	423.00	443.00	2	31391	2018-05-30	2.1	1540	8.53	1090	76.2	35.5	4140	236	83.3	19.3	1.35	5.09	0.836	-	-	0.518	0.0497
KFR102A	423.00	443.00	2	31392	2018-05-30	2.2	1520	8.53	1100	76.0	34.9	4120	241	83.1	20.0	1.34	5.06	0.850	-	-	0.520	0.0494
KFR102A	423.00	443.00	2	31393	2018-05-31	1.0	1490	8.35	1080	75.2	35.8	4150	236	82.1	19.4	1.34	5.03	0.856	0.91	0.91	0.516	0.0499
KFR104	333.00	454.57	1	31400	2018-06-04	3.7	769	4.21	411	3.04	43.0	1730	40.1	14.0	10.1	1.66	5.44	<0.02	-	-	<0.003	0.0194
KFR104	333.00	454.57	1	31401	2018-06-05	4.0	789	4.49	432	4.73	42.6	1780	46.9	15.7	10.2	1.58	5.59	<0.02	-	-	0.0040	0.0218
KFR104	333.00	454.57	1	31402	2018-06-07	3.6	811	4.30	436	5.74	35.6	1840	47.4	17.7	10.3	1.58	5.32	<0.002	-	-	0.0047	0.0224
KFR106	143.00	259.00	2	31406	2018-06-04	-0.7	1710	15.3	737	163	111	4170	335	113	14.8	1.34	5.15	1.06	-	-	1.06	0.0586
KFR106	143.00	259.00	2	31407	2018-06-05	1.1	1790	15.9	758	171	111	4190	334	119	15.4	1.36	5.36	1.10	-	-	1.14	0.0605
KFR106	143.00	259.00	2	31408	2018-06-07	-0.4	1740	15.4	769	171	107	4270	341	117	15.0	1.34	5.20	1.19	-	-	1.14	0.0613
KFR106	260.00	300.13	1	31403	2018-06-04	4.4	977	12.9	435	54.9	123	2110	76.7	29.4	9.98	1.53	5.20	0.076	-	-	0.211	0.0433
KFR106	260.00	300.13	1	31404	2018-06-04	2.7	1100	12.3	543	67.5	110	2550	124	45.0	11.5	1.50	5.12	0.219	-	-	0.349	0.0450
KFR106	260.00	300.13	1	31405	2018-06-05	3.2	1160	12.6	519	71.6	111	2570	155	52.0	11.0	1.55	4.77	0.172	-	-	0.366	0.0438
KFR01	44.65	62.30	1	31554	2018-12-12	1.2	1550	8.44	576	117	106	3330	358	125	14.6	1.27	4.27	0.429	-	-	0.658	0.0606

RCB % = Rel. charge balance error %

- = Not analysed

< "value" = value below reporting limit

Table A3-5. Water Composition, continued 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
HFM01	33.50	45.50	2	31529	2018-12-04	0.306	-	7.90	7.78	10.1	10.3	0.100	1.9	218	216	-	-	-	-
HFM01	33.50	45.50	2	31530	2018-12-05	0.300	-	7.87	7.63	10.4	10.5	0.097	2.0	216	219	-	-	-	-
HFM01	33.50	45.50	2	31531	2018-12-07	0.294	-	7.87	7.88	10.5	10.5	0.089	2.0	218	217	<0.0002	<0.0003	0.710	<0.0003
HFM02	38.00	48.00	2	31520	2018-11-27	0.361	-	7.76	7.75	11.1	11.2	0.034	1.9	167	165	-	-	-	-
HFM02	38.00	48.00	2	31521	2018-11-28	0.382	-	7.76	8.70	10.6	10.8	0.034	1.9	161	160	-	-	-	-
HFM02	38.00	48.00	2	31522	2018-11-29	0.378	-	7.69	7.30	10.8	10.7	0.038	2.2	159	157	<0.0002	<0.0003	0.514	<0.0003
HFM04	58.00	66.00	2	31535	2018-11-27	0.269	-	7.63	7.57	10.3	10.4	0.057	1.5	96.0	92.4	-	-	-	-
HFM04	58.00	66.00	2	31536	2018-11-27	0.268	-	7.72	8.27	10.1	10.2	0.063	1.5	95.0	92.7	-	-	-	-
HFM04	58.00	66.00	2	31537	2018-11-28	0.257	-	7.73	7.59	9.9	9.9	0.051	1.5	95.0	94.5	<0.0002	0.0007	0.518	0.0008
HFM13	159.00	173.00	1	31523	2018-11-30	13.0	-	7.40	7.23	1.7	1.8	0.038	0.6	1500	1510	-	-	-	-
HFM13	159.00	173.00	1	31524	2018-12-03	13.1	-	7.15	7.36	1.7	1.9	0.025	0.6	1510	1490	-	-	-	-
HFM13	159.00	173.00	1	31525	2018-12-06	13.1	-	7.24	7.20	1.7	1.7	0.020	0.6	1520	1490	<0.0002	0.0013	1.53	0.0014
HFM15	85.00	95.00	1	31526	2018-12-03	0.434	-	7.25	7.47	9.0	9.2	0.141	1.4	120	119	-	-	-	-
HFM15	85.00	95.00	1	31527	2018-12-04	0.434	-	7.24	6.98	9.6	9.5	0.135	1.4	120	119	-	-	-	-
HFM15	85.00	95.00	1	31528	2018-12-05	0.416	-	7.18	7.04	9.5	9.2	0.125	1.4	120	120	<0.0002	<0.0003	0.485	<0.0003
HFM16	54.00	67.00	2	31541	2018-12-05	0.308	-	7.76	7.38	14.1	14.3	0.056	2.4	127	127	-	-	-	-
HFM16	54.00	67.00	2	31542	2018-12-06	0.302	-	7.76	7.93	14.4	14.6	0.052	2.4	129	128	-	-	-	-
HFM16	54.00	67.00	2	31543	2018-12-07	0.289	-	7.74	8.81	13.8	13.8	0.050	2.6	131	130	<0.0002	<0.0003	0.705	<0.0003
HFM21	22.00	32.00	3	31532	2018-12-04	0.340	-	7.56	7.41	10.5	10.6	0.053	1.6	153	152	-	-	-	-
HFM21	22.00	32.00	3	31533	2018-12-05	0.342	-	7.53	7.37	10.8	11.1	0.070	1.7	155	155	-	-	-	-
HFM21	22.00	32.00	3	31534	2018-12-06	0.319	-	7.59	7.70	10.7	11.0	0.066	1.7	155	155	<0.0002	0.0003	0.444	0.0004
HFM27	46.00	58.00	2	31538	2018-11-27	2.41	-	7.45	8.22	6.1	6.1	0.060	1.5	699	695	-	-	-	-
HFM27	46.00	58.00	2	31539	2018-11-28	2.39	-	7.43	7.99	5.9	5.9	0.038	1.6	693	685	-	-	-	-
HFM27	46.00	58.00	2	31540	2018-11-30	2.34	-	7.44	7.49	5.5	5.7	0.053	1.3	687	680	<0.0002	<0.0003	1.48	<0.0003
KFM01A	109.00	130.00	5	31337	2018-05-16	6.21	-	7.88	8.05	1.8	1.8	0.372	30.0	1150	1150	-	-	-	-
KFM01A	109.00	130.00	5	31338	2018-05-16	6.01	-	7.80	7.91	1.8	1.8	0.321	30.8	1140	1140	-	-	-	-
KFM01A	109.00	130.00	5	31339	2018-05-17	5.88	-	7.84	8.19	1.8	1.8	0.223	32.4	1130	1110	<0.0002	0.0008	0.808	0.0008

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-5. Water Composition, continued 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFM01D	311.00	321.00	4	31328	2018-05-14	11.2	-	7.66	7.79	2.5	2.6	0.194	18.0	1260	1260	-	-	-	-
KFM01D	311.00	321.00	4	31329	2018-05-14	11.2	-	7.64	7.65	2.6	1.5	0.178	17.9	1260	1230	-	-	-	-
KFM01D	311.00	321.00	4	31330	2018-05-14	11.2	-	7.67	7.71	2.6	2.6	0.237	18.0	1260	1250	<0.0002	0.0004	0.491	0.0003
KFM01D	429.00	438.00	2	31397	2018-05-31	15.6	-	8.09	8.22	2.8	2.7	5.20	13.7	1410	1350	-	-	-	-
KFM01D	429.00	438.00	2	31398	2018-05-31	15.5	-	7.99	8.19	2.5	2.2	6.08	14.1	1410	1420	-	-	-	-
KFM01D	429.00	438.00	2	31399	2018-05-31	15.8	-	7.94	8.36	2.3	2.4	5.53	13.7	1420	1420	<0.0002	0.0008	0.322	0.0007
KFM02A	411.00	442.00	5	31376	2018-05-21	12.6	-	7.38	-	1.4	1.5	0.286	40.7	1540	1520	-	-	-	-
KFM02A	411.00	442.00	5	31377	2018-05-22	12.6	-	7.32	7.33	1.3	1.3	0.200	42.0	1550	1540	-	-	-	-
KFM02A	411.00	442.00	5	31378	2018-05-23	9.91	-	7.45	7.48	1.3	1.3	0.187	42.0	1540	1550	0.0002	0.0005	1.68	0.0004
KFM02A	490.00	518.00	3	31364	2018-05-22	8.87	-	7.43	7.56	2.4	2.4	0.517	7.6	1570	1570	-	-	-	-
KFM02A	490.00	518.00	3	31365	2018-05-22	8.91	-	7.33	7.21	2.1	2.0	0.361	7.2	1560	1560	-	-	-	-
KFM02A	490.00	518.00	3	31366	2018-05-23	8.97	-	7.27	7.36	1.7	1.7	0.205	6.7	1590	1560	<0.0002	0.0007	2.55	0.0005
KFM02B	410.00	431.00	4	31379	2018-05-24	11.3	-	7.43	7.49	1.3	1.4	0.096	4.2	1590	1550	-	-	-	-
KFM02B	410.00	431.00	4	31380	2018-05-24	11.4	-	7.36	7.46	1.3	1.4	0.079	4.5	1600	1560	-	-	-	-
KFM02B	410.00	431.00	4	31381	2018-05-25	11.5	-	7.41	7.43	1.3	1.4	0.074	4.7	1580	1550	<0.0002	0.0005	2.01	0.0004
KFM02B	491.00	506.00	2	31373	2018-05-23	8.42	-	7.28	7.45	1.6	1.7	0.071	2.7	1570	1590	-	-	-	-
KFM02B	491.00	506.00	2	31374	2018-05-23	8.45	-	7.37	7.33	1.6	1.6	0.064	2.7	1570	1580	-	-	-	-
KFM02B	491.00	506.00	2	31375	2018-05-24	8.38	-	7.20	7.43	1.7	1.5	0.063	2.7	1590	1580	0.0008	0.0110	2.73	0.0003
KFM03A	633.50	650.00	4	31382	2018-05-24	19.2	-	7.56	7.68	1.0	0.9	0.211	2.8	1600	1580	-	-	-	-
KFM03A	633.50	650.00	4	31383	2018-05-24	19.1	-	7.59	7.71	0.9	0.9	0.153	2.6	1600	1580	-	-	-	-
KFM03A	633.50	650.00	4	31384	2018-05-24	19.2	-	7.50	7.60	0.8	0.8	0.138	2.5	1630	1580	<0.0002	0.0003	0.171	<0.0003
KFM03A	969.50	994.50	1	31385	2018-05-28	43.1	-	8.19	-	0.5	0.5	0.153	0.5	2610	2620	-	-	-	-
KFM03A	969.50	994.50	1	31386	2018-05-29	44.6	-	8.20	7.15	0.5	0.6	0.113	0.5	2680	2690	-	-	-	-
KFM03A	969.50	994.50	1	31387	2018-05-30	43.3	-	8.23	8.02	0.4	0.4	0.093	0.3	2690	2620	<0.0002	0.0009	0.0229	0.0009
KFM04A	230.00	245.00	4	31322	2018-05-08	16.7	-	7.29	7.55	1.1	1.3	0.307	0.9	1690	1660	-	-	-	-
KFM04A	230.00	245.00	4	31323	2018-05-08	16.7	-	7.23	7.50	1.3	1.3	0.215	1.1	1690	1670	-	-	-	-
KFM04A	230.00	245.00	4	31324	2018-05-08	16.7	-	7.23	7.60	1.2	1.2	0.168	1.1	1700	1700	0.0003	0.0007	1.57	0.0004

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-5. Water Composition, continued 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFM06A	341.00	362.00	5	31313	2018-05-07	16.5	-	7.89	7.68	1.1	1.1	0.045	15.0	1300	1320	-	-	-	-
KFM06A	341.00	362.00	5	31314	2018-05-07	16.4	-	7.88	7.94	1.1	1.2	0.045	14.9	1320	1310	-	-	-	-
KFM06A	341.00	362.00	5	31315	2018-05-07	16.4	-	7.90	8.09	1.0	1.0	0.041	14.7	1330	1320	<0.0002	<0.0003	0.159	<0.0003
KFM06A	738.00	748.00	3	31409	2018-05-07	29.4	-	8.42	7.42	1.0	1.1	-	27.0	1830	1830	-	-	-	-
KFM06A	738.00	748.00	3	31410	2018-06-07	26.0	-	8.32	8.72	1.0	1.0	0.045	26.7	1820	1810	-	-	-	-
KFM06A	738.00	748.00	3	31411	2018-06-08	27.4	-	8.16	8.10	0.9	0.9	0.048	22.8	1830	1810	<0.0002	0.0016	0.147	0.0016
KFM06C	531.00	540.00	5	31319	2018-05-29	14.4	-	7.69	11.00	1.4	1.5	0.141	44.6	1440	1420	-	-	-	-
KFM06C	531.00	540.00	5	31320	2018-05-29	14.6	-	7.72	8.17	1.5	1.4	0.124	45.7	1440	1420	-	-	-	-
KFM06C	531.00	540.00	5	31321	2018-05-29	14.4	-	7.69	7.52	1.3	1.3	0.112	44.0	1440	1420	<0.0002	0.0005	0.446	0.0003
KFM06C	647.00	666.00	3	31370	2018-05-21	22.7	-	8.78	7.85	1.0	0.9	0.150	11.3	1530	1560	-	-	-	-
KFM06C	647.00	666.00	3	31371	2018-05-23	22.9	-	8.68	8.73	0.7	0.7	0.134	11.1	1560	1530	-	-	-	-
KFM06C	647.00	666.00	3	31372	2018-05-25	22.8	-	8.43	8.63	0.7	0.7	0.146	10.4	1570	1570	<0.0002	0.0040	0.100	0.0039
KFM08A	265.00	280.00	6	31331	2018-05-15	10.8	-	7.58	7.66	1.4	1.4	0.097	7.6	1050	1030	-	-	-	-
KFM08A	265.00	280.00	6	31332	2018-05-16	10.6	-	7.64	7.75	1.5	1.5	0.092	7.4	1050	1050	-	-	-	-
KFM08A	265.00	280.00	6	31333	2018-05-18	10.4	-	7.62	8.09	1.2	1.3	0.088	6.8	1050	1070	0.0003	0.0005	0.321	<0.0003
KFM08A	684.00	694.00	2	31358	2018-05-17	24.8	-	8.98	9.04	0.9	0.9	0.103	10.2	1690	1730	-	-	-	-
KFM08A	684.00	694.00	2	31359	2018-05-17	24.9	-	8.72	9.06	0.8	0.8	0.061	10.3	1710	1720	-	-	-	-
KFM08A	684.00	694.00	2	31360	2018-05-17	24.6	-	8.59	8.59	0.7	0.7	0.052	10.4	1710	1730	<0.0002	<0.0003	0.0790	<0.0003
KFM08D	660.00	680.00	4	31334	2018-05-14	25.8	-	8.54	8.23	0.7	0.8	<0.019	26.6	1770	1800	-	-	-	-
KFM08D	660.00	680.00	4	31335	2018-05-15	26.0	-	8.42	8.34	0.7	0.7	<0.019	25.6	1770	1760	-	-	-	-
KFM08D	660.00	680.00	4	31336	2018-05-16	26.1	-	8.40	7.66	0.5	0.6	<0.019	25.5	1770	1810	<0.0002	<0.0003	0.0815	<0.0003
KFM08D	825.00	835.00	2	31367	2018-05-21	32.6	-	8.96	8.78	0.7	0.8	0.031	0.5	2250	2180	-	-	-	-
KFM08D	825.00	835.00	2	31368	2018-05-22	32.7	-	8.92	8.47	0.7	0.7	0.036	0.3	2200	2140	-	-	-	-
KFM08D	825.00	835.00	2	31369	2018-05-23	32.4	-	8.97	9.09	0.4	0.4	<0.019	0.6	2180	2180	<0.0002	0.0007	0.0137	0.0007
KFM10A	430.00	440.00	2	31355	2018-05-16	12.0	-	7.43	7.76	1.8	1.7	0.155	0.8	1620	1640	-	-	-	-
KFM10A	430.00	440.00	2	31356	2018-05-17	11.9	-	7.47	7.77	1.5	1.7	0.140	0.7	1630	1620	-	-	-	-
KFM10A	430.00	440.00	2	31357	2018-05-18	11.8	-	7.38	7.62	1.5	1.5	0.147	0.8	1620	1630	0.0003	0.0007	1.30	0.0004

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-5. Water Composition, continued 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFM11A	446.00	456.00	4	31316	2018-05-07	24.0	-	8.68	8.73	1.0	1.0	0.219	1.8	1500	1470	-	-	-	-
KFM11A	446.00	456.00	4	31317	2018-05-07	24.0	-	8.48	8.54	1.0	1.5	0.178	2.0	1490	1490	-	-	-	-
KFM11A	446.00	456.00	4	31318	2018-05-07	24.0	-	8.44	8.79	0.8	0.8	0.173	1.9	1480	1460	<0.0002	0.0008	0.0342	0.0007
KFM11A	690.00	710.00	2	31361	2018-05-17	30.7	-	8.79	8.57	0.6	0.7	0.196	0.5	1880	1910	-	-	-	-
KFM11A	690.00	710.00	2	31362	2018-05-18	30.4	-	8.63	8.66	0.5	0.4	0.192	0.4	1910	1940	-	-	-	-
KFM11A	690.00	710.00	2	31363	2018-05-18	30.6	-	8.61	8.73	0.3	0.3	0.174	0.4	1920	1950	<0.0002	<0.0003	0.0707	<0.0003
KFM12A	270.00	280.00	3	31325	2018-05-09	19.5	-	7.95	7.90	0.9	1.1	0.275	1.5	1100	1110	-	-	-	-
KFM12A	270.00	280.00	3	31326	2018-05-09	19.5	-	7.95	7.86	0.9	0.9	0.208	1.5	1100	1100	-	-	-	-
KFM12A	270.00	280.00	3	31327	2018-05-09	19.4	-	7.74	8.07	0.8	0.7	0.132	1.6	1090	1090	<0.0002	0.0006	0.0456	0.0004
KFR101	279.50	341.76	1	31394	2018-06-08	7.34	-	7.76	7.25	1.0	1.0	0.471	0.4	633	633	-	-	-	-
KFR101	279.50	341.76	1	31395	2018-06-08	7.45	-	7.80	7.46	1.1	1.0	0.482	0.4	635	641	-	-	-	-
KFR101	279.50	341.76	1	31396	2018-06-11	7.65	-	7.68	7.84	0.8	0.9	0.210	0.4	650	641	0.0003	0.0031	0.0561	0.0035
KFR102A	214.00	219.00	5	31388	2018-05-30	10.8	-	7.75	7.56	1.3	1.3	0.211	1.0	1120	1070	-	-	-	-
KFR102A	214.00	219.00	5	31389	2018-05-30	10.6	-	7.59	7.43	1.2	1.2	0.121	1.1	1120	1080	-	-	-	-
KFR102A	214.00	219.00	5	31390	2018-05-31	10.6	-	7.71	7.83	1.1	1.1	0.086	1.1	1100	1100	<0.0002	0.0003	0.0959	<0.0003
KFR102A	423.00	443.00	2	31391	2018-05-30	16.0	-	7.66	7.35	0.7	0.7	0.126	0.2	1220	1210	-	-	-	-
KFR102A	423.00	443.00	2	31392	2018-05-30	16.0	-	7.45	7.68	0.7	0.7	0.105	0.2	1230	1190	-	-	-	-
KFR102A	423.00	443.00	2	31393	2018-05-31	15.8	-	7.60	7.64	0.6	0.6	0.090	0.2	1210	1200	<0.0002	0.0007	0.0369	0.0006
KFR104	333.00	454.57	1	31400	2018-06-04	6.89	-	9.71	9.89	1.4	1.5	4.69	0.9	409	549	-	-	-	-
KFR104	333.00	454.57	1	31401	2018-06-05	7.19	-	9.60	9.89	1.2	3.1	3.80	1.2	550	559	-	-	-	-
KFR104	333.00	454.57	1	31402	2018-06-07	7.27	-	9.54	9.46	1.2	1.1	2.59	1.3	565	574	<0.0002	0.0007	0.0311	0.0008
KFR106	143.00	259.00	2	31406	2018-06-04	9.30	-	7.39	7.71	5.8	5.9	0.387	0.7	1250	1240	-	-	-	-
KFR106	143.00	259.00	2	31407	2018-06-05	9.65	-	7.49	7.44	5.3	5.2	0.216	0.5	1230	1240	-	-	-	-
KFR106	143.00	259.00	2	31408	2018-06-07	9.75	-	7.47	7.48	5.0	6.0	0.151	-	1270	1250	0.0005	0.0032	0.202	0.0026
KFR106	260.00	300.13	1	31403	2018-06-04	6.73	-	7.77	7.86	5.0	4.4	7.95	0.7	668	660	-	-	-	-
KFR106	260.00	300.13	1	31404	2018-06-04	8.41	-	7.66	7.91	3.2	3.3	2.84	1.4	746	777	-	-	-	-
KFR106	260.00	300.13	1	31405	2018-06-05	7.76	-	7.74	7.80	2.2	2.2	2.24	-	820	850	<0.0002	0.0007	0.146	0.0007
KFR01	44.65	62.30	1	31554	2018-12-12	8.73	0.0358	7.40	7.62	1.7	2.1	-	-	1030	1010	-	-	-	-

pH_L; EC_L = Laboratory measurements of pH and EC
pH_F; EC_F = Field measurements of pH and EC

- = Not analysed
< "value" = value below reporting limit

Table A3-5. Water Composition, continued 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	PO₄-P mg/L	PO₄-P² mg/L	P mg/L	Temp_F
HFM01	33.50	45.50	2	31529	2018-12-04	-	-	-	7.4
HFM01	33.50	45.50	2	31530	2018-12-05	-	-	-	6.0
HFM01	33.50	45.50	2	31531	2018-12-07	0.0869	0.0857	0.0916	4.8
HFM02	38.00	48.00	2	31520	2018-11-27	-	-	-	5.7
HFM02	38.00	48.00	2	31521	2018-11-28	-	-	-	2.6
HFM02	38.00	48.00	2	31522	2018-11-29	0.0367	0.0360	0.0434	6.2
HFM04	58.00	66.00	2	31535	2018-11-27	-	-	-	5.9
HFM04	58.00	66.00	2	31536	2018-11-27	-	-	-	5.7
HFM04	58.00	66.00	2	31537	2018-11-28	0.0172	0.0167	0.0231	2.2
HFM13	159.00	173.00	1	31523	2018-11-30	-	-	-	7.2
HFM13	159.00	173.00	1	31524	2018-12-03	-	-	-	8.3
HFM13	159.00	173.00	1	31525	2018-12-06	<0.0005	0.0007	<0.04	2.6
HFM15	85.00	95.00	1	31526	2018-12-03	-	-	-	6.8
HFM15	85.00	95.00	1	31527	2018-12-04	-	-	-	6.2
HFM15	85.00	95.00	1	31528	2018-12-05	0.0084	0.0085	0.0121	5.5
HFM16	54.00	67.00	2	31541	2018-12-05	-	-	-	6.7
HFM16	54.00	67.00	2	31542	2018-12-06	-	-	-	6.3
HFM16	54.00	67.00	2	31543	2018-12-07	0.0701	0.0692	0.0788	6.7
HFM21	22.00	32.00	3	31532	2018-12-04	-	-	-	7.9
HFM21	22.00	32.00	3	31533	2018-12-05	-	-	-	6.8
HFM21	22.00	32.00	3	31534	2018-12-06	0.0182	0.0190	0.0254	4.0
HFM27	46.00	58.00	2	31538	2018-11-27	-	-	-	4.8
HFM27	46.00	58.00	2	31539	2018-11-28	-	-	-	3.1
HFM27	46.00	58.00	2	31540	2018-11-30	<0.0005	0.0145	0.0190	5.7
KFM01A	109.00	130.00	5	31337	2018-05-16	-	-	-	10.5
KFM01A	109.00	130.00	5	31338	2018-05-16	-	-	-	12.0
KFM01A	109.00	130.00	5	31339	2018-05-17	<0.0005	0.0006	<0.005	10.4

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-5. Water Composition, continued 2018

Id code	Secup	Seclow	Section	Sample	Sampling	PO₄-P	PO₄-P²	P	Temp_F
	m	m	no.	no.	Date	mg/L	mg/L	mg/L	
KFM01D	311.00	321.00	4	31328	2018-05-14	-	-	-	13.0
KFM01D	311.00	321.00	4	31329	2018-05-14	-	-	-	14.4
KFM01D	311.00	321.00	4	31330	2018-05-14	0.0028	0.0054	0.0053	13.2
KFM01D	429.00	438.00	2	31397	2018-05-31	-	-	-	20.2
KFM01D	429.00	438.00	2	31398	2018-05-31	-	-	-	20.6
KFM01D	429.00	438.00	2	31399	2018-05-31	0.0010	0.0017	<0.005	20.1
KFM02A	411.00	442.00	5	31376	2018-05-21	-	-	-	11.1
KFM02A	411.00	442.00	5	31377	2018-05-22	-	-	-	9.6
KFM02A	411.00	442.00	5	31378	2018-05-23	<0.0005	<0.0005	<0.04	10.6
KFM02A	490.00	518.00	3	31364	2018-05-22	-	-	-	10.3
KFM02A	490.00	518.00	3	31365	2018-05-22	-	-	-	13.4
KFM02A	490.00	518.00	3	31366	2018-05-23	<0.0005	<0.0005	<0.04	10.6
KFM02B	410.00	431.00	4	31379	2018-05-24	-	-	-	8.6
KFM02B	410.00	431.00	4	31380	2018-05-24	-	-	-	10.0
KFM02B	410.00	431.00	4	31381	2018-05-25	<0.0005	0.0008	<0.04	9.8
KFM02B	491.00	506.00	2	31373	2018-05-23	-	-	-	9.2
KFM02B	491.00	506.00	2	31374	2018-05-23	-	-	-	8.8
KFM02B	491.00	506.00	2	31375	2018-05-24	<0.0005	0.0006	<0.04	8.6
KFM03A	633.50	650.00	4	31382	2018-05-24	-	-	-	9.4
KFM03A	633.50	650.00	4	31383	2018-05-24	-	-	-	10.8
KFM03A	633.50	650.00	4	31384	2018-05-24	<0.0005	0.0007	<0.04	12.4
KFM03A	969.50	994.50	1	31385	2018-05-28	-	-	-	14.7
KFM03A	969.50	994.50	1	31386	2018-05-29	-	-	-	32.8
KFM03A	969.50	994.50	1	31387	2018-05-30	<0.0005	<0.0005	<0.04	23.5
KFM04A	230.00	245.00	4	31322	2018-05-08	-	-	-	12.4
KFM04A	230.00	245.00	4	31323	2018-05-08	-	-	-	13.2
KFM04A	230.00	245.00	4	31324	2018-05-08	<0.0005	0.0009	<0.005	13.2

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-5. Water Composition, continued 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	PO₄-P mg/L	PO₄-P² mg/L	P mg/L	Temp_F
KFM06A	341.00	362.00	5	31313	2018-05-07	-	-	-	16.2
KFM06A	341.00	362.00	5	31314	2018-05-07	-	-	-	18.0
KFM06A	341.00	362.00	5	31315	2018-05-07	<0.0005	0.0005	<0.005	19.7
KFM06A	738.00	748.00	3	31409	2018-05-07	-	-	-	17.2
KFM06A	738.00	748.00	3	31410	2018-06-07	-	-	-	18.7
KFM06A	738.00	748.00	3	31411	2018-06-08	0.0005	0.0014	<0.04	18.3
KFM06C	531.00	540.00	5	31319	2018-05-29	-	-	-	14.5
KFM06C	531.00	540.00	5	31320	2018-05-29	-	-	-	15.6
KFM06C	531.00	540.00	5	31321	2018-05-29	<0.0005	<0.0005	<0.005	15.0
KFM06C	647.00	666.00	3	31370	2018-05-21	-	-	-	24.6
KFM06C	647.00	666.00	3	31371	2018-05-23	-	-	-	16.0
KFM06C	647.00	666.00	3	31372	2018-05-25	<0.0005	0.0008	<0.04	28.4
KFM08A	265.00	280.00	6	31331	2018-05-15	-	-	-	15.2
KFM08A	265.00	280.00	6	31332	2018-05-16	-	-	-	14.5
KFM08A	265.00	280.00	6	31333	2018-05-18	0.0005	0.0012	<0.005	9.5
KFM08A	684.00	694.00	2	31358	2018-05-17	-	-	-	9.1
KFM08A	684.00	694.00	2	31359	2018-05-17	-	-	-	11.6
KFM08A	684.00	694.00	2	31360	2018-05-17	0.0005	0.0012	<0.04	12.5
KFM08D	660.00	680.00	4	31334	2018-05-14	-	-	-	12.2
KFM08D	660.00	680.00	4	31335	2018-05-15	-	-	-	20.6
KFM08D	660.00	680.00	4	31336	2018-05-16	<0.0005	0.0008	<0.04	14.4
KFM08D	825.00	835.00	2	31367	2018-05-21	-	-	-	29.1
KFM08D	825.00	835.00	2	31368	2018-05-22	-	-	-	20.5
KFM08D	825.00	835.00	2	31369	2018-05-23	<0.0005	<0.0005	<0.04	17.0
KFM10A	430.00	440.00	2	31355	2018-05-16	-	-	-	11.4
KFM10A	430.00	440.00	2	31356	2018-05-17	-	-	-	9.1
KFM10A	430.00	440.00	2	31357	2018-05-18	0.0015	0.0028	<0.04	12.9

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-5. Water Composition, continued 2018

Id code	Secup	Seclow	Section	Sample	Sampling	PO₄-P	PO₄-P²	P	Temp_F
	m	m	no.	no.	Date	mg/L	mg/L	mg/L	
KFM11A	446.00	456.00	4	31316	2018-05-07	-	-	-	12.7
KFM11A	446.00	456.00	4	31317	2018-05-07	-	-	-	12.9
KFM11A	446.00	456.00	4	31318	2018-05-07	<0.0005	<0.0005	<0.005	12.8
KFM11A	690.00	710.00	2	31361	2018-05-17	-	-	-	11.0
KFM11A	690.00	710.00	2	31362	2018-05-18	-	-	-	9.7
KFM11A	690.00	710.00	2	31363	2018-05-18	<0.0005	0.0006	<0.04	11.3
KFM12A	270.00	280.00	3	31325	2018-05-09	-	-	-	9.9
KFM12A	270.00	280.00	3	31326	2018-05-09	-	-	-	11.5
KFM12A	270.00	280.00	3	31327	2018-05-09	<0.0005	<0.0005	<0.005	12.1
KFR101	279.50	341.76	1	31394	2018-06-08	-	-	-	11.2
KFR101	279.50	341.76	1	31395	2018-06-08	-	-	-	13.2
KFR101	279.50	341.76	1	31396	2018-06-11	0.0011	0.0012	<0.005	13.1
KFR102A	214.00	219.00	5	31388	2018-05-30	-	-	-	10.4
KFR102A	214.00	219.00	5	31389	2018-05-30	-	-	-	9.9
KFR102A	214.00	219.00	5	31390	2018-05-31	<0.0005	<0.0005	<0.005	12.1
KFR102A	423.00	443.00	2	31391	2018-05-30	-	-	-	8.8
KFR102A	423.00	443.00	2	31392	2018-05-30	-	-	-	9.9
KFR102A	423.00	443.00	2	31393	2018-05-31	<0.0005	<0.0005	<0.005	10.5
KFR104	333.00	454.57	1	31400	2018-06-04	-	-	-	15.7
KFR104	333.00	454.57	1	31401	2018-06-05	-	-	-	12.3
KFR104	333.00	454.57	1	31402	2018-06-07	0.0015	0.0021	0.0053	18.9
KFR106	143.00	259.00	2	31406	2018-06-04	-	-	-	10.8
KFR106	143.00	259.00	2	31407	2018-06-05	-	-	-	10.5
KFR106	143.00	259.00	2	31408	2018-06-07	<0.0005	0.0005	<0.005	16.3
KFR106	260.00	300.13	1	31403	2018-06-04	-	-	-	11.0
KFR106	260.00	300.13	1	31404	2018-06-04	-	-	-	11.0
KFR106	260.00	300.13	1	31405	2018-06-05	0.0013	0.0019	<0.005	9.5
KFR01	44.65	62.30	1	31554	2018-12-12	-	-	-	8.7

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-6. Trace elements - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Ag µg/L	Al µg/L	As µg/L	B µg/L	Ba µg/L	Cd µg/L	Cr µg/L	Cu µg/L	Co µg/L	Hg µg/L	Ni µg/L	Mo µg/L	Nb µg/L
HFM01	33.50	45.50	2	31531	2018-12-07	-	5.10	-	-	18.6	0.0131	0.123	0.105	0.0488	<0.002	0.219	11.2	-
HFM02	38.00	48.00	2	31522	2018-11-29	-	3.01	-	-	34.0	0.0059	0.854	<0.1	0.0460	<0.002	0.607	7.15	-
HFM04	58.00	66.00	2	31537	2018-11-28	-	5.16	-	-	40.2	0.0069	0.226	<0.1	0.0342	<0.002	0.285	3.39	-
HFM13	159.00	173.00	1	31525	2018-12-06	-	1.55	-	-	72.7	<0.05	0.179	<0.5	<0.05	<0.002	<0.5	3.74	-
HFM15	85.00	95.00	1	31528	2018-12-05	-	17.3	-	-	41.3	0.0104	0.416	<0.1	0.0332	<0.002	0.322	9.34	-
HFM16	54.00	67.00	2	31543	2018-12-07	-	6.34	-	-	28.0	0.0215	0.494	<0.1	0.0504	<0.002	0.278	21.9	-
HFM21	22.00	32.00	3	31534	2018-12-06	-	6.71	-	-	39.6	0.0085	0.822	0.106	0.0422	<0.002	0.556	6.67	-
HFM27	46.00	58.00	2	31540	2018-11-30	-	6.17	-	-	40.3	<0.02	0.185	<0.2	0.0206	<0.002	<0.2	8.07	-
KFM01A	109.00	130.00	5	31339	2018-05-17	-	2.92	-	-	82.9	<0.02	0.589	<0.2	<0.02	<0.002	0.345	24.5	-
KFM01D	311.00	321.00	4	31330	2018-05-14	-	2.29	-	-	492	<0.02	0.522	<0.2	0.0326	<0.002	0.436	3.48	-
KFM01D	429.00	438.00	2	31399	2018-05-31	-	3.28	-	-	620	<0.02	0.185	<0.2	<0.02	<0.002	<0.2	0.29	-
KFM02A	411.00	442.00	5	31378	2018-05-22	-	2.51	-	-	68.1	<0.05	0.336	<0.5	<0.05	<0.002	<0.5	13.4	-
KFM02A	490.00	518.00	3	31366	2018-05-23	-	3.30	-	-	84.2	<0.05	0.413	<0.5	<0.05	<0.002	0.597	73.8	-
KFM02B	410.00	431.00	4	31381	2018-05-25	-	1.11	-	-	82.2	<0.05	0.784	<0.5	<0.05	<0.002	<0.5	6.65	-
KFM02B	491.00	506.00	2	31375	2018-05-24	-	<0.7	-	-	84.3	<0.05	0.304	<0.5	0.143	<0.002	<0.5	5.65	-
KFM03A	633.50	650.00	4	31384	2018-05-24	-	2.08	-	-	145	<0.05	<0.1	<0.5	<0.05	<0.002	<0.5	25.4	-
KFM03A	969.50	994.50	1	31387	2018-05-30	-	13.1	-	-	982	<0.05	0.286	<0.5	<0.05	<0.002	0.669	8.55	-
KFM04A	230.00	245.00	4	31324	2018-05-08	-	2.06	-	-	103	0.0492	1.22	<0.2	2.32	<0.002	0.924	42.7	-
KFM06A	341.00	362.00	5	31315	2018-05-07	-	0.72	-	-	231	0.1340	0.214	<0.2	0.226	<0.002	0.705	162	-
KFM06A	738.00	748.00	3	31411	2018-06-08	-	0.81	-	-	352	0.330	<0.1	<0.5	<0.05	<0.002	<0.5	367	-
KFM06C	531.00	540.00	5	31321	2018-05-29	-	1.85	-	-	99	0.0335	0.342	<0.2	<0.02	<0.002	0.412	49.6	-
KFM06C	647.00	666.00	3	31372	2018-05-25	-	<0.7	-	-	329	<0.05	1.32	<0.5	<0.05	<0.002	1.28	29.1	-
KFM08A	265.00	280.00	6	31333	2018-05-18	-	1.85	-	-	491	<0.02	0.084	<0.2	<0.02	<0.002	0.206	8.59	-
KFM08A	684.00	694.00	2	31360	2018-05-17	-	<0.7	-	-	372	0.0701	0.513	<0.5	0.0590	<0.002	0.748	32.4	-
KFM08D	660.00	680.00	4	31336	2018-05-16	-	1.74	-	-	532	<0.05	0.456	<0.5	<0.05	<0.002	0.929	40.4	-
KFM08D	825.00	835.00	2	31369	2018-05-23	-	<0.7	-	-	221	<0.05	<0.1	<0.5	<0.05	<0.002	2.83	33.1	-
KFM10A	430.00	440.00	2	31357	2018-05-18	-	1.35	-	-	67.9	<0.05	0.209	<0.5	<0.05	<0.002	<0.5	2.27	-
KFM11A	446.00	456.00	4	31318	2018-05-07	-	1.80	-	-	110	<0.02	0.275	<0.2	<0.02	<0.002	<0.2	14.5	-
KFM11A	690.00	710.00	2	31363	2018-05-18	-	<0.7	-	-	250	<0.05	<0.1	<0.5	<0.05	<0.002	<0.5	23.6	-
KFM12A	270.00	280.00	3	31327	2018-05-09	-	2.08	-	-	550	<0.02	0.560	<0.2	0.115	<0.002	0.453	9.87	-

- = Not analysed

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Table A3-6. Trace elements, continued - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Ag µg/L	Al µg/L	As µg/L	B µg/L	Ba µg/L	Cd µg/L	Cr µg/L	Cu µg/L	Co µg/L	Hg µg/L	Ni µg/L	Mo µg/L	Nb µg/L
KFR101	279.50	341.76	1	31396	2018-06-11	-	4.18	-	-	594	<0.02	<0.04	<0.2	<0.02	<0.002	0.433	3.24	-
KFR102A	214.00	219.00	5	31390	2018-05-31	-	1.89	-	-	114	<0.02	0.152	<0.2	0.0236	<0.002	0.277	5.47	-
KFR102A	423.00	443.00	2	31393	2018-05-31	-	3.39	-	-	114	<0.02	0.509	<0.2	0.0448	<0.002	0.507	3.73	-
KFR104	333.00	454.57	1	31402	2018-06-07	-	14.3	-	-	200	0.0283	<0.04	<0.2	<0.02	<0.002	0.463	19.0	-
KFR106	143.00	259.00	2	31408	2018-06-07	-	5.91	-	-	72.9	<0.02	<0.04	<0.2	0.0609	<0.002	0.989	5.85	-
KFR106	260.00	300.13	1	31405	2018-06-05	-	9.97	-	-	307	<0.02	0.691	<0.2	<0.02	<0.002	2.12	5.34	-

- = Not analysed

< "value" = value below reporting limit

Table A3-6. Trace elements, continued - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Pb µg/L	Pd µg/L	Se µg/L	Sn µg/L	V µg/L	Zn µg/L
HFM01	33.50	45.50	2	31531	2018-12-07	0.0480	-	-	-	1.49	0.698
HFM02	38.00	48.00	2	31522	2018-11-29	0.0195	-	-	-	1.34	0.242
HFM04	58.00	66.00	2	31537	2018-11-28	0.0226	-	-	-	0.984	0.371
HFM13	159.00	173.00	1	31525	2018-12-06	<0.3	-	-	-	0.290	<2
HFM15	85.00	95.00	1	31528	2018-12-05	0.0225	-	-	-	1.27	<0.2
HFM16	54.00	67.00	2	31543	2018-12-07	0.0198	-	-	-	1.78	0.423
HFM21	22.00	32.00	3	31534	2018-12-06	0.0273	-	-	-	1.01	1.27
HFM27	46.00	58.00	2	31540	2018-11-30	<0.1	-	-	-	0.342	<0.8
KFM01A	109.00	130.00	5	31339	2018-05-17	<0.1	-	-	-	0.111	<0.8
KFM01D	311.00	321.00	4	31330	2018-05-14	0.165	-	-	-	0.171	<0.8
KFM01D	429.00	438.00	2	31399	2018-05-31	<0.1	-	-	-	0.113	0.992
KFM02A	411.00	442.00	5	31378	2018-05-22	<0.3	-	-	-	0.0787	<2
KFM02A	490.00	518.00	3	31366	2018-05-23	<0.3	-	-	-	0.130	<2
KFM02B	410.00	431.00	4	31381	2018-05-25	<0.3	-	-	-	<0.05	<2
KFM02B	491.00	506.00	2	31375	2018-05-24	<0.3	-	-	-	0.165	<2
KFM03A	633.50	650.00	4	31384	2018-05-24	<0.3	-	-	-	<0.05	<2
KFM03A	969.50	994.50	1	31387	2018-05-30	<0.3	-	-	-	0.0601	<2
KFM04A	230.00	245.00	4	31324	2018-05-08	<0.1	-	-	-	0.0994	0.837
KFM06A	341.00	362.00	5	31315	2018-05-07	<0.1	-	-	-	0.118	0.984
KFM06A	738.00	748.00	3	31411	2018-06-08	<0.3	-	-	-	0.202	<2
KFM06C	531.00	540.00	5	31321	2018-05-29	0.104	-	-	-	0.192	<0.8
KFM06C	647.00	666.00	3	31372	2018-05-25	<0.3	-	-	-	0.141	<2
KFM08A	265.00	280.00	6	31333	2018-05-18	<0.1	-	-	-	0.160	<0.8
KFM08A	684.00	694.00	2	31360	2018-05-17	<0.3	-	-	-	0.0814	<2
KFM08D	660.00	680.00	4	31336	2018-05-16	<0.3	-	-	-	0.167	<2
KFM08D	825.00	835.00	2	31369	2018-05-23	<0.3	-	-	-	0.165	<2
KFM10A	430.00	440.00	2	31357	2018-05-18	<0.3	-	-	-	0.096	<2
KFM11A	446.00	456.00	4	31318	2018-05-07	0.206	-	-	-	0.0758	<0.8
KFM11A	690.00	710.00	2	31363	2018-05-18	<0.3	-	-	-	<0.05	<2
KFM12A	270.00	280.00	3	31327	2018-05-09	<0.1	-	-	-	0.229	1.02

- = Not analysed

< "value" = result less than reporting limit

Table A3-6. Trace elements, continued - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Pb µg/L	Pd µg/L	Se µg/L	Sn µg/L	V µg/L	Zn µg/L
KFR101	279.50	341.76	1	31396	2018-06-11	<0.1	-	-	-	0.123	2.35
KFR102A	214.00	219.00	5	31390	2018-05-31	<0.1	-	-	-	0.0591	<0.8
KFR102A	423.00	443.00	2	31393	2018-05-31	<0.1	-	-	-	0.0445	<0.8
KFR104	333.00	454.57	1	31402	2018-06-07	<0.1	-	-	-	0.150	<0.8
KFR106	143.00	259.00	2	31408	2018-06-07	<0.1	-	-	-	0.174	<0.8
KFR106	260.00	300.13	1	31405	2018-06-05	<0.1	-	-	-	0.194	1.82

- = Not analysed

< "value" = result less than reporting limit

Table A3-7. Isotopes I (H-, O- and C-isotopes) - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	$\delta^2\text{H}$ dev SMOW	^3H TU	$\delta^{18}\text{O}$ dev SMOW
HFM01	33.50	45.50	2	31529	2018-12-04	-75.8	-	-10.15
HFM01	33.50	45.50	2	31530	2018-12-05	-76.1	-	-10.14
HFM01	33.50	45.50	2	31531	2018-12-07	-76.1	2.0	-10.14
HFM02	38.00	48.00	2	31520	2018-11-27	-82.4	-	-11.32
HFM02	38.00	48.00	2	31521	2018-11-28	-82.9	-	-11.47
HFM02	38.00	48.00	2	31522	2018-11-29	-82.7	4.1	-11.47
HFM04	58.00	66.00	2	31535	2018-11-27	-83.3	-	-11.60
HFM04	58.00	66.00	2	31536	2018-11-27	-83.8	-	-11.69
HFM04	58.00	66.00	2	31537	2018-11-28	-83.7	3.6	-11.66
HFM13	159.00	173.00	1	31523	2018-11-30	-71.4	-	-9.26
HFM13	159.00	173.00	1	31524	2018-12-03	-71.1	-	-9.30
HFM13	159.00	173.00	1	31525	2018-12-06	-71.6	<0.8	-9.39
HFM15	85.00	95.00	1	31526	2018-12-03	-85.2	-	-11.66
HFM15	85.00	95.00	1	31527	2018-12-04	-84.6	-	-11.65
HFM15	85.00	95.00	1	31528	2018-12-05	-85.0	4.4	-11.73
HFM16	54.00	67.00	2	31541	2018-12-05	-81.4	-	-11.09
HFM16	54.00	67.00	2	31542	2018-12-06	-81.3	-	-11.09
HFM16	54.00	67.00	2	31543	2018-12-07	-81.1	3.3	-11.08
HFM21	22.00	32.00	3	31532	2018-12-04	-81.6	-	-11.13
HFM21	22.00	32.00	3	31533	2018-12-05	-81.8	-	-11.05
HFM21	22.00	32.00	3	31534	2018-12-06	-81.2	4.8	-10.93
HFM27	46.00	58.00	2	31538	2018-11-27	-73.1	-	-9.89
HFM27	46.00	58.00	2	31539	2018-11-28	-73.3	-	-9.89
HFM27	46.00	58.00	2	31540	2018-11-30	-73.5	1.0	-9.91
KFM01A	109.00	130.00	5	31337	2018-05-16	-88.3	-	-11.74
KFM01A	109.00	130.00	5	31338	2018-05-16	-88.4	-	-11.85
KFM01A	109.00	130.00	5	31339	2018-05-17	-88.5	<0.8	-11.82
KFM01D	311.00	321.00	4	31328	2018-05-14	-74.1	-	-10.04
KFM01D	311.00	321.00	4	31329	2018-05-14	-74.8	-	-10.20
KFM01D	311.00	321.00	4	31330	2018-05-14	-74.3	<0.8	-10.06

- = Not analysed

< "value" = result less than reporting limit

Table A3-7. Isotopes I (H-, O- and C-isotopes), continued - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	$\delta^2\text{H}$ dev SMOW	^3H TU	$\delta^{18}\text{O}$ dev SMOW
KFM01D	429.00	438.00	2	31397	2018-05-31	-72.6	-	-10.59
KFM01D	429.00	438.00	2	31398	2018-05-31	-73.5	-	-10.62
KFM01D	429.00	438.00	2	31399	2018-05-31	-72.2	<0.8	-10.49
KFM02A	411.00	442.00	5	31376	2018-05-21	-76.6	-	-10.40
KFM02A	411.00	442.00	5	31377	2018-05-22	-76.5	-	-10.39
KFM02A	411.00	442.00	5	31378	2018-05-23	-77.5	<0.8	-9.98
KFM02A	490.00	518.00	3	31364	2018-05-22	-67.2	-	-8.91
KFM02A	490.00	518.00	3	31365	2018-05-22	-66.4	-	-8.98
KFM02A	490.00	518.00	3	31366	2018-05-23	-66.6	<0.8	-8.79
KFM02B	410.00	431.00	4	31379	2018-05-24	-71.1	-	-9.48
KFM02B	410.00	431.00	4	31380	2018-05-24	-72.0	-	-9.64
KFM02B	410.00	431.00	4	31381	2018-05-25	-71.7	<0.8	-9.58
KFM02B	491.00	506.00	2	31373	2018-05-23	-64.3	-	-8.65
KFM02B	491.00	506.00	2	31374	2018-05-23	-64.4	-	-8.57
KFM02B	491.00	506.00	2	31375	2018-05-24	-65.7	<0.8	-8.85
KFM03A	633.50	650.00	4	31382	2018-05-24	-84.3	-	-11.74
KFM03A	633.50	650.00	4	31383	2018-05-24	-84.4	-	-11.79
KFM03A	633.50	650.00	4	31384	2018-05-24	-84.4	<0.8	-11.83
KFM03A	969.50	994.50	1	31385	2018-05-28	-97.3	-	-13.79
KFM03A	969.50	994.50	1	31386	2018-05-29	-96.8	-	-13.69
KFM03A	969.50	994.50	1	31387	2018-05-30	-95.5	<0.8	-13.68
KFM04A	230.00	245.00	4	31322	2018-05-08	-70.9	-	-9.38
KFM04A	230.00	245.00	4	31323	2018-05-08	-70.6	-	-9.29
KFM04A	230.00	245.00	4	31324	2018-05-08	-70.4	<0.8	-9.45
KFM06A	341.00	362.00	5	31313	2018-05-07	-89.3	-	-12.22
KFM06A	341.00	362.00	5	31314	2018-05-07	-89.2	-	-12.30
KFM06A	341.00	362.00	5	31315	2018-05-07	-89.1	<0.8	-12.30
KFM06A	738.00	748.00	3	31409	2018-05-07	-83.1	-	-11.90
KFM06A	738.00	748.00	3	31410	2018-06-07	-81.4	-	-11.81
KFM06A	738.00	748.00	3	31411	2018-06-08	-82.4	<0.8	-11.90

- = Not analysed

< "value" = result less than reporting limit

Table A3-7. Isotopes I (H-, O- and C-isotopes), continued - 2018

Id code	Secup	Seclow	Section no.	Sample no.	Sampling date	$\delta^2\text{H}$	^3H	$\delta^{18}\text{O}$
	m	m				dev SMOW	TU	dev SMOW
KFM06C	531.00	540.00	5	31319	2018-05-29	-82.2	-	-10.98
KFM06C	531.00	540.00	5	31320	2018-05-29	-82.2	-	-10.96
KFM06C	531.00	540.00	5	31321	2018-05-29	-82.2	1.3	-11.18
KFM06C	647.00	666.00	3	31370	2018-05-21	-93.9	-	-13.11
KFM06C	647.00	666.00	3	31371	2018-05-23	-94.1	-	-13.01
KFM06C	647.00	666.00	3	31372	2018-05-25	-96.0	<0.8	-12.87
KFM08A	265.00	280.00	6	31331	2018-05-15	-101.0	-	-13.67
KFM08A	265.00	280.00	6	31332	2018-05-16	-100.5	-	-13.47
KFM08A	265.00	280.00	6	31333	2018-05-18	-100.8	<0.8	-13.58
KFM08A	684.00	694.00	2	31358	2018-05-17	-90.3	-	-12.98
KFM08A	684.00	694.00	2	31359	2018-05-17	-89.5	-	-12.88
KFM08A	684.00	694.00	2	31360	2018-05-17	-93.1	<0.8	-12.84
KFM08D	660.00	680.00	4	31334	2018-05-14	-83.8	-	-12.00
KFM08D	660.00	680.00	4	31335	2018-05-15	-83.5	-	-11.93
KFM08D	660.00	680.00	4	31336	2018-05-16	-83.5	<0.8	-12.05
KFM08D	825.00	835.00	2	31367	2018-05-21	-81.3	-	-12.13
KFM08D	825.00	835.00	2	31368	2018-05-22	-81.9	-	-11.98
KFM08D	825.00	835.00	2	31369	2018-05-23	-81.9	<0.8	-12.14
KFM10A	430.00	440.00	2	31355	2018-05-16	-65.3	-	-8.58
KFM10A	430.00	440.00	2	31356	2018-05-17	-63.7	-	-8.52
KFM10A	430.00	440.00	2	31357	2018-05-18	-64.5	<0.8	-8.59
KFM11A	446.00	456.00	4	31316	2018-05-07	-89.6	-	-12.23
KFM11A	446.00	456.00	4	31317	2018-05-07	-89.7	-	-12.34
KFM11A	446.00	456.00	4	31318	2018-05-07	-90.0	0.9	-12.20
KFM11A	690.00	710.00	2	31361	2018-05-17	-87.0	-	-11.99
KFM11A	690.00	710.00	2	31362	2018-05-18	-87.0	-	-12.01
KFM11A	690.00	710.00	2	31363	2018-05-18	-88.7	<0.8	-11.91
KFM12A	270.00	280.00	3	31325	2018-05-09	-112.7	-	-15.14
KFM12A	270.00	280.00	3	31326	2018-05-09	-113.1	-	-15.19
KFM12A	270.00	280.00	3	31327	2018-05-09	-113.2	<0.8	-15.23

- = Not analysed

< "value" = result less than reporting limit

Table A3-7. Isotopes I (H-, O- and C-isotopes), continued - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	$\delta^2\text{H}$ dev SMOW	^3H TU	$\delta^{18}\text{O}$ dev SMOW
KFR101	279.50	341.76	31394	1	2018-06-08	-110.0	-	-15.10
KFR101	279.50	341.76	31395	1	2018-06-08	-109.7	-	-14.93
KFR101	279.50	341.76	31396	1	2018-06-11	-110.7	-	-14.82
KFR102A	214.00	219.00	31388	5	2018-05-30	-80.0	-	-10.73
KFR102A	214.00	219.00	31389	5	2018-05-30	-79.7	-	-10.70
KFR102A	214.00	219.00	31390	5	2018-05-31	-80.5	1.4	-10.84
KFR102A	423.00	443.00	31391	2	2018-05-30	-88.6	-	-12.03
KFR102A	423.00	443.00	31392	2	2018-05-30	-90.2	-	-12.08
KFR102A	423.00	443.00	31393	2	2018-05-31	-90.3	<0.8	-12.09
KFR104	333.00	454.57	31400	1	2018-06-04	-107.1	-	-14.42
KFR104	333.00	454.57	31401	1	2018-06-05	-107.4	-	-14.41
KFR104	333.00	454.57	31402	1	2018-06-07	-107.1	<0.8	-14.39
KFR106	143.00	259.00	31406	2	2018-06-04	-82.5	-	-10.85
KFR106	143.00	259.00	31407	2	2018-06-05	-81.6	-	-10.78
KFR106	143.00	259.00	31408	2	2018-06-07	-80.6	1.3	-10.75
KFR106	260.00	300.13	31403	1	2018-06-04	-109.4	-	-14.48
KFR106	260.00	300.13	31404	1	2018-06-04	-110.4	-	-14.93
KFR106	260.00	300.13	31405	1	2018-06-05	-107.0	1.5	-14.51
KFR01	44.65	62.30	31554	1	2018-12-12	-76.3	1.9	-9.98

- = Not analysed

< "value" = result less than reporting limit

Table A3-8. Isotopes II (U- and Th-isotopes) - 2018

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	²³⁸ U mBq/kg	²³⁵ U mBq/kg	²³⁴ U mBq/kg	²³² Th mBq/kg	²³⁰ Th mBq/kg
KFM02A	490.00	518.00	3	31366	2018-05-23	1000	39.7	2046	0.08	0.28
KFM02A	411.00	442.00	5	31378	2018-05-23	215	8.4	832	0.45	1.85
KFR106	260.00	300.10	1	31405	2018-06-05	308	12.0	601	0.15	0.28
KFR106	143.00	259.00	2	31408	2018-06-07	293	12.1	916	0.08	0.11

Table A3-9. Water Composition - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
HFM01	33.50	45.50	2	66979	2019-05-21	0.0	414	13.2	44.7	13.8	478	355	193	59.2	1.50	2.60	5.90	0.284	-	-	0.0733	0.0129
HFM01	33.50	45.50	2	66980	2019-05-22	1.6	427	13.3	46.5	13.6	484	346	170	61.1	1.40	2.50	5.87	0.293	-	-	0.0731	0.0128
HFM01	33.50	45.50	2	66981	2019-05-24	1.3	418	13.1	45.7	13.4	473	345	153	60.1	1.30	2.30	5.79	0.298	0.30	0.29	0.0720	0.0128
HFM02	38.00	48.00	2	66684	2019-05-14	2.0	283	13.1	51.4	15.8	431	257	65.0	23.3	1.00	1.80	6.65	0.349	-	-	0.0983	0.0123
HFM02	38.00	48.00	2	66688	2019-05-15	3.9	283	13.2	51.7	16.0	428	239	63.0	23.2	0.96	1.80	6.86	0.358	-	-	0.100	0.0127
HFM02	38.00	48.00	2	66745	2019-05-16	5.7	281	12.7	50.4	15.4	434	212	57.0	22.3	0.89	1.70	6.75	0.350	0.34	0.34	0.0970	0.0132
HFM04	58.00	66.00	2	66976	2019-05-20	1.9	182	7.02	32.7	8.23	414	81.0	38.0	13.7	0.30	1.80	6.72	0.384	-	-	0.0839	0.0101
HFM04	58.00	66.00	2	66977	2019-05-21	4.9	192	7.55	34.6	8.74	411	78.0	41.0	14.9	0.30	1.80	7.24	0.398	-	-	0.0880	0.0109
HFM04	58.00	66.00	2	66978	2019-05-21	3.2	185	7.23	32.7	8.34	410	78.0	41.0	14.4	0.30	1.80	6.92	0.378	0.37	0.37	0.0837	0.0105
HFM13	159.00	173.00	1	66682	2019-05-14	-0.5	1820	25.8	1260	210	118	5300	473	164	22.0	1.30	7.07	3.74	-	-	2.25	0.058
HFM13	159.00	173.00	1	66746	2019-05-17	2.1	1940	25.9	1270	219	120	5220	444	169	21.0	1.30	7.44	3.82	-	-	2.35	0.066
HFM13	159.00	173.00	1	66955	2019-05-20	2.9	1950	26.2	1280	221	121	5160	447	171	21.0	1.30	7.58	3.84	4.10	3.80	2.38	0.065
HFM15	85.00	95.00	1	66985	2019-05-23	2.3	99.7	6.96	73.8	8.97	378	59.0	27.0	10.2	0.29	0.76	7.13	1.17	-	-	0.208	0.0062
HFM15	85.00	95.00	1	66986	2019-05-23	-1.4	97.1	6.84	73.8	8.85	379	78.0	26.0	9.97	0.39	0.54	7.06	1.18	-	-	0.206	0.0058
HFM15	85.00	95.00	1	66987	2019-05-24	1.8	99.9	6.79	73.3	8.73	382	60.0	26.0	10.2	0.30	0.61	7.08	1.18	1.13	1.12	0.201	0.0057
HFM16	54.00	67.00	2	66276	2019-05-07	4.5	266	7.29	35.4	8.37	439	137	79.0	29.1	0.62	2.30	6.67	0.496	-	-	0.0899	0.0113
HFM16	54.00	67.00	2	66277	2019-05-08	3.2	269	7.26	34.8	8.19	465	137	79.0	29.0	0.63	2.30	6.66	0.497	-	-	0.0885	0.0113
HFM16	54.00	67.00	2	66278	2019-05-09	2.7	265	7.73	34.5	7.84	465	137	81.0	28.0	0.64	2.30	6.39	0.489	0.48	0.48	0.0850	0.0120
HFM19	168.00	182.00	1	66685	2019-05-14	-0.3	2000	50.6	992	236	119	5140	499	176	19.4	1.30	5.54	4.01	-	-	1.58	0.0564
HFM19	168.00	182.00	1	66686	2019-05-15	-0.2	1980	50.5	1000	236	126	5110	500	177	19.5	1.20	5.61	4.45	-	-	1.67	0.0566
HFM19	168.00	182.00	1	66744	2019-05-16	2.0	2090	52.4	1030	248	127	5110	562	184	22.0	1.20	6.01	4.88	4.80	4.80	1.79	0.0640
HFM21	22.00	32.00	3	67549	2019-06-17	1.5	260	13.9	61.0	16.4	469	196	112	36.9	0.68	1.40	7.29	0.756	-	-	0.150	0.0170
HFM21	22.00	32.00	3	67550	2019-06-18	1.2	281	14.5	64.6	17.6	463	240	113	39.0	0.82	1.40	7.16	0.774	-	-	0.155	0.0176
HFM21	22.00	32.00	3	67551	2019-06-18	1.4	287	14.9	65.6	18.4	458	252	109	40.0	0.78	1.30	7.28	0.763	0.76	0.75	0.159	0.0172
HFM27	46.00	58.00	2	67552	2019-06-17	0.0	941	31.9	298	79.4	307	1850	254	93.1	6.40	1.60	6.06	1.810	-	-	0.504	0.0330
HFM27	46.00	58.00	2	67553	2019-06-18	1.3	980	32.0	296	84.0	306	1860	251	94.8	6.50	1.60	6.16	1.820	-	-	0.524	0.0328
HFM27	46.00	58.00	2	67554	2019-06-20	0.9	969	32.1	296	82.5	308	1860	259	93.8	6.40	1.60	6.17	1.780	1.87	1.84	0.510	0.0316

RCB % = Rel. charge balance error %

- = Not analysed

< "value" = value below reporting limit

Table A3-9. Water Composition, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
HFM32	26.00	31.00	3	67345	2019-05-29	0.2	1910	65.5	456	159	198	3840	382	134	14.3	1.40	5.39	4.670	-	-	0.779	0.0584
HFM32	26.00	31.00	3	67346	2019-05-29	0.3	1920	65.6	462	160	198	3860	365	134	13.6	1.40	5.42	4.760	-	-	0.801	0.0590
HFM32	26.00	31.00	3	67347	2019-05-29	0.1	1910	65.1	465	160	200	3870	383	135	14.2	1.30	5.45	4.540	2.83	2.75	0.795	0.0608
KFM01A	109.00	130.00	5	66687	2019-05-15	-0.1	1610	19.8	722	103	68.0	3860	237	83.9	16.2	1.40	8.05	0.193	-	-	0.496	0.0409
KFM01A	109.00	130.00	5	66740	2019-05-16	2.7	1710	20.4	732	109	68.6	3810	226	85.7	15.4	1.60	8.86	0.312	-	-	0.551	0.0436
KFM01A	109.00	130.00	5	66741	2019-05-16	0.3	1620	19.6	691	102	68.9	3790	228	80.8	15.5	1.50	8.34	0.337	0.32	0.32	0.516	0.0418
KFM01D	311.00	321.00	4	66988	2019-05-24	2.7	1770	13.7	1140	55.6	22.5	4490	205	69.4	24.0	1.50	11.0	0.410	-	-	0.279	0.0341
KFM01D	311.00	321.00	4	66989	2019-05-24	2.5	1770	14.6	1120	59.6	23.4	4490	193	70.3	23.0	1.50	11.4	0.510	-	-	0.291	0.0360
KFM01D	311.00	321.00	4	66990	2019-05-24	2.5	1760	15.1	1100	58.8	24.7	4440	196	67.9	24.0	1.40	11.4	0.560	0.54	0.54	0.296	0.0370
KFM01D	429.00	438.00	2	66982	2019-05-22	2.2	1800	12.5	1380	31.2	23.5	5000	115	33.0	37.0	1.30	10.4	<0.1	-	-	0.103	0.0307
KFM01D	429.00	438.00	2	66983	2019-05-22	3.8	1860	13.0	1420	33.4	25.5	4990	105	33.6	31.0	1.40	10.9	<0.1	-	-	0.106	0.0324
KFM01D	429.00	438.00	2	66984	2019-05-23	2.0	1760	11.6	1410	29.2	22.0	5010	104	33.1	32.0	1.30	10.5	0.023	<0.02	<0.02	0.106	0.0310
KFM02A	411.00	442.00	5	66279	2019-05-08	0.0	2030	25.8	1300	207	92.2	5660	422	156	21.0	1.40	7.43	0.678	-	-	1.73	0.674
KFM02A	411.00	442.00	5	66280	2019-05-09	0.0	1960	24.9	1240	200	94.3	5440	422	151	21.0	1.50	7.26	0.684	-	-	1.70	0.596
KFM02A	411.00	442.00	5	66281	2019-05-10	-0.8	1950	23.2	1210	195	94.6	5450	422	148	23.0	1.40	7.12	0.684	0.72	0.72	1.65	0.550
KFM02A	490.00	518.00	3	66282	2019-05-09	0.1	2280	42.8	1010	239	122	5560	489	178	19.8	1.50	6.95	1.37	-	-	1.84	0.0485
KFM02A	490.00	518.00	3	66283	2019-05-10	0.2	2250	41.1	1000	237	125	5480	494	177	19.7	1.50	6.79	1.56	-	-	1.94	0.0497
KFM02A	490.00	518.00	3	66284	2019-05-10	-0.4	2230	39.3	985	235	124	5490	500	174	22.0	1.50	6.65	1.56	1.61	1.62	1.93	0.0472
KFM02B	410.00	431.00	4	66628	2019-05-13	0.0	2080	28.2	1160	216	101	5500	453	160	21.0	1.50	8.49	1.83	-	-	1.87	0.0845
KFM02B	410.00	431.00	4	66667	2019-05-14	1.4	2150	28.3	1200	222	104	5520	450	166	21.0	1.60	8.70	2.03	-	-	1.99	0.0945
KFM02B	410.00	431.00	4	66683	2019-05-14	1.1	2160	27.5	1210	222	103	5580	450	166	21.0	1.50	8.65	2.05	2.08	2.06	1.99	0.0971
KFM02B	491.00	506.00	2	66539	2019-05-13	1.3	2380	44.1	994	249	123	5550	512	186	19.7	1.50	8.78	3.47	-	-	1.95	0.0587
KFM02B	491.00	506.00	2	66625	2019-05-13	-0.1	2280	42.6	967	242	123	5510	510	182	19.7	1.60	8.40	3.68	-	-	1.93	0.0561
KFM02B	491.00	506.00	2	66681	2019-05-14	0.1	2300	41.5	982	245	125	5550	511	184	19.8	1.60	8.31	4.15	3.50	3.50	2.01	0.0598
KFM03A	633.50	650.00	4	66956	2019-05-20	4.5	2060	17.4	1700	58.2	17.7	5650	193	71.6	33.0	1.60	7.03	0.469	-	-	0.325	0.0348
KFM03A	633.50	650.00	4	66957	2019-05-20	2.0	1970	16.1	1610	54.6	16.5	5660	194	68.7	33.0	1.60	6.51	0.435	-	-	0.301	0.0319
KFM03A	633.50	650.00	4	66958	2019-05-21	2.0	2010	15.7	1610	53.5	15.5	5720	195	69.1	33.0	1.60	6.24	0.386	0.39	0.39	0.285	0.0345

RCB % = Rel. charge balance error %

- = Not analysed

< "value" = value below reporting limit

Table A3-9. Water Composition, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFM03A	633.50	650.00	4	71429	2019-10-09	1.4	1960	15.9	1590	54.5	18.1	5680	187	66.7	34.0	1.60	6.55	0.428	-	-	0.312	0.0305
KFM03A	633.50	650.00	4	71430	2019-10-09	1.6	1970	15.6	1590	53.9	17.3	5670	188	67.0	34.0	1.70	6.49	0.439	-	-	0.305	0.0326
KFM03A	633.50	650.00	4	71431	2019-10-09	1.9	1980	15.3	1590	53.6	16.4	5650	192	68.4	33.0	1.70	6.33	0.426	0.43	0.43	0.300	0.0327
KFM03A	969.50	994.50	1	66973	2019-05-20	2.2	2470	9.47	3940	8.19	6.6	10300	54.0	16.5	96.0	1.50	5.41	<0.1	-	-	0.0286	0.0309
KFM03A	969.50	994.50	1	66974	2019-05-22	0.5	2310	9.27	3820	7.45	6.1	10200	47.0	16.4	92.0	1.50	4.75	<0.1	-	-	0.0313	0.0256
KFM03A	969.50	994.50	1	66975	2019-05-23	0.2	2340	8.99	3820	7.49	6.1	10300	48.0	16.4	95.0	1.70	4.69	0.045	0.05	0.04	0.0297	0.0272
KFM04A	230.00	245.00	4	67342	2019-05-27	-0.6	1980	26.8	1470	222	100	5970	477	168	27.0	1.10	6.30	1.87	-	-	2.76	0.0591
KFM04A	230.00	245.00	4	67343	2019-05-27	0.1	1990	27.0	1490	225	100	5940	439	170	26.0	1.10	6.43	1.94	-	-	2.81	0.0598
KFM04A	230.00	245.00	4	67344	2019-05-27	1.4	2050	27.4	1520	230	100	5930	467	174	27.0	1.20	6.53	1.77	2.02	2.02	2.86	0.0614
KFM06A	341.00	362.00	5	66264	2019-05-06	2.3	1590	15.8	1330	38.0	30.1	4600	111	39.0	29.0	1.10	2.00	<0.1	-	-	0.018	0.0537
KFM06A	341.00	362.00	5	66265	2019-05-06	4.8	1640	14.7	1370	43.1	25.3	4520	108	38.8	29.0	1.30	5.51	0.108	-	-	0.224	0.0562
KFM06A	341.00	362.00	5	66266	2019-05-07	3.5	1620	11.0	1370	40.8	25.4	4610	107	37.9	30.0	1.30	5.30	0.435	0.43	0.42	0.245	0.0563
KFM06A	738.00	748.00	3	66273	2019-05-07	2.2	1860	11.4	2320	17.6	15.8	6640	94.0	35.0	47.0	1.40	6.71	<0.1	-	-	0.158	0.0422
KFM06A	738.00	748.00	3	66274	2019-05-08	1.4	1860	11.0	2290	16.1	13.7	6700	117	34.5	50.0	1.40	6.48	<0.1	-	-	0.166	0.0394
KFM06A	738.00	748.00	3	66275	2019-05-09	1.3	1870	9.77	2290	15.4	11.5	6730	100	34.0	49.0	1.40	6.39	0.075	0.08	0.07	0.158	0.0423
KFM06C	531.00	540.00	5	66267	2019-05-06	1.3	1720	19.5	1270	55.8	33.6	4760	214	77.3	25.0	0.84	1.43	<0.1	-	-	0.0259	0.0405
KFM06C	531.00	540.00	5	66268	2019-05-06	2.7	1770	17.7	1340	80.1	25.1	4860	247	86.5	26.0	0.97	4.44	0.126	-	-	0.446	0.0458
KFM06C	531.00	540.00	5	66269	2019-05-07	0.6	1700	14.8	1330	83.2	36.2	4950	255	88.4	26.0	1.10	4.83	0.262	0.28	0.27	0.572	0.0459
KFM06C	647.00	666.00	3	66270	2019-05-06	2.5	1610	8.29	1910	2.39	69.3	5500	64.0	22.9	41.0	1.40	0.41	<0.1	-	-	0.0200	0.0367
KFM06C	647.00	666.00	3	66271	2019-05-10	1.9	1600	7.22	1940	14.1	27.8	5660	64.0	22.2	43.0	1.30	2.23	<0.1	-	-	0.0200	0.0348
KFM06C	647.00	666.00	3	66272	2019-05-13	3.9	1700	7.01	1960	16.7	23.1	5620	65.0	22.8	44.0	1.30	3.08	0.010	<0.02	<0.02	0.0110	0.0387
KFM08A	265.00	280.00	6	67534	2019-06-10	1.2	1360	14.9	900	54.3	59.7	3580	204	68.5	17.9	1.30	7.09	1.10	-	-	0.566	0.0314
KFM08A	265.00	280.00	6	67535	2019-06-11	3.3	1400	15.4	938	57.5	59.3	3550	201	72.3	17.1	1.30	7.20	1.19	-	-	0.603	0.0338
KFM08A	265.00	280.00	6	67536	2019-06-18	1.0	1380	14.3	910	58.7	57.9	3650	200	73.8	16.5	1.30	6.66	1.22	1.23	1.21	0.595	0.0364
KFM08A	684.00	694.00	2	67531	2019-06-28	3.0	1920	10.6	2090	10.2	14.9	6240	69.0	26.0	44.0	1.40	4.65	<0.1	-	-	0.0476	0.0208
KFM08A	684.00	694.00	2	67532	2019-06-28	1.6	1830	10.7	2090	9.89	13.0	6290	69.0	25.5	45.0	1.40	5.38	<0.1	-	-	0.0703	0.0200
KFM08A	684.00	694.00	2	67533	2019-06-28	1.8	1890	10.6	2070	9.86	12.0	6310	67.0	25.3	45.0	1.50	5.60	0.055	0.05	0.05	0.0842	0.0190

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Table A3-9. Water Composition, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br ⁻ mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFM08D	660.00	680.00	4	67540	2019-10-07	1.6	1880	7.66	2160	8.46	8.6	6470	74.0	25.1	50.0	1.40	6.13	<0.1	-	-	0.0873	0.0256
KFM08D	660.00	680.00	4	67541	2019-10-09	0.8	1850	7.32	2160	8.04	7.7	6540	71.0	24.7	49.0	1.40	5.64	<0.1	-	-	0.0868	0.0240
KFM08D	660.00	680.00	4	67542	2019-10-11	1.6	1930	6.95	2150	7.71	7.4	6530	69.0	24.5	50.0	1.50	5.37	0.057	0.07	0.06	0.0856	0.0264
KFM08D	825.00	835.00	2	67537	2019-06-17	0.1	2180	5.87	2880	0.81	118	8270	130	47.1	62.0	1.40	4.26	<0.1	-	-	0.0200	0.0249
KFM08D	825.00	835.00	2	67538	2019-06-19	0.2	2260	4.47	2910	2.21	40.4	8480	128	45.7	65.0	1.40	3.67	<0.1	-	-	0.0200	0.0265
KFM08D	825.00	835.00	2	67539	2019-06-20	-0.4	2220	4.10	2880	2.40	19.4	8470	133	46.9	68.0	1.50	4.21	0.565	<0.02	<0.02	0.0102	0.0289
KFM10A	430.00	440.00	2	66689	2019-05-15	-0.2	2160	31.3	1180	217	97.3	5600	568	204	19.4	1.40	7.38	2.68	-	-	1.27	0.0617
KFM10A	430.00	440.00	2	66742	2019-05-16	0.4	2220	30.8	1160	221	99.3	5590	573	204	19.6	1.40	7.50	2.72	-	-	1.34	0.0653
KFM10A	430.00	440.00	2	66743	2019-05-17	2.4	2320	32.2	1210	229	99.9	5590	565	212	19.4	1.40	7.71	2.98	2.98	2.96	1.44	0.0696
KFM11A	446.00	456.00	4	67543	2019-06-19	2.1	1650	5.46	1650	22.5	9.4	5120	246	86.2	24.0	1.30	3.62	<0.1	-	-	0.0593	0.0515
KFM11A	446.00	456.00	4	67544	2019-06-19	2.1	1660	5.34	1630	22.2	7.8	5100	237	84.9	23.0	1.30	3.81	<0.1	-	-	0.0661	0.0517
KFM11A	446.00	456.00	4	67545	2019-06-19	2.1	1630	5.29	1650	22.0	7.2	5090	238	85.1	23.0	1.30	3.86	0.060	0.06	0.06	0.0665	0.0539
KFM11A	690.00	710.00	2	67339	2019-05-27	1.1	2080	9.08	2320	14.5	12.1	7110	99.0	35.7	51.0	1.40	4.63	<0.1	-	-	0.0513	0.0491
KFM11A	690.00	710.00	2	67340	2019-05-28	0.5	2030	8.79	2290	14.4	11.8	7070	104	35.1	54.0	1.40	4.56	<0.1	-	-	0.0553	0.0498
KFM11A	690.00	710.00	2	67341	2019-05-28	0.6	2020	8.55	2270	14.3	11.1	7010	101	34.6	52.0	1.40	4.56	0.077	0.08	0.08	0.0550	0.0501
KFM12A	270.00	280.00	3	67546	2019-06-27	0.9	1090	6.51	1290	34.2	27.0	3940	63.0	20.9	24.0	0.93	3.94	0.116	-	-	0.357	0.0451
KFM12A	270.00	280.00	3	67547	2019-06-27	-1.7	1100	6.44	1290	35.0	29.9	4170	61.0	20.8	24.0	0.95	3.84	0.119	-	-	0.399	0.0436
KFM12A	270.00	280.00	3	67548	2019-06-27	1.5	1070	6.27	1290	35.4	31.0	3860	64.0	20.7	25.0	0.96	3.78	0.120	0.12	0.12	0.412	0.0451
KFR101	279.50	341.80	1	67555	2019-06-13	0.0	842	4.93	432	32.3	62.5	2070	67.0	24.0	10.5	1.50	4.84	0.320	-	-	0.490	0.0340
KFR101	279.50	341.80	1	67556	2019-06-17	0.0	859	5.07	433	33.0	63.9	2100	67.0	24.5	10.4	1.40	4.92	0.356	-	-	0.504	0.0347
KFR101	279.50	341.80	1	67557	2019-06-18	0.5	881	5.31	443	34.1	63.5	2130	69.0	25.7	10.5	1.80	4.94	0.371	0.39	0.38	0.512	0.0351
KFR102A	214.00	219.00	5	67561	2019-06-10	1.3	1540	9.64	614	103	94.5	3380	301	107	13.2	1.40	5.69	0.505	-	-	0.495	0.0465
KFR102A	214.00	219.00	5	67562	2019-06-10	1.7	1550	9.63	623	103	94.0	3380	301	108	12.9	1.50	5.68	0.516	-	-	0.487	0.0469
KFR102A	214.00	219.00	5	67563	2019-06-11	1.7	1570	9.10	624	101	95.8	3410	297	107	12.3	1.50	5.44	0.533	0.52	0.52	0.489	0.0474
KFR102A	423.00	443.00	2	67558	2019-06-10	3.0	1540	9.38	978	83.3	45.9	3870	259	93.9	18.1	1.50	5.50	0.731	-	-	0.472	0.0488
KFR102A	423.00	443.00	2	67559	2019-06-11	2.1	1510	9.15	1000	80.3	45.2	3930	250	91.6	18.1	1.50	5.42	0.817	-	-	0.484	0.0487
KFR102A	423.00	443.00	2	67560	2019-06-12	1.8	1510	8.39	1030	79.1	43.2	4010	252	90.1	18.6	1.50	5.35	0.878	0.86	0.86	0.495	0.0495

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Table A3-9. Water Composition, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO ₃ ⁻ mg/L	Cl ⁻ mg/L	SO ₄ ²⁻ mg/L	SO ₄ -S mg/L	Br ⁻ mg/L	F ⁻ mg/L	Si mg/L	Fe mg/L	Fe-tot mg/L	Fe(II) mg/L	Mn mg/L	Li mg/L
KFR104	333.00	454.60	1	67564	2019-06-12	0.8	732	3.82	408	2.46	33.4	1780	37.0	13.7	9.40	1.80	4.15	<0.02	-	-	0.0030	0.0184
KFR104	333.00	454.60	1	67565	2019-06-14	1.2	767	4.00	426	4.87	30.0	1850	45.0	17.8	9.50	1.80	4.26	<0.02	-	-	0.0030	0.0212
KFR104	333.00	454.60	1	67566	2019-06-17	0.3	783	4.03	436	6.77	24.6	1930	51.0	19.1	9.70	1.80	4.21	0.004	<0.02	<0.02	0.0052	0.0220
KFR106	143.00	259.00	2	67570	2019-06-04	1.9	1840	16.0	781	163	113	4200	340	122	16.2	1.40	5.41	1.13	-	-	1.09	0.0548
KFR106	143.00	259.00	2	67571	2019-06-05	1.5	1830	15.7	787	165	110	4240	335	122	15.9	1.50	5.34	1.19	-	-	1.12	0.0563
KFR106	143.00	259.00	2	67572	2019-06-05	1.7	1850	15.4	790	165	111	4250	328	121	15.7	1.50	5.40	1.19	-	-	1.13	0.0559
KFR106	260.00	300.10	1	67567	2019-06-04	2.1	893	10.8	397	45.0	142	1980	81.0	29.6	9.00	1.70	4.84	0.067	-	-	0.164	0.0369
KFR106	260.00	300.10	1	67568	2019-06-04	1.7	962	11.2	464	54.7	107	2250	94.0	34.9	11.8	1.70	5.07	0.157	-	-	0.255	0.0411
KFR106	260.00	300.10	1	67569	2019-06-05	4.6	1270	9.83	732	80.1	81.2	3000	165	63.2	13.5	1.60	5.43	0.576	-	-	0.455	0.0461
KFR01	44.65	62.30	1	74124	2019-12-10	1.2	1580	8.98	595	115	103	3410	342	124	11.1	1.30	4.34	0.482	-	-	0.622	0.0563
KFR01	44.65	62.30	1	74125	2019-12-10	1.6	1590	9.10	591	115	103	3390	337	124	11.5	1.30	4.37	0.449	-	-	0.628	0.0599
KFR01	44.65	62.30	1	74126	2019-12-11	0.8	1560	9.47	586	115	104	3390	338	124	11.1	1.30	4.45	0.563	0.45	0.45	0.647	0.0580
KFR105	265.00	306.81	1	74127	2019-12-11	0.8	1410	6.73	773	102	82.9	3540	242	89.9	12.0	1.30	4.74	0.746	-	-	1.50	0.0666
KFR105	265.00	306.81	1	74128	2019-12-13	1.7	1420	6.75	763	101	83.3	3470	259	89.2	12.6	1.30	4.78	0.754	-	-	1.50	0.0632
KFR105	265.00	306.81	1	74129	2019-12-16	1.7	1420	6.72	744	98.5	84.4	3430	243	88.4	11.8	1.30	4.82	0.756	0.73	0.73	1.46	0.0628
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Table A3-9. Water Composition, continued 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
HFM01	33.50	45.50	2	66979	2019-05-21	0.292	-	7.98	7.94	10.9	10.1	0.130	1.8	218	214	-	-	-	-
HFM01	33.50	45.50	2	66980	2019-05-22	0.291	-	7.91	8.00	10.8	10.8	0.120	1.9	220	215	-	-	-	-
HFM01	33.50	45.50	2	66981	2019-05-24	0.286	0.0090	7.98	7.99	10.5	10.7	0.089	1.9	217	212	<0.0002	<0.0003	0.716	<0.0003
HFM02	38.00	48.00	2	66684	2019-05-14	0.373	-	7.73	7.79	11.6	11.4	0.039	1.7	158	159	-	-	-	-
HFM02	38.00	48.00	2	66688	2019-05-15	0.374	-	7.78	7.74	11.2	11.4	0.038	1.8	152	153	-	-	-	-
HFM02	38.00	48.00	2	66745	2019-05-16	0.365	0.0178	7.75	7.78	11.5	11.4	0.036	1.8	151	150	<0.0002	<0.0003	0.493	<0.0003
HFM04	58.00	66.00	2	66976	2019-05-20	0.263	-	7.75	7.69	10.6	1.5	0.055	1.4	97.0	929	-	-	-	-
HFM04	58.00	66.00	2	66977	2019-05-21	0.278	-	7.74	7.17	10.3	10.6	0.054	1.4	96.0	927	-	-	-	-
HFM04	58.00	66.00	2	66978	2019-05-21	0.266	0.0426	7.74	7.65	10.3	10.4	0.053	1.4	95.0	932	<0.0002	<0.0003	0.527	<0.0003
HFM13	159.00	173.00	1	66682	2019-05-14	12.9	-	7.37	7.49	1.8	1.8	0.033	0.6	1490	1510	-	-	-	-
HFM13	159.00	173.00	1	66746	2019-05-17	13.7	-	7.30	7.49	1.8	1.8	0.030	0.6	1500	1510	-	-	-	-
HFM13	159.00	173.00	1	66955	2019-05-20	13.8	0.1190	7.35	7.41	1.8	1.8	0.028	0.7	1480	1470	0.0003	<0.0003	1.31	0.0004
HFM15	85.00	95.00	1	66985	2019-05-23	0.332	-	7.28	7.16	9.2	9.2	0.140	1.2	81.0	79.9	-	-	-	-
HFM15	85.00	95.00	1	66986	2019-05-23	0.327	-	7.22	7.20	9.0	9.2	0.130	1.2	80.0	79.5	-	-	-	-
HFM15	85.00	95.00	1	66987	2019-05-24	0.325	0.0060	7.20	7.20	9.5	8.8	0.140	1.2	81.0	80.7	0.0002	0.0004	0.393	0.0006
HFM16	54.00	67.00	2	66276	2019-05-07	0.303	-	7.84	8.46	14.4	14.6	0.110	2.2	125	128	-	-	-	-
HFM16	54.00	67.00	2	66277	2019-05-08	0.301	-	7.83	6.73	14.2	14.4	0.070	2.1	129	129	-	-	-	-
HFM16	54.00	67.00	2	66278	2019-05-09	0.288	0.0073	7.80	7.54	14.0	14.2	0.064	2.2	134	129	<0.0002	<0.0003	0.701	<0.0003
HFM19	168.00	182.00	1	66685	2019-05-14	8.06	-	7.33	7.46	1.9	1.8	0.220	0.6	1490	1500	-	-	-	-
HFM19	168.00	182.00	1	66686	2019-05-15	7.99	-	7.31	7.40	1.9	1.8	0.280	0.6	1480	1500	-	-	-	-
HFM19	168.00	182.00	1	66744	2019-05-16	8.50	0.0822	7.24	7.44	2.0	1.7	0.240	0.6	1490	1500	<0.0002	0.0007	2.07	0.0008
HFM21	22.00	32.00	3	67549	2019-06-17	0.330	-	7.57	7.64	8.3	8.4	0.039	1.6	152	155	-	-	-	-
HFM21	22.00	32.00	3	67550	2019-06-18	0.356	-	7.56	7.71	9.0	8.9	0.045	1.6	161	164	-	-	-	-
HFM21	22.00	32.00	3	67551	2019-06-18	0.363	0.0121	7.51	7.64	9.0	9.1	0.044	1.6	165	166	0.0003	<0.0003	0.467	<0.0003
HFM27	46.00	58.00	2	67552	2019-06-17	2.01	-	7.52	7.70	6.3	6.3	0.045	1.4	632	631	-	-	-	-
HFM27	46.00	58.00	2	67553	2019-06-18	2.08	-	7.49	7.64	6.2	6.3	0.039	1.4	628	629	-	-	-	-
HFM27	46.00	58.00	2	67554	2019-06-20	2.04	0.0249	7.51	7.66	6.4	6.5	0.030	1.4	636	628	<0.0002	<0.0003	1.62	<0.0003

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-9. Water Composition, continued 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
HFM32	26.00	31.00	3	67345	2019-05-29	3.21	-	7.16	7.71	3.4	3.4	0.160	0.5	1180	1180	-	-	-	-
HFM32	26.00	31.00	3	67346	2019-05-29	3.23	-	7.26	7.77	3.4	3.4	0.092	0.6	1190	1180	-	-	-	-
HFM32	26.00	31.00	3	67347	2019-05-29	3.26	0.0514	7.25	7.34	3.4	3.4	0.055	0.6	1190	1170	<0.0002	<0.0003	2.05	<0.0003
KFM01A	109.00	130.00	5	66687	2019-05-15	6.09	-	7.92	8.07	1.9	2.2	0.820	29.0	1150	1150	-	-	-	-
KFM01A	109.00	130.00	5	66740	2019-05-16	6.38	-	7.83	8.06	1.9	1.8	0.290	31.0	1130	1130	-	-	-	-
KFM01A	109.00	130.00	5	66741	2019-05-16	6.05	0.118	7.82	8.05	1.8	1.8	0.280	31.0	1120	1120	<0.0002	<0.0003	0.801	<0.0003
KFM01D	311.00	321.00	4	66988	2019-05-24	12.1	-	7.88	8.19	2.0	2.1	0.270	13.3	1290	1290	-	-	-	-
KFM01D	311.00	321.00	4	66989	2019-05-24	11.8	-	7.78	7.80	2.5	2.1	0.250	14.6	1280	1270	-	-	-	-
KFM01D	311.00	321.00	4	66990	2019-05-24	11.5	0.120	7.78	7.83	2.2	2.3	0.250	16.0	1270	1240	<0.0002	<0.0003	0.440	<0.0003
KFM01D	429.00	438.00	2	66982	2019-05-22	15.7	-	8.34	8.54	2.6	2.4	2.70	13.3	1420	1370	-	-	-	-
KFM01D	429.00	438.00	2	66983	2019-05-22	16.0	-	8.23	8.54	2.4	2.4	2.30	13.3	1430	1390	-	-	-	-
KFM01D	429.00	438.00	2	66984	2019-05-23	16.0	0.163	7.85	8.35	2.5	2.3	4.60	13.1	1390	1400	<0.0002	<0.0003	0.254	<0.0003
KFM02A	411.00	442.00	5	66279	2019-05-08	13.2	-	7.38	6.75	1.4	1.4	0.160	43.0	1550	1560	-	-	-	-
KFM02A	411.00	442.00	5	66280	2019-05-09	12.7	-	7.39	6.08	1.5	1.6	0.120	41.0	1570	1540	-	-	-	-
KFM02A	411.00	442.00	5	66281	2019-05-10	12.4	0.137	7.52	7.57	1.3	1.3	0.110	39.0	1540	1540	0.0003	<0.0003	1.42	0.0005
KFM02A	490.00	518.00	3	66282	2019-05-09	9.11	-	7.31	7.42	2.2	2.1	0.170	6.8	1620	1550	-	-	-	-
KFM02A	490.00	518.00	3	66283	2019-05-10	9.04	-	7.33	7.11	2.0	2.0	0.140	6.7	1600	1580	-	-	-	-
KFM02A	490.00	518.00	3	66284	2019-05-10	8.90	0.0986	7.35	7.35	1.7	2.0	0.130	6.7	1600	1560	<0.0002	<0.0003	2.56	<0.0003
KFM02B	410.00	431.00	4	66628	2019-05-13	11.4	-	7.53	7.52	1.4	1.6	0.085	3.6	1560	1550	-	-	-	-
KFM02B	410.00	431.00	4	66667	2019-05-14	11.9	-	7.44	7.43	1.3	1.5	0.066	3.9	1560	1580	-	-	-	-
KFM02B	410.00	431.00	4	66683	2019-05-14	11.9	0.110	6.89	7.59	1.4	1.9	0.065	3.9	1550	1580	<0.0002	<0.0003	1.66	<0.0003
KFM02B	491.00	506.00	2	66539	2019-05-13	8.75	-	7.00	7.65	1.9	2.0	0.110	1.9	1560	1600	-	-	-	-
KFM02B	491.00	506.00	2	66625	2019-05-13	8.51	-	7.39	7.24	1.7	1.9	0.092	2.0	1570	1560	-	-	-	-
KFM02B	491.00	506.00	2	66681	2019-05-14	8.61	0.701	7.36	7.52	1.7	1.8	0.076	2.2	1600	1600	<0.0002	<0.0003	2.69	<0.0003
KFM03A	633.50	650.00	4	66956	2019-05-20	21.2	-	7.53	7.73	1.2	1.7	0.140	2.6	1590	1570	-	-	-	-
KFM03A	633.50	650.00	4	66957	2019-05-20	20.0	-	7.50	7.62	1.6	1.5	0.130	2.4	1610	1570	-	-	-	-
KFM03A	633.50	650.00	4	66958	2019-05-21	20.2	0.540	7.48	7.67	0.8	1.1	0.110	2.2	1590	1570	<0.0002	<0.0003	0.149	<0.0003

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-9. Water Composition, continued 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFM03A	633.50	650.00	4	71429	2019-10-09	19.6	-	7.74	7.38	0.8	0.9	0.250	2.6	1580	1470	-	-	-	-
KFM03A	633.50	650.00	4	71430	2019-10-09	19.6	-	7.57	8.31	0.8	0.9	0.160	2.5	1580	1470	-	-	-	-
KFM03A	633.50	650.00	4	71431	2019-10-09	19.7	0.117	7.43	7.75	0.7	0.7	0.120	2.3	1570	1460	<0.0002	<0.0003	0.157	<0.0003
KFM03A	969.50	994.50	1	66973	2019-05-20	46.5	-	8.06	8.22	0.9	0.7	0.130	0.5	2680	2590	-	-	-	-
KFM03A	969.50	994.50	1	66974	2019-05-22	43.5	-	8.17	8.63	1.0	0.8	0.079	<0.5	2710	2630	-	-	-	-
KFM03A	969.50	994.50	1	66975	2019-05-23	43.9	0.394	8.13	8.46	0.5	0.6	0.075	0.5	2640	2620	<0.0002	0.0029	0.0146	0.0029
KFM04A	230.00	245.00	4	67342	2019-05-27	16.0	-	7.31	7.25	1.1	<0.3	0.240	1.2	1690	1620	-	-	-	-
KFM04A	230.00	245.00	4	67343	2019-05-27	16.2	-	7.34	7.17	1.5	1.4	0.150	1.3	1700	1650	-	-	-	-
KFM04A	230.00	245.00	4	67344	2019-05-27	16.5	0.0783	7.29	7.17	1.2	1.4	0.160	1.2	1640	1660	<0.0002	0.0008	1.50	0.0008
KFM06A	341.00	362.00	5	66264	2019-05-06	16.0	-	10.00	10.52	2.3	2.4	0.180	16.0	1320	1290	-	-	-	-
KFM06A	341.00	362.00	5	66265	2019-05-06	16.4	-	9.03	8.71	1.6	1.8	0.062	17.0	1300	1290	-	-	-	-
KFM06A	341.00	362.00	5	66266	2019-05-07	16.6	0.147	8.12	9.53	2.0	1.6	0.046	16.0	1310	1310	<0.0002	<0.0003	0.158	<0.0003
KFM06A	738.00	748.00	3	66273	2019-05-07	26.8	-	8.59	7.99	1.4	1.3	0.061	27.0	1820	1810	-	-	-	-
KFM06A	738.00	748.00	3	66274	2019-05-08	26.7	-	8.44	5.54	1.0	0.7	0.049	26.0	1830	1750	-	-	-	-
KFM06A	738.00	748.00	3	66275	2019-05-09	26.8	0.775	8.22	6.16	1.0	1.0	0.042	25.0	1860	1760	0.0004	<0.0003	0.141	0.0007
KFM06C	531.00	540.00	5	66267	2019-05-06	13.9	-	10.07	10.55	2.3	2.2	1.20	42.0	1400	1390	-	-	-	-
KFM06C	531.00	540.00	5	66268	2019-05-06	14.8	-	8.55	8.66	1.8	1.6	0.220	44.0	1410	1360	-	-	-	-
KFM06C	531.00	540.00	5	66269	2019-05-07	14.6	0.0808	7.87	8.96	1.6	1.7	0.110	44.0	1440	1430	0.0002	<0.0003	0.372	0.0003
KFM06C	647.00	666.00	3	66270	2019-05-06	22.8	-	10.62	11.11	2.2	2.5	0.730	10.6	1550	1550	-	-	-	-
KFM06C	647.00	666.00	3	66271	2019-05-10	23.1	-	9.68	10.40	0.8	0.9	0.130	10.5	1590	1570	-	-	-	-
KFM06C	647.00	666.00	3	66272	2019-05-13	23.6	0.200	9.45	9.67	0.7	0.9	0.200	10.3	1560	1560	<0.0002	0.0013	0.0992	0.0015
KFM08A	265.00	280.00	6	67534	2019-06-10	10.5	-	7.67	7.82	1.2	0.9	0.094	6.8	1040	1040	-	-	-	-
KFM08A	265.00	280.00	6	67535	2019-06-11	10.8	-	7.66	7.79	1.2	1.2	0.081	6.7	1050	1020	-	-	-	-
KFM08A	265.00	280.00	6	67536	2019-06-18	10.6	0.103	7.61	7.93	1.3	1.2	0.071	5.8	1050	1060	<0.0002	<0.0003	0.336	<0.0003
KFM08A	684.00	694.00	2	67531	2019-06-28	25.8	-	9.01	9.32	1.0	0.8	0.130	9.9	1730	1730	-	-	-	-
KFM08A	684.00	694.00	2	67532	2019-06-28	25.5	-	8.76	9.16	0.9	0.8	0.071	10.2	1720	1720	-	-	-	-
KFM08A	684.00	694.00	2	67533	2019-06-28	25.4	0.300	8.62	9.00	0.9	1.0	0.053	10.3	1710	1730	<0.0002	<0.0003	0.0735	<0.0003

pH_L; EC_L = Laboratory measurements of pH and EC

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Table A3-9. Water Composition, continued 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFM08D	660.00	680.00	4	67540	2019-10-07	26.2	-	8.42	8.51	0.6	0.6	<0.019	25.0	1770	1580	-	-	-	-
KFM08D	660.00	680.00	4	67541	2019-10-09	26.3	-	8.26	8.59	0.6	0.7	0.019	25.0	1750	1640	-	-	-	-
KFM08D	660.00	680.00	4	67542	2019-10-11	26.5	0.204	8.27	8.51	0.6	0.7	<0.019	24.0	1770	1610	<0.0002	<0.0003	0.0744	<0.0003
KFM08D	825.00	835.00	2	67537	2019-06-17	32.8	-	10.87	10.85	2.0	1.2	0.051	0.5	2210	2200	-	-	-	-
KFM08D	825.00	835.00	2	67538	2019-06-19	34.1	-	10.18	10.14	0.9	1.1	<0.019	0.7	2240	2260	-	-	-	-
KFM08D	825.00	835.00	2	67539	2019-06-20	33.7	0.363	9.61	9.10	1.0	0.5	<0.019	0.8	2270	2220	<0.0002	<0.0003	0.0097	<0.0003
KFM10A	430.00	440.00	2	66689	2019-05-15	11.9	-	7.51	7.83	1.7	1.8	0.140	0.8	1620	1620	-	-	-	-
KFM10A	430.00	440.00	2	66742	2019-05-16	12.3	-	7.54	7.86	1.8	1.7	0.160	0.8	1610	1620	-	-	-	-
KFM10A	430.00	440.00	2	66743	2019-05-17	12.8	0.0620	7.51	7.86	1.7	1.8	0.140	0.7	1610	1620	<0.0002	<0.0003	1.24	<0.0003
KFM11A	446.00	456.00	4	67543	2019-06-19	23.3	-	8.84	9.11	1.0	1.1	0.250	1.8	1430	1440	-	-	-	-
KFM11A	446.00	456.00	4	67544	2019-06-19	23.3	-	8.58	8.87	0.8	0.9	0.190	1.9	1430	1430	-	-	-	-
KFM11A	446.00	456.00	4	67545	2019-06-19	23.4	0.121	8.42	8.78	0.8	0.8	0.170	1.9	1420	1440	<0.0002	<0.0003	0.0272	<0.0003
KFM11A	690.00	710.00	2	67339	2019-05-27	31.2	-	8.80	8.87	0.6	0.4	0.210	<0.5	1910	1820	-	-	-	-
KFM11A	690.00	710.00	2	67340	2019-05-28	30.9	-	8.52	8.77	0.4	0.4	0.210	<0.5	1910	1850	-	-	-	-
KFM11A	690.00	710.00	2	67341	2019-05-28	30.6	0.229	8.57	8.75	0.5	0.4	0.180	<0.5	1900	1870	<0.0002	0.0012	0.0687	0.0012
KFM12A	270.00	280.00	3	67546	2019-06-27	19.8	-	7.84	7.81	0.9	0.9	0.320	1.3	1100	1130	-	-	-	-
KFM12A	270.00	280.00	3	67547	2019-06-27	19.8	-	7.77	8.00	0.9	0.9	0.180	1.5	1120	1110	-	-	-	-
KFM12A	270.00	280.00	3	67548	2019-06-27	19.7	0.151	7.72	7.96	0.7	0.7	0.150	1.5	1110	1100	<0.0002	<0.0003	0.0553	<0.0003
KFR101	279.50	341.80	1	67555	2019-06-13	7.07	-	7.63	7.93	0.9	0.9	0.380	<0.5	634	627	-	-	-	-
KFR101	279.50	341.80	1	67556	2019-06-17	7.10	-	7.76	7.68	0.8	0.9	0.280	<0.5	636	635	-	-	-	-
KFR101	279.50	341.80	1	67557	2019-06-18	7.24	0.136	7.59	7.85	0.7	0.6	0.250	<0.5	636	644	<0.0002	<0.0003	0.0626	<0.0003
KFR102A	214.00	219.00	5	67561	2019-06-10	9.05	-	7.71	7.72	1.2	1.3	0.270	0.9	1030	1020	-	-	-	-
KFR102A	214.00	219.00	5	67562	2019-06-10	9.16	-	6.94	7.88	1.2	1.3	0.280	0.9	1020	1020	-	-	-	-
KFR102A	214.00	219.00	5	67563	2019-06-11	9.32	0.0623	7.71	7.85	1.2	1.2	0.260	0.9	1030	1030	<0.0002	0.0007	0.0858	0.0008
KFR102A	423.00	443.00	2	67558	2019-06-10	13.9	-	7.61	7.77	0.9	0.8	0.230	<0.5	1130	1120	-	-	-	-
KFR102A	423.00	443.00	2	67559	2019-06-11	14.2	-	7.62	7.85	0.7	0.8	0.190	<0.5	1160	1140	-	-	-	-
KFR102A	423.00	443.00	2	67560	2019-06-12	14.6	0.119	7.59	7.88	0.7	0.7	0.160	<0.5	1160	1160	<0.0002	<0.0003	0.0392	<0.0003

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SICADA_17_037

Table A3-9. Water Composition, continued 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	Sr mg/L	I ⁻ mg/L	pH_L	pH_F	TOC mg/L	DOC mg/L	HS ⁻ mg/L	Uranine µg/L	EC_L mS/m	EC_F mS/m	NO ₂ -N mg/L	NO ₃ -N mg/L	NH ₄ -N mg/L	NO ₂ -N+ NO ₃ -N mg/L
KFR104	333.00	454.60	1	67564	2019-06-12	6.63	-	9.72	10.27	1.4	1.3	2.00	1.1	546	542	-	-	-	-
KFR104	333.00	454.60	1	67565	2019-06-14	7.06	-	9.50	9.99	1.0	1.2	1.50	1.4	571	568	-	-	-	-
KFR104	333.00	454.60	1	67566	2019-06-17	7.21	0.108	9.15	9.24	1.1	1.2	0.780	1.4	585	588	<0.0002	<0.0003	0.0149	0.0003
KFR106	143.00	259.00	2	67570	2019-06-04	9.44	-	7.43	7.63	2.0	1.7	0.300	0.7	1250	1240	-	-	-	-
KFR106	143.00	259.00	2	67571	2019-06-05	9.57	-	7.39	7.63	1.7	1.4	0.270	0.6	1250	1250	-	-	-	-
KFR106	143.00	259.00	2	67572	2019-06-05	9.63	0.0462	7.47	7.66	1.2	1.5	0.330	0.6	1270	1240	<0.0002	0.0010	0.191	0.0010
KFR106	260.00	300.10	1	67567	2019-06-04	6.06	-	7.65	7.90	3.3	2.9	7.00	0.7	618	608	-	-	-	-
KFR106	260.00	300.10	1	67568	2019-06-04	7.19	-	7.72	7.88	1.7	2.1	1.40	0.9	691	676	-	-	-	-
KFR106	260.00	300.10	1	67569	2019-06-05	10.70	0.0856	7.58	7.85	1.9	2.2	0.390	1.3	902	900	<0.0002	<0.0003	0.097	<0.0003
KFR01	44.65	62.30	1	74124	2019-12-10	9.03	-	7.44	7.40	1.2	1.3	<0.019	<0.5	1030	929	-	-	-	-
KFR01	44.65	62.30	1	74125	2019-12-10	8.98	-	7.52	7.60	1.3	1.3	<0.019	<0.5	1020	955	-	-	-	-
KFR01	44.65	62.30	1	74126	2019-12-11	8.77	0.0385	7.48	7.48	1.1	1.5	<0.019	<0.5	1020	908	<0.0002	0.0085	0.224	0.0086
KFR105	265.00	306.81	1	74127	2019-12-11	12.2	-	7.52	7.36	0.8	0.7	<0.019	<0.5	1040	965	-	-	-	-
KFR105	265.00	306.81	1	74128	2019-12-13	12.1	-	7.55	7.54	0.8	0.8	<0.019	<0.5	1020	962	-	-	-	-
KFR105	265.00	306.81	1	74129	2019-12-16	11.8	0.0541	7.57	7.57	0.9	0.8	<0.019	<0.5	1020	969	<0.0002	0.0008	0.0185	0.0008

pH_L; EC_L = Laboratory measurements of pH and EC

- = Not analysed

pH_F; EC_F = Field measurements of pH and EC

< "value" = value below reporting limit

Table A3-9. Water Composition, continued 2019

Id code	Secup	Seclow	Section	Sample	Sampling	PO ₄ -P	PO ₄ -P ²	P	Temp_F
	m	m				mg/L	mg/L	mg/L	
HFM01	33.50	45.50	2	66979	2019-05-21	-	-	-	9.3
HFM01	33.50	45.50	2	66980	2019-05-22	-	-	-	8.5
HFM01	33.50	45.50	2	66981	2019-05-24	0.0504	0.0772	0.1050	8.8
HFM02	38.00	48.00	2	66684	2019-05-14	-	-	-	10.1
HFM02	38.00	48.00	2	66688	2019-05-15	-	-	-	10.6
HFM02	38.00	48.00	2	66745	2019-05-16	0.0213	0.0363	0.0410	11.0
HFM04	58.00	66.00	2	66976	2019-05-20	-	-	-	9.2
HFM04	58.00	66.00	2	66977	2019-05-21	-	-	-	9.1
HFM04	58.00	66.00	2	66978	2019-05-21	0.0107	0.0181	0.0250	11.7
HFM13	159.00	173.00	1	66682	2019-05-14	-	-	-	8.4
HFM13	159.00	173.00	1	66746	2019-05-17	-	-	-	10.6
HFM13	159.00	173.00	1	66955	2019-05-20	<0.0005	0.0007	0.0400	11.0
HFM15	85.00	95.00	1	66985	2019-05-23	-	-	-	8.9
HFM15	85.00	95.00	1	66986	2019-05-23	-	-	-	9.5
HFM15	85.00	95.00	1	66987	2019-05-24	0.0013	0.0090	0.0140	12.7
HFM16	54.00	67.00	2	66276	2019-05-07	-	-	-	7.4
HFM16	54.00	67.00	2	66277	2019-05-08	-	-	-	7.5
HFM16	54.00	67.00	2	66278	2019-05-09	0.0419	0.0640	0.0829	7.4
HFM19	168.00	182.00	1	66685	2019-05-14	-	-	-	9.2
HFM19	168.00	182.00	1	66686	2019-05-15	-	-	-	8.3
HFM19	168.00	182.00	1	66744	2019-05-16	<0.0005	0.0046	0.0400	7.5
HFM21	22.00	32.00	3	67549	2019-06-17	-	-	-	22.9
HFM21	22.00	32.00	3	67550	2019-06-18	-	-	-	13.4
HFM21	22.00	32.00	3	67551	2019-06-18	0.0040	0.0168	-	14.2
HFM27	46.00	58.00	2	67552	2019-06-17	-	-	-	14.0
HFM27	46.00	58.00	2	67553	2019-06-18	-	-	-	16.3
HFM27	46.00	58.00	2	67554	2019-06-20	<0.0005	0.0146	-	14.4

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-9. Water Composition, continued 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	PO ₄ -P mg/L	PO ₄ -P ² mg/L	P mg/L	Temp_F
HFM32	26.00	31.00	3	67345	2019-05-29	-	-	-	9.8
HFM32	26.00	31.00	3	67346	2019-05-29	-	-	-	9.4
HFM32	26.00	31.00	3	67347	2019-05-29	<0.0005	0.0084	0.0120	10.4
KFM01A	109.00	130.00	5	66687	2019-05-15	-	-	-	11.3
KFM01A	109.00	130.00	5	66740	2019-05-16	-	-	-	10.7
KFM01A	109.00	130.00	5	66741	2019-05-16	<0.0005	0.0006	0.0050	11.5
KFM01D	311.00	321.00	4	66988	2019-05-24	-	-	-	11.7
KFM01D	311.00	321.00	4	66989	2019-05-24	-	-	-	12.5
KFM01D	311.00	321.00	4	66990	2019-05-24	0.0013	0.0052	0.0071	12.9
KFM01D	429.00	438.00	2	66982	2019-05-22	-	-	-	14.9
KFM01D	429.00	438.00	2	66983	2019-05-22	-	-	-	11.2
KFM01D	429.00	438.00	2	66984	2019-05-23	0.0009	0.0016	0.0050	10.0
KFM02A	411.00	442.00	5	66279	2019-05-08	-	-	-	7.3
KFM02A	411.00	442.00	5	66280	2019-05-09	-	-	-	10.5
KFM02A	411.00	442.00	5	66281	2019-05-10	<0.0005	0.0006	0.0400	11.6
KFM02A	490.00	518.00	3	66282	2019-05-09	-	-	-	15.6
KFM02A	490.00	518.00	3	66283	2019-05-10	-	-	-	9.6
KFM02A	490.00	518.00	3	66284	2019-05-10	<0.0005	<0.0005	0.0400	14.9
KFM02B	410.00	431.00	4	66628	2019-05-13	-	-	-	8.6
KFM02B	410.00	431.00	4	66667	2019-05-14	-	-	-	8.0
KFM02B	410.00	431.00	4	66683	2019-05-14	<0.0005	0.0006	0.0400	8.7
KFM02B	491.00	506.00	2	66539	2019-05-13	-	-	-	8.3
KFM02B	491.00	506.00	2	66625	2019-05-13	-	-	-	10.1
KFM02B	491.00	506.00	2	66681	2019-05-14	<0.0005	0.0007	0.0400	8.9
KFM03A	633.50	650.00	4	66956	2019-05-20	-	-	-	10.6
KFM03A	633.50	650.00	4	66957	2019-05-20	-	-	-	14.1
KFM03A	633.50	650.00	4	66958	2019-05-21	<0.0005	0.0007	0.0400	12.0

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-9. Water Composition, continued 2019

Id code	Secup	Seclow	Section	Sample	Sampling	PO₄-P	PO₄-P²	P	Temp_F
	m	m	no.	no.	Date	mg/L	mg/L	mg/L	
KFM03A	633.50	650.00	4	71429	2019-10-09	-	-	-	7.4
KFM03A	633.50	650.00	4	71430	2019-10-09	-	-	-	8.0
KFM03A	633.50	650.00	4	71431	2019-10-09	<0.0005	0.0008	-	8.6
KFM03A	969.50	994.50	1	66973	2019-05-20	-	-	-	14.8
KFM03A	969.50	994.50	1	66974	2019-05-22	-	-	-	15.2
KFM03A	969.50	994.50	1	66975	2019-05-23	<0.0005	0.0007	0.0400	11.7
KFM04A	230.00	245.00	4	67342	2019-05-27	-	-	-	9.7
KFM04A	230.00	245.00	4	67343	2019-05-27	-	-	-	13.4
KFM04A	230.00	245.00	4	67344	2019-05-27	<0.0005	<0.0005	0.0400	9.9
KFM06A	341.00	362.00	5	66264	2019-05-06	-	-	-	8.3
KFM06A	341.00	362.00	5	66265	2019-05-06	-	-	-	8.2
KFM06A	341.00	362.00	5	66266	2019-05-07	<0.0005	0.0006	0.0050	6.7
KFM06A	738.00	748.00	3	66273	2019-05-07	-	-	-	7.6
KFM06A	738.00	748.00	3	66274	2019-05-08	-	-	-	12.3
KFM06A	738.00	748.00	3	66275	2019-05-09	<0.0005	0.0011	0.0400	12.3
KFM06C	531.00	540.00	5	66267	2019-05-06	-	-	-	8.3
KFM06C	531.00	540.00	5	66268	2019-05-06	-	-	-	9.2
KFM06C	531.00	540.00	5	66269	2019-05-07	<0.0005	0.0005	0.0050	6.7
KFM06C	647.00	666.00	3	66270	2019-05-06	-	-	-	11.8
KFM06C	647.00	666.00	3	66271	2019-05-10	-	-	-	13.6
KFM06C	647.00	666.00	3	66272	2019-05-13	<0.0005	0.0007	0.0400	10.5
KFM08A	265.00	280.00	6	67534	2019-06-10	-	-	-	11.1
KFM08A	265.00	280.00	6	67535	2019-06-11	-	-	-	12.3
KFM08A	265.00	280.00	6	67536	2019-06-18	<0.0005	0.0011	0.0050	13.0
KFM08A	684.00	694.00	2	67531	2019-06-28	-	-	-	9.6
KFM08A	684.00	694.00	2	67532	2019-06-28	-	-	-	9.6
KFM08A	684.00	694.00	2	67533	2019-06-28	<0.0005	0.0011	-	10.3

PO₄-P* = P after hydrolysis

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Table A3-9. Water Composition, continued 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling Date	PO ₄ -P mg/L	PO ₄ -P ² mg/L	P mg/L	Temp_F
KFM08D	660.00	680.00	4	67540	2019-10-07	-	-	-	9.2
KFM08D	660.00	680.00	4	67541	2019-10-09	-	-	-	7.3
KFM08D	660.00	680.00	4	67542	2019-10-11	<0.0005	0.0010	-	9.8
KFM08D	825.00	835.00	2	67537	2019-06-17	-	-	-	23.7
KFM08D	825.00	835.00	2	67538	2019-06-19	-	-	-	23.5
KFM08D	825.00	835.00	2	67539	2019-06-20	<0.0005	0.0379	-	20.9
KFM10A	430.00	440.00	2	66689	2019-05-15	-	-	-	10.3
KFM10A	430.00	440.00	2	66742	2019-05-16	-	-	-	8.9
KFM10A	430.00	440.00	2	66743	2019-05-17	<0.0005	0.0024	0.0400	8.0
KFM11A	446.00	456.00	4	67543	2019-06-19	-	-	-	13.3
KFM11A	446.00	456.00	4	67544	2019-06-19	-	-	-	13.9
KFM11A	446.00	456.00	4	67545	2019-06-19	<0.0005	0.0006	-	14.2
KFM11A	690.00	710.00	2	67339	2019-05-27	-	-	-	13.7
KFM11A	690.00	710.00	2	67340	2019-05-28	-	-	-	11.9
KFM11A	690.00	710.00	2	67341	2019-05-28	<0.0005	0.0005	0.0400	11.6
KFM12A	270.00	280.00	3	67546	2019-06-27	-	-	-	8.8
KFM12A	270.00	280.00	3	67547	2019-06-27	-	-	-	9.5
KFM12A	270.00	280.00	3	67548	2019-06-27	<0.0005	<0.0005	-	10.4
KFR101	279.50	341.80	1	67555	2019-06-13	-	-	-	9.0
KFR101	279.50	341.80	1	67556	2019-06-17	-	-	-	10.7
KFR101	279.50	341.80	1	67557	2019-06-18	<0.0005	0.0007	0.0050	9.8
KFR102A	214.00	219.00	5	67561	2019-06-10	-	-	-	13.8
KFR102A	214.00	219.00	5	67562	2019-06-10	-	-	-	17.4
KFR102A	214.00	219.00	5	67563	2019-06-11	<0.0005	<0.0005	0.0050	11.6
KFR102A	423.00	443.00	2	67558	2019-06-10	-	-	-	10.4
KFR102A	423.00	443.00	2	67559	2019-06-11	-	-	-	8.4
KFR102A	423.00	443.00	2	67560	2019-06-12	<0.0005	<0.0005	0.0050	8.4

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-9. Water Composition, continued 2019

Id code	Secup	Seclow	Section	Sample	Sampling	PO₄-P	PO₄-P²	P	Temp_F
	m	m	no.	no.	Date	mg/L	mg/L	mg/L	
KFR104	333.00	454.60	1	67564	2019-06-12	-	-	-	12.8
KFR104	333.00	454.60	1	67565	2019-06-14	-	-	-	11.9
KFR104	333.00	454.60	1	67566	2019-06-17	<0.0005	0.0015	0.0050	22.6
KFR106	143.00	259.00	2	67570	2019-06-04	-	-	-	12.3
KFR106	143.00	259.00	2	67571	2019-06-05	-	-	-	11.1
KFR106	143.00	259.00	2	67572	2019-06-05	<0.0005	0.0008	0.0050	11.2
KFR106	260.00	300.10	1	67567	2019-06-04	-	-	-	12.8
KFR106	260.00	300.10	1	67568	2019-06-04	-	-	-	15.8
KFR106	260.00	300.10	1	67569	2019-06-05	<0.0005	0.0010	0.0050	12.0
KFR01	44.65	62.30	1	74124	2019-12-10	-	-	-	8.9
KFR01	44.65	62.30	1	74125	2019-12-10	-	-	-	8.9
KFR01	44.65	62.30	1	74126	2019-12-11	<0.0005	<0.0005	-	9.1
KFR105	265.00	306.81	1	74127	2019-12-11	-	-	-	9.0
KFR105	265.00	306.81	1	74128	2019-12-13	-	-	-	8.6
KFR105	265.00	306.81	1	74129	2019-12-16	<0.0005	<0.0005	-	8.6

PO₄-P* = P after hydrolysis

- = Not analysed

< "value" = value below reporting limit

Table A3-10. Trace elements - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Ag µg/L	Al µg/L	As µg/L	B µg/L	Ba µg/L	Cd µg/L	Cr µg/L	Cu µg/L	Co µg/L	Hg µg/L	Ni µg/L	Mo µg/L	Nb µg/L
HFM01	33.50	45.50	2	66981	2019-05-24	<0.05	3.82	0.0849	373	20.3	0.0085	0.282	<0.1	0.0472	<0.002	0.228	12.5	0.0259
HFM02	38.00	48.00	2	66745	2019-05-16	0.0500	2.66	0.153	244	33.2	0.0071	0.234	<0.1	0.0340	<0.002	0.395	7.25	0.0332
HFM04	58.00	66.00	2	66978	2019-05-21	<0.05	4.15	0.136	207	41.8	0.0024	0.640	<0.1	0.0324	<0.002	0.366	3.58	0.0719
HFM13	159.00	173.00	1	66955	2019-05-20	<0.5	1.72	<0.5	591	71.4	<0.05	0.544	<0.5	<0.05	<0.002	0.748	3.58	<0.01
HFM15	85.00	95.00	1	66987	2019-05-24	0.0636	17.9	0.121	92.5	29.7	0.0074	0.623	0.147	0.0295	<0.002	0.471	10.3	0.0362
HFM16	54.00	67.00	2	66278	2019-05-09	-	7.11	-	-	28.9	<0.01	0.442	<0.5	0.0514	<0.002	<0.3	25.5	-
HFM19	168.00	182.00	1	66744	2019-05-16	<0.5	6.97	<0.5	540	64.6	<0.05	0.151	<0.5	<0.05	<0.002	<0.5	3.20	<0.01
HFM21	22.00	32.00	3	67551	2019-06-18	<0.05	2.74	0.160	200	44.9	0.0054	0.333	-	0.0334	<0.002	0.281	-	0.0261
HFM27	46.00	58.00	2	67554	2019-06-20	<0.3	4.01	<0.5	357	34.6	<0.02	0.316	-	0.0248	<0.002	0.233	-	0.0169
HFM32	26.00	31.00	3	67347	2019-05-29	<0.3	3.38	1.05	626	62.4	<0.02	0.665	<0.2	0.0566	<0.002	0.338	13.2	0.0079
KFM01A	109.00	130.00	5	66741	2019-05-16	<0.3	1.47	<0.5	740	96.5	0.0212	1.67	<0.2	0.0202	<0.002	0.742	26.2	0.0081
KFM01D	311.00	321.00	4	66990	2019-05-24	<0.3	1.94	<0.5	676	479	<0.02	0.169	<0.2	0.0271	<0.002	0.231	4.21	0.0084
KFM01D	429.00	438.00	2	66984	2019-05-23	<0.3	2.52	<0.5	629	622	<0.02	0.106	<0.2	0.0359	<0.002	<0.2	0.36	0.0105
KFM02A	411.00	442.00	5	66281	2019-05-10	-	4.10	-	-	84.1	<0.05	2.21	0.584	0.205	<0.002	1.10	15.7	-
KFM02A	490.00	518.00	3	66284	2019-05-10	-	3.60	-	-	91.8	0.122	0.141	<0.5	0.139	<0.002	0.894	88.9	-
KFM02B	410.00	431.00	4	66683	2019-05-14	<0.5	3.23	<0.5	674	92.7	<0.05	0.419	<0.5	0.0678	<0.002	0.810	6.96	-
KFM02B	491.00	506.00	2	66681	2019-05-14	<0.5	1.18	<0.5	606	101	<0.05	0.527	<0.5	0.203	<0.002	<0.5	9.92	-
KFM03A	633.50	650.00	4	66958	2019-05-21	<0.5	4.45	<0.5	1060	162	<0.05	0.335	<0.5	<0.05	<0.002	1.22	21.7	0.0110
KFM03A	633.50	650.00	4	71431	2019-10-09	<0.5	2.67	0.529	1030	152	<0.05	0.199	-	<0.05	<0.002	0.567	-	0.0185
KFM03A	969.50	994.50	1	66975	2019-05-23	<0.5	16.5	<0.5	853	989	<0.05	1.33	<0.5	<0.05	<0.002	<0.5	9.54	0.0315
KFM04A	230.00	245.00	4	67344	2019-05-27	<0.5	0.89	<0.5	557	89.3	<0.05	<0.1	<0.5	2.15	<0.002	0.728	45.3	0.0116
KFM06A	341.00	362.00	5	66266	2019-05-07	-	1.72	-	-	233	0.152	0.714	<0.2	0.479	<0.002	1.34	197	-
KFM06A	738.00	748.00	3	66275	2019-05-09	-	2.17	-	-	377	0.260	0.297	<0.5	<0.05	<0.002	<0.5	358	-
KFM06C	531.00	540.00	5	66269	2019-05-07	-	1.05	-	-	107	0.0468	0.173	<0.2	0.0309	<0.002	0.221	61.1	-
KFM06C	647.00	666.00	3	66272	2019-05-13	-	6.94	-	-	380	<0.05	0.158	<0.5	0.0882	<0.002	1.13	31.9	-
KFM08A	265.00	280.00	6	67536	2019-06-18	<0.3	2.00	<0.5	871	418	<0.02	0.158	<0.2	0.0208	<0.002	<0.2	8.10	0.0088
KFM08A	684.00	694.00	2	67533	2019-06-28	<0.5	1.72	2.36	690	384	0.0549	0.497	-	<0.05	<0.002	0.535	-	0.0177
KFM08D	660.00	680.00	4	67542	2019-10-11	<0.5	<0.7	1.01	680	501	<0.05	0.767	-	0.0550	<0.002	1.38	-	0.0185
KFM08D	825.00	835.00	2	67539	2019-06-20	1.19	59.3	0.67	682	238	2.86	36.4	-	0.986	0.0187	37.2	-	0.0573
KFM10A	430.00	440.00	2	66743	2019-05-17	<0.5	1.33	<0.5	742	69.9	<0.05	0.194	<0.5	<0.05	<0.002	<0.5	2.47	<0.01

- = Not analysed

< "value" = result less than reporting limit

Table A3-10. Trace elements, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Ag µg/L	Al µg/L	As µg/L	B µg/L	Ba µg/L	Cd µg/L	Cr µg/L	Cu µg/L	Co µg/L	Hg µg/L	Ni µg/L	Mo µg/L	Nb µg/L
KFM11A	446.00	456.00	4	67545	2019-06-19	<0.3	3.39	<0.5	911	104	0.066	0.124	-	<0.02	<0.002	0.430	-	0.0063
KFM11A	690.00	710.00	2	67341	2019-05-28	<0.5	<0.7	<0.5	791	231	<0.05	0.247	<0.5	<0.05	<0.002	<0.5	23.6	0.0207
KFM12A	270.00	280.00	3	67548	2019-06-27	<0.3	1.58	1.49	775	556	<0.02	<0.04	-	0.0987	<0.002	0.290	-	0.0053
KFR101	279.50	341.80	1	67557	2019-06-18	<0.3	4.43	<0.5	885	618	<0.02	<0.04	<0.2	0.0741	<0.002	0.244	3.56	<0.005
KFR102A	214.00	219.00	5	67563	2019-06-11	<0.3	1.24	<0.5	762	103	<0.02	0.251	<0.2	<0.02	<0.002	<0.2	9.14	<0.005
KFR102A	423.00	443.00	2	67560	2019-06-12	<0.3	2.91	<0.5	924	106	<0.02	0.758	<0.2	<0.02	<0.002	<0.2	6.49	0.0061
KFR104	333.00	454.60	1	67566	2019-06-17	<0.3	3.41	<0.5	871	247	<0.02	<0.04	<0.2	<0.02	<0.002	0.277	13.0	<0.005
KFR106	143.00	259.00	2	67572	2019-06-05	<0.3	4.82	<0.5	761	75.9	<0.02	<0.04	<0.2	0.0380	<0.002	1.38	6.53	0.0056
KFR106	260.00	300.10	1	67569	2019-06-05	<0.3	3.45	<0.5	836	338	<0.02	0.326	<0.2	0.0376	<0.002	0.487	6.87	0.0068
KFR01	44.65	62.30	1	74126	2019-12-11	<0.3	38.0	<0.5	707	52.4	0.39	0.202	-	0.0428	<0.002	-	<0.2	0.0159
KFR105	265.00	306.81	1	74129	2019-12-16	<0.3	26.2	<0.5	870	111	<0.02	0.091	-	<0.02	<0.002	-	0.32	0.0157

- = Not analysed

< "value" = result less than reporting limit

Table A3-10. Trace elements, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Pb µg/L	Pd µg/L	Se µg/L	Sn µg/L	V µg/L	Zn µg/L
HFM01	33.50	45.50	2	66981	2019-05-24	<0.3	3.39	<0.5	911	104	0.0657
HFM02	38.00	48.00	2	66745	2019-05-16	<0.5	<0.7	<0.5	791	231	<0.05
HFM04	58.00	66.00	2	66978	2019-05-21	<0.3	1.58	1.49	775	556	<0.02
HFM13	159.00	173.00	1	66955	2019-05-20	<0.3	4.43	<0.5	885	618	<0.02
HFM15	85.00	95.00	1	66987	2019-05-24	<0.3	1.24	<0.5	762	103	<0.02
HFM16	54.00	67.00	2	66278	2019-05-09	<0.3	2.91	<0.5	924	106	<0.02
HFM19	168.00	182.00	1	66744	2019-05-16	<0.3	3.41	<0.5	871	247	<0.02
HFM21	22.00	32.00	3	67551	2019-06-18	<0.3	4.82	<0.5	761	75.9	<0.02
HFM27	46.00	58.00	2	67554	2019-06-20	<0.3	3.45	<0.5	836	338	<0.02
HFM32	26.00	31.00	3	67347	2019-05-29	<0.3	38.0	<0.5	707	52.4	0.39
KFM01A	109.00	130.00	5	66741	2019-05-16	<0.3	26.2	<0.5	870	111	<0.02
KFM01D	311.00	321.00	4	66990	2019-05-24	<0.3	3.39	<0.5	911	104	0.0657
KFM01D	429.00	438.00	2	66984	2019-05-23	<0.5	<0.7	<0.5	791	231	<0.05
KFM02A	411.00	442.00	5	66281	2019-05-10	<0.3	1.58	1.49	775	556	<0.02
KFM02A	490.00	518.00	3	66284	2019-05-10	<0.3	4.43	<0.5	885	618	<0.02
KFM02B	410.00	431.00	4	66683	2019-05-14	<0.3	1.24	<0.5	762	103	<0.02
KFM02B	491.00	506.00	2	66681	2019-05-14	<0.3	2.91	<0.5	924	106	<0.02
KFM03A	633.50	650.00	4	66958	2019-05-21	<0.3	3.41	<0.5	871	247	<0.02
KFM03A	633.50	650.00	4	71431	2019-10-09	<0.3	4.82	<0.5	761	75.9	<0.02
KFM03A	969.50	994.50	1	66975	2019-05-23	<0.3	3.45	<0.5	836	338	<0.02
KFM04A	230.00	245.00	4	67344	2019-05-27	<0.3	38.0	<0.5	707	52.4	0.39
KFM06A	341.00	362.00	5	66266	2019-05-07	<0.3	26.2	<0.5	870	111	<0.02
KFM06A	738.00	748.00	3	66275	2019-05-09	<0.3	3.39	<0.5	911	104	0.0657
KFM06C	531.00	540.00	5	66269	2019-05-07	<0.5	<0.7	<0.5	791	231	<0.05
KFM06C	647.00	666.00	3	66272	2019-05-13	<0.3	1.58	1.49	775	556	<0.02
KFM08A	265.00	280.00	6	67536	2019-06-18	<0.3	4.43	<0.5	885	618	<0.02
KFM08A	684.00	694.00	2	67533	2019-06-28	<0.3	1.24	<0.5	762	103	<0.02
KFM08D	660.00	680.00	4	67542	2019-10-11	<0.3	2.91	<0.5	924	106	<0.02
KFM08D	825.00	835.00	2	67539	2019-06-20	<0.3	3.41	<0.5	871	247	<0.02
KFM10A	430.00	440.00	2	66743	2019-05-17	<0.3	4.82	<0.5	761	75.9	<0.02

- = Not analysed

< "value" = result less than reporting limit

Table A3-10. Trace elements, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	Pb µg/L	Pd µg/L	Se µg/L	Sn µg/L	V µg/L	Zn µg/L
KFM11A	446.00	456.00	4	67545	2019-06-19	-	0.0395	<3	<0.3	0.0650	-
KFM11A	690.00	710.00	2	67341	2019-05-28	<0.3	<0.01	<3	<0.5	0.134	<2
KFM12A	270.00	280.00	3	67548	2019-06-27	-	0.0366	<3	<0.3	0.168	-
KFR101	279.50	341.80	1	67557	2019-06-18	<0.1	0.0230	<3	<0.3	0.118	<0.8
KFR102A	214.00	219.00	5	67563	2019-06-11	<0.1	<0.005	<3	<0.3	0.0441	<0.8
KFR102A	423.00	443.00	2	67560	2019-06-12	<0.1	<0.005	<3	<0.3	0.0949	<0.8
KFR104	333.00	454.60	1	67566	2019-06-17	<0.1	<0.005	<3	<0.3	0.0721	<0.8
KFR106	143.00	259.00	2	67572	2019-06-05	<0.1	0.0225	<3	<0.3	0.0708	<0.8
KFR106	260.00	300.10	1	67569	2019-06-05	<0.1	<0.005	<3	<0.3	0.229	<0.8
KFR01	44.65	62.30	1	74126	2019-12-11	-	0.0053	<3	<0.3	0.146	-
KFR105	265.00	306.81	1	74129	2019-12-16	-	<0.005	<3	<0.3	0.0925	-

- = Not analysed

< "value" = result less than reporting limit

Table A3-10. Trace elements, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	U µg/L	Th µg/L	Rb µg/L	Zr µg/L	Sb µg/L	Cs µg/L	Nd µg/L
HFM01	33.50	45.50	2	66981	2019-05-24	-	-	7.38	9.11	0.0187	0.227	-
HFM02	38.00	48.00	2	66745	2019-05-16	-	-	7.74	7.33	0.0176	0.205	-
HFM04	58.00	66.00	2	66978	2019-05-21	-	-	8.41	6.32	<0.01	0.230	-
HFM13	159.00	173.00	1	66955	2019-05-20	-	-	50.8	0.340	<0.1	1.95	-
HFM15	85.00	95.00	1	66987	2019-05-24	-	-	7.67	10.6	0.0329	85.0	-
HFM19	168.00	182.00	1	66744	2019-05-16	-	-	46.0	0.409	<0.1	1.68	-
HFM21	22.00	32.00	3	67551	2019-06-18	-	-	8.42	3.76	0.0148	0.151	-
HFM27	46.00	58.00	2	67554	2019-06-20	-	-	20.1	2.56	<0.1	0.890	-
HFM32	26.00	31.00	3	67347	2019-05-29	-	-	39.3	0.708	<0.1	0.898	-
KFM01A	109.00	130.00	5	66741	2019-05-16	-	-	53.3	0.602	<0.1	0.757	-
KFM01D	311.00	321.00	4	66990	2019-05-24	-	-	49.4	0.498	<0.1	0.621	-
KFM01D	429.00	438.00	2	66984	2019-05-23	-	-	46.5	0.397	<0.1	2.80	-
KFM02A	411.00	442.00	5	66281	2019-05-10	25.3	<0.2	-	-	-	-	-
KFM02A	490.00	518.00	3	66284	2019-05-10	114	<0.2	-	-	-	-	-
KFM02B	410.00	431.00	4	66683	2019-05-14	-	-	-	<50	<0.1	4.32	-
KFM02B	491.00	506.00	2	66681	2019-05-14	-	-	-	<50	<0.1	1.58	-
KFM03A	633.50	650.00	4	66958	2019-05-21	-	-	40.1	<0.3	<0.1	2.40	-
KFM03A	633.50	650.00	4	71431	2019-10-09	16.3	-	41.1	<0.3	1.08	2.61	0.0997
KFM03A	969.50	994.50	1	66975	2019-05-23	-	-	33.8	<0.3	0.127	0.614	-
KFM04A	230.00	245.00	4	67344	2019-05-27	-	-	41.8	<0.3	<0.1	1.19	-
KFM08A	265.00	280.00	6	67536	2019-06-18	-	-	32.1	0.307	<0.1	0.293	-
KFM08A	684.00	694.00	2	67533	2019-06-28	-	-	27.3	<0.3	<0.1	0.457	-
KFM08D	660.00	680.00	4	67542	2019-10-11	-	-	20.0	<0.3	0.202	0.242	<0.05
KFM08D	825.00	835.00	2	67539	2019-06-20	-	-	15.7	<0.3	1.35	0.306	-
KFM10A	430.00	440.00	2	66743	2019-05-17	-	-	62.5	0.379	<0.1	1.03	-
KFM11A	446.00	456.00	4	67545	2019-06-19	-	-	13.5	<0.1	<0.1	0.321	-
KFM11A	690.00	710.00	2	67341	2019-05-28	-	-	19.0	<0.3	<0.1	0.279	-
KFM12A	270.00	280.00	3	67548	2019-06-27	-	-	13.3	<0.1	0.158	0.255	-

- = Not analysed

< "value" = result less than reporting limit

Table A3-10. Trace elements, continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	U µg/L	Th µg/L	Rb µg/L	Zr µg/L	Sb µg/L	Cs µg/L	Nd µg/L
KFR101	279.50	341.80	1	67557	2019-06-18	-	-	11.6	0.312	<0.1	0.293	-
KFR102A	214.00	219.00	5	67563	2019-06-11	-	-	19.7	0.233	<0.1	0.459	-
KFR102A	423.00	443.00	2	67560	2019-06-12	-	-	18.7	0.236	<0.1	0.344	-
KFR104	333.00	454.60	1	67566	2019-06-17	-	-	8.19	0.271	<0.1	0.149	-
KFR106	143.00	259.00	2	67572	2019-06-05	30.7	<0.2	26.6	0.248	<0.1	0.791	-
KFR106	260.00	300.10	1	67569	2019-06-05	13.0	<0.2	16.5	0.254	<0.1	0.403	-
KFR01	44.65	62.30	1	74126	2019-12-11	-	-	14.3	<50	<0.1	0.355	0.148
KFR105	265.00	306.81	1	74129	2019-12-16	-	-	12.5	<50	<0.1	0.284	0.534

- = Not analysed

< "value" = result less than reporting limit

Table A3-11. Isotopes I (H-, O- and C-isotopes) - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	$\delta^2\text{H}$ dev SMOW	^3H TU	$\delta^{18}\text{O}$ dev SMOW
HFM01	33.50	45.50	2	66979	2019-05-21	-75.1	-	-10.18
HFM01	33.50	45.50	2	66980	2019-05-22	-75.4	-	-10.29
HFM01	33.50	45.50	2	66981	2019-05-24	-75.5	<0.8	-10.36
HFM02	38.00	48.00	2	66684	2019-05-14	-82.3	-	-11.57
HFM02	38.00	48.00	2	66688	2019-05-15	-82.2	-	-11.56
HFM02	38.00	48.00	2	66745	2019-05-16	-81.9	4.5	-11.41
HFM04	58.00	66.00	2	66976	2019-05-20	-83.6	-	-11.57
HFM04	58.00	66.00	2	66977	2019-05-21	-82.5	-	-11.52
HFM04	58.00	66.00	2	66978	2019-05-21	-82.2	5.1	-11.55
HFM13	159.00	173.00	1	66682	2019-05-14	-70.3	-	-9.43
HFM13	159.00	173.00	1	66746	2019-05-17	-70.2	-	-9.29
HFM13	159.00	173.00	1	66955	2019-05-20	-70.2	<0.8	-9.25
HFM15	85.00	95.00	1	66985	2019-05-23	-87.7	-	-12.15
HFM15	85.00	95.00	1	66986	2019-05-23	-87.3	-	-12.01
HFM15	85.00	95.00	1	66987	2019-05-24	-86.9	2.1	-11.97
HFM16	54.00	67.00	2	66276	2019-05-07	-81.4	-	-11.19
HFM16	54.00	67.00	2	66277	2019-05-08	-81.5	-	-11.30
HFM16	54.00	67.00	2	66278	2019-05-09	-80.8	2.9	-11.23
HFM19	168.00	182.00	1	66685	2019-05-14	-67.3	-	-8.85
HFM19	168.00	182.00	1	66686	2019-05-15	-67.8	-	-8.86
HFM19	168.00	182.00	1	66744	2019-05-16	-67.6	<0.8	-8.93
HFM21	22.00	32.00	3	67549	2019-06-17	-80.8	-	-11.33
HFM21	22.00	32.00	3	67550	2019-06-18	-80.8	-	-11.27
HFM21	22.00	32.00	3	67551	2019-06-18	-80.5	4.4	-11.31
HFM27	46.00	58.00	2	67552	2019-06-17	-73.5	-	-10.01
HFM27	46.00	58.00	2	67553	2019-06-18	-73.6	-	-10.00
HFM27	46.00	58.00	2	67554	2019-06-20	-73.2	1.6	-9.99
HFM32	26.00	31.00	3	67345	2019-05-29	-66.2	-	-8.66
HFM32	26.00	31.00	3	67346	2019-05-29	-67.1	-	-8.61
HFM32	26.00	31.00	3	67347	2019-05-29	-66.9	<0.8	-8.76

- = Not analysed

< "value" = result less than reporting limit

Table A3-11. Isotopes I (H-, O- and C-isotopes), continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	$\delta^2\text{H}$ dev SMOW	^3H TU	$\delta^{18}\text{O}$ dev SMOW
KFM01A	109.00	130.00	5	66687	2019-05-15	-88.6	-	-11.91
KFM01A	109.00	130.00	5	66740	2019-05-16	-88.3	-	-11.86
KFM01A	109.00	130.00	5	66741	2019-05-16	-88.5	1.3	-11.82
KFM01D	311.00	321.00	4	66988	2019-05-24	-73.9	-	-10.30
KFM01D	311.00	321.00	4	66989	2019-05-24	-74.0	-	-10.56
KFM01D	311.00	321.00	4	66990	2019-05-24	-74.6	<0.8	-10.50
KFM01D	429.00	438.00	2	66982	2019-05-22	-73.5	-	-10.61
KFM01D	429.00	438.00	2	66983	2019-05-22	-73.1	-	-10.47
KFM01D	429.00	438.00	2	66984	2019-05-23	-72.6	<0.8	-10.42
KFM02A	411.00	442.00	5	66279	2019-05-08	-76.5	-	-10.13
KFM02A	411.00	442.00	5	66280	2019-05-09	-75.9	-	-10.39
KFM02A	411.00	442.00	5	66281	2019-05-10	-75.2	<0.8	-10.13
KFM02A	490.00	518.00	3	66282	2019-05-09	-65.7	-	-8.73
KFM02A	490.00	518.00	3	66283	2019-05-10	-66.4	-	-8.74
KFM02A	490.00	518.00	3	66284	2019-05-10	-65.8	<0.8	-8.69
KFM02B	410.00	431.00	4	66628	2019-05-13	-71.4	-	-9.70
KFM02B	410.00	431.00	4	66667	2019-05-14	-71.4	-	-9.75
KFM02B	410.00	431.00	4	66683	2019-05-14	-71.6	<0.8	-9.61
KFM02B	491.00	506.00	2	66539	2019-05-13	-65.1	-	-8.67
KFM02B	491.00	506.00	2	66625	2019-05-13	-64.9	-	-8.71
KFM02B	491.00	506.00	2	66681	2019-05-14	-66.0	<0.8	-8.82
KFM03A	633.50	650.00	4	66956	2019-05-20	-84.3	-	-11.67
KFM03A	633.50	650.00	4	66957	2019-05-20	-83.7	-	-11.60
KFM03A	633.50	650.00	4	66958	2019-05-21	-85.3	<0.8	-11.62
KFM03A	633.50	650.00	4	71429	2019-10-09	-84.4	-	-11.79
KFM03A	633.50	650.00	4	71430	2019-10-09	-83.8	-	-11.64
KFM03A	633.50	650.00	4	71431	2019-10-09	-83.8	<0.8	-11.74
KFM03A	969.50	994.50	1	66973	2019-05-20	-96.7	-	-13.75
KFM03A	969.50	994.50	1	66974	2019-05-22	-95.7	-	-13.66
KFM03A	969.50	994.50	1	66975	2019-05-23	-96.1	<0.8	-13.75

- = Not analysed

< "value" = result less than reporting limit

Table A3-11. Isotopes I (H-, O- and C-isotopes), continued - 2019

Id code	Secup	Seclow	Section	Sample	Sampling	$\delta^2\text{H}$	^3H	$\delta^{18}\text{O}$
	m	m	no.	no.	date	dev SMOW	TU	dev SMOW
KFM04A	230.00	245.00	4	67342	2019-05-27	-70.0	-	-9.24
KFM04A	230.00	245.00	4	67343	2019-05-27	-70.6	-	-9.24
KFM04A	230.00	245.00	4	67344	2019-05-27	-70.6	<0.8	-9.35
KFM06A	341.00	362.00	5	66264	2019-05-06	-89.3	-	-12.27
KFM06A	341.00	362.00	5	66265	2019-05-06	-87.9	-	-12.07
KFM06A	341.00	362.00	5	66266	2019-05-07	-89.7	<0.8	-12.36
KFM06A	738.00	748.00	3	66273	2019-05-07	-82.0	-	-12.05
KFM06A	738.00	748.00	3	66274	2019-05-08	-81.8	-	-11.86
KFM06A	738.00	748.00	3	66275	2019-05-09	-82.0	<0.8	-11.80
KFM06C	531.00	540.00	5	66267	2019-05-06	-81.8	-	-11.20
KFM06C	531.00	540.00	5	66268	2019-05-06	-82.3	-	-11.23
KFM06C	531.00	540.00	5	66269	2019-05-07	-81.7	<0.8	-11.19
KFM06C	647.00	666.00	3	66270	2019-05-06	-94.2	-	-13.17
KFM06C	647.00	666.00	3	66271	2019-05-10	-93.1	-	-12.85
KFM06C	647.00	666.00	3	66272	2019-05-13	-94.4	<0.8	-12.93
KFM08A	265.00	280.00	6	67534	2019-06-10	-99.9	-	-13.41
KFM08A	265.00	280.00	6	67535	2019-06-11	-100.6	-	-13.51
KFM08A	265.00	280.00	6	67536	2019-06-18	-99.7	0.8	-13.35
KFM08A	684.00	694.00	2	67531	2019-06-28	-91.4	-	-13.10
KFM08A	684.00	694.00	2	67532	2019-06-28	-90.8	-	-12.86
KFM08A	684.00	694.00	2	67533	2019-06-28	-90.7	<0.8	-13.04
KFM08D	660.00	680.00	4	67540	2019-10-07	-83.7	-	-12.07
KFM08D	660.00	680.00	4	67541	2019-10-09	-83.2	-	-12.00
KFM08D	660.00	680.00	4	67542	2019-10-11	-83.4	<0.8	-11.98
KFM08D	825.00	835.00	2	67537	2019-06-17	-82.0	-	-12.00
KFM08D	825.00	835.00	2	67538	2019-06-19	-81.8	-	-11.97
KFM08D	825.00	835.00	2	67539	2019-06-20	-81.7	<0.8	-11.86
KFM10A	430.00	440.00	2	66689	2019-05-15	-64.1	-	-8.46
KFM10A	430.00	440.00	2	66742	2019-05-16	-64.4	-	-8.50
KFM10A	430.00	440.00	2	66743	2019-05-17	-64.2	<0.8	-8.53

- = Not analysed

< "value" = result less than reporting limit

Table A3-11. Isotopes I (H-, O- and C-isotopes), continued - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	$\delta^2\text{H}$ dev SMOW	^3H TU	$\delta^{18}\text{O}$ dev SMOW
KFM11A	446.00	456.00	4	67543	2019-06-19	-90.6	-	-12.33
KFM11A	446.00	456.00	4	67544	2019-06-19	-90.8	-	-12.22
KFM11A	446.00	456.00	4	67545	2019-06-19	-91.1	<0.8	-12.31
KFM11A	690.00	710.00	2	67339	2019-05-27	-86.2	-	-12.07
KFM11A	690.00	710.00	2	67340	2019-05-28	-86.0	-	-12.04
KFM11A	690.00	710.00	2	67341	2019-05-28	-86.8	<0.8	-12.21
KFM12A	270.00	280.00	3	67546	2019-06-27	-112.0	-	-15.17
KFM12A	270.00	280.00	3	67547	2019-06-27	-112.2	-	-15.13
KFM12A	270.00	280.00	3	67548	2019-06-27	-112.6	<0.8	-15.19
KFR101	279.50	341.80	1	67555	2019-06-13	-109.9	-	-14.86
KFR101	279.50	341.80	1	67556	2019-06-17	-110.2	-	-14.91
KFR101	279.50	341.80	1	67557	2019-06-18	-109.9	<0.8	-14.85
KFR102A	214.00	219.00	5	67561	2019-06-10	-84.6	-	-11.17
KFR102A	214.00	219.00	5	67562	2019-06-10	-84.7	-	-11.18
KFR102A	214.00	219.00	5	67563	2019-06-11	-83.8	2.3	-11.08
KFR102A	423.00	443.00	2	67558	2019-06-10	-88.0	-	-11.83
KFR102A	423.00	443.00	2	67559	2019-06-11	-87.8	-	-11.80
KFR102A	423.00	443.00	2	67560	2019-06-12	-89.3	1.3	-12.03
KFR104	333.00	454.60	1	67564	2019-06-12	-106.9	-	-14.40
KFR104	333.00	454.60	1	67565	2019-06-14	-106.7	-	-14.39
KFR104	333.00	454.60	1	67566	2019-06-17	-106.9	<0.8	-14.41
KFR106	143.00	259.00	2	67570	2019-06-04	-81.3	-	-10.80
KFR106	143.00	259.00	2	67571	2019-06-05	-81.6	-	-10.87
KFR106	143.00	259.00	2	67572	2019-06-05	-80.5	1.5	-10.73
KFR106	260.00	300.10	1	67567	2019-06-04	-108.9	-	-14.69
KFR106	260.00	300.10	1	67568	2019-06-04	-113.2	-	-15.16
KFR106	260.00	300.10	1	67569	2019-06-05	-106.5	1.1	-14.23
KFR01	44.65	62.30	1	74124	2019-12-10	-76.7	-	-10.08
KFR01	44.65	62.30	1	74125	2019-12-10	-76.1	-	-10.05
KFR01	44.65	62.30	1	74126	2019-12-11	-76.0	2.1	-9.99

- = Not analysed

< "value" = result less than reporting limit

Table A3-11. Isotopes I (H-, O- and C-isotopes), continued - 2019

Id code	Secup	Seclow	Section	Sample	Sampling	$\delta^2\text{H}$	^3H	$\delta^{18}\text{O}$
	m	m	no.	no.	date	dev SMOW	TU	dev SMOW
KFR105	265.00	306.81	1	74127	2019-12-11	-101.6	-	-13.61
KFR105	265.00	306.81	1	74128	2019-12-13	-101.8	-	-13.52
KFR105	265.00	306.81	1	74129	2019-12-16	-101.9	1.0	-13.61

- = Not analysed

< "value" = result less than reporting limit

Table A3-12. Isotopes II (U- and Th-isotopes) - 2019

Id code	Secup m	Seclow m	Section no.	Sample no.	Sampling date	²³⁸U mBq/kg	²³⁵U mBq/kg	²³⁴U mBq/kg	²³²Th mBq/kg	²³⁰Th mBq/kg
KFM02A	490.00	518.00	3	66284	2019-05-10	1179	46.7	2424	0.38	0.60
KFM02A	411.00	442.00	5	66281	2019-05-10	239	9.7	959	0.36	0.61
KFRM03A	633.50	650.00	4	71431	2019-10-09	175	7.6	276	0.28	0.31
KFR106	260.00	300.10	1	67569	2019-06-05	162	6.1	323	BDL	0.38
KFR106	143.00	259.00	2	67572	2019-06-05	298	11.3	950	0.14	0.44

- = Not analysed

BDL = Below detection limit

Pressure registrations during pumping and sampling, HMS system

Data from 2017

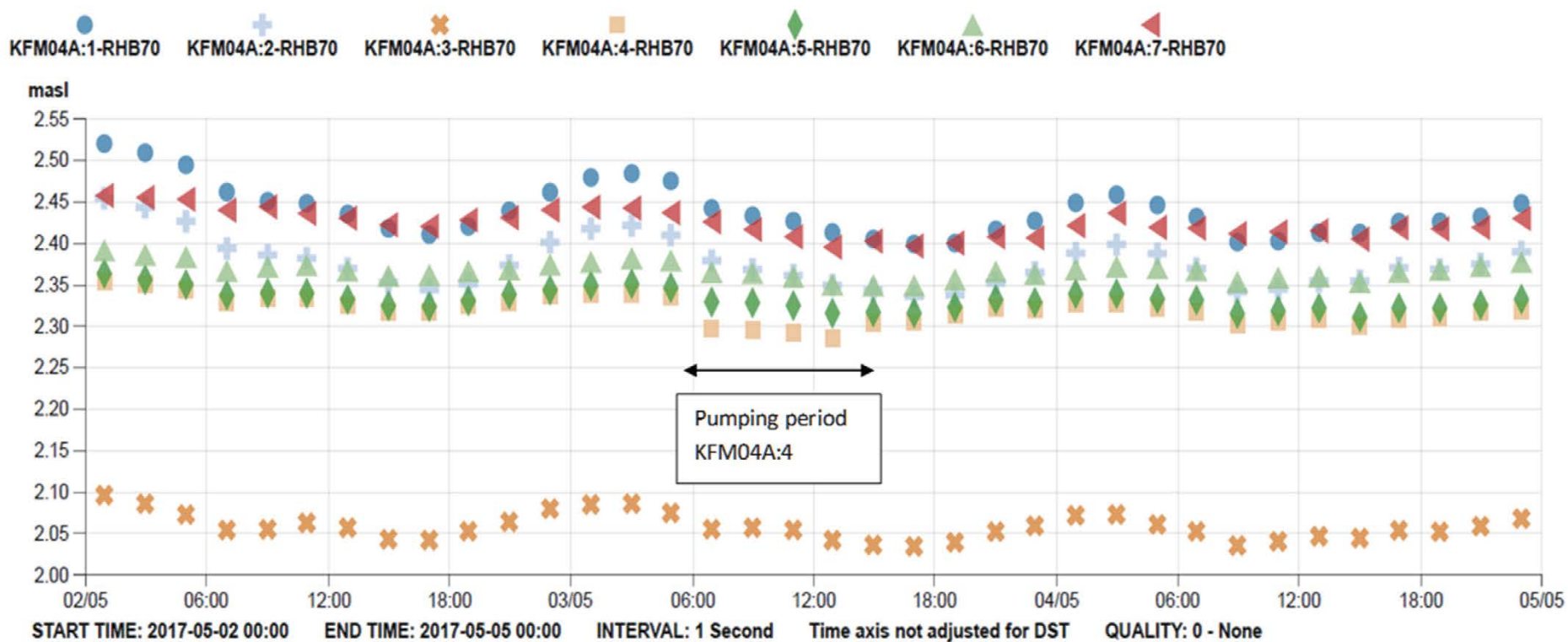


Figure A4-1. Pumping and drawdown in KFM04A:4 in May 2017. None of the other sections were significantly affected by the pumping.

Data from 2017

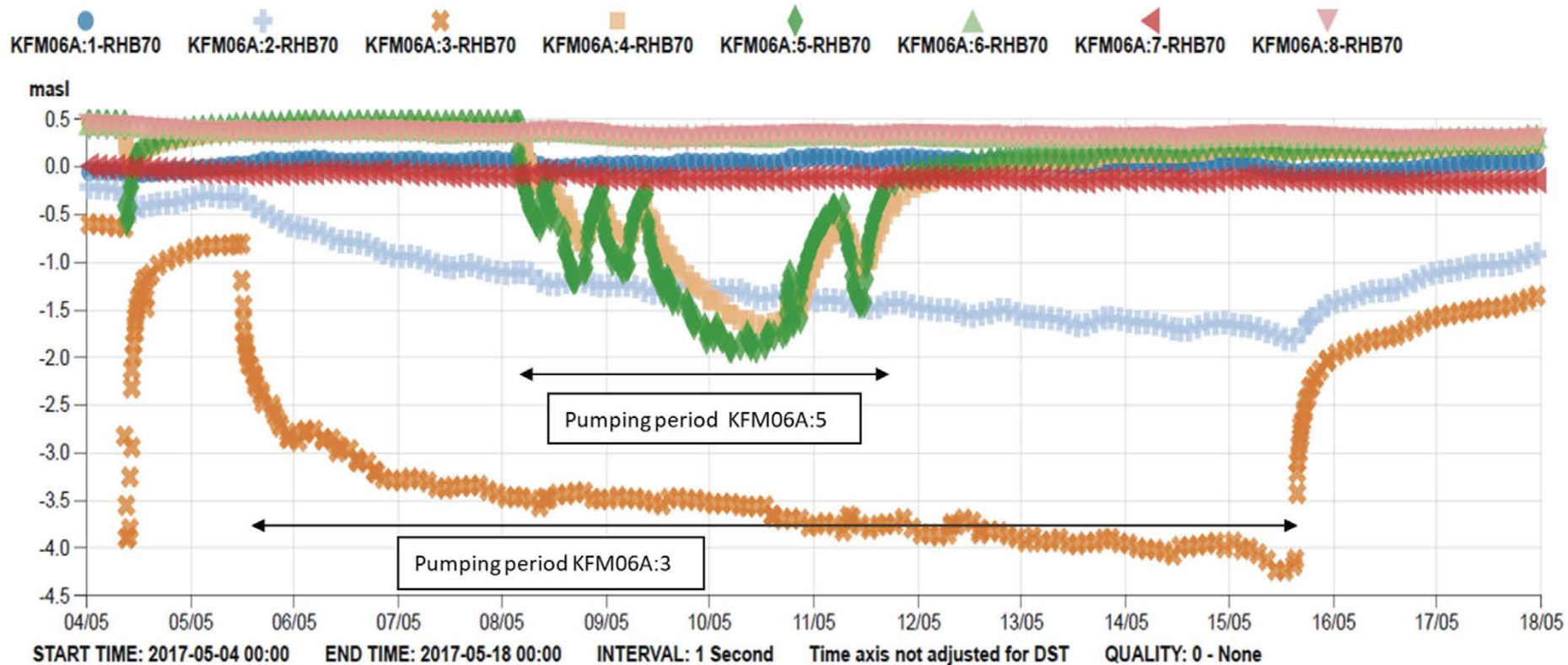


Figure A4-2. Pumping and drawdown in KFM06A:3 and KFM06A:5 in May 2017. Section KFM06A:2 was affected by the pumping in KFM06A:3. Section KFM06A:4 was affected by the pumping in KFM06A:5

Data from 2017

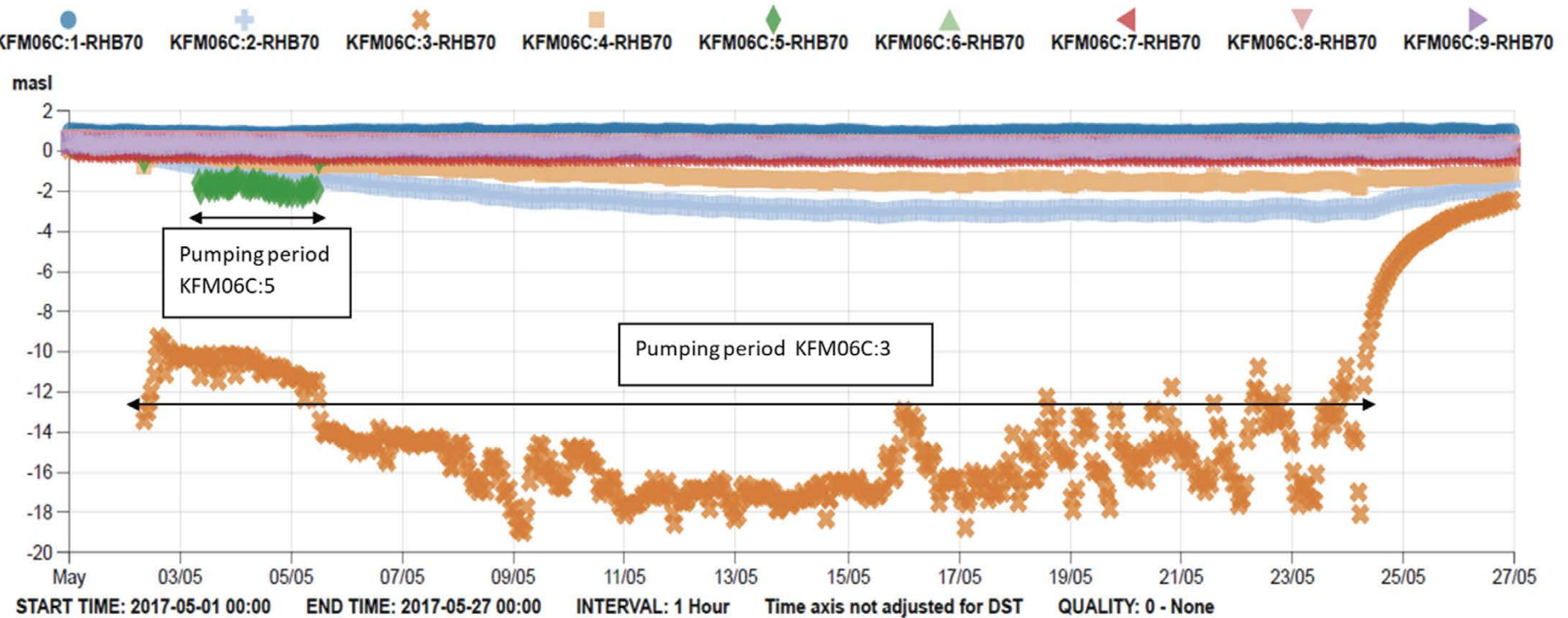


Figure A4-3. Pumping and drawdown in KFM06A:3 and KFM06A:5 in May 2017. Pumping start in KFM06A:2 occurred 2017-05-05. According to field notes pump start was two days later, 2017-05-07, at evaluation it is considered to be wrong date in field notes. Section KFM06A:2 was affected by the pumping in KFM06A:3. Section KFM06A:4 was affected by the pumping in KFM06A:5

Data from 2017

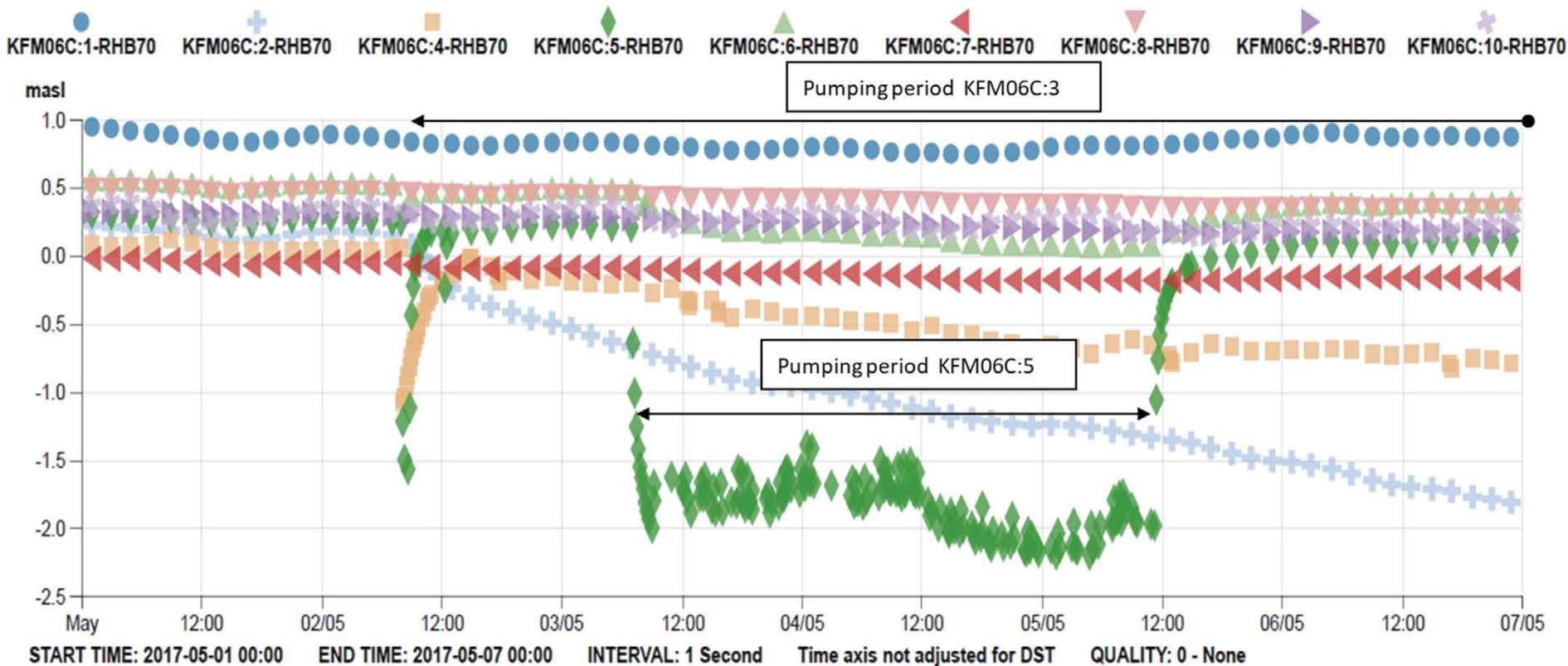


Figure A4-4. Detailed plot of pumping and drawdown in KFM06C:5 in May 2017. The pumping in section KFM06C:5 causes a response in KFM06C:6. KFM06C:3 is excluded from the plot but was pumped between 2017-05-02 – 2017-05-24.

Data from 2017

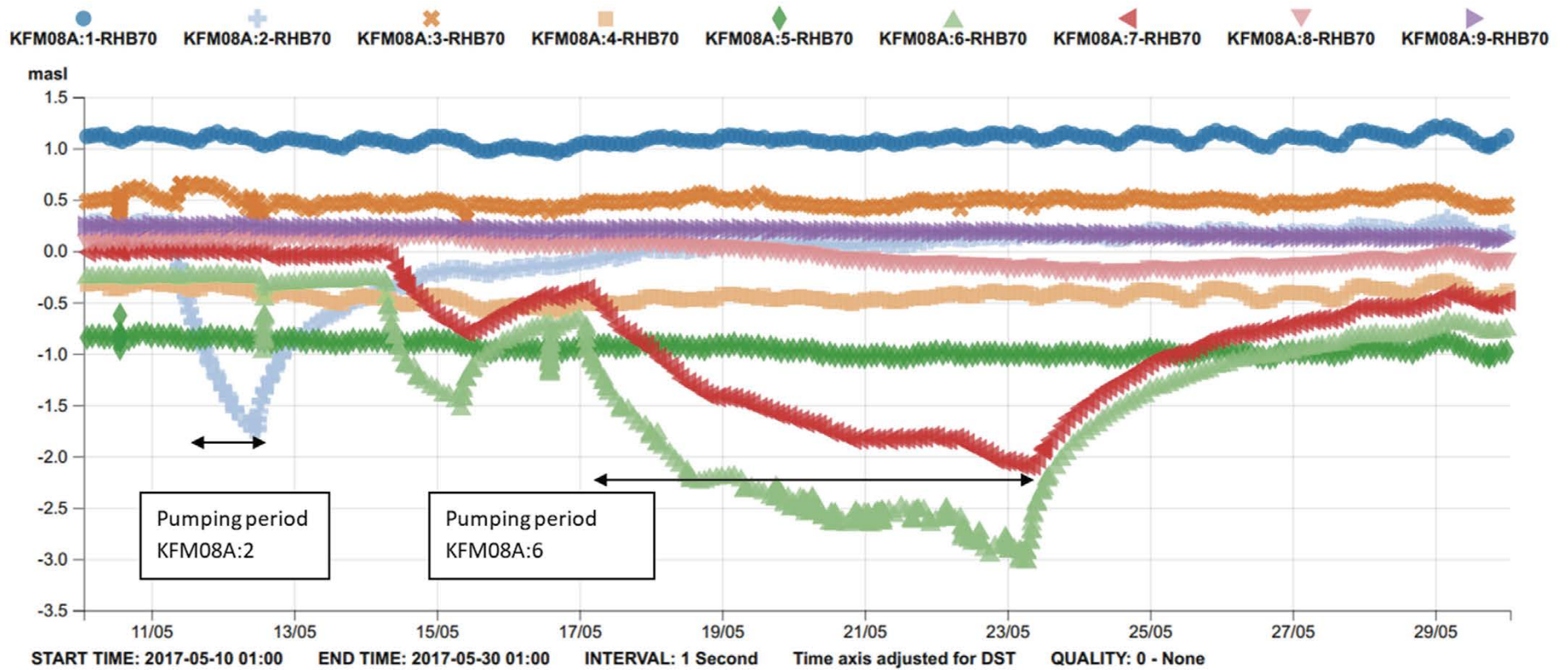


Figure A4-5. Plot of pumping and drawdown in KFM08A:6 and KFM08A:2 in May 2017. The pumping in section KFM08A:6 causes a response in KFM08A:7. For a more detailed plot of the pumping in KFM08A:2, see next figure. Pumping in KFM08A:6 was first started earlier in May, but was then stopped and continued a few days later. All samples were taken after the restart.

Data from 2017

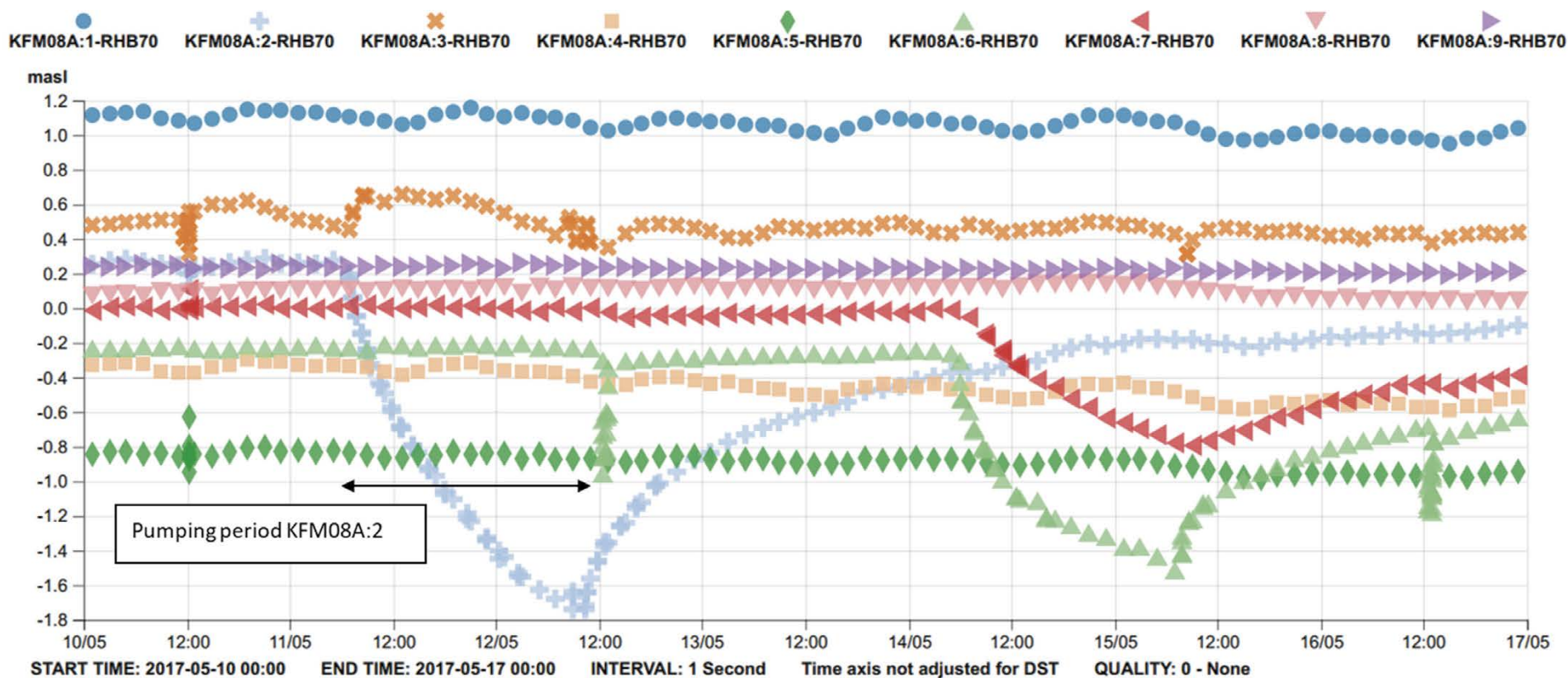


Figure A4-6. Detailed plot of pumping and drawdown in KFM08A:2 in May 2017. None of the other sections were significantly affected by the pumping.

Data from 2017

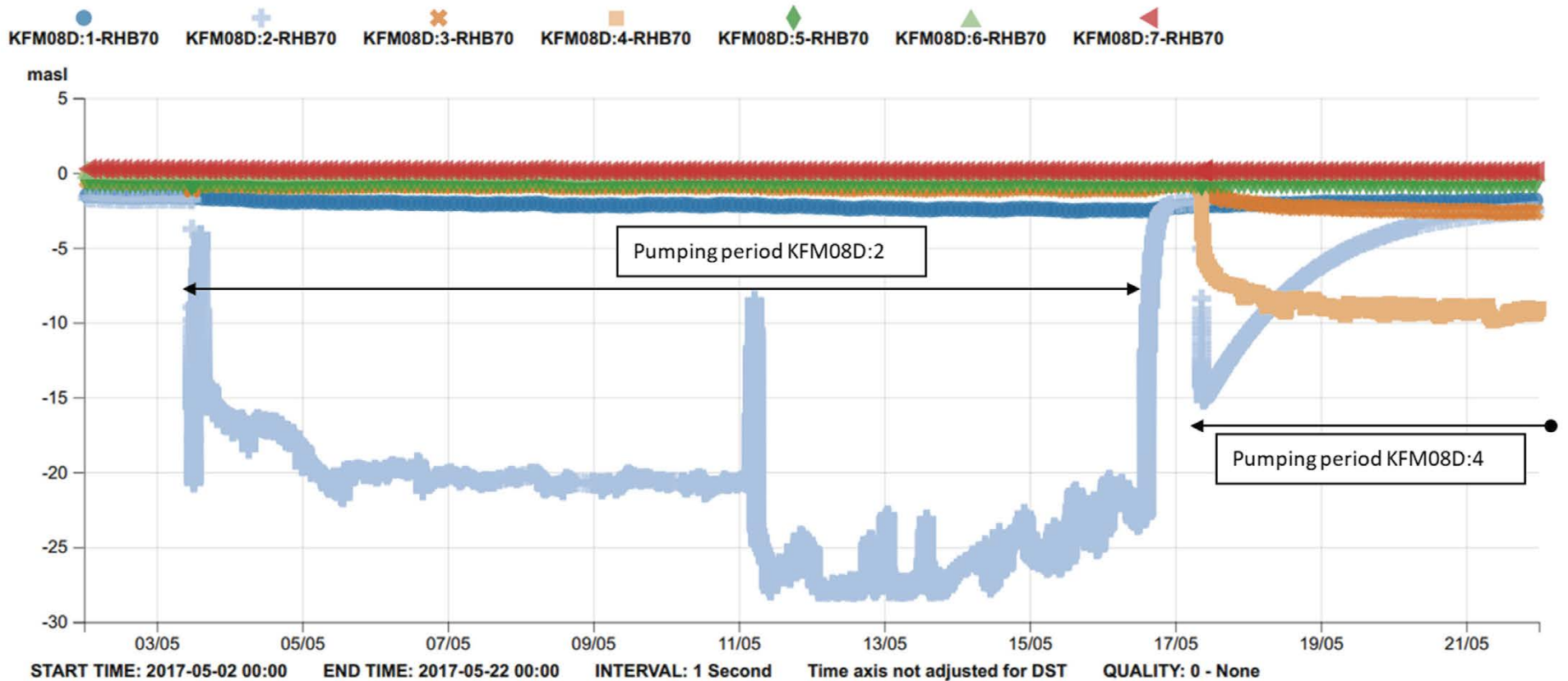


Figure A4-7. Detailed plot of pumping and drawdown in KFM08D:2 in May 2017. The pumping in section KFM08D:2 causes a response in KFM08D:1 and KFM08D:3. The pumping rate in KFM08D:2 had to be adjusted several times. A major change in pumping rate occurred 2017-05-11, which could be seen in the graph. Plot of the pumping in KFM08D:4, see next figure. The pressure change in KFM08D:2 in 2017-05-17 is due to deflation of the mini packers and uninstallation of the pumping equipment.

Data from 2017

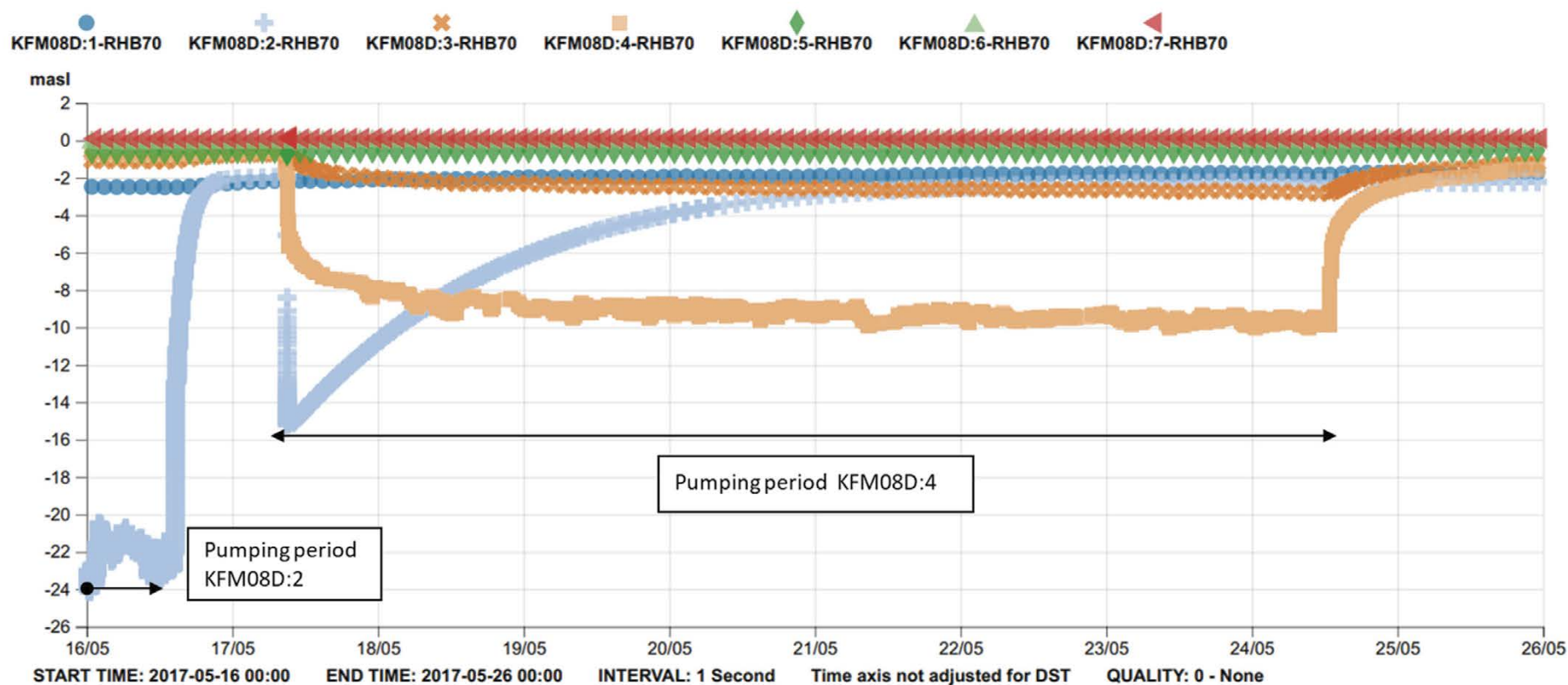


Figure A4-8. Detailed plot of pumping and drawdown in KFM08D:4 in May 2017. The pumping in section KFM08D:4 causes a response in KFM08D:3. The pressure drop in KFM08D:2 in 2017-05-17 is due to deflation of the mini packers and uninstallation of the pumping equipment.

Data from 2017

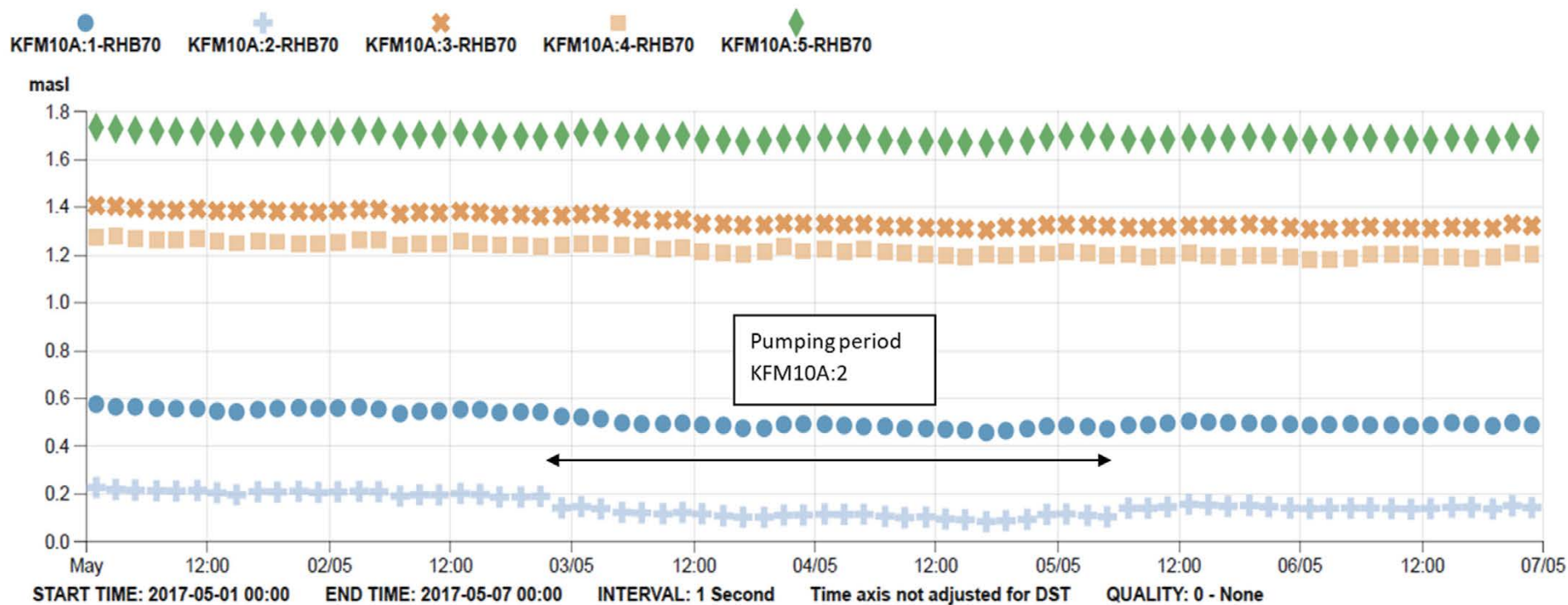


Figure A4-9. Detailed plot of pumping and drawdown in KFM10A:2 in May 2017. None of the other sections were significantly affected by the pumping.

Data from 2017

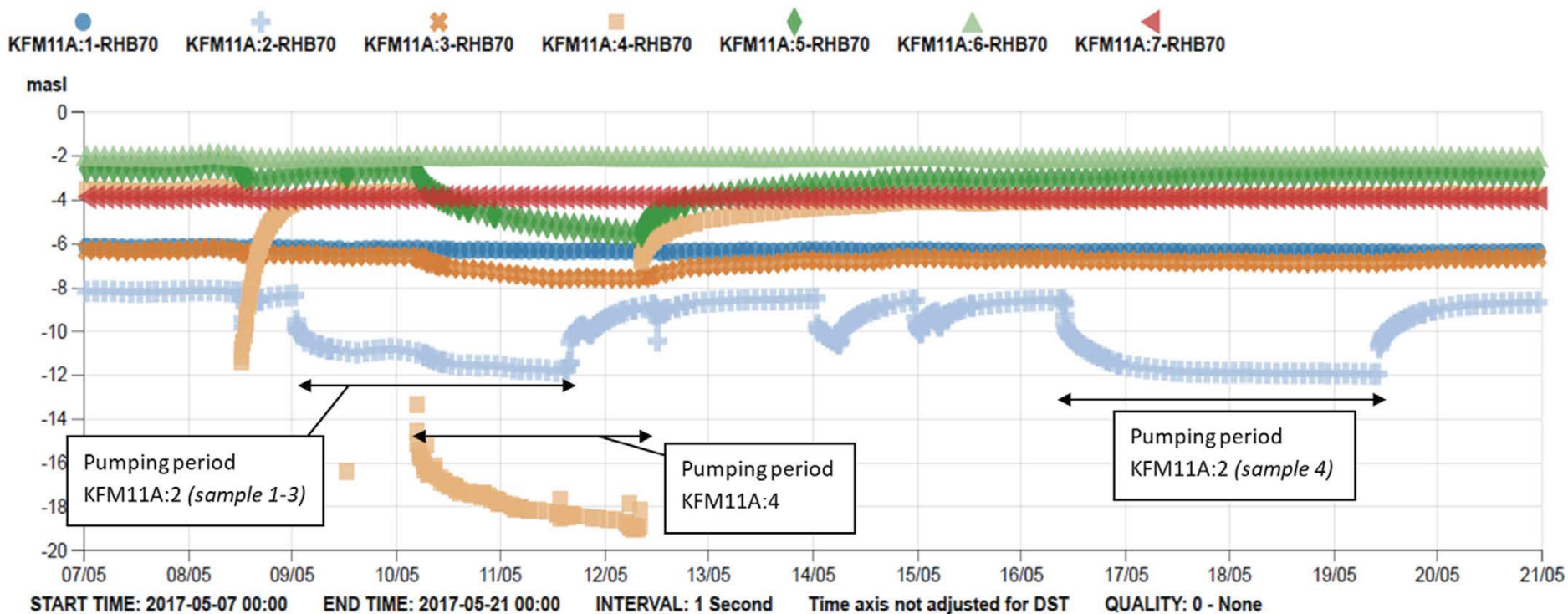


Figure A4-10. Pumping and drawdown in KFM11A:2 and KFM11A:4 in May 2017. A pumping stop occurred between the third and the fourth sample. A new pump start was planned 2017-05-18. During the next days the pump stopped and started twice by itself. As the pressure recovers completely between, 2017-05-16 must be counted as start time for the second pump period containing the fourth sample. No other sections were affected by the pumping in KFM11A:2. The pumping in KFM11A:4 causes a response in KFM11A:5 and KFM11A:3.

Data from 2017

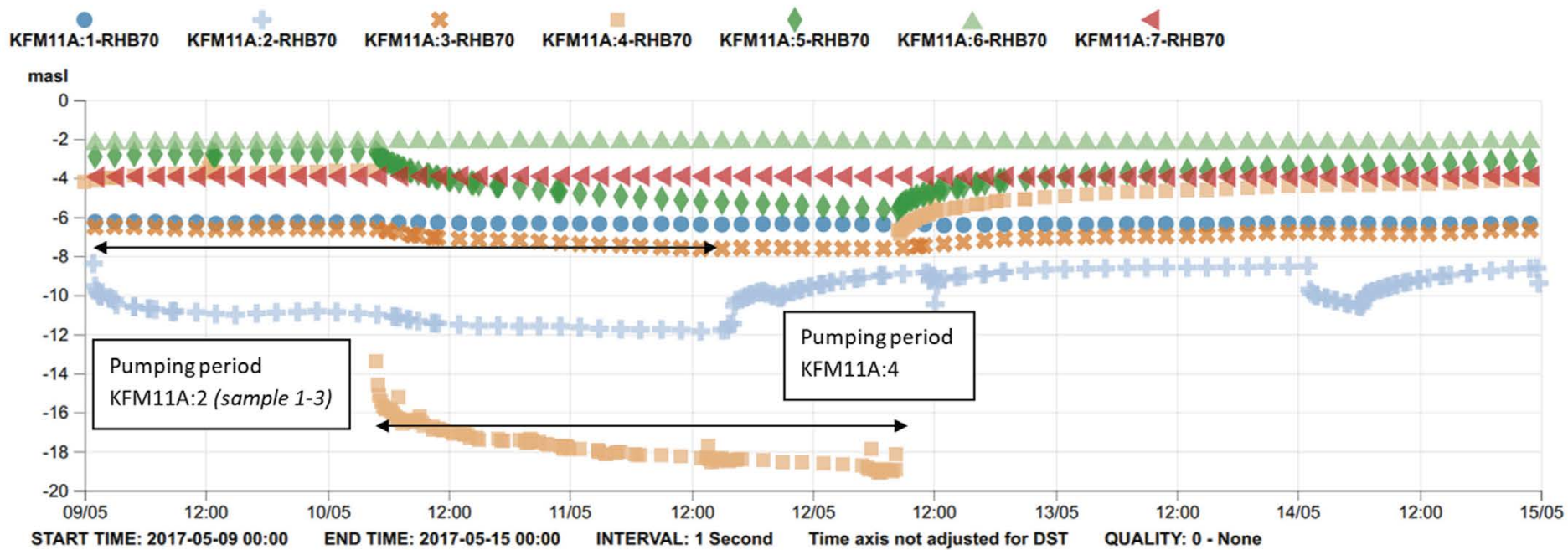


Figure A4-11. Pumping and drawdown in KFM11A:4 in May 2017. The pumping in KFM11A:4 causes a response in KFM11A:5 and KFM11A:3.

Data from 2017

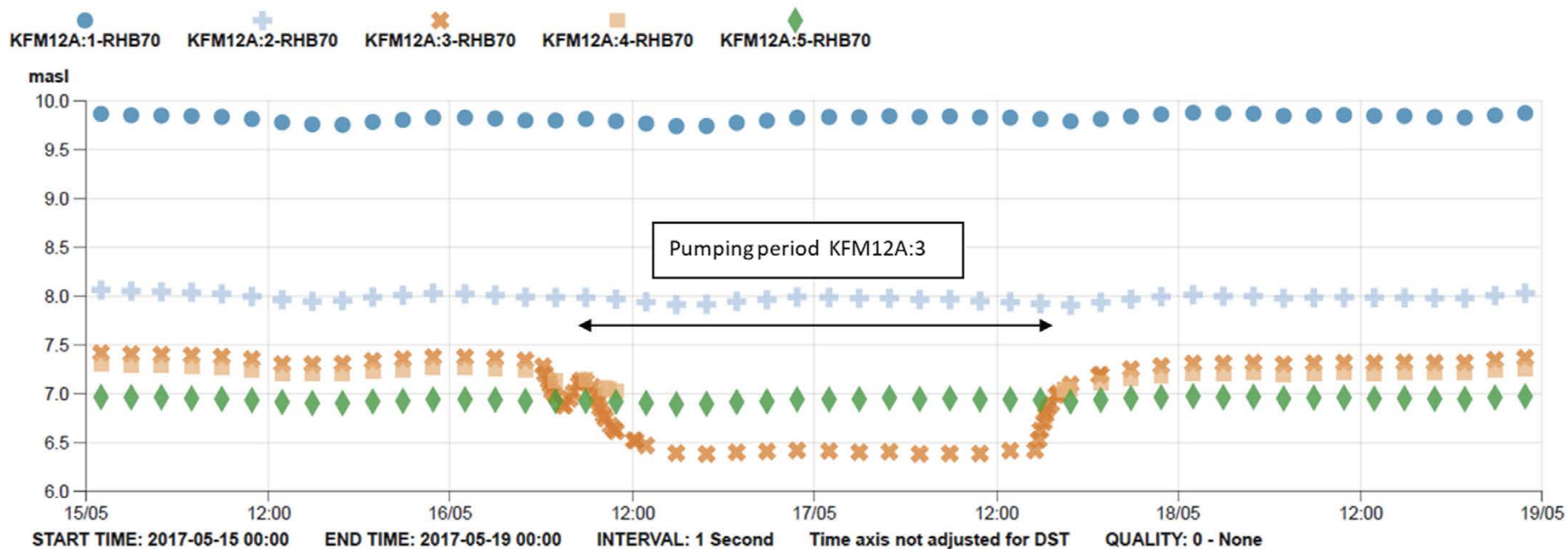


Figure A4-12. Pumping and drawdown in KFM12A:3 in May 2017. The pumping in section KFM12A:3 causes a response in KFM12A:4.

Data from 2017

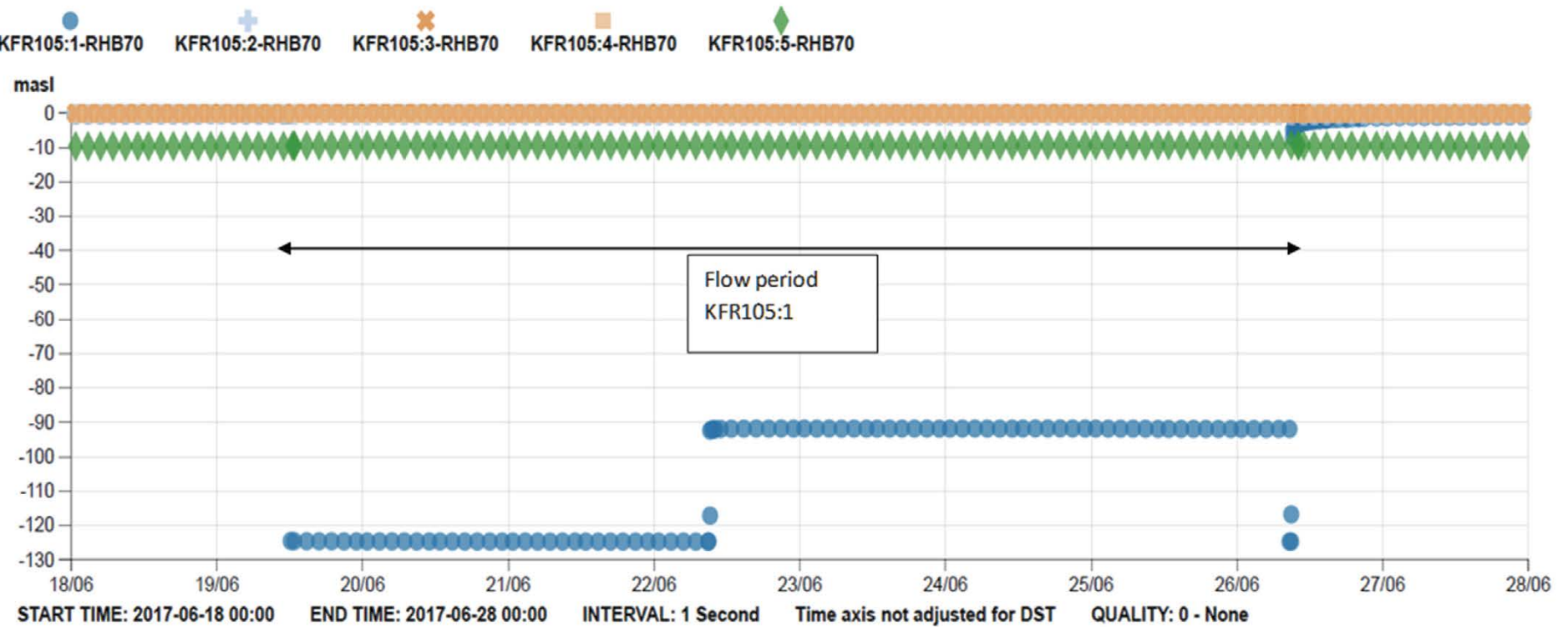


Figure A4-13. Flow period in KFR105:1 in June 2017. No other sections were affected by the flow period in KFR105:1. The pressure change 2017-06-22 is due to an major decrease in flow.

Data from 2017

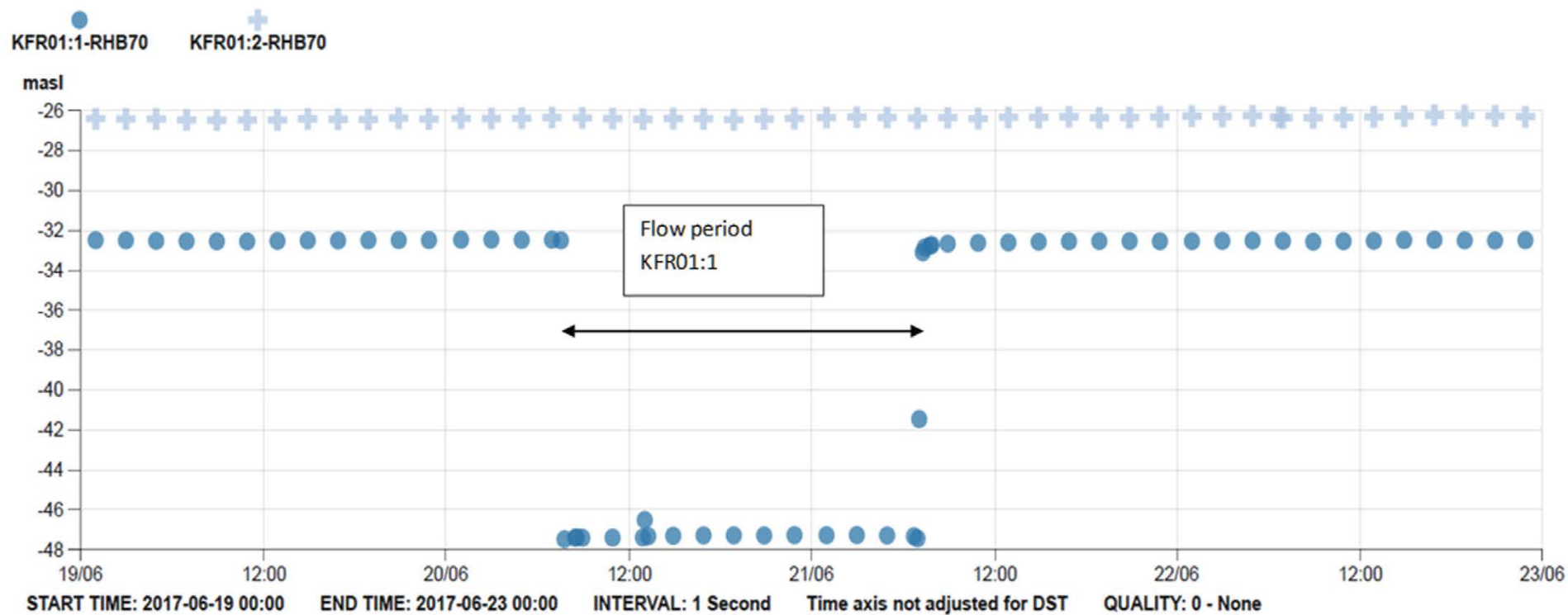


Figure A4-14. Flow period in KFR01:1 in June 2017. No other sections were affected by the flow period in KFR01:1.

Data from 2018

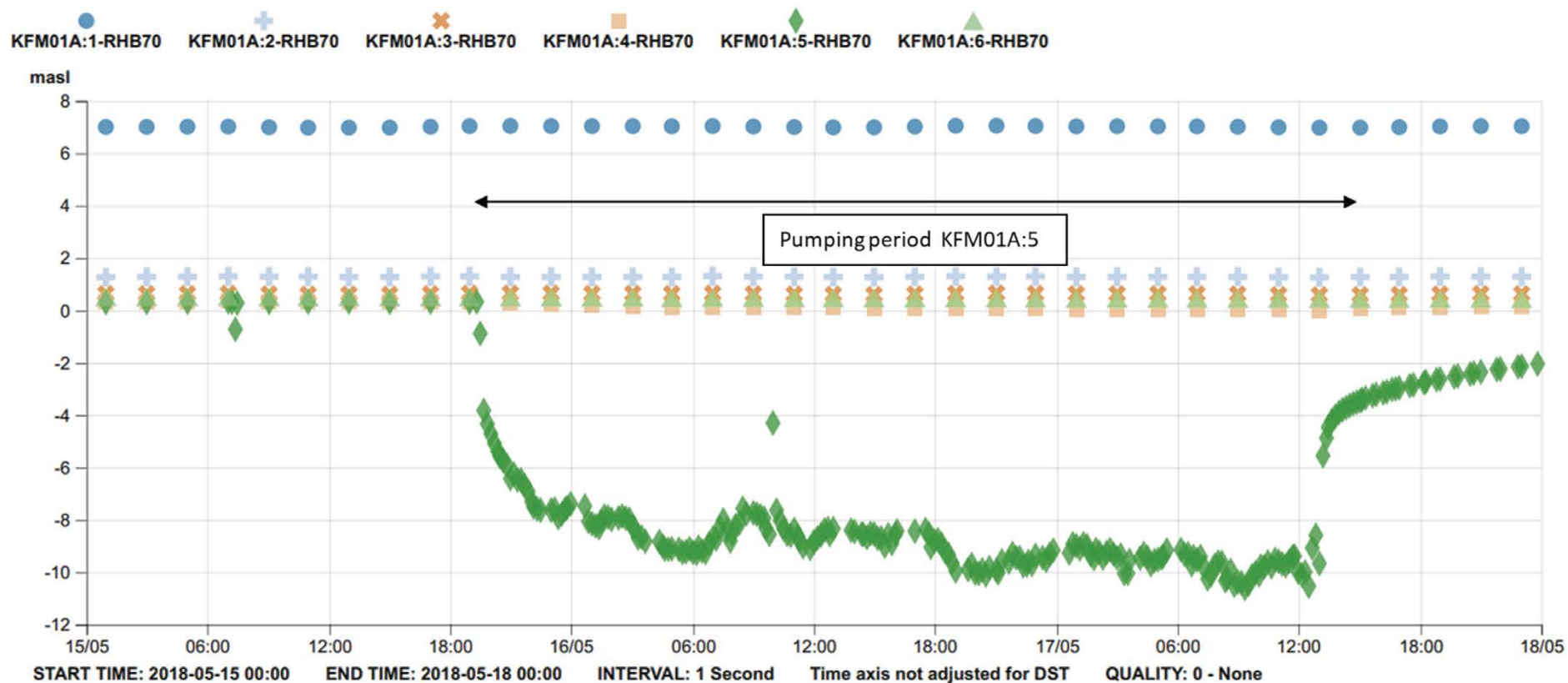


Figure A4-15. Pumping and drawdown in KFM01A:5 in May 2018. A response was observed in section KFM01A:4. See next figure for a more detailed plot.

Data from 2018

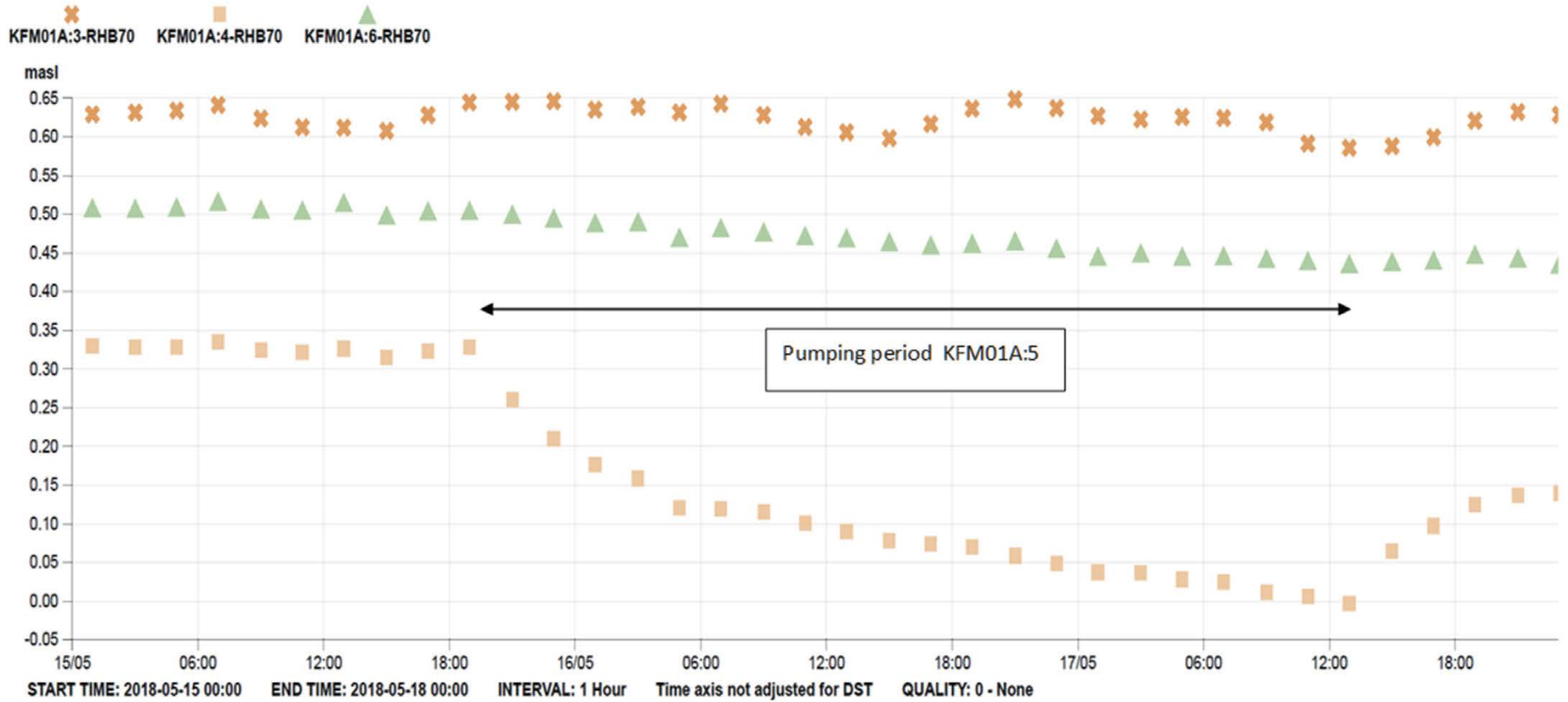
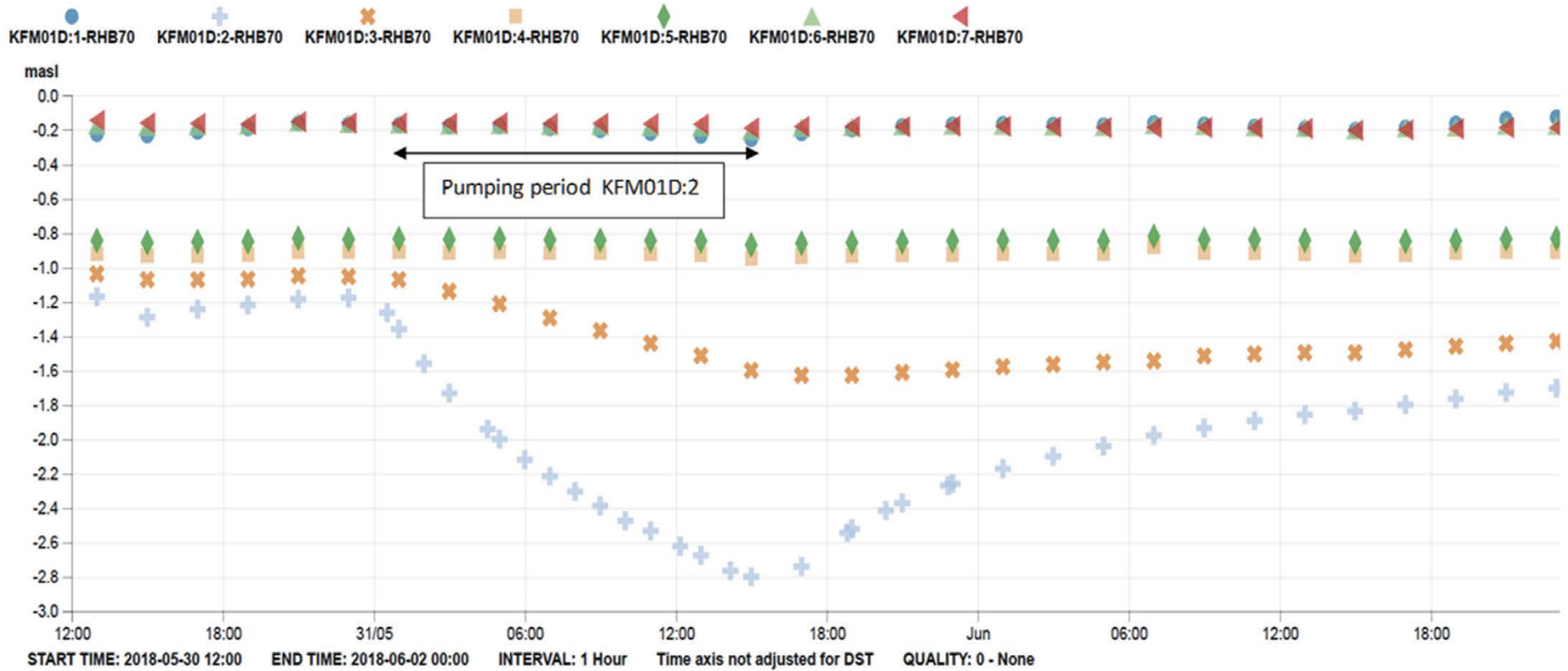


Figure A4-16. Detailed plot of pumping and drawdown in KFM01A:5 in May 2018. The pumping in KFM01A:5 causes a drawdown in KFM01A:4.



Data from 2018

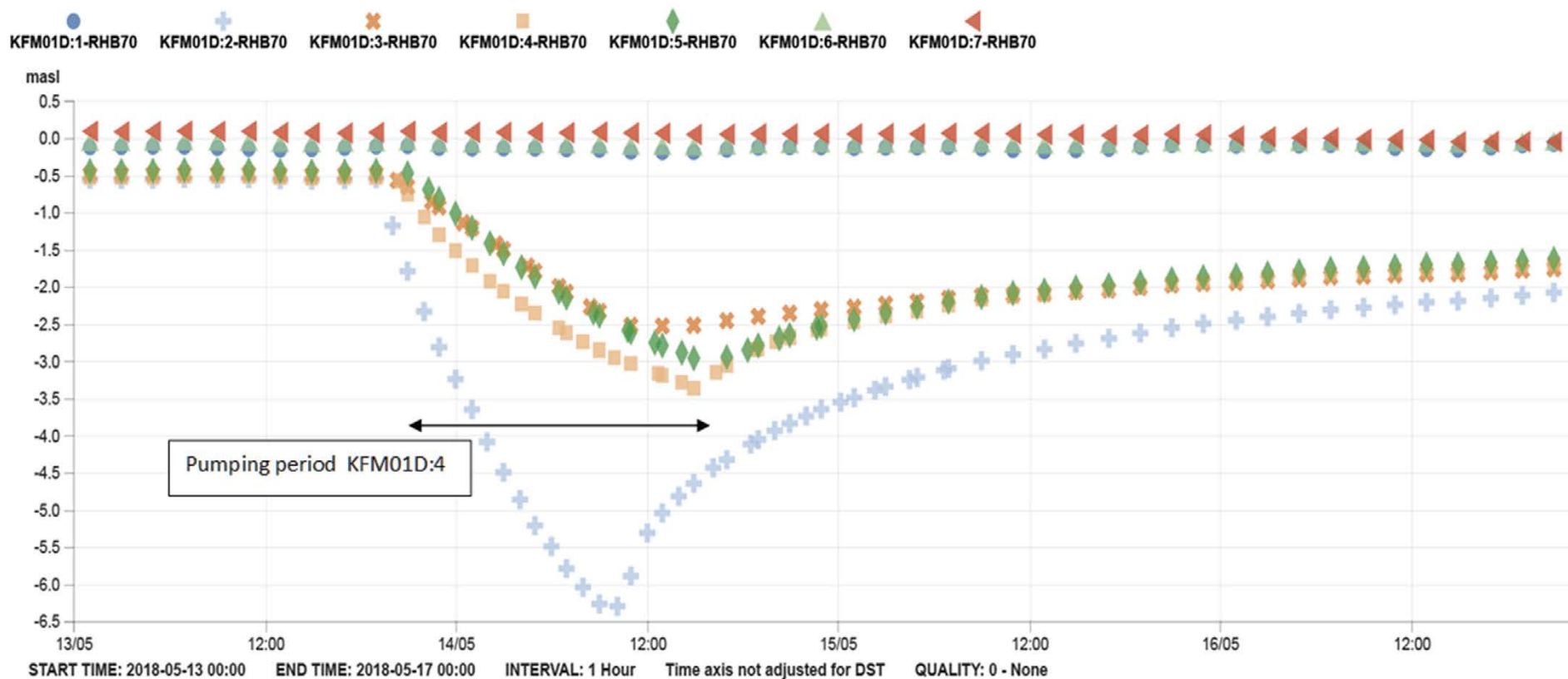


Figure A4-18. Pumping and drawdown in KFM01D:4 in May 2018. Section KFM01D:5 was affected by the pumping in KFM01D:4. Pumping also occurred in KFM01D:2 during 2018-05-13 – 2018-05-14 but no samples were taken. Section KFM01D:3 was affected by the pumping in KFM01D:2.

Data from 2018

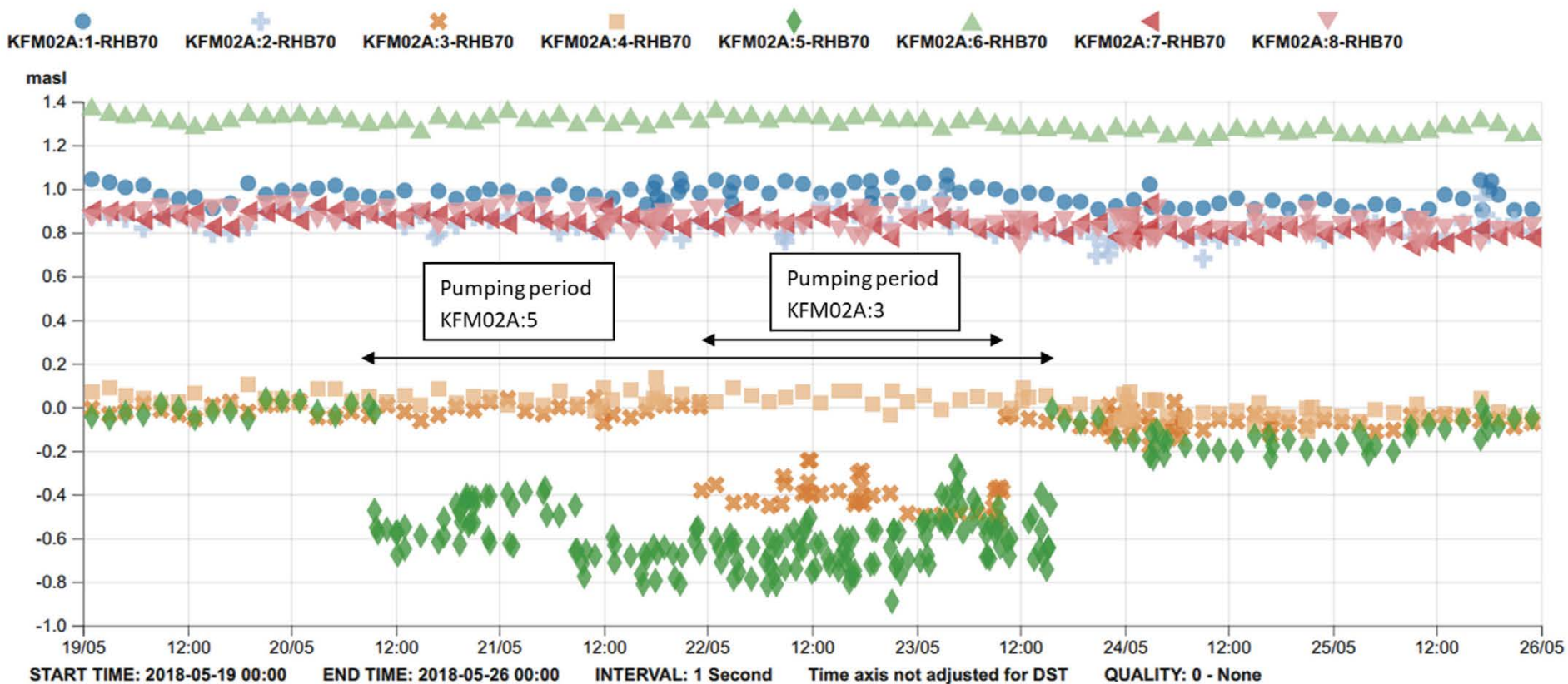


Figure A4-19. Pumping and drawdown in KFM02A:3 and KFM02A:5 in May 2018. No other sections were affected.

Data from 2018

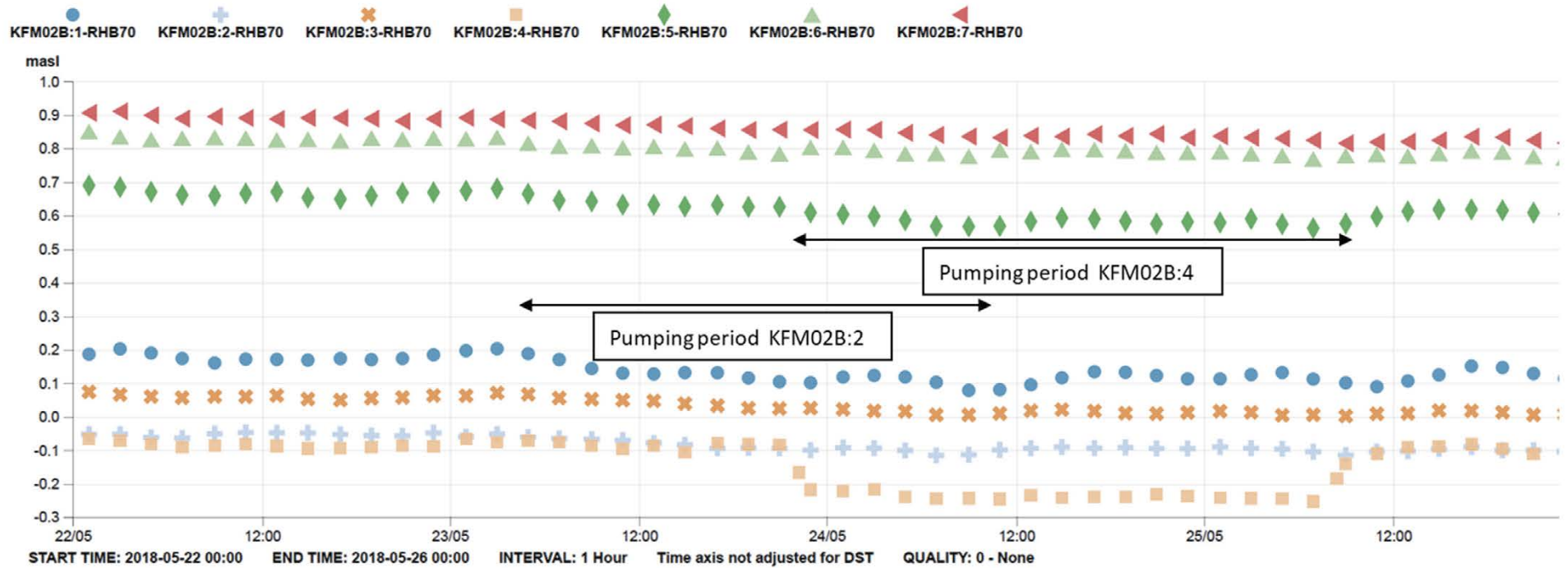


Figure A4-20. Pumping and drawdown in KFM02B:4 and KFM02B:2 in May 2018. No other sections were affected.

Data from 2018

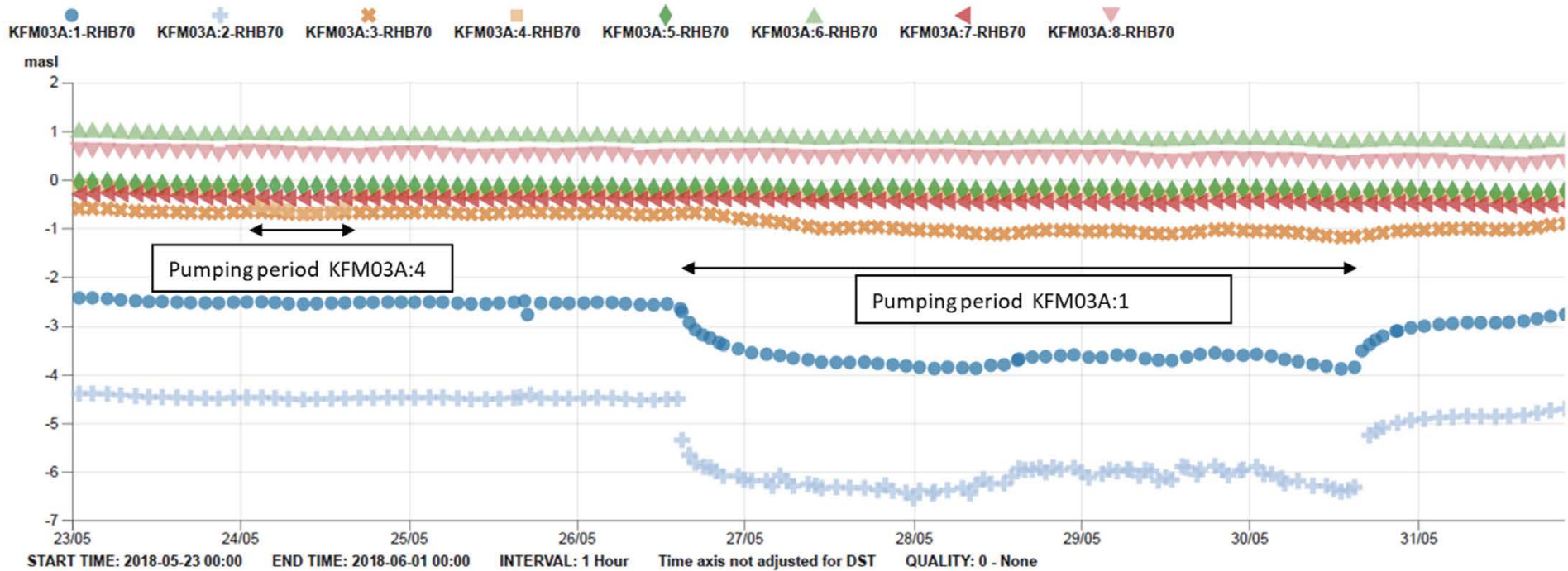


Figure A4-21. Pumping and drawdown in KFM03A:4 and KFM03A:1 in May 2018. The pressure response observed in KFM03A:2 during pumping in KFM03A:1 may be caused by a leaking connection in the equipment between sections KFM03A:1 and KFM03A:2 rather than a connected fracture system. A small response was also seen in KFM03A:3 during the pumping of KFM03A:1. No other sections were affected by the pumping in KFM03A:4.

Data from 2018

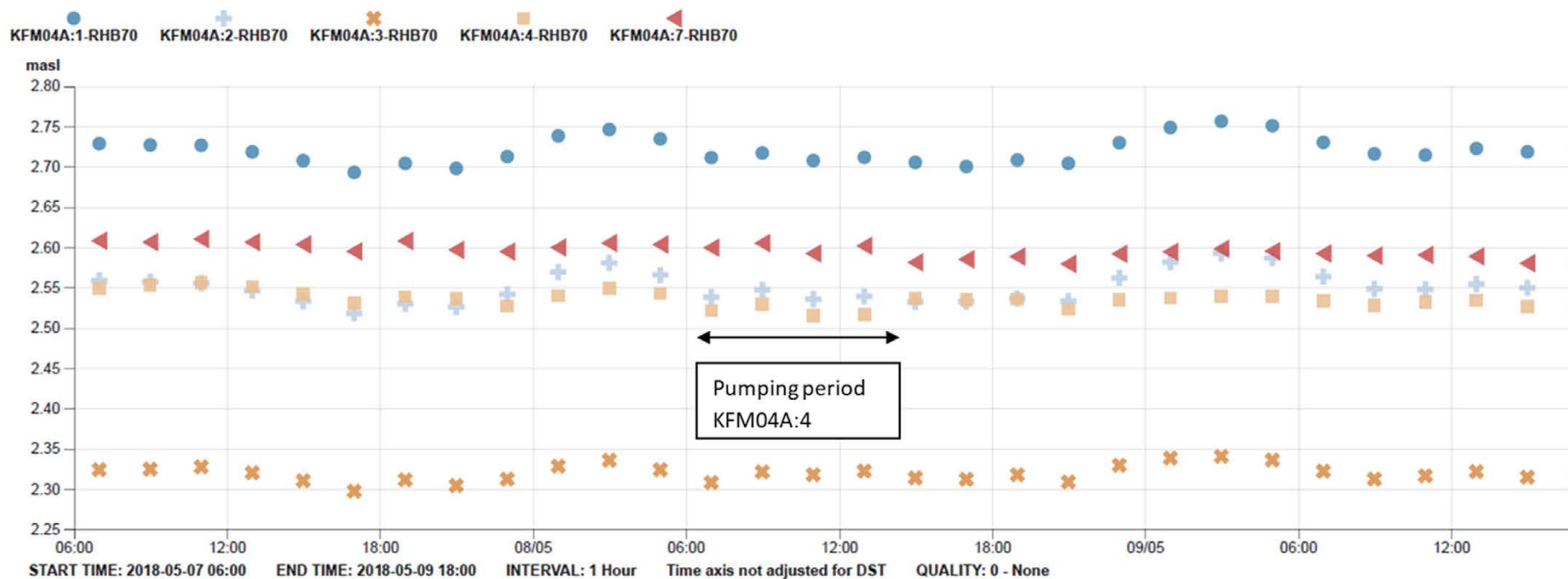


Figure A4-22. Pumping and drawdown in KFM04A:4 in May 2018. None of the other sections were significantly affected by the pumping. Section KFM04A:5-6 are not included in the plot due to scale, but these sections are also not affected.

Data from 2018

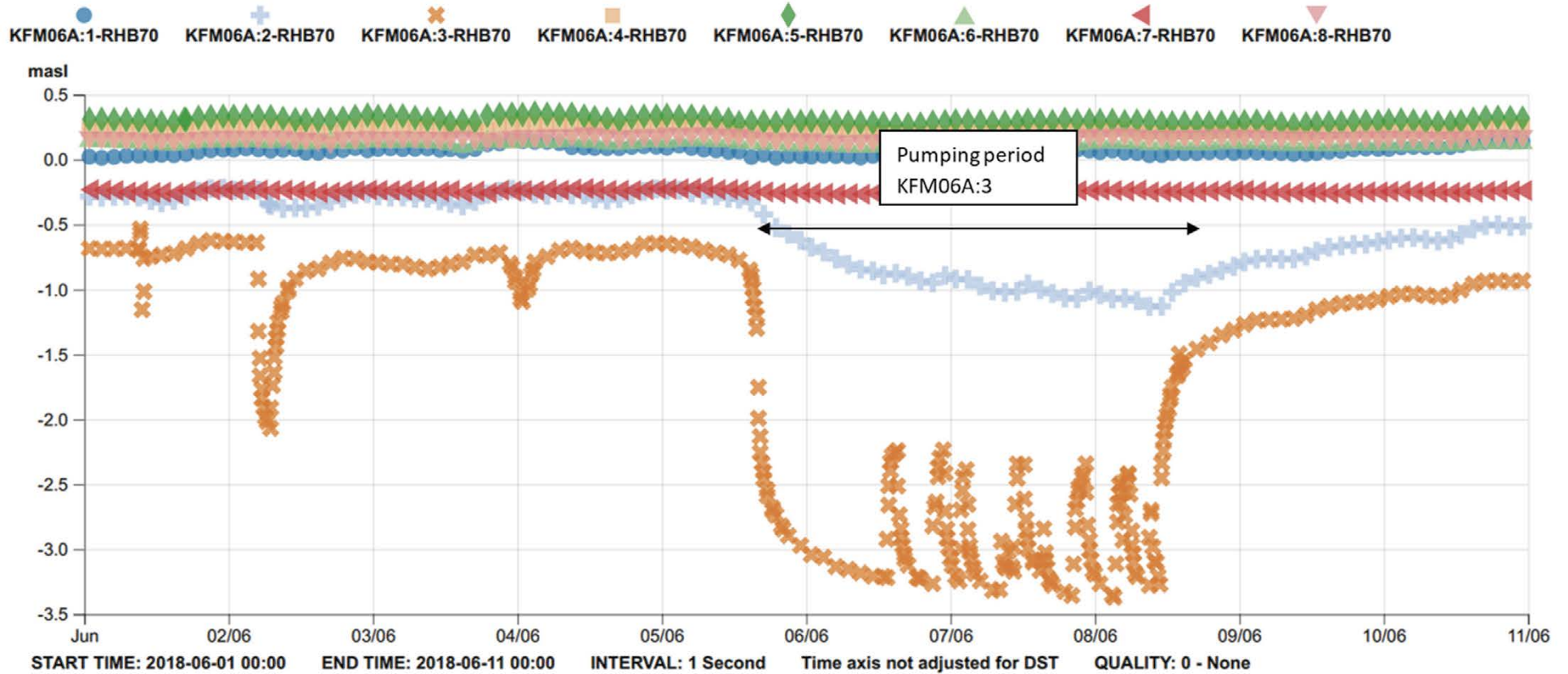


Figure A4-23. Pumping and drawdown in KFM06A:3 in June 2018. Pumping was scheduled to start 2018-06-02. The pump stopped shortly after start and restarted by itself 2018-06-05 before the stop was discovered in field. As the pressure completely recovered 2018-06-05 has to be considered as pumping start. There are also problems with the pump and the flow rate after 2018-06-05 but the pressure never complete recovers before pump stop at 2018-06-08. Section KFM06A:2 was affected by the pumping in KFM06A:3.

Data from 2018

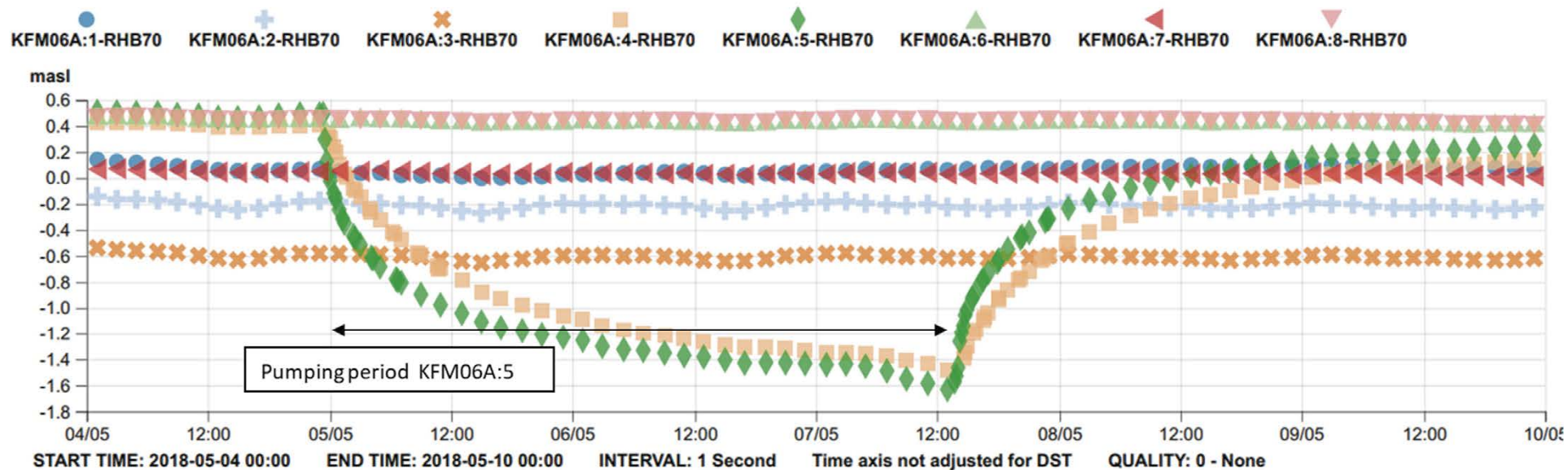


Figure A4-24. Pumping and drawdown in KFM06A:5 in May 2018. KFM06A:4 was effected by the pumping.

Data from 2018

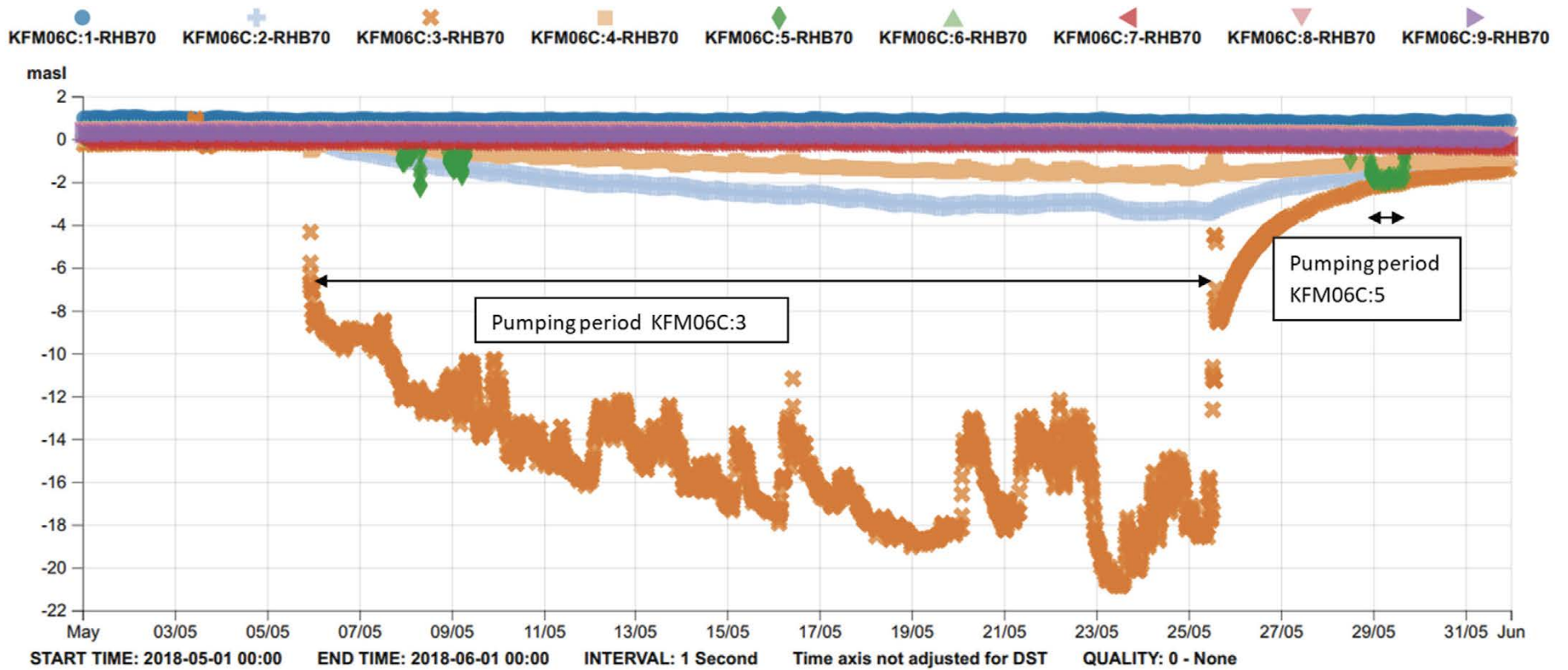


Figure A4-25. Pumping and drawdown in KFM06C:3 and KFM06C:5 in May 2018. Sections KFM06C:2 and KFM06C:4 were affected by the pumping in section KFM06C:3. The pumping in section KFM06C:5 causes a response in KFM06C:6. For a more detailed plot of the pumping in KFM06C:5, see next figure.

Data from 2018

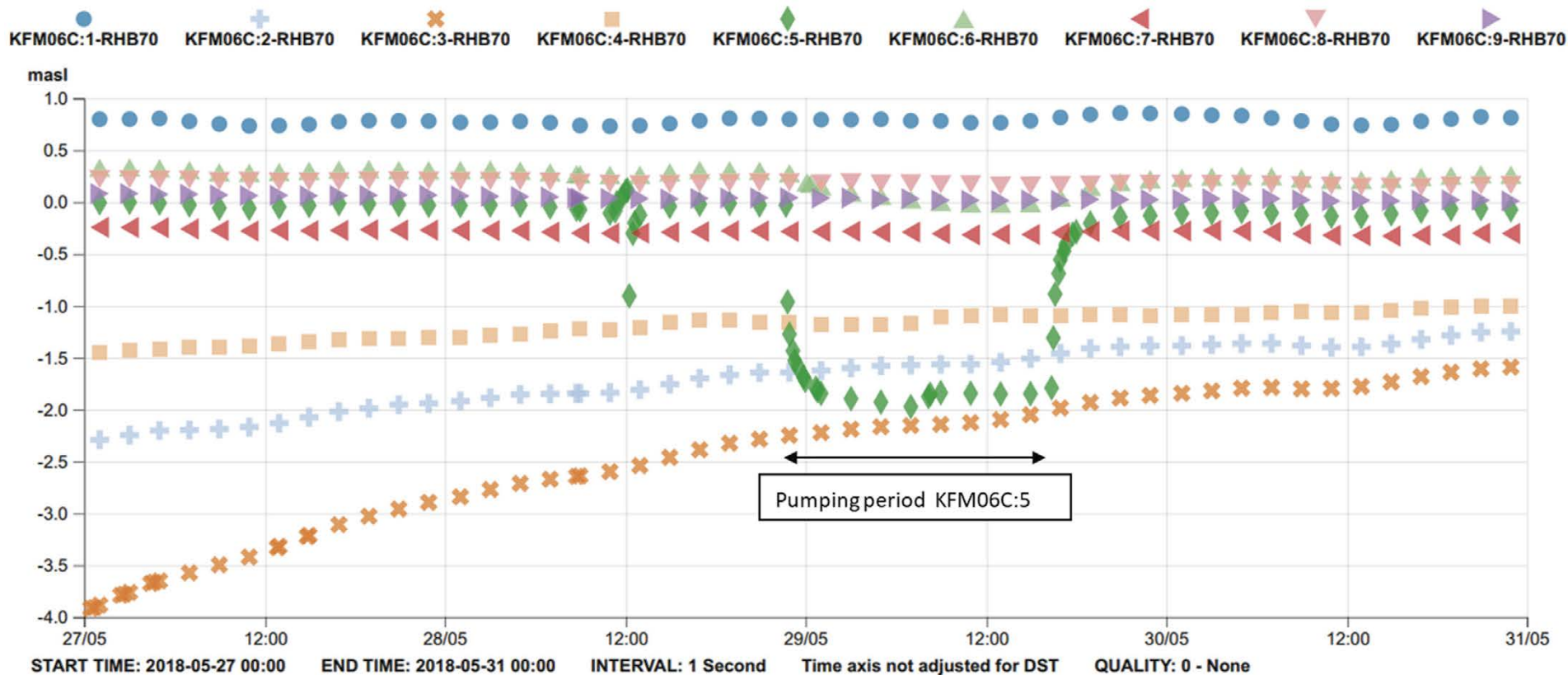


Figure A4-26. Detailed plot of pumping and drawdown in KFM06C:5 in May 2018. The pumping in section KFM06C:5 causes a response in KFM06C:6.

Data from 2018

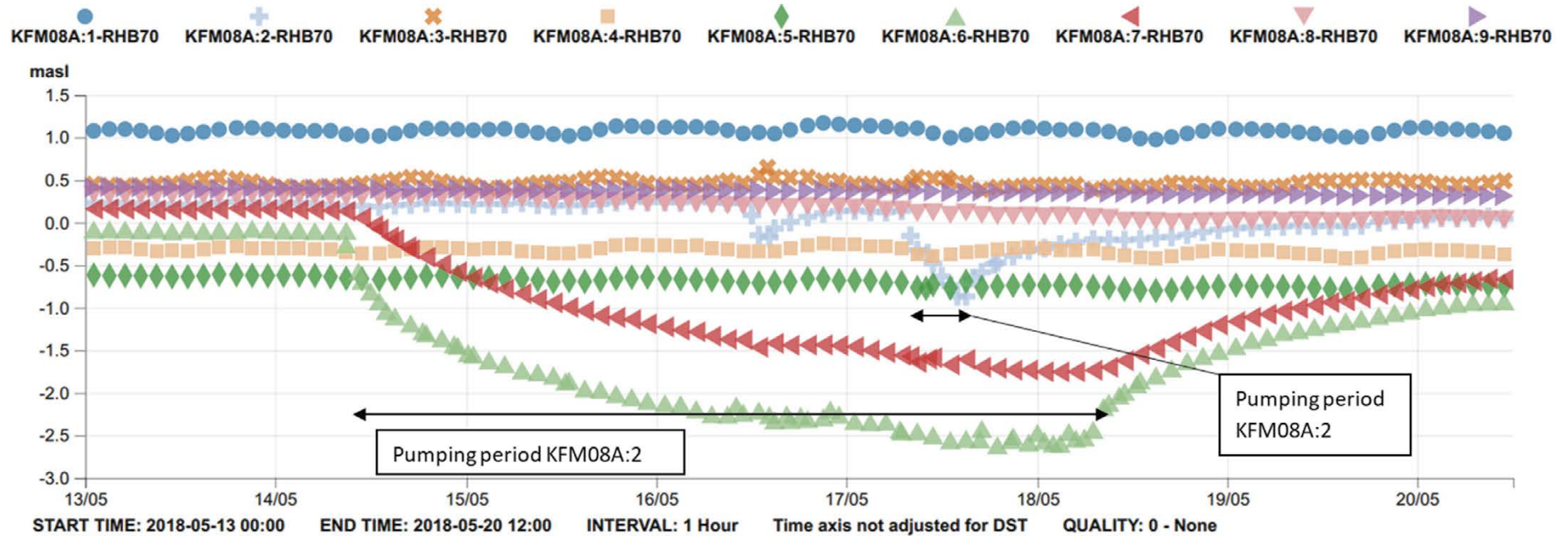


Figure A4-27. Detailed plot of pumping and drawdown in KFM08A:6 and KFM08A:2 in May 2018. The pumping in section KFM08A:6 causes a response in KFM08A:7. None of the other sections were significantly affected by the pumping in KFM08A:2.

Data from 2018

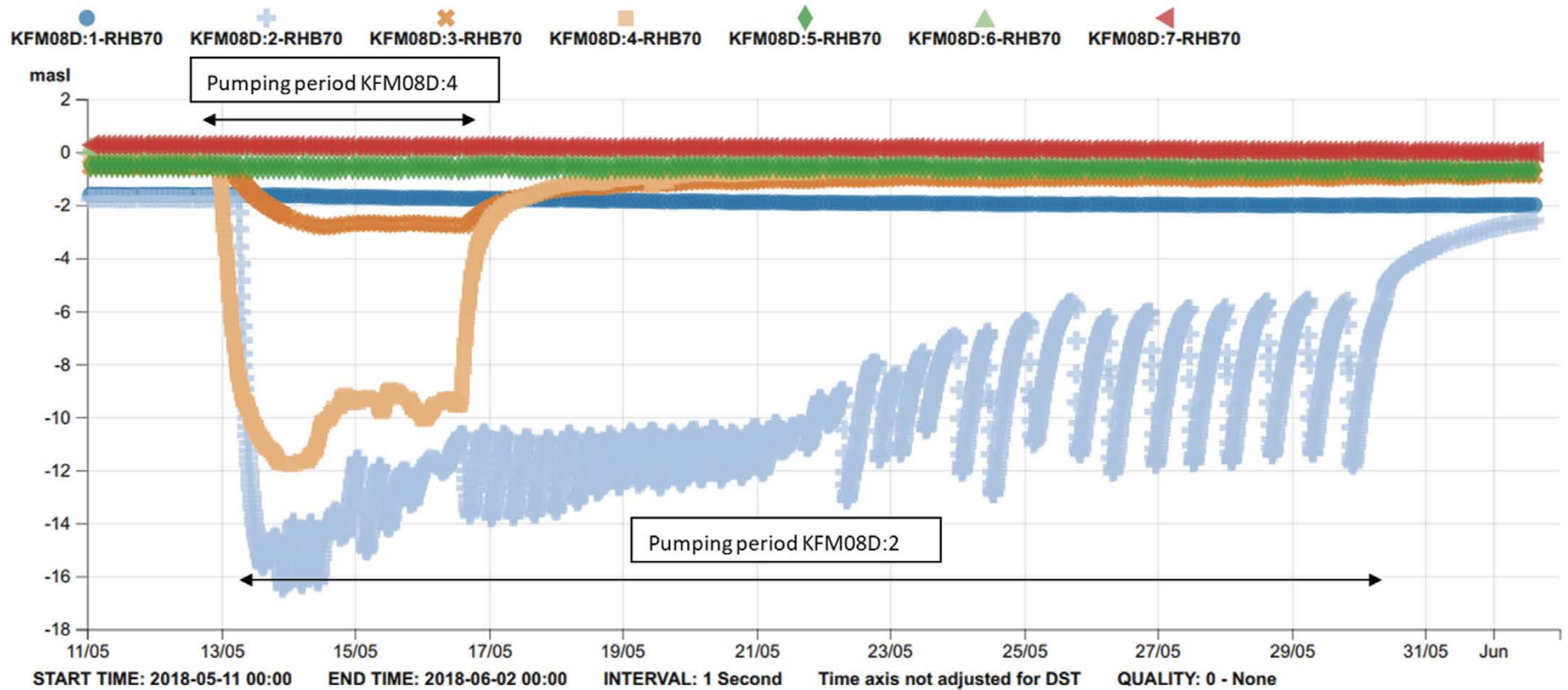


Figure A4-28. Pumping and drawdown in KFM08D:2 and KFM08D:4 in May 2018. None of the other sections were significantly affected by the pumping in KFM08D:2. KFM08D:3 was affected by the pumping in KFM08D:4. The flow rate are instable during the pumping in KFM08D:2. See next figure for detailed plot of the pumping in KFM08D:4.

Data from 2018

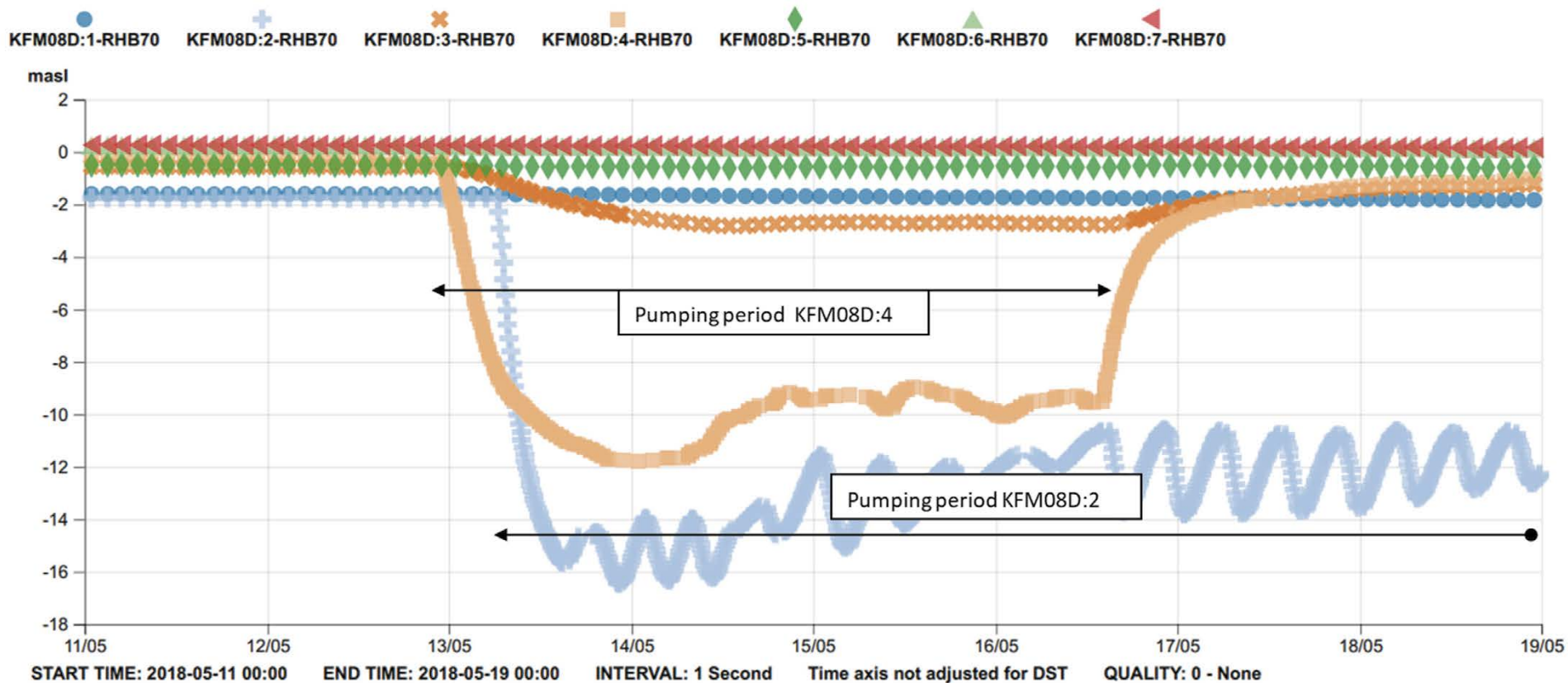


Figure A4-29. Detailed plot of pumping and drawdown in KFM08D:4 in May 2018. KFM08D:3 significantly affected by the pumping in KFM08D:4.

Data from 2018

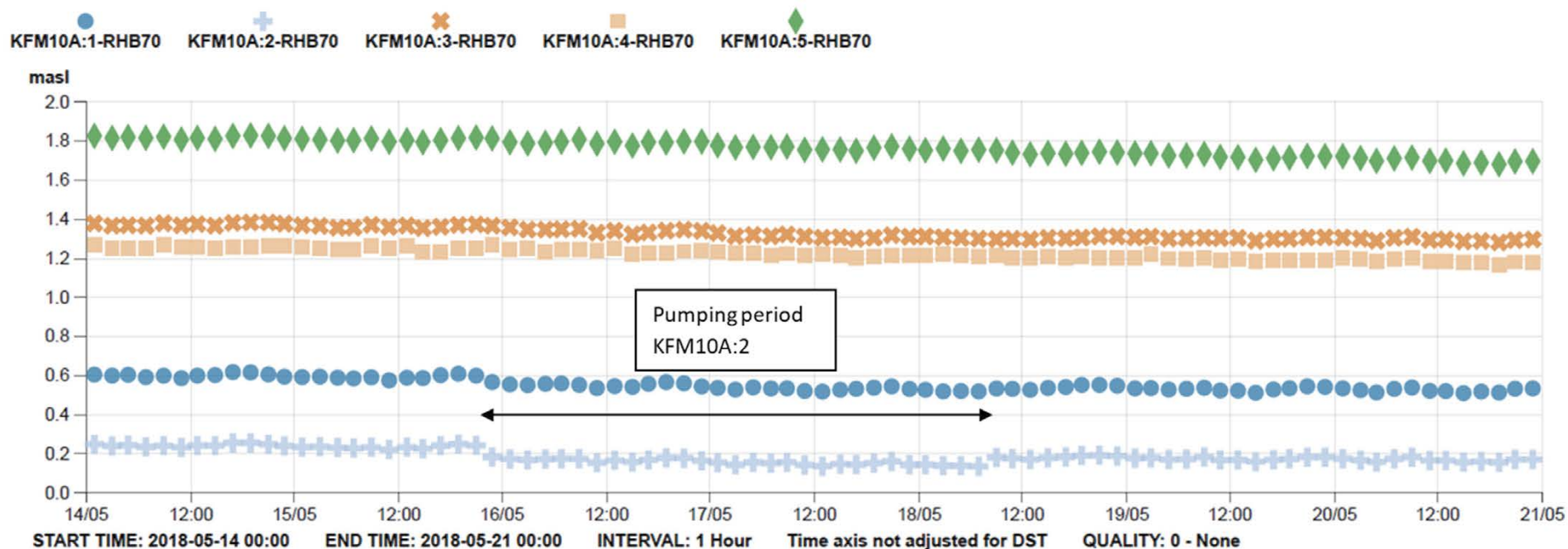


Figure A4-30. Detailed plot of pumping and drawdown in KFM10A:2 in May 2018. None of the other sections were significantly affected by the pumping.

Data from 2018

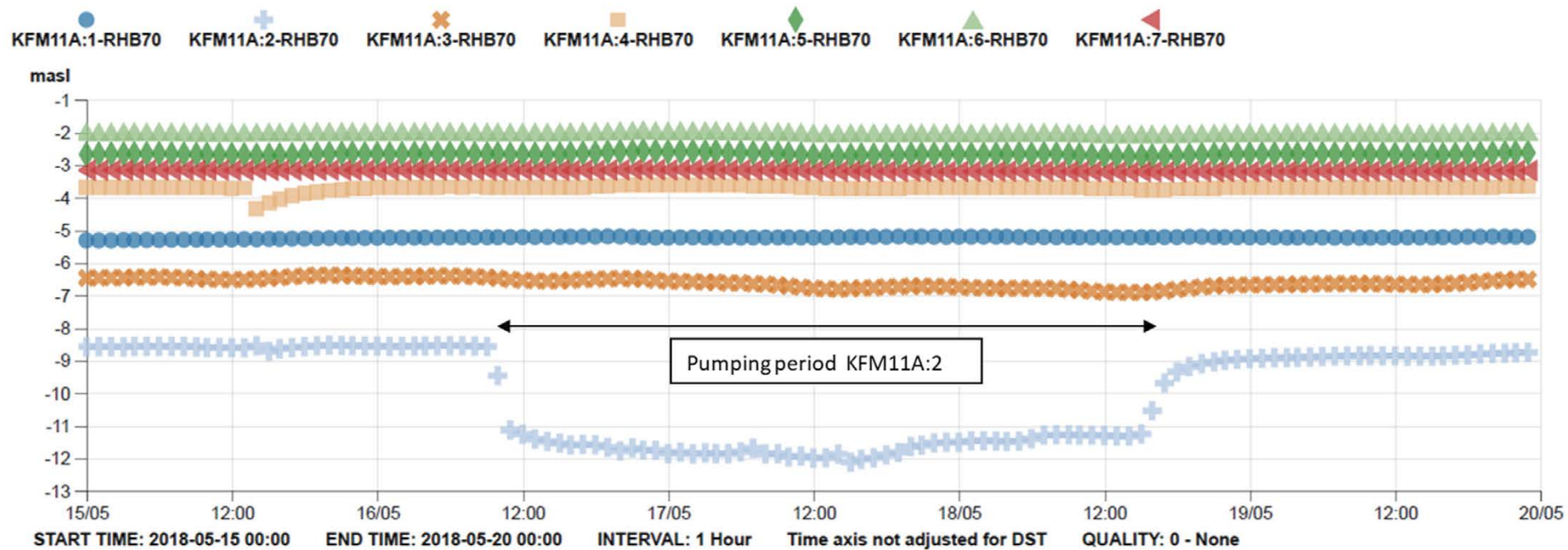


Figure A4-31. Pumping and drawdown in KFM11A:2 in May 2018. No other sections were affected.

Data from 2018

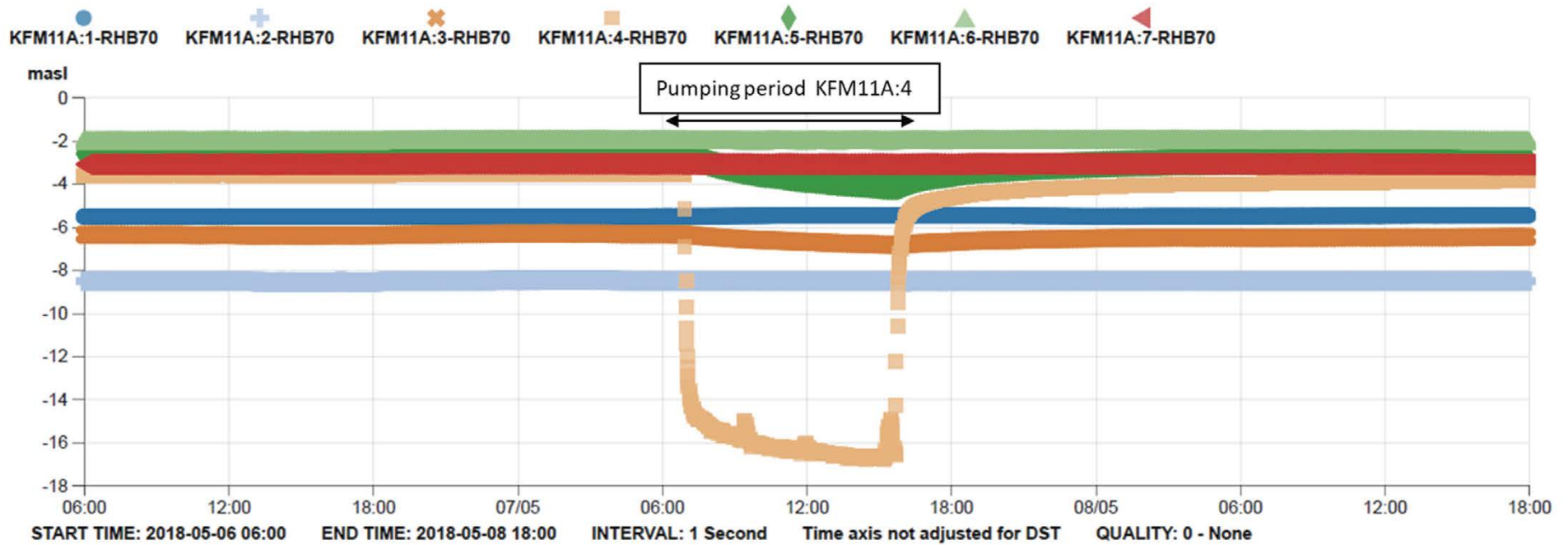


Figure A4-32. Pumping and drawdown in KFM11A:4 in May 2018. The pumping in section KFM011A:4 causes a response in KFM11A:3 and KFM11A:5.

Data from 2018

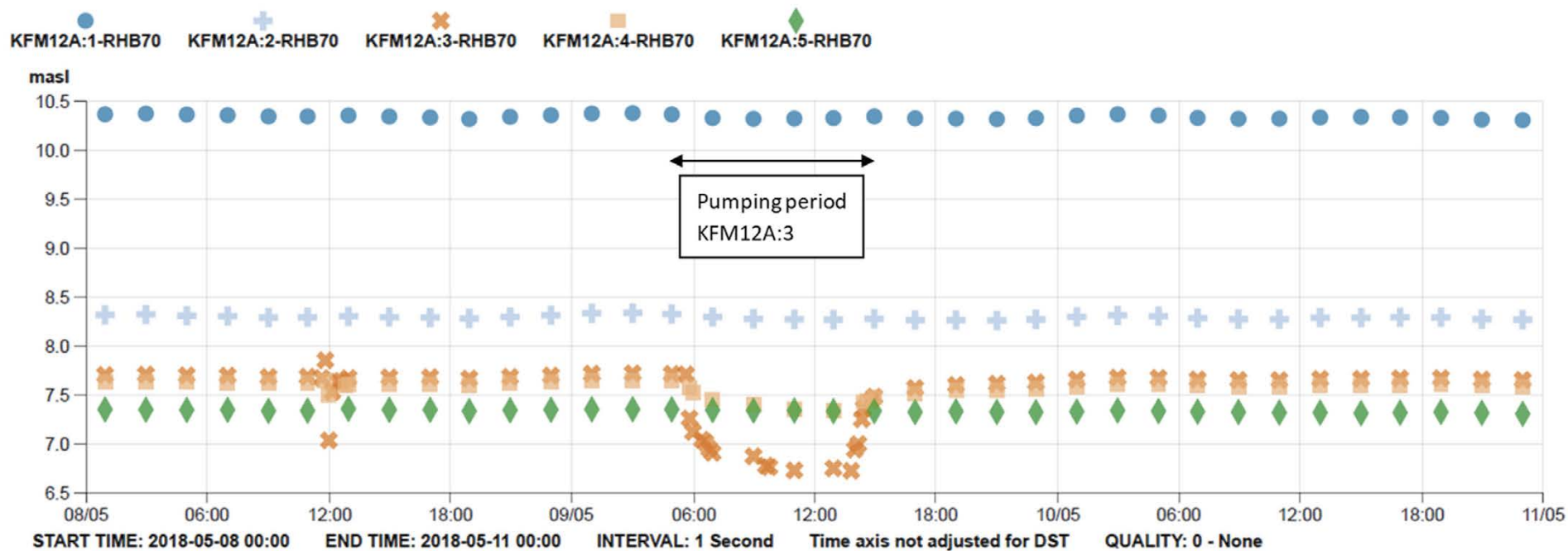


Figure A4-33. Pumping and drawdown in KFM12A:3 in May 2018. The pumping in section KFM12A:3 causes a response in KFM12A:4.

Data from 2018

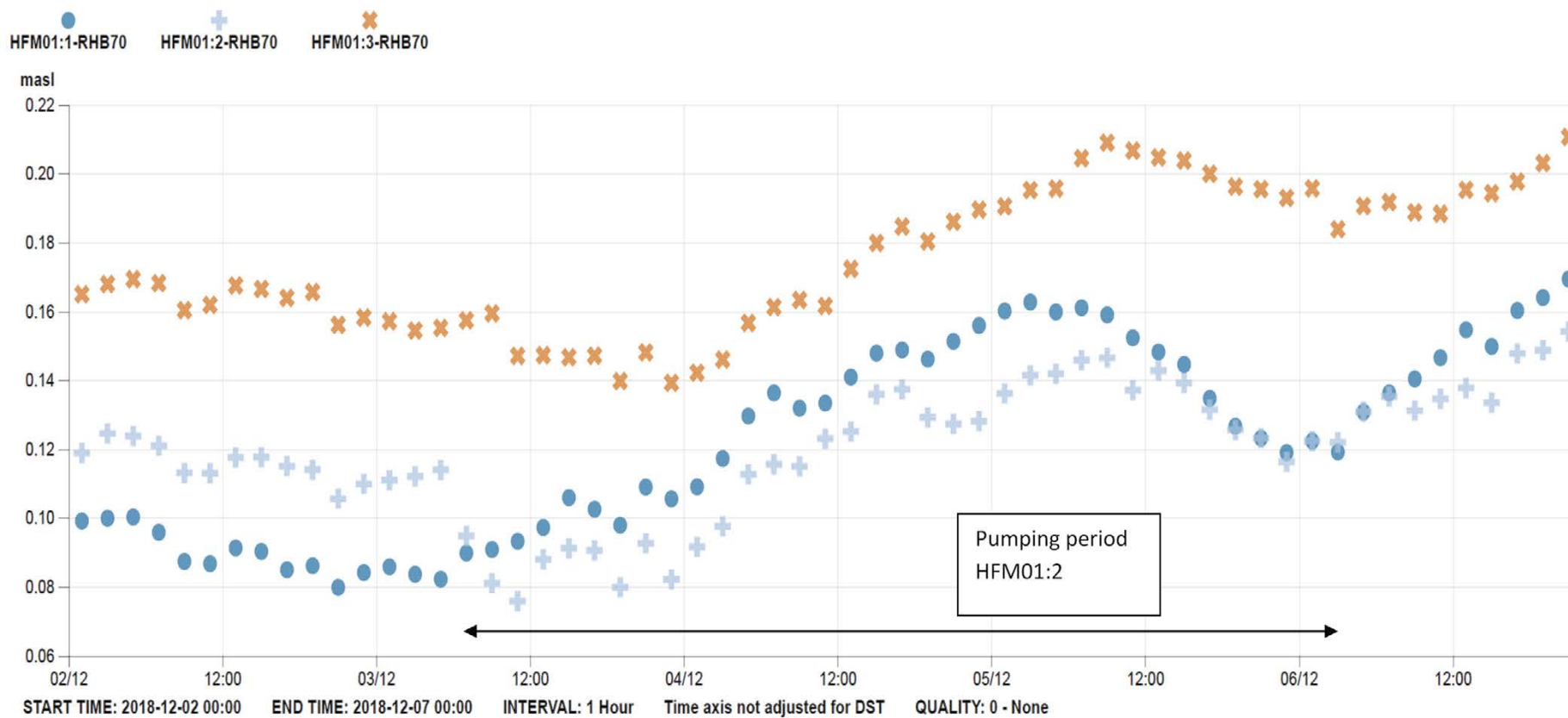


Figure A4-34. Pumping and drawdown in HFM01:2 in December 2018. A possible pressure response was observed in section HFM01:3.

Data from 2018

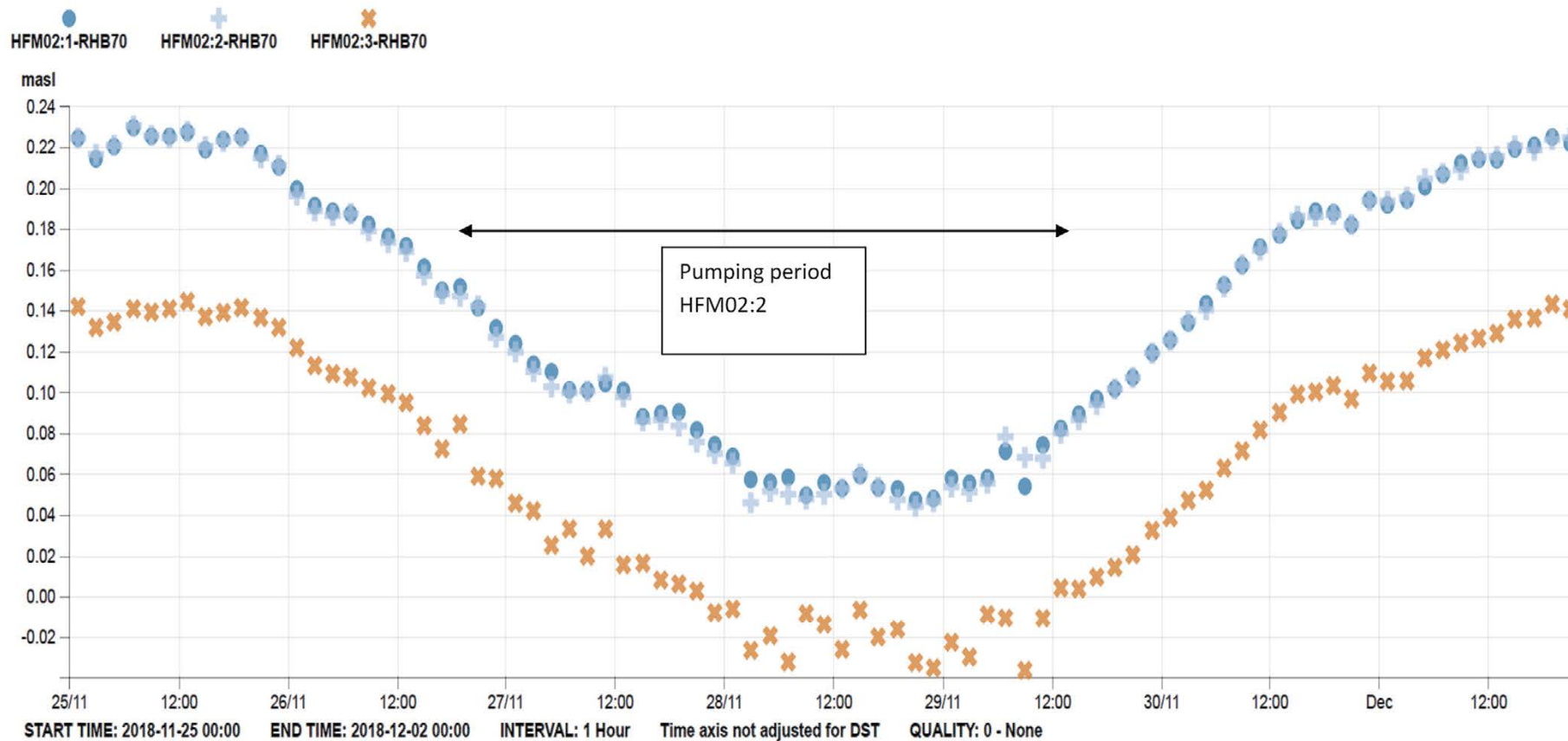


Figure A4-35. Pumping in HFM02:2 in November 2018. No significant drawdown was observed in any of the borehole sections.

Data from 2018

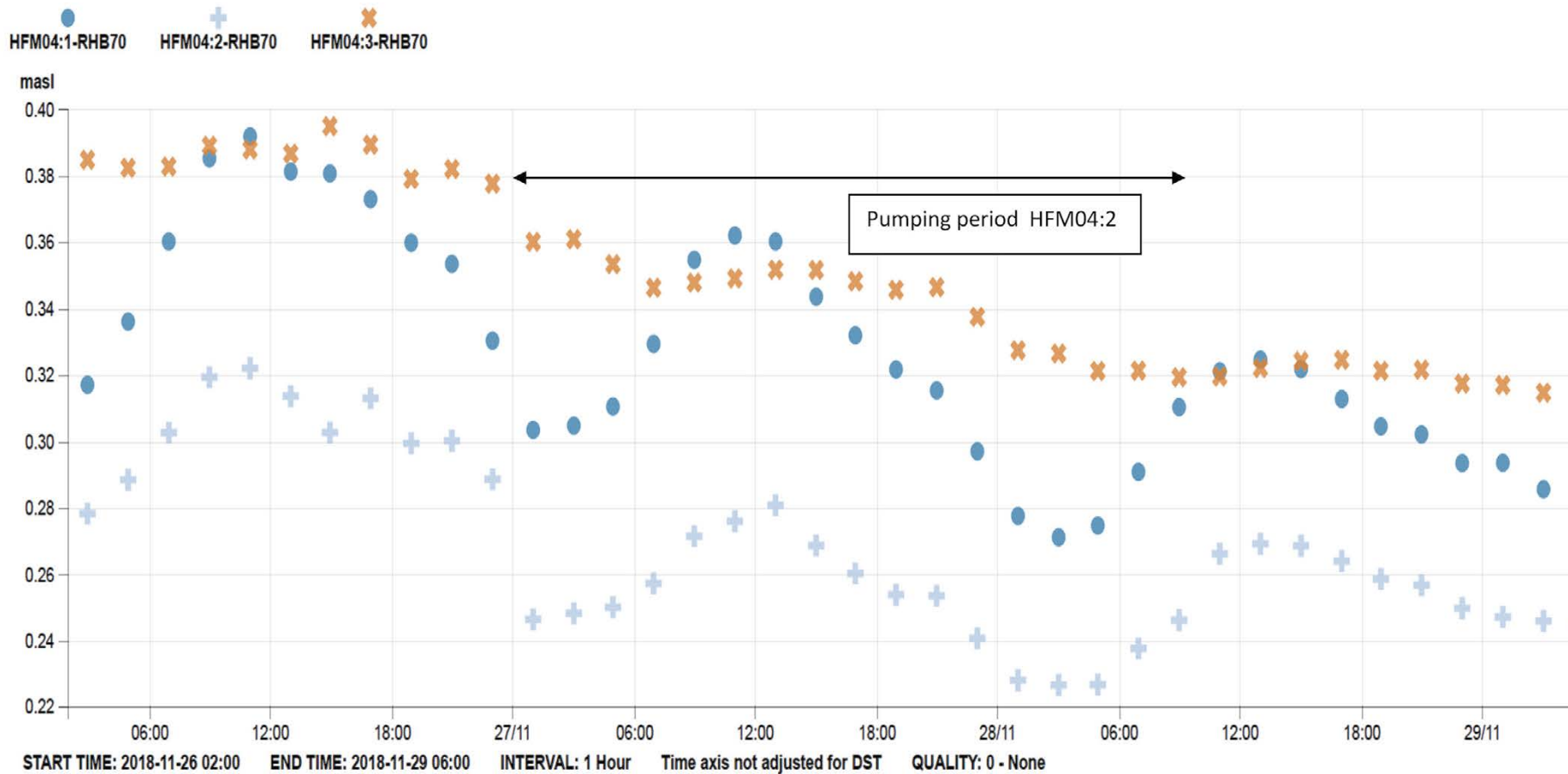


Figure A4-36. Pumping in HFM04:2 in November 2018. No significant drawdown was seen in any section at pump start.

Data from 2018

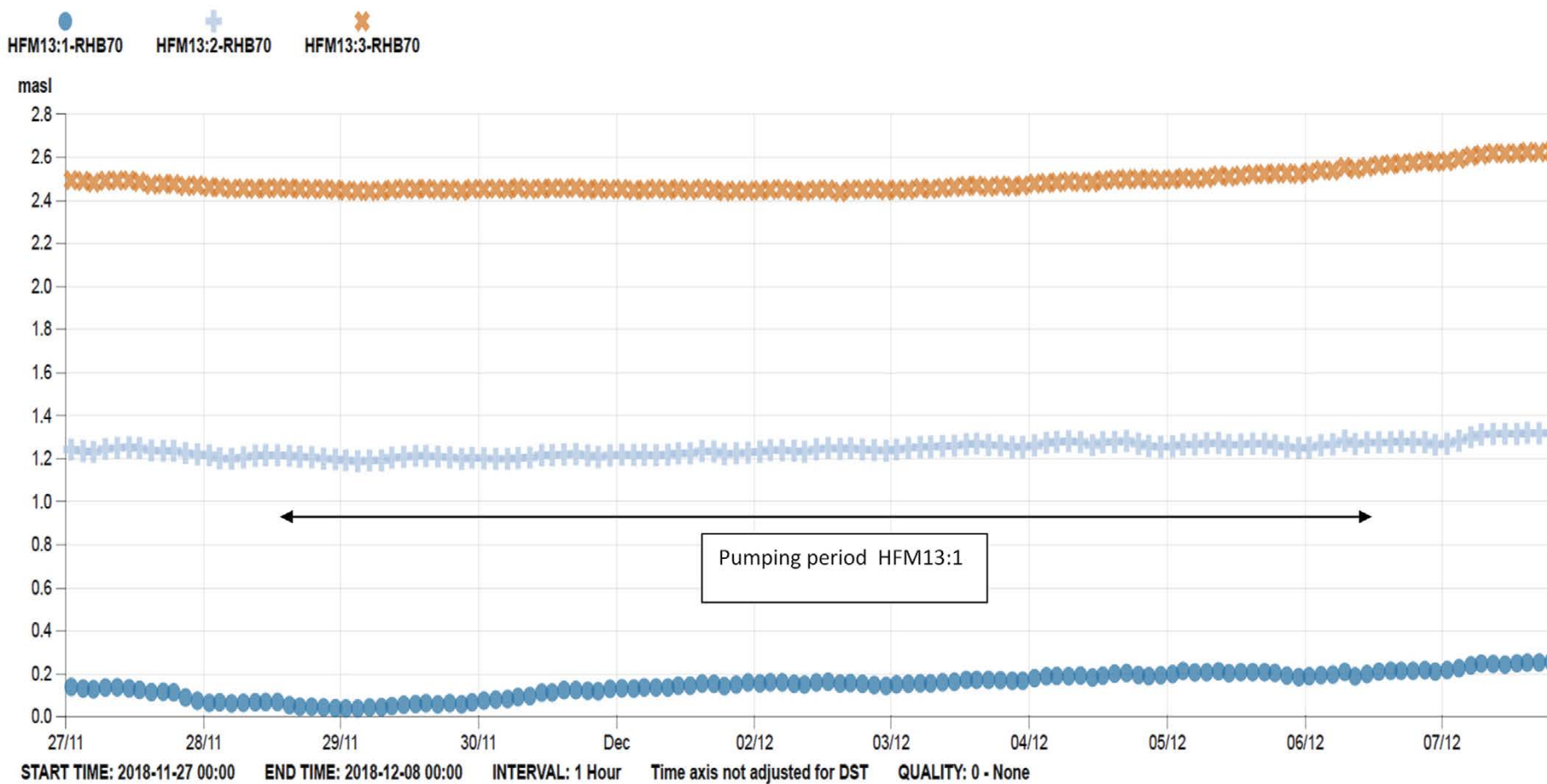


Figure A4-37. Pumping in HFM13:1 in November and December 2018. No significant drawdown was seen in any section at pump start.

Data from 2018

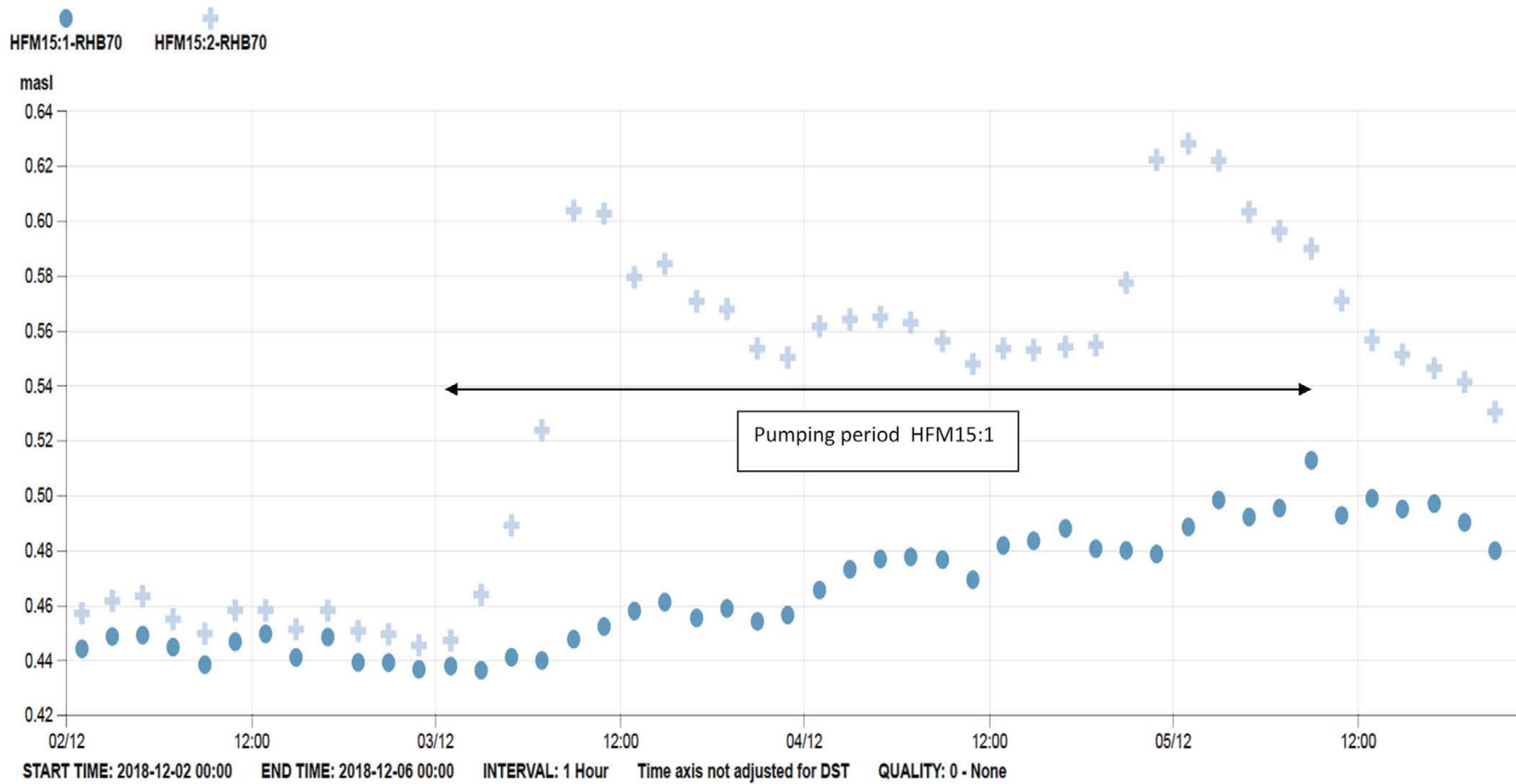


Figure A4-38. Pumping in HFM15:1 during December 2018. An pressure increase in HFM15:2 occurs during pumping of HFM15:1.

Data from 2018

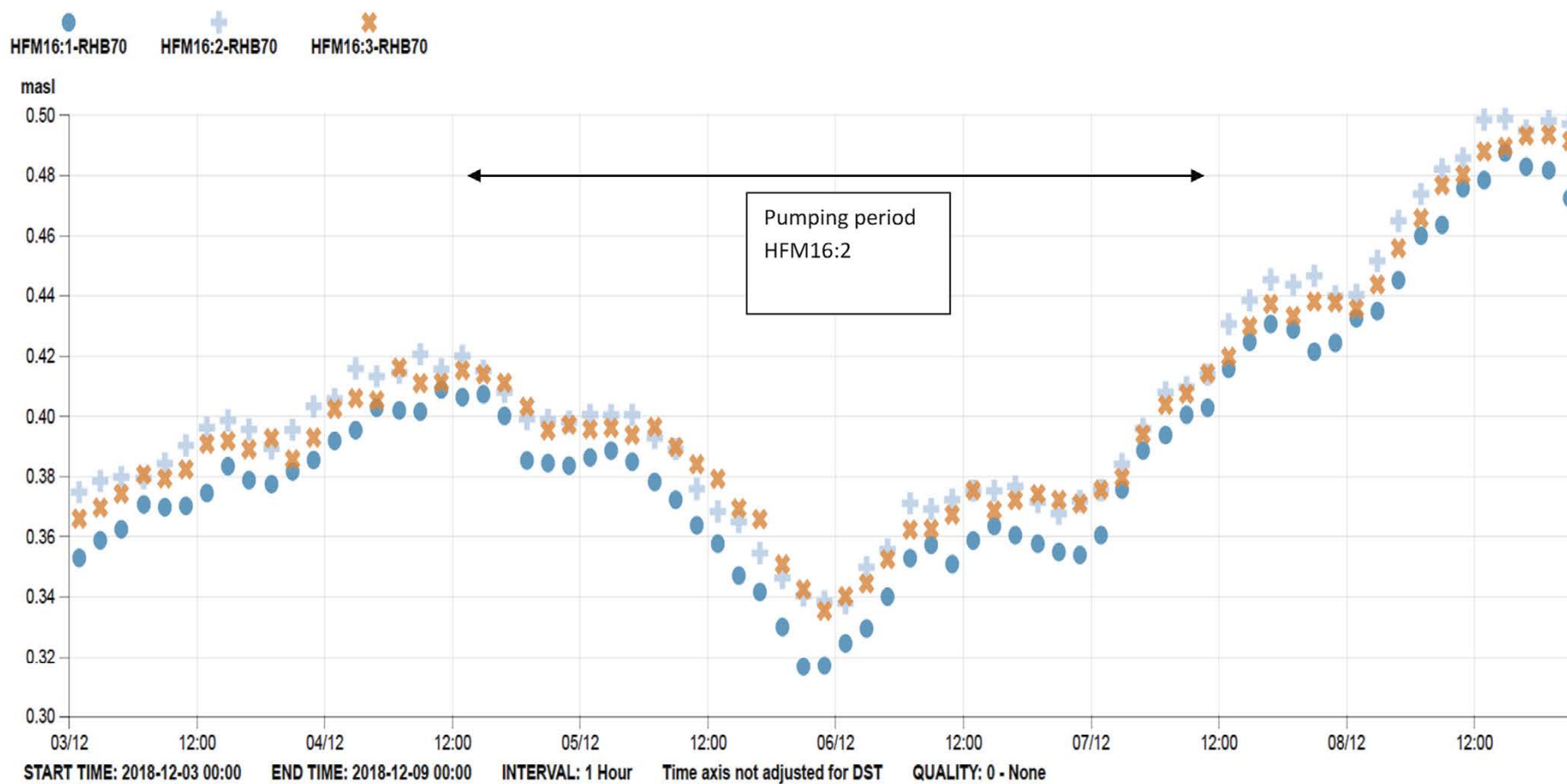


Figure A4-39. Pumping in HFM16:2 in December 2018. No significant drawdown was seen in any section at pump start.

Data from 2018

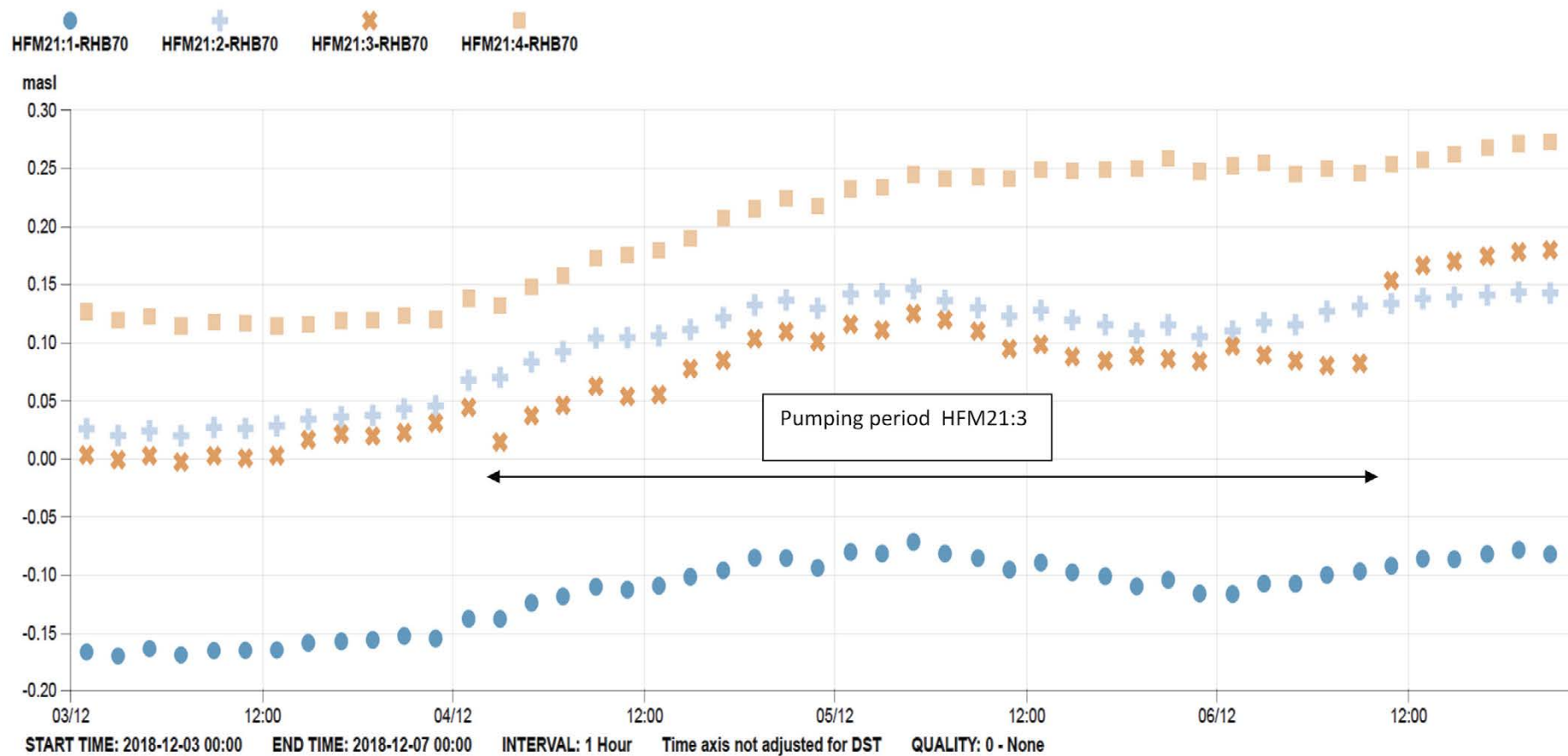


Figure A4-40. Pumping in HFM21:1 in December 2018. No significant drawdown was observed in any of the borehole sections.

Data from 2018

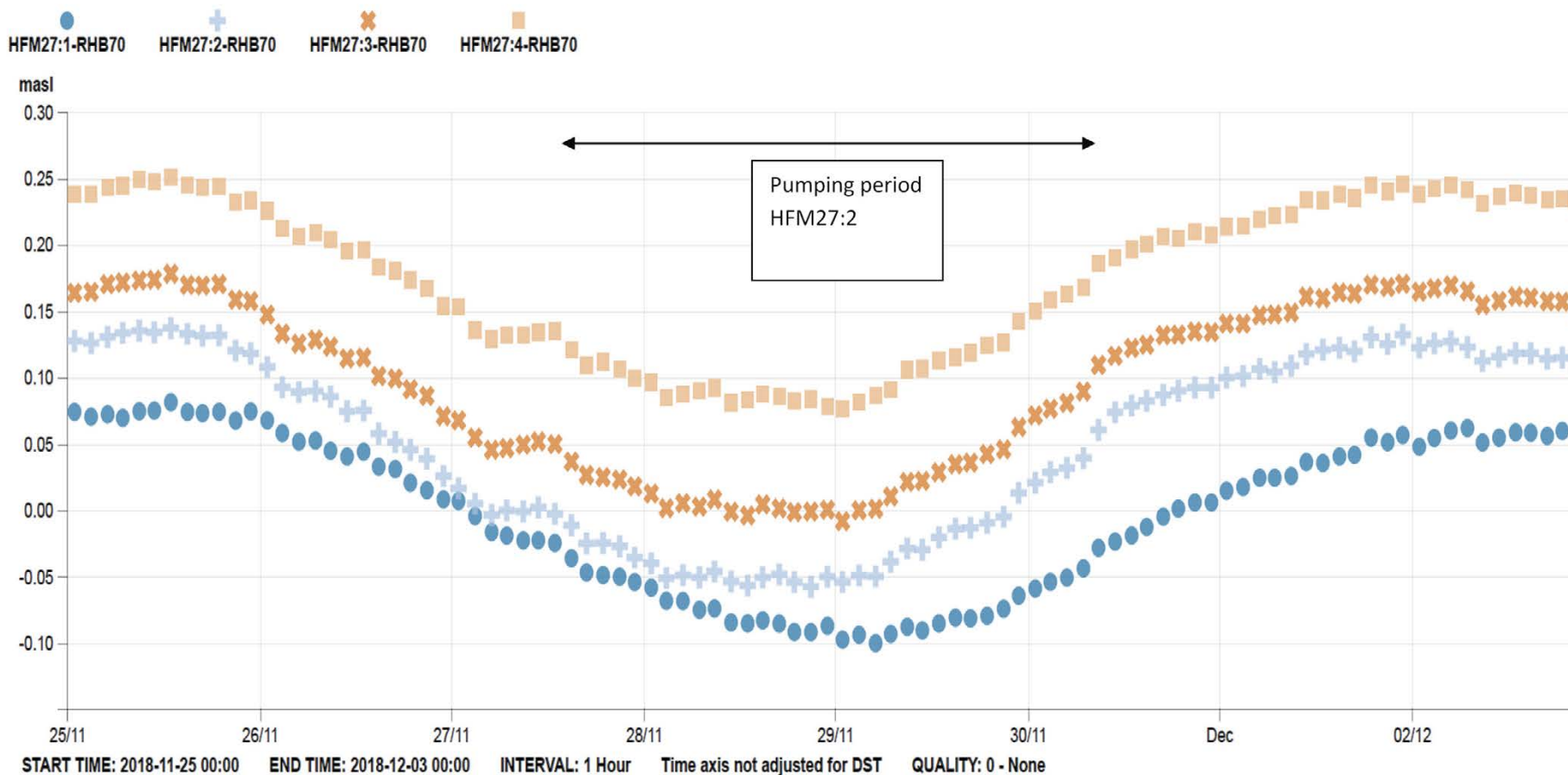


Figure A4-41. Pumping in HFM27:2 in November 2018. No significant drawdown was observed in any of the borehole sections.

Data from 2018

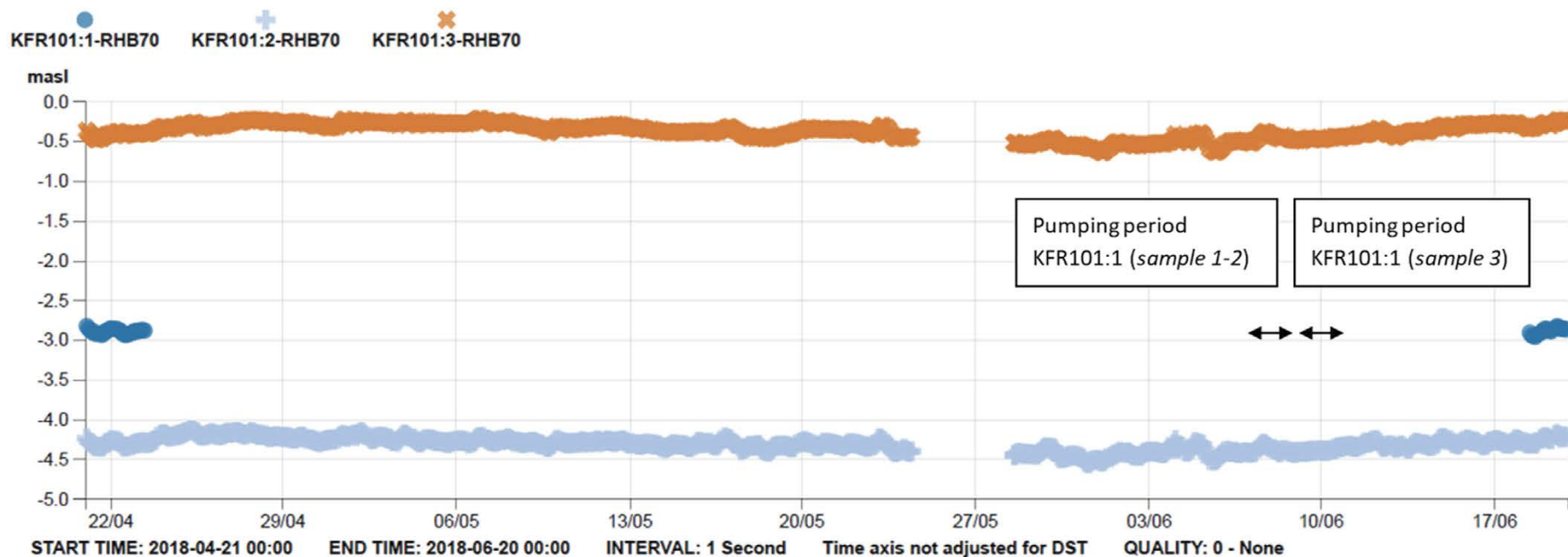


Figure A4-42. Pumping in KFR101:1 in June 2018. The pressure transducer in KFR101:1 was lifted during the pumping. No significant drawdown was noted in any other section. A pump stop occurred between second and third sample.

Data from 2018

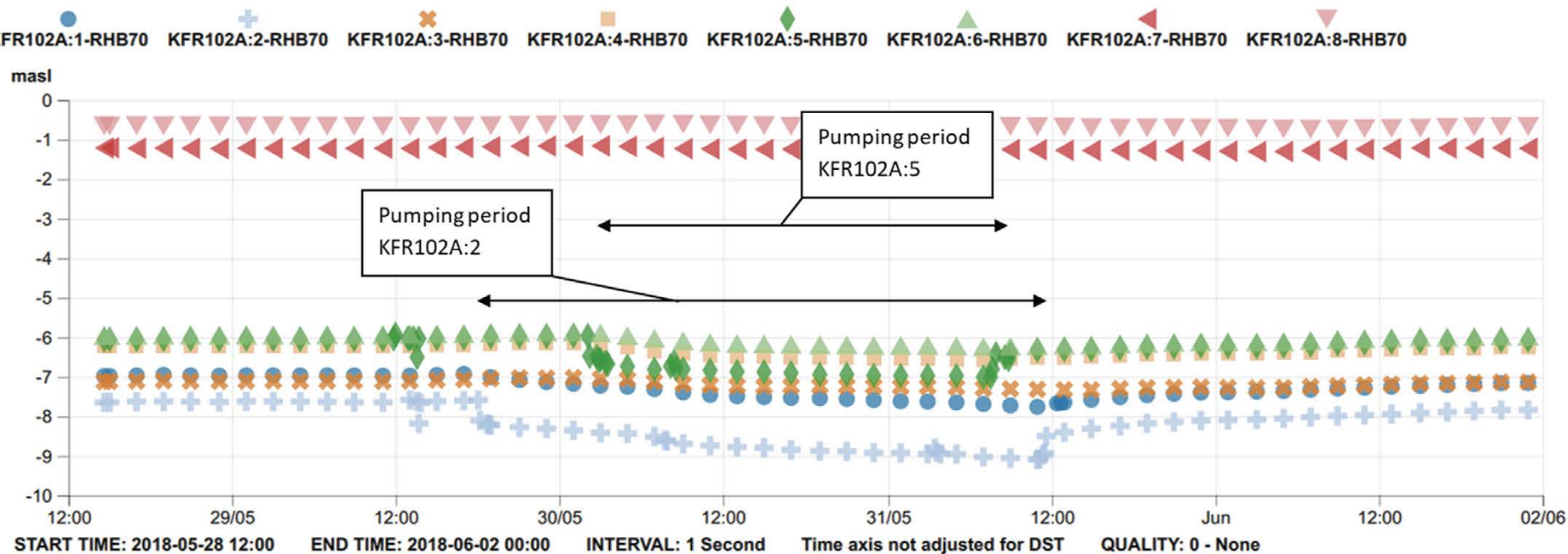


Figure A4-43. Pumping and drawdown in KFR102A:2 and KFR102A:5 in June 2018. A clear response in KFR102A:1 was observed during pumping in KFR102A:2. A response in KFR102A:4 and KFR 102A:6 was observed during pumping in KFR102A:5. A response in KFR102A:3 cannot be excluded during pumping in KFR102A:5.

Data from 2018

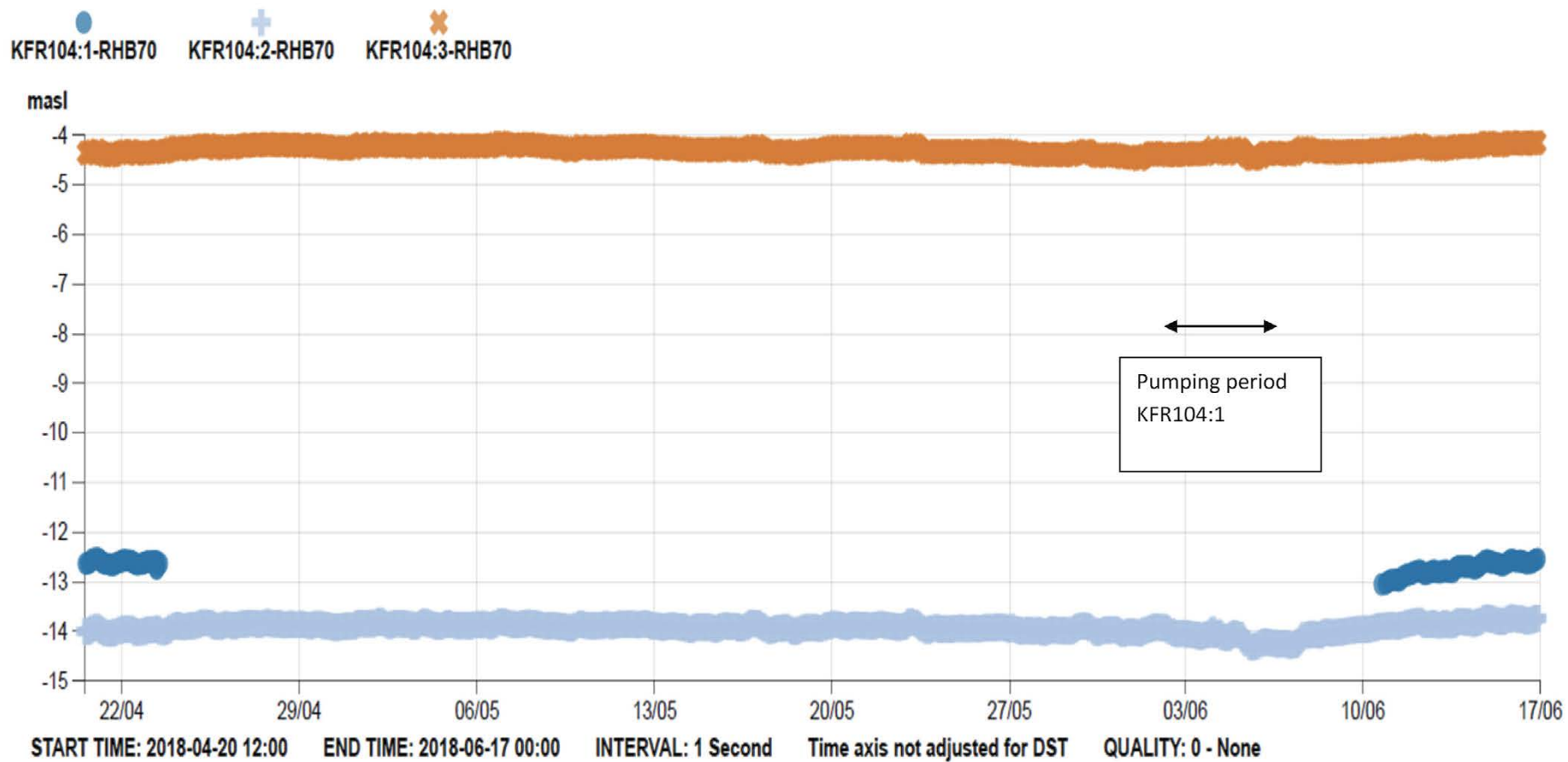


Figure A4-44. Pumping in KFR104:1 in June 2018. The pressure transducer in KFR104:1 was lifted during the pumping. A possible response cannot be excluded in section KFR104:2.

Data from 2018

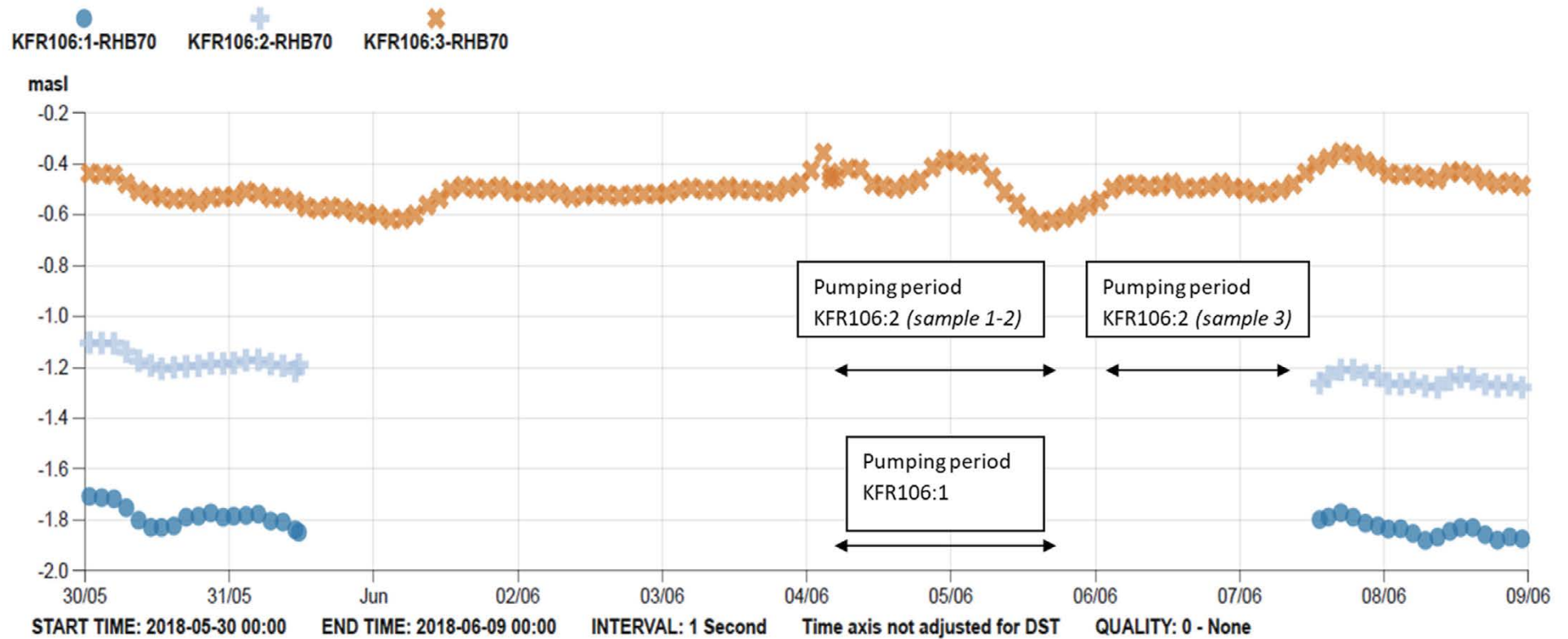


Figure A4-45. Pumping in KFR106:1 and KFR106:2 in June 2018. The pressure transducers in the pumped sections were lifted during the pumping. KFR106:3 was not affected. A pump stop occurred between second and third sample in KFR106:2.

Data from 2018

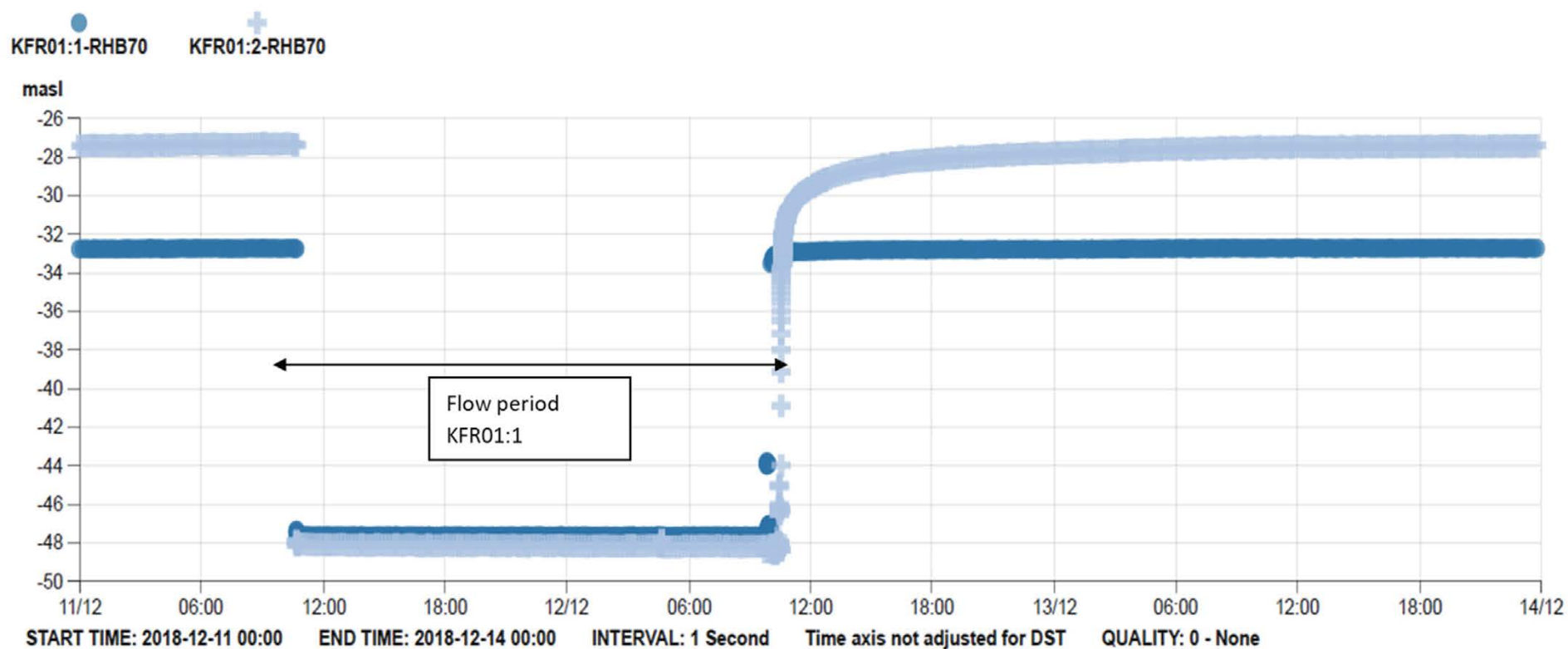


Figure A4-46. Flow period in KFR01:1 in December 2018. KFR01:2 was sampled parallel to KFR01:1 and the pressure valves was opened to both sections.

Data from 2019

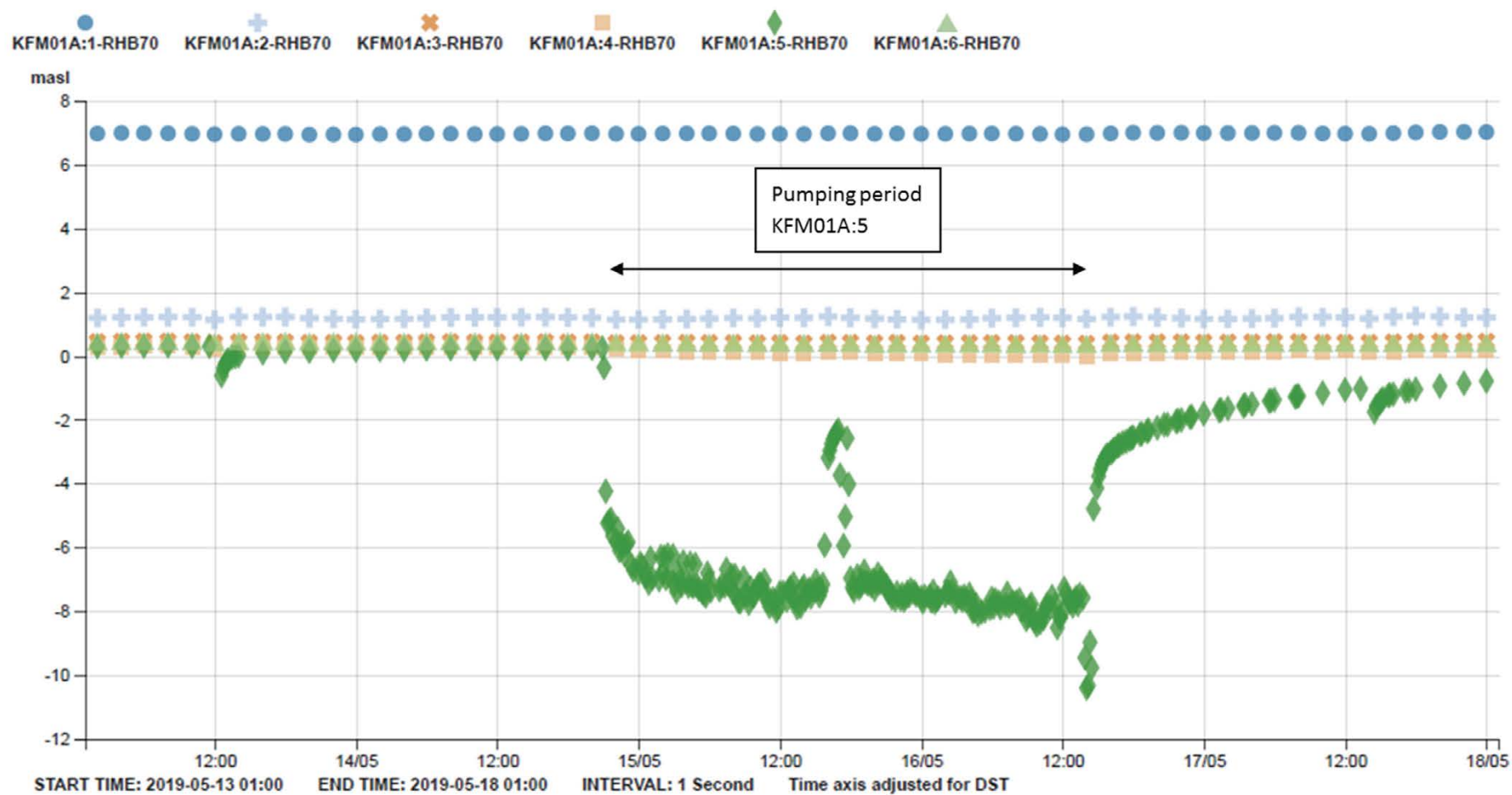


Figure A4-47. Pumping and drawdown in KFM01A:5 in May 2019. A response was observed in section KFM01A:4. See next figure for a more detailed plot .

Figure A4-48. Detailed plot of pumping and drawdown in KFM01A:5 in May 2019. The pumping in KFM01A:5 causes a drawdown in KFM01A:4.

Data from 2019

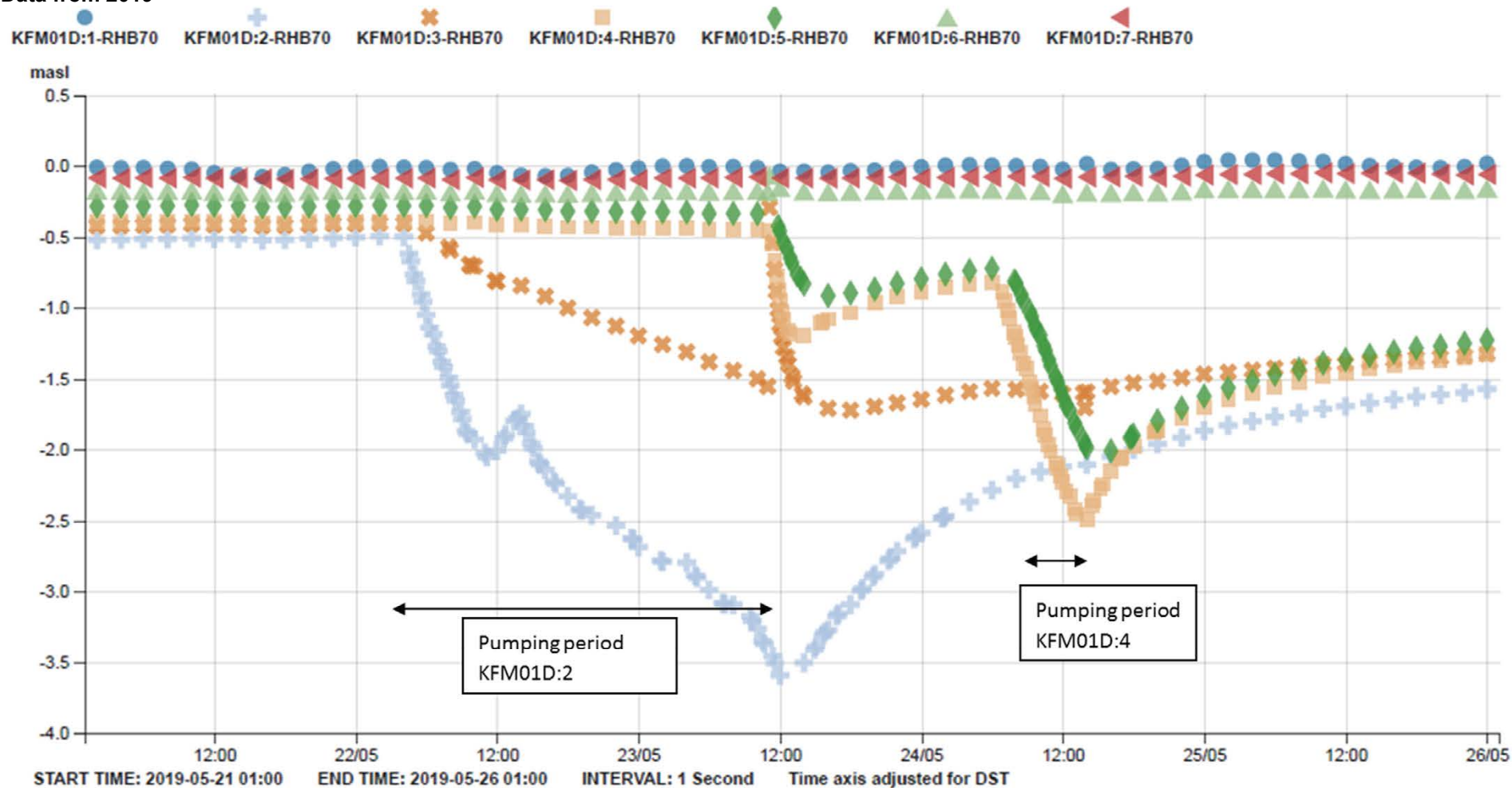


Figure A4-49. Pumping and drawdown in KFM01D:2 in May 2019 and in KFM01D:4 in May 2019. Section KFM01D:3 was affected by the pumping in KFM01D:2. Section KFM01D:5 was affected by the pumping in KFM01D:4. The pressure changes 2019-05-23 in section 3-5 are due to deflating of the mini-packers.

Data from 2019

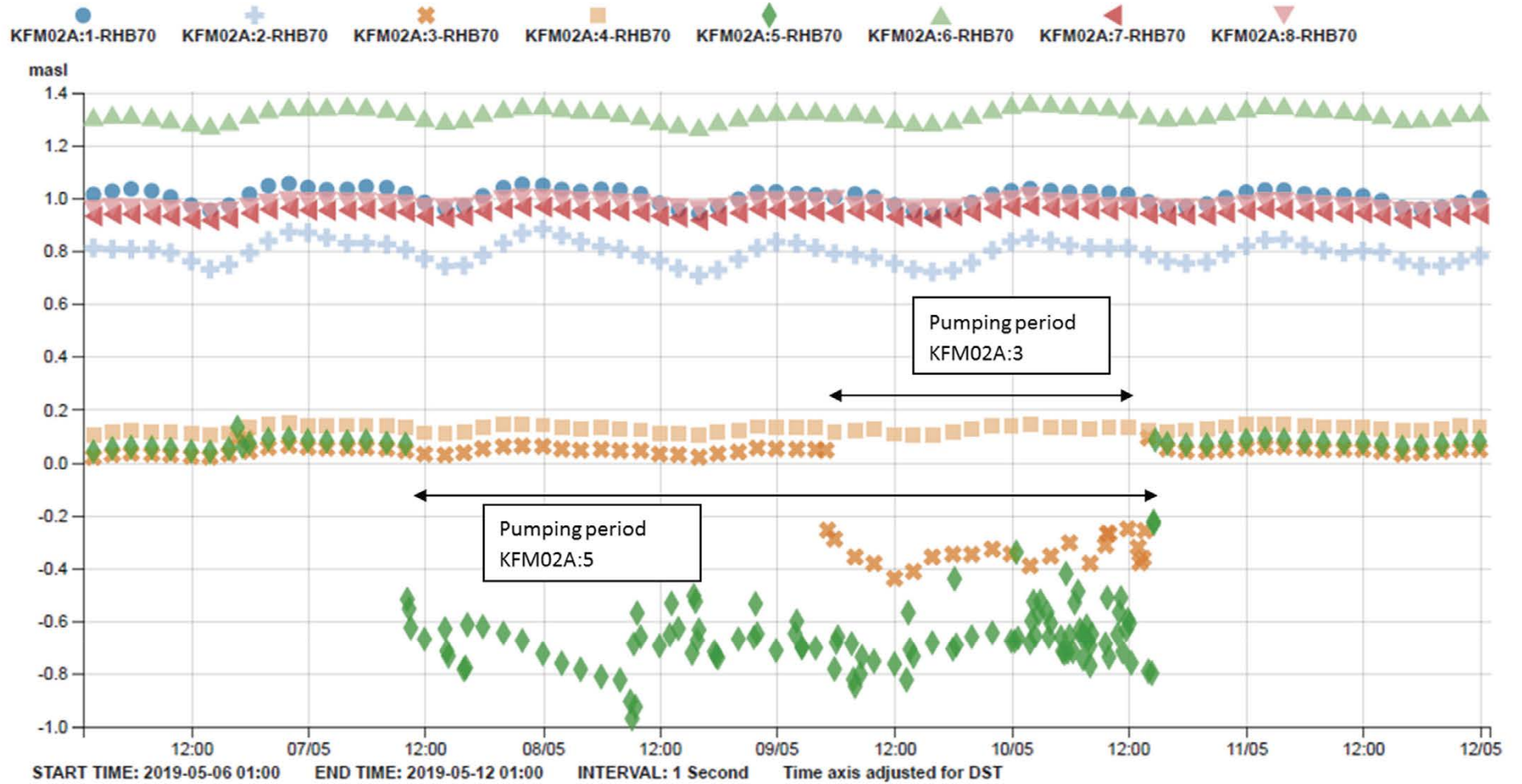


Figure A4-50. Pumping and drawdown in KFM02A:5 and KFM02A:3 in May 2019. No other sections were affected.

Data from 2019

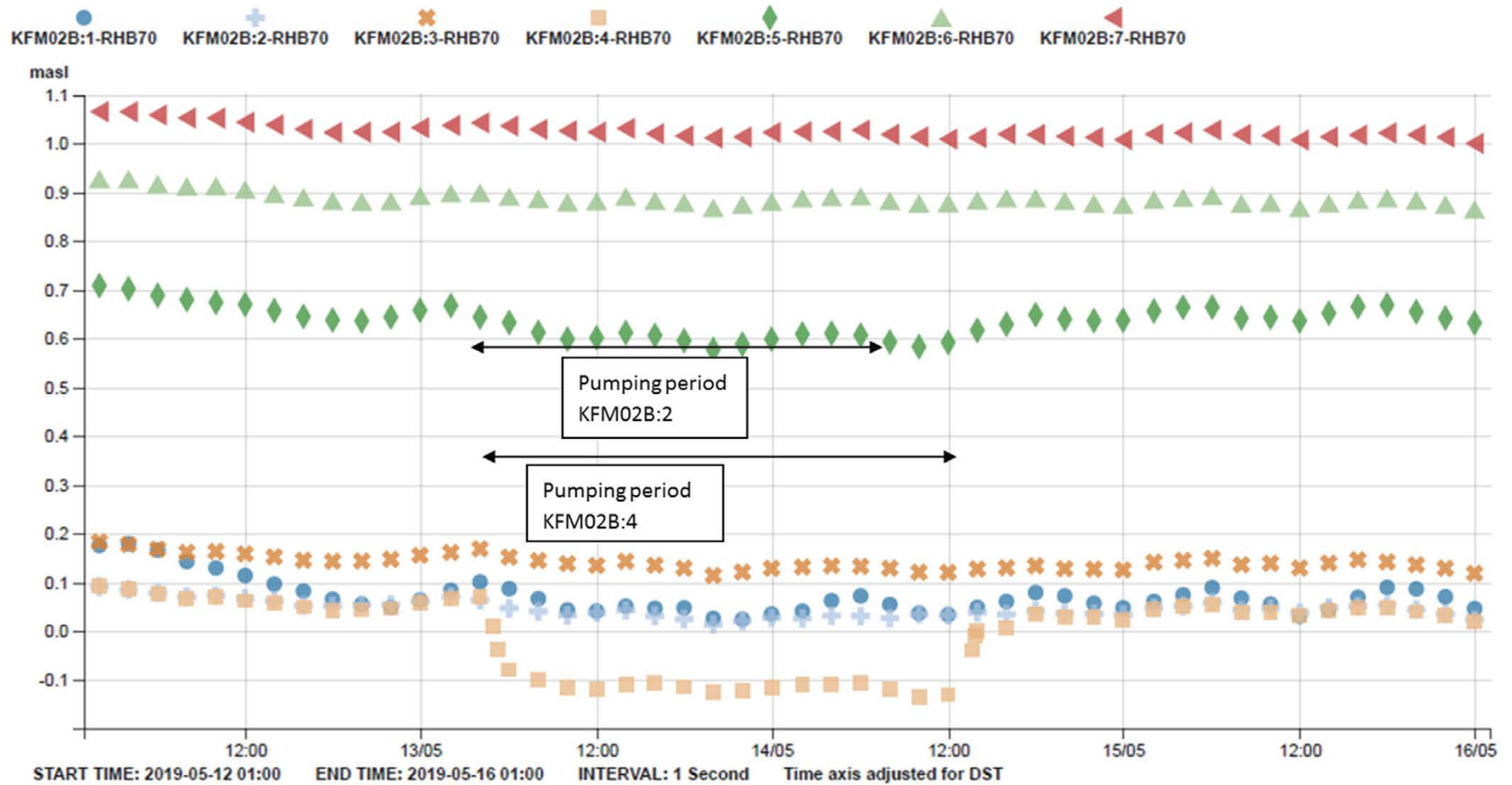


Figure A4-51. Pumping and drawdown in KFM02B:4 and KFM02B:2 in May 2019. No other sections were affected.

Data from 2019

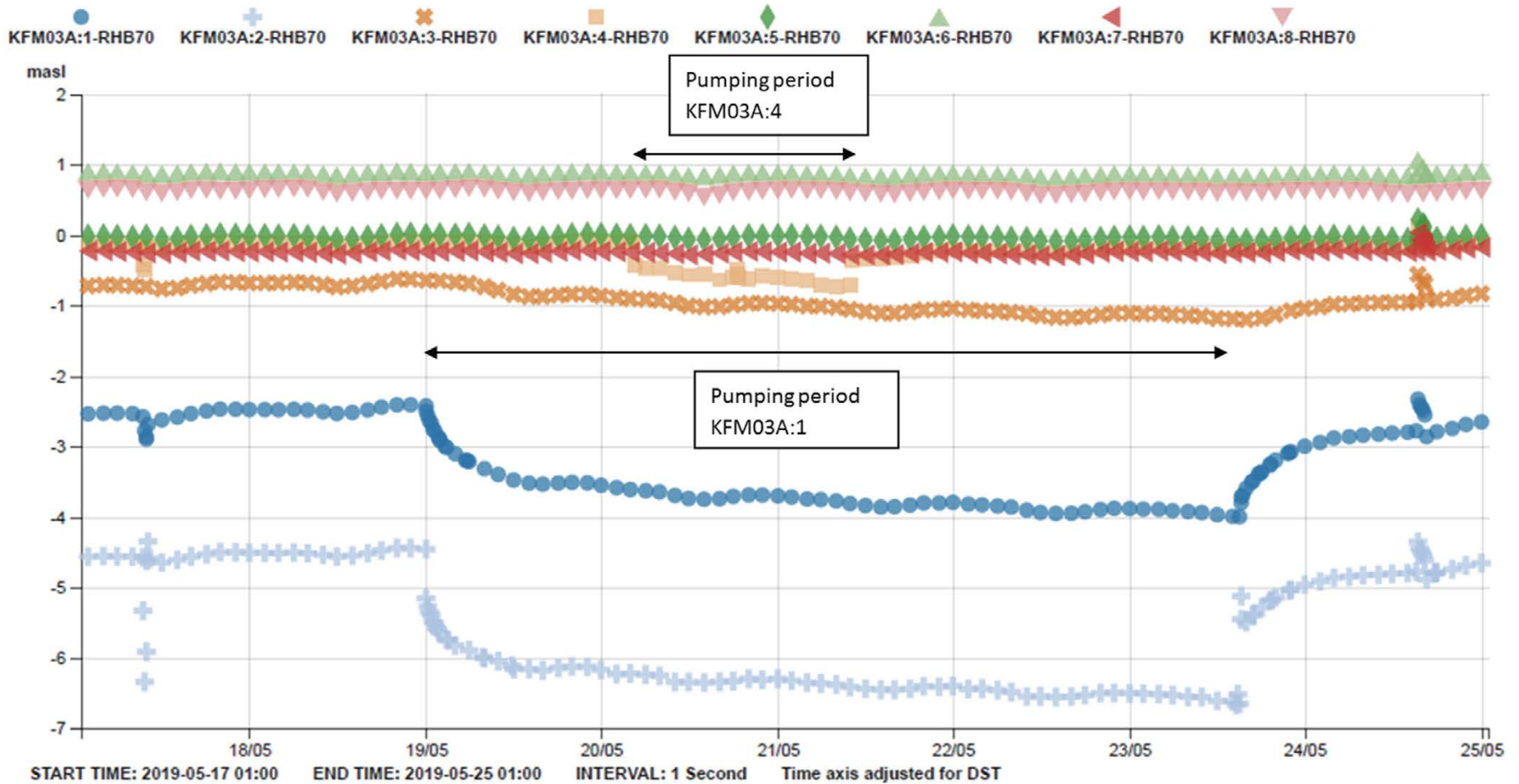


Figure A4-52. Pumping and drawdown in KFM03A:1 in May 2019. The pressure response observed in KFM03A:2 during pumping in KFM03A:1 may be caused by a leaking connection in the equipment between sections KFM03A:1 and KFM03A:2 rather than a connected fracture system. A small response was also seen in KFM03A:3. KFM03A:4 was pumped and sample during a period in the middle. Due to mistake in the sample planning, uranium sample was missed in spring. Pumping and sampling in KFM03A:4 was repeated during the autumn, see figure Figure A4-53.

Data from 2019

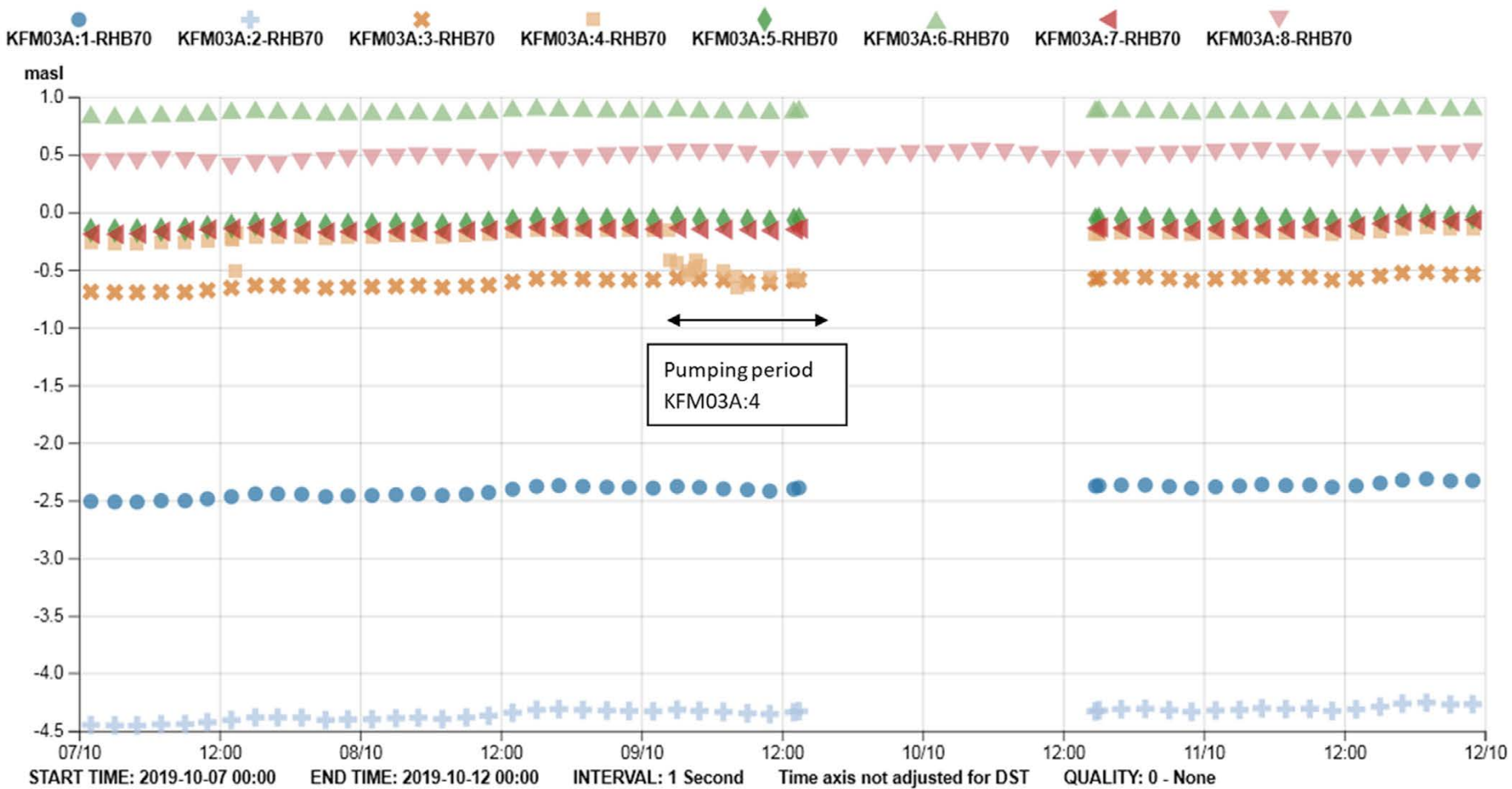


Figure A4-53. Pumping and drawdown in KFM03A:4 in October 2019. No other sections were affected. Due to problems with an electrical fuse in the data collecting system, pressure data are not available during parts of pumping period.

Data from 2019

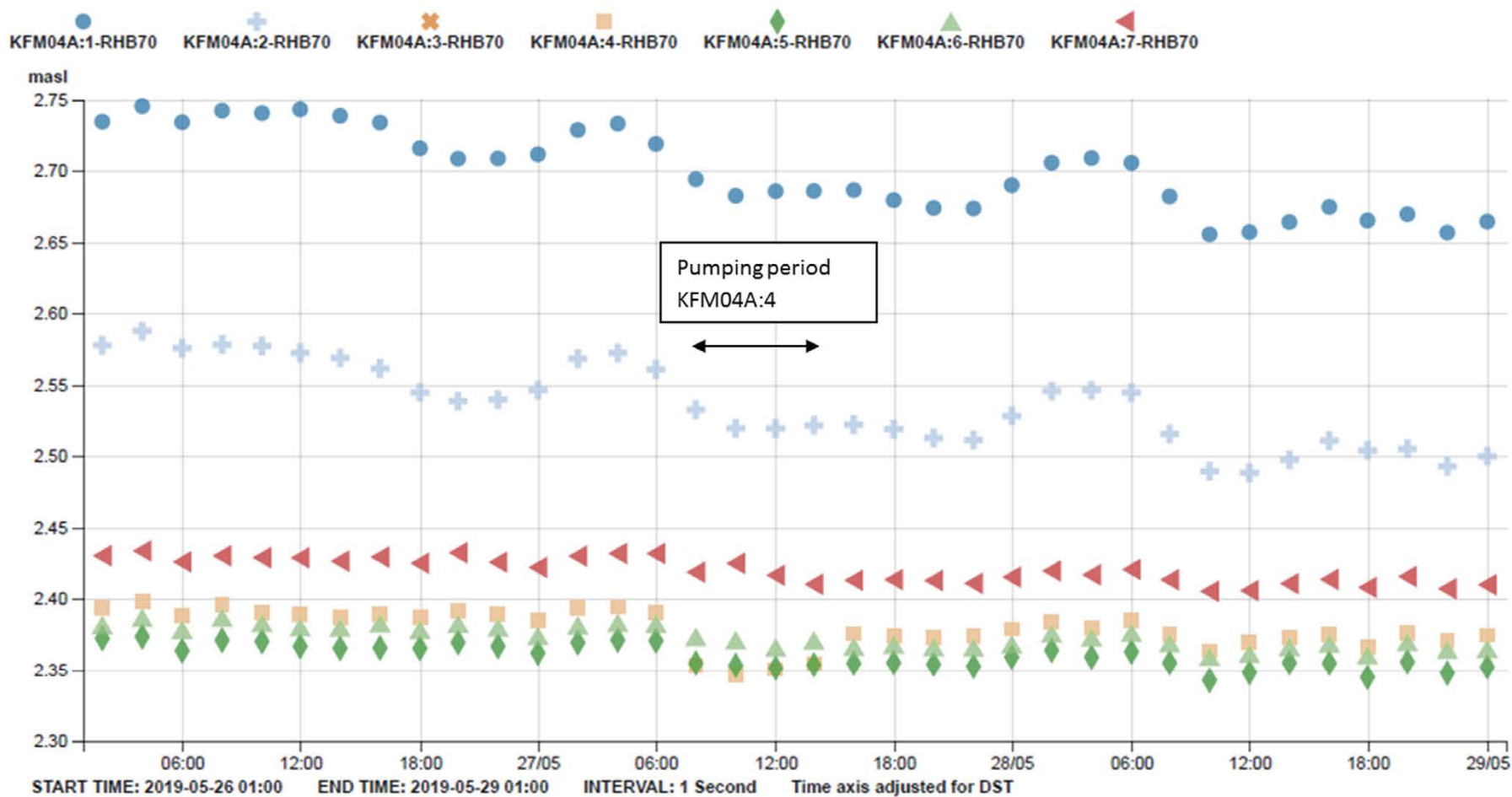


Figure A4-54. Pumping and drawdown in KFM04A:4 in May 2019. None of the other sections were significantly affected by the pumping.

Data from 2019

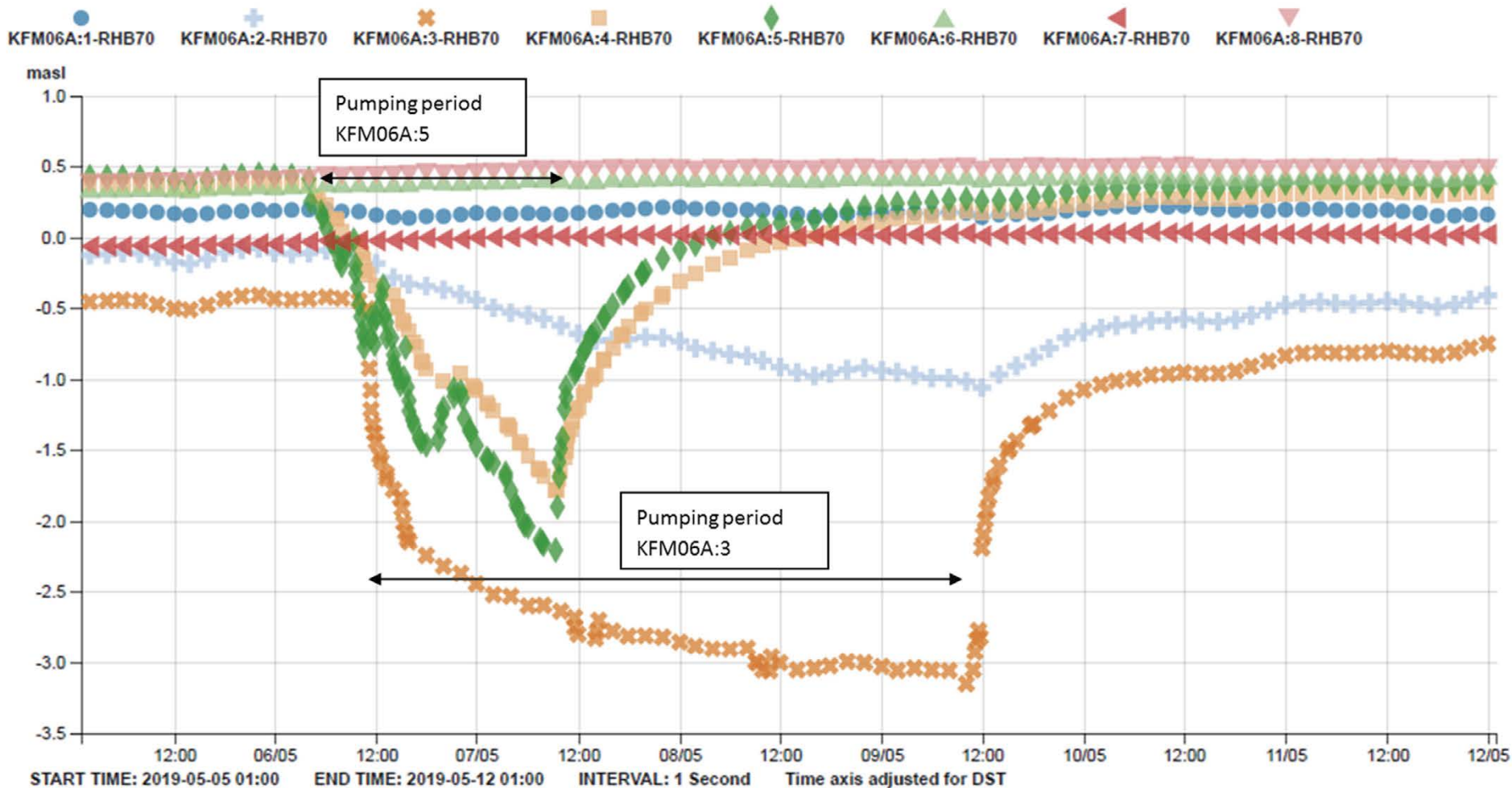


Figure A4-55. Pumping and drawdown in KFM06A:3 and KFM06A:5 in May 2019. Section KFM06A:2 was affected by the pumping in KFM06A:3. KFM06A:4 was effected by the pumping in section KFM06A:5.

Data from 2019

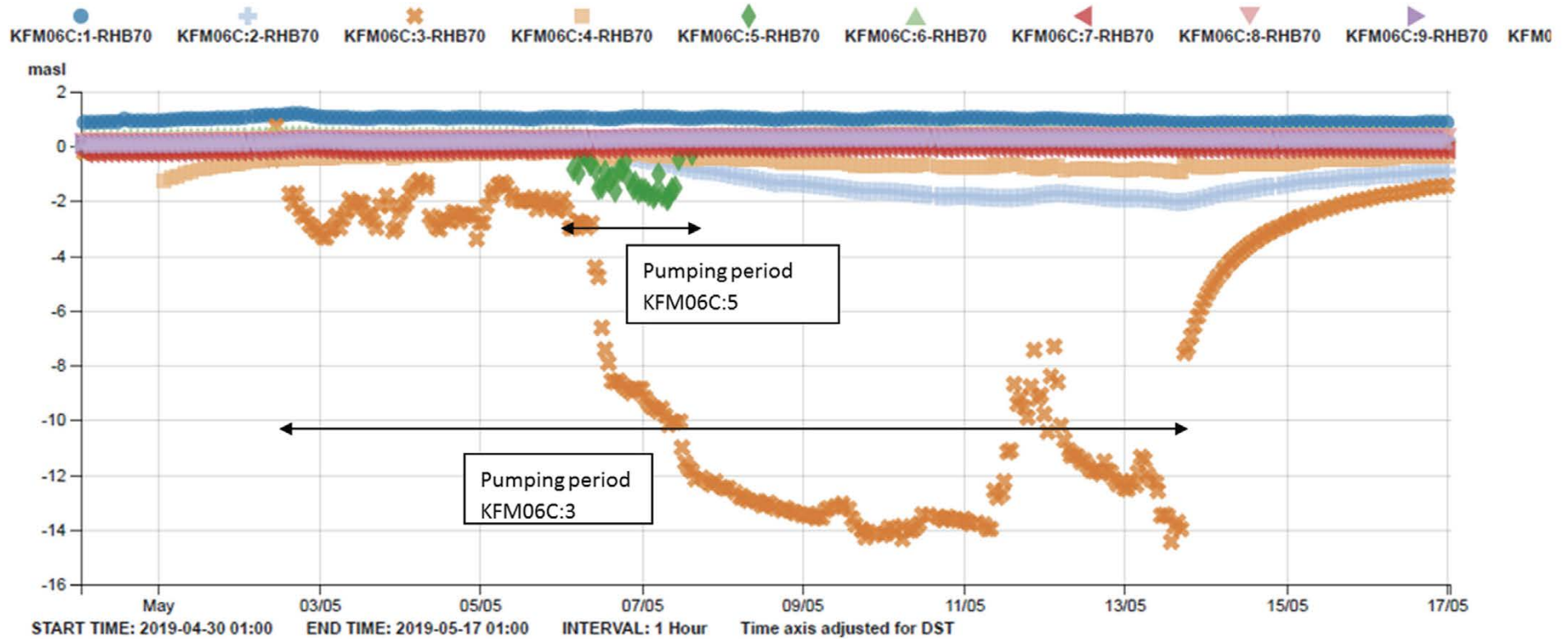


Figure A4-56. Pumping and drawdown in KFM06C:3 and KFM06C:5 in May 2019. Sections KFM06C:2 and KFM06C:4 were affected by the pumping in section KFM06C:3. The pumping in section KFM06C:5 causes a response in KFM06C:6. For a more detailed plot of the pumping in KFM06C:5, see next figure. The pumping rate in KFM06C:3 had to be adjusted several times which could be seen in the graph.

Data from 2019

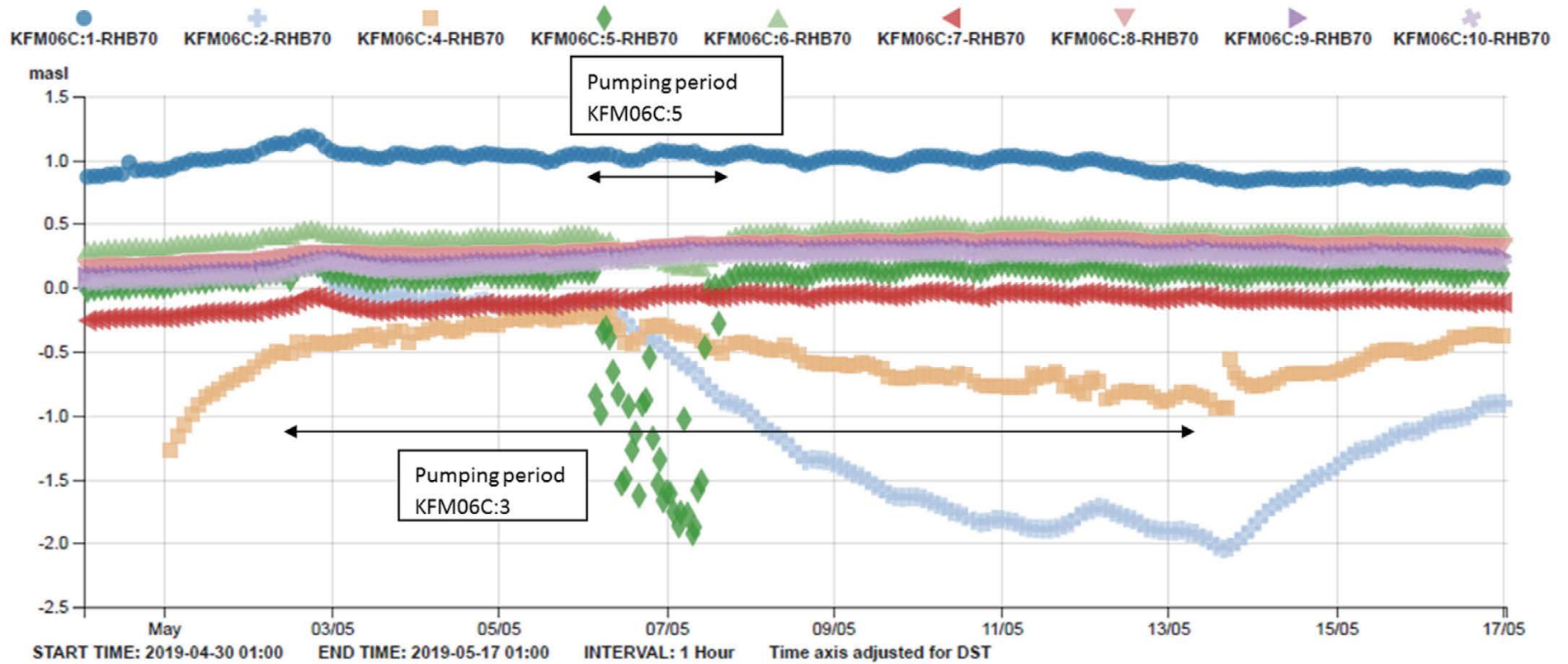


Figure A4-57. Detailed plot of pumping and drawdown in KFM06C:3 and KFM06C:5 in May 2019. The pumping in section KFM06C:5 causes a response in KFM06C:6 and KFM06C:4.

Data from 2019

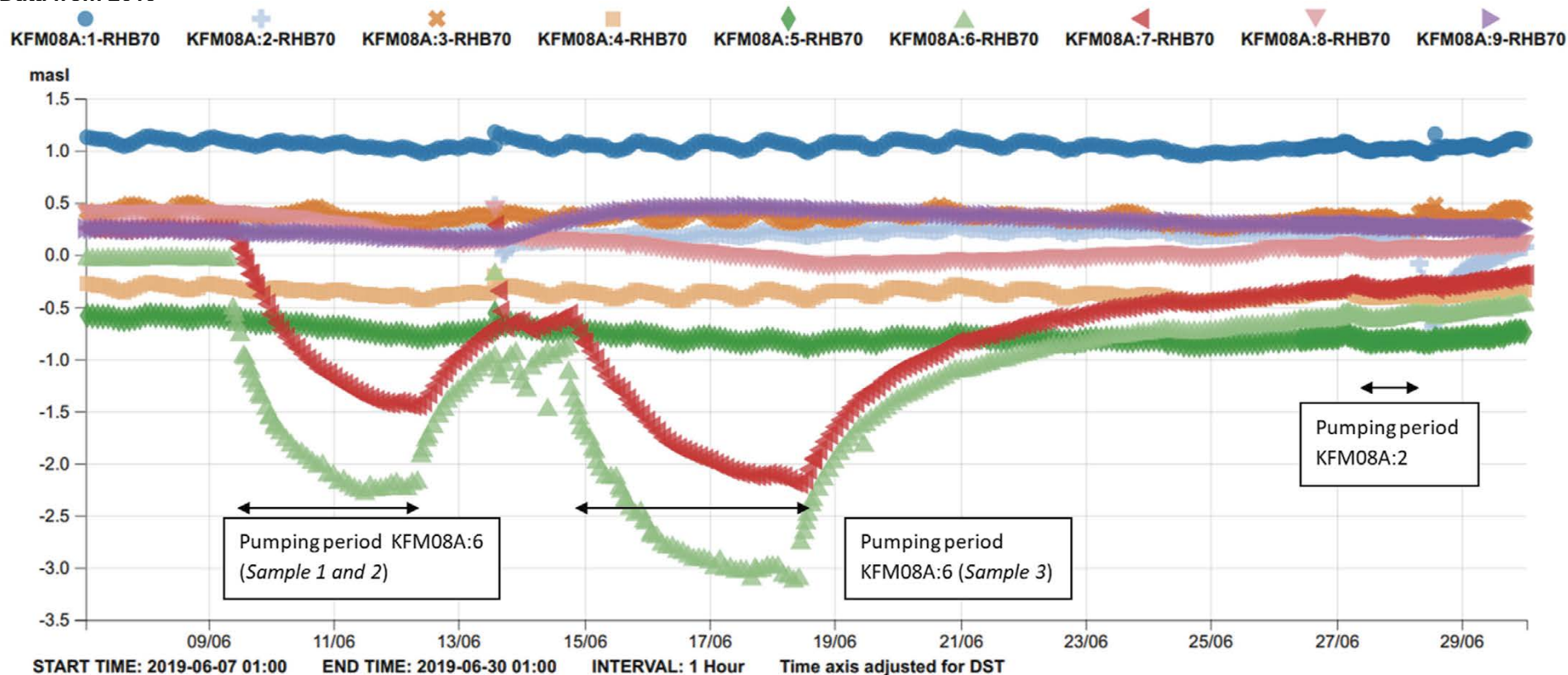


Figure A4-58. Detailed plot of pumping and drawdown in KFM08A:6 and KFM08A:2 in June 2019. The pumping in section KFM08A:6 causes a response in KFM08A:7. For a more detailed plot of the pumping in KFM08A:2, see next figure. A pumping stop occurred in KFM08A:6 between the second and the third sample.

Data from 2019

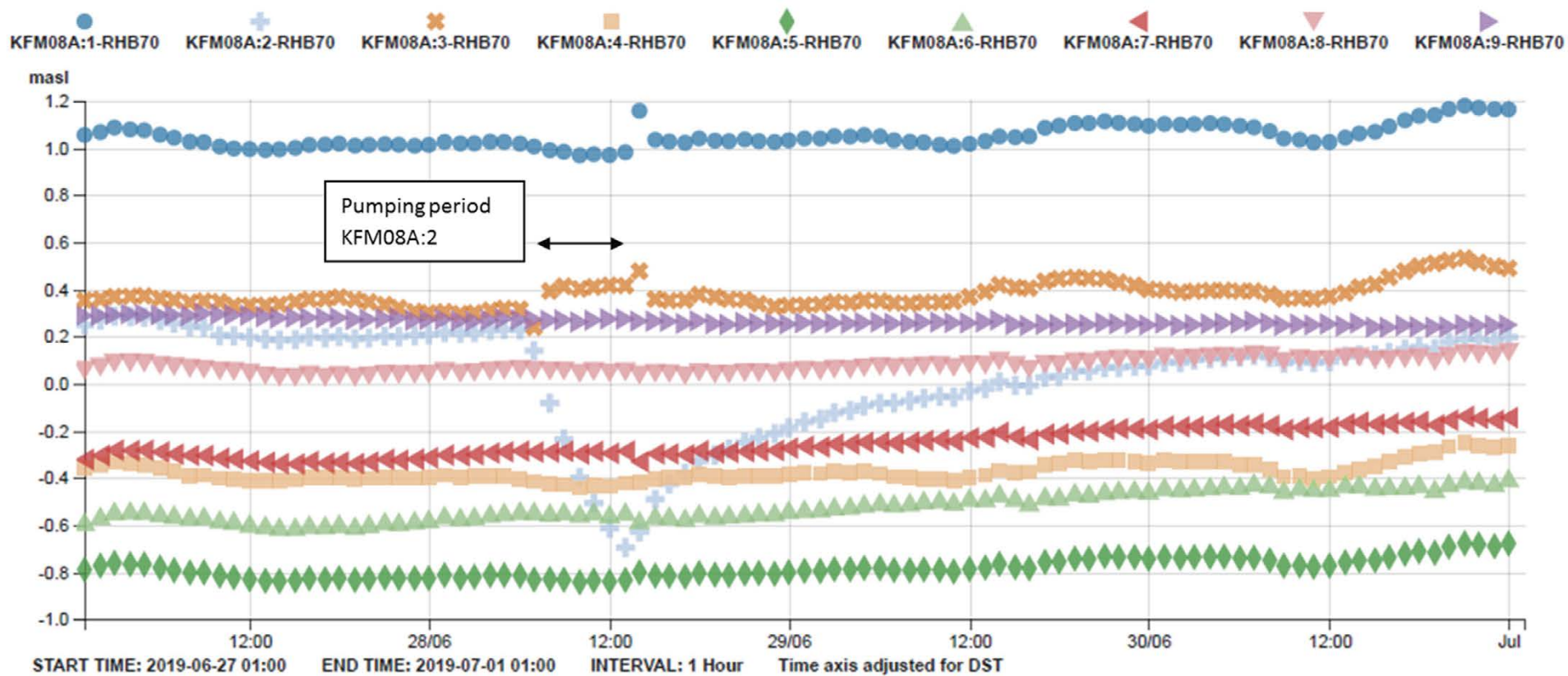


Figure A4-59. Detailed plot of pumping and drawdown in KFM08A:2 in June 2019. None of the other sections were significantly affected by the pumping.

Data from 2019

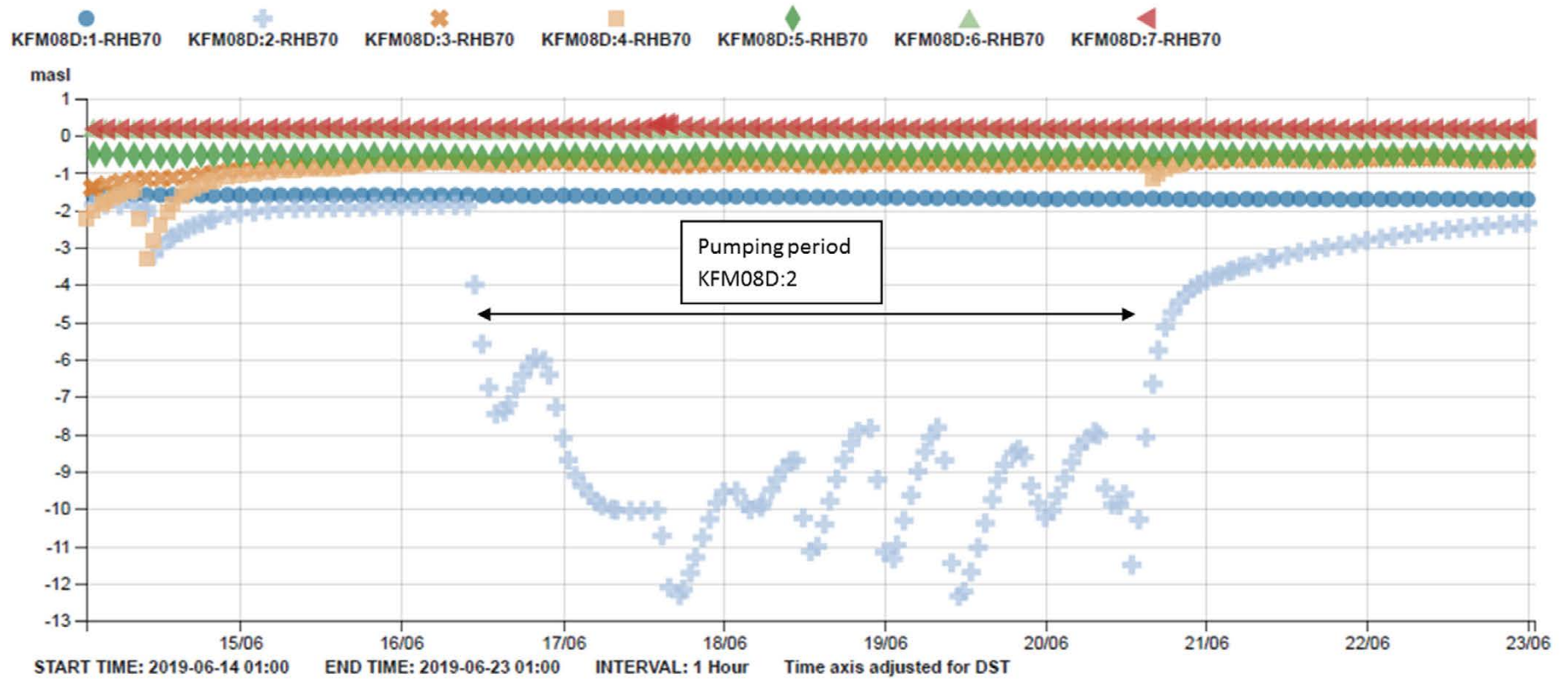


Figure A4-60. Detailed plot of pumping and drawdown in KFM08D:2 in June 2019. None of the other sections were significantly affected by the pumping. The pumping rate in KFM08D:2 had to be adjusted several times which could be seen in the graph.

Data from 2019

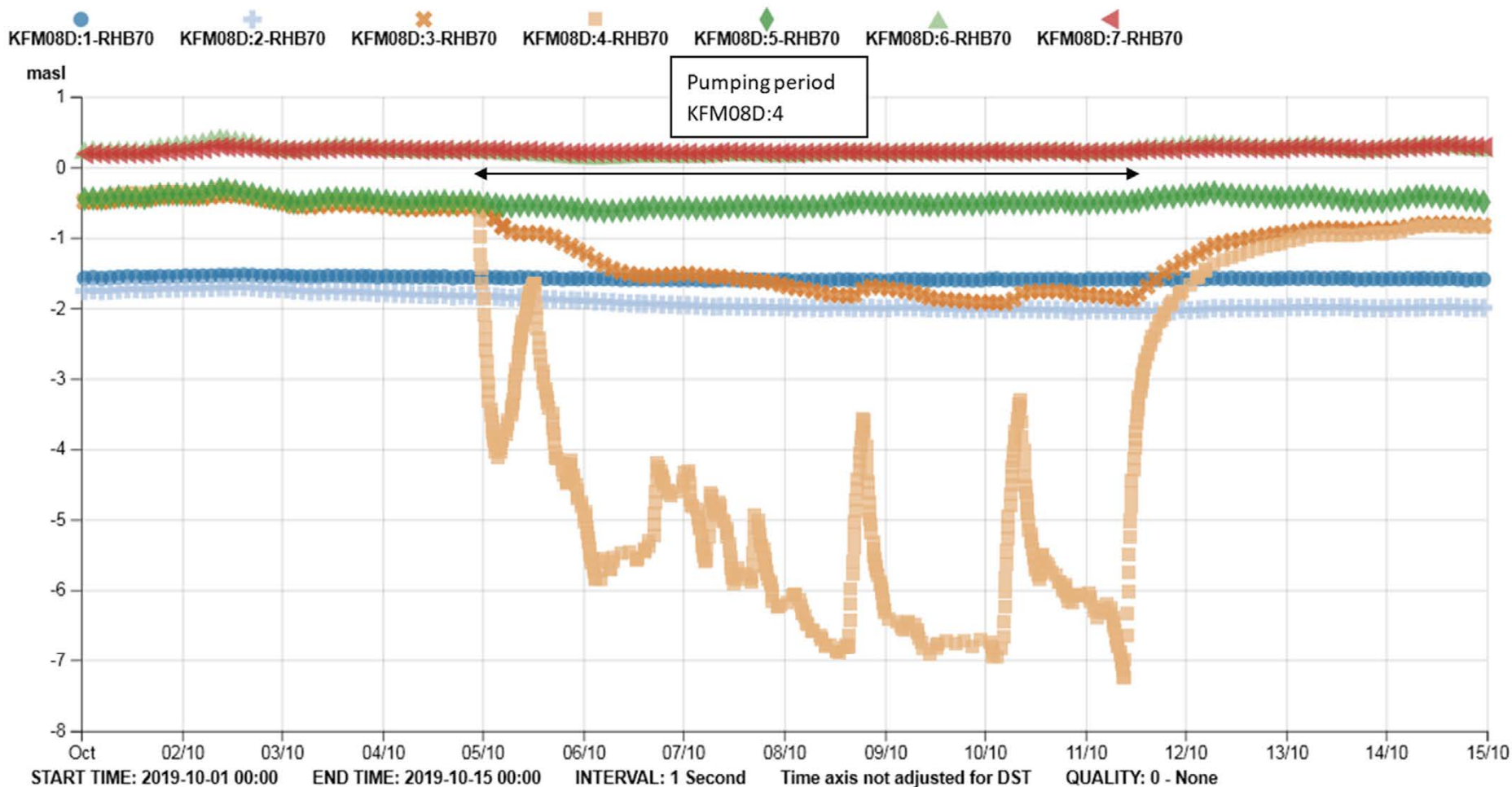


Figure A4-61. Detailed plot of pumping and drawdown in KFM08D:4 in October 2019. The pumping in section KFM08D:4 causes a response in KFM08D:3

Data from 2019

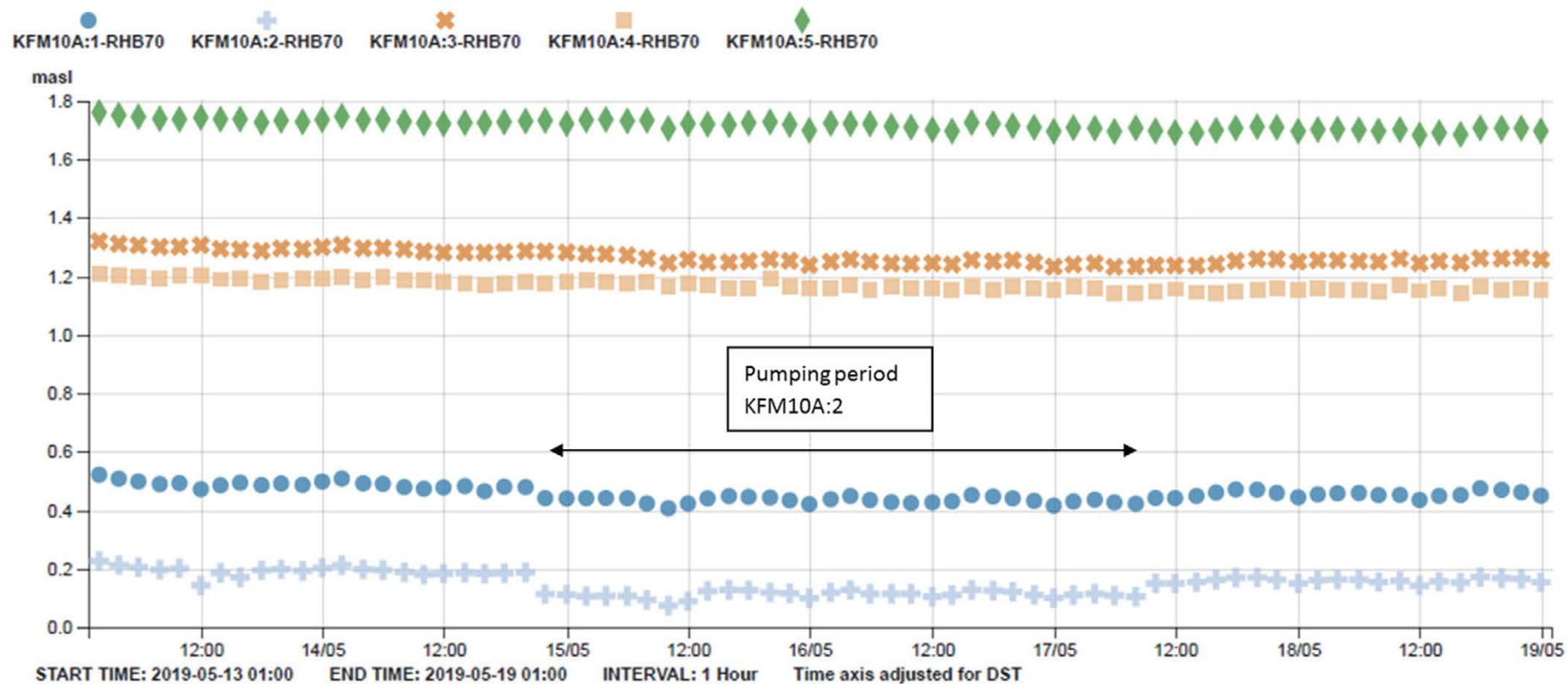


Figure A4-62. Detailed plot of pumping and drawdown in KFM10A:1 in May 2019. None of the other sections were significantly affected by the pumping.

Data from 2019

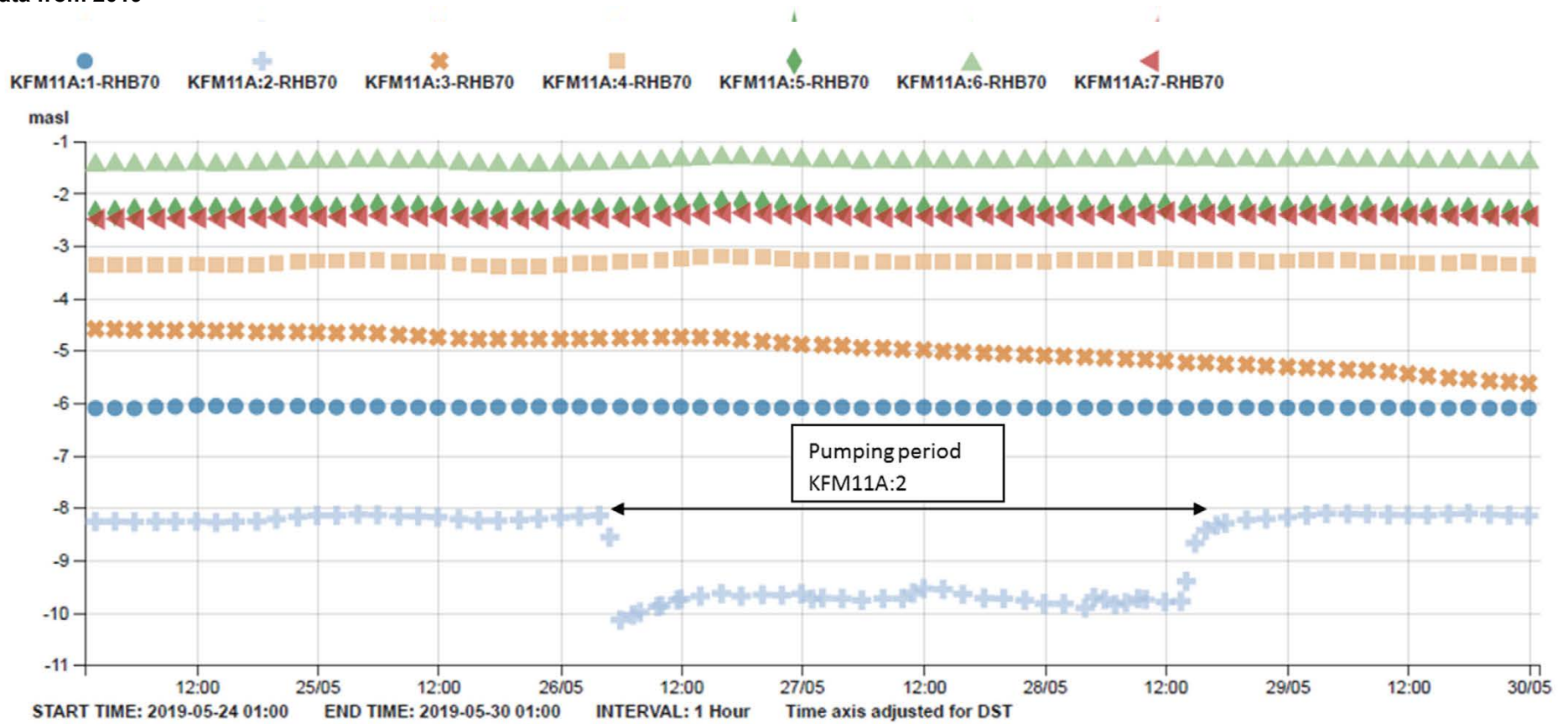


Figure A4-63. Pumping and drawdown in KFM11A:2 in May 2019. No other sections were affected.

Data from 2019

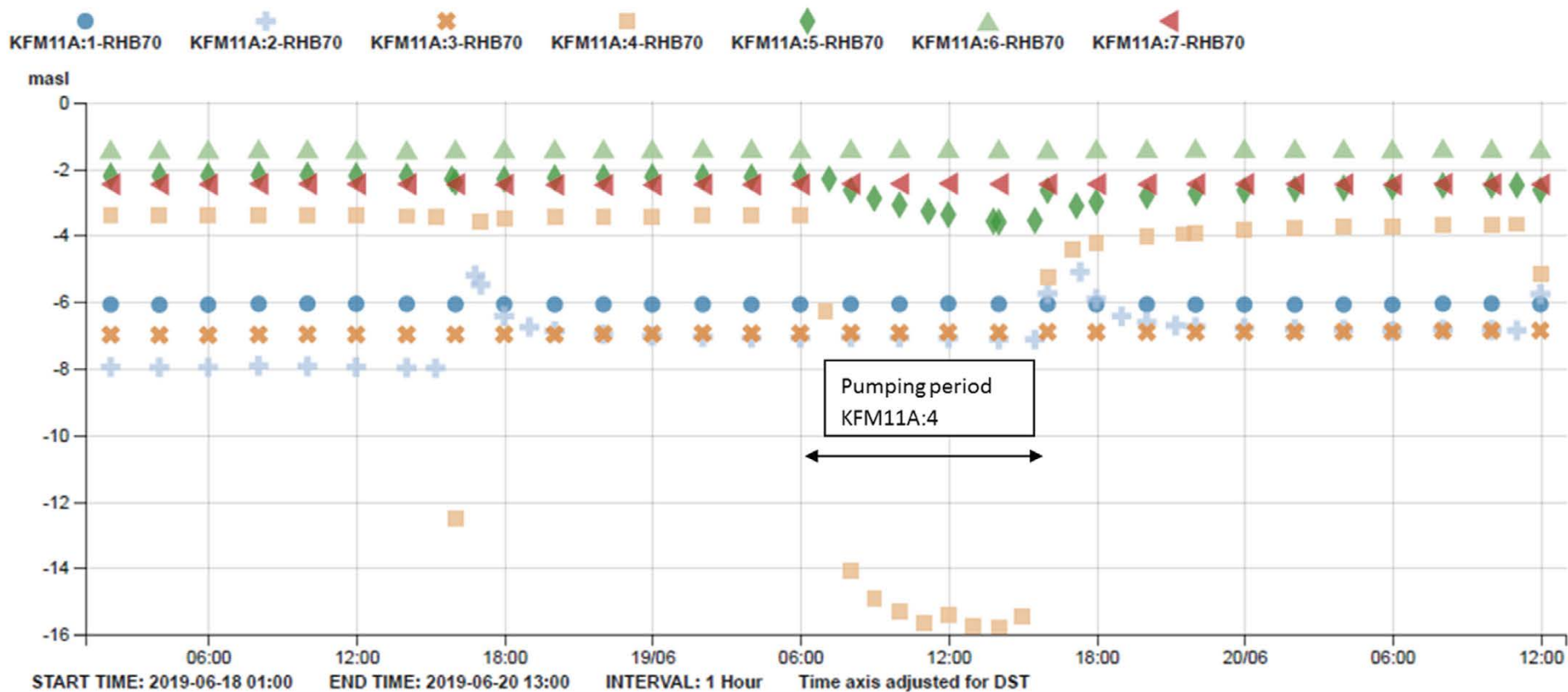


Figure A4-64. Pumping and drawdown in KFM11A:4 in May 2019. The pumping in section KFM011A:4 causes a response in KFM11A:5.

Data from 2019

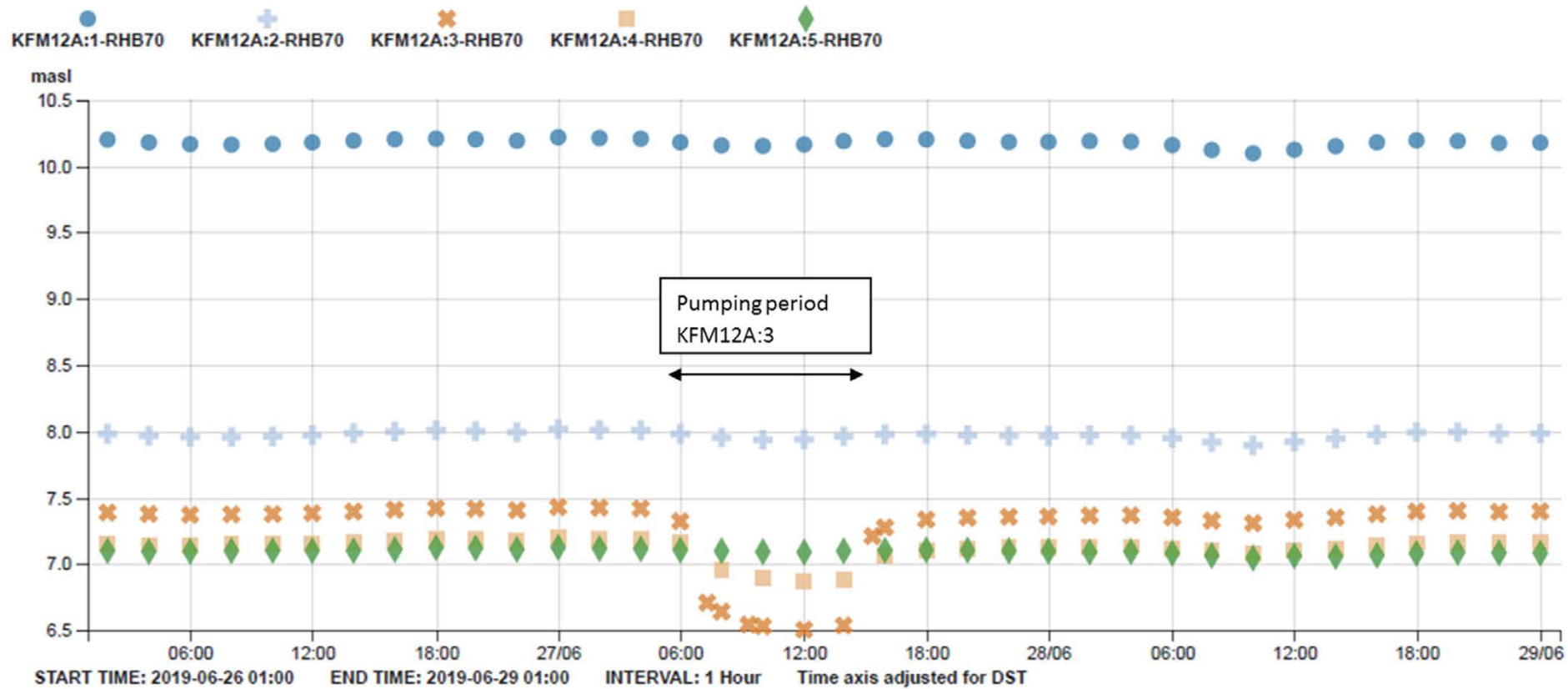


Figure A4-65. Pumping and drawdown in KFM12A:3 in May 2019. The pumping in section KFM12A:3 causes a response in KFM12A:4.

Data from 2019

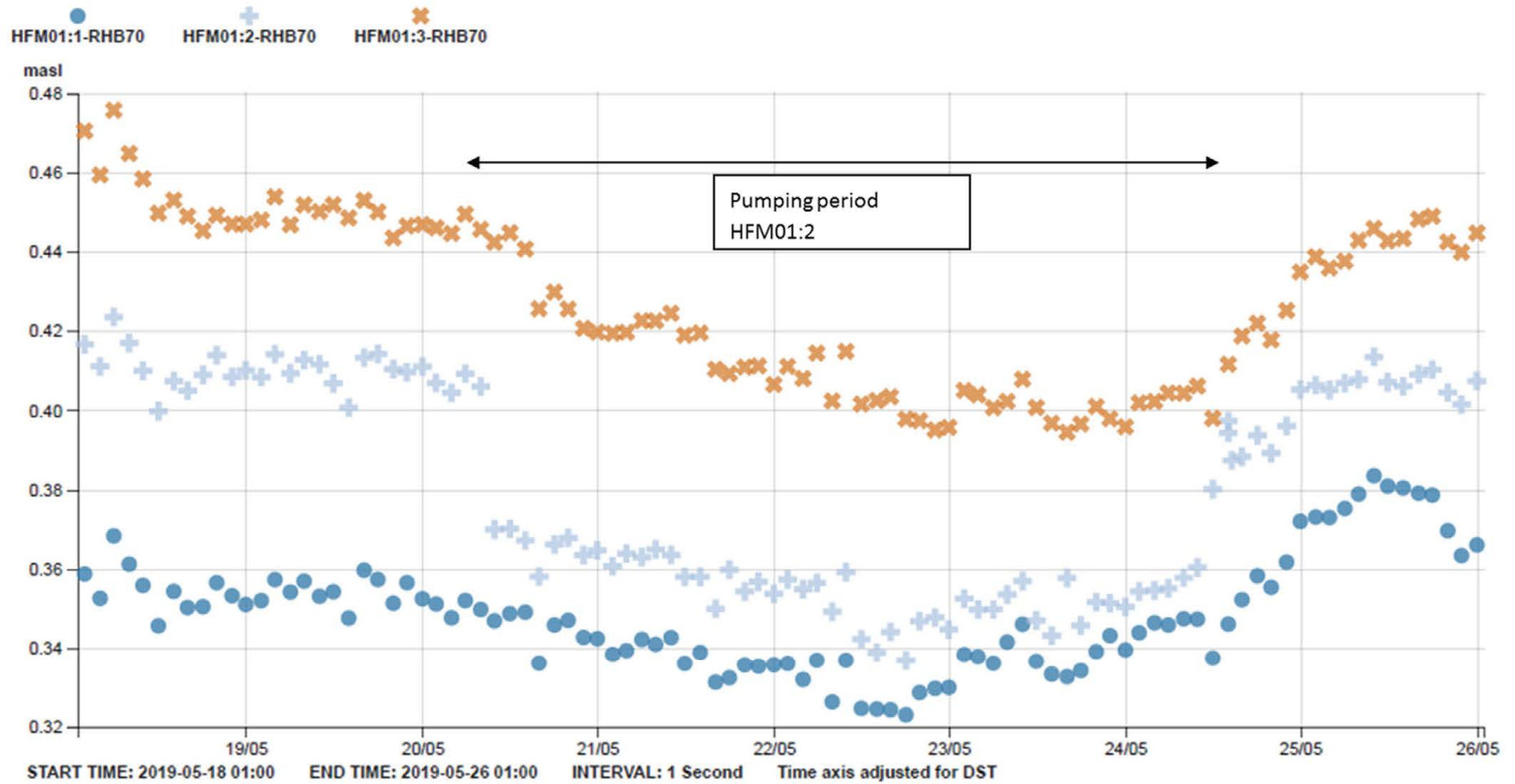


Figure A4-66. Pumping and drawdown in HFM01:2 in May 2019. A possible pressure response was observed in section HFM01:1 and HFM01:3.

Data from 2019

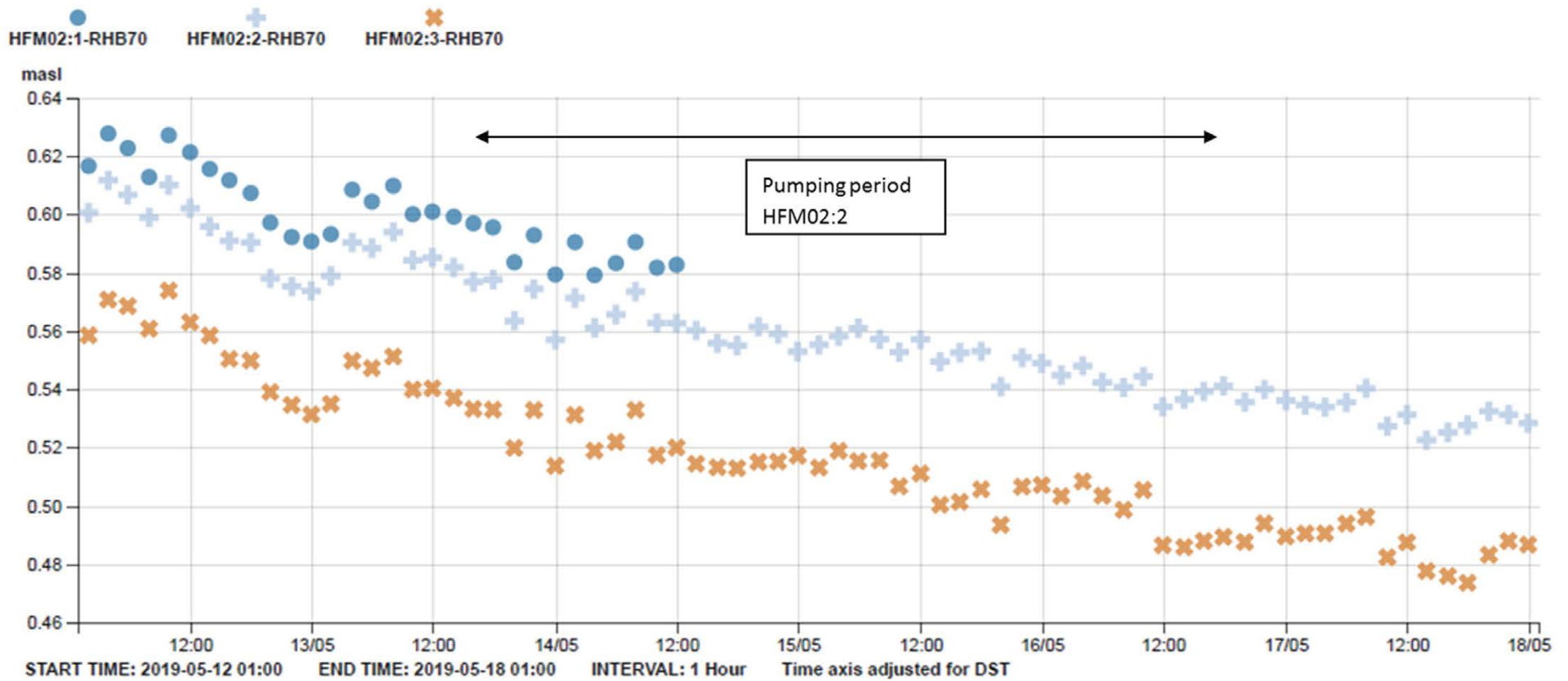


Figure A4-67. Pumping in HFM02:2 in May 2019. No significant drawdown was observed in any of the borehole sections. Pressure data for HFM02:1 are missing due to measurements problems.

Data from 2019

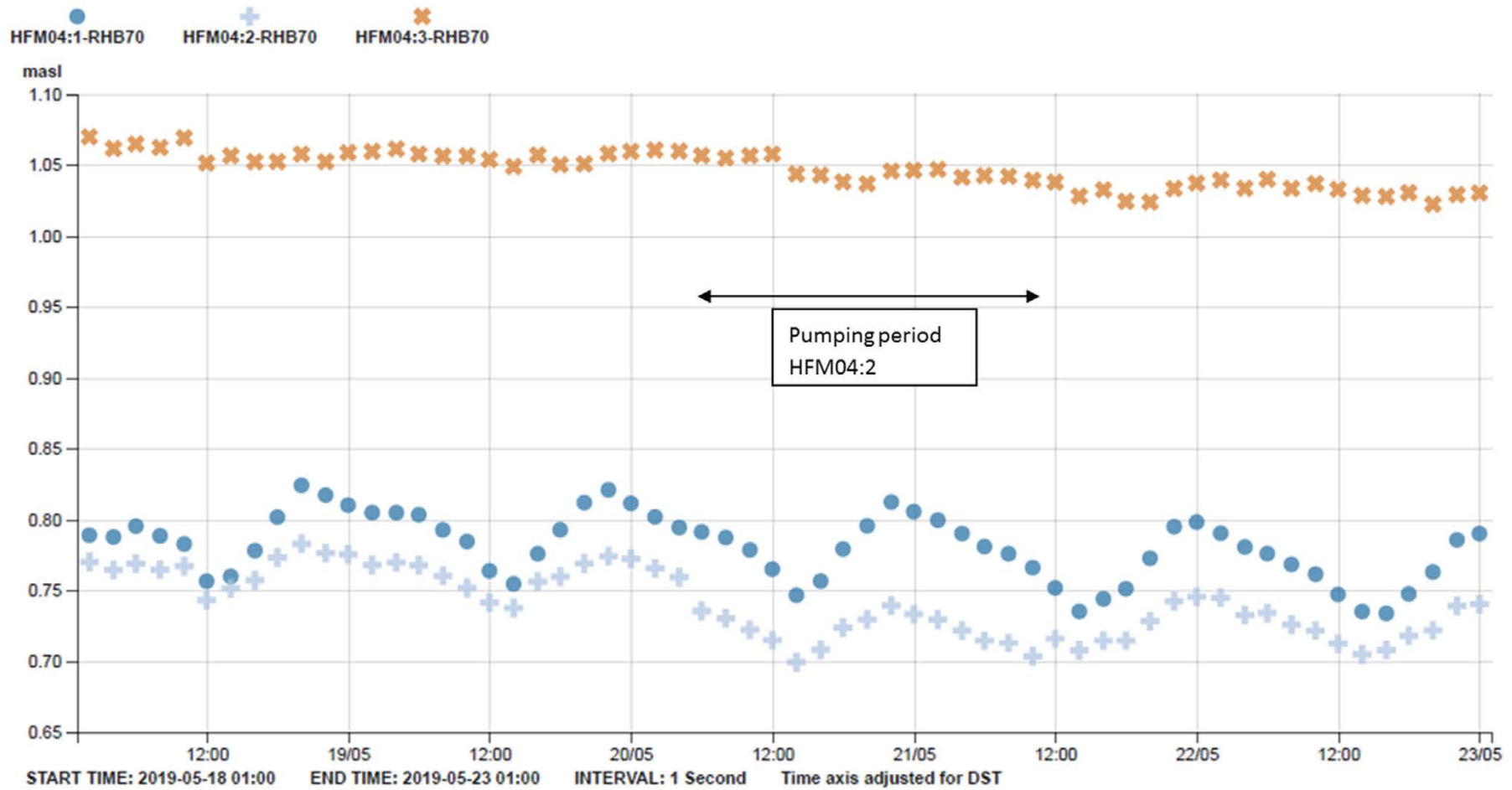


Figure A4-68. Pumping in HFM04:2 in May 2019. No significant drawdown was seen in any section at pump start.

HFM13:1-RHB70 HFM13:2-RHB70 HFM13:3-RHB70

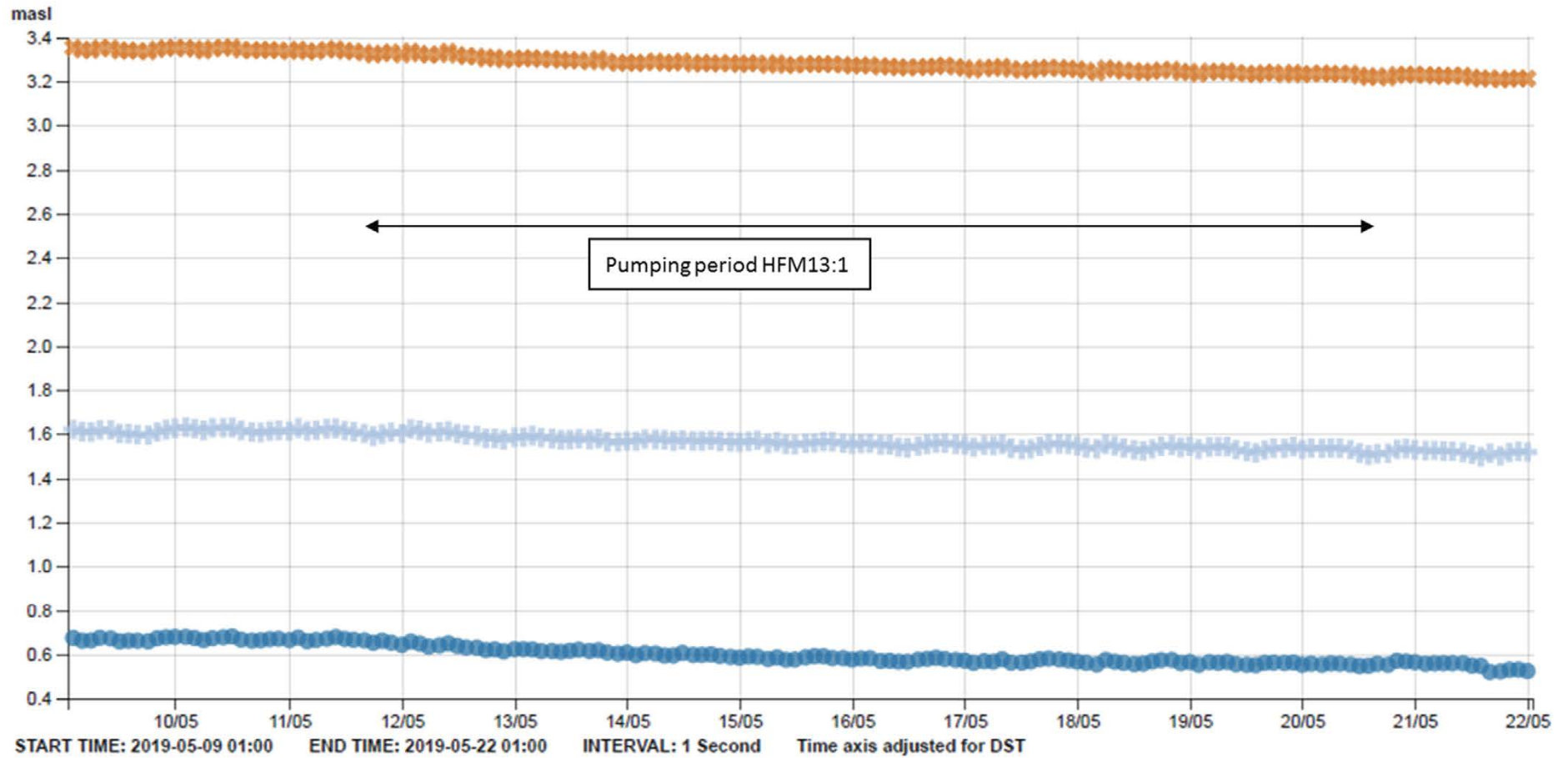


Figure A4-69. Pumping in HFM13:1 in May 2019. No significant drawdown was seen in any section at pump start.

Data from 2019

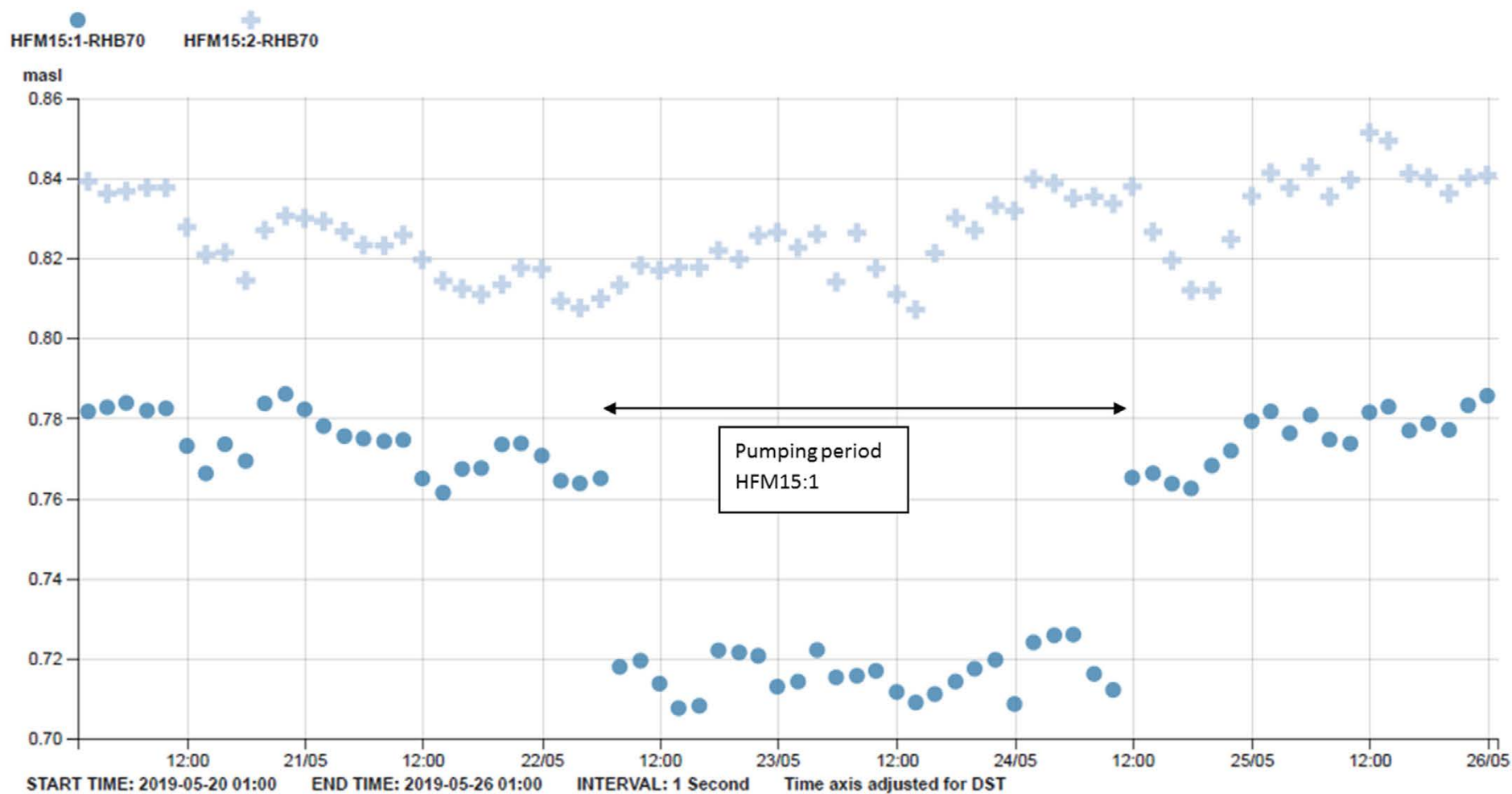


Figure A4-70. Pumping in HFM15:1 during May 2019. No significant drawdown was observed in any of the borehole sections.

Data from 2019

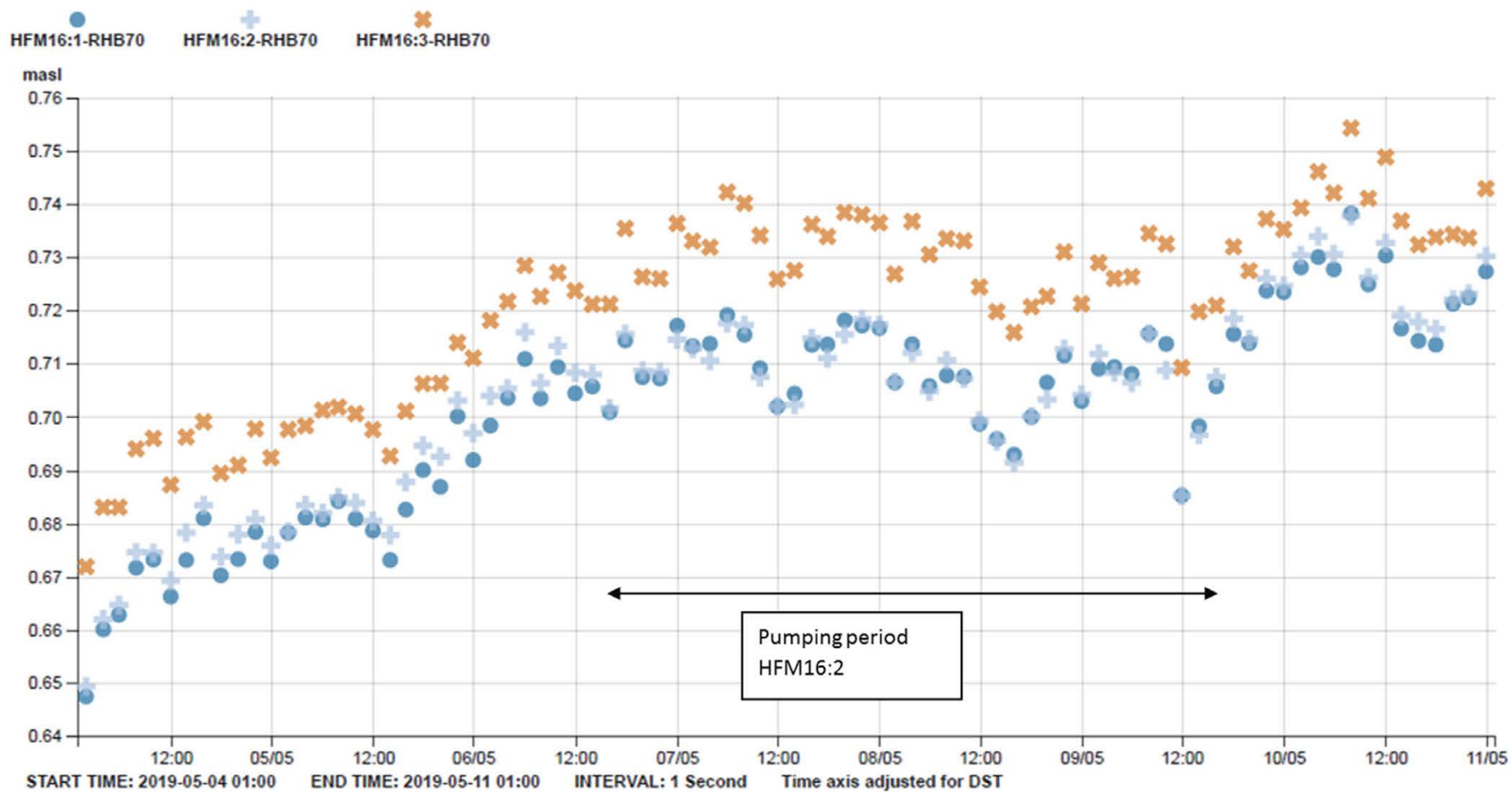


Figure A4-71. Pumping in HFM16:2 in June 2019. No significant drawdown was observed in any of the borehole sections.

Data from 2019

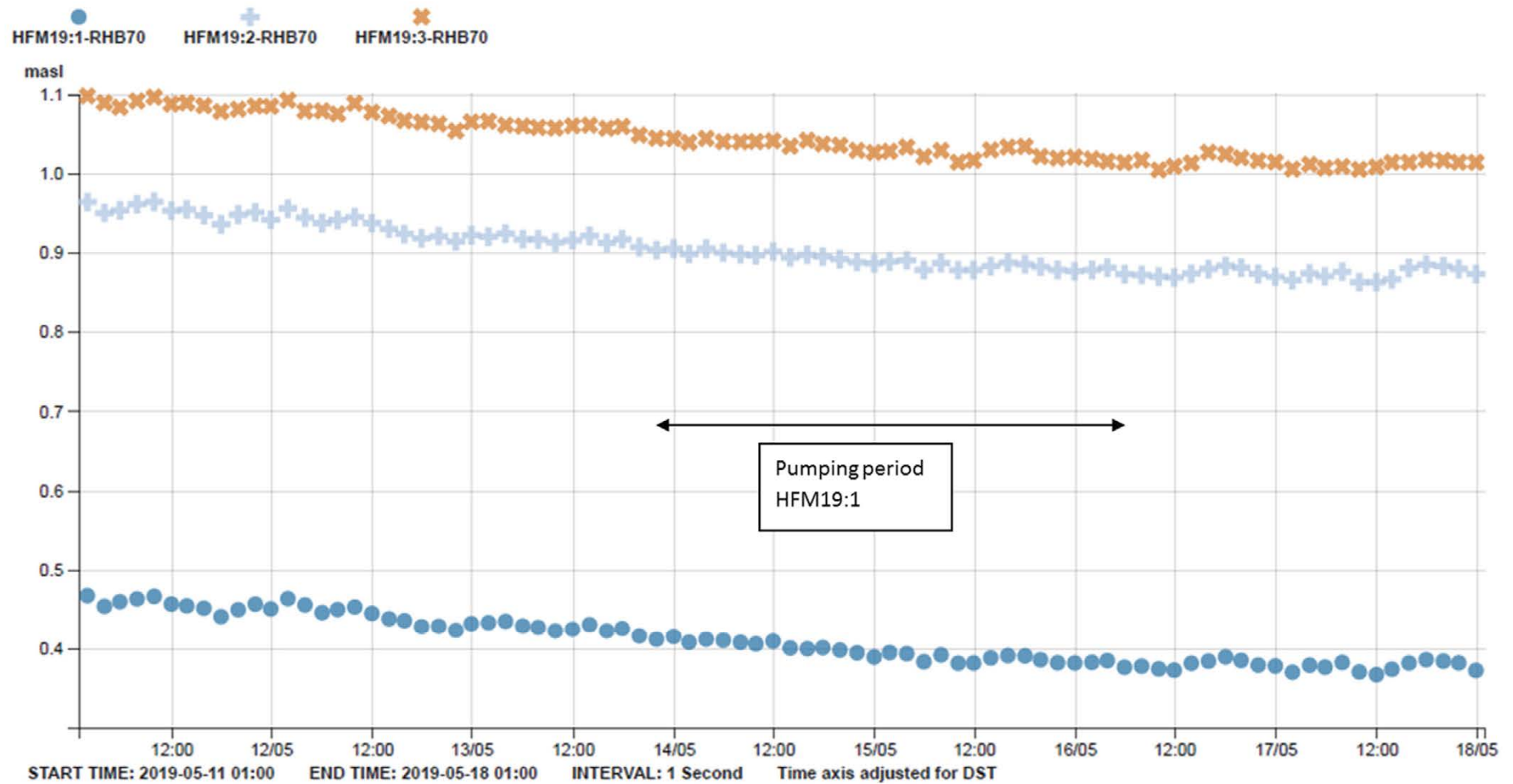


Figure A4-72. Pumping in HFM19:1 in May 2019. No significant drawdown was observed in any of the borehole sections. Plot consist of unreliable data as borehole packers are deflated.

Data from 2019

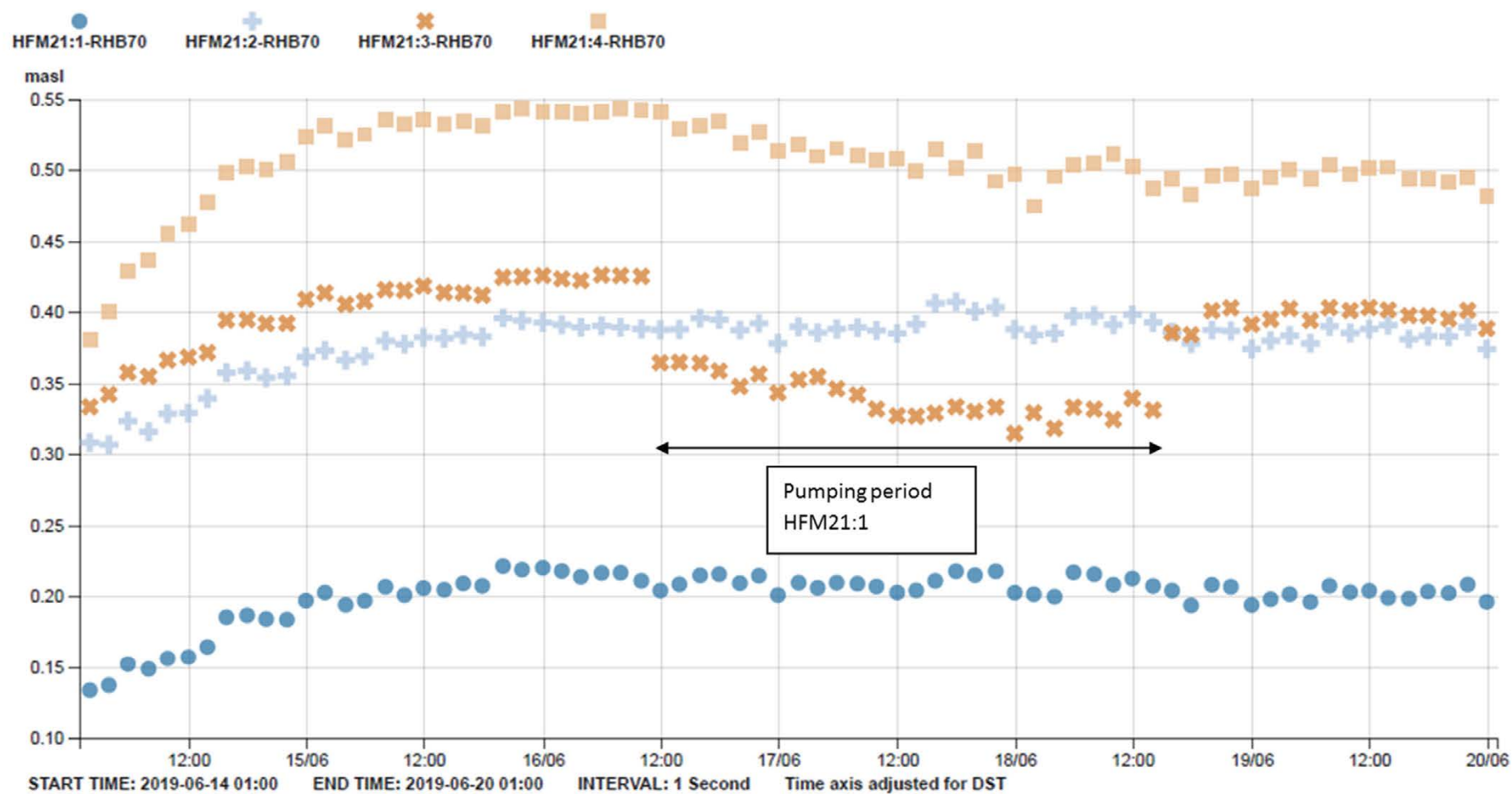


Figure A4-73. Pumping in HFM21:1 in June 2019. No significant drawdown was observed in any of the borehole sections.

Data from 2019

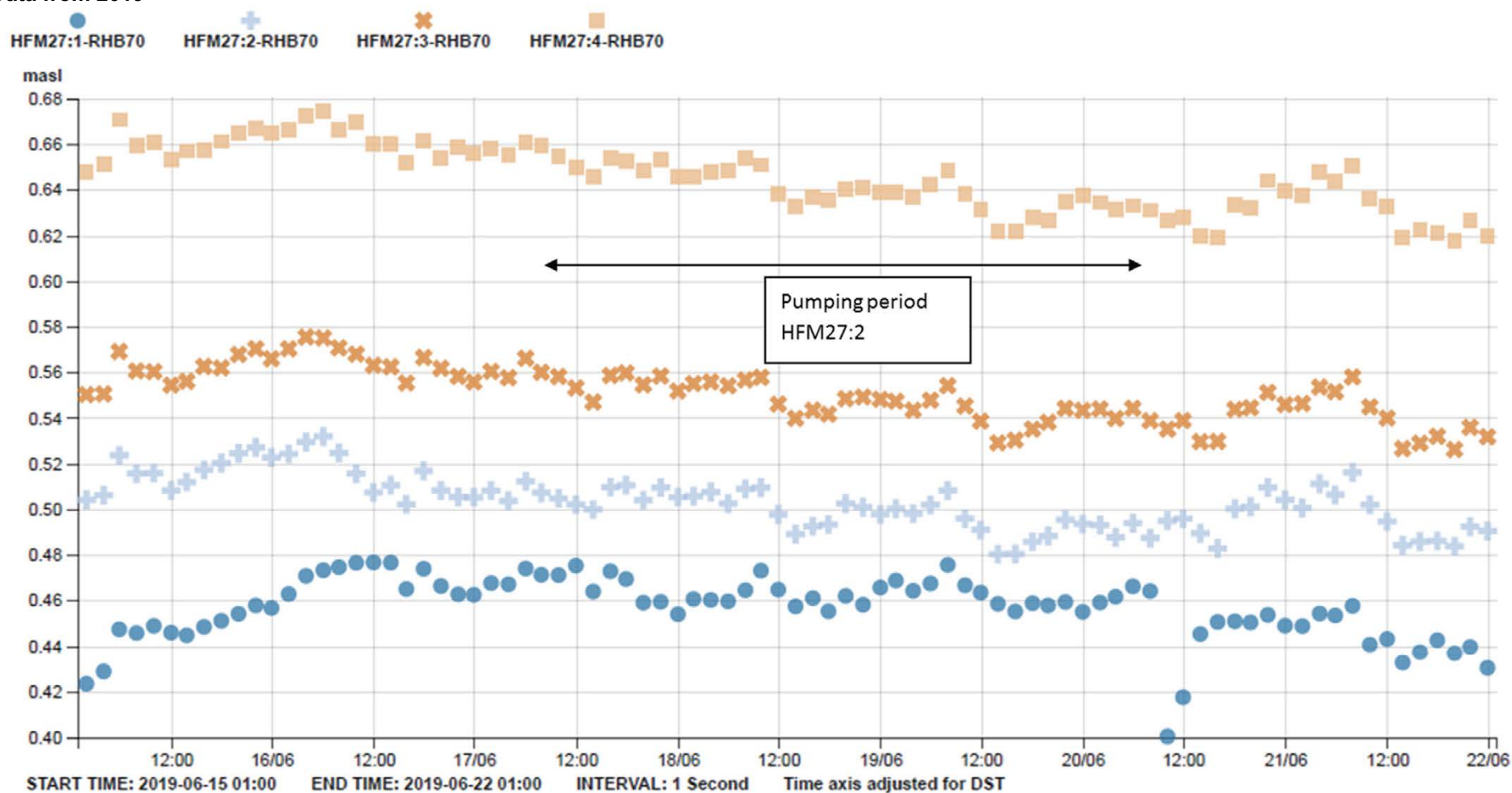


Figure A4-74. Pumping in HFM27:2 in June 2019. No significant drawdown was observed in any of the borehole sections.

Data from 2019

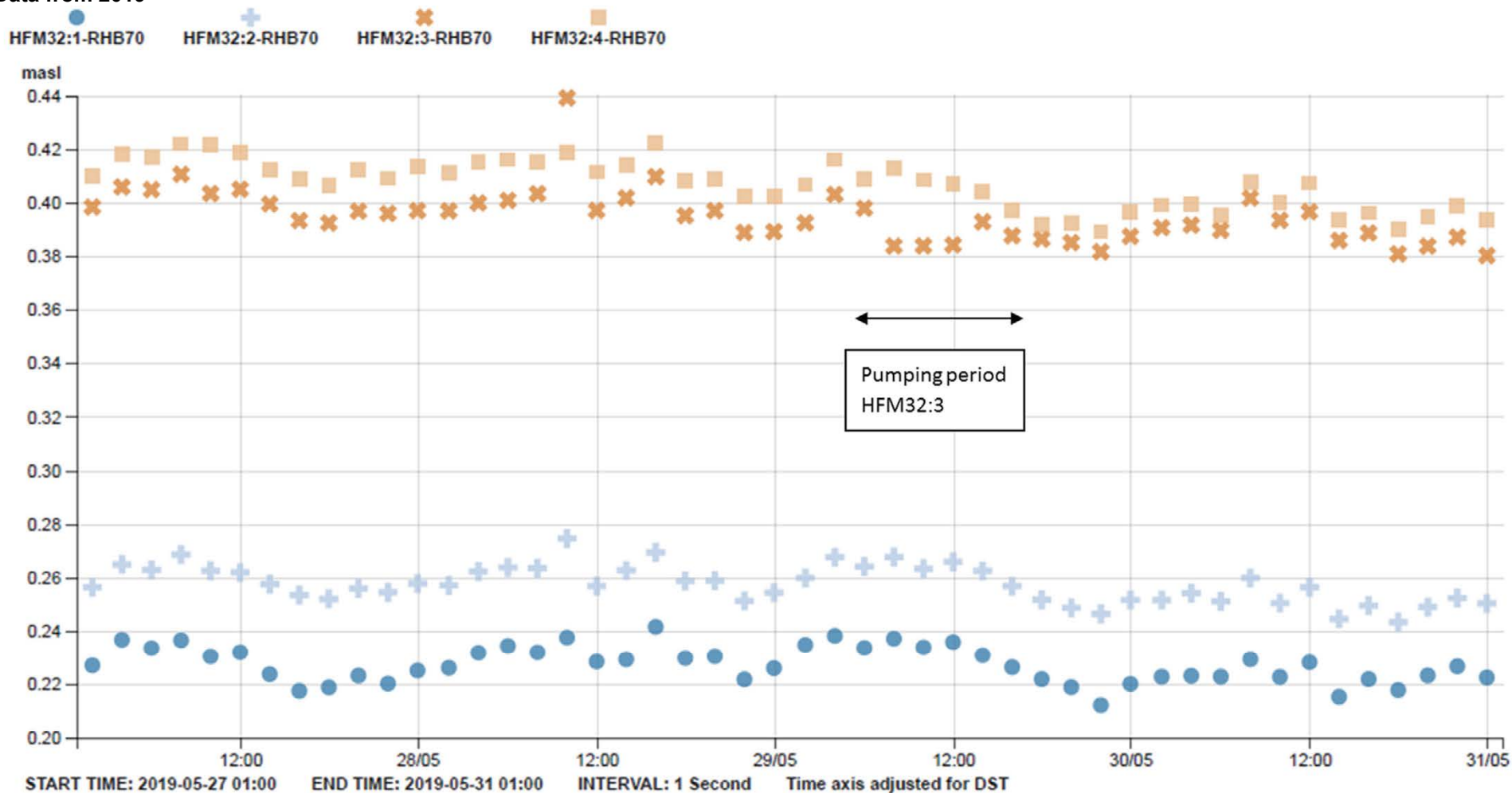


Figure A4-75. Pumping and minor drawdown in HFM32:3 in May 2019. No significant drawdown was observed in any of the borehole sections.

Data from 2019

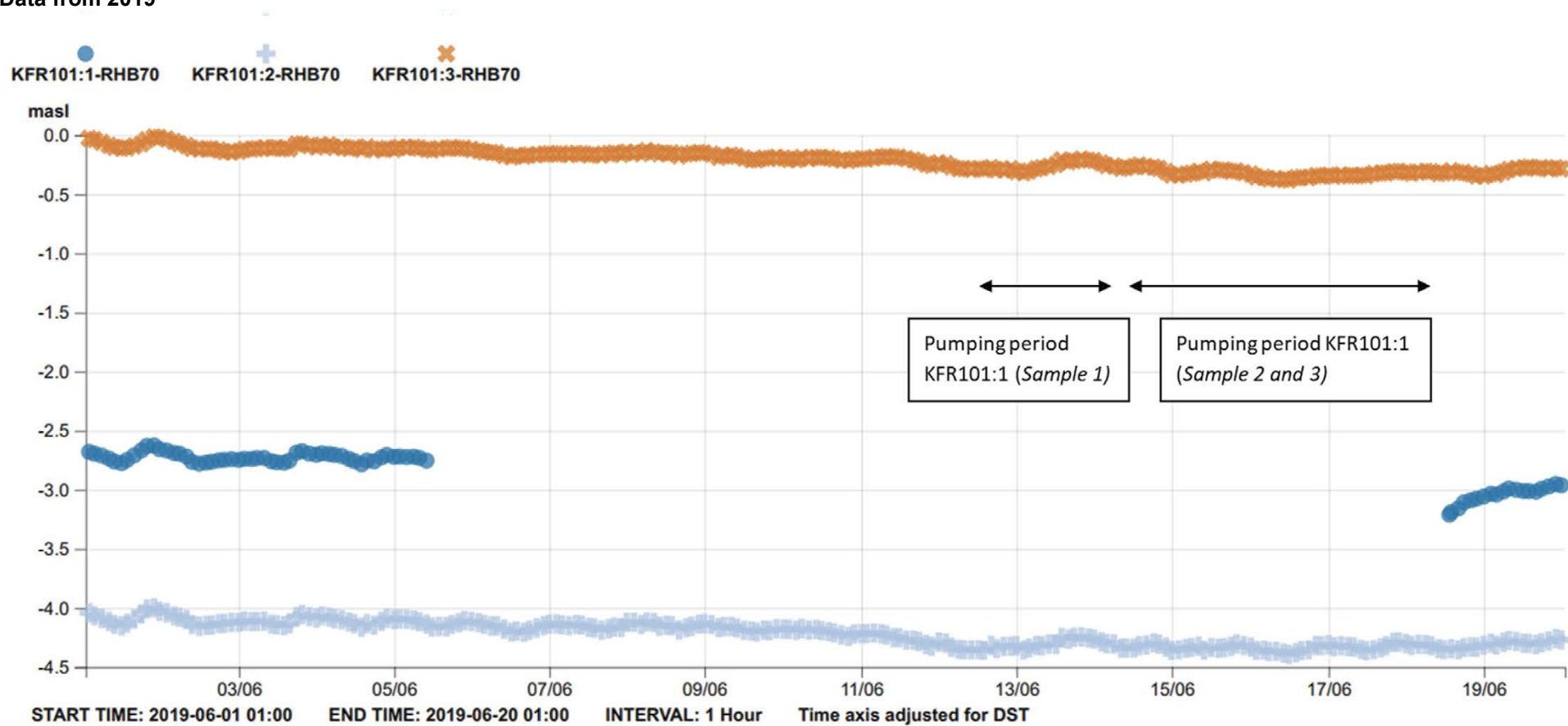


Figure A4-76. Pumping in KFR101:1 in June 2019. The pressure transducer in KFR101:1 was lifted during the pumping. No significant drawdown was noted in any other section. A pump stop occurred between the first and the second sample in KFR101:1

Data from 2019

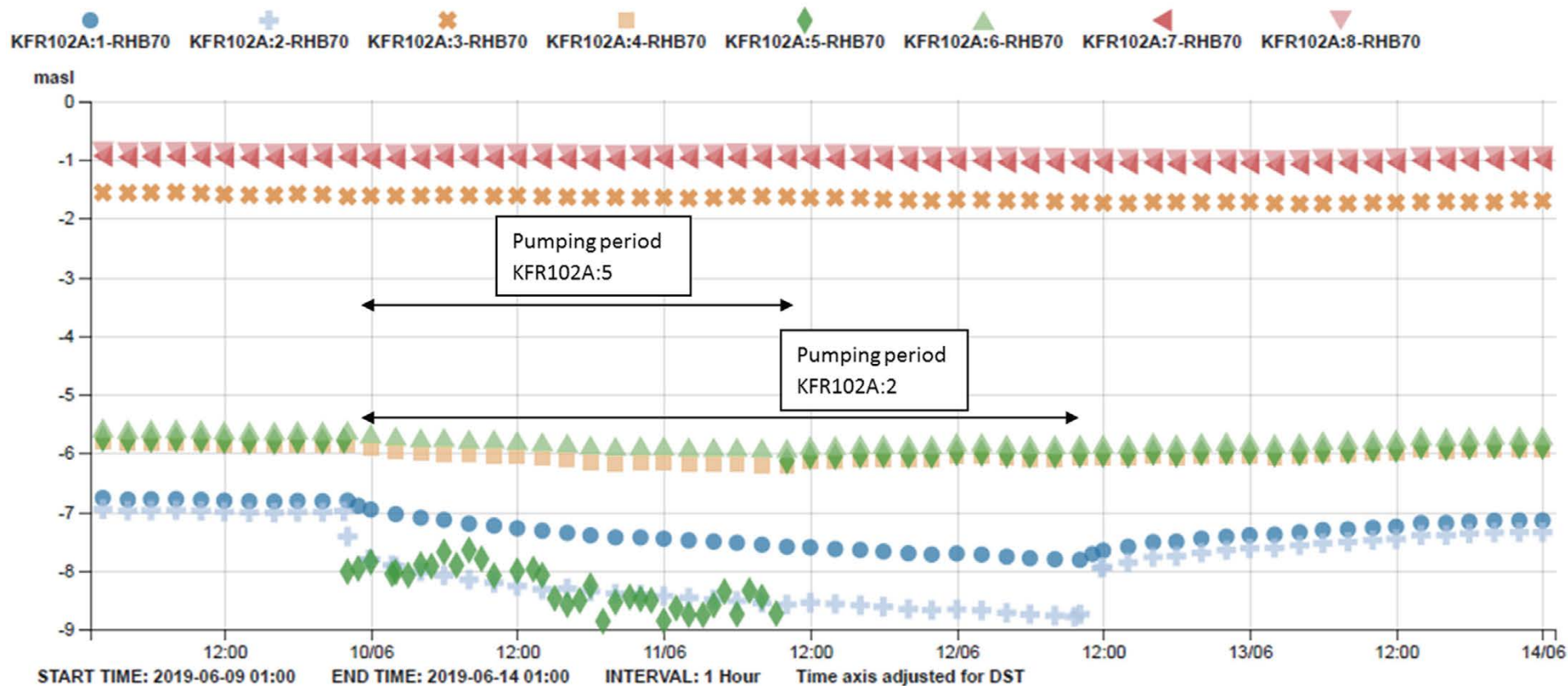


Figure A4-77. Pumping and drawdown in KFR102A:2 and KFR102A:5 in June 2018. A clear response in KFR102A:1 was observed during pumping in KFR102A:2. A response in KFR102A:4 was observed during pumping in KFR102A:5.

Data from 2019

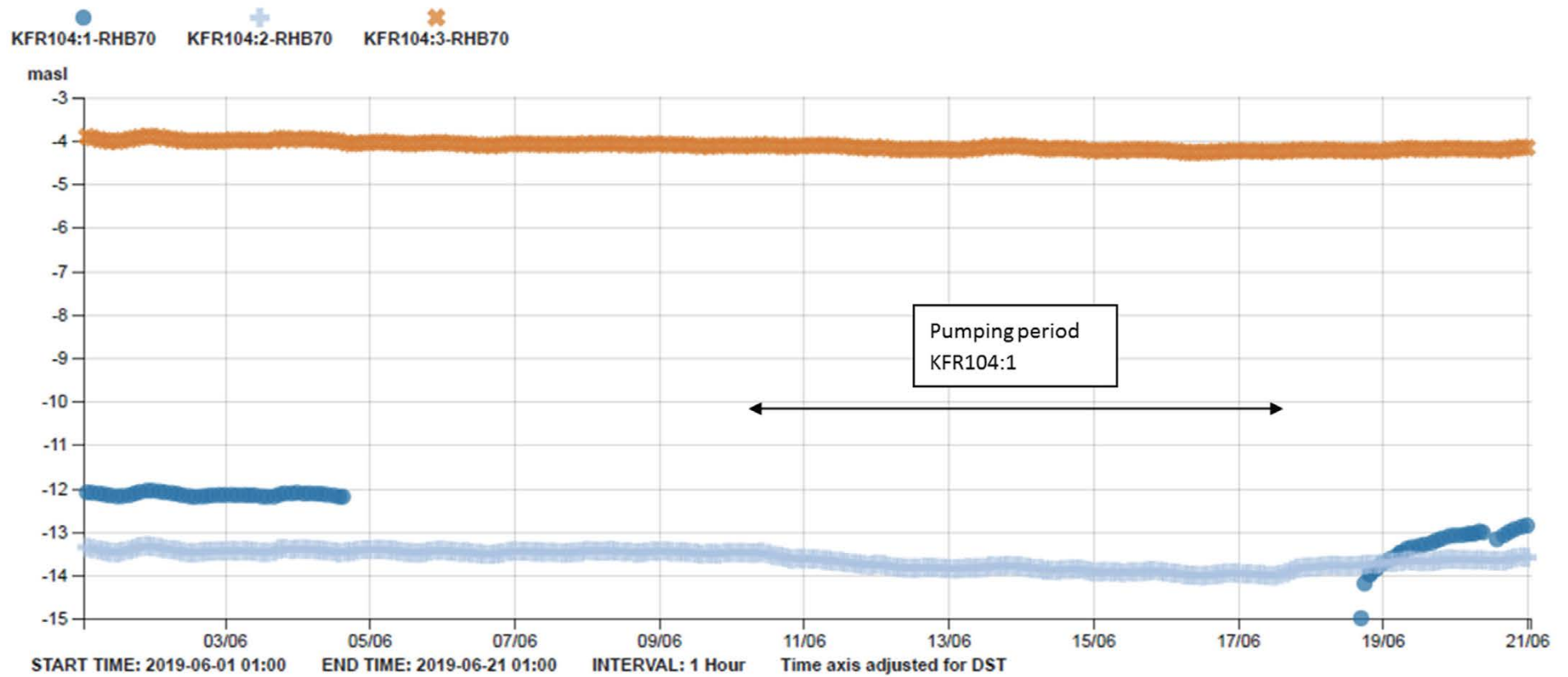


Figure A4-78. Pumping in KFR104:1 in June 2019. The pressure transducer in KFR104:1 was lifted during the pumping. A possible response was seen in section KFR104:2.

Data from 2019

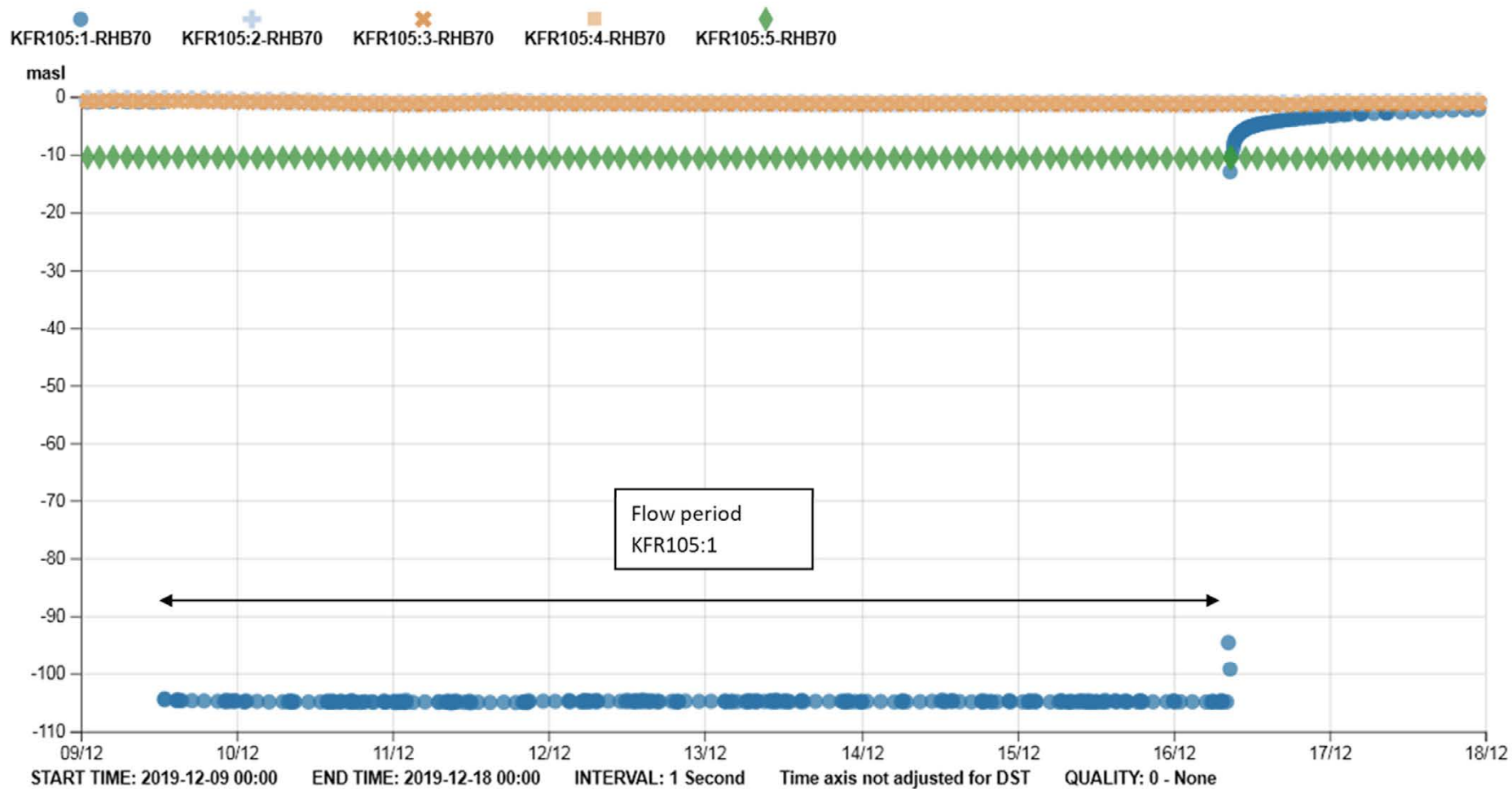


Figure A4-79. Flow period in KFR105:1 in December 2019. No significant drawdown was observed in any of the borehole sections.

Data from 2019

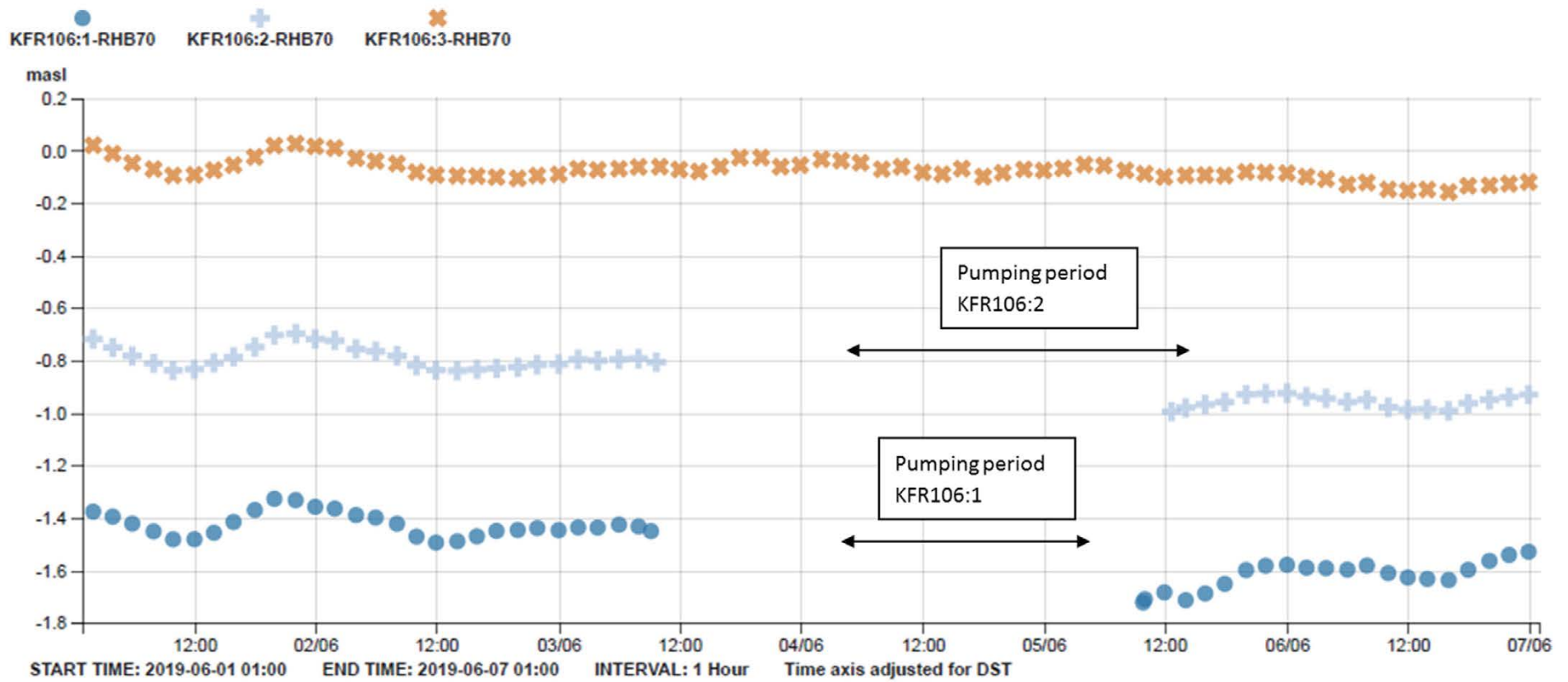


Figure A4-80. Pumping in KFR106:1 and KFR106:2 in June 2019. The pressure transducers in the pumped sections were lifted during the pumping. KFR106:3 was not affected.

Data from 2019

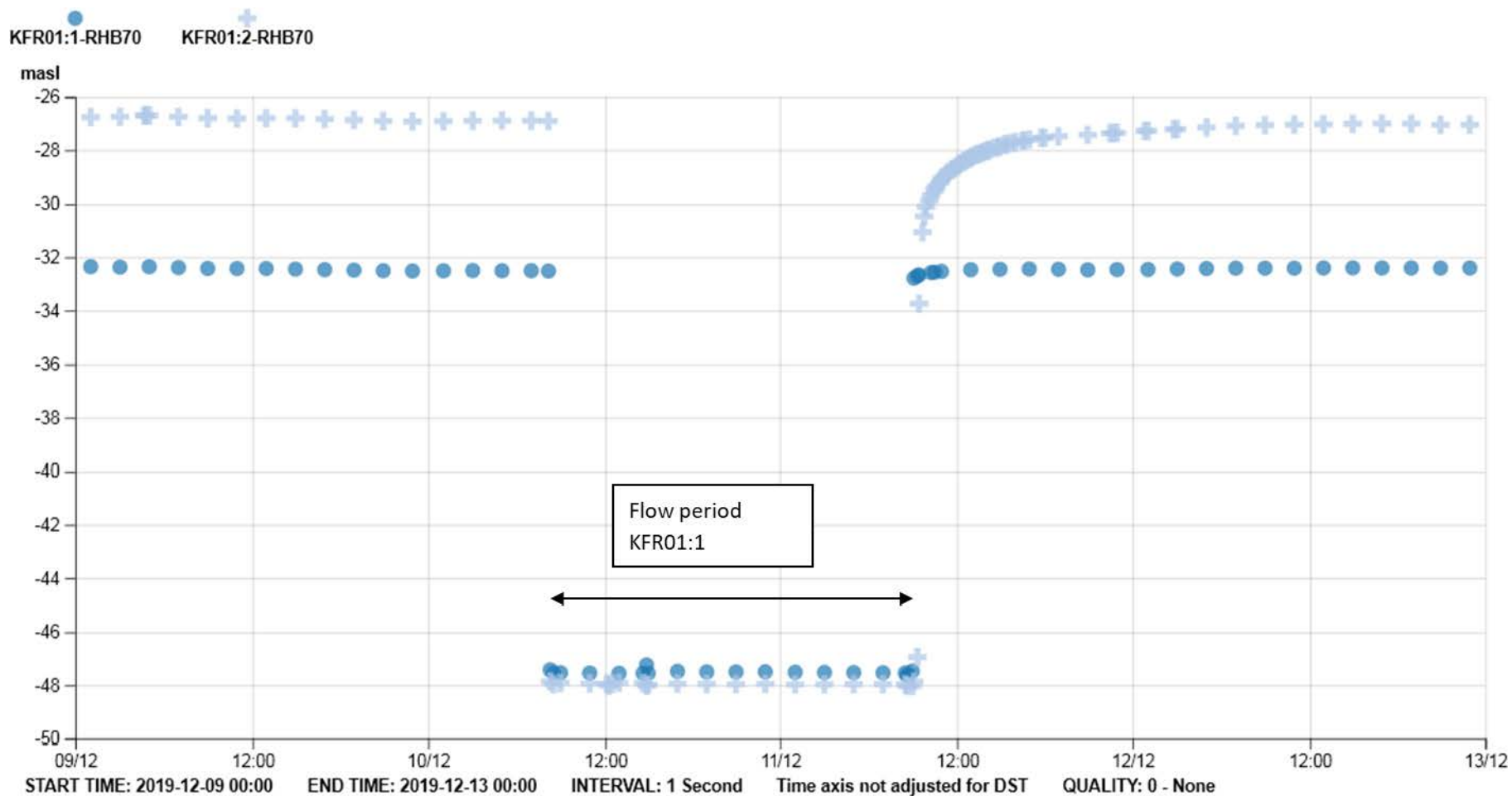


Figure A4-81. Flow period in KFR01:1 in December 2019. A response was observed in section KFR01:2.

pH trends in some of the core drilled boreholes

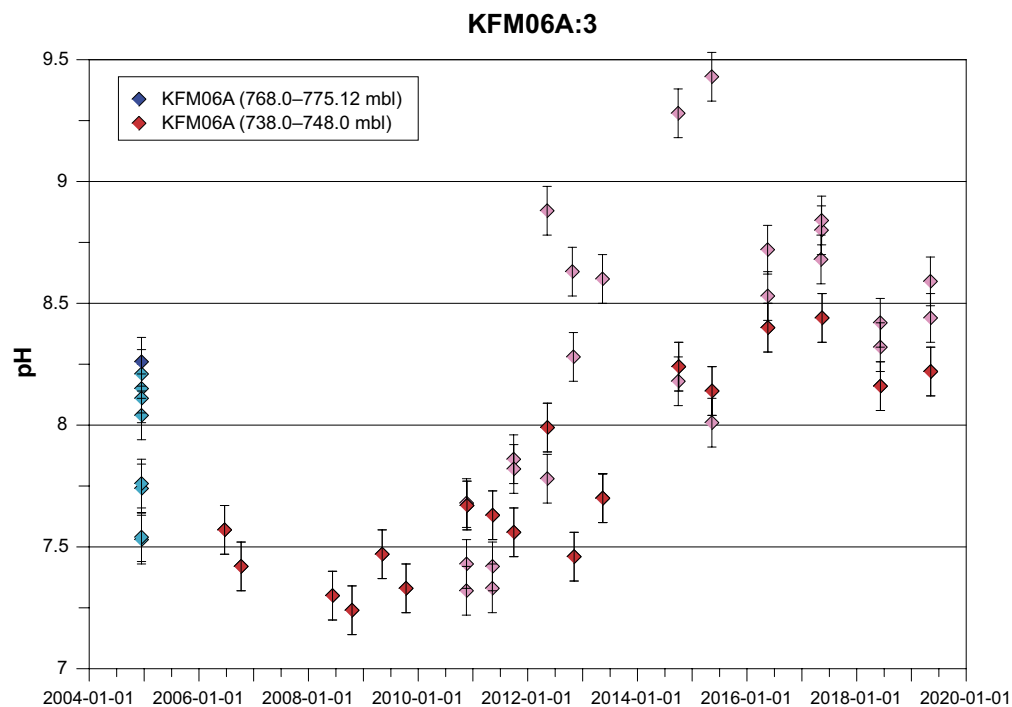


Figure A5-1. Comparison between initial pH measurements from complete chemical characterisation during PLU (blue points) and later measurements in the ongoing monitoring programme (red points) for KFM06A:3. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C, except those from 2013 which are from field measurements.

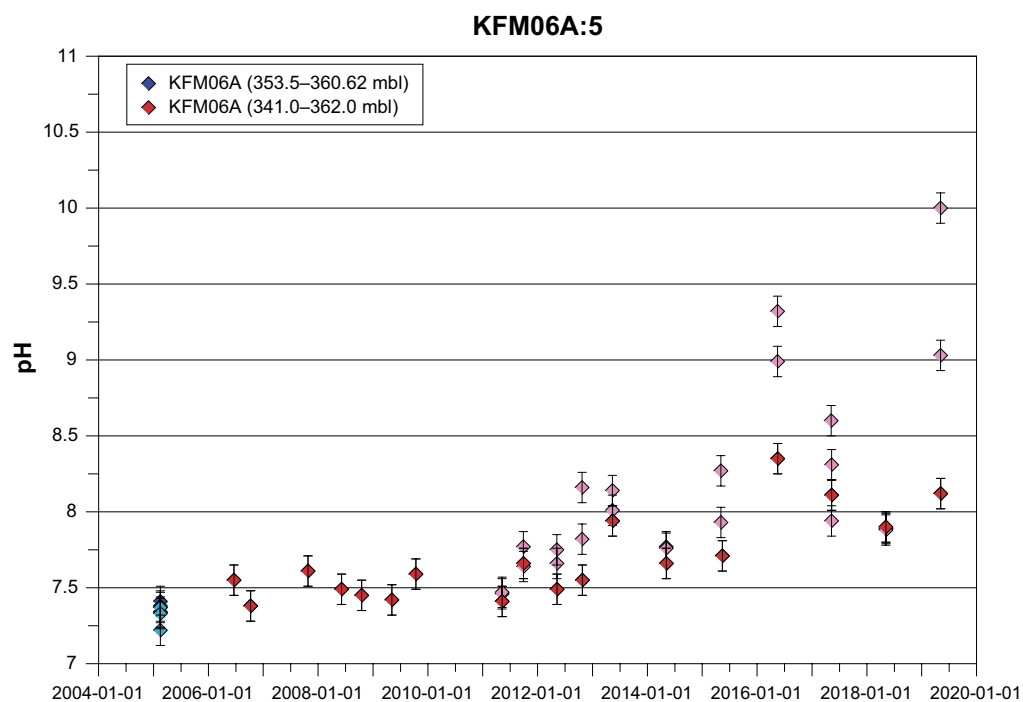


Figure A5-2. Comparison between initial pH measurements from complete chemical characterisation during PLU (blue points) and later measurements in the ongoing monitoring programme (red points) for KFM06A:5. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C, except those from 2013 which are from field measurements.

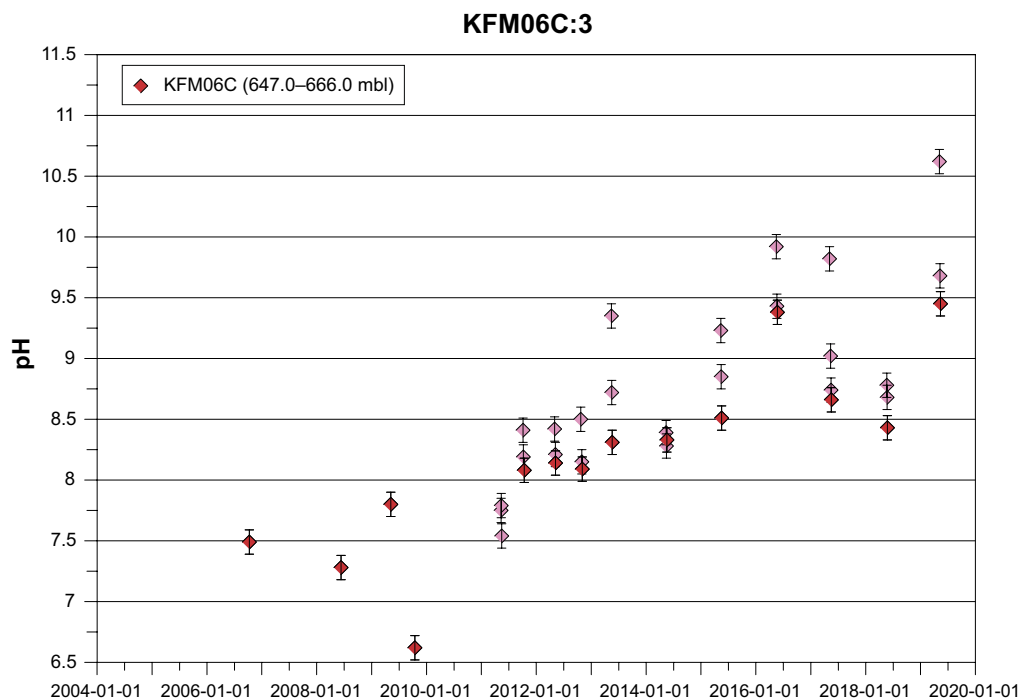


Figure A5-3. Measurements of pH values from the ongoing monitoring programme (red points) for KFM06C:3. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C, except those from 2013 and the last sample from 2015 which are from field measurements.

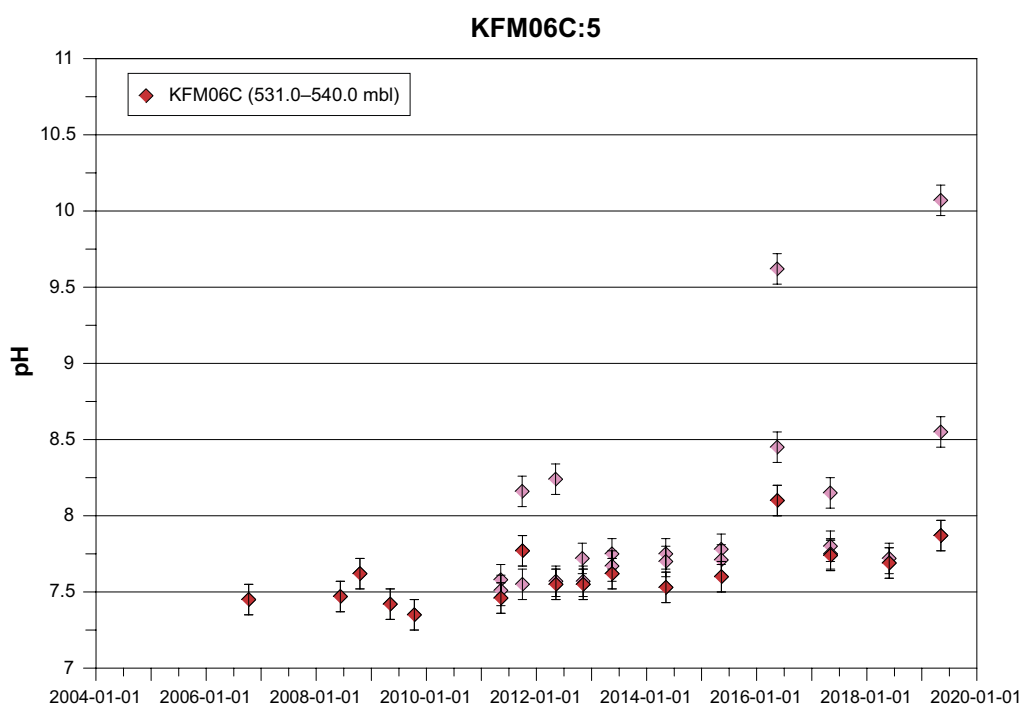


Figure A5-4. Measurements of pH values from the ongoing monitoring programme (red points) for KFM06C:5. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C, except those 2013 which are from field measurements.

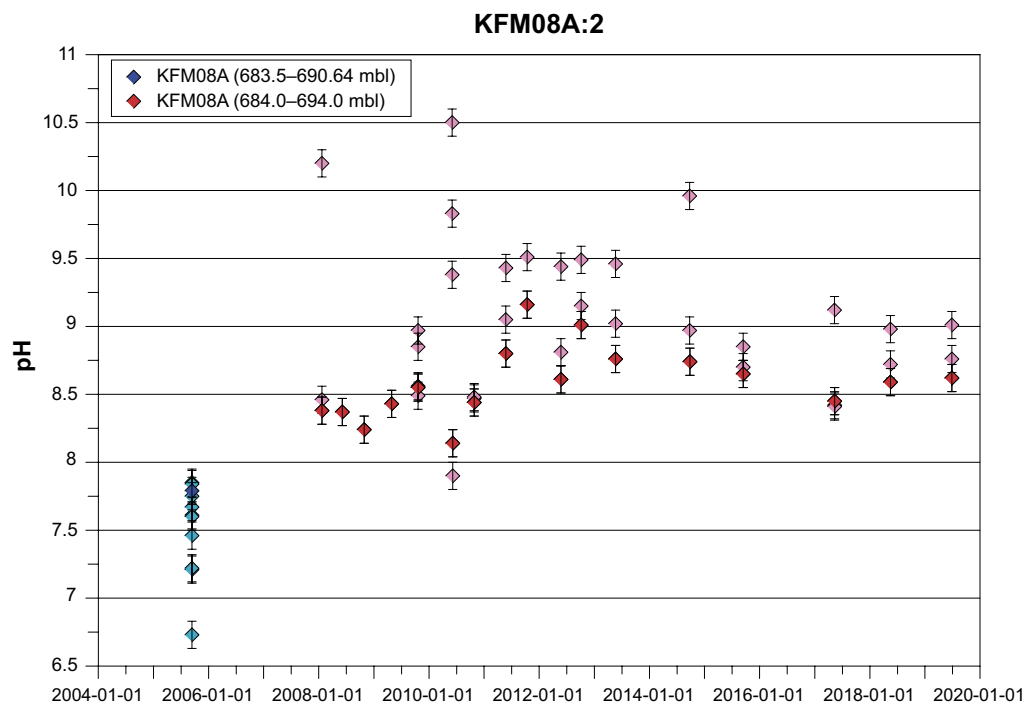


Figure A5-5. Comparison between initial pH measurements from complete chemical characterisation during PLU (blue points) and later measurements in the ongoing monitoring programme (red points) for KFM08A:2. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C, except those from 2013 which are from field measurements. No sampling of this section 2016 due to drilling of KFM24.

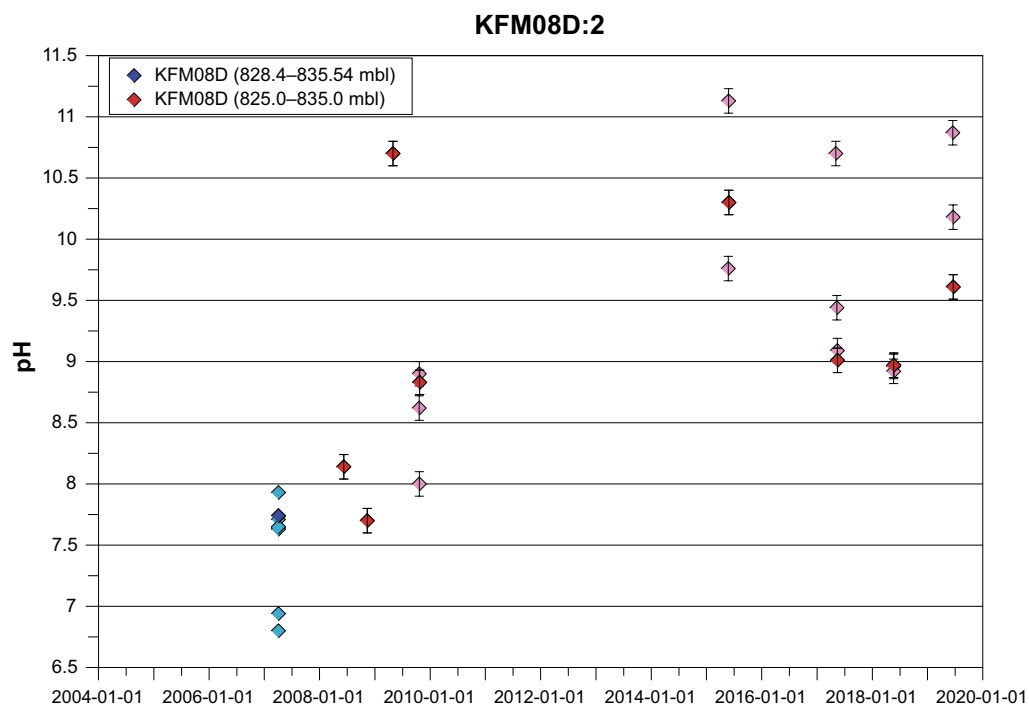


Figure A5-6. Comparison between initial pH measurements from complete chemical characterisation during PLU (blue points) and later measurements in the ongoing monitoring programme (red points) for KFM08D:2. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C. This section has been omitted from the monitoring program for many years due to corrosion problem. After reinstallation of borehole equipment it was sampled again 2015. No sampling of this section 2016 due to drilling of KFM24.

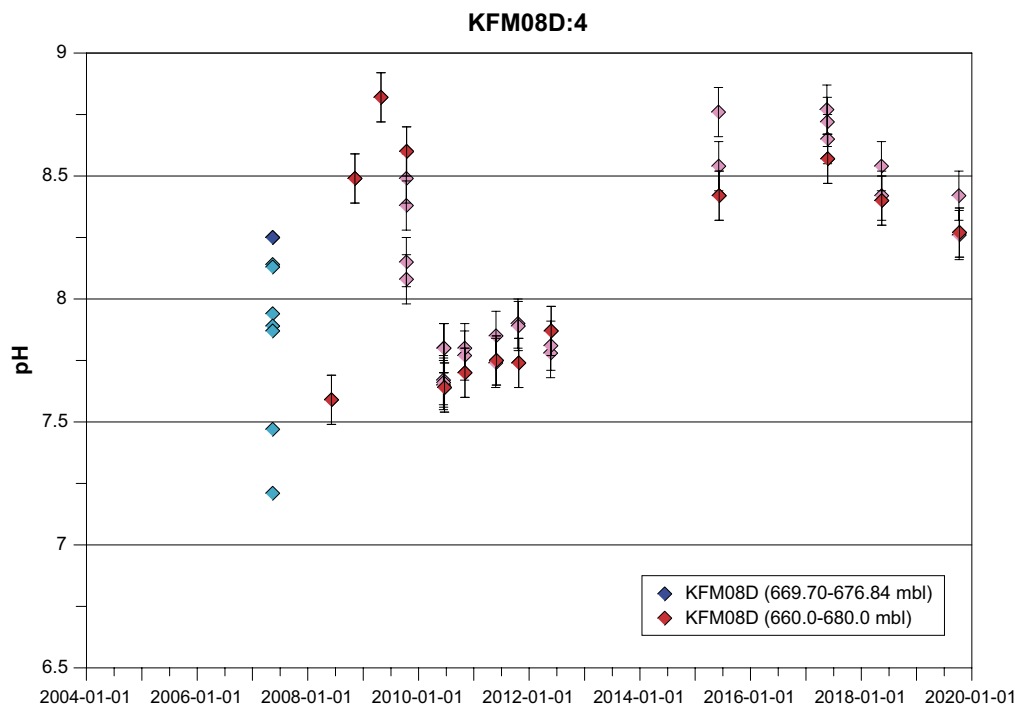


Figure A5-7. Comparison between initial pH measurements from complete chemical characterisation during PLU (blue points) and later measurements in the ongoing monitoring programme (red points) for KFM08D:4. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C. This section has been omitted from the monitoring program for 2013-2014 due to corrosion problem. After reinstallation of borehole equipment it was sampled again 2015. No sampling of this section 2016 due to drilling of KFM24.

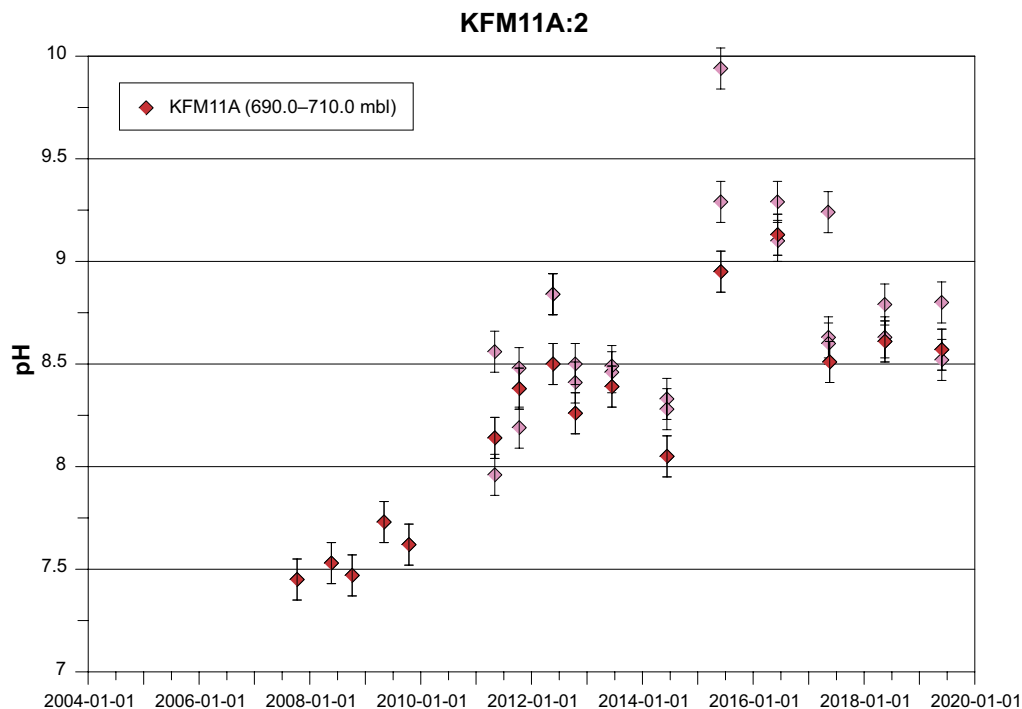


Figure A5-8. Measurements of PH values from the ongoing monitoring programme (red points) for KFM11A:2. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C, except those from 2013 which are from field measurements.

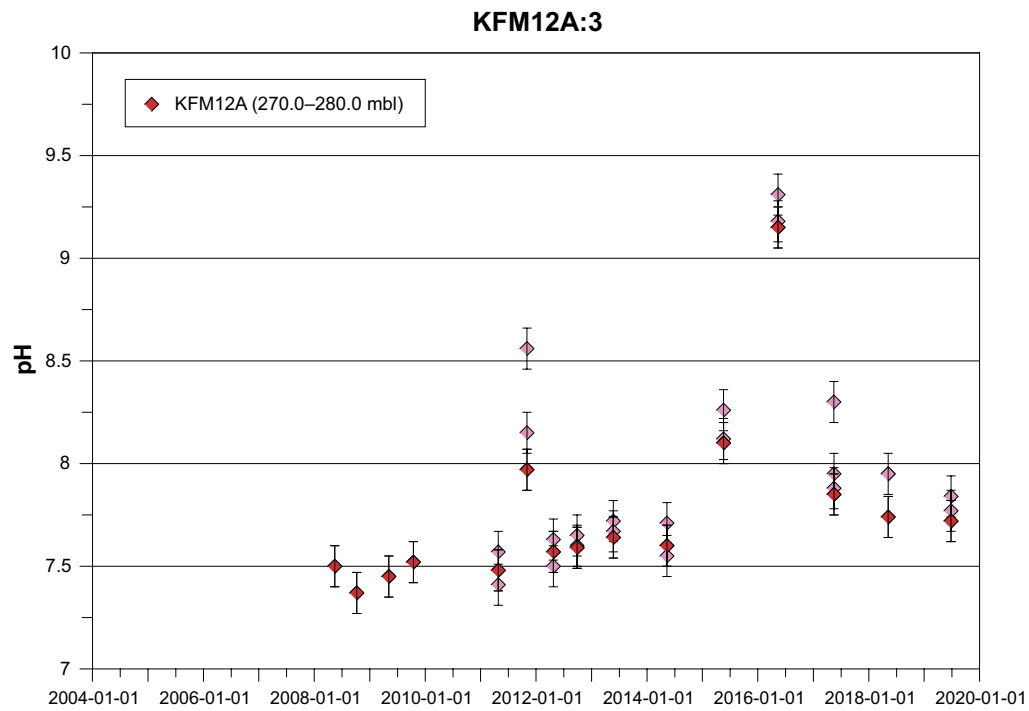


Figure A5-9. Measurements of PH values from the ongoing monitoring programme (red points) for KFM12A:3. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C, except those from 2013 and 2015 which are from field measurements.

pH compared to pumped volumes in some of the core drilled boreholes

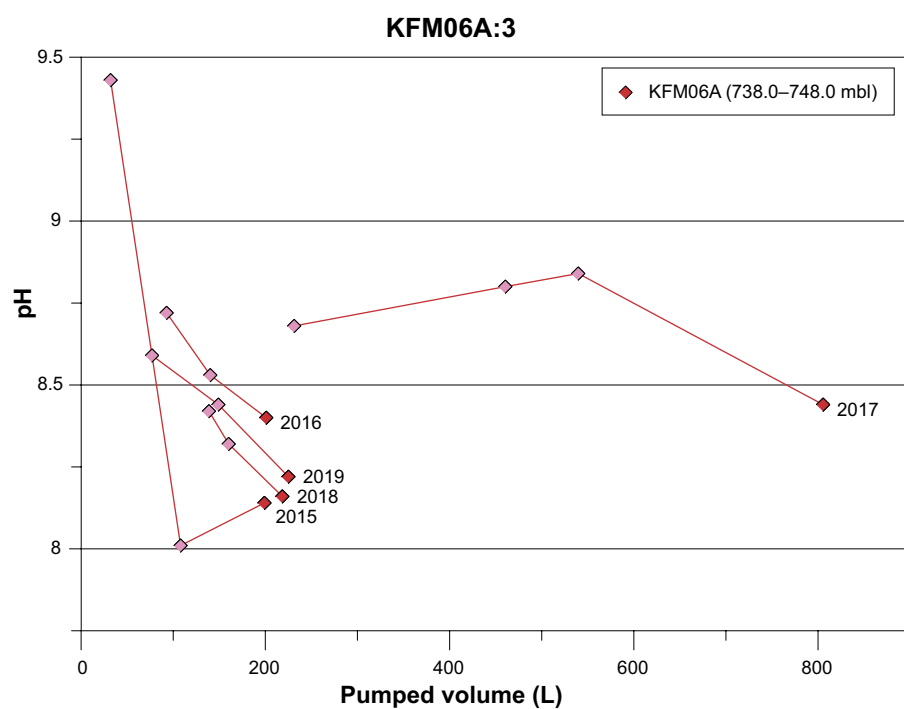


Figure A6-1. Comparison between pH values and pumped volumes during 2015–2019 for KFM06A:3. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C.

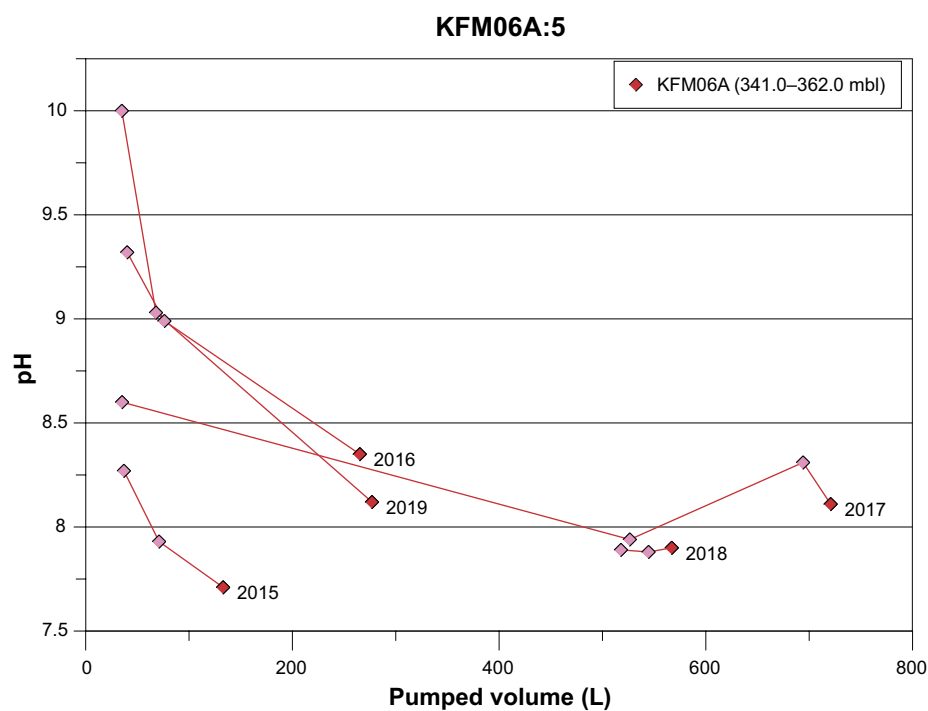


Figure A6-2. Comparison between pH values and pumped volumes during 2015–2019 for KFM06A:5. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C.

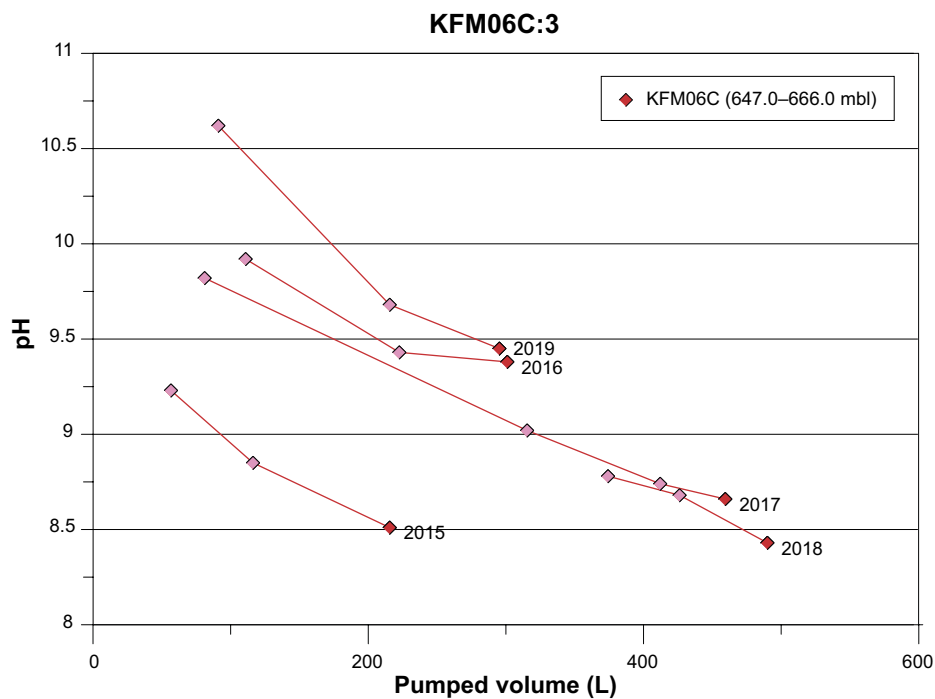


Figure A6-3. Comparison between pH values and pumped volumes during 2015–2019 for KFM06C:3. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C, except the last sample from 2015 which is from field measurements.

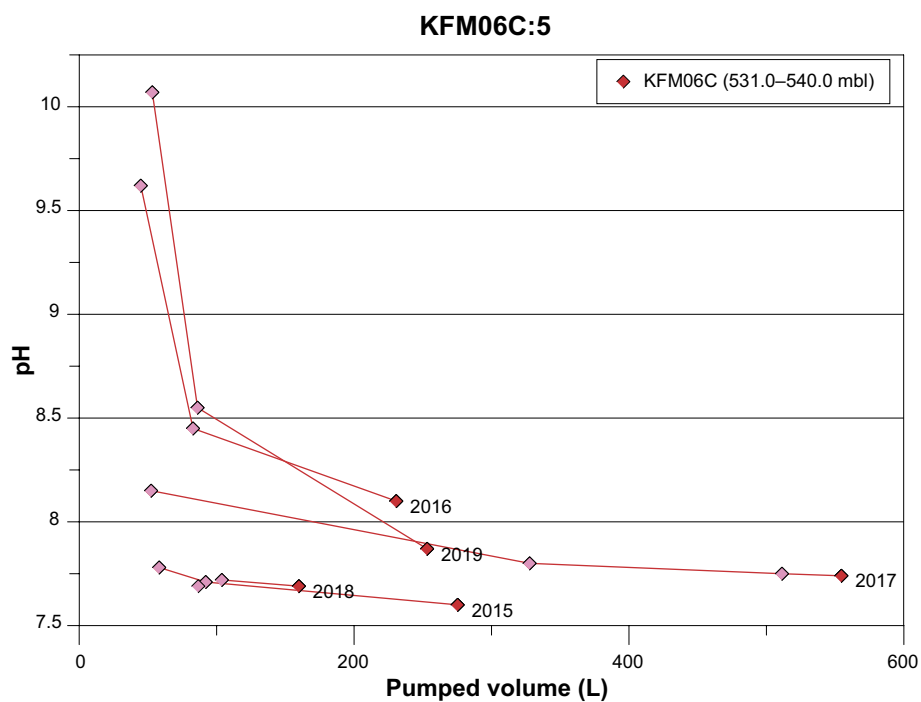


Figure A6-4. Comparison between pH values and pumped volumes during 2015–2019 for KFM06C:5. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C.

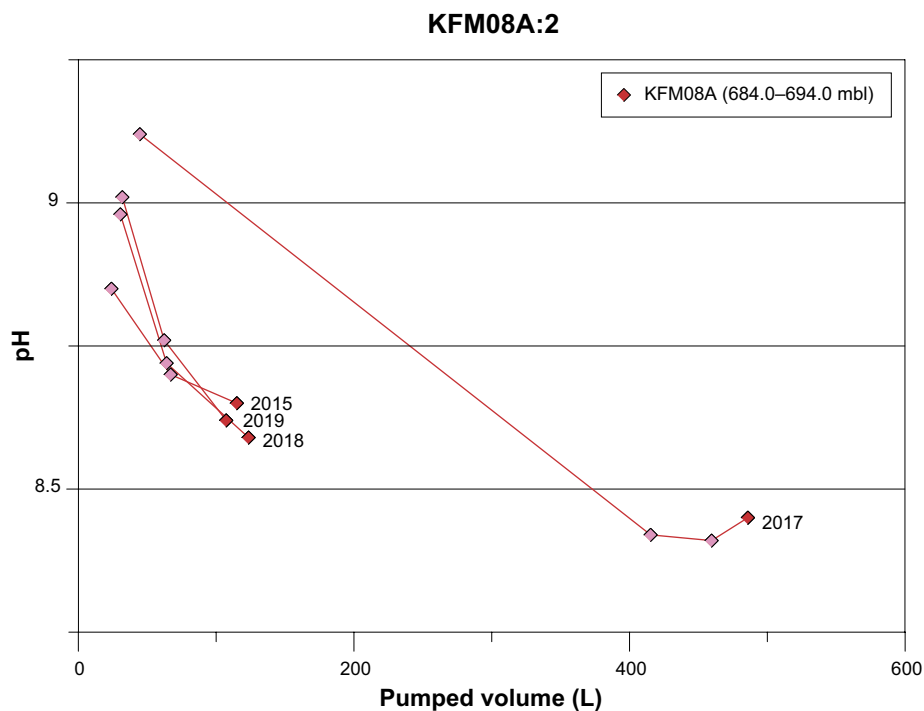


Figure A6-5. Comparison between pH values and pumped volumes during 2015–2019 for KFM08A:2. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C. No sampling of this section 2016 due to drilling of KFM24.

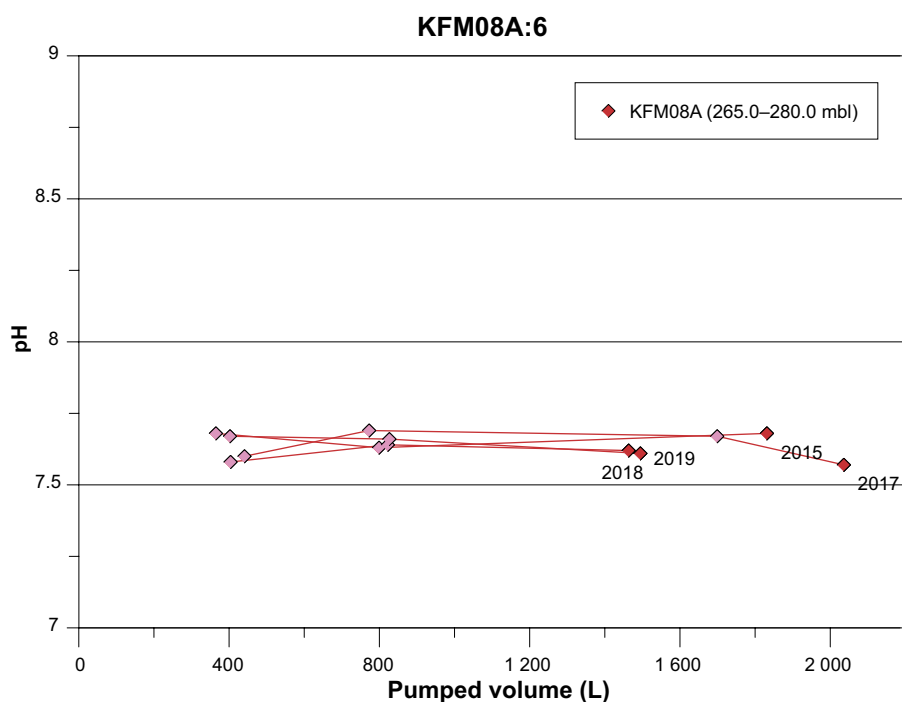


Figure A6-6. Comparison between pH values and pumped volumes during 2015–2019 for KFM08A:6. Observe scale on x-axis. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C. No sampling of this section 2016 due to drilling of KFM24.

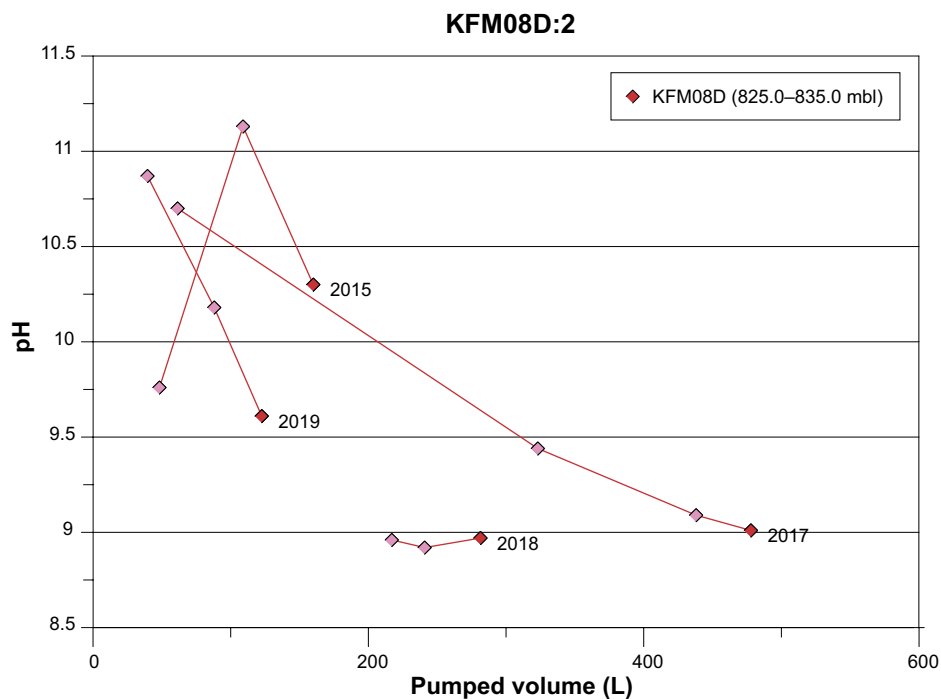


Figure A6-7. Comparison between pH values and pumped volumes during 2015–2019 for KFM08D:2. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C. This section has been omitted from the monitoring program for many years due to corrosion problem. After reinstallation of borehole equipment it was sampled again 2015. No sampling of this section 2016 due to drilling of KFM24.

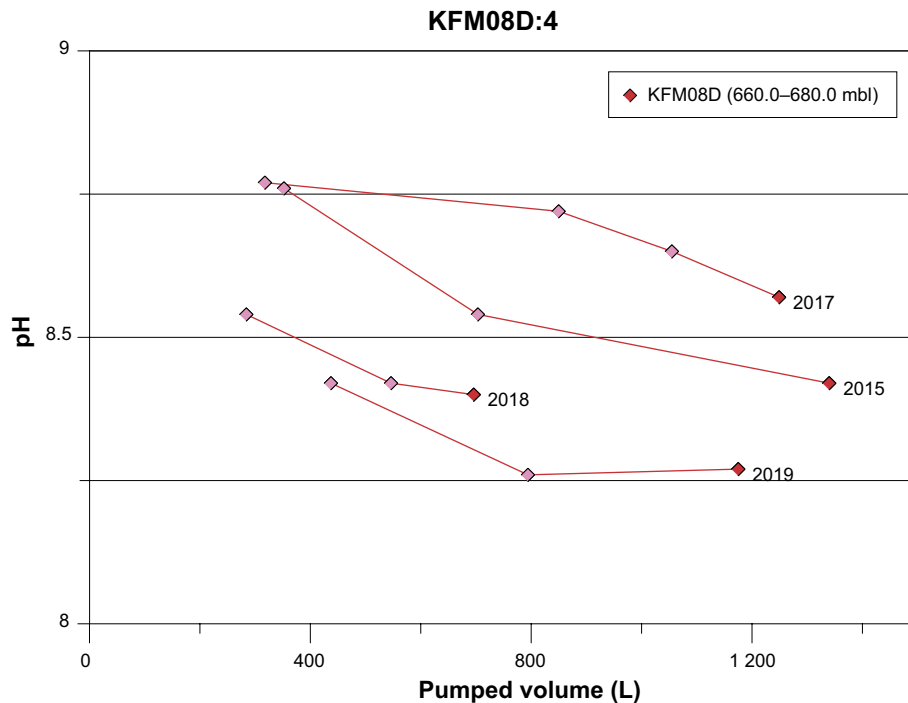


Figure A6-8. Comparison between pH values and pumped volumes during 2015–2019 for KFM08D:4. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C. This section has been omitted from the monitoring program for 2013–2014 due to corrosion problem. After reinstallation of borehole equipment it was sampled again 2015. No sampling of this section 2016 due to drilling of KFM24.

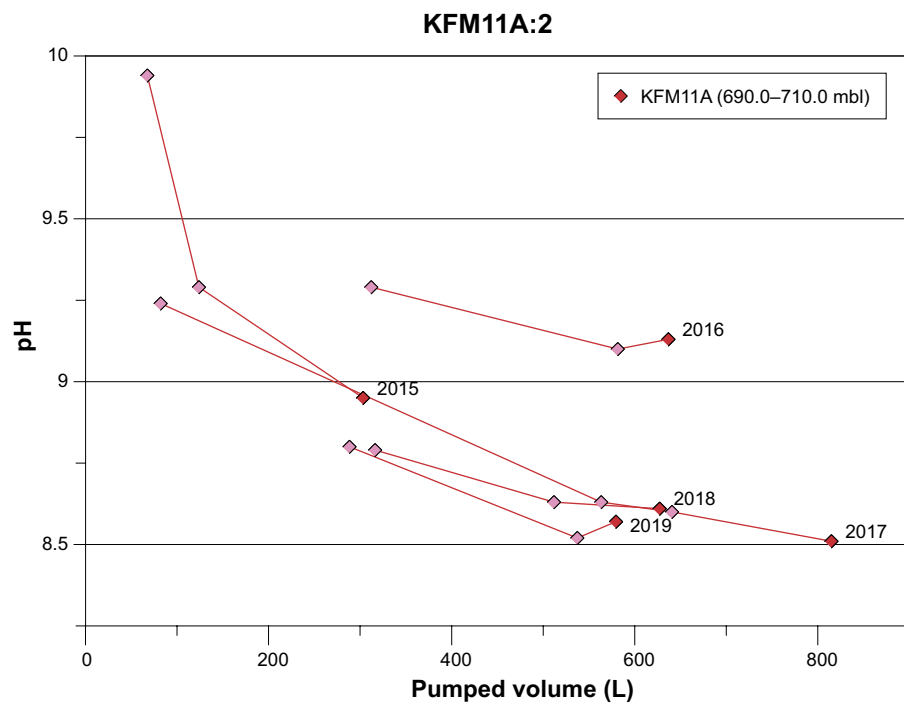


Figure A6-9. Comparison between pH values and pumped volumes during 2015–2019 for KFM11A:2. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C.

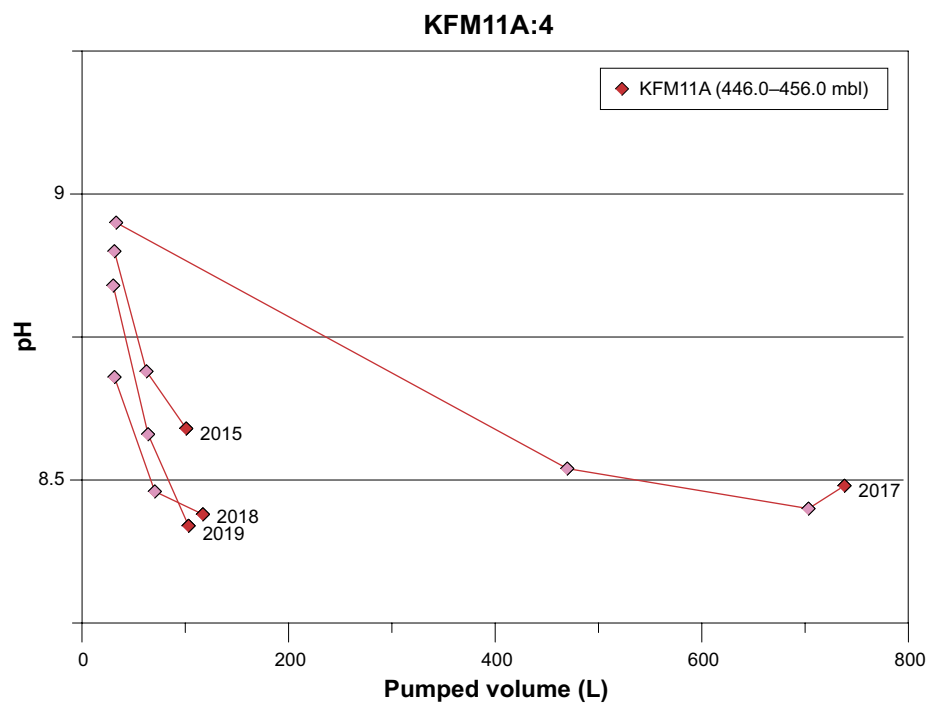


Figure A6-10. Comparison between pH values and pumped volumes during 2015–2019 for KFM11A:4. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C. No sampling in 2016.

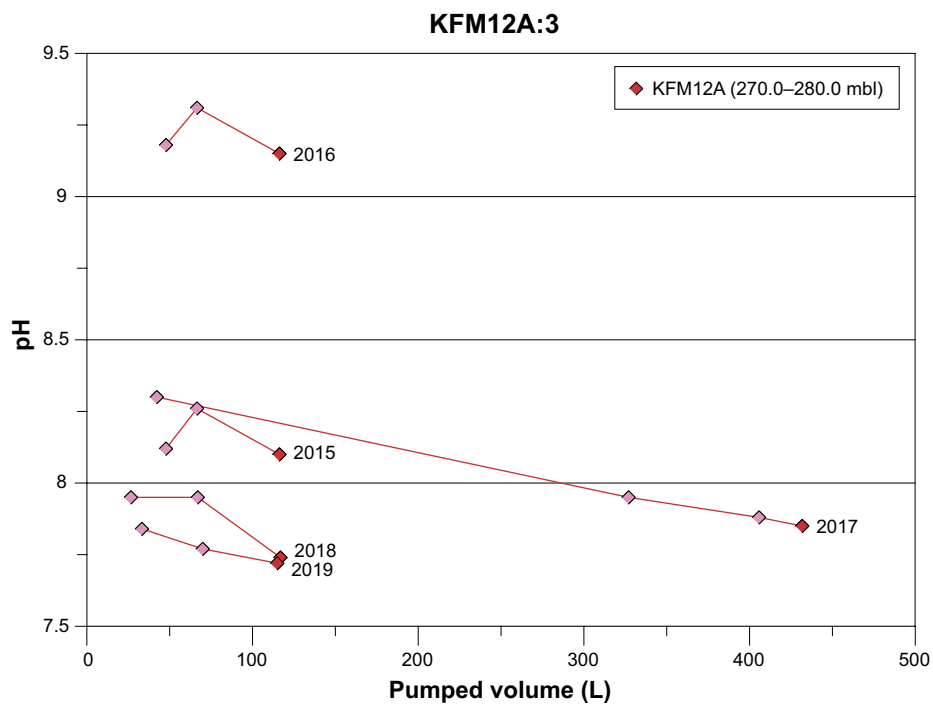


Figure A6-11. Comparison between pH values and pumped volumes during 2015–2019 for KFM12A:3. The last sample in the series (or the only sample if no series) is marked with a darker red colour. All the presented pH values are measured in the laboratory at 25 °C.

Plug-flow volumes

Table A7-1. Plug-flow volumes and section volumes.

Borehole Idcode: section	Plug-flow volume [L]
KFM01A:5	93
KFM01D:2	16
KFM01D:4	18
KFM02A:3	42
KFM02A:5	182
KFM02B:2	60
KFM02B:4	191
KFM03A:1	79
KFM03A:4	29
KFM04A:4	16
KFM06A:3	28
KFM06A:5	26
KFM06C:3 ²⁾	43
KFM06C:5 ²⁾	28
KFM07A:2	38
KFM08A:2	22
KFM08A:6	259
KFM08D:2	33
KFM08D:4	235
KFM10A:2	125
KFM11A:2 ²⁾	46
KFM11A:4	21
KFM12A:3 ²⁾	23
HFM01:2	306
HFM02:2	238
HFM04:2	103
HFM13:1	515
HFM15:1	116
HFM16:2	840
HFM19:1	203
HFM21:3	134
HFM27:2	222
HFM32:3	29
KFR101:1 ¹⁾	73
KFR102A:2 ¹⁾	194
KFR102A:5	52
KFR104:1 ¹⁾	60
KFR106:1	16
KFR106:2 ¹⁾	55
KFR105:1 ¹⁾	696
KFR01:1 ²⁾	40

¹⁾ Used volumes plug-flow smaller than 100 % formation waters, se Table A7-2.

²⁾ Section volume

Table A7-2. Plug-flow volumes special.

Idcode: section	Used plug-flow volume [L]	Percent formation water [%]	Volume needed for 100 % formation water [L]
KFR101:1	73	99	17 881
KFR102A:2	194	100	986
KFR104:1	60	83	491
KFR105:1	696	99	2 433
KFR106:2	55	89	1 450

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