P-10-37

Oskarshamn site investigation

Hydrogeochemical monitoring programme for core and percussion drilled boreholes 2009

Summary of ground water chemistry results from spring and autumn sampling

Claes Regander, Bo Bergman
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September 2010

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ISSN 1651-4416
SKB P-10-37

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Keywords: Groundwater, Borehole, Chemical analysis, Isotope determinations, Major cations, Trace elements, Rare earth elements, Sulphide, Electric conductivity, AP PS 400-09-004, AP PS 400-09-005.

Abstract

This report summarises the results obtained in 2009 from the hydrogeochemical monitoring programme for core and percussion drilled boreholes. During 2009 groundwater sampling has been performed in monitored (permanently installed) boreholes in two sampling periods, spring (May–June), and autumn (October–November). Both in spring and autumn groundwater sampling was carried out in the following 12 sections; HLX28:2, HLX35:2, HLX37:1, HLX39:1, KLX08:4, KLX10:2, KLX10:5, KLX12A:2, KLX15A:3, KLX15A:6, KLX18A:3, KLX19A:3.

The programme started in 2005 and since then water sampling has been performed twice every year. The objective of the hydrogeochemical monitoring programme is to determine the groundwater composition in selected sections chosen for this purpose.

In 2009 the sampling of core drilled borehole sections has been conducted in time series, where each borehole section has been sampled at seven occasions. Percussion drilled borehole sections has been sampled at three occasions. The final sample in each section was taken when the electric conductivity had reached a stable level.

Obtained results from the activities presented here include groundwater chemistry data in accordance with SKB chemistry class 5 including options and SKB chemistry reduced class 5. SKB chemistry reduced class 5 includes analysis of pH, electric conductivity, alkalinity, density, drill water (uranine), major cations (Chapter 5.4), F^-, Br^-, Cl^-, SO_4^{2-}, Fe(II)/Fe(tot), HS^-, DOC, TOC and the isotopes δ^2H, $\delta^{18}O$ and ^3H. Options for SKB chemistry class 5 include even lanthanoids and other trace elements, As, In, I, environmental metals, NH_4^+, nutrient salts and the isotopes $\delta^{34}S$, $\delta^{37}Cl$, $^{87}Sr/^{86}Sr$, $^{10}B/^{11}B$, $\delta^{13}C$, ^{226}Ra, ^{222}Rn, ^{238}U, ^{234}U, ^{230}Th and ^{232}Th.

All data from the activity are stored in the SICADA database.

Sammanfattning

Denna rapport sammanfattar resultaten från det hydrogeokemiska moniteringsprogrammet för kärn- och hammarborrhål år 2009. Grundvattenprovtagning har genomförts i moniterade (permanent installerade) borrhål under en våromgång, maj–juni, samt en höstomgång, oktober–november. Under såväl vår- som höstomgången provtogs följande 12 sektioner; HLX28:2, HLX35:2, HLX37:1, HLX39:1, KLX08:4, KLX10:2, KLX10:5, KLX12A:2, KLX15A:3, KLX15A:6, KLX18A:3, KLX19A:3.

Moniteringsprogrammet startade 2005 och provtagning har genomförts två gånger per år. Syftet med provtagningen är att dokumentera grundvattensammansättningen för de i programmet ingående borrhålssektionerna.

2009 års provtagning i kärnborrhål har genomförts i tidsserier omfattande sju provtagningstillfällen i varje sektion. Provtagning av hammarborrhål har genomförts vid tre provtagningstillfällen, varav det sista då den elektriska konduktiviteten stabiliserats.

Resultat från denna aktivitet inkluderar vattenkemidata enligt SKB kemiklass 5 med tillval och SKB reducerad kemiklass 5. SKB reducerad kemiklass 5 utgörs av pH, elektrisk konduktivitet, alkalinitet, densitet, spolvatten (uranin), stora katjoner (kapitel 5.4), F^-, Br^-, Cl^-, SO_4^{2-}, Fe(II)/Fe(tot), HS^-, DOC, TOC samt isotoperna δ^2H, $\delta^{18}O$ och ^3H. Tillval till SKB kemiklass 5 utgörs även av lantanoider och spårelement, As, In, I, miljömetaller, NH_4^+, närsalter samt isotoperna $\delta^{34}S$, $\delta^{37}Cl$, $^{87}Sr/^{86}Sr$, $^{10}B/^{11}B$, $\delta^{13}C$, ^{226}Ra, ^{222}Rn, ^{238}U, ^{234}U ^{230}Th och ^{232}Th.

All data från aktivitetens genomförande återfinns i databasen SICADA.

Contents

1 Introduction

This document presents the data collected during 2009 within the hydrogeochemical monitoring programme for core and percussion drilled boreholes.

The work was carried out in accordance with the activity plans AP PS 400-09-004 (spring sampling) and AP PS 400-09-005 (autumn sampling). Documents controlling the performance of this activity are listed in Table 1-1. The activity plans as well as the method descriptions are SKB internal controlling documents.

The field work was carried out in May–June and in October–November 2009. Both sampling periods included sampling in 12 selected borehole sections (Chapter 2.1).

Data from the field work, as well as analytical results, are traceable by the number of the activity plans in the SICADA database.

A map showing the investigation site at Oskarshamn including the boreholes sampled in the hydrogeochemical monitoring programme for core and percussion drilled boreholes 2009, is presented in Figure 1-1.

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

Activity plan	**Number**	**Version**
Hydrogeokemisk monitering av kärnborrhål (våromgången) 2009.	AP PS 400-09-004	1.0
Hydrogeokemisk monitering av kärnborrhål (höstomgången) 2009.	AP PS 400-09-005	1.0
Method descriptions	**Number**	**Version**
Mätsystembeskrivning (MSB) – Handhavandedel, System för hydrologisk och meterologisk datainsamling. Vattenprovtagning och utspädningsmätning i observationshål.	SKB MD 368.010	2 (Aug 2004)
Instruktion för rengöring av borrhålsutrustning och viss markbaserad utrustning.	SKB MD 600.004	1.0 (2002-02-07)

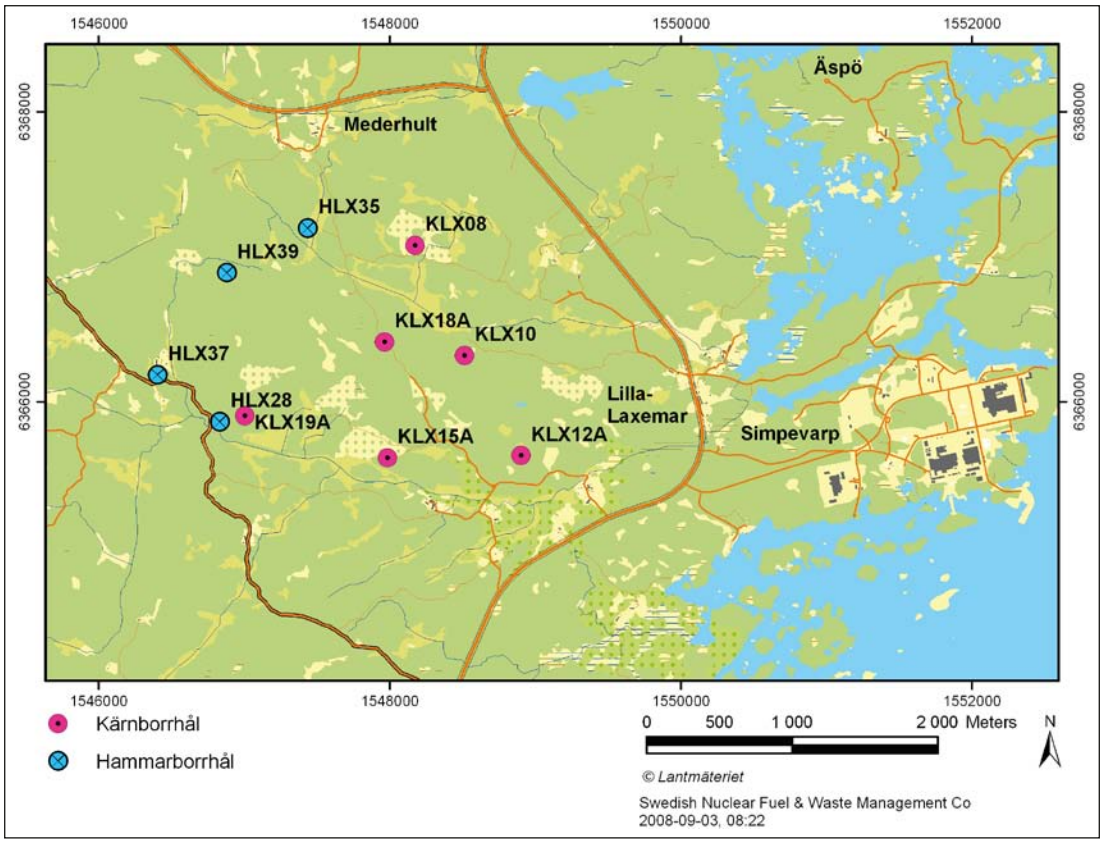

Figure 1-1. *Overview of the Oskarshamn site investigation area. The following borehole sections were sampled during the spring and autumn in 2009: HLX28:2, HLX35:2, HLX37:1, HLX39:1, KLX08:4, KLX10:2, KLX10:5, KLX12A:2, KLX15A:3, KLX15A:6, KLX18A:3, KLX19A:3.*

2 Objective and scope

According to the general programme for the Oskarshamn site investigation, core and percussion drilled boreholes are to be monitored twice every year. The water sampling is performed in circulation sections that are sealed off using permanently installed packers. The objective of the hydrogeochemical monitoring programme is to determine ground water composition over time in selected borehole sections chosen for this purpose. Water sampling within this programme has been made since 2005.

Ground water sampling within the monitoring programme of 2009 was carried out in the spring during May–June and in the autumn during October–November. During the spring groundwater sampling was carried out in totally 12 sections, and in the autumn field work included sampling of groundwater from the same 12 sections.

Apart from sending samples to laboratory for chemical analysis, field measurements of pH, temperature and electric conductivity were performed. Archive samples were stored in a freezer.

2.1 Sampled sections

The following sections in core drilled boreholes were sampled during 2009, both in the spring and autumn sampling periods:

- KLX08 Section 4, 594 to 625 m.
- KLX10 Section 2 and 5, 689 to 710 and 351 to 368 m.
- KLX12A Section 2, 535 to 545 m.
- KLX15A Section 3 and 6, 623 to 640 and 260 to 272 m.
- KLX18A Section 3, 472 to 489 m.
- KLX19A Section 3, 509 to 517 m.

The following sections in percussion drilled boreholes were sampled during 2009, both in the spring and autumn sampling periods:

- HLX28 Section 2, 70 to 90 m.
- HLX35 Section 2, 120 to 130 m.
- HLX37 Section 1, 150 to 200 m.
- HLX39 Section 1, 187 to 199 m.

In both sampling periods the eight core drilled sections was sampled in time series, while the four percussion drilled sections were sampled at three occasions (Chapter 4.3).

3 Equipment

3.1 Description of equipment

Groundwater sampling is performed in boreholes with permanently installed packers. The pump equipment used for the groundwater sampling is schematically presented in Figure 3-1.

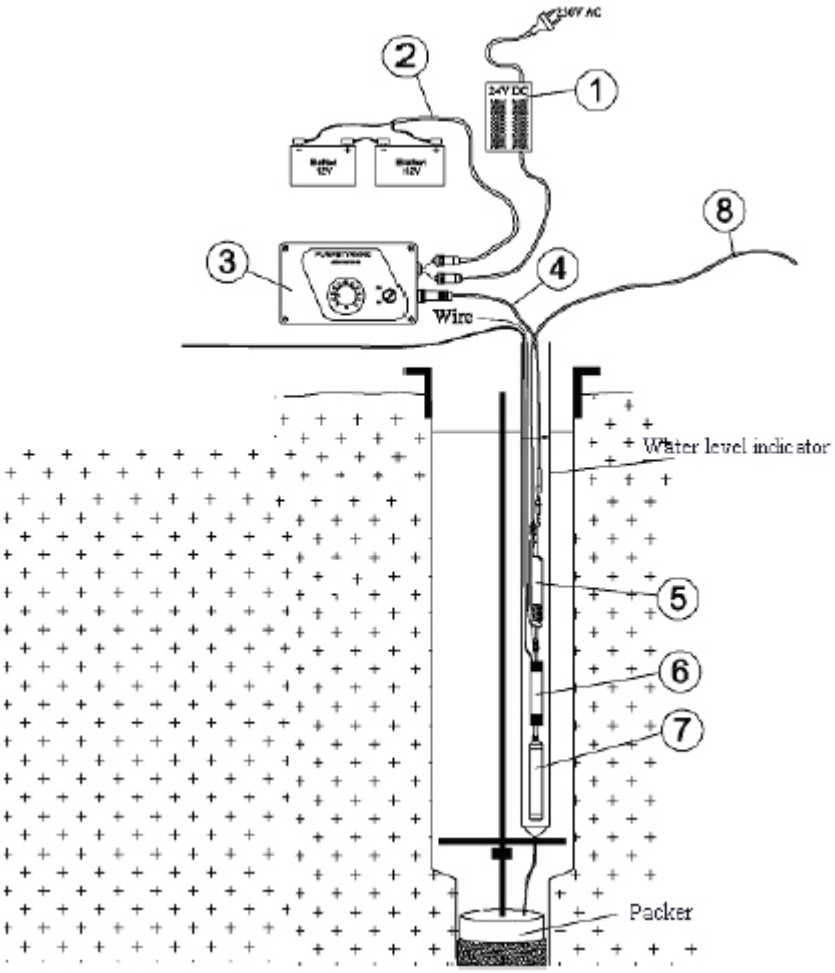

Figure 3-1. *Schematic drawing of the equipment used for groundwater sampling. 1. Battery eliminator 2. Battery cable 3. Pump control GEOPUMP UV 45 4. Pump cable 5. GEOPUMP UV 45 6. Mini packer 7. Filter holder with filter 8. Pump tube, polyamide 8/6 mm.*

4 Execution

4.1 General

The activity was performed in accordance with the activity plans AP PS 400-09-004 (spring sampling) and AP PS 400-09-005 (autumn sampling). Installation and handling of equipment was carried out in line with the method descriptions SKB MD 368.010 (Mätsystembeskrivning (MSB) – Handhavandedel, System för hydrologisk och meterologisk datainsamling. Vattenprovtagning och utspädningsmätning i observationshål. SKB internal document) and SKB MD 600.004 (Instruktion för rengöring av borrhålsutrustning och viss markbaserad utrustning. SKB internal document).

4.2 Preparations

The portable pH- and electric conductivity-meters were calibrated at the Äspö Laboratory at the beginning of each sampling period.

Sampling bottles belonging to the same sample portion was labelled with the same SKB sampling number. Acid washed bottles for analysis of major cations and archive samples was prepared with 1 ml HNO_3 suprapur. Acid washed bottles for analysis of Fe(II)/Fe(tot) was prepared with 5 ml HCl suprapur.

The first sample occasion in each time series was sampled after one half conversion of the volume of water in the tube between the section and the pump. Since this volume is quite small the pump was not tested in fresh water before lowered into the borehole. The test in fresh water was eliminated in order to avoid that fresh water from the pump filter and the pump affected the water composition at the first sample occasion. Instead the pump was lowered approximately 10 m below the surface in the borehole and tested in the section. If the pump was not functional it was exchanged. To reduce the risk of particles entering the permanent installation in the boreholes, tubes and cables were placed on plastic sheaths. During the lowering of the pump into a borehole all visible particles on the tube and cable were wiped off. New tubes and pump filters were used in each borehole section.

4.3 Execution of field work

Water sampling in each borehole section was performed using identical pump equipment set-ups, as shown in Figure 3-1.

During 2005, 2006 and part of 2007 sampling was made after 3–5 conversions. This means that the water volume in the tube, plus the volume in the section should be converted preferably five times, but at least three times before sampling. In 2007 the sample method was changed from 3–5 conversions to time series sampling. This resulted in five sampling occasions instead of one for each borehole section. In 2008 an initial sampling of HS^- was added, that is in total each borehole section was sampled six times.

During 2009 sampling of core drilled borehole sections has been made in time series. In comparison with 2008 an additional sampling occasion was added, that is in total each borehole section was sampled seven times. The first sample (analyzed for HS^- only) was taken after one half conversion of the water in the tube between the section and the pump. The second sample (analyzed for HS^-, alkalinity and Cl^-) was taken after conversion of the water in the tube and one half litre of water from the section itself.

The next three sampling occasions consisted of a SKB reduced chemistry class 5 and was sampled after 1, 2 and 3 conversions of the section volume. After the third conversion field measurements of electric conductivity were performed until electric conductivity stabilised, then a fourth SKB reduced chemistry class 5 (Chapter 4.5) was sampled. During the time series sampling the activity leader (SKB client) was continuously updated on the electric conductivity values and took part in the decision of when the fourth SKB reduced chemistry class 5 should be sampled. After the fourth

sampling of SKB reduced chemistry class 5 a SKB chemistry class 5 including options was sampled, in most cases after additionally one day. Field measurements of electric conductivity were performed until the last sample occasion.

Percussion drilled borehole sections were sampled two times in connection with pump start, equivalent to the core drilled borehole sections, and then monitored by measuring electric conductivity after 1, 2 and 3 conversions of section volume and thereafter until electric conductivity stabilised. When electric conductivity was stable a SKB chemistry class 5 including options (Chapter 4.5) was sampled.

To control the volume of groundwater pumped to the surface the flow was measured. The excess water not used for sampling was released in close vicinity of the borehole container.

The water level in the borehole sections was logged in order to determine the maximal drawdown during the sampling. The drawdown was generally not allowed to exceed 10 m.

Field measurements of pH, temperature and electric conductivity were performed.

After completion of sampling in a borehole the pump was uninstalled.

Archive samples were stored in a freezer.

4.3.1 Spring sampling

Groundwater sampling was performed in 12 sections. Sampled sections, volume in tube, volume in tube and section and the approximate total converted volume are listed in Table 4-1.

Approximate converted water volume, volume of water sample, drawdown, pump effect and flow rate for each borehole section are listed in Appendix 1 Table A1-1–A1-3.

Events during field work, such as pump start, date and time of water sampling and field measurements of temperature, pH, electric conductivity and sample number are listed in Appendix 1 Table A1-4–A1-15.

4.3.2 Autumn sampling

Groundwater sampling was conducted exactly the same way as in the spring. The same 12 sections as in the spring were sampled. Sampled sections, volume in tube, volume in tube and section and the approximate converted volume are listed in Table 4-2.

The water level in the borehole sections was logged in order to determine the maximal drawdown during the sampling.

Table 4-1. Sampled borehole sections during the spring sampling 2009. Volume in tube, volume in tube and borehole section and the approximate total converted volume.

Borehole section	Volume tube (L)	Volume tube+section (L)	Approximate total converted volume (L)
HLX28:2	1.8	307.72	5,000
HLX35:2	2.5	230.79	5,800
HLX37:1	3.9	600	5,000
HLX39:1	4.4	184.63	5,000
KLX08:4	15.7	48.8	5,000
KLX10:2	18.3	31.1	1,500
KLX10:5	8.8	20.2	5,000
KLX12A:2	14	23.2	900
KLX15A:3	16.5	58.0	5,200
KLX15A:6	6.2	29.6	5,000
KLX18A:3	12.2	37.3	713
KLX19A:3	13.3	36.5	6,500

Table 4-2. Sampled borehole sections during the autumn sampling 2009. Volume in tube, volume in tube and borehole section and the approximate total converted volume.

Borehole section	Volume tube (L)	Volume tube+section (L)	Approximate total converted volume (L)
HLX28:2	1.8	307.72	4,350
HLX35:2	2.5	230.79	4,300
HLX37:1	3.9	600	5,200
HLX39:1	4.4	184.63	3,600
KLX08:4	15.7	48.8	3,900
KLX10:2	18.3	31.1	710
KLX10:5	8.8	20.2	4,000
KLX12A:2	14	23.2	1,500
KLX15A:3	16.5	58.0	3,500
KLX15A:6	6.2	29.6	5,300
KLX18A:3	12.2	37.3	750
KLX19A:3	13.3	36.5	5,200

Approximate converted water volume, volume of water sample, drawdown, pump effect and flow rate for each borehole section during the field work are listed in Appendix 1 Table A1-16–A1-18.

Events during the field work, such as pump start, date of water sampling and field measurements of temperature, pH, electric conductivity and sample number are listed in Appendix 1 Table A1-19–A1-30.

4.4 Data handling

All data related to events during field work such as installation of pumps, water sampling and field measurements were noted in protocols. Before the protocols were handed over to SKB they were quality reviewed and signed by the responsible field engineer.

Quality control of chemical analyse results were made by the responsible personnel before they were sent to SKB. A statistical evaluation showing results above and below the 90th and 10th percentile, as well as the 95th and 5th percentile, were conducted. In addition to the statistical evaluation calculation of charge balance errors (equation 1) were made and reported.

$$\text{Relative error}(\%) = 100 \times \frac{\sum \text{cations(equivalents)} - \sum \text{anions(equivalents)}}{\sum \text{cations(equivalents)} + \sum \text{anions(equivalents)}} \qquad (4\text{-}1)$$

When the quality reviewed data are sent to SKB, routines for quality control and data management are applied.

Some of the constituents are determined by more than one method and/or laboratory. All analytical results are stored in the SICADA database. The applied hierarchy path “Hydrogeochemistry/Hydrochemical investigation/Analyses/Water in the database” contains two types of tables, raw data tables and primary data tables (final data tables).

Data regarding basic water analyses are inserted into the raw data tables for further evaluation. The evaluation finally results in a reduced dataset for each sample. These data sets are compiled in a primary data table named “water composition”. The evaluation is based on:

- Comparison of the results from different laboratories and/or methods.
- Calculation of charge balance errors, Equation 4-1. Relative errors within ± 5% are considered acceptable.
- General judgement of plausibility based on earlier results and experience.

All results from special analyses of trace metals and isotopes are inserted directly into primary data tables. In cases when the analyses are repeated or performed by more than one laboratory, a “best choice” notation will indicate those results which are considered most reliable.

An overview of the data management is given in Figure 4-1.

4.5 Analyses

Water pumped from the borehole was conveyed from the tube into the sample bottles. A water sample is defined as groundwater collected at one occasion and consists of several sample portions, labelled with the same SKB sample number.

The sampling bottles for each SKB chemistry class 5 including options consist of:

- eight 250 ml plastic bottles for pH, alkalinity, electric conductivity, anions, density, nutrient salts, TOC, DOC and archive samples,
- nine 100 ml plastic bottles; six for I^-, δ^2H, $\delta^{18}O$, $^{87}Sr/^{86}Sr$, $\delta^{13}C$ and drill water (brown) and three acid washed for major cations and archive samples,
- three 500 ml plastic bottles; two for ^3H (dried) and $\delta^{37}Cl$ and one acid washed for Fe(II)/Fe(tot),
- three 1,000 ml plastic bottles for $\delta^{34}S$, ^{226}Ra, ^{222}Rn, ^{238}U, ^{234}U,^{230}Th and ^{232}Th,
- two 50 ml flasks for NH_4,
- two Winkler flasks for HS^-.

The sampling bottles for each SKB chemistry reduced class 5 consist of:

- seven 250 ml plastic bottles for pH, alkalinity, conductivity, anions, density, TOC, DOC and archive samples,
- three 100 ml plastic bottles; two for $\delta^2H/\delta^{18}O$ analyses and drill water (uranine) analyses (brown) and one acid washed for major cations,
- two 500 ml plastic bottles; one for ^3H (dried) and one acid washed for Fe(II)/Fe(tot),
- two Winkler flasks for HS^-.

The sampling bottles for each of the first initial sampling (Chapter 4.3) consisted of two Winkler flasks for HS^-.

The sampling bottles for each of the second initial sampling (Chapter 4.3) consisted of two Winkler flasks for HS^- and two 250 ml plastic bottles for alkalinity and Cl^-.

Portioning into sample bottles, filtration and conservation of samples were performed in field.

An overview of sample treatment and analyse methods is given in Appendix 2 Table A2-1. An overview of methods, reporting limits and uncertainties is given in Appendix 2 Table A2-2.

All analytical results are traceable by the activity plan numbers and the SKB sample numbers in the database SICADA.

4.6 Control analyses

Control analyses of major cations, TOC, DOC and bromide has been made by sending samples for analysis to two different laboratories. The borehole sections selected for control analysis of main components, TOC and DOC were made together with the activity leader (SKB client). A sample from the deepest section in each borehole has been sent for control analysis of bromide.

4.6.1 Spring sampling

During the spring sampling three samples (SKB sample numbers 15916, 15930 and 15937) were sent for control analyses of TOC, DOC and major cations.

Eleven samples (SKB sample numbers 15895, 15902, 15916, 15923, 15930, 15937, 15940, 15943, 15976, 15979 and 15982) were sent for control analysis of bromide.

4.6.2 Autumn sampling

During the autumn sampling three samples (SKB sample numbers 19117, 19124 and 19160) were sent for control analyses of TOC, DOC and major cations.

Twelve samples (SKB numbers 19091, 19105, 19108, 19111, 19114, 19117, 19124, 19131, 19131, 19153, 19160 and 19167) were sent for control analysis of bromide.

4.7 Nonconformities

4.7.1 Spring sampling

SKB decided that two litres should be sampled for Ra/Rn analysis. This was decided after sampling the chemistry class 5 in KLX18A:3, whereas only one litre was sampled at that time.

4.7.2 Autumn sampling

Drawdown in sections KLX12A:2 and HLX39:1 could not be monitored during part of or the sampling period. The problems with the drawdown logging system were caused by lightning.

Pumps used in previous trials had been left in sections KLX15A:3 and KLX15A:6. As a time saving measure it was decided that these pumps could be used for sampling within the hydrogeochemical monitoring programme without replacing the used pump filters to new ones.

SKB sample number 19167 has not been analyzed for $\delta^{13}C$ and PMC. Due to a very low alkalinity the result would be unreliable.

5 Results

Water chemistry data obtained within the hydrogeochemical monitoring programme during 2009 originate from groundwater samples from borehole sections HLX28:2, HLX35:2, HLX37:1, HLX39:1, KLX08:4, KLX10:2, KLX10:5, KLX12A:2, KLX15A:3, KLX15A:6, KLX18A:3 and KLX19A:3.

5.1 Chemical analyses

Results from the chemical analyses for both spring and autumn sampling periods are presented below and in Appendix 3. The results are stored in the SICADA database and are traceable by the activity plan numbers AP PS 400-09-004, AP PS 400-09-005 and the SKB sample numbers. It is only the data in the database that are accepted for further interpretation (modelling).

The same sections that were sampled in the spring were again sampled during the autumn.

The extent of the analyses in the two sampling periods was identical with exception for Ra/Rn, which was not included in the autumn sampling.

5.2 Field measurements of electric conductivity

For each section field measurements of electric conductivity were made at least once a day (weekdays) and at every sample occasion.

5.2.1 Spring sampling

In Appendix 4 Figure A4-1 field measurement of electric conductivity is plotted versus date. Appendix 4 Figure A4-2 shows electric conductivity plotted versus time (minutes) after pump start. Appendix 4 Figure A4-3 shows electric conductivity plotted versus pumped volume (L).

5.2.2 Autumn sampling

In Appendix 4 Figure A4-4 field measurement of electric conductivity is plotted versus date. Appendix 4 Figure A4-5 shows electric conductivity plotted versus time (minutes) after pump start. Appendix 4 Figure A4-6 shows electric conductivity plotted versus pumped volume (L).

5.3 Sulphide analyses

Every sampling occasion, in core drilled as well as percussion drilled borehole sections, included a sample for analysis of sulphide.

All samples intended for analysis of sulphide (Winkler flasks) were preserved with 0.5 ml zinc acetate and 0.5 ml sodium hydroxide.

5.3.1 Spring sampling

Appendix 5 Figure A5-1 shows HS^- concentration versus time (min) after pump start. Note the logarithmic scale on the both the x-axis and the y-axis.

Appendix 5 Figure A5-2 shows HS^- concentration plotted versus volume (L) after pump start. Note the logarithmic scale on the x-axis.

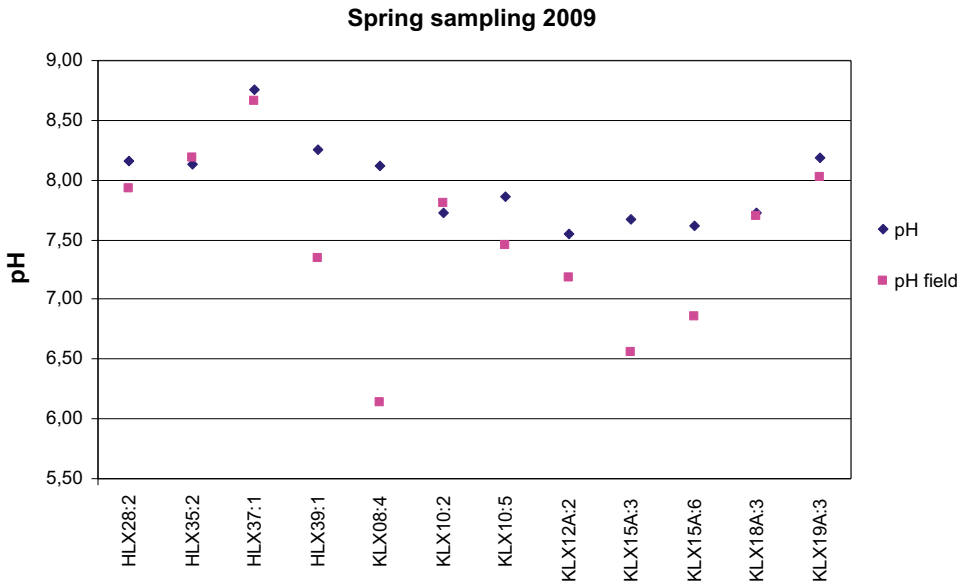

Figure 5-1. *pH analysed at the Äspö Laboratory compared to pH measured in field at the last sampling occasion in each borehole section during the spring sampling.*

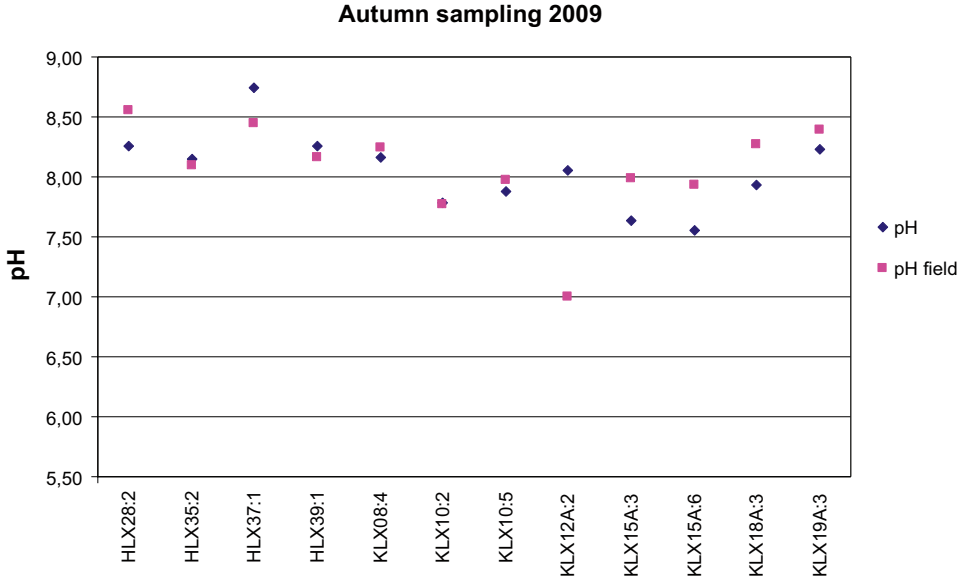

Figure 5-2. *pH analysed at the Äspö Laboratory compared to pH measured in field at the last sampling occasion in each borehole section during the autumn sampling.*

5.3.2 Autumn sampling

Appendix 5 Figure A5-3 shows HS^- concentration versus time (min) after pump start. Note the logarithmic scale on the both the x-axis and the y-axis.

Appendix 5 Figure A5-4 shows HS^- concentration plotted versus volume (L) after pump start. Note the logarithmic scale on the x-axis.

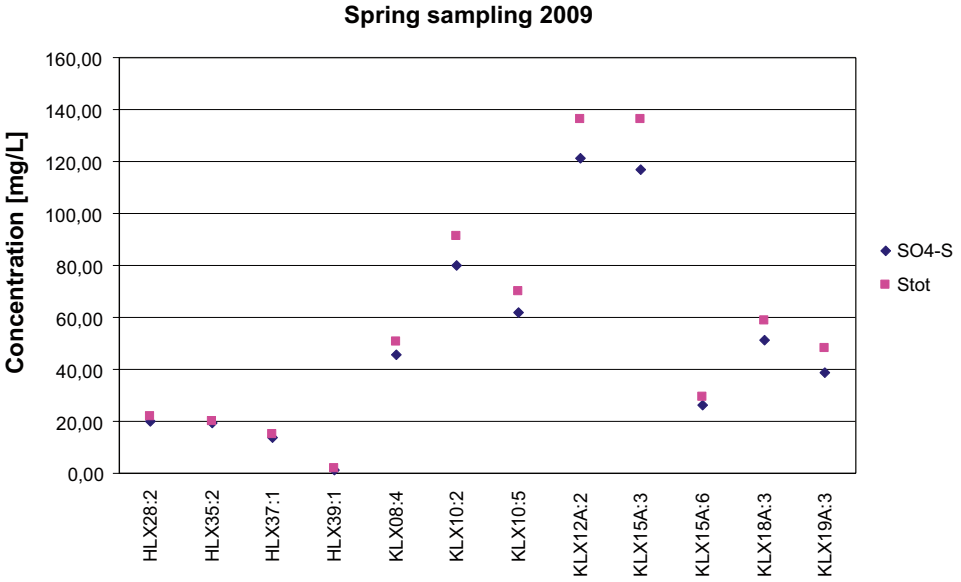

Figure 5-3. Comparison of sulphur in sulphate (analysed using spectrophotometer) with total sulphur content (analysed using ICP-AES) for investigated sections during the spring sampling 2009.

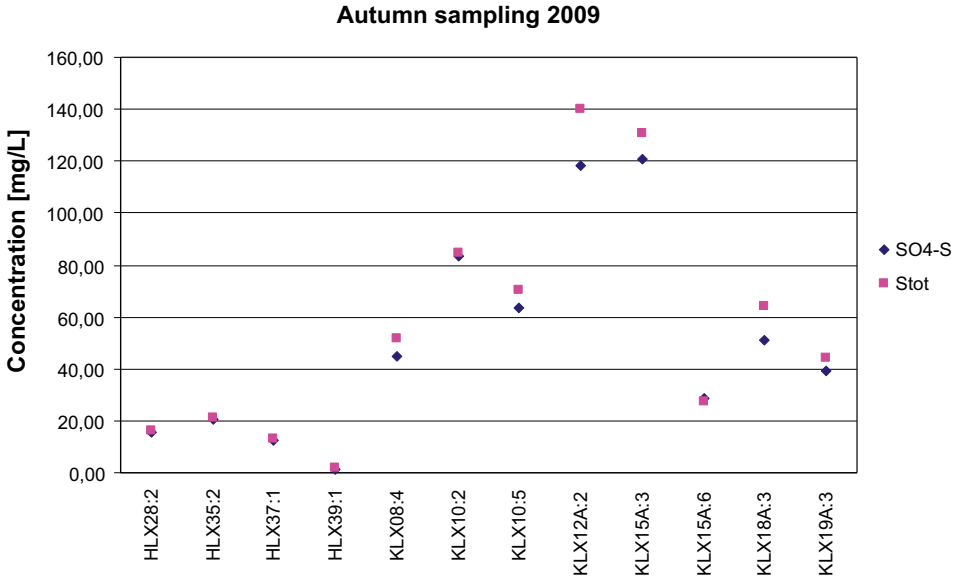

Figure 5-4. Comparison of sulphur in sulphate (analysed using spectrophotometer) with total sulphur content (analysed using ICP-AES) for investigated sections during the autumn sampling 2009.

5.4 Basic water analyses

The basic water analyses include major cations (Na, K, Ca, Mg, Si, Li, S, Sr) and SO_4^{2-}, Cl^-, HCO_3^-, Br^-, and F^-. Furthermore, measurements were made of pH, electric conductivity, drill water content (uranine) and density. The basic water analysis data and relative charge balance errors are compiled in Appendix 3 Table A3-1.

Values of pH from laboratory and field measurements are compared in Figure 5-1 (spring) and in Figure 5-2 (autumn). All values are from the last sample occasion in each borehole section.

The sulphur in sulphate has been analysed with two different methods, as sulphur in sulphate using spectrophotometer and as total sulphur using ICP-AES. In Figure 5-3 the sulphur in sulphate are compared to the total sulphur content for the spring sampling 2009. In Figure 5-4 the sulphur in sulphate are compared to the total sulphur content for the autumn sampling 2009.

The chloride concentration is plotted versus the corresponding value of electric conductivity for both the spring and the autumn sampling in Figure 5-5.

5.5 Trace elements (rare earth elements and other)

The analyses of trace and rare earth elements include As, Ba, Cd, Ce, Cs, Dy, Er, Eu, Gd, Hg, Hf, Ho, In, La, Lu, Nd, Pr, Rb, Sc, Sm, Th, Tb, Tl, Tm, U, V, Y, Yb and Zr. Commonly occurring metals, such as Cu, Zn, Pb and Mo are not included in the analysis programme due to contamination considerations. The trace element data are compiled in Appendix 3 Table A3-2.

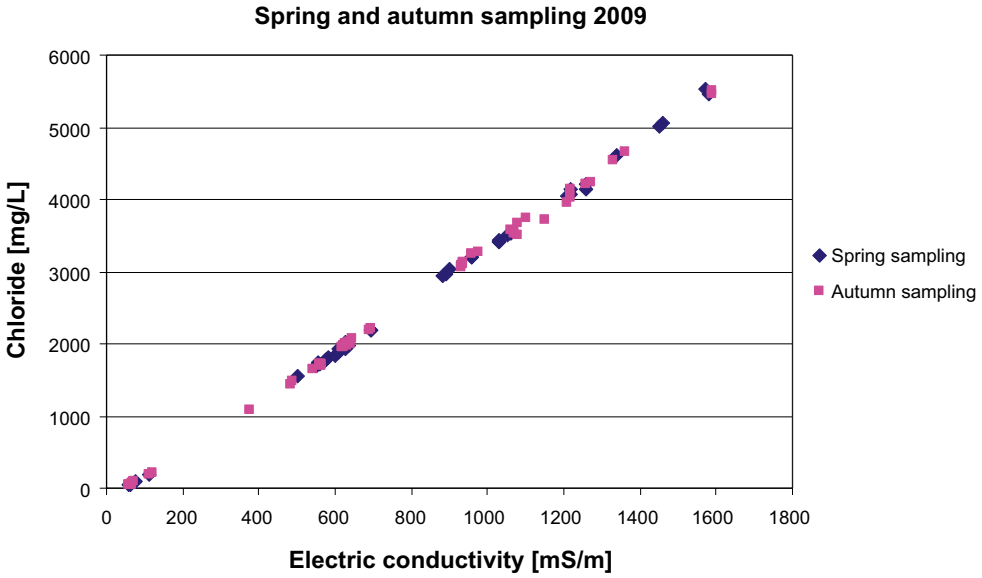

Figure 5-5. *Chloride concentration plotted versus electrical conductivity for sampling conducted during the spring and autumn sampling 2009.*

5.6 Stable and radioactive isotopes

The isotope determinations include stable isotopes as well as radioactive isotopes. The isotope data are compiled in Appendix 3 Table A3-3.

The ^{3}H results from the monitored sections during the spring and autumn sampling are presented in Figure 5-6 and 5-7 respectively.

The $\delta^{2}H$ and $\delta^{18}O$ results from the monitored sections during the spring and autumn sampling are presented in Figure 5-8 and 5-9 respectively. In the figures the $\delta^{2}H$ and $\delta^{18}O$ isotopes are plotted against each other.

The local specific plot of $\delta^{2}H$ and $\delta^{18}O$ isotopes against each other is compared to the Global Meteoric Water Line (GMWL, or sometimes GML) relationship. The GMWL describes the average relationship between hydrogen and oxygen isotope ratios in natural terrestrial waters, expressed as a worldwide average.

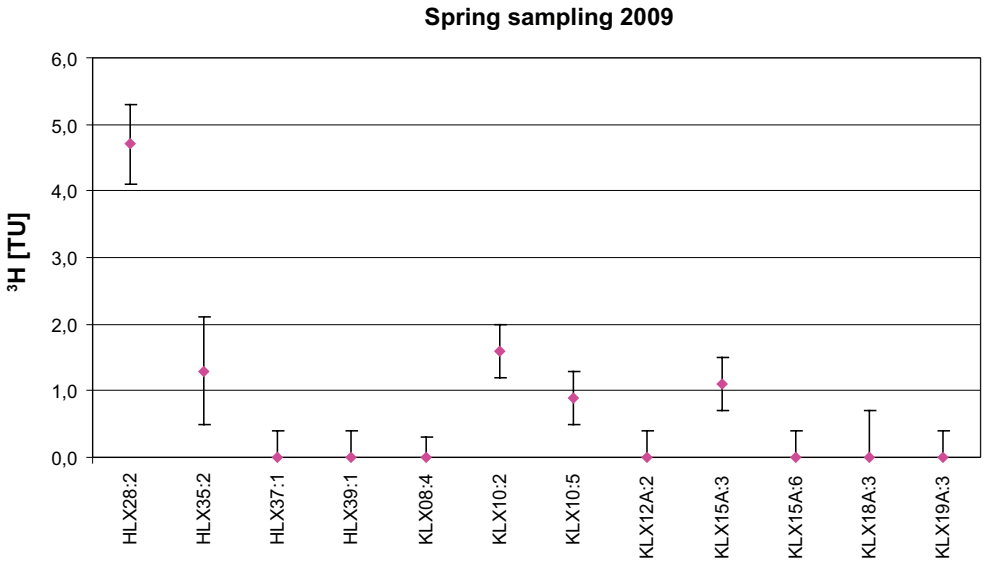

Figure 5-6. ^{3}H data from samples collected from the monitored sections during the spring sampling (error bars shows standard deviation).

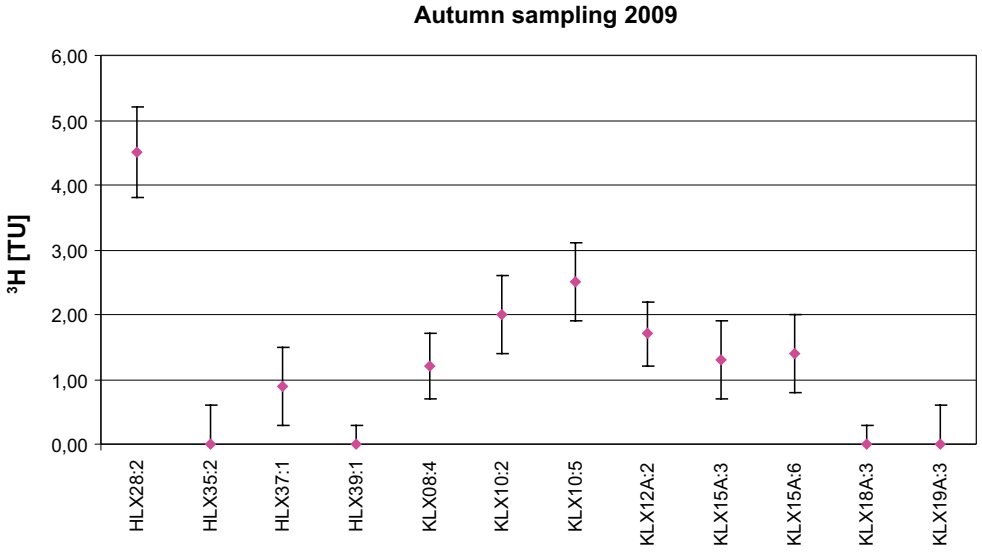

Figure 5-7. ^{3}H data from samples collected from the monitored sections during the autumn sampling (error bars shows standard deviation).

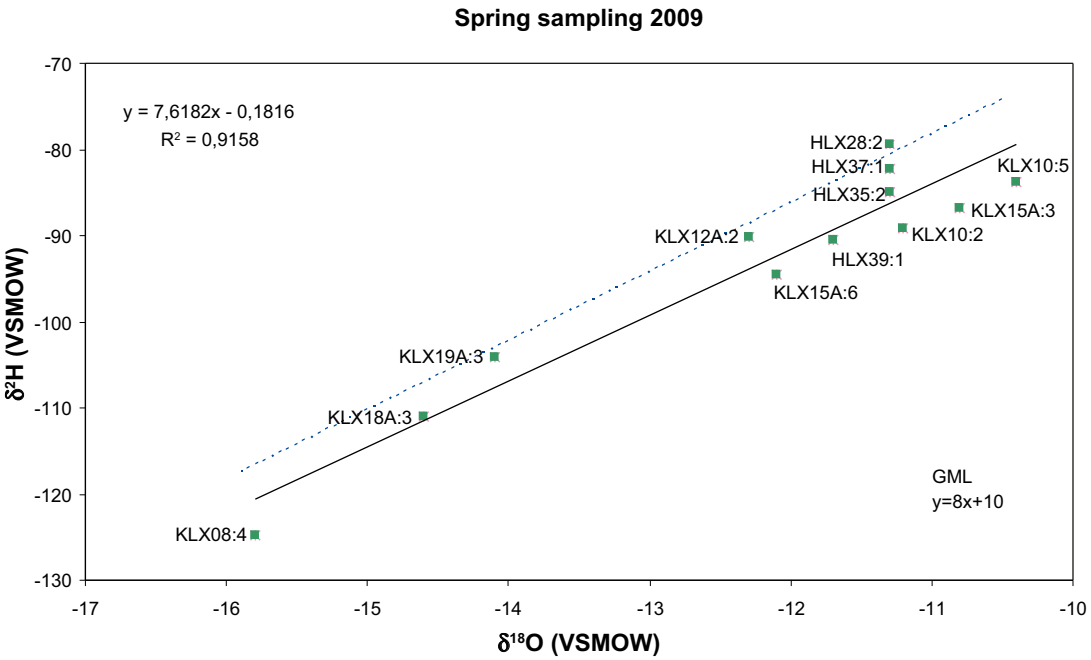

Figure 5-8. *δ^2H and $\delta^{18}O$ data from samples collected from the monitored sections during the spring sampling. The solid line represents the regression of δ^2H against $\delta^{18}O$ according to the equation in the left upper corner. The blue dotted line represents the Global Meteoric Water Line relationship between δ^2H and $\delta^{18}O$ according to the equation given by Craig (1961).*

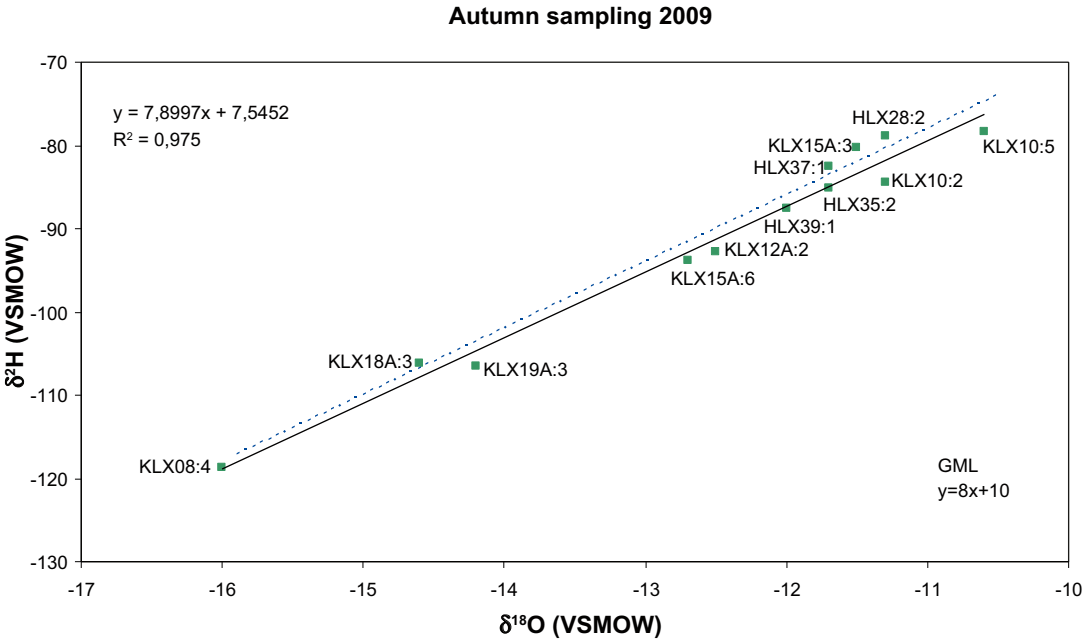

Figure 5-9. *δ^2H and $\delta^{18}O$ data from samples collected from the monitored sections during the autumn sampling. The solid line represents the regression of δ^2H against $\delta^{18}O$ according to the equation in the left upper corner. The blue dotted line represents the Global Meteoric Water Line relationship between δ^2H and $\delta^{18}O$ according to the equation given by Craig (1961).*

6 Summary and discussion

Two sampling periods were performed during 2009, the first in the spring and the second in the autumn. Twelve borehole sections were sampled during the spring sampling period, and during the autumn sampling the same borehole sections were sampled again. Sampling was made in accordance with SKB chemistry class 5 including options and reduced class 5. Sampling was made in time series in all core drilled boreholes, each section was sampled seven times in total. Electric conductivity has been an important parameter in the time series sampling and the last sample in each time series was sampled when electric conductivity was stable. The percussion drilled boreholes were sampled at three occasions, the last when the electric conductivity was stable.

The nonconformities during the sampling periods were few and are considered to be insignificant with regard to the quality of the collected samples.

No nonconformities have been reported from the laboratories involved in the analyses of the samples.

Obtained results have been quality reviewed and comparison of the results from different laboratories and/or methods showed agreement in most cases. The charge balance error did not in any single case exceed the acceptable level of ± 5 %.

A statistical evaluation based on the complete data set of analytical results (SKB chemistry class 5) from the hydrogeochemical monitoring programmes of 2007, 2008 and 2009 were conducted. The obtained results are generally within the 10th and the 90th percentile. In some cases however, the obtained results show a distinct deviation. For the percussion drilled boreholes the results generally lies below the 5th percentile. The consistent deviations for the percussion drilled boreholes clearly indicate a systematic measure/sampling related phenomenon as opposed to an analytical error, which would occur as randomly distributed deviations. The systematic deviations for the percussion drilled boreholes could be related to the shallow depth of the sections. Neither of these sections is placed below 200 meters, unlike sections in core drilled boreholes which all are placed deeper. The generally lower electric conductivity and lower density of the groundwater from these shallow sections suggests a different composition than groundwater from deeper sections and perhaps another origin.

In KLX15A:6 the content of uranine exceeds 95th percentile. Uranine is not a naturally occurring element in groundwater, but an additive to the mud during drilling. Measured levels were well above 50% of the original content in the mud which suggests that uranine have been used as a tracer at test(s) after the completion of the borehole.

In KLX15A:6 a number of analysed elements also show results above the 95th percentile, witch could indicate a different chemical composition in this section compared to other sections in core drilled boreholes. It can however not be ruled out that the deviation in this section has a connection to the above mentioned test(s).

The local specific plot of $\delta^{2}H$ and $\delta^{18}O$ isotopes against each other, see Figures 5-8 and 5-9, deviates between spring and autumn. The local specific plot in Figure 5-8 (spring) deviates from the Global Meteoric Water Line (GMWL), whereas the local specific plot in Figure 5-9 (autumn) is in accordance with the GMWL.

The GMWL describes the average relationship between hydrogen and oxygen isotope ratios in natural terrestrial waters, expressed as a worldwide average. The original assertion of the GMWL is that the isotopic enrichments, relative to ocean water, is linear for all waters which have not undergone excessive evaporation (Craig 1961).

Any deviations from the GMWL as well as temporal variations in the relationship between $\delta^{2}H$ and $\delta^{18}O$ may depend on isotopic fractionation.

The overall $\delta^{2}H$ to $\delta^{18}O$ isotopic results plotted in Figures 5-8 and 5-9 display a wide variation, reflecting different water types. The slight variation between the spring and autumn sampling for the percussion boreholes may reflect the seasonal isotopic fractionation of recharged meteoric water.

Given the outcome of the execution of the samplings and the consistently high quality of the analyses, the obtained data can be recommended for further evaluation of the hydrogeochemical conditions in the investigation area.

7 References

SKB's (Svensk Kärnbränslehantering AB) publications can be found at www.skb.se/publications.

Craig H, 1961. Isotopic variations in meteoric waters. Science, 133, pp 1702–1703.

Appendix 1

Sampling conditions and events during field work

Spring sampling

Table A1-1. Sampling conditions in borehole sections sampled during the spring sampling.

	HLX28:2	HLX35:2	HLX37:1	HLX39:1
Pumped, converted water volume (L)	5,000	5,800	5,000	5,000
Water sample, volume (L)	15	15	15	15
Maximal drawdown (m)	0.05	0.1	0.15	0.2
Maximum pump effect (%)	47,5	75,5	60	44
Maximum flow rate (L/min)	0.5	0.5	0.5	0.5

Table A1-2. Sampling conditions in borehole sections sampled during the spring sampling.

	KLX08:4	KLX10:2	KLX10:5	KLX12A:2
Pumped, converted water volume (L)	5,000	1,500	5,000	900
Water sample, volume (L)	29	29	29	29
Maximal drawdown (m)	5	8	1,6	12
Maximum pump effect (%)	67	27	41	54.5
Maximum flow rate (L/min)	0.5	0.07	0.4	0.085

Table A1-3. Sampling conditions in borehole sections sampled during the spring sampling.

	KLX15A:3	KLX15A:6	KLX18A:3	KLX19A:3
Pumped, converted water volume (L)	5,200	5,000	713	6,500
Water sample, volume (L)	29	29	29	29
Maximal drawdown (m)	2.9	1.2	15.6	2.8
Maximum pump effect (%)	46	44	32	57
Maximum flow rate (L/min)	0.3	0.5	0.07	0.5

Table A1-4. Events in HLX28, 70 to 90 m, Section 2.

Date	Event	SKB sample no.
2009-06-16	Deflation of packer	
2009-06-16	Installation of pump	
2009-06-16	Start of pump*	
2009-06-16	Water sampling: SKB reduced chemistry class 5 (HS^-)	15977
	T_{field}: 11.2°C, pH_{field}: 7.22, EC_{field}: 83.1 mS/m Conversed volume: 0.9 L	
2009-06-16	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15978
	T_{field}: 9°C, pH_{field}: 7.34, EC_{field}: 79.7 mS/m Conversed volume: 2.3 L	
2009-06-24	Water sampling: SKB chemistry class 5	15979
	T_{field}: 9.8°C, pH_{field}: 7.93, EC_{field}: 78.1 mS/m	
2009-06-24	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-5. Events in HLX35, 120 to 130 m, Section 2.

Date	Event	SKB sample no.
2009-05-18	Deflation of packer	
2009-05-18	Installation of pump	
2009-05-18	Start of pump*	
2009-05-18	Water sampling: SKB reduced chemistry class 5 (HS^-)	15941
	T_{field}: 9.1°C, pH_{field}: 6.21, EC_{field}: 75.2 mS/m	
	Conversed volume: 1,4 L	
2009-05-18	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15942
	T_{field}: 8.9°C, pH_{field}: 6.04, EC_{field}: 90.3 mS/m	
	Conversed volume: 3 L	
2009-05-26	Water sampling: SKB chemistry class 5	15943
	T_{field}: 12.7°C, pH_{field}: 8.18, EC_{field}: 109.3 mS/m	
2009-05-26	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-6 Events in HLX37, 150 to 200 m, Section 1.

Date	Event	SKB sample no.
2009-06-16	Deflation of packer	
2009-06-16	Installation of pump	
2009-06-16	Start of pump*	
2009-06-16	Water sampling: SKB reduced chemistry class 5 (HS^-)	15980
	T_{field}: 10.9°C, pH_{field}: 7.68, EC_{field}: 33.5 mS/m	
	Conversed volume: 1.8 L	
2009-06-16	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15981
	T_{field}: 11°C, pH_{field}: 7.89, EC_{field}: 32.9 mS/m	
	Conversed volume: 4.4 L	
2009-06-23	Water sampling: SKB chemistry class 5	15982
	T_{field}: 9.7°C, pH_{field}: 8.66 , EC_{field}: 59.2 mS/m	
2009-06-23	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-7. Events in HLX39, 187 to 199 m, Section 1.

Date	Event	SKB sample no.
2009-05-14	Deflation of packer	
2009-05-14	Installation of pump	
2009-05-18	Start of pump*	
2009-05-18	Water sampling: SKB reduced chemistry class 5 (HS^-)	15938
	T_{field}: 8.9°C, pH_{field}: 7.1, EC_{field}: 65 mS/m	
	Conversed volume: 1.9 L	
2009-05-18	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15939
	T_{field}: 8.6°C, pH_{field}: 7.06, EC_{field}: 52,2 mS/m	
	Conversed volume: 4.9 L	
2009-05-25	Water sampling: SKB chemistry class 5	15940
	T_{field}: 12.1°C, pH_{field}: 7.35, EC_{field}: 65,7 mS/m	
2009-05-25	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-8. Events in KLX08, 594 to 625 m, Section 4.

Date	Event	SKB sample no.
2009-05-11	Deflation of packer	
2009-05-11	Installation of pump	
2009-05-12	Start of pump*	
2009-05-12	Stop of pump	
2009-05-12	Deflation of packer	
2009-05-12	Installation of pump	
2009-05-12	Start of pump*	
2009-05-12	Water sampling: SKB reduced chemistry class 5 (HS^-) T_{field}: 12.5°C, pH_{field}: 7.28, EC_{field}: 641 mS/m Conversed volume: 12.5 L	15931
2009-05-12	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-) T_{field}: 10.7°C, pH_{field}: 7.44, EC_{field}: 639 mS/m Conversed volume: 16,2 L	15932
2009-05-12	Water sampling: SKB reduced chemistry class 5 T_{field}: 10.1°C, pH_{field}: 7.78, EC_{field}: 616 mS/m	15933
2009-05-12	Water sampling: SKB reduced chemistry class 5 T_{field}: 9.4°C, pH_{field}: 6.59, EC_{field}: 634 mS/m	15934
2009-05-12	Water sampling: SKB reduced chemistry class 5 T_{field}: 9.7°C, pH_{field}: 6.98, EC_{field}: 637 mS/m	15935
2009-05-18	Water sampling: SKB reduced chemistry class 5 T_{field}: 9.6°C, pH_{field}: 6.11, EC_{field}: 659 mS/m	15936
2009-05-19	Water sampling: SKB chemistry class 5 T_{field}: 9.3°C, pH_{field}: 6.14, EC_{field}: 651 mS/m	15937
2009-05-19	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-9. Events in KLX10, 689 to 710 m, Section 2.

Date	Event	SKB sample no.
2009-05-05	Deflation of packer	
2009-05-05	Installation of pump	
2009-05-11	Start of pump*	
2009-05-11	Water sampling: SKB reduced chemistry class 5 (HS^-) T_{field}: 12.4°C, pH_{field}: 8, EC_{field}: 1,006 mS/m Conversed volume: 13 L	15917
2009-05-11	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-) T_{field}: 9.3°C, pH_{field}: 8.05, EC_{field}: 1,067 mS/m Conversed volume: 18.8 L	15918
2009-05-11	Water sampling: SKB reduced chemistry class 5 T_{field}: 7.4°C, pH_{field}: 7.78, EC_{field}: 910 mS/m	15919
2009-05-11	Water sampling: SKB reduced chemistry class 5 T_{field}: 12.2°C, pH_{field}: 8.07, EC_{field}: 1,042 mS/m	15920
2009-05-11	Water sampling: SKB reduced chemistry class 5 T_{field}: 10.8°C, pH_{field}: 7.48, EC_{field}: 1,044 mS/m	15921
2009-05-25	Water sampling: SKB reduced chemistry class 5 T_{field}: 11.4°C, pH_{field}: 7, EC_{field}: 1,071 mS/m	15922
2009-05-26	Water sampling: SKB chemistry class 5 T_{field}: 21.9°C, pH_{field}: 7.81, EC_{field}: 1,057 mS/m	15923
2009-05-26	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-10. Events in KLX10, 351 to 368 m, Section 5.

Date	Event	SKB sample no.
2009-05-05	Deflation of packer	
2009-05-05	Installation of pump	
2009-05-11	Start of pump*	15924
2009-05-11	Water sampling: SKB reduced chemistry class 5 (HS^-)	
	T_{field}: 9.8°C, pH_{field}: 8.20, EC_{field}: 119.7 mS/m	
	Conversed volume: L	
2009-05-11	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15925
	T_{field}: 9.8°C, pH_{field}: 7.85, EC_{field}: 375 mS/m	
	Conversed volume: L	
2009-05-11	Water sampling: SKB reduced chemistry class 5	15926
	T_{field}: 9.1°C, pH_{field}: 7.98, EC_{field}: 614 mS/m	
2009-05-11	Water sampling: SKB reduced chemistry class 5	15927
	T_{field}: 8.5°C, pH_{field}: 8.12, EC_{field}: 616 mS/m	
2009-05-11	Water sampling: SKB reduced chemistry class 5	15928
	T_{field}: 8.9°C, pH_{field}: 8.35, EC_{field}: 623 mS/m	
2009-05-19	Water sampling: SKB reduced chemistry class 5	15929
	T_{field}: 13.6°C, pH_{field}: 7.6, EC_{field}: 666 mS/m	
2009-05-20	Water sampling: SKB chemistry class 5	15930
	T_{field}: 8.8°C, pH_{field}: 7.45, EC_{field}: 708 mS/m	
2009-05-20	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-11. Events in KLX12A, 535 to 545 m, Section 2.

Date	Event	SKB sample no.
2009-05-05	Deflation of packer	
2009-05-05	Installation of pump	
2009-05-06	Start of pump*	
2009-05-06	Water sampling: SKB reduced chemistry class 5 (HS^-)	15889
	T_{field}: 8.4°C, pH_{field}: 6.18, EC_{field}: 1,302 mS/m	
	Conversed volume: 10 L	
2009-05-06	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15890
	T_{field}: 8.6°C, pH_{field}: 7.52, EC_{field}: 1,251 mS/m	
	Conversed volume: 14.5 L	
2009-05-06	Water sampling: SKB reduced chemistry class 5	15891
	T_{field}: 8.4°C, pH_{field}: 7.59, EC_{field}: 1,260 mS/m	
2009-05-06	Water sampling: SKB reduced chemistry class 5	15892
	T_{field}: 7.7°C, pH_{field}: 7.06, EC_{field}: 1,288 mS/m	
2009-05-06	Water sampling: SKB reduced chemistry class 5	15893
	T_{field}: 7.7°C, pH_{field}: 6.81, EC_{field}: 1,292 mS/m	
2009-05-14	Water sampling: SKB reduced chemistry class 5	15894
	T_{field}: 11.1°C, pH_{field}: 7.08, EC_{field}: 1,304 mS/m	
2009-05-14	Water sampling: SKB chemistry class 5	15895
	T_{field}: 13.1°C, pH_{field}: 7.18, EC_{field}: 1,295 mS/m	
2009-05-14	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-12. Events in KLX15A, 623 to 640 m, Section 3.

Date	Event	SKB sample no.
2009-05-05	Deflation of packer	
2009-05-05	Installation of pump	
2009-05-07	Start of pump*	15910
2009-05-07	Water sampling: SKB reduced chemistry class 5 (HS^-)	
	T_{field}: 9.3°C, pH_{field}: 7.85, EC_{field}: 1,100 mS/m	
	Conversed volume: 10.2 L	
2009-05-07	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15911
	T_{field}: 10.1°C, pH_{field}: 8.15, EC_{field}: 1,137 mS/m	
	Conversed volume: 17 L	
2009-05-07	Water sampling: SKB reduced chemistry class 5	15912
	T_{field}: 11.6°C, pH_{field}: 7.36, EC_{field}: 1,370 mS/m	
2009-05-07	Water sampling: SKB reduced chemistry class 5	15913
	T_{field}: 10.8°C, pH_{field}: 5.47, EC_{field}: 1,493 mS/m	
2009-05-07	Water sampling: SKB reduced chemistry class 5	15914
	T_{field}: 11.8°C, pH_{field}: 6.33, EC_{field}: 1,508 mS/m	
2009-05-18	Water sampling: SKB reduced chemistry class 5	15915
	T_{field}: 9.3°C, pH_{field}: 6.45, EC_{field}: 1,644 mS/m	
2009-05-19	Water sampling: SKB chemistry class 5	15916
	T_{field}: 9.6°C, pH_{field}: 6.56, EC_{field}: 1,639 mS/m	
2009-05-19	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-13. Events in KLX15A, 260 to 272 m, Section 6.

Date	Event	SKB sample no.
2009-05-05	Deflation of packer	
2009-05-05	Installation of pump	
2009-05-07	Start of pump*	
2009-05-07	Water sampling: SKB reduced chemistry class 5 (HS^-)	15903
	T_{field}: 9.6°C, pH_{field}: 7.63, EC_{field}: 967 mS/m	
	Conversed volume: 5.5 L	
2009-05-07	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15904
	T_{field}: 9.2°C, pH_{field}: 7.6, EC_{field}: 948 mS/m	
	Conversed volume: 6.7 L	
2009-05-07	Water sampling: SKB reduced chemistry class 5	15905
	T_{field}: 10.5°C, pH_{field}: 6.57, EC_{field}: 944 mS/m	
2009-05-07	Water sampling: SKB reduced chemistry class 5	15906
	T_{field}: 10.3°C, pH_{field}: 6.64, EC_{field}: 913 mS/m	
2009-05-07	Water sampling: SKB reduced chemistry class 5	15907
	T_{field}: 11.4°C, pH_{field}: 7.55, EC_{field}: 908 mS/m	
2009-05-13	Water sampling: SKB reduced chemistry class 5	15908
	T_{field}: 11.2°C, pH_{field}: 6.92, EC_{field}: 980 mS/m	
2009-05-14	Water sampling: SKB chemistry class 5	15909
	T_{field}: 8.0°C, pH_{field}: 6.85, EC_{field}: 991 mS/m	
2009-05-14	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-14. Events in KLX18A, 472 to 489 m, Section 3.

Date	Event	SKB sample no.
2009-05-05	Deflation of packer	
2009-05-05	Installation of pump	
2009-05-06	Start of pump*	
2009-05-06	Water sampling: SKB reduced chemistry class 5 (HS^-)	15896
	T_{field}: 9.2°C, pH_{field}: 8.08, EC_{field}: 483 mS/m	
	Conversed volume: 6.1 L	
2009-05-06	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15897
	T_{field}: 8.5°C, pH_{field}: 7.98, EC_{field}: 490 mS/m	
	Conversed volume: 12.7 L	
2009-05-06	Water sampling: SKB reduced chemistry class 5	15898
	T_{field}: 7.8°C, pH_{field}: 7.16, EC_{field}: 516 mS/m	
2009-05-07	Water sampling: SKB reduced chemistry class 5	15899
	T_{field}: 7.8°C, pH_{field}: 7.0, EC_{field}: 565 mS/m	
2009-05-07	Water sampling: SKB reduced chemistry class 5	15900
	T_{field}: 13.1°C, pH_{field}: 7.92, EC_{field}: 557 mS/m	
2009-05-12	Water sampling: SKB reduced chemistry class 5	15901
	T_{field}: 12.1°C, pH_{field}: 7.83, EC_{field}: 554 mS/m	
2009-05-13	Water sampling: SKB chemistry class 5	15902
	T_{field}: 8.4°C, pH_{field}: 7.7, EC_{field}: 556 mS/m	
2009-05-13	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-15. Events in KLX19A, 509 to 517 m, Section 3.

Date	Event	SKB sample no.
2009-06-15	Deflation of packer	
2009-06-15	Installation of pump	
2009-06-15	Start of pump	
2009-06-15	Water sampling: SKB reduced chemistry class 5 (HS^-)	15970
	T_{field}: 14°C, pH_{field}: 7.35, EC_{field}: 560 mS/m	
	Conversed volume: 6.5 L	
2009-06-15	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	15971
	T_{field}: 13.1°C, pH_{field}: 7.56, EC_{field}: 571 mS/m	
	Conversed volume: 13.8 L	
2009-06-15	Water sampling: SKB reduced chemistry class 5	15972
	T_{field}: 14°C, pH_{field}: 8.1, EC_{field}: 566 mS/m	
2009-06-15	Water sampling: SKB reduced chemistry class 5	15973
	T_{field}: 13.4°C, pH_{field}: 8.07, EC_{field}: 580 mS/m	
2009-06-15	Water sampling: SKB reduced chemistry class 5	15974
	T_{field}: 12.8°C, pH_{field}: 7.61, EC_{field}: 581 mS/m	
2009-06-23	Water sampling: SKB reduced chemistry class 5	15975
	T_{field}: 14.8°C, pH_{field}: 8.23, EC_{field}: 637 mS/m	
2009-06-24	Water sampling: SKB chemistry class 5	15976
	T_{field}: 12.7°C, pH_{field}: 8.03, EC_{field}: 633 mS/m	
2009-06-24	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Autumn sampling

Table A1-16. Sampling conditions in borehole sections sampled during the autumn sampling.

	HLX28:2	HLX35:2	HLX37:1	HLX39:1
Pumped, converted water volume (L)	4,350	4,300	5,200	3,600
Water sample, volume (L)	8.2	8.2	8.2	8.2
Maximal drawdown (m)	0,1	0.13	0.4	–*
Maximum pump effect (%)	43	36	32.5	36.5
Maximum flow rate (L/min)	0.5	0.5	0.5	0.5

Table A1-17. Sampling conditions in borehole sections sampled during the autumn sampling.

	KLX08:4	KLX10:2	KLX10:5	KLX12A:2
Pumped, converted water volume (L)	3,900	710	4,000	1,500
Water sample, volume (L)	25	25	25	25
Maximal drawdown (m)	5.3	7	1.8	–*
Maximum pump effect (%)	68	30	38	35
Maximum flow rate (L/min)	0.5	0.07	0.4	0.085

Table A1-18. Sampling conditions in borehole sections sampled during the autumn sampling.

	KLX15A:3	KLX15A:6	KLX18A:3	KLX19A:3
Pumped, converted water volume (L)	3,500	5,300	750	5,200
Water sample, volume (L)	25	25	25	25
Maximal drawdown (m)	2.7	1.2	20.2	3
Maximum pump effect (%)	67	40	40	47
Maximum flow rate (L/min)	0.3	0.5	0.07	0.5

* See under chapter unconformities.

Table A1-19. Events in HLX28, 70 to 90 m, Section 2.

Date	Event	SKB sample no.
2009-10-13	Deflation of packer	
2009-10-13	Installation of pump	
2009-10-14	Start of pump*	
2009-10-14	Water sampling: SKB reduced chemistry class 5 (HS^-)	19109
	T_{field}: 6.8°C, pH_{field}: 7.66, EC_{field}: 72.3 mS/m	
	Conversed volume: 0.9 L	
2009-10-14	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19110
	T_{field}: 8°C, pH_{field}: 7.29, EC_{field}: 69.8 mS/m	
	Conversed volume: 2.3 L	
2009-10-20	Water sampling: SKB chemistry class 5	19111
	T_{field}: 7.6°C, pH_{field}: 8.56, EC_{field}: 67.6 mS/m	
2009-10-20	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-20. Events in HLX35, 120 to 130 m, Section 2.

Date	Event	SKB sample no.
2009-10-22	Deflation of packer	
2009-10-22	Installation of pump	
2009-10-27	Start of pump*	
2009-10-27	Water sampling: SKB reduced chemistry class 5 (HS^-)	19112
	T_{field}: 8.6°C, pH_{field}: 7.37, EC_{field}: 117.5 mS/m	
	Conversed volume: 1,3 L	
2009-10-27	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19113
	T_{field}: 7.5°C, pH_{field}: 8.05, EC_{field}: 110.1 mS/m	
	Conversed volume: 3 L	
2009-11-02	Water sampling: SKB chemistry class 5	19114
	T_{field}: 7.4°C, pH_{field}: 8.1, EC_{field}: 124.1 mS/m	
2009-11-02	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-21 Events in HLX37, 150 to 200 m, Section 1.

Date	Event	SKB sample no.
2009-10-13	Deflation of packer	
2009-10-13	Installation of pump	
2009-10-14	Start of pump*	
2009-10-14	Water sampling: SKB reduced chemistry class 5 (HS^-)	19106
	T_{field}: 4.7°C, pH_{field}: 5.98, EC_{field}: 44.6 mS/m	
	Conversed volume: 1.8 L	
2009-10-14	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19107
	T_{field}: 6.0°C, pH_{field}: 7.53, EC_{field}: 57.8 mS/m	
	Conversed volume: 4.4 L	
2009-10-21	Water sampling: SKB chemistry class 5	19108
	T_{field}: 8.1°C, pH_{field}: 8.44 , EC_{field}: 60.1 mS/m	
2009-10-21	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-22. Events in HLX39, 187 to 199 m, Section 1.

Date	Event	SKB sample no.
2009-10-27	Deflation of packer	
2009-10-27	Installation of pump	
2009-10-28	Start of pump*	
2009-10-28	Water sampling: SKB reduced chemistry class 5 (HS^-)	19115
	T_{field}: 7.2°C, pH_{field}: 6.83, EC_{field}: 91.3 mS/m	
	Conversed volume: 2.2 L	
2009-10-28	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19116
	T_{field}: 7.2°C, pH_{field}: 7.5, EC_{field}: 64.7 mS/m	
	Conversed volume: 4.9 L	
2009-11-02	Water sampling: SKB chemistry class 5	19117
	T_{field}: 7.3°C, pH_{field}: 8.16, EC_{field}: 65.2 mS/m	
2009-11-02	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-23. Events in KLX08, 594 to 625 m, Section 4.

Date	Event	SKB sample no.
2009-10-22	Deflation of packer	
2009-10-22	Installation of pump	
2009-10-22	Deflation of packer	
2009-10-26	Installation of new pump	
2009-10-27	Start of pump*	
2009-10-27	Water sampling: SKB reduced chemistry class 5 (HS^-)	19154
	T_{field}: 8.8°C, pH_{field}: 7.59, EC_{field}: 578 mS/m	
	Conversed volume: 7.9 L	
2009-10-27	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19155
	T_{field}: 8.7°C, pH_{field}: 7.6, EC_{field}: 580 mS/m	
	Conversed volume: 16,2 L	
2009-10-27	Water sampling: SKB reduced chemistry class 5	19156
	T_{field}: 8.8°C, pH_{field}: 7.94, EC_{field}: 563 mS/m	
2009-10-27	Water sampling: SKB reduced chemistry class 5	19157
	T_{field}: 8.6°C, pH_{field}: 8.07, EC_{field}: 557 mS/m	
2009-10-27	Water sampling: SKB reduced chemistry class 5	19158
	T_{field}: 8.3°C, pH_{field}: 8.03, EC_{field}: 559 mS/m	
2009-11-02	Water sampling: SKB reduced chemistry class 5	19159
	T_{field}: 8.0°C, pH_{field}: 8.11, EC_{field}: 640 mS/m	
2009-11-03	Water sampling: SKB chemistry class 5	19160
	T_{field}: 8.0°C, pH_{field}: 8.24, EC_{field}: 636 mS/m	
2009-11-03	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-24. Events in KLX10, 689 to 710 m, Section 2.

Date	Event	SKB sample no.
2009-10-19	Deflation of packer	
2009-10-19	Installation of pump	
2009-10-20	Start of pump*	
2009-10-20	Water sampling: SKB reduced chemistry class 5 (HS^-)	19147
	T_{field}: 8.5°C, pH_{field}: 7.44, EC_{field}: 1,006 mS/m	
	Conversed volume: 10 L	
2009-10-20	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19148
	T_{field}: 8°C, pH_{field}: 7.75, EC_{field}: 999 mS/m	
	Conversed volume: 18.8 L	
2009-10-21	Water sampling: SKB reduced chemistry class 5	19149
	T_{field}: 6.1°C, pH_{field}: 7.7, EC_{field}: 982 mS/m	
2009-10-21	Water sampling: SKB reduced chemistry class 5	19150
	T_{field}: 7.6°C, pH_{field}: 8.22, EC_{field}: 969 mS/m	
2009-10-21	Water sampling: SKB reduced chemistry class 5	19151
	T_{field}: 6.6°C, pH_{field}: 7.98, EC_{field}: 972 mS/m	
2009-10-26	Water sampling: SKB reduced chemistry class 5	19152
	T_{field}: 9.6°C, pH_{field}: 7.71, EC_{field}: 968 mS/m	
2009-10-27	Water sampling: SKB chemistry class 5	19153
	T_{field}: 8.4°C, pH_{field}: 7.77, EC_{field}: 975 mS/m	
2009-10-27	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-25. Events in KLX10, 351 to 368 m, Section 5.

Date	Event	SKB sample no.
2009-10-19	Deflation of packer	
2009-10-19	Installation of pump	
2009-10-20	Start of pump*	19125
2009-10-20	Water sampling: SKB reduced chemistry class 5 (HS^-)	
	T_{field}: 8.9°C, pH_{field}: 7.4, EC_{field}: 178.7 mS/m	
	Conversed volume: 4.4 L	
2009-10-20	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19126
	T_{field}: 8.7°C, pH_{field}: 7.42, EC_{field}: 319 mS/m	
	Conversed volume: 9.3 L	
2009-10-20	Water sampling: SKB reduced chemistry class 5	19127
	T_{field}: 8.3°C, pH_{field}: 7.51, EC_{field}: 432 mS/m	
2009-10-20	Water sampling: SKB reduced chemistry class 5	19128
	T_{field}: 8.3°C, pH_{field}: 7.53, EC_{field}: 488 mS/m	
2009-10-20	Water sampling: SKB reduced chemistry class 5	19129
	T_{field}: 8.1°C, pH_{field}: 8.01, EC_{field}: 507 mS/m	
2009-10-26	Water sampling: SKB reduced chemistry class 5	19130
	T_{field}: 9.1°C, pH_{field}: 7.95, EC_{field}: 629 mS/m	
2009-10-27	Water sampling: SKB chemistry class 5	19131
	T_{field}: 8.3°C, pH_{field}: 7.97, EC_{field}: 632 mS/m	
2009-10-27	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-26. Events in KLX12A, 535 to 545 m, Section 2.

Date	Event	SKB sample no.
2009-10-19	Deflation of packer	
2009-10-19	Installation of pump	
2009-10-21	Start of pump*	
2009-10-21	Water sampling: SKB reduced chemistry class 5 (HS^-)	19118
	T_{field}: 6.8°C, pH_{field}: 7.71, EC_{field}: 1,019 mS/m	
	Conversed volume: 7 L	
2009-10-21	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19119
	T_{field}: 7.3°C, pH_{field}: 7.89, EC_{field}: 1,017 mS/m	
	Conversed volume: 14.5 L	
2009-10-21	Water sampling: SKB reduced chemistry class 5	19120
	T_{field}: 7.4°C, pH_{field}: 7.86, EC_{field}: 1,030 mS/m	
2009-10-21	Water sampling: SKB reduced chemistry class 5	19121
	T_{field}: 7.7°C, pH_{field}: 7.91, EC_{field}: 1,100 mS/m	
2009-10-21	Water sampling: SKB reduced chemistry class 5	19122
	T_{field}: 7.0°C, pH_{field}: 7.9, EC_{field}: 1,124 mS/m	
2009-10-27	Water sampling: SKB reduced chemistry class 5	19123
	T_{field}: 9.5°C, pH_{field}: 7.14, EC_{field}: 1,146 mS/m	
2009-11-02	Water sampling: SKB chemistry class 5	19124
	T_{field}: 6.7°C, pH_{field}: 7.0, EC_{field}: 1,170 mS/m	
2009-11-02	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-27. Events in KLX15A, 623 to 640 m, Section 3.

Date	Event	SKB sample no.
Unknown**	Deflation of packer	
Unknown**	Installation of pump	
2009-10-19	Start of pump*	19099
2009-10-19	Water sampling: SKB reduced chemistry class 5 (HS^-)	
	T_{field}: 7.4°C, pH_{field}: 7.52, EC_{field}: 995 mS/m	
	Conversed volume: 8.3 L	
2009-10-19	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19100
	T_{field}: 7.5°C, pH_{field}: 7.96, EC_{field}: 1,099 mS/m	
	Conversed volume: 17 L	
2009-10-19	Water sampling: SKB reduced chemistry class 5	19101
	T_{field}: 8°C, pH_{field}: 7.99, EC_{field}: 1,235 mS/m	
2009-10-19	Water sampling: SKB reduced chemistry class 5	19102
	T_{field}: 8.5°C, pH_{field}: 7.76, EC_{field}: 1,347 mS/m	
2009-10-19	Water sampling: SKB reduced chemistry class 5	19103
	T_{field}: 8.6°C, pH_{field}: 7.25, EC_{field}: 1,397 mS/m	
2009-10-26	Water sampling: SKB reduced chemistry class 5	19104
	T_{field}: 10.0°C, pH_{field}: 8.13, EC_{field}: 1,617 mS/m	
2009-10-27	Water sampling: SKB chemistry class 5	19105
	T_{field}: 8.4°C, pH_{field}: 7.98, EC_{field}: 1,643 mS/m	
2009-10-27	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

** See under chapter Unconformities.

Table A1-28. Events in KLX15A, 260 to 272 m, Section 6.

Date	Event	SKB sample no.
Unknown**	Deflation of packer	
Unknown**	Installation of pump	
2009-10-15	Start of pump*	19092
2009-10-15	Water sampling: SKB reduced chemistry class 5 (HS^-)	
	T_{field}: 7.2°C, pH_{field}: 7.7, EC_{field}: 959 mS/m	
	Conversed volume: 3.1 L	
2009-10-15	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19093
	T_{field}: 7.0°C, pH_{field}: 7.83, EC_{field}: 961 mS/m	
	Conversed volume: 6.7 L	
2009-10-15	Water sampling: SKB reduced chemistry class 5	19094
	T_{field}: 7.1°C, pH_{field}: 7.97, EC_{field}: 968 mS/m	
2009-10-15	Water sampling: SKB reduced chemistry class 5	19095
	T_{field}: 7.5°C, pH_{field}: 7.93, EC_{field}: 953 mS/m	
2009-10-15	Water sampling: SKB reduced chemistry class 5	19096
	T_{field}: 7.6°C, pH_{field}: 7.97, EC_{field}: 940 mS/m	
2009-10-22	Water sampling: SKB reduced chemistry class 5	19097
	T_{field}: 8.1°C, pH_{field}: 7.66, EC_{field}: 1,016 mS/m	
2009-10-22	Water sampling: SKB chemistry class 5	19098
	T_{field}: 8.0°C, pH_{field}: 7.93, EC_{field}: 1,010 mS/m	
2009-10-22	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

** See under chapter Unconformities.

Table A1-29. Events in KLX18A, 472 to 489 m, Section 3.

Date	Event	SKB sample no.
2009-10-19	Deflation of packer	
2009-10-19	Installation of pump	
2009-10-21	Start of pump*	
2009-10-21	Water sampling: SKB reduced chemistry class 5 (HS^-)	19161
	T_{field}: 6.4°C, pH_{field}: 7.75, EC_{field}: 397 mS/m	
	Conversed volume: 6.1 L	
2009-10-21	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19162
	T_{field}: 6.7°C, pH_{field}: 7.94, EC_{field}: 400 mS/m	
	Conversed volume: 12.7 L	
2009-10-21	Water sampling: SKB reduced chemistry class 5	19163
	T_{field}: 7.9°C, pH_{field}: 7.51, EC_{field}: 498 mS/m	
2009-10-22	Water sampling: SKB reduced chemistry class 5	19164
	T_{field}: 7.9°C, pH_{field}: 8.19, EC_{field}: 580 mS/m	
2009-10-22	Water sampling: SKB reduced chemistry class 5	19165
	T_{field}: 8.2°C, pH_{field}: 7.02, EC_{field}: 579 mS/m	
2009-10-28	Water sampling: SKB reduced chemistry class 5	19166
	T_{field}: 4.8°C, pH_{field}: 8.1, EC_{field}: 575 mS/m	
2009-10-28	Water sampling: SKB chemistry class 5	19167
	T_{field}: 6.8°C, pH_{field}: 8.27, EC_{field}: 566 mS/m	
2009-10-28	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Table A1-30. Events in KLX19A, 509 to 517 m, Section 3.

Date	Event	SKB sample no.
2009-10-13	Deflation of packer	
2009-10-13	Installation of pump	
2009-10-14	Start of pump	
2009-10-14	Water sampling: SKB reduced chemistry class 5 (HS^-)	19085
	T_{field}: 6.6°C, pH_{field}: 6.72, EC_{field}: 638 mS/m	
	Conversed volume: 6.5 L	
2009-10-14	Water sampling: SKB reduced chemistry class 5 (HS^-, HCO_3, Cl^-)	19086
	T_{field}: 6.4°C, pH_{field}: 6.54, EC_{field}: 649 mS/m	
	Conversed volume: 13.8 L	
2009-10-14	Water sampling: SKB reduced chemistry class 5	19087
	T_{field}: 6.9°C, pH_{field}: 8.16, EC_{field}: 646 mS/m	
2009-10-14	Water sampling: SKB reduced chemistry class 5	19088
	T_{field}: 5.6°C, pH_{field}: 8.21, EC_{field}: 654 mS/m	
2009-10-14	Water sampling: SKB reduced chemistry class 5	19089
	T_{field}: 7.8°C, pH_{field}: 8.16, EC_{field}: 645 mS/m	
2009-10-20	Water sampling: SKB reduced chemistry class 5	19090
	T_{field}: 9°C, pH_{field}: 8.38, EC_{field}: 646 mS/m	
2009-10-21	Water sampling: SKB chemistry class 5	19091
	T_{field}: 8.4°C, pH_{field}: 8.39, EC_{field}: 656 mS/m	
2009-10-21	Stop of pump	

* Field measurement of temperature, pH and EC has been made in between water sampling, these values can be found in SICADA.

Appendix 2

Sampling and analyse methods

Table A2-1 (page 1 of 2). Sample handling routines and analyse methods.

Component group	Component/element	Samplecontainer (material)	Volume (ml)	Filtering	Preparation/ Conservation	Analysis method	Analysis within – or delivery time to lab	Included in SKB class
Drill water	Uranine	Plastic (brown)	100	No	No	Spectroflurometry	–	2,3,5
Anions	HCO_3	Plastic	250	No	No	Alkalinity titration	The same day – maximum 24 h	2,3,5
	pH (lab)					Potentiometric		2,3,5
	cond (lab)					Electrical Conductivity meas.		2,3,5
	SO_4^{2-}, Br^-, F^-	Plastic	250	No	No	IC/ICP SFMS/potentiometric	Not critical (month)	3,5
	Cl^-					Mohr- titration/IC	Not critical (month)	2,3,5
	Br^-, I^-	Plastic	100	No	No	ICP SFMS	Not critical (month)	5
Cations	Na, K, Ca, Mg, S(tot), Si (tot), Li, Sr, Fe, Mn	Plastic (acid washed)	100	Yes	Yes (1 mL HNO_3, suprapur)	ICP AES/ICP SFMS	Not critical (month)	3 (except Fe, Mn),5
Environmental metals	Al, As, Ba, Cd, Co, Cr, Cu, Hg, In, Mo, Ni, P, Pb, V, Zn					ICP SFMS	Not critical (month)	5
Boron isotopes	$^{10}B/^{11}B$*					ICP SFMS	No limit	5
Lantanoids	Sc, Rb, Y, Zr, Sb, Cs, La, Hf, Tl, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, U, Th					ICP SFMS	Not critical (month)	5
Fe(II), Fe (tot)	Fe(II), Fe(tot)	Plastic (PEH, acid washed)	500	Yes	Yes (5 mL HCl, suprapur)	Spectrophotometry	As soon as possible the same day	5
Hydrogen sulphide	HS^-	Glass (Winkler)	About 120×2	Yes	Yes (0.5 mL 1M ZnAc, 0.5 mL 1M NaOH)	Spectrophotometry	Immeddiately or if conserved, a few days	5
Nutrient salts	NO_2–N, (NO_2+NO_3)-N, PO_4-P	Plastic	250	Yes Frozen, transported in isolated bag	No	Spectrphotometry	Short transportation time	5
	NH_4-N	Glass (flask)	2×25	No	No	Spectrophotometry	Maximum 24 h	5

Table A2-1 (page 2 of 2). Sample handling routines and analyse methods.

Component group	Component/element	Samplecontainer (material)	Volume (ml)	Filtering	Preparation/ Conservation	Analysis method	Analysis within – or delivery time to lab	Included in SKB class
Dissolved organic carbon	DOC	Plastic	250	Yes	No	UV oxidation, IR. Carbon analysator	Short transportation time	5
Total organic carbon	TOC	Plastic	250	No	No	UV oxidation, IR. Carbon analysator	Short transportation time	5
Environmental isotopes	δD, $\delta^{18}O$	Plastic	100	No	No	MS	Not critical (month)	2,3,5
Tritium	^{3}H (enhanced)	Plastic (dry bottle)	500	No	No	LSC	Not critical (month)	2,3,5
Chlorine-37	$\delta^{37}Cl$	Plastic	500	No	No	A (MS)	Not critical (month)	5
Carbon isotopes	$\delta^{13}C$, pmC (^{14}C)	Plastic (fluorescence)	2×100	No	No	A (MS)	A few days	5
Sulphur isotopes	$\delta^{34}S$	Plastic	1,000	No	No	MS	No limit	5
Strontium isotopes	$^{87}Sr/^{86}Sr$	Plastic	100	No	No	TIMS	Days or weeks	5
Uranium and Thorium isotopes	^{234}U, ^{235}U, ^{238}U, ^{230}Th, ^{232}Th	Plastic (HPDE)	1,000	No	No	Alfa spectr.	No limit	5
Radon and Radium isotopes	^{222}Ra, ^{226}Rn	Plastic (HPDE)	1,000	No	No	LSS	Immediate transport	5
Density	Density	Plastic	250	No	No	Pycnometer	–	2,3,5
Archive samples with acid	–	Plastic (acid washed)	2×100	Yes	Yes (1 mL HNO_3, suprapur)	–	Storage in freeze container	5
Archive samples without acid	–	Plastic	2×250	Yes	No	–	Storage in freeze container	2,3,5
Archive samples without acid**	–	Plastic	2×2,500	Yes	No	–	Storage in freeze container	2,3,5
Archive samples without acid**	–	Plastic	2×1,000	Yes	No	–	Storage in freeze container	2,3,5

* The B-isotope ratio is given as $^{10}B/^{11}B$ (the result reported from the consulting laboratory). If the notation according to internatiol stanard for environmental isotopes, $^{11}B/^{10}B$, it is necessary to invert the $^{10}B/^{11}B$ value ($1/^{10}B/^{11}B$).

** Archive samples during sprong sampling.

Abbrevations and definitions:

IC	Ion chromatograph.
ICP AES	Inductively Coupled Plasma Atomic Emission Spectrometry.
ICP SFMS	Inductively Coupled Plasma Sector Field Mass Spectrometry.
MS	Mass Spectrometry.
LSC	Liquid Scintillation Counting.
A (MS)	Accelerator (Mass Spectrometry).
TIMS	Thermal Ionization Mass Spectrometry.
LSS	Liquid Scintillation Spectroscopy.

Table A2-2 (page 1 of 3). Methods, reporting limits and measurement uncertainties (updated 2008).

Component	Method[1]	Reporting limits (RL), detection limits (DL) or range[2]	Unit	Measurement uncertainty[3]
pH	Potentiometric	3–10	pH unit	±0.1
EC	Electrical Conductivity meas.	1–150	mS/m	5%
		150–10,000		3%
HCO_3	Alkalinity titration	1	mg/L	4%
Cl^-	Mohr- titration	≥ 70	mg/L	5%
Cl^-	IC	0.5–70		8%
SO_4	IC	0.5	mg/L	12%
Br^-	IC	DL 0.2, RL 0.5	mg/L	15%
Br	ICP SFMS	0.001, 0.004, 0.010[4]	mg/L	25%[5]
F^-	IC	DL 0.2, RL 0.5	mg/L	13%
F^-	Potentiometric	DL 0.1, RL 0.2		12%
I^-	ICP SFMS	0.001, 0.004, 0.010[4]	mg/L	25%[5]
Na	ICP AES	0.1	mg/L	13%
K	ICP AES	0.4	mg/L	12%
Ca	ICP AES	0.1	mg/L	12%
Mg	ICP AES	0.09	mg/L	12%
S(tot)	ICP AES	0.16	mg/L	12%
Si(tot)	ICP AES	0.03	mg/L	14%
Sr	ICP AES	0.002	mg/L	12%
Li	ICP AES	0.004	mg/L	12.2%
Fe	ICP AES	0.02	mg/L	13.3%[6]
Fe	ICP SFMS	0.0004, 0.002, 0.004[4]	mg/L	20%[6]
Mn	ICP AES	0.003	mg/L	12.1%[5]
Mn	ICP SFMS	0.00003, 0.00004, 0.0001[4]	mg/L	53%[6]
Fe(II), Fe(tot)	Spectrophotometry	DL 0.006, RL 0.02	mg/L	0.005 (0.02–0.05 mg/L)
				9% (0.05–1 mg/L)
				7% (1–3 mg/L)
HS^-	Spectrophotometry, SKB	SKB DL 0.006, RL 0.02	mg/L	25%
HS^-	Spectrophotometry, external laboratory	0.01	mg/L	0.02 (0.01–0.2 mg/L)
				12% (>0.2 mg/L)
NO_2 as N	Spectrophotometry	0.1	mg/L	2%
NO_3 as N	Spectrophotometry	0.2	mg/L	5%
NO_2+NO_3 as N	Spectrophotometry	0.2	mg/L	0.2 (0.2–20 mg/L)
				2% (> 20 mg/L)
NH_4 as N	Spectrophotometry, SKB	11	mg/L	30% (11–20 mg/L)
				25% (20–50 mg/L)
				12% (50–1,200 mg/L)
NH_4 as N	Spectrophotometry	0.8	mg/L	0.8 (0.8–20 mg/L)
	external laboratory			5% (> 20 mg/L)
PO_4 as P	Spectrophotometry	0.7	mg/L	0.7 (0.7–20 mg/L)
				3% (> 20 mg/L)
Al,	ICP SFMS	0.2, 0.3, 0.7[4]	mg/L	17.6%[6]
Zn	ICP SFMS	0.2, 0.8, 2[4]	mg/L	15.5, 17.7, 25.5%[6]

Table A2-2 (page 2 of 3). Methods, reporting limits and measurement uncertainties (updated 2008).

Component	Method[1]	Reporting limits (RL), detection limits (DL) or range[2]	Unit	Measurement uncertainty[3]
Ba, Cr, Mo,	ICP SFMS	0.01, 0.04, 0.1[4]	mg/L	Ba 15%[4], Cr 22%[5] Mo 39%[6]
Pb	ICP SFMS	0.01, 0.1, 0.3[4]	mg/L	15%[6]
Cd	ICP SFMS	0.002, 0.02, 0.5[4]	mg/L	15.5%[6]
Hg	ICP AFS	0.002	mg/L	10.7%[6]
Co	ICP SFMS	0.005, 0.02, 0.05[4]	mg/L	25.9%[6]
V	ICP SFMS	0.005, 0.03, 0.05[4]	mg/L	18.1%[6]
Cu	ICP SFMS	0.1, 0.2, 0.5[4]	mg/L	14.4%[6]
Ni	ICP SFMS	0.05, 0.2, 0.5[4]	mg/L	15.8%[6]
P	ICP SFMS	1, 5, 40[4]	mg/L	16.3%[6]
As	ICP SFMS	0.01 (520 mS/m)	mg/L	59.2%[6]
La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu	ICP SFMS	0.005, 0.02, 0.05[4]	mg/L	20%, 20%, 25%[6]
Sc, In, Th	ICP SFMS	0.05, 0.2, 0.5[4]	mg/L	25%[6]
Rb, Zr, Sb, Cs	ICP SFMS	0.025, 0.1, 0.25[4]	mg/L	15%, 20%, 20%[5] 25%[6]
Tl	ICP SFMS	0.025, 0.1, 0.25[4]	mg/L	14.3%[5 and 6]
Y, Hf	ICP SFMS	0.005, 0.02, 0.05[4]	mg/L	15%, 20%, 20%[5] 25%[6]
U	ICP SFMS	0.001, 0.005, 0.01[4]	mg/L	13.5%, 14.3%, 15.9%[5] 19.1%, 17.9%, 20.9%[6]
DOC	UV oxidation, IR Carbon analysator	0.5	mg/L	8%
TOC	UV oxidation, IR Carbon analysator	0.5	mg/L	10%
$\delta^{2}H$	MS	2	‰ SMOW[7]	0.9 (one standard deviation)
$\delta^{18}O$	MS	0.1	‰ SMOW[7]	0.1 (one standard dev.)
^{3}H	LSC	0.8	TU[8]	0.8
$\delta^{37}Cl$	A (MS)	0.2	‰ SMOC[9]	0.2[15]
$\delta^{13}C$	A (MS)	–	‰ PDB[10]	0.3[15]
^{14}C pmc	A (MS)	–	PMC[11]	0.4[15]
δ^{34} S	MS	0.2	‰ CDT[12]	0.4 (one standard dev.)
$^{87}Sr/^{86}Sr$	TIMS	–	No unit (ratio)[13]	0.00002
$^{10}B/^{11}B$	ICP SFMS	–	No unit (ratio)[13]	–
^{234}U, ^{235}U, ^{238}U, ^{232}Th, ^{230}Th	Alfa spectr.	0.0001	Bq/L[14]	≤5% (Counting statistics uncertainty)
^{222}Rn, ^{226}Ra	LSS	0.015	Bq/L[14]	≤5% (Counting statistics uncertainty)

Table A2-2 (page 3 of 3). Methods, reporting limits and measurement uncertainties (updated 2008).

1. Many elements may be determined by more than one ICP technique depending on concentration range. The most relevant technique and measurement uncertainty for the concentrations normally encountered in groundwater are presented. In cases where two techniques were frequently used, both are displayed.
2. Reporting limits (RL), generally 10×standard deviation, if nothing else is stated.

   Measured values below RL or DL are stored as negative values in SICADA (i.e. –RL value and –DL value).
3. Measurement uncertainty reported by the laboratory, generally as ± percent of measured value in question at 95% confidence interval.
4. Reporting limits at electrical cond. 520 mS/m, 1,440 mS/m and 3,810 mS/m respectively.
5. Measurement uncertainty at concentrations 100×RL
6. Measurement uncertainty at concentrations 10×RL
7. Per mille deviation from SMOW (Standard Mean Oceanic Water).
8. TU=Tritium Units, where one TU corresponds to a tritium/hydrogen ratio of 10–18 (1 Bq/L Tritium = 8.45 TU).
9. Per mille deviation from SMOC (Standard Mean Oceanic Chloride).
10. Per mille deviation from PDB (the standard PeeDee Belemnite).
11. The following relation is valid between pmC (percent modern carbon) and Carbon-14 age: pmC = 100 ´ e((1,950-y-1.03t)/8,274) where y = the year of the C-14 measurement and t = C-14 age.
12. Per mille deviation from CDT (the standard Canyon Diablo Troilite).
13. Isotope ratio without unit.
14. The following expressions are applicable to convert activity to concentration, for uranium-238 and thorium-232: 1 ppm U = 12.4 Bq/kg238U, 1 ppm Th = 3.93 Bq/kg232Th.
15. Isotopes are often reported as per mill deviation from a standard. The deviation is calculated as: $\delta yI = 1{,}000\times(K_{sample}-K_{standard})/K_{standard}$, where K= the isotope ratio and yI = $\delta^{2}H$, $\delta^{18}O$, $\delta^{37}Cl$, $\delta^{13}C$ or $\delta^{34}S$ etc.

Appendix 3

Groundwater chemistry data

Table A3-1 (page 1 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Na mg/l	K mg/l	Ca mg/l	Mg mg/l	Si mg/l	Li mg/l	SO_4^2 mg/l	SO_4S mg/l	Sr mg/l	Cl mg/l	Br mg/l	F mg/l	Mn mg/l	I mg/l	HCO_3 mg/l
KLX12A	535.00	545.00	2009-05-06 09:20:00	15889	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 10:50:00	15890	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 12:30:00	15891	1,980.0	9.67	696.0	17.20	7.02	0.2010	316.00	118.00	13.300	4,040.0	21.200	2.12	0.14900	–	59.90
KLX12A	535.00	545.00	2009-05-06 14:22:00	15892	2,000.0	9.53	702.0	18.10	7.10	0.2080	350.00	125.00	14.000	4,060.0	20.000	2.19	0.16900	–	29.80
KLX12A	535.00	545.00	2009-05-06 16:05:00	15893	1,980.0	9.36	698.0	18.50	6.88	0.2000	343.00	126.00	14.000	4,140.0	21.800	1.93	0.17500	–	22.10
KLX12A	535.00	545.00	2009-05-14 08:45:00	15894	2,020.0	9.45	738.0	18.90	6.25	0.2020	348.00	134.00	14.600	4,150.0	20.600	2.06	0.18300	–	12.90
KLX12A	535.00	545.00	2009-05-14 12:55:00	15895	2,050.0	9.39	737.0	18.30	6.26	0.2080	363.00	136.00	14.500	4,210.0	22.000	2.13	0.17700	0.2330	12.80
KLX18A	472.00	489.00	2009-05-06 09:15:00	15896	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-06 10:47:00	15897	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-06 16:05:00	15898	784.0	3.67	214.0	13.90	7.47	0.1150	126.00	41.40	4.130	1,550.0	7.980	2.10	0.07650	–	75.80
KLX18A	472.00	489.00	2009-05-07 07:06:00	15899	845.0	3.79	246.0	15.40	6.74	0.1310	150.00	56.60	4.650	1,710.0	9.020	2.22	0.08260	–	35.80
KLX18A	472.00	489.00	2009-05-07 15:56:00	15900	873.0	3.89	248.0	15.70	6.90	0.1340	156.00	56.80	4.870	1,730.0	9.390	2.18	0.08180	–	35.60
KLX18A	472.00	489.00	2009-05-12 13:45:00	15901	876.0	4.06	247.0	15.50	6.29	0.1250	151.00	55.10	4.790	1,690.0	8.520	2.38	0.08160	–	37.40
KLX18A	472.00	489.00	2009-05-13 07:10:00	15902	915.0	4.23	262.0	16.20	6.73	0.1350	153.00	58.80	5.040	1,690.0	8.730	2.20	0.07830	0.0986	36.70
KLX15A	260.00	272.00	2009-05-07 08:42:00	15903	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 08:50:00	15904	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 09:38:00	15905	1,160.0	25.40	594.0	76.70	5.99	2.0600	78.80	30.20	11.800	3,040.0	12.100	1.70	0.48300	–	75.50
KLX15A	260.00	272.00	2009-05-07 10:29:00	15906	1,140.0	25.70	581.0	77.40	5.96	2.1300	82.60	31.90	11.800	2,940.0	12.400	1.79	0.47000	–	78.20
KLX15A	260.00	272.00	2009-05-07 11:18:00	15907	1,110.0	25.40	583.0	76.00	6.07	2.0900	81.90	32.90	11.700	2,960.0	11.700	1.84	0.46900	–	79.20
KLX15A	260.00	272.00	2009-05-13 13:25:00	15908	1,260.0	21.90	650.0	80.50	6.32	1.5100	79.40	29.80	13.100	3,190.0	12.800	1.53	0.59100	–	58.50
KLX15A	260.00	272.00	2009-05-14 07:20:00	15909	1,260.0	21.30	631.0	79.60	6.22	1.4700	78.80	29.60	12.900	3,210.0	12.800	1.80	0.52300	0.4180	57.70
KLX15A	623.00	640.00	2009-05-07 08:24:00	15910	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 08:52:00	15911	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 11:15:00	15912	1,770.0	19.80	1,090.0	69.30	7.16	0.9970	222.00	85.00	21.200	4,620.0	21.000	1.66	0.51900	–	45.40
KLX15A	623.00	640.00	2009-05-07 13:35:00	15913	1,890.0	18.60	1,200.0	65.80	7.15	0.8990	269.00	102.00	23.100	5,000.0	23.500	1.60	0.55900	–	33.10
KLX15A	623.00	640.00	2009-05-07 15:50:00	15914	1,880.0	17.30	1,200.0	65.20	7.05	0.8380	291.00	102.00	22.600	5,070.0	23.500	1.99	0.55900	–	31.50
KLX15A	623.00	640.00	2009-05-18 15:40:00	15915	1,930.0	13.50	1,410.0	63.00	5.97	0.5240	350.00	131.00	24.200	5,470.0	26.200	1.81	0.52700	–	21.70

– = not analysed.

Table A3-1 (page 2 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Na mg/l	K mg/l	Ca mg/l	Mg mg/l	Si mg/l	Li mg/l	SO_4^2 mg/l	SO_4S mg/l	Sr mg/l	Cl mg/l	Br mg/l	F mg/l	Mn mg/l	I mg/l	HCO_3 mg/l
KLX15A	623.00	640.00	2009-05-19 07:25:00	15916	1,980.0	14.80	1,420.0	64.30	6.04	0.5510	351.00	136.00	24.700	5,520.0	25.100	1.84	0.53400	0.3500	21.80
KLX10	689.00	710.00	2009-05-11 13:06:00	15917	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-11 15:14:00	15918	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-12 07:06:00	15919	1,450.0	12.70	757.0	36.20	9.72	0.2540	197.00	76.40	14.200	3,440.0	14.700	1.71	0.21700	–	26.40
KLX10	689.00	710.00	2009-05-12 11:16:00	15920	1,440.0	12.30	740.0	34.80	9.53	0.2650	205.00	76.50	13.800	3,410.0	15.100	2.07	0.21500	–	26.30
KLX10	689.00	710.00	2009-05-12 15:28:00	15921	1,410.0	12.60	758.0	35.10	9.83	0.2550	207.00	77.90	14.400	3,420.0	15.600	1.82	0.22000	–	25.50
KLX10	689.00	710.00	2009-05-25 07:55:00	15922	1,370.0	9.86	812.0	29.30	9.13	0.2640	238.00	90.30	14.900	3,530.0	15.900	2.08	0.21100	–	21.20
KLX10	689.00	710.00	2009-05-26 11:45:00	15923	1,390.0	9.77	810.0	29.00	8.99	0.2690	240.00	91.30	14.900	3,510.0	16.800	1.58	0.22300	0.1970	21.50
KLX10	351.00	368.00	2009-05-11 13:20:00	15924	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 13:30:00	15925	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 14:00:00	15926	952.0	8.35	260.0	40.60	7.41	0.1070	133.00	50.70	4.470	1,840.0	6.400	1.99	0.22100	–	126.00
KLX10	351.00	368.00	2009-05-11 14:40:00	15927	988.0	7.89	264.0	41.50	7.02	0.1090	143.00	53.70	4.590	1,880.0	6.650	2.04	0.22700	–	110.00
KLX10	351.00	368.00	2009-05-11 15:15:00	15928	984.0	8.16	262.0	41.10	7.02	0.1110	155.00	55.60	4.670	1,920.0	6.430	2.11	0.22400	–	99.20
KLX10	351.00	368.00	2009-05-19 14:30:00	15929	1,060.0	6.46	300.0	45.40	6.08	0.1150	185.00	69.60	4.850	2,180.0	7.380	2.04	0.25400	–	65.50
KLX10	351.00	368.00	2009-05-20 06:55:00	15930	1,050.0	6.82	300.0	47.10	6.11	0.1130	185.00	70.10	5.110	2,180.0	7.260	2.07	0.26400	0.1190	65.30
KLX08	594.00	625.00	2009-05-12 13:34:00	15931	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 13:53:00	15932	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 14:55:00	15933	936.0	4.43	339.0	8.16	8.25	0.1840	107.00	43.70	6.550	1,920.0	9.560	2.42	0.08080	–	50.30
KLX08	594.00	625.00	2009-05-12 16:00:00	15934	928.0	4.21	341.0	8.28	8.16	0.1830	122.00	46.30	6.580	1,930.0	10.400	2.47	0.08460	–	33.40
KLX08	594.00	625.00	2009-05-12 17:00:00	15935	938.0	4.08	345.0	8.24	7.92	0.1870	124.00	46.10	6.760	1,930.0	9.990	2.44	0.08510	–	32.30
KLX08	594.00	625.00	2009-05-18 15:26:00	15936	903.0	3.33	360.0	7.82	7.24	0.1820	135.00	49.90	6.600	2,020.0	10.300	2.44	0.08320	–	19.50
KLX08	594.00	625.00	2009-05-19 07:10:00	15937	900.0	3.23	358.0	7.83	7.24	0.1800	137.00	50.60	6.710	2,010.0	10.400	2.52	0.08520	0.0893	19.70
HLX39	187.00	199.30	2009-05-18 11:12:00	15938	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX39	187.00	199.30	2009-05-18 11:23:00	15939	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX39	187.00	199.30	2009-05-25 12:52:00	15940	124.0	1.78	16.0	2.47	7.71	0.0139	4.55	1.61	0.169	57.5	0.229	5.37	0.04880	<0.01	278.00
HLX35	120.00	135.00	2009-05-18 12:02:00	15941	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX35	120.00	135.00	2009-05-18 12:14:00	15942	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

– = not analysed.

Table A3-1 (page 3 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Na mg/l	K mg/l	Ca mg/l	Mg mg/l	Si mg/l	Li mg/l	SO_4^2 mg/l	SO_4S mg/l	Sr mg/l	Cl mg/l	Br mg/l	F mg/l	Mn mg/l	I mg/l	HCO_3 mg/l
HLX35	120.00	135.00	2009-05-26 12:38:00	15943	198.0	3.91	16.8	5.32	6.51	0.0161	57.70	19.70	0.252	177.0	0.652	4.25	0.07220	<0.01	252.00
KLX19A	509.00	517.00	2009-06-15 13:16:00	15970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 13:29:00	15971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 13:54:00	15972	1,010.0	9.95	159.0	11.00	7.69	0.0830	62.60	25.10	2.740	1,770.0	8.970	2.64	0.12500	–	101.00
KLX19A	509.00	517.00	2009-06-15 14:40:00	15973	1,010.0	9.92	160.0	10.60	7.55	0.0851	73.50	29.50	2.720	1,790.0	9.060	2.61	0.11500	–	87.30
KLX19A	509.00	517.00	2009-06-15 15:26:00	15974	1,030.0	10.20	163.0	10.80	7.52	0.0916	79.70	32.30	2.750	1,810.0	9.110	2.58	0.11000	–	79.00
KLX19A	509.00	517.00	2009-06-23 13:40:00	15975	1,130.0	7.35	183.0	10.60	6.58	0.0965	117.00	46.10	3.090	2,010.0	10.300	2.72	0.07020	–	23.60
KLX19A	509.00	517.00	2009-06-24 10:02:00	15976	1,110.0	7.36	190.0	10.50	6.71	0.1010	116.00	47.90	3.180	1,980.0	10.000	2.61	0.07030	0.0792	23.60
HLX28	70.00	90.00	2009-06-16 11:15:00	15977	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX28	70.00	90.00	2009-06-16 11:21:00	15978	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX28	70.00	90.00	2009-06-24 08:50:00	15979	151.0	4.32	15.7	4.68	7.10	0.0121	60.00	22.00	0.232	89.9	0.363	3.78	0.09330	0.0084	216.00
HLX37	150.00	199.80	2009-06-16 13:42:00	15980	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX37	150.00	199.80	2009-06-16 13:53:00	15981	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX37	150.00	199.80	2009-06-23 09:20:00	15982	130.0	2.03	5.3	1.26	6.35	0.0109	41.50	14.70	0.086	47.2	0.168	7.29	0.00929	0.0033	209.00
KLX19A	509.00	517.00	2009-10-14 08:01:00	19085	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-14 08:18:00	19086	–	–	–	–	–	–	–	–	–	2,010.0	–	–	–	–	138.00
KLX19A	509.00	517.00	2009-10-14 09:10:00	19087	1,060.0	7.88	172.0	10.50	7.05	0.0905	108.00	41.60	2.810	1,990.0	9.670	2.58	0.08000	–	35.90
KLX19A	509.00	517.00	2009-10-14 10:28:00	19088	1,060.0	7.50	170.0	10.30	6.86	0.0891	112.00	41.20	2.630	1,970.0	9.850	2.65	0.07400	–	32.00
KLX19A	509.00	517.00	2009-10-14 11:50:00	19089	1,080.0	7.30	168.0	11.20	6.81	0.0914	117.00	42.20	2.720	1,970.0	9.940	3.03	0.07210	–	30.10
KLX19A	509.00	517.00	2009-10-20 10:03:00	19090	1,040.0	5.80	170.0	10.10	6.19	0.0952	224.00	42.50	2.770	2,020.0	19.000	5.16	0.05890	–	23.00
KLX19A	509.00	517.00	2009-10-21 14:30:00	19091	1,050.0	5.77	171.0	10.20	6.27	0.0992	118.00	44.30	2.770	1,990.0	10.100	2.71	0.06290	0.1530	23.00
KLX15A	260.00	272.00	2009-10-15 09:36:00	19092	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-15 09:42:00	19093	–	–	–	–	–	–	–	–	–	3,130.0	–	–	–	–	63.80
KLX15A	260.00	272.00	2009-10-15 10:30:00	19094	1,140.0	22.80	595.0	73.80	5.47	1.5200	82.00	28.20	10.900	3,110.0	13.500	2.15	0.47100	–	63.40
KLX15A	260.00	272.00	2009-10-15 11:30:00	19095	1,110.0	22.80	598.0	73.90	5.69	1.5500	78.00	28.30	10.800	3,070.0	12.300	2.06	0.46700	–	64.60
KLX15A	260.00	272.00	2009-10-15 12:30:00	19096	1,120.0	23.40	601.0	74.30	5.69	1.5600	79.60	28.50	11.200	3,080.0	12.100	2.05	0.46500	–	64.80
KLX15A	260.00	272.00	2009-10-22 12:22:00	19097	1,200.0	20.10	659.0	79.90	6.18	1.1600	81.90	27.90	13.200	3,250.0	12.800	1.30	0.56900	–	50.40

– = not analysed.

Table A3-1 (page 4 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Na mg/l	K mg/l	Ca mg/l	Mg mg/l	Si mg/l	Li mg/l	SO_4^2 mg/l	SO_4S mg/l	Sr mg/l	Cl mg/l	Br mg/l	F mg/l	Mn mg/l	I mg/l	HCO_3 mg/l
KLX15A	260.00	272.00	2009-10-22 16:21:00	19098	1,190.0	19.40	654.0	78.60	6.00	1.1500	85.50	27.40	12.700	3,270.0	13.600	1.99	0.61100	0.4750	50.60
KLX15A	623.00	640.00	2009-10-19 09:03:00	19099	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-19 09:30:00	19100	–	–	–	–	–	–	–	–	–	3,670.0	–	–	–	–	72.90
KLX15A	623.00	640.00	2009-10-19 11:54:00	19101	1,530.0	18.10	895.0	63.50	7.14	0.9930	165.00	66.00	16.500	4,140.0	18.100	2.05	0.48700	–	51.90
KLX15A	623.00	640.00	2009-10-19 14:15:00	19102	1,640.0	16.80	1,050.0	60.60	7.15	0.8980	218.00	82.80	18.200	4,540.0	20.400	2.01	0.50200	–	40.40
KLX15A	623.00	640.00	2009-10-19 16:40:00	19103	1,670.0	16.00	1,080.0	59.10	7.13	0.8480	236.00	88.30	18.900	4,650.0	21.300	2.01	0.49900	–	37.30
KLX15A	623.00	640.00	2009-10-26 13:05:00	19104	1,980.0	14.80	1,370.0	62.50	6.21	0.4750	351.00	132.00	24.400	5,500.0	26.100	2.14	0.50800	–	21.70
KLX15A	623.00	640.00	2009-10-27 08:12:00	19105	1,990.0	14.40	1,390.0	61.80	6.16	0.4920	363.00	131.00	24.800	5,460.0	28.600	2.21	0.49400	0.3200	21.00
HLX37	150.00	199.80	2009-10-14 10:00:00	19106	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX37	150.00	199.80	2009-10-14 10:10:00	19107	–	–	–	–	–	–	32.90	–	–	45.1	0.237	6.50	–	–	201.00
HLX37	150.00	199.80	2009-10-21 15:23:00	19108	118.0	1.57	5.0	1.20	6.00	0.0108	37.90	13.10	0.082	43.2	0.236	7.39	0.01110	0.0086	213.00
HLX28	70.00	90.00	2009-10-14 08:45:00	19109	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX28	70.00	90.00	2009-10-14 08:52:00	19110	–	–	–	–	–	–	–	–	–	86.1	–	–	–	–	213.00
HLX28	70.00	90.00	2009-10-20 08:37:00	19111	124.0	3.19	11.5	3.38	6.65	0.0117	47.40	16.40	0.165	60.0	0.310	4.40	0.06920	0.0093	227.00
HLX35	120.00	135.00	2009-10-27 14:31:00	19112	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX35	120.00	135.00	2009-10-27 14:40:00	19113	–	–	–	–	–	–	–	–	–	196.0	–	–	–	–	252.00
HLX35	120.00	135.00	2009-11-02 12:55:00	19114	215.0	4.15	19.6	6.21	6.67	0.0170	61.90	21.20	0.296	221.0	0.776	4.03	0.08040	0.0124	247.00
HLX39	187.00	199.30	2009-10-28 13:46:00	19115	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX39	187.00	199.30	2009-10-28 14:00:00	19116	–	–	–	–	–	–	1.57	–	–	58.3	0.299	4.39	–	–	272.00
HLX39	187.00	199.30	2009-11-02 11:40:00	19117	119.0	1.67	15.6	2.37	7.84	0.0138	4.65	1.76	0.178	56.2	0.287	5.31	0.04800	0.0076	277.00
KLX12A	535.00	545.00	2009-10-21 10:34:00	19118	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-21 11:50:00	19119	–	–	–	–	–	–	–	–	–	3,710.0	–	–	–	–	196.00
KLX12A	535.00	545.00	2009-10-21 13:38:00	19120	1,690.0	9.13	636.0	15.20	6.57	0.1870	244.00	114.00	11.000	3,710.0	18.700	2.28	0.13700	–	131.00
KLX12A	535.00	545.00	2009-10-21 15:28:00	19121	1,810.0	9.23	679.0	16.90	6.60	0.2000	315.00	124.00	12.100	3,950.0	19.500	2.29	0.15600	–	57.70
KLX12A	535.00	545.00	2009-10-21 15:28:00	19122	1,800.0	8.96	685.0	17.10	6.50	0.1990	325.00	124.00	12.100	4,030.0	19.700	2.33	0.16300	–	30.50
KLX12A	535.00	545.00	2009-10-27 10:42:00	19123	1,980.0	9.22	726.0	17.90	6.05	0.2130	353.00	126.00	14.100	4,210.0	21.000	2.37	0.16900	–	12.80
KLX12A	535.00	545.00	2009-11-02 09:42:00	19124	1,950.0	9.08	731.0	17.80	5.97	0.2190	354.00	140.00	14.300	4,230.0	21.000	2.33	0.17700	0.2620	12.30

– = not analysed.

Table A3-1 (page 5 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Na mg/l	K mg/l	Ca mg/l	Mg mg/l	Si mg/l	Li mg/l	SO_4^2 mg/l	SO_4S mg/l	Sr mg/l	Cl mg/l	Br mg/l	F mg/l	Mn mg/l	I mg/l	HCO_3 mg/l
KLX10	351.00	368.00	2009-10-20 11:02:00	19125	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-20 11:12:00	19126	–	–	–	–	–	–	–	–	–	1,090.0	–	–	–	–	183.00
KLX10	351.00	368.00	2009-10-20 11:40:00	19127	727.0	6.72	207.0	33.10	7.08	0.0840	115.00	44.40	3.190	1,440.0	4.760	2.07	0.20700	–	141.00
KLX10	351.00	368.00	2009-10-20 12:40:00	19128	781.0	6.43	218.0	34.40	6.74	0.0921	134.00	49.50	3.360	1,640.0	5.240	2.05	0.19600	–	120.00
KLX10	351.00	368.00	2009-10-20 13:40:00	19129	809.0	6.61	226.0	35.30	6.59	0.0949	144.00	51.60	3.540	1,710.0	5.610	2.07	0.20000	–	112.00
KLX10	351.00	368.00	2009-10-26 13:15:00	19130	1,040.0	7.39	298.0	46.50	6.28	0.1210	187.00	70.30	5.120	2,210.0	7.100	2.06	0.25600	–	65.90
KLX10	351.00	368.00	2009-10-27 08:55:00	19131	1,040.0	6.97	301.0	44.90	6.21	0.1250	190.00	70.20	4.960	2,190.0	7.610	2.02	0.25700	0.1170	65.40
KLX10	689.00	710.00	2009-10-20 13:10:00	19147	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-20 15:25:00	19148	–	–	–	–	–	–	–	–	–	3,750.0	–	–	–	–	135.00
KLX10	689.00	710.00	2009-10-21 07:25:00	19149	1,330.0	11.10	760.0	31.40	9.23	0.2710	228.00	86.70	13.300	3,510.0	15.200	2.14	0.18600	–	26.70
KLX10	689.00	710.00	2009-10-21 12:34:00	19150	1,300.0	10.90	737.0	30.70	8.91	0.2620	237.00	82.20	13.200	3,540.0	15.200	2.19	0.18300	–	25.10
KLX10	689.00	710.00	2009-10-21 17:40:00	19151	1,310.0	10.90	755.0	30.70	9.01	0.2690	227.00	84.80	13.100	3,520.0	15.300	2.18	0.18900	–	24.50
KLX10	689.00	710.00	2009-10-26 13:10:00	19152	1,400.0	11.00	796.0	29.20	9.25	0.2810	238.00	85.10	15.200	3,570.0	15.300	2.10	0.20400	–	21.80
KLX10	689.00	710.00	2009-10-27 08:50:00	19153	1,370.0	10.80	802.0	29.30	9.34	0.2770	250.00	84.90	15.500	3,550.0	15.500	2.15	0.22700	0.2100	21.30
KLX08	594.00	625.00	2009-10-27 12:37:00	19154	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-10-27 12:51:00	19155	–	–	–	–	–	–	–	–	–	2,060.0	–	–	–	–	172.00
KLX08	594.00	625.00	2009-10-27 13:45:00	19156	886.0	4.10	352.0	7.99	8.18	0.1860	191.00	34.40	6.420	2,020.0	19.700	4.61	0.05400	–	113.00
KLX08	594.00	625.00	2009-10-27 14:43:00	19157	885.0	3.81	341.0	7.96	7.96	0.1820	118.00	42.80	6.510	1,950.0	9.610	2.37	0.06800	–	38.50
KLX08	594.00	625.00	2009-10-27 15:40:00	19158	894.0	3.85	339.0	7.91	7.84	0.1860	122.00	42.90	6.480	1,960.0	9.530	2.28	0.07000	–	31.40
KLX08	594.00	625.00	2009-11-02 10:20:00	19159	901.0	3.45	356.0	8.05	7.43	0.1860	142.00	51.90	6.670	1,990.0	9.670	2.33	0.08100	–	19.70
KLX08	594.00	625.00	2009-11-03 08:10:00	19160	904.0	3.38	356.0	8.03	7.39	0.1870	134.00	51.70	6.580	1,980.0	9.450	2.31	0.08880	0.0935	19.80
KLX18A	472.00	489.00	2009-10-21 09:00:00	19161	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-21 10:25:00	19162	–	–	–	–	–	–	–	–	–	1,150.0	–	–	–	–	178.00
KLX18A	472.00	489.00	2009-10-21 16:25:00	19163	721.0	3.70	211.0	13.80	7.03	0.1130	119.00	40.80	3.650	1,480.0	7.420	2.12	0.07860	–	90.40
KLX18A	472.00	489.00	2009-10-22 07:10:00	19164	816.0	3.93	240.0	15.00	6.63	0.1280	154.00	55.30	4.310	1,700.0	8.620	2.17	0.07590	–	37.30
KLX18A	472.00	489.00	2009-10-22 15:55:00	19165	829.0	3.93	244.0	15.20	6.53	0.1310	156.00	56.30	4.390	1,720.0	9.240	2.33	0.07700	–	34.60
KLX18A	472.00	489.00	2009-10-28 08:10:00	19166	859.0	3.68	257.0	15.20	6.54	0.1320	154.00	55.20	4.720	1,720.0	9.080	2.32	0.07960	–	33.10
KLX18A	472.00	489.00	2009-10-28 15:13:00	19167	858.0	3.75	255.0	15.30	6.37	0.1320	154.00	63.90	4.890	1,720.0	9.180	2.33	0.08730	0.1030	33.00

– = not analysed.

Table A3-1 (page 6 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Fe mg/l	Fetot mg/l	Fe(II) mg/l	HS mg/l	TOC mg/l	DOC mg/l	NO_2<N mg/l	NO_3<N mg/l	NO_2<+NO_3<N mg/l	NH_4<N mg/l	PO_4<P mg/l	PO_4<P hlysis mg/l	P mg/l
KLX12A	535.00	545.00	2009-05-06 09:20:00	15889	–	–	–	2.340	–	–	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 10:50:00	15890	–	–	–	34.100	–	–	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 12:30:00	15891	<0.02	0.019	0.017	15.100	4.5	4.3	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 14:22:00	15892	<0.02	0.019	0.010	5.630	3.4	3.5	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 16:05:00	15893	<0.02	0.017	0.010	3.780	3.1	3.1	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-14 08:45:00	15894	0.0313	0.037	0.032	0.864	2.1	2.1	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-14 12:55:00	15895	0.0339	0.051	0.042	0.649	2.2	2.3	<0.0002	<0.0003	<0.0003	0.0157	0.0008	0.0009	<0.00500
KLX18A	472.00	489.00	2009-05-06 09:15:00	15896	–	–	–	25.400	–	–	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-06 10:47:00	15897	–	–	–	24.200	–	–	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-06 16:05:00	15898	<0.02	0.026	0.015	7.530	7.1	6.5	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-07 07:06:00	15899	0.0323	0.035	0.028	1.190	3.4	3.4	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-07 15:56:00	15900	0.0359	0.042	0.033	0.923	3.2	3.4	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-12 13:45:00	15901	0.0357	0.042	0.034	0.868	3.3	3.4	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-13 07:10:00	15902	0.0363	0.037	0.032	1.030	3.2	3.3	<0.0002	<0.0003	<0.0003	0.0407	0.0012	0.0023	<0.00500
KLX15A	260.00	272.00	2009-05-07 08:42:00	15903	–	–	–	1.610	–	–	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 08:50:00	15904	–	–	–	6.180	–	–	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 09:38:00	15905	0.5350	0.550	0.086	0.087	2.8	3.1	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 10:29:00	15906	0.4900	0.462	0.097	0.056	2.8	2.9	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 11:18:00	15907	0.4520	0.562	0.369	0.054	2.8	2.7	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-13 13:25:00	15908	0.2230	0.240	0.058	0.012	2.2	2.2	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-14 07:20:00	15909	0.2150	0.247	0.173	0.016	2.1	2.1	<0.0002	<0.0003	<0.0003	0.2490	0.0003	0.0011	<0.00500
KLX15A	623.00	640.00	2009-05-07 08:24:00	15910	–	–	–	27.000	–	–	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 08:52:00	15911	–	–	–	55.400	–	–	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 11:15:00	15912	0.1540	0.162	0.168	3.130	2.1	2.3	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 13:35:00	15913	0.2960	0.309	0.179	0.507	1.8	1.8	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 15:50:00	15914	0.3060	0.322	0.312	0.276	1.7	1.7	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-18 15:40:00	15915	0.2860	0.301	0.285	0.117	1.1	1.7	–	–	–	–	–	–	–

– = not analysed.

Table A3-1 (page 7 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Fe mg/l	Fetot mg/l	Fe(II mg/l	HS mg/l	TOC mg/l	DOC mg/l	NO_2<N mg/l	NO_3<N mg/l	NO_2<+NO_3<N mg/l	NH_4<N mg/l	PO_4<P mg/l	PO_4<P hlysis mg/l	P mg/l
KLX15A	623.00	640.00	2009-05-19 07:25:00	15916	0.2950	0.282	0.282	0.132	1.3	1.4	0.0003	<0.0003	0.0003	0.1120	<0.0005	0.0010	<0.00500
KLX10	689.00	710.00	2009-05-11 13:06:00	15917	–	–	–	26.200	–	–	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-11 15:14:00	15918	–	–	–	58.800	–	–	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-12 07:06:00	15919	0.0270	0.036	0.028	1.740	2.4	2.5	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-12 11:16:00	15920	0.0282	0.044	0.030	1.670	2.3	2.5	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-12 15:28:00	15921	0.0299	0.037	0.030	1.910	2.2	2.3	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-25 07:55:00	15922	0.0591	0.056	0.053	0.945	1.8	1.6	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-26 11:45:00	15923	0.0595	0.062	0.051	0.735	1.9	1.7	<0.0002	0.0003	0.0005	0.0510	0.0028	0.0041	0.00953
KLX10	351.00	368.00	2009-05-11 13:20:00	15924	–	–	–	11.100	–	–	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 13:30:00	15925	–	–	–	20.500	–	–	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 14:00:00	15926	0.0478	0.054	0.045	6.880	4.5	4.7	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 14:40:00	15927	0.0637	0.068	0.061	4.840	4.0	4.2	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 15:15:00	15928	0.0807	0.090	0.083	3.310	3.7	3.9	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-19 14:30:00	15929	0.1970	0.207	0.202	0.251	2.7	2.7	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-20 06:55:00	15930	0.1990	0.212	0.201	0.268	2.8	2.6	<0.0002	0.0003	0.0004	0.0745	0.0012	0.0023	<0.00500
KLX08	594.00	625.00	2009-05-12 13:34:00	15931	–	–	–	8.420	–	–	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 13:53:00	15932	–	–	–	20.600	–	–	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 14:55:00	15933	0.0425	0.054	0.045	4.130	5.2	5.5	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 16:00:00	15934	0.0510	0.290	0.278	1.930	3.5	3.7	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 17:00:00	15935	0.0530	0.056	0.054	1.710	3.3	3.5	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-18 15:26:00	15936	0.0799	0.088	0.079	0.054	2.2	1.9	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-19 07:10:00	15937	0.0719	0.074	0.066	0.057	1.9	1.9	<0.0002	0.0003	0.0003	0.0224	0.0007	0.0022	<0.00500
HLX39	187.00	199.30	2009-05-18 11:12:00	15938	–	–	–	0.253	–	–	–	–	–	–	–	–	–
HLX39	187.00	199.30	2009-05-18 11:23:00	15939	–	–	–	1.260	–	–	–	–	–	–	–	–	–
HLX39	187.00	199.30	2009-05-25 12:52:00	15940	0.0370	0.044	0.032	0.072	7.6	7.2	0.0005	<0.0003	0.0004	0.0758	0.0208	0.0231	0.02340
HLX35	120.00	135.00	2009-05-18 12:02:00	15941	–	–	–	0.881	–	–	–	–	–	–	–	–	–
HLX35	120.00	135.00	2009-05-18 12:14:00	15942	–	–	–	4.610	–	–	–	–	–	–	–	–	–

– = not analysed.

Table A3-1 (page 8 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Fe mg/l	Fetot mg/l	Fe(II) mg/l	HS mg/l	TOC mg/l	DOC mg/l	NO_2<N mg/l	NO_3<N mg/l	NO_2<+NO_3<N mg/l	NH_4<N mg/l	PO_4<P mg/l	PO_4<P hlysis mg/l	P mg/l
HLX35	120.00	135.00	2009-05-26 12:38:00	15943	0.0580	0.068	0.054	0.020	5.7	5.7	0.0003	<0.0003	0.0003	0.1620	0.0191	0.0210	0.02110
KLX19A	509.00	517.00	2009-06-15 13:16:00	15970	–	–	–	4.250	–	–	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 13:29:00	15971	–	–	–	5.700	–	–	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 13:54:00	15972	0.1140	0.123	0.101	0.587	4.2	4.0	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 14:40:00	15973	0.1150	0.124	0.109	0.353	3.5	3.5	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 15:26:00	15974	0.1140	0.125	0.126	0.257	3.4	3.3	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-23 13:40:00	15975	0.0778	0.087	0.074	–	1.4	1.7	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-24 10:02:00	15976	0.0813	0.072	0.073	0.030	1.3	1.5	<0.0002	0.0011	0.0012	0.0251	0.0016	0.0032	<0.00500
HLX28	70.00	90.00	2009-06-16 11:15:00	15977	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX28	70.00	90.00	2009-06-16 11:21:00	15978	–	–	–	0.033	–	–	–	–	–	–	–	–	–
HLX28	70.00	90.00	2009-06-24 08:50:00	15979	0.1080	0.124	0.115	0.036	7.1	7.2	0.0004	0.0012	0.0016	0.1540	0.0129	0.0127	0.01410
HLX37	150.00	199.80	2009-06-16 13:42:00	15980	–	–	–	2.070	–	–	–	–	–	–	–	–	–
HLX37	150.00	199.80	2009-06-16 13:53:00	15981	–	–	–	–	–	–	–	–	–	–	–	–	–
HLX37	150.00	199.80	2009-08-23 09:20:00	15982	0.0076	0.012	0.006	0.023	2.6	2.8	0.0002	<0.0003	0.0003	0.0378	0.0105	0.0104	0.00930
KLX19A	509.00	517.00	2009-10-14 08:01:00	19085	–	–	–	3.090	–	–	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-14 08:18:00	19086	–	–	–	15.700	–	–	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-14 09:10:00	19087	0.0716	0.079	0.072	0.587	1.9	2.7	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-14 10:28:00	19088	0.0719	0.080	0.070	0.423	4.4	2.3	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-14 11:50:00	19089	0.0711	0.078	0.067	0.265	2.0	2.2	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-20 10:03:00	19090	0.0571	0.074	0.067	0.038	1.8	1.8	–	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-21 14:30:00	19091	0.0701	0.088	0.083	0.028	1.5	1.9	<0.0002	<0.0003	<0.0003	0.0287	0.0033	0.0044	<0.00500
KLX15A	260.00	272.00	2009-10-15 09:36:00	19092	–	–	–	0.515	–	–	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-15 09:42:00	19093	–	–	–	0.375	–	–	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-15 10:30:00	19094	0.4700	0.525	0.265	0.073	3.6	3.5	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-15 11:30:00	19095	0.4100	0.432	0.309	0.086	3.5	2.3	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-15 12:30:00	19096	0.3660	0.408	0.341	0.045	3.2	3.5	–	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-22 12:22:00	19097	0.2000	0.208	0.184	0.021	2.1	2.0	–	–	–	–	–	–	–

– = not analysed.

Table A3-1 (page 9 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Fe mg/l	Fetot mg/l	Fe(II) mg/l	HS mg/l	TOC mg/l	DOC mg/l	NO_2<N mg/l	NO_3<N mg/l	NO_2<+NO_3<N mg/l	NH_4<N mg/l	PO_4<P mg/l	PO_4<P hlysis mg/l	P mg/l
KLX15A	260.00	272.00	2009-10-22 16:21:00	19098	0.2120	0.202	0.198	0.029	1.9	1.9	<0.0002	<0.0003	<0.0003	0.2680	0.0006	0.0015	<0.00500
KLX15A	623.00	640.00	2009-10-19 09:03:00	19099	–	–	–	3.100	–	–	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-19 09:30:00	19100	–	–	–	7.220	–	–	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-19 11:54:00	19101	0.0994	0.150	0.139	1.030	2.7	2.5	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-19 14:15:00	19102	0.1520	0.179	0.178	0.678	3.5	3.4	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-19 16:40:00	19103	0.1620	0.194	0.202	0.503	3.5	3.4	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-26 13:05:00	19104	0.2260	0.258	0.238	0.272	1.3	1.4	–	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-27 08:12:00	19105	0.2310	0.251	0.244	0.295	1.3	1.4	0.0002	<0.0003	<0.0003	0.1180	<0.0005	0.0006	<0.04000
HLX37	150.00	199.80	2009-10-14 10:00:00	19106	–	–	–	2.650	–	–	–	–	–	–	–	–	–
HLX37	150.00	199.80	2009-10-14 10:10:00	19107	–	–	–	2.130	–	–	–	–	–	–	–	–	–
HLX37	150.00	199.80	2009-10-21 15:23:00	19108	0.0066	0.017	0.012	0.021	3.2	3.2	0.0002	<0.0003	<0.0003	0.0394	0.0108	0.0109	0.01010
HLX28	70.00	90.00	2009-10-14 08:45:00	19109	–	–	–	13.900	–	–	–	–	–	–	–	–	–
HLX28	70.00	90.00	2009-10-14 08:52:00	19110	–	–	–	15.700	–	–	–	–	–	–	–	–	–
HLX28	70.00	90.00	2009-10-20 08:37:00	19111	0.0721	0.078	0.068	0.059	7.5	7.4	0.0004	<0.0003	<0.0003	0.1500	0.0160	0.0158	0.01720
HLX35	120.00	135.00	2009-10-27 14:31:00	19112	–	–	–	0.461	–	–	–	–	–	–	–	–	–
HLX35	120.00	135.00	2009-10-27 14:40:00	19113	–	–	–	1.150	–	–	–	–	–	–	–	–	–
HLX35	120.00	135.00	2009-11-02 12:55:00	19114	0.0665	0.074	0.067	0.031	5.9	6.0	0.0003	<0.0003	<0.0003	0.1630	0.0157	0.0155	0.01800
HLX39	187.00	199.30	2009-10-28 13:46:00	19115	–	–	–	0.709	–	–	–	–	–	–	–	–	–
HLX39	187.00	199.30	2009-10-28 14:00:00	19116	–	–	–	0.671	–	–	–	–	–	–	–	–	–
HLX39	187.00	199.30	2009-11-02 11:40:00	19117	0.0389	0.039	0.033	0.050	7.3	7.3	0.0005	<0.0003	<0.0003	0.0795	0.0194	0.0194	0.02250
KLX12A	535.00	545.00	2009-10-21 10:34:00	19118	–	–	–	19.400	–	–	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009–10-21 11:50:00	19119	–	–	–	51.000	–	–	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-21 13:38:00	19120	<0.02	0.013	0.008	24.700	7.0	6.6	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-21 15:28:00	19121	<0.02	0.012	0.015	10.900	4.4	4.7	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-21 15:28:00	19122	<0.02	0.019	0.014	5.140	3.5	3.9	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-27 10:42:00	19123	0.0261	0.038	0.038	0.489	2.2	2.3	–	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-11-02 09:42:00	19124	0.0378	0.045	0.036	0.605	2.0	2.3	<0.0002	<0.0003	0.0003	0.0165	0.0014	0.0016	<0.00500

– = not analysed.

Table A3-1 (page 10 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Fe mg/l	Fetot mg/l	Fe(II) mg/l	HS mg/l	TOC mg/l	DOC mg/l	NO_2<N mg/l	NO_3<N mg/l	NO_2<+NO_3<N mg/l	NH_4<N mg/l	PO_4<P mg/l	PO_4<P hlysis mg/l	P mg/l
KLX10	351.00	368.00	2009-10-20 11:02:00	19125	–	–	–	10.400	–	–	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-20 11:12:00	19126	–	–	–	9.540	–	–	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-20 11:40:00	19127	0.0433	0.065	0.049	1.840	5.6	6.1	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-20 12:40:00	19128	0.0653	0.076	0.070	1.130	4.7	4.9	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-20 13:40:00	19129	0.0683	0.084	0.074	0.870	4.4	4.5	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-26 13:15:00	19130	0.1910	0.207	0.190	0.299	3.0	2.7	–	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-27 08:55:00	19131	0.1870	0.212	0.187	0.286	2.9	2.7	<0.0002	<0.0003	<0.0003	0.0741	0.0014	0.0026	<0.00500
KLX10	689.00	710.00	2009-10-20 13:10:00	19147	–	–	–	41.000	–	–	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-20 15:25:00	19148	–	–	–	31.100	–	–	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-21 07:25:00	19149	0.0223	0.036	0.030	1.750	2.6	2.7	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-21 12:34:00	19150	0.0259	0.037	0.039	1.200	2.5	2.6	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-21 17:40:00	19151	0.0307	0.064	0.073	1.170	2.6	1.0	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-26 13:10:00	19152	0.0444	0.053	0.046	1.260	1.9	2.0	–	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-27 08:50:00	19153	0.0506	0.053	0.044	1.120	2.0	2.0	<0.0002	0.0003	0.0003	0.0622	0.0027	0.0045	0.00691
KLX08	594.00	625.00	2009-10-27 12:37:00	19154	–	–	–	30.400	–	–	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-10-27 12:51:00	19155	–	–	–	20.100	–	–	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-10-27 13:45:00	19156	<0.02	0.016	0.012	13.800	7.0	7.6	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-10-27 14:43:00	19157	0.0307	0.034	0.027	2.760	3.9	4.4	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-10-27 15:40:00	19158	0.0350	0.041	0.032	2.260	3.2	3.7	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-11-02 10:20:00	19159	0.0787	0.086	0.077	0.052	2.0	2.3	–	–	–	–	–	–	–
KLX08	594.00	625.00	2009-11-03 08:10:00	19160	0.0696	0.083	0.073	0.055	2.2	2.2	<0.0002	<0.0003	<0.0003	0.0227	0.0016	0.0019	<0.00500
KLX18A	472.00	489.00	2009-10-21 09:00:00	19161	–	–	–	17.600	–	–	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-21 10:25:00	19162	–	–	–	18.700	–	–	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-21 16:25:00	19163	<0.02	0.033	0.026	7.780	5.5	4.7	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-22 07:10:00	19164	0.0316	0.041	0.033	1.360	3.9	3.3	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-22 15:55:00	19165	0.0348	0.013	0.008	0.675	3.7	3.3	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-28 08:10:00	19166	0.0453	0.052	0.048	0.687	3.5	3.5	–	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-28 15:13:00	19167	0.0457	0.048	0.043	0.884	3.5	3.7	<0.0002	0.0003	0.0003	0.0458	0.0023	0.0029	<0.00500

– = not analysed.

Table A3-1 (page 11 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Ph	El. cond mS/m	Drill water %	Charge balance %	Density g/ml
KLX12A	535.00	545.00	2009-05-06 09:20:00	15889	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 10:50:00	15890	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 12:30:00	15891	8.43	1,210.0	2.42	0.07	1.0022
KLX12A	535.00	545.00	2009-05-06 14:22:00	15892	7.52	1,220.0	1.98	0.37	1.0023
KLX12A	535.00	545.00	2009-05-06 16:05:00	15893	7.37	1,220.0	1.96	–0.93	1.0023
KLX12A	535.00	545.00	2009-05-14 08:45:00	15894	7.85	1,260.0	1.69	0.33	1.0023
KLX12A	535.00	545.00	2009-05-14 12:55:00	15895	7.55	1,260.0	1.66	0.08	1.0024
KLX18A	472.00	489.00	2009-05-06 09:15:00	15896	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-06 10:47:00	15897	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-06 16:05:00	15898	7.49	503.0	5.58	–1.74	0.9991
KLX18A	472.00	489.00	2009-05-07 07:06:00	15899	7.42	560.0	6.37	–2.00	0.9992
KLX18A	472.00	489.00	2009-05-07 15:56:00	15900	7.78	557.0	6.05	–1.23	0.9992
KLX18A	472.00	489.00	2009-05-12 13:45:00	15901	7.81	551.0	3.26	–0.02	0.9992
KLX18A	472.00	489.00	2009-05-13 07:10:00	15902	7.72	551.0	3.07	2.14	0.9992
KLX15A	260.00	272.00	2009-05-07 08:42:00	15903	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 08:50:00	15904	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 09:38:00	15905	7.59	899.0	130.00	–0.83	1.0008
KLX15A	260.00	272.00	2009-05-07 10:29:00	15906	7.58	884.0	141.00	–0.15	1.0006
KLX15A	260.00	272.00	2009-05-07 11:18:00	15907	7.60	893.0	134.00	–1.29	1.0005
KLX15A	260.00	272.00	2009-05-13 13:25:00	15908	7.53	957.0	79.10	1.02	1.0008
KLX15A	260.00	272.00	2009-05-14 07:20:00	15909	7.62	957.0	77.70	0.17	1.0009
KLX15A	623.00	640.00	2009-05-07 08:24:00	15910	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 08:52:00	15911	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 11:15:00	15912	7.73	1,340.0	56.70	0.55	1.0028
KLX15A	623.00	640.00	2009-05-07 13:35:00	15913	7.59	1,450.0	45.50	0.11	1.0033
KLX15A	623.00	640.00	2009-05-07 15:50:00	15914	7.59	1,460.0	42.70	–0.73	1.0033
KLX15A	623.00	640.00	2009-05-18 15:40:00	15915	7.60	1,580.0	19.80	–0.86	0.9998

– = not analysed.

Table A3-1 (page 12 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Ph	El. cond mS/m	Drill water %	Charge balance %	Density g/ml
KLX15A	623.00	640.00	2009-05-19 07:25:00	15916	7.67	1,570.0	19.20	–0.50	1.0000
KLX10	689.00	710.00	2009-05-11 13:06:00	15917	–	–	–	–	–
KLX10	689.00	710.00	2009-05-11 15:14:00	15918	–	–	–	–	–
KLX10	689.00	710.00	2009-05-12 07:06:00	15919	7.67	1,030.0	16.90	0.97	1.0012
KLX10	689.00	710.00	2009-05-12 11:16:00	15920	7.76	1,030.0	17.00	0.68	1.0012
KLX10	689.00	710.00	2009-05-12 15:28:00	15921	7.75	1,030.0	17.40	0.34	1.0012
KLX10	689.00	710.00	2009-05-25 07:55:00	15922	7.74	1,060.0	15.70	–1.30	0.9974
KLX10	689.00	710.00	2009-05-26 11:45:00	15923	7.73	1,050.0	14.50	–0.70	1.0015
KLX10	351.00	368.00	2009-05-11 13:20:00	15924	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 13:30:00	15925	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 14:00:00	15926	7.96	602.0	16.10	0.64	0.9993
KLX10	351.00	368.00	2009-05-11 14:40:00	15927	8.12	611.0	16.40	1.28	0.9994
KLX10	351.00	368.00	2009-05-11 15:15:00	15928	8.00	625.0	16.60	0.12	0.9994
KLX10	351.00	368.00	2009-05-19 14:30:00	15929	7.79	693.0	17.00	–1.51	0.9958
KLX10	351.00	368.00	2009-05-20 06:55:00	15930	7.86	695.0	16.80	–1.74	0.9957
KLX08	594.00	625.00	2009-05-12 13:34:00	15931	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 13:53:00	15932	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 14:55:00	15933	7.46	609.0	2.72	0.54	0.9993
KLX08	594.00	625.00	2009-05-12 16:00:00	15934	7.67	612.0	2.76	0.19	0.9993
KLX08	594.00	625.00	2009-05-12 17:00:00	15935	7.86	616.0	2.79	0.75	0.9994
KLX08	594.00	625.00	2009-05-18 15:26:00	15936	8.10	629.0	2.28	–2.12	0.9955
KLX08	594.00	625.00	2009-05-19 07:10:00	15937	8.12	630.0	2.22	–2.13	0.9953
HLX39	187.00	199.30	2009-05-18 11:12:00	15938	–	–	–	–	–
HLX39	187.00	199.30	2009-05-18 11:23:00	15939	–	–	–	–	–
HLX39	187.00	199.30	2009-05-25 12:52:00	15940	8.26	64.4	0.12	–0.89	0.9932
HLX35	120.00	135.00	2009-05-18 12:02:00	15941	–	–	–	–	–
HLX35	120.00	135.00	2009-05-18 12:14:00	15942	–	–	–	–	–

– = not analysed.

Table A3-1 (page 13 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Ph	El. cond mS/m	Drill water %	Charge balance %	Density g/ml
HLX35	120.00	135.00	2009-05-26 12:38:00	15943	8.13	112.0	0.07	–2.84	0.9974
KLX19A	509.00	517.00	2009-06-15 13:16:00	15970	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 13:29:00	15971	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 13:54:00	15972	8.15	572.0	5.08	–0.28	1.0004
KLX19A	509.00	517.00	2009-06-15 14:40:00	15973	8.23	578.0	5.36	–0.83	0.9991
KLX19A	509.00	517.00	2009-06-15 15:26:00	15974	8.24	581.0	5.44	–0.41	0.9992
KLX19A	509.00	517.00	2009-06-23 13:40:00	15975	8.21	633.0	3.97	–0.67	0.9994
KLX19A	509.00	517.00	2009-06-24 10:02:00	15976	8.19	635.0	3.88	–0.50	0.9994
HLX28	70.00	90.00	2009-06-16 11:15:00	15977	–	–	–	–	–
HLX28	70.00	90.00	2009-06-16 11:21:00	15978	–	–	–	–	–
HLX28	70.00	90.00	2009-06-24 08:50:00	15979	8.16	78.1	0.09	1.33	0.9973
HLX37	150.00	199.80	2009-06-16 13:42:00	15980	–	–	–	–	–
HLX37	150.00	199.80	2009-06-16 13:53:00	15981	–	–	–	–	–
HLX37	150.00	199.80	2009-08-23 09:20:00	15982	8.75	59.7	0.07	0.16	0.9972
KLX19A	509.00	517.00	2009-10-14 08:01:00	19085	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-14 08:18:00	19086	7.86	627.0	–	–	–
KLX19A	509.00	517.00	2009-10-14 09:10:00	19087	8.20	639.0	4.71	–3.24	0.9994
KLX19A	509.00	517.00	2009-10-14 10:28:00	19088	8.25	632.0	4.96	–2.81	0.9994
KLX19A	509.00	517.00	2009-10-14 11:50:00	19089	8.30	631.0	5.19	–2.11	0.9995
KLX19A	509.00	517.00	2009-10-20 10:03:00	19090	8.27	640.0	4.44	–4.98	0.9995
KLX19A	509.00	517.00	2009-10-21 14:30:00	19091	8.23	642.0	4.37	–3.72	0.9993
KLX15A	260.00	272.00	2009-10-15 09:36:00	19092	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-15 09:42:00	19093	7.51	937.0	–	–	–
KLX15A	260.00	272.00	2009-10-15 10:30:00	19094	7.55	937.0	96.90	–2.47	1.0010
KLX15A	260.00	272.00	2009-10-15 11:30:00	19095	7.58	930.0	102.00	–2.52	1.0008
KLX15A	260.00	272.00	2009-10-15 12:30:00	19096	7.51	930.0	101.00	–2.31	1.0010
KLX15A	260.00	272.00	2009-10-22 12:22:00	19097	7.57	959.0	60.60	–0.97	1.0009

– = not analysed.

Table A3-1 (page 14 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Ph	El. cond mS/m	Drill water %	Charge balance %	Density g/ml
KLX15A	260.00	272.00	2009-10-22 16:21:00	19098	7.56	977.0	60.00	–1.72	1.0009
KLX15A	623.00	640.00	2009-10-19 09:03:00	19099	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-19 09:30:00	19100	–	1,080.0	–	–	–
KLX15A	623.00	640.00	2009-10-19 11:54:00	19101	7.74	1,220.0	63.00	–1.94	1.0024
KLX15A	623.00	640.00	2009-10-19 14:15:00	19102	7.74	1,330.0	49.90	–1.72	1.0027
KLX15A	623.00	640.00	2009-10-19 16:40:00	19103	7.72	1,360.0	46.10	–1.96	1.0029
KLX15A	623.00	640.00	2009-10-26 13:05:00	19104	7.59	1,590.0	14.40	–1.09	1.0039
KLX15A	623.00	640.00	2009-10-27 08:12:00	19105	7.64	1,590.0	14.10	–0.30	1.0040
HLX37	150.00	199.80	2009-10-14 10:00:00	19106	–	–	–	–	–
HLX37	150.00	199.80	2009-10-14 10:10:00	19107	8.02	58.8	–	–	–
HLX37	150.00	199.80	2009-10-21 15:23:00	19108	8.75	65.5	–	–3.48	0.9971
HLX28	70.00	90.00	2009-10-14 08:45:00	19109	–	–	–	–	–
HLX28	70.00	90.00	2009-10-14 08:52:00	19110	7.38	70.4	–	–	–
HLX28	70.00	90.00	2009-10-20 08:37:00	19111	8.26	67.6	–	–2.58	0.9974
HLX35	120.00	135.00	2009-10-27 14:31:00	19112	–	–	–	–	–
HLX35	120.00	135.00	2009-10-27 14:40:00	19113	7.97	114.0	–	–	–
HLX35	120.00	135.00	2009-11-02 12:55:00	19114	8.15	121.0		–3.81	0.9976
HLX39	187.00	199.30	2009-10-28 13:46:00	19115	–	–	–	–	–
HLX39	187.00	199.30	2009-10-28 14:00:00	19116	7.66	63.6	–	–	–
HLX39	187.00	199.30	2009-11-02 11:40:00	19117	8.26	63.5	–	–2.50	0.9973
KLX12A	535.00	545.00	2009-10-21 10:34:00	19118	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-21 11:50:00	19119	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-21 13:38:00	19120	7.70	1,150.0	2.26	–3.28	1.0018
KLX12A	535.00	545.00	2009-10-21 15:28:00	19121	7.42	1,210.0	1.87	–2.52	1.0020
KLX12A	535.00	545.00	2009-10-21 15:28:00	19122	7.22	1,220.0	1.75	–3.33	1.0021
KLX12A	535.00	545.00	2009-10-27 10:42:00	19123	7.97	1,260.0	1.37	–1.11	1.0023
KLX12A	535.00	545.00	2009-11-02 09:42:00	19124	8.06	1,270.0	1.11	–2.10	1.0025

– = not analysed.

Table A3-1 (page 15 of 15). Compilation of results from basic water analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Ph	El. cond mS/m	Drill water %	Charge balance %	Density g/ml
KLX10	351.00	368.00	2009-10-20 11:02:00	19125	–	–	–	–	–
KLX10	351.00	368.00	2009-10-20 11:12:00	19126	7.75	374.0	–	–	–
KLX10	351.00	368.00	2009-10-20 11:40:00	19127	7.86	482.0	10.50	–1.03	0.9990
KLX10	351.00	368.00	2009-10-20 12:40:00	19128	7.94	542.0	12.10	–3.57	0.9993
KLX10	351.00	368.00	2009-10-20 13:40:00	19129	7.97	562.0	12.70	–3.71	0.9994
KLX10	351.00	368.00	2009-10-26 13:15:00	19130	7.84	695.0	15.00	–2.83	0.9997
KLX10	351.00	368.00	2009-10-27 08:55:00	19131	7.88	691.0	15.00	–2.40	0.9999
KLX10	689.00	710.00	2009-10-20 13:10:00	19147	–	–	–	–	–
KLX10	689.00	710.00	2009-10-20 15:25:00	19148	7.75	1,100.0	–	–	–
KLX10	689.00	710.00	2009-10-21 07:25:00	19149	7.78	1,080.0	15.60	–3.02	1.0014
KLX10	689.00	710.00	2009-10-21 12:34:00	19150	7.67	1,070.0	15.50	–4.57	1.0014
KLX10	689.00	710.00	2009-10-21 17:40:00	19151	7.73	1,070.0	15.40	–3.69	1.0014
KLX10	689.00	710.00	2009-10-26 13:10:00	19152	7.66	1,060.0	15.10	–1.42	1.0014
KLX10	689.00	710.00	2009-10-27 08:50:00	19153	7.79	1,070.0	15.00	–1.63	1.0014
KLX08	594.00	625.00	2009-10-27 12:37:00	19154	–	–	–	–	–
KLX08	594.00	625.00	2009-10-27 12:51:00	19155	7.61	646.0	–	–	–
KLX08	594.00	625.00	2009-10-27 13:45:00	19156	7.61	635.0	2.37	–3.74	0.9994
KLX08	594.00	625.00	2009-10-27 14:43:00	19157	7.63	617.0	2.29	–1.84	0.9994
KLX08	594.00	625.00	2009-10-27 15:40:00	19158	7.95	621.0	2.30	–1.73	0.9993
KLX08	594.00	625.00	2009-11-02 10:20:00	19159	8.14	628.0	1.79	–1.74	0.9995
KLX08	594.00	625.00	2009-11-03 08:10:00	19160	8.16	621.0	1.75	–1.39	0.9994
KLX18A	472.00	489.00	2009-10-21 09:00:00	19161	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-21 10:25:00	19162	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-21 16:25:00	19163	7.92	489.0	4.15	–3.09	0.9988
KLX18A	472.00	489.00	2009-10-22 07:10:00	19164	7.75	564.0	4.64	–3.28	0.9991
KLX18A	472.00	489.00	2009-10-22 15:55:00	19165	7.79	564.0	4.54	–3.06	0.9991
KLX18A	472.00	489.00	2009-10-28 08:10:00	19166	7.89	558.0	2.46	–1.04	0.9993
KLX18A	472.00	489.00	2009-10-28 15:13:00	19167	7.93	559.0	2.44	–1.67	0.9994

– = not analysed.

Table A3-2 (page 1 of 2). Compilation of results from analyses of trace elements and rare earth elements.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	As ug/l	Ba ug/l	Cd ug/l	Hg ug/l	Se ug/l	V ug/l	Zr ug/l	U ug/l	Th ug/l	Sc ug/l	Rb ug/l	Y ug/l	Indium ug/l	Cs ug/l	La ug/l
KLX12A	535.00	545.00	2009-05-14 12:55:00	15895	<0.5	52.0000	0.0449	<0.002	–	0.0323	<0.1	<0.005	<0.2	<0.4	24.00	0.0839	<0.2	1.250	0.0944
KLX18A	472.00	489.00	2009-05-13 07:10:00	15902	<0.5	59.4000	0.0231	<0.002	–	0.0738	<0.1	0.1090	<0.2	<0.4	66.00	0.0360	<0.2	18.800	0.0640
KLX15A	260.00	272.00	2009-05-14 07:20:00	15909	<0.5	849.0000	0.0264	<0.002	–	0.1970	<0.1	1.7500	<0.2	<0.4	3,550.00	1.6100	<0.2	1,610.000	0.0820
KLX15A	623.00	640.00	2009-05-19 07:25:00	15916	<0.9	246.0000	<0.02	<0.002	–	0.1040	<0.1	0.4300	<0.2	<0.4	719.00	0.4500	<0.2	291.000	0.1890
KLX10	689.00	710.00	2009-05-26 11:45:00	15923	<0.6	132.0000	<0.02	<0.002	–	0.1490	<0.1	0.0076	<0.2	<0.4	26.40	0.0963	<0.2	1.120	0.0496
KLX10	351.00	368.00	2009-05-20 06:55:00	15930	<0.5	91.7000	<0.02	<0.002	–	0.1610	0.1100	0.0819	<0.2	<0.4	14.70	0.0980	<0.2	0.881	0.0482
KLX08	594.00	625.00	2009-05-19 07:10:00	15937	<0.5	59.3000	<0.02	<0.002	–	0.0386	<0.1	0.0056	<0.2	<0.4	10.20	0.0404	<0.2	0.925	<0.02
HLX39	187.00	199.30	2009-05-25 12:52:00	15940	<0.06	30.0000	0.0178	<0.002	–	1.4400	0.5580	2.4800	0.0413	<0.05	3.31	0.2600	<0.05	0.229	0.2530
HLX35	120.00	135.00	2009-05-26 12:38:00	15943	<0.05	55.4000	0.0142	<0.002	–	0.6280	0.3840	0.5500	<0.02	<0.05	7.63	0.1300	<0.05	0.697	0.0906
KLX19A	509.00	517.00	2009-06-24 10:02:00	15976	0.3210	125.0000	<0.02	<0.002	–	0.1110	<0.1	0.0417	<0.2	<0.4	17.20	0.1640	<0.2	0.419	0.0220
HLX28	70.00	90.00	2009-06-24 08:50:00	15979	0.0601	28.9000	<0.002	<0.002	–	1.4100	0.9030	0.2370	0.0479	<0.05	6.33	0.7280	<0.05	0.400	0.1620
HLX37	150.00	199.80	2009-08-23 09:20:00	15982	<0.05	15.4000	<0.002	<0.002	–	0.2260	0.2600	0.1330	<0.02	<0.05	3.51	0.3060	<0.05	0.173	0.0870
KLX19A	509.00	517.00	2009-10-21 14:30:00	19091	<0.5	109.0000	<0.02	<0.002	–	0.0450	<0.1	0.0428	<0.2	<0.4	17.30	0.0283	<0.2	0.444	<0.02
KLX15A	260.00	272.00	2009-10-22 16:21:00	19098	<0.5	996.0000	<0.02	<0.002	–	0.1700	<0.1	1.5500	<0.2	<0.4	3,040.00	1.5800	<0.2	1,310.000	0.0687
KLX15A	623.00	640.00	2009-10-27 08:12:00	19105	<1	219.0000	<0.05	<0.002	–	0.0935	<0.3	0.3600	<0.2	<0.5	588.00	0.4050	<0.5	234.000	0.1850
HLX37	150.00	199.80	2009-10-21 15:23:00	19108	<0.1	15.3000	<0.002	<0.002	–	0.2100	0.0873	0.1320	<0.02	<0.05	3.47	0.2600	<0.05	0.170	0.0792
HLX28	70.00	90.00	2009-10-20 08:37:00	19111	0.1080	21.3000	<0.002	<0.002	–	1.3300	0.3950	0.2260	0.0282	<0.05	5.46	0.9730	<0.05	0.398	0.1560
HLX35	120.00	135.00	2009-11-02 12:55:00	19114	<0.1	60.9000	<0.002	<0.002	–	0.4990	0.2340	0.5240	<0.02	<0.05	7.75	0.1300	<0.05	0.744	0.0780
HLX39	187.00	199.30	2009-11-02 11:40:00	19117	<0.1	30.6000	<0.002	<0.002	–	1.4700	0.3780	2.5600	<0.02	<0.05	3.45	0.2440	<0.05	0.241	0.2030
KLX12A	535.00	545.00	2009-11-02 09:42:00	19124	<0.5	45.6000	<0.02	<0.002	–	<0.03	<0.1	0.0068	<0.2	<0.4	26.40	0.0828	<0.2	1.370	0.1020
KLX10	351.00	368.00	2009-10-27 08:55:00	19131	<0.5	83.2000	<0.02	<0.002	–	0.1820	<0.1	0.0783	<0.2	<0.4	16.10	0.1150	<0.2	0.986	0.0482
KLX10	689.00	710.00	2009-10-27 08:50:00	19153	<0.5	125.0000	<0.02	<0.002	–	0.1080	<0.1	0.0065	<0.2	<0.4	28.20	0.1000	<0.2	1.270	0.0481
KLX08	594.00	625.00	2009-11-03 08:10:00	19160	<0.5	55.4000	<0.02	<0.002	–	0.0337	<0.1	<0.005	<0.2	<0.4	9.46	0.0362	<0.2	0.856	0.0207
KLX18A	472.00	489.00	2009-10-28 15:13:00	19167	<0.5	52.3000	<0.02	<0.002	–	0.0800	<0.1	0.0590	<0.2	<0.4	59.20	0.0391	<0.2	14.900	0.0584

– = not analysed.

Table A3-2 (page 2 of 2). Compilation of results from analyses of trace elements and rare earth elements.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	Hf ug/l	Tl ug/l	Ce ug/l	Pr ug/l	Nd ug/l	Sm ug/l	Eu ug/l	Gd ug/l	Tb ug/l	Dy ug/l	Ho ug/l	Er ug/l	Tm ug/l	Yb ug/l	Lu ug/l
KLX12A	535.00	545.00	2009-05-14 12:55:00	15895	<0.02	<0.05	0.0578	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX18A	472.00	489.00	2009-05-13 07:10:00	15902	<0.02	<0.05	0.0553	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX15A	260.00	272.00	2009-05-14 07:20:00	15909	<0.02	<0.05	0.5520	0.1830	1.6200	0.6170	0.1160	0.7730	14.9000	0.3680	0.0725	0.1720	<0.02	0.0673	<0.02
KLX15A	623.00	640.00	2009-05-19 07:25:00	15916	<0.02	<0.05	0.2020	0.0437	0.3130	0.1180	0.0209	0.1710	2.5400	0.0829	<0.02	0.0356	<0.02	<0.02	<0.02
KLX10	689.00	710.00	2009-05-26 11:45:00	15923	<0.02	<0.05	0.0410	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX10	351.00	368.00	2009-05-20 06:55:00	15930	<0.02	<0.05	0.0617	<0.02	0.0288	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX08	594.00	625.00	2009-05-19 07:10:00	15937	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
HLX39	187.00	199.30	2009-05-25 12:52:00	15940	0.0060	<0.01	0.3710	0.0407	0.2090	0.0382	0.0086	0.0401	<0.005	0.0308	0.0075	0.0241	<0.004	0.0232	<0.005
HLX35	120.00	135.00	2009-05-26 12:38:00	15943	<0.005	<0.01	0.1420	0.0188	0.0905	0.0147	<0.005	0.0230	<0.005	0.0137	<0.005	0.0107	<0.004	0.0117	<0.005
KLX19A	509.00	517.00	2009-06-24 10:02:00	15976	<0.02	<0.05	0.0320	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
HLX28	70.00	90.00	2009-06-24 08:50:00	15979	0.0065	<0.01	0.3300	0.0460	0.2260	0.0640	0.0122	0.0961	0.0215	2.3200	0.0213	0.0670	0.0098	0.0691	0.0118
HLX37	150.00	199.80	2009-08-23 09:20:00	15982	0.0849	<0.01	0.2300	0.0342	0.1780	0.0452	0.0088	0.0636	0.0068	21.4000	0.0095	0.0271	<0.004	0.0145	<0.005
KLX19A	509.00	517.00	2009-10-21 14:30:00	19091	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX15A	260.00	272.00	2009-10-22 16:21:00	19098	<0.02	<0.05	0.4620	0.1500	1.4200	0.5770	0.1170	0.8360	8.1000	0.4020	0.0754	0.1810	<0.02	0.0602	<0.02
KLX15A	623.00	640.00	2009-10-27 08:12:00	19105	<0.05	<0.1	0.1920	<0.05	0.3220	0.1190	<0.05	0.1490	1.5200	0.0802	<0.05	<0.05	<0.05	<0.05	<0.05
HLX37	150.00	199.80	2009-10-21 15:23:00	19108	0.0468	<0.01	0.1870	0.0309	0.1610	0.0401	0.0090	0.0569	0.0063	9.6500	0.0089	0.0214	<0.004	0.0160	<0.005
HLX28	70.00	90.00	2009-10-20 08:37:00	19111	0.0403	<0.01	0.3260	0.0547	0.3000	0.0959	0.0280	0.1700	0.0236	6.5700	0.0323	0.1040	0.0120	0.0909	0.0165
HLX35	120.00	135.00	2009-11-02 12:55:00	19114	<0.005	<0.01	0.1220	0.0163	0.0810	0.0148	<0.005	0.0201	<0.005	0.0137	<0.005	0.0111	<0.004	0.0106	<0.005
HLX39	187.00	199.30	2009-11-02 11:40:00	19117	0.0065	<0.01	0.2980	0.0381	0.1970	0.0332	0.0070	0.0414	<0.005	0.0266	0.0069	0.0240	<0.004	0.0221	<0.005
KLX12A	535.00	545.00	2009-11-02 09:42:00	19124	<0.02	<0.05	0.0627	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX10	351.00	368.00	2009-10-27 08:55:00	19131	<0.02	<0.05	0.0578	<0.02	0.0269	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX10	689.00	710.00	2009-10-27 08:50:00	19153	<0.02	<0.05	0.0382	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX08	594.00	625.00	2009-11-03 08:10:00	19160	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
KLX18A	472.00	489.00	2009-10-28 15:13:00	19167	<0.02	<0.05	0.0551	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

– = not analysed.

Table A3-3 (page 1 of 5). Compilation of results from isotope analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	$\delta^{2}H$ dev SMOW	^{3}H TU	$\delta^{18}O$ dev SMOW	PMC pmc	$\delta^{13}C$ dev PDB	$\delta^{34}S$ dev CDT	$^{10}B/^{11}B$ ratio	$\delta^{37}Cl$ dev SMOC	$^{87}Sr/^{86}Sr$ ratio
KLX12A	535.00	545.00	2009-05-06 12:30:00	15891	–88.2	1.20	–12.00	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 14:22:00	15892	–90.2	1.10	–12.10	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-06 16:05:00	15893	–91.2	<0.8	–12.10	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-14 08:45:00	15894	–92.0	<0.8	–12.30	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-05-14 12:55:00	15895	–90.2	<0.8	–12.30	–	–	13.0	0.2377	–0.78	0.714855
KLX18A	472.00	489.00	2009-05-06 16:05:00	15898	–102.4	<0.8	–13.80	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-07 07:06:00	15899	–106.9	<0.8	–14.20	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-07 15:56:00	15900	–104.9	<0.8	–14.20	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-12 13:45:00	15901	–106.9	<0.8	–15.70	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-05-13 07:10:00	15902	–111.0	<0.8	–14.60	29.50	–18.40	12.7	0.2379	–0.37	0.715306
KLX15A	260.00	272.00	2009-05-07 09:38:00	15905	–89.0	<0.8	–12.00	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 10:29:00	15906	–88.8	<0.8	–12.00	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-07 11:18:00	15907	–89.8	<0.8	–12.00	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-13 13:25:00	15908	–96.5	<0.8	–13.30	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-05-14 07:20:00	15909	–94.5	<0.8	–12.10	33.90	–15.80	12.4	0.2414	–0.17	0.714423
KLX15A	623.00	640.00	2009-05-07 11:15:00	15912	–84.3	<0.8	–11.40	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 13:35:00	15913	–83.9	0.90	–11.20	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-07 15:50:00	15914	–83.3	1.00	–11.10	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-18 15:40:00	15915	–86.2	<0.8	–10.90	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-05-19 07:25:00	15916	–86.8	1.10	–10.80	–	–	12.9	0.2409	–0.14	0.715425
KLX10	689.00	710.00	2009-05-12 07:06:00	15919	–88.3	<0.8	–11.30	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-12 11:16:00	15920	–83.9	1.00	–11.00	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-12 15:28:00	15921	–83.5	1.20	–11.10	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-25 07:55:00	15922	–91.6	1.40	–11.30	–	–	–	–	–	–
KLX10	689.00	710.00	2009-05-26 11:45:00	15923	–89.1	1.60	–11.20	–	–	13.2	0.2392	–0.29	0.715702
KLX10	351.00	368.00	2009-05-11 14:00:00	15926	–77.4	2.10	–10.50	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-11 14:40:00	15927	–76.4	1.70	–10.60	–	–	–	–	–	–

– = not analysed.

Table A3-3 (page 2 of 5). Compilation of results from isotope analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	$\delta^{2}H$ dev SMOW	^{3}H TU	$\delta^{18}O$ dev SMOW	PMC pmc	$\delta^{13}C$ dev PDB	$\delta^{34}S$ dev CDT	$^{10}B/^{11}B$ ratio	$\delta^{37}Cl$ dev SMOC	$^{87}Sr/^{86}Sr$ ratio
KLX10	351.00	368.00	2009-05-11 15:15:00	15928	–77.1	1.30	–10.60	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-19 14:30:00	15929	–83.9	1.00	–10.50	–	–	–	–	–	–
KLX10	351.00	368.00	2009-05-20 06:55:00	15930	–83.8	0.90	–10.40	34.80	–13.60	13.1	0.2367	–0.58	0.715417
KLX08	594.00	625.00	2009-05-12 14:55:00	15933	–117.0	<0.8	–16.00	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 16:00:00	15934	–115.6	<0.8	–16.00	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-12 17:00:00	15935	–115.8	1.20	–16.10	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-18 15:26:00	15936	–123.0	<0.8	–15.80	–	–	–	–	–	–
KLX08	594.00	625.00	2009-05-19 07:10:00	15937	–124.8	<0.8	–15.80	–	–	12.9	0.2357	–0.31	0.715530
HLX39	187.00	199.30	2009-05-25 12:52:00	15940	–90.5	<0.8	–11.70	40.40	–15.80	11.8	0.2378	–0.03	0.716081
HLX35	120.00	135.00	2009-05-26 12:38:00	15943	–84.9	1.30	–11.30	41.10	–16.70	13.1	0.2378	–0.10	0.715021
KLX19A	509.00	517.00	2009-06-15 13:54:00	15972	–101.7	0.90	–13.90	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 14:40:00	15973	–102.0	1.00	–13.90	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-15 15:26:00	15974	–102.2	0.80	–13.80	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-23 13:40:00	15975	–103.2	<0.8	–14.20	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-06-24 10:02:00	15976	–104.1	<0.8	–14.10	–	–	15.7	0.2345	0.60	0.715442
HLX28	70.00	90.00	2009-06-24 08:50:00	15979	–79.4	4.70	–11.30	49.10	–16.70	12.6	0.2335	0.35	0.715756
HLX37	150.00	199.80	2009-08-23 09:20:00	15982	–82.2	<0.8	–11.30	31.80	–16.50	24.9	0.2341	0.46	0.715672
KLX19A	509.00	517.00	2009-10-14 09:10:00	19087	–103.9	<0.8	–13.60	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-14 10:28:00	19088	–107.7	<0.8	–14.46	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-14 11:50:00	19089	–105.2	<0.8	–14.44	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-20 10:03:00	19090	–105.8	1.30	–14.20	–	–	–	–	–	–
KLX19A	509.00	517.00	2009-10-21 14:30:00	19091	–106.6	<0.8	–14.20	–	–	20.7	0.2341	0.00	0.715409
KLX15A	260.00	272.00	2009-10-15 10:30:00	19094	–92.0	<0.8	–12.70	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-15 11:30:00	19095	–91.9	1.00	–12.56	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-15 12:30:00	19096	–92.2	1.50	–12.71	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-22 12:22:00	19097	–93.6	0.90	–12.60	–	–	–	–	–	–
KLX15A	260.00	272.00	2009-10-22 16:21:00	19098	–93.9	1.40	–12.70	27.00	–16.10	25.6	0.2367	0.05	0.714609

– = not analysed.

Table A3-3 (page 3 of 5). Compilation of results from isotope analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	$\delta^{2}H$ dev SMOW	^{3}H TU	$\delta^{18}O$ dev SMOW	PMC pmc	$\delta^{13}C$ dev PDB	$\delta^{34}S$ dev CDT	$^{10}B/^{11}B$ ratio	$\delta^{37}Cl$ dev SMOC	$^{87}Sr/^{86}Sr$ ratio
KLX15A	623.00	640.00	2009-10-19 11:54:00	19101	–86.9	1.00	–12.04	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-19 14:15:00	19102	–86.8	1.70	–11.78	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-19 16:40:00	19103	–86.5	1.30	–11.65	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-26 13:05:00	19104	–81.2	1.30	–11.00	–	–	–	–	–	–
KLX15A	623.00	640.00	2009-10-27 08:12:00	19105	–80.3	1.30	–11.50	–	–	19.9	0.2355	0.12	0.715407
HLX37	150.00	199.80	2009-10-21 15:23:00	19108	–82.6	0.90	–11.70	32.70	–16.60	26.9	0.2325	–0.39	0.715596
HLX28	70.00	90.00	2009-10-20 08:37:00	19111	–78.8	4.50	–11.30	49.00	–17.40	17.1	0.2322	–0.46	0.715673
HLX35	120.00	135.00	2009-11-02 12:55:00	19114	–85.1	<0.8	–11.70	40.70	–17.30	27.3	0.2334	0.09	0.715486
HLX39	187.00	199.30	2009-11-02 11:40:00	19117	–87.5	<0.8	–12.00	40.20	–16.70	37.3	0.2324	0.38	0.716027
KLX12A	535.00	545.00	2009-10-21 13:38:00	19120	–87.6	0.90	–12.40	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-21 15:28:00	19121	–96.3	0.80	–12.90	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-21 15:28:00	19122	–92.6	1.10	–12.50	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-10-27 10:42:00	19123	–91.5	0.80	–12.40	–	–	–	–	–	–
KLX12A	535.00	545.00	2009-11-02 09:42:00	19124	–92.7	1.70	–12.50	–	–	15.7	0.2350	0.34	0.714830
KLX10	351.00	368.00	2009-10-20 11:40:00	19127	–79.0	4.30	–10.70	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-20 12:40:00	19128	–80.0	2.70	–10.70	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-20 13:40:00	19129	–79.7	2.60	–10.80	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-26 13:15:00	19130	–80.9	1.80	–10.70	–	–	–	–	–	–
KLX10	351.00	368.00	2009-10-27 08:55:00	19131	–78.4	2.50	–10.60	31.30	–15.10	22.8	0.2349	–0.02	0.715357
KLX10	689.00	710.00	2009-10-21 07:25:00	19149	–86.6	2.10	–11.40	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-21 12:34:00	19150	–85.0	1.50	–11.50	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-21 17:40:00	19151	–83.9	1.40	–11.50	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-26 13:10:00	19152	–83.8	1.40	–11.40	–	–	–	–	–	–
KLX10	689.00	710.00	2009-10-27 08:50:00	19153	–84.5	2.00	–11.30	–	–	20.1	0.2348	0.15	0.715665
KLX08	594.00	625.00	2009-10-27 13:45:00	19156	–115.8	<0.8	–15.60	–	–	–	–	–	–
KLX08	594.00	625.00	2009-10-27 14:43:00	19157	–177.4	1.80	–16.00	–	–	–	–	–	–
KLX08	594.00	625.00	2009-10-27 15:40:00	19158	–117.6	1.60	–16.00	–	–	–	–	–	–

– = not analysed.

Table A3-3 (page 4 of 5). Compilation of results from isotope analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	$\delta^{2}H$ dev SMOW	^{3}H TU	$\delta^{18}O$ dev SMOW	PMC pmc	$\delta^{13}C$ dev PDB	$\delta^{34}S$ dev CDT	$^{10}B/^{11}B$ ratio	$\delta^{37}Cl$ dev SMOC	$^{87}Sr/^{86}Sr$ ratio
KLX08	594.00	625.00	2009-11-02 10:20:00	19159	–117.5	<0.8	–15.90	–	–	–	–	–	–
KLX08	594.00	625.00	2009-11-03 08:10:00	19160	–118.7	1.20	–16.00	–	–	15.0	0.2343	0.17	0.715500
KLX18A	472.00	489.00	2009-10-21 16:25:00	19163	–103.1	1.00	–13.90	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-22 07:10:00	19164	–107.0	<0.8	–14.50	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-22 15:55:00	19165	–106.9	<0.8	–14.40	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-28 08:10:00	19166	–106.6	1.00	–14.70	–	–	–	–	–	–
KLX18A	472.00	489.00	2009-10-28 15:13:00	19167	–106.1	<0.8	–14.60	–	–	16.8	0.2339	0.13	0.715276

– = not analysed.

Table A3-3 (page 5 of 5). Compilation of results from isotope analyses.

Idcode	Secup m	Seclow m	Date and time of sampling	SKB sample no.	^{238}U mBq/kg	^{235}U mBq/kg	^{234}U mBq/kg	^{232}Th mBq/kg	^{230}Th mBq/kg	^{226}Ra Bq/l	^{222}Rn Bq/l	^{222}Rn corr* Bq/l
KLX12A	535.00	545.00	2009-05-14 12:55:00	15895	0.20	0.05	0.50	0.17000	0.36000	9.10E-002	3.10E-002	1.39E+002
KLX18A	472.00	489.00	2009-05-13 07:10:00	15902	1.40	0.08	3.10	BDL	0.37000	1.20E-002	4.10E-002	2.41E+002
KLX08	594.00	625.00	2009-05-19 07:10:00	15937	0.05	0.06	0.59	0.24000	0.41000	2.00E-002	7.90E-002	1.64E+002
HLX39	187.00	199.30	2009-05-25 12:52:00	15940	31.20	1.30	36.30	0.11000	0.34000	2.30E-002	7.70E-002	5.38E+001
HLX35	120.00	135.00	2009-05-26 12:38:00	15943	9.20	0.41	14.60	0.08000	0.50000	8.00E-003	1.23E-001	7.32E+001
KLX19A	509.00	517.00	2009-06-24 10:02:00	15976	0.60	0.17	2.20	BDL	BDL	6.00E-003	7.01E+001	2.32E+002
HLX28	70.00	90.00	2009-06-24 08:50:00	15979	3.00	0.19	7.40	0.28000	0.77000	3.40E-002	8.34E+001	2.87E+002
HLX37	150.00	199.80	2009-08-23 09:20:00	15982	1.80	1.70	7.40	BDL	BDL	<0.015	4.66E+001	1.98E+002
KLX19A	509.00	517.00	2009-10-21 14:30:00	19091	0.70	0.11	2.80	0.18000	0.65000	–	–	–
HLX37	150.00	199.80	2009-10-21 15:23:00	19108	2.00	0.17	7.30	0.32000	0.77000	–	–	–
HLX28	70.00	90.00	2009-10-20 08:37:00	19111	2.60	0.14	7.90	0.37000	0.99000	–	–	–
HLX35	120.00	135.00	2009-11-02 12:55:00	19114	6.60	0.42	14.40	0.33000	0.77000	–	–	–
HLX39	187.00	199.30	2009-11-02 11:40:00	19117	30.50	1.20	41.80	0.39000	0.93000	–	–	–
KLX12A	535.00	545.00	2009-11-02 09:42:00	19124	0.40	0.10	0.80	0.46000	0.69000	–	–	–
KLX08	594.00	625.00	2009-11-03 08:10:00	19160	BDL	0.11	BDL	0.45000	0.74000	–	–	–
KLX18A	472.00	489.00	2009-10-28 15:13:00	19167	1.10	0.08	2.50	0.39000	0.79000	–	–	–

– = not analysed.
* = value at time of collection (calculated).
BDL = below detection level.

Appendix 4

Electric conductivity during time series sampling

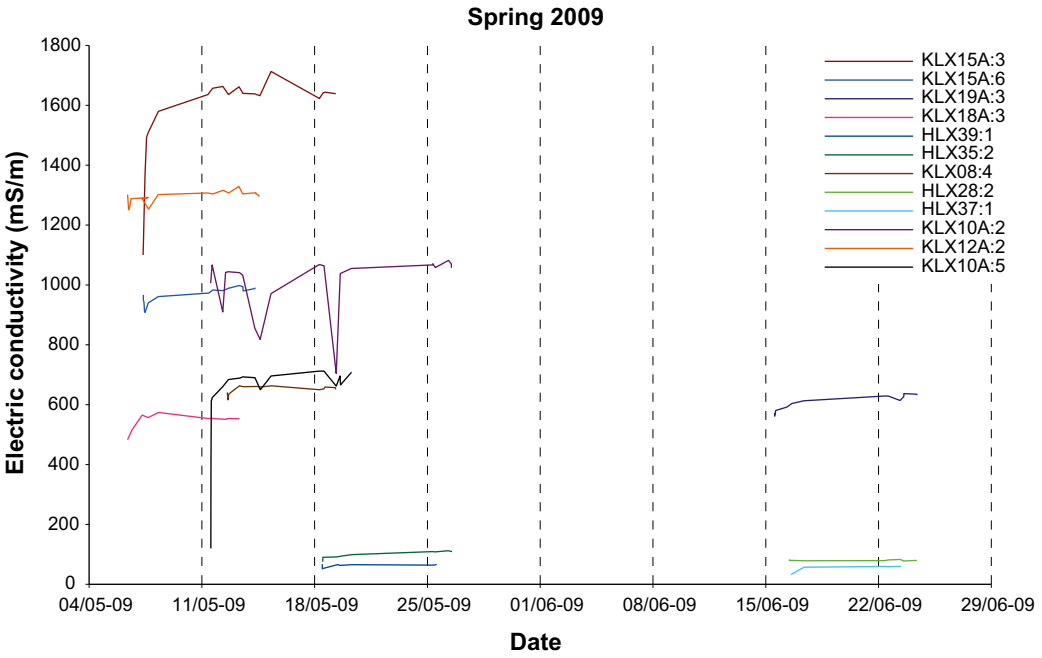

Figure A4-1. *Field measurements of electric conductivity plotted versus date for borehole sections sampled during the spring sampling.*

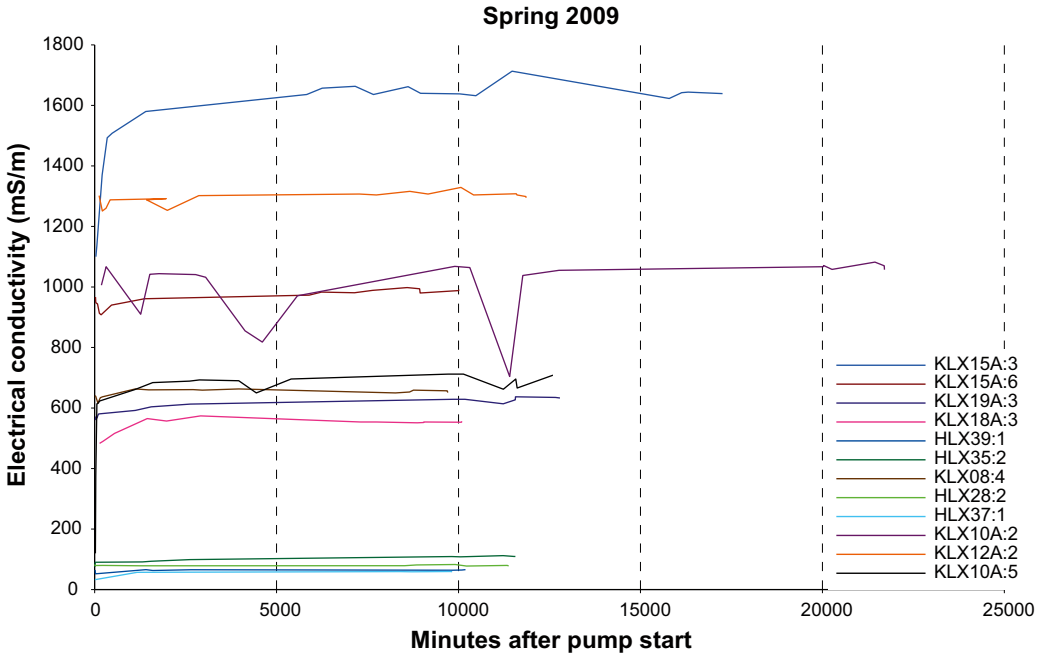

Figure A4-2. *Field measurements of electric conductivity plotted versus minutes after pump start for borehole sections sampled during the spring sampling.*

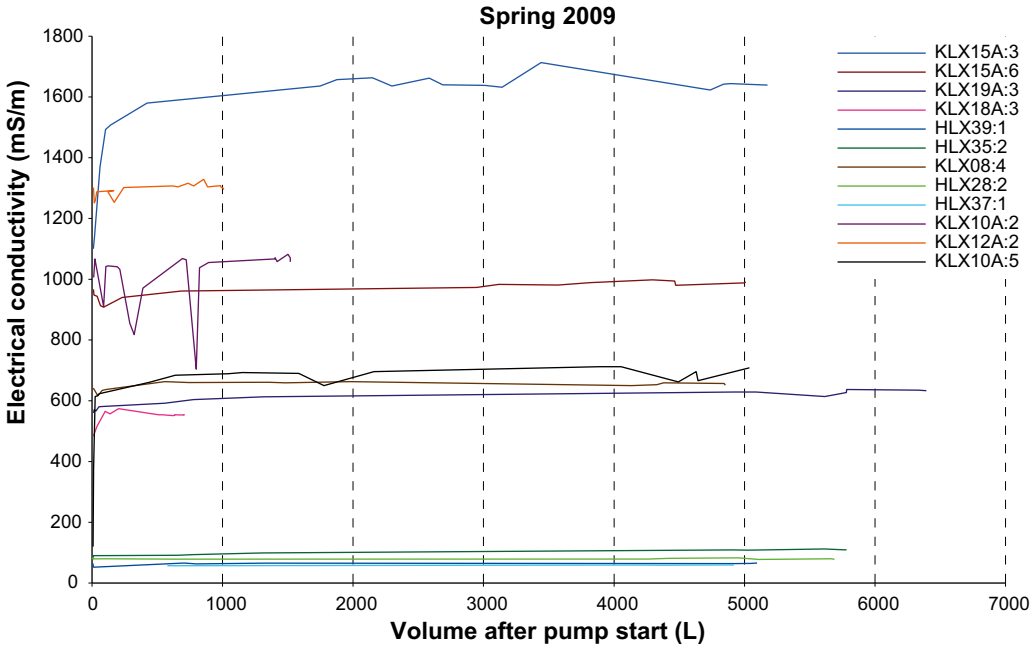

Figure A4-3. *Field measurements of electric conductivity plotted versus volume (L) after pump start for borehole sections sampled during the spring sampling.*

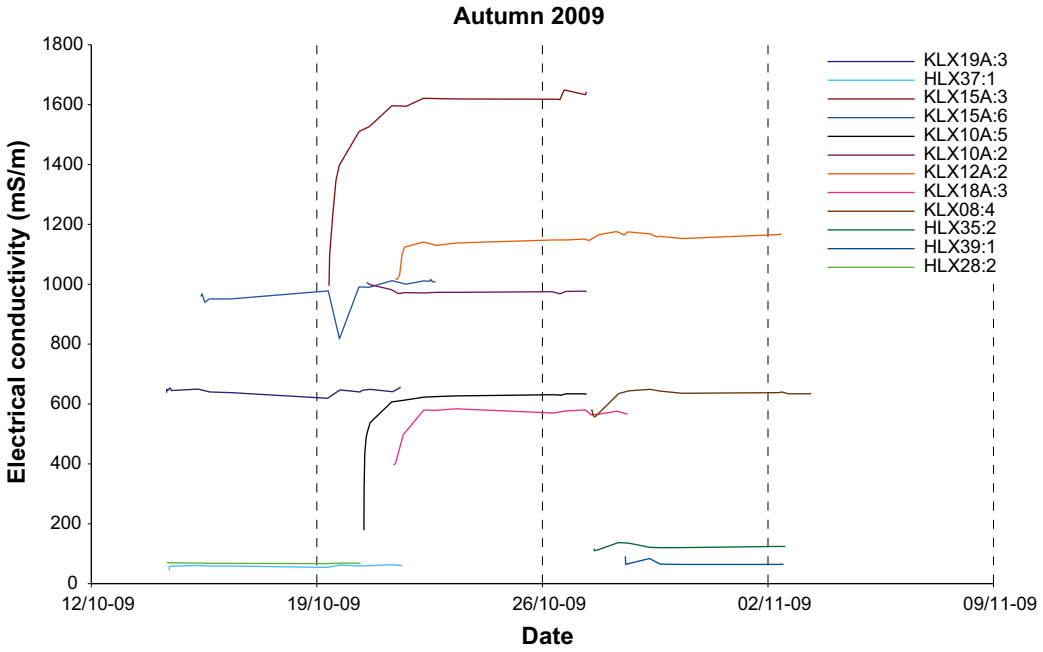

Figure A4-4. *Field measurements of electric conductivity plotted versus date for borehole sections sampled during the autumn sampling.*

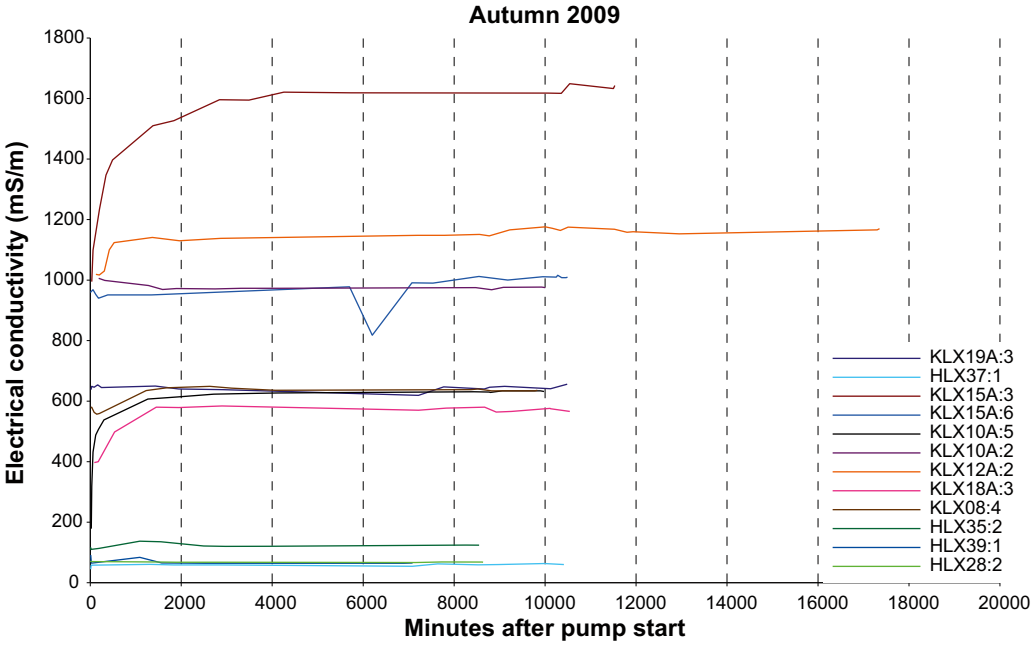

Figure A4-5. *Field measurements of electric conductivity plotted versus minutes after pump start for borehole sections sampled during the autumn sampling.*

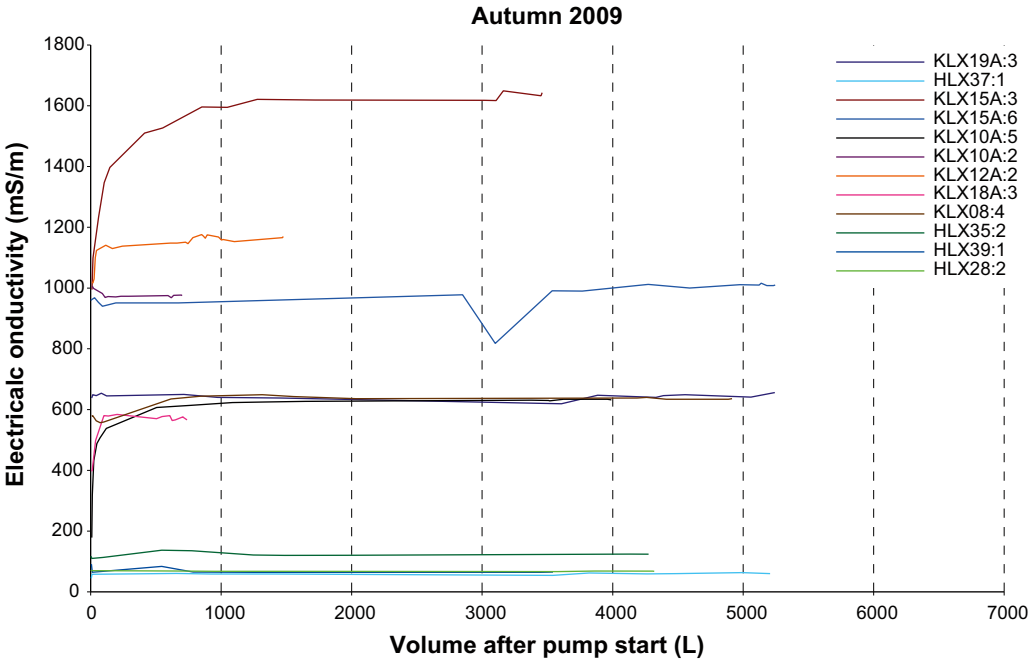

Figure A4-6. *Field measurements of electric conductivity plotted versus volume (L) after pump start for borehole sections sampled during the autumn sampling.*

Appendix 5

Sulphide during time series sampling

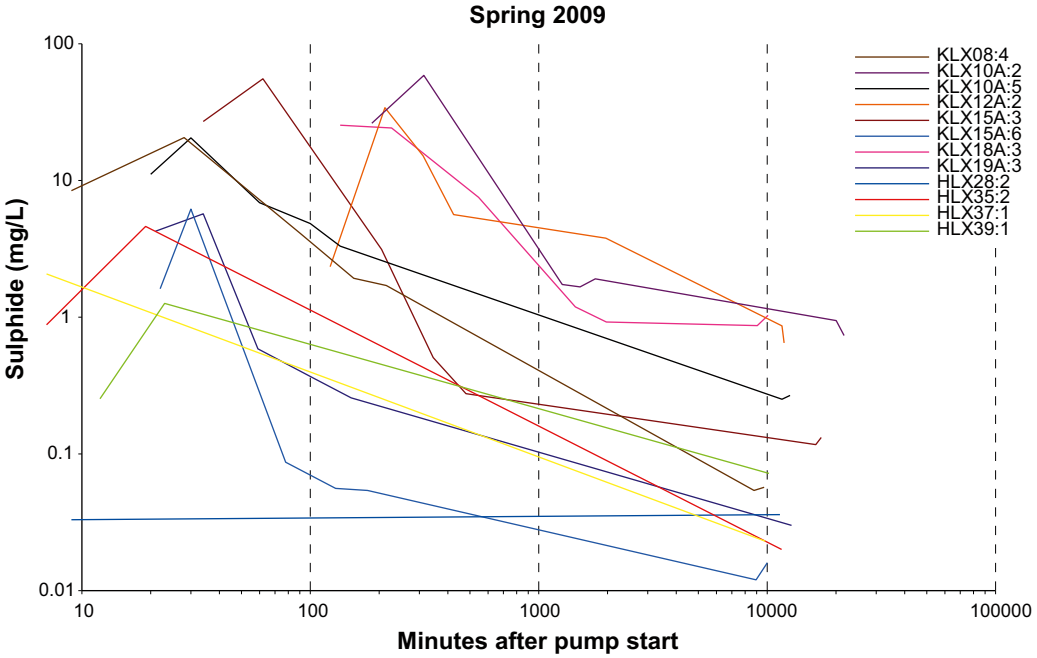

Figure A5-1. *HS^- concentration (mg/L) plotted versus minutes after pump start, spring sampling.*

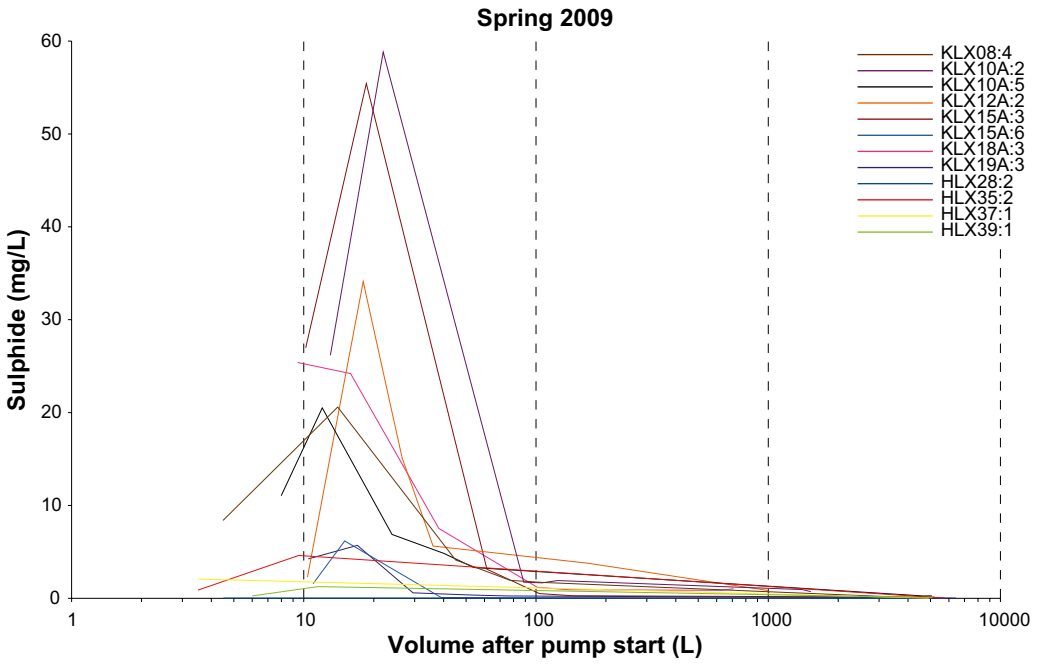

Figure A5-2. *HS^- concentration (mg/L) plotted versus volume (L) after pump start, spring sampling.*

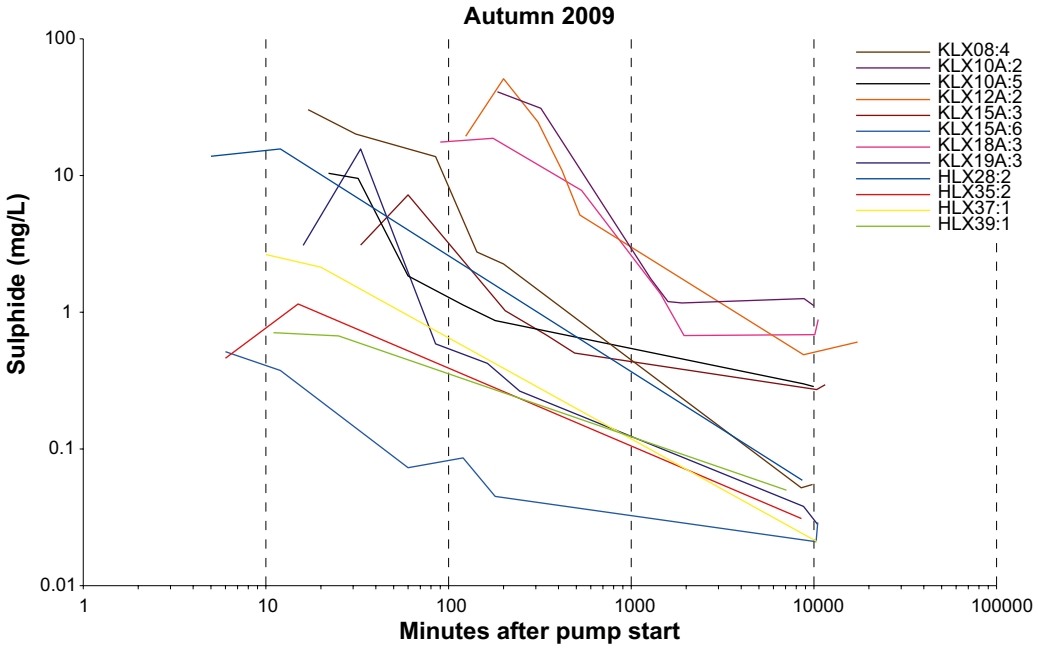

Figure A5-3. *HS^- concentration (mg/L) plotted versus minutes after pump start, autumn sampling.*

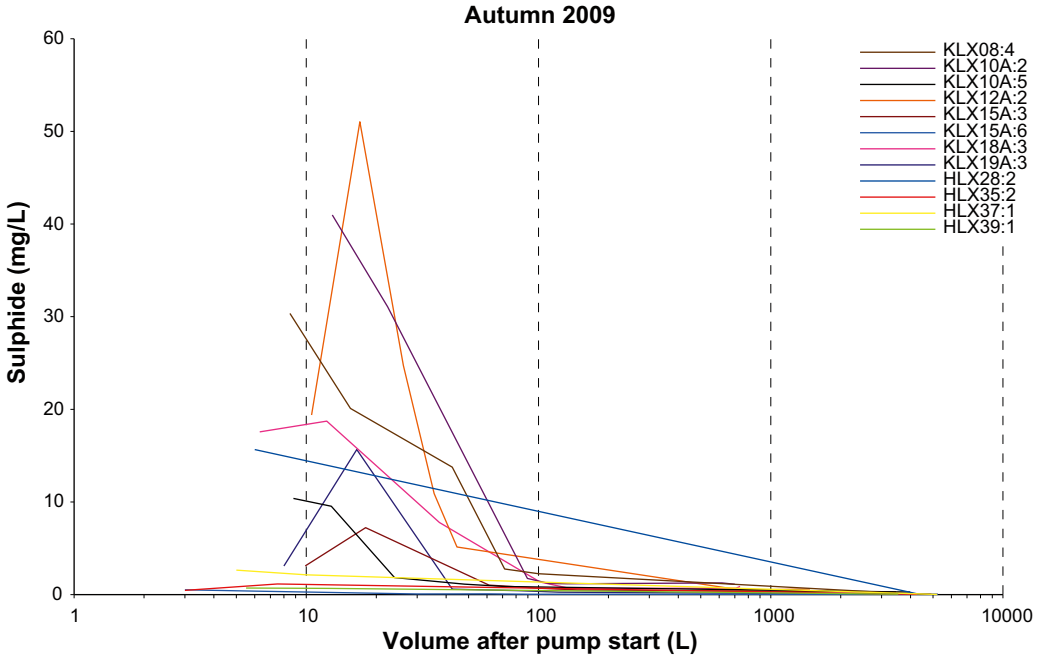

Figure A5-4. *HS^- concentration (mg/L) plotted versus volume (L) after pump start, autumn sampling.*