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Oskarshamn site investigation

Laboratory measurements within the site investigation programme for the transport properties of the rock

Final report

Eva Selnert, Johan Byegård, Henrik Widestrand
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October 2009

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Abstract

This report presents data gained from laboratory investigations of porosity, diffusivity and sorption characteristics, which are part of the discipline-specific programme “Transport Properties of the Rock” within the SKB site investigations. The report also comprises an evaluation of the methods used in the diffusion and sorption measurements. No analyses or interpretations of the data results are included in this report.

The laboratory investigations started in 2003 and were terminated during 2008. Fourteen cored boreholes from both Laxemar and Simpevarp have been included in the laboratory work; KSH01A, KSH02, KSH03A, KLX02, KLX03, KLX04, KLX05, KLX06, KLX07A, KLX08, KLX10, KLX11A, KLX13A and KLX17A. The rock sample collection comprises major and minor rock types, fracture types as well as various types of altered rock found in or close to deformation zones. Generally, the laboratory work has followed the method descriptions and activity plans with exception for a slight modification of the method description for batch sorption.

The parameters that has been determined for the rock materials are: porosity, porosity distribution, effective diffusivity, specific surface area (BET), cation exchange capacity (CEC) and sorption coefficients.

Sammanfattning

Föreliggande rapport redovisar resultat erhållna från laboratorieundersökningar av porositets-, diffusions- och sorptionsegenskaper, vilka är del av det platsspecifika programmet ”Bergets transportegenskaper” inom SKB:s platsundersökningar. Rapporten innehåller även en utvärdering av de metoder som använts för diffusions- och sorptionsmätningar. Utvärdering och analys av mätresultat ingår inte i denna rapport.

Laboratoriemätningarna startade 2003 och avslutades under 2008. Fjorton kärnborrhål från Laxemar och Simpevarp har inkluderats i laboratoriemätningarna; KSH01A, KSH02, KSH03A, KLX02, KLX03, KLX04, KLX05, KLX06, KLX07A, KLX08, KLX10, KLX11A, KLX13A and KLX17A. Provurvalet representerar huvudbergarter och underordnade bergarter, spricktyper liksom olika typer av omvandlat berg inuti, eller i anslutning till, deformationszoner.

Laboratoriemätningarna har i stort sett följt gällande metodbeskrivningar och aktivitetsplaner, med undantag för en mindre modifiering av metodbeskrivningen för batchsorption.

De parametrar som bestämts är porositet, porositetsfördelning, effektiv diffusivitet, specifik ytarea (BET), katjonbyteskapacitet (CEC) och sorptionskoefficienter.

Contents

1 Introduction

This report presents the results of the laboratory investigations of porosity, diffusivity and sorption characteristics within the discipline-specific programme "Transport Properties of the Rock", which is one of the activities performed within the site investigation at Oskarshamn.

The work was carried out during the period from May 2003 to June 2008. In Table 1-1, controlling documents for performing this activity are listed. Both activity plans and method descriptions are SKB's internal controlling documents.

The rock samples for the laboratory measurements are collected from the core drilled boreholes KSH01A, KSH02, KSH03A, KLX02, KLX03, KLX04, KLX05, KLX06, KLX07A, KLX08, KLX10, KLX11A, KLX13A and KLX17A by Eva Selnert (Gustavsson before 2007), Johan Byegård and Henrik Widestrand, Geosigma AB. The locations of the boreholes are presented in Figure 1-1 below.

The present report is the final report from the laboratory measurements of transport properties of the rock and includes all data earlier reported. Consequently, SKB P-05-18, SKB P-05-106 and SKB P-06-286, i.e. the data reports produced for data freeze 2.1 and 2.2, are subsets of this report. The laboratory data presented have been delivered to Sicada according to AP PS 400-03-041, AP PS 400-03-093 and AP PS 400-06-023 and are traceable by the activity plan numbers.

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

Activity plans	Number	Version
Provtagning och analyser av borrkärna från kärnborrhål KSH01 och KSH02 för bestämning av bergets transportegenskaper.	AP PS 400-03-041	1.0
Provtagning och analyser av borrkärna från kärnborrhål KLX01, KLX02, KLX03 samt KLX04 för bestämning av bergets transportegenskaper.	AP PS 400-03-093	1.0
Provtagning och analyser av borrkärnor under 2006 för bestämning av bergets transportegenskaper.	AP-PS 400-06-023	1.0
Method descriptions	**Number**	**Version**
Metodbeskrivning för instruktion och provtagning av borrkärna	SKB MD 143.007	3.0
Metodbeskrivning för bergartsanalyser	SKB MD 160.001	1.0
Metodbeskrivning för mätning av bergets petrofysiska egenskaper	SKB MD 230.001	2.0
Metodbeskrivning för genomdiffusionsmätning	SKB MD 540.001	1.0
Metodbeskrivning för batchsorptionsmätning	SKB MD 540.002	3.0
Metodbeskrivning för porositetsbestämning med PMMA	SKB MD 540.003	1.0

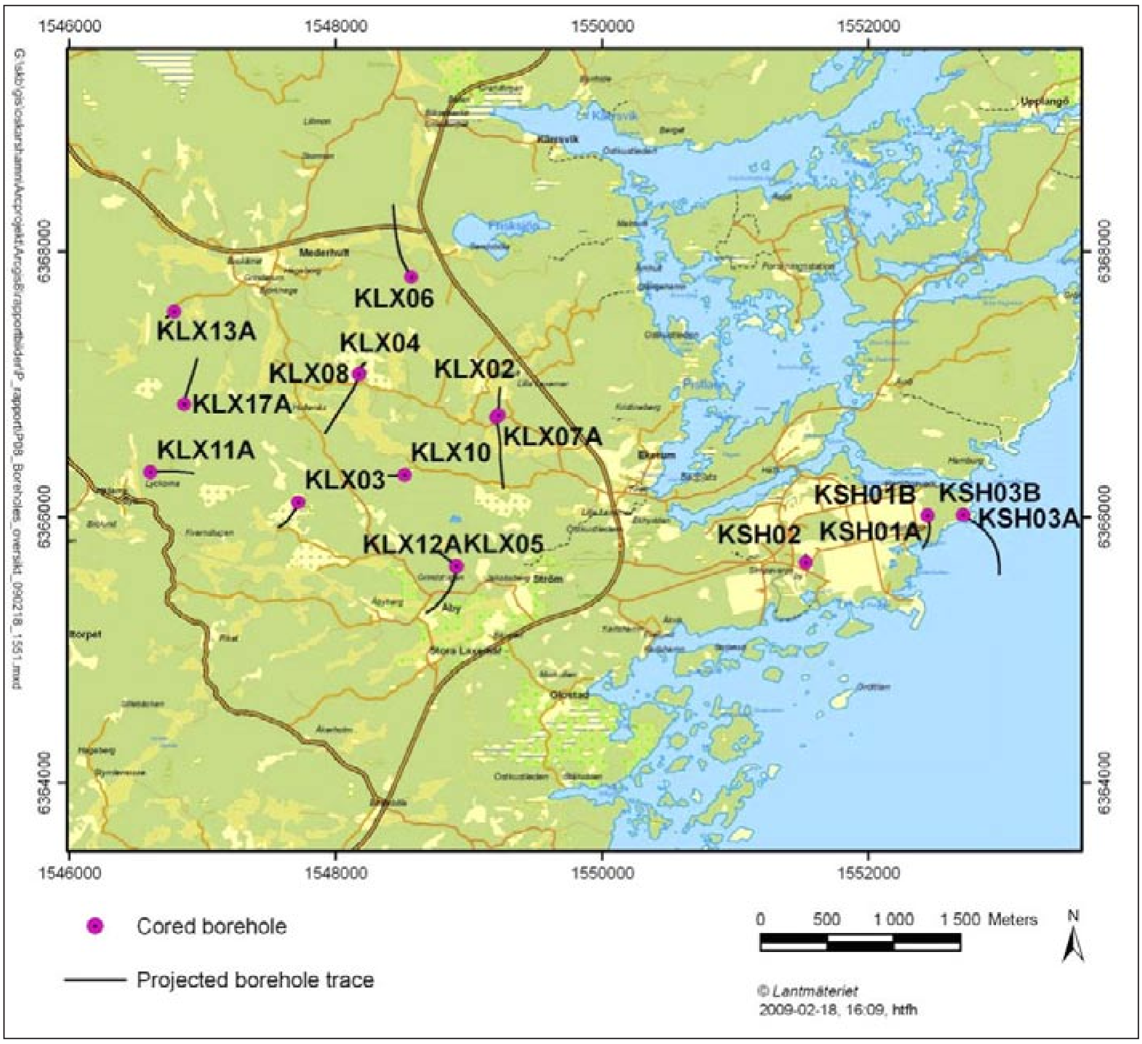


Figure 1-1. *Oskarshamn site investigation area, including the boreholes KSH01A, KSH02, KSH03A, KLX02, KLX03, KLX04, KLX05, KLX06, KLX07A, KLX08, KLX10, KLX11A, KLX13A and KLX17A respectively.*

2 Objective and scope

2.1 Transport Properties of the Rock

The focus of the programme for the Transport Properties of the Rock is to furnish the data on the transport properties of the rock that are required for an assessment of the long term performance and radiological safety of the deep repository. The transport programme is divided into three parts: field measurements to obtain site-specific transport parameters, laboratory experiments on site-specific rock material and modelling of transport properties. An integrated analysis of these parts will form the main product of the transport programme; the Transport properties site descriptive model. Strategy and guidelines for the modelling process is presented in "Transport properties site descriptive model" /Berglund and Selroos 2003/, and in the associated "Strategy for the use of laboratory methods in the site investigations programme for the transport properties of the rock" /Byegård et al. 2003/. The site descriptive modelling of transport properties involves two main categories of parameters:

- **Parameters that characterise the retention properties of geologic materials.**
  These parameters quantify the diffusion and sorption properties of intact and altered rock, fracture coatings and fracture-filling materials, and are described within the framework of the 3D geometric models devised by the Geology programme.
- **Parameters that characterise solute transport along flow paths (flow-related transport parameters).**
  These parameters include the "*F*-parameter" and "water travel time", *t*w, and parameters that account for spatial variability in diffusion and sorption. The flow-related parameters are obtained by means of particle tracking simulations in groundwater flow models/ Berglund and Selroos, 2003/.

The main objectives of the laboratory measurements are to determine site-specific retardation parameters for solutes (sorbing and nonsorbing) and rock materials of importance for safety assessment of a deep repository, and furthermore, to obtain a geoscientific understanding of the retardation (porosity, diffusivity and sorption) properties of the Oskarshamn site, i.e. to understand how the different geologic processes and materials of a site affect the retardation properties.

The specific parameters determined for the different rock materials are:

- porosity (defined as open porosity in SS-EN 1936),
- porosity distribution,
- matrix diffusivity (equivalent to effective diffusivity),
- specific surface area, BET,
- cation exchange capacity, CEC,
- sorption coefficients for a number of combinations of rock materials, radionuclides and groundwater compositions.

The final product of the laboratory investigations is an interpreted retardation model, which is presented in a separate report /Selnert et al. 2009/.

2.2 Selection of rock samples

This section comprises a selection of background data from the Oskarshamn site investigation, both Laxemar and Simpevarp subareas, which form the base for the rock sampling as well as the methodology for the sampling work. A very brief summary of the geology model, primarily with respect to rock type, fractures and deformation zones characteristics, mainly based on /Wahlgren et al. 2005, 2008, Drake and Tullborg 2009/ is presented in Section 2.2.1. Section 2.2.2 comprises in turn a presentation of the sampled rock material for the laboratory measurements.

2.2.1 Geology of the Laxemar/Simpevarp area

Rock types

The bedrock in the Laxemar-Simpevarp area is dominated by 1.80 Ga intrusive rocks that formed during an intense period of igneous activity during the Svecokarelian orogeny. Magma mixing and mingling together with diffuse contact relationships is characteristic features of these rocks, which show compositions varying from granites to quartz monzodiorite. The rocks are more or less undeformed, but a weak foliation is locally developed as well as low-grade ductile shear zones do occur. The various rock types in the Simpevarp and Laxemar subareas display similar and overlapping compositional variations. Apart from the composition, the most important criteria employed in distinguishing between different rock types are texture and grain size.

Both the Laxemar and the Simpevarp subareas are dominated by Ävrö granite (501044) and quartz monzodiorite (501036). At Laxemar these two rock types cover about 94% of the bedrock at the surface. In the latest model version for Laxemar (version 2.3) the Ävrö granite has been divided into Ävrö granodiorite (501056) and Ävrö quartz monzodiorite (501046). In addition to the dominating rock types, fine-grained dioritoid (501030) is also common at the Simpevarp subarea. Subordinate rock types comprise diorite/gabbro (501033), granite (501058), fine-grained granite (511058), fine-grained diorite-gabbro (505102) and pegmatite (501061) as well. The three latter occur as narrow, dyke-like to irregular tabular bodies. The fine-grained diorite-gabbro commonly constitutes composite intrusions together with veins of fine-grained granite. Dolerite dykes (501027) are also found in the westernmost Laxemar. Further descriptions of the rock types is found in /Wahlgren et al. 2005, 2008/.

Fractures

During detailed studies of the fracture mineralogy and wall rock alteration at the Laxemar-Simpevarp area /Drake and Tullborg 2009/, six sequences of events of fracture mineralization have been identified. These are presented in Table 2-3, and refer to both sealed and open fractures.

Deformation zones

The term deformation zone is referring to a structure (essentially 2D) where there is a concentration of ductile, brittle/ductile or brittle deformation. Possible deformation zones at Laxemar and Simpevarp have been identified through the extended single hole interpretation (ESHI) where a general description of each identified zone is given, based on geological and geophysical criteria. Many zones have a ductile origin but show clear signs of brittle reactivation. The main zones at Laxemar are divided into five groups based on their overall orientation, origin and character. Deformation zones at Laxemar are further presented in /Wahlgren et al. 2008, Appendix 14/.

Table 2-3. Schematic fracture filling-sequence from the Laxemar subarea. After /Drake and Tullborg 2009/. Minerals within brackets are found in minor or trace amounts.

	Generation	Age
1.	Mylonite; quartz, epidote, (muscovite, chlorite, albite, calcite, K-feldspar)	>1.45 Ga, probably older than c 1.77 Ga.
2.	a) Cataclasite; epidote, quartz, chlorite, (K-feldspar, albite)	>1.45 Ga
	b) Cataclasite; K-feldspar, chlorite, quartz, hematite, albite, (illite)	
3.	a) Quartz, epidote, chlorite, calcite, pyrite, fluorite, muscovite, (K-feldspar, hornblende)	
	b) Prehnite, calcite, (fluorite, K-feldspar)	1.42 Ga or older
	c) Calcite, laumontite, adularia, chlorite, quartz, illite, hematite, (albite, fluorite)	
4.	Calcite, adularia, laumontite, chlorite, quartz, illite, hematite, illite/chlorite-mixed layer clay, (albite, apatite)	1.42–0.7 Ga
	Sandstone	Cambrian
5.	Calcite, adularia, chlorite, hematite, fluorite, quartz, pyrite, barite, gypsum, mixed-layer clay (e.g. corrensite), apophyllite, harmotome, REE-carbonate, (galena, illite, chalcopyrite, laumontite, sphalerite, U-silicate, apatite, albite, analcime).	The earliest and major fillings ("warm brine" precipitates) were formed at c 448–400 Ma, but fillings formed at lower temperatures might be considerably younger.
6.	Calcite, pyrite, clay minerals, goethite (near surface)	Paleozoic to recent (possibly Quaternary)

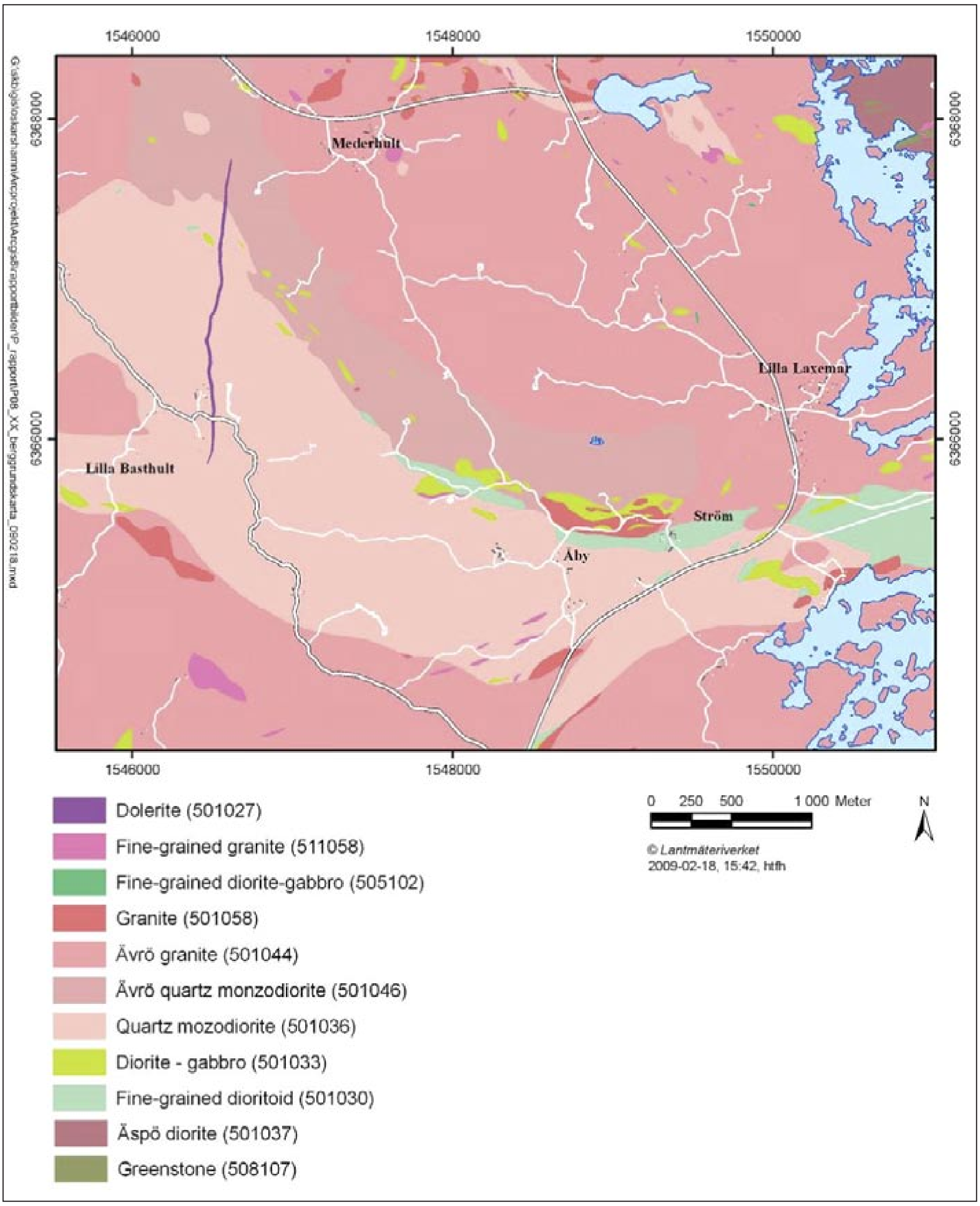


Figure 2-1. *Bedrock geological map for the Laxemar and Simpevarp subarea /modified after Wahlgren et al. 2008/. The Ävrö granite (501044) at the map comprises both Ävrö granodiorite (501056) and Ävrö quartz monzodiorite (501046).*

Rock alteration

About 20–25% of the bedrock at Laxemar is affected by alteration, although heterogeneously distributed. The different types of mapped alterations are albitization, epidotization, oxidation (red staining), quartz dissolution, saussuritization, sericitization and in addition, silicification and carbonatization. Red-stained, hydrothermally altered rock is a common feature adjacent to fractures in the Laxemar area. According to /Drake and Tullborg 2009/, about 50% of the sealed fractures and 11% of the open fractures at Laxemar are bordered by red-stained wall rock. For Laxemar in general, the degree of alteration in the bedrock in between the deformation zones is classified as faint to weak. Inside deformation zones hematite dissemination (oxidation), is abundant. Most of the red stained bedrock inside deformation zones is mapped with an intensity of weak to medium. Hence, it must be taken into consideration that the degree of intensity of red staining might be underestimated because of the original grey-red colour of some of the rock types.

2.2.2 The rock sample collection

In order to describe the heterogeneity of the rock material at the Oskarshamn site investigation area, features as major and minor rock types, different fracture types together with altered rock within deformation zones and adjacent to fractures, were represented in the total sample collection (Figure 2-2). The rock samples were also selected from different depths in the boreholes with purpose to reflect possible effects of stress relief.

As sorption and through-diffusion experiments are time-consuming, a part of the strategy was to identify and collect rock material of importance in the initial phase of the site investigations. The rock sampling for the laboratory program therefore started in May 2003 with the purpose to collect samples from three boreholes at Simpevarp and Laxemar subareas, KSH01A, KSH02 and KLX02. Since that time the number of cored boreholes has increased and the geological conceptual model has progressed. The improved knowledge of the site was later influencing the rock sampling. This means that additional boreholes were included in the sample collection and resulted in a total sample collection that consist of about 400 rock samples from the cored boreholes KSH01A, KSH02, KSH03A, KLX02, KLX03, KLX04, KLX05, KLX06, KLX07A, KLX08, KLX10, KLX11A, KLX13A and KLX17A. However, there is a predominance of rock samples from the early cored boreholes mentioned above. All the sampling work were performed according to /Byegård et al. 2003/ and with support from the Geology, Hydrogeology and Hydrogeochemistry programmes within the Oskarshamn site investigations.

a) b)

Figure 2-2. *Pictures of; a) fresh rock sample of Ävrö granite, selected for electrical resistivity experiments (KLX04 759 mbl), and b) altered rock sample with an open fracture, used in the batch sorption measurements (KLX07 620 mbl).*

Rock type samples

Rock types display variations with respect to e.g. grain-size as well as texture and might therefore have different impact on the transport properties. Rock samples from fresh, non-altered rock types besides slightly altered (red-stained) rock were selected with assistance from core mapping teams and data from the Boremap drill core mapping system. A majority of the samples represent the major rock types Ävrö granite (including both Ävrö granodiorite and Ävrö quartz monzodiorite varieties) and quartz monzodiorite, but the minor rock types described in Section 2.2.1 are represented as well.

Fracture samples

Fractures are considered as possible transport paths as water flow takes place in open fractures in the intact rock and/or within deformation zones. Further on, the presence or absence of an altered zone in the wall rock adjacent to the conductive fractures, constitutes possible flow paths or, more probable, diffusion pathways. Therefore, the mineralogical composition of the fracture coatings in open fractures, and particularly hydraulically conductive fractures, were of interest during the rock sampling, e.g. for the sorption interaction of released radionuclides.

The selection of samples from open fractures were controlled by the indications of water flow, as recorded in Posiva flow logs, but was also affected by the amounts of loose fracture material accessible for use in the laboratory investigations and the hypothesis that any open fracture is a potential transport path. Consequently, not all fracture samples are from water conducting fractures. As mentioned in Section 2.2.1, the fractures at Simpevarp and Laxemar subareas has developed during long time periods and many of them are reactivated several times. Therefore, the described fracture mineralization in Table 2-3 does not completely reflect the current fracture assemblage in open fractures. Several different fracture types, i.e. combination of different minerals, were identified (mainly based on macroscopical observations) and sampled during the laboratory investigations, provided that there were enough material that could be scraped off and used in the measurements (Section 4.2.2).

Samples from deformation zones

Deformation zones have, beside a higher concentration of fractures, a relatively high content of altered rock compared to the rock outside the zones. As altered segments of rock might have divergent transport properties, various kind of altered rock were identified and sampled with assistance from the core mapping teams as well as data from the Boremap drill core mapping system and information from the single hole interpretations, when available.

2.3 This report

This report comprises a presentation of the laboratory investigations of the transport properties of the rock, i.e. description and evaluation of the performance of the measurements. In addition, data results from the laboratory investigations of porosity, through-diffusion, specific surface area (BET), cation exchange capacity (CEC) and batch sorption are reported. Data tables are presented in Appendices 1, 2, 3, 4, 5 and 6. The present report does not include interpretations and evaluations of the results. The analytical work is presented in the Retardation model 2.3 for the Oskarshamn site investigation area /Selnert et al. 2009/.

3 Methods for the laboratory investigations

3.1 Sample preparations

Before the onset of the laboratory experiments, some sample preparations were required; i.e. accurate sawing of the rock core samples into specific lengths in addition to crushing and sieving rock material into different size fractions. Milling of a minor amount of the rock samples was also made. The sample preparations were performed at the CBI, Swedish Cement and Concrete Research Institute (former SP Technical Research Institute of Sweden).

3.2 Geological characterisation

Mineral contents, textures and occurrence of microfractures in the rock samples are properties that might have influences on the diffusivity and sorption capacity, and consequently on the retardation capacity of the rock. Information about geological properties of the rock samples is a vital part for the further evaluation of the laboratory results, i.e. the Retardation model. For instance, occurrence of microfractures might be an explanation for a deviating porosity result, as well as the presence of clay within a fracture coating might be a conceivable reason for high BET results. As a consequence of this, a geological characterisation of the rock samples involved was performed as a preparatory step of the laboratory measurements. The general characterisation included photography (Nikon Coolpix 4500) and study in stereo microscope (Nikon, SMZ645) with the purpose to determine mineralogy, texture, degree of alteration, as well as identifying microfractures.

For a minor amount of the rock samples, mainly samples intended for batch sorption experiments, thin sections were produced and analysed in transmissive light microscope. The purpose of these analyses was to confirm the rock mineralogy, as well as study microfractures and identify alteration within mineral grains. The geological characterisation was performed by Geosigma AB, apart from the analyses in transmissive light microscopic analyses which were performed by Isochrone Geoconsulting HB. Documentation of every single rock sample is not presented in this report but data are stored in the database Sicada. A few thin sections were also analysed with scanning electron microscope with an energy dispersive spectrometer, SEM-EDS, with the purpose to identify the mineralogy in strongly altered rock samples.

Laboratory measurements like BET, CEC and batch sorption (c.f. Section 3.5) require crushing and sieving of the rock samples. Previous investigations of Äspö diorite /Byegård et al. 1998/ have shown that there might be significant differences with respect to the mineralogy between coarse- and fine-grained fractions due to different original grain sizes as well as variability in brittleness between minerals. Therefore, geochemical analyses on crushed rock material were performed in addition to the microscopic work described above. The main objective of these analyses was to confirm the mineralogical and chemical element distribution within different size fractions of the rock material used in batch sorption experiments. The analytical work focused on determination of main elements and trace elements. Main elements usually constitute the key components of rock (silica, aluminium, calcium etc.) which occur together with oxygen in specific proportions (SiO_2, Al_2O_3 etc.). In typical silicate rock, the total of these main elements in oxide form plus the LOI (Loss On Ignition, usually reflecting the content of organic material), should equal 100%. Trace elements generally make a negligible contribution to the total content. The geochemical analyses were performed according to SKB MD 160.001, SKB internal document, and were executed at the ALS Analytica laboratory group with the ICP-MS (Inductively Coupled Mass Spectrometry) and ICP-AES (Inductively Coupled Atomic Emission Spectrometry) methods.

The results of the geochemical analyses were later used for simple calculations of the mineral content in different size fractions of crushed rock material used in batch sorption measurements. These calculations were based on the mineralogy of the entire rock sample, determined with point counting of thin sections, in addition to the already known composition of biotite and plagioclase /Drake et al. 2006/. General assumptions for granitic rock types, after the same concept as in previous investigations /Byegård et al. 1998/, are summarized below:

1. All Mg is hosted in the biotite.
2. All Na is hosted in the plagioclase.
3. All P is hosted in the apatite.
4. K is partitioned between the biotite and the K-feldspars.
5. Ti is partitioned between the biotite and the titanite.
6. Fe is partitioned between biotite, epidote, titanite and magnetite.
7. The SiO_2 in access, after subtracted for the amounts of the minerals above, is assumed to be quartz.

3.3 Porosity measurements

The total porosity in crystalline rock can briefly be summarized as the volume which is not occupied by mineral grains; i.e. the pore spaces between mineral grains but also within mineral grains, e.g. in fluid inclusions. The total porosity can be divided into a connected as well as an unconnected part, of which the connected porosity is the result of microfractures and grain boundary porosity, together with an intra-granular porosity in altered mineral grains. Porosity measurements on rock samples were performed in order to give information about available transport pathways of fluids in the rock and were the initial phase of the through-diffusion and the resistivity measurements. The porosity measured in this case, was consequently the connected porosity. However, the pores available for water to soak into a core sample may deviate significantly from the pores available under e.g. diffusion measurements as well as under *in situ* conditions. The porosity was measured with two different methods, described below.

3.3.1 Water saturation method

There are several different ways to measure the porosity of a rock sample, but the most common method is the water saturation technique, in this investigation determined according to standard method SS EN 1936. Briefly summarized, this standard involves drying of the rock samples at 70º until constant mass is reached followed by water saturation in vacuum. SS EN 1936 is considered to be a rather non-destructive method which was supposed to be of importance since the majority of the measured rock samples were further investigated in diffusion and/or resistivity measurements. For the interpretation of these laboratory investigations, it was important to avoid the extra chemical and mechanical degradation of the samples that could result from the higher drying temperature used in other methods. SS EN 1936 differs slightly from the recommended standard in MD 160.002 (SKB internal document), i.e. ISRM 1979, which is used for porosity measurements by e.g. the Geology programme.

The diameter of the measured core samples were approximately 5.0 centimetres and the sample thickness varies from 0.5 to 5 centimetres, although the majority of the samples were 3 centimetres. Porosity measurements with water saturation technique were performed at the Swedish Cement and Concrete Research Institute, CBI, (former SP Technical Research Institute of Sweden).

3.3.2 ^{14}C-PMMA method

Porosity investigations using the ^{14}C-PMMA technique have been performed at the Laboratory of Radiochemistry, University of Helsinki (HYRL). The ^{14}C-PMMA method is used to measure microfracturing as well as the two-dimensional distribution of porosity. The method can also be used to evaluate porosity gradients in e.g. altered and fractured rock materials. The method entails drying slices of drill cores and impregnating them with a ^{14}C-tagged polymethylmethacrylate monomer, whereby both the connected (matrix) porosity and its spatial distribution in the rock matrix are determined. This provides information for estimation of penetration depth for radionuclides. Comparable porosity determinations were made using conventional water gravimetric measurements at the University of Helsinki. The modified water gravimetry method used here was produced during the development of the PMMA technique and is not a standard method. More detailed information of the method, results and the specific rocks samples are documented in a separate report /Penttinen et al. 2006/.

3.4 Diffusion measurements

3.4.1 Through-diffusion

The analyses were performed according to SKB MD 540.001, SKB internal document, in which it is described that the method is aimed to quantify the matrix porosity, ε_p (%), and the matrix diffusivity, D_e (m^2/s), i.e. the ability for a solute to diffuse through a rock disc. Matrix diffusivity and rock capacity factor are the primary parameters obtained in the evaluation procedure. In theory, the rock capacity factor is equivalent to the matrix porosity for a non-sorbing tracer. However, in order to avoid misinterpretation with matrix porosity determination by water saturation measurements (SKB MD 160.002 or SS-EN 1936) the term rock capacity factor, α (%), has been used in the reporting for the through-diffusion experiments.

Matrix diffusivity measurements are carried out by measuring how quickly an added substance diffuses through a piece of a drill core, so-called through-diffusion measurements /Ohlsson and Neretnieks 1995, Byegård et al. 1998/. The measurement is normally performed on a 1–5 cm thick sawn-out slice of a drill core placed in a measurement cell (Figure 3-1). One side of the core piece is in contact with a synthetic groundwater and the other is in contact with a synthetic groundwater tagged with the radionuclide to be studied (in this case tritiated water, H^3HO or HTO). Samples are then taken on the un-tagged side, and the effective diffusion coefficient, D_e, for the rock matrix can be calculated based on the concentration increase on the un-tagged side.

The effective diffusivity is related to the water diffusivity, D_w, through the formation factor F_f (-) as:

$$D_e = F_f \cdot D_w \qquad \text{(Equation 3-1)}$$

The rock formation factor depends only on the properties of the rock and not on the tracer or solute properties. The formation factor includes properties such as the tortuous winding of pores (tortuosity), variations in cross-sectional area of pores (constrictivity) and the porosity of the backbone of the pores that are utilised for transport by diffusion in a certain direction (transport porosity). These properties are poorly known and cannot easily be separated from each other in measurements. In this work, a water diffusivity of $2.1 \cdot 10^{-9}$ m^2/s has been used for calculation of the formation factor, which is based on the /Mills and Lobo 1989/ using a temperature compensation for the somewhat elevated temperatures obtained in the glove box in which the through-diffusion experiments have been performed.

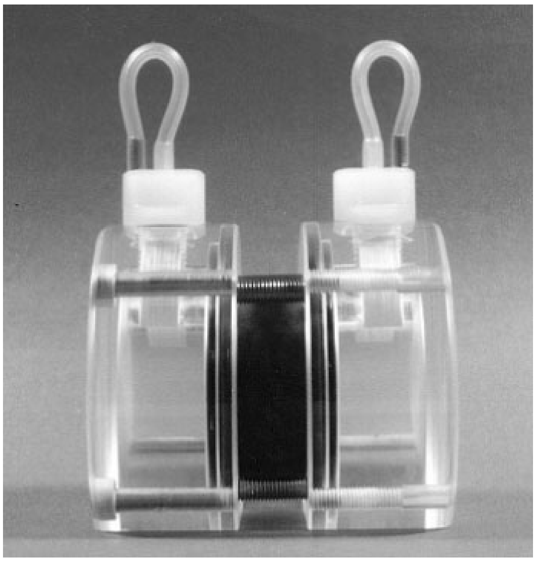


Figure 3-1. *Photograph of a rock sample assembled in a diffusion cell.*

Diffusion model

For a homogeneous, porous media, the accumulated scaled ratio of concentration, C_r (-), of the diffusing species which has passed through the rock disc (initially at zero concentration at time t) can be obtained by solving the diffusion equation for the boundary conditions: constant inlet concentration C_1 from $t = 0$ and outlet concentration C_2 ($C_2 << C_1$) at a distance l /Crank, 1975/. The result is:

$$C_r = \frac{C_2 V_2}{C_1 A l} = \frac{D_e t}{l^2} - \frac{\alpha}{6} - \frac{2\alpha}{\pi^2} \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} \exp\left\{ - \frac{D_e n^2 \pi^2 t}{l^2 \alpha} \right\} \qquad \text{(Equation 3-2)}$$

where t is the experimental time after injection of tracer, l is the length of the rock sample, n is the summation factor, V_2 is the volume of the outlet container and A is the geometrical surface area The capacity factor is defined as

$$\alpha = \varepsilon_p + K_d \rho \ , \qquad \text{(Equation 3-3)}$$

where ρ (kg/m^3) is the rock bulk density and K_d (m^3/kg) is the sorption coefficient. Consequently, for a truly non-sorbing tracer ($K_d = 0$) the matrix porosity is in theory equivalent to the rock capacity factor ($\alpha = \varepsilon_p$).

The effective diffusivity D_e and the rock capacity factor α were fitted to the experimental data (time history of C_r *(-)*) using Equation 3-2.

The latter part of the experimental data was also fitted to a simplified linear form of Equation 3-2, *i.e.*

$$C_r = \frac{D_e t}{l^2} - \frac{\alpha}{6} \ . \qquad \text{(Equation 3-4)}$$

Equation 3-4 was used for control of the results obtained in Equation 3-2 and also for estimation of the individual errors in D_e and α for a particular sample.

Samples and experimental conditions

The through-diffusion experiments were carried out at the Chalmers University of Technology (CTH). A total number of 90 samples were measured, of which 84 were rock type samples and 6 were deformation zone units (92 samples were originally intended for measurements, however 2 samples broke during handling).

Sample thickness ranged from 0.5 to 5 cm, with a majority of the samples being 3 cm which was selected as a standard size. The distribution of sample thickness was: 13 each of 0,5 cm samples, 12 each of 1 cm samples, 54 each of 3 cm samples and 11 each of 5 cm samples.

A synthetic groundwater consisting of the major components of the Type II water (Ca^{2+}, Na^+, Cl^-, SO_4^{2-}, see Appendix 6) was used in the matrix diffusivity measurements since the effect on diffusivity of the minor components was considered to be negligible. Tritiated water, H^3HO, was used as a tracer.

For all diffusion cells the following applies: $V_2 \sim 3.5E–5$ m^3 and $A = 1.77E–3$ m^2 (~47.5 mm core diameter). Relative measurements were applied for C_1 and C_2 and consequently no absolute calibration of H^3HO radioactivity concentration was required. The inlet concentration C_1 of H^3HO was ~4E12 CPM/m^3 (CPM = counts per minute in the radiation measurement of H^3HO).

The experiments were performed at room temperature (20–25°C).

3.4.2 Electrical resistivity

Resistivity is a measure of the disability to conduct electric current in the form of ions in the pore space of a rock sample. Low resistivity will thus correspond to a high ability of conduction and vice versa. The resistivity of the water that the sample has been soaked in is often normalised with the resistivity of the sample. The resulting ratio is then referred to as the formation factor, F_f, which in turn is related to the effective diffusivity, D_e (see Section 3.4.1).

Resistivity measurements for obtaining the formation factor were performed by GeoVista AB, according to SKB MD 230.001, SKB internal document, as well as by the Royal Institute of Technology according to /Löfgren and Neretnieks 2005/.

Resistivity along the sample axis were measured with an in-house two-electrode equipment at the frequencies of 0.1, 0.6 and 4.0 Hz, after the rock core samples have been saturated in 1.0 M NaCl-solution for approximately ten weeks. The formation factor was then calculated as the ratio between the resistivity of the soaking water and the resistivity of the samples at 0.1 Hz:

$$Formation\_factor = \frac{\rho_{water}}{\rho_{sample}} \qquad \text{(Equation 3-5)}$$

Primarily the resistivity measurements were performed on 3 cm long rock core samples with plane-parallel end surfaces, but there were also a few 1 cm and 5 cm rock core samples included. More detailed descriptions of the measurements and the results are presented in 5 separate reports /Löfgren and Neretnieks 2005, Thunehed 2005a, b, 2006, 2007/.

3.5 Sorption measurements

All activities done and described within the SKB MD 540.002, SKB internal document, are aimed to quantify the adsorptive properties of the rock material, i.e. the ability for the different radionuclides to adsorb on the rock surfaces. Three different methods are identified:

- Specific surface area measurements of the rock material, BET.
- Measurements of the cation exchange capacity, CEC.
- Actual measurements of the distribution of a radionuclide between the rock/groundwater phases, i.e. Batch sorption experiments.

3.5.1 BET surface area

BET surface area measurement (Brunauer, Emmet, Teller, cf /Brunauer et al. 1938/) is a method for measuring the specific surface area of a solid material by use of gas adsorption. BET measurements have been performed on site-specific materials from Oskarshamn according to the ISO 9277 standard method. BET measurements on crushed rock material were in this activity performed at the CBI, Swedish Cement and Concrete Research Institute (former SP Technical Research Institute of Sweden), whereas BET on whole rock core samples were executed at the Royal Institute of Technology (KTH).

The determination of the specific surface area does not produce parameters that are used in the safety assessment calculation to determine the retardation of radionuclides due to adsorption on to mineral surfaces. However, the BET surface areas, as well as the CEC, are good diagnostic parameters in order to give rough qualitative estimations of the sorption capacity of different geologic materials.

BET surface areas in this investigation were measured on the fractions 0.063–0.125 mm and 2–4 mm of crushed and sieved matrix rock samples. Quantified identification of “inner” and “outer” surfaces of the rock material has been done, using the assumption of spherical shape of the crushed rock particles, i.e.:

$$A_d = A_i + \frac{6n}{d_p \rho} \qquad \text{(Equation 3-6)}$$

where A_d (m^2/g) is the measured BET surface area for the fraction having the d_p (m) average particle diameter, A_i (m^2/g) is the amount of inner BET surface area (representative for intact rock) and ρ (g/m^3) is the rock density. The term $6n/(d_p\rho)$ (m^2/g) thus corresponds to the outer BET surface area of the crushed particles, i.e. the amount of surface areas obtained by the crushing process and thus not representative for the intact rock material. One can therefore identify the factor n as the microscopic roughness of the rock, i.e. the ratio of the BET surface area versus the geometric area. For a few number of rock types, BET surface area measurements have also been performed using intact drill core samples (50 mm diameter, 90 mm length). Ideally, the obtained values for these measurements should resemble the A_i obtained from the extrapolation.

For fracture coatings and altered rock material adjacent to fractures, the rock material was sampled by careful scraping of the rock. After sieving, only the <0.125 mm fraction was used for the BET surface measurement. The general basis for this decision is that a loose material in an even smaller size fraction is lost during the drilling and the selection of the 0.125 mm fraction is still suspected to give an underestimation of the BET surface areas abundant in natural fractures.

3.5.2 CEC

The Cation Exchange Capacity (CEC) refers to the numbers of negatively charged sites of the rock material that can participate in a cation exchange. This parameter is closely related to BET and can be considered as a diagnostic parameter for a rough estimation of the sorption capacity of the rock material. Cation exchange is considered as the major sorption mechanism for several of the radionuclides involved in the batch sorption experiments, e.g. Cs^{+}, Sr^{2+} and Ra^{2+}.

The determination of potential cation exchange capacity, CEC, as well as exchangeable cations, involves that the negatively charged sorption sites of a geological material are saturated with one particular cation in a high concentration solution; in this specific case barium chloride ($BaCl_2$). A determination of sodium, potassium, calcium, magnesium, strontium and rubidium in the barium chloride extract of the rock material gives the sum of exchangeable cations.

Subsequently, the Ba saturated rock material is contacted with a $MgSO_4$ solution causing all adsorbed Ba^{2+} ions to be exchanged with Mg^{2+} ions. From this operation, the CEC is obtained by estimation of the total amount of Mg^{2+} ions that was, due to cation exchange with Ba^{2+}, lost from the original $MgSO_4$ solution.

The measurements of the CEC and exchangeable cations were performed according to ISO 13536 at the Swedish Geotechnical Institute (SGI). The host rock samples were measured on crushed and sieved rock core samples using the size fractions of 0.063–0.125 mm and 1–2 mm (corresponding to the smallest and largest size fractions used in the batch sorption experiment, cf Section 3.5.3). Some fracture coating materials were also measured; in this case only the <0.125 mm fraction was used. The basis for the selection of this size fraction was the same as described for the BET surface measurements, cf Section 3.5.1.

3.5.3 Batch sorption

In batch sorption measurements, crushed rock is contacted with a groundwater spiked with radioactive tracers. The distribution of the radioactive tracers between the aqueous and the solid phase is measured /cf. e.g. Byegård et al. 1998/. Batch sorption measurements were performed at the Chalmers University of Technology (CTH) and at the Royal Institute of Technology (KTH).

Basically, two different methods were applied for the batch sorption experiments, one method used for the crushed matrix rock samples and one method used for non-consolidated rock material sampled in association with fractures:

Matrix rock

For the use of rock samples from the rock matrix, the material was crushed and sieved to different size fractions. The 0.063–0.125 mm, 0.25–0.5 mm and the 1–2 mm size fractions were used and the tracer distribution ratio (R_d) was measured for all of these size fractions. The results were thereafter interpreted from a model consisting of:

- Adsorption of the tracers on the outer surfaces of the rock material, determined by the surface sorption parameter, K_a (m). This interaction is considered to be caused by surfaces created during the crushing process and this adsorption is therefore not applicable in the process when the tracer penetrates into the rock matrix, i.e. matrix diffusion.
- Adsorption of the tracers on the inner surfaces of the rock material, determined by the volumetric sorption parameter, K_d (m^3/kg). These inner surfaces are representative to the intact rock and this amount of adsorption should thus be applied for the matrix diffusion process.

Using the assumption of spherical shape of the crushed rock material, the evaluation of the batch sorption experimental results to sorption parameters is thus done according to:

$$R_d = K_d + \frac{6K_a}{d_p \rho} \qquad \text{(Equation 3-7)}$$

where R_d (m^3/kg) is the measured tracer distribution between solid and liquid phases, d_p (m) is the average particle diameter, and ρ (kg/m^3) is the rock density. A graph of R_d versus $1/d_p$ gives an intercept corresponding to the K_d value, and a slope corresponding to $6K_a/\rho$, cf Figure 3-2. The concept is thus analogous to the estimation of inner and outer surface area of the BET measurements, cf Section 3.5.1.

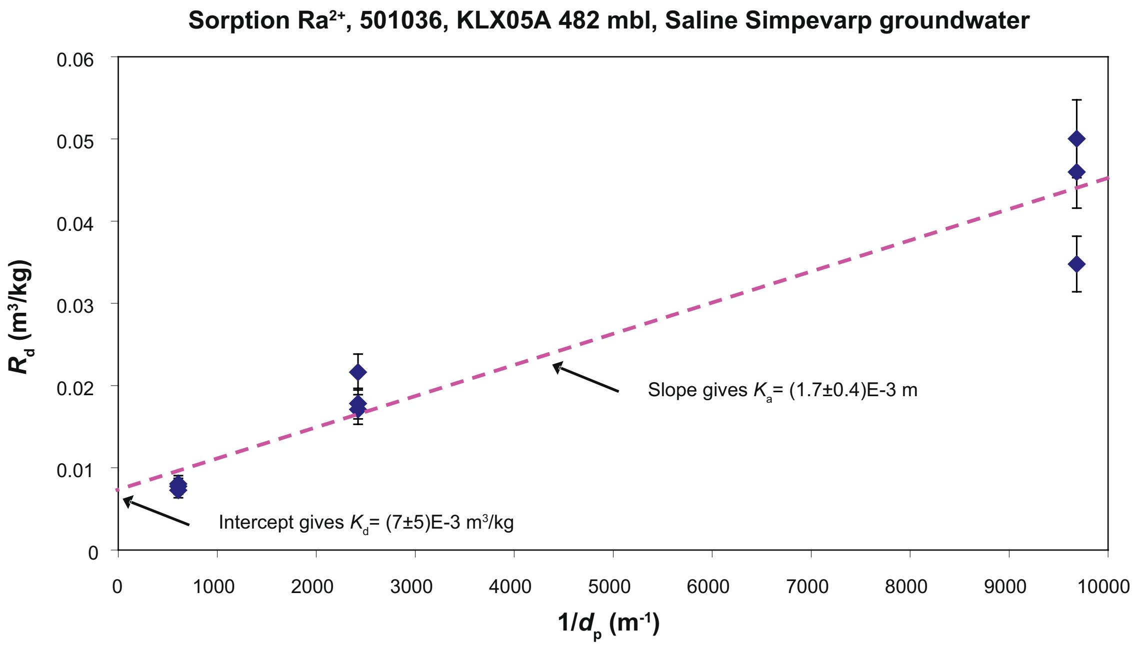


Figure 3-2. *Illustration of the evaluation method used for the batch sorption experiments on rock samples, exemplified by Ra^{2+} adsorption on rock material from KLX05A 482 mbl.*

Fracture coatings

Similarly to the BET surface measurements, the adsorption on loose fracture filling materials as well as altered materials adjacent was for the same reasons studied using only the <0.125 mm size fraction. In this case the measured tracer distribution ratio (R_d) was directly transferred and applied as the volumetric sorption parameter, K_d.

Experimental conditions

Since it can be suspected that the R_d due to slow diffusion into the particles should be influenced by the contact time, sampling was performed at different contact times, i.e. 1, 7, 30, 90 and 180 days. A solid to liquid volume of 1 g to 4 ml was applied in the experiments and this ratio was allowed to decrease a total of <10% due to the sampling during the experiment period. The batch sorption experiments were performed in glove-boxes with continuous nitrogen flow attempting to minimise the influence of oxygen during the sorption experiment. Synthetically produced groundwater (i.e. addition of salts to distilled water) having the same chemical composition as sampled groundwater was used in the experiments. The addition of redox-sensitive chemicals (e.g. salts of Fe(II), Mn(II) and S(-II)) together with potentially volatile chemicals (salts of HCO_3^-) were added inside the glove-box, after a thorough bubbling of water had been performed).

At the measurement start four different groundwaters were selected for the batch experiments to represent a (I) fresh diluted Ca-HCO3 water, (II) groundwater with marine character, Na-(Ca)-Mg-Cl, 5,000 mg/L Cl, (III) saline groundwater of Na-Ca-Cl type, 5,400 mg/L Cl and (IV) Brine type water of very high salinity, Ca-Na-Cl type water with Cl content of 45,000 mg/L. Later on, a complementary water type (V) , brackish of non-marine character, Na-Ca-Cl type (2,000 mg/L Cl), was included. This water type was supposed to be common in the Laxemar subarea at repository depth. The exact composition of the different groundwaters can be found in Appendix 6.

For the selection of tracers to be used in the batch experiments, it was decided to apply two different levels in the investigations:

- Level B, sorption studies using Cs+, Sr^{2+} and Am(III), (Am in some cases exchanged to its analogue Eu) as tracers.
- Level A, sorption studies using Cs+, Sr^{2+}, Ra^{2+}, Ni(II), Am(III), (Am in some cases exchanged to its analogue Eu), Th(IV), Np(V) and U(VI) as tracers.

The aim of this differentiation was that groundwater/rock mixtures which were foreseen to be very important in the performance assessment should be investigated using the A level. Consequently, less important groundwater/rock mixtures were only investigated using the B level.

4 Results

4.1 General

Original data from the reported activities are stored in the primary database Sicada, where they are traceable by the Activity Plan number (AP PS 400-03-041, AP PS 400-03-093 and AP PS 400-06-023). Only data in SKB's databases are accepted for further interpretation and modelling. The data presented in this report are regarded as copies of the original data. Data in the databases may be revised, if needed. Such revisions will not necessarily result in a revision of the P-report, although the normal procedure is that major data revisions entail a revision of the P-report. Minor data revisions are normally presented as supplements, available at www.skb.se.

Some results of the geological characterisation of the most important rock materials within the laboratory programme are given in the following sections. This summary should be considered as supporting information needed in the forthcoming interpretation of the result, i.e. the Retardation model, and is not a complete specification of the geological properties of the Laxemar and Simpevarp areas. A complete description of the site can be found in /Wahlgren et al. 2008/. Yet, the observations made during the geological characterisation of the laboratory rock samples are generally consistent with the work performed by the Geology programme.

4.2 Geological characterisation

4.2.1 Rock types

The majority of the rock core samples are represented by fresh rock types, with a predominance of the major rock types Ävrö granite (including both Ävrö granodiorite and Ävrö quartz monzodiorite) and Quartz monzodiorite. These granitic to quartz monzoritic rock samples comprise minerals as plagioclase, quartz, K-feldspar, biotite, amphibole, magnetite/hematite, epidote, ± titanite, ± pyroxene. Biotite is partly replaced by chlorite, the plagioclase is sometimes altered and saussuritized.

Altered varieties of the rock core samples are often redstained due to small hematite grains besides secondary mineralization as chlorite and saussuritization of plagioclase. Verifications of the mineralogy for these two rock types, during analyses and point counting of thin sections in transmissive light microscope, are presented in Table 4-1. Redstaining (faint, weak, medium and strong degree), is observed together with 30% of the examined rock samples.

Ävrö granite samples are generally porphyritic, with larger mineral grains of K-feldspar even though the intensity varies within the rock type. The quartz monzodiorite on the other hand, is generally equigranular and medium-grained.

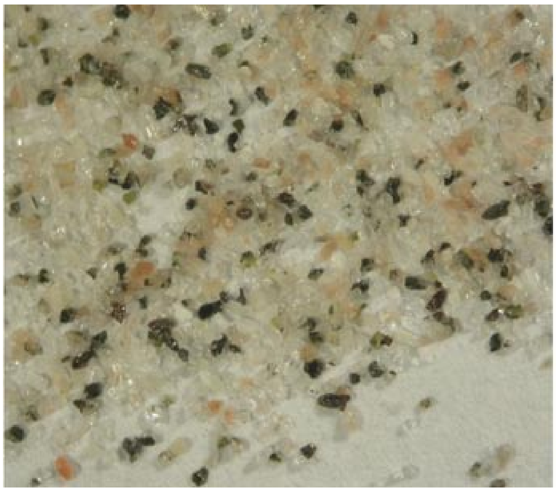
The mineralogy and texture of minor rock types (e.g. fine-grained granite (511058) and fine-grained dioritoid (501030) are not described in detail in this report, but are in agreement with the mineralogy described in /Wahlgren et al. 2005/.

Microscopic observations of different size fractions of crushed rock material have been performed as well, as mineralogical differences between coarse and fine-grained fractions might be of importance in the analysing process of the results from e.g. batch sorption measurements. These studies showed small differences with respect to the mineralogy between the fractions. Generally, concerning crushed material from rock types, the finer fractions (0.063–0.125 mm and 0.125–0.25 mm) more often consist of single mineral grains in contrast to the coarser (1–2 mm and 2–4 mm) which constitutes mineral aggregates with two or more minerals (Figure 4-1). Still, the mineralogy is the same within all the size fractions. Similar observations have been made for crushed and sieved altered rock within deformation zones. These observations were later supported by the calculations from the performed geochemical analyses (discussed in Section 3-1) and illustrated in Figure 4-2 and 4-3. The values should be considered as an approximate estimation of the mineral content and no exact values.

Table 4-1. Results from pointcounting of thin sections from Ävrögranite (501044) and quartz monzodiorite (501036) involved in the laboratory measurements of the transport properties of the rock. Mineralogical distributions are given in intervals as percent (vol %), + = <0.2%.

	Ävrögranite* (n=4)	Mean	Std	Quartz monzodiorite (n=2)	Mean	Std
Quartz	13.4–30.4	22.8	7.7	15.8–17.9	16.9	1.5
K-feldspar	10.2–26.2	20.6	7.5	2.6–10.9	6.8	5.9
Plagioclase**	33.2–49.6	38.6	7.6	38.1–39.7	38.9	1.1
Biotite	2.2–14.2	8.3	5.5	13.7–17.0	15.4	2.3
Muscovite	0.2–0.6	0.4	0.2			
Chlorite	1.0–3.6	2.0	1.4	2.3–3.0	2.6	0.5
Amphibole***	0.6–8.4	2.8	3.9	9.7–11.8	10.8	1.5
Epidote	2.6–5.2	3.5	1.4	2.5–8.2	5.4	4.0
Prehnite	0.0–1.0	0.7	0.4	0.2	0.2	
Titanite	0.0–2.0	1.3	0.8	0.7–1.4	1.0	0.5
Apatite	0.0–0.2	0.2	0.0	0.2	0.2	
Zircon	0.0–0.8	0.4	0.3			
Opaque	0.0–1.4	0.9	0.5	0.5 1.2	0.8	0.5
Pyroxene	0.0–0.6	0.6	-	0.4–1.3	1.0	0.6
Flourite	0.0–0.2	0.2	-			

* Including both of the two sub groups Ävrö granodiorite (501056) and Ävrö quartz monzodiorite (501046).
** Partly saussuritized or sericited.
***Hornblende.



a)

b)

***Figure 4-1.** Stereomicroscopic pictures of two different size fractions of crushed and sieved Ävrö granite: a) 0.063–0.125 mm with mostly single grains of quartz, K-feldspar, plagioclase, biotite and a few grains of titanite and opaques. b) 1–2 mm fraction with rock fragments which contains f two or more of the minerals mentioned above.*

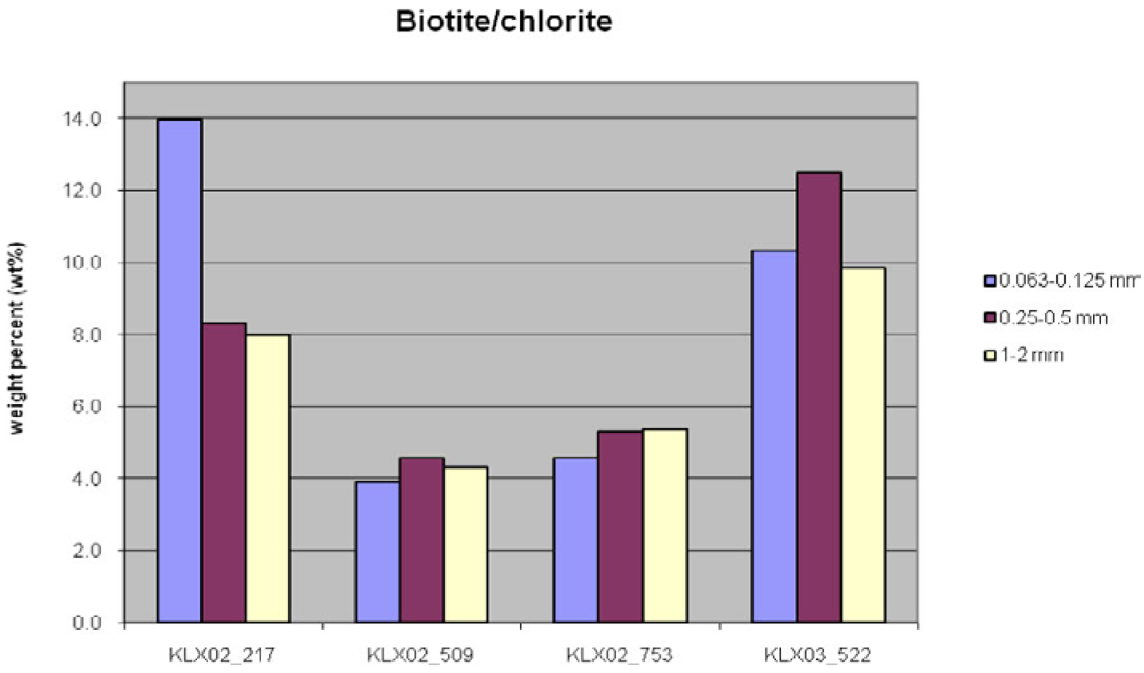


Figure 4-2. *Distribution of biotite/chlorite in different size fractions in four rock samples of Ävrö granite in KLX02 and KLX03; at 217 mbl, 509 mbl and, 753 mbl respectively in KLX02 and at 522 mbl in KLX03. The mineral content is calculated from geochemical analyses.*

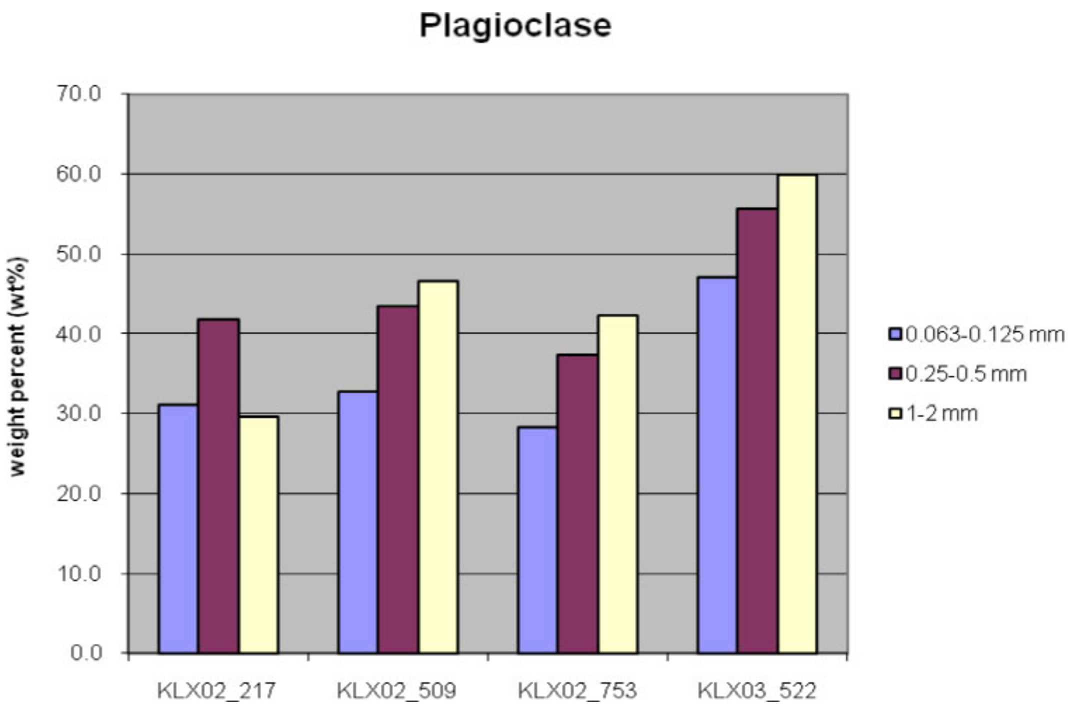


Figure 4-3. *Distribution of plagioclase (calculated for An_{23}) in different size fractions from four rock samples of Ävrö granite in KLX02 and KLX03; at 217 mbl, 509 mbl and 753 mbl respectively in KLX02 and at 522 mbl in KLX03. The mineral content is calculated from geochemical analyses.*

In the two examples, a comparison of the biotite and/or chlorite content in the different size fractions, as well as of plagioclase (with a suggested anortite content of 23%, (An_{23})). For biotite/chlorite there are small variations between the different fractions except for one sample, a result that is verified by the calculations of other rock types too, e.g. quartz monzodiorite. The plagioclase has generally a decreasing trend with decreasing fractions which could probable be explained by alteration of plagioclase. These secondary mineralizations consist of porous aggregates of e.g. epidote, which might be less resistant in the crushing procedure and thus come to be placed in the smaller fractions while the intact plagioclase crystals are placed in larger fractions.

Microfractures

In this report the term microfracture refers to a short (1 mm to 30 mm) and thin (<0.5 mm) open or sealed fracture (Figure 4-4). Microfractures usually cut right through mineral grains and are common in altered rock samples, but are visible in fresh rock samples as well. About 35% of the rock core samples included in the laboratory measurements were documented with open, partly open or sealed microfractures and/or fractures when examined in stereo microscope. Although the percentage is high it is suggested to be a minimum value because of the restricted area available for examination. However, there are differences between the Simpevarp and Laxemar subareas. Rock samples from the Simpevarp area (KSH01–KSH03) have significantly more microfractures than the rock samples from Laxemar which might be due to deformation zones surrounding the Simpevarp peninsula.

Calcite, hematite, prehnite, epidote, laumontite, quartz and chlorite are minerals that have been identified in sealed microfractures during the examination in stereomicroscope and transmissive light microscope.

4.2.2 Open fractures

Due to reactivation of open fractures during the geological history, the described fracture mineralizations in Section 2.2.1 does not fully reflect the current fracture assemblage in open fractures. Therefore, the open fractures were divided into different fracture types, distinguished on the present fracture mineralogy and wall rock alteration. This work was based on macroscopic observations and in cooperation with fracture mineralogical expertise and core mapping geologists at the Laxemar-Simpevarp. Small adjustments were later made with the increasing experience and knowledge of the site. The mineralogy for the identified fracture types is as follows:

A) *Chlorite + calcite + pyrite/ chalcopyrite* ± any mineral. The thickness of the fracture coating is about 0.2–1 mm.

B) *Epidote and/or prehnite and/or adularia* ± chlorite ± calcite ± quartz. 0.5–1 mm fracture coating thickness.

C) *Hematite* ± any mineral. The fracture coating is relatively thick, 0.5–5 mm.

D) *Laumontite* ± calcite ± chlorite. The fracture coating is approximately 0.2–2 mm thickness.

E) *Chlorite + calcite* with oxidized or saussuritized walls. Thin fracture coating, 0.2–0.5 mm.

F) *Clay* ± any mineral. Relatively thick fracture coating, 0.2–5 mm.

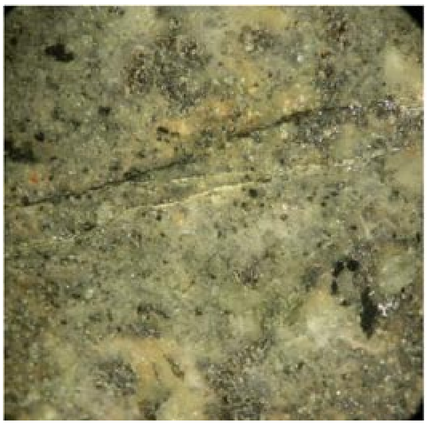
G) *Chlorite* ± any mineral. Fracture coating of about 0.2 mm thickness.

H) *No mineral*, i.e. fractures without any visible mineral.

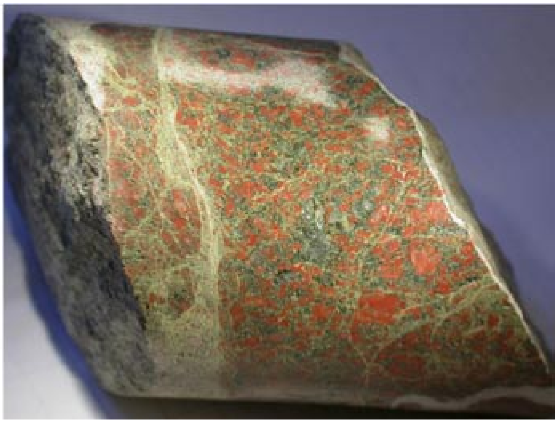
I) *Calcite* ± any mineral. Fracture coating of approximately 0.2 mm thickness.

In the present report, fracture coating is used as a collective term for both fracture coating and loose material in open fractures. Only a few of the fracture types above has loose fracture coatings that could be scraped off and later be used in the laboratory investigations. Therefore, not all of the distinguished fracture types could be sampled for laboratory measurements. The stereomicroscopic studies of different fracture coatings were performed on both core samples with thin fracture coating, as well as loose fracture material which have been scraped off when possible (Figure 4-2). There are no thin sections with solely fracture minerals analyzed within the laboratory program.

Comparison between the mineralogy in different size fractions, as performed on rock types (Section 4.2.1), is not always possible on fracture coatings due to lack of material. Further on, the loose fracture material preferably is relatively fine-grained and consequently placed in the smaller fractions.



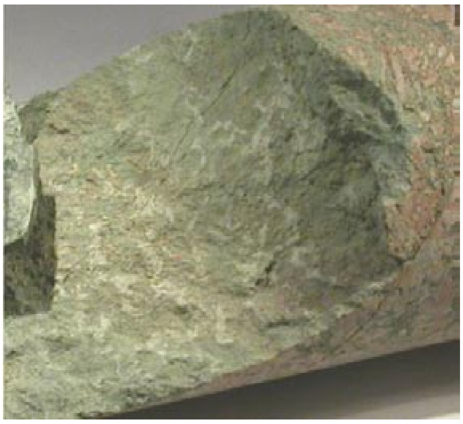
a)



b)

Figure 4-4. *Photograph of a) partly open microfractures in rock sample KSH02 100 mbl, and b) sealed network of fractures and microfractures, mainly filled with hematite, calcite and chlorite in rock sample KLX03 663 mbl. The scales of the pictures are approximately 1.5 cm.*

a)



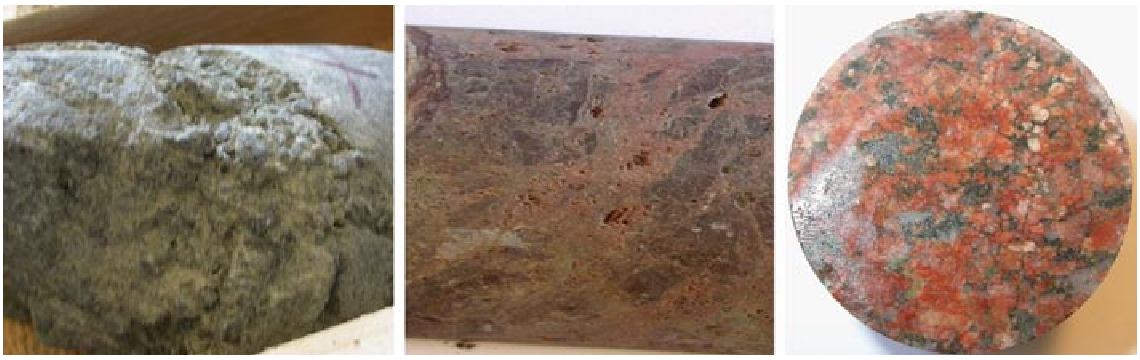
b)

Figure 4-5. *Illustration of two types of fracture materials involved in the laboratory measurements; a) fracture coating including calcite, pyrite, chlorite and b) loose fracture material with mainly clay and chlorite.*

4.2.3 Deformation zones

At the initial phase of the laboratory investigations several kinds of rock alteration within deformation zones were identified and grouped in the same way as the fracture types; i.e. after macroscopic observations of altered parts of the rock cores together with discussions with the core mapping geologists. These deformation zone units represent both features which are commonly abundant in deformation zones as well as features that are not so common but nevertheless considered to possibly give significant contribution to the total retardation capacity of the deformation zones. The identified deformation zone units can occur individually or together within a deformation zone and are described below:

1) *Fault rock/gouge* (strongly tectonized and partly incohesive material). Generally, altered rock fragment, mineralogy partially depending on host rock together with chlorite, saussurite and clay.
2) *Chlorite* (green gouge, primarily close to mafic rock types). Chlorite ± corrensite.
3) *Porous episyenitic wall rock.* Secondary mineral formation of prehnite, adularia, calcite, laumontite, epidote and hematite ± quartz. Quartz dissolution as well as quartz redistribution occur.
4) *Cataclasite (with mylonitic banding)*. Altered rock fragments sealed with epidote, adularia, quartz and hematite ± laumontite in various portions.
5) *Oxidized wall rock (medium to strong degree of alteration).* Hydrothermally altered host rock, with a mineralogy related to initial rock type. Red staining due to small hematite grains, K-feldspar, saussurite, plagioclase, quartz and chlorite are common in granitic variants.



a) b) c)

Figure 4-6. *Examples of deformation zone units sampled and measured within the laboratory programme; a) chlorite (green gouge)b) porous, episyenitic wall rock and c) oxidized (red-stained) wall rock.*

4.3 Porosity measurements

4.3.1 Water saturation

Data gained from the laboratory measurements using water saturation technique are presented in Appendix 1. The uncertainty of a single reported porosity value is 0.09%, given with a coverage factor of 2.

The porosity range is in the interval of 0.1% to 0.5% for the majority of the rock samples. Generally, the fine-to medium grained rock types (e.g. 501030, 505102, 501036 and 511058) have the lowest porosities. An overview of the porosity for different rock types are displayed in Table 4-2. The relatively large range between minimum and maximum values is supposed to be an effect of the sampling strategy; i.e. to include both fresh and altered rock material. In addition, sampling each 20 meter for porosity and resistivity measurements also include rock samples with fractures, both open microfractures, partly open and sealed fractures.

Alteration as well as microfractures is assumed to affect the porosity. This is also indicated in Table 4-2 where a more homogeneous and decreasing porosity are shown when moderately altered and/or microfractured rock core samples are excluded. An increased porosity is also shown in Figure 4-7 where rock samples with strong alteration in or near deformation zones (so called zone units) are plotted. The observation of increased porosity in altered rock is also verified during the porosity measurements with ^{14}C-PMMA (cf Chapter 4.3.2).

Table 4-2. Porosities (vol%) for different rock types at the Laxemar and Simpevarp subareas, measured within the Transport programme. Data are presented as median, minimum and maximum values, the number of samples within parenthesis.

SKB rock type (rock code)	All rock samples (n)			Altered 1) and microfractured samples excluded (n)		
	median	min	max	median	min	max
Ävrö granodiorite (501056)	0.32 (77)	0.13	0.99	0.30 (60)	0.13	0.89
Ävrö quartz monzodiorite (501046)	0.40 (34)	0.05	1.45	0.37 (28)	0.05	0.60
Quartz monzodiorite (501036)	0.16 (71)	0.00	1.59	0.14 (61)	0.00	1.32
Fine-grained dioritoid (501030)	0.22 (94)	0.00	1.49	0.10 (61)	0.00	1.49
Granite (501058)	0.76 (3)	0.38	0.84	2)		
Fine-grained diorite-gabbro (505102)	0.19 (12)	0.03	1.15	2)		
Fine-grained granite (511058)	0.23 (30)	0.05	1.15	0.22 (13)	0.07	0.30
Diorite to gabbro (501033)	0.06 (2)	0.05	0.06	3)		
Pegmatite (501061)	0.02			3)		

1) Altered samples does here refer to medium to strong degree of alteration.
2) Not evaluated.
3) No samples excluded.

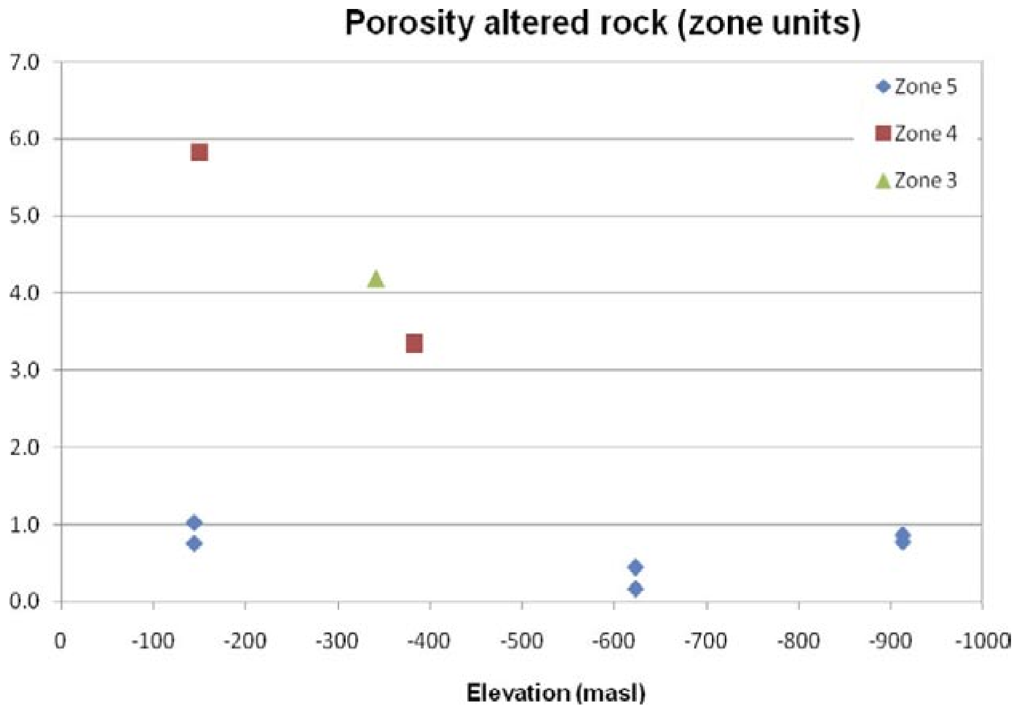


Figure 4-7. *Porosity for strongly altered rock types, within or close to deformation zones. (see Section 4.2.3).*

Porosity is measured on a couple of series of rock samples with different sample length; 0.5, 1, 3 and 5 cm. In this case each series are from a relatively homogeneous sample of originally about 30 cm core length which was cut into twelve sub-samples. As can be seen Figure 4-8, a slight increase of the porosity for short rock samples is indicated.

The porosity of a rock sample in laboratory is not obviously the same as the porosity *in situ*, as the rock samples may be affected by stress-release or mechanical damage. The mechanical damage is not directly investigated in the laboratory program although it cannot be excluded that the relatively high number of microfractures to some extent is a product of the drilling. No clear signs of stress-release are indicated when the porosity is illustrated versus elevation (metres in height system RHB 70) in Figure 4-9.

4.3.2 ^{14}C-PMMA

For the laboratory investigations of the transport properties of the rock, sixteen rock samples have been selected to be measured by the ^{14}C-PMMA method. As mentioned in section 4.3.2 the data and results from the ^{14}C-PMMA measurements are presented in a separate report /Penttinen et al. 2006/ , and the following section is a only a brief summary from this report.

The porosities measured with the ^{14}C-PMMA method vary from about 0.1% in fresh and unaltered rock up to 20% in highly altered rock samples. The average PMMA porosities of low porous rock (lower than 1%) are in the range from 0.03% to 0.8%. These samples represent unaltered rock types. The intragranular porosity is found to dominate in rock samples with high porosity. These samples have also a very heterogeneous porosity pattern in cm scales. However, in many cases the porosity pattern was not congruent with the mineral texture. High porosity is also indicated in and around sealed microfractures (Figure 4-10).

Correlations between PMMA porosities and water gravimetry show that the PMMA porosity values in most of the cases are lower than the water gravimetry values. Relative to water gravimetry measurements the PMMA method underestimates the porosity values by 10 to 40%. The porosity distribution is generally homogeneous in unaltered rock samples while it generally is heterogeneous in strongly altered rock samples (Figure 4-11).

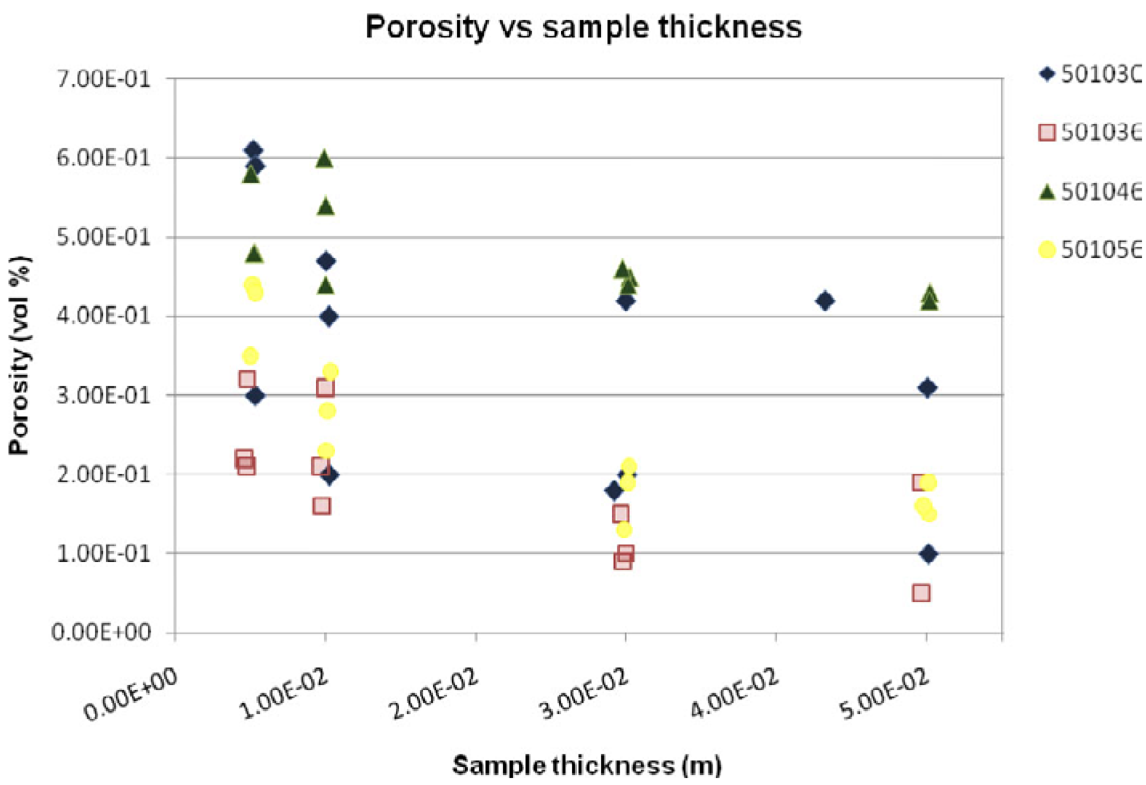


Figure 4-8. *Porosities versus sample thickness for some rock samples from the major rock types. The thickness of the samples is 0.5, 1, 3 and 5 cm.*

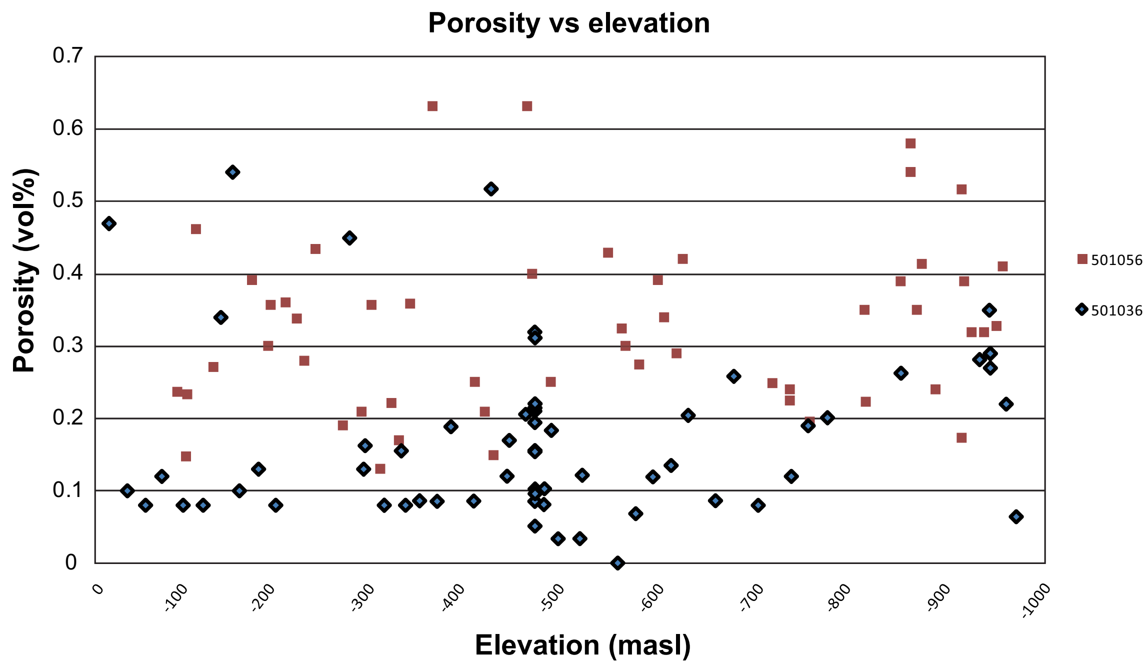
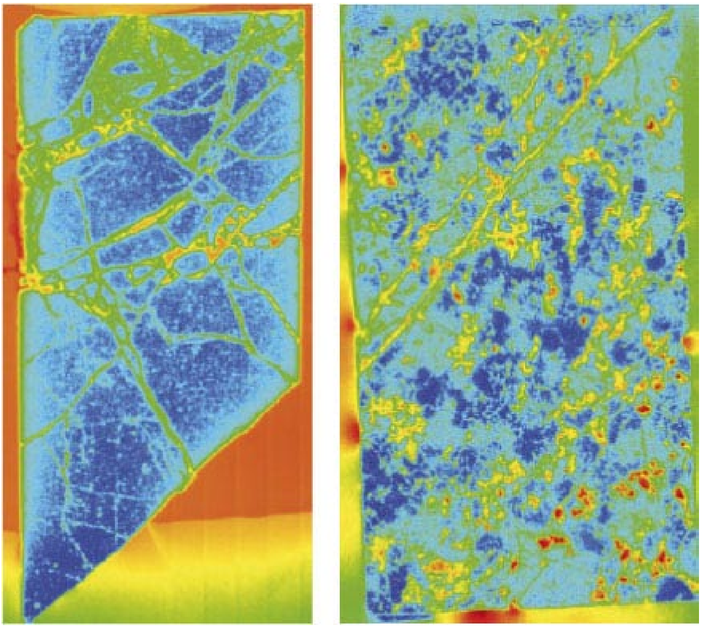


Figure 4-9. *Porosity versus elevation (m.a.s.l.) for fresh rock samples. The rock samples represent different boreholes at the Oskarshamn site investigation area. Porosity values larger than 0.7 vol % are not shown in this diagram.*



a) *b)*

Figure 4-10. *Digital autoradiograph of two rock samples with increased porosity (green, yellow and light red colour); a) in a sealed fracture network and b) in altered mineral grains as well as in grain boundaries and two microfractures.*

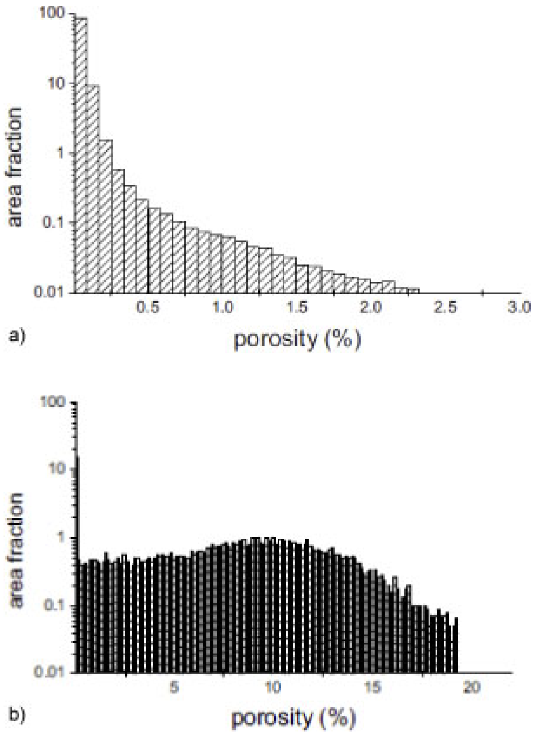


Figure 4-11. *Porosity histograms for a) homogeneous porosity distribution in fresh rock sample (rock type 501046) where a total PMMA porosity of 0.12% was determined; and b) heterogeneous porosity distribution in a strongly altered (see Section 4.2.3, Zone unit 1) rock sample A total PMMA porosity of about 8% was determined.*

4.4 Diffusion experiments

4.4.1 Through-diffusion

A typical example of the results of an individual through-diffusion experiment is shown in Figure 4-12. The model has a very slight inability to reproduce the early time data, but the steady state at late times is well fitted. The deviation at early times (the model is below the early data) has also been observed in earlier studies /e.g. Johansson et al. 2000, Valkiainen et al. 1992/. The derivate plot shows how a steady state is reached at about 200 days. Some scatter in data is observed, most obviously in the derivative plot which is due to the relatively small concentration differences between successive measurements. The uncertainty in the parameter estimation for an individual rock sample is further discussed in the uncertainty analysis below.

The evaluated matrix diffusivities are presented in Table 4-3 and in Figure 4-13 where a histogram displays the diffusivity distribution for all samples. A total number of 90 rock samples could be evaluated for matrix diffusivities that ranged over three orders of magnitude, from the lowest fine-grained dioritoid (KSH01A 219,36 m) value of 2.4E-15 m^2/s to the deformation zone unit type 4 sample in KSH03A at 188,96 m of 1.6E-11 m^2/s.

Generally, the diffusivity ranges seem to reflect the porosity range in the rock types, i.e. lower formation factor is found e.g. for the lower porous 501030 type while higher formation factor is obtained for the more porous 501046. The matrix diffusivity for deformation zone unit samples (Zone type 3, 4 and 5 in Section 4.2.3) range from approximately 1E-13 to 1E-11 m^2/s which is in accordance with the higher porosity of those samples.

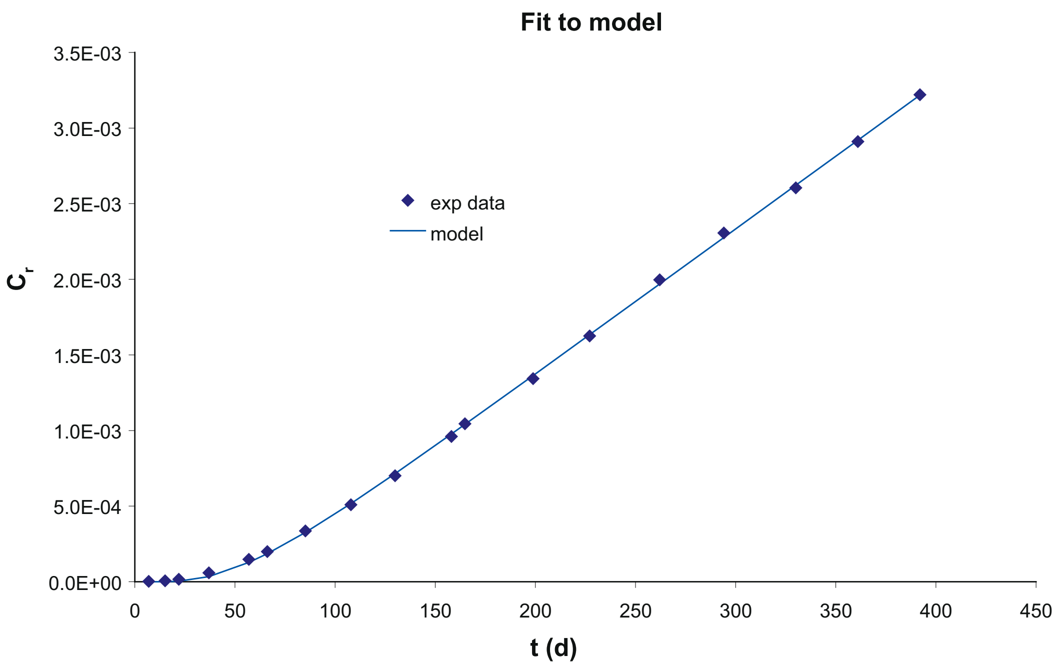
The variation of diffusivity with borehole length is shown in Figure 4-13. No correlation of diffusivity with depth can be verified with significance, although a very slight general diffusivity increase below 800 m borehole length can be suspected.

Diffusivity data for four rock samples, each cut into different sample thicknesses are shown in Figure 4-15. It is indicated that 0.5 and 1 cm sizes have a slightly increased diffusivity compared to the 3 and 5 cm sizes, which is in accordance with the porosity increase indicated for the same samples (Figure 4-8). However, the normal variation within a given size is typically larger than the size effect. The effect of including shorter sample sizes in the total results for a rock type is therefore small. Increased porosity (and thus increased effective diffusivity) in shorter samples can be caused by e.g. a larger contribution of sawing induced porosity and/or a too small sample size relative to the mineral size which may increase available porosity.

The influence of the porosity on the formation factor was studied in /Selnert et al. 2009/. The different formation factors determined by through-diffusion experiments are presented in Figure 4-16 as a function of their porosity measured by water saturation technique. As expected, a relationship is indicated and two functions are presented for the interpretation; the Archie law F_f=0.71·$\varepsilon^{1.58}$ /Parkhomenko 1967/ and a fit of a similar equation to the actual data in this investigation. The large variation observed in experimental data is an indication that one has to deal with a sample heterogeneity which probably cannot be covered by a simple porosity-diffusivity relation as proposed by e.g. Archies law or the relationship established by the fit of the experimental values involved in this work.

In Figure 4-17 the capacity factors and water saturation porosities are compared. Theoretically, the data are expected to be equal for each sample since non-sorbing HTO was used as tracer for which $\alpha=\varepsilon$. However, the mean capacity factor/porosity ratio is ~1.9 for all samples. It is apparent that the capacity factor is a poor estimate of the matrix porosity with consideration to the scattering in data. No variation with capacity factor of sample thickness was observed.

The epoxy resin, used to seal the rock piece to the diffusion cell (Figure 3-1); has a very low diffusivity (<5E-16 m^2/s) according to a separate measurement of an epoxy disc, i.e. that the diffusion in the resin is about 100 times lower than that of the lowest measured values of the rock types (~5E-14 m^2/s). Consequently the diffusion in the resin is negligible compared to that in the rock samples studied. However, it can not be excluded that a diffusion accessible pore space is created by casting in the resin-rock interface which may affect the diffusivity. The effect of this method uncertainty on the quantification of matrix diffusivity is estimated in the uncertainty analysis below.



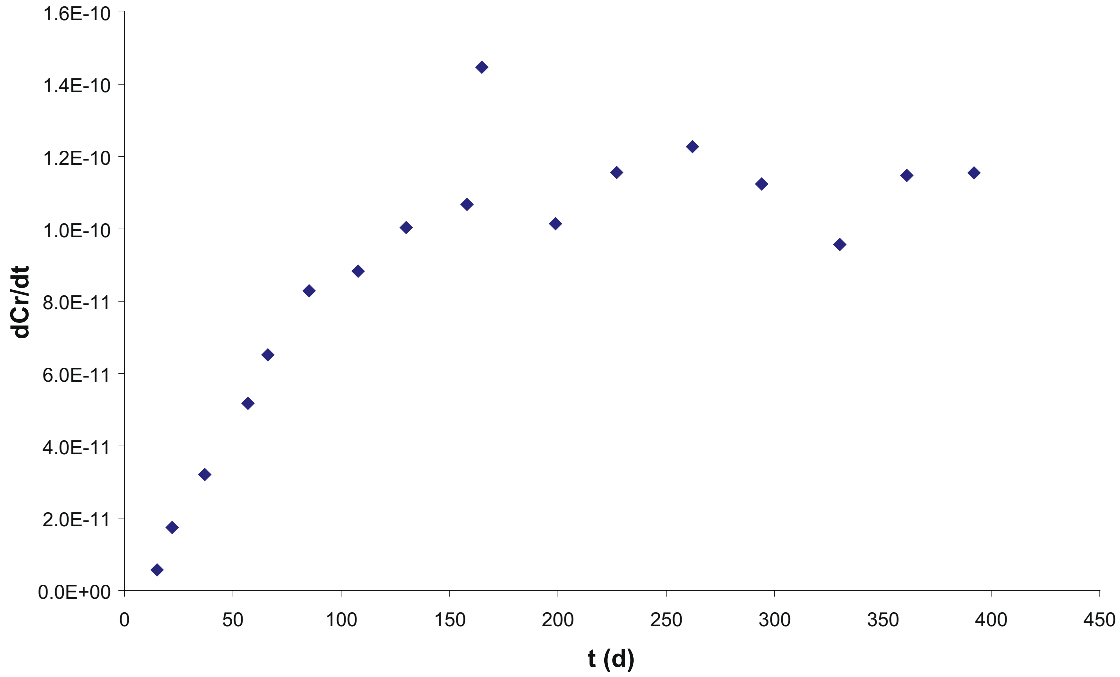


Figure 4-12. *Concentration versus time plot (top) and dCr/dt versus time for KLX02-258.96–258.99 m (actual sample thickness 30 mm. D_e = 1.0E-13 m²/s; capacity factor = 0.33%; water saturation porosity = 0.23%.*

Table 4-3. Median value, maximum and minimum values in matrix diffusivity and median formation factor for the investigated rock types and deformation zone units. A general method uncertainty of ±25% (given with a coverage factor of 2 corresponding to a 95% confidence interval) should be applied for matrix diffusivity data from individual samples (see the method uncertainty analysis further below).

	Rock type samples							**Deformation zone unit samples**		
	All rock type samples	**Fine-grained dioritoid (Metavolcanite, volcanite) 501030**	**Quartz monzonite to monzodiorite, equigranular to weakly porphyritic 501036**	**Ävrö quartz monzodiorite 501046**	**Ävrö granodiorite 501056**	**Granite, fine- to medium-grained 511058**	**Mafic rock, fine-grained 505102**	**Type 3**	**Type 4**	**Type 5**
D_e ,median value (m^2/s)	1.2E-13	4.0E-14	2.4E-13	9.8E-13	1.4E-13	9.4E-14	2.1E-13	2.4E-12	3.3E-12	2.9E-13
D_e ,maximum value (m^2/s)	1.3E-12	8.5E-13	1.0E-12	1.1E-12	1.3E-12	1.3E-13	-	-	1.6E-11	7.8E-13
D_e minimum value (m^2/s)	2.4E-15	2.4E-15	4.3E-15	1.6E-14	2.7E-14	5.0E-14	-	-	1.6E-12	8.1E-14
$F_{f,HTO}$, median value (-)	5.5E-5	1.9E-05	1.1E-04	4.6E-04	6.6E-05	4.4E-05	9.8E-05	1.1E-03	1.5E-03	1.4E-04
Number of samples	84	24	22	9**	23	5	1	1	4	9(1)*

*One of these 9 samples was originally collected as a deformation zone unit sample. The other eight samples are selected and defined as medium or strongly altered samples of all rock type samples located within deformation zones.

**8 of these 9 samples are from a series of deep samples in Simpevarp KSH01A 891.69-891.94 m which are coarse grained and of higher porosity which increases the formation factor / diffusivity of the group.

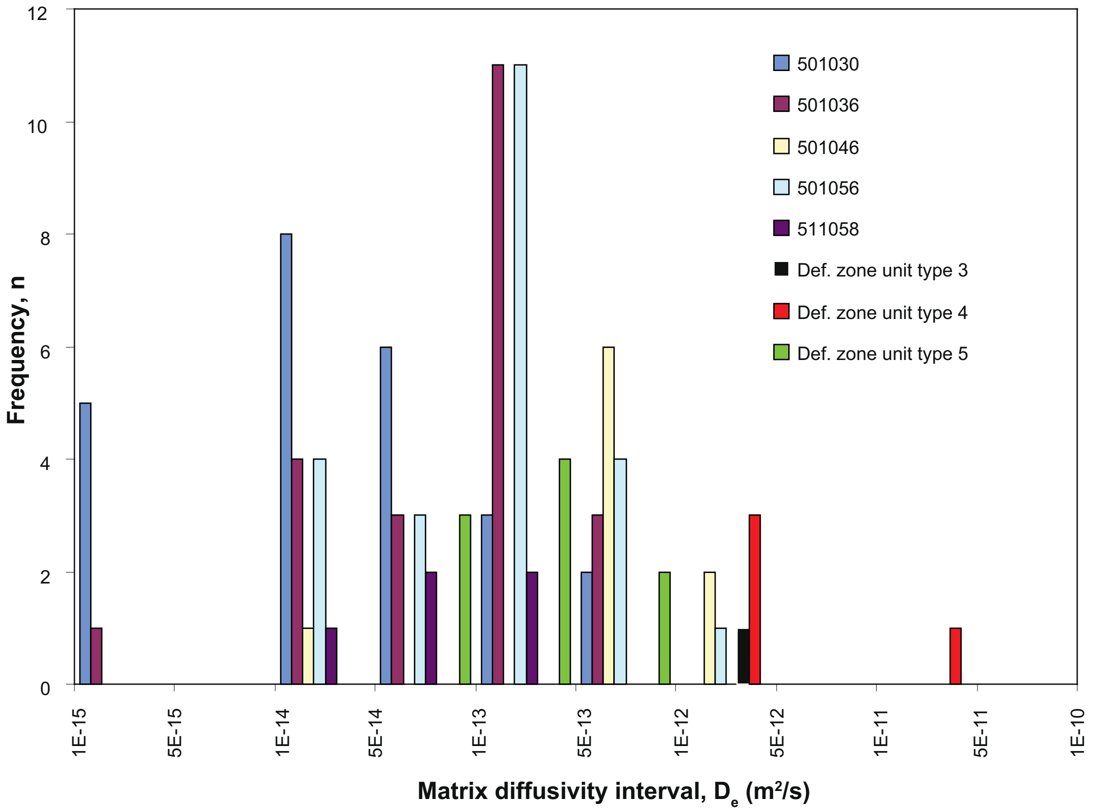


Figure 4-13. *Frequency distribution of matrix diffusivity for rock types and deformation zone units. The staples show the number of samples in each interval (e.g. there are 5 samples of 501030 in the interval 1.0E-15 to 5E-15 m^2/s).*

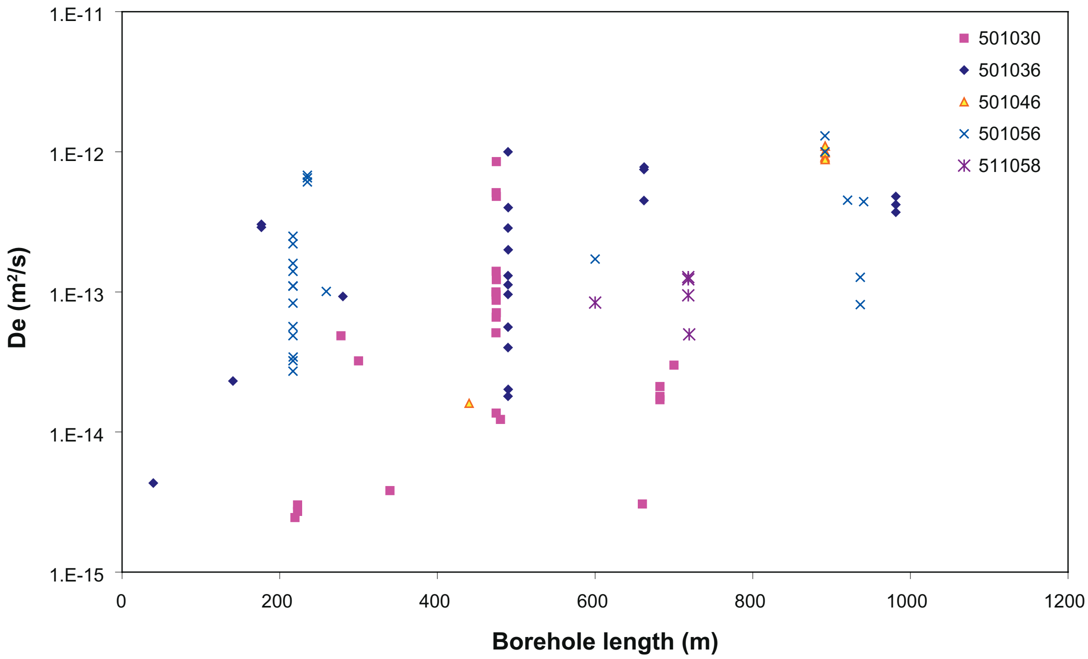


Figure 4-14. *Matrix diffusivity versus borehole length for the major rock types.*

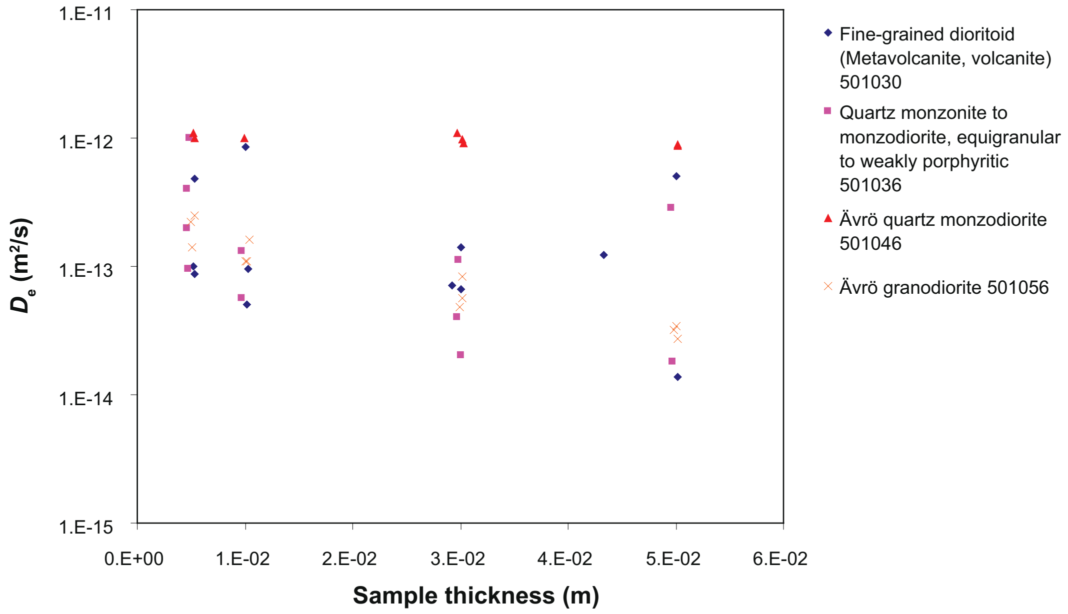


Figure 4-15. *Matrix diffusivity versus sample thickness for different rock types.*

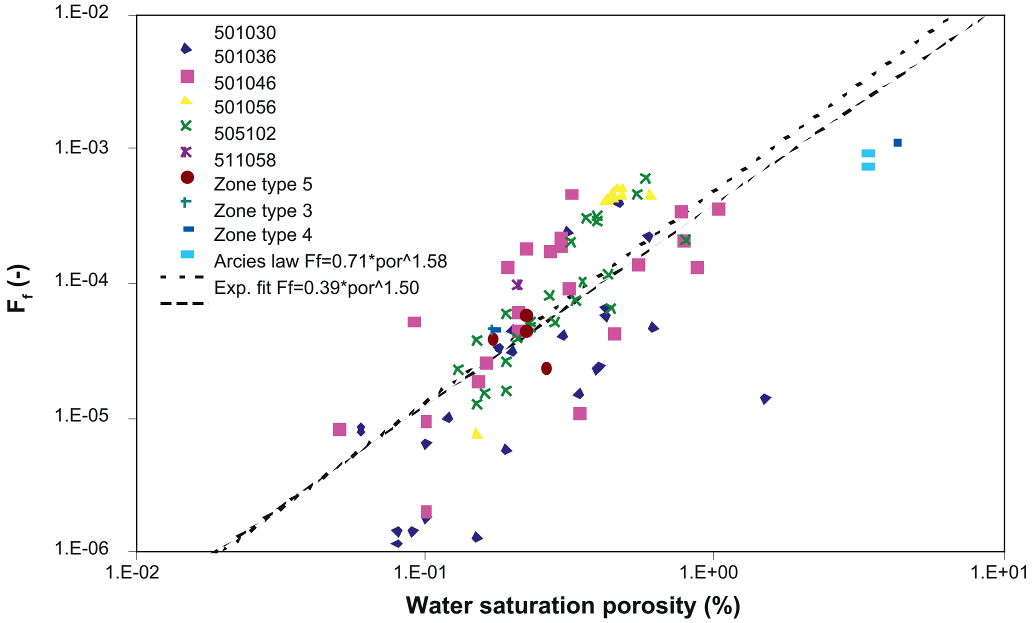


Figure 4-16. *Formation factor versus the porosity, with formation factor determined from through-diffusion experiments. Comparisons are made to a representation of Archies law /Parkhomenko 1967/ and to a fit of a similar equation to the actual results in this investigation. The porosities have been measured using the water saturation method (SS-EN 1936).*

Besides a possible influence of the casting as discussed above it can be questioned if the considerably longer experimental time used in the diffusion experiment compared to that of the water saturation measurement may affect the results. On average 8 months was used for each diffusion experiment while the water saturation part of the porosity measurement lasts for approximately 4 days. It can not be excluded that mineral reactions may affect the porosity and that the water absorption continues to increase the accessible pore space during the longer time applied in the through-diffusion experiments. Such effects would result in an increased capacity factor.

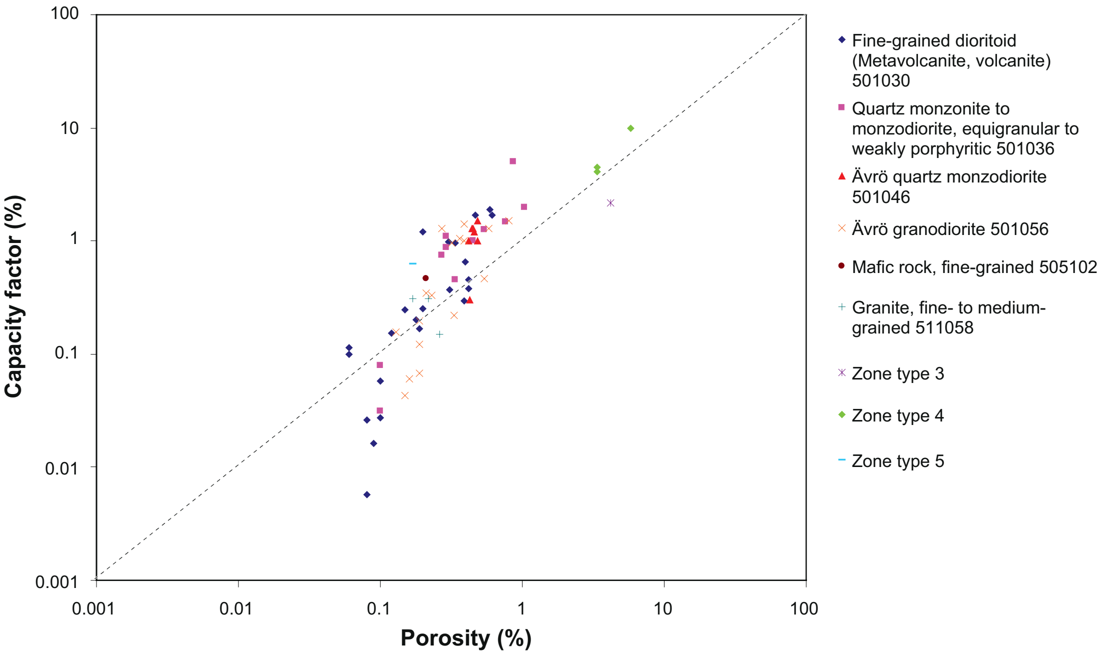


Figure 4-17. *Capacity factor versus porosity for different rock types. The relative uncertainty in individual capacity factors was on average ±22% (Note that this is relative uncertainty!) for a 95% confidence interval. The absolute uncertainty in individual porosity data is ±0.09% for a 95% confidence interval.*

Method uncertainty estimation

The through-diffusion experiments were terminated when a plateau was reached in the time derivative curves. Scatter in data could however have an influence of the decision of termination of an experiment which may cause an "*experiment time uncertainty*". The effect of the duration of a single through-diffusion experiment on the evaluated matrix diffusivity was analysed for one 30 mm sample and one 50 mm thick sample in /Selnert et al. 2008/. It was concluded by the authors that even though some samples may not have reached a true steady state at the termination of the experiment, the experiment time uncertainty is within a few % of the matrix diffusivity.

The *parameter estimation uncertainty* in the modelling of a *particular* through-diffusion sample (at its final experiment time such as that showed in Figure 4-12) is on average only ±4% for the matrix diffusivity and ±22% for the capacity factor (both given with a coverage factor of 2, i.e. for a 95% confidence interval). However, the poor correlation between porosity and capacity factor causes a *general method uncertainty* since the evaluated matrix diffusivity differs somewhat between the following two cases:

A. Evaluation according to the method description with estimation of two parameters, D_e and α.

B. Alternative evaluation with estimation of one parameter, De, and setting a fixed capacity factor, α=ε, based on the water saturation porosity (considering that ideally α=ε).

Case A is defined in the method description which theoretically implies that the capacity factor is equivalent to the matrix porosity for HTO. Case B is a reasonable alternative evaluation method that results in a slightly changed D_e value for samples with $\alpha/\varepsilon \neq 1$.

The general method uncertainty for the matrix diffusivity was estimated in the following way:

1. The mean and standard deviation of the distribution of log (α/ε) was determined (see Figure 4-19).
2. D_e was calculated according to case A and B above for 4 samples at the –1 s and 4 samples at the +1 s level (the left and right arrows in Figure 4-19).
3. For each sample the relative absolute difference (in %) between D_e from case A and B was calculated. An example is given in Figure 4-18.
4. The mean relative absolute difference in D_e of the eight samples was calculated. The result was ±12%.
5. The general method uncertainty in D_e at ±2 s level can thus be approximated with $2 \times \pm 12 \approx \pm 25\%$ (for a 95% confidence interval).

Since the general method uncertainty dominates over the parameter estimation uncertainty and experiment time uncertainty in matrix diffusivity, it is equivalent to a *general combined method uncertainty* that includes the parameter estimation uncertainty and experiment time uncertainty. The *general combined method uncertainty* in matrix diffusivity is on average approximately ±25% (coverage factor of 2) and should be applied for any particular matrix diffusivity table data.

It should be noted that the general method uncertainty varies between samples and that it can be calculated for each sample. However, Sicada data base does not contain uncertainty information for specific samples and accordingly the general combined method uncertainty of ±25% should be used for individual matrix diffusivity data in Sicada.

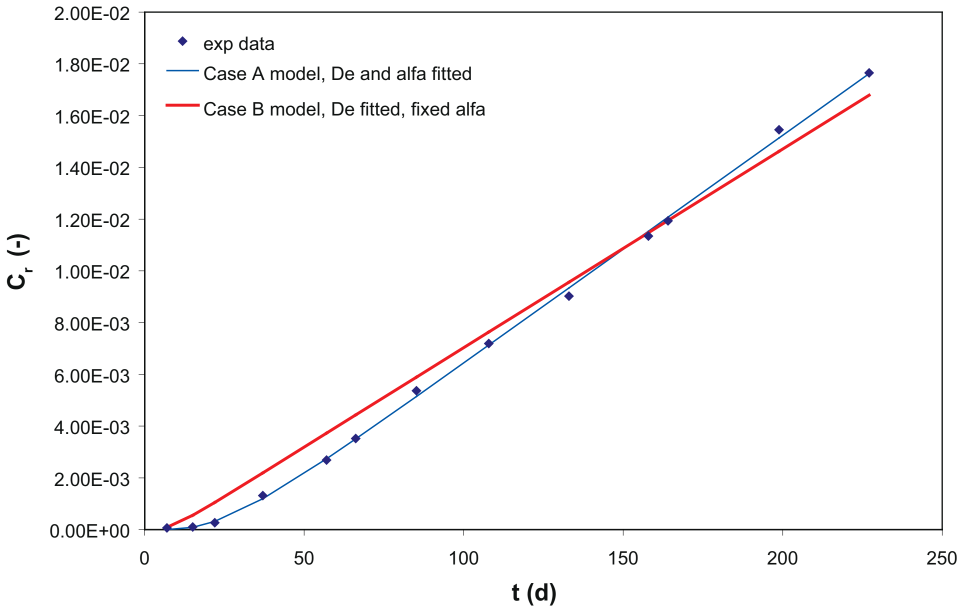


Figure 4-18. *Example of the evaluation for Case A and B for sample KLX02 235.08–235.11 m, 30 mm thickness. Case A: D_e = 6.80E-13 m^2/s, α=1.42%. Case B: D_e = 5.93E-13 m^2/s, α=ε=0.39% (fixed). The relative difference, $(D_{e,A} - D_{e,B})/D_{e,A}$, was 12.8% for this sample.*

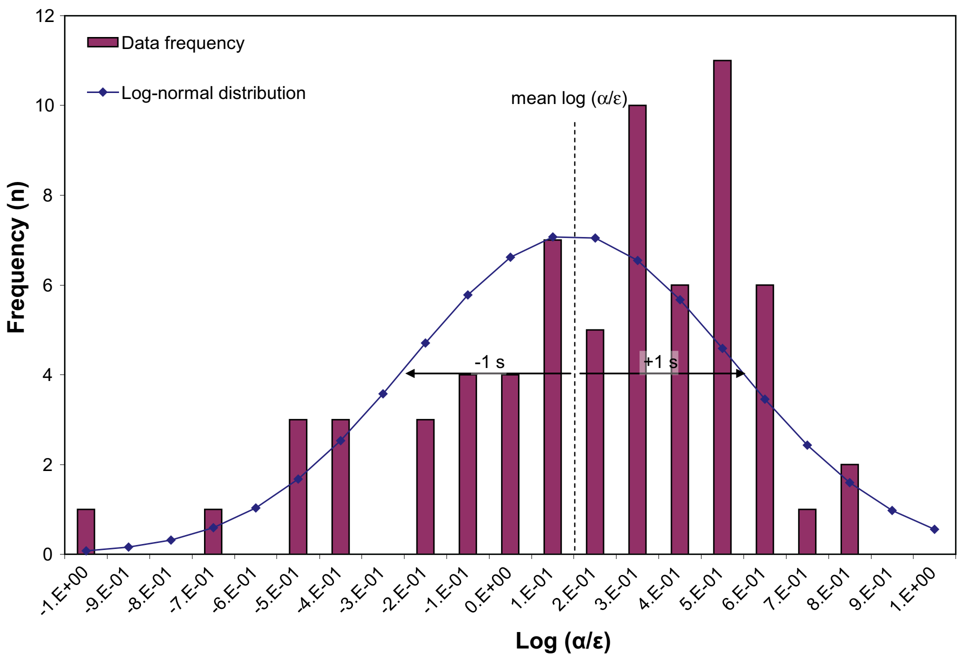


Figure 4-19. *Frequency of the logarithmic capacity factor-porosity ratio (log(α/ε)).*

4.4.2 Resistivity and Formation factor

Resistivity data for calculation of the formation factor and effective diffusivity is reported in 5 separate reports. However, a brief summary of the results is presented in Table 4-4 and in the text below. Data from the resistivity measurements are reported by one or several boreholes, not by rock types. Presentation of data for different rock types is given in the Retardation model /Selnert et al. 2009/.

Resistivity measurements have been made on 167 rock core samples in five campaigns. In the first and second campaign, samples were taken each 20 m throughout the whole borehole, in boreholes KSH01, KSH02 and KLX02. These rock samples therefore comprise both fresh and altered rock. Nevertheless, the rock types in KSH02 and KLX02 are fairly uniform and consist of mainly dioritoid (KSH02) and Ävrö granite (KLX02). The obtained formation factor ranged from 1.3E-6 to 9.0E-4 and from 2.2E-7 to 8.4E-4, respectively. The formation factors appear to be distributed according to the log-normal distribution.

The third campaign comprised samples from KLX04 sampled in the same ways as described above but between about 300 to 700 metres (borehole length). The resistivity values showed a rather large spread. A few of the samples had very high resistivity and consequently low formation factor. Most of these samples consisted of dark dioritoid. The samples with the lowest resistivity contained sealed fractures.

The last two campaigns were performed as complementary measurements with the purpose to include further rock types, rock samples that represented the focused area, rock samples that had undergone through-diffusion measurements and pairs of altered/unaltered rock samples. The resistivity values showed a rather large spread. A positive correlation can be seen between the resistivity of the samples and the induced polarisation, indicating current flow in thin membrane pores for the high resistivity samples.

Table 4-4. Summary of the SKB P-reports for laboratory resistivity measurements, the number of rock samples as well as median values of laboratory formation factors.

SKB report	Boreholes	No of samples	Formation factor (F_f)
P-05-19	KLX02	27	1.36E-4
P-05-27	KSH01, KSH02	78	1)
P-05-75	KSH02, KLX04	27	7.67E-5
P-06-289	KSH01, KSH02, KLX02, KLX04 and KLX11A	45	9.05E-5
P-07-203	KLX03, KLX04, KLX05, KLX10, KLX12A and KLX13A	17	4.03E-5

1) No information.

4.5 Sorption investigations

4.5.1 BET

A numerical representation of the complete results of the BET measurements is given in Appendix 3 and a summary of the results is given in Table 4-5. Some general observations can be made from the investigations:

- Samples from crushed fresh rock types show that values <0.05 m^2/g are obtained for the 2–4 mm size fraction and <0.57 m^2/g for the 0.063–0.125 mm size fraction. It is always observed that the BET surface area increased with decreasing particle size which supports the hypothesis that the crushing process creates surfaces not representative of intact rock. This hypothesis is also supported by the relatively few numbers of measurements of non-crushed drill cores (Figure 4-20) which give results in good agreement with their corresponding 2–4 mm size fraction. An exception to this is the measurements of the 501036 entire drill core which indicates much lower BET surface compared to the 2–4 mm size fraction.
- Extrapolations according to the outer/inner surface concept (Equation 3-6) yield inner BET surface area values close to the ones measured for the 2–4 mm size fraction (Figure 4-21). However, for some samples, large uncertainties are obtained in the extrapolation concept and no inner surface area can be verified (only a "lower than" value is given for these cases).
- A very large increase in BET surface is observed for the rock material sampled from the fractures (which opposite to the samples from the fresh rock types has not undergone any crushing process). Samples in the <0.125 and 0.063–0.125 mm size fractions (Figure 4-22) gives values in the range of 0.58–33 m^2/g are obtained, which is significantly higher than the corresponding range of values for crushed matrix rock in the similar size fraction, 0.04–1.8 m^2/g. A summary and a comparison of the results from the smallest size fractions are presented in Figure 4-22.

Table 4-5. Results of the BET surface area measurements, mean values and standard deviation (1σ) for the major rock types and the different measurement methods.

Rock Type (SKB code)	0.063–0.125 mm size fraction (number of samples)	2–4 mm size fraction (number of samples)	Extrapolation according to Equation 4-1 (number of samples)	Entire drill core (number of samples)
501030	0.57±0.27 (16)	0.048±0.032 (17)	0.035±0.025 (8)	No measurements
501036	0.48±0.30 (20)	0.036±0.028 (20)	0.022±0.022 (10)	0.017 (1)
501046	0.38±0.12 (10)	0.043±0.017 (10)	0.032±0.016 (5)	0.006±0.002 (3)
501056	0.25±0.14 (15)	0.033±0.022 (14)	0.026±0.019 (5)	0.018–0.022 (2)

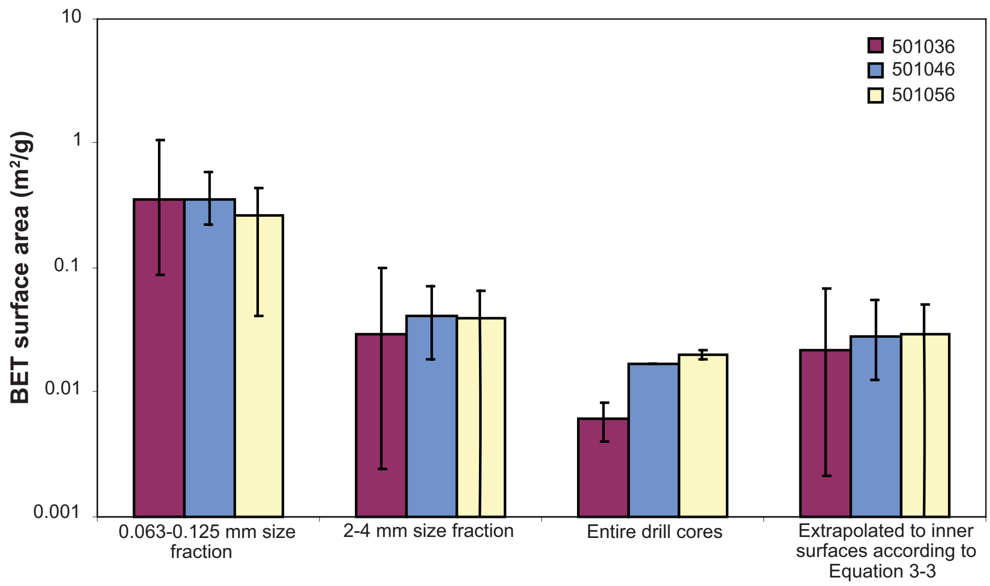
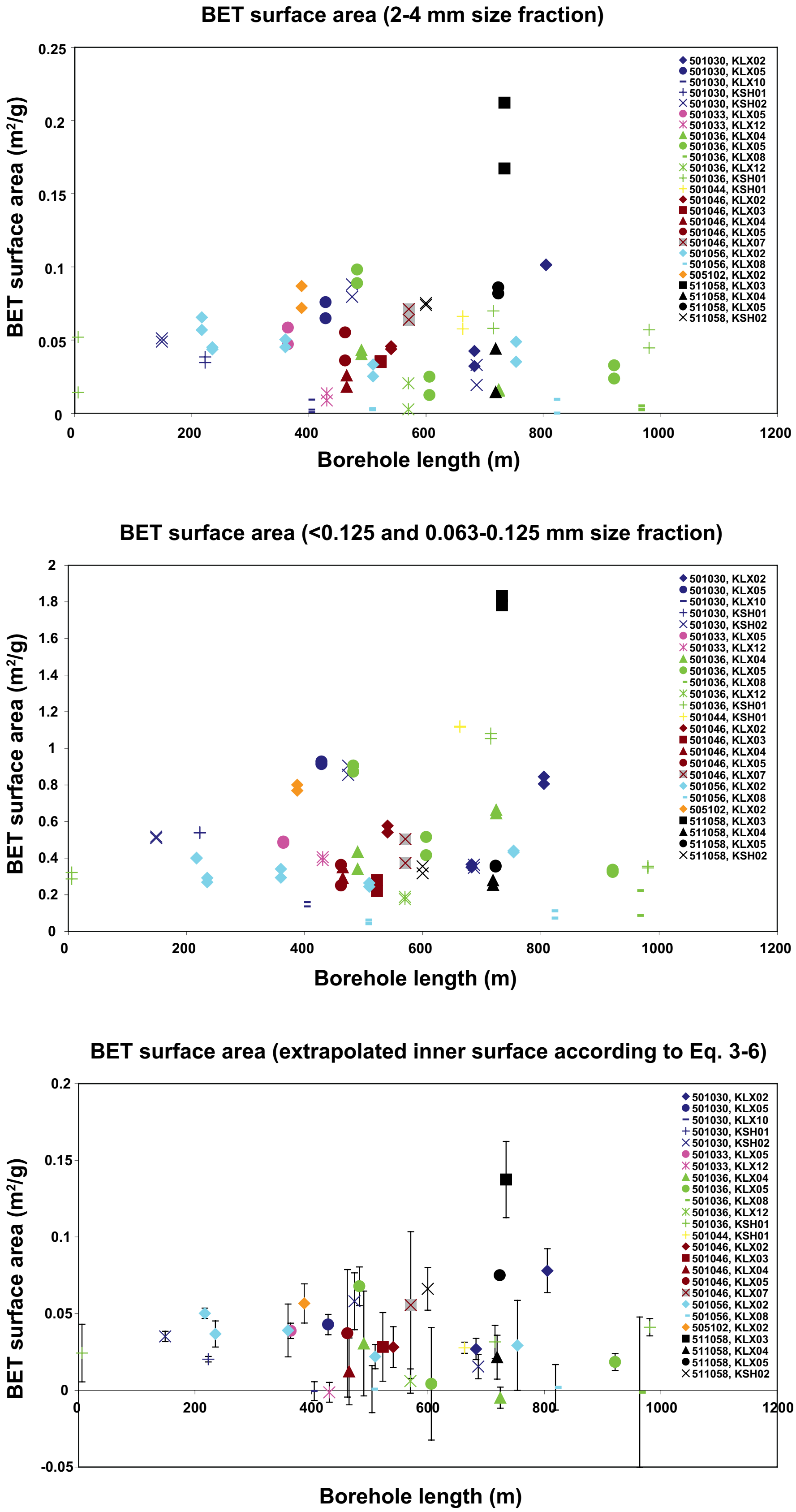


***Figure 4-20.** Comparison between the results of BET surface area measurement of the major rock type of the Oskarshamn site investigation area. The presented values refer to the average values and the error bars refer to the standard deviation.*



Figures 4-21. *Results for the BET surface are measurements for the crushed rock samples, large (top) and small (middle) size fraction combined with the results for the extrapolation (bottom).*

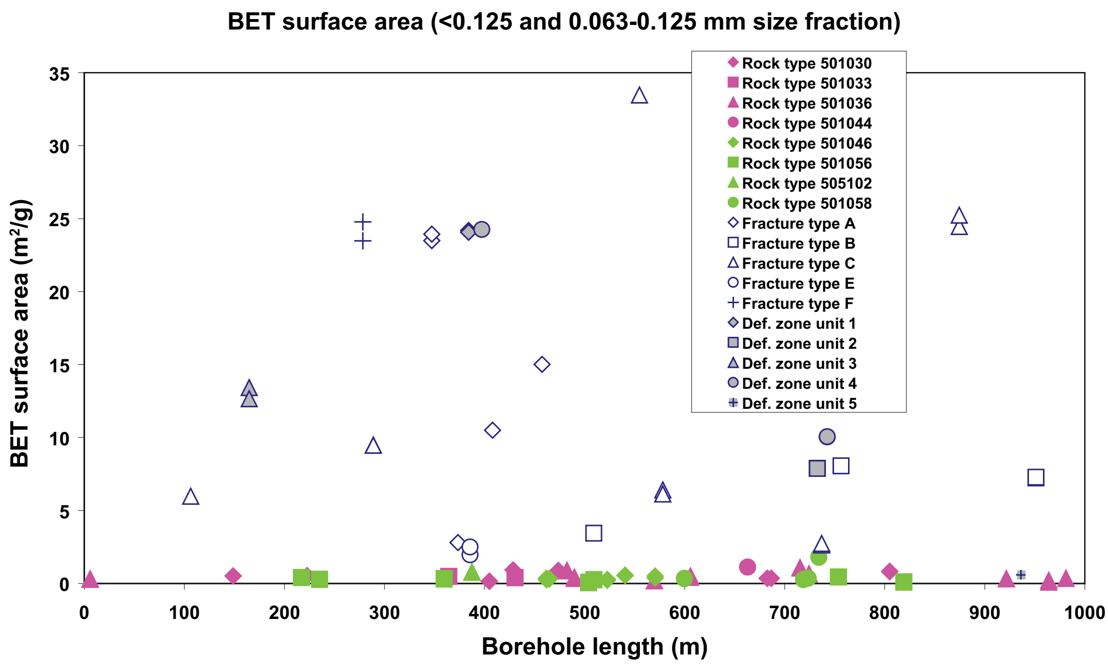


***Figure 4-22.** Results of the BET surface area measurement for the fracture and deformation zone unit material given in comparison to the different non-altered rock type.*

The number of BET surface measurements is rather low and a meaningful mean value can only be given for the fresh and non-altered major rock types, cf. Table 4-5.

A relatively large spreading in the results for the crushed rock material can be observed. Given the results of the fracture material, a plausible explanation to the strong variation could be heterogeneous distribution of small amounts of altered material in the samples.

4.5.2 CEC measurements

As a general comment to the results of the Cation Exchange Capacities (CEC) measurements, it must be mentioned that the method applied in this work (cf Section 3.5.2) is comparatively insensitive for employment on the low CEC:s most often associated with crystalline rock. The implication of a low CEC is that a very low amount of the Mg^{2+} is lost from the aqueous solution and it becomes difficult to statistically verify such a small loss. It has been reported (Karin Lindholm, Analytica AB, pers. comm.) that the precision in the Mg^{2+} is 5% which causes the most results for the unaltered rock samples to be below the detection limit or associated with considerable uncertainty.

The fracture and deformation unit samples show higher CEC, but the results are, nevertheless, also associated with rather high uncertainty. The reason for this is that a general shortage of the availability of this material made it necessary in the CEC measurements to use less amount of material than the 10 g stipulated by the method.

Data from the CEC measurements are to be found in Appendix 4. Some preliminary conclusions can be made from the data (Table 4-6 and Figure 4-23):

- CEC can be found in the range of 0.9–2.3 cmoles/kg for the crushed major rock types and in the range of 4–40 for the rock materials associated with the fractures and deformation zone units.
- The agreement between the CEC and the amount of desorbed cations is rather bad which indicates difficulties of applying the method to this rock material of rather low CEC. Generally, the results give much lower CEC compared to the amount of extracted cations which could be an indication that mineral dissolution is taking place during the step of contact to the Ba solution.
- Comparisons of the BET surface area to the CEC (Figure 4-23) indicate some correlation, although far from perfect.

Table 4-6. Results from the CEC measurements.

		Borehole	length (m)	CEC (cmoles/kg)	Exchangeable cations (cmoles/kg) min	max	BET (m²/g)
Unaltered rock							
Rock type	Fraction						
501030	0.063–0.125 mm	KLX02	682.70	2.3±1.4	14	16	0.36±0.02
	1–2 mm	KLX02	682.70	1.0±0.6	0.001	3.5	0.037±0.014
501036	0.063–0.125 mm	KLX04	489.85	2.2±0.9	0.9	3.6	0.39±0.13
	0.063–0.125 mm	KLX05	482.30	2.3±1.8	3.4	10.8	0.89±0.05
	1–2 mm	KLX04	489.85	1.0±0.7	0.003	3.4	0.042±0.004
501046	0.063–0.125 mm	KLX03	522.61	2.1±1.4	0.04	3.5	0.25±0.09
	1–2 mm	KLX03	522.61	0.9±0.7	0.02	3.5	0.035±0.008
501056	0.063–0.125 mm	KLX02	217.00	<2.5	21	30	0.40±0.01
	1–2 mm	KLX02	217.00	<1.0	8.4	10.4	0.061±0.012
Altered rock and fracture material							
	Fraction						
Def. zone unit 2	<0.125 mm	KLX03	732.59	13±2	24	24	7.89±0.02
Fracture type A	<0.125 mm	KLX13A	373.35	40±13	69	79	2.8
Fracture type C	1–2 mm	KLX10	106.38	4±1	5	6	1.8±0.2
	1–2 mm	KLX13A	554.89	15±1	20	21	19
	<0.125 mm	KLX10	106.38	12±4	23	31	6
	<0.125 mm	KLX13A	554.89	24±4	28	28	25

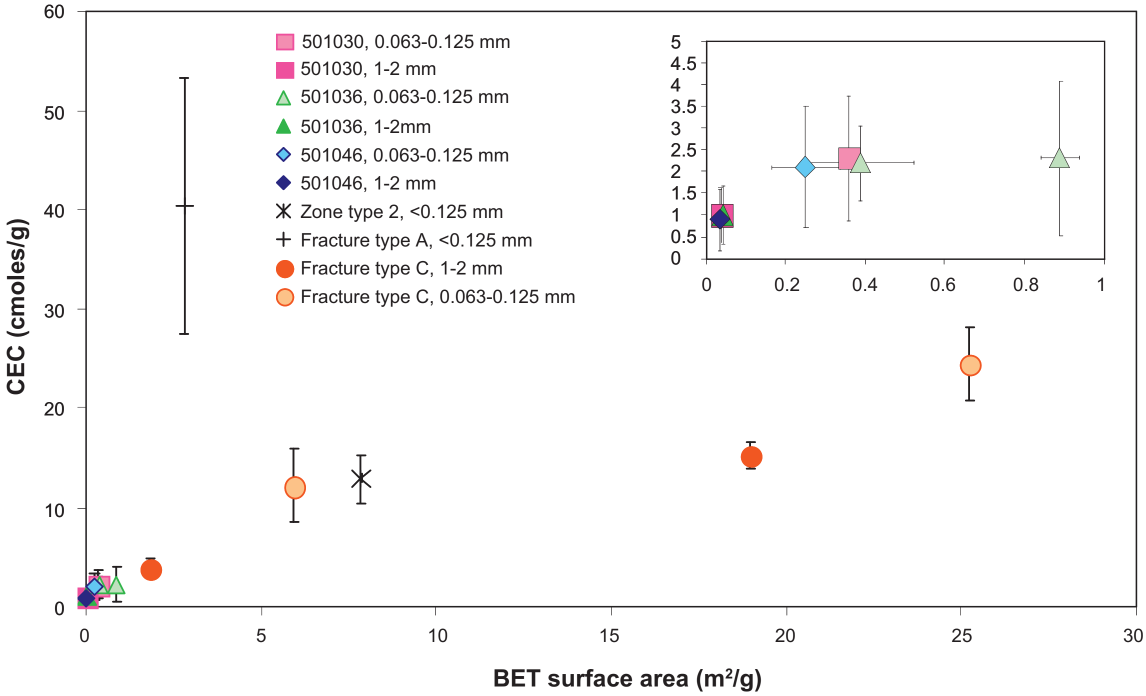


Figure 4-23. Comparisons of the CEC versus the BET surface area. An expansion of the lower part of the figure is given in the upper right corner of the figure.

4.5.3 Batch sorption experiments

Some results from the batch sorption experiment are exemplified in this section (Figure 4-24 to 4-26). The major part of the results is found in Appendix 5. Some general observations can be made from the material:

- As expected, a strong increase of the sorption with decreasing ionic strength of the groundwater can be observed for the cations presumably dominated by a cation exchange sorption mechanism, i.e. Cs^+, Sr^{2+} and Ra^{2+}. Sr^{2+} is by far the weakest sorbing tracer and a concentration decrease in the water phase can, for several cases, only be statistically verified for the fresh groundwater. There is no or very little influence of the ionic strength on the adsorption of trivalent cations (i.e. Am(III) and Eu(III)) while Ni(II) seems to be an intermediate; i.e. some influence of the ionic strength but not as much as for Cs^+, Sr^{2+} and Ra^{2+}.
- The interpretation of the sorption results for crushed rock using the outer/inner surface model (cf. Section 3.5.1) results in varying agreement. Furthermore, for several interpretations the evaluation of the intercept yields no or even negative value; i.e. a negative K_d is obtained. It is obvious that the contribution of inner surfaces (according to the conceptual model used, representative for the intact rock) in the adsorption is low compared to the contribution of the outer surfaces (obtained in the crushing process and thus non-representative for the intact rock).
- Concerning the potentially redox sensitive tracers (e.g. U and Np), it is indicated that a strong sorption is obtained in the 0.063–0.125 mm size fraction, an increased sorption that cannot be explained by the increased BET-surface for this size fraction. A possible explanation to this is that minerals possible to be involved in a reduction reaction of these tracers (e.g. $U(VI)O_2^{2+} \rightarrow U(IV)(OH)_x^{(4-x)+}$ and $Np(V)O_2^{+} \rightarrow Np(IV)(OH)_x^{(4-x)+}$) could be enriched in the smaller size fraction. These tetravalent species are known to be strongly sorbed and a faster reduction rate would thus lead to an increased sorption in the smaller size fraction.
- The time dependence of the sorption has been studied by performing samplings at different tracer contact times, i.e. 1 day, 1 week, 1 month, 3 months and 6 months. One should be aware of the fact that full diffusion equilibrium may not have been reached, especially not for the most strongly sorbing tracers. For different practical reasons, it has been considered unrealistic to ensure full diffusion equilibrium. This can be illustrated by an approximate calculation; applying the numbers D_e= 5E13 m^2/s, K_d=0.1 m^3/kg, ρ=2,700 kg/m^3, ε=0.002, the theoretically estimated time for obtaining a diffusion equilibrium of r=0.75E-3 m (average radius of the largest size fraction used) can be calculated according to:

$$t = \frac{r^2}{D_e / (\varepsilon + K_d \cdot \rho)} \qquad \text{(Equation 4-1)}$$

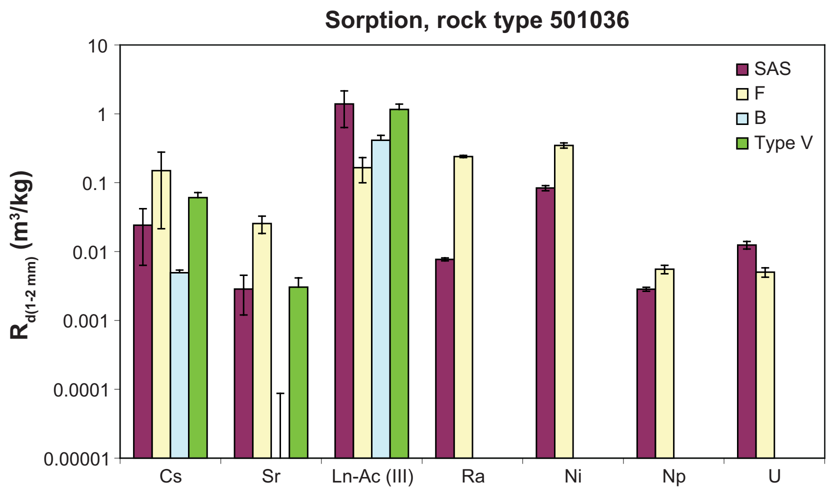


Figure 4-24. Illustration of the sorption measured in the 1–2 mm size fraction of the 501036 rock type. The median values are given together with error bars representing standard deviation of the measurements. The different groundwater types used are saline Forsmark groundwater (SaF), fresh groundwater (F), brine groundwater (B) and the intermediate salinity groundwater of Laxemar (V).

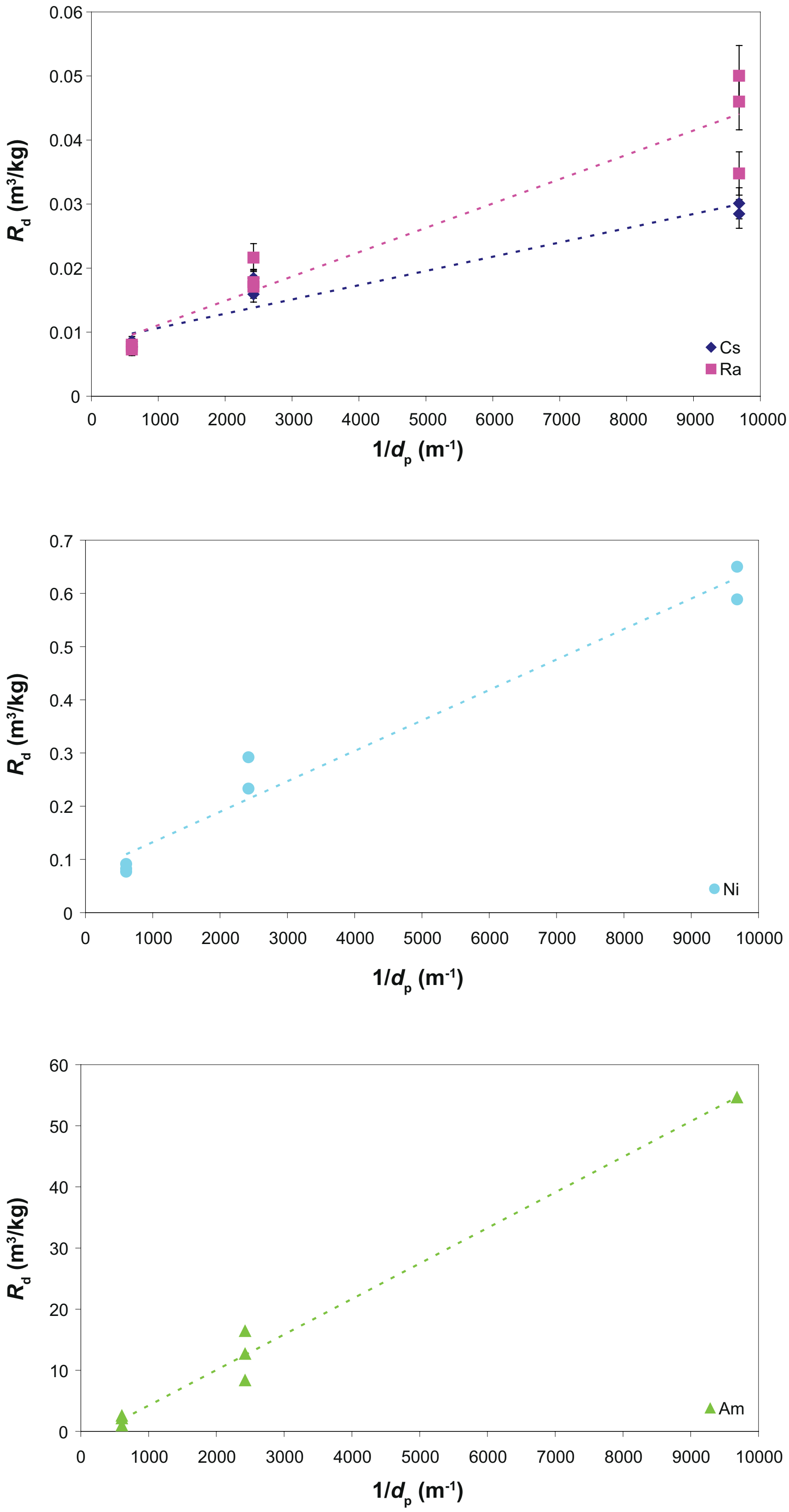


Figure 4-25. *Illustration of the results of the extrapolation according to the inner-outer surface model (Equation 3-7) for Cs and Ra (top), Ni (middle) and Am (bottom) for the sorption studies using saline Simpevarp groundwater and 501036 rock type from KLX05 482.30 mbl.*

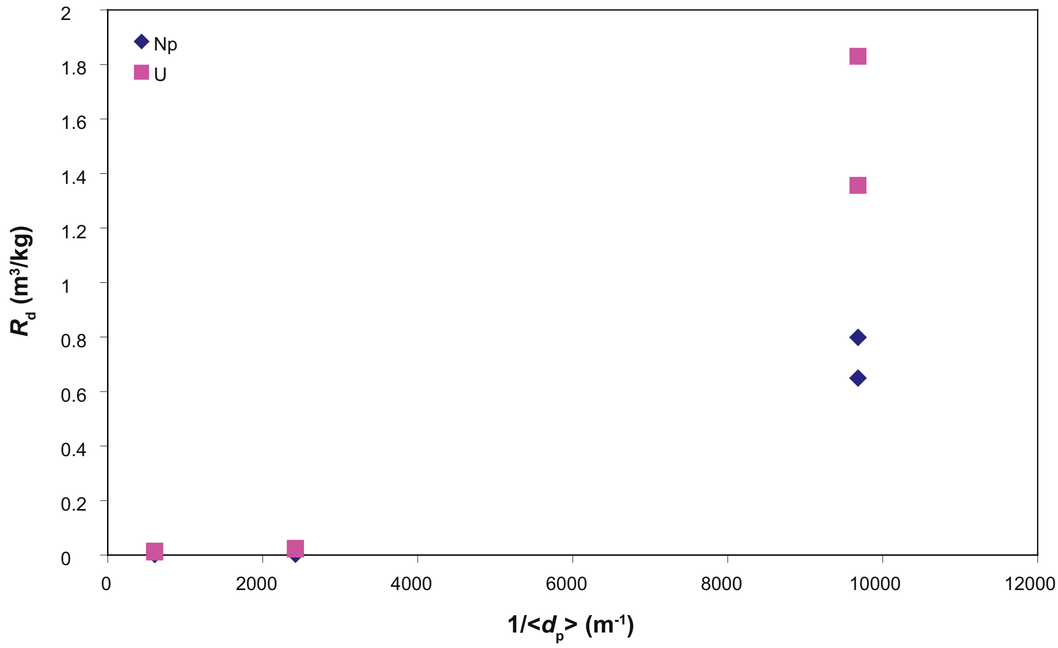


Figure 4-26. *Illustration of the results of sorption of the redox sensitive U and Np, using saline Simpevarp groundwater and 501036 rock type from KLX05 482,30 mbl. It is obvious that the sorption in the smallest size fraction is far higher than what can be explained by increased amounts of surfaces due to the crushing process.*

This results in a necessary contact time of approximately 10 years, indeed an unrealistic time perspective fort a batch experiment. Furthermore, it has been argued that long contact time in the batch sorption experiments may result in degradation and weathering of the rock material, which also may give erroneous sorption coefficients.

From the discussion above it can therefore be concluded that the present sorption coefficients should more be regarded from a comparative perspective, i.e. identification of strongly and less strongly sorbing rock material/groundwater combinations. For the application of these values in e.g. performance assessment calculation, the limitations mentioned should be regarded.

4.6 Nonconformities

4.6.1 General

The outline for the laboratory work is clearly documented in the laboratory strategy /Byegård et al. 2003/. However it has not always been possible to perform the work as intended. Some deviations to the strategy are listed below:

- It has not been possible to include all identified fracture fillings and altered rock types in the laboratory measurements, mainly due to restricted amount of available material but also because of problem with in-cohesive rock samples in e.g. porosity and through-diffusion measurements.

4.6.2 Diffusion measurements

- He-gas through-diffusion measurements, the suggested method for verifying pore connectivity, have not been performed. One reason for this is that no clear indications of restricted pore connectivity have been seen in the porosity measurements of 5 mm to 50 mm rock samples (see Section 4.3.1). Another reason is that the in situ electrical resistivity measurements give similar information.

Nonconformities with respect to method description SKB MD540.001 and Appendix 4.

- According to the method description, matrix diffusivity and matrix porosity are the primary result parameters in the through-diffusion method. The term "rock capacity factor" was used for data delivery to Sicada instead of "matrix porosity" in order to distinguish matrix porosities determined by water saturation measurements from matrix porosity theoretically equivalent to the rock capacity factor.
- The interruption criteria with 2% increase over 4 weeks for stop of the experiment given in Appendix B4.4 was difficult to use in reality due to data scattering of the derivative plot. Instead, enough experimental time was allowed to follow the derivative plot to a constant value over several months.

Nonconformities in experimental boundary conditions:

- Two samples containing microcracks broke during handling and could not be measured as planned.
- One 5 cm sample was limited by the experimental time available within the project and could only be evaluated as a "> value".
- 21 samples were subject to contamination of HTO on the target side which made evaluation of the capacity factor impossible for those samples. D_e could still be evaluated for all of them, however with an expanded uncertainty in five cases and as a "< value" in one case. The contamination was of two types (exemplified in Figures in /Selnert et al. 2008/):
  - o initial contamination of the groundwater from e.g. the glove box atmosphere or,
  - o contamination of the target side water container from earlier measurements. For these diffusion cells, it was obvious that tracer transport occurred into the target volume from another source than the injection volume. A reasonable explanation is that a cell container (mounted on each side of the rock sample to contain the water) previously used on the start side was re-used on the target side. A small absorption of high-concentration tracer containing water may have occurred on the start side. When re-used to the target side (with 50% probability) the container will act as a source of the now out-diffusing tracer that decreases in strength with time.

4.6.3 Sorption measurements

- CEC measurements were originally /Byegård et al. 2003/ identified as a rather important method for obtaining a general sorption capacity of the rock material and therefore acting as a bridge between the batch sorption methods and a related method obtainable in a standardized form (ISO 13536). However, it was soon realized that the CEC methods were mainly aimed for soil investigations and therefore not likely to be sensitive enough for rock material with much lower CEC-values than soil. The CEC method was therefore instead decided to be used as a comparative method only applied on a very limited number of rock material.
- A significant loss of trivalent cations (Eu/Am) was observed already for the blank samples (i.e. samples with natural groundwater spiked with tracer, but without any solid phase). Actually, in most cases the loss of tracer in the blank samples is as high (and in some cases even higher) as in the samples with rock material. The method description stipulates that for the evaluation of the experiments, only the concentration decrease above the simultaneous loss in the blank samples should be attributed as the adsorption on the rock surfaces, whereas all other loss should be considered as adsorption on the test tube walls. Having high losses in the blank samples, very low adsorption is thus obtained and hence, very low adsorption coefficients are obtained.

However, the method description for batch sorption experiments (SKB MD 540.002) also stipulates that a separate investigation should be performed in the case of more than 10% loss of the tracer in the water phase. In the investigation performed in this case, it was suggested during some preliminary discussions that the present evaluation probably gave a significant overestimation of the adsorption on the test tube walls. It was therefore decided to make alternative measurements for some samples where extraction of rock phase and the water phase was performed, followed by γ-spectrometric quantification of the tracer content for both phases separately. From the results of these measurements it became obvious that for the batches including rock material, the tracer content associated with the test tube walls was negligible compared to the tracer content of the rock surfaces. It was therefore decided in the evaluation of the sorption of the Am/Eu to instead use the tracer concentration in the acidified blank sample also included in the investigation.

5 Summary and conclusions

The laboratory measurements for the Transport properties of the rock in Oskarshamn were initiated already in 2003 and belong to the most time consuming activities in the entire investigation programme. Due to the long experimental time needed for several of the methods involved, it was necessary to begin at an early stage and an effect of this is that the majority of the rock samples originate from the first six drill sites; i.e. KSH01–KSH03 and KLX02–KLX04 (Figure 1-1). Supplementary rock sampling during the later stage of the site investigations for addition of new boreholes has been limited due to the long experiment time, accessibility in the laboratories as well as the prioritisation of resources. The representativeness of the samples regarding areal distribution might not be optimal for the Oskarshamn site in general and for the target area in particular. However, from a rock material point of view (rock types, fracture types etc.) and the strategy document /Byegård et al. 2003/, the sample collection is considered to be adequate. Thus, it should be noted that the interpretation and analysis of the laboratory results are performed long time after the measurement has started, and together with the improved knowledge of the site this could possibly change the view of the rock samples representativeness.

About 400 rock core samples are included in the laboratory programme. Table 5-1 presents a summary of the total amount of different types of rock samples and their distribution in the various measurements. One rock sample can be involved in several measurements, e.g. BET-, CEC- and batch sorption measurements or through-diffusion and resistivity measurements.

Porosity results from the water saturation measurements show rather homogeneous median values, between 0.16 and 0.40%, for the major rock types. The large spread between minimum and maximum values is supposed to be an effect of the mixture of fresh and altered rock samples within the total sample collection and is further analysed in the Retardation model /Selnert et al. 2009/. Porosity measured with ^{14}C-PMMA displays homogeneous porosity distribution for fresh rock samples but heterogeneous porosity distribution for the altered rock material. Generally, the PMMA method underestimates the water saturation porosity values by 10 to 40%.

Concerning the through-diffusion measurements, although there are some nonconformities regarding experimental boundary conditions, effective diffusivity (D_e) and formation factor (F_f) are obtained for almost all rock samples involved. Data shows relatively small differences between the different rock types. Deviating results, i.e. higher D_e, were discovered from altered rock of type 3 and 4. Formation factors are also obtained by using electric resistivity measurements. The resistivity values show a rather large spread. This is probably due to the mix of altered and fresh rock samples as well as the fact that the recorded data contains several different rock types.

A slight modification has been made for the method description for batch sorption (cf Section 4.6.3), i.e. for the strongly sorbing trivalent tracers Am and Eu, acidified blank samples are used as reference samples. Some complementary investigations addressing experiments (BET surface area measurements and batch sorption experiments) using intact drill cores have also been performed.

The results from the sorption investigations indicate that rock material which is associated with fracture and/or alteration also shows increased sorption capacity (BET surface area and cation exchange capacity). Concerning the batch sorption experiments, one can, as expected, for the presumed cation exchange sorption sorbing tracers (e.g. Cs^{+}, Sr^{2+} and Ra^{2+}) observe a decreased sorption with increasing ionic strength. For the presumably surface complexation sorbing tracers (e.g. Ni(II), Am(III)/Eu(III)) there is not an obvious trend of influence of the ionic strength on the sorption. The redox sensitive tracers (e.g. Np and U) are sorbed to a comparatively high extent in the 0.063–0.125 mm size fraction, an increased sorption, indicating that minerals possible to be involved in a reduction could be enriched in the smaller size fraction.

Table 5-1. Rock sample distribution for the different measurements within the laboratory programme and their division into fresh and altered rock types as well as fracture fillings.

Method	Tracer	Fresh rock samples[1)]	Altered rock samples[2)]	Fracture minerals
Porosity (water saturation)		295	38	-
^{14}C-PMMA		6	10	(2) [3)]
Through-diffusion	HTO	76	14	-
Electrical resistivity		173	21	
BET		69	18	6
CEC		5	1	3
Batch sorption		10	5	7
Level A***	Sr, Cs, Am, Ra, Ni, Th, Np and U	2	2	-
Level B***	Sr, Cs and Am or Eu	8	3	7

1) Includes samples with faint to weak oxidation as well as samples with microfractures.
2) Rock samples with medium to strong oxidation in addition to altered rock segments within deformation zones.
3) Generally, porosity determinations were not possible to perform with satisfying results due to limited sample thickness and/or to the fact that the samples were not consolidated. Nevertheless, studies of alteration near an open fracture gave indication of porosity for Fracture type G and studies of altered rock samples with sealed networks gave information of two different phases of fracture minerals.

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Appendix 1

Porosity

Appendix 1 contains porosity data presented per drill-site. The uncertainty of a single reported porosity value is 0.09%. given with a coverage factor of 2.

Table A1-1. Porosity data for drill site 1 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KSH01	19.96	19.99	–14.36	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.47
KSH01	39.59	39.62	–33.69	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.10
KSH01	59.12	59.15	–52.86	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.08
KSH01	76.65	76.68	–70.01	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.12
KSH01	99.71	99.74	–92.46	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.08
KSH01	121.41	121.44	–113.53	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.08
KSH01	140.68	140.71	–132.25	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.34
KSH01	160.72	160.75	–151.74	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.10
KSH01	181.47	181.50	–171.90	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.13
KSH01	200.11	200.14	–190.02	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.08
KSH01	219.36	219.39	–208.73	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.08
KSH01	222.72	222.73	–212.00	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.15
KSH01	222.73	222.76	–212.01	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.08
KSH01	239.96	239.99	–228.77	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.19
KSH01	261.08	261.11	–249.29	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	1.59
KSH01	280.23	280.26	–267.91	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.45
KSH01	295.41	295.44	–282.66	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.13
KSH01	317.78	317.81	–304.39	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.08
KSH01	340.88	340.91	–326.84	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.08
KSH01	362.55	362.58	–347.89	Granite. fine- to medium-grained	511058	0.12
KSH01	378.98	379.01	–363.82	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.08
KSH01	398.75	398.78	–382.99	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.13
KSH01	420.78	420.81	–404.33	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.41
KSH01	440.23	440.26	–423.18	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.75

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KSH01	460.01	460.04	–442.34	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.20
KSH01	478.21	478.24	–459.97	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.07
KSH01	500.31	500.34	–481.39	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.24
KSH01	520.76	520.79	–501.21	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.15
KSH01	539.01	539.04	–518.90	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.10
KSH01	559.91	559.94	–539.17	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.07
KSH01	580.88	580.91	–559.49	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.13
KSH01	598.66	598.69	–576.73	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.13
KSH01	620.23	620.26	–597.62	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.41
KSH01	640.56	640.59	–617.32	Granite to quartz monzodiorite. generally porphyritic	501044	0.17
KSH01	661.07	661.10	–637.19	Granite to quartz monzodiorite. generally porphyritic	501044	0.12
KSH01	680.21	680.24	–655.71	Granite. fine- to medium-grained	511058	0.05
KSH01	699.01	699.04	–673.88	Pegmatite	501061	0.02
KSH01	720.25	720.28	–694.38	Granite. fine- to medium-grained	511058	0.20
KSH01	760.76	760.79	–733.39	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.12
KSH01	779.20	779.23	–751.12	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.19
KSH01	800.41	800.44	–771.48	Granite to quartz monzodiorite. generally porphyritic	501044	0.58
KSH01	820.09	820.12	–790.35	Granite to quartz monzodiorite. generally porphyritic	501044	0.47
KSH01	840.71	840.74	–810.07	Granite to quartz monzodiorite. generally porphyritic	501044	0.35
KSH01	859.16	859.19	–827.67	Granite. fine- to medium-grained	511058	0.30
KSH01	880.51	880.54	–847.98	Granite to quartz monzodiorite. generally porphyritic	501044	0.39
KSH01	891.66	891.67	–858.58	Granite to quartz monzodiorite. generally porphyritic	501044	0.58
KSH01	891.67	891.68	–858.58	Granite to quartz monzodiorite. generally porphyritic	501044	0.54
KSH01	891.69	891.72	–858.60	Granite to quartz monzodiorite. generally porphyritic	501044	0.45
KSH01	891.72	891.77	–858.63	Granite to quartz monzodiorite. generally porphyritic	501044	0.43
KSH01	891.77	891.78	–858.68	Granite to quartz monzodiorite. generally porphyritic	501044	0.48
KSH01	891.78	891.79	–858.69	Granite to quartz monzodiorite. generally porphyritic	501044	0.60
KSH01	891.80	891.83	–858.71	Granite to quartz monzodiorite. generally porphyritic	501044	0.44
KSH01	891.83	891.88	–858.74	Granite to quartz monzodiorite. generally porphyritic	501044	0.42
KSH01	891.88	891.89	–858.78	Granite to quartz monzodiorite. generally porphyritic	501044	0.48
KSH01	891.89	891.90	–858.79	Granite to quartz monzodiorite. generally porphyritic	501044	0.44

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KSH01	891.91	891.94	–858.81	Granite to quartz monzodiorite. generally porphyritic	501044	0.46
KSH01	898.61	898.64	–865.15	Granite to quartz monzodiorite. generally porphyritic	501044	0.35
KSH01	919.66	919.69	–885.04	Granite to quartz monzodiorite. generally porphyritic	501044	0.24
KSH01	940.81	940.84	–906.19	Granite to quartz monzodiorite. generally porphyritic	501044	0.32
KSH01	960.78	960.81	–923.69	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.35
KSH01	980.41	980.44	–942.07	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.25
KSH01	981.43	981.46	–943.03	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.29
KSH01	981.46	981.49	–943.06	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.29
KSH01	981.50	981.53	–943.10	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.27
KSH01	999.46	999.49	–959.82	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.22

Table A1-2. Porosity data for drill site 2 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KSH02	19.96	19.99	–14.41	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.05
KSH02	39.96	39.99	–34.35	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.07
KSH02	60.18	60.21	–54.50	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.20
KSH02	80.01	80.04	–74.28	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.12
KSH02	99.91	99.94	–94.15	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.53
KSH02	119.96	119.99	–114.17	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.10
KSH02	140.16	140.19	–134.33	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.08
KSH02	148.09	148.10	–142.25	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.38
KSH02	148.11	148.12	–142.27	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.15
KSH02	148.12	148.15	–142.28	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.07
KSH02	148.16	148.21	–142.32	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.06
KSH02	148.21	148.22	–142.37	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.00
KSH02	148.23	148.24	–142.39	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.05
KSH02	148.24	148.27	–142.40	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.08
KSH02	148.28	148.33	–142.44	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.02
KSH02	148.34	148.35	–142.50	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.05

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KSH02	148.36	148.39	–142.52	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.05
KSH02	148.39	148.44	–142.55	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.03
KSH02	159.96	159.99	–154.10	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.20
KSH02	179.96	179.99	–174.07	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.10
KSH02	219.66	219.69	–213.70	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.12
KSH02	239.96	239.99	–233.97	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.07
KSH02	259.83	259.86	–253.80	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.05
KSH02	280.01	280.04	–273.94	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.07
KSH02	299.95	299.98	–293.84	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.34
KSH02	339.94	339.97	–333.75	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.10
KSH02	360.06	360.09	–353.84	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.68
KSH02	397.42	397.45	–391.03	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	1.32
KSH02	397.45	397.48	–391.06	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	1.41
KSH02	397.58	397.61	–391.16	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	3.35
KSH02	397.61	397.64	–391.19	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	3.35
KSH02	419.96	419.99	–413.63	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.84
KSH02	459.69	459.72	–453.30	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.27
KSH02	474.46	474.47	–468.04	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.61
KSH02	474.47	474.48	–468.05	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.40
KSH02	474.56	474.59	–468.14	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.42
KSH02	474.60	474.65	–468.18	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.10
KSH02	474.65	474.66	–468.23	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.30
KSH02	474.66	474.67	–468.24	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.20
KSH02	474.68	474.71	–468.26	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.20
KSH02	474.71	474.76	–468.29	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.31
KSH02	474.77	474.78	–468.35	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.59
KSH02	474.78	474.79	–468.36	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.47
KSH02	474.80	474.83	–468.38	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.18
KSH02	474.86	474.91	–468.44	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.42
KSH02	480.01	480.04	–473.58	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.19

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KSH02	500.01	500.04	–493.55	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	1.33
KSH02	539.86	539.89	–533.33	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.20
KSH02	560.06	560.09	–553.49	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.21
KSH02	580.11	580.14	–573.50	Granite. fine- to medium-grained	511058	0.07
KSH02	599.35	599.36	–592.70	Granite. fine- to medium-grained	511058	0.32
KSH02	599.36	599.37	–592.71	Granite. fine- to medium-grained	511058	0.28
KSH02	599.37	599.40	–592.72	Granite. fine- to medium-grained	511058	0.19
KSH02	599.41	599.46	–592.76	Granite. fine- to medium-grained	511058	0.20
KSH02	599.46	599.47	–592.81	Granite. fine- to medium-grained	511058	0.23
KSH02	599.47	599.48	–592.82	Granite. fine- to medium-grained	511058	0.26
KSH02	599.48	599.51	–592.83	Granite. fine- to medium-grained	511058	0.19
KSH02	599.52	599.57	–592.87	Granite. fine- to medium-grained	511058	0.24
KSH02	599.57	599.58	–592.92	Granite. fine- to medium-grained	511058	0.40
KSH02	599.58	599.59	–592.93	Granite. fine- to medium-grained	511058	0.25
KSH02	599.59	599.62	–592.94	Granite. fine- to medium-grained	511058	0.29
KSH02	599.62	599.67	–592.97	Granite. fine- to medium-grained	511058	0.24
KSH02	600.01	600.04	–593.36	Granite. fine- to medium-grained	511058	0.17
KSH02	639.89	639.92	–633.16	Granite. fine- to medium-grained	511058	0.30
KSH02	660.09	660.12	–653.33	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.09
KSH02	680.16	680.19	–673.36	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.31
KSH02	685.98	685.99	–679.17	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.38
KSH02	685.99	686.00	–679.18	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.25
KSH02	686.00	686.03	–679.19	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.10
KSH02	686.04	686.09	–679.23	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.08
KSH02	686.09	686.10	–679.28	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.19
KSH02	686.10	686.11	–679.29	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.25
KSH02	686.11	686.14	–679.30	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.12
KSH02	686.15	686.20	–679.34	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.04
KSH02	686.20	686.21	–679.39	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.10
KSH02	686.21	686.22	–679.40	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.05

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KSH02	686.22	686.25	–679.41	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.05
KSH02	686.26	686.31	–679.45	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.05
KSH02	700.01	700.04	–693.17	Granite. fine- to medium-grained	511058	0.20
KSH02	720.01	720.04	–713.14	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.10
KSH02	740.01	740.04	–733.10	Granite. fine- to medium-grained	511058	1.15
KSH02	760.17	760.20	–753.23	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.14
KSH02	779.82	779.85	–772.85	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.25
KSH02	819.91	819.94	–812.87	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.42
KSH02	840.01	840.04	–832.93	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.02
KSH02	859.96	859.99	–852.85	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.21
KSH02	880.01	880.04	–872.86	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.15
KSH02	900.01	900.04	–892.83	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.17
KSH02	920.01	920.04	–912.79	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.13
KSH02	940.01	940.04	–932.76	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.13
KSH02	959.96	959.99	–952.67	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.12
KSH02	979.96	979.99	–972.63	Mafic rock. fine-grained	505102	0.20

Table A1-3. Porosity data for drill site 3 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KSH03A	176.63	176.66	–144.66	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.54
KSH03A	176.66	176.67	–144.68	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.87
KSH03A	188.96	188.99	–155.05	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	5.83

Table A1-4. Porosity data for drill site 2 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX02	201.89	201.92	–182.67	Granite to quartz monzodiorite. generally porphyritic	501044	0.30
KLX02	216.69	216.70	–197.41	Granite to quartz monzodiorite. generally porphyritic	501044	0.35
KLX02	216.70	216.71	–197.42	Granite to quartz monzodiorite. generally porphyritic	501044	0.23
KLX02	216.71	216.74	–197.43	Granite to quartz monzodiorite. generally porphyritic	501044	0.13
KLX02	216.74	216.79	–197.46	Granite to quartz monzodiorite. generally porphyritic	501044	0.15
KLX02	216.79	216.80	–197.51	Granite to quartz monzodiorite. generally porphyritic	501044	0.44
KLX02	216.80	216.81	–197.52	Granite to quartz monzodiorite. generally porphyritic	501044	0.28
KLX02	216.81	216.84	–197.53	Granite to quartz monzodiorite. generally porphyritic	501044	0.19
KLX02	216.84	216.89	–197.56	Granite to quartz monzodiorite. generally porphyritic	501044	0.16
KLX02	216.89	216.90	–197.61	Granite to quartz monzodiorite. generally porphyritic	501044	0.43
KLX02	216.91	216.92	–197.63	Granite to quartz monzodiorite. generally porphyritic	501044	0.33
KLX02	216.92	216.95	–197.64	Granite to quartz monzodiorite. generally porphyritic	501044	0.21
KLX02	216.95	217.00	–197.67	Granite to quartz monzodiorite. generally porphyritic	501044	0.19
KLX02	220.11	220.14	–200.82	Granite to quartz monzodiorite. generally porphyritic	501044	0.36
KLX02	235.02	235.05	–215.67	Granite to quartz monzodiorite. generally porphyritic	501044	0.36
KLX02	235.05	235.08	–215.70	Granite to quartz monzodiorite. generally porphyritic	501044	0.39
KLX02	235.08	235.11	–215.73	Granite to quartz monzodiorite. generally porphyritic	501044	0.39
KLX02	239.88	239.91	–220.51	Granite to quartz monzodiorite. generally porphyritic	501044	0.28
KLX02	258.96	258.99	–239.51	Granite to quartz monzodiorite. generally porphyritic	501044	0.23
KLX02	280.01	280.04	–260.48	Granite to quartz monzodiorite. generally porphyritic	501044	0.19
KLX02	299.79	299.82	–280.18	Granite to quartz monzodiorite. generally porphyritic	501044	0.21
KLX02	320.04	320.07	–300.35	Granite to quartz monzodiorite. generally porphyritic	501044	0.13
KLX02	339.95	339.98	–320.17	Granite to quartz monzodiorite. generally porphyritic	501044	0.17
KLX02	387.78	387.81	–367.77	Mafic rock. fine-grained	505102	0.21
KLX02	420.02	420.05	–399.83	Granite to quartz monzodiorite. generally porphyritic	501044	0.25
KLX02	440.21	440.24	–419.90	Granite to quartz monzodiorite. generally porphyritic	501044	0.15
KLX02	459.69	459.72	–439.27	Granite to quartz monzodiorite. generally porphyritic	501044	0.38
KLX02	480.02	480.05	–459.48	Granite to quartz monzodiorite. generally porphyritic	501044	0.40
KLX02	499.95	499.98	–479.28	Granite to quartz monzodiorite. generally porphyritic	501044	0.25

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX02	519.63	519.66	–498.84	Granite to quartz monzodiorite. generally porphyritic	501044	0.21
KLX02	540.03	540.06	–519.10	Granite to quartz monzodiorite. generally porphyritic	501044	0.29
KLX02	560.72	560.75	–539.66	Granite to quartz monzodiorite. generally porphyritic	501044	0.43
KLX02	579.77	579.80	–558.58	Granite to quartz monzodiorite. generally porphyritic	501044	0.30
KLX02	600.19	600.22	–578.86	Granite to quartz monzodiorite. generally porphyritic	501044	0.27
KLX02	620.79	620.82	–599.33	Granite to quartz monzodiorite. generally porphyritic	501044	0.34
KLX02	639.93	639.96	–618.34	Granite to quartz monzodiorite. generally porphyritic	501044	0.42
KLX02	680.83	680.86	–658.95	Granite to quartz monzodiorite. generally porphyritic	501044	0.27
KLX02	682.34	682.37	–660.45	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.06
KLX02	682.37	682.40	–660.48	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.06
KLX02	682.40	682.43	–660.51	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.12
KLX02	700.15	700.18	–678.14	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	1.49
KLX02	754.00	754.03	–731.60	Granite to quartz monzodiorite. generally porphyritic	501044	0.24
KLX02	839.39	839.42	–816.39	Fine-grained dioritoid (Metavolcanite. volcanite)	505102	0.15
KLX02	859.70	859.73	–836.55	Granite to quartz monzodiorite. generally porphyritic	501044	0.42
KLX02	880.95	880.98	–857.65	Granite to quartz monzodiorite. generally porphyritic	501044	1.12
KLX02	898.04	898.07	–874.62	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.04
KLX02	921.15	921.18	–897.56	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.07
KLX02	936.32	936.35	–912.62	Granite to quartz monzodiorite. generally porphyritic	501044	0.52
KLX02	936.44	936.47	–912.74	Granite to quartz monzodiorite. generally porphyritic	501044	0.19
KLX02	936.50	936.53	–912.80	Granite to quartz monzodiorite. generally porphyritic	501044	0.17
KLX02	936.53	936.56	–912.83	Granite to quartz monzodiorite. generally porphyritic	501044	0.15
KLX02	938.42	938.45	–914.71	Granite to quartz monzodiorite. generally porphyritic	501044	0.39
KLX02	959.56	959.59	–935.70	Granite to quartz monzodiorite. generally porphyritic	501044	0.32
KLX02	979.92	979.95	–955.91	Granite to quartz monzodiorite. generally porphyritic	501044	0.41
KLX02	998.20	998.23	–974.05	Granite to quartz monzodiorite. generally porphyritic	501044	0.25

Table A1-5. Porosity data for drill site 3 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX03	355.66	355.69	–325.54	Granite to quartz monzodiorite. generally porphyritic	501044	0.21
KLX03	522.39	522.42	–487.46	Granite to quartz monzodiorite. generally porphyritic	501044	0.05
KLX03	524.52	524.55	–489.54	Granite to quartz monzodiorite. generally porphyritic	501044	0.43
KLX03	590.15	590.18	–553.27	Granite to quartz monzodiorite. generally porphyritic	501044	0.30
KLX03	662.10	662.13	–623.15	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.78
KLX03	662.13	662.16	–623.18	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.76
KLX03	662.16	662.19	–623.21	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	1.03
KLX03	803.05	803.08	–760.18	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.73
KLX03	814.67	814.70	–771.48	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.20
KLX03	894.32	894.35	–848.97	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.26
KLX03	979.42	979.45	–931.78	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.28

Table A1-6. Porosity data for drill site 3 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX04	110.40	110.43	–85.78	Granite to quartz monzodiorite. generally porphyritic	501044	0.24
KLX04	130.55	130.58	–105.82	Granite to quartz monzodiorite. generally porphyritic	501044	0.46
KLX04	149.56	149.59	–124.73	Granite to quartz monzodiorite. generally porphyritic	501044	0.27
KLX04	169.66	169.69	–144.72	Granite. medium- to coarse-grained	501058	0.38
KLX04	190.62	190.65	–165.57	Granite to quartz monzodiorite. generally porphyritic	501044	0.39
KLX04	209.72	209.75	–184.57	Granite to quartz monzodiorite. generally porphyritic	501044	0.36
KLX04	236.78	236.81	–211.48	Granite to quartz monzodiorite. generally porphyritic	501044	0.99
KLX04	256.72	256.75	–231.32	Granite to quartz monzodiorite. generally porphyritic	501044	0.43
KLX04	277.66	277.69	–252.16	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	0.39
KLX04	297.06	297.09	–271.47	Granite to quartz monzodiorite. generally porphyritic	501044	0.89
KLX04	317.19	317.22	–291.51	Granite to quartz monzodiorite. generally porphyritic	501044	0.36
KLX04	337.55	337.58	–311.78	Granite to quartz monzodiorite. generally porphyritic	501044	0.22
KLX04	357.06	357.09	–331.21	Granite to quartz monzodiorite. generally porphyritic	501044	0.36
KLX04	380.78	380.81	–354.82	Granite to quartz monzodiorite. generally porphyritic	501044	0.63

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX04	400.72	400.75	–374.67	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.19
KLX04	419.62	419.65	–393.49	Granite. medium- to coarse-grained	501058	0.76
KLX04	419.95	419.98	–393.82	Granite. medium- to coarse-grained	501058	0.84
KLX04	436.57	436.60	–410.37	Granite to quartz monzodiorite. generally porphyritic	501044	0.21
KLX04	460.09	460.12	–433.79	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.12
KLX04	479.82	479.85	–453.43	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.21
KLX04	489.48	489.49	–463.04	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.32
KLX04	489.49	489.50	–463.05	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.21
KLX04	489.50	489.53	–463.06	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.09
KLX04	489.53	489.58	–463.09	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.19
KLX04	489.60	489.61	–463.16	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.21
KLX04	489.61	489.62	–463.17	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.16
KLX04	489.62	489.65	–463.18	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.15
KLX04	489.65	489.70	–463.21	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.05
KLX04	489.73	489.74	–463.29	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.22
KLX04	489.74	489.75	–463.30	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.31
KLX04	489.75	489.78	–463.31	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.10
KLX04	489.78	489.83	–463.34	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.10
KLX04	499.07	499.10	–472.59	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.08
KLX04	499.70	499.73	–473.22	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.10
KLX04	519.84	519.87	–493.27	Granite. fine- to medium-grained	511058	0.28
KLX04	539.68	539.71	–513.02	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.12
KLX04	559.69	559.72	–532.95	Granite to quartz monzodiorite. generally porphyritic	501044	0.33
KLX04	579.73	579.76	–552.90	Granite to quartz monzodiorite. generally porphyritic	501044	0.43
KLX04	600.37	600.40	–573.45	Granite to quartz monzodiorite. generally porphyritic	501044	0.27
KLX04	620.02	620.05	–593.00	Granite to quartz monzodiorite. generally porphyritic	501044	0.39
KLX04	640.02	640.05	–612.90	Granite to quartz monzodiorite. generally porphyritic	501044	0.29
KLX04	659.81	659.84	–632.59	Granite to quartz monzodiorite. generally porphyritic	501044	0.33
KLX04	680.77	680.80	–653.44	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.09
KLX04	700.20	700.23	–672.76	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.26

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX04	718.21	718.24	–690.67	Granite. fine- to medium-grained	511058	0.22
KLX04	718.24	718.27	–690.70	Granite. fine- to medium-grained	511058	0.22
KLX04	718.27	718.30	–690.73	Granite. fine- to medium-grained	511058	0.22
KLX04	719.37	719.40	–691.82	Granite. fine- to medium-grained	511058	0.26
KLX04	726.07	726.10	–698.48	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.08
KLX04	740.40	740.43	–712.72	Granite to quartz monzodiorite. generally porphyritic	501044	0.25
KLX04	759.83	759.86	–732.03	Granite to quartz monzodiorite. generally porphyritic	501044	0.22
KLX04	780.73	780.76	–752.79	Granite to quartz monzodiorite. generally porphyritic	501044	0.20
KLX04	800.02	800.05	–771.96	Granite to quartz monzodiorite. generally porphyritic	501044	0.15
KLX04	820.90	820.93	–792.70	Granite to quartz monzodiorite. generally porphyritic	501044	0.23
KLX04	840.17	840.20	–811.84	Granite to quartz monzodiorite. generally porphyritic	501044	0.22
KLX04	860.28	860.31	–831.81	Fine-grained diorite-gabbro	505102	0.16
KLX04	880.25	880.28	–851.63	Granite to quartz monzodiorite. generally porphyritic	501044	1.45
KLX04	899.89	899.92	–871.13	Granite to quartz monzodiorite. generally porphyritic	501044	0.41
KLX04	920.40	920.43	–891.48	Granite to quartz monzodiorite. generally porphyritic	501044	0.80
KLX04	939.77	939.80	–910.71	Granite to quartz monzodiorite. generally porphyritic	501044	0.79
KLX04	978.72	978.75	–949.35	Granite to quartz monzodiorite. generally porphyritic	501044	0.33

Table A1-7. Porosity data for drill site 5 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX05	364.02	364.05	–309.53	Diorite to gabbro	501033	0.06
KLX05	435.99	436.02	–362.50	Mafic rock. fine-grained	505102	0.22
KLX05	552.68	552.71	–480.51	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.18
KLX05	722.49	722.52	–633.67	Granite. fine- to medium-grained	511058	0.15

Table A1-8. Porosity data for drill site 6 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX06	246.02	246.05	–204.31	Granite to quartz monzodiorite. generally porphyritic	501044	0.32
KLX06	402.41	402.44	–340.97	Granite. medium- to coarse-grained	501058	4.19
KLX06	639.99	640.02		Mafic rock. fine-grained	505102	0.17

Table A1-9. Porosity data for drill site 7 and 8 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX07A	622.31	622.34	–455.52	Granite to quartz monzodiorite. generally porphyritic	501044	0.63
KLX08	417.05	417.08	–336.02	Granite to quartz monzodiorite. generally porphyritic	501044	0.45

Table A1-10. Porosity data for drill site 10 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX10	159.16	159.19	–139.56	Granite to quartz monzodiorite. generally porphyritic	501044	8.28
KLX10	235.25	235.28	–215.02	Granite. fine- to medium-grained	511058	0.16
KLX10	237.20	237.23	–216.96	Granite. fine- to medium-grained	511058	0.13
KLX10	281.34	281.37	–260.80	Granite. fine- to medium-grained	511058	0.25
KLX10	330.23	330.26	–309.36	Mafic rock. fine-grained	505102	1.15
KLX10	331.46	331.49	–310.58	Mafic rock. fine-grained	505102	0.51
KLX10	577.69	577.72	–555.19	Granite to quartz monzodiorite. generally porphyritic	501044	0.32
KLX10	768.04	768.07	–744.25	Mafic rock. fine-grained	505102	0.11
KLX10	790.41	790.44	–766.83	Mafic rock. fine-grained	505102	0.21
KLX10	995.79	995.82	–970.40	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.06

Table A1-11. Porosity data for drill site 11 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX11A	306.37	306.40	–265.50	Granite. fine- to medium-grained	511058	0.73
KLX11A	326.15	326.18	–284.26	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.16
KLX11A	346.45	346.48	–303.50	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	3.74
KLX11A	366.35	366.38	–322.36	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.16
KLX11A	386.69	386.72	–341.63	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.09
KLX11A	406.18	406.21	–360.10	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.09
KLX11A	426.63	426.66	–379.46	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	1.32
KLX11A	446.92	446.95	–398.68	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.09
KLX11A	466.28	466.31	–417.02	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.52
KLX11A	486.49	486.52	–436.15	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.17
KLX11A	506.39	506.42	–454.98	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.91
KLX11A	526.92	526.95	–474.39	Mafic rock. fine-grained	505102	0.05
KLX11A	540.89	540.92	–487.61	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.03
KLX11A	565.14	565.17	–510.53	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.03
KLX11A	586.36	586.39	–530.59	Mafic rock. fine-grained	505102	0.03
KLX11A	607.35	607.38	–550.42	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.00
KLX11A	627.46	627.49	–569.41	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.07
KLX11A	646.63	646.66	–587.50	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.12
KLX11A	666.98	667.01	–606.67	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.14
KLX11A	686.13	686.16	–624.70	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501036	0.20

Table A1-12. Porosity data for drill site 12 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX12A	240.24	240.26	–212.33	Granite to quartz monzodiorite. generally porphyritic	501044	0.34
KLX12A	240.69	240.71	–212.76	Granite to quartz monzodiorite. generally porphyritic	501044	0.35
KLX12A	430.50	430.53	–395.19	Diorite to gabbro	501033	0.05

Table A1-13. Porosity data for drill site 13 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX13A	121.06	121.09	–95.94	Granite to quartz monzodiorite. generally porphyritic	501044	0.15
KLX13A	122.10	122.13	–96.97	Granite to quartz monzodiorite. generally porphyritic	501044	0.23
KLX13A	373.62	373.65	–346.54	Granite to quartz monzodiorite. generally porphyritic	501044	0.20
KLX13A	373.36	373.69	–346.28	Granite to quartz monzodiorite. generally porphyritic	501044	0.26

Table A1-14. Porosity data for drill site 17 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	Porosity (vol%)
KLX17A	435.99	436.02	–350.20	Granite to quartz monzodiorite. generally porphyritic	501044	0.22
KLX17A	636.69	636.72	–519.01	Granite to quartz monzodiorite. generally porphyritic	501044	0.17

Appendix 2

Through-diffusion

Appendix 2 contains results from through-diffusion experiments. Matrix diffusivity, D_e (also denoted effective diffusivity), and α, the rock capacity factor, was obtained from least square fits of experimental data to Equation 3-2 and Equation 3-4 (described in Section 3.4.1).

Table A2-1. Through-diffusion data for drill site 1 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Sample length (mm)	Rock type	Rock code	D_e from Equation 3-2 (m^2/s)	D_e from Equation 3-4 (m^2/s)	α from Equation 3-2	α from Equation 3-4
KSH01A	39.59	39.62	–33.69	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	4.3E-15	4.5E-15	3.1E-04	3.6E-04
KSH01A	140.68	140.71	–132.25	31	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	2.3E-14	2.2E-14	4.6E-03	3.8E-03
KSH01A	219.36	219.39	–208.73	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	2.4E-15	2.5E-15	5.7E-05	5.9E-05
KSH01A	222.72	222.73	–212.00	10	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	2.7E-15	2.9E-15	2.5E-03	3.0E-03
KSH01A	222.73	222.76	–212.01	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	3.0E-15	3.5E-15	2.6E-04	2.0E-04
KSH01A	280.23	280.26	–267.91	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	9.3E-14	9.3E-14	1.0E-02	1.0E-02
KSH01A	891.66	891.67	–858.58	5	Granite to quartz monzodiorite, generally porphyritic	501044	1.3E-12	1.3E-12	1.3E-02	1.5E-02
KSH01A	891.67	891.68	–858.58	10	Granite to quartz monzodiorite, generally porphyritic	501044	1.0E-12	1.0E-12	4.6E-03	4.9E-03
KSH01A	891.69	891.72	–858.60	30	Granite to quartz monzodiorite, generally porphyritic	501044	9.2E-13	9.3E-13	1.3E-02	1.4E-02
KSH01A	891.72	891.77	–858.63	50	Granite to quartz monzodiorite, generally porphyritic	501044	9.0E-13	9.2E-13	3.0E-03	4.1E-03
KSH01A	891.77	891.78	–858.68	5	Granite to quartz monzodiorite, generally porphyritic	501044	1.0E-12	1.0E-12	1.5E-02	1.8E-02
KSH01A	891.78	891.79	–858.69	10	Granite to quartz monzodiorite, generally porphyritic	501044	1.1E-12	1.2E-12	n.e. [1)]	n.e. [1)]
KSH01A	891.80	891.83	–858.71	30	Granite to quartz monzodiorite, generally porphyritic	501044	9.8E-13	9.9E-13	1.3E-02	1.5E-02
KSH01A	891.83	891.88	–858.74	30	Granite to quartz monzodiorite, generally porphyritic	501044	8.8E-13	8.6E-13	1.0E-02	9.8E-03
KSH01A	891.88	891.89	–858.78	5	Granite to quartz monzodiorite, generally porphyritic	501044	1.1E-12	1.1E-12	1.0E-02	1.1E-02
KSH01A	891.91	891.94	–858.81	30	Granite to quartz monzodiorite, generally porphyritic	501044	1.1E-12	1.1E-12	1.2E-02	1.2E-02
KSH01A	940.81	940.84	–904.95	30	Granite to quartz monzodiorite, generally porphyritic	501044	4.4E-13	4.4E-13	9.5E-03	9.7E-03
KSH01A	981.43	981.46	–943.03	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	4.8E-13	4.9E-13	8.8E-03	9.7E-03
KSH01A	981.46	981.49	–943.06	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	4.2E-13	4.2E-13	1.1E-02	1.2E-02
KSH01A	981.50	981.53	–943.10	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	3.7E-13	3.8E-13	7.4E-03	8.4E-03

1) Capacity factor not evaluated.

Table A2-2. Through-diffusion data for drill site 2 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Sample length (mm)	Rock type	Rock code	D_e from Equation 3-2 (m^2/s)	D_e from Equation 3-4 (m^2/s)	α from Equation 3-2	α from Equation 3-4
KSH02	299.95	299.98	–293.84	18	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	3.2E-14	3.1E-14	9.6E-03	8.6E-03
KSH02	339.94	339.97	–333.75	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	3.8E-15	3.7E-15	2.7E-04	2.3E-04
KSH02	397.58	397.61	–353.33	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	2.0E-12	2.0E-12	4.1E-02	3.7E-02
KSH02	397.61	397.64	–353.36	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1.6E-12	1.6E-12	4.5E-02	4.2E-02
KSH02	474.46	474.47	–468.04	5	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1.0E-13	1.0E-13	1.7E-02	1.8E-02
KSH02	474.47	474.48	–468.05	10	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	5.1E-14	5.2E-14	6.6E-03	7.0E-03
KSH02	474.56	474.59	–468.14	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1.4E-13	1.4E-13	3.8E-03	4.2E-03
KSH02	474.60	474.65	–468.18	50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1.4E-14	1.4E-14	5.8E-04	5.6E-04
KSH02	474.65	474.66	–468.23	5	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	8.7E-14	8.8E-14	9.9E-03	1.3E-02
KSH02	474.66	474.67	–468.24	10	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	9.5E-14	9.6E-14	1.2E-02	1.2E-02
KSH02	474.68	474.71	–468.26	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	6.6E-14	6.6E-14	2.5E-03	2.6E-03
KSH02	474.71	474.76	–468.29	50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	5.1E-13	5.2E-13	3.7E-03	4.2E-03
KSH02	474.77	474.78	–468.35	5	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	4.8E-13	4.8E-13	1.9E-02	2.0E-02
KSH02	474.78	474.79	–468.36	10	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	8.5E-13	8.5E-13	1.7E-02	1.5E-02
KSH02	474.80	474.83	–468.40	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	7.1E-14	7.2E-14	2.0E-03	2.1E-03
KSH02	474.86	474.91	–468.44	43	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1.2E-13	1.2E-13	4.5E-03	4.4E-03
KSH02	480.01	480.04	–473.58	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1.2E-14	1.2E-14	1.7E-03	1.5E-03
KSH02	600.01	600.04	–593.36	30	Granite, fine- to medium-grained	511058	8.4E-14	8.5E-14	3.1E-03	3.2E-03
KSH02	660.09	660.12	–653.33	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	3.1E-15	3.1E-15	1.6E-04	1.9E-04

Table A2-3. Through-diffusion data for drill site 3 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Sample length (mm)	Rock type	Rock code	D_e from Equation 3-2 (m^2/s)	D_e from Equation 3-4 (m^2/s)	α from Equation 3-2	α from Equation 3-4
KSH03A	176.63	176.66	–144.66	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	3.0E-13	2.9E-13	1.3E-02	1.0E-02
KSH03A	176.66	176.67	–144.68	10	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	2.9E-13	2.7E-13	5.0E-02	3.3E-02
KSH03A	188.96	188.99	–155.05	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	1.6E-11	1.6E-11	1.0E-01	9.8E-02

Table A2-4. Through-diffusion data for drill site 2 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Sample length (mm)	Rock type	Rock code	D_e from Equation 3-2 (m²/s)	D_e from Equation 3-4 (m²/s)	α from Equation 3-2	α from Equation 3-4
KLX02	216.69	216.70	–197.41	5	Granite to quartz monzodiorite, generally porphyritic	501044	2.2E-13	n.e. [1]	n.e. [1]	n.e. [1]
KLX02	216.70	216.71	–197.42	10	Granite to quartz monzodiorite, generally porphyritic	501044	1.1E-13	1.1E-13	n.e. [1]	n.e. [1]
KLX02	216.71	216.74	–197.43	30	Granite to quartz monzodiorite, generally porphyritic	501044	4.9E-14	4.8E-14	1.6E-03	1.5E-03
KLX02	216.74	216.79	–197.46	50	Granite to quartz monzodiorite, generally porphyritic	501044	2.7E-14	2.7E-14	4.3E-04	4.3E-04
KLX02	216.79	216.80	–197.51	5	Granite to quartz monzodiorite, generally porphyritic	501044	1.4E-13	n.e. [1]	n.e. [1]	n.e. [1]
KLX02	216.80	216.81	–197.52	10	Granite to quartz monzodiorite, generally porphyritic	501044	1.1E-13	1.3E-13	n.e. [1]	n.e. [1]
KLX02	216.81	216.84	–197.53	30	Granite to quartz monzodiorite, generally porphyritic	501044	5.6E-14	5.7E-14	2.0E-03	2.0E-03
KLX02	216.84	216.89	–197.56	50	Granite to quartz monzodiorite, generally porphyritic	501044	3.2E-14	3.2E-14	6.1E-04	6.3E-04
KLX02	216.89	216.90	–197.56	5	Granite to quartz monzodiorite, generally porphyritic	501044	2.5E-13	n.e. [1]	n.e. [1]	n.e. [1]
KLX02	216.91	216.92	–197.63	10	Granite to quartz monzodiorite, generally porphyritic	501044	1.6E-13	1.8E-13	2.2E-03	6.0E-03
KLX02	216.92	216.95	–197.64	30	Granite to quartz monzodiorite, generally porphyritic	501044	8.3E-14	8.3E-14	3.5E-03	3.5E-03
KLX02	216.95	217.00	–197.67	50	Granite to quartz monzodiorite, generally porphyritic	501044	3.4E-14	3.4E-14	6.8E-04	6.8E-04
KLX02	235.02	235.05	–215.67	30	Granite to quartz monzodiorite, generally porphyritic	501044	6.5E-13	6.4E-13	1.0E-02	9.4E-03
KLX02	235.05	235.08	–215.70	30	Granite to quartz monzodiorite, generally porphyritic	501044	6.1E-13	6.0E-13	1.0E-02	9.6E-03
KLX02	235.08	235.11	–215.73	30	Granite to quartz monzodiorite, generally porphyritic	501044	6.8E-13	6.8E-13	1.4E-02	1.4E-02
KLX02	258.96	258.99	–239.51	30	Granite to quartz monzodiorite, generally porphyritic	501044	1.0E-13	1.0E-13	3.3E-03	3.3E-03
KLX02	387.78	387.81	–367.77	30	Mafic rock, fine-grained	505102	2.1E-13	2.1E-13	4.6E-03	4.8E-03
KLX02	440.19	440.26	–419.90	30	Granite to quartz monzodiorite, generally porphyritic	501044	1.6E-14	n.e. [1]	n.e. [1]	n.e. [1]
KLX02	600.19	600.22	–578.86	30	Granite to quartz monzodiorite, generally porphyritic	501044	1.7E-13	1.7E-13	1.3E-02	1.3E-02
KLX02	682.34	682.37	–660.45	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1.7E-14	1.8E-14	1.0E-03	1.3E-03
KLX02	682.37	682.40	–660.48	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1.8E-14	1.9E-14	1.1E-03	1.3E-03
KLX02	682.40	682.43	–660.51	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	2.1E-14	2.1E-14	1.5E-03	1.6E-03
KLX02	700.15	700.18	–678,14	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	3.0E-14	n.e. [1]	n.e. [1]	n.e. [1]
KLX02	936.44	936.47	–912.74	30	Granite to quartz monzodiorite, generally porphyritic	501044	1.3E-13	1.3E-13	1.2E-03	2.1E-03
KLX02	936.50	936.53	–912.80	30	Granite to quartz monzodiorite, generally porphyritic	501044	9.8E-14	9.2E-14	6.2E-03	5.1E-03
KLX02	936.53	936.56	–912.83	30	Granite to quartz monzodiorite, generally porphyritic	501044	8.1E-14	7.6E-14	n.e. [1]	6.5E-04

1) Not evaluated.

Table A2-5. Through-diffusion data for drill site 3 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Sample length (mm)	Rock type	Rock code	D_e from Equation 3-2 (m^2/s)	D_e from Equation 3-4 (m^2/s)	α from Equation 3-2	α from Equation 3-4
KLX03	662.10	662.13	–623.15	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	4.5E-13	4.8E-13	n.e. 1)	n.e. 1)
KLX03	662.13	662.16	–623.18	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	7.5E-13	7.2E-13	1.5E-02	1.2E-02
KLX03	662.16	662.19	–623.21	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	7.8E-13	7.5E-13	2.0E-02	1.7E-02
KLX03	725.50	725.54	–684.78	40	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	4.5E-12	4.5E-12	4.5E-02	4.2E-02

1) Not evaluated.

Table A2-6. Through-diffusion data for drill site 4 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Sample length (mm)	Rock type	Rock code	D_e from Equation 3-2 (m^2/s)	D_e from Equation 3-4 (m^2/s)	α from Equation 3-2	α from Equation 3-4
KLX04	277.66	277.69	–252.16	30	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	4.8E-14	5.0E-14	2.9E-03	3.2E-03
KLX04	489.48	489.49	–463.04	5	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	1.0E-12	9.8E-13	n.e. 1)	n.e. 1)
KLX04	489.49	489.50	–463.05	10	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	1.3E-13	1.3E-13	n.e. 1)	n.e. 1)
KLX04	489.50	489.53	–463.06	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	1.1E-13	1.1E-13	n.e. 1)	n.e. 1)
KLX04	489.53	489.58	–463.09	50	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	2.9E-13	3.2E-13	n.e. 1)	n.e. 1)
KLX04	489.60	489.61	–463.16	5	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	9.6E-14	1.1E-13	n.e. 1)	n.e. 1)
KLX04	489.61	489.62	–463.17	10	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	5.6E-14	5.2E-14	n.e. 1)	n.e. 1)
KLX04	489.62	489.65	–463.18	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	n.e. 1)	n.e. 1)	>4E-14	n.e. 1)
KLX04	489.65	489.70	–463.21	50	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	>1,8E-14	>1,8E-14	n.e. 1)	n.e. 1)
KLX04	489.73	489.74	–463.29	5	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	4.0E-13	4.0E-13	n.e. 1)	n.e. 1)
KLX04	489.74	489.75	–463.30	10	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	2.0E-13	n.e. 1)	2.0E-13	n.e. 1)
KLX04	489.75	489.78	–463.31	30	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	2.0E-14	2.1E-14	8.0E-04	8.5E-04
KLX04	718.21	718.24	–690.67	30	Granite, fine- to medium-grained	511058	9.4E-14	9.7E-14	3.1E-03	3.3E-03
KLX04	718.24	718.27	–690.70	30	Granite, fine- to medium-grained	511058	1.2E-13	1.2E-13	n.e. 1)	n.e. 1)
KLX04	718.27	718.30	–690.73	30	Granite, fine- to medium-grained	511058	1.3E-13	1.4E-13	n.e. 1)	n.e. 1)
KLX04	719.37	719.40	–691.82	30	Granite, fine- to medium-grained	511058	5.0E-14	5.2E-14	1.5E-03	1.9E-03
KLX04	920.40	920.43	–891.48	30	Granite to quartz monzodiorite, generally porphyritic	501044	4.5E-13	4.5E-13	1.5E-02	1.5E-02

1) Not evaluated

Table A2-7. Through-diffusion data for drill site 6 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Sample length (mm)	Rock type	Rock code	D_e from Equation 3-2 (m^2/s)	D_e from Equation 3-4 (m^2/s)	α from Equation 3-2	α from Equation 3-4
KLX06	402.41	402.44	–340.97	30	Granite, medium- to coarse-grained	501058	2.4E-12	2.4E-12	2.2E-02	2.2E-02

Appendix 3

Specific surface area, BET

BET surface area is measured using double samples of the fractions 0.063–0.125 mm and 2–4 mm of crushed and sieved rock samples, or scraped fracture filling material, <0.125 mm. A few whole core samples, with 90 mm length and 50 mm in diameter, are presented as well. Tables in Appendix 3 are presented per drill-site.

Table A3-1. Specific surface area, BET, for drill site 1 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Elevation Secup (m.a.s.l.)	Rock type	Rock code	BET 2–4 mm (m^2/g)	BET 0.063–0.125 mm (m^2/g)	BET < 0.125 mm (m^2/g)
KSH01A	5.83	6.03	–0.43	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	0.0142		
KSH01A	5.83	6.03	–0.43	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	0.0520		
KSH01A	5.83	6.03	–0.43	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036		0.2865	
KSH01A	5.83	6.03	–0.43	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036		0.3215	
KSH01A	222.77	222.86	–212.05	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	0.0346		
KSH01A	222.77	222.86	–212.05	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	0.0385		
KSH01A	222.77	222.86	–212.05	Fine-grained dioritoid (Metavolcanite, volcanite)	501030		0.5381	
KSH01A	222.77	222.86	–212.05	Fine-grained dioritoid (Metavolcanite, volcanite)	501030		0.5411	
KSH01A	662.90	663.05	–638.97	Granite to quartz monzodiorite, generally porphyritic	501044	0.0576		
KSH01A	662.90	663.05	–638.97	Granite to quartz monzodiorite, generally porphyritic	501044	0.0662		
KSH01A	662.90	663.05	–638.97	Granite to quartz monzodiorite, generally porphyritic	501044		1.1159	
KSH01A	662.90	663.05	–638.97	Granite to quartz monzodiorite, generally porphyritic	501044		1.1208	
KSH01A	715.24	715.39	–689.56	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	0.0699		
KSH01A	715.24	715.39	–689.56	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	0.0580		
KSH01A	715.24	715.39	–689.56	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036		1.0536	
KSH01A	715.24	715.39	–689.56	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036		1.0808	
KSH01A	981.14	981.29	–942.76	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	0.0447		

Appendix 4

Cation exchange capacity, CEC

Measured cation exchange capacity, CEC and sum of the exchangeable cations on the fractions 0.063–0.125 mm and 1–2 mm of crushed and sieved rock samples, or scraped fracture filling material, <0.125 mm. Tables in Appendix 4 are presented per drill site.

Table A4-1. Cation exchange capacity, CEC, for rock samples from drill site 2 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Fraction (mm)	CEC (cmol/kg)	Na (cmol/kg)	K (cmol/kg)	Mg (cmol/kg)	Ca (cmol/kg)	Cs (cmol/kg)	Rb (cmol/kg)	Sr (cmol/kg)
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	0.063–0.125	8.00E-01	<1.5E+00	<4.3E+00	<2.5E+00	2.12E+01	3.30E-05	2.02E-03	7.70E-03
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	1–2	4.00E-01	1.40E-01	<1.3E+00	<7.0E-01	8.30E+00	3.40E-05	4.20E-07	n.e. [1)]
KLX02	682.70	682.90	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	0.063–0.125	2.30E+00	<0.9E-01	6.40E-01	<1.5E+00	1.32E+01	n.e. [1)]	2.64E-03	4.60E-03
KLX02	682.70	682.90	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	1–2	1.00E+00	<0.4E-01	<1.3E+00	<0.8E-01	<1E+00	2.27E-05	8.80E-04	n.e. [1)]

2) Not evaluated.

Table A4-2. Cation exchange capacity, CEC, for rock samples from drill site 3 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Fraction (mm)	CEC (cmol/kg)	Na (cmol/kg)	K (cmol/kg)	Mg (cmol/kg)	Ca (cmol/kg)	Cs (cmol/kg)	Rb (cmol/kg)	Sr (cmol/kg)
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	0.063–0.125	2.10E+00	<0.4E-01	<1.3E+00	<0.8E-01	<1E+00	1.00E-05	1.62E-03	3.60E-02
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	1–2	9.00E-01	<0.4E-01	<1.3E+00	<0.8E-01	<1E+00	1.96E-05	7.50E-04	1.60E-02

Appendix 5a

Batch sorption, K_d

Sorption coefficients, K_d, for a number of combinations of rock materials. radio nuclides and groundwater compositions are presented in Table A5-1 to A5-9. The different water types used are: Fresh water (F), marine water (M), Saline water Simpevarp (SaS), brine water (B) and brackish water (Bsh), also found in Appendix 6.

Table A5-1. Sorption coefficients, K_d for rock samples from drill site 1 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KSH01A	222.77	222.86	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	Cs	< 4.90E-03	2.30E-03	SaS
KSH01A	222.77	222.86	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	Sr	< 8.90E-03	< 3.80E-04	SaS
KSH01A	222.77	222.86	Fine-grained dioritoid (Metavolcanite. volcanite)	501030	Eu	< 1.40E-01	< 6.60E-03	SaS
KSH01A	981.14	981.29	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501030	Cs	< 1.70E-02	1.80E-02	SaS
KSH01A	981.14	981.29	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501030	Sr	< 9.90E-05	< 4.90E-06	SaS
KSH01A	981.14	981.29	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501030	Eu	2.90E-01	8.80E-03	SaS
KSH01A	981.14	981.29	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501030	Cs	< 1.60E-02	5.20E-03	B
KSH01A	981.14	981.29	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501030	Sr	< 1.30E-04	< 3.20E-05	B
KSH01A	981.14	981.29	Quartz monzonite to monzodiorite. equigranular to weakly porphyritic	501030	Eu	3.90E-01	5.30E-02	B

Table A5-2. Sorption coefficients, K_d for rock samples from drill site 2 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Cs	7.60E-01	n.e. [1]	F
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Sr	> 3.30E-02	n.e. [1]	F
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Am	4.40E-01	n.e. [1]	F
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Ra	1.90E+00	n.e. [1]	F
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Ni	1.20E+00	n.e. [1]	F
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Np	2.30E-01	n.e. [1]	F
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	U	5.90E-02	n.e. [1]	F
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Cs	8.50E-02	n.e. [1]	SaS
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Sr	1.00E-02	n.e. [1]	SaS
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Am	5.60E+00	n.e. [1]	SaS
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Ra	1.90E-01	n.e. [1]	SaS
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Ni	5.20E-01	n.e. [1]	SaS
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Np	8.10E-02	n.e. [1]	SaS
KSH02	397.40	397.50	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	U	5.80E+00	n.e. [1]	SaS
KSH02	578.23	578.73	Granite, fine- to medium-grained	511058	Cs	3.20E-01	n.e. [1]	F
KSH02	578.23	578.73	Granite, fine- to medium-grained	511058	Sr	4.80E-01	n.e. [1]	F
KSH02	578.23	578.73	Granite, fine- to medium-grained	511058	Eu	6.90E-02	n.e. [1]	F
KSH02	578.23	578.73	Granite, fine- to medium-grained	511058	Cs	2.50E-02	n.e. [1]	SaS
KSH02	578.23	578.73	Granite, fine- to medium-grained	511058	Sr	< 2.40E-01	n.e. [1]	SaS
KSH02	578.23	578.73	Granite, fine- to medium-grained	511058	Eu	8.00E-02	n.e. [1]	SaS

2) Not evaluated.

Table A5-3. Sorption coefficients, Kd for rock samples from drill site 3 at the Simpevarp subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KSH03A	164.75	165.00	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	1.30E+00	< 2.00E-01	F
KSH03A	164.75	165.00	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	> 6.90E-02	< 2.90E-04	F
KSH03A	164.75	165.00	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	6.50E-01	1.30E-01	F
KSH03A	164.75	165.00	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	4.10E-02	8.70E-02	SaS
KSH03A	164.75	165.00	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	3.50E-03	9.60E-05	SaS
KSH03A	164.75	165.00	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	2.00E+00	2.20E-01	SaS

Table A5-4. Sorption coefficients, K_d for rock samples from drill site 2 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	2.6E-002	9.3E-003	F
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	7.7E-003	7.3E-004	F
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	2.8E-001	1.1E-002	F
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	2.5E-003	3.7E-003	SaS
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	2.3E-004	< 1.9E-005	SaS
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	3.0E-001	1.1E-001	SaS
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	3.1E-003	4.3E-004	B
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	< 1.4E-004	2.6E-005	B
KLX02	217.00	217.20	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	< 4.9E-002	5.4E-002	B
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	< 3.7E-002	7.7E-002	F
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	1.9E-002	< 7.8E-003	F
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Am	1.4E-001	4.7E-002	F
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	< 5.5E-003	7.6E-003	M
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	3.0E-003	8.3E-005	M
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Am	9.4E-001	< 1.5E-002	M
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	< 4.8E-003	5.0E-003	B
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	3.4E-003	< 1.9E-004	B
KLX02	509.50	509.70	Granite to quartz monzodiorite, generally porphyritic	501044	Am	8.1E-001	6.6E-002	B
KLX02	682.70	682.90	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Cs	< 3.0E-001	9.9E-002	F
KLX02	682.70	682.90	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Sr	2.0E-002	< 7.2E-003	F
KLX02	682.70	682.90	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Am	1.2E-001	1.6E-002	F
KLX02	682.70	682.90	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Cs	< 3.5E-003	4.2E-002	SaS
KLX02	682.70	682.90	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Sr	4.7E-003	< 5.7E-005	SaS
KLX02	682.70	682.90	Fine-grained dioritoid (Metavolcanite, volcanite)	501030	Am	9.6E-001	< 5.8E-003	Sas
KLX02	753.80	754.00	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	2.2E-002	4.3E-003	F
KLX02	753.80	754.00	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	7.2E-003	8.2E-004	F
KLX02	753.80	754.00	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	< 1.8E-001	1.2E-001	F
KLX02	753.80	754.00	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	2.2E-003	9.6E-004	SaS
KLX02	753.80	754.00	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	< 1.1E-003	< 5.5E-005	SaS
KLX02	753.80	754.00	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	1.8E-001	< 9.3E-004	Sas
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	1.6E-003	1.0E-004	SaS

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	< 2.0E-004	< 5.1E-005	SaS
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	1.3E-001	< 4.5E-004	Sas
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	6.1E-004	4.2E-005	B
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	< 3.9E-004	< 1.4E-005	B
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	1.6E-001	3.3E-002	B
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	< 6.0E-003	2.7E-003	Bsh
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	4.2E-003	< 6.3E-005	Bsh
KLX02	936.11	936.37	Granite to quartz monzodiorite, generally porphyritic	501044	Am	< 1.5E+00	2.5E-001	Bsh

Table A5-5. Sorption coefficients, K_d for rock samples from drill site 3 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX03	278.27	278.39	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	> 3.6E+000	n.e. [1)]	F
KLX03	278.27	278.39	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	> 1.8E-001	n.e. [1)]	F
KLX03	278.27	278.39	Granite to quartz monzodiorite, generally porphyritic	501044	Am	1.1E+000	n.e. [1)]	F
KLX03	278.27	278.39	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	3.0E+000	n.e. [1)]	SaS
KLX03	278.27	278.39	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	3.0E-003	n.e. [1)]	SaS
KLX03	278.27	278.39	Granite to quartz monzodiorite, generally porphyritic	501044	Am	9.3E+000	n.e. [1)]	Sas
KLX03	457.42	457.51	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	> 3.4E+000	n.e. [1)]	F
KLX03	457.42	457.51	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	> 1.7E-001	n.e. [1)]	F
KLX03	457.42	457.51	Granite to quartz monzodiorite, generally porphyritic	501044	Am	8.8E-001	n.e. [1)]	F
KLX03	457.42	457.51	Granite to quartz monzodiorite, generally porphyritic	501044	Am	6.6E+000	n.e. [1)]	Sas
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	< 3.1E-001	1.1E-001	F
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	< 3.4E-002	2.7E-003	F
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Am	9.4E-002	2.6E-002	F
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Th	< 1.0E-003	< 1.2E-004	F
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Ra	1.3E-001	1.5E-002	F
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Ni	3.1E-001	3.4E-002	F
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Np	< 2.1E-002	7.9E-003	F
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	U	4.8E-003	6.3E-004	F

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	< 6.0E-002	2.4E-002	SaS
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	2.5E-003	8.2E-005	SaS
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Am	< 5.9E+000	6.2E-001	SaS
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Th	4.2E-002	< 5.5E-003	SaS
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Ra	8.8E-003	6.5E-004	SaS
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Ni	< 3.2E-001	3.7E-002	SaS
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Np	7.4E-003	5.9E-004	SaS
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	U	7.2E-003	1.1E-003	SaS
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	< 6.0E-002	2.4E-002	Bsh
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	2.5E-003	8.2E-002	Bsh
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Am	< 5.9E+000	6.2E-001	Bsh
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Th	4.2E-002	< 5.5E-003	Bsh
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Ra	8.8E-003	6.5E-004	Bsh
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Ni	< 3.2E-001	3.7E-002	Bsh
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	Np	7.4E-003	5.9E-004	Bsh
KLX03	522.61	523.00	Granite to quartz monzodiorite, generally porphyritic	501044	U	7.2E-003	1.1E-003	Bsh
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Cs	4.0E-001	n.e. [1]	F
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Sr	> 2.6E-001	n.e. [1]	F
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Am	1.2E+000	n.e. [1]	F
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Ra	1.7E+000	n.e. [1]	F
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Ni	1.0E+000	n.e. [1]	F
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Np	2.1E-001	n.e. [1]	F
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	U	4.0E-002	n.e. [1]	F
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Cs	1.7E-002	n.e. [1]	SaS
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Sr	5.1E-003	n.e. [1]	SaS
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Am	9.5E+000	n.e. [1]	SaS
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Ra	2.9E-002	n.e. [1]	SaS
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Ni	1.2E+000	n.e. [1]	SaS
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	Np	4.7E-002	n.e. [1]	SaS
KLX03	732.59	733.07	Mafic rock, fine-grained	505102	U	3.5E+000	n.e. [1]	SaS

1) Not evaluated.

Table A5-6. Sorption coefficients, K_d for rock samples from drill site 4 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Cs	< 2.4E-001	1.6E-001	F
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Sr	1.9E-002	2.4E-003	F
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Am	9.9E-002	3.5E-002	F
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Cs	< 1.4E-001	2.9E-002	SaS
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Sr	3.2E-003	< 3.3E-005	SaS
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Am	3.0E+000	< 2.0E-001	SaS
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Cs	< 3.0E-002	6.6E-002	Bsh
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Sr	3.3E-003	< 1.4E-004	Bsh
KLX04	489.85	490.25	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Am	1.6E+000	2.0E-001	Bsh
KLX04	718.91	719.36	Granite, fine- to medium-grained	511058	Cs	9.0E-002	1.2E-002	F
KLX04	718.91	719.36	Granite, fine- to medium-grained	511058	Sr	2.0E-002	1.6E-003	F
KLX04	718.91	719.36	Granite, fine- to medium-grained	511058	Am	< 2.4E-001	3.7E-002	F
KLX04	718.91	719.36	Granite, fine- to medium-grained	511058	Cs	1.2E-002	2.3E-003	SaS
KLX04	718.91	719.36	Granite, fine- to medium-grained	511058	Sr	3.0E-003	< 4.8E-005	SaS
KLX04	718.91	719.36	Granite, fine- to medium-grained	511058	Am	< 1.1E+000	4.1E-001	SaS
KLX04	874.48	874.64	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	4.1E-001	n.e. 1)	F
KLX04	874.48	874.64	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	2.3E-001	n.e. 1)	F
KLX04	874.48	874.64	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	8.5E-001	n.e. 1)	F
KLX04	874.48	874.64	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	1.1E-002	n.e. 1)	B
KLX04	874.48	874.64	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	7.4E-004	n.e. 1)	B
KLX04	874.48	874.64	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	5.6E-001	n.e. 1)	B
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	1.5E-001	5.2E-003	F
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	7.0E-002	< 5.6E-003	F
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	3.0E-001	< 1.7E-002	F
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	1.7E-002	1.5E-003	SaS
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	< 1.6E-006	1.2E-005	SaS
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	6.9E-003	< 2.0E-005	SaS
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	7.7E-003	4.1E-004	B
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	8.7E-005	< 8.4E-006	B
KLX04	951.30	951.44	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	3.0E-003	< 2.0E-004	B

1) Not evaluated.

Table A5-7. Sorption coefficients, K_d for rock samples from drill site 5 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Cs	3.6E-002	5.9E-003	F
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Sr	2.6E-002	< 6.9E-003	F
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Am	< 1.2E+000	2.8E-001	F
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Ra	< 1.3E+000	1.4E-001	F
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Ni	< 5.6E-001	< 4.9E-002	F
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Np	< 6.2E-001	< 5.4E-002	F
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	U	< 4.8E-003	9.4E-004	F
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Cs	8.4E-003	1.0E-003	SaS
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Sr	4.6E-003	< 1.7E-004	SaS
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Am	< 1.9E+001	1.6E+000	SaS
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Ra	< 9.5E-003	1.8E-003	SaS
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Ni	< 9.7E-002	2.7E-002	SaS
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	Np	< 1.9E-001	3.9E-002	SaS
KLX05	482.30	482.70	Quartz monzonite to monzodiorite, equigranular to weakly porphyritic	501036	U	< 4.6E-001	8.5E-002	SaS

Table A5-8. Sorption coefficients, K_d for rock samples from drill site 6 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX06	384.00	384.04	Mafic rock, fine-grained	505102	Cs	5.1E+000	n.e. 1)	F
KLX06	384.00	384.04	Mafic rock, fine-grained	505102	Sr	1.4E-001	n.e. 1)	F
KLX06	384.00	384.04	Mafic rock, fine-grained	505102	Eu	2.5E+000	n.e. 1)	F
KLX06	384.00	384.04	Mafic rock, fine-grained	505102	Cs	6.0E-001	n.e. 1)	SaS
KLX06	384.00	384.04	Mafic rock, fine-grained	505102	Sr	1.8E-003	n.e. 1)	SaS
KLX06	384.00	384.04	Mafic rock, fine-grained	505102	Eu	< 5.9E+000	n.e. 1)	SaS

1) Not evaluated.

Table A5-9. Sorption coefficients, K_d for rock samples from drill site 7 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX07A	620.94	621.28	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	2,1E-001	7,0E-003	SaS
KLX07A	620.95	621.29	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	1,3E-003	1,7E-005	SaS
KLX07A	620.96	621.30	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	2,1E+000	< 5,5E-002	SaS

Table A5-10. Sorption coefficients, K_d for rock samples from drill site 11 at the Laxemar subarea.

Borehole	Secup (mbl)	Seclow (mbl)	Rock type	Rock code	Tracer	Sorption coefficent K_d	Surface sorption coefficent K_a	Water composition
KLX11A	509.30	509.40	Granite to quartz monzodiorite, generally porphyritic	501044	Cs	6.7E-003	2.3E-004	SaS
KLX11A	509.30	509.40	Granite to quartz monzodiorite, generally porphyritic	501044	Sr	1.4E-003	< 4.7E-005	SaS
KLX11A	509.30	509.40	Granite to quartz monzodiorite, generally porphyritic	501044	Eu	2.3E+000	< ********	SaS

Appendix 5b

Batch sorption, R_d

Tracer distribution ratio, R_d, for all combination of size fractions, water types and tracers at the different measurement times. Data are presented on borehole basis. The different groundwater types used are: fresh water (F), marine water (M), saline water Simpevarp (SaS), brackish water (Bsh) and brine water (B).

Table A5-11. Tracer distribution ratio, R_d, for rock samples from KSH01A.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KSH01A	222.77	222.86	SaS	Cs	2.000	1.000	1	2.79E-03	4.01E-03	
KSH01A	222.77	222.86	SaS	Cs	0.500	0.250	1	3.35E-02	3.15E-02	
KSH01A	222.77	222.86	SaS	Cs	0.125	0.063	1	2.24E-01	2.06E-01	
KSH01A	222.77	222.86	SaS	Cs	2.000	1.000	7	4.60E-03	7.21E-03	4.91E-03
KSH01A	222.77	222.86	SaS	Cs	0.500	0.250	7	5.43E-02	5.25E-02	
KSH01A	222.77	222.86	SaS	Cs	0.125	0.063	7	3.10E-01	3.10E-01	
KSH01A	222.77	222.86	SaS	Cs	2.000	1.000	30	6.59E-03	7.03E-03	6.77E-03
KSH01A	222.77	222.86	SaS	Cs	0.500	0.250	30	7.37E-02	6.05E-02	
KSH01A	222.77	222.86	SaS	Cs	0.125	0.063	30	4.30E-01	4.03E-01	
KSH01A	222.77	222.86	SaS	Cs	2.000	1.000	97	8.34E-03	1.26E-02	8.46E-03
KSH01A	222.77	222.86	SaS	Cs	0.500	0.250	97	8.50E-02	7.74E-02	
KSH01A	222.77	222.86	SaS	Cs	0.125	0.063	97	5.09E-01	4.67E-01	
KSH01A	222.77	222.86	SaS	Cs	2.000	1.000	196	1.00E-02		
KSH01A	222.77	222.86	SaS	Cs	0.500	0.250	196	2.13E-01		
KSH01A	222.77	222.86	SaS	Cs	0.125	0.063	196	5.44E-01		
KSH01A	222.77	222.86	SaS	Sr	2.000	1.000	1	-1.54E-04	3.13E-05	6.12E-05
KSH01A	222.77	222.86	SaS	Sr	0.500	0.250	1	-2.36E-04	-6.65E-05	
KSH01A	222.77	222.86	SaS	Sr	0.125	0.063	1	-7.71E-04	-8.44E-04	
KSH01A	222.77	222.86	SaS	Sr	2.000	1.000	7	3.06E-04	1.90E-04	3.50E-04
KSH01A	222.77	222.86	SaS	Sr	0.500	0.250	7	6.57E-05	2.30E-04	
KSH01A	222.77	222.86	SaS	Sr	0.125	0.063	7	-5.27E-04	-4.34E-04	
KSH01A	222.77	222.86	SaS	Sr	2.000	1.000	30	2.70E-04	6.97E-04	2.64E-04
KSH01A	222.77	222.86	SaS	Sr	0.500	0.250	30	4.95E-05	6.23E-05	
KSH01A	222.77	222.86	SaS	Sr	0.125	0.063	30	-1.90E-04	-4.01E-04	
KSH01A	222.77	222.86	SaS	Sr	2.000	1.000	97	2.12E-04	2.26E-04	3.02E-04
KSH01A	222.77	222.86	SaS	Sr	0.500	0.250	97	1.26E-05	1.13E-04	
KSH01A	222.77	222.86	SaS	Sr	0.125	0.063	97	1.48E-04	-3.94E-04	
KSH01A	222.77	222.86	SaS	Sr	2.000	1.000	196	-3.17E-04		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KSH01A	222.77	222.86	SaS	Sr	0.500	0.250	196	4.54E-03		
KSH01A	222.77	222.86	SaS	Sr	0.125	0.063	196	-1.55E-03		
KSH01A	222.77	222.86	SaS	Eu	2.000	1.000	1	3.31E-01	2.03E-01	3.27E-01
KSH01A	222.77	222.86	SaS	Eu	0.500	0.250	1	3.89E-01	3.92E-01	
KSH01A	222.77	222.86	SaS	Eu	0.125	0.063	1	6.27E-01	8.89E-01	
KSH01A	222.77	222.86	SaS	Eu	2.000	1.000	7	2.62E-01	2.01E-01	2.20E-01
KSH01A	222.77	222.86	SaS	Eu	0.500	0.250	7	1.57E-01	4.28E-01	
KSH01A	222.77	222.86	SaS	Eu	0.125	0.063	7	6.70E-01	2.41E-01	
KSH01A	222.77	222.86	SaS	Eu	2.000	1.000	30	1.64E-01	4.62E-01	4.25E-01
KSH01A	222.77	222.86	SaS	Eu	0.500	0.250	30	5.50E-01	5.66E-01	
KSH01A	222.77	222.86	SaS	Eu	0.125	0.063	30	1.12E+00	9.55E-01	
KSH01A	222.77	222.86	SaS	Eu	2.000	1.000	97	2.73E-01	3.60E-01	3.33E-01
KSH01A	222.77	222.86	SaS	Eu	0.500	0.250	97	7.79E-01	7.36E-01	
KSH01A	222.77	222.86	SaS	Eu	0.125	0.063	97	7.78E-01	9.02E-01	
KSH01A	222.77	222.86	SaS	Eu	2.000	1.000	196	2.81E-01		
KSH01A	222.77	222.86	SaS	Eu	0.500	0.250	196	9.75E-01		
KSH01A	222.77	222.86	SaS	Eu	0.125	0.063	196	8.94E-01		
KSH01A	981.14	981.29	SaS	Cs	2.000	1.000	1	6.01E-03	5.55E-03	5.07E-03
KSH01A	981.14	981.29	SaS	Cs	0.500	0.250	1	4.50E-02	4.32E-02	4.45E-02
KSH01A	981.14	981.29	SaS	Cs	0.125	0.063	1	1.67E-01	1.63E-01	
KSH01A	981.14	981.29	SaS	Cs	2.000	1.000	7	9.14E-03	8.19E-03	8.31E-03
KSH01A	981.14	981.29	SaS	Cs	0.500	0.250	7	6.60E-02	5.97E-02	6.45E-02
KSH01A	981.14	981.29	SaS	Cs	0.125	0.063	7	2.33E-01	2.33E-01	
KSH01A	981.14	981.29	SaS	Cs	2.000	1.000	30	-4.18E-02	-3.81E-02	-3.76E-02
KSH01A	981.14	981.29	SaS	Cs	0.500	0.250	30	-2.02E-01	-2.21E-01	-2.14E-01
KSH01A	981.14	981.29	SaS	Cs	0.125	0.063	30	-6.75E-01	-6.32E-01	
KSH01A	981.14	981.29	SaS	Cs	2.000	1.000	97	1.33E-02	1.11E-02	1.11E-02
KSH01A	981.14	981.29	SaS	Cs	0.500	0.250	97	9.28E-02	9.29E-02	9.35E-02
KSH01A	981.14	981.29	SaS	Cs	0.125	0.063	97	3.06E-01	3.22E-01	
KSH01A	981.14	981.29	SaS	Cs	2.000	1.000	196	1.61E-02		
KSH01A	981.14	981.29	SaS	Cs	0.500	0.250	196	1.02E-01		
KSH01A	981.14	981.29	SaS	Cs	0.125	0.063	196	3.74E-01		
KSH01A	981.14	981.29	SaS	Sr	2.000	1.000	1	-2.32E-04	-1.78E-04	3.24E-02
KSH01A	981.14	981.29	SaS	Sr	0.500	0.250	1	-1.63E-04	-4.60E-04	-2.12E-04
KSH01A	981.14	981.29	SaS	Sr	0.125	0.063	1	-2.30E-04	-2.35E-04	
KSH01A	981.14	981.29	SaS	Sr	2.000	1.000	7	1.46E-05	6.61E-05	-6.98E-06

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KSH01A	981.14	981.29	SaS	Sr	0.500	0.250	7	6.31E-05	-1.94E-04	-1.50E-04
KSH01A	981.14	981.29	SaS	Sr	0.125	0.063	7	2.87E-05	-5.82E-05	
KSH01A	981.14	981.29	SaS	Sr	2.000	1.000	30	-1.21E-02	-1.28E-02	-1.20E-02
KSH01A	981.14	981.29	SaS	Sr	0.500	0.250	30	-1.28E-02	-1.23E-02	-1.25E-02
KSH01A	981.14	981.29	SaS	Sr	0.125	0.063	30	-1.28E-02	-1.28E-02	
KSH01A	981.14	981.29	SaS	Sr	2.000	1.000	97	-1.52E-04	-9.26E-05	-2.39E-04
KSH01A	981.14	981.29	SaS	Sr	0.500	0.250	97	-2.60E-04	-4.64E-04	-5.00E-04
KSH01A	981.14	981.29	SaS	Sr	0.125	0.063	97	-3.02E-04	-4.71E-04	
KSH01A	981.14	981.29	SaS	Sr	2.000	1.000	196	-4.87E-04	-3.63E-04	
KSH01A	981.14	981.29	SaS	Sr	0.500	0.250	196	-5.89E-04		
KSH01A	981.14	981.29	SaS	Sr	0.125	0.063	196	-1.56E-04		
KSH01A	981.14	981.29	SaS	Eu	2.000	1.000	1	2.56E-01	2.52E-01	2.31E-01
KSH01A	981.14	981.29	SaS	Eu	0.500	0.250	1	3.55E-01	2.78E-01	4.10E-01
KSH01A	981.14	981.29	SaS	Eu	0.125	0.063	1	4.20E-01	2.83E-01	
KSH01A	981.14	981.29	SaS	Eu	2.000	1.000	7	1.79E-01	1.98E-01	1.61E-01
KSH01A	981.14	981.29	SaS	Eu	0.500	0.250	7	1.34E-01	2.92E-01	1.60E-01
KSH01A	981.14	981.29	SaS	Eu	0.125	0.063	7	2.35E-01	2.03E-01	
KSH01A	981.14	981.29	SaS	Eu	2.000	1.000	30	3.03E-01	2.66E-01	2.29E-01
KSH01A	981.14	981.29	SaS	Eu	0.500	0.250	30	7.15E-01	3.51E-01	4.88E-01
KSH01A	981.14	981.29	SaS	Eu	0.125	0.063	30	3.86E-01	5.89E-01	
KSH01A	981.14	981.29	SaS	Eu	2.000	1.000	97	2.65E-01	3.48E-01	2.06E-01
KSH01A	981.14	981.29	SaS	Eu	0.500	0.250	97	4.87E-01	3.56E-01	4.24E-01
KSH01A	981.14	981.29	SaS	Eu	0.125	0.063	97	4.95E-01	3.35E-01	
KSH01A	981.14	981.29	SaS	Eu	2.000	1.000	196	3.34E-01		
KSH01A	981.14	981.29	SaS	Eu	0.500	0.250	196	2.99E-01		
KSH01A	981.14	981.29	SaS	Eu	0.125	0.063	196	4.83E-01		
KSH01A	981.14	981.29	B	Cs	2.000	1.000	1	2.24E-03	2.43E-03	2.17E-03
KSH01A	981.14	981.29	B	Cs	0.500	0.250	1	1.80E-02	1.87E-02	1.87E-02
KSH01A	981.14	981.29	B	Cs	0.125	0.063	1	4.85E-02	7.40E-02	
KSH01A	981.14	981.29	B	Cs	2.000	1.000	7	3.37E-03	2.81E-03	-1.47E-04
KSH01A	981.14	981.29	B	Cs	0.500	0.250	7	2.68E-02	2.65E-02	3.00E-03
KSH01A	981.14	981.29	B	Cs	0.125	0.063	7	6.34E-02	2.62E-02	
KSH01A	981.14	981.29	B	Cs	2.000	1.000	30	3.75E-03	3.98E-03	3.69E-03
KSH01A	981.14	981.29	B	Cs	0.500	0.250	30	3.28E-02	3.35E-02	3.48E-02
KSH01A	981.14	981.29	B	Cs	0.125	0.063	30	8.63E-02	1.24E-01	
KSH01A	981.14	981.29	B	Cs	2.000	1.000	97	4.40E-03	5.08E-03	4.66E-03

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KSH01A	981.14	981.29	B	Cs	0.500	0.250	97	4.11E-02	3.93E-02	4.01E-02
KSH01A	981.14	981.29	B	Cs	0.125	0.063	97	8.87E-02	1.33E-01	
KSH01A	981.14	981.29	B	Cs	2.000	1.000	196	4.72E-03	5.44E-03	4.64E-03
KSH01A	981.14	981.29	B	Cs	0.500	0.250	196	3.88E-02	3.79E-02	3.45E-02
KSH01A	981.14	981.29	B	Cs	0.125	0.063	196	9.04E-02	1.28E-01	
KSH01A	981.14	981.29	B	Sr	2.000	1.000	1	-4.06E-05	-3.70E-05	-1.82E-04
KSH01A	981.14	981.29	B	Sr	0.500	0.250	1	-8.36E-05	-4.60E-05	-6.98E-05
KSH01A	981.14	981.29	B	Sr	0.125	0.063	1	-1.19E-03	-1.11E-05	
KSH01A	981.14	981.29	B	Sr	2.000	1.000	7	-1.20E-04	-1.84E-04	-1.01E-04
KSH01A	981.14	981.29	B	Sr	0.500	0.250	7	-1.09E-04	-1.20E-04	-1.33E-04
KSH01A	981.14	981.29	B	Sr	0.125	0.063	7	-1.21E-03	-3.25E-05	
KSH01A	981.14	981.29	B	Sr	2.000	1.000	30	-2.86E-04	-3.27E-04	-2.07E-04
KSH01A	981.14	981.29	B	Sr	0.500	0.250	30	-1.06E-04	-2.67E-04	-1.19E-04
KSH01A	981.14	981.29	B	Sr	0.125	0.063	30	-1.26E-03	-1.58E-04	
KSH01A	981.14	981.29	B	Sr	2.000	1.000	97	-1.88E-04	-4.32E-04	-2.89E-04
KSH01A	981.14	981.29	B	Sr	0.500	0.250	97	3.07E-04	-3.56E-04	-1.71E-04
KSH01A	981.14	981.29	B	Sr	0.125	0.063	97	-1.13E-03	-2.78E-04	
KSH01A	981.14	981.29	B	Sr	2.000	1.000	196	-7.43E-04	1.50E-04	-6.41E-04
KSH01A	981.14	981.29	B	Sr	0.500	0.250	196	-6.11E-04	-4.34E-04	-8.37E-04
KSH01A	981.14	981.29	B	Sr	0.125	0.063	196	-1.70E-03	-6.24E-06	
KSH01A	981.14	981.29	B	Eu	2.000	1.000	1	2.00E-02	2.38E-02	2.83E-02
KSH01A	981.14	981.29	B	Eu	0.500	0.250	1	6.58E-02	8.01E-02	4.97E-02
KSH01A	981.14	981.29	B	Eu	0.125	0.063	1	1.33E-01	2.21E-01	
KSH01A	981.14	981.29	B	Eu	2.000	1.000	7	-4.17E-03	-4.07E-03	-4.13E-03
KSH01A	981.14	981.29	B	Eu	0.500	0.250	7	-3.94E-03	-3.87E-03	-3.93E-03
KSH01A	981.14	981.29	B	Eu	0.125	0.063	7	-3.61E-03	-3.80E-03	
KSH01A	981.14	981.29	B	Eu	2.000	1.000	30	1.72E-01	2.06E-01	2.15E-01
KSH01A	981.14	981.29	B	Eu	0.500	0.250	30	4.96E-01	5.25E-01	3.64E-01
KSH01A	981.14	981.29	B	Eu	0.125	0.063	30	1.03E+00	1.54E+00	
KSH01A	981.14	981.29	B	Eu	2.000	1.000	97	2.66E-01	2.70E-01	3.60E-01
KSH01A	981.14	981.29	B	Eu	0.500	0.250	97	9.55E-01	7.89E-01	5.45E-01
KSH01A	981.14	981.29	B	Eu	0.125	0.063	97	1.67E+00	2.33E+00	
KSH01A	981.14	981.29	B	Eu	2.000	1.000	196	3.30E-01	4.54E-01	4.56E-01
KSH01A	981.14	981.29	B	Eu	0.500	0.250	196	7.74E-01	6.64E-01	7.11E-01
KSH01A	981.14	981.29	B	Eu	0.125	0.063	196	1.41E+00	1.53E+00	

Table A5-12. Tracer distribution ratio, R_d, for rock samples from KSH02.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KSH02	397.40	397.50	SaS	Cs	0.125	0	1	4.51E-02		
KSH02	397.40	397.50	SaS	Cs	0.125	0	7	6.05E-02		
KSH02	397.40	397.50	SaS	Cs	0.125	0	30	6.91E-02		
KSH02	397.40	397.50	SaS	Cs	0.125	0	96	7.71E-02		
KSH02	397.40	397.50	SaS	Cs	0.125	0	175	8.53E-02		
KSH02	397.40	397.50	SaS	Sr	0.125	0	1	6.45E-03		
KSH02	397.40	397.50	SaS	Sr	0.125	0	7	7.70E-03		
KSH02	397.40	397.50	SaS	Sr	0.125	0	30	8.14E-03		
KSH02	397.40	397.50	SaS	Sr	0.125	0	96	8.19E-03		
KSH02	397.40	397.50	SaS	Sr	0.125	0	175	1.05E-02		
KSH02	397.40	397.50	SaS	Am	0.125	0	1	2.39E+00		
KSH02	397.40	397.50	SaS	Am	0.125	0	7	1.36E+01		
KSH02	397.40	397.50	SaS	Am	0.125	0	30	1.39E+01		
KSH02	397.40	397.50	SaS	Am	0.125	0	96	3.77E+01		
KSH02	397.40	397.50	SaS	Am	0.125	0	175	5.58E+00		
KSH02	397.40	397.50	SaS	Ra	0.125	0	1	1.16E-01		
KSH02	397.40	397.50	SaS	Ra	0.125	0	7	2.04E-01		
KSH02	397.40	397.50	SaS	Ra	0.125	0	30	1.92E-01		
KSH02	397.40	397.50	SaS	Ra	0.125	0	96	1.94E-01		
KSH02	397.40	397.50	SaS	Ni	0.125	0	1	1.91E-01		
KSH02	397.40	397.50	SaS	Ni	0.125	0	7	5.21E-01		
KSH02	397.40	397.50	SaS	Np	0.125	0	1	2.84E-02		
KSH02	397.40	397.50	SaS	Np	0.125	0	7	4.28E-02		
KSH02	397.40	397.50	SaS	Np	0.125	0	30	5.70E-02		
KSH02	397.40	397.50	SaS	Np	0.125	0	96	7.03E-02		
KSH02	397.40	397.50	SaS	Np	0.125	0	175	8.09E-02		
KSH02	397.40	397.50	SaS	U	0.125	0	1	2.33E-01		
KSH02	397.40	397.50	SaS	U	0.125	0	7	7.46E-01		
KSH02	397.40	397.50	SaS	U	0.125	0	30	2.00E+00		
KSH02	397.40	397.50	SaS	U	0.125	0	96	5.94E+00		
KSH02	397.40	397.50	SaS	U	0.125	0	175	5.84E+00		
KSH02	397.40	397.50	F	Cs	0.125	0	1	2.62E-01		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KSH02	397.40	397.50	F	Cs	0.125	0	7	4.68E-01		
KSH02	397.40	397.50	F	Cs	0.125	0	30	9.77E-01		
KSH02	397.40	397.50	F	Cs	0.125	0	96	7.88E-01		
KSH02	397.40	397.50	F	Cs	0.125	0	175	7.63E-01		
KSH02	397.40	397.50	F	Sr	0.125	0	1	1.37E-01		
KSH02	397.40	397.50	F	Sr	0.125	0	7	1.37E-01		
KSH02	397.40	397.50	F	Sr	0.125	0	30	1.55E-01		
KSH02	397.40	397.50	F	Sr	0.125	0	96	9.51E-02		
KSH02	397.40	397.50	F	Sr	0.125	0	175	3.28E-02		
KSH02	397.40	397.50	F	Am	0.125	0	1	5.25E-01		
KSH02	397.40	397.50	F	Am	0.125	0	7	6.66E-01		
KSH02	397.40	397.50	F	Am	0.125	0	30	4.08E-01		
KSH02	397.40	397.50	F	Am	0.125	0	96	5.04E-01		
KSH02	397.40	397.50	F	Am	0.125	0	175	4.36E-01		
KSH02	397.40	397.50	F	Ra	0.125	0	1	1.14E+00		
KSH02	397.40	397.50	F	Ra	0.125	0	7	1.71E+00		
KSH02	397.40	397.50	F	Ra	0.125	0	30	7.50E-01		
KSH02	397.40	397.50	F	Ra	0.125	0	96	1.93E+00		
KSH02	397.40	397.50	F	Ni	0.125	0	1	6.98E-01		
KSH02	397.40	397.50	F	Ni	0.125	0	7	1.24E+00		
KSH02	397.40	397.50	F	Ni	0.125	0	30	5.64E-01		
KSH02	397.40	397.50	F	Ni	0.125	0	96	4.57E+00		
KSH02	397.40	397.50	F	Ni	0.125	0	175	9.04E-01		
KSH02	397.40	397.50	F	Np	0.125	0	1	4.79E-02		
KSH02	397.40	397.50	F	Np	0.125	0	7	7.64E-02		
KSH02	397.40	397.50	F	Np	0.125	0	30	1.30E-01		
KSH02	397.40	397.50	F	Np	0.125	0	96	1.88E-01		
KSH02	397.40	397.50	F	Np	0.125	0	175	2.31E-01		
KSH02	397.40	397.50	F	U	0.125	0	1	2.41E-02		
KSH02	397.40	397.50	F	U	0.125	0	7	2.98E-02		
KSH02	397.40	397.50	F	U	0.125	0	30	4.16E-02		
KSH02	397.40	397.50	F	U	0.125	0	96	5.08E-02		
KSH02	397.40	397.50	F	U	0.125	0	175	5.95E-02		
KSH02	578.23	578.73	F	Cs	0.125	0	1	2.15E-01	2.20E-01	2.30E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KSH02	578.23	578.73	F	Cs	0.125	0	8	2.43E-01	2.47E-01	2.48E-01
KSH02	578.23	578.73	F	Cs	0.125	0	30	2.61E-01	2.56E-01	2.39E-01
KSH02	578.23	578.73	F	Cs	0.125	0	94	3.73E-01	3.24E-01	2.77E-01
KSH02	578.23	578.73	F	Cs	0.125	0	190	3.38E-01	3.19E-01	2.99E-01
KSH02	578.23	578.73	F	Sr	0.125	0	1	3.71E-01	4.06E-01	3.73E-01
KSH02	578.23	578.73	F	Sr	0.125	0	8	2.14E-01	2.31E-01	2.72E-01
KSH02	578.23	578.73	F	Sr	0.125	0	30	4.00E-01	4.36E-01	4.28E-01
KSH02	578.23	578.73	F	Sr	0.125	0	94	4.68E-01	4.20E-01	3.71E-01
KSH02	578.23	578.73	F	Sr	0.125	0	190	4.82E-01	3.93E-01	5.55E-01
KSH02	578.23	578.73	F	Eu	0.125	0	1	9.95E-03	4.85E-02	4.40E-02
KSH02	578.23	578.73	F	Eu	0.125	0	8	8.35E-02	1.03E-01	1.12E-01
KSH02	578.23	578.73	F	Eu	0.125	0	30	6.67E-02	4.76E-02	3.87E-02
KSH02	578.23	578.73	F	Eu	0.125	0	94	9.01E-02	1.21E-01	9.52E-02
KSH02	578.23	578.73	F	Eu	0.125	0	190	7.49E-02	7.02E-02	6.11E-02
KSH02	578.23	578.73	F	Cs	0.125	0	1	1.93E-02	1.81E-02	1.82E-02
KSH02	578.23	578.73	F	Cs	0.125	0	7	2.21E-02	2.17E-02	2.08E-02
KSH02	578.23	578.73	F	Cs	0.125	0	30	2.37E-02	2.35E-02	2.13E-02
KSH02	578.23	578.73	F	Cs	0.125	0	91	1.83E-02	1.85E-02	1.69E-02
KSH02	578.23	578.73	F	Cs	0.125	0	196	2.53E-02	2.47E-02	2.42E-02
KSH02	578.23	578.73	F	Eu	0.125	0	1	1.85E-01	4.98E-02	7.10E-02
KSH02	578.23	578.73	F	Eu	0.125	0	7	1.19E-01	6.42E-02	4.02E-02
KSH02	578.23	578.73	F	Eu	0.125	0	30	1.30E-01	6.22E-02	1.04E-01
KSH02	578.23	578.73	F	Eu	0.125	0	91	8.85E-02	1.35E-01	6.79E-02
KSH02	578.23	578.73	F	Eu	0.125	0	196	4.98E-02	9.27E-02	9.76E-02
KSH02	578.23	578.73	SaS	Cs	0.125	0	1	1.93E-02	1.81E-02	1.82E-02
KSH02	578.23	578.73	SaS	Cs	0.125	0	7	2.21E-02	2.17E-02	2.08E-02
KSH02	578.23	578.73	SaS	Cs	0.125	0	30	2.37E-02	2.35E-02	2.13E-02
KSH02	578.23	578.73	SaS	Cs	0.125	0	91	1.83E-02	1.85E-02	1.69E-02
KSH02	578.23	578.73	SaS	Cs	0.125	0	196	2.53E-02	2.47E-02	2.42E-02
KSH02	578.23	578.73	SaS	Eu	0.125	0	1	1.85E-01	4.98E-02	7.10E-02
KSH02	578.23	578.73	SaS	Eu	0.125	0	7	1.19E-01	6.42E-02	4.02E-02
KSH02	578.23	578.73	SaS	Eu	0.125	0	30	1.30E-01	6.22E-02	1.04E-01
KSH02	578.23	578.73	SaS	Eu	0.125	0	91	8.85E-02	1.35E-01	6.79E-02
KSH02	578.23	578.73	SaS	Eu	0.125	0	196	4.98E-02	9.27E-02	9.76E-02

Table A5-13. Tracer distribution ratio, *Rd,* for rock samples from KSH03.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KSH03	164.75	165.00	F	Cs	2.000	1.000	1	1.31E-01	1.30E-01	1.08E-01
KSH03	164.75	165.00	F	Cs	0.500	0.250	1	1.57E+00	8.02E-01	1.25E+00
KSH03	164.75	165.00	F	Cs	0.125	0.063	1	3.45E+00	3.02E+00	
KSH03	164.75	165.00	F	Cs	2.000	1.000	7	4.47E-01	2.98E-01	3.64E-01
KSH03	164.75	165.00	F	Cs	0.500	0.250	7	3.16E+00	1.18E+00	1.74E+00
KSH03	164.75	165.00	F	Cs	0.125	0.063	7	3.34E+00	3.50E+00	
KSH03	164.75	165.00	F	Cs	2.000	1.000	36	4.96E-01	5.32E-01	4.75E-01
KSH03	164.75	165.00	F	Cs	0.500	0.250	36	3.30E+00	3.44E+00	3.36E+00
KSH03	164.75	165.00	F	Cs	0.125	0.063	36	3.40E+00	3.30E+00	
KSH03	164.75	165.00	F	Cs	2.000	1.000	92	9.95E-01	1.11E+00	6.39E-01
KSH03	164.75	165.00	F	Cs	0.500	0.250	92	2.89E+00	3.47E+00	1.26E+00
KSH03	164.75	165.00	F	Cs	0.125	0.063	92	2.90E+00	2.96E+00	
KSH03	164.75	165.00	F	Cs	2.000	1.000	187	5.80E-01	8.33E-01	6.50E-01
KSH03	164.75	165.00	F	Cs	0.500	0.250	187	2.83E+00	2.54E+00	2.54E+00
KSH03	164.75	165.00	F	Cs	0.125	0.063	187	2.58E+00	2.57E+00	
KSH03	164.75	165.00	F	Sr	2.000	1.000	1	5.63E-02	4.94E-02	4.60E-02
KSH03	164.75	165.00	F	Sr	0.500	0.250	1	4.54E-01	3.07E-01	6.60E-01
KSH03	164.75	165.00	F	Sr	0.125	0.063	1	6.51E-01	5.69E-01	
KSH03	164.75	165.00	F	Sr	2.000	1.000	7	1.16E-01	7.92E-02	9.56E-02
KSH03	164.75	165.00	F	Sr	0.500	0.250	7	5.35E-01	6.95E-01	6.49E-01
KSH03	164.75	165.00	F	Sr	0.125	0.063	7	5.66E-01	5.93E-01	
KSH03	164.75	165.00	F	Sr	2.000	1.000	36	1.43E-01	1.07E-01	1.22E-01
KSH03	164.75	165.00	F	Sr	0.500	0.250	36	4.23E-01	4.05E-01	4.30E-01
KSH03	164.75	165.00	F	Sr	0.125	0.063	36	4.35E-01	4.23E-01	
KSH03	164.75	165.00	F	Sr	2.000	1.000	92	2.19E-01	2.17E-01	9.08E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KSH03	164.75	165.00	F	Sr	0.500	0.250	92	2.17E-01	2.86E-01	2.21E-01
KSH03	164.75	165.00	F	Sr	0.125	0.063	92	2.18E-01	2.23E-01	
KSH03	164.75	165.00	F	Sr	2.000	1.000	187	6.48E-02	6.41E-02	6.68E-02
KSH03	164.75	165.00	F	Sr	0.500	0.250	187	7.32E-02	6.52E-02	6.52E-02
KSH03	164.75	165.00	F	Sr	0.125	0.063	187	6.61E-02	6.60E-02	
KSH03	164.75	165.00	F	Eu	2.000	1.000	1	4.61E-02	5.16E-02	6.25E-02
KSH03	164.75	165.00	F	Eu	0.500	0.250	1	1.45E-01	9.66E-02	1.18E-01
KSH03	164.75	165.00	F	Eu	0.125	0.063	1	3.38E-01		
KSH03	164.75	165.00	F	Eu	2.000	1.000	7	1.18E-01	1.27E-01	1.02E-01
KSH03	164.75	165.00	F	Eu	0.500	0.250	7	6.22E-01	4.69E-01	3.70E-01
KSH03	164.75	165.00	F	Eu	0.125	0.063	7	7.19E-01		
KSH03	164.75	165.00	F	Eu	2.000	1.000	36	2.13E-01	1.62E-01	2.32E-01
KSH03	164.75	165.00	F	Eu	0.500	0.250	36	6.22E-01	6.63E-01	5.31E-01
KSH03	164.75	165.00	F	Eu	0.125	0.063	36	1.14E+00		
KSH03	164.75	165.00	F	Eu	2.000	1.000	92	5.26E-01	3.02E-01	3.85E-01
KSH03	164.75	165.00	F	Eu	0.500	0.250	92	1.24E+00	1.20E+00	1.20E+00
KSH03	164.75	165.00	F	Eu	0.125	0.063	92	2.99E+00		
KSH03	164.75	165.00	F	Eu	2.000	1.000	187	4.21E-01	5.29E-01	6.10E-01
KSH03	164.75	165.00	F	Eu	0.500	0.250	187	1.66E+00	1.92E+00	1.51E+00
KSH03	164.75	165.00	F	Eu	0.125	0.063	187	3.15E+00		
KSH03	164.75	165.00	SaS	Cs	2.000	1.000	1	1.92E-02	2.87E-02	2.20E-02
KSH03	164.75	165.00	SaS	Cs	0.500	0.250	1	1.86E-01	2.72E-01	2.86E-01
KSH03	164.75	165.00	SaS	Cs	0.125	0.063	1	7.03E-01	1.41E+00	
KSH03	164.75	165.00	SaS	Cs	2.000	1.000	7	5.46E-02	9.35E-02	6.23E-02
KSH03	164.75	165.00	SaS	Cs	0.500	0.250	7	4.64E-01	4.80E-01	3.93E-01
KSH03	164.75	165.00	SaS	Cs	0.125	0.063	7	1.28E+00	1.10E+00	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KSH03	164.75	165.00	SaS	Cs	2.000	1.000	36	7.27E-02	1.36E-01	1.23E-01
KSH03	164.75	165.00	SaS	Cs	0.500	0.250	36	6.47E-01	6.10E-01	5.74E-01
KSH03	164.75	165.00	SaS	Cs	0.125	0.063	36	2.84E+00	3.31E+00	
KSH03	164.75	165.00	SaS	Cs	2.000	1.000	92	8.30E-02	1.19E-01	1.23E-01
KSH03	164.75	165.00	SaS	Cs	0.500	0.250	92	7.05E-01	9.28E-01	9.52E-01
KSH03	164.75	165.00	SaS	Cs	0.125	0.063	92	1.71E+00		
KSH03	164.75	165.00	SaS	Cs	2.000	1.000	187	9.12E-02	1.55E-01	1.26E-01
KSH03	164.75	165.00	SaS	Cs	0.500	0.250	187	5.51E-01	5.79E-01	4.71E-01
KSH03	164.75	165.00	SaS	Cs	0.125	0.063	187	1.83E+00		
KSH03	164.75	165.00	SaS	Sr	2.000	1.000	1	2.53E-03	3.97E-03	3.33E-03
KSH03	164.75	165.00	SaS	Sr	0.500	0.250	1	3.06E-03	4.93E-03	4.41E-03
KSH03	164.75	165.00	SaS	Sr	0.125	0.063	1	4.51E-03	4.85E-03	
KSH03	164.75	165.00	SaS	Sr	2.000	1.000	7	4.24E-03	4.52E-03	3.72E-03
KSH03	164.75	165.00	SaS	Sr	0.500	0.250	7	6.75E-03	5.16E-03	4.35E-03
KSH03	164.75	165.00	SaS	Sr	0.125	0.063	7	6.50E-03	5.99E-03	
KSH03	164.75	165.00	SaS	Sr	2.000	1.000	36	1.63E-03	4.62E-03	4.41E-03
KSH03	164.75	165.00	SaS	Sr	0.500	0.250	36	4.44E-03	4.76E-03	4.15E-03
KSH03	164.75	165.00	SaS	Sr	0.125	0.063	36	5.50E-03	4.58E-03	
KSH03	164.75	165.00	SaS	Sr	2.000	1.000	92	2.25E-03	2.18E-03	2.75E-03
KSH03	164.75	165.00	SaS	Sr	0.500	0.250	92	2.92E-03	3.63E-03	3.71E-03
KSH03	164.75	165.00	SaS	Sr	0.125	0.063	92	2.84E-03	4.39E-03	
KSH03	164.75	165.00	SaS	Sr	2.000	1.000	187	3.12E-03	5.02E-03	3.45E-03
KSH03	164.75	165.00	SaS	Sr	0.500	0.250	187	2.62E-03	4.95E-03	3.59E-03
KSH03	164.75	165.00	SaS	Sr	0.125	0.063	187	5.95E-03	5.21E-03	
KSH03	164.75	165.00	SaS	Eu	2.000	1.000	1	1.64E-01	1.47E-01	2.27E-01
KSH03	164.75	165.00	SaS	Eu	0.500	0.250	1	1.93E-01	2.89E-01	3.97E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KSH03	164.75	165.00	SaS	Eu	0.125	0.063	1	7.91E-01		
KSH03	164.75	165.00	SaS	Eu	2.000	1.000	7	1.21E+00	3.94E-01	4.48E-01
KSH03	164.75	165.00	SaS	Eu	0.500	0.250	7	1.22E+00	1.42E+00	1.27E+00
KSH03	164.75	165.00	SaS	Eu	0.125	0.063	7	1.74E+00		
KSH03	164.75	165.00	SaS	Eu	2.000	1.000	36	6.61E-01	1.06E+00	1.16E+00
KSH03	164.75	165.00	SaS	Eu	0.500	0.250	36	2.09E+00	1.99E+00	1.55E+00
KSH03	164.75	165.00	SaS	Eu	0.125	0.063	36	3.12E+00		
KSH03	164.75	165.00	SaS	Eu	2.000	1.000	92	8.50E-01	2.86E+00	1.18E+00
KSH03	164.75	165.00	SaS	Eu	0.500	0.250	92	4.07E+00	7.27E+00	6.80E+00
KSH03	164.75	165.00	SaS	Eu	0.125	0.063	92	3.60E+00		
KSH03	164.75	165.00	SaS	Eu	2.000	1.000	187	2.53E+00	5.44E-01	8.49E-01
KSH03	164.75	165.00	SaS	Eu	0.500	0.250	187	5.28E+00	4.31E+00	3.29E+00
KSH03	164.75	165.00	SaS	Eu	0.125	0.063	187	5.76E+00		

Table A5-14. Tracer distribution ratio, *Rd,* for rock samples from KLX02.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	217.00	217.20	F	Cs	2.000	1.000	1	9.05E-02	9.44E-02	1.01E-04
KLX02	217.00	217.20	F	Cs	0.500	0.250	1	5.11E-03	9.90E-02	6.66E-03
KLX02	217.00	217.20	F	Cs	0.125	0.063	1	2.54E-02	2.76E-02	2.77E-02
KLX02	217.00	217.20	F	Cs	2.000	1.000	8	1.36E-01	1.32E-01	-1.85E-04
KLX02	217.00	217.20	F	Cs	0.500	0.250	8	1.15E-02	1.38E-02	1.36E-02
KLX02	217.00	217.20	F	Cs	0.125	0.063	8	4.62E-02	5.05E-02	4.56E-02
KLX02	217.00	217.20	F	Cs	2.000	1.000	30	1.62E-02	2.03E-02	1.93E-02
KLX02	217.00	217.20	F	Cs	0.500	0.250	30	6.16E-02	5.87E-02	5.49E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	217.00	217.20	F	Cs	0.125	0.063	30	1.70E-01	1.55E-01	1.52E-01
KLX02	217.00	217.20	F	Cs	2.000	1.000	91	2.17E-02	2.79E-02	2.66E-02
KLX02	217.00	217.20	F	Cs	0.500	0.250	91	7.04E-02	6.93E-02	6.31E-02
KLX02	217.00	217.20	F	Cs	0.125	0.063	91	1.97E-01	1.88E-01	1.68E-01
KLX02	217.00	217.20	F	Cs	2.000	1.000	189	2.83E-02	3.45E-02	3.49E-02
KLX02	217.00	217.20	F	Cs	0.500	0.250	189	8.42E-02	8.49E-02	7.65E-02
KLX02	217.00	217.20	F	Cs	0.125	0.063	189	2.16E-01	2.20E-01	2.19E-01
KLX02	217.00	217.20	F	Sr	2.000	1.000	1	1.20E-02	1.38E-02	1.80E-04
KLX02	217.00	217.20	F	Sr	0.500	0.250	1	2.78E-03	3.56E-03	3.65E-03
KLX02	217.00	217.20	F	Sr	0.125	0.063	1	1.07E-01	7.57E-03	7.73E-03
KLX02	217.00	217.20	F	Sr	2.000	1.000	8	1.38E-02	2.05E-02	-9.65E-05
KLX02	217.00	217.20	F	Sr	0.500	0.250	8	6.03E-03	9.05E-02	5.42E-03
KLX02	217.00	217.20	F	Sr	0.125	0.063	8	6.70E-03	6.86E-03	8.84E-03
KLX02	217.00	217.20	F	Sr	2.000	1.000	30	4.58E-03	6.12E-03	6.00E-03
KLX02	217.00	217.20	F	Sr	0.500	0.250	30	8.54E-03	9.67E-03	8.24E-03
KLX02	217.00	217.20	F	Sr	0.125	0.063	30	2.08E-02	1.49E-02	1.97E-02
KLX02	217.00	217.20	F	Sr	2.000	1.000	91	5.92E-03	7.13E-03	5.43E-03
KLX02	217.00	217.20	F	Sr	0.500	0.250	91	9.91E-03	1.09E-02	9.22E-03
KLX02	217.00	217.20	F	Sr	0.125	0.063	91	1.59E-02	1.45E-02	1.89E-02
KLX02	217.00	217.20	F	Sr	2.000	1.000	189	6.95E-03	8.19E-03	8.14E-03
KLX02	217.00	217.20	F	Sr	0.500	0.250	189	1.18E-02	1.34E-02	1.24E-02
KLX02	217.00	217.20	F	Sr	0.125	0.063	189	2.12E-02	2.32E-02	2.33E-02
KLX02	217.00	217.20	F	Eu	2.000	1.000	1	-3.10E-03	-2.93E-03	-3.85E-03
KLX02	217.00	217.20	F	Eu	0.500	0.250	1	-3.52E-03	-3.63E-03	-3.73E-03

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	217.00	217.20	F	Eu	0.125	0.063	1	-2.91E-03	-3.35E-03	-3.11E-03
KLX02	217.00	217.20	F	Eu	2.000	1.000	8	1.91E-01	3.74E-01	4.38E-03
KLX02	217.00	217.20	F	Eu	0.500	0.250	8	1.16E-01	4.74E-02	5.84E-02
KLX02	217.00	217.20	F	Eu	0.125	0.063	8	2.24E-01	1.73E-01	1.47E-01
KLX02	217.00	217.20	F	Eu	2.000	1.000	30	1.73E-01	9.21E-02	6.35E-02
KLX02	217.00	217.20	F	Eu	0.500	0.250	30	1.65E-01	2.84E-01	2.27E-01
KLX02	217.00	217.20	F	Eu	0.125	0.063	30	4.55E-01	3.31E-01	4.17E-01
KLX02	217.00	217.20	F	Eu	2.000	1.000	91	1.94E-01	1.89E-01	1.67E-01
KLX02	217.00	217.20	F	Eu	0.500	0.250	91	4.97E-01	2.93E-01	3.91E-01
KLX02	217.00	217.20	F	Eu	0.125	0.063	91	5.56E-01	4.09E-01	2.99E-01
KLX02	217.00	217.20	F	Eu	2.000	1.000	189	2.83E-01	2.08E-01	1.99E-01
KLX02	217.00	217.20	F	Eu	0.500	0.250	189	4.28E-01	4.09E-01	4.21E-01
KLX02	217.00	217.20	F	Eu	0.125	0.063	189	6.64E-01	4.96E-01	3.31E-01
KLX02	217.00	217.20	B	Cs	2.000	1.000	1	7.56E-04	5.46E-04	5.76E-04
KLX02	217.00	217.20	B	Cs	0.500	0.250	1	2.61E-03	2.95E-03	2.66E-03
KLX02	217.00	217.20	B	Cs	0.125	0.063	1	8.78E-03	9.94E-03	9.62E-03
KLX02	217.00	217.20	B	Cs	2.000	1.000	8	1.09E-03	1.07E-03	1.10E-03
KLX02	217.00	217.20	B	Cs	0.500	0.250	8	3.88E-03	4.26E-03	4.09E-03
KLX02	217.00	217.20	B	Cs	0.125	0.063	8	1.12E-02	1.25E-02	1.20E-02
KLX02	217.00	217.20	B	Cs	2.000	1.000	42	1.74E-03	1.55E-03	1.47E-03
KLX02	217.00	217.20	B	Cs	0.500	0.250	42	5.11E-03	5.81E-03	5.30E-03
KLX02	217.00	217.20	B	Cs	0.125	0.063	42	1.19E-02	1.31E-02	1.23E-02
KLX02	217.00	217.20	B	Cs	2.000	1.000	90	2.11E-03	1.78E-03	1.85E-03
KLX02	217.00	217.20	B	Cs	0.500	0.250	90	5.79E-03	6.47E-03	6.15E-03

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	217.00	217.20	B	Cs	0.125	0.063	90	1.40E-02	1.64E-02	1.58E-02
KLX02	217.00	217.20	B	Cs	2.000	1.000	181	2.53E-03	2.05E-03	2.15E-03
KLX02	217.00	217.20	B	Cs	0.500	0.250	181	6.99E-03	7.23E-03	6.85E-03
KLX02	217.00	217.20	B	Cs	0.125	0.063	181	1.11E-02	1.19E-02	1.17E-02
KLX02	217.00	217.20	B	Sr	2.000	1.000	1	-1.01E-03	-1.21E-03	-1.03E-03
KLX02	217.00	217.20	B	Sr	0.500	0.250	1	-1.12E-03	-9.13E-04	-1.08E-03
KLX02	217.00	217.20	B	Sr	0.125	0.063	1			
KLX02	217.00	217.20	B	Sr	2.000	1.000	8	9.42E-05	-2.69E-04	-3.76E-04
KLX02	217.00	217.20	B	Sr	0.500	0.250	8	-1.10E-03	-7.11E-05	1.51E-04
KLX02	217.00	217.20	B	Sr	0.125	0.063	8			
KLX02	217.00	217.20	B	Sr	2.000	1.000	42	-2.12E-04	-1.41E-04	9.42E-05
KLX02	217.00	217.20	B	Sr	0.500	0.250	42	-1.02E-04	1.76E-04	-1.64E-04
KLX02	217.00	217.20	B	Sr	0.125	0.063	42			
KLX02	217.00	217.20	B	Sr	2.000	1.000	90	1.72E-04	-7.09E-05	4.59E-06
KLX02	217.00	217.20	B	Sr	0.500	0.250	90	2.34E-05	1.70E-06	-1.29E-04
KLX02	217.00	217.20	B	Sr	0.125	0.063	90			
KLX02	217.00	217.20	B	Sr	2.000	1.000	181	-1.87E-04	3.64E-04	-5.17E-05
KLX02	217.00	217.20	B	Sr	0.500	0.250	181	1.35E-04	-5.46E-05	-9.62E-05
KLX02	217.00	217.20	B	Sr	0.125	0.063	181	4.72E-04	5.29E-04	2.90E-04
KLX02	217.00	217.20	B	Eu	2.000	1.000	1	1.86E-01	5.23E-02	4.46E-02
KLX02	217.00	217.20	B	Eu	0.500	0.250	1	6.02E-02	8.07E-02	7.40E-02
KLX02	217.00	217.20	B	Eu	0.125	0.063	1	1.50E-01	1.57E-01	1.59E-01
KLX02	217.00	217.20	B	Eu	2.000	1.000	8	1.07E-01	7.72E-02	5.59E-02
KLX02	217.00	217.20	B	Eu	0.500	0.250	8	3.08E-01	8.98E-02	7.02E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	217.00	217.20	B	Eu	0.125	0.063	8	3.22E-01	2.57E-01	2.58E-01
KLX02	217.00	217.20	B	Eu	2.000	1.000	42	5.66E-02	4.15E-02	2.62E-01
KLX02	217.00	217.20	B	Eu	0.500	0.250	42	5.03E-02	2.93E-02	5.97E-02
KLX02	217.00	217.20	B	Eu	0.125	0.063	42	5.08E-01	3.99E-01	5.02E-01
KLX02	217.00	217.20	B	Eu	2.000	1.000	90	1.06E-01	3.58E-01	8.78E-02
KLX02	217.00	217.20	B	Eu	0.500	0.250	90	1.32E-01	1.23E-01	1.56E-01
KLX02	217.00	217.20	B	Eu	0.125	0.063	90	7.97E-01	6.42E-01	8.64E-01
KLX02	217.00	217.20	B	Eu	2.000	1.000	181	6.88E-02	5.52E-02	6.80E-02
KLX02	217.00	217.20	B	Eu	0.500	0.250	181	1.51E-01	9.50E-02	8.12E-02
KLX02	217.00	217.20	B	Eu	0.125	0.063	181	9.06E-01	1.24E+00	9.50E-01
KLX02	217.00	217.20	SaS	Cs	2.000	1.000	1	1.86E-03	1.73E-03	2.01E-03
KLX02	217.00	217.20	SaS	Cs	0.500	0.250	1	7.24E-03	7.61E-03	8.47E-03
KLX02	217.00	217.20	SaS	Cs	0.125	0.063	1	3.16E-02	3.06E-02	3.66E-02
KLX02	217.00	217.20	SaS	Cs	2.000	1.000	8	3.03E-03	2.90E-03	3.25E-03
KLX02	217.00	217.20	SaS	Cs	0.500	0.250	8	1.24E-02	1.40E-02	1.50E-02
KLX02	217.00	217.20	SaS	Cs	0.125	0.063	8	5.06E-02	5.99E-02	2.95E-04
KLX02	217.00	217.20	SaS	Cs	2.000	1.000	42	4.36E-03	4.44E-03	4.64E-03
KLX02	217.00	217.20	SaS	Cs	0.500	0.250	42	1.64E-02	1.76E-02	2.01E-02
KLX02	217.00	217.20	SaS	Cs	0.125	0.063	42	6.87E-02	6.16E-02	7.74E-02
KLX02	217.00	217.20	SaS	Cs	2.000	1.000	90	5.25E-03	5.35E-03	5.43E-03
KLX02	217.00	217.20	SaS	Cs	0.500	0.250	90	1.82E-02	2.15E-02	2.34E-02
KLX02	217.00	217.20	SaS	Cs	0.125	0.063	90	8.39E-02	7.46E-02	9.18E-02
KLX02	217.00	217.20	SaS	Cs	2.000	1.000	181	6.17E-03	6.00E-03	6.79E-03
KLX02	217.00	217.20	SaS	Cs	0.500	0.250	181	2.02E-02	2.26E-02	2.54E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	217.00	217.20	SaS	Cs	0.125	0.063	181	8.08E-02	7.58E-02	9.09E-02
KLX02	217.00	217.20	SaS	Sr	2.000	1.000	1	3.55E-05	9.00E-05	2.38E-04
KLX02	217.00	217.20	SaS	Sr	0.500	0.250	1	1.35E-04	3.09E-04	8.19E-05
KLX02	217.00	217.20	SaS	Sr	0.125	0.063	1	-2.52E-04	2.82E-04	9.21E-05
KLX02	217.00	217.20	SaS	Sr	2.000	1.000	8	1.05E-04	6.81E-05	6.06E-05
KLX02	217.00	217.20	SaS	Sr	0.500	0.250	8	2.58E-04	-5.07E-06	1.64E-04
KLX02	217.00	217.20	SaS	Sr	0.125	0.063	8	1.48E-04	-1.02E-05	4.35E-04
KLX02	217.00	217.20	SaS	Sr	2.000	1.000	42	1.58E-04	-7.18E-05	1.28E-04
KLX02	217.00	217.20	SaS	Sr	0.500	0.250	42	2.35E-05	1.37E-04	-6.85E-05
KLX02	217.00	217.20	SaS	Sr	0.125	0.063	42	-8.79E-05	2.78E-05	7.13E-05
KLX02	217.00	217.20	SaS	Sr	2.000	1.000	90	7.66E-05	1.10E-04	-1.37E-04
KLX02	217.00	217.20	SaS	Sr	0.500	0.250	90	1.68E-06	1.81E-04	2.07E-04
KLX02	217.00	217.20	SaS	Sr	0.125	0.063	90	2.35E-04	2.15E-06	1.71E-04
KLX02	217.00	217.20	SaS	Sr	2.000	1.000	181	3.98E-04	4.61E-04	2.31E-04
KLX02	217.00	217.20	SaS	Sr	0.500	0.250	181	1.89E-06	2.67E-04	-1.08E-04
KLX02	217.00	217.20	SaS	Sr	0.125	0.063	181	2.64E-04	2.88E-04	1.81E-04
KLX02	217.00	217.20	SaS	Eu	2.000	1.000	1	7.39E-02	1.03E-01	1.03E-01
KLX02	217.00	217.20	SaS	Eu	0.500	0.250	1	1.56E-01	8.21E-02	2.32E-01
KLX02	217.00	217.20	SaS	Eu	0.125	0.063	1	3.15E-01	2.77E-01	3.49E-01
KLX02	217.00	217.20	SaS	Eu	2.000	1.000	8	1.52E-01	1.67E-01	1.69E-01
KLX02	217.00	217.20	SaS	Eu	0.500	0.250	8	3.16E-01	3.52E-01	4.34E-01
KLX02	217.00	217.20	SaS	Eu	0.125	0.063	8	9.06E-01	6.83E-01	9.42E-01
KLX02	217.00	217.20	SaS	Eu	2.000	1.000	42	2.62E-01	2.82E-01	2.83E-01
KLX02	217.00	217.20	SaS	Eu	0.500	0.250	42	6.44E-01	6.75E-01	8.07E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	217.00	217.20	SaS	Eu	0.125	0.063	42	1.61E+00	1.24E+00	2.03E+00
KLX02	217.00	217.20	SaS	Eu	2.000	1.000	90	4.07E-01	3.64E-01	3.09E-01
KLX02	217.00	217.20	SaS	Eu	0.500	0.250	90	6.58E-01	7.64E-01	1.16E+00
KLX02	217.00	217.20	SaS	Eu	0.125	0.063	90	3.08E+00	3.11E+00	1.25E+00
KLX02	217.00	217.20	SaS	Eu	2.000	1.000	181	3.35E-01	4.69E-01	4.84E-01
KLX02	217.00	217.20	SaS	Eu	0.500	0.250	181	8.73E-01	9.21E-01	9.77E-01
KLX02	217.00	217.20	SaS	Eu	0.125	0.063	181	2.52E+00	2.81E+00	4.14E+00
KLX02	509.50	509.70	B	Cs	2.000	1.000	1	6.32E-03	7.39E-03	7.85E-03
KLX02	509.50	509.70	B	Cs	0.500	0.250	1	1.61E-02	1.95E-02	
KLX02	509.50	509.70	B	Cs	0.125	0.063	1	5.58E-02		
KLX02	509.50	509.70	B	Cs	2.000	1.000	7	7.30E-03	1.11E-02	6.71E-03
KLX02	509.50	509.70	B	Cs	0.500	0.250	7	2.24E-02	2.49E-02	
KLX02	509.50	509.70	B	Cs	0.125	0.063	7	7.81E-02		
KLX02	509.50	509.70	B	Cs	2.000	1.000	31	6.96E-03	1.73E-02	9.19E-03
KLX02	509.50	509.70	B	Cs	0.500	0.250	31	2.36E-02	2.83E-02	
KLX02	509.50	509.70	B	Cs	0.125	0.063	31	9.27E-02		
KLX02	509.50	509.70	B	Cs	2.000	1.000	92	7.79E-03	1.27E-02	8.11E-03
KLX02	509.50	509.70	B	Cs	0.500	0.250	92	2.44E-02	2.33E-02	
KLX02	509.50	509.70	B	Cs	0.125	0.063	92	8.61E-02		
KLX02	509.50	509.70	B	Cs	2.000	1.000	182	7.60E-03	1.27E-02	8.33E-03
KLX02	509.50	509.70	B	Cs	0.500	0.250	182	2.70E-02	2.54E-02	
KLX02	509.50	509.70	B	Cs	0.125	0.063	182	1.07E-01		
KLX02	509.50	509.70	B	Sr	2.000	1.000	1	4.18E-03	3.33E-03	6.75E-03
KLX02	509.50	509.70	B	Sr	0.500	0.250	1	3.97E-03	4.04E-03	
KLX02	509.50	509.70	B	Sr	0.125	0.063	1	5.51E-03		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	509.50	509.70	B	Sr	2.000	1.000	7	5.06E-03	3.73E-03	5.03E-03
KLX02	509.50	509.70	B	Sr	0.500	0.250	7	5.12E-03	5.80E-03	
KLX02	509.50	509.70	B	Sr	0.125	0.063	7	5.40E-03		
KLX02	509.50	509.70	B	Sr	2.000	1.000	31	4.29E-03	8.11E-03	6.11E-03
KLX02	509.50	509.70	B	Sr	0.500	0.250	31	5.63E-03	4.72E-03	
KLX02	509.50	509.70	B	Sr	0.125	0.063	31	4.62E-03		
KLX02	509.50	509.70	B	Sr	2.000	1.000	92	4.17E-03	3.72E-03	4.59E-03
KLX02	509.50	509.70	B	Sr	0.500	0.250	92	3.76E-03	3.28E-03	
KLX02	509.50	509.70	B	Sr	0.125	0.063	92	4.76E-03		
KLX02	509.50	509.70	B	Sr	2.000	1.000	182	1.93E-03	2.05E-03	5.02E-03
KLX02	509.50	509.70	B	Sr	0.500	0.250	182	2.99E-03	5.14E-03	
KLX02	509.50	509.70	B	Sr	0.125	0.063	182	3.10E-03		
KLX02	509.50	509.70	B	Am	2.000	1.000	1	2.63E-02	2.81E-02	4.89E-02
KLX02	509.50	509.70	B	Am	0.500	0.250	1	6.19E-02	7.44E-02	
KLX02	509.50	509.70	B	Am	0.125	0.063	1	1.45E-01		
KLX02	509.50	509.70	B	Am	2.000	1.000	7	9.12E-02	7.86E-02	1.31E-01
KLX02	509.50	509.70	B	Am	0.500	0.250	7	3.15E-01	4.62E-01	
KLX02	509.50	509.70	B	Am	0.125	0.063	7	7.47E-01		
KLX02	509.50	509.70	B	Am	2.000	1.000	31	1.94E-01	3.19E-01	3.43E-01
KLX02	509.50	509.70	B	Am	0.500	0.250	31	1.16E+00	1.16E+00	
KLX02	509.50	509.70	B	Am	0.125	0.063	31	2.63E+00		
KLX02	509.50	509.70	B	Am	2.000	1.000	92	2.34E-01	6.42E-01	3.82E-01
KLX02	509.50	509.70	B	Am	0.500	0.250	92	8.97E-01	6.46E-01	
KLX02	509.50	509.70	B	Am	0.125	0.063	92	1.06E+00		
KLX02	509.50	509.70	B	Am	2.000	1.000	182	7.40E-01	5.23E-01	5.88E-01
KLX02	509.50	509.70	B	Am	0.500	0.250	182	1.55E+00	1.83E+00	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	509.50	509.70	B	Am	0.125	0.063	182	1.97E+00		
KLX02	509.50	509.70	F	Cs	2.000	1.000	1	3.32E-02	2.48E-02	3.03E-02
KLX02	509.50	509.70	F	Cs	0.500	0.250	1	1.32E-01		
KLX02	509.50	509.70	F	Cs	2.000	1.000	7	5.55E-02	3.47E-02	5.07E-02
KLX02	509.50	509.70	F	Cs	0.500	0.250	7	1.71E-01		
KLX02	509.50	509.70	F	Cs	2.000	1.000	31	7.19E-02	5.21E-02	7.15E-02
KLX02	509.50	509.70	F	Cs	0.500	0.250	31	2.56E-01		
KLX02	509.50	509.70	F	Cs	2.000	1.000	92	8.13E-02	6.20E-02	8.46E-02
KLX02	509.50	509.70	F	Cs	0.500	0.250	92	2.77E-01		
KLX02	509.50	509.70	F	Cs	2.000	1.000	182	1.14E-01	7.97E-02	1.16E-01
KLX02	509.50	509.70	F	Cs	0.500	0.250	182	4.04E-01		
KLX02	509.50	509.70	F	Sr	2.000	1.000	1	1.48E-02	1.19E-02	1.29E-02
KLX02	509.50	509.70	F	Sr	0.500	0.250	1	2.44E-02		
KLX02	509.50	509.70	F	Sr	2.000	1.000	7	2.22E-02	9.82E-03	1.30E-02
KLX02	509.50	509.70	F	Sr	0.500	0.250	7	1.82E-02		
KLX02	509.50	509.70	F	Sr	2.000	1.000	31	1.82E-02	1.58E-02	1.87E-02
KLX02	509.50	509.70	F	Sr	0.500	0.250	31	2.76E-02		
KLX02	509.50	509.70	F	Sr	2.000	1.000	92	3.24E-02	1.60E-02	2.13E-02
KLX02	509.50	509.70	F	Sr	0.500	0.250	92	3.45E-02		
KLX02	509.50	509.70	F	Sr	2.000	1.000	182	2.80E-02	2.61E-02	
KLX02	509.50	509.70	F	Am	2.000	1.000	1	8.04E-02	4.68E-02	1.07E-01
KLX02	509.50	509.70	F	Am	0.500	0.250	1	8.04E-02	1.21E-01	
KLX02	509.50	509.70	F	Am	0.125	0.063	1	4.29E-02		
KLX02	509.50	509.70	F	Am	2.000	1.000	7	4.45E-02	6.81E-02	1.43E-01
KLX02	509.50	509.70	F	Am	0.500	0.250	7	1.61E-01	2.11E-01	
KLX02	509.50	509.70	F	Am	0.125	0.063	7	3.56E-01		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	509.50	509.70	F	Am	2.000	1.000	31	1.75E-01	1.50E-01	2.80E-01
KLX02	509.50	509.70	F	Am	0.500	0.250	31	2.21E-01	2.69E-01	
KLX02	509.50	509.70	F	Am	0.125	0.063	31	5.03E-01		
KLX02	509.50	509.70	F	Am	2.000	1.000	92	2.09E-01	1.10E-01	2.11E-01
KLX02	509.50	509.70	F	Am	0.500	0.250	92	2.90E-01	2.17E-01	
KLX02	509.50	509.70	F	Am	0.125	0.063	92	6.51E-01		
KLX02	509.50	509.70	F	Am	2.000	1.000	182	2.44E-01	1.48E-01	2.23E-01
KLX02	509.50	509.70	F	Am	0.500	0.250	182	3.89E-01	3.19E-01	
KLX02	509.50	509.70	F	Am	0.125	0.063	182	1.25E-01		
KLX02	509.50	509.70	M	Cs	2.000	1.000	1	6.47E-03	7.89E-03	7.48E-03
KLX02	509.50	509.70	M	Cs	0.500	0.250	1	1.56E-02	1.64E-02	
KLX02	509.50	509.70	M	Cs	0.125	0.063	1	4.82E-02		
KLX02	509.50	509.70	M	Cs	2.000	1.000	7	9.43E-03	8.98E-03	8.62E-03
KLX02	509.50	509.70	M	Cs	0.500	0.250	7	2.56E-02	2.32E-02	
KLX02	509.50	509.70	M	Cs	0.125	0.063	7	7.84E-02		
KLX02	509.50	509.70	M	Cs	2.000	1.000	30	1.03E-02	1.09E-02	8.88E-03
KLX02	509.50	509.70	M	Cs	0.500	0.250	30	3.01E-02	3.42E-02	
KLX02	509.50	509.70	M	Cs	0.125	0.063	30	1.48E-01		
KLX02	509.50	509.70	M	Cs	2.000	1.000	96	1.16E-02	9.47E-03	1.09E-02
KLX02	509.50	509.70	M	Cs	0.500	0.250	96	3.26E-02	3.91E-02	
KLX02	509.50	509.70	M	Cs	0.125	0.063	96	1.21E-01		
KLX02	509.50	509.70	M	Cs	2.000	1.000	175	1.35E-02	1.34E-02	1.10E-02
KLX02	509.50	509.70	M	Cs	0.500	0.250	175	3.76E-02	3.12E-02	
KLX02	509.50	509.70	M	Cs	0.125	0.063	175	1.60E-01		
KLX02	509.50	509.70	M	Sr	2.000	1.000	1	4.69E-03	5.05E-03	4.36E-03
KLX02	509.50	509.70	M	Sr	0.500	0.250	1	2.98E-03	3.01E-03	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	509.50	509.70	M	Sr	0.125	0.063	1	3.77E-03		
KLX02	509.50	509.70	M	Sr	2.000	1.000	7	4.61E-03	3.20E-03	3.40E-03
KLX02	509.50	509.70	M	Sr	0.500	0.250	7	4.12E-03	3.96E-03	
KLX02	509.50	509.70	M	Sr	0.125	0.063	7	3.71E-03		
KLX02	509.50	509.70	M	Sr	2.000	1.000	30	4.81E-03	4.28E-03	2.95E-03
KLX02	509.50	509.70	M	Sr	0.500	0.250	30	5.87E-03	4.24E-03	
KLX02	509.50	509.70	M	Sr	0.125	0.063	30	5.82E-03		
KLX02	509.50	509.70	M	Sr	2.000	1.000	96	3.25E-03	2.39E-03	3.27E-03
KLX02	509.50	509.70	M	Sr	0.500	0.250	96	1.90E-03	3.19E-03	
KLX02	509.50	509.70	M	Sr	0.125	0.063	96	1.74E-03		
KLX02	509.50	509.70	M	Sr	2.000	1.000	175	3.30E-03	4.00E-03	2.61E-03
KLX02	509.50	509.70	M	Sr	0.500	0.250	175	2.75E-03	3.38E-03	
KLX03	509.50	509.70	M	Sr	0.125	0.063	175	4.87E-03		
KLX02	509.50	509.70	M	Am	2.000	1.000	1	1.15E-01	1.21E-01	1.62E-01
KLX02	509.50	509.70	M	Am	0.500	0.250	1	1.37E-01	9.17E-01	
KLX02	509.50	509.70	M	Am	0.125	0.063	1	6.23E-01		
KLX02	509.50	509.70	M	Am	2.000	1.000	7	2.25E-01	2.34E-01	3.16E-01
KLX02	509.50	509.70	M	Am	0.500	0.250	7	2.07E+00	1.90E+00	
KLX02	509.50	509.70	M	Am	0.125	0.063	7	6.27E+00		
KLX02	509.50	509.70	M	Am	2.000	1.000	30	3.99E-01	6.09E-01	4.22E-01
KLX02	509.50	509.70	M	Am	0.500	0.250	30	6.51E-01	1.24E+00	
KLX02	509.50	509.70	M	Am	0.125	0.063	30	4.55E+00		
KLX02	509.50	509.70	M	Am	2.000	1.000	96	4.96E-01	7.05E-01	2.30E-01
KLX02	509.50	509.70	M	Am	0.500	0.250	96	6.03E-01	1.83E-01	
KLX02	509.50	509.70	M	Am	0.125	0.063	96	1.12E+00		
KLX02	509.50	509.70	M	Am	2.000	1.000	175	9.49E-01	8.52E-01	1.32E+00

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	509.50	509.70	M	Am	0.500	0.250	175	6.70E-01	5.83E-01	
KLX02	509.50	509.70	M	Am	0.125	0.063	175	6.84E-01		
KLX02	682.70	682.90	F	Cs	2.000	1.000	1	4.52E-02	5.43E-02	6.58E-02
KLX02	682.70	682.90	F	Cs	0.500	0.250	1	1.64E-01	1.57E-01	1.24E-01
KLX02	682.70	682.90	F	Cs	2.000	1.000	7	1.13E-01	1.31E-01	1.55E-01
KLX02	682.70	682.90	F	Cs	0.500	0.250	7	3.03E-01	3.61E-01	3.83E-01
KLX02	682.70	682.90	F	Cs	2.000	1.000	31	1.96E-01	2.02E-01	2.32E-01
KLX02	682.70	682.90	F	Cs	0.500	0.250	31	3.62E-01	6.81E-01	5.05E-01
KLX02	682.70	682.90	F	Cs	2.000	1.000	92	1.75E-01	2.23E-01	2.42E-01
KLX02	682.70	682.90	F	Cs	0.500	0.250	92	6.85E-01	7.28E-01	3.78E-01
KLX02	682.70	682.90	F	Cs	2.000	1.000	182	2.63E-01	2.45E-01	2.47E-01
KLX02	682.70	682.90	F	Cs	0.500	0.250	182	4.46E-01		
KLX02	682.70	682.90	F	Sr	2.000	1.000	1	1.04E-02	1.43E-02	1.74E-02
KLX02	682.70	682.90	F	Sr	0.500	0.250	1	2.26E-02	2.43E-02	2.30E-02
KLX02	682.70	682.90	F	Sr	0.125	0.063	1	8.43E-02		
KLX02	682.70	682.90	F	Sr	2.000	1.000	7	1.53E-02	1.93E-02	2.11E-02
KLX02	682.70	682.90	F	Sr	0.500	0.250	7	2.19E-02	4.13E-02	2.39E-02
KLX02	682.70	682.90	F	Sr	0.125	0.063	7	1.02E-01		
KLX02	682.70	682.90	F	Sr	2.000	1.000	31	1.97E-02	2.76E-02	2.83E-02
KLX02	682.70	682.90	F	Sr	0.500	0.250	31	2.69E-02	4.72E-02	2.63E-02
KLX02	682.70	682.90	F	Sr	2.000	1.000	92	1.99E-02	2.57E-02	2.53E-02
KLX02	682.70	682.90	F	Sr	0.500	0.250	92	4.55E-02	4.15E-02	2.03E-02
KLX02	682.70	682.90	F	Sr	2.000	1.000	182	3.39E-02	3.62E-02	1.89E-02
KLX02	682.70	682.90	F	Am	2.000	1.000	1	2.10E-02	2.05E-02	2.42E-02
KLX02	682.70	682.90	F	Am	0.500	0.250	1	3.45E-02	4.93E-02	4.97E-02
KLX02	682.70	682.90	F	Am	0.125	0.063	1	1.07E-01		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	682.70	682.90	F	Am	2.000	1.000	7	5.35E-02	5.07E-02	7.30E-02
KLX02	682.70	682.90	F	Am	0.500	0.250	7	8.59E-02	1.97E-01	1.21E-01
KLX02	682.70	682.90	F	Am	0.125	0.063	7	3.68E-01		
KLX02	682.70	682.90	F	Am	2.000	1.000	31	8.51E-02	8.53E-02	1.01E-01
KLX02	682.70	682.90	F	Am	0.500	0.250	31	1.40E-01	2.89E-01	1.94E-01
KLX02	682.70	682.90	F	Am	2.000	1.000	92	1.13E-01	9.21E-02	1.30E-01
KLX02	682.70	682.90	F	Am	0.500	0.250	92	1.70E-01	4.02E-01	2.25E-01
KLX02	682.70	682.90	F	Am	0.125	0.063	92	4.04E-01		
KLX02	682.70	682.90	F	Am	2.000	1.000	182	1.24E-01	1.07E-01	1.40E-01
KLX02	682.70	682.90	F	Am	0.500	0.250	182	1.60E-01	2.73E-01	2.17E-01
KLX02	682.70	682.90	F	Am	0.125	0.063	182	4.37E-01		
KLX02	682.70	682.90	SaS	Cs	2.000	1.000	1	1.36E-02	1.55E-02	1.34E-02
KLX02	682.70	682.90	SaS	Cs	0.500	0.250	1	3.36E-02	4.41E-02	2.63E-02
KLX02	682.70	682.90	SaS	Cs	0.125	0.063	1	1.99E-01		
KLX02	682.70	682.90	SaS	Cs	2.000	1.000	7	2.50E-02	2.33E-02	2.74E-02
KLX02	682.70	682.90	SaS	Cs	0.500	0.250	7	6.58E-02	1.05E-01	7.04E-02
KLX02	682.70	682.90	SaS	Cs	0.125	0.063	7	4.73E-01		
KLX02	682.70	682.90	SaS	Cs	2.000	1.000	34	3.06E-02	3.11E-02	3.07E-02
KLX02	682.70	682.90	SaS	Cs	0.500	0.250	34	8.54E-02	1.23E-01	8.02E-02
KLX02	682.70	682.90	SaS	Cs	0.125	0.063	34	5.14E-01		
KLX02	682.70	682.90	SaS	Cs	2.000	1.000	97	3.88E-02	4.04E-02	3.73E-02
KLX02	682.70	682.90	SaS	Cs	0.500	0.250	97	1.02E-01	1.33E-01	8.09E-02
KLX02	682.70	682.90	SaS	Cs	0.125	0.063	97	4.75E-01		
KLX02	682.70	682.90	SaS	Cs	2.000	1.000	181	4.18E-02	4.20E-02	4.29E-02
KLX02	682.70	682.90	SaS	Cs	0.500	0.250	181	1.10E-01	1.44E-01	8.53E-02
KLX02	682.70	682.90	SaS	Cs	0.125	0.063	181	8.51E-01		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	682.70	682.90	SaS	Sr	2.000	1.000	1	4.25E-03	4.76E-03	3.75E-03
KLX02	682.70	682.90	SaS	Sr	0.500	0.250	1	4.28E-03	6.37E-03	4.03E-03
KLX02	682.70	682.90	SaS	Sr	0.125	0.063	1	4.76E-03		
KLX02	682.70	682.90	SaS	Sr	2.000	1.000	7	4.31E-03	3.81E-03	3.43E-03
KLX02	682.70	682.90	SaS	Sr	0.500	0.250	7	4.14E-03	5.69E-03	3.70E-03
KLX02	682.70	682.90	SaS	Sr	0.125	0.063	7	2.97E-03		
KLX02	682.70	682.90	SaS	Sr	2.000	1.000	34	3.13E-03	3.43E-03	2.95E-03
KLX02	682.70	682.90	SaS	Sr	0.500	0.250	34	3.77E-03	5.69E-03	3.18E-03
KLX02	682.70	682.90	SaS	Sr	0.125	0.063	34	3.07E-03		
KLX02	682.70	682.90	SaS	Sr	2.000	1.000	97	3.78E-03	4.33E-03	3.70E-03
KLX02	682.70	682.90	SaS	Sr	0.500	0.250	97	4.60E-03	6.84E-03	4.28E-03
KLX02	682.70	682.90	SaS	Sr	0.125	0.063	97	4.78E-03		
KLX02	682.70	682.90	SaS	Sr	2.000	1.000	181	3.95E-03	4.30E-03	4.01E-03
KLX02	682.70	682.90	SaS	Sr	0.500	0.250	181	5.23E-03	5.60E-03	4.66E-03
KLX02	682.70	682.90	SaS	Sr	0.125	0.063	181	3.58E-03		
KLX02	682.70	682.90	SaS	Am	2.000	1.000	1	6.80E-02	7.19E-02	6.35E-02
KLX02	682.70	682.90	SaS	Am	0.500	0.250	1	1.35E-01	1.54E-01	2.53E-01
KLX02	682.70	682.90	SaS	Am	0.125	0.063	1	2.71E-01		
KLX02	682.70	682.90	SaS	Am	2.000	1.000	7	2.85E-01	3.39E-01	2.97E-01
KLX02	682.70	682.90	SaS	Am	0.500	0.250	7	9.27E-01	7.43E-01	9.27E-01
KLX02	682.70	682.90	SaS	Am	0.125	0.063	7	1.79E+00		
KLX02	682.70	682.90	SaS	Am	2.000	1.000	34	7.41E-01	4.23E-01	5.36E-01
KLX02	682.70	682.90	SaS	Am	0.500	0.250	34	8.48E-01	2.04E+00	9.74E-01
KLX02	682.70	682.90	SaS	Am	0.125	0.063	34	9.62E-01		
KLX02	682.70	682.90	SaS	Am	2.000	1.000	97	5.49E-01	6.19E-01	4.23E-01
KLX02	682.70	682.90	SaS	Am	0.500	0.250	97	1.27E-01	3.23E-01	9.38E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	682.70	682.90	SaS	Am	0.125	0.063	97	1.01E+00		
KLX02	682.70	682.90	SaS	Am	2.000	1.000	181	7.14E-01	9.38E-01	1.38E+00
KLX02	682.70	682.90	SaS	Am	0.500	0.250	181	8.84E-01	4.35E-01	8.03E-01
KLX02	682.70	682.90	SaS	Am	0.125	0.063	181	4.46E-01		
KLX02	753.80	754.00	F	Cs	2.000	1.000	1	4.42E-03	6.19E-03	-3.28E-05
KLX02	753.80	754.00	F	Cs	0.500	0.250	1	1.90E-02	1.50E-02	5.34E-03
KLX02	753.80	754.00	F	Cs	0.125	0.063	1	4.82E-02	6.21E-02	2.08E-02
KLX02	753.80	754.00	F	Cs	2.000	1.000	7	8.31E-03	8.70E-03	9.82E-03
KLX02	753.80	754.00	F	Cs	0.500	0.250	7	2.45E-02	2.60E-02	2.22E-02
KLX02	753.80	754.00	F	Cs	0.125	0.063	7	6.68E-02	5.80E-02	7.34E-02
KLX02	753.80	754.00	F	Cs	2.000	1.000	29	1.28E-02	1.20E-02	1.50E-02
KLX02	753.80	754.00	F	Cs	0.500	0.250	29	3.29E-02	3.64E-02	3.11E-02
KLX02	753.80	754.00	F	Cs	0.125	0.063	29	8.63E-02	7.83E-02	9.23E-02
KLX02	753.80	754.00	F	Cs	2.000	1.000	91	1.58E-02	1.52E-02	1.70E-02
KLX02	753.80	754.00	F	Cs	0.500	0.250	91	3.42E-02	3.69E-02	3.14E-02
KLX02	753.80	754.00	F	Cs	0.125	0.063	91	8.46E-02	7.26E-02	9.62E-02
KLX02	753.80	754.00	F	Cs	2.000	1.000	182	2.33E-02	2.18E-02	2.49E-02
KLX02	753.80	754.00	F	Cs	0.500	0.250	182	4.97E-02	5.21E-02	4.41E-02
KLX02	753.80	754.00	F	Cs	0.125	0.063	182	1.19E-01	7.81E-02	1.32E-01
KLX02	753.80	754.00	F	Sr	2.000	1.000	1	4.11E-03	5.87E-03	-2.14E-05
KLX02	753.80	754.00	F	Sr	0.500	0.250	1	8.19E-03	7.84E-03	4.64E-03
KLX02	753.80	754.00	F	Sr	0.125	0.063	1	1.70E-02	1.94E-02	9.79E-03
KLX02	753.80	754.00	F	Sr	2.000	1.000	7	5.96E-03	6.66E-03	7.02E-03
KLX02	753.80	754.00	F	Sr	0.500	0.250	7	9.02E-03	9.50E-03	9.67E-03
KLX02	753.80	754.00	F	Sr	0.125	0.063	7	1.88E-02	1.75E-02	1.92E-02
KLX02	753.80	754.00	F	Sr	2.000	1.000	29	6.45E-03	6.68E-03	7.89E-03

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	753.80	754.00	F	Sr	0.500	0.250	29	9.52E-03	1.01E-02	1.06E-02
KLX02	753.80	754.00	F	Sr	0.125	0.063	29	2.05E-02	1.99E-02	2.03E-02
KLX02	753.80	754.00	F	Sr	2.000	1.000	91	7.00E-03	7.61E-03	7.41E-03
KLX02	753.80	754.00	F	Sr	0.500	0.250	91	1.01E-02	1.04E-02	1.16E-02
KLX02	753.80	754.00	F	Sr	0.125	0.063	91	1.77E-02	2.12E-02	2.24E-02
KLX02	753.80	754.00	F	Sr	2.000	1.000	182	7.40E-03	8.30E-03	8.78E-03
KLX02	753.80	754.00	F	Sr	0.500	0.250	182	1.13E-02	1.15E-02	1.22E-02
KLX02	753.80	754.00	F	Sr	0.125	0.063	182	2.41E-02	2.22E-02	2.61E-02
KLX02	753.80	754.00	F	Eu	2.000	1.000	1	-1.78E-03	-1.19E-03	-3.46E-03
KLX02	753.80	754.00	F	Eu	0.500	0.250	1	3.32E-03	1.28E-03	-2.08E-03
KLX02	753.80	754.00	F	Eu	0.125	0.063	1	1.67E-02	2.75E-02	4.17E-03
KLX02	753.80	754.00	F	Eu	2.000	1.000	7	7.16E-02	6.87E-02	7.44E-02
KLX02	753.80	754.00	F	Eu	0.500	0.250	7	2.32E-01	2.28E-01	2.63E-01
KLX02	753.80	754.00	F	Eu	0.125	0.063	7	7.79E-01	6.87E-01	9.60E-01
KLX02	753.80	754.00	F	Eu	2.000	1.000	29	1.04E-01	1.08E-01	1.23E-01
KLX02	753.80	754.00	F	Eu	0.500	0.250	29	3.62E-01	3.91E-01	4.29E-01
KLX02	753.80	754.00	F	Eu	0.125	0.063	29	1.35E+00	1.24E+00	1.72E+00
KLX02	753.80	754.00	F	Eu	2.000	1.000	91	1.61E-01	1.46E-01	1.44E-01
KLX02	753.80	754.00	F	Eu	0.500	0.250	91	4.15E-01	3.94E-01	2.88E-01
KLX02	753.80	754.00	F	Eu	0.125	0.063	91	9.81E-01	8.31E-01	8.29E-01
KLX02	753.80	754.00	F	Eu	2.000	1.000	182	2.06E-01	2.25E-01	2.22E-01
KLX02	753.80	754.00	F	Eu	0.500	0.250	182	7.40E-01	6.25E-01	7.27E-01
KLX02	753.80	754.00	F	Eu	0.125	0.063	182	2.37E+00	2.51E+00	2.79E+00
KLX02	753.80	754.00	SaS	Cs	2.000	1.000	1	1.07E-03	1.13E-03	1.04E-03
KLX02	753.80	754.00	SaS	Cs	0.500	0.250	1	3.48E-03	2.71E-03	3.17E-03
KLX02	753.80	754.00	SaS	Cs	0.125	0.063	1	1.25E-02	1.34E-02	1.01E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	753.80	754.00	SaS	Cs	2.000	1.000	7	2.41E-03	1.91E-03	1.78E-03
KLX02	753.80	754.00	SaS	Cs	0.500	0.250	7	4.40E-03	3.78E-03	4.07E-03
KLX02	753.80	754.00	SaS	Cs	0.125	0.063	7	1.74E-02	1.81E-02	1.26E-02
KLX02	753.80	754.00	SaS	Cs	2.000	1.000	30	3.32E-03	2.54E-03	2.49E-03
KLX02	753.80	754.00	SaS	Cs	0.500	0.250	30	5.17E-03	4.70E-03	5.12E-03
KLX02	753.80	754.00	SaS	Cs	0.125	0.063	30	2.14E-02	2.38E-02	1.47E-02
KLX02	753.80	754.00	SaS	Cs	2.000	1.000	91	3.78E-03	3.00E-03	2.54E-03
KLX02	753.80	754.00	SaS	Cs	0.500	0.250	91	5.29E-03	4.59E-03	5.46E-03
KLX02	753.80	754.00	SaS	Cs	0.125	0.063	91	2.05E-02	2.18E-02	1.48E-02
KLX02	753.80	754.00	SaS	Cs	2.000	1.000	196	5.50E-03	4.35E-03	3.97E-03
KLX02	753.80	754.00	SaS	Cs	0.500	0.250	196	5.89E-03	5.38E-03	5.72E-03
KLX02	753.80	754.00	SaS	Cs	0.125	0.063	196	2.18E-02	2.33E-02	1.77E-02
KLX02	753.80	754.00	SaS	Sr	2.000	1.000	1	-6.25E-04	-2.39E-04	-3.41E-04
KLX02	753.80	754.00	SaS	Sr	0.500	0.250	1	1.11E-03	-6.81E-05	4.76E-04
KLX02	753.80	754.00	SaS	Sr	0.125	0.063	1	8.47E-05	8.14E-04	6.08E-04
KLX02	753.80	754.00	SaS	Sr	2.000	1.000	7	-9.11E-05	-1.78E-04	-1.88E-04
KLX02	753.80	754.00	SaS	Sr	0.500	0.250	7	-5.08E-04	1.24E-03	-1.84E-04
KLX02	753.80	754.00	SaS	Sr	0.125	0.063	7	-2.57E-04	1.58E-03	1.00E-03
KLX02	753.80	754.00	SaS	Sr	2.000	1.000	30	-2.21E-04	-2.67E-04	-1.54E-04
KLX02	753.80	754.00	SaS	Sr	0.500	0.250	30	-5.77E-04	-3.68E-04	2.02E-04
KLX02	753.80	754.00	SaS	Sr	0.125	0.063	30	-1.73E-04	9.19E-03	4.27E-05
KLX02	753.80	754.00	SaS	Sr	2.000	1.000	91	-3.27E-04	-3.91E-04	-4.97E-04
KLX02	753.80	754.00	SaS	Sr	0.500	0.250	91	5.40E-04	1.84E-04	4.16E-04
KLX02	753.80	754.00	SaS	Sr	0.125	0.063	91	2.35E-04	1.40E-03	6.98E-05
KLX02	753.80	754.00	SaS	Sr	2.000	1.000	196	1.67E-03	1.33E-04	-5.47E-04
KLX02	753.80	754.00	SaS	Sr	0.500	0.250	196	9.09E-04	-3.53E-06	-2.31E-04

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	753.80	754.00	SaS	Sr	0.125	0.063	196	-4.05E-05	2.62E-04	-1.16E-04
KLX02	753.80	754.00	SaS	Eu	2.000	1.000	1	2.41E-01	2.70E-01	1.64E-01
KLX02	753.80	754.00	SaS	Eu	0.500	0.250	1	4.42E-02	2.02E-02	3.96E-02
KLX02	753.80	754.00	SaS	Eu	0.125	0.063	1	5.44E-02	8.13E-02	5.87E-02
KLX02	753.80	754.00	SaS	Eu	2.000	1.000	7	1.64E-01	1.52E-01	1.60E-01
KLX02	753.80	754.00	SaS	Eu	0.500	0.250	7	2.31E-02	2.44E-02	4.12E-02
KLX02	753.80	754.00	SaS	Eu	0.125	0.063	7	1.61E-02	2.40E-02	3.69E-02
KLX02	753.80	754.00	SaS	Eu	2.000	1.000	30	2.15E-01	2.66E-01	1.89E-01
KLX02	753.80	754.00	SaS	Eu	0.500	0.250	30	4.37E-02	3.50E-02	3.98E-02
KLX02	753.80	754.00	SaS	Eu	0.125	0.063	30	5.68E-02	5.40E-02	1.47E-02
KLX02	753.80	754.00	SaS	Eu	2.000	1.000	91	2.86E-01	3.11E-01	1.77E-01
KLX02	753.80	754.00	SaS	Eu	0.500	0.250	91	5.52E-02	3.20E-02	3.32E-02
KLX02	753.80	754.00	SaS	Eu	0.125	0.063	91	3.26E-02	2.52E-02	2.94E-02
KLX02	753.80	754.00	SaS	Eu	2.000	1.000	196	1.94E-01	2.88E-01	2.86E-01
KLX02	753.80	754.00	SaS	Eu	0.500	0.250	196	2.23E-02	1.92E-02	4.17E-02
KLX02	753.80	754.00	SaS	Eu	0.125	0.063	196	4.18E-02	2.72E-02	1.80E-02
KLX02	753.80	754.00	Bsh	Cs	2.000	1.000	1	6.04E-03	7.15E-03	7.35E-03
KLX02	753.80	754.00	Bsh	Cs	0.500	0.250	1	2.07E-02	2.43E-02	2.02E-02
KLX02	753.80	754.00	Bsh	Cs	0.125	0.063	1	1.37E-01	1.18E-01	
KLX02	753.80	754.00	Bsh	Cs	2.000	1.000	7	1.12E-02	1.22E-02	1.31E-02
KLX02	753.80	754.00	Bsh	Cs	0.500	0.250	7	5.17E-02	7.55E-02	5.34E-02
KLX02	753.80	754.00	Bsh	Cs	0.125	0.063	7	2.99E-01	2.66E-01	
KLX02	753.80	754.00	Bsh	Cs	2.000	1.000	31	1.60E-02	1.89E-02	1.67E-02
KLX02	753.80	754.00	Bsh	Cs	0.500	0.250	31	5.67E-02	8.31E-02	7.13E-02
KLX02	753.80	754.00	Bsh	Cs	0.125	0.063	31	3.45E-01	3.07E-01	
KLX02	753.80	754.00	Bsh	Cs	2.000	1.000	92	1.83E-02	1.69E-02	1.77E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	753.80	754.00	Bsh	Cs	0.500	0.250	92	7.60E-02	1.24E-01	7.73E-02
KLX02	753.80	754.00	Bsh	Cs	0.125	0.063	92	4.34E-01	3.35E-01	
KLX02	753.80	754.00	Bsh	Cs	2.000	1.000	182	2.32E-02	2.56E-02	2.63E-02
KLX02	753.80	754.00	Bsh	Cs	0.500	0.250	182	8.56E-02	1.18E-01	1.01E-01
KLX02	753.80	754.00	Bsh	Cs	0.125	0.063	182	5.59E-01	4.97E-01	
KLX02	753.80	754.00	Bsh	Sr	2.000	1.000	1	2.48E-03	2.65E-03	2.73E-03
KLX02	753.80	754.00	Bsh	Sr	0.500	0.250	1	2.31E-03	2.81E-03	2.68E-03
KLX02	753.80	754.00	Bsh	Sr	0.125	0.063	1	3.54E-03	3.25E-03	
KLX02	753.80	754.00	Bsh	Sr	2.000	1.000	7	2.94E-03	2.36E-03	3.06E-03
KLX02	753.80	754.00	Bsh	Sr	0.500	0.250	7	3.53E-03	3.52E-03	3.14E-03
KLX02	753.80	754.00	Bsh	Sr	0.125	0.063	7	4.33E-03	4.12E-03	
KLX02	753.80	754.00	Bsh	Sr	2.000	1.000	31	3.79E-03	3.51E-03	3.27E-03
KLX02	753.80	754.00	Bsh	Sr	0.500	0.250	31	3.27E-03	4.14E-03	4.24E-03
KLX02	753.80	754.00	Bsh	Sr	0.125	0.063	31	4.52E-03	3.47E-03	
KLX02	753.80	754.00	Bsh	Sr	2.000	1.000	92	3.33E-03	3.08E-03	3.35E-03
KLX02	753.80	754.00	Bsh	Sr	0.500	0.250	92	3.22E-03	4.22E-03	4.01E-03
KLX02	753.80	754.00	Bsh	Sr	0.125	0.063	92	5.11E-03	4.19E-03	
KLX02	753.80	754.00	Bsh	Sr	2.000	1.000	182	3.51E-03	3.97E-03	3.53E-03
KLX02	753.80	754.00	Bsh	Sr	0.500	0.250	182	2.55E-03	3.45E-03	4.06E-03
KLX02	753.80	754.00	Bsh	Sr	0.125	0.063	182	4.44E-03	4.18E-03	
KLX02	753.80	754.00	Bsh	Eu	2.000	1.000	1	6.07E-02	5.44E-02	5.39E-02
KLX02	753.80	754.00	Bsh	Eu	0.500	0.250	1	2.06E-01	2.34E-01	1.75E-01
KLX02	753.80	754.00	Bsh	Eu	0.125	0.063	1	1.10E+00		
KLX02	753.80	754.00	Bsh	Eu	2.000	1.000	7	2.39E-01	2.43E-01	2.16E-01
KLX02	753.80	754.00	Bsh	Eu	0.500	0.250	7	7.28E-01	9.79E-01	9.41E-01
KLX02	753.80	754.00	Bsh	Eu	0.125	0.063	7	3.36E+00		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	753.80	754.00	Bsh	Eu	2.000	1.000	31	5.81E-01	5.58E-01	5.12E-01
KLX02	753.80	754.00	Bsh	Eu	0.500	0.250	31	1.36E+00	1.58E+00	1.35E+00
KLX02	753.80	754.00	Bsh	Eu	0.125	0.063	31	3.72E+00		
KLX02	753.80	754.00	Bsh	Eu	2.000	1.000	92	1.51E+00	1.30E+00	1.07E+00
KLX02	753.80	754.00	Bsh	Eu	0.500	0.250	92	1.48E+00	1.50E+00	1.73E+00
KLX02	753.80	754.00	Bsh	Eu	0.125	0.063	92	4.04E+00		
KLX02	753.80	754.00	Bsh	Eu	2.000	1.000	182	8.80E-01	1.24E+00	1.14E+00
KLX02	753.80	754.00	Bsh	Eu	0.500	0.250	182	1.65E+00	2.01E+00	1.18E+00
KLX02	753.80	754.00	Bsh	Eu	0.125	0.063	182	6.34E+00		
KLX02	936.11	936.37	SaS	Cs	2.000	1.000	1	5.41E-04	6.46E-04	7.07E-04
KLX02	936.11	936.37	SaS	Cs	0.500	0.250	1	1.29E-03	1.84E-03	5.18E-02
KLX02	936.11	936.37	SaS	Cs	0.125	0.063	1	2.79E-03	3.38E-03	2.70E-03
KLX02	936.11	936.37	SaS	Cs	2.000	1.000	7	7.37E-04	6.42E-04	8.38E-04
KLX02	936.11	936.37	SaS	Cs	0.500	0.250	7	1.07E-03	1.90E-03	1.48E-03
KLX02	936.11	936.37	SaS	Cs	0.125	0.063	7	2.45E-03	2.33E-03	2.64E-03
KLX02	936.11	936.37	SaS	Cs	2.000	1.000	30	1.02E-03	9.22E-04	9.41E-04
KLX02	936.11	936.37	SaS	Cs	0.500	0.250	30	1.63E-03	2.09E-03	2.15E-03
KLX02	936.11	936.37	SaS	Cs	0.125	0.063	30	3.13E-03	3.47E-03	3.00E-03
KLX02	936.11	936.37	SaS	Cs	2.000	1.000	91	9.04E-04	7.12E-04	7.52E-04
KLX02	936.11	936.37	SaS	Cs	0.500	0.250	91	5.99E-04	8.72E-04	1.09E-03
KLX02	936.11	936.37	SaS	Cs	0.125	0.063	91	1.91E-03	2.21E-03	2.47E-03
KLX02	936.11	936.37	SaS	Cs	2.000	1.000	196	1.88E-03	1.61E-03	1.74E-03
KLX02	936.11	936.37	SaS	Cs	0.500	0.250	196	1.65E-03	2.20E-03	2.37E-03
KLX02	936.11	936.37	SaS	Cs	0.125	0.063	196	3.65E-03	3.87E-03	7.49E-03
KLX02	936.11	936.37	SaS	Sr	2.000	1.000	1	-1.04E-04	-3.87E-05	-1.82E-04
KLX02	936.11	936.37	SaS	Sr	0.500	0.250	1	-1.37E-03	-1.25E-03	1.50E-03

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	936.11	936.37	SaS	Sr	0.125	0.063	1	2.39E-04	-2.78E-04	-1.85E-03
KLX02	936.11	936.37	SaS	Sr	2.000	1.000	7	-1.48E-04	-2.15E-04	-1.04E-05
KLX02	936.11	936.37	SaS	Sr	0.500	0.250	7	-1.12E-03	-1.18E-03	7.68E-04
KLX02	936.11	936.37	SaS	Sr	0.125	0.063	7	-7.31E-04	-8.64E-05	-1.48E-03
KLX02	936.11	936.37	SaS	Sr	2.000	1.000	30	-8.81E-05	8.06E-05	-3.99E-04
KLX02	936.11	936.37	SaS	Sr	0.500	0.250	30	-1.47E-03	2.23E-03	1.20E-03
KLX02	936.11	936.37	SaS	Sr	0.125	0.063	30	-2.63E-04	2.66E-03	1.55E-03
KLX02	936.11	936.37	SaS	Sr	2.000	1.000	91	-3.56E-04	-5.18E-04	-3.45E-04
KLX02	936.11	936.37	SaS	Sr	0.500	0.250	91	-1.43E-03	-9.94E-04	-1.40E-03
KLX02	936.11	936.37	SaS	Sr	0.125	0.063	91	-1.16E-03	1.08E-03	5.84E-04
KLX02	936.11	936.37	SaS	Sr	2.000	1.000	196	-9.75E-05	6.12E-04	-6.13E-04
KLX02	936.11	936.37	SaS	Sr	0.500	0.250	196	-2.05E-03	-1.37E-03	-1.51E-03
KLX02	936.11	936.37	SaS	Sr	0.125	0.063	196	-1.14E-03	-8.68E-04	-1.09E-03
KLX02	936.11	936.37	SaS	Eu	2.000	1.000	1	1.69E-01	1.93E-01	2.16E-01
KLX02	936.11	936.37	SaS	Eu	0.500	0.250	1	2.91E-02	3.61E-02	3.75E-02
KLX02	936.11	936.37	SaS	Eu	0.125	0.063	1	6.41E-02	5.20E-02	6.59E-02
KLX02	936.11	936.37	SaS	Eu	2.000	1.000	7	2.61E-01	2.39E-01	1.67E-01
KLX02	936.11	936.37	SaS	Eu	0.500	0.250	7	3.00E-02	6.28E-02	5.74E-02
KLX02	936.11	936.37	SaS	Eu	0.125	0.063	7	4.01E-02	4.27E-02	3.92E-02
KLX02	936.11	936.37	SaS	Eu	2.000	1.000	30	1.94E-01	1.86E-01	2.89E-01
KLX02	936.11	936.37	SaS	Eu	0.500	0.250	30	9.52E-02	1.79E-01	4.70E-02
KLX02	936.11	936.37	SaS	Eu	0.125	0.063	30	5.09E-02	6.84E-02	6.91E-02
KLX02	936.11	936.37	SaS	Eu	2.000	1.000	91	4.63E-02	3.39E-01	3.67E-01
KLX02	936.11	936.37	SaS	Eu	0.500	0.250	91	1.40E-01	1.10E-01	4.23E-02
KLX02	936.11	936.37	SaS	Eu	0.125	0.063	91	7.10E-02	4.37E-02	6.37E-02
KLX02	936.11	936.37	SaS	Eu	2.000	1.000	196	2.01E-01	1.41E-01	1.72E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX02	936.11	936.37	SaS	Eu	0.500	0.250	196	3.87E-02	6.53E-02	5.15E-02
KLX02	936.11	936.37	SaS	Eu	0.125	0.063	196	4.62E-02	3.28E-02	5.07E-02
KLX02	936.11	936.37	B	Cs	2.000	1.000	1	4.82E-04	3.82E-04	2.55E-04
KLX02	936.11	936.37	B	Cs	0.500	0.250	1	8.20E-04	5.59E-04	6.53E-04
KLX02	936.11	936.37	B	Cs	0.125	0.063	1	9.93E-04	9.00E-04	
KLX02	936.11	936.37	B	Cs	2.000	1.000	7	3.54E-04	3.52E-04	3.04E-04
KLX02	936.11	936.37	B	Cs	0.500	0.250	7	7.21E-04	5.81E-04	-5.52E-05
KLX02	936.11	936.37	B	Cs	0.125	0.063	7	9.55E-04	7.17E-04	
KLX02	936.11	936.37	B	Cs	2.000	1.000	30	5.07E-04	5.52E-04	4.42E-04
KLX02	936.11	936.37	B	Cs	0.500	0.250	30	8.22E-04	6.85E-04	6.97E-04
KLX02	936.11	936.37	B	Cs	0.125	0.063	30	1.28E-03	9.31E-04	
KLX02	936.11	936.37	B	Cs	2.000	1.000	91	1.05E-03	6.41E-04	6.33E-04
KLX02	936.11	936.37	B	Cs	0.500	0.250	91	9.81E-04	5.38E-04	6.27E-04
KLX02	936.11	936.37	B	Cs	0.125	0.063	91	1.14E-03	1.15E-03	
KLX02	936.11	936.37	B	Cs	2.000	1.000	196	5.61E-04	6.04E-04	3.11E-04
KLX02	936.11	936.37	B	Cs	0.500	0.250	196	1.33E-03	9.54E-04	8.59E-04
KLX02	936.11	936.37	B	Cs	0.125	0.063	196	1.32E-03	1.52E-03	
KLX02	936.11	936.37	B	Sr	2.000	1.000	1	8.87E-05	2.04E-05	-1.16E-04
KLX02	936.11	936.37	B	Sr	0.500	0.250	1	3.31E-04	3.28E-05	9.76E-05
KLX02	936.11	936.37	B	Sr	0.125	0.063	1	1.72E-04	5.05E-05	
KLX02	936.11	936.37	B	Sr	2.000	1.000	7	-4.32E-05	-1.00E-04	-1.30E-04
KLX02	936.11	936.37	B	Sr	0.500	0.250	7	-8.29E-06	-9.65E-05	-1.66E-04
KLX02	936.11	936.37	B	Sr	0.125	0.063	7	-1.87E-04	-4.97E-05	
KLX02	936.11	936.37	B	Sr	2.000	1.000	30	1.51E-05	-1.38E-04	-7.86E-05
KLX02	936.11	936.37	B	Sr	0.500	0.250	30	3.22E-05	8.95E-05	-1.72E-04
KLX02	936.11	936.37	B	Sr	0.125	0.063	30	-1.30E-04	2.12E-05	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	936.11	936.37	B	Sr	2.000	1.000	91	3.26E-04	-3.28E-04	2.06E-04
KLX02	936.11	936.37	B	Sr	0.500	0.250	91	-1.60E-04	-3.49E-04	-1.67E-04
KLX02	936.11	936.37	B	Sr	0.125	0.063	91	-8.60E-05	-8.23E-04	
KLX02	936.11	936.37	B	Sr	2.000	1.000	196	-3.24E-04	-5.15E-05	2.17E-04
KLX02	936.11	936.37	B	Sr	0.500	0.250	196	2.53E-04	-8.16E-04	-7.81E-04
KLX02	936.11	936.37	B	Sr	0.125	0.063	196	-7.92E-04	-1.59E-03	
KLX02	936.11	936.37	B	Eu	2.000	1.000	1	2.04E-02	1.62E-02	2.07E-02
KLX02	936.11	936.37	B	Eu	0.500	0.250	1	1.85E-02	1.89E-02	2.44E-02
KLX02	936.11	936.37	B	Eu	0.125	0.063	1	9.90E-02	1.09E-01	
KLX02	936.11	936.37	B	Eu	2.000	1.000	7	-4.11E-03	-4.10E-03	-4.13E-03
KLX02	936.11	936.37	B	Eu	0.500	0.250	7	1.06E-02	1.21E-02	1.04E-03
KLX02	936.11	936.37	B	Eu	0.125	0.063	7	7.62E-02	1.01E-02	
KLX02	936.11	936.37	B	Eu	2.000	1.000	30	1.65E-01	1.46E-01	1.56E-01
KLX02	936.11	936.37	B	Eu	0.500	0.250	30	1.15E-01	1.03E-01	1.56E-01
KLX02	936.11	936.37	B	Eu	0.125	0.063	30	6.01E-01	7.67E-01	
KLX02	936.11	936.37	B	Eu	2.000	1.000	91	2.30E-01	1.51E-01	2.28E-01
KLX02	936.11	936.37	B	Eu	0.500	0.250	91	2.37E-01	2.24E-01	2.64E-01
KLX02	936.11	936.37	B	Eu	0.125	0.063	91	7.24E-01	1.08E+00	
KLX02	936.11	936.37	B	Eu	2.000	1.000	196	2.46E-01	2.74E-01	2.71E-01
KLX02	936.11	936.37	B	Eu	0.500	0.250	196	2.46E-01	2.55E-01	2.65E-01
KLX02	936.11	936.37	B	Eu	0.125	0.063	196	8.33E-01	8.95E-01	
KLX02	936.11	936.37	Bsh	Cs	2.000	1.000	1	5.32E-03	5.04E-03	5.54E-03
KLX02	936.11	936.37	Bsh	Cs	0.500	0.250	1	1.21E-02	9.39E-03	9.82E-03
KLX02	936.11	936.37	Bsh	Cs	0.125	0.063	1	3.47E-02	3.57E-02	
KLX02	936.11	936.37	Bsh	Cs	2.000	1.000	7	7.32E-03	7.88E-03	6.60E-03
KLX02	936.11	936.37	Bsh	Cs	0.500	0.250	7	1.50E-02	1.22E-02	1.38E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	936.11	936.37	Bsh	Cs	0.125	0.063	7	4.24E-02	4.43E-02	
KLX02	936.11	936.37	Bsh	Cs	2.000	1.000	31	8.65E-03	8.16E-03	8.92E-03
KLX02	936.11	936.37	Bsh	Cs	0.500	0.250	31	1.51E-02	1.41E-02	1.47E-02
KLX02	936.11	936.37	Bsh	Cs	0.125	0.063	31	5.80E-02	5.03E-02	
KLX02	936.11	936.37	Bsh	Cs	2.000	1.000	92	8.65E-03	8.80E-03	9.34E-03
KLX02	936.11	936.37	Bsh	Cs	0.500	0.250	92	1.77E-02	1.42E-02	1.65E-02
KLX02	936.11	936.37	Bsh	Cs	0.125	0.063	92	5.61E-02	5.77E-02	
KLX02	936.11	936.37	Bsh	Cs	2.000	1.000	182	1.05E-02	1.02E-02	1.21E-02
KLX02	936.11	936.37	Bsh	Cs	0.500	0.250	182	2.02E-02	1.79E-02	1.72E-02
KLX02	936.11	936.37	Bsh	Cs	0.125	0.063	182	6.45E-02	6.14E-02	
KLX02	936.11	936.37	Bsh	Sr	2.000	1.000	1	3.00E-03	2.68E-03	3.11E-03
KLX02	936.11	936.37	Bsh	Sr	0.500	0.250	1	4.60E-03	3.05E-03	3.74E-03
KLX02	936.11	936.37	Bsh	Sr	0.125	0.063	1	4.13E-03	4.38E-03	
KLX02	936.11	936.37	Bsh	Sr	2.000	1.000	7	3.03E-03	3.58E-03	2.63E-03
KLX02	936.11	936.37	Bsh	Sr	0.500	0.250	7	4.40E-03	3.62E-03	4.50E-03
KLX02	936.11	936.37	Bsh	Sr	0.125	0.063	7	3.92E-03	4.26E-03	
KLX02	936.11	936.37	Bsh	Sr	2.000	1.000	31	3.42E-03	3.43E-03	4.01E-03
KLX02	936.11	936.37	Bsh	Sr	0.500	0.250	31	4.78E-03	3.88E-03	4.71E-03
KLX02	936.11	936.37	Bsh	Sr	0.125	0.063	31	4.92E-03	4.34E-03	
KLX02	936.11	936.37	Bsh	Sr	2.000	1.000	92	3.14E-03	3.35E-03	3.70E-03
KLX02	936.11	936.37	Bsh	Sr	0.500	0.250	92	4.86E-03	3.13E-03	4.84E-03
KLX02	936.11	936.37	Bsh	Sr	0.125	0.063	92	3.78E-03	4.47E-03	
KLX02	936.11	936.37	Bsh	Sr	2.000	1.000	182	3.44E-03	3.99E-03	4.51E-03
KLX02	936.11	936.37	Bsh	Sr	0.500	0.250	182	5.05E-03	3.85E-03	4.75E-03
KLX02	936.11	936.37	Bsh	Sr	0.125	0.063	182	4.56E-03	4.16E-03	
KLX02	936.11	936.37	Bsh	Eu	2.000	1.000	1	1.13E-01	6.46E-02	7.45E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX02	936.11	936.37	Bsh	Eu	0.500	0.250	1	2.25E-01	2.78E-01	1.94E-01
KLX02	936.11	936.37	Bsh	Eu	0.125	0.063	1	2.07E+00	9.13E-01	
KLX02	936.11	936.37	Bsh	Eu	2.000	1.000	7	4.57E-01	2.63E-01	3.00E-01
KLX02	936.11	936.37	Bsh	Eu	0.500	0.250	7	7.46E-01	1.02E+00	6.83E-01
KLX02	936.11	936.37	Bsh	Eu	0.125	0.063	7	6.38E+00	3.98E+00	
KLX02	936.11	936.37	Bsh	Eu	2.000	1.000	31	9.27E-01	6.70E-01	7.82E-01
KLX02	936.11	936.37	Bsh	Eu	0.500	0.250	31	1.61E+00	1.78E+00	1.31E+00
KLX02	936.11	936.37	Bsh	Eu	0.125	0.063	31	6.66E+00	5.16E+00	
KLX02	936.11	936.37	Bsh	Eu	2.000	1.000	92	2.06E+00	1.58E+00	1.65E+00
KLX02	936.11	936.37	Bsh	Eu	0.500	0.250	92	2.40E+00	3.11E+00	2.38E+00
KLX02	936.11	936.37	Bsh	Eu	0.125	0.063	92	7.41E+00	7.74E+00	
KLX02	936.11	936.37	Bsh	Eu	2.000	1.000	182	1.86E+00	1.27E+00	1.94E+00
KLX02	936.11	936.37	Bsh	Eu	0.500	0.250	182	7.65E-01	1.01E+00	1.44E+00
KLX02	936.11	936.37	Bsh	Eu	0.125	0.063	182	6.14E+00	6.03E+00	

Table A5-15. Tracer distribution ratio, *Rd,* for rock samples from KLX03.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	278.27	278.39	F	Cs	0.125	0.000	1	3.69E+00		
KLX03	278.27	278.39	F	Cs	0.125	0.000	7	3.88E+00		
KLX03	278.27	278.39	F	Cs	0.125	0.000	31	4.18E+00		
KLX03	278.27	278.39	F	Cs	0.125	0.000	92	3.37E+00		
KLX03	278.27	278.39	F	Cs	0.125	0.000	182	3.16E+00		
KLX03	278.27	278.39	F	Sr	0.125	0.000	1	1.12E+00		
KLX03	278.27	278.39	F	Sr	0.125	0.000	7	1.14E+00		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	278.27	278.39	F	Sr	0.125	0.000	31	9.57E-01		
KLX03	278.27	278.39	F	Sr	0.125	0.000	92	4.54E-01		
KLX03	278.27	278.39	F	Sr	0.125	0.000	182	1.60E-01		
KLX03	278.27	278.39	F	Am	0.125	0.000	1	2.85E+00		
KLX03	278.27	278.39	F	Am	0.125	0.000	7	4.38E+00		
KLX03	278.27	278.39	F	Am	0.125	0.000	31	2.02E+00		
KLX03	278.27	278.39	F	Am	0.125	0.000	92	1.79E+00		
KLX03	278.27	278.39	F	Am	0.125	0.000	182	1.17E+00		
KLX03	278.27	278.39	SaS	Cs	0.125	0.000	1	5.50E-01		
KLX03	278.27	278.39	SaS	Cs	0.125	0.000	7	9.43E-01		
KLX03	278.27	278.39	SaS	Cs	0.125	0.000	31	1.19E+00		
KLX03	278.27	278.39	SaS	Cs	0.125	0.000	92	3.13E+00		
KLX03	278.27	278.39	SaS	Cs	0.125	0.000	182	3.03E+00		
KLX03	278.27	278.39	SaS	Sr	0.125	0.000	1	6.41E-03		
KLX03	278.27	278.39	SaS	Sr	0.125	0.000	7	5.04E-03		
KLX03	278.27	278.39	SaS	Sr	0.125	0.000	31	4.57E-03		
KLX03	278.27	278.39	SaS	Sr	0.125	0.000	92	4.49E-03		
KLX03	278.27	278.39	SaS	Sr	0.125	0.000	182	2.97E-03		
KLX03	278.27	278.39	SaS	Am	0.125	0.000	1	2.81E+00		
KLX03	278.27	278.39	SaS	Am	0.125	0.000	7	3.55E+00		
KLX03	278.27	278.39	SaS	Am	0.125	0.000	31	6.15E+00		
KLX03	278.27	278.39	SaS	Am	0.125	0.000	92	6.89E+00		
KLX03	278.27	278.39	SaS	Am	0.125	0.000	182	9.31E+00		
KLX03	457.42	457.51	F	Cs	0.125	0.000	1	4.66E+00	2.38E+00	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	457.42	457.51	F	Cs	0.125	0.000	7	3.84E+00	4.05E+00	
KLX03	457.42	457.51	F	Cs	0.125	0.000	31	3.63E+00	3.65E+00	
KLX03	457.42	457.51	F	Cs	0.125	0.000	92	3.34E+00	3.43E+00	
KLX03	457.42	457.51	F	Cs	0.125	0.000	182	3.13E+00	3.29E+00	
KLX03	457.42	457.51	F	Sr	0.125	0.000	1	9.51E-01	6.61E-01	
KLX03	457.42	457.51	F	Sr	0.125	0.000	7	1.13E+00	1.19E+00	
KLX03	457.42	457.51	F	Sr	0.125	0.000	31	8.31E-01	8.35E-01	
KLX03	457.42	457.51	F	Sr	0.125	0.000	92	4.51E-01	4.63E-01	
KLX03	457.42	457.51	F	Sr	0.125	0.000	182	1.59E-01	1.67E-01	
KLX03	457.42	457.51	F	Am	0.125	0.000	1	2.90E+00		
KLX03	457.42	457.51	F	Am	0.125	0.000	7	3.99E+00		
KLX03	457.42	457.51	F	Am	0.125	0.000	31	1.88E+00		
KLX03	457.42	457.51	F	Am	0.125	0.000	92	1.80E+00		
KLX03	457.42	457.51	F	Am	0.125	0.000	182	8.69E-01		
KLX03	457.42	457.51	SaS	Am	0.125	0.000	1	3.35E+00	2.35E+00	
KLX03	457.42	457.51	SaS	Am	0.125	0.000	7	7.48E+00	5.72E+00	
KLX03	457.42	457.51	SaS	Am	0.125	0.000	31	5.93E+00	5.94E+00	
KLX03	457.42	457.51	SaS	Am	0.125	0.000	86	7.08E+00	7.59E+00	
KLX03	457.42	457.51	SaS	Am	0.125	0.000	184	5.61E+00	7.60E+00	
KLX03	522.61	523.00	F	Cs	2.000	1.000	1	2.69E-02	1.87E-02	2.15E-02
KLX03	522.61	523.00	F	Cs	0.500	0.250	1	1.44E-01	1.60E-01	1.37E-01
KLX03	522.61	523.00	F	Cs	0.125	0.063	1	7.17E-01	6.38E-01	
KLX03	522.61	523.00	F	Cs	2.000	1.000	7	5.46E-02	5.08E-02	4.99E-02
KLX03	522.61	523.00	F	Cs	0.500	0.250	7	2.64E-01	3.28E-01	1.76E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	F	Cs	0.125	0.063	7	1.32E+00	7.17E-01	
KLX03	522.61	523.00	F	Cs	2.000	1.000	31	9.28E-02	9.72E-02	9.84E-02
KLX03	522.61	523.00	F	Cs	0.500	0.250	31	3.50E-01	4.43E-01	2.48E-01
KLX03	522.61	523.00	F	Cs	0.125	0.063	31	1.07E+00	1.02E+00	
KLX03	522.61	523.00	F	Cs	2.000	1.000	86	1.10E-01	1.17E-01	1.29E-01
KLX03	522.61	523.00	F	Cs	0.500	0.250	86	6.07E-01	5.76E-01	3.77E-01
KLX03	522.61	523.00	F	Cs	0.125	0.063	86	1.26E+00	2.15E+00	
KLX03	522.61	523.00	F	Cs	2.000	1.000	184	1.63E-01	1.68E-01	1.62E-01
KLX03	522.61	523.00	F	Cs	0.500	0.250	184	6.27E-01	7.31E-01	4.62E-01
KLX03	522.61	523.00	F	Cs	0.125	0.063	184			
KLX03	522.61	523.00	F	Sr	2.000	1.000	1	1.32E-02	8.47E-03	9.27E-03
KLX03	522.61	523.00	F	Sr	0.500	0.250	1	2.29E-02	2.22E-02	1.85E-02
KLX03	522.61	523.00	F	Sr	0.125	0.063	1	4.09E-02	4.17E-02	
KLX03	522.61	523.00	F	Sr	2.000	1.000	7	1.30E-02	1.31E-02	1.28E-02
KLX03	522.61	523.00	F	Sr	0.500	0.250	7	1.92E-02	2.22E-02	1.25E-02
KLX03	522.61	523.00	F	Sr	0.125	0.063	7	4.31E-02	3.88E-02	
KLX03	522.61	523.00	F	Sr	2.000	1.000	31	1.39E-02	1.48E-02	1.36E-02
KLX03	522.61	523.00	F	Sr	0.500	0.250	31	2.14E-02	2.26E-02	1.23E-02
KLX03	522.61	523.00	F	Sr	0.125	0.063	31	4.40E-02	3.80E-02	
KLX03	522.61	523.00	F	Sr	2.000	1.000	86	1.69E-02	1.85E-02	1.82E-02
KLX03	522.61	523.00	F	Sr	0.500	0.250	86	2.52E-02	2.05E-02	1.51E-02
KLX03	522.61	523.00	F	Sr	0.125	0.063	86	4.44E-02	3.89E-02	
KLX03	522.61	523.00	F	Sr	2.000	1.000	184	1.98E-02	1.68E-02	1.92E-02
KLX03	522.61	523.00	F	Sr	0.500	0.250	184	3.41E-02	2.59E-02	1.21E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	F	Sr	0.125	0.063	184	9.73E-02	4.27E-02	
KLX03	522.61	523.00	F	Am	2.000	1.000	1	3.17E-02	3.24E-02	4.04E-02
KLX03	522.61	523.00	F	Am	0.500	0.250	1	8.22E-02	8.09E-02	7.97E-02
KLX03	522.61	523.00	F	Am	0.125	0.063	1	1.31E-01	1.49E-01	
KLX03	522.61	523.00	F	Am	2.000	1.000	7	4.34E-02	5.37E-02	5.19E-02
KLX03	522.61	523.00	F	Am	0.500	0.250	7	1.57E-01	1.39E-01	1.10E-01
KLX03	522.61	523.00	F	Am	0.125	0.063	7	3.22E-01	2.78E-01	
KLX03	522.61	523.00	F	Am	2.000	1.000	32	1.01E-01	1.05E-01	1.08E-01
KLX03	522.61	523.00	F	Am	0.500	0.250	32	2.92E-01	2.62E-01	2.14E-01
KLX03	522.61	523.00	F	Am	0.125	0.063	32	6.98E-01	6.19E-01	
KLX03	522.61	523.00	F	Am	2.000	1.000	96	7.66E-02	8.28E-02	6.49E-02
KLX03	522.61	523.00	F	Am	0.500	0.250	96	2.08E-01	1.89E-01	1.46E-01
KLX03	522.61	523.00	F	Am	0.125	0.063	96	4.73E-01	5.84E-01	
KLX03	522.61	523.00	F	Am	2.000	1.000	186	1.44E-01	1.53E-01	1.41E-01
KLX03	522.61	523.00	F	Am	0.500	0.250	186	2.97E-01	2.45E-01	8.27E-02
KLX03	522.61	523.00	F	Am	0.125	0.063	186	7.42E-01	5.54E-01	
KLX03	522.61	523.00	F	Ra	2.000	1.000	1	3.21E-02	3.08E-02	3.48E-02
KLX03	522.61	523.00	F	Ra	0.500	0.250	1	1.19E-01	1.26E-01	1.35E-01
KLX03	522.61	523.00	F	Ra	0.125	0.063	1	2.11E-01	2.10E-01	
KLX03	522.61	523.00	F	Ra	2.000	1.000	7	7.77E-02	6.58E-02	8.64E-02
KLX03	522.61	523.00	F	Ra	0.500	0.250	7	2.07E-01	2.12E-01	6.13E-01
KLX03	522.61	523.00	F	Ra	0.125	0.063	7	5.97E-01	5.95E-01	
KLX03	522.61	523.00	F	Ra	2.000	1.000	31	1.29E-01	1.22E-01	1.56E-01
KLX03	522.61	523.00	F	Ra	0.500	0.250	31	2.11E-01	6.15E-01	2.20E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	F	Ra	0.125	0.063	31	5.95E-01	5.33E-01	
KLX03	522.61	523.00	F	Ra	2.000	1.000	86	1.52E-01	1.50E-01	1.96E-01
KLX03	522.61	523.00	F	Ra	0.500	0.250	86	2.22E-01	2.23E-01	2.38E-01
KLX03	522.61	523.00	F	Ra	0.125	0.063	86	5.81E-01	6.09E-01	
KLX03	522.61	523.00	F	Ra	2.000	1.000	184			
KLX03	522.61	523.00	F	Ra	0.500	0.250	184			
KLX03	522.61	523.00	F	Ra	0.125	0.063	184			
KLX03	522.61	523.00	F	Ni	2.000	1.000	1	2.24E-02	2.11E-02	1.58E-02
KLX03	522.61	523.00	F	Ni	0.500	0.250	1	6.65E-02	7.92E-02	6.04E-02
KLX03	522.61	523.00	F	Ni	0.125	0.063	1	1.09E-01	9.42E-02	
KLX03	522.61	523.00	F	Ni	2.000	1.000	7	8.01E-02	7.87E-02	4.87E-02
KLX03	522.61	523.00	F	Ni	0.500	0.250	7	2.19E-01	1.93E-01	2.01E-01
KLX03	522.61	523.00	F	Ni	0.125	0.063	7	4.93E-01	2.47E-01	
KLX03	522.61	523.00	F	Ni	2.000	1.000	31	2.81E-01	2.68E-01	2.02E-01
KLX03	522.61	523.00	F	Ni	0.500	0.250	31	4.12E-01	4.33E-01	3.97E-01
KLX03	522.61	523.00	F	Ni	0.125	0.063	31	1.15E+00	7.12E-01	
KLX03	522.61	523.00	F	Ni	2.000	1.000	86	3.29E-01	4.12E-01	3.23E-01
KLX03	522.61	523.00	F	Ni	0.500	0.250	86	4.60E-01	4.85E-01	7.75E-01
KLX03	522.61	523.00	F	Ni	0.125	0.063	86	2.27E+00	1.07E+00	
KLX03	522.61	523.00	F	Ni	2.000	1.000	185	4.04E-01	4.14E-01	2.95E-01
KLX03	522.61	523.00	F	Ni	0.500	0.250	185	4.54E-01	3.89E-01	5.41E-01
KLX03	522.61	523.00	F	Ni	0.125	0.063	185	8.90E-01	1.14E+00	
KLX03	522.61	523.00	F	Np	2.000	1.000	1	2.31E-03	2.66E-03	2.70E-03
KLX03	522.61	523.00	F	Np	0.500	0.250	1	1.06E-02	1.07E-02	1.25E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	F	Np	0.125	0.063	1	1.32E-02	1.37E-02	
KLX03	522.61	523.00	F	Np	2.000	1.000	7	2.95E-03	3.03E-03	3.01E-03
KLX03	522.61	523.00	F	Np	0.500	0.250	7	1.25E-02	1.17E-02	1.31E-02
KLX03	522.61	523.00	F	Np	0.125	0.063	7	2.27E-02	2.21E-02	
KLX03	522.61	523.00	F	Np	2.000	1.000	31	3.08E-03	3.19E-03	3.12E-03
KLX03	522.61	523.00	F	Np	0.500	0.250	31	1.42E-02	1.28E-02	1.36E-02
KLX03	522.61	523.00	F	Np	0.125	0.063	31	6.61E-02	5.83E-02	
KLX03	522.61	523.00	F	Np	2.000	1.000	86	3.31E-03	3.36E-03	3.35E-03
KLX03	522.61	523.00	F	Np	0.500	0.250	86	1.47E-02	1.33E-02	1.37E-02
KLX03	522.61	523.00	F	Np	0.125	0.063	86	1.54E-01	1.49E-01	
KLX03	522.61	523.00	F	Np	2.000	1.000	185			
KLX03	522.61	523.00	F	Np	0.500	0.250	185			
KLX03	522.61	523.00	F	Np	0.125	0.063	185			
KLX03	522.61	523.00	F	U	2.000	1.000	1	2.33E-03	2.65E-03	2.74E-03
KLX03	522.61	523.00	F	U	0.500	0.250	1	1.04E-02	1.09E-02	1.22E-02
KLX03	522.61	523.00	F	U	0.125	0.063	1	1.14E-02	1.21E-02	
KLX03	522.61	523.00	F	U	2.000	1.000	7	2.82E-03	2.87E-03	2.88E-03
KLX03	522.61	523.00	F	U	0.500	0.250	7	1.16E-02	1.13E-02	1.26E-02
KLX03	522.61	523.00	F	U	0.125	0.063	7	1.34E-02	1.32E-02	
KLX03	522.61	523.00	F	U	2.000	1.000	31	2.71E-03	2.80E-03	2.77E-03
KLX03	522.61	523.00	F	U	0.500	0.250	31	1.16E-02	1.07E-02	1.23E-02
KLX03	522.61	523.00	F	U	0.125	0.063	31	1.62E-02	1.53E-02	
KLX03	522.61	523.00	F	U	2.000	1.000	86	2.83E-03	2.91E-03	2.88E-03
KLX03	522.61	523.00	F	U	0.500	0.250	86	1.15E-02	1.09E-02	1.22E-02
KLX03	522.61	523.00	F	U	0.125	0.063	86	1.70E-02	1.67E-02	
KLX03	522.61	523.00	F	U	2.000	1.000	185			

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	F	U	0.500	0.250	185			
KLX03	522.61	523.00	F	U	0.125	0.063	185			
KLX03	522.61	523.00	SaS	Cs	2.000	1.000	1	8.84E-03	9.84E-03	1.00E-02
KLX03	522.61	523.00	SaS	Cs	0.500	0.250	1	4.19E-02	4.30E-02	4.97E-02
KLX03	522.61	523.00	SaS	Cs	0.125	0.063	1	1.81E-01	1.29E-01	
KLX03	522.61	523.00	SaS	Cs	2.000	1.000	7	1.56E-02	1.51E-02	1.69E-02
KLX03	522.61	523.00	SaS	Cs	0.500	0.250	7	8.14E-02	7.91E-02	8.62E-02
KLX03	522.61	523.00	SaS	Cs	0.125	0.063	7	3.09E-01	2.72E-01	
KLX03	522.61	523.00	SaS	Cs	2.000	1.000	31	2.27E-02	2.43E-02	2.25E-02
KLX03	522.61	523.00	SaS	Cs	0.500	0.250	31	1.14E-01	1.18E-01	1.19E-01
KLX03	522.61	523.00	SaS	Cs	0.125	0.063	31	3.41E-01	4.44E-01	
KLX03	522.61	523.00	SaS	Cs	2.000	1.000	86	2.39E-02	2.50E-02	2.49E-02
KLX03	522.61	523.00	SaS	Cs	0.500	0.250	86	1.03E-01	1.16E-01	1.14E-01
KLX03	522.61	523.00	SaS	Cs	0.125	0.063	86	5.10E-01	4.35E-01	
KLX03	522.61	523.00	SaS	Cs	2.000	1.000	184	2.62E-02	2.88E-02	3.16E-02
KLX03	522.61	523.00	SaS	Cs	0.500	0.250	184	1.48E-01	1.36E-01	1.64E-01
KLX03	522.61	523.00	SaS	Cs	0.125	0.063	184	4.62E-01	5.50E-01	
KLX03	522.61	523.00	SaS	Sr	2.000	1.000	1	4.57E-03	4.86E-03	5.35E-03
KLX03	522.61	523.00	SaS	Sr	0.500	0.250	1	6.70E-03	5.19E-03	5.29E-03
KLX03	522.61	523.00	SaS	Sr	0.125	0.063	1	6.33E-03	4.83E-03	
KLX03	522.61	523.00	SaS	Sr	2.000	1.000	7	3.82E-03	3.77E-03	4.25E-03
KLX03	522.61	523.00	SaS	Sr	0.500	0.250	7	5.48E-03	4.02E-03	4.89E-03
KLX03	522.61	523.00	SaS	Sr	0.125	0.063	7	4.99E-03	4.95E-03	
KLX03	522.61	523.00	SaS	Sr	2.000	1.000	31	3.50E-03	3.10E-03	3.26E-03
KLX03	522.61	523.00	SaS	Sr	0.500	0.250	31	4.54E-03	3.25E-03	3.53E-03
KLX03	522.61	523.00	SaS	Sr	0.125	0.063	31	2.82E-03	3.80E-03	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	SaS	Sr	2.000	1.000	86	2.45E-03	2.04E-03	2.26E-03
KLX03	522.61	523.00	SaS	Sr	0.500	0.250	86	2.93E-03	2.02E-03	2.43E-03
KLX03	522.61	523.00	SaS	Sr	0.125	0.063	86	3.31E-03	2.42E-03	
KLX03	522.61	523.00	SaS	Sr	2.000	1.000	184	1.89E-03	2.48E-03	3.28E-03
KLX03	522.61	523.00	SaS	Sr	0.500	0.250	184	3.64E-03	2.91E-03	2.51E-03
KLX03	522.61	523.00	SaS	Sr	0.125	0.063	184	3.96E-03	4.41E-03	
KLX03	522.61	523.00	SaS	Am	2.000	1.000	1	4.00E-02	5.32E-02	4.98E-02
KLX03	522.61	523.00	SaS	Am	0.500	0.250	1	1.53E-01	8.92E-02	2.28E-01
KLX03	522.61	523.00	SaS	Am	0.125	0.063	1	4.66E-01	1.03E+00	
KLX03	522.61	523.00	SaS	Am	2.000	1.000	7	1.49E-01	1.95E-01	1.90E-01
KLX03	522.61	523.00	SaS	Am	0.500	0.250	7	6.72E-01	3.41E-01	5.40E-01
KLX03	522.61	523.00	SaS	Am	0.125	0.063	7	1.77E+00	3.51E+00	
KLX03	522.61	523.00	SaS	Am	2.000	1.000	32	4.73E-01	6.30E-01	6.00E-01
KLX03	522.61	523.00	SaS	Am	0.500	0.250	32	1.39E+00	1.51E+00	1.41E+00
KLX03	522.61	523.00	SaS	Am	0.125	0.063	32	2.67E+00	8.44E+00	
KLX03	522.61	523.00	SaS	Am	2.000	1.000	96	7.24E-01	9.28E-01	1.07E+00
KLX03	522.61	523.00	SaS	Am	0.500	0.250	96	2.06E+00	3.54E-01	2.49E+00
KLX03	522.61	523.00	SaS	Am	0.125	0.063	96	4.61E+00	6.94E+00	
KLX03	522.61	523.00	SaS	Am	2.000	1.000	186	1.40E+00	1.89E+00	1.31E+00
KLX03	522.61	523.00	SaS	Am	0.500	0.250	186	9.82E-01	1.64E+00	5.05E-01
KLX03	522.61	523.00	SaS	Am	0.125	0.063	186	8.37E+00	1.71E+01	
KLX03	522.61	523.00	SaS	Ra	2.000	1.000	1	4.61E-03	4.19E-03	4.57E-03
KLX03	522.61	523.00	SaS	Ra	0.500	0.250	1	8.13E-03	8.52E-03	7.89E-03
KLX03	522.61	523.00	SaS	Ra	0.125	0.063	1	1.43E-02	1.41E-02	
KLX03	522.61	523.00	SaS	Ra	2.000	1.000	7	5.77E-03	4.71E-03	5.40E-03
KLX03	522.61	523.00	SaS	Ra	0.500	0.250	7	9.70E-03	9.73E-03	9.70E-03

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	SaS	Ra	0.125	0.063	7	1.66E-02	1.71E-02	
KLX03	522.61	523.00	SaS	Ra	2.000	1.000	31	6.60E-03	5.74E-03	6.16E-03
KLX03	522.61	523.00	SaS	Ra	0.500	0.250	31	1.09E-02	1.01E-02	1.14E-02
KLX03	522.61	523.00	SaS	Ra	0.125	0.063	31	2.01E-02	2.03E-02	
KLX03	522.61	523.00	SaS	Ra	2.000	1.000	86	7.99E-03	6.67E-03	7.29E-03
KLX03	522.61	523.00	SaS	Ra	0.500	0.250	86	1.23E-02	1.43E-02	1.14E-02
KLX03	522.61	523.00	SaS	Ra	0.125	0.063	86	2.55E-02	2.26E-02	
KLX03	522.61	523.00	SaS	Ra	2.000	1.000	184	1.02E-02	6.53E-03	7.74E-03
KLX03	522.61	523.00	SaS	Ra	0.500	0.250	184	1.39E-02	1.40E-02	1.43E-02
KLX03	522.61	523.00	SaS	Ra	0.125	0.063	184	2.15E-02	2.21E-02	
KLX03	522.61	523.00	SaS	Ni	2.000	1.000	1	3.75E-03	4.04E-03	4.05E-03
KLX03	522.61	523.00	SaS	Ni	0.500	0.250	1	6.90E-03	3.68E-03	4.68E-03
KLX03	522.61	523.00	SaS	Ni	0.125	0.063	1	8.12E-03	8.39E-03	
KLX03	522.61	523.00	SaS	Ni	2.000	1.000	7	6.60E-03	6.42E-03	6.48E-03
KLX03	522.61	523.00	SaS	Ni	0.500	0.250	7	1.82E-02	1.88E-02	1.79E-02
KLX03	522.61	523.00	SaS	Ni	0.125	0.063	7	3.26E-02	3.14E-02	
KLX03	522.61	523.00	SaS	Ni	2.000	1.000	31	1.52E-02	1.51E-02	1.60E-02
KLX03	522.61	523.00	SaS	Ni	0.500	0.250	31	6.63E-02	6.66E-02	6.71E-02
KLX03	522.61	523.00	SaS	Ni	0.125	0.063	31	1.70E-01	1.24E-01	
KLX03	522.61	523.00	SaS	Ni	2.000	1.000	86	3.69E-02	3.52E-02	3.54E-02
KLX03	522.61	523.00	SaS	Ni	0.500	0.250	86	2.38E-01	2.12E-01	1.91E-01
KLX03	522.61	523.00	SaS	Ni	0.125	0.063	86	5.86E-01	3.49E-01	
KLX03	522.61	523.00	SaS	Ni	2.000	1.000	185	6.10E-02	6.94E-02	6.65E-02
KLX03	522.61	523.00	SaS	Ni	0.500	0.250	185	3.66E-01	3.82E-01	3.60E-01
KLX03	522.61	523.00	SaS	Ni	0.125	0.063	185	1.07E+00	5.78E-01	
KLX03	522.61	523.00	SaS	Np	2.000	1.000	1	2.58E-03	2.26E-03	2.29E-03

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	SaS	Np	0.500	0.250	1	8.94E-03	9.27E-03	1.21E-02
KLX03	522.61	523.00	SaS	Np	0.125	0.063	1	1.01E-02	9.44E-03	
KLX03	522.61	523.00	SaS	Np	2.000	1.000	7	3.07E-03	2.76E-03	2.79E-03
KLX03	522.61	523.00	SaS	Np	0.500	0.250	7	1.06E-02	1.06E-02	1.37E-02
KLX03	522.61	523.00	SaS	Np	0.125	0.063	7	1.42E-02	1.13E-02	
KLX03	522.61	523.00	SaS	Np	2.000	1.000	31	3.55E-03	3.26E-03	3.27E-03
KLX03	522.61	523.00	SaS	Np	0.500	0.250	31	1.20E-02	1.21E-02	1.50E-02
KLX03	522.61	523.00	SaS	Np	0.125	0.063	31	1.54E-02	1.32E-02	
KLX03	522.61	523.00	SaS	Np	2.000	1.000	86	3.57E-03	3.33E-03	3.27E-03
KLX03	522.61	523.00	SaS	Np	0.500	0.250	86	1.24E-02	1.26E-02	1.50E-02
KLX03	522.61	523.00	SaS	Np	0.125	0.063	86	1.61E-02	1.37E-02	
KLX03	522.61	523.00	SaS	Np	2.000	1.000	185	4.12E-03	3.69E-03	3.72E-03
KLX03	522.61	523.00	SaS	Np	0.500	0.250	185	1.50E-02	1.53E-02	1.73E-02
KLX03	522.61	523.00	SaS	Np	0.125	0.063	185	1.94E-02	1.66E-02	
KLX03	522.61	523.00	SaS	U	2.000	1.000	1	2.83E-03	2.48E-03	2.49E-03
KLX03	522.61	523.00	SaS	U	0.500	0.250	1	9.41E-03	1.02E-02	1.33E-02
KLX03	522.61	523.00	SaS	U	0.125	0.063	1	1.15E-02	1.09E-02	
KLX03	522.61	523.00	SaS	U	2.000	1.000	7	3.20E-03	2.89E-03	2.96E-03
KLX03	522.61	523.00	SaS	U	0.500	0.250	7	1.07E-02	1.14E-02	1.47E-02
KLX03	522.61	523.00	SaS	U	0.125	0.063	7	1.61E-02	1.33E-02	
KLX03	522.61	523.00	SaS	U	2.000	1.000	31	3.34E-03	3.02E-03	3.04E-03
KLX03	522.61	523.00	SaS	U	0.500	0.250	31	1.08E-02	1.11E-02	1.44E-02
KLX03	522.61	523.00	SaS	U	0.125	0.063	31	1.53E-02	1.38E-02	
KLX03	522.61	523.00	SaS	U	2.000	1.000	86	3.79E-03	3.00E-03	3.49E-03
KLX03	522.61	523.00	SaS	U	0.500	0.250	86	1.34E-02	1.43E-02	1.79E-02
KLX03	522.61	523.00	SaS	U	0.125	0.063	86	2.20E-02	1.92E-02	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	SaS	U	2.000	1.000	185	4.27E-03	3.85E-03	3.91E-03
KLX03	522.61	523.00	SaS	U	0.500	0.250	185	1.58E-02	1.83E-02	2.19E-02
KLX03	522.61	523.00	SaS	U	0.125	0.063	185	3.04E-02	2.65E-02	
KLX03	522.61	523.00	Bsh	Cs	2.000	1.000	1	9.50E-03	9.60E-03	1.12E-02
KLX03	522.61	523.00	Bsh	Cs	0.500	0.250	1	3.54E-02	4.48E-02	4.70E-02
KLX03	522.61	523.00	Bsh	Cs	0.125	0.063	1	1.26E-01		
KLX03	522.61	523.00	Bsh	Cs	2.000	1.000	7	3.77E-02	3.91E-02	4.56E-02
KLX03	522.61	523.00	Bsh	Cs	0.500	0.250	7	1.64E-01	2.17E-01	2.36E-01
KLX03	522.61	523.00	Bsh	Cs	0.125	0.063	7	4.86E-01		
KLX03	522.61	523.00	Bsh	Cs	2.000	1.000	31	2.48E-02	2.58E-02	2.53E-02
KLX03	522.61	523.00	Bsh	Cs	0.500	0.250	31	8.28E-02	1.33E-01	8.40E-01
KLX03	522.61	523.00	Bsh	Cs	0.125	0.063	31	3.98E-01		
KLX03	522.61	523.00	Bsh	Cs	2.000	1.000	86	2.94E-02	2.80E-02	3.18E-02
KLX03	522.61	523.00	Bsh	Cs	0.500	0.250	86	9.77E-02	1.09E-01	1.74E-01
KLX03	522.61	523.00	Bsh	Cs	0.125	0.063	86	4.03E-01		
KLX03	522.61	523.00	Bsh	Cs	2.000	1.000	184	3.31E-02	3.01E-02	3.66E-02
KLX03	522.61	523.00	Bsh	Cs	0.500	0.250	184	1.09E-01	1.52E-01	2.25E-01
KLX03	522.61	523.00	Bsh	Cs	0.125	0.063	184			
KLX03	522.61	523.00	Bsh	Sr	2.000	1.000	1	2.17E-03	2.15E-03	2.56E-03
KLX03	522.61	523.00	Bsh	Sr	0.500	0.250	1	1.91E-03	2.42E-03	3.38E-03
KLX03	522.61	523.00	Bsh	Sr	0.125	0.063	1	2.31E-03		
KLX03	522.61	523.00	Bsh	Sr	2.000	1.000	7	2.21E-03	2.92E-03	2.71E-03
KLX03	522.61	523.00	Bsh	Sr	0.500	0.250	7	2.36E-03	3.34E-03	3.99E-02
KLX03	522.61	523.00	Bsh	Sr	0.125	0.063	7	2.99E-03		
KLX03	522.61	523.00	Bsh	Sr	2.000	1.000	31	2.56E-03	3.20E-03	3.02E-03
KLX03	522.61	523.00	Bsh	Sr	0.500	0.250	31	2.36E-03	3.44E-03	4.32E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	Bsh	Sr	0.125	0.063	31	2.90E-03		
KLX03	522.61	523.00	Bsh	Sr	2.000	1.000	86	2.53E-03	2.73E-03	3.54E-03
KLX03	522.61	523.00	Bsh	Sr	0.500	0.250	86	2.55E-03	1.28E-03	4.47E-03
KLX03	522.61	523.00	Bsh	Sr	0.125	0.063	86	2.80E-03		
KLX03	522.61	523.00	Bsh	Sr	2.000	1.000	184	3.43E-03	2.98E-03	4.65E-03
KLX03	522.61	523.00	Bsh	Sr	0.500	0.250	184	2.50E-03	2.62E-03	7.34E-03
KLX03	522.61	523.00	Bsh	Sr	0.125	0.063	184	2.59E-03		
KLX03	522.61	523.00	Bsh	Am	2.000	1.000	1	8.25E-02	7.91E-02	8.05E-02
KLX03	522.61	523.00	Bsh	Am	0.500	0.250	1	1.73E-01	1.60E-01	1.86E-01
KLX03	522.61	523.00	Bsh	Am	0.125	0.063	1	2.77E-01		
KLX03	522.61	523.00	Bsh	Am	2.000	1.000	7	2.71E-01	2.89E-01	2.95E-01
KLX03	522.61	523.00	Bsh	Am	0.500	0.250	7	7.02E-01	8.53E-01	5.54E-01
KLX03	522.61	523.00	Bsh	Am	0.125	0.063	7	9.12E-01		
KLX03	522.61	523.00	Bsh	Am	2.000	1.000	32	4.72E-01	6.67E-01	4.99E-01
KLX03	522.61	523.00	Bsh	Am	0.500	0.250	32	1.44E+00	2.12E+00	9.76E-01
KLX03	522.61	523.00	Bsh	Am	0.125	0.063	32	4.38E+00		
KLX03	522.61	523.00	Bsh	Am	2.000	1.000	96	1.33E+00	1.03E+00	1.45E+00
KLX03	522.61	523.00	Bsh	Am	0.500	0.250	96	2.36E+00	4.41E+00	2.52E+00
KLX03	522.61	523.00	Bsh	Am	0.125	0.063	96	1.18E+01		
KLX03	522.61	523.00	Bsh	Am	2.000	1.000	186	5.22E-01	1.39E+00	1.25E+00
KLX03	522.61	523.00	Bsh	Am	0.500	0.250	186	4.42E+00	1.86E+00	1.58E+00
KLX03	522.61	523.00	Bsh	Am	0.125	0.063	186	9.29E+00		
KLX03	522.61	523.00	Bsh	Ra	2.000	1.000	1	9.23E-03	1.17E-02	1.01E-02
KLX03	522.61	523.00	Bsh	Ra	0.500	0.250	1	3.06E-02	4.88E-02	
KLX03	522.61	523.00	Bsh	Ra	0.125	0.063	1	2.41E-01		
KLX03	522.61	523.00	Bsh	Ra	2.000	1.000	7	1.85E-02	2.40E-02	2.00E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	Bsh	Ra	0.500	0.250	7	4.99E-02	5.46E-02	
KLX03	522.61	523.00	Bsh	Ra	0.125	0.063	7	1.15E-01		
KLX03	522.61	523.00	Bsh	Ra	2.000	1.000	31	2.84E-02	3.49E-02	3.20E-02
KLX03	522.61	523.00	Bsh	Ra	0.500	0.250	31	5.84E-02	5.60E-02	
KLX03	522.61	523.00	Bsh	Ra	0.125	0.063	31	9.50E-02		
KLX03	522.61	523.00	Bsh	Ra	2.000	1.000	86	3.32E-02	3.92E-02	3.24E-02
KLX03	522.61	523.00	Bsh	Ra	0.500	0.250	86	6.01E-02	5.40E-02	
KLX03	522.61	523.00	Bsh	Ra	0.125	0.063	86	1.15E-01		
KLX03	522.61	523.00	Bsh	Ra	2.000	1.000	184	3.70E-02	4.65E-02	3.78E-02
KLX03	522.61	523.00	Bsh	Ra	0.500	0.250	184	7.23E-02	6.42E-02	
KLX03	522.61	523.00	Bsh	Ra	0.125	0.063	184	1.40E-01		
KLX03	522.61	523.00	Bsh	Ni	2.000	1.000	1	4.58E-03	4.92E-03	4.62E-03
KLX03	522.61	523.00	Bsh	Ni	0.500	0.250	1	1.04E-02	1.08E-02	
KLX03	522.61	523.00	Bsh	Ni	0.125	0.063	1	1.86E-02		
KLX03	522.61	523.00	Bsh	Ni	2.000	1.000	7	8.08E-03	9.64E-03	8.74E-03
KLX03	522.61	523.00	Bsh	Ni	0.500	0.250	7	3.08E-02	2.67E-02	
KLX03	522.61	523.00	Bsh	Ni	0.125	0.063	7	9.65E-02		
KLX03	522.61	523.00	Bsh	Ni	2.000	1.000	31	2.02E-02	2.28E-02	2.05E-02
KLX03	522.61	523.00	Bsh	Ni	0.500	0.250	31	8.11E-02	8.63E-02	
KLX03	522.61	523.00	Bsh	Ni	0.125	0.063	31	2.87E-01		
KLX03	522.61	523.00	Bsh	Ni	2.000	1.000	86	4.23E-02	5.37E-02	4.59E-02
KLX03	522.61	523.00	Bsh	Ni	0.500	0.250	86	1.93E-01	1.78E-01	
KLX03	522.61	523.00	Bsh	Ni	0.125	0.063	86	7.63E-01		
KLX03	522.61	523.00	Bsh	Ni	2.000	1.000	185	5.72E-02	5.87E-02	5.51E-02
KLX03	522.61	523.00	Bsh	Ni	0.500	0.250	185	1.73E-01	1.57E-01	
KLX03	522.61	523.00	Bsh	Ni	0.125	0.063	185	5.78E-01		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	Bsh	Np	2.000	1.000	1	2.98E-03	2.30E-03	2.86E-03
KLX03	522.61	523.00	Bsh	Np	0.500	0.250	1	1.41E-02	1.03E-02	
KLX03	522.61	523.00	Bsh	Np	0.125	0.063	1	2.19E-02		
KLX03	522.61	523.00	Bsh	Np	2.000	1.000	7	3.18E-03	2.65E-03	3.02E-03
KLX03	522.61	523.00	Bsh	Np	0.500	0.250	7	1.53E-02	1.04E-02	
KLX03	522.61	523.00	Bsh	Np	0.125	0.063	7	2.43E-02		
KLX03	522.61	523.00	Bsh	Np	2.000	1.000	31	3.61E-03	3.03E-03	3.94E-03
KLX03	522.61	523.00	Bsh	Np	0.500	0.250	31	1.70E-02	1.14E-02	
KLX03	522.61	523.00	Bsh	Np	0.125	0.063	31	4.01E-02		
KLX03	522.61	523.00	Bsh	Np	2.000	1.000	86	2.04E-03	1.69E-03	1.69E-03
KLX03	522.61	523.00	Bsh	Np	0.500	0.250	86	1.30E-02	7.65E-03	
KLX03	522.61	523.00	Bsh	Np	0.125	0.063	86	3.99E-02		
KLX03	522.61	523.00	Bsh	Np	2.000	1.000	185	8.13E-05	-4.03E-04	-1.76E-04
KLX03	522.61	523.00	Bsh	Np	0.500	0.250	185	6.15E-03	2.43E-03	
KLX03	522.61	523.00	Bsh	Np	0.125	0.063	185	1.96E-02		
KLX03	522.61	523.00	Bsh	U	2.000	1.000	1	2.96E-03	2.23E-03	2.78E-03
KLX03	522.61	523.00	Bsh	U	0.500	0.250	1	2.61E-02	1.73E-02	
KLX03	522.61	523.00	Bsh	U	0.125	0.063	1	3.65E-02		
KLX03	522.61	523.00	Bsh	U	2.000	1.000	7	3.13E-03	2.46E-03	2.99E-03
KLX03	522.61	523.00	Bsh	U	0.500	0.250	7	2.66E-02	1.85E-02	
KLX03	522.61	523.00	Bsh	U	0.125	0.063	7	3.14E-02		
KLX03	522.61	523.00	Bsh	U	2.000	1.000	31	3.28E-03	2.57E-03	3.20E-03
KLX03	522.61	523.00	Bsh	U	0.500	0.250	31	3.77E-02	1.83E-02	
KLX03	522.61	523.00	Bsh	U	0.125	0.063	31	3.75E-02		
KLX03	522.61	523.00	Bsh	U	2.000	1.000	86	3.44E-03	2.68E-03	3.28E-03
KLX03	522.61	523.00	Bsh	U	0.500	0.250	86	3.88E-02	1.95E-02	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX03	522.61	523.00	Bsh	U	0.125	0.063	86	2.93E-02		
KLX03	522.61	523.00	Bsh	U	2.000	1.000	185	3.84E-03	3.51E-03	3.26E-03
KLX03	522.61	523.00	Bsh	U	0.500	0.250	185	1.58E-02	1.09E-02	
KLX03	522.61	523.00	Bsh	U	0.125	0.063	185	4.95E-02		
KLX03	732.59	733.07	F	Cs	0.125	0.000	1	2.03E-01		
KLX03	732.59	733.07	F	Cs	0.125	0.000	7	2.10E-01		
KLX03	732.59	733.07	F	Cs	0.125	0.000	30	2.60E-01		
KLX03	732.59	733.07	F	Cs	0.125	0.000	96	2.86E-01		
KLX03	732.59	733.07	F	Cs	0.125	0.000	175	4.03E-01		
KLX03	732.59	733.07	F	Sr	0.125	0.000	1	2.64E-01		
KLX03	732.59	733.07	F	Sr	0.125	0.000	7	2.59E-01		
KLX03	732.59	733.07	F	Sr	0.125	0.000	30	1.92E-01		
KLX03	732.59	733.07	F	Sr	0.125	0.000	96	9.02E-02		
KLX03	732.59	733.07	F	Sr	0.125	0.000	175	3.82E-02		
KLX03	732.59	733.07	F	Am	0.125	0.000	1	1.86E+00		
KLX03	732.59	733.07	F	Am	0.125	0.000	7	2.01E+00		
KLX03	732.59	733.07	F	Am	0.125	0.000	30	1.23E+00		
KLX03	732.59	733.07	F	Am	0.125	0.000	96	1.31E+00		
KLX03	732.59	733.07	F	Am	0.125	0.000	175	1.18E+00		
KLX03	732.59	733.07	F	Ra	0.125	0.000	1	1.72E+00		
KLX03	732.59	733.07	F	Ra	0.125	0.000	7	3.79E+00		
KLX03	732.59	733.07	F	Ra	0.125	0.000	30	3.87E+00		
KLX03	732.59	733.07	F	Ra	0.125	0.000	96	3.78E+00		
KLX03	732.59	733.07	F	Ni	0.125	0.000	1	1.09E+00		
KLX03	732.59	733.07	F	Ni	0.125	0.000	7	1.25E+00		
KLX03	732.59	733.07	F	Ni	0.125	0.000	30	1.03E+00		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	732.59	733.07	F	Np	0.125	0.000	1	2.71E-02		
KLX03	732.59	733.07	F	Np	0.125	0.000	7	3.92E-02		
KLX03	732.59	733.07	F	Np	0.125	0.000	30	6.53E-02		
KLX03	732.59	733.07	F	Np	0.125	0.000	96	1.38E-01		
KLX03	732.59	733.07	F	Np	0.125	0.000	175	2.13E-01		
KLX03	732.59	733.07	F	U	0.125	0.000	1	1.80E-02		
KLX03	732.59	733.07	F	U	0.125	0.000	7	2.17E-02		
KLX03	732.59	733.07	F	U	0.125	0.000	30	2.72E-02		
KLX03	732.59	733.07	F	U	0.125	0.000	96	3.55E-02		
KLX03	732.59	733.07	F	U	0.125	0.000	175	4.01E-02		
KLX03	732.59	733.07	SaS	Cs	0.125	0.000	1	1.17E-02		
KLX03	732.59	733.07	SaS	Cs	0.125	0.000	7	1.50E-02		
KLX03	732.59	733.07	SaS	Cs	0.125	0.000	30	1.16E-02		
KLX03	732.59	733.07	SaS	Cs	0.125	0.000	96	1.49E-02		
KLX03	732.59	733.07	SaS	Cs	0.125	0.000	175	1.67E-02		
KLX03	732.59	733.07	SaS	Sr	0.125	0.000	1	4.28E-03		
KLX03	732.59	733.07	SaS	Sr	0.125	0.000	7	2.57E-03		
KLX03	732.59	733.07	SaS	Sr	0.125	0.000	30	2.72E-03		
KLX03	732.59	733.07	SaS	Sr	0.125	0.000	96	3.14E-03		
KLX03	732.59	733.07	SaS	Sr	0.125	0.000	175	5.11E-03		
KLX03	732.59	733.07	SaS	Am	0.125	0.000	1	1.39E+01		
KLX03	732.59	733.07	SaS	Am	0.125	0.000	7	1.32E+01		
KLX03	732.59	733.07	SaS	Am	0.125	0.000	30	7.13E+00		
KLX03	732.59	733.07	SaS	Am	0.125	0.000	96	2.76E+01		
KLX03	732.59	733.07	SaS	Am	0.125	0.000	175	9.47E+00		
KLX03	732.59	733.07	SaS	Ra	0.125	0.000	1	1.92E-02		

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX03	732.59	733.07	SaS	Ra	0.125	0.000	7	1.95E-02		
KLX03	732.59	733.07	SaS	Ra	0.125	0.000	30	1.93E-02		
KLX03	732.59	733.07	SaS	Ra	0.125	0.000	96	2.91E-02		
KLX03	732.59	733.07	SaS	Ni	0.125	0.000	1	1.69E-01		
KLX03	732.59	733.07	SaS	Ni	0.125	0.000	7	3.83E-01		
KLX03	732.59	733.07	SaS	Ni	0.125	0.000	30	1.18E+00		
KLX03	732.59	733.07	SaS	Np	0.125	0.000	1	2.28E-02		
KLX03	732.59	733.07	SaS	Np	0.125	0.000	7	2.79E-02		
KLX03	732.59	733.07	SaS	Np	0.125	0.000	30	3.43E-02		
KLX03	732.59	733.07	SaS	Np	0.125	0.000	96	4.19E-02		
KLX03	732.59	733.07	SaS	Np	0.125	0.000	175	4.68E-02		
KLX03	732.59	733.07	SaS	U	0.125	0.000	1	4.85E-01		
KLX03	732.59	733.07	SaS	U	0.125	0.000	7	2.40E+00		
KLX03	732.59	733.07	SaS	U	0.125	0.000	30	7.22E+00		
KLX03	732.59	733.07	SaS	U	0.125	0.000	96	7.16E+00		
KLX03	732.59	733.07	SaS	U	0.125	0.000	175	3.51E+00		

Table A5-16. Tracer distribution ratio, *Rd,* for rock samples from KLX04.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	489.85	490.25	F	Cs	2.000	1.000	1	4.65E-02	4.34E-02	3.67E-02
KLX04	489.85	490.25	F	Cs	0.500	0.250	1	2.18E-01	1.94E-01	1.79E-01
KLX04	489.85	490.25	F	Cs	0.125	0.063	1	3.63E+00	8.13E-01	1.19E+00
KLX04	489.85	490.25	F	Cs	2.000	1.000	7	1.13E-01	1.15E-01	1.02E-01
KLX04	489.85	490.25	F	Cs	0.500	0.250	7	5.07E-01	4.41E-01	5.79E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX04	489.85	490.25	F	Cs	0.125	0.063	7	1.22E+00	1.44E+00	9.00E-01
KLX04	489.85	490.25	F	Cs	2.000	1.000	32	1.62E-01	1.45E-01	1.59E-01
KLX04	489.85	490.25	F	Cs	0.500	0.250	32	8.28E-01	7.09E-01	5.71E-01
KLX04	489.85	490.25	F	Cs	0.125	0.063	32	3.61E+00	3.55E+00	1.81E+00
KLX04	489.85	490.25	F	Cs	2.000	1.000	99	2.91E-01	2.28E-01	2.50E-01
KLX04	489.85	490.25	F	Cs	0.500	0.250	99	1.19E+00	8.90E-01	8.54E-01
KLX04	489.85	490.25	F	Cs	2.000	1.000	183	2.40E-01	2.97E-01	2.60E-01
KLX04	489.85	490.25	F	Cs	0.500	0.250	183	1.00E+00	9.17E-01	7.05E-01
KLX04	489.85	490.25	F	Sr	2.000	1.000	1	1.11E-02	1.00E-02	8.44E-03
KLX04	489.85	490.25	F	Sr	0.500	0.250	1	2.34E-02	2.52E-02	1.99E-02
KLX04	489.85	490.25	F	Sr	0.125	0.063	1	4.86E-02	4.25E-02	3.90E-02
KLX04	489.85	490.25	F	Sr	2.000	1.000	7	1.63E-02	1.61E-02	1.43E-02
KLX04	489.85	490.25	F	Sr	0.500	0.250	7	2.31E-02	2.54E-02	2.80E-02
KLX04	489.85	490.25	F	Sr	0.125	0.063	7	5.16E-02	5.00E-02	4.41E-02
KLX04	489.85	490.25	F	Sr	2.000	1.000	32	1.83E-02	1.59E-02	1.53E-02
KLX04	489.85	490.25	F	Sr	0.500	0.250	32	2.70E-02	2.78E-02	2.98E-02
KLX04	489.85	490.25	F	Sr	0.125	0.063	32	5.45E-02	5.11E-02	4.77E-02
KLX04	489.85	490.25	F	Sr	2.000	1.000	99	1.86E-02	1.75E-02	1.59E-02
KLX04	489.85	490.25	F	Sr	0.500	0.250	99	3.05E-02	2.92E-02	2.61E-02
KLX04	489.85	490.25	F	Sr	0.125	0.063	99	5.66E-02	5.66E-02	6.12E-02
KLX04	489.85	490.25	F	Sr	2.000	1.000	183	1.82E-02	2.63E-02	1.74E-02
KLX04	489.85	490.25	F	Sr	0.500	0.250	183	3.80E-02	3.56E-02	2.64E-02
KLX04	489.85	490.25	F	Sr	0.125	0.063	183	5.19E-02	9.76E-02	5.59E-02
KLX04	489.85	490.25	F	Am	2.000	1.000	1	3.04E-02	2.92E-02	2.85E-02
KLX04	489.85	490.25	F	Am	0.500	0.250	1	4.15E-02	5.18E-02	6.05E-02
KLX04	489.85	490.25	F	Am	0.125	0.063	1	1.99E-01	2.38E-01	2.39E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX04	489.85	490.25	F	Am	2.000	1.000	7	7.86E-02	6.32E-02	5.91E-02
KLX04	489.85	490.25	F	Am	0.500	0.250	7	1.18E-01	1.55E-01	1.79E-01
KLX04	489.85	490.25	F	Am	0.125	0.063	7	3.16E-01	3.64E-01	3.51E-01
KLX04	489.85	490.25	F	Am	2.000	1.000	32	1.21E-01	1.08E-01	5.76E-02
KLX04	489.85	490.25	F	Am	0.500	0.250	32	1.75E-01	2.08E-01	2.79E-01
KLX04	489.85	490.25	F	Am	0.125	0.063	32	6.39E-01	6.63E-01	6.73E-01
KLX04	489.85	490.25	F	Am	2.000	1.000	99	1.39E-01	1.22E-01	9.83E-02
KLX04	489.85	490.25	F	Am	0.500	0.250	99	2.36E-01	2.76E-01	3.38E-01
KLX04	489.85	490.25	F	Am	0.125	0.063	99	9.00E-01	1.03E+00	1.02E+00
KLX04	489.85	490.25	F	Am	2.000	1.000	183	1.73E-01	8.44E-02	9.27E-02
KLX04	489.85	490.25	F	Am	0.500	0.250	183	2.70E-01	3.39E-01	3.50E-01
KLX04	489.85	490.25	F	Am	0.125	0.063	183	8.17E-01	8.85E-01	7.81E-01
KLX04	489.85	490.25	SaS	Cs	2.000	1.000	1	1.07E-02	1.09E-02	1.11E-02
KLX04	489.85	490.25	SaS	Cs	0.500	0.250	1	4.26E-02	3.94E-02	4.60E-02
KLX04	489.85	490.25	SaS	Cs	0.125	0.063	1	2.15E-01	2.55E-01	2.19E-01
KLX04	489.85	490.25	SaS	Cs	2.000	1.000	7	2.51E-02	2.56E-02	2.35E-02
KLX04	489.85	490.25	SaS	Cs	0.500	0.250	7	1.48E-01	1.21E-01	1.19E-01
KLX04	489.85	490.25	SaS	Cs	0.125	0.063	7	4.02E-01	4.03E-01	3.83E-01
KLX04	489.85	490.25	SaS	Cs	2.000	1.000	32	2.78E-02	2.97E-02	3.13E-02
KLX04	489.85	490.25	SaS	Cs	0.500	0.250	32	1.62E-01	1.20E-01	1.51E-01
KLX04	489.85	490.25	SaS	Cs	0.125	0.063	32	5.29E-01	4.97E-01	5.08E-01
KLX04	489.85	490.25	SaS	Cs	2.000	1.000	99	3.33E-02	3.46E-02	3.61E-02
KLX04	489.85	490.25	SaS	Cs	0.500	0.250	99	1.84E-01	1.42E-01	1.82E-01
KLX04	489.85	490.25	SaS	Cs	0.125	0.063	99	6.76E-01	5.80E-01	5.95E-01
KLX04	489.85	490.25	SaS	Cs	2.000	1.000	183	4.19E-02	4.37E-02	4.31E-02
KLX04	489.85	490.25	SaS	Cs	0.500	0.250	183	2.17E-01	1.97E-01	1.97E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX04	489.85	490.25	SaS	Cs	0.125	0.063	183	3.86E-01	7.09E-01	7.55E-01
KLX04	489.85	490.25	SaS	Sr	2.000	1.000	1	2.75E-03	2.85E-03	2.95E-03
KLX04	489.85	490.25	SaS	Sr	0.500	0.250	1	2.86E-03	2.96E-03	2.95E-03
KLX04	489.85	490.25	SaS	Sr	0.125	0.063	1	3.74E-03	4.13E-03	4.23E-03
KLX04	489.85	490.25	SaS	Sr	2.000	1.000	7	4.28E-03	4.62E-03	3.96E-03
KLX04	489.85	490.25	SaS	Sr	0.500	0.250	7	4.45E-03	4.30E-03	3.83E-03
KLX04	489.85	490.25	SaS	Sr	0.125	0.063	7	4.16E-03	4.38E-03	4.43E-03
KLX04	489.85	490.25	SaS	Sr	2.000	1.000	32	3.42E-03	3.45E-03	3.48E-03
KLX04	489.85	490.25	SaS	Sr	0.500	0.250	32	3.69E-03	2.79E-03	3.41E-03
KLX04	489.85	490.25	SaS	Sr	0.125	0.063	32	3.66E-03	3.84E-03	3.69E-03
KLX04	489.85	490.25	SaS	Sr	2.000	1.000	99	2.26E-03	2.32E-03	2.38E-03
KLX04	489.85	490.25	SaS	Sr	0.500	0.250	99	3.03E-03	1.74E-03	2.55E-03
KLX04	489.85	490.25	SaS	Sr	0.125	0.063	99	3.31E-03	3.05E-03	1.61E-03
KLX04	489.85	490.25	SaS	Sr	2.000	1.000	183	2.32E-03	2.55E-03	3.63E-03
KLX04	489.85	490.25	SaS	Sr	0.500	0.250	183	4.22E-03	3.29E-03	2.89E-03
KLX04	489.85	490.25	SaS	Sr	0.125	0.063	183	2.86E-03	2.62E-03	2.79E-03
KLX04	489.85	490.25	SaS	Am	2.000	1.000	1	6.96E-02	7.46E-02	7.94E-02
KLX04	489.85	490.25	SaS	Am	0.500	0.250	1	1.91E-01	1.86E-01	1.83E-01
KLX04	489.85	490.25	SaS	Am	0.125	0.063	1	7.00E-01	6.58E-01	5.34E-01
KLX04	489.85	490.25	SaS	Am	2.000	1.000	7	2.88E-01	2.46E-01	3.00E-01
KLX04	489.85	490.25	SaS	Am	0.500	0.250	7	5.87E-01	7.60E-01	5.83E-01
KLX04	489.85	490.25	SaS	Am	0.125	0.063	7	1.47E+00	1.08E+00	1.27E+00
KLX04	489.85	490.25	SaS	Am	2.000	1.000	32	3.56E-01	4.52E-01	8.40E-01
KLX04	489.85	490.25	SaS	Am	0.500	0.250	32	1.49E+00	9.44E-01	2.16E+00
KLX04	489.85	490.25	SaS	Am	0.125	0.063	32	4.37E+00	4.27E+00	3.67E+00
KLX04	489.85	490.25	SaS	Am	2.000	1.000	99	1.28E+00	5.05E-01	2.11E+00

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	489.85	490.25	SaS	Am	0.500	0.250	99	5.12E+00	5.11E+00	4.93E+00
KLX04	489.85	490.25	SaS	Am	0.125	0.063	99	7.54E+00	5.46E+00	4.85E+00
KLX04	489.85	490.25	SaS	Am	2.000	1.000	183	1.51E+00	1.07E+00	1.10E+00
KLX04	489.85	490.25	SaS	Am	0.500	0.250	183	5.80E+00	5.30E+00	5.25E+00
KLX04	489.85	490.25	SaS	Am	0.125	0.063	183	3.25E+00	4.47E+00	2.74E+00
KLX04	489.85	490.25	Bsh	Cs	2.000	1.000	1	1.21E-02	1.11E-02	1.37E-02
KLX04	489.85	490.25	Bsh	Cs	0.500	0.250	1	5.40E-02	6.13E-02	7.62E-02
KLX04	489.85	490.25	Bsh	Cs	0.125	0.063	1	1.29E-01	1.98E-01	1.65E-01
KLX04	489.85	490.25	Bsh	Cs	2.000	1.000	7	2.92E-02	2.37E-02	3.08E-02
KLX04	489.85	490.25	Bsh	Cs	0.500	0.250	7	1.87E-01	1.65E-01	2.36E-01
KLX04	489.85	490.25	Bsh	Cs	0.125	0.063	7	4.93E-01	5.02E-01	6.78E-01
KLX04	489.85	490.25	Bsh	Cs	2.000	1.000	31	3.97E-02	3.54E-02	4.71E-02
KLX04	489.85	490.25	Bsh	Cs	0.500	0.250	31	2.11E-01	2.30E-01	2.52E-01
KLX04	489.85	490.25	Bsh	Cs	0.125	0.063	31	1.87E+00	7.34E-01	6.96E-01
KLX04	489.85	490.25	Bsh	Cs	2.000	1.000	92	4.96E-02	4.12E-02	4.54E-02
KLX04	489.85	490.25	Bsh	Cs	0.500	0.250	92	2.33E-01	2.04E-01	3.18E-01
KLX04	489.85	490.25	Bsh	Cs	0.125	0.063	92	8.97E-01	7.83E-01	1.29E+00
KLX04	489.85	490.25	Bsh	Cs	2.000	1.000	182	6.25E-02	4.84E-02	7.10E-02
KLX04	489.85	490.25	Bsh	Cs	0.500	0.250	182	3.35E-01	3.54E-01	3.97E-01
KLX04	489.85	490.25	Bsh	Cs	0.125	0.063	182	1.34E+00		
KLX04	489.85	490.25	Bsh	Sr	2.000	1.000	1	2.34E-03	2.15E-03	3.11E-03
KLX04	489.85	490.25	Bsh	Sr	0.500	0.250	1	1.65E-03	3.39E-03	4.26E-03
KLX04	489.85	490.25	Bsh	Sr	0.125	0.063	1	3.64E-03	3.69E-03	2.33E-03
KLX04	489.85	490.25	Bsh	Sr	2.000	1.000	7	2.65E-03	2.57E-03	3.56E-03
KLX04	489.85	490.25	Bsh	Sr	0.500	0.250	7	2.99E-03	3.48E-03	4.32E-03
KLX04	489.85	490.25	Bsh	Sr	0.125	0.063	7	3.32E-03	3.94E-03	5.00E-03

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	489.85	490.25	Bsh	Sr	2.000	1.000	31	3.18E-03	3.65E-03	4.19E-03
KLX04	489.85	490.25	Bsh	Sr	0.500	0.250	31	4.86E-03	4.26E-03	5.10E-03
KLX04	489.85	490.25	Bsh	Sr	0.125	0.063	31	4.70E-03	3.74E-03	4.82E-03
KLX04	489.85	490.25	Bsh	Sr	2.000	1.000	92	2.66E-03	2.93E-03	2.90E-03
KLX04	489.85	490.25	Bsh	Sr	0.500	0.250	92	3.28E-03	3.44E-03	3.54E-03
KLX04	489.85	490.25	Bsh	Sr	0.125	0.063	92	4.65E-03	4.20E-03	4.16E-03
KLX04	489.85	490.25	Bsh	Sr	2.000	1.000	182	2.55E-03	2.31E-03	4.29E-03
KLX04	489.85	490.25	Bsh	Sr	0.500	0.250	182	3.16E-03	5.56E-03	2.99E-03
KLX04	489.85	490.25	Bsh	Sr	0.125	0.063	182	4.20E-03	3.39E-03	5.37E-03
KLX04	489.85	490.25	Bsh	Am	2.000	1.000	1	7.92E-02	1.09E-01	8.81E-02
KLX04	489.85	490.25	Bsh	Am	0.500	0.250	1	2.13E-01	1.91E-01	2.34E-01
KLX04	489.85	490.25	Bsh	Am	0.125	0.063	1	5.15E-01	5.33E-01	4.96E-01
KLX04	489.85	490.25	Bsh	Am	2.000	1.000	7	3.35E-01	3.45E-01	3.01E-01
KLX04	489.85	490.25	Bsh	Am	0.500	0.250	7	6.48E-01	4.73E-01	9.72E-01
KLX04	489.85	490.25	Bsh	Am	0.125	0.063	7	1.75E+00	2.15E+00	2.34E+00
KLX04	489.85	490.25	Bsh	Am	2.000	1.000	31	7.68E-01	8.45E-01	7.38E-01
KLX04	489.85	490.25	Bsh	Am	0.500	0.250	31	1.16E+00	1.59E+00	2.01E+00
KLX04	489.85	490.25	Bsh	Am	0.125	0.063	31	3.33E+00	3.50E+00	3.32E+00
KLX04	489.85	490.25	Bsh	Am	2.000	1.000	92	9.26E-01	1.14E+00	1.12E+00
KLX04	489.85	490.25	Bsh	Am	0.500	0.250	92	1.58E+00	2.65E+00	2.78E+00
KLX04	489.85	490.25	Bsh	Am	0.125	0.063	92	4.20E+00	5.41E+00	3.91E+00
KLX04	489.85	490.25	Bsh	Am	2.000	1.000	182	9.97E-01	1.07E+00	1.42E+00
KLX04	489.85	490.25	Bsh	Am	0.500	0.250	182	4.10E+00	2.18E+00	4.02E+00
KLX04	489.85	490.25	Bsh	Am	0.125	0.063	182	5.58E+00	5.31E+00	5.90E+00
KLX04	718.91	719.36	F	Cs	2.000		1	1.32E-02	1.53E-02	1.28E-02
KLX04	718.91	719.36	F	Cs	0.500		1	3.01E-02	3.62E-02	3.39E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)	Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX04	718.91	719.36	F	Cs	0.125	1	1.17E-01	1.09E-01	1.34E-01
KLX04	718.91	719.36	F	Cs	2.000	7	3.08E-02	2.91E-02	3.14E-02
KLX04	718.91	719.36	F	Cs	0.500	7	7.72E-02	6.81E-02	7.55E-02
KLX04	718.91	719.36	F	Cs	0.125	7	2.04E-01	2.15E-01	1.76E-01
KLX04	718.91	719.36	F	Cs	2.000	36	5.75E-02	5.06E-02	5.54E-02
KLX04	718.91	719.36	F	Cs	0.500	36	1.15E-01	9.72E-02	1.09E-01
KLX04	718.91	719.36	F	Cs	0.125	36	2.79E-01	2.26E-01	2.27E-01
KLX04	718.91	719.36	F	Cs	2.000	92	7.18E-02	6.31E-02	6.75E-02
KLX04	718.91	719.36	F	Cs	0.500	92	1.14E-01	1.66E-01	1.63E-01
KLX04	718.91	719.36	F	Cs	0.125	92	3.56E-01	3.12E-01	2.93E-01
KLX04	718.91	719.36	F	Cs	2.000	187	1.08E-01	9.73E-02	8.96E-02
KLX04	718.91	719.36	F	Cs	0.500	187	1.77E-01	1.68E-01	1.35E-01
KLX04	718.91	719.36	F	Cs	0.125	187	3.53E-01	3.14E-01	3.34E-01
KLX04	718.91	719.36	F	Sr	2.000	1	7.63E-01	9.65E-01	7.67E-01
KLX04	718.91	719.36	F	Sr	0.500	1	1.17E-02	1.41E-02	1.30E-02
KLX04	718.91	719.36	F	Sr	0.125	1	2.55E-02	2.55E-02	2.76E-02
KLX04	718.91	719.36	F	Sr	2.000	7	1.54E-02	1.35E-02	1.68E-02
KLX04	718.91	719.36	F	Sr	0.500	7	1.73E-02	1.58E-02	1.79E-02
KLX04	718.91	719.36	F	Sr	0.125	7	3.18E-02	3.25E-02	2.64E-02
KLX04	718.91	719.36	F	Sr	2.000	36	1.88E-02	1.89E-02	1.97E-02
KLX04	718.91	719.36	F	Sr	0.500	36	2.07E-02	1.86E-02	2.01E-02
KLX04	718.91	719.36	F	Sr	0.125	36	4.16E-02	3.49E-02	3.06E-02
KLX04	718.91	719.36	F	Sr	2.000	92	2.12E-02	2.09E-02	2.10E-02
KLX04	718.91	719.36	F	Sr	0.500	92	2.35E-02	2.44E-02	2.95E-02
KLX04	718.91	719.36	F	Sr	0.125	92	4.37E-02	3.55E-02	3.98E-02
KLX04	718.91	719.36	F	Sr	2.000	187	2.26E-02	2.44E-02	2.10E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)	Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX04	718.91	719.36	F	Sr	0.500	187	2.99E-02	3.26E-02	2.15E-02
KLX04	718.91	719.36	F	Sr	0.125	187	6.28E-02	3.75E-02	5.79E-02
KLX04	718.91	719.36	F	Am	2.000	1	2.19E-02	2.63E-02	3.31E-02
KLX04	718.91	719.36	F	Am	0.500	1	3.95E-02	4.69E-02	2.47E-02
KLX04	718.91	719.36	F	Am	0.125	1	1.02E-01	8.91E-02	1.27E-01
KLX04	718.91	719.36	F	Am	2.000	7	3.58E-02	5.55E-02	
KLX04	718.91	719.36	F	Am	0.500	7	1.04E-01	1.09E-01	
KLX04	718.91	719.36	F	Am	0.125	7	2.30E-01	2.39E-01	
KLX04	718.91	719.36	F	Am	2.000	36	7.14E-02	8.76E-02	
KLX04	718.91	719.36	F	Am	0.500	36	2.57E-01	3.15E-01	
KLX04	718.91	719.36	F	Am	0.125	36	5.45E-01	5.38E-01	
KLX04	718.91	719.36	F	Am	2.000	92	1.07E-01	1.66E-01	
KLX04	718.91	719.36	F	Am	0.500	92	2.93E-01	3.83E-01	
KLX04	718.91	719.36	F	Am	0.125	92	9.62E-01	4.10E-01	
KLX04	718.91	719.36	F	Am	2.000	187	8.33E-02	1.19E-01	
KLX04	718.91	719.36	F	Am	0.500	187	2.45E-01	4.08E-01	
KLX04	718.91	719.36	F	Am	0.125	187	1.02E+00	4.98E-01	
KLX04	718.91	719.36	SaS	Cs	2.000	1	6.09E-03	5.96E-03	
KLX04	718.91	719.36	SaS	Cs	0.500	1	8.38E-03	8.18E-03	
KLX04	718.91	719.36	SaS	Cs	0.125	1	1.85E-02	2.34E-02	
KLX04	718.91	719.36	SaS	Cs	2.000	7	6.21E-03	6.62E-03	
KLX04	718.91	719.36	SaS	Cs	0.500	7	1.57E-02	1.57E-02	
KLX04	718.91	719.36	SaS	Cs	0.125	7	4.77E-02	3.89E-02	
KLX04	718.91	719.36	SaS	Cs	2.000	36	1.13E-02	1.05E-02	
KLX04	718.91	719.36	SaS	Cs	0.500	36	2.07E-02	1.80E-02	
KLX04	718.91	719.36	SaS	Cs	0.125	36	4.37E-02	5.53E-02	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)	Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	718.91	719.36	SaS	Cs	2.000	92	1.11E-02	1.09E-02	
KLX04	718.91	719.36	SaS	Cs	0.500	92	2.27E-02	2.34E-02	
KLX04	718.91	719.36	SaS	Cs	0.125	92	6.40E-02	6.00E-02	
KLX04	718.91	719.36	SaS	Cs	2.000	187	1.36E-02	1.31E-02	
KLX04	718.91	719.36	SaS	Cs	0.500	187	2.47E-02	2.53E-02	
KLX04	718.91	719.36	SaS	Cs	0.125	187	6. 08E-02	5.61E-02	
KLX04	718.91	719.36	SaS	Sr	2.000	1	3.65E-03	3.60E-03	
KLX04	718.91	719.36	SaS	Sr	0.500	1	2.76E-03	2.59E-03	
KLX04	718.91	719.36	SaS	Sr	0.125	1	3.06E-03	4.04E-03	
KLX04	718.91	719.36	SaS	Sr	2.000	7	2.73E-03	2.64E-03	
KLX04	718.91	719.36	SaS	Sr	0.500	7	3.85E-03	3.58E-03	
KLX04	718.91	719.36	SaS	Sr	0.125	7	4.03E-03	3.65E-03	
KLX04	718.91	719.36	SaS	Sr	2.000	36	3.59E-03	3.16E-03	
KLX04	718.91	719.36	SaS	Sr	0.500	36	3.22E-03	2.15E-03	
KLX04	718.91	719.36	SaS	Sr	0.125	36	1.79E-03	3.44E-03	
KLX04	718.91	719.36	SaS	Sr	2.000	92	2.33E-03	2.25E-03	
KLX04	718.91	719.36	SaS	Sr	0.500	92	2.48E-03	2.10E-03	
KLX04	718.91	719.36	SaS	Sr	0.125	92	2.35E-03	2.67E-03	
KLX04	718.91	719.36	SaS	Sr	2.000	187	3.24E-03	2.96E-03	
KLX04	718.91	719.36	SaS	Sr	0.500	187	3.11E-03	2.18E-03	
KLX04	718.91	719.36	SaS	Sr	0.125	187	3.57E-03	3.23E-03	
KLX04	718.91	719.36	SaS	Am	2.000	1	2.66E-02	3.30E-02	
KLX04	718.91	719.36	SaS	Am	0.500	1	7.09E-02	9.18E-02	
KLX04	718.91	719.36	SaS	Am	0.125	1	3.55E-01	4.15E-01	
KLX04	718.91	719.36	SaS	Am	2.000	7	1.16E-01	1.53E-01	
KLX04	718.91	719.36	SaS	Am	0.500	7	4.95E-01	3.65E-01	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	718.91	719.36	SaS	Am	0.125		7	2.00E+00	1.38E+00	
KLX04	718.91	719.36	SaS	Am	2.000		36	3.71E-01	3.69E-01	
KLX04	718.91	719.36	SaS	Am	0.500		36	3.11E-01	1.29E+00	
KLX04	718.91	719.36	SaS	Am	0.125		36	4.13E+00	4.84E+00	
KLX04	718.91	719.36	SaS	Am	2.000		92	6.95E-01	8.02E-01	
KLX04	718.91	719.36	SaS	Am	0.500		92	1.77E+00	2.94E+00	
KLX04	718.91	719.36	SaS	Am	0.125		92	5.93E+00	6.11E+00	
KLX04	718.91	719.36	SaS	Am	2.000		187	6.94E-01	9.97E-01	
KLX04	718.91	719.36	SaS	Am	0.500		187	3.11E+00	3.34E+00	
KLX04	718.91	719.36	SaS	Am	0.125		187	7.99E+00	9.84E+00	
KLX04	874.48	874.64	F	Cs	0.125	0.000	1	8.93E-02	7.81E-02	
KLX04	874.48	874.64	F	Cs	0.125	0.000	8	2.03E-01	2.06E-01	
KLX04	874.48	874.64	F	Cs	0.125	0.000	42	3.45E-01	3.57E-01	
KLX04	874.48	874.64	F	Cs	0.125	0.000	90	4.89E-01	4.63E-01	
KLX04	874.48	874.64	F	Cs	0.125	0.000	181	4.03E-01	4.11E-01	
KLX04	874.48	874.64	F	Sr	0.125	0.000	181	1.65E-01	2.93E-01	
KLX04	874.48	874.64	F	Eu	0.125	0.000	1	2.59E+00	1.29E+00	
KLX04	874.48	874.64	F	Eu	0.125	0.000	8	1.90E+00	1.47E+00	
KLX04	874.48	874.64	F	Eu	0.125	0.000	42	5.27E+00	1.35E+00	
KLX04	874.48	874.64	F	Eu	0.125	0.000	90	1.64E+00	1.62E+00	
KLX04	874.48	874.64	F	Eu	0.125	0.000	181	8.72E-01	8.37E-01	
KLX04	874.48	874.64	B	Cs	0.125	0.000	1	7.57E-03	6.84E-03	
KLX04	874.48	874.64	B	Cs	0.125	0.000	8	1.05E-02	9.14E-03	
KLX04	874.48	874.64	B	Cs	0.125	0.000	42	1.00E-02	9.45E-03	
KLX04	874.48	874.64	B	Cs	0.125	0.000	90	1.22E-02	1.04E-02	
KLX04	874.48	874.64	B	Cs	0.125	0.000	181	1.20E-02	1.07E-02	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	874.48	874.64	B	Sr	0.125	0.000	181	6.23E-04	8.66E-04	
KLX04	874.48	874.64	B	Eu	0.125	0.000	1	6.64E-01	7.86E-01	
KLX04	874.48	874.64	B	Eu	0.125	0.000	8	5.23E-01	6.77E-01	
KLX04	874.48	874.64	B	Eu	0.125	0.000	42	2.06E+00	8.09E-01	
KLX04	874.48	874.64	B	Eu	0.125	0.000	90	1.35E+00	1.22E+00	
KLX04	874.48	874.64	B	Eu	0.125	0.000	181	6.73E-01	4.41E-01	
KLX04	951.30	951.44	F	Cs	2.000	1.000	1	7.35E-02	7.83E-02	
KLX04	951.30	951.44	F	Cs	0.500	0.250	1	9.45E-02	1.14E-01	
KLX04	951.30	951.44	F	Cs	0.125	0.063	1	1.49E-01	1.50E-01	
KLX04	951.30	951.44	F	Cs	2.000	1.000	8	1.13E-01	1.96E-01	
KLX04	951.30	951.44	F	Cs	0.500	0.250	8	1.34E-01	1.26E-01	
KLX04	951.30	951.44	F	Cs	0.125	0.063	8	1.84E-01	1.76E-01	
KLX04	951.30	951.44	F	Cs	2.000	1.000	30	1.25E-01	1.34E-01	
KLX04	951.30	951.44	F	Cs	0.500	0.250	30	1.50E-01	1.73E-01	
KLX04	951.30	951.44	F	Cs	0.125	0.063	30	2.12E-01	2.14E-01	
KLX04	951.30	951.44	F	Cs	2.000	1.000	91	1.25E-01	1.39E-01	
KLX04	951.30	951.44	F	Cs	0.500	0.250	91	1.59E-01	1.90E-01	
KLX04	951.30	951.44	F	Cs	0.125	0.063	91	2.50E-01	2.27E-01	
KLX04	951.30	951.44	F	Cs	2.000	1.000	189	1.44E-01	1.67E-01	
KLX04	951.30	951.44	F	Cs	0.500	0.250	189	1.81E-01	1.96E-01	
KLX04	951.30	951.44	F	Cs	0.125	0.063	189	2.69E-01	2.57E-01	
KLX04	951.30	951.44	F	Sr	2.000	1.000	1	7.46E-02	6.68E-02	
KLX04	951.30	951.44	F	Sr	0.500	0.250	1	4.91E-02	6.11E-02	
KLX04	951.30	951.44	F	Sr	0.125	0.063	1	6.93E-02	6.90E-02	
KLX04	951.30	951.44	F	Sr	2.000	1.000	8	6.42E-02	1.25E-01	
KLX04	951.30	951.44	F	Sr	0.500	0.250	8	5.08E-02	1.45E-01	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	951.30	951.44	F	Sr	0.125	0.063	8	7.05E-02	2.13E-01	
KLX04	951.30	951.44	F	Sr	2.000	1.000	30	2.09E-01	1.69E-01	
KLX04	951.30	951.44	F	Sr	0.500	0.250	30	4.97E-02	8.20E-02	
KLX04	951.30	951.44	F	Sr	0.125	0.063	30	1.15E-01	7.23E-02	
KLX04	951.30	951.44	F	Sr	2.000	1.000	91	9.93E-02	7.11E-02	
KLX04	951.30	951.44	F	Sr	0.500	0.250	91	8.34E-02	7.94E-02	
KLX04	951.30	951.44	F	Sr	0.125	0.063	91	6.23E-02	7.68E-02	
KLX04	951.30	951.44	F	Sr	2.000	1.000	189	7.08E-02	-2.30E-03	
KLX04	951.30	951.44	F	Sr	0.500	0.250	189	6.04E-02	-2.31E-03	
KLX04	951.30	951.44	F	Sr	0.125	0.063	189	9.70E-02	1.69E-01	
KLX04	951.30	951.44	F	Eu	2.000	1.000	1	1.53E-03	-1.21E-03	
KLX04	951.30	951.44	F	Eu	0.500	0.250	1	8.28E-04	-7.00E-04	
KLX04	951.30	951.44	F	Eu	0.125	0.063	1	3.05E-03	1.16E-03	
KLX04	951.30	951.44	F	Eu	2.000	1.000	8	5.89E-01	3.64E-01	
KLX04	951.30	951.44	F	Eu	0.500	0.250	8	4.68E-01	3.71E-01	
KLX04	951.30	951.44	F	Eu	0.125	0.063	8	7.15E-01	3.60E-01	
KLX04	951.30	951.44	F	Eu	2.000	1.000	30	4.13E-01	3.48E-01	
KLX04	951.30	951.44	F	Eu	0.500	0.250	30	4.08E-01	3.38E-01	
KLX04	951.30	951.44	F	Eu	0.125	0.063	30	2.07E-01	4.70E-01	
KLX04	951.30	951.44	F	Eu	2.000	1.000	91	3.53E-01	5.44E-01	
KLX04	951.30	951.44	F	Eu	0.500	0.250	91	4.04E-01	6.58E-01	
KLX04	951.30	951.44	F	Eu	0.125	0.063	91	2.67E-01	5.93E-01	
KLX04	951.30	951.44	F	Eu	2.000	1.000	189	6.20E-01	1.37E-01	
KLX04	951.30	951.44	F	Eu	0.500	0.250	189	5.20E-01	1.89E-01	
KLX04	951.30	951.44	F	Eu	0.125	0.063	189	3.88E-01	4.32E-01	
KLX04	951.30	951.44	SaS	Cs	2.000	1.000	1	8.77E-03	7.96E-03	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	951.30	951.44	SaS	Cs	0.500	0.250	1	1.40E-02	1.39E-02	
KLX04	951.30	951.44	SaS	Cs	0.125	0.063	1	2.40E-02	2.65E-02	
KLX04	951.30	951.44	SaS	Cs	2.000	1.000	8	1.61E-02	1.55E-02	
KLX04	951.30	951.44	SaS	Cs	0.500	0.250	8	2.00E-02	1.89E-02	
KLX04	951.30	951.44	SaS	Cs	0.125	0.063	8	3.58E-02	3.63E-02	
KLX04	951.30	951.44	SaS	Cs	2.000	1.000	42	1.91E-02	1.87E-02	
KLX04	951.30	951.44	SaS	Cs	0.500	0.250	42	2.27E-02	2.21E-02	
KLX04	951.30	951.44	SaS	Cs	0.125	0.063	42	4.79E-02	4.51E-02	
KLX04	951.30	951.44	SaS	Cs	2.000	1.000	90	1.96E-02	1.92E-02	
KLX04	951.30	951.44	SaS	Cs	0.500	0.250	90	2.40E-02	2.30E-02	
KLX04	951.30	951.44	SaS	Cs	0.125	0.063	90	4.61E-02	4.46E-02	
KLX04	951.30	951.44	SaS	Cs	2.000	1.000	181	2.00E-02	1.99E-02	
KLX04	951.30	951.44	SaS	Cs	0.500	0.250	181	2.46E-02	2.34E-02	
KLX04	951.30	951.44	SaS	Cs	0.125	0.063	181	4.66E-02	4.77E-02	
KLX04	951.30	951.44	SaS	Sr	2.000	1.000	1	-1.73E-04	-1.29E-05	
KLX04	951.30	951.44	SaS	Sr	0.500	0.250	1	1.17E-05	-8.97E-05	
KLX04	951.30	951.44	SaS	Sr	0.125	0.063	1	6.01E-05	-9.17E-05	
KLX04	951.30	951.44	SaS	Sr	2.000	1.000	8	-1.70E-04	-2.15E-04	
KLX04	951.30	951.44	SaS	Sr	0.500	0.250	8	1.92E-05	-7.86E-05	
KLX04	951.30	951.44	SaS	Sr	0.125	0.063	8	3.94E-05	1.14E-04	
KLX04	951.30	951.44	SaS	Sr	2.000	1.000	42	-2.80E-04	-2.34E-04	
KLX04	951.30	951.44	SaS	Sr	0.500	0.250	42	-1.34E-04	-1.50E-04	
KLX04	951.30	951.44	SaS	Sr	0.125	0.063	42	1.38E-04	2.71E-04	
KLX04	951.30	951.44	SaS	Sr	2.000	1.000	90	5.91E-05	-1.27E-05	
KLX04	951.30	951.44	SaS	Sr	0.500	0.250	90	1.96E-04	-2.56E-04	
KLX04	951.30	951.44	SaS	Sr	0.125	0.063	90	1.71E-04	9.64E-05	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	951.30	951.44	SaS	Sr	2.000	1.000	181	2.70E-06	8.96E-05	
KLX04	951.30	951.44	SaS	Sr	0.500	0.250	181	-7.71E-05	-1.31E-04	
KLX04	951.30	951.44	SaS	Sr	0.125	0.063	181	2.25E-04	1.41E-04	
KLX04	951.30	951.44	SaS	Eu	2.000	1.000	1	2.82E-01	2.58E-01	
KLX04	951.30	951.44	SaS	Eu	0.500	0.250	1	6.05E-01	6.43E-01	
KLX04	951.30	951.44	SaS	Eu	0.125	0.063	1	1.47E+00	1.49E+00	
KLX04	951.30	951.44	SaS	Eu	2.000	1.000	8	9.04E-01	7.33E-01	
KLX04	951.30	951.44	SaS	Eu	0.500	0.250	8	1.06E+00	1.41E+00	
KLX04	951.30	951.44	SaS	Eu	0.125	0.063	8	1.17E+00	1.75E+00	
KLX04	951.30	951.44	SaS	Eu	2.000	1.000	42	1.51E+00	1.60E+00	
KLX04	951.30	951.44	SaS	Eu	0.500	0.250	42	3.70E+00	5.11E+00	
KLX04	951.30	951.44	SaS	Eu	0.125	0.063	42	2.22E+00	4.79E+00	
KLX04	951.30	951.44	SaS	Eu	2.000	1.000	90	2.82E+00	1.82E+00	
KLX04	951.30	951.44	SaS	Eu	0.500	0.250	90	4.53E+00	3.99E+00	
KLX04	951.30	951.44	SaS	Eu	0.125	0.063	90	5.73E+00	3.69E+00	
KLX04	951.30	951.44	SaS	Eu	2.000	1.000	181	4.06E+00	1.75E+00	
KLX04	951.30	951.44	SaS	Eu	0.500	0.250	181	1.70E+00	1.68E+00	
KLX04	951.30	951.44	SaS	Eu	0.125	0.063	181	5.02E-01	1.83E+00	
KLX04	951.30	951.44	B	Cs	2.000	1.000	1	3.57E-03	4.60E-03	
KLX04	951.30	951.44	B	Cs	0.500	0.250	1	6.28E-03	6.20E-03	
KLX04	951.30	951.44	B	Cs	0.125	0.063	1	1.03E-02	8.03E-03	
KLX04	951.30	951.44	B	Cs	2.000	1.000	7	6.14E-03	7.04E-03	
KLX04	951.30	951.44	B	Cs	0.500	0.250	7	7.33E-03	6.93E-03	
KLX04	951.30	951.44	B	Cs	0.125	0.063	7	1.26E-02	1.33E-02	
KLX04	951.30	951.44	B	Cs	2.000	1.000	33	7.31E-03	7.90E-03	
KLX04	951.30	951.44	B	Cs	0.500	0.250	33	8.97E-03	8.08E-03	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	951.30	951.44	B	Cs	0.125	0.063	33	1.47E-02	1.53E-02	
KLX04	951.30	951.44	B	Cs	2.000	1.000	91	1.14E-01	8.72E-03	
KLX04	951.30	951.44	B	Cs	0.500	0.250	91	9.13E-03	9.18E-03	
KLX04	951.30	951.44	B	Cs	0.125	0.063	91	1.57E-02	1.63E-02	
KLX04	951.30	951.44	B	Cs	2.000	1.000	183	8.13E-03	8.94E-03	
KLX04	951.30	951.44	B	Cs	0.500	0.250	183	1.01E-02	9.81E-03	
KLX04	951.30	951.44	B	Cs	0.125	0.063	183	1.61E-02	1.62E-02	
KLX04	951.30	951.44	B	Sr	2.000	1.000	1	-1.25E-03	-1.03E-03	
KLX04	951.30	951.44	B	Sr	0.500	0.250	1	-9.07E-04	-1.41E-03	
KLX04	951.30	951.44	B	Sr	0.125	0.063	1	-1.10E-03	-1.37E-03	
KLX04	951.30	951.44	B	Sr	2.000	1.000	7	-5.00E-04	3.80E-04	
KLX04	951.30	951.44	B	Sr	0.500	0.250	7	-4.00E-04	-3.92E-04	
KLX04	951.30	951.44	B	Sr	0.125	0.063	7	-9.67E-04	1.46E-04	
KLX04	951.30	951.44	B	Sr	2.000	1.000	33	1.57E-04	-1.17E-04	
KLX04	951.30	951.44	B	Sr	0.500	0.250	33	-2.65E-04	-4.07E-04	
KLX04	951.30	951.44	B	Sr	0.125	0.063	33	-3.95E-04	3.68E-05	
KLX04	951.30	951.44	B	Sr	2.000	1.000	91	8.28E-05	5.68E-04	
KLX04	951.30	951.44	B	Sr	0.500	0.250	91	2.72E-04	3.22E-04	
KLX04	951.30	951.44	B	Sr	0.125	0.063	91	1.04E-04	1.23E-05	
KLX04	951.30	951.44	B	Sr	2.000	1.000	183	9.51E-05	7.81E-05	
KLX04	951.30	951.44	B	Sr	0.500	0.250	183	3.27E-05	1.21E-04	
KLX04	951.30	951.44	B	Sr	0.125	0.063	183	1.17E-04	1.95E-04	
KLX04	951.30	951.44	B	Eu	2.000	1.000	1	2.96E-01	1.08E-01	
KLX04	951.30	951.44	B	Eu	0.500	0.250	1	7.51E-02	1.17E-01	
KLX04	951.30	951.44	B	Eu	0.125	0.063	1	1.23E-01	9.64E-02	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX04	951.30	951.44	B	Eu	2.000	1.000	7	1.05E-01	1.62E-01	
KLX04	951.30	951.44	B	Eu	0.500	0.250	7	1.59E-01	1.66E-01	
KLX04	951.30	951.44	B	Eu	0.125	0.063	7	1.09E-01	8.36E-02	
KLX04	951.30	951.44	B	Eu	2.000	1.000	33	7.16E-02	9.42E-02	
KLX04	951.30	951.44	B	Eu	0.500	0.250	33	5.20E-02	4.12E-02	
KLX04	951.30	951.44	B	Eu	0.125	0.063	33	2.67E-02	6.00E-02	
KLX04	951.30	951.44	B	Eu	2.000	1.000	91	1.31E-01	8.57E-02	
KLX04	951.30	951.44	B	Eu	0.500	0.250	91	1.45E-01	9.80E-02	
KLX04	951.30	951.44	B	Eu	0.125	0.063	91	6.65E-02	1.30E-01	
KLX04	951.30	951.44	B	Eu	2.000	1.000	183	9.59E-02	7.38E-02	
KLX04	951.30	951.44	B	Eu	0.500	0.250	183	1.63E-01	1.53E-01	
KLX04	951.30	951.44	B	Eu	0.125	0.063	183	1.37E-01	1.26E-01	

Table A5-17. Tracer distribution ratio, *Rd,* for rock samples from KLX05.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	F	Cs	2.000	1.000	1	1.05E-02	1.20E-02	1.19E-02
KLX05	482.30	482.70	F	Cs	0.500	0.250	1	3.31E-02	3.21E-02	
KLX05	482.30	482.70	F	Cs	0.125	0.063	1	5.50E-02	7.46E-02	
KLX05	482.30	482.70	F	Cs	2.000	1.000	7	2.34E-02	2.22E-02	2.31E-02
KLX05	482.30	482.70	F	Cs	0.500	0.250	7	5.10E-02	5.40E-02	
KLX05	482.30	482.70	F	Cs	0.125	0.063	7	8.25E-02	1.19E-01	
KLX05	482.30	482.70	F	Cs	2.000	1.000	35	2.90E-02	2.78E-02	3.10E-02
KLX05	482.30	482.70	F	Cs	0.500	0.250	35	5.89E-02	5.92E-02	
KLX05	482.30	482.70	F	Cs	0.125	0.063	35	1.48E-01	1.43E-01	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	F	Cs	2.000	1.000	96	3.14E-02	2.76E-02	2.99E-02
KLX05	482.30	482.70	F	Cs	0.500	0.250	96	6.46E-02	6.15E-02	
KLX05	482.30	482.70	F	Cs	0.125	0.063	96	1.57E-01	1.38E-01	
KLX05	482.30	482.70	F	Cs	2.000	1.000	183	3.06E-02	3.37E-02	3.72E-02
KLX05	482.30	482.70	F	Cs	0.500	0.250	183	8.42E-02	8.74E-02	
KLX05	482.30	482.70	F	Cs	0.125	0.063	183	1.59E-01	1.50E-01	
KLX05	482.30	482.70	F	Sr	2.000	1.000	1	1.25E-02	1.27E-02	1.16E-02
KLX05	482.30	482.70	F	Sr	0.500	0.250	1	2.92E-02	2.88E-02	
KLX05	482.30	482.70	F	Sr	0.125	0.063	1	5.52E-02	5.95E-02	
KLX05	482.30	482.70	F	Sr	2.000	1.000	7	2.21E-02	1.60E-02	1.95E-02
KLX05	482.30	482.70	F	Sr	0.500	0.250	7	3.76E-02	3.91E-02	
KLX05	482.30	482.70	F	Sr	0.125	0.063	7	4.77E-02	8.15E-02	
KLX05	482.30	482.70	F	Sr	2.000	1.000	35	2.65E-02	1.82E-02	2.85E-02
KLX05	482.30	482.70	F	Sr	0.500	0.250	35	4.15E-02	4.38E-02	
KLX05	482.30	482.70	F	Sr	0.125	0.063	35	7.32E-02	1.04E-01	
KLX05	482.30	482.70	F	Sr	2.000	1.000	96	3.13E-02	1.75E-02	2.21E-02
KLX05	482.30	482.70	F	Sr	0.500	0.250	96	7.02E-02	6.04E-02	
KLX05	482.30	482.70	F	Sr	0.125	0.063	96			
KLX05	482.30	482.70	F	Sr	2.000	1.000	183	2.49E-02	2.98E-02	3.64E-02
KLX05	482.30	482.70	F	Sr	0.500	0.250	183	4.27E-02		
KLX05	482.30	482.70	F	Sr	0.125	0.063	183			
KLX05	482.30	482.70	F	Am	2.000	1.000	1	5.24E-02	5.50E-02	5.31E-02
KLX05	482.30	482.70	F	Am	0.500	0.250	1	1.04E-01	1.43E-01	1.32E-01
KLX05	482.30	482.70	F	Am	0.125	0.063	1	2.69E-01	2.98E-01	3.47E-01
KLX05	482.30	482.70	F	Am	2.000	1.000	7	1.12E-01	1.23E-01	1.22E-01
KLX05	482.30	482.70	F	Am	0.500	0.250	7	3.91E-01	4.26E-01	4.10E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	F	Am	0.125	0.063	7	1.12E+00	2.26E+00	2.39E+00
KLX05	482.30	482.70	F	Am	2.000	1.000	28	2.71E-01	2.57E-01	1.95E-01
KLX05	482.30	482.70	F	Am	0.500	0.250	28	8.29E-01	8.20E-01	9.61E-01
KLX05	482.30	482.70	F	Am	0.125	0.063	28	2.81E+00	2.49E+00	4.33E+00
KLX05	482.30	482.70	F	Am	2.000	1.000	88	2.92E-01	3.15E-01	2.09E-01
KLX05	482.30	482.70	F	Am	0.500	0.250	88	8.48E-01	9.14E-01	5.21E-01
KLX05	482.30	482.70	F	Am	0.125	0.063	88	1.88E+00	8.85E+00	1.86E+00
KLX05	482.30	482.70	F	Am	2.000	1.000	182	2.54E-01	1.96E-01	1.93E-01
KLX05	482.30	482.70	F	Am	0.500	0.250	182	1.34E+00	7.44E-01	2.22E-01
KLX05	482.30	482.70	F	Am	0.125	0.063	182	6.05E+00	4.46E+00	5.79E+00
KLX05	482.30	482.70	F	Ra	2.000	1.000	1	5.29E-02	6.06E-02	5.68E-02
KLX05	482.30	482.70	F	Ra	0.500	0.250	1	1.14E-01	1.80E-01	1.77E-01
KLX05	482.30	482.70	F	Ra	0.125	0.063	1	6.50E-01	9.03E-01	8.49E-01
KLX05	482.30	482.70	F	Ra	2.0000	1.000	7	9.45E-02	1.32E-01	1.41E-01
KLX05	482.30	482.70	F	Ra	0.5000	0.250	7	3.99E-01	4.31E-01	4.08E-01
KLX05	482.30	482.70	F	Ra	0.1250	0.063	7	1.86E+00	3.80E+00	1.66E+00
KLX05	482.30	482.70	F	Ra	2.0000	1.000	35	1.89E-01	1.66E-01	1.83E-01
KLX05	482.30	482.70	F	Ra	0.5000	0.250	35	4.12E-01	1.16E+00	1.20E+00
KLX05	482.30	482.70	F	Ra	0.1250	0.063	35	3.90E+00	1.19E+00	
KLX05	482.30	482.70	F	Ra	2.0000	1.000	96	1.82E-01	1.81E-01	1.81E-01
KLX05	482.30	482.70	F	Ra	0.5000	0.250	96	1.09E+00	1.21E+00	1.18E+00
KLX05	482.30	482.70	F	Ra	0.1250	0.063	96	4.00E+00	1.89E+00	1.54E+03
KLX05	482.30	482.70	F	Ra	2.0000	1.000	183	2.40E-01	2.31E-01	2.50E-01
KLX05	482.30	482.70	F	Ra	0.5000	0.250	183	1.61E+00	1.72E+00	1.54E+00
KLX05	482.30	482.70	F	Ra	0.1250	0.063	183	3.50E+00	3.30E+00	1.30E+03
KLX05	482.30	482.70	F	Ni	2.0000	1.000	1	3.70E-02	4.29E-02	5.58E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	F	Ni	0.5000	0.250	1	6.39E-02	1.09E-01	
KLX05	482.30	482.70	F	Ni	0.1250	0.063	1	7.89E-02	1.43E-01	
KLX05	482.30	482.70	F	Ni	2.0000	1.000	7	1.39E-01	1.51E-01	1.71E-01
KLX05	482.30	482.70	F	Ni	0.5000	0.250	7	3.54E-01	4.68E-01	
KLX05	482.30	482.70	F	Ni	0.1250	0.063	7	3.90E-01	6.51E-01	
KLX05	482.30	482.70	F	Ni	2.0000	1.000	35	2.18E-01	1.94E-01	2.20E-01
KLX05	482.30	482.70	F	Ni	0.5000	0.250	35	7.09E-01	6.23E-01	
KLX05	482.30	482.70	F	Ni	0.1250	0.063	35	1.58E+00	2.26E+00	
KLX05	482.30	482.70	F	Ni	2.0000	1.000	96	4.09E-01	4.95E-01	3.37E-01
KLX05	482.30	482.70	F	Ni	0.5000	0.250	96	1.10E+00	9.22E-01	
KLX05	482.30	482.70	F	Ni	0.1250	0.063	96	1.12E+00	2.23E+00	
KLX05	482.30	482.70	F	Ni	2.0000	1.000	183	3.43E-01	3.20E-01	3.80E-01
KLX05	482.30	482.70	F	Ni	0.5000	0.250	183	9.03E-01	9.83E-01	
KLX05	482.30	482.70	F	Ni	0.1250	0.063	183	1.24E+00	8.64E-01	
KLX05	482.30	482.70	F	Np	2.0000	1.000	1	5.40E-03	4.16E-03	5.68E-03
KLX05	482.30	482.70	F	Np	0.5000	0.250	1	4.97E-03	4.79E-03	
KLX05	482.30	482.70	F	Np	0.1250	0.063	1	1.87E-02	2.13E-02	
KLX05	482.30	482.70	F	Np	2.0000	1.000	7	5.93E-03	4.51E-03	6.08E-03
KLX05	482.30	482.70	F	Np	0.5000	0.250	7	6.61E-03	5.50E-03	
KLX05	482.30	482.70	F	Np	0.1250	0.063	7	3.14E-02	3.29E-02	
KLX05	482.30	482.70	F	Np	2.0000	1.000	35	6.14E-03	4.67E-03	6.63E-03
KLX05	482.30	482.70	F	Np	0.5000	0.250	35	9.98E-03	6.15E-03	
KLX05	482.30	482.70	F	Np	0.1250	0.063	35	8.81E-02	7.28E-02	
KLX05	482.30	482.70	F	Np	2.0000	1.000	96	5.27E-03	3.96E-03	5.44E-03
KLX05	482.30	482.70	F	Np	0.5000	0.250	96	1.08E-02	5.19E-03	
KLX05	482.30	482.70	F	Np	0.1250	0.063	96	3.32E-01	2.16E-01	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	F	Np	2.0000	1.000	183	5.99E-03	4.64E-03	5.99E-03
KLX05	482.30	482.70	F	Np	0.5000	0.250	183	1.42E-02	5.96E-03	
KLX05	482.30	482.70	F	Np	0.1250	0.063	183	1.33E+00	4.40E-01	
KLX05	482.30	482.70	F	U	2.000	1.000	1	5.05E-03	3.87E-03	5.30E-03
KLX05	482.30	482.70	F	U	0.500	0.250	1	4.01E-03	4.13E-03	
KLX05	482.30	482.70	F	U	0.125	0.063	1	1.48E-02	1.67E-02	
KLX05	482.30	482.70	F	U	2.000	1.000	7	5.29E-03	4.00E-03	5.45E-03
KLX05	482.30	482.70	F	U	0.500	0.250	7	4.42E-03	4.36E-03	
KLX05	482.30	482.70	F	U	0.125	0.063	7	1.69E-02	1.85E-02	
KLX05	482.30	482.70	F	U	2.000	1.000	35	5.37E-03	3.99E-03	5.52E-03
KLX05	482.30	482.70	F	U	0.500	0.250	35	4.61E-03	4.64E-03	
KLX05	482.30	482.70	F	U	0.125	0.063	35	2.12E-02	2.05E-02	
KLX05	482.30	482.70	F	U	2.000	1.000	96	5.39E-03	4.02E-03	5.44E-03
KLX05	482.30	482.70	F	U	0.500	0.250	96	4.63E-03	4.37E-03	
KLX05	482.30	482.70	F	U	0.125	0.063	96	2.30E-02	1.96E-02	
KLX05	482.30	482.70	F	U	2.000	1.000	183	5.50E-03	4.12E-03	5.44E-03
KLX05	482.30	482.70	F	U	0.500	0.250	183	4.84E-03	4.29E-03	
KLX05	482.30	482.70	F	U	0.125	0.063	183	2.39E-02	2.11E-02	
KLX05	482.30	482.70	SaS	Cs	2.000	1.000	1	4.20E-03	5.12E-03	4.18E-03
KLX05	482.30	482.70	SaS	Cs	0.500	0.250	1	8.72E-03	7.21E-03	
KLX05	482.30	482.70	SaS	Cs	0.125	0.063	1	1.60E-02	1.29E-02	
KLX05	482.30	482.70	SaS	Cs	2.000	1.000	7	5.16E-03	7.38E-03	5.90E-03
KLX05	482.30	482.70	SaS	Cs	0.500	0.250	7	1.50E-02	1.44E-02	
KLX05	482.30	482.70	SaS	Cs	0.125	0.063	7	2.63E-02	2.44E-02	
KLX05	482.30	482.70	SaS	Cs	2.000	1.000	35	5.48E-03	5.96E-03	5.76E-03
KLX05	482.30	482.70	SaS	Cs	0.500	0.250	35	1.29E-02	1.24E-02	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	SaS	Cs	0.125	0.063	35	2.23E-02	2.31E-02	
KLX05	482.30	482.70	SaS	Cs	2.000	1.000	96	6.45E-03	7.65E-03	6.50E-03
KLX05	482.30	482.70	SaS	Cs	0.500	0.250	96	1.63E-02	1.58E-02	
KLX05	482.30	482.70	SaS	Cs	0.125	0.063	96	2.30E-02	2.53E-02	
KLX05	482.30	482.70	SaS	Cs	2.000	1.000	183	7.69E-03	8.59E-03	7.72E-03
KLX05	482.30	482.70	SaS	Cs	0.500	0.250	183	1.84E-02	1.59E-02	
KLX05	482.30	482.70	SaS	Cs	0.125	0.063	183	2.85E-02	3.01E-02	
KLX05	482.30	482.70	SaS	Sr	2.000	1.000	1	3.02E-03	4.35E-03	3.40E-03
KLX05	482.30	482.70	SaS	Sr	0.500	0.250	1	3.96E-03	3.21E-03	
KLX05	482.30	482.70	SaS	Sr	0.125	0.063	1	5.00E-03	4.40E-03	
KLX05	482.30	482.70	SaS	Sr	2.000	1.000	7	2.64E-03	3.98E-03	3.15E-03
KLX05	482.30	482.70	SaS	Sr	0.500	0.250	7	5.53E-03	5.19E-03	
KLX05	482.30	482.70	SaS	Sr	0.125	0.063	7	5.45E-03	4.95E-03	
KLX05	482.30	482.70	SaS	Sr	2.000	1.000	35	2.76E-03	3.23E-03	3.15E-03
KLX05	482.30	482.70	SaS	Sr	0.500	0.250	35	3.75E-03	3.38E-03	
KLX05	482.30	482.70	SaS	Sr	0.125	0.063	35	2.47E-03	3.19E-03	
KLX05	482.30	482.70	SaS	Sr	2.000	1.000	96	2.99E-03	3.04E-03	3.45E-03
KLX05	482.30	482.70	SaS	Sr	0.500	0.250	96	3.79E-03	5.21E-03	
KLX05	482.30	482.70	SaS	Sr	0.125	0.063	96	3.99E-03	3.82E-03	
KLX05	482.30	482.70	SaS	Sr	2.000	1.000	183	3.78E-03	4.55E-03	3.69E-03
KLX05	482.30	482.70	SaS	Sr	0.500	0.250	183	5.69E-03	5.41E-03	
KLX05	482.30	482.70	SaS	Sr	0.125	0.063	183	3.29E-03	3.95E-03	
KLX05	482.30	482.70	SaS	Am	2.000	1.000	1	3.89E-02	3.49E-02	4.43E-02
KLX05	482.30	482.70	SaS	Am	0.500	0.250	1	1.87E-01	1.87E-01	2.76E-01
KLX05	482.30	482.70	SaS	Am	0.125	0.063	1	2.54E+00	1.66E+00	1.90E+00
KLX05	482.30	482.70	SaS	Am	2.000	1.000	7	1.86E-01	1.44E-01	1.95E-01

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	SaS	Am	0.500	0.250	7	9.51E-01	9.64E-01	1.35E+00
KLX05	482.30	482.70	SaS	Am	0.125	0.063	7	6.28E+00	7.84E+00	8.72E+00
KLX05	482.30	482.70	SaS	Am	2.000	1.000	28	7.18E-01	8.15E-01	6.82E-01
KLX05	482.30	482.70	SaS	Am	0.500	0.250	28	3.10E+00	3.12E+00	5.14E+00
KLX05	482.30	482.70	SaS	Am	0.125	0.063	28	4.98E+00	1.03E+01	2.05E+01
KLX05	482.30	482.70	SaS	Am	2.000	1.000	88	8.12E-01	6.78E-01	3.45E-01
KLX05	482.30	482.70	SaS	Am	0.500	0.250	88	2.96E+00	6.19E-01	3.27E+00
KLX05	482.30	482.70	SaS	Am	0.125	0.063	88	8.93E+00	6.35E+00	5.46E+00
KLX05	482.30	482.70	SaS	Am	2.000	1.000	182	2.15E+00	2.58E+00	9.92E-01
KLX05	482.30	482.70	SaS	Am	0.500	0.250	182	1.27E+01	1.64E+01	8.37E+00
KLX05	482.30	482.70	SaS	Am	0.125	0.063	182	5.47E+01	2.34E+01	2.81E+01
KLX05	482.30	482.70	SaS	Ra	2.000	1.000	1	4.21E-03	4.79E-03	5.39E-03
KLX05	482.30	482.70	SaS	Ra	0.500	0.250	1	6.74E-03	1.56E-02	9.83E-03
KLX05	482.30	482.70	SaS	Ra	0.125	0.063	1	1.73E-02	2.05E-02	1.99E-02
KLX05	482.30	482.70	SaS	Ra	2.000	1.000	7	4.51E-03	5.08E-03	5.46E-03
KLX05	482.30	482.70	SaS	Ra	0.500	0.250	7	1.09E-02	2.28E-02	1.34E-02
KLX05	482.30	482.70	SaS	Ra	0.125	0.063	7	2.19E-02	2.74E-02	2.54E-02
KLX05	482.30	482.70	SaS	Ra	2.000	1.000	35	5.08E-03	5.97E-03	6.21E-03
KLX05	482.30	482.70	SaS	Ra	0.500	0.250	35	1.16E-02	1.52E-02	1.25E-02
KLX05	482.30	482.70	SaS	Ra	0.125	0.063	35	2.19E-02	3.26E-02	
KLX05	482.30	482.70	SaS	Ra	2.000	1.000	96	6.51E-03	6.90E-03	7.04E-03
KLX05	482.30	482.70	SaS	Ra	0.500	0.250	96	1.53E-02	1.95E-02	1.61E-02
KLX05	482.30	482.70	SaS	Ra	0.125	0.063	96	3.86E-02	4.14E-02	3.80E-02
KLX05	482.30	482.70	SaS	Ra	2.000	1.000	183	7.75E-03	7.28E-03	8.05E-03
KLX05	482.30	482.70	SaS	Ra	0.500	0.250	183	1.71E-02	2.16E-02	1.78E-02
KLX05	482.30	482.70	SaS	Ra	0.125	0.063	183	3.48E-02	5.00E-02	4.60E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	SaS	Ni	2.000	1.000	1	4.54E-03	5.77E-03	6.11E-03
KLX05	482.30	482.70	SaS	Ni	0.500	0.250	1	7.08E-03	8.56E-03	
KLX05	482.30	482.70	SaS	Ni	0.125	0.063	1	1.38E-02	1.58E-02	
KLX05	482.30	482.70	SaS	Ni	2.000	1.000	7	7.73E-03	9.45E-03	1.03E-02
KLX05	482.30	482.70	SaS	Ni	0.500	0.250	7	1.48E-02	2.11E-02	
KLX05	482.30	482.70	SaS	Ni	0.125	0.063	7	3.69E-02	4.59E-02	
KLX05	482.30	482.70	SaS	Ni	2.000	1.000	35	1.55E-02	1.85E-02	2.06E-02
KLX05	482.30	482.70	SaS	Ni	0.500	0.250	35	4.65E-02	5.44E-02	
KLX05	482.30	482.70	SaS	Ni	0.125	0.063	35	9.16E-02	1.08E-01	
KLX05	482.30	482.70	SaS	Ni	2.000	1.000	96	4.75E-02	5.04E-02	5.09E-02
KLX05	482.30	482.70	SaS	Ni	0.500	0.250	96	1.33E-01	1.72E-01	
KLX05	482.30	482.70	SaS	Ni	0.125	0.063	96	4.84E-01	3.77E-01	
KLX05	482.30	482.70	SaS	Ni	2.000	1.000	183	7.69E-02	8.27E-02	9.14E-02
KLX05	482.30	482.70	SaS	Ni	0.500	0.250	183	2.33E-01	2.92E-01	
KLX05	482.30	482.70	SaS	Ni	0.125	0.063	183	6.50E-01	5.89E-01	
KLX05	482.30	482.70	SaS	Np	2.000	1.000	1	3.43E-03	3.76E-03	3.29E-03
KLX05	482.30	482.70	SaS	Np	0.500	0.250	1	3.62E-03	2.99E-03	
KLX05	482.30	482.70	SaS	Np	0.125	0.063	1	1.46E-02	1.50E-02	
KLX05	482.30	482.70	SaS	Np	2.000	1.000	7	4.11E-03	4.55E-03	4.03E-03
KLX05	482.30	482.70	SaS	Np	0.500	0.250	7	4.30E-03	3.73E-03	
KLX05	482.30	482.70	SaS	Np	0.125	0.063	7	2.87E-02	2.99E-02	
KLX05	482.30	482.70	SaS	Np	2.000	1.000	35	4.09E-03	4.60E-03	4.08E-03
KLX05	482.30	482.70	SaS	Np	0.500	0.250	35	4.66E-03	4.40E-03	
KLX05	482.30	482.70	SaS	Np	0.125	0.063	35	1.06E-01	1.66E-01	
KLX05	482.30	482.70	SaS	Np	2.000	1.000	96	2.74E-03	3.21E-03	2.82E-03
KLX05	482.30	482.70	SaS	Np	0.500	0.250	96	3.49E-03	3.48E-03	

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX05	482.30	482.70	SaS	Np	0.125	0.063	96	2.08E-01	8.39E-01	
KLX05	482.30	482.70	SaS	Np	2.000	1.000	183	2.72E-03	3.06E-03	2.74E-03
KLX05	482.30	482.70	SaS	Np	0.500	0.250	183	3.72E-03	3.66E-03	
KLX05	482.30	482.70	SaS	Np	0.125	0.063	183	6.49E-01	7.99E-01	
KLX05	482.30	482.70	SaS	U	2.000	1.000	1	3.59E-03	3.96E-03	3.49E-03
KLX05	482.30	482.70	SaS	U	0.500	0.250	1	4.24E-03	3.59E-03	
KLX05	482.30	482.70	SaS	U	0.125	0.063	1	2.08E-02	2.29E-02	
KLX05	482.30	482.70	SaS	U	2.000	1.000	7	4.62E-03	5.14E-03	4.56E-03
KLX05	482.30	482.70	SaS	U	0.500	0.250	7	5.67E-03	4.98E-03	
KLX05	482.30	482.70	SaS	U	0.125	0.063	7	4.85E-02	4.65E-02	
KLX05	482.30	482.70	SaS	U	2.000	1.000	35	5.68E-03	8.45E-03	5.68E-03
KLX05	482.30	482.70	SaS	U	0.500	0.250	35	8.08E-03	7.34E-03	
KLX05	482.30	482.70	SaS	U	0.125	0.063	35	1.52E-01	1.61E-01	
KLX05	482.30	482.70	SaS	U	2.000	1.000	96	2.23E-02	9.70E-03	8.04E-03
KLX05	482.30	482.70	SaS	U	0.500	0.250	96	1.42E-02	1.31E-02	
KLX05	482.30	482.70	SaS	U	0.125	0.063	96	6.13E-01	8.13E-01	
KLX05	482.30	482.70	SaS	U	2.000	1.000	183	1.20E-02	1.42E-02	1.12E-02
KLX05	482.30	482.70	SaS	U	0.500	0.250	183	2.45E-02	2.16E-02	
KLX05	482.30	482.70	SaS	U	0.125	0.063	183	1.36E+00	1.83E+00	

Table A5-18. Tracer distribution ratio, *Rd,* for rock samples from KLX06.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX06	384.00	384.04	F	Cs	0.125	0	1	2.65E+00	2.34E+00	
KLX06	384.00	384.04	F	Cs	0.125	0	7	3.31E+00	3.03E+00	
KLX06	384.00	384.04	F	Cs	0.125	0	30	3.09E+00	3.05E+00	
KLX06	384.00	384.04	F	Cs	0.125	0	95	3.76E+00	2.80E+00	
KLX06	384.00	384.04	F	Cs	0.125	0	185	4.81E+00	5.45E+00	
KLX06	384.00	384.04	F	Sr	0.125	0	185	1.93E-01	9.60E-02	
KLX06	384.00	384.04	F	Eu	0.125	0	1	1.28E+00	1.16E+00	
KLX06	384.00	384.04	F	Eu	0.125	0	7	2.49E+00	9.60E-01	
KLX06	384.00	384.04	F	Eu	0.125	0	30	3.09E+00	2.65E+00	
KLX06	384.00	384.04	F	Eu	0.125	0	95	1.75E+00	2.23E+00	
KLX06	384.00	384.04	F	Eu	0.125	0	185	2.65E+00	2.34E+00	
KLX06	384.00	384.04	SaS	Cs	0.125	0	1	3.90E-01	3.69E-01	3.95E-01
KLX06	384.00	384.04	SaS	Cs	0.125	0	7	4.84E-01	4.91E-01	4.85E-01
KLX06	384.00	384.04	SaS	Cs	0.125	0	30	5.65E-01	5.62E-01	1.05E+01
KLX06	384.00	384.04	SaS	Cs	0.125	0	95	6.19E-01	7.49E-01	6.31E-01
KLX06	384.00	384.04	SaS	Cs	0.125	0	185	5.85E-01	6.28E-01	5.78E-01
KLX06	384.00	384.04	SaS	Sr	0.125	0	185	1.81E-03	1.79E-03	1.71E-03
KLX06	384.00	384.04	SaS	Eu	0.125	0	1	1.41E+00	1.42E+00	1.92E+00
KLX06	384.00	384.04	SaS	Eu	0.125	0	7	7.32E-01	1.69E+00	7.01E-01
KLX06	384.00	384.04	SaS	Eu	0.125	0	30	2.33E+00	1.58E+00	3.86E+00
KLX06	384.00	384.04	SaS	Eu	0.125	0	95	2.96E+00	1.99E+00	3.90E+00
KLX06	384.00	384.04	SaS	Eu	0.125	0	185	1.50E+00	1.71E+00	4.46E+00

Table A5-19. Tracer distribution ratio, *Rd,* for rock samples from KLX07A.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m^3/kg) sample no 1	sample no 2	sample no 3
KLX07A	620.94	621.28	SaS	Cs	2.000	1.000	1	1.94E-02	1.50E-02	3.05E-02
KLX07A	620.94	621.28	SaS	Cs	0.500	0.250	1	1.23E-01	8.50E-02	1.21E-01
KLX07A	620.94	621.28	SaS	Cs	0.125	0.000	1	2.56E-02	2.45E-02	1.62E-02
KLX07A	620.94	621.28	SaS	Cs	2.000	1.000	7	6.44E-02	6.43E-02	7.32E-02
KLX07A	620.94	621.28	SaS	Cs	0.500	0.250	7	1.83E-01	1.53E-01	1.94E-01
KLX07A	620.94	621.28	SaS	Cs	0.125	0.000	7	1.14E-01	1.10E-01	1.01E-01
KLX07A	620.94	621.28	SaS	Cs	2.000	1.000	30	1.21E-01	1.25E-01	1.33E-01
KLX07A	620.94	621.28	SaS	Cs	0.500	0.250	30	2.37E-01	2.08E-01	2.26E-01
KLX07A	620.94	621.28	SaS	Cs	0.125	0.000	30	2.28E-01	2.09E-01	1.97E-01
KLX07A	620.94	621.28	SaS	Cs	2.000	1.000	95	1.93E-01	1.76E-01	2.07E-01
KLX07A	620.94	621.28	SaS	Cs	0.500	0.250	95	2.58E-01	2.57E-01	2.30E-01
KLX07A	620.94	621.28	SaS	Cs	0.125	0.000	95	2.96E-01	2.85E-01	2.83E-01
KLX07A	620.94	621.28	SaS	Cs	2.000	1.000	185	2.19E-01	1.85E-01	1.93E-01
KLX07A	620.94	621.28	SaS	Cs	0.500	0.250	185	2.95E-01	2.85E-01	2.51E-01
KLX07A	620.94	621.28	SaS	Cs	0.125	0.000	185	3.90E-01	3.27E-01	3.60E-01
KLX07A	620.94	621.28	SaS	Sr	2.000	1.000	185	1.24E-03	1.29E-03	1.31E-03
KLX07A	620.94	621.28	SaS	Sr	0.500	0.250	185	1.31E-03	1.46E-03	1.62E-03
KLX07A	620.94	621.28	SaS	Sr	0.125	0.000	185	1.73E-03	1.62E-03	1.62E-03
KLX07A	620.94	621.28	SaS	Eu	2.000	1.000	1	8.15E-01	5.23E-01	9.61E-01
KLX07A	620.94	621.28	SaS	Eu	0.500	0.250	1	1.53E+00	2.07E+00	1.67E+00
KLX07A	620.94	621.28	SaS	Eu	0.125	0.000	1	5.82E-01	5.50E-01	3.18E-01
KLX07A	620.94	621.28	SaS	Eu	2.000	1.000	7	9.68E-01	1.04E+00	1.27E+00
KLX07A	620.94	621.28	SaS	Eu	0.500	0.250	7	1.41E+00	1.55E+00	1.97E+00
KLX07A	620.94	621.28	SaS	Eu	0.125	0.000	7	1.08E+00	1.23E+00	6.10E-01
KLX07A	620.94	621.28	SaS	Eu	2.000	1.000	30	1.03E+00	1.21E+00	2.63E+00

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX07A	620.94	621.28	SaS	Eu	0.500	0.250	30	2.34E+00	2.49E+00	2.24E+00
KLX07A	620.94	621.28	SaS	Eu	0.125	0.000	30	1.41E+00	1.03E+00	1.17E+00
KLX07A	620.94	621.28	SaS	Eu	2.000	1.000	95	1.98E+00	3.92E+00	2.45E+00
KLX07A	620.94	621.28	SaS	Eu	0.500	0.250	95	2.29E+00	1.85E+00	1.74E+00
KLX07A	620.94	621.28	SaS	Eu	0.125	0.000	95	1.33E+00	1.56E+00	1.04E+00
KLX07A	620.94	621.28	SaS	Eu	2.000	1.000	185	1.20E+00	1.19E+00	2.19E+00
KLX07A	620.94	621.28	SaS	Eu	0.500	0.250	185	1.62E+00	3.03E+00	3.33E+00
KLX07A	620.94	621.28	SaS	Eu	0.125	0.000	185	2.18E+00	1.73E+00	1.43E+00

Table A5-20. Tracer distribution ratio, *Rd,* for rock samples from KLX11A.

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX11A	509.30	509.40	SaS	Cs	2.000	1.000	1	5.40E-03	5.37E-03	5.27E-03
KLX11A	509.30	509.40	SaS	Cs	0.500	0.250	1	7.19E-03	7.14E-03	5.71E-03
KLX11A	509.30	509.40	SaS	Cs	0.125	0.000	1	9.50E-03	9.76E-03	8.36E-03
KLX11A	509.30	509.40	SaS	Cs	2.000	1.000	7	5.93E-03	6.23E-03	5.40E-03
KLX11A	509.30	509.40	SaS	Cs	0.500	0.250	7	7.55E-03	7.56E-03	8.42E-03
KLX11A	509.30	509.40	SaS	Cs	0.125	0.000	7	1.02E-02	1.16E-02	1.05E-02
KLX11A	509.30	509.40	SaS	Cs	2.000	1.000	30	6.14E-03	6.59E-03	5.25E-03
KLX11A	509.30	509.40	SaS	Cs	0.500	0.250	30	8.59E-03	8.22E-03	8.31E-03
KLX11A	509.30	509.40	SaS	Cs	0.125	0.000	30	1.10E-02	1.03E-02	1.05E-02
KLX11A	509.30	509.40	SaS	Cs	2.000	1.000	95	6.34E-03	6.65E-03	5.77E-03
KLX11A	509.30	509.40	SaS	Cs	0.500	0.250	95	8.48E-03	8.37E-03	8.19E-03
KLX11A	509.30	509.40	SaS	Cs	0.125	0.000	95	1.12E-02	1.08E-02	1.05E-02

Borehole	Secup	Seclow	Water	Tracer	Size fraction (mm)		Contact time (days)	Rd (m³/kg) sample no 1	sample no 2	sample no 3
KLX11A	509.30	509.40	SaS	Cs	2.000	1.000	185	7.43E-03	6.74E-03	6.17E-03
KLX11A	509.30	509.40	SaS	Cs	0.500	0.250	185	8.07E-03	8.32E-03	8.08E-03
KLX11A	509.30	509.40	SaS	Cs	0.125	0.000	185	1.21E-02	1.20E-02	1.06E-02
KLX11A	509.30	509.40	SaS	Sr	2.000	1.000	185	1.91E-03	2.07E-03	1.01E-03
KLX11A	509.30	509.40	SaS	Sr	0.500	0.250	185	1.04E-03	1.22E-03	1.18E-03
KLX11A	509.30	509.40	SaS	Sr	0.125	0.000	185	1.54E-03	1.67E-03	2.05E-03
KLX11A	509.30	509.40	SaS	Eu	2.000	1.000	1	8.03E-01	3.49E+00	8.06E-01
KLX11A	509.30	509.40	SaS	Eu	0.500	0.250	1	1.49E+00	1.07E+00	1.83E+00
KLX11A	509.30	509.40	SaS	Eu	0.125	0.000	1	1.64E+00	1.37E+00	1.78E+00
KLX11A	509.30	509.40	SaS	Eu	2.000	1.000	7	1.86E+00	1.37E+00	1.58E+00
KLX11A	509.30	509.40	SaS	Eu	0.500	0.250	7	1.15E+00	1.34E+00	9.86E-01
KLX11A	509.30	509.40	SaS	Eu	0.125	0.000	7	1.36E+00	1.14E+00	1.08E+00
KLX11A	509.30	509.40	SaS	Eu	2.000	1.000	30	1.53E+00	2.37E+00	1.37E+00
KLX11A	509.30	509.40	SaS	Eu	0.500	0.250	30	1.14E+00	1.77E+00	1.46E+00
KLX11A	509.30	509.40	SaS	Eu	0.125	0.000	30	1.02E+00	9.98E-01	7.73E-01
KLX11A	509.30	509.40	SaS	Eu	2.000	1.000	95	1.26E+00	2.35E+00	1.45E+00
KLX11A	509.30	509.40	SaS	Eu	0.500	0.250	95	1.34E+00	1.29E+00	1.83E+00
KLX11A	509.30	509.40	SaS	Eu	0.125	0.000	95	5.70E-01	6.98E-01	1.94E+00
KLX11A	509.30	509.40	SaS	Eu	2.000	1.000	185	2.32E+00	1.92E+00	3.12E+00
KLX11A	509.30	509.40	SaS	Eu	0.500	0.250	185	1.37E+00	1.54E+00	2.13E+00
KLX11A	509.30	509.40	SaS	Eu	0.125	0.000	185	1.36E+00	1.12E+00	9.88E-01

Appendix 6

Water compositions

Groundwater composition used in the laboratory measurements (methods described in /Byegård et al. 2003/, Oskarshamn site investigation area. Concentrations are given in mg/L. Specific sampling intervals in the boreholes in brackets. For diffusion experiments; only the major components (i.e. Ca^{2+}, $Na^{+,}$ Cl^{-} and SO_4^{2-}) from water type II, were included.

Table 6-1. Water compositions.

	Type I (HSH02 0–200 mbl) Fresh water	Type II (KFM02A 509–516 mbl) Brackish groundwater with marine character	Type III (KSH01A 558–565 mbl Present ground-water at repository level	Type IV (KLX02 1,383–1,392 mbl) Brine type water of very high salinity	Type V (KLX04 510–515 mbl) Brackish groundwater of non-marine character
Li^{+}	1.60E-2	5.10E-2	5.80E-1	4.85E+0	1.52E-2
Na^{+}	1.27E+2	2.12E+3	3.23E+3	7.45E+3	6.91E+2
K^{+}	2.16E+0	3.33E+1	1.24E+1	3.26E+1	3.19E+0
Rb^{+}	(2.52E-2)[A]	6.28E-2	4.24E-2	1.78E-1	4.24E-2
Cs^{+}	(1.17E-3)[A]	1.79E-3	1.37E-3	1.86E-2	1.37E-3
NH^{4+}	(9.47E-2)[A]	4.00E-2	4.00E-2	5.60E-1	3.19E-2
Mg^{2+}	1.43E+0	2.32E+2	4.47E+1	1.20E+0	6.9E+0
Ca^{2+}	5.21E+0	9.34E+2	2.19E+3	1.48E+4	2.34E+2
Sr^{2+}	6.95E-2	7.95E+0	3.23E+1	2.53E+2	4.67E+0
Ba^{2+}	(1.29E+0)[A]	1.88E-1	1.88E-1	2.40E-2	1.88E-1
Fe^{2+}	(3.64E-1)[C]	1.20E+0	6.86E-1	3.45E+0	9.00E-2
Mn^{2+}	2.00E-2	2.12E+0	4.60E-1	1.11E+0	1.09E-1
F^{-}	3.03E+0	9.00E-1	9.67E-1	(1.60E+0)[D]	2.7E+0
Cl^{-}	2.15E+1	5.15E+3	8.80E+3	3.68E+4	1.48E+3
Br^{-}	(2.00E-1)[B]	2.20E+1	7.10E+1	5.09E+2	1.34E+1
SO_4^{2-}	8.56E+0	5.10E+2	2.21E+2	1.21E+3	1.04E+2
Si(tot)	6.56E+0	5.20E+0	4.70E+0	2.60E+0	6.63E+0
HCO_3^{-}	2.52E+2	1.24E+2	1.20E+1	4.20E+1	5.14E+1
S^{2-}	(1.00E-2)[B]	5.00E-2	5.00E-2	5.00E-2	6.00E-3
pH	8.58	7.1	7.45	6.8	7.83

A) No measurements available, data imported from comparable water sample; KSH01 156–167 m.
B) Based on detection limit.
C) Based on the Fe-tot measurement.
D) No measurements available, data imported from comparable water sample; KLX021420–1,705 m.