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Abstract

This report presents the rock type coding, overview lithological mapping and identification of rock units and possible deformation zones in drill cores from 32 boreholes associated with the construction of SFR. This work can be seen as complementary to single-hole interpretations of other older SFR boreholes earlier reported in /Petersson and Andersson 2010/: KFR04, KFR08, KFR09, KFR13, KFR35, KFR36, KFR54, KFR55, KFR7A, KFR7B and KFR7C.

Due to deficiencies in the available material, the necessary activities have deviated somewhat from the established methodologies used during the recent Forsmark site investigations for the final repository for spent nuclear fuel. The aim of the current work has been, wherever possible, to allow the incorporation of all relevant material from older boreholes in the ongoing SFR geological modelling work in spite of the deficiencies. The activities include:

- Rock type coding of the original geological mapping according to the nomenclature used during the preceding Forsmark site investigation. As part of the Forsmark site investigation such rock type coding has already been performed on most of the old SFR boreholes if the original geological mapping results were available. This earlier work has been complemented by rock type coding on two further boreholes: KFR01 and KFR02.
- Lithological overview mapping, including documentation of (1) rock types, (2) ductile and brittle-ductile deformation and (3) alteration for drill cores from eleven of the boreholes for which no original geological borehole mapping was available (KFR31, KFR32, KFR34, KFR37,KFR38, KFR51, KFR69, KFR70, KFR71, KFR72 and KFR89).
- Identification of possible deformation zones and merging of similar rock types into rock units. This follows SKB's established criteria and methodology of the geological Single-hole interpretation (SHI) process wherever possible. Deviations from the standard SHI process are associated with the lack of data, for example BIPS images, or a lack of quality in the available data, for example, time and transport have that affected the frequency and condition of fractures. This activity has been performed on all 32 boreholes considered in this report: KFR01, KFR02, KFR03, KFR05, KFR10, KFR11, KFR 12, KFR14, KFR19, KFR20, KFR31, KFR32, KFR34, KFR37, KFR38, KFR51, KFR52, KFR57, KFR61–KFR68, KFR69, KFR70, KFR71, KFR72, KFR89, SFR (Silo 1).

The lithology in KFR01 and KFR02 was earlier described in terms of pegmatite, coarse-grained granite, fine-grained biotite gneiss and fine- to medium-grained granite gneiss. Generally, the pegmatite and coarse-grained granite were translated into pegmatitic granite (101061), whereas the gneisses were coded as felsic to intermediate metavolcanic rock (103076) and fine- to medium-grained metagranite-granodiorite (101057).

The major lithological components in the eleven drill cores subjected to the overview mapping are fine- to medium-grained metagranite-granodiorite (101057), pegmatitic granite (101061), felsic to intermediate metavolcanic rock (103076), fine- to medium-grained granite (111058) and subordinate occurrences of amphibolite (102017) and aplitic metagranite (101058). A continuous occurrence of cataclastic rock (108003) with a total drill core length of 11.2 m occurs in KFR71. Alteration other than oxidation is typically found in drill cores from boreholes intersecting or in the intimate vicinity of the Singö deformation zone (i.e. KFR69, KFR71 and KFR72).

Up to seven rock units have been identified in a single borehole, with an average of 2–4. Most rock units are dominated by fine- to medium-grained metagranite-granodiorite (101057) or pegmatitic granite (101061). All rock units have been interpreted with a medium or high degree of confidence. The rock units with a lower degree of confidence are restricted to boreholes with existing mappings, which were rock coded during the Forsmark site investigation, when the geological experience from the SFR area was more limited.

In total 40 possible deformation zones of brittle and locally brittle-ductile character have been interpreted in the drill cores from the 32 boreholes, seven with a low degree of confidence, eight with a medium degree of confidence and 25 with a high degree of confidence. The most extensive possible deformation zones occur in boreholes intersecting or in the intimate vicinity of the Singö deformation zone. No possible deformation zones have been identified in drill cores from KFR14, KFR34, KFR63, KFR70 and SFR (Silo1).

Sammanfattning

Denna rapport presenterar bergartskodning, litologisk översiktskartering och identifiering av litologiska enheter och möjliga deformationszoner i borrkärnor från 32 borrhål från byggnationen av SFR. Arbetet kan ses som ett komplement till de geologiska enhålstolkningarna av andra, äldre SFR-borrhål som behandlas av /Petersson and Andersson 2010/: KFR04, KFR08, KFR09, KFR13, KFR35, KFR36, KFR54, KFR55, KFR7A, KFR7B and KFR7C.

På grund av brister i tillgängligt material följer ingen av aktiviteterna den metodik som tillämpats under den föregående platsundersökningen för slutförvaring av utbränt kärnbränsle. Ambitionen med föreliggande arbete har i de fall det varit möjligt, att införliva allt relevant material från befintliga borrhål i det pågående geologiska modelleringsarbetet trots bristerna. Aktiviteterna omfattar:

- Bergartskodning av den ursprungliga geologiska karteringen i enlighet med nomenklaturen som användes under den föregående platsundersökning Forsmark. En sådan bergartskodning har redan genomförts under den föregående platsundersökningen för flertalet äldre SFR-borrhål i de fall då en äldre geologisk kartering bevarad. Arbetet med kodningen har här kompletterats med ytterligare två borrhål: KFR01 och KFR02.
- Litologisk översiktskartering som omfattar dokumentation av (1) bergart, (2) plastisk och spröd-plastisk deformation och (3) omvandlingar i borrkärnorna från elva av borrhålen som det inte finns någon ursprunglig geologisk kartering bevarad (KFR31, KFR32, KFR34, KFR37,KFR38, KFR51, KFR69, KFR70, KFR71, KFR72 and KFR89).
- Identifiering av möjliga deformationszoner och gruppering av likartade bergarter i litologiska enheter. Detta följer i möjligaste mån SKB's kriterier och den metodik som tillämpats under den geologiska enhålstolkningen. Avvikelser från den fastslagna metodiken har orsakats av brist på data, t.ex. BIPS-bilder, bristande kvalitet i tillgänglig data, så som att borrkärnornas sprickighet påverkats av transport och tid. Denna aktivitet har genomförts för alla 32 borrhålen som behandlas i denna rapport: KFR01, KFR02, KFR03, KFR05, KFR10, KFR11, KFR 12, KFR14, KFR19, KFR20, KFR31, KFR32, KFR34, KFR37, KFR38, KFR51, KFR52, KFR57, KFR61–KFR68, KFR69, KFR70, KFR71, KFR72, KFR89, SFR (Silo 1).

Litologin i KFR01 och KFR02 beskrivs i termer av pegmatit, grovkorning granit, finkornig biotitgnejs och fin- till medelkornig granitgnejs. Generellt kodades pegmatiten och den grovkorniga graniten som pegmatitisk granit (101061), medan gnejserna kodats som felsisk till intermediär metavulkanisk bergart (103076) och fin- till medelkornig metagranit-granodiorit (101057).

De huvudsakliga litologiska beståndsdelarna i de elva borrkärnor som genomgått översiktskartering är fin- till medelkornig metagranit-granodiorit (101057), pegmatitisk granit (101061), felsisk till intermediär metavukanisk bergart (103076) och underordnade förekomster av amfibolit (102017) och aplitisk metagranit (101058). En kontinuerlig förekomst av en kataklastisk bergart (108003) med en total längd på 11.2 m uppträder i KFR71. Omvandlingar utöver oxidation förekommer företrädelsevis i borrkärnor från borrhål som tvärar igenom Singözonen eller i dess omedelbara närhet (d.v.s. KFR69, KFR71 och KFR72).

Upp till sju bergenheter har identifierats i ett enskilt borrhål, med ett genomsnitt på 2–4. Huvuddelen av bergenheterna domineras av fin- till medelkornig metagranit-granodiorit (101057) eller pegmatitisk granit (101061). Alla bergenheter har tolkats med en medelhög eller hög grad av tillförlitlighet. Bergenheter med lägre grad av tillförlitlighet begränsar sig till borrhål med befintlig kartering som har bergartkodats.

Totalt 40 möjliga deformationszoner av spröd och lokalt spröd-plastisk deformation har identifierats i borrkärnorna från de 32 borrhålen, sju med en låg grad av tillförlitlighet, åtta med en medelhög grad av tillförlitlighet och de resterande 25 med en hög grad av tillförlitlighet. De möjliga deformationszoner med störst utsträckning förekommer i borrhål som tvärar igenom Singözonen eller i dess omedelbara närhet. Inga möjliga deformationszoner har identifierats i borrkärnor från KFR14, KFR34, KFR63, KFR70 och SFR (Silo1).

Contents

1 Introduction

SKB initiated 2008 an investigation programme for the future expansion of the final repository for low- and intermediate-level radioactive waste, SFR /SKB 2008/. An essential part in this project is to incorporate existing borehole data from the earlier construction of SFR in the ongoing geological modelling work. This necessitates a reassessment of the data together with a renewed examination of all available drill cores, along with input from the experiences from the preceding SFR construction phase and Forsmark site investigation.

A key input to the geological modelling of borehole data during the site investigations in Forsmark and Oskarshamn areas has been the so-called geological single-hole interpretation (SHI). The established methodology provides an integrated synthesis of the geological and geophysical information in a borehole (SKB MD 810.003). Currently, borehole documentation from the older SFR boreholes is too sparse to allow the full application of the established SHI methodology due to the lack of BIPS-images, obscurities in the lithological classification and the methodology of the original fracture mapping, along with the fact that geophysical logs only exist for a few of the boreholes /Mattsson 2009/.

In total, there is drill core left from 43 of the cored boreholes drilled during the construction of SFR. During the Forsmark site investigation programme the original information on rock types for 27 of these boreholes were converted to the modern rock nomenclature used in the Forsmark site investigation (SKB MD 132.005). The details of this activity are given in /Stephens et al. 2008/ and the objective was to enable correlation between the drill core mapping and surface mapping data. At the beginning of the investigations for the expansion of SFR, eleven of the drill cores were subjected to renewed mapping by use of the so-called Boremap-system (SKB MD 143.006). The prime criterion for the selection of these drill cores was a distinct crosscutting relationship with inferred deformation zones in the earlier geological model of SFR /cf. Axelsson and Maersk Hansen 1997/. This mapping, which included documentation of (1) lithological units that exceed 1 m in drill core length, (2) alteration, (3) the exact position along the drill core of broken and unbroken fractures, (4) fracture minerals, (5) the angle of deviation between a fracture plane and the drill core length axis, (6) crush zones, (7) breccias, (8) sealed fracture networks and (9) ductile shear zones, formed the basis for a geological single-hole interpretation as presented in /Petersson et al. 2009/. These eleven boreholes are marked with an asterisk in Table 1-1, and comprise KFR04, KFR08, KFR09, KFR13, KFR35, KFR36, KFR54, KFR55, KFR7A, KFR7B and KFR7C. Six of these boreholes were previously rock type coded during Forsmark site investigation programme.

In order to maximize the use of older data in the current modelling work it was decided to perform the following activities on the remaining boreholes, which still had drill core available:

- If there exists an original geological mapping it should be converted to the rock nomenclature of SKB MD 132.005. This was already done during the Forsmark site investigation for most of the boreholes. The only boreholes that remain are KFR01 and KFR02.
- Boreholes lacking geological mapping should be subjected to overview mapping in which lithological units exceeding 1 m in drill core length are recorded. This activity comprises KFR31, KFR32, KFR34, KFR37, KFR38, KFR51, KFR69, KFR70, KFR71, KFR72 and KFR89.
- The rock code translation and the lithological overview mapping is utilized to define rock units consisting of sections of similar rock types, or sections where one rock type is very dominant, following the criteria applied during the geological single-hole interpretation.
- Possible deformation zones should be identified by visual inspection of the drill cores, following the criteria applied during the geological single-hole interpretation.

Except for the 11 boreholes selected for renewed mapping during the beginning of the investigations for the expansion of SFR, the material comprises drill cores from 32 boreholes with a total length of approximately 3,000 m. Table 1-1 gives the length of individual drill cores, borehole orientation and which type of geological mapping is available.

Table 1-1. Data for 32 of the boreholes from the construction of SFR.

New ID-code	Original ID-code	Start [m]	End [m]	Bearing [°]	Inclination [°]	Rock type coding	Overview mapping	Borehole geo-physics
KFR01	HK1	0	62.30	230.5	–60.0	X	–	X
KFR02	HK2	0	170.33	000.0	–90.0	X	–	X
KFR03	HK3	0	101.60	000.0	–90.0	X	–	X
KFR04*	HK4	0	100.50	098.2	–75.0		X	X
KFR05	HK5	0.60	131.40	009.1	–70.0	X	–	X
KFR08*	HK8	0	104.40	056.4	–05.0		X	
KFR09*	HK9	0	80.29	299.9	–05.0		X	
KFR10	HK10	0	107.28	302.5	–45.0	X	–	–
KFR11	HK11	0	98.07	072.5	–10.0	X	–	–
KFR12	HK12	0	50.26	000.0	–90.0	X	–	–
KFR13*	HK13	0	76.60	000.0	–90.0		X	
KFR14	HK14	0	29.10	135.1	–45.0	X	–	–
KFR19	KB19	0	110.17	038.2	13.8	X	–	X
KFR20	KB20	0	109.70	056.4	10.4	X	–	X
KFR31	KB11	16.60	242.13	082.1	–43.2	–	X	–
KFR32	KB12	16.35	209.70	024.9	–46.5	–	X	–
KFR34	KB14	13.44	142.00	198.1	–49.0	–	X	–
KFR35*	KB15	18.00	140.17	208.1	–51.5		X	
KFR36*	KB16	16.00	123.93	291.7	–46.0		X	
KFR37	KB17	12.23	204.90	188.5	–62.5	–	X	–
KFR38	KB18	12.43	185.41	092.2	–57.6	–	X	–
KFR51	KB21	0	46.28	358.8	35.0	–	X	–
KFR52	KB22	0	29.95	230.5	10.0	X	–	–
KFR54*	KB24	0	53.30	309.97	–47.7		X	
KFR55*	KB25	0	61.90	328.98	–11.0		X	
KFR57	KB27	0	25.38	230.5	–90.0	X	–	–
KFR61	DS1	1.43	70.90	038.4	–44.0	X	–	–
KFR62	DS2	1.40	82.20	042.9	–45.0	X	–	–
KFR63	DS3	0	15.08	230.5	–90.0	X	–	–
KFR64	DS4	0	54.17	033.9	–60.0	X	–	–
KFR65	DS5	0	39.68	230.5	–90.0	X	–	–
KFR66	DS6	0	29.17	230.5	–90.0	X	–	–
KFR67	DS7	0	48.95	034.6	–65.0	X	–	–
KFR68	DS8	0	128.03	082.0	–45.0	X	–	–
KFR69	DS9	11.68	201.30	014.5	–45.0	–	X	–
KFR70	DS10	9.24	172.51	061.8	–51.3	–	X	–
KFR71	DS101	0	120.90	059.5	02.0	–	X	–
KFR72	DS102	0	100.53	n/a	n/a	–	X	–
KFR89	SFR1/177	0	17.14	n/a	n/a	–	X	–
KFR7A*	HK7A	0	74.45	020.8	–02.0		X	
KFR7B*	HK7B	0	21.10	011.5	–75.0		X	
KFR7C*	HK7C	0	34.00	196.0	–70.0		X	
n/a	SFR (Silo1)	0	45.12	n/a	n/a	X	–	–

* Mapped by the Boremap-system. In addition to rock types exceeding 1 m in borehole length, the mapping included alteration, fracture positions, fracture mineralogy, the angle of deviation between a fracture plane and the drill core length axis, crush zones, breccias, sealed fracture networks and ductile shear zones, as presented in /Petersson et al. 2010/. The geological SHI of these boreholes is presented in /Petersson et al. 2009/.

This report outlines the results from the rock type coding, overview lithological mapping and identification of rock units and possible deformation zones for 32 of the drill cores that remain from the construction of SFR (Figure 1-1). Note that results from 11 other boreholes from the construction of SFR have already been reported in /Petersson et al. 2009 and 2010/. The work was carried out in accordance with activity plans AP SFR-09-014, AP SFR-09-020 and AP SFR-09-028. In Table 1-2 controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents.

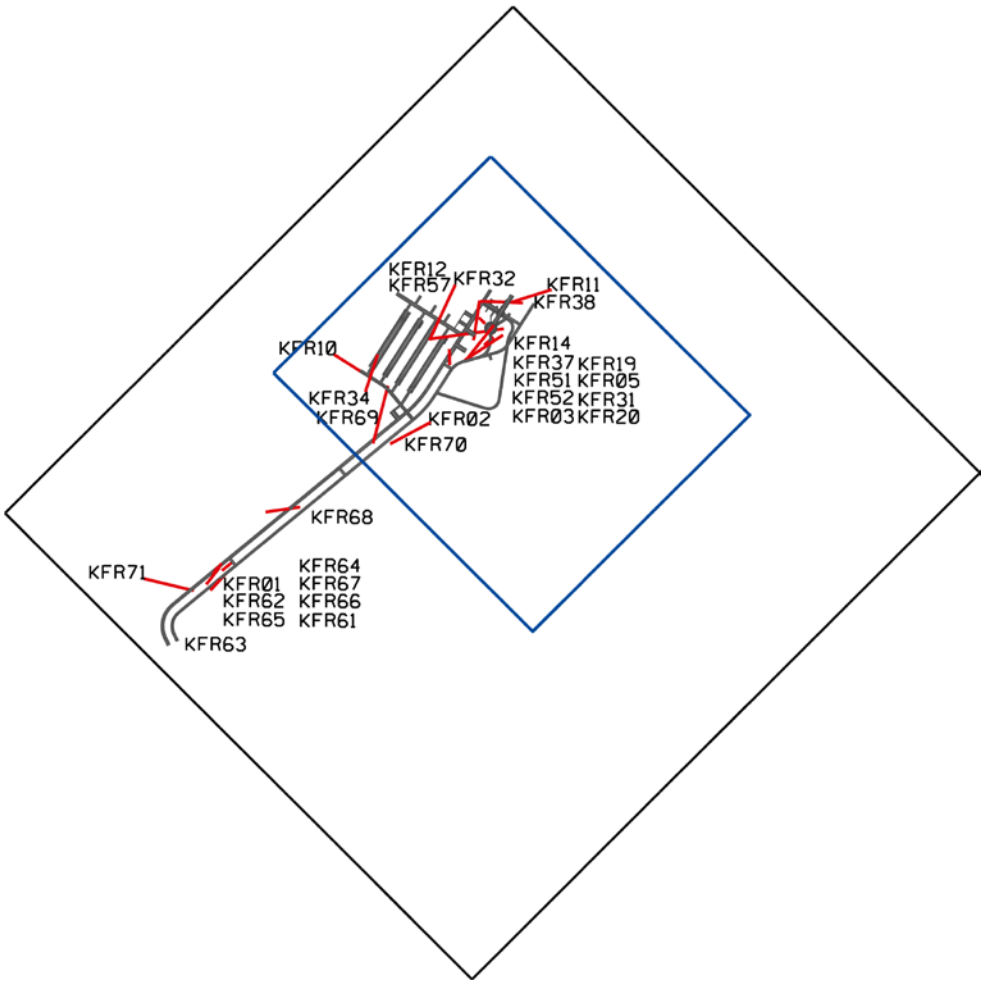

Figure 1-1. *Illustration showing the horizontal projection of the cored boreholes considered in this report in red and their positions relative to existing SFR and the regional (black) and local (blue) SFR model area. KFR72, KFR89 and SFR(Silo1) are not included due to the lack of coordinates.*

Original data from the reported activity are stored in the primary database Sicada. 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 associated 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.

Table 1-2. Controlling documents for the performance of the activity.

Activity plan	**Number**	**Version**
Identifiering av möjliga deformationszoner samt förenklad översikts-kartering av borrkärnor från byggnationen av SFR	AP SFR-09-014	1.0
Identifiering av möjliga deformationszoner från KFR03, KFR05, KFR10, KFR11, KFR12, KFR19, KFR20, KFR52, KFR57, KFR61, KFR62, KFR63, KFR64, KFR65, KFR66, KFR67, KFR68 och SFR (Silo 1)	AP SFR-09-020	1.0
Litologisk enhålstolkning baserad på översiktskartering och bergarts-kodning av 32 äldre kärnborrhål från SFR, i vissa fall med komplement av geofysisk borrhålsdata	AP SFR-09-028	1.0
Method descriptions	**Number**	**Version**
Instruktion: Regler för bergarters benämningar vid platsundersökningen i Forsmark	SKB MD 132.005	1.0
Metodbeskrivning för Boremap-kartering	SKB MD 143.006	2.0
Metodbeskrivning för geologisk enhålstolkning	SKB MD 810.003	3.0

2 Objective and scope

In order to use information from the cored boreholes associated with the construction of SFR in the current geological modelling work, it was decided that all boreholes that still had drill core available should be inspected and have their previously mapped lithologies, as recorded on older borehole logs, translated into current SKB rock codes. Where such logs are not available the drill core should be inspected and subject to more comprehensive overview mapping. This activity includes:

1. Rock type coding or lithological overview mapping, depending on whether the original geological mapping is available or not. During the rock type coding, old rock type nomenclature was translated into current rock codes and the drill core lengths given in the original logs were used to define rock contacts. However, similar to the overview mapping the rock type coding included drill core inspection.
2. Identification of rock units and possible deformation zones, following the criteria applied during geological single-hole interpretation.

The aim is to include as many as possible of the boreholes drilled during the construction of SFR in the current geological modelling work. This should be done by application of SKB's current nomenclature and methodology as used within the Forsmark site investigation programme. Where deviations from this methodology are required due to the absence or lack of quality of the available input data this fact should be recorded and the deviations described.

The report presents the results from the rock type coding of KFR01 and KFR02. Rock type coding of the remaining 19 boreholes listed in Table 2-1 was done during the Forsmark site investigation programme(KFR03, KFR05, KFR10, KFR11, KFR12, KFR14, KFR19, KFR20, KFR52, KFR57, KF61–KFR68 and SFR (Silo1)). A summary of this activity is provided in the Appendix of /Stephens et al. 2008/. Eleven of the drill cores from the boreholes listed in Table 2-1 that lack original geological mapping logs (KFR31, KFR32, KFR34, KFR37, KFR38, KFR51, KFR69, KFR70, KFR71, KFR72 and KFR89) have been subjected to overview mapping by the use of Boremap where lithological units that exceeds 1 m in drill core length have been registered. A brief lithological summary of individual drill cores is given in section 5.2.

Rock units and possible deformation zones have been defined in all boreholes listed in Table 1-1, except in the 11 earlier reported boreholes for which the geological SHI's are presented in /Petersson et al. 2009/. In those cases where borehole geophysics is available /Mattsson 2009/ details have been included in the description of individual possible deformation zones. The results are presented both in section 5.3 and in Appendix 1 as WellCAD plots.

3 Description of equipment/interpretation tools

The lithological overview mapping of drill cores, for which no original geological mappings are available, was performed by Boremap v. 4.1. This software contains the bedrock nomenclature of SKB MD 132.005, which was used both for the geological mapping of the surface and boreholes during the preceding site investigation Forsmark.

The subdivision of the drill core into different rock units is initially based on a study of all the available geological data as synthesized and presented in a WellCAD log for a particular borehole. The material used is to define rock units consisting of sections of similar rock types, or sections where one rock type is very dominant. The log presents the results of the rock type coding or the lithological overview mapping, and if available, borehole geophysics.

The following equipment was used to facilitate the work with the drill cores: folding rule, concentrated hydrochloric acid diluted with three parts of water, knife, hand lens, paint brush and tap water.

All drill cores were photographed in wet condition with two core boxes per image according to AP SFR-09-014 (SKB internal document) following SKB MD 143.007.

4 Execution

4.1 General

During the overview mapping, the drill cores from the 32 boreholes were available in their full length on roller tables in the core-mapping accommodation at Forsmark (the Llentab hall, near the SKB/SFR-office). No petrographic thin sections were available from the drill cores, and all mapping activities are based on ocular inspection.

4.2 Rock type coding

Rock type coding of the original geological mapping has previously been done for 19 drill cores from the construction of SFR and a description of the methodology for this activity is given in /Stephens et al. 2008/. There are two additional boreholes, KFR01 and KFR02, for which there exist old geological mappings, but neither were coded during the Forsmark site investigation. The rock type coding of the mappings for these two boreholes was carried out during the current SFR extension project according to the same procedure as for the other 19 drill cores. In addition to the overview mapping, a condensed lithological version of the original, written geological logs, found in /Christiansson and Magnusson 1985/, were digitized. The written original logs are more detailed and may also include information regarding fracture intensity and geophysical properties. It is important to emphasise that none of these written lithological descriptions were modified during the work. Rock codes, following SKB MD 132.005, were assigned to the rock types of the original geological logs, by ocular inspection of the drill cores. This type of inspection was a form of spot control and less comprehensive than the formal overview mapping performed on other drill cores. Drill core lengths given in the original logs were rarely changed during this procedure. However, a particular rock type defined in the original mapping is not always translated into the corresponding current rock code after inspection. In some cases, there is complimentary information on structure, alteration or other significant features added from the inspection carried out in the context of this study.

4.3 Lithological overview mapping

The eleven drill cores (KFR31, KFR32, KFR34, KFR37, KFR38, KFR51, KFR69–72 and KFR89), for which no original geological logs are available, have been subjected to lithological overview mapping. The activity was performed in Boremap according to AP SFR-09-014 (SKB internal document) following the SKB method description for ‘overview mapping of cored boreholes, based on drill cores’, section 3.2.1 in SKB MD 143.006. It should be emphasised that the focus of the mapping was lithology (i.e. rock types) and that fracture frequency and crushes were not recorded. The features included are (1) rock types exceeding 1 m in drill core length, (2) occurrences of brittle-ductile deformation and (3) all alteration except for oxidation/red staining. Oxidation is omitted since previous studies in the Forsmark area (cf. /SKB 2008/) have shown an unequivocal association with brittle structures. The parameters registered for each rock type are rock type name/code, colour, structure, structure intensity, grain-size and texture. For the alteration, type and intensity were registered.

The lengths used in Boremap are the lengths marked as part of the original drilling activity.

4.4 Identification of rock units and possible deformation zones

In order to facilitate the use of the geological borehole data in the modelling work all 32 boreholes included in this report were subjected to a procedure where the drill core was examined and the intersection of possible deformation zones were identified and sections of similar rock types, or sections where one rock type is very dominant, were merged into rock units. During current site investigations this work is done routinely for boreholes by geological single-hole interpretations

following SKB MD 810.003, where an integrated synthesis of geological mapping data, geophysical logs and borehole radar data forms the key part. The available data for the 32 boreholes included in this report are, however, considerably more sparse and lack BIPS-images, fracture data, borehole radar data and for most of the boreholes geophysics (cf. /Mattsson 2009/). This lack of data prevents the performance of a full SHI that is possible with new boreholes. However, it was decided to follow the nomenclature and methodology of the current SHI procedure as far as possible and record all necessary deviations. Due to the departures from the established methodology, the current activity described in this report has not been classified as a 'single-hole interpretation', but has rather been classified as 'overview mapping and simplified geological single-hole interpretation.' The results are stored in the primary database Sicada.

4.4.1 Rock units

The working procedure is to study all types of data related to the character of the rock type and to merge sections of similar rock types, or sections where one rock type is very dominant, into rock units. All data to be used are presented side by side in a borehole document extracted from the software WellCAD. Geophysical data are available for six of the boreholes /Mattsson 2009/. For the remaining 26 boreholes, the available data is limited to rock type coding or lithological overview mapping. A minimum length of about 5 m was used for rock units in the single-hole interpretations during the site investigation. This minimum length was generally also used during this work. The division into rock units was carried out by two geologists and one geophysicist. Each rock unit is defined in terms of the borehole length interval and provided with a brief description for inclusion in WellCAD plot. The confidence in the interpretation of a rock unit is assigned according to three classes: 3 = high, 2 = medium and 1 = low. The rock units with a lower degree of confidence are restricted to boreholes with existing mappings, which were rock coded during the Forsmark site investigation, when the geological experience from the SFR area was more limited.

4.4.2 Possible deformation zones

The procedure to identify possible deformation zones is primarily based on inspection of the drill cores. The section of each identified possible deformation zone is defined in terms of the borehole length interval and provided with a brief description for inclusion in the WellCAD plot. This includes a brief description of the rock types affected by the possible deformation zone. A reassessment of each interval was done at the basis of the digital drill core images and, if available, the geophysical borehole data. If judged necessary, the boundaries and/or descriptions are adjusted. The confidence in the interpretation of a possible deformation zone is assigned according to three classes: 3 = high, 2 = medium and 1 = low.

Possible deformation zones that are brittle in character have been identified primarily on the basis of the frequency of fractures, according to the concept presented in /Munier et al. 2003/. Brittle deformation zones defined by an increased frequency of extensional fractures (joints) or shear fractures (faults) are not distinguished. Both the transitional part (damage zone), with a fracture frequency in the range 4–9 fractures/m, and the core part, with a fracture frequency > 9 fractures/m, have been included in each zone (Figure 4-1). The frequencies of broken and unbroken fractures have been assessed in the identification procedure, and the character of the zone has been described accordingly. The presence of bedrock alteration, the resistivity, SPR and magnetic susceptibility logs have all assisted in the identification of the zones. The anomalies in these parameters that assist with the interpretation are presented in the short description. The flow anomalies and hydraulic properties of each zone were then evaluated and described in comparison to the properties of the whole borehole.

4.5 Nonconformities

Due to the lack of BIPS-images and radar data, obscurities in the lithological classification and the methodology of the original fracture mapping, and the fact that geophysical logs only exist for a few of the boreholes, it has not been possible to allow the full application of the established SHI methodology. Consequently, it has neither been meaningful to fully apply the established methodology for overview mapping. Table 4-1 presents the data limitations and deviations from SKB's method descriptions.

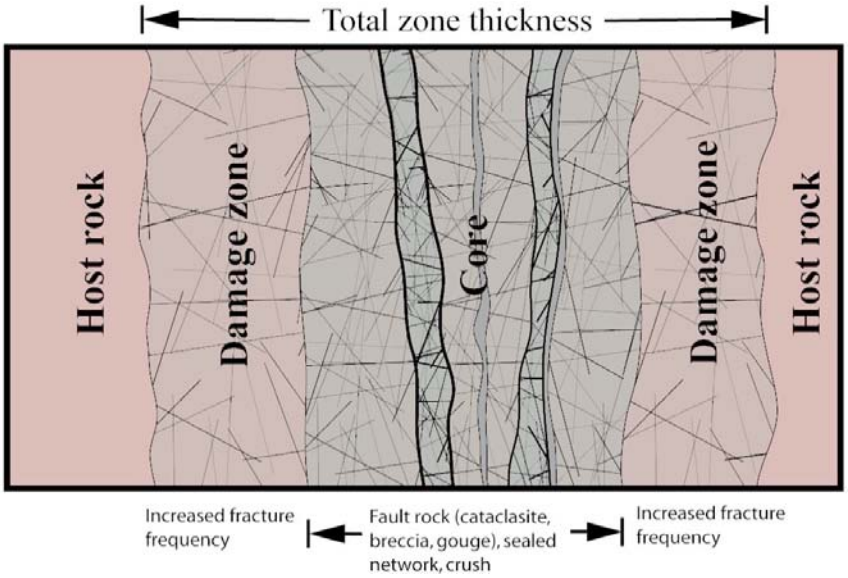

Figure 4-1. *Schematic illustration of the structure of a brittle deformation zone. After Munier et al. /2003/.*

The total length of KFR02 is 170.33 m, though the geophysical logs covers only the interval down to 116.80 m length /Mattsson 2009/.

It should be noted that there is no print-outs from the software WellCAD in Appendix 1 for the borehole SFR (Silo1), since the results have not been store in Sicada yet.

Table 4-1. Deviations from SKB method descriptions.

Included	Not included
Lithological overview mapping (SKB MD 143.006, v. 2.0, activity type GE044)	
Rock types (> 1 m in borehole lengths).	Rock occurrences (< 1 m borehole length).
Ductile and brittle-ductile deformation (registered as rock occurrences).	Open fractures and crushes.
Alteration type and intensity (except for oxidation).	Oxidation.
Photography of drill cores in wet condition.	Photography of drill cores in dry condition.
Simplified geological single-hole interpretation (SHI)(SKB MD 810.003, v. 3.0, activity type GE299) Rock units (RU)	
Geological data limited to results from overview mapping and rock type coding.	BIPS-images and radar data is lacking for all boreholes.
Geophysical logs limited to six of the boreholes.	Commonly an absence of geophysical information. If availble geophysical information is of reduced quality.
Possible deformation zones (PDZ)	
Identification of PDZ was made based on direct drill core observations	No preliminary group inspection of a WellCAD log and Identification of PDZ was performed due to the lack of relevant data.
Futher revision after independent review, inspection of drill core photographs and further spot checks on the drill core.	
Completion with geophysical information if available.	Commonly an absence of geophysical information. If availble geophysical information is of reduced quality.

5 Results

5.1 Rock type coding

The results of the rock type coding of KFR01 and KFR02 are presented below and as print-outs from the software WellCAD in Appendix 1.

5.1.1 KFR01

The predominant rock types in the borehole are described as a medium-grained pegmatite and a dark, fine-grained biotite gneiss by /Christiansson and Magnusson 1985/. These two rock types were coded as pegmatitic granite (101061) and felsic to intermediate metavolcanic rock (103076), respectively. An occurrence of cataclasite (108003) with an intervening occurrence of pegmatitic granite occurs at 9.33–10.11 m length. Weak to strong brittle-ductile deformation has affected mainly the metavolcanic rock along two separate intervals at 18.25–29.40 and 41.60–45.30 m length.

5.1.2 KFR02

The borehole is dominated by grey, fine- to medium-grained 'granite gneiss' with subordinate amounts of medium- to coarse-grained granite and pegmatite according to /Christiansson and Magnusson 1985/. The 'granite gneiss' was coded as fine- to medium-grained metagranite-granodiorite (101057), whereas the medium- to coarse-grained granite and pegmatite generally were translated into pegmatitic granite (101061). Minor occurrences of greenstone were coded as felsic to intermediate metavolcanic rock (103076). A few occurrences of fine- to medium-grained granite (111058) and aplite (1062) were also registered.

5.2 Lithological overview mapping

The results of the lithological overview mapping for eleven of the boreholes included in this report are presented below and as print-outs from the software WellCAD in Appendix 1.

5.2.1 KFR31

The upper part of the drill core, down to 83.20 m length consists of pegmatitic granite (101061) with subordinate amounts of fine- to medium-grained metagranite-granodiorite (101057), fine- to medium-grained granite (111058), felsic to intermediate metavolcanic rock (103076) and amphibolite (102017). The remaining part of the drill core is dominated by fine- to medium-grained metagranite-granodiorite (101057) with a considerable proportion of fine- to medium-grained granite (111058) and pegmatitic granite (101061) along with minor aplitic metagranite (101058), felsic to intermediate metavolcanic rock (103076) and amphibolite (102017). No alterations other than oxidation/reddening were noted in the drill core.

5.2.2 KFR32

The upper part of the drill core down to 92.58 m length is composed of pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) with minor amphibolite (102017) and aplitic metagranite (101058). The remaining part, down to 209.70 m length, consists of fine- to medium-grained metagranite-granodiorite (101057) with subordinate fine- to medium-grained granite (111058) and amphibolite (102017) along with very minor pegmatitic granite (101061). No alterations other than oxidation/reddening were noted in the drill core.

5.2.3 KFR34

The drill core consists of fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061) in approximate equal proportions, with subordinate felsic to intermediate metavolcanic rock (103076). In addition there are a few minor occurrences of amphibolite (102017) and fine- to medium-grained granite (111058). No alterations other than oxidation/reddening were noted in the drill core.

5.2.4 KFR37

The lithology of the drill core from KFR37 can be described in three sections. The uppermost, at 12.23–45.50 m length, consists of aplitic metagranite (101058) with subordinate amphibolite in the upper part. The middle, at 45.50–111.30 m length, consists of fine- to medium-grained granite (111058) with minor pegmatitic granite (101061), whereas the lowermost section, at 111.30–204.90 m length, is composed of fine- to medium-grained metagranite-granodiorite (101057) with subordinate pegmatitic granite (101061) and aplitic metagranite (101058). A major interval of brecciation was registered at 42.60–43.70 m length. No alterations other than oxidation/reddening were noted in the drill core.

5.2.5 KFR38

The predominant rock type in the drill core from KFR38 is fine- to medium-grained metagranite-granodiorite (101057). Except for one continuous interval of pegmatitic granite (101061) and one of fine- to medium-grained granite (111058) at 63.65–73.65 and 103.35–122.43 m length, respectively, subordinate rock types, including amphibolite (102017), pegmatitic granite (101061), aplitic metagranite (101058) and fine- to medium-grained granite (111058), are frequent and form occurrences up to a few metres in length. No alterations other than oxidation/reddening were noted in the drill core.

5.2.6 KFR51

The upper part of the drill core down to 30.07 m length consists of fine- to medium-grained metagranite-granodiorite (101057) with subordinate pegmatitic granite (101061), felsic to intermediate metavolcanic rock (103076) and amphibolite (102017). The remaining part of the drill core consists of pegmatitic granite (101061) with one minor occurrence of felsic to intermediate metavolcanic rock (103076). No alterations other than oxidation/reddening were noted in the drill core.

5.2.7 KFR69

The drill core consists predominantly of pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in approximate equal proportion. In addition there are a few minor occurrences of fine- to medium-grained granite (111058), amphibolite (102017), felsic to intermediate metavolcanic rock (103076), aplitic metagranite (101058) and metatonalite-granodiorite (101054). An occurrence of moderate calcite alteration accompanied by faint sericitization was noted at 64.10–78.80 m length.

5.2.8 KFR703

The drill core from KFR70 consists of pegmatitic granite (101061) with two intervals at 22.48–50.30 and 74.00–93.04 m length that include occurrences of fine- to medium-grained metagranite-granodiorite (101057) and minor amphibolite (102017). A brecciated interval was registered at 102.17–102.50 m length. No alterations other than oxidation/reddening were noted in the drill core.

5.2.9 KFR71

The predominant rock type in the drill core from KFR71 is a fine- to medium-grained metagranite-granodiorite (101057). Subordinate rock types consist of amphibolite (102017), pegmatitic granite (101061), felsic to intermediate metavolcanic rock (103076) and fine- to medium-grained granite (111058). A major interval of cataclastic rock (108003) occurs at 79.00–90.20 m length, whereas a pegmatitic granite affected by brittle-ductile deformation occurs at 41.29–41.40 m length. The

amphibolites in the lower part of the drill core are typically weakly to moderately chloritized. Faint to moderate argillization occurs at 99.31–99.85 m length and a continuous interval of sericitization was noted at 109.25–120.93 m length.

5.2.10 KFR72

The upper part of the drill core down to 41.50 m length is a mixed interval of felsic to intermediate metavolcanic rock (103076), amphibolite (102017), pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057). The remaining part consists of fine- to medium-grained metagranite-granodiorite (101057) with several occurrences of pegmatitic granite (101061), as well as minor amphibolite (102017) in the lowermost part. Two minor, ductile shear zones occur at 31.45–31.87 and 91.14–91.45 m length. Alteration including faint to moderate argillization, weak chloritization, weak sericitization and moderate epidotization occur frequently down to 61.66 m length.

5.2.11 KFR89

The drill core consists of fine- to medium-grained metagranite-granodiorite (101057) with one occurrence of amphibolite (102017) at 11.19–14.40 m length. A brittle-ductile shear zone occurs at 14.00–14.40 m length. No alterations other than oxidation/reddening were noted in the drill core.

5.3 Identification of rock units and possible deformation zones

The results of the identification of rock units and possible deformation zones in the 32 drill cores are presented below and as print-outs from the software WellCAD in Appendix 1.

5.3.1 KFR01

Rock units

The borehole can be divided into three different rock units, RU1–RU3. All rock units have been interpreted with a high degree of confidence.

0–11.25 m

RU1: Pegmatitic granite (101061) with one occurrence of fine- to medium-grained metagranite-granodiorite (101057) in the uppermost part of the interval. Confidence level = 3.

11.25–45.84 m

RU2: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061). Confidence level = 3.

45.84–62.30 m

RU3: Pegmatitic granite (101061) with one subordinate occurrence of amphibolite (102017) in the lower part of the interval. Confidence level = 3.

Possible deformation zones

One possible deformation zone, spanning the entire length of the borehole, of brittle and locally brittle-ductile character and with high degree of confidence has been interpreted in KFR01.

0–62.30 m

DZ1: High frequency of broken fractures, with consistently more than 10 broken fractures per metre; locally considerably more, especially in the lowermost 18 m, which consists of pegmatitic granite (101061). α-angles in the pegmatitic granite (101061) are generally high and in the strongly foliated

felsic to intermediate volcanic rock (103076) generally parallel with the foliation. In the interval 18.25–29.40 m length there is brittle-ductile deformation and intense foliation, locally cataclasite in the pegmatitic granite (101061). Several crushes, especially between 49 m length and the end of the borehole. Muscovitization and faint to weak argillization of the felsic to intermediate metavolcanic rock (103076). Predominant minerals in broken fractures are calcite, clay minerals and locally chlorite; in the pegmatitic granite (101061) mainly calcite. The SPR log is generally decreased along the entire borehole (200 ohm relative to the 'normal' background of 1,000 ohm), which indicates a high frequency of open fractures. Felsic to intermediate metavolcanic rock (103076) and pegmatitic granite (101061). Confidence level = 3.

No hydraulic test data from the section 0–11.0 m length. The transmissivity of the section 11.0–43.5 m length is low ($4 \cdot 10^{-8}$ m^2/s). Increased transmissivity ($1 \cdot 10^{-6}$ m^2/s) of the section 44.5–62.3 m length.

5.3.2 KFR02

Rock units

The borehole can be divided into four different rock units, RU1–RU4. All rock units have been interpreted with a high degree of confidence.

0–35.85 m

RU1: Pegmatitic granite (101061). Confidence level = 3.

35.85–94.52 m

RU2: Fine- to medium-grained metagranite-granodiorite (101057) with considerable amounts of pegmatitic granite (101061). Subordinate occurrences of felsic to intermediate metavolcanic rocks (103076). Confidence level = 3.

94.52–141.94 m

RU3: Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076) and fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

141.94–170.33 m

RU4: Fine- to medium-grained metagranite-granodiorite (101057) with considerable amounts of pegmatitic granite (101061). One subordinate occurrence of fine- to medium-grained granite (111058). Confidence level = 3.

Possible deformation zones

Three possible deformation zones of brittle character have been identified in KFR02, one with a low degree of confidence, one with a medium degree of confidence and one with a high degree of confidence.

32.5–37.5 m

DZ1: Only defined by geophysical data. Distinctly decreased levels in the resistivity and SPR data along the entire interval. In the fluid temperature data there is a significant anomaly centered at c. 34.0 m length, which indicates in or out flow of water. Pegmatitic granite (101061), fine- to medium-grained metagranite-granodiorite (101057) and felsic to intermediate metavolcanic rock (103076). Confidence level = 2.

Moderate but increased transmissivity of the sections 26–36 m length and 36–46 m length ($7 \cdot 10^{-7}$ and $4 \cdot 10^{-7}$ m^2/s, respectively).

99.2–100.2 m

DZ2: Only defined by geophysical data. Decreased levels in the resistivity and SPR data along the interval. In the fluid temperature data there is a minor anomaly centered at c. 99.8 m length, which indicates in or out flow of water. Pegmatitic granite (101061). Confidence level = 1.

Moderate transmissivity of the section 96–106 m length ($6 \cdot 10^{-8}$ m^2/s).

114.80–124.45 m

DZ3: Increased frequency of broken fractures, with an average of c. 7 broken fractures/m. Generally high α-angles. Highest frequency of broken fractures in the interval 116.70–117.65 m length. Increased frequency of unbroken fractures that form networks in the interval 114.80–116.80 m length. Faint to weak oxidation throughout the interval. Predominant minerals in broken fractures are calcite, hematite along with locally minor amounts of clay minerals and in the sealed fracture networks at 114.80–116.80 m length adularia, quartz and calcite. Locally vugs in the sealed fracture networks. Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

Moderate transmissivity of the tested section 81–136 m length ($9 \cdot 10^{-8}$ m^2/s).

5.3.3 KFR03

Rock Units

The borehole can be divided into five different rock units, RU1–RU5. Rock unit 3 occurs in two separate length intervals. Three rock units have been interpreted with a medium degree of confidence and two with a high degree of confidence.

0–18.86 m

RU1: In the uppermost 6 m consists of fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061). The remaining part of the interval consists of felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of amphibolite (102017). Confidence level = 2.

18.86–46.00 m

RU2: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

46.00–59.49 m

RU3a: Aplitic metagranite (101058) wit one minor occurrence of pegmatitic granite (101061) in the upper part of the interval. Confidence level = 2.

59.49–74.85 m

RU4: Mixed interval dominated by fine- to medium-grained metagranitoid (101051) with occurrences of amphibolite (102017), pegmatitic granite (101061) and aplitic metagranite (101058). Confidence level = 2.

74.85–94.17 m

RU3b: Aplitic metagranite (101058) with subordinate occurrences of pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in the upper half of the interval. Confidence level = 2.

94.17–101.60 m

RU5: Pegmatitic granite (101061). Confidence level = 3.

Possible deformation zones

Four possible deformation zones of brittle character have been identified in KFR03, two with a medium degree of confidence and two with a high degree of confidence.

6–12 m

DZ1: Only defined by geophysical data. Distinct decrease in the SPR logging data along the entire interval. Felsic to intermediate metavolcanic rock (103076) and amphibolite (102017). Confidence level = 2.

Moderate transmissivity of the section 5–44 m length ($1 \cdot 10^{-6}$ m^2/s).

48.00–53.65 m

DZ2: Increased frequency of broken and unbroken fractures. Generally α-angles > 45°. Crushed section at 50.85–51.20 m length. A 4 dm long laumontite-sealed breccia at approximately 49.5 m length. Generally faint oxidation. Predominant fracture minerals are laumontite, calcite, clay minerals, chlorite and hematite. Distinct decrease in the SPR logging data along the entire interval. Moderately foliated metagranite-granodiorite (101057) and pegmatitic granite (101061). Confidence level = 2.

Moderate transmissivity of the section 45–56 m length ($3 \cdot 10^{-7}$ m^2/s).

70.42–72.75 m

DZ3: Slightly increased frequency of broken and unbroken fractures. Generally α-angles < 45°. Faint to weak oxidation and in most of the interval strong laumontization. Predominant fracture minerals are laumontite, hematite/Fe-hydroxide, clay minerals and chlorite. Distinct decrease in the SPR logging values along the entire interval. Fine- to medium-grained granite (111058) and amphibolite (102017). Confidence level = 3.

Low transmissivity of the section 57–80 m length ($4 \cdot 10^{-8}$ m^2/s).

81.86–95.95 m

DZ4: Increased frequency of broken and unbroken fractures, which locally forms sealed networks. Approximately 9 broken fractures/m outside crushed intervals. Varying α-angles with several conspicuous, clay-dominated fractures at angles < 30°. Four minor crushes. Faint to weak oxidation and minor argillization associated with clay-dominated fractures. Predominant fracture minerals are clay minerals, Fe-hydroxide/hematite, chlorite and calcite, and in unbroken fractures also adularia. Distinct decrease in the SPR logging values along the section 85.0–93.0 m length. Fine- to medium-grained granite (111058) and pegmatitic granite (101061). Confidence level = 3.

Low transmissivity of the section 81–101.6 m length ($2 \cdot 10^{-8}$ m^2/s).

5.3.4 KFR05

Rock units
The borehole can be divided into five different rock units, RU1–RU5. All rock units have been interpreted with a medium degree of confidence.

0.60–7.48 m

RU1: The upper half of the interval consists of amphibolite (102017) one occurrence of felsic to intermediate metavolcanic rock (103076), whereas the lower half consists of felsic to intermediate metavolcanic rock (103076) with one occurrence of pegmatitic granite (101061). Confidence level = 2.

7.48–45.44 m

RU2: Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061) and in the lower part felsic to intermediate metavolcanic rock (103076). Confidence level = 2.

45.44–75.95 m

RU3: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061) and amphibolite (102017). Confidence level = 2.

75.95–84.93 m

RU4: Fine- to medium-grained granite (111058) with one minor occurrence of pegmatitic granite (101061). Confidence level = 2.

84.93–131.40 m

RU5: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of fine- to medium-grained granite (111058), pegmatitic granite (101061) and amphibolite (102017). The physical properties of the felsic to intermediate volcanic rock differ significantly from that of RU3 and from what is normally expected of this rock type. The felsic to intermediate volcanic rock shows an increased natural gamma radiation (40 µR/h) and partly significantly decreased density of 2,630 kg/m^3, which deviates strongly from the 'normal' properties of this rock type of c. 5-15 µR/h and c. 2,720-2,750 kg/m^3. Confidence level = 2.

Possible deformation zones

One possible deformation zone of brittle character and with high degree of confidence has been interpreted in KFR05.

85.00–87.90 m

DZ1: Increased frequency of broken fractures, most of them with α-angles > 45°. Crushed section at 85.25–86.22 m length. Faint to weak oxidation throughout the interval. Predominant fracture minerals are Fe-hydroxide/hematite, calcite, clay minerals and chlorite. Distinct decrease in the SPR logging values along the section 84.2–86.8 m length. There is also an anomaly in the fluid temperature data, with its minima at c. 86.6 m length, which indicates in or out flow of water. Moderately foliated metagranite-granodiorite (101057). Confidence level = 3.

No hydraulic test data from this section of the borehole.

5.3.5 KFR10

Rock Units

The borehole can be divided into two different rock units, RU1–RU2. Both rock units have been interpreted with a medium degree of confidence.

0–63.42 m

RU1: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of fine- to medium-grained granite (111058), pegmatitic granite (101061), amphibolite (102017) and one occurrence of fine- to medium-grained metagranite-granodiorite (103076). Confidence level = 2.

63.42–107.28 m

RU2: Fine- to medium-grained granite (111058), felsic to intermediate metavolcanic rock (103076) and pegmatitic granite (101061) in approximate equal proportions. Minor occurrences of amphibolite (102017) and in the uppermost part of the interval one occurrence of fine- to medium-grained metagranitoid (101051). Confidence level = 2.

Possible deformation zones

Two possible deformation zones of brittle character have been identified in KFR10, one with a low degree of confidence and one with a high degree of confidence.

0–5.00 m

DZ1: Increased frequency of broken and locally unbroken fractures. α-angles > 45°. Weak to medium oxidation outside amphibolites. Predominant fracture minerals are chlorite, laumontite, calcite and clay minerals. Moderately foliated metagranite-granodiorite (101057) and amphibolite (102017). Confidence level = 1.

No hydraulic test data from this section of the borehole.

95.65–107.28 m

DZ2: Increased frequency of broken and unbroken fractures. Several crushes and the most extensive at 96.50–97.15 m length. Varying α-angles, but generally > 45°. Weak to moderate oxidation throughout the interval. Predominant minerals in broken fractures are clay minerals, calcite and chlorite and in unbroken fractures quartz, adularia and calcite. Fine- to medium-grained granite (111058) and felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

High transmissivity of the section 87.0–107.28 m length ($3 \cdot 10^{-5}$ m^2/s). The transmissivity of this section is significantly elevated compared with the rest of the tested borehole sections.

5.3.6 KFR11

Rock units

The borehole can be divided into four different rock units, RU1–RU4. All rock units have been interpreted with a medium degree of confidence.

0–18.73 m

RU1: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061) in the upper part and one occurrence of amphibolite (102017) in the lower part of the interval. Confidence level = 2.

18.73–32.35 m

RU2: Fine- to medium-grained metatonalite-granodiorite (101054) with one subordinate occurrence of amphibolite (102017) in the upper part and subordinate occurrences of pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in the lower part of the interval. Confidence level = 2.

32.35–52.40 m

RU3: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057) and felsic to intermediate metavolcanic rock (103076). Confidence level = 2.

52.40–98.07 m

RU4: Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061) and one minor occurrence of amphibolite (102017). Confidence level = 2.

Possible deformation zones

One possible deformation zone of brittle and locally brittle-ductile character and with high degree of confidence has been interpreted in KFR11.

41.45–95.65 m

DZ1: Increased frequency of broken fractures. In the section 61.90–92.12 m length more highly increased frequency, several crushes, breccias and locally brittle-ductile deformation, particularly at 66.58–74.30 m length. Varying α-angles, but generally > 45°. A considerable amount of the fractures are parallel with the tectonic foliation. Occurrences of quartz dissolution ('vuggy granite') at 66.58–67.15 and 70.45–70.60 m length. Faint to weak oxidation throughout the interval. Predominant fracture minerals are chlorite, calcite, laumontite and in the core of the possible zone clay minerals, asphaltite and quartz. Pegmatitic granite (101061) and fine- to medium-grained granite (111058). Confidence level = 3.

High transmissivity of the section 40.0–98.07 m length ($6 \cdot 10^{-5}$ m^2/s). The absolutely dominating transmissivity is contained in the in the section 56–98.07 mlength.

5.3.7 KFR12

Rock units

The borehole can be divided into three different rock units, RU1–RU3. One rock unit has been interpreted with a medium degree of confidence and two with a high degree of confidence.

0–14.77 m

RU1: Pegmatitic granite (101061) and fine- to medium-grained granite (111058) in approximately equal proportions. Minor occurrences of fine- to medium-grained metagranite-granodiorite (101057) in the lowermost part of the interval. Confidence level = 3.

14.77–36.04 m

RU2: Fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

36.04–50.26 m

RU3: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained granite (111058), fine- to medium-grained metagranitoid (101051), felsic to intermediate metavolcanic rock (103076) and amphibolite (102017). Confidence level = 2.

Possible deformation zones

One possible deformation zone of brittle character and with high degree of confidence has been interpreted in KFR12.

21.25–31.50 m

DZ1: Increased frequency of broken fractures. The section 24.30–25.64 m length is generally crushed. α-angles > 55°. Weak oxidation throughout the interval. Predominant fracture minerals are clay minerals, Fe-hydroxide/hematite and chlorite. Fine- to medium-grained granite (111058). Confidence level = 3.

Relatively high transmissivity of the section 20.0–33.0 m length ($3 \cdot 10^{-6}$ m^2/s). The transmissivity of this section is significantly elevated compared with the rest of the tested borehole sections.

5.3.8 KFR14

Rock Units

The borehole can be divided into one rock unit, RU1, which has been interpreted with a medium degree of confidence.

0–28.67 m

RU1: Amphibolite (102017) with subordinate occurrences of felsic to intermediate metavolcanic rocks (103076), pegmatitic granite (101061) and fine- to medium-grained granite (111058). Confidence level = 2.

Possible deformation zones

No possible deformation zones have been identified in KFR14.

5.3.9 KFR19

Rock units

The borehole can be divided into four different rock units, RU1–RU4. Rock unit 2 occurs in two separate length intervals. Three rock units have been interpreted with a medium degree of confidence and one with a high degree of confidence.

0–9.90 m

RU1: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076). Confidence level = 2.

9.90–46.60 m

RU2a: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061), amphibolite (102017) and in the lowermost part fine- to medium-grained granite (111058). The physical properties of the felsic to intermediate volcanic rock differ significantly from what is normally expected of this rock type, with an increased natural gamma radiation (30-50 µR/h) and partly significantly decreased density of 2,650-2,690 kg/m^3, which deviates strongly from the 'normal' properties of this rock type of c. 5-15 µR/h and c. 2,720-2,750 kg/m^3. Confidence level = 2.

46.60–78.81 m

RU3: Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061) and one minor occurrence of fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 2.

78.81–97.13 m

RU4: Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

97.13–110.17 m

RU2b: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061) and one minor occurrence of amphibolite (102017). Confidence level = 2.

Possible deformation zones

One possible deformation zone of brittle character and with medium degree of confidence has been interpreted in KFR19.

38.53–49.32 m

DZ1: Slightly increased frequency of unbroken and broken fractures with a mean of 11 broken fractures/m. α-angles are generally high (> 55°), but in the lowermost 3 m of the interval several laumontite-dominated fractures with angles < 35°. Locally faint oxidation and minor oxidation adjacent to fractures. Predominant fracture minerals are laumontite, calcite, chlorite and locally clay minerals. There is a minor decrease in the SPR amplitude along the section which indicates

decreased bulk resistivity. Moderately foliated metagranite-granodiorite (101057) and pegmatitic granite (101061). Confidence level = 2.

No hydraulic test data from this section of the borehole.

5.3.10 KFR20

Rock units

The borehole can be divided into six different rock units, RU1–RU6. Three rock units have been interpreted with a medium degree of confidence and three with a high degree of confidence.

0–33.10 m

RU1: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061), felsic to intermediate metavolcanic rocks (103076) and amphibolite (102017). Confidence level = 2.

33.10–41.87 m

RU2: Amphibolite (102017) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

41.87–61.60 m

RU3: Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061). Confidence level = 3.

61.60–75.85 m

RU4: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of amphibolite (102017) and pegmatitic granite (101061). Confidence level = 2.

75.85–88.10 m

RU5: Felsic to intermediate metavolcanic rock (103076). The physical properties of the felsic to intermediate volcanic rock differ significantly from what is normally expected of this rock type. It shows an increased natural gamma radiation (50-70 µR/h) and partly significantly decreased density of 2,640-2,680 kg/m^3, which deviates strongly from the 'normal' properties of this rock type of c. 5-15 µR/h and c. 2,720–2,750 kg/m^3. Confidence level = 2.

88.10–109.70 m

RU6: Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076). One single occurrence of amphibolite (102017) and one of fine- to medium-grained granite (111058). Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle character and with low degree of confidence has been interpreted in KFR20.

48.50–52.00 m

DZ1: Increased frequency of unbroken and broken fractures. Variable α-angles, which generally are < 30° for the widest fractures. Weak oxidation throughout the interval. Predominant fracture minerals are laumontite, calcite and chlorite. There are no significant anomalies in the geophysical logging data. Fine- to medium-grained granite (111058). Confidence level = 1.

Moderate transmissivity of the section 44.0–58.0 m length ($1 \cdot 10^{-6}$ m^2/s).

5.3.11 KFR31

Rock Units

The borehole can be divided into seven different rock units, RU1–RU7. All rock units have been interpreted with a high degree of confidence.

16.60–81.95 m

RU1: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057), fine- to medium-grained granite (111058), felsic to intermediate metavolcanic rock (103076) and amphibolite (102017). Confidence level = 3.

81.95–104.91 m

RU2: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017). Single minor occurrences of felsic to intermediate metavolcanic rock (103076), aplitic metagranite (101058) and pegmatitic granite (101061). Confidence level = 3.

104.91–151.06 m

RU3: Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in approximately equal proportions. Subordinate occurrences of felsic to intermediate metavolcanic rock (103076), amphibolite (102017) and fine- to medium-grained granite (111058). Confidence level = 3.

151.06–198.65 m

RU4: Fine- to medium-grained metagranite-granodiorite (101057) and fine- to medium-grained granite (111058) in approximately equal proportions. Subordinate occurrences of amphibolite (102017) in the lowermost part of the interval. Confidence level = 3.

198.65–213.34 m

RU5: Aplitic metagranite (101058). Confidence level = 3.

213.34–227.54 m

RU6: Fine- to medium-grained granite (111058). Confidence level = 3.

227.54–242.10 m

RU7: Fine- to medium-grained metagranite-granodiorite (101057) with one single occurrence of pegmatitic granite (101061) and one of amphibolite (102017). Confidence level = 3.

Possible deformation zones

Two possible deformation zones of brittle character have been identified in KFR31, one with a medium degree of confidence and one with a high degree of confidence.

82.05–91.70 m

DZ1: Increased frequency of broken fractures, with an average of c. 13 broken fractures/m. Variable α-angles, but generally > 40°. Locally minor crushes. Generally faint to weak oxidation. Predominant minerals in broken fractures are chlorite, calcite and hematite. Fine- to medium-grained metagranite-granodiorite (101057) and at the lower end of the possible deformation zone a minor occurrence of amphibolite. Confidence level = 2.

Moderate transmissivity of the interval 87–90 m length ($8 \cdot 10^{-7}$ m^2/s). This section is one of four 3-m-sections in the borehole with a transmissivity above the measurement limit at $5 \cdot 10^{-8}$ m^2/s. The transmissivity of the rest of the section is low and below the measurement limit.

228.76–232.00 m

DZ2: Increased frequency of broken fractures and several crushed intervals. α-angles generally > 45° and typically parallel with the tectonic foliation. Generally faint to weak oxidation of the metagranite and faint to weak chloritization of the amphibolites. Predominant minerals in broken fractures are clay minerals, hematite, chlorite and calcite. Fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017). Confidence level = 3.

Moderate transmissivity of the interval 204–242 m length ($9 \cdot 10^{-7}$ m^2/s).

5.3.12 KFR32

Rock Units

The borehole can be divided into six different rock units, RU1–RU6. All rock units have been interpreted with a high degree of confidence.

16.55 – 48.56 m

RU1: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057) in the lower part of the interval. Confidence level = 3.

48.56 – 66.45 m

RU2: Fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

66.45 – 92.58 m

RU3: Pegmatitic granite (101061) with one single occurrence of aplitic metagranite (101058) in the uppermost part of the interval. Subordinate occurrences of amphibolite (102017) in the upper part of the interval. Confidence level = 3.

92.58 – 140.69 m

RU4: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017), pegmatitic granite (101061) and fine- to medium-grained granite (111058). Confidence level = 3.

140.69 – 163.10 m

RU5: Fine- to medium-grained granite (111058) with one subordinate occurrence of fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

163.10 – 209.70 m

RU6: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017). Confidence level = 3.

Possible deformation zones

Two possible deformation zones of brittle character and with high degree of confidence have been interpreted in KFR32.

155.70 – 159.00 m

DZ1: Increased frequency of broken fractures. A few fractures with very low α-angles, almost parallel to the drill core length axis dominate the interval. Weak to moderate oxidation throughout the interval. Predominant minerals in broken fractures are calcite, chlorite, clay minerals and locally laumontite. Fine- to medium-grained metagranite-granodiorite (101057) and fine- to medium-grained granite (111058). Confidence level = 3.

The transmissivity of the section 154–160 m length is low and below the measurement limit.

163.10–186.10 m

DZ2: Increased frequency of unbroken fractures and especially broken fractures. More than 10 broken fractures/m throughout the interval. α-angles generally > 45°. Locally minor crushes. Weak to medium oxidation throughout the interval and weak to medium chloritization of amphibolites (102017). Predominant minerals in broken fractures are clay minerals, hematite, chlorite and calcite, and in unbroken fractures laumontite. Fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017). Confidence level = 3.

High transmissivity of the interval 163–176 m length ($4 \cdot 10^{-5}$ m^2/s) and moderate transmissivity of the interval 176–187 m length ($2 \cdot 10^{-6}$ m^2/s).

5.3.13 KFR34

Rock Units

The borehole can be divided into three different rock units, RU1–RU3. Rock unit 2 occurs in two separate length intervals. All rock units have been interpreted with a high degree of confidence.

13.55–28.20 m

RU1: Felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

28.20–47.09 m

RU2a: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061) and one occurrence of felsic to intermediate metavolcanic rock (103076) and one of amphibolite (102017). Confidence level = 3.

47.09–76.30 m

RU3: Pegmatitic granite (101057) with one minor occurrence of fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

76.30–142.00 m

RU2b: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061), felsic to intermediate metavolcanic rock (103076), amphibolite (102017) and one occurrence of fine- to medium-grained granite (111058). Confidence level = 3.

Possible deformation zones

No possible deformation zone has been identified in KFR34.

5.3.14 KFR37

Rock Units

The borehole can be divided into four different rock units, RU1–RU4. All rock units have been interpreted with a high degree of confidence.

12.23–24.70 m

RU1: Amphibolite (102017) and aplitic metagranite (101058) in approximately equal proportions. Confidence level = 3.

24.70–45.50 m

RU2: Aplitic metagranite (101058). Confidence level = 3.

45.50–111.30 m

RU3: Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061) and one occurrence of aplitic metagranite (101058). Confidence level = 3.

111.30–204.90 m

RU4: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061) and aplitic metagranite (101058). Confidence level = 3.

Possible deformation zones

Two possible deformation zones of brittle character have been identified in KFR37, one with a medium degree of confidence and one with a high degree of confidence.

36.60–45.60 m

DZ1: Increased frequency of unbroken, irregular fractures, often as sealed networks. α-angles generally > 45°, whereas the tectonic foliation is almost perpendicular to the drill core length axis. Several brecciated intervals, of which the most extensive occurs at 42.60–43.70 m length. Generally weak oxidation. Predominant minerals in unbroken fractures are calcite, adularia, laumontite and hematite. Fine- to medium-grained granite (111058). Confidence level = 2.

Moderate transmissivity of the interval 36–48 m length ($1 \cdot 10^{-6}$ m^2/s).

183.43–193.60 m

DZ2: Increased frequency of broken fractures with an average of c. 10 broken fractures/m outside crushes. Variable α-angles, but generally > 45°. Crushed interval at 191.00–192.35 m length. Generally weak to medium oxidation. Predominant minerals in broken fractures are clay minerals, hematite/Fe-hydroxide and locally chlorite. Fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061). Confidence level = 3.

High transmissivity of the interval 183–194 m length ($4 \cdot 10^{-5}$ m^2/s). The dominating transmissivity is contained in the in the section 191–194 m length.

5.3.15 KFR38

Rock Units

The borehole can be divided into three different rock units, RU1–RU3. Rock unit 2 occurs in two separate length intervals. All rock units have been interpreted with a high degree of confidence.

13.45–42.75 m

RU1: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061) and one occurrence of aplitic metagranite (101058) and one of amphibolite (102017). Confidence level = 3.

42.75–99.65 m

RU2a: Mixed interval dominated by fine- to medium-grained metagranite-granodiorite (101057) with considerable amounts of pegmatitic granite (101061), aplitic metagranite (101058) and amphibolite (102017). Subordinate occurrences of fine- to medium-grained granite (111058). Confidence level = 3.

99.65–122.43 m

RU3: Fine- to medium-grained granite (111058) with a minor occurrence of pegmatitic granite (101061) in the uppermost part of the interval. Confidence level = 3.

122.43–185.40 m

RU2b: Mixed interval dominated by fine- to medium-grained metagranite-granodiorite (101057) with considerable amounts of pegmatitic granite (101061) and aplitic metagranite (101058). Subordinate occurrences of amphibolite (102017) and one occurrence of fine- to medium-grained granite (111058). Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle character and with high degree of confidence has been interpreted in KFR38.

153.60–181.65 m

DZ1: Increased frequency of broken and unbroken fractures. Several crushes, of which the most extensive occurs at 178.90–186.00 m length. Generally α-angles > 45°. Locally weak oxidation. Amphibolites are consistently weakly chloritized. Predominant minerals in broken fractures are clay minerals, chlorite, hematite, calcite and laumontite and in unbroken fractures laumontite, calcite and hematite. Pegmatitic granite (101061), fine- to medium-grained metagranite-granodiorite (101057), aplitic metagranite (101058) and amphibolite (102017). Confidence level = 3.

High transmissivity of the interval 153–182 m length ($4 \cdot 10^{-5}$ m^2/s). The dominating transmissivity is contained in the in the section 179–182 m length.

5.3.16 KFR51

Rock Units

The borehole can be divided into two different rock units, RU1–RU2. Both rock units have been interpreted with a high degree of confidence.

0–30.07 m

RU1: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076), pegmatitic granite (101061) and amphibolite (102017). Confidence level = 3.

30.07–46.28 m

RU2: Pegmatitic granite (101061) with one minor occurrence of felsic to intermediate metavolcanic rock (103076) in the lower part of the interval. Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle character and with low degree of confidence has been interpreted in KFR51.

9.84–11.15 m

DZ1: Increased frequency of unbroken and broken fractures. α-angles between 35–50°. Locally oxidation. Amphibolites are consistently weakly chloritized. Predominant minerals are laumontite, calcite and chlorite. Felsic to intermediate metavolcanic rock (103076) and fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 1.

No hydraulic test data from this borehole.

5.3.17 KFR52

Rock Units

The borehole can be divided into one rock unit, RU1, which has been interpreted with a high degree of confidence.

0–29.95 m

RU1: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained granite (111058), fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017). Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle character and with low degree of confidence has been interpreted in KFR52.

19.85–22.40 m

DZ1: Several fractures with low α-angles (c. 25°) and infillings of chlorite and clay minerals in the section 21.70–22.40 m length. Strong argillization and generally crushed in the section 20.99–21.11 m length. Most fractures have α-angles > 60°. Calcite sealed breccia with low α-angle (c. 25°) at 19.85–20.05 m length. Faint to weak oxidation throughout the interval. Pegmatitic granite (101061), fine- to medium-grained granite (111058) and strongly foliated metagranite-granodiorite (101057). Confidence level = 2.

No hydraulic test data from this borehole.

5.3.18 KFR57

Rock Units

The borehole can be divided into two different rock units, RU1–RU2. Both rock units have been interpreted with a medium degree of confidence.

0–16.44 m

RU1: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of amphibolite (102017), fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061). Confidence level = 2.

16.44–25.38 m

RU2: Pegmatitic granite (101061) and fine- to medium-grained granite (111058) in approximately equal proportions. Confidence level = 2.

Possible deformation zones

One possible deformation zone of brittle character and with high degree of confidence has been interpreted in KFR57.

15.85–25.38 m

DZ1: Increased frequency of broken fractures. Varying α-angles with generally low angles (< 30°) in the cental part of the interval. Generally faint to moderate oxidation and at 16.80–21.50 m length argillization, locally of strong intensity. Predominant minerals in broken fractures are clay minerals. Pegmatitic granite (101061), fine- to medium-grained granite (111058) and amphibolite (102017). Confidence level = 3.

No hydraulic test data from this borehole.

5.3.19 KFR61

Rock Units

The borehole can be divided into two different rock units, RU1–RU2. Both rock units have been interpreted with a medium degree of confidence.

1.43–44.35 m

RU1: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061), one minor occurrence of fine- to medium-grained metagranitoid (101051) and one of amphibolite (102017). Confidence level = 3.

44.35–70.90 m

RU2: Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076) in the upper part of the interval. Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle and locally brittle-ductile character and with high a degree of confidence has been interpreted in KFR61.

1.40–70.90 m

DZ1: Generally 10–15 broken fractures/m. Varying α-angles but generally >45°. A considerable proportion of the fractures are oriented parallel with the tectonic foliation. More highly fractured with several crushes, cataclasite and brecciation in the approximate section between 50 and 65 m length. Very local argillization and the amphibolite is affected by chloritisation. Predominant minerals in broken fractures are chlorite, calcite, laumontite and clay minerals. In the section 50–60 m length clay minerals and asphaltite dominate the fracture mineralogy. Cataclasite (108003), high strained pegmatitic granite (101061), recrystallized metagranite-granodiorite (101057) and amphibolite (102017). Confidence level = 3.

No hydraulic test data from this borehole.

5.3.20 KFR62

Rock Units

The borehole can be divided into two different rock units, RU1–RU2. Both rock units have been interpreted with a medium degree of confidence.

1.40–30.18 m

RU1: Felsic to intermediate metavolcanic rock (103076) with minor occurrences of pegmatitic granite (101061). Confidence level = 3.

30.18–82.80 m

RU2: Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle and locally brittle-ductile character and with high degree of confidence has been interpreted in KFR62.

45.64–82.80 m

DZ1: Increased frequency of unbroken and particularly broken fractures, with 10–20 broken fractures/m. Several crushes in the section 51.90–77.00 m length. Generally high α-angles with a considerable amount parallel with the tectonic foliation. Locally brittle-ductile deformation. Cataclasite and locally breccia between 53.00 and c. 73 m length. Minor occurrences of faint oxidation and moderate to strong argillization. Predominant in broken fractures are clay minerals, chlorite, calcite and locally asphaltite. Strongly foliated pegmatitic granite (101061), cataclasite (108003), strongly foliated metagranite-granodiorite (101057) and amphibolite (102017). Confidence level = 3.

No hydraulic test data from this borehole.

5.3.21 KFR63

Rock Units

The borehole can be described by one rock unit, RU1, which has been interpreted with a high degree of confidence.

0–15.08 m

RU1: Felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

Possible deformation zones

No possible deformation zones have been identified in KFR63.

5.3.22 KFR64

Rock Units

The borehole can be divided into three different rock units, RU1–RU3. All rock units have been interpreted with a high degree of confidence.

12.79–30.79 m

RU1: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061) and one occurrence of amphibolite (102017) in the uppermost part of the interval. Confidence level = 3.

30.79–43.55 m

RU2: Pegmatitic granite (101061). Confidence level = 3.

43.55–54.17 m

RU3: Felsic to intermediate metavolcanic rock (103076) with subordinate pegmatitic granite (101061). Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle and brittle-ductile character and with a high degree of confidence has been interpreted in KFR64.

12.79–54.17 m

DZ1: Highly fractured, locally with > 20 broken fractures/m. Several crushed sections. α-angles generally > 45° and parallel with the tectonic foliation. Unbroken fractures with aperture occur locally. Strong brittle-ductile deformation throughout the borehole. Brecciated cataclasite at 11.60–19.00 m length. Locally strong argillization and in the lowermost 10 m also muscovitization and chloritization. Predominant minerals in broken fractures are clay minerals, chlorite and more subordinate laumontite, calcite and asphaltite. Pegmatitic granite (101061), cataclasite (108003), amphibolite (102017), strongly foliated metagranite-granodiorite (101057) and possibly felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

No hydraulic test data from this borehole.

5.3.23 KFR65

Rock Units

The borehole can be divided into one rock unit, RU1, which has been interpreted with a high degree of confidence.

10.73–39.68 m

RU1: Felsic to intermediate metavolcanic rock (103076) with subordinate pegmatitic granite (101061) in the uppermost and lowermost part. Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle character and with high degree of confidence has been interpreted in KFR65.

17.63–39.68 m

DZ1: Increased frequency of unbroken and broken fractures. Highly variable α-angles. Note that the tectonic foliation is sub-parrallel with the borehole direction. Locally faint oxidation. Predominant minerals in broken and unbroken fractures are laumontite and calcite. Recrystallised metagranite-granodiorite (101057). Confidence level = 2.

No hydraulic test data from this borehole.

5.3.24 KFR66

Rock Units

The borehole can be described by one rock unit, RU1, which has been interpreted with a high degree of confidence.

14.99–29.17 m

RU1: Amphibolite (102017) and pegmatitic granite (101061), generally with a cataclastic overprinting, which hampers identification of the protolith. Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle and brittle-ductile character and with high degree of confidence has been interpreted in KFR66.

14.99–29.17 m

DZ1: Increased frequency of broken fractures. Crushes predominate down to 6.08 m length with several minor crushes below that drill core length. Generally high, but variable α-angles. Virtually the entire interval consists of brecciated cataclasite. Chloritization of amphibolites and locally some argillization of granitic material. Generally faint to moderate oxidation and at 16.80–21.50 m length argillization, locally of strong intensity. Predominant minerals in broken fractures are clay minerals, calcite, chlorite and locally asphaltite. Cataclasite (108003) in the uppermost metre with a pegmatitic precursor and in the lowermost metre of amphibolitic composition. Confidence level = 3.

No hydraulic test data from this borehole.

5.3.25 KFR67

Rock Units

The borehole can be divided into two different rock units, RU1–RU2. Both rock units have been interpreted with a medium degree of confidence.

13.74–36.87 m

RU1: Pegmatitic granite (101061) with subordinate occurrences of amphibolite (102017) and one minor occurrence of felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

36.87–48.95 m

RU2: Felsic to intermediate metavolcanic rock (103076) and amphibolite (102017) in approximately equal proportions. Subordinate occurrences of pegmatitic granite (101061). Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle character and with high degree of confidence has been interpreted in KFR67.

13.74–48.95 m

DZ1: High frequency of broken fractures with > 10 broken fractures/m, locally up to 30 fractures/m. Fracture orientations generally parallel with the tectonic foliation with α-angles at 45–50°. Several minor crushes. Locally faint oxidation and amphibolites affected by weak to moderate chloritization. Strong ductile strain throughout the drill core. Predominant minerals in broken fractures are chlorite, clay minerals and calcite. Pegmatitic granite (101061), amphibolite (102017) and strongly foliated metagranite-granodiorite (101057). Confidence level = 3.

No hydraulic test data from this borehole.

5.3.26 KFR68

Rock Units

The borehole can be divided into three different rock units, RU1–RU3. Rock unit 2 occurs in two separate length intervals. Two rock units have been interpreted with a medium degree of confidence and one with a high degree of confidence.

11.31–30.21 m

RU1: Fine- to medium-grained metagranite-granodiorite (101057) with minor occurrences of pegmatitic granite (101061). Confidence level = 2.

30.21–76.31 m

RU2a: Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061). Confidence level = 3.

76.31–104.81 m

RU3: Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of fine- to medium-grained granite (111058), pegmatitic granite (101061) and amphibolite (102017). Confidence level = 3.

104.81–128.03 m

RU2b: Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061) and one occurrence of felsic to intermediate metavolcanic rock (102017). Confidence level = 3.

Possible deformation zones

Two possible deformation zones of brittle character have been identified in KFR68, one with a low degree of confidence and one with a high degree of confidence.

71.59–78.11 m

DZ1: Increased frequency of broken fractures, locally also sealed fracture networks. Most of the section at 64.28–66.72 m length is crushed. Variable α-angles, but generally > 45°. Locally faint to weak argillization. Weak muscovitization throughout the interval. Predominant minerals in broken and unbroken fractures are clay minerals, calcite and chlorite. Pegmatitic granite (101061) and aplitic metagranite (101058). Confidence level = 3.

Transmissivity below the measurement limit ($7 \cdot 10^{-7}$ m^2/s).

102.83–105.13 m

DZ2: Increased frequency of broken fractures and crushes. Variable α-angles. Weak to moderate oxidation throughout the interval. Predominant minerals in broken fractures are clay minerals, chlorite, hematite and calcite. Fine- to medium-grained granite (111058) and pegmatitic granite (101061). Confidence level = 1.

Moderate transmissivity of the interval 91.2–94.2 m length ($8 \cdot 10^{-7}$ m^2/s).

5.3.27 KFR69

Rock Units

The borehole can be divided into three different rock units, RU1–RU3. Rock unit 1 occurs in two separate length intervals. All rock units have been interpreted with a high degree of confidence.

11.68–80.77 m

RU1a: Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in approximately equal proportions. One minor occurrence of aplitic metagranite (101058). Confidence level = 3.

80.77–116.40 m

RU2: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained granite (111058). Confidence level = 3.

116.40–159.96 m

RU1b: Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in approximately equal proportions. One minor occurrence of amphibolite (102017). Confidence level = 3.

159.96–201.20 m

RU3: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061). Single minor occurrences of felsic to intermediate metavolcanic rock (103076), fine- to medium-grained metatonalite-granodiorite (101054), fine- to medium-grained granite (111058) and amphibolite (102017). Confidence level = 3.

Possible deformation zones

Two possible deformation zones of brittle character have been identified in KFR69, one with a medium degree of confidence and one with a high degree of confidence.

52.38–79.00 m

DZ1: Increased frequency of broken fractures in the interval 52.38–60.50 m length with an average of c. 12 broken fractures/m outside crushes. Generally α-angles > 45°. Minor crush at 60.25–60.35 m length. Faint oxidation in the interval 52.38–60.50 m length. Calcite alteration of weak to medium intensity in the interval 60.50–79.00 m length. Predominant minerals in broken fractures are hematite/Fe-hydroxide, chlorite, calcite and laumontite. Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057), muscovite bearing in the interval 60.50–79.00 m length. Confidence level = 2.

Moderate transmissivity of the interval ($2 \cdot 10^{-7}$ m^2/s).

121.60–146.10 m

DZ2: Increased frequency of broken and unbroken fractures with sealed fracture networks in the upper 4 m of the interval. 10–20 broken fractures/m throughout the interval. Generally fracture orientations deviating from the orientation of the foliation with α-angles > 45°. Mostly weak to moderate oxidation and locally carbonatization. At 142.31–142.94 m length a highly fractured and chloritized amphibolite. Predominant minerals in broken and unbroken fractures are calcite, hematite, chlorite and laumontite and in the sealed fracture networks adularia and calcite. Pegmatitic granite (101061), fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017). Confidence level = 3.

High transmissivity of the interval 120–132 m length ($1 \cdot 10^{-5}$ m^2/s). The dominating transmissivity is contained in the in the section 126–129 m length. Moderate transmissivity in the interval 132–201 m length ($7 \cdot 10^{-7}$ m^2/s).

5.3.28 KFR70

Rock Units

The borehole can be divided into three different rock units, RU1–RU3. Both rock units 1 and 2 occur in two separate length intervals. All rock units have been interpreted with a high degree of confidence.

9.24–37.53 m

RU1a: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

37.53–50.30 m

RU2a: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017) and one occurrence of pegmatitic granite (101061). Confidence level = 3.

50.30–78.04 m

RU1b: Pegmatitic granite (101061) with one occurrence of fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

78.04–93.04 m

RU2b: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017) and pegmatitic granite (101061). Confidence level = 3.

93.04–172.50 m

RU3: Pegmatitic granite (101061). Confidence level = 3.

Possible deformation zones

No possible deformation zones have been identified in KFR70.

5.3.29 KFR71

Rock Units

The borehole can be divided into four different rock units, RU1–RU4. Rock unit 3 occurs in two separate length intervals. All rock units have been interpreted with a high degree of confidence.

0–9.08 m

RU1: Amphibolite (102017). Confidence level = 3.

9.08–54.58 m

RU2: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061), one occurrence of felsic to intermediate metavolcanic rock (103076) and one minor occurrence of amphibolite (102017). Confidence level = 3.

54.58–79.00 m

RU3a: Mixed interval, consisting of fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061). One occurrence of amphibolite (102017) and one of fine- to medium-grained granite (111058). Confidence level = 3.

79.00–90.20 m

RU4: Cataclastic rock (108003). Confidence level = 3.

90.20–120.90 m

RU3b: Mixed interval, consisting of fine- to medium-grained metagranite-granodiorite (101057), pegmatitic granite (101061) and amphibolite (102017). Confidence level = 3.

Possible deformation zones

Two possible deformation zones of brittle and locally brittle-ductile character have been identified in KFR71, both with a high degree of confidence.

65.67–69.50 m

DZ1: Increased frequency of unbroken fractures. Generally brittle-ductile deformation and locally minor crushes. α-angles generally parallel with the foliation (i.e. > 50°). Moderate chloritization of amphibolites and weak to moderate oxidation of pegmatitic granites. Predominant minerals in broken fractures are clay minerals, calcite, chlorite and laumontite and in unbroken fractures epidote. Pegmatitic granite (101061), metagranite-granodiorite (101057), and amphibolite (102017). Confidence level = 3.

Relatively high transmissivity of the interval 60–70 m length ($3 \cdot 10^{-6}$ m^2/s).

72.14–120.90 m

DZ2: Increased frequency of broken and locally unbroken fractures, with fracture frequencies exceeding 15 and locally 30 fractures/m. Consistently strong brittle-ductile deformation and extensive intervals of cataclasite. Several crushed sections of which the most extensive exceeds one metre. The majority of the fractures are parallel with the foliation with α-angles > 45°. Predominant fracture minerals are clay minerals, chlorite and calcite. Locally, occurrences of asphaltite. Amphibolites are generally chloritized. Muscovitization from 109 m length to the end of the interval. Local argillization. Fine- to medium-grained metagranite-granodiorite (101057), cataclasite (108003), amphibolite (102017) and pegmatitic granite (101061). Confidence level = 3.

Very high transmissivity of the interval 70–120.90 m length ($2 \cdot 10^{-4}$ m^2/s). The absolutely dominating transmissivity is contained in the in the section 80–120.93 m length.

5.3.30 KFR72

Rock Units

The borehole can be divided into five different rock units, RU1–RU5. All rock units have been interpreted with a high degree of confidence.

0–10.60 m

RU1: Felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

10.60–23.95 m

RU2: Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

23.95–41.50 m

RU3: Amphibolite (102017) and felsic to intermediate metavolcanic rock (103076). Confidence level = 3.

41.50–69.03 m

RU4: Fine- to medium-grained metagranite-granodiorite (101057). Confidence level = 3.

69.03–100.53 m

RU5: Fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061) in approximately equal proportions. Minor occurrences of amphibolite (102017). Confidence level = 3.

Possible deformation zones

Two possible deformation zones of brittle and locally brittle-ductile character have been identified in KFR72, both with a high degree of confidence.

0–13 m

DZ1: Increased frequency of broken fractures, especially in the upper half of the interval where the frequency locally exceeds 30 fractures/m. High α-angles, generally parallel with the orientation of the foliation. Brittle-ductile from 0 to 8.40 m length. Several minor crushes. Locally faint muscovitization and argillization. Predominant minerals in broken fractures are clay minerals, chlorite and calcite. Fine- to medium-grained metagranite-granodiorite (101057) and felsic to intermediate volcanic rock (103076). Confidence level = 3.

No hydraulic test data from this borehole.

23.90–153 m

DZ2: Increased frequency of broken and locally unbroken fractures, especially between 23.90 and 64.83 m length, where the frequency is about 20 fractures/m. The fracture frequency below that ranges between 10 to 20 fractures/m. Slightly lower fracture frequencies in pegmatitic granites. The majority of the fractures are parallel with the foliation with α-angles > 50°. Predominant alterations are chloritization, argillization and muscovitization. Predominant minerals in broken and unbroken fractures are chlorite, clay minerals, calcite, hematite and laumontite. Fine- to medium-grained metagranite-granodiorite (101057), pegmatitic granite (101061), amphibolite (102017) and felsic to intermediate metavolcanic rocks (103076). Confidence level = 3.

No hydraulic test data from this borehole.

5.3.31 KFR89

Rock Units

The borehole can be described by one rock unit, RU1, which has been interpreted with a high degree of confidence.

0–17.00 m

RU1: Fine- to medium-grained metagranite-granodiorite (101057) with one occurrence of amphibolite (102017). Confidence level = 3.

Possible deformation zones

One possible deformation zone of brittle character and with low degree of confidence has been interpreted in KFR89.

10.53–14.40 m

DZ1: Increased frequency of broken fractures with at least 8 fractures/m (some core material is missing in the interval due to sampling and overcoring). Variable α-angles; in the amphibolites generally parallel with the orientation of the foliation. Brittle-ductile deformation at the lower end of the interval. Locally faint to weak oxidation. Predominant minerals in broken fractures are chlorite, calcite, clay minerals and hematite. Fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017). Confidence level = 1.

No hydraulic test data from this borehole.

5.3.32 SFR (Silo 1)

Rock Units

The borehole can be divided into three different rock units, RU1–RU3. All rock units have been interpreted with a high degree of confidence. Note that there is no WellCAD-log in Appendix 1 for this borehole, since the results have not been store in Sicada yet.

0–7.78 m

RU1: Pegmatitic granite (101061). Confidence level = 3.

7.78–32.85 m

RU2: Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of fine- to medium-grained granite (111058), pegmatitic granite (101061), amphibolite (102017) and felsic to intermediate metavolcanic rock (103076). Confidence level = 2.

32.85–45.12 m

RU3: Felsic to intermediate metavolcanic rock (103076) and pegmatitic granite (101061) in approximately equal proportions. Minor occurrences of amphibolite (102017) in the upper part of the interval. Confidence level = 2.

Possible deformation zones

No possible deformation zones have been identified in SFR (Silo 1).

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WellCAD image

Title GEOLOGY KFR01

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR01	**Northing [m]**	6701434.83
Diameter [mm]		**Easting [m]**	1632453.42
Length [m]	62.300	**Elevation [m]**	-47.97
Bearing [°]	230.50	**Plot Date**	2010-03-09
Inclination [°]	-59.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

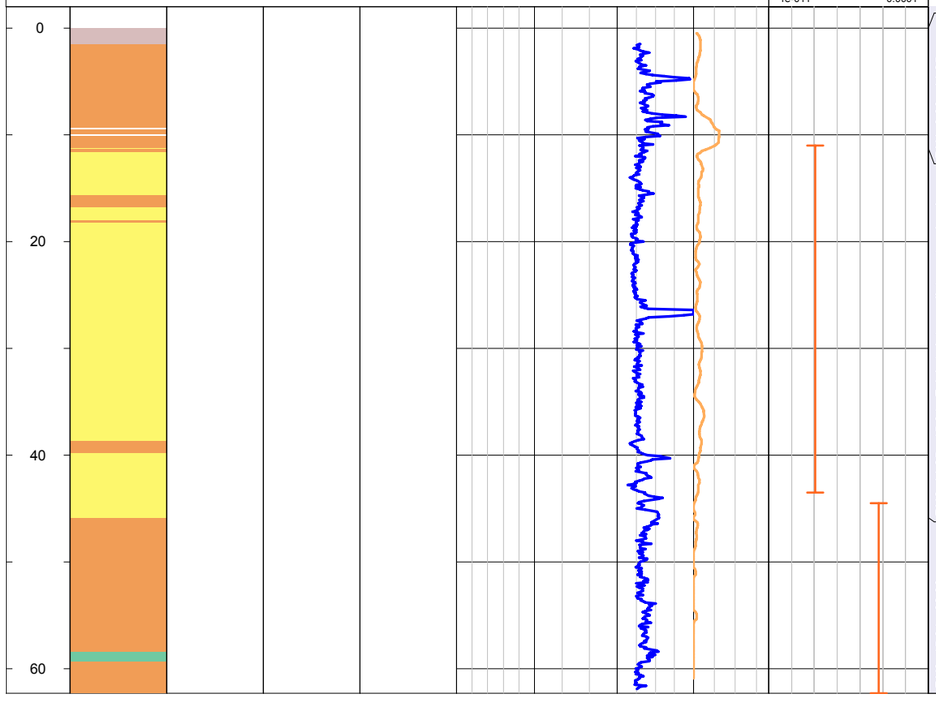
- Pegmatite, pegmatitic granite
- Granite to granodiorite, metamorphic, medium-grained
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m^3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70



RU1 0.00 - 11.25 Pegmatitic granite (101061) with one occurrence of fine- to medum-grained metagranite-granodiorite (101057) in the uppermost part of the interval.

RU2 11.25 - 45.84 Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061).

RU3 45.84 - 62.30 Pegmatitic granite (101061) with one subordinate occurrence of amphibolite (102017) in the lower part of the interval.

DZ1 0.00 - 62.30 High frequency of broken fractures, with consistently more than 10 broken fractures per metre; locally considerably more, especially in the lowermost 18 m, which consists of pegmatitic granite (101061). Alpha angles in the pegmatitic granite (101061) are generally high and in the strongly foliated felsic to intermediate volcanic rock (103076) generally parallel with the foliation. In the interval 18.25–29.40 m there is brittle-ductile deformation and intense foliation, locally cataclasite in the pegmatitic granite (101061). Several crushes, especially between 49 m and the end of the borehole. Muscovitization and faint to weak argillization of the felsic to intermediate metavolcanic rock (103076). Predominant minerals in broken fractures are calcite, clay minerals and locally chlorite; in the pegmatitic granite (101061) mainly calcite. The SPR log is generally decreased along the entire borehole (200 ohm relative to the 'normal' background of 1,000 ohm), which indicates a high frequency of open fractures. Felsic to intermediate metavolcanic rock (103076) and pegmatitic granite (101061).

DZ1 0.00 - 62.30 No hydraulic test data from the section 0–11.0 m. The transmissivity of the section 11.0–43.5 m is low (4E–8 m^2/s). Increased transmissivity (1E–6 m^2/s) of the section 44.5–62.3 m.

Title GEOLOGY KFR02

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR02	**Northing [m]**	6701770.05
Diameter [mm]	56	**Easting [m]**	1632887.79
Length [m]	170.330	**Elevation [m]**	-85.42
Bearing [°]	0.00	**Plot Date**	2010-03-09
Inclination [°]	-89.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

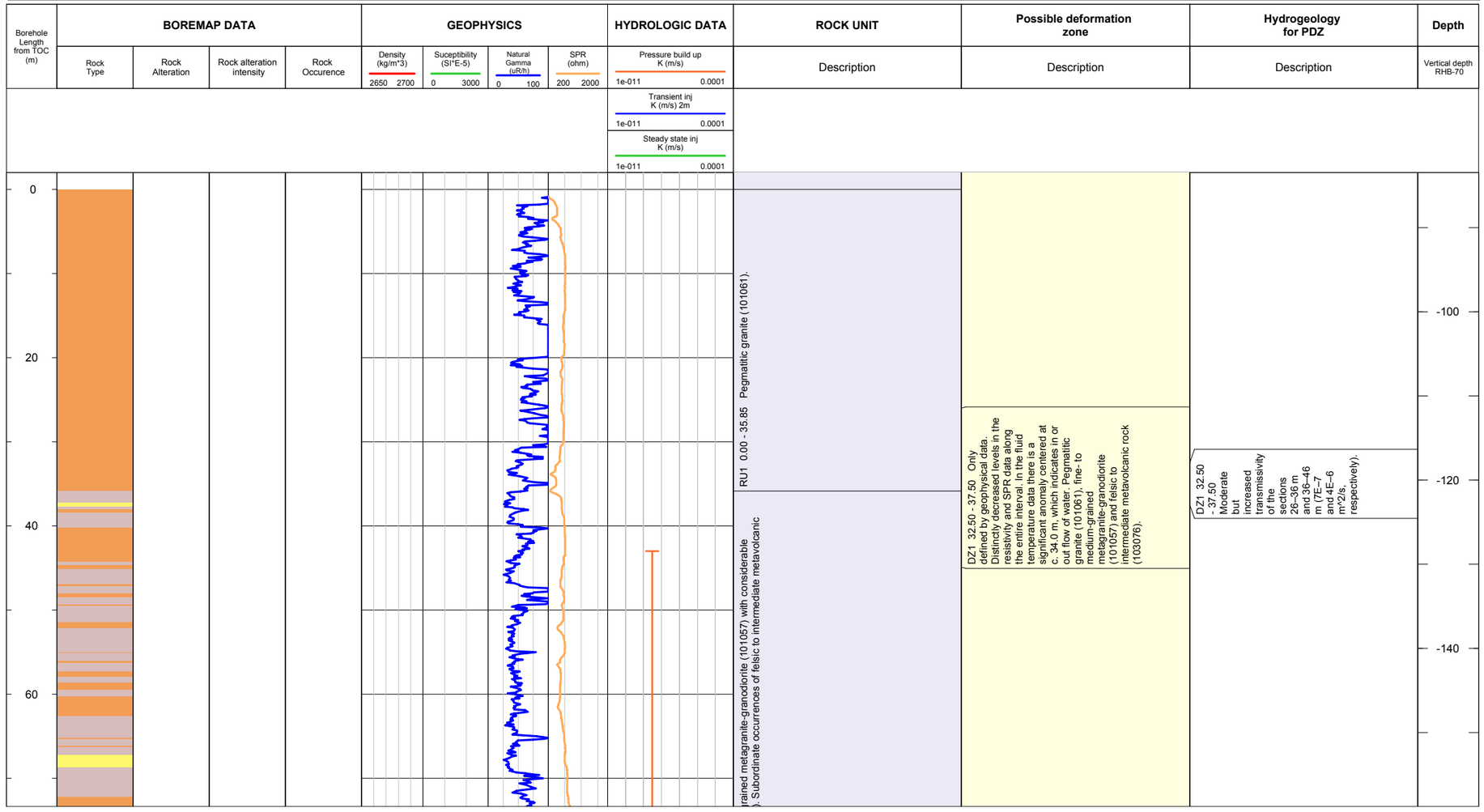
ROCKTYPE

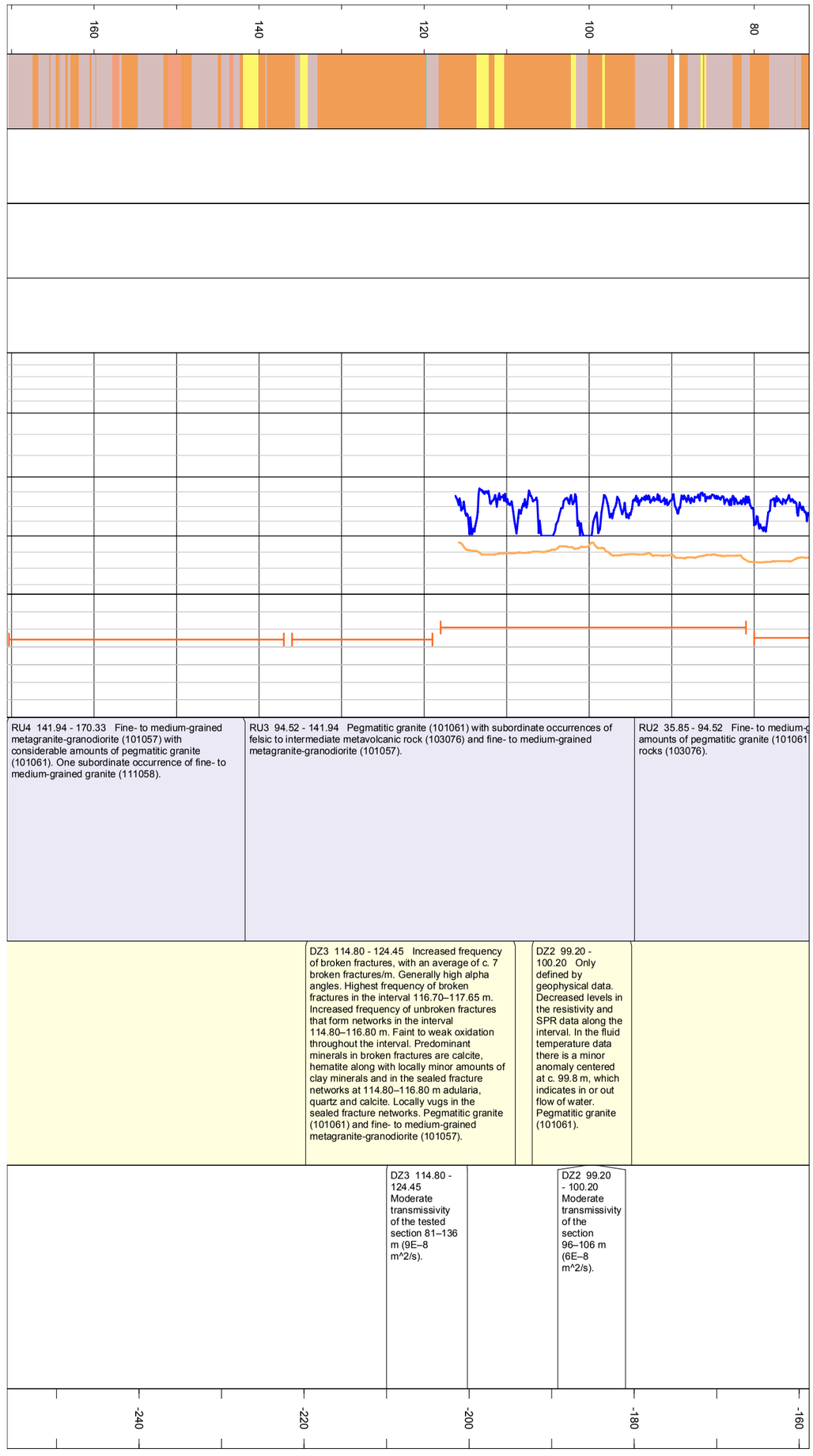
- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE




80
100
120
140
160
RU4 141.94 - 170.33 Fine- to medium-grained metagranite-granodiorite (101057) with considerable amounts of pegmatitic granite (101061). One subordinate occurrence of fine- to medium-grained granite (111058).
RU3 94.52 - 141.94 Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076) and fine- to medium-grained metagranite-granodiorite (101057).
RU2 35.85 - 94.52 Fine- to medium-g
amounts of pegmatitic granite (101061
rocks (103076).
DZ3 114.80 - 124.45 Increased frequency of broken fractures, with an average of c. 7 broken fractures/m. Generally high alpha angles. Highest frequency of broken fractures in the interval 116.70–117.65 m. Increased frequency of unbroken fractures that form networks in the interval 114.80–116.80 m. Faint to weak oxidation throughout the interval. Predominant minerals in broken fractures are calcite, hematite along with locally minor amounts of clay minerals and in the sealed fracture networks at 114.80–116.80 m adularia, quartz and calcite. Locally vugs in the sealed fracture networks. Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057).
DZ2 99.20 - 100.20 Only defined by geophysical data. Decreased levels in the resistivity and SPR data along the interval. In the fluid temperature data there is a minor anomaly centered at c. 99.8 m, which indicates in or out flow of water. Pegmatitic granite (101061).
DZ3 114.80 - 124.45 Moderate transmissivity of the tested section 81–136 m (9E–8 m^2/s).
DZ2 99.20 - 100.20 Moderate transmissivity of the section 96–106 m (6E–8 m^2/s).
-240
-220
-200
-180
-160

Title GEOLOGY KFR03

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR03	**Northing [m]**	6701908.96
Diameter [mm]	56	**Easting [m]**	1632997.74
Length [m]	101.600	**Elevation [m]**	-82.36
Bearing [°]	0.00	**Plot Date**	2010-03-09
Inclination [°]	-89.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

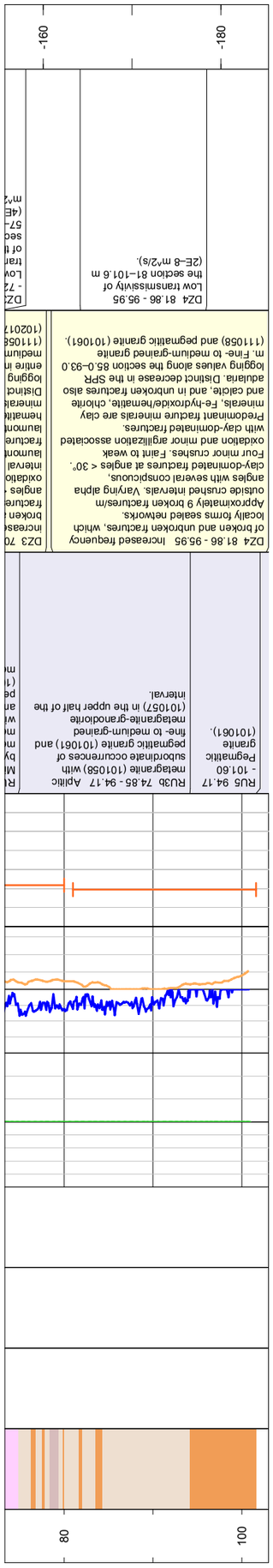
- Pegmatite, pegmatitic granite
- Granite, granodiorite and tonalite, metamorphic, fine- to medium-grained
- Granite, metamorphic, aplitic
- Granite to granodiorite, metamorphic, medium-grained
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0													
20													
40													
60													
										RU1 0.00 - 18.86 In the uppermost 6 m consists of fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061). The remaining part of the interval consists of felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of amphibolite (102017).	DZ1 6.00 - 12.00 Only defined by geophysical data. Distinct decrease in the SPR logging data along the entire interval. Felsic to intermediate metavolcanic rock (103076) and amphibolite (102017).	DZ1 6.00 - 12.00 Moderate transmissivity of the section 5–44 m (1E–6 m^2/s).	-100
										RU2 18.86 - 46.00 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057).			
										RU3a 46.00 - 59.49 Aplitic metagranite (101058) wit one minor occurrence of pegmatitic granite (101061) in the upper part of the interval.	DZ2 48.00 - 53.65 Increased frequency of broken and unbroken fractures. Generally alpha angles > 45°. Crushed section at 50.85–51.20 m. A 4 dm long laumontite-sealed breccia at approximately 49.5 m. Generally faint oxidation. Predominant fracture minerals are laumontite, calcite, clay minerals, chlorite and hematite. Distinct decrease in the SPR logging data along the entire interval. Moderately foliated metagranite-granodiorite (101057) and pegmatitic granite (101061).	DZ2 48.00 - 53.65 Moderate transmissivity of the section 45–56 m (3E–7 m^2/s).	-120
										J4 59.49 - 74.85 xed interval dominated fine- to edium-grained etagranitoid (101051) th occurrences of mphibolite (102017), gmatitic granite 01061) and aplitic etagranite (101058).	.42 - 72.75 Slightly ed frequency of and unbroken s. Generally alpha < 45°. Faint to weak n and in most of the strong ization. Predominant minerals are ite. e/Fe-hydroxide, clay s and chlorite. decrease in the SPR values along the terval. Fine- to -grained granite) and amphibolite).	B 70.42 :75 y smissivity he tion 80 m –8 2/s).	-140



RU5 94.17 - 101.60 Pegmatitic granite (101061).

RU3b 74.85 - 94.17 Aplitic metagranite (101058) with subordinate occurrences of pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in the upper half of the interval.

DZ24 81.86 - 95.95 Increased frequency of broken and unbroken fractures, which locally forms sealed networks. Approximately 9 broken fractures/m outside crushed intervals. Varying alpha angles with several conspicuous, clay-dominated fractures at angles < 30°. Four minor crushes. Faint to weak oxidation and minor argillization associated with clay-dominated fractures. Predominant fracture minerals are clay minerals, Fe-hydroxide/hematite, chlorite and calcite, and in unbroken fractures also adularia. Distinct decrease in the SPR logging values along the section 85.0–93.0 m. Fine- to medium-grained granite (111058) and pegmatitic granite (101061).

DZ24 81.86 - 95.95 Low transmissivity of the section 81–101.6 m (2E–8 m^2/s).

Title GEOLOGY KFR05

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR05	**Northing [m]**	6701946.04
Diameter [mm]	56	**Easting [m]**	1633056.58
Length [m]	131.400	**Elevation [m]**	-77.15
Bearing [°]	9.10	**Plot Date**	2010-03-09
Inclination [°]	-69.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

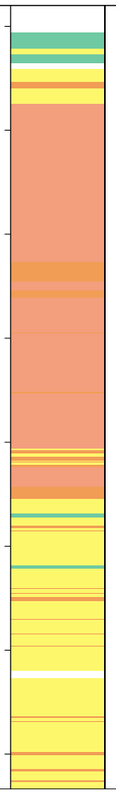
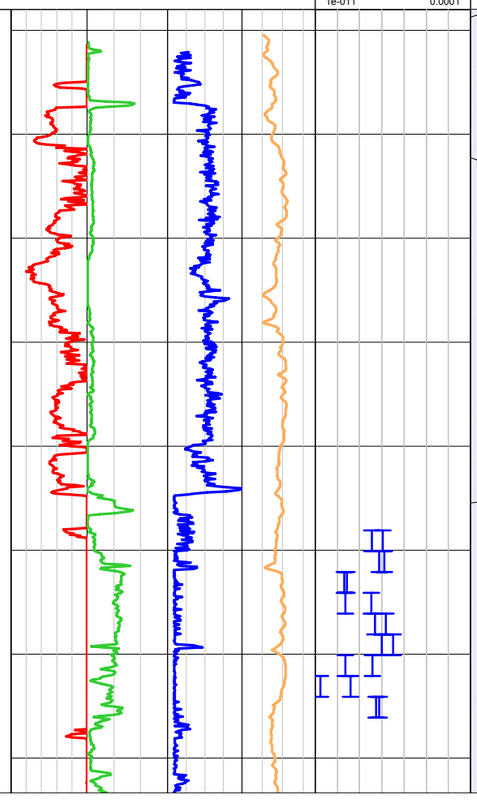
ROCKTYPE

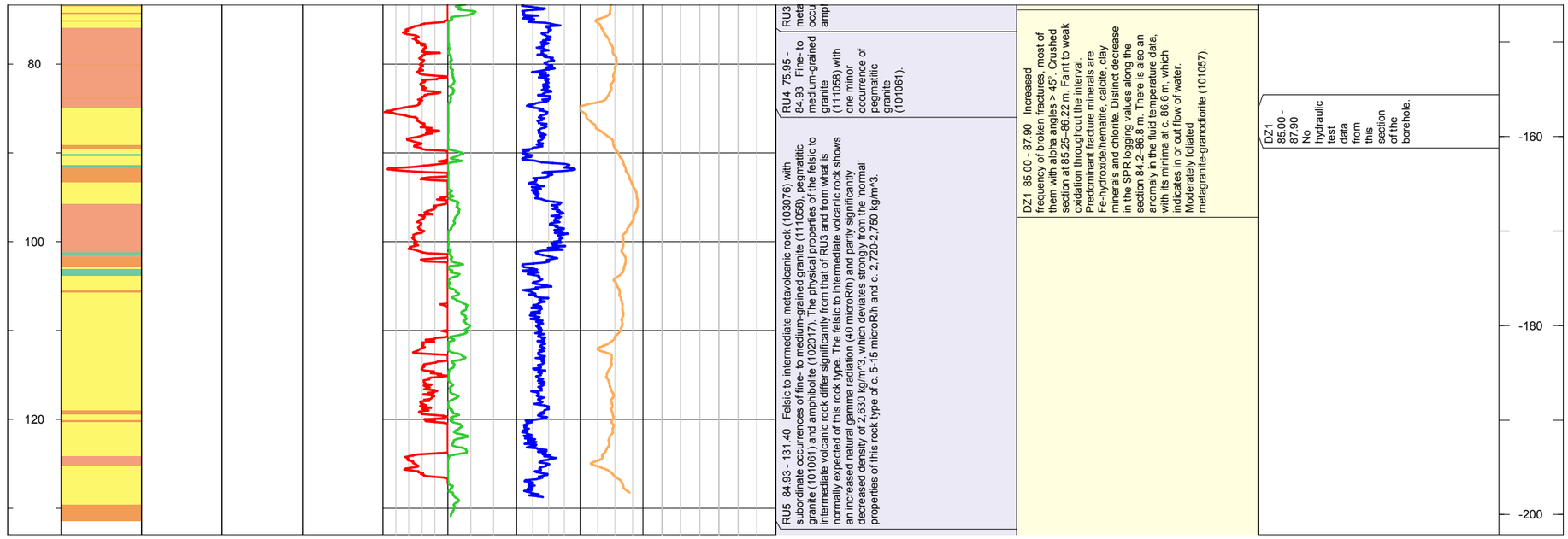
- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA: Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	GEOPHYSICS: Density (kg/m*3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	HYDROLOGIC DATA: Pressure build up K (m/s) 1e-011 0.0001	Transient inj K (m/s) 2m 1e-011 0.0001	Steady state inj K (m/s) 1e-011 0.0001	ROCK UNIT: Description	Possible deformation zone: Description	Hydrogeology for PDZ: Description	Depth: Vertical depth RHB-70
0 – 20 – 40 – 60												RU1 0.60 - 7.48 The upper half of the interval consists of amphibolite (102017) one occurrence of felsic to intermediate metavolcanic rock (103076), whereas the lower half consists of felsic to intermediate metavolcanic rock (103076) with one occurrence of pegmatitic granite (101061). RU2 7.48 - 45.44 Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061) and in the lower part felsic to intermediate metavolcanic rock (103076). 45.44 - 75.95 Felsic to intermediate volcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061) and amphibolite (102017).			-80 – -100 – -120 – -140


80
100
120
-160
-180
-200
RU5 84.93 - 131.40 Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of fine- to medium-grained granite (111058), pegmatitic granite (101061) and amphibolite (102017). The physical properties of the felsic to intermediate volcanic rock differ significantly from that of RU3 and from what is normally expected of this rock type. The felsic to intermediate volcanic rock shows an increased natural gamma radiation (40 microR/h) and partly significantly decreased density of 2,630 kg/m^3, which deviates strongly from the 'normal' properties of this rock type of c. 5-15 microR/h and c. 2,720-2,750 kg/m^3.
RU4 75.95 - 84.93 Fine- to medium-grained granite (111058) with one minor occurrence of pegmatitic granite (101061).
RU3 meta occu amp
DZ1 85.00 - 87.90 Increased frequency of broken fractures, most of them with alpha angles > 45°. Crushed section at 85.25–86.22 m. Faint to weak oxidation throughout the interval. Predominant fracture minerals are Fe-hydroxide/hematite, calcite, clay minerals and chlorite. Distinct decrease in the SPR logging values along the section 84.2–86.8 m. There is also an anomaly in the fluid temperature data, with its minima at c. 86.6 m, which indicates in or out flow of water. Moderately foliated metagranite-granodiorite (101057).
DZ1 85.00 - 87.90 No hydraulic test data from this section of the borehole.

Title GEOLOGY KFR10

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR10	**Northing [m]**	6701882.58
Diameter [mm]	56	**Easting [m]**	1632755.89
Length [m]	107.280	**Elevation [m]**	-78.29
Bearing [°]	302.50	**Plot Date**	2010-03-09
Inclination [°]	-44.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

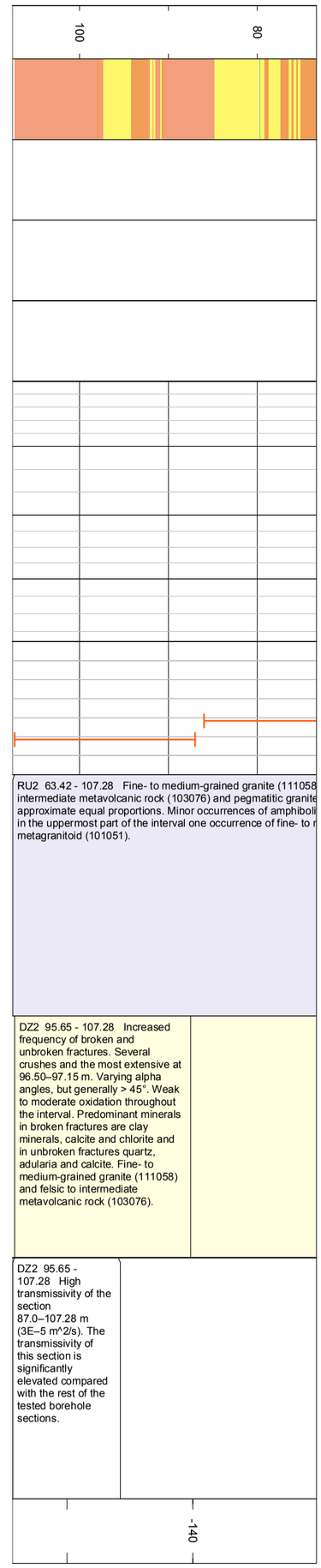
- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite, granodiorite and tonalite, metamorphic, fine- to medium-grained**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m^3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0										RU1 0.00 - 63.42 Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of fine- to medium-grained granite (111058), pegmatitic granite (101061), amphibolite (102017) and one occurrence of fine- to medium-grained metagranite-granodiorite (103076).	DZ1 0.00 - 5.00 Increased frequency of broken and locally unbroken fractures. Alpha angles > 45°. Weak to medium oxidation outside amphibolites. Predominant fracture minerals are chlorite, laumontite, calcite and clay minerals. Moderately foliated metagranite-granodiorite (101057) and amphibolite (102017).	DZ1 0.00 - 5.00 No hydraulic test data from this section of the borehole.	-80
20													-100
40													
60										), felsic to (101061) in te (102017) and medium-grained			-120


80
100
RU2 63.42 - 107.28 Fine- to medium-grained granite (111058
intermediate metavolcanic rock (103076) and pegmatitic granite
approximate equal proportions. Minor occurrences of amphiboli
in the uppermost part of the interval one occurrence of fine- to
metagranitoid (101051).
DZ2 95.65 - 107.28 Increased frequency of broken and unbroken fractures. Several crushes and the most extensive at 96.50–97.15 m. Varying alpha angles, but generally > 45°. Weak to moderate oxidation throughout the interval. Predominant minerals in broken fractures are clay minerals, calcite and chlorite and in unbroken fractures quartz, adularia and calcite. Fine- to medium-grained granite (111058) and felsic to intermediate metavolcanic rock (103076).
DZ2 95.65 - 107.28 High transmissivity of the section 87.0–107.28 m (3E–5 m^2/s). The transmissivity of this section is significantly elevated compared with the rest of the tested borehole sections.
-140

Title GEOLOGY KFR11

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR11	**Northing [m]**	6702046.91
Diameter [mm]	56	**Easting [m]**	1633110.05
Length [m]	98.070	**Elevation [m]**	-86.49
Bearing [°]	72.51	**Plot Date**	2010-03-09
Inclination [°]	-9.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

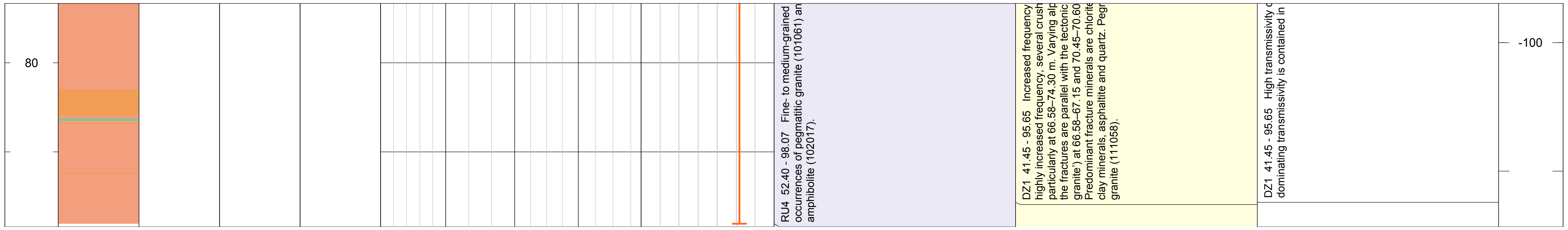
- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Tonalite to granodiorite, metamorphic**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m^3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0–18.73										RU1 0.00 - 18.73 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061) in the upper part and one occurrence of amphibolite (102017) in the lower part of the interval.			-90
18.73–32.35										RU2 18.73 - 32.35 Fine- to medium-grained metatonalite-granodiorite (101054) with one subordinate occurrence of amphibolite (102017) in the upper part and subordinate occurrences of pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in the lower part of the interval.			
32.35–52.40										RU3 32.35 - 52.40 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057) and felsic to intermediate metavolcanic rock (103076).	of broken fractures. In the section 61.90–92.12 m more es, breccias and locally brittle-ductile deformation. ha angles, but generally > 45°. A considerable amount of foliation. Occurrences of quartz dissolution ('vuggy m. Faint to weak oxidation throughout the interval. e, calcite, laumontite and in the core of the possible zone matitic granite (101061) and fine- to medium-grained	of the section 40.0–98.07 m (6E−5 m^2/s). The absolutely the in the section 56–98.07 m.	-95
52.40–98.07										granite (111058) with subordinate d one minor occurrence of			


80
RU4 52.40 - 98.07 Fine- to medium-grained
occurrences of pegmatitic granite (101061) an
amphibolite (102017).
DZ1 41.45 - 95.65 Increased frequency
highly increased frequency, several crush
particularly at 66.58–74.30 m. Varying alp
the fractures are parallel with the tectonic
granite') at 66.58–67.15 and 70.45–70.60
Predominant fracture minerals are chlorite
clay minerals, asphaltite and quartz. Pegr
granite (111058).
DZ1 41.45 - 95.65 High transmissivity c
dominating transmissivity is contained in
-100

Title GEOLOGY KFR12

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR12	**Northing [m]**	6702057.64
Diameter [mm]	56	**Easting [m]**	1632899.87
Length [m]	50.260	**Elevation [m]**	-87.12
Bearing [°]	0.00	**Plot Date**	2010-03-10
Inclination [°]	-89.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite, granodiorite and tonalite, metamorphic, fine- to medium-grained**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0 20 40										RU1 0.00 - 14.77 Pegmatitic granite (101061) and fine- to medium-grained granite (111058) in approximately equal proportions. Minor occurrences of fine- to medium-grained metagranite-granodiorite (101057) in the lowermost part of the interval. RU2 14.77 - 36.04 Fine- to medium-grained metagranite-granodiorite (101057). RU3 36.04 - 50.26 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained granite (111058), fine- to medium-grained metagranitoid (101051), felsic to intermediate metavolcanic rock (103076) and amphibolite (102017).	DZ1 21.25 - 31.50 Increased frequency of broken fractures. The section 24.30–25.64 m is generally crushed. Alpha angles > 55°. Weak oxidation throughout the interval. Predominant fracture minerals are clay minerals, Fe-hydroxide/hematite and chlorite. Fine- to medium-grained granite (111058).	DZ1 21.25 - 31.50 Relatively high transmissivity of the section 20.0–33.0 m (3E–6 m^2/s). The transmissivity of this section is significantly elevated compared with the rest of the tested borehole sections.	-100 -120

Title GEOLOGY KFR14

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR14	**Northing [m]**	6702010.36
Diameter [mm]	56	**Easting [m]**	1633031.74
Length [m]	29.100	**Elevation [m]**	-89.66
Bearing [°]	135.10	**Plot Date**	2010-03-09
Inclination [°]	-44.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-005 100 Transient inj K (m/s) 2m 1e-005 100 Steady state inj K (m/s) 1e-005 100	Description	Description	Description	Vertical depth RHB-70
0										RU1 0.00 - 28.67 Amphibolite (102017) with subordinate occurrences of felsic to intermediate metavolcanic rocks (103076), pegmatitic granite (101061) and fine- to medium-grained granite (111058).			-90
20													-100
													-110

Title GEOLOGY KFR19

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR19	**Northing [m]**	6701908.32
Diameter [mm]	56	**Easting [m]**	1633000.46
Length [m]	110.170	**Elevation [m]**	-80.81
Bearing [°]	38.20	**Plot Date**	2010-03-09
Inclination [°]	13.80	**Date of mapping**	2009-10-26
Activity Type	GE299		

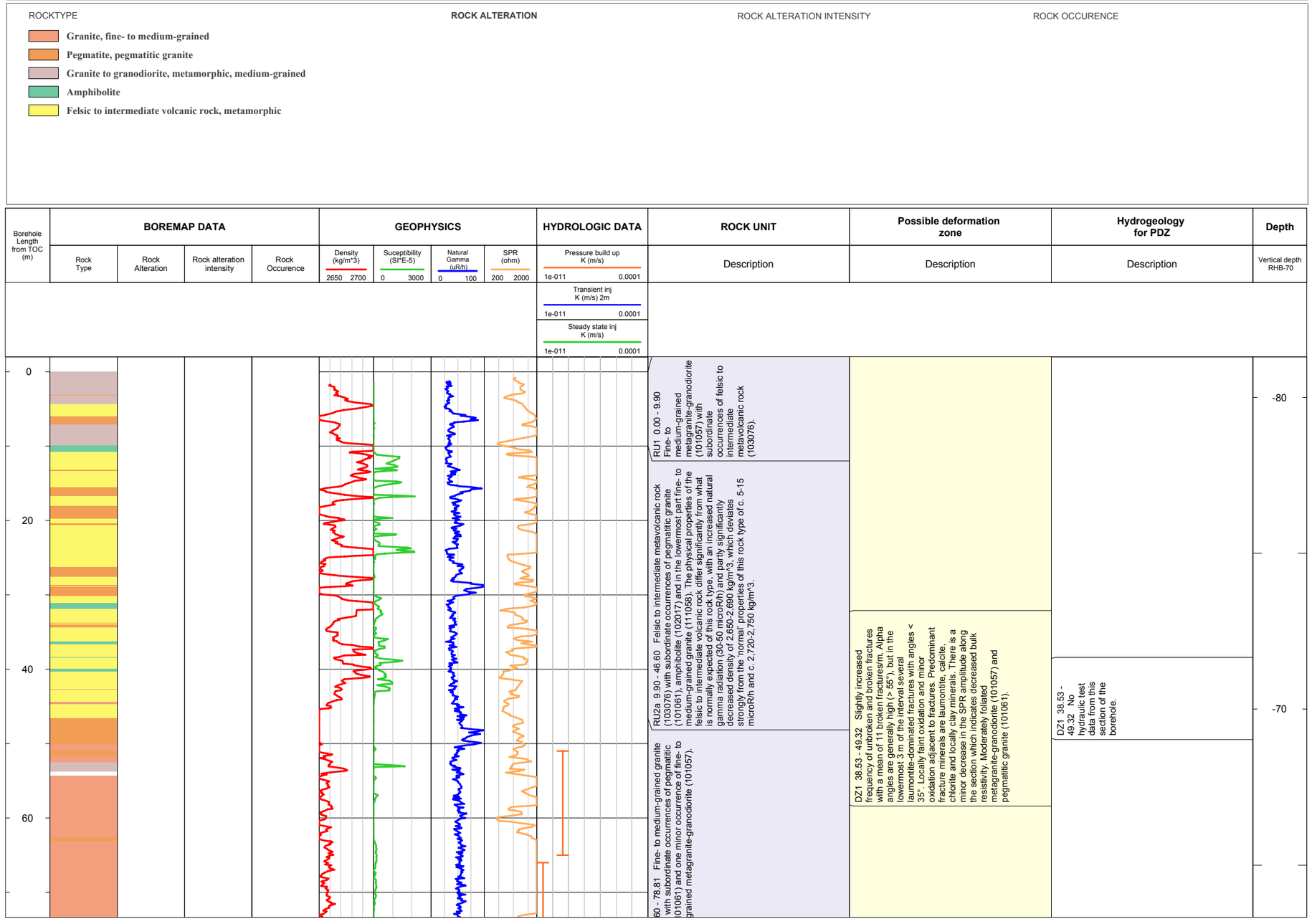
ROCKTYPE

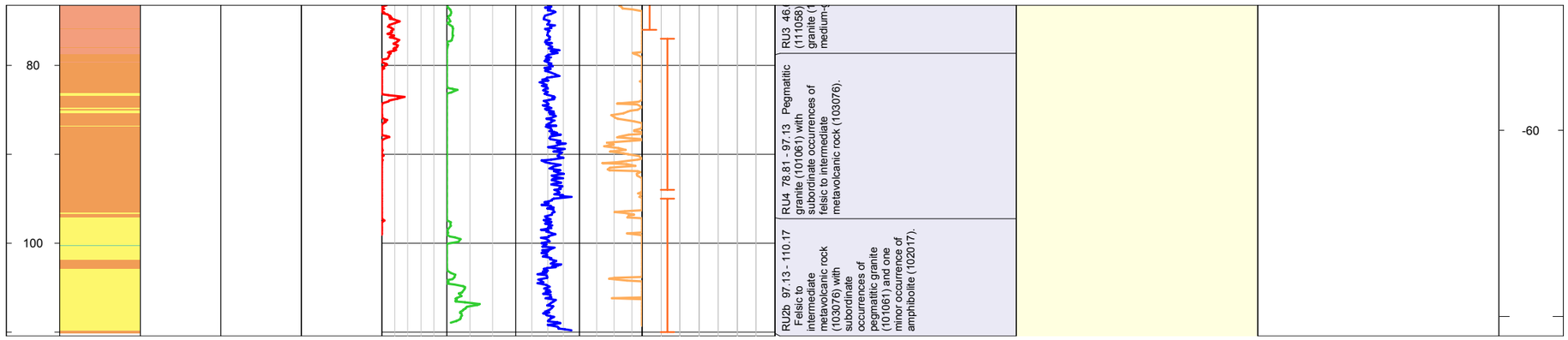
- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granite to granodiorite, metamorphic, medium-grained
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE




80
100
RU2b 97.13 - 110.17 Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061) and one minor occurrence of amphibolite (102017).
RU4 78.81 - 97.13 Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076).
RU3 46
(111058)
granite (1
medium-
-60

Title GEOLOGY KFR20

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR20	**Northing [m]**	6701909.55
Diameter [mm]	56	**Easting [m]**	1632998.33
Length [m]	109.700	**Elevation [m]**	-81.17
Bearing [°]	56.40	**Plot Date**	2010-03-09
Inclination [°]	10.44	**Date of mapping**	2009-10-26
Activity Type	GE299		

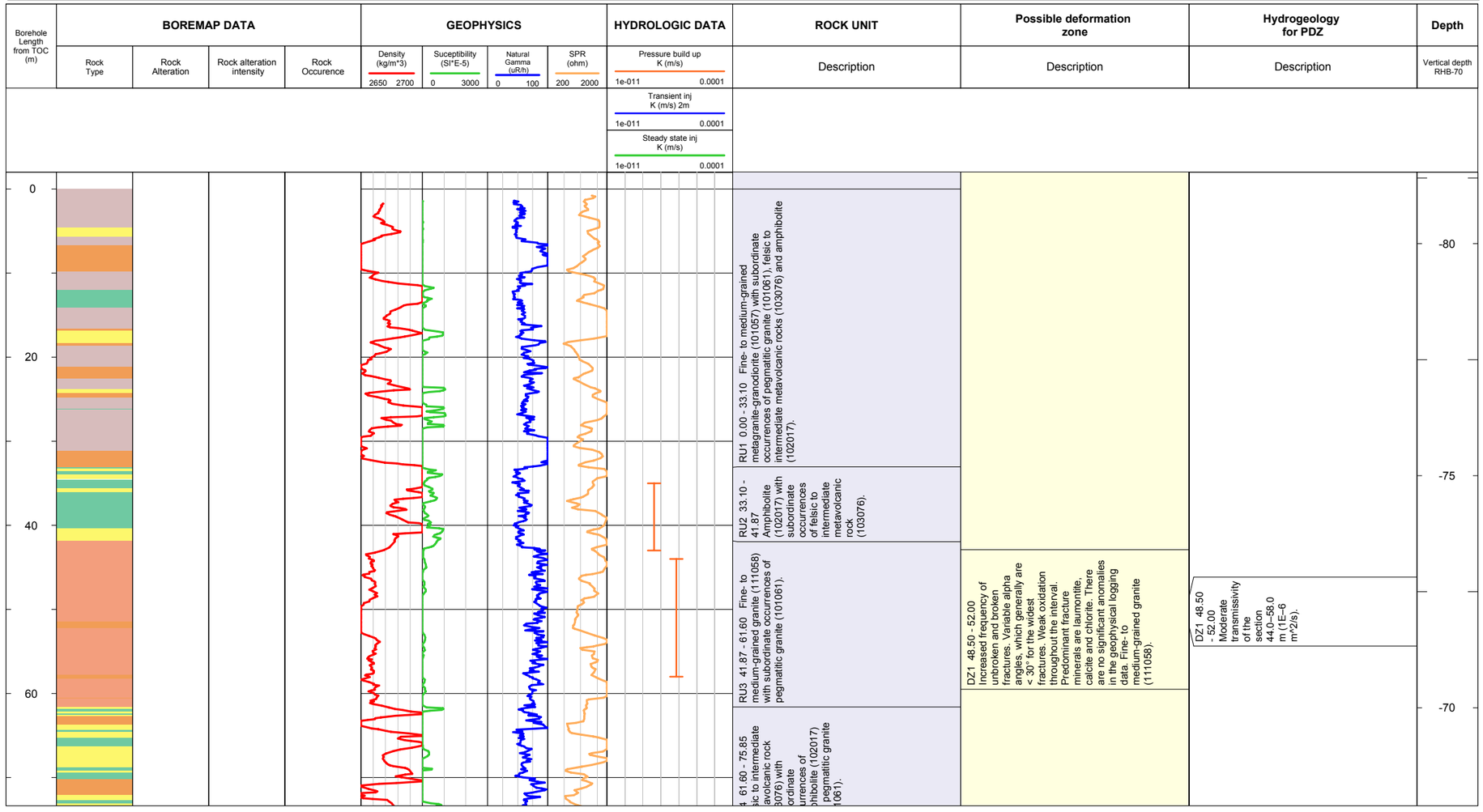
ROCKTYPE

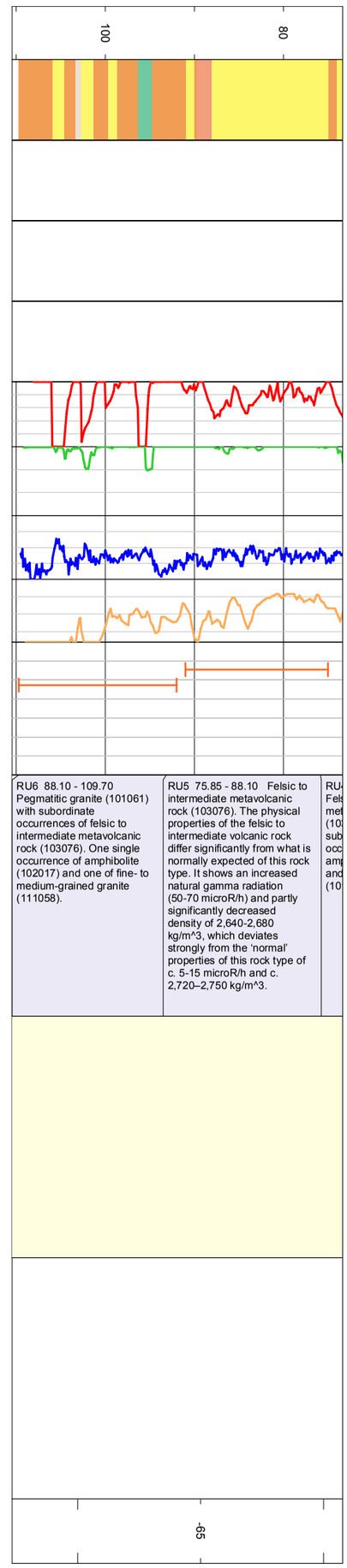
- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granite, metamorphic, aplitic
- Granite to granodiorite, metamorphic, medium-grained
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE





RU6 88.10 - 109.70 Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076). One single occurrence of amphibolite (102017) and one of fine- to medium-grained granite (111058).

RU5 75.85 - 88.10 Felsic to intermediate metavolcanic rock (103076). The physical properties of the felsic to intermediate volcanic rock differ significantly from what is normally expected of this rock type. It shows an increased natural gamma radiation (50-70 microR/h) and partly significantly decreased density of 2,640-2,680 kg/m^3, which deviates strongly from the 'normal' properties of this rock type of c. 5-15 microR/h and c. 2,720–2,750 kg/m^3.

Title GEOLOGY KFR31

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR31	**Northing [m]**	6701959.66
Diameter [mm]		**Easting [m]**	1632915.47
Length [m]	242.100	**Elevation [m]**	5.00
Bearing [°]	82.11	**Plot Date**	2010-03-09
Inclination [°]	-43.19	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

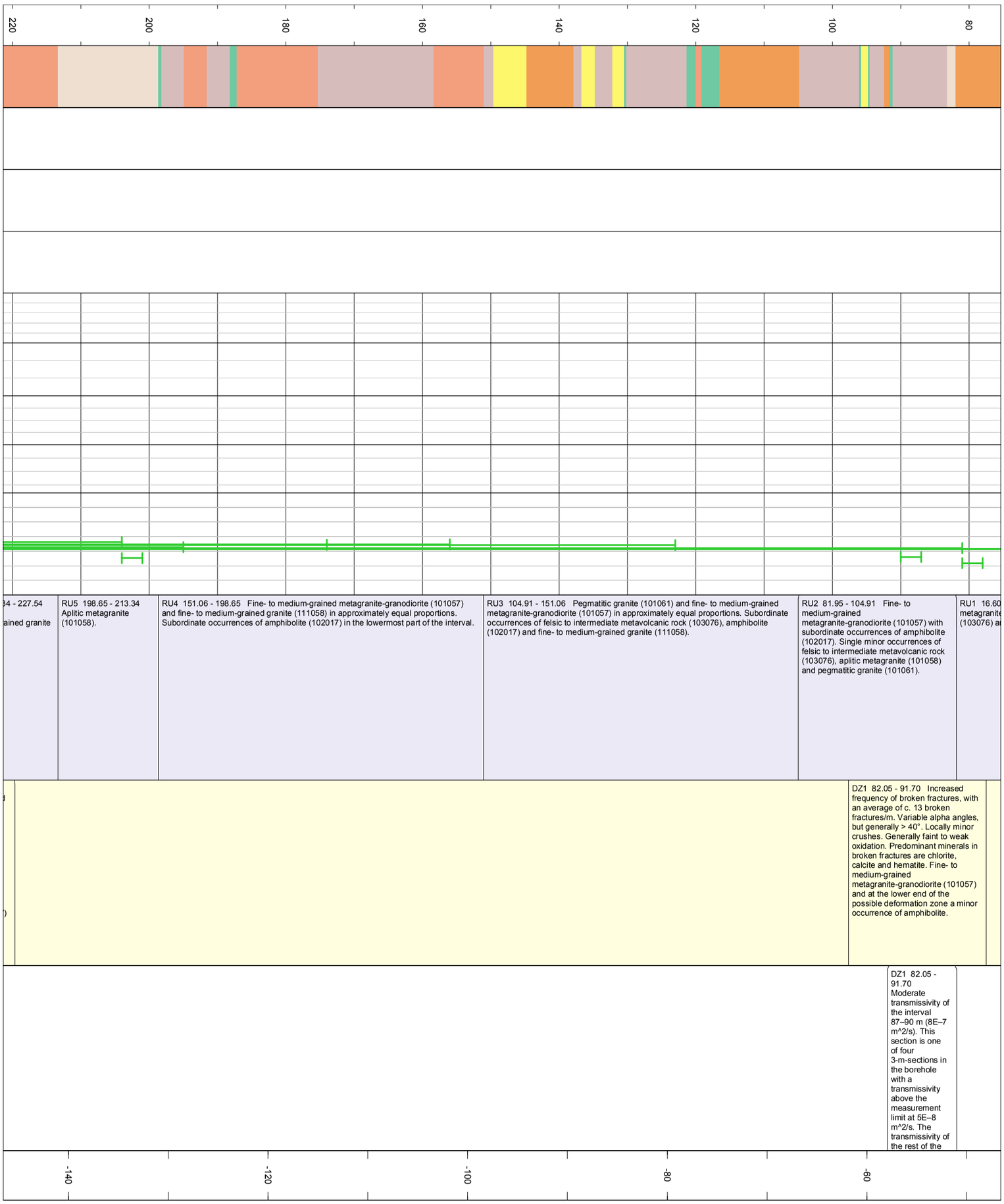
- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite, metamorphic, aplitic**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

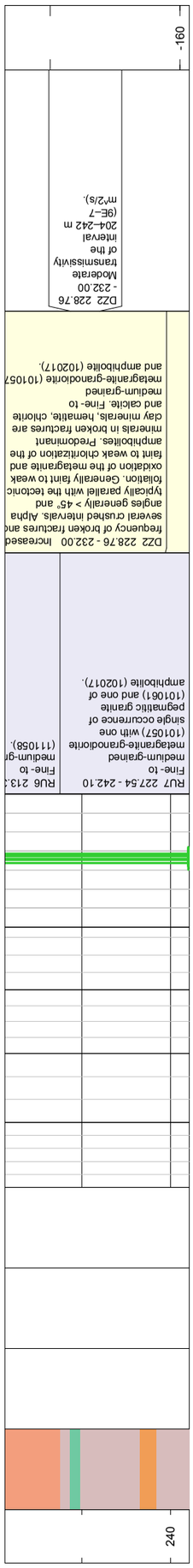
ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0													0
20													-20
40													-40
60										- 81.95 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained granodiorite (101057), fine- to medium-grained granite (111058), felsic to intermediate metavolcanic rock and amphibolite (1020017).			


80
100
120
140
160
180
200
220
34 - 227.54
ained granite
RU5 198.65 - 213.34 Aplitic metagranite (101058).
RU4 151.06 - 198.65 Fine- to medium-grained metagranite-granodiorite (101057) and fine- to medium-grained granite (111058) in approximately equal proportions. Subordinate occurrences of amphibolite (102017) in the lowermost part of the interval.
RU3 104.91 - 151.06 Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in approximately equal proportions. Subordinate occurrences of felsic to intermediate metavolcanic rock (103076), amphibolite (102017) and fine- to medium-grained granite (111058).
RU2 81.95 - 104.91 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017). Single minor occurrences of felsic to intermediate metavolcanic rock (103076), aplitic metagranite (101058) and pegmatitic granite (101061).
RU1 16.60
metagranite
(103076) a
DZ1 82.05 - 91.70 Increased frequency of broken fractures, with an average of c. 13 broken fractures/m. Variable alpha angles, but generally > 40°. Locally minor crushes. Generally faint to weak oxidation. Predominant minerals in broken fractures are chlorite, calcite and hematite. Fine- to medium-grained metagranite-granodiorite (101057) and at the lower end of the possible deformation zone a minor occurrence of amphibolite.
DZ1 82.05 - 91.70 Moderate transmissivity of the interval 87–90 m (8E–7 m^2/s). This section is one of four 3-m-sections in the borehole with a transmissivity above the measurement limit at 5E–8 m^2/s. The transmissivity of the rest of the
-140
-120
-100
-80
-60


240
RU7 227.54 - 242.10
Fine- to
medium-grained
metagranite-granodiorite
(101057) with one
single occurrence of
pegmatitic granite
(101061) and one of
amphibolite (102017).
RU6 213.2
Fine- to
medium-gr
(111058).
DZ2 228.76 - 232.00 Increased
frequency of broken fractures and
several crushed interavals. Alpha
angles generally > 45° and
typically parallel with the tectonic
foliation. Generally faint to weak
oxidation of the metagranite and
faint to weak chloritization of the
amphibolites. Predominant
minerals in broken fractures are
clay minerals, hematite, chlorite
and calcite. Fine- to
medium-grained
metagranite-granodiorite (101057
and amphibolite (102017).
DZ2 228.76
- 232.00
Moderate
transmissivity
of the
interval
204–242 m
(9E–7
m^2/s).
-160

Title GEOLOGY KFR32

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR32	**Northing [m]**	6701956.59
Diameter [mm]		**Easting [m]**	1632915.67
Length [m]	209.700	**Elevation [m]**	5.00
Bearing [°]	24.91	**Plot Date**	2010-03-10
Inclination [°]	-46.49	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

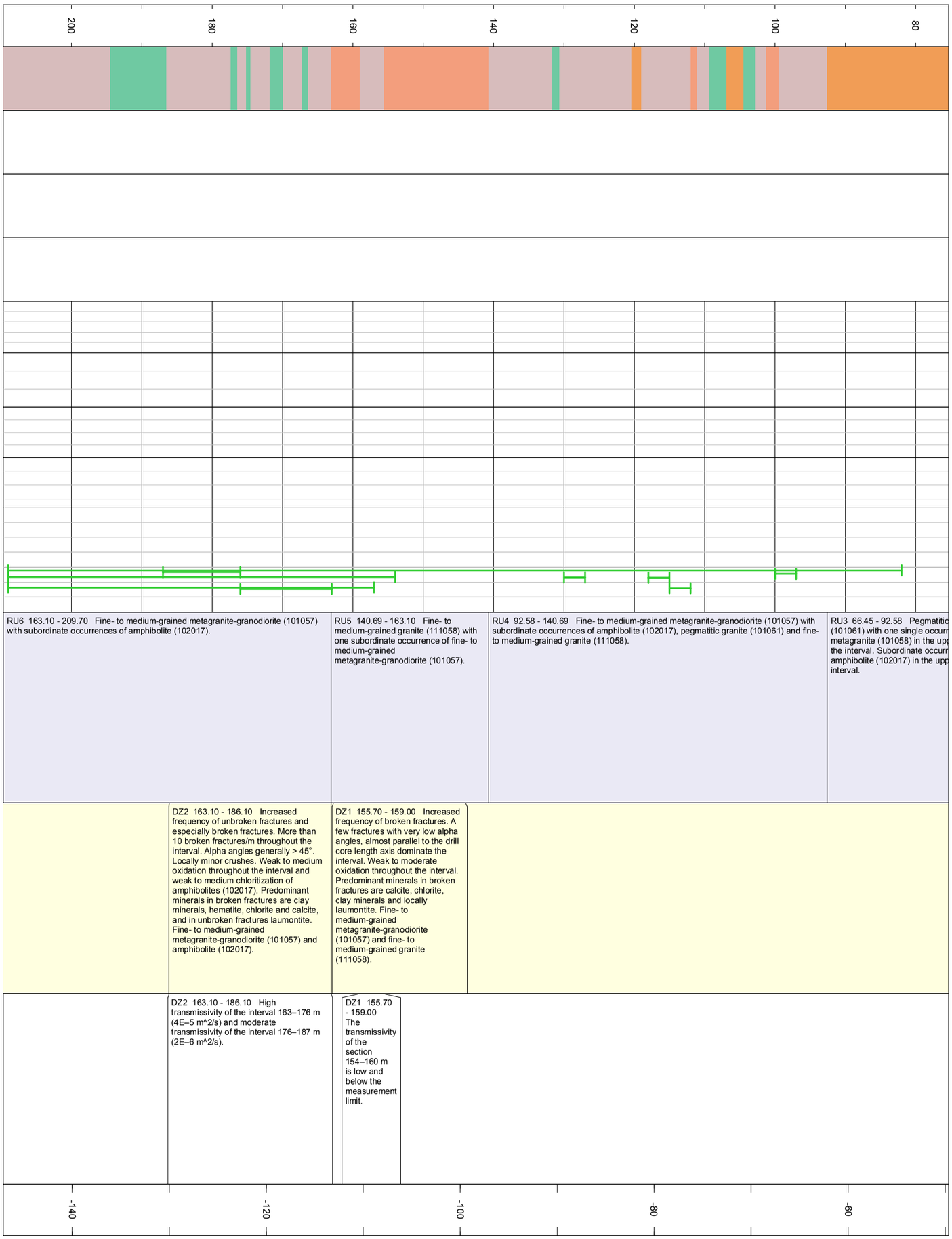
- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite, metamorphic, aplitic**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0													0
20										RU1 16.55 - 48.56 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057) in the lower part of the interval.			-20
40										RU2 48.56 - 66.45 Fine- to medium-grained metagranite-granodiorite (101057).			-40
60										granite ence of aplitic ermost part of ences of er part of the			


80
100
120
140
160
180
200
RU6 163.10 - 209.70 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017).
RU5 140.69 - 163.10 Fine- to medium-grained granite (111058) with one subordinate occurrence of fine- to medium-grained metagranite-granodiorite (101057).
RU4 92.58 - 140.69 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017), pegmatitic granite (101061) and fine- to medium-grained granite (111058).
RU3 66.45 - 92.58 Pegmatitic
(101061) with one single occurr
metagranite (101058) in the upp
the interval. Subordinate occurr
amphibolite (102017) in the upp
interval.
DZ2 163.10 - 186.10 Increased frequency of unbroken fractures and especially broken fractures. More than 10 broken fractures/m throughout the interval. Alpha angles generally > 45°. Locally minor crushes. Weak to medium oxidation throughout the interval and weak to medium chloritization of amphibolites (102017). Predominant minerals in broken fractures are clay minerals, hematite, chlorite and calcite, and in unbroken fractures laumontite. Fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017).
DZ1 155.70 - 159.00 Increased frequency of broken fractures. A few fractures with very low alpha angles, almost parallel to the drill core length axis dominate the interval. Weak to moderate oxidation throughout the interval. Predominant minerals in broken fractures are calcite, chlorite, clay minerals and locally laumontite. Fine- to medium-grained metagranite-granodiorite (101057) and fine- to medium-grained granite (111058).
DZ2 163.10 - 186.10 High transmissivity of the interval 163–176 m (4E–5 m^2/s) and moderate transmissivity of the interval 176–187 m (2E–6 m^2/s).
DZ1 155.70 - 159.00 The transmissivity of the section 154–160 m is low and below the measurement limit.
-140
-120
-100
-80
-60

Title GEOLOGY KFR34

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR34	**Northing [m]**	6701923.75
Diameter [mm]		**Easting [m]**	1632794.20
Length [m]	142.000	**Elevation [m]**	5.00
Bearing [°]	198.11	**Plot Date**	2010-03-09
Inclination [°]	-48.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

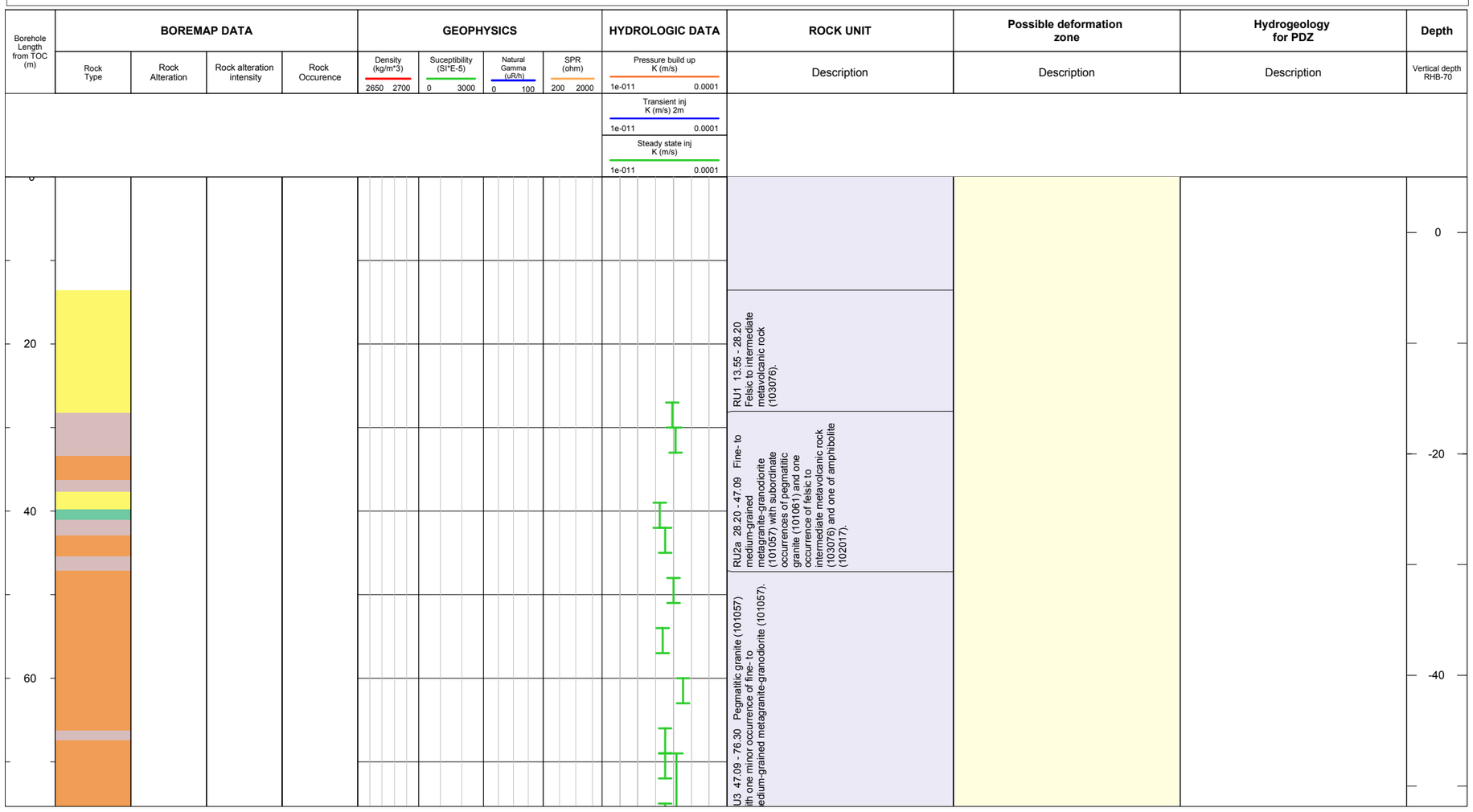
ROCKTYPE

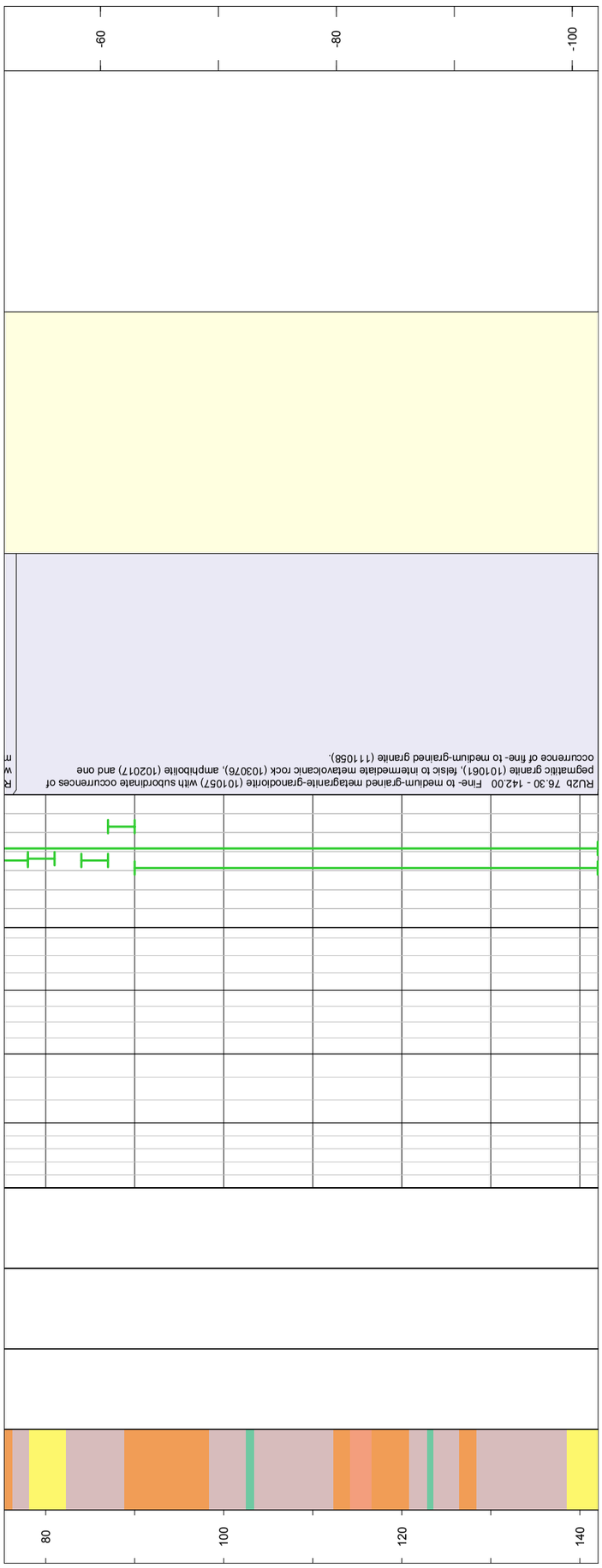
- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE




80
100
120
140
RU2b 76.30 - 142.00 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061), felsic to intermediate metavolcanic rock (103076), amphibolite (102017) and one occurrence of fine- to medium-grained granite (111058).
-60
-80
-100

Title GEOLOGY KFR37

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR37	**Northing [m]**	6702050.31
Diameter [mm]		**Easting [m]**	1633033.49
Length [m]	204.900	**Elevation [m]**	4.40
Bearing [°]	188.51	**Plot Date**	2010-03-09
Inclination [°]	-62.49	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granite, metamorphic, aplitic
- Granite to granodiorite, metamorphic, medium-grained
- Amphibolite

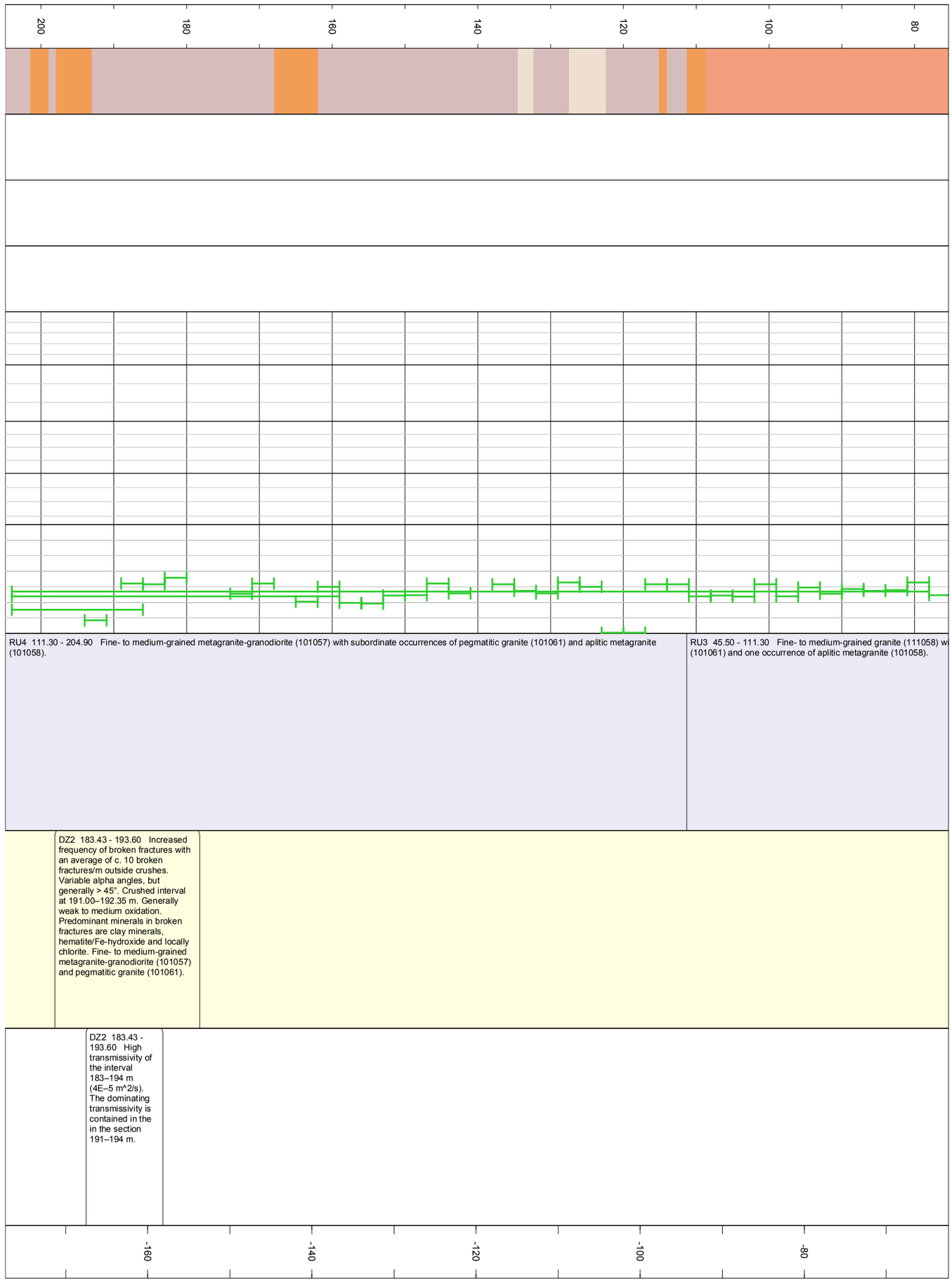
ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

- Breccia

Borehole Length from TOC (m)	BOREMAP DATA: Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	GEOPHYSICS: Density (kg/m*3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	HYDROLOGIC DATA: Pressure build up K (m/s) 1e-011 0.0001	Transient inj K (m/s) 2m 1e-011 0.0001	Steady state inj K (m/s) 1e-011 0.0001	ROCK UNIT: Description	Possible deformation zone: Description	Hydrogeology for PDZ: Description	Depth: Vertical depth RHB-70
0															0
20												RU1 12.23 - 24.70 Amphibolite (102017) and aplitic metagranite (101058) in approximately equal proportions.			-20
40												RU2 24.70 - 45.50 Aplitic metagranite (101058).	DZ1 36.60 - 45.60 Increased frequency of unbroken, irregular fractures, often as sealed networks. alpha angles generally > 45°, whereas the tectonic foliation is almost perpendicular to the drill core length axis. Several brecciated intervals, of which the most extensive occurs at 42.60–43.70 m. Generally weak oxidation. Predominant minerals in unbroken fractures are calcite, adularia, laumontite and hematite. Fine- to medium-grained granite (111058).	DZ1 36.60 - 45.60 Moderate transmissivity of the interval 36–48 m (1E-6 m^2/s).	-40
60												th subordinate occurrences of pegmatitic granite			-60


80
100
120
140
160
180
200
RU4 111.30 - 204.90 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061) and aplitic metagranite (101058).
RU3 45.50 - 111.30 Fine- to medium-grained granite (111058) wi
(101061) and one occurrence of aplitic metagranite (101058).
DZ2 183.43 - 193.60 Increased frequency of broken fractures with an average of c. 10 broken fractures/m outside crushes. Variable alpha angles, but generally > 45°. Crushed interval at 191.00–192.35 m. Generally weak to medium oxidation. Predominant minerals in broken fractures are clay minerals, hematite/Fe-hydroxide and locally chlorite. Fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061).
DZ2 183.43 - 193.60 High transmissivity of the interval 183–194 m (4E–5 m^2/s). The dominating transmissivity is contained in the in the section 191–194 m.
-160
-140
-120
-100
-80

Title GEOLOGY KFR38

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR38	**Northing [m]**	6702048.62
Diameter [mm]		**Easting [m]**	1633035.53
Length [m]	185.400	**Elevation [m]**	4.50
Bearing [°]	92.21	**Plot Date**	2010-03-09
Inclination [°]	-57.59	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

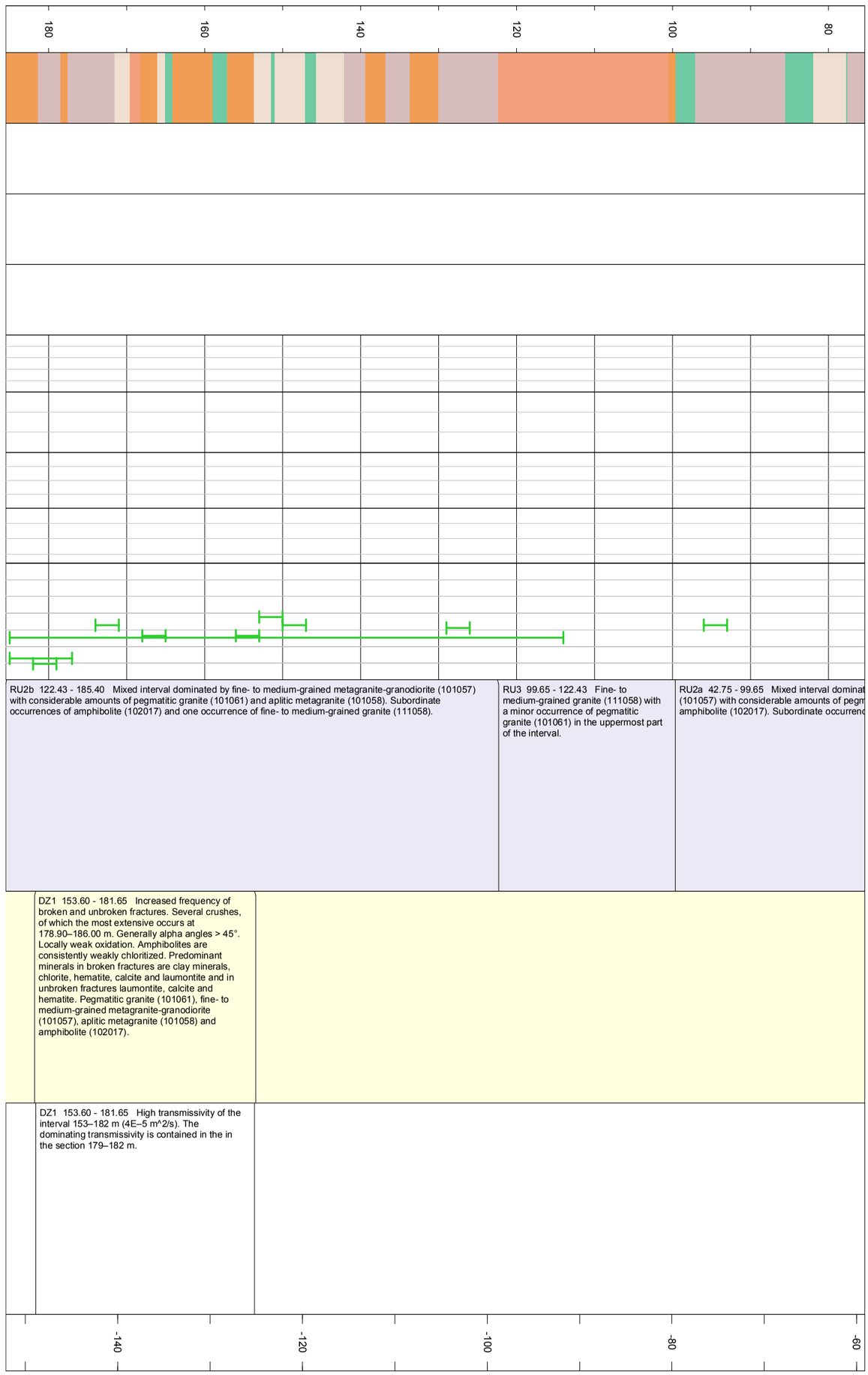
- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite, metamorphic, aplitic**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0													0
20													-20
40										RU1 13.45 - 42.75 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061) and one occurrence of aplitic metagranite (101058) and one of amphibolite (102017).			
60										ed by fine- to medium-grained metagranite-granodiorite natitic granite (101061), aplitic metagranite (101058) and ces of fine- to medium-grained granite (111058).			-40


80
100
120
140
160
180
RU2b 122.43 - 185.40 Mixed interval dominated by fine- to medium-grained metagranite-granodiorite (101057) with considerable amounts of pegmatitic granite (101061) and aplitic metagranite (101058). Subordinate occurrences of amphibolite (102017) and one occurrence of fine- to medium-grained granite (111058).
RU3 99.65 - 122.43 Fine- to medium-grained granite (111058) with a minor occurrence of pegmatitic granite (101061) in the uppermost part of the interval.
RU2a 42.75 - 99.65 Mixed interval dominat
(101057) with considerable amounts of pegm
amphibolite (102017). Subordinate occurrenc
DZ1 153.60 - 181.65 Increased frequency of broken and unbroken fractures. Several crushes, of which the most extensive occurs at 178.90–186.00 m. Generally alpha angles > 45°. Locally weak oxidation. Amphibolites are consistently weakly chloritized. Predominant minerals in broken fractures are clay minerals, chlorite, hematite, calcite and laumontite and in unbroken fractures laumontite, calcite and hematite. Pegmatitic granite (101061), fine- to medium-grained metagranite-granodiorite (101057), aplitic metagranite (101058) and amphibolite (102017).
DZ1 153.60 - 181.65 High transmissivity of the interval 153–182 m (4E–5 m^2/s). The dominating transmissivity is contained in the in the section 179–182 m.
-140
-120
-100
-80
-60

Title GEOLOGY KFR51

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR51	**Northing [m]**	6701898.12
Diameter [mm]	76	**Easting [m]**	1632963.47
Length [m]	46.850	**Elevation [m]**	-84.99
Bearing [°]	358.76	**Plot Date**	2010-03-09
Inclination [°]	35.00	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- **Pegmatite, pegmatitic granite**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0													
20										RU1 0.00 - 30.07 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076), pegmatitic granite (101061) and amphibolite (102017).	DZ1 9.84 - 11.15 Increased frequency of unbroken and broken fractures. alpha angles between 35–50°. Locally oxidation. Amphibolites are consistently weakly chloritized. Predominant minerals are laumontite, calcite and chlorite. Felsic to intermediate metavolcanic rock (103076) and fine- to medium-grained metagranite-granodiorite (101057).	DZ1 9.84 - 11.15 No hydraulic test data from this borehole.	-80
40										RU2 30.07 - 46.28 Pegmatitic granite (101061) with one minor occurrence of felsic to intermediate metavolcanic rock (103076) in the lower part of the interval.			-60

Title GEOLOGY KFR52

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR52	**Northing [m]**	6701963.79
Diameter [mm]	76	**Easting [m]**	1633066.43
Length [m]	29.950	**Elevation [m]**	-74.59
Bearing [°]	138.50	**Plot Date**	2010-10-06
Inclination [°]	10.00	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granite to granodiorite, metamorphic, medium-grained
- Amphibolite
- Cataclastic rock

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA			ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-006 1	Transient inj K (m/s) 2m 1e-011 1e-005	Steady state inj K (m/s) 1e-011 1e-005	Description	Description	Description	Vertical depth RHB-70
										10m 1e-011 1e-005	Below measur limit K (m/s) 1e-008 1				
0												RU1 0.00 - 29.95 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained granite (111058), fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017).	DZ1 19.85 - 22.40 Several fractures with low alpha-angles (c. 25°) and infillings of chlorite and clay minerals in the section 21.70–22.40 m. Strong argillization and generally crushed in the section 20.99–21.11 m. Most fractures have alpha angles > 60°. Calcite sealed breccia with low alpha angle (c. 25°) at 19.85–20.05 m. Faint to weak oxidation throughout the interval. Pegmatitic granite (101061), fine- to medium-grained granite (111058) and strongly foliated metagranite-granodiorite (101057).	DZ1 19.85 - 22.40 No hydraulic test data from this borehole.	-75
20															-72

Title GEOLOGY KFR57

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR57	**Northing [m]**	6702050.77
Diameter [mm]	56	**Easting [m]**	1632854.91
Length [m]	25.380	**Elevation [m]**	-87.59
Bearing [°]	230.51	**Plot Date**	2010-03-09
Inclination [°]	-89.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0 20										RU1 0.00 - 16.44 Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of amphibolite (102017), fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061). RU2 16.44 - 25.38 Pegmatitic granite (101061) and fine- to medium-grained granite (111058) in approximately equal proportions.	DZ1 15.85 - 25.38 Increased frequency of broken fractures. Varying alpha angles with generally low angles (< 30°) in the cental part of the interval. Generally faint to moderate oxidation and at 16.80–21.50 m argillization, locally of strong intensity. Predominant minerals in broken fractures are clay minerals. Pegmatitic granite (101061), fine- to medium-grained granite (111058) and amphibolite (102017).	DZ1 15.85 - 25.38 No hydraulic test data from this borehole.	-90 -100 -110

Title GEOLOGY KFR61

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR61	**Northing [m]**	6701382.45
Diameter [mm]	56	**Easting [m]**	1632391.99
Length [m]	70.900	**Elevation [m]**	1.40
Bearing [°]	38.41	**Plot Date**	2010-03-09
Inclination [°]	-43.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granite, granodiorite and tonalite, metamorphic, fine- to medium-grained
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m^3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0													0
20													0
40										RU1 1.43 - 44.35 Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061), one minor occurrence of fine- to medium-grained metagranitoid (101051) and one of amphibolite (102017).	DZ1 1.40 - 70.90 Generally 10–15 broken fractures/m. Varying alpha angles but generally >45°. A considerable proportion of the fractures are oriented parallel with the tectonic foliation. More highly fractured with several crushes, cataclasite and brecciation in the approximate section between 50 and 65 m. Very local argillization and the amphibolite is affected by chloritisation. Predominant minerals in broken fractures are chlorite, calcite, laumontite and clay minerals. In the section 50–60 m clay minerals and asphaltite dominate the fracture mineralogy. Cataclasite (108003), high strained pegmatitic granite (101061), recrystallized metagranite-granodiorite (101057) and amphibolite (102017).	DZ1 1.40 - 70.90 No hydraulic test data from this borehole.	-10
60										RU2 44.35 - 70.90 Pegmatitic granite (101061) with subordinate occurrences of felsic to intermediate metavolcanic rock (103076) in the upper part of the interval.			-30
													-40

Title GEOLOGY KFR62

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR62	**Northing [m]**	6701368.43
Diameter [mm]	56	**Easting [m]**	1632401.86
Length [m]	82.800	**Elevation [m]**	0.60
Bearing [°]	42.91	**Plot Date**	2010-03-09
Inclination [°]	-44.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

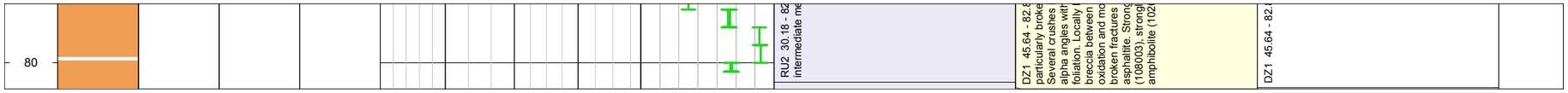
- Pegmatite, pegmatitic granite
- Felsic to intermediate volcanic rock, metamorphic
- Cataclastic rock

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA: Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	GEOPHYSICS: Density (kg/m^3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	HYDROLOGIC DATA: Pressure build up K (m/s) 1e-011 0.0001	Transient inj K (m/s) 2m 1e-011 0.0001	Steady state inj K (m/s) 1e-011 0.0001	ROCK UNIT: Description	Possible deformation zone: Description	Hydrogeology for PDZ: Description	Depth: Vertical depth RHB-70
0															0
20												RU1 1.40 - 30.18 Felsic to intermediate metavolcanic rock (103076) with minor occurrences of pegmatitic granite (101061).			-20
40												.20 Pegmatitic granite (101061) with subordinate occurrences of felsic to tavolcanic rock (103076).			-40
60													00 Increased frequency of unbroken and n fractures, with 10–20 broken fractures/m. n the section 51.90–77.00 m. Generally high a considerable amount parallel with the tectonic rittle-ductile deformation. Cataclasite and locally 53.00 and c. 73 m. Minor occurrences of faint derate to strong argillization. Predominant in are clay minerals, chlorite, calcite and locally ly foliated pegmatitic granite (101061), cataclasite y foliated metegranite-granodiorite (101057) and 017).	30 No hydraulic test data from this borehole.	


80
RU2 30.18 - 82
intermediate me
DZ1 45.64 - 82.
particularly broke
Several crushes
alpha angles with
foliation. Locally
breccia between
oxidation and mo
broken fractures
asphaltite. Strong
(108003), strongl
amphibolite (102
DZ1 45.64 - 82.

Title GEOLOGY KFR63

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR63	**Northing [m]**	6701226.87
Diameter [mm]	56	**Easting [m]**	1632315.81
Length [m]	15.080	**Elevation [m]**	0.80
Bearing [°]	230.51	**Plot Date**	2010-03-09
Inclination [°]	-89.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0													0
5													0
10										RU1 0.00 - 15.08 Felsic to intermediate metavolcanic rock (103076).			-10
15													

Title GEOLOGY KFR64

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR64	**Northing [m]**	6701406.16
Diameter [mm]	56	**Easting [m]**	1632407.71
Length [m]	54.170	**Elevation [m]**	0.30
Bearing [°]	33.91	**Plot Date**	2010-09-23
Inclination [°]	-59.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- **Pegmatite, pegmatitic granite**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**
- **Cataclastic rock**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA			ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-006 1	Transient inj K (m/s) 2m 1e-006 1	Steady state inj K (m/s) 1e-011 1e-005	Description	Description	Description	Vertical depth RHB-70
										10m 1e-006 1	Below measur limit K (m/s) 1e-008 1				
0															0
20															-20
40															-40
												RU1 12.79 - 30.79 Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of pegmatitic granite (101061) and one occurrence of amphibolite (102017) in the uppermost part of the interval.			
												RU2 30.79 - 43.55 Pegmatitic granite (101061).			
												RU3 43.55 - 54.17 Felsic to intermediate metavolcanic rock (103076) with subordinate pegmatitic granite (101061).	DZ1 12.79 - 54.17 Highly fractured, locally with > 20 broken fractures/m. Several crushed sections. alpha angles generally > 45° and parallel with the tectonic foliation. Unbroken fractures with aperture occur locally. Strong brittle-ductile deformation throughout the borehole. Brecciated cataclasite at 11.60–19.00 m. Locally strong argillization and in the lowermost 10 m also muscovitization and chloritization. Predominant minerals in broken fractures are clay minerals, chlorite and more subordinate laumontite, calcite and asphaltite. Pegmatitic granite (101061), cataclasite (108003), amphibolite (102017), strongly foliated metagranite-granodiorite (101057) and possibly felsic to intermediate metavolcanic rock (103076).	DZ1 12.79 - 54.17 No hydraulic test data from this borehole.	

Title GEOLOGY KFR65

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR65	**Northing [m]**	6701403.62
Diameter [mm]	56	**Easting [m]**	1632406.04
Length [m]	39.680	**Elevation [m]**	0.00
Bearing [°]	230.51	**Plot Date**	2010-09-23
Inclination [°]	-89.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- **Granite, fine- to medium-grained**
- **Pegmatite, pegmatitic granite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA			ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m^3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-006 1	Transient inj K (m/s) 2m 1e-006 1	Steady state inj K (m/s) 1e-011 1e-005	Description	Description	Description	Vertical depth RHB-70
										10m 1e-006 1	Below measur limit K (m/s) 1e-008 1				
0															0
20												RU1 10.73 - 39.68 Felsic to intermediate metavolcanic rock (103076) with subordinate pegmatitic granite (101061) in the uppermost and lowermost part.	DZ1 17.63 - 39.68 Increased frequency of unbroken and broken fractures. Highly variable alpha angles. Note that the tectonic foliation is sub-parrallel with the borehole direction. Locally faint oxidation. Predominant minerals in broken and unbroken fractures are laumontite and calcite. Recrystallised metagranite-granodiorite (101057).	DZ1 17.63 - 39.68 No hydraulic test data from this borehole.	-20

Title GEOLOGY KFR66

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR66	**Northing [m]**	6701420.17
Diameter [mm]	56	**Easting [m]**	1632417.16
Length [m]	29.170	**Elevation [m]**	0.00
Bearing [°]	230.51	**Plot Date**	2010-09-23
Inclination [°]	-89.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- Pegmatite, pegmatitic granite
- Amphibolite
- Cataclastic rock

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA			ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-006 1	Transient inj K (m/s) 2m 1e-006 1	Steady state inj K (m/s) 1e-011 1e-005	Description	Description	Description	Vertical depth RHB-70
										10m 1e-006 1	Below measur limit K (m/s) 1e-008 1				
0															0
															-10
20												RU1 14.99 - 29.17 Amphibolite (102017) and pegmatitic granite (101061), generally with a cataclastic overprinting, which hampers identification of the protolith.	DZ1 14.99 - 29.17 Increased frequency of broken fractures. Crushes predominate down to 6.08 m with several minor crushes below that drill core length. Generally high, but variable alpha angles. Virtually the entire interval consists of brecciated cataclasite. Chloritization of amphibolites and locally	DZ1 14.99 - 29.17 No hydraulic test data from this borehole.	-20

Title GEOLOGY KFR67

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR67	**Northing [m]**	6701419.85
Diameter [mm]	46	**Easting [m]**	1632419.75
Length [m]	48.950	**Elevation [m]**	0.00
Bearing [°]	34.61	**Plot Date**	2011-01-19
Inclination [°]	-64.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

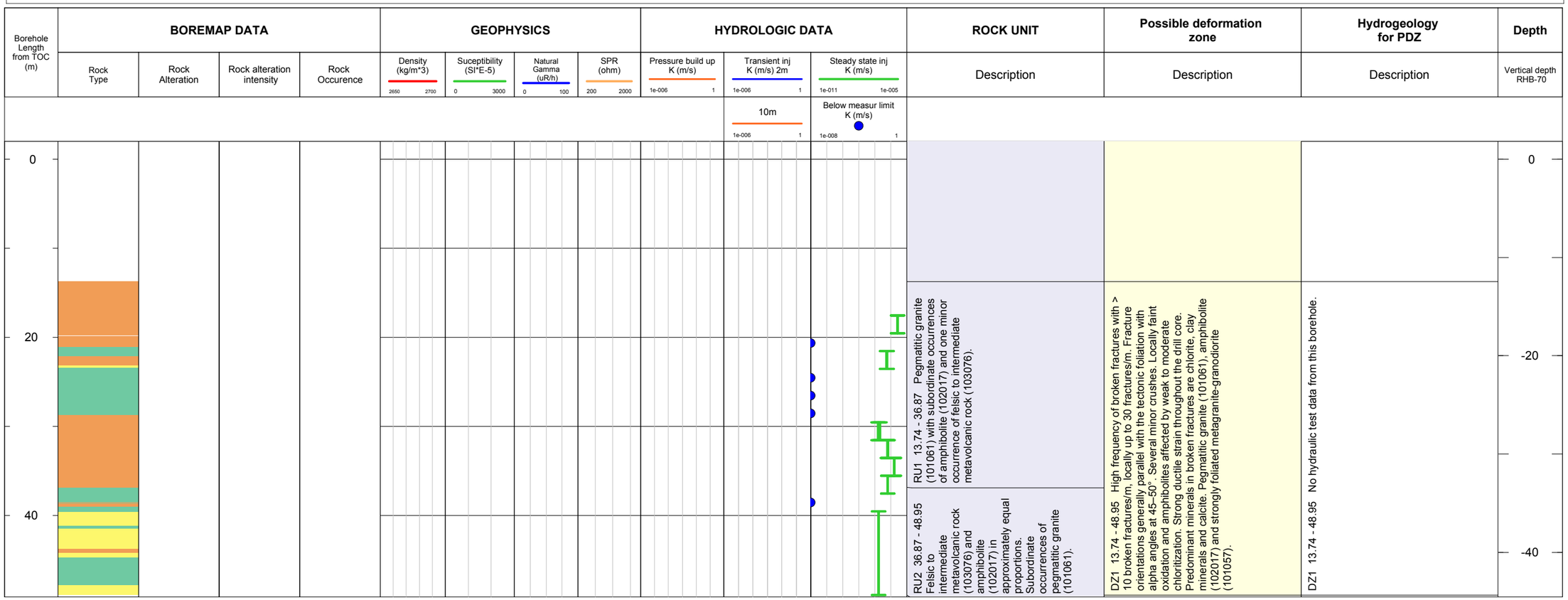
ROCKTYPE

- **Pegmatite, pegmatitic granite**
- **Amphibolite**
- **Felsic to intermediate volcanic rock, metamorphic**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE



Title GEOLOGY KFR68

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR68	**Northing [m]**	6701552.67
Diameter [mm]	56	**Easting [m]**	1632530.76
Length [m]	128.030	**Elevation [m]**	0.00
Bearing [°]	82.01	**Plot Date**	2010-10-28
Inclination [°]	-44.99	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

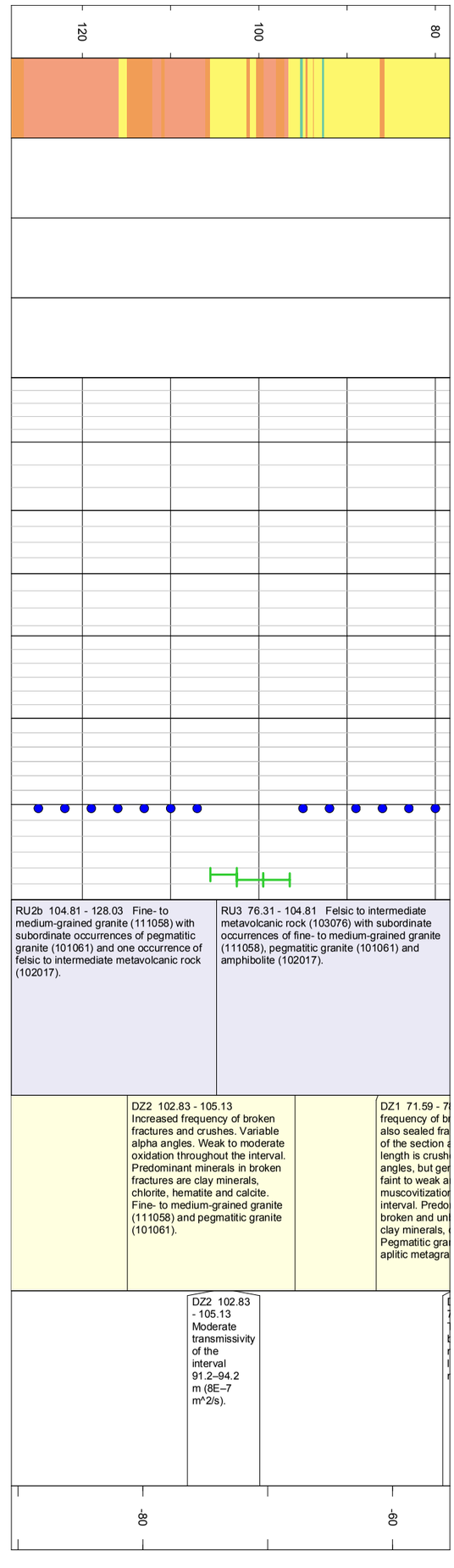
- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granite to granodiorite, metamorphic, medium-grained
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA			ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-006 1	Transient inj K (m/s) 2m 1e-006 1	Steady state inj K (m/s) 1e-011 1e-005	Description	Description	Description	Vertical depth RHB-70
										10m 1e-006 1	Below measur limit K (m/s) 1e-008 1				
0															0
20												RU1 11.31 - 30.21 Fine- to medium-grained metagranite-granodiorite (101057) with minor occurrences of pegmatitic granite (101061).			-20
40												RU2a 30.21 - 76.31 Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061).	3.11 Increased oken fractures, locally cture networks. Most at 64.28–66.72 m ed. Variable alpha herally > 45°. Locally gillization. Weak h throughout the minant minerals in broken fractures are calcite and chlorite. hite (101061) and hite (101058).	pZ1 71.59 - 78.11 Transmissivity below the measurement imit (7E–7 m^2/s).	-40
60															


80
100
120
RU2b 104.81 - 128.03 Fine- to medium-grained granite (111058) with subordinate occurrences of pegmatitic granite (101061) and one occurrence of felsic to intermediate metavolcanic rock (102017).
RU3 76.31 - 104.81 Felsic to intermediate metavolcanic rock (103076) with subordinate occurrences of fine- to medium-grained granite (111058), pegmatitic granite (101061) and amphibolite (102017).
DZ2 102.83 - 105.13
Increased frequency of broken fractures and crushes. Variable alpha angles. Weak to moderate oxidation throughout the interval. Predominant minerals in broken fractures are clay minerals, chlorite, hematite and calcite. Fine- to medium-grained granite (111058) and pegmatitic granite (101061).
DZ1 71.59 - 7
frequency of br
also sealed fra
of the section a
length is crush
angles, but ger
faint to weak a
muscovitizatior
interval. Predo
broken and unl
clay minerals,
Pegmatitic gra
aplitic metagra
DZ2 102.83 - 105.13 Moderate transmissivity of the interval 91.2–94.2 m (8E–7 m^2/s).
-80
-90

Title GEOLOGY KFR69

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR69	**Northing [m]**	6701713.56
Diameter [mm]		**Easting [m]**	1632783.24
Length [m]	201.200	**Elevation [m]**	2.40
Bearing [°]	14.51	**Plot Date**	2010-03-09
Inclination [°]	-45.39	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granite, metamorphic, aplitic
- Granite to granodiorite, metamorphic, medium-grained
- Tonalite to granodiorite, metamorphic
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

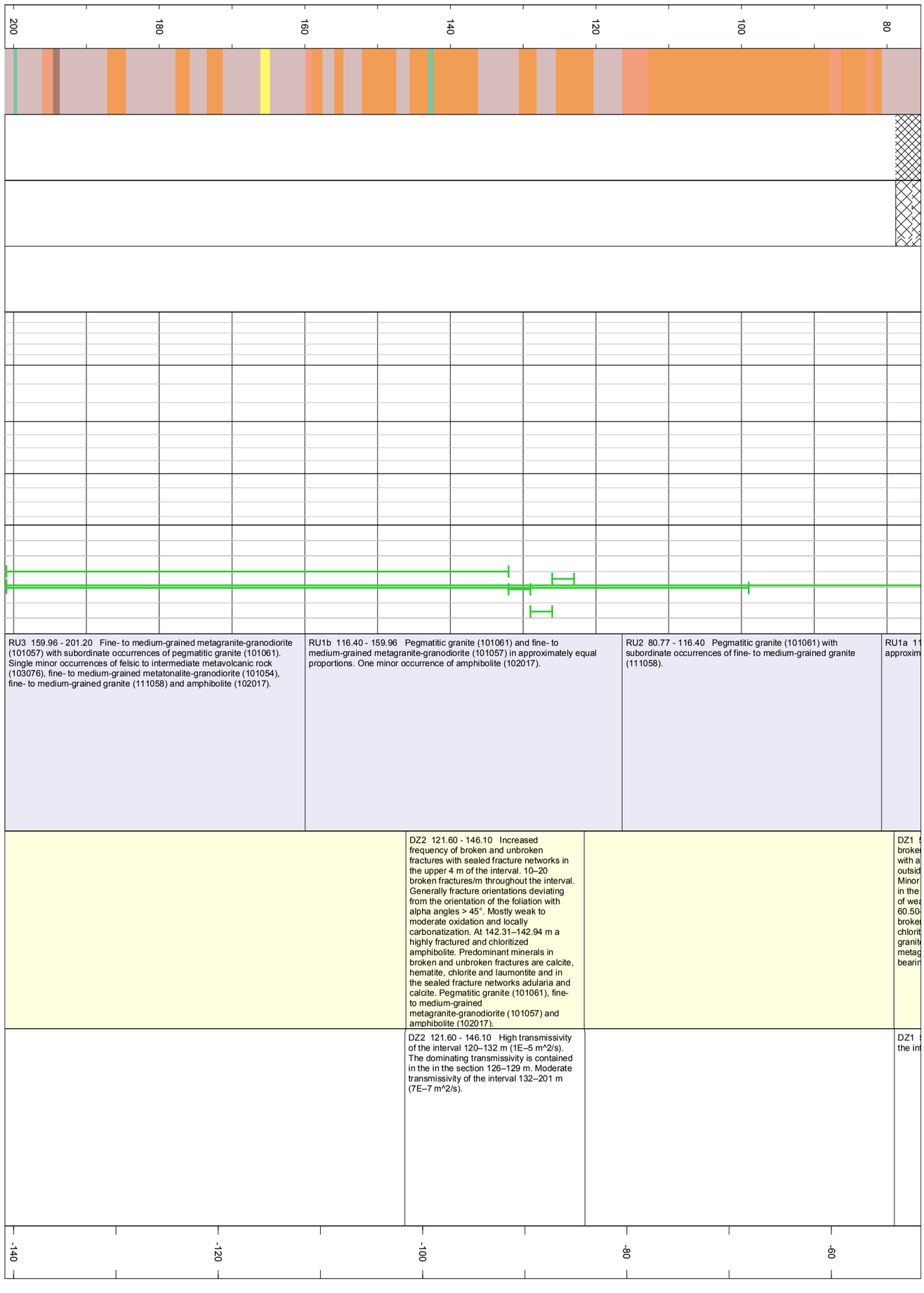
- Sericitisized
- Carbonatization

ROCK ALTERATION INTENSITY

- Faint
- Medium

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA	ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m^3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-011 0.0001 Transient inj K (m/s) 2m 1e-011 0.0001 Steady state inj K (m/s) 1e-011 0.0001	Description	Description	Description	Vertical depth RHB-70
0													0
20													-20
40													-40
60										.68 - 80.77 Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in ately equal proportions. One minor occurrence of aplitic metagranite (101058).	52.38 - 79.00 Increased frequency of n fractures in the interval 52.38–60.50 m n average of c. 12 broken fractures/m e crushes. Generally alpha angles > 45°. crush at 60.25–60.35 m. Faint oxidation interval 52.38–60.50 m. Calcite alteration ak to medium intensity in the interval 79.00 m. Predominant minerals in n fractures are hematite/Fe-hydroxide, e, calcite and laumontite. Pegmatitic e (101061) and fine- to medium-grained ranite-granodiorite (101057); muscovite g in the interval 60.50–79.00 m.	52.38 - 79.00 Moderate transmissivity of erval (2E–7 m^2/s).	


80
100
120
140
160
180
200
RU3 159.96 - 201.20 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061). Single minor occurrences of felsic to intermediate metavolcanic rock (103076), fine- to medium-grained metatonalite-granodiorite (101054), fine- to medium-grained granite (111058) and amphibolite (102017).
RU1b 116.40 - 159.96 Pegmatitic granite (101061) and fine- to medium-grained metagranite-granodiorite (101057) in approximately equal proportions. One minor occurrence of amphibolite (102017).
RU2 80.77 - 116.40 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained granite (111058).
RU1a 11
approxim
DZ2 121.60 - 146.10 Increased frequency of broken and unbroken fractures with sealed fracture networks in the upper 4 m of the interval. 10–20 broken fractures/m throughout the interval. Generally fracture orientations deviating from the orientation of the foliation with alpha angles > 45°. Mostly weak to moderate oxidation and locally carbonatization. At 142.31–142.94 m a highly fractured and chloritized amphibolite. Predominant minerals in broken and unbroken fractures are calcite, hematite, chlorite and laumontite and in the sealed fracture networks adularia and calcite. Pegmatitic granite (101061), fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017).
DZ1 9
broke
with a
outsid
Minor
in the
of wea
60.50-
broke
chlorit
granit
metag
bearin
DZ2 121.60 - 146.10 High transmissivity of the interval 120–132 m (1E–5 m^2/s). The dominating transmissivity is contained in the in the section 126–129 m. Moderate transmissivity of the interval 132–201 m (7E–7 m^2/s).
DZ1 9
the int
-140
-120
-100
-80
-60

Title GEOLOGY KFR70

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR70	**Northing [m]**	6701712.85
Diameter [mm]		**Easting [m]**	1632823.74
Length [m]	172.500	**Elevation [m]**	2.50
Bearing [°]	61.81	**Plot Date**	2010-03-09
Inclination [°]	-51.29	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- **Pegmatite, pegmatitic granite**
- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**

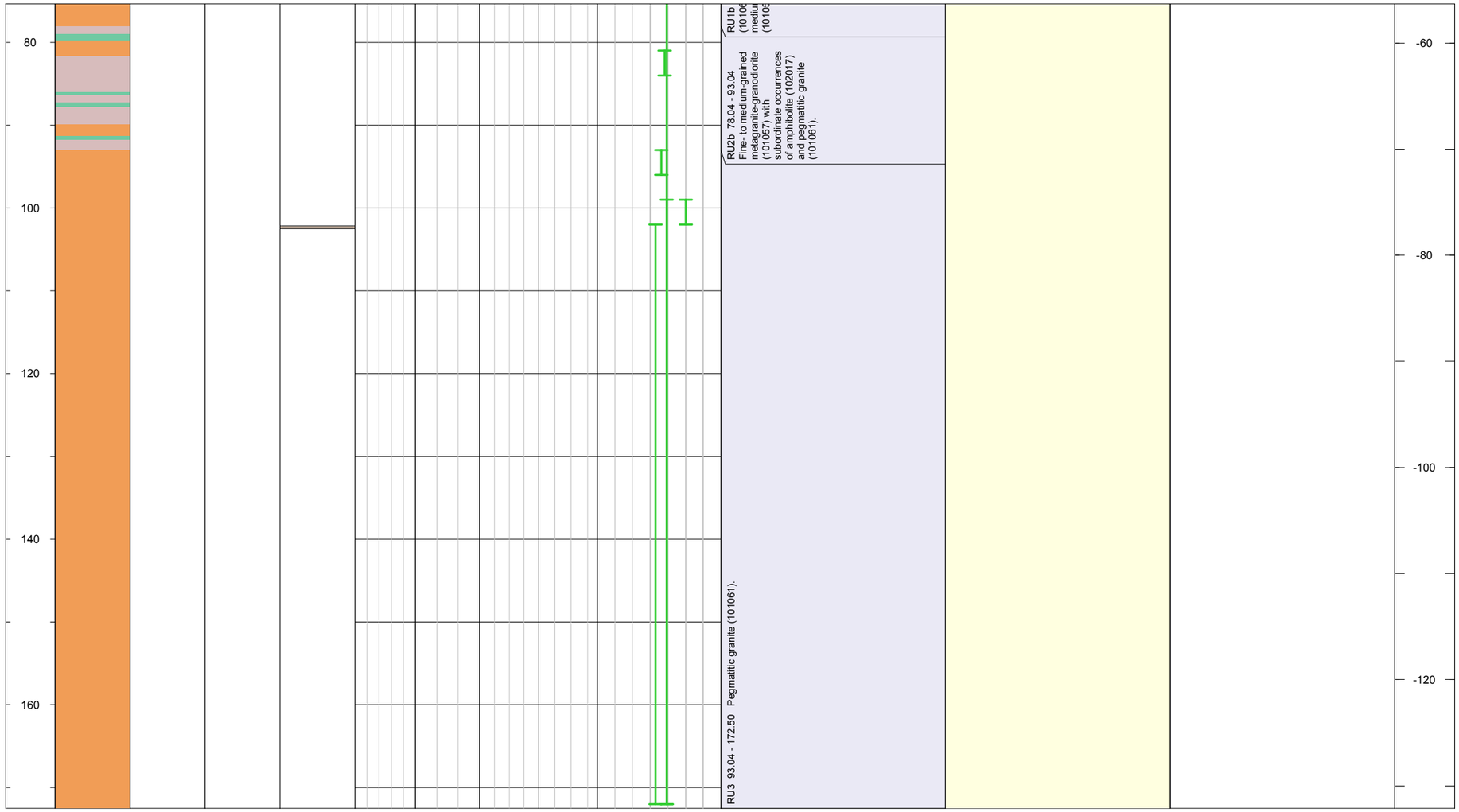
ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

- **Breccia**

Borehole Length from TOC (m)	BOREMAP DATA: Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	GEOPHYSICS: Density (kg/m*3) 2650 2700	Susceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	HYDROLOGIC DATA: Pressure build up K (m/s) 1e-011 0.0001	Transient inj K (m/s) 2m 1e-011 0.0001	Steady state inj K (m/s) 1e-011 0.0001	ROCK UNIT: Description	Possible deformation zone: Description	Hydrogeology for PDZ: Description	Depth: Vertical depth RHB-70
0															0
9.24												RU1a 9.24 - 37.53 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057).			
37.53												RU2a 37.53 - 50.30 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017) and one occurrence of pegmatitic granite (101061).			
50.30												50.30 - 78.04 Pegmatitic granite (101061) with one occurrence of fine- to medium-grained metagranite-granodiorite (101057).			
78.04															


80
100
120
140
160
-60
-80
-100
-120
RU1b
RU2b 78.04 - 93.04 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of amphibolite (102017) and pegmatitic granite (101061).
RU3 93.04 - 172.50 Pegmatitic granite (101061).

Title GEOLOGY KFR71

Site	FORSMARK - SFR	**Coordinate System**	RT90-RHB70
Borehole	KFR71	**Northing [m]**	6701367.83
Diameter [mm]	56	**Easting [m]**	1632363.08
Length [m]	120.900	**Elevation [m]**	-33.29
Bearing [°]	59.51	**Plot Date**	2011-01-19
Inclination [°]	2.00	**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- Granite, fine- to medium-grained
- Pegmatite, pegmatitic granite
- Granite to granodiorite, metamorphic, medium-grained
- Granodiorite, metamorphic
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic
- Cataclastic rock

ROCK ALTERATION

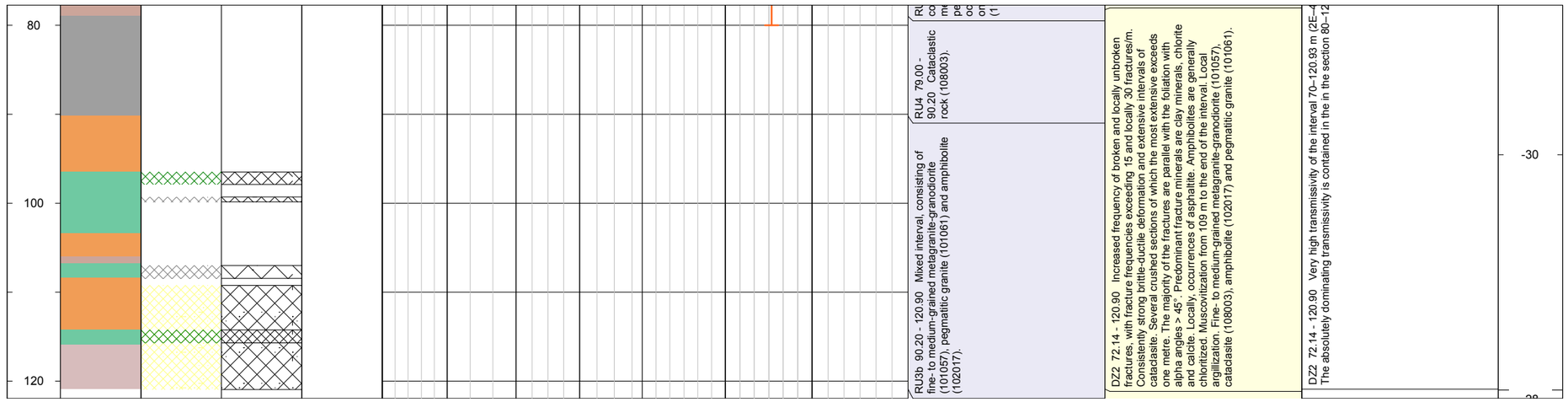
- Chloritisized
- Sericitisized
- Argillization

ROCK ALTERATION INTENSITY

- Faint
- Weak
- Medium

ROCK OCCURENCE

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA			ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m^3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-006 1	Transient inj K (m/s) 2m 1e-011 1e-005	Steady state inj K (m/s) 1e-006 1	Description	Description	Description	Vertical depth RHB-70
										10m 1e-011 1e-005	Below measur limit K (m/s) 1e-008 1				
0												RU1 0.00 - 9.08 Amphibolite (102017).			
20												RU2 9.08 - 54.58 Fine- to medium-grained metagranite-granodiorite (101057) with subordinate occurrences of pegmatitic granite (101061), one occurrence of felsic to intermediate metavolcanic rock (103076) and one minor occurrence of amphibolite (102017).			
40															
60												J3a 54.58 - 79.00 Mixed interval, consisting of fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061). One occurrence of amphibolite (102017) and one of fine- to medium-grained granite (101058).	DZ1 65.67 - 69.50 Increased frequency of unbroken fractures. Generally brittle-ductile deformation and locally minor crushes. Alpha angles generally parallel with the foliation (i.e. > 50°). Moderate chloritization of amphibolites and weak to moderate oxidation of pegmatitic granites. Predominant minerals in broken fractures are clay minerals, calcite, chlorite and laumontite and in unbroken fractures epidote. Pegmatitic granite (101061), metagranite-granodiorite (101057), and amphibolite (102017).	DZ1 65.67 - 69.50 Relatively high transmissivity of the interval 60–70 m (3E–6 m^2/s).	-32
														m^2/s). 0.93 m.	


80
100
120
RU3b 90.20 - 120.90 Mixed interval, consisting of fine- to medium-grained metagranite-granodiorite (101057), pegmatitic granite (101061) and amphibolite (102017).
RU4 79.00 - 90.20 Cataclastic rock (108003).
DZ2 72.14 - 120.90 Increased frequency of broken and locally unbroken fractures, with fracture frequencies exceeding 15 and locally 30 fractures/m. Consistently strong brittle-ductile deformation and extensive intervals of cataclasite. Several crushed sections of which the most extensive exceeds one metre. The majority of the fractures are parallel with the foliation with alpha angles > 45°. Predominant fracture minerals are clay minerals, chlorite and calcite. Locally, occurrences of asphaltite. Amphibolites are generally chloritized. Muscovitization from 109 m to the end of the interval. Local argillization. Fine- to medium-grained metagranite-granodiorite (101057), cataclasite (108003), amphibolite (102017) and pegmatitic granite (101061).
DZ2 72.14 - 120.90 Very high transmissivity of the interval 70–120.93 m (2E–4
The absolutely dominating transmissivity is contained in the in the section 80–12
-30

Title GEOLOGY KFR72

Site	FORSMARK - SFR	**Coordinate System**	
Borehole	KFR72	**Northing [m]**	
Diameter [mm]		**Easting [m]**	
Length [m]	100.53	**Elevation [m]**	
Bearing [°]		**Plot Date**	2010-09-24
Inclination [°]		**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- Pegmatite, pegmatitic granite
- Granite to granodiorite, metamorphic, medium-grained
- Granodiorite, metamorphic
- Amphibolite
- Felsic to intermediate volcanic rock, metamorphic

ROCK ALTERATION

- Chloritisized
- Epidotisized
- Sericitisized
- Argillization

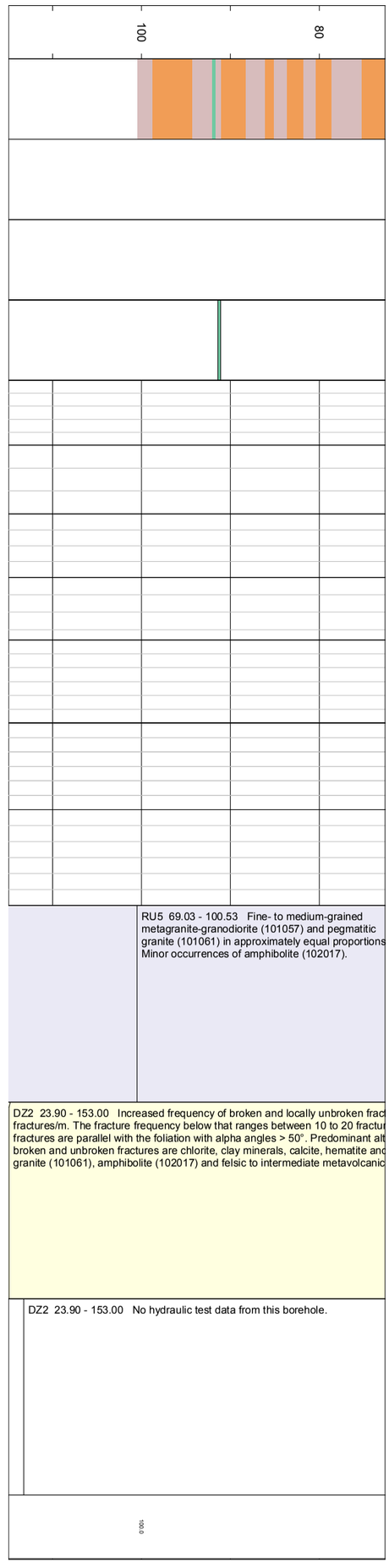
ROCK ALTERATION INTENSITY

- Faint
- Weak
- Medium

ROCK OCCURENCE

- Amphibolite
- Felsic to intermediate volcanic rock, metamorph

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA			ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-006 1	Transient inj K (m/s) 2m 1e-006 1	Steady state inj K (m/s) 1e-006 1	Description	Description	Description	Vertical depth RHB-70
										10m 1e-006 1	Below measur limit K (m/s) 1e-008 1				
										Transient_Inj 3 0.01 1000					
0												RU1 0.00 - 10.60 Felsic to intermediate metavolcanic rock (103076).	DZ1 0.00 - 13.00 Increased frequency of broken fractures, especially in the upper half of the interval where the frequency locally exceeds 30 fractures/m. High alpha angles, generally parallel with the orientation of the foliation. Brittle-ductile from 0 to 8.40 m. Several minor crushes. Locally faint muscovitization and argillization. Predominant minerals in broken fractures are clay minerals, chlorite and calcite. Fine- to medium-grained metagranite-granodiorite (101057) and felsic to intermediate volcanic rock (103076).	DZ1 0.00 - 13.00 No hydraulic test data from this borehole.	0.0
20												RU2 10.60 - 23.95 Pegmatitic granite (101061) with subordinate occurrences of fine- to medium-grained metagranite-granodiorite (101057).			
40												RU3 23.95 - 41.50 Amphibolite (102017) and felsic to intermediate metavolcanic rock (103076).			
60												RU4 41.50 - 69.03 Fine- to medium-grained metagranite-granodiorite (101057).	ures, especially between 23.90 and 64.83 m, where the frequency is about 20 es/m. Slightly lower fracture frequencies in pegmatitic granites. The majority of the erations are chloritization, argillization and muscovitization. Predominant minerals in laumontite. Fine- to medium-grained metagranite-granodiorite (101057), pegmatitic rocks (103076).		



RU5 69.03 - 100.53 Fine- to medium-grained metagranite-granodiorite (101057) and pegmatitic granite (101061) in approximately equal proportions. Minor occurrences of amphibolite (102017).

DZ2 23.90 - 153.00 Increased frequency of broken and locally unbroken fract fractures/m. The fracture frequency below that ranges between 10 to 20 fractu fractures are parallel with the foliation with alpha angles > 50°. Predominant alt broken and unbroken fractures are chlorite, clay minerals, calcite, hematite and granite (101061), amphibolite (102017) and felsic to intermediate metavolcanic

DZ2 23.90 - 153.00 No hydraulic test data from this borehole.

100.0

Title GEOLOGY KFR89

Site	FORSMARK - SFR	**Coordinate System**	
Borehole	KFR89	**Northing [m]**	
Diameter [mm]		**Easting [m]**	
Length [m]	17.00	**Elevation [m]**	
Bearing [°]		**Plot Date**	2011-01-21
Inclination [°]		**Date of mapping**	2009-10-26
Activity Type	GE299		

ROCKTYPE

- **Granite to granodiorite, metamorphic, medium-grained**
- **Amphibolite**

ROCK ALTERATION

ROCK ALTERATION INTENSITY

ROCK OCCURENCE

- **Amphibolite**

Borehole Length from TOC (m)	BOREMAP DATA				GEOPHYSICS				HYDROLOGIC DATA			ROCK UNIT	Possible deformation zone	Hydrogeology for PDZ	Depth
	Rock Type	Rock Alteration	Rock alteration intensity	Rock Occurence	Density (kg/m*3) 2650 2700	Suceptibility (SI*E-5) 0 3000	Natural Gamma (uR/h) 0 100	SPR (ohm) 200 2000	Pressure build up K (m/s) 1e-006 1	Transient inj K (m/s) 2m 1e-006 1	Steady state inj K (m/s) 1e-006 1	Description	Description	Description	Vertical depth RHB-70
										10m 1e-006 1	Below measur limit K (m/s) 1e-008 1				
										Transient_Inj 3 0.01 1000					
0												RU1 0.00 - 17.00 Fine- to medium-grained metagranite-granodiorite (101057) with one occurrence of amphibolite (102017).	DZ1 10.53 - 14.40 Increased frequency of broken fractures with at least 8 fractures/m (some core material is missing in the interval due to sampling and overcoring). Variable alpha angles; in the amphibolites generally parallel with the orientation of the foliation. Brittle-ductile deformation at the lower end of the interval. Locally faint to weak oxidation. Predominant minerals in broken fractures are chlorite, calcite, clay minerals and hematite. Fine- to medium-grained metagranite-granodiorite (101057) and amphibolite (102017).	DZ1 10.53 - 14.40 No hydraulic test data from this borehole.	0.0
20															