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Oskarshamn site investigation

Drill hole KSH01A

Determining of porosity by water saturation and density by buoyancy technique

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March 2004

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Keywords: Rock mechanics, Petro physics, Density, Porosity.

Abstract

The density and porosity has been determined on 22 specimens (each divided in two pieces) from drill hole KSH01A. The specimens were sampled on four levels in the drill hole: 300, 400, 480 and 700 m. The investigated rock types are mapped as Quartz monzodiorite (300 and 700 m) and Fine-grained dioritoid (400 and 480 m). The results for dry density varied between 2760 and 2880 kg/m^3, for wet density the results varied between 2770 and 2880 kg/m^3 and the results for porosity varied between 0.1 and 0.4%.

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1 Introduction

The purpose is to determine the porosity and the water saturated and dry density of the samples. The test programme follows the activity plan AP PS 400-03-066 (SKB internal controlling document).

The cores are sampled from borehole KSH01A in the Simpevarp area. They were sampled 13 May 2003 by Rolf Christiansson, Swedish Nuclear & Waste Management Co (SKB), and Urban Åkesson, Swedish National Testing and Research Institute (SP). Specimens were taken from four levels in the rock core: level 1 between 299 and 306 m, level 2 between 399 and 415 m, level 3 between 479 and 497 m, and level 4 between 703 and 713. The samples were selected based on the preliminary core logging, and with the strategy to primarily investigate the properties of the dominant rock properties. The rock cores were transported by SP from Simpevarp and arrived to SP 14 May 2003. The testing was performed during August 2003 and January 2004.

Figure 1-1. *Map of Oskarshamn site.*

2 Objective and scope

The purpose of the testing is to determine the density and porosity of intact rock core. The parameters are used in the rock mechanical and thermal model which will be established for the candidate area selected for site investigations at Simpevarp.

The samples are from the borehole KSH01A in Simpevarp, which is a telescope borehole of SKB-standard type with a borehole depth of 1000 m. The samples in this report are taken at four different main levels.

3 Equipment

Following equipment has been used for the analyses:

- Thermometer (inv no 102080) for measurement of water temperature. Calibrated 2003-01-07. Uncertainty of measurement ± 0,4°C.
- Scale (inv no 102084 and 102291) for weight measurement. Calibrated 2003-03-19 and 2003-08-12. Uncertainty of measurement ± 0,2 g.
- Heating chamber (inv no 102065 and 102289) for drying the specimens. Calibrated 2003-02-21 and 2003-08-22. Uncertainty of measurement ± 5°C.
- A covered plastic box filled with water for water saturation of the samples.
- A desiccators for cooling samples in.

Uncertainty of method as expanded uncertainty with covering factor 2 (95% confidence interval):

Density	± 4 kg/m^3
Porosity	± 0.09%
Water absorption	± 0.05%

4 Execution

Determination of the porosity and density was made in accordance with SKB's method description SKB MD 160.002-version 1.9 (SKB internal controlling document); This includes determination of density in accordance to /ISRM, 1979/, volume 16, number 2, water saturation by /EN 13755/ and in accordance to Activity plan AP PS 400-03-066 (SKB internal controlling document). The department of Building Technology and Mechanics (BM) at SP performed the test.

4.1 Description of the samples

From the Simpevarp area, Sweden was specimens sampled from four levels in drill hole KSH01A. The drill hole starts at a depth of 100 m. Level 1 range between 299 and 306 m, level 2 between 399 and 415 m, level 3 between 479 and 497 m, and level 4 between 703 and 713 m. Table 4-1 show the rock type and identification marks of the specimens.

Table 4-1. Rock type and identification marks (Rock-type classification according to Boremap).

Rock type	Identification	Sampling depth (Sec up)
Quartz monzodiorite	KSH01A-90V-1	299.15
Quartz monzodiorite	KSH01A-90V-2	300.21
Quartz monzodiorite	KSH01A-90V-3	300.33
Quartz monzodiorite	KSH01A-90V-4	301.94
Quartz monzodiorite	KSH01A-90V-5	305.89
Quartz monzodiorite	KSH01A-90V-6	306.10
Fine-grained dioritoid	KSH01A-90V-7	399.27
Fine-grained dioritoid	KSH01A-90V-8	401.09
Fine-grained dioritoid	KSH01A-90V-9	401.63
Fine-grained dioritoid	KSH01A-90V-10	404.00
Fine-grained dioritoid	KSH01A-90V-11	404.12
Fine-grained dioritoid)	KSH01A-90V-12	414.67
Fine-grained dioritoid	KSH01A-90V-13	479.59
Fine-grained dioritoid	KSH01A-90V-14	482.90
Fine-grained dioritoid	KSH01A-90V-15	483.42
Fine-grained dioritoid	KSH01A-90V-16	494.96
Fine-grained dioritoid	KSH01A-90V-17	495.72
Fine-grained dioritoid	KSH01A-90V-18	497.08
Quartz monzodiorite	KSH01A-90V-19	703.37
Quartz monzodiorite	KSH01A-90V-20	703.49
Quartz monzodiorite	KSH01A-90V-21	707.00
Quartz monzodiorite	KSH01A-90V-22	707.92
Quartz monzodiorite	KSH01A-90V-23	709.12
Quartz monzodiorite	KSH01A-90V-24	712.73

4.2 Testing

The execution procedure followed the prescription in SKB MD 160.002-version 1.9 (SKB internal controlling document) and the following steps were performed:

Activity no	Activity
1	The specimens were cut according to the marks on the rock cores. Every specimen was cut in two pieces, marked A and B and about 25 mm thick each. The same specimens were used to test Thermal properties: heat conductivity and heat capacity determine using the TPS method.
2	The specimens were water saturated in normal air pressure for at least seven days.
3	The specimens were weighted in tap water. (See Appendix 2)
4	The specimens were surface dried with a towel and weighted.
5	The water saturated density was determined. (See Appendix 2)
6	The samples were sent from SP Building and Mechanics to SP Fire Technology for measurement of thermal properties.
7	The samples were sent back from SP Fire Technology to SP Building and Mechanics
8	The specimens were dried in a heating chamber at 105°C.
9	The specimens were transported to a desiccators for cooling.
10	The dry density and porosity was determined. (See Appendix 2)
11	The specimens were photographed in JPEG-format.

5 Results

The main results of the site investigation of KFM01A could be found in the database SICADA, FN96. The data from SICADA should be used for modelling.

Protocols, calculations and pictures can be found in Appendix 1–2.

5.1 Description and presentation of the specimen

The temperature of water for water saturation was 21.9 and 18.4°C and the density of the water was 998 kg/m^3. The specimens were dried in 105°C for one week after water saturation.

Table 5-1. Summary of the results for porosity, dry density and wet density of the specimens from level 1, secup 299 to 306 m. The result for each specimen is a mean value of sub sample A and B.

Specimen	Sampling depth, according to the marks on the drill-core boxes (Sec up) (m)	Porosity (%)	Dry density (kg/m^3)	Wet density (kg/m^3)
KSH01A-90V-1	299.15	0.3	2780	2780
KSH01A-90V-2	300.21	0.2	2780	2780
KSH01A-90V-3	300.33	0.2	2780	2780
KSH01A-90V-4	301.94	0.4	2760	2770
KSH01A-90V-5	305.89	0.2	2780	2790
KSH01A-90V-6	306.10	0.1	2790	2790
Mean value	0.3	2780	2780	
Standard deviation	0.11	10	9	

Table 5-2. Summary of the results for porosity, dry density and wet density of the specimens from level 2 secup 399 m to 415 m. The result for each specimen is a mean value of sub sample A and B.

Specimen	Sampling depth, according to the marks on the drill-core boxes (Sec up) (m)	Porosity (%)	Dry density (kg/m^3)	Wet density (kg/m^3)
KSH01A-90V-7	399.27	0.2	2790	2790
KSH01A-90V-8	401.09	–	–	2770
KSH01A-90V-9	401.63	0.2	2770	2770
KSH01A-90V-10	404.00	0.1	2780	2780
KSH01A-90V-11	404.12	0.2	2780	2780
KSH01A-90V-12	414.67	0.3	2790	2790
Mean value	0.2	2780	2780	
Standard deviation	0,03	8	8	

Table 5-3. Summary of the results for porosity, dry density and wet density of the specimens from level 3 seclup 479 m to 497 m. The result for each specimen is a mean value of sub sample A and B.

Specimen	Sampling depth, according to the marks on the drill-core boxes (Sec up) (m)	Porosity (%)	Dry density (kg/m^3)	Wet density (kg/m^3)
KSH01A-90V-13	479.59	0.1	2820	2820
KSH01A-90V-14	482.90	0.1	2800	2800
KSH01A-90V-15	483.42	0.4	2770	2770
KSH01A-90V-16	494.96	0.2	2790	2790
KSH01A-90V-17	495.72	0.2	2790	2800
KSH01A-90V-18	497.08	0.2	2780	2780
Mean value	0.2	2790	2790	
Standard deviation	0.10	17	16	

Table 5-4. Summary of the results for porosity, dry density and wet density of the specimens from level 4 secup 703 m to 713 m. The result for each specimen is a mean value of sub sample A and B.

Specimen	Sampling depth, according to the marks on the drill-core boxes (Sec up) (m)	Porosity (%)	Dry density (kg/m^3)	Wet density (kg/m^3)
KSH01A-90V-19	703.37	0.1	2830	2840
KSH01A-90V-20	703.49	0.2	2800	2800
KSH01A-90V-21	707.00	–	–	–
KSH01A-90V-22	707.92	0.2	2850	2850
KSH01A-90V-23	709.12	0.2	2880	2880
KSH01A-90V-24	712.73	0.2	2860	2860
Mean value	0.2	2840	2850	
Standard deviation	0.04	27	27	

5.2 Results for the entire test series

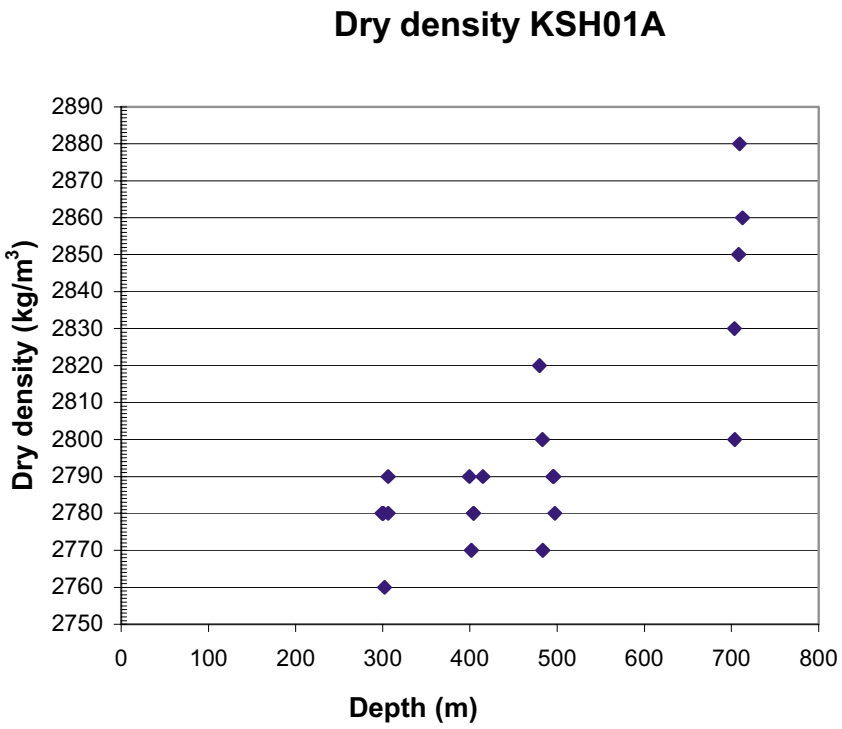


Figure 5-1. *Density (dry) versus depth which the samples are taken in the borehole.*

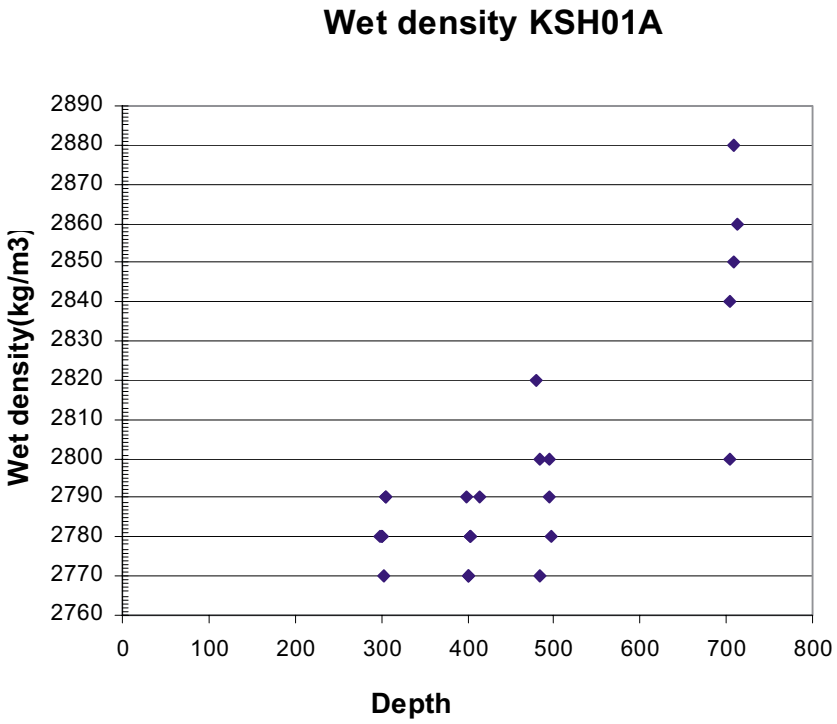


Figure 5-2. *Density (wet) versus depth which the samples are taken in the borehole.*

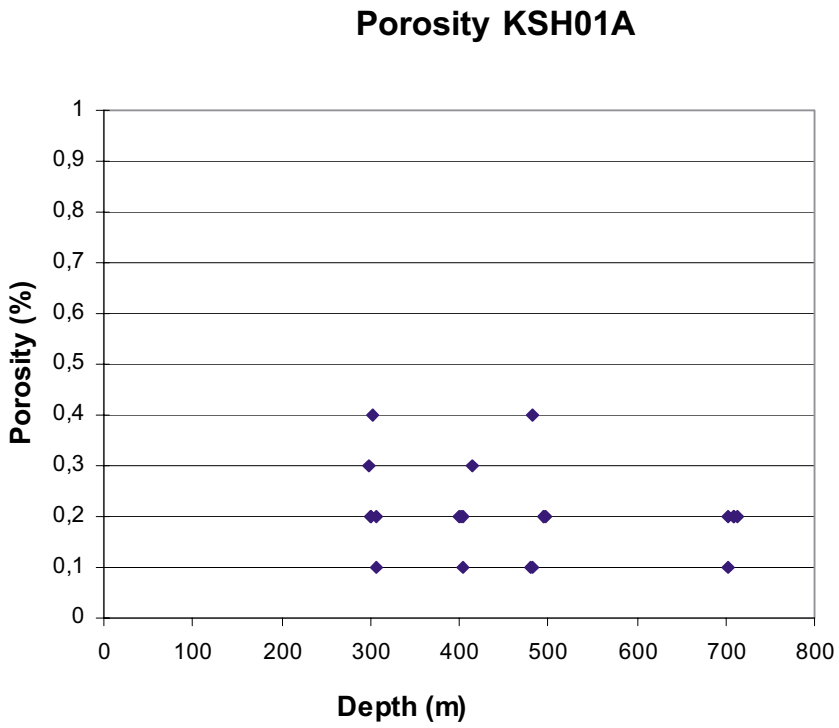


Figure 5-3. *Porosity versus depth which the samples are taken in the borehole.*

5.3 Discussion

The specimens ware measured in two separate occasions. The first ten samples were measured in July 2003 according /EN 13755/, to compare different methods for density and porosity measurements, see /Sandström, 2004/. The rest of the specimens were measured in January 2004.

Among the samples measured in January 2004 two samples cracked along sealed fractures under the testing with TPS, KSH01A-90V-8 and KSH01A-90V-21 with secup 401.09 m and 707.00 m. Pictures for KSH01A-90V-6 and KSH01A-90V-18 with secup 306.10 and 497.08 were not taken because they were spare samples.

References

EN 13755. Natural stone test methods – Determination of water absorption at atmospheric pressure.

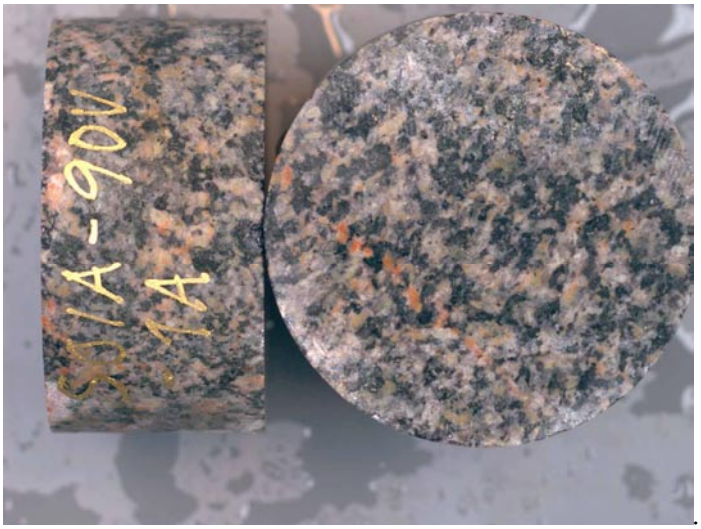
ISRM, 1979. Suggested Method for Determining Water Content, Porosity, Density, Absorption and Related Properties and Swelling and Slake-durability Index Properties.

Sandström M, 2004. Forsmark, drill hole KFM01A and Oskarshamn drill hole KSH01A, Comparison of three test methods for determination of water absorption and density, SKB P-04-93, Svensk Kärnbränslehantering AB.

Results and pictures

KSH01A: Density and porosity

Table 1: Level 1 299-306 m, Specimen KSH01A-090V-1 to KSH01A-090V-6

KSH01A-90V-1 (299,15) The dry density for specimen KSH01A-90V-1A was measured to be 2780 kg/m^3 and the porosity to 0,4 % and the dry density for specimen KSH01A-90V-1B was measured to be 2780 kg/m^3 and the porosity to 0,3 %.	**Fig. 1**. *Specimen KSH01A-90V-1* 
KSH01A-90V-2 (300,21) The dry density for specimen KSH01A-90V-2A was measured to be 2780 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-2B was measured to be 2780 kg/m^3 and the porosity to 0,2 %.	**Fig. 2.** *Specimen KSH01A-90V-2.* 
KSH01A-90V-3 (300,33) The dry density for specimen KSH01A-90V-3A was measured to be 2780 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-3B was measured to be 2780 kg/m^3 and the porosity to 0,2 %.	**Fig. 3**. *Specimen KSH01A-90V-3.* 

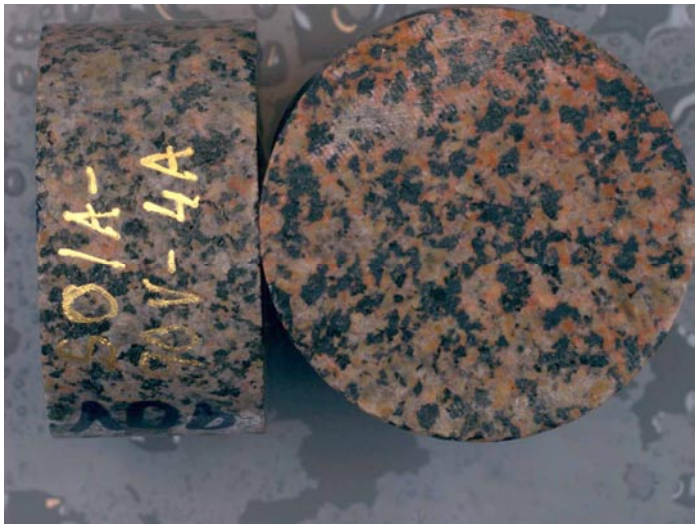
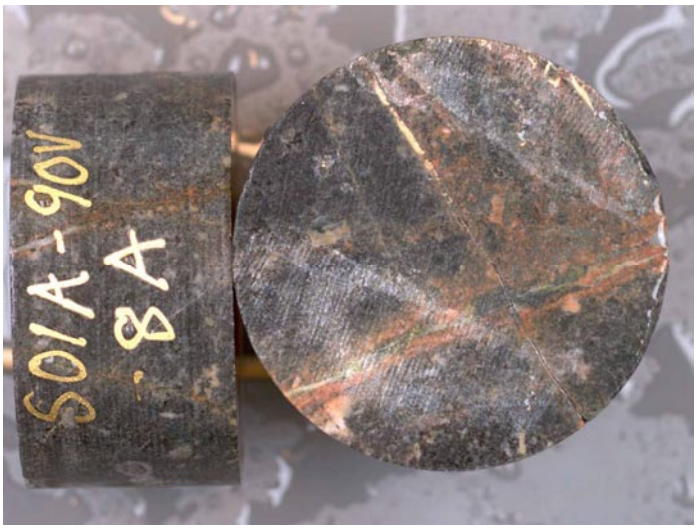
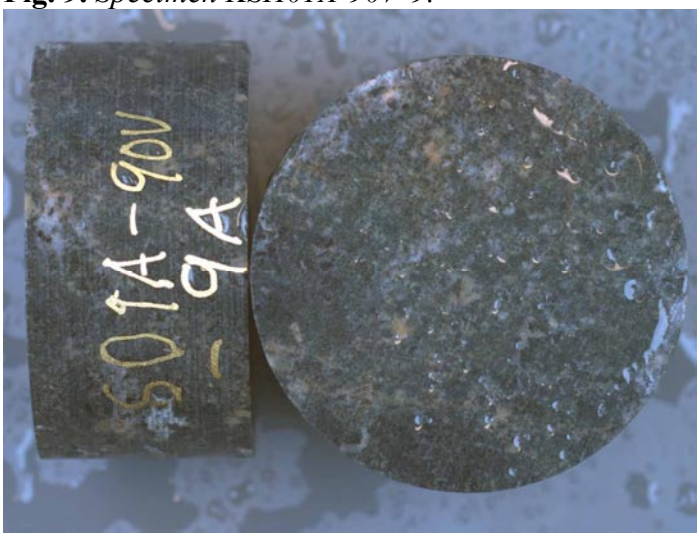
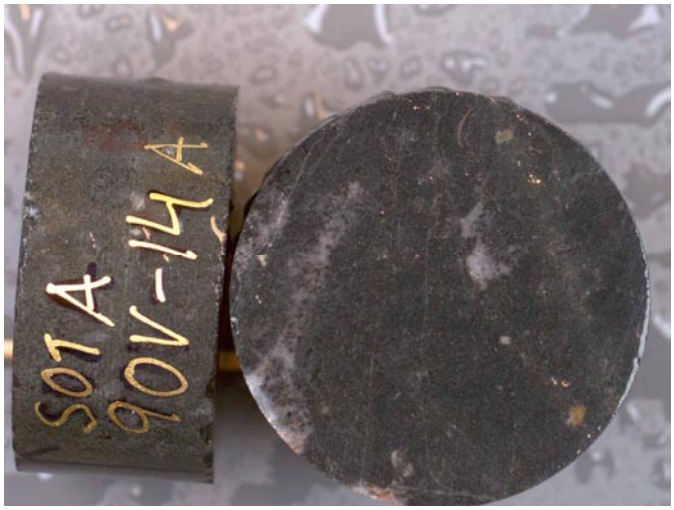
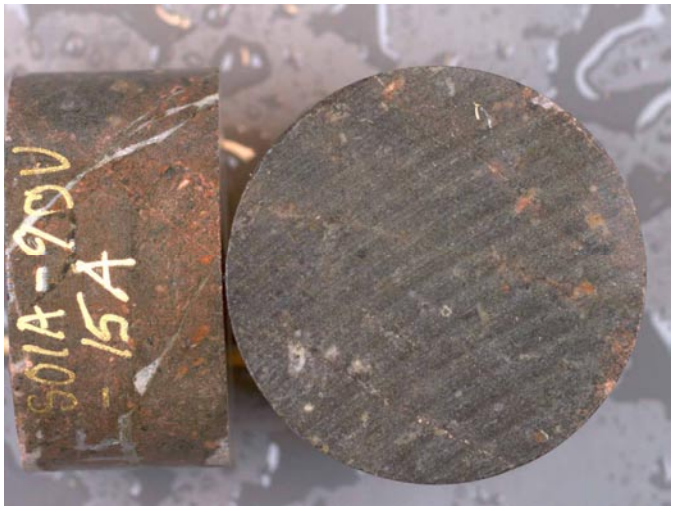
KSH01A-90V-4 (301,94) The dry density for specimen KSH01A-90V-4A was measured to be 2760 kg/m^3 and the porosity to 0,4 % and the dry density for specimen KSH01A-90V-4B was measured to be 2760 kg/m^3 and the porosity to 0,5 %.	**Fig. 4.** *Specimen KSH01A-90V-4.* 
KSH01A-90V-5 (305,89) The dry density for specimen KSH01A-90V-5A was measured to be 2790 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-5B was measured to be 2780 kg/m^3 and the porosity to 0,2 %.	**Fig. 5.** *Specimen KSH01A-90V-5.* 
KSH01A-90V-6 (306,10) The dry density for specimen KSH01A-90V-6A was measured to be 2790 kg/m^3 and the porosity to 0,1 % and the dry density for specimen KSH01A-90V-6B was measured to be 2790 kg/m^3 and the porosity to 0,2 %.	**Fig. 6.** *Specimen KSH01A-90V-6.* Picture was not taken because this sample is a spare sample.

Table 2: Level 1 399-415 m, Specimen KSH01A-090V-7 to KSH01A-090V-12

KSH01A-90V-7 (399,27) The dry density for specimen KSH01A-90V-7A was measured to be 2790 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-7B was measured to be 2790 kg/m^3 and the porosity to 0,2 %.	**Fig. 7.** *Specimen KSH01A-90V-7.* 
KSH01A-90V-8 (401,09) This sample cracked along sealed fractures under the testing therefore there are no results.	**Fig. 8.** *Specimen KSH01A-90V-8.* 
KSH01A-90V-9 (401,63) The dry density for specimen KSH01A-90V-9A was measured to be 2780 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-9B was measured to be 2760 kg/m^3 and the porosity to 0,2 %.	**Fig. 9.** *Specimen KSH01A-90V-9.* 

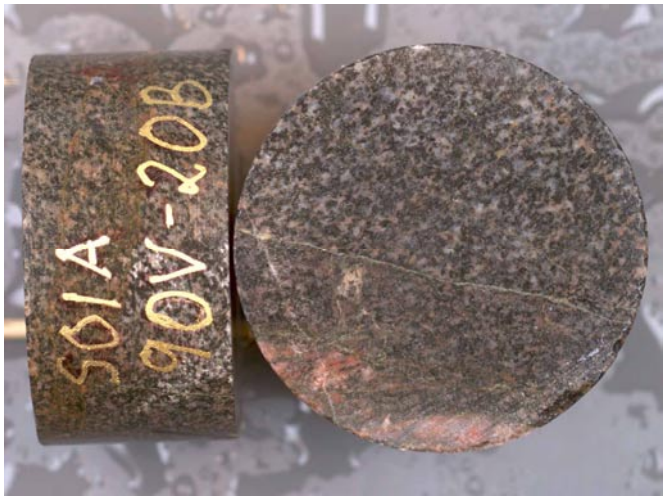
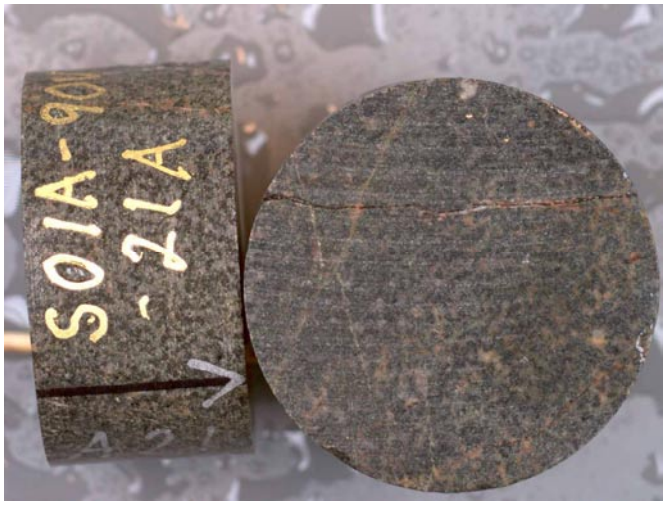
KSH01A-90V-10 (404,00) The dry density for specimen KSH01A-90V-10A was measured to be 2780 kg/m^3 and the porosity to 0,1 % and the dry density for specimen KSH01A-90V-10B was measured to be 2770 kg/m^3 and the porosity to 0,2 %.	**Fig. 10.** *Specimen KSH01A-90V-10.* 
KSH01A-90V-11 (404,12) The dry density for specimen KSH01A-90V-11A was measured to be 2770 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-11B was measured to be 2790 kg/m^3 and the porosity to 0,2 %.	**Fig. 11.** *Specimen KSH01A-90V-11.* 
KSH01A-90V-12 (414,67) The dry density for specimen KSH01A-90V-12A was measured to be 2790 kg/m^3 and the porosity to 0,3 % and the dry density for specimen KSH01A-90V-12B was measured to be 2790 kg/m^3 and the porosity to 0,2 %.	**Fig.12.** *Specimen KSH01A-90V-12.* 

Table 3: Level 1 479-497 m, Specimen KSH01A-090V-13 to KSH01A-090V-18

KSH01A-90V-13 (479,59) The dry density for specimen KSH01A-90V-13A was measured to be 2820 kg/m^3 and the porosity to 0,1 % and the dry density for specimen KSH01A-90V-13B was measured to be 2820 kg/m^3 and the porosity to 0,2 %.	**Fig. 13.** *Specimen KSH01A-90V-13.* 
KSH01A-90V-14 (482,90) The dry density for specimen KSH01A-90V-14A was measured to be 2800 kg/m^3 and the porosity to 0,1 % and the dry density for specimen KSH01A-90V-14B was measured to be 2800 kg/m^3 and the porosity to 0,1 %.	**Fig. 14.** *Specimen KSH01A-90V-14.* 
KSH01A-90V-15 (483,42) The dry density for specimen KSH01A-90V-15A was measured to be 2760 kg/m^3 and the porosity to 0,5 % and the dry density for specimen KSH01A-90V-15B was measured to be 2780 kg/m^3 and the porosity to 0,3 %.	**Fig. 15.** *Specimen KSH01A-90V-15.* 

KSH01A-90V-16 (494,96) The dry density for specimen KSH01A-90V-16A was measured to be 2790 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-16B was measured to be 2790 kg/m^3 and the porosity to 0,2 %.	**Fig. 16.** *Specimen KSH01A-90V-16.* 
KSH01A-90V-17 (495,72) The dry density for specimen KSH01A-90V-17A was measured to be 2790 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-17B was measured to be 2800 kg/m^3 and the porosity to 0,2 %.	**Fig. 17.** *Specimen KSH01A-90V-17.* 
KSH01A-90V-18 (497,08) The dry density for specimen KSH01A-90V-18A was measured to be 2780 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-18B was measured to be 2780 kg/m^3 and the porosity to 0,2 %.	**Fig. 18.** *Specimen KSH01A-90V-18.* Picture was not taken because this sample is a spare sample.

Table 4: Level 4 703-713 m, Specimen KSH01A-090V-19 to KSH01A-090V-24

KSH01A-90V-19 (703,37) The dry density for specimen KSH01A-90V-19A was measured to be 2830 kg/m^3 and the porosity to 0,1 % and the dry density for specimen KSH01A-90V-19B was measured to be 2830 kg/m^3 and the porosity to 0,2 %.	**Fig. 19.** *Specimen KSH01A-90V-19.* 
KSH01A-90V-20 (703,49) The dry density for specimen KSH01A-90V-20A was measured to be 2800 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-20B was measured to be 2800 kg/m^3 and the porosity to 0,1 %.	**Fig. 20.** *Specimen KSH01A-90V-20.* 
KSH01A-90V-21 (707,00) This sample cracked along sealed fractures under the testing therefore there are no results.	**Fig. 21.** *Specimen KSH01A-90V-21.* 

KSH01A-90V-22 (707,92) The dry density for specimen KSH01A-90V-22A was measured to be 2850 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-22B was measured to be 2850 kg/m^3 and the porosity to 0,2 %.	**Fig. 22.** *Specimen KSH01A-90V-22.* 
KSH01A-90V-23 (709,12) The dry density for specimen KSH01A-90V-23A was measured to be 2880 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-23B was measured to be 2880 kg/m^3 and the porosity to 0,2 %.	**Fig. 23.** *Specimen KSH01A-90V-23.* 
KSH01A-90V-24 (712,73) The dry density for specimen KSH01A-90V-24A was measured to be 2860 kg/m^3 and the porosity to 0,2 % and the dry density for specimen KSH01A-90V-24B was measured to be 2860 kg/m^3 and the porosity to 0,2 %.	**Fig. 24.** *Specimen KSH01A-90V-24.* 

Appendix 2

Calculations of density and porosity

Densitet och porositet, SKB

Uppdrags nr: P302247-09
Metod: EN 13755, ISRM (1973), avsnitt 3 samt SKB MD 160.002 version 1.9
Provad av: mhs
Datum: 2003-12-04

	Provmärkning:	Vikt i vatten, Msub (g)	Yttor vikt, Msat (g)	Torr vikt, Ms (g)	Bulk volume, V (cm3)	Pore volume, Vv (cm3)	Porosity, n (%)	medel por	Dry density, ρd (g/cm3)	medel dens	Wet density (g/cm3)	medel våt dens
1	KSHO1A-1A	90,22	140,70	140,51	50,59	0,19	0,38	0,3	2,778	2,78	2,781	2,78
2	KSHO1A-1B	89,31	139,22	139,06	50,02	0,16	0,32		2,780		2,784	
3	KSHO1A-4A	89,66	140,21	139,99	50,66	0,22	0,44	0,4	2,764	2,76	2,768	2,77
4	KSHO1A-4B	88,54	138,61	138,38	50,18	0,23	0,46		2,758		2,763	
5	KSHO1A-7A	90,38	140,72	140,63	50,45	0,09	0,18	0,2	2,788	2,79	2,790	2,79
6	KSHO1A-7B	90,32	140,57	140,47	50,36	0,10	0,20		2,790		2,792	
7	KSHO1A-8A	89,70	140,10		50,51	140,39	277,98		0,000		2,774	2,77
8	KSHO1A-8B	88,85	138,93		50,19	139,22	277,42		0,000		2,768	
9	KSHO1A-9A	89,64	139,90	139,79	50,37	0,11	0,22	0,2	2,775	2,77	2,778	2,77
10	KSHO1A-9B	89,32	139,73	139,61	50,52	0,12	0,24		2,764		2,766	
11	KSHO1A-12A	88,73	138,17	138	49,54	0,17	0,34	0,3	2,785	2,79	2,789	2,79
12	KSHO1A-12B	89,07	138,63	138,54	49,66	0,09	0,18		2,790		2,791	
13	KSHO1A-13A	92,17	142,54	142,48	50,48	0,06	0,12	0,1	2,823	2,82	2,824	2,82
14	KSHO1A-13B	92,16	142,70	142,62	50,65	0,08	0,16		2,816		2,818	
15	KSHO1A-15A	89,43	139,84	139,6	50,52	0,24	0,48	0,4	2,763	2,77	2,768	2,77
16	KSHO1A-15B	89,62	139,88	139,74	50,37	0,14	0,28		2,775		2,777	
17	KSHO1A-16A	90,43	140,79	140,68	50,47	0,11	0,22	0,2	2,788	2,79	2,790	2,79
18	KSHO1A-16B	90,84	141,42	141,33	50,69	0,09	0,18		2,788		2,790	
19	KSHO1A-17A	90,61	141,01	140,9	50,51	0,11	0,22	0,2	2,790	2,79	2,792	2,80
20	KSHO1A-17B	90,96	141,35	141,25	50,50	0,10	0,20		2,797		2,799	
21	KSHO1A-18A	90,08	140,46	140,36	50,49	0,10	0,20	0,2	2,780	2,78	2,782	2,78
22	KSHO1A-18B	89,93	140,13	140,05	50,31	0,08	0,16		2,784		2,786	
23	KSHO1A-21A	93,07	143,60		50,64	143,90	284,19		0,000		2,836	
24	KSHO1A-21B	trasig			#VÄRDEFEL!	0,00	#VÄRDEFEL!		#VÄRDEFEL!		#VÄRDEFEL!	
25	KSHO1A-22A	94,14	144,690	144,59	50,66	0,10	0,20	0,2	2,854	2,85	2,856	2,85
26	KSHO1A-22B	94,28	145,010	144,92	50,84	0,09	0,18		2,851		2,852	
27	KSHO1A-24A	94,22	144,680	144,56	50,57	0,12	0,24	0,2	2,859	2,86	2,861	2,86
28	KSHO1A-24B	94,10	144,520	144,41	50,53	0,11	0,22		2,858		2,860	
	Medel	90,733	141,041	140,936	#VÄRDEFEL!	15,233	#VÄRDEFEL!	**0,212**	#VÄRDEFEL!	**2,797**	#VÄRDEFEL!	**2,798**
	std avvikelse	1,803	1,990	2,013	#VÄRDEFEL!	44,432	#VÄRDEFEL!	**0,083**	#VÄRDEFEL!	**0,031**	#VÄRDEFEL!	**0,031**

Vattnets temperatur (	21,5	Våg, inv.nr:	102291
Vattnets desitet (ºC):	0,9979	Termometer, inv.nr:	102080

Densitet och porc Uppdrags nr: P302826
Datum: 2003-07-14
Metod: Provad av: MS

	Provmärkning:	Pore volume Vv (cm3)	Porosity n (%)	medel por	Dry density ρd (g/cm3)	medel dens	Wet density (g/cm3)	medel v dens
1	S01A 90V-2A	0,11	0,22	0,2	2,783	2,78	2,785	2,78
2	S01A 90V-2B	0,12	0,24		2,777		2,780	
3	S01A 90V-3A	0,11	0,22	0,2	2,775	2,78	2,777	2,78
4	S01A 90V-3B	0,11	0,22		2,777		2,779	
5	S01A 90V-5A	0,08	0,16	0,2	2,787	2,78	2,789	2,79
6	S01A 90V-5B	0,09	0,18		2,781		2,782	
7	S01A 90V-6A	0,07	0,14	0,1	2,788	2,79	2,789	2,79
8	S01A 90V-6B	0,07	0,15		2,793		2,794	
9	S01A 90V-10A	0,05	0,10	0,1	2,780	2,78	2,781	2,78
10	S01A 90V-10B	0,07	0,15		2,770		2,772	
11	S01A 90V-11A	0,08	0,16	0,2	2,771	2,78	2,773	2,78
12	S01A 90V-11B	0,09	0,19		2,789		2,791	
13	S01A 90V-14A	0,06	0,12	0,1	2,799	2,80	2,800	2,80
14	S01A 90V-14B	0,05	0,10		2,801		2,802	
15	S01A 90V-19A	0,06	0,12	0,1	2,834	2,83	2,836	2,84
16	S01A 90V-19B	0,08	0,16		2,834		2,835	
17	S01A 90V-20A	0,09	0,18	0,2	2,802	2,80	2,804	2,80
18	S01A 90V-20B	0,07	0,14		2,798		2,800	
19	S01A 90V-23A	0,10	0,20	0,2	2,877	2,88	2,879	2,88
20	S01A 90V-23B	0,08	0,16		2,875		2,877	

medel 1-6	0,26	2,78	2,78
stdavva 1-6	0,111494855	0,009819829	0,008872035
medel 7-12	0,20	2,78	2,78
stdavv 7-12	0,0298	0,0080	0,0080
medel 13-18	0,20	2,79	2,79
stdavv 13-18	0,099386687	0,016608102	0,015866334
medel 19-24	0,18	2,84	2,85
stdavv 19-24	0,035014877	0,02721513	0,027387274

porositet kontroll
medel 1-6 m 0,26