Óshlíðargöng

Viðauki A

Lýsingar á borkjarna

Borholur OK-01 til OK-16

Jarðfræðistofan Ehf
JFS Geological services Ltd

Október 2007
Unnið fyrir Vegagerðina

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-1a
	Óshlið - Óshyrna	Date Feb. 2006	Page **1** of **6**
	Corehole OK - 01 0 - 50 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 311.363,2 Y: 634.107,8 Elev.: 17,7	Driller RFS	Drilled Feb. 2006

Description of corehole OK - 01

Elev. m a.s.l.	Depth m	Description	Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
17,7	0	3,5" steel casing down to 3,28 m. The hole is inclined 49°, towards SW (225°).	0			
	2	NQ drilling rods, triple tube. Core diameter 45 mm. Drilled at uphill side of Óshlið road (No.61).	2			
15,55	4	**Tholeiite basalt** Medium grey, very strong, hard and brittle. scattered small plagioclase phenocrysts (2-3 % <3 mm). Joint spacing close to medium. 6 / 47; 7 / 13,3 kN / 138 MPa	4	100 100 **100** 100	86/86/0/0 26/0/0/0 **55/19/0/0** 60/18/0/0	***Q = 4 - 12*** $Q=\frac{55}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
	6		6			
13,35	8	Scoria - Scoriaceous basalt. 13 / 5,4 kN / 56 MPa **Olivine basalt** Dark grey, strong rock. Microporous and vesicular <15 %. Most vesicles filled with zeolites (chabasite) and dark brown clay. 7 / 20; 6 / 17	8	100 98	100/0/0/0 63/37/0/0	
	10	Vesicular - slightly scoriaceous rock, not very strong owing to vesicles. 14 / 8,5 kN / 88 MPa	10	97	78/29/0/0	
	12	Medium to widely spaced joints, rough and undulating. Commonly 10-15 mm brown alteration zones at joints. K-1 K-2	12	**98**	**83/47/12/0**	
	14	7 / 32; 11 / 9,0 kN / 94 MPa	14	99	86/55/0/0	***Q = 6 - 18*** $Q=\frac{83}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
7,18	16	Scoriaceous basalt	16	100	62/0/0/0	
		Tholeiite basalt		94	77/28/0/0	***Q = 4 - 14*** $Q=\frac{63}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
	18	Light to medium grey, very strong, vesicular <10 % <15 mm, mainly half filled to filled with zeolites (chabasite - thomsonite). 7 / 37	18			
	20	Joints medium to closely spaced, rough and undulating; slightly coated with black clay. 7 / 12,5 kN / 130 MPa	20	87	45/12/0/0	
	22	5 / 39; 9 / 20,2 kN / 211 MPa K-2 K-3	22	**93** 100	**63/26/0/0** 71/56/0/0	
	24	4 / 20,5 kN / 213 MPa RML, 0,02 m	24	96 100	71/24/0/0 59/0/0/0	
1,24	26	**Porphyritic basalt,** medium dark grey, very strong. <10-15 % plagioclase phenocrysts <7 mm. Vesicular, approx. 5 % vesicles <20 mm, half filled and filled with chabazite, thomsonite and grey clay. Joint spacing medium to close 9 / 29; 9 / 9,1 kN / 95 MPa	26	100	87/27/27/0	***Q = 5 - 18*** $Q=\frac{79}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
	28	Welded layer contact. 8 / 29; 5 / 8,3 kN / 86 MPa	28	100	70/0/0/0	
	30	**Scoriaceous basalt,** reddish grey, strong, vesicular, approx.15 % < 10 mm, all filled with zeolites. Joint spacing close to medium. 10 / 26; 6 / 6,0 kN / 62 MPa K-3 K-4	30	96 95	74/37/27/0 75/0/0/0	
	32	**Porphyritic basalt** Medium grey, approx. 10 % plagioclase phenocrysts. Very strong. Few large vesicles <5 % half filled with zeolites (chabasite - thomsonite). Joint spacing medium to close. 9 / 50; 8 / 14,6 kN / 152 MPa	32	**97** 97	**79/21/13/0** 75/26/0/0	
	34	**Scoriaceous basalt,** reddish grey, very strong, 10-20 % vesicles. 6 / 6,5 kN / 67 MPa	34	97 100	87/33/0/0 83/0/0/0	
-5,28		Layer contact, sediment 0,01 m - sandstone.				**0,15 LU at 6,2 bar**
	36	**Scoriaceous basalt** Joints closely spaced. 9 / 25 **Porphyritic basalt** Medium grey, <10 % plagioclase phenocrysts <2-3 mm. Very strong, joint spacing close to medium, joints rough and undulating, slightly coated with clay.	36	96	55/29/0/0	***Q = 4 - 14*** $Q=\frac{65}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
	38	13 / 9,2 kN / 96 MPa 9 / 35; K-4 7 / 7,0 kN / 73 MPa K-5	38	96 **97**	63/51/19/0 **65/43/11/0**	
-8,7	40	6 / 28 Cemented layer contact.	40	100	83/36/0/0	
		Scoriaceous basalt Red sediment, 0,01-0,02 m. Reddish brown, medium strong, very vesicular, all vesicles filled with zeolites.		90	68/0/0/0	***Q = 5 - 16***
	42	**Porphyritic basalt** Medium grey, strong, vesicular approx. 10 % vesicles <20 mm, half filled and well filled with zeolites. 5 / 16,0 kN / 167 MPa	42	98	71/12/0/0	
	44	Closely spaced joints, rough and undulating. Almost absent of clay.	44	**96**	**72/10/0/0**	$Q=\frac{72}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
-12,7	46	Welded layer contact. 5 / 9,9 kN / 103 MPa	46	99	73/0/0/0	
		Scoriaceous basalt, reddish brown. 6 / 31; 5 / 7,2 kN / 75 MPa **Porphyritic basalt** Medium grey, <7 % plagioclase phenocrysts. Very vesicular approx.15-20 % vesicles <10 mm. Closely spaced joints, roughly and undulating. Almost clean surfaces.				***Q = 5 - 18***
	48	6 / 8,8 kN / 91 MPa K-5 K-6	48	94	82/62/0/0	$Q=\frac{82}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
-14,60	50	**Scoriaceous basalt,** reddish brown, medium strong, very vesicular, vesicles filled with zeolites. Joints closely spaced. 6 / 5,8 kN / 61 MPa	50	94	64/28/0/0	

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-1b
	Óshlið - Óshyrna	Date Feb. 2006	Page **2** of **6**
	Corehole OK - 01 50 - 100 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 311.363,2 Y: 634.107,8 Elev.: 17,7	Driller RFS	Drilled Feb. 2006

Description of corehole OK - 01

Elev. m a.s.l.	Depth m	Description	Core %	RQD % 10 / 30 / 50 /100 Q	GWT	Perm. (LU) 2,5 5,0 7,5
	50	**Porphyritic basalt** Medium grey, strong, very vesicular, vesicles half filled with zeolites. Joints closely spaced.	94	**64/28/0/0**		
-16,17				***Q = 6 - 21***		
	52	**Scoriaceous basalt** Pale reddish grey, strong. Joint spacing medium to close. Turns gradually into porphyritic basalt, strong, plagioclase phenocrysts approx.10 % <5 mm. Competent rock. 9 / 27; 11 / 7,5 kN / 78 MPa		$Q=\frac{94}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
			100	94/66/0/0		
	54	Good contact.	**100**	**94/66/0/0**		
-18,08						
-18,73		**Basaltic dyke,** dark grey, strong, microporous, flow banded, closely spaced joints, strong contacts. 7 / 27; 5 / 6,7 kN / 70 MPa	97	77/0/0/0		
	56	**Scoriaceous - porphyritic basalt** Porphyritic basalt is light grey. Very strong, plagioclase phenocrysts approx. 10 % <5 mm. Joints medium spaced, rough, undulating, slightly coated with clay. Overall very strong and competent basalt, scattered microporous to massive. Hard and brittle basalt. K-6	95	64/31/31/0		
	58	K-7	95	76/41/28/0		
			95	**70/30/18/0**		
	60	10 / 50; 10 / 24,9 kN / 259 MPa				
	62		97	72/29/19/0		
				Q = 5 - 16		
	64			$Q=\frac{70}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
		7 / 18,6 kN / 194 MPa	95	67/21/0/0		**1,97 LU at 5 bar**
	66	12 / 49				
-25,69		Scoriaceous at top 0,5 m. K-7	83	58/0/0/0		
		Porphyritic basalt Light grey, strong to very strong. Vesicular, 3-5 % up to 20 mm, some half filled with zeolites, others empty. Joint spacing medium to close. K-8				
	68	7 / 32,1 kN / 335 MPa; 5 / 47	100	93/61/0/0		
	70		99	83/10/0/0		
	72	8 / 8,7 kN / 90 MPa	**94**	**75/20/9/0**		
		Scoriaceous basalt Reddish brown, strong, closely spaced joints gradually changing into massive basalt. 9 / 24	100	92/33/23/0		
	74	**Porphyritic basalt** Medium grey, vesicular, most vesicles filled with zeolites (chabasite thomsonite) and brown clay. Joint spacing close to medium. K-8 / K-9		***Q = 5 - 17***		
				$Q=\frac{75}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
	76	**Porphyritic basalt** Medium grey, very strong, vesicular, approx. 5 % vesicles <20 mm, mainly filled with zeolites.	83	55/0/0/0		
	78	Very thin microcracks forming an irregular vein pattern, cemented with black clay. Relatively fresh dense basalt.				
	80		100	76/18/18/0		
	82	14 / 18,6 kN / 193 MPa	97	97/40/18/0		
		12 / 49				
	84	12 / 14,9 kN / 155 MPa				
-37,96		K-9	100	100/0/0/0		
		Red Sandstone, 0,1 m, mixed with scoria. 10 / 7,4 kN / 77 MPa K-10	98	92/0/0/0		
	86	**Scoria - Scoriaceous basalt** 6 / 25 Reddish brown, strong, very competent tunnelling rock. Very well compressed and consolidated. Porous rock, all pores filled with zeolites. Medium joint spacing.		***Q = 5 - 18***		
	88			$Q=\frac{79}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
			97	85/50/38/0		
		Diffuse boundary.	**96**	**79/31/15/0**		
	90	**Tholeiite basalt** Light grey, very fine grained basalt, very strong, hard and brittle, small plagioclase crystals 2-3 %. 11 / 21,5 kN / 224 MPa; 8 / 51				
	92	Disperse zones with small pores and micropores <5 % porous, empty and half filled vesicles. Joint spacing medium.	90	65/50/0/0		
	94	Several tectonized cracks, recemented with zeolites, medium to closely spaced. K-10 / K-11				
		Joints rough, undulating, and coated with black clay. Frequent microporous flow banding in the lower part. Approx. 3-4 % pores <10 mm, half filled with zeolites.	98	83/21/0/0		
	96	11 / 17 kN / 177 MPa; 10 / 54				
	98		94	87/49/39/0		
	100		99	42/0/0/0		

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-1c
	Óshlið - Óshyrna	Date Feb. 2006	Page **3** of **6**
	Corehole OK - 01 100 - 150 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 311.363,2 Y: 634.107,8 Elev.: 17,7	Driller RFS	Drilled Feb. 2006

Description of corehole OK - 01

Welded boundary.

100 m

Scoriaceous basalt, reddish brown at top, strong, very compact. Consolidated and competent rock. Medium spaced joints.

9 / 45 — 7 — 14,1 kN / 147 MPa

102 m

Tholeiite basalt, medium grey, very strong, fine grained basalt. Varying porosity from dense to microporous. Vesicular zones with up to 5-10 % small pores, half filled with zeolites or empty, coated with black clay. Wide to medium spaced joints, rough, undulating, and coated with black clay.

K-11

13 / 50 — K-12

10 — 19,9 kN / 207 MPa

104 m

106 m

108 m

0,1 m core loss.

110 m

8 / 48 — 5 — 17,4 kN / 181 MPa — K-12 K-13

112 m

114 m

116 m (-58,42)

Scoria - Scoriaceous basalt

Reddish brown, strong, vesicular rock.
Well compressed and consolidated, 15 % irregular pores, mainly filled with zeolites (chabasite, thomsonite).
The rock is probably yielding continuous core which breaks into 0,3 to 1 m stumps during drilling and handling.
Very competent tunnelling rock.

10 — 6,5 kN / 67 MPa

5 / 14 — K-13

Diffuse boundary

118 m

120 m

122 m

Tholeiite basalt

Very strong, fine grained basalt.
Microporous zones, up to 3 % small vesicles, some are coated with black clay and others are filled with zeolites.

K-14

6 — 21,3 kN / 221 MPa

7 / 52

Slightly tectonized but recemented rock.
Joints widely spaced, rough, undulating, and coated with black clay.

124 m

126 m

128 m

5 — 20,5 kN / 213 MPa

130 m

K-14 K-15

132 m (-68,99)

Scoriaceous basalt, red brown.
Strong, very vesicular, approx.15 % vesicles <10 mm, half filled with zeolites and dark clay.

Sediment, red sandstone, 0,1 m, medium strong rock.

Diffuse boundary

Olivine basalt, medium to dark grey.
Very strong, microporous and vesicular, most vesicles filled with zeolites. Joints medium spaced.

8 — 12,3 kN / 128 MPa

10 / 32

134 m

136 m

138 m

140 m

3 — 16,2 kN / 168 MPa

9 / 45 — K-15 K-16

142 m

Scoriaceous basalt

Red brown, strong, compact and well cemented rock.
Joint spacing wide to medium.

7 — 6,2 kN / 65 MPa

7 / 18

144 m

146 m

Sediment, red sandstone, 3-5 cm mixed with scoria fragments. All well cemented and consolidated.

148 m

Tholeiite basalt

Medium grey, very strong, slightly porous and vesicular basalt, vesicles <7 % <5 mm.

7 — 20,7 kN / 216 MPa — K-16 K-17

21 / 51

150 m

Core %	RQD % 10 / 30 / 50 /100	Q
92	25/0/0/0	
100	95/53/0/0	
100	96/45/34/0	
		Q = 6 - 21
		$Q = \frac{95}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
100	96/63/34/0	
99	94/69/32/0	
99	**95/62/32/7**	
97	93/65/65/0	
100	100/87/0/0	
98	88/51/0/0	
98	95/62/45/0	
98	**93/64/25/0**	
100	93/93/0/0	
100	100/93/41/0	
97	97/60/34/34	
		Q = 6 - 21
		$Q = \frac{93}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
100	72/35/23/0	
99	97/66/66/0	
96	72/0/0/0	
100	100/67/0/0	
		Q = 6 - 20
		$Q = \frac{90}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
99	95/70/0/0	
98	91/71/20/0	
100	0/0/0/0	
99	**90/68/30/9**	
99	90/71/41/41	
99	94/94/83/55	
100	97/85/39/0	

GWT

Perm. (LU) 2,5 5,0 7,5

1,56 LU at 1,5 bar

0,11 LU at 7 bar

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-1d
	Óshlið - Óshyrna	Date Feb. 2006	Page **4** of **6**
	Corehole OK- 01 150 - 200 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 311.363,2 Y: 634.107,8 Elev.: 17,7	Driller RFS	Drilled Feb. 2006

Description of corehole OK - 01

150
Tholeiite basalt, medium grey.
Very strong, slightly porous and microporous, small pores coated with black clay, larger pores filled with zeolites.
152
Joints medium to widely spaced, rough and undulating surfaces, coated with black clay. Microporous flow banding 1-2 m.
154
Tectonic zone from 154,9 - 155,3 m depth, joints with chabazite and chalcedony (zeolites and quartz).
156
Diffuse boundary
K-17
K-18
158
Scoriaceous basalt, reddish brown, medium strong.
-86,5
Sediment, red sandstone, 5 cm, weak rock.
Scoriaceous basalt, reddish brown, moderately strong, competent rock. Medium spaced joints.
6
8 21 6,1 kN 63 MPa
160
Diffuse boundary
Olivine basalt
Dark grey, very strong, vesicular 5-10 % vesicles of various size, mainly filled with zeolites and clay. Some vesicles half filled. Joint spacing medium.
162
-89,3
Sharp boundary.
-89,6
Dyke and Tectonic breccia mixed.
Welded layer contact.
164
Scoriaceous basalt
9
8,1 kN 84 MPa
Reddish brown in the upper part, greyish in the lower part.
Strong-very strong, very competent, continuous core.
8 21
166
K-18
K-19
168
Unclear boundary, very strong.
Tholeiite basalt, light fresh grey. Extremely strong and hard basalt.
170
Joints medium to widely spaced, rough, undulating, and thinly coated with grey clay and zeolites. Also some pattern of healed joints.
172
9
29,3 kN 305 MPa
Small pores and micropores 1-3 %, coated and filled with black clay and zeolites.
9 55
174
Tholeiite basalt, light to medium grey colour.
K-19
176
Extremely strong, hard and brittle basalt.
K-20
2-3 % vesicles of various size, mainly filled with zeolites.
Slightly microporous flow banding towards the bottom of the layer.
Joint spacing medium.
178
180
182
13 54
5
22,8 kN 237 MPa
Increasing alteration minerals. Black clay in all vesicles and joints.
184
Sharp contact.
K-20
-103,36
Tectonic zone, probably mixed with a dyke intrusion.
K-21
Small angular basalt fragments cemented in quartz chalcedony.
186
Scoriaceous basalt.
Olivine basalt Closely spaced joints.
188
Scoriaceous basalt. Closely spaced joints.
-105,79
Basaltic dyke, dark grey.
8
5,8 kN 61 MPa
Very strong but highly jointed rock (closely spaced joints).
Diffuse contact.
-106,97
190
Scoriaceous basalt, dark greyish, brown, moderately strong.
Porous with approx. 10 % irregular vugs, filled with zeolites.
Widely spaced joints. Very competent tunnelling rock.
192
13 29
K-21
K-22
194
Tholeiite basalt, medium grey, very strong.
porous, approx. 5-10 % vesicles <5 mm, half filled with black clay and zeolites. Joints medium spaced, becoming closely spaced towards the base.
196
-111,30
Sediment, red at top, brown below, 25 cm.
A mix of scoria and sediment.
198
Scoriaceous basalt, dark grey.
4
9 32 6,5 kN 68 MPa
Medium strong to strong rock, well compressed and consolidated. Almost no joints.
200
Slightly tectonized rock, well recemented.

Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
150			
152	100	96/87/53/0	
154	94	67/24/0/0	
156			
158	100	91/71/71/0	
	100	100/100/0/0	
160	98	87/49/17/0	
	99	**90/68/30/9**	***Q = 6 - 20*** $Q=\frac{90}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
162			
164	100	96/84/54/34	
166	99	99/78/66/38	
168			
170	99	96/70/0/0	
172	100	88/51/22/0	***Q = 6 - 21*** $Q=\frac{94}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
174	99	97/76/65/0	
176	**100**	**94/70/40/10**	
178	99	95/66/18/0	
180			
182	99	86/65/46/0	
184	100	100/70/70/0	
	94	69/0/0/0	
	97	**79/11/0/0**	***Q = 5-18*** $Q=\frac{79}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
186	100	78/36/0/0	
188	100	100/0/0/0	
	87	**32/0/0/0**	***Q=1-5*** $Q=\frac{32}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
	82	23/0/0/0	
190	100	56/0/0/0	$Q=\frac{88}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
	99	95/95/62/0	
192	**98**	**88/79/24/0**	
	100	100/100/0/0	***Q = 6 - 20***
194	100	94/74/0/0	
196	92	47/34/0/0	
	100	100/0/0/0	
198	100	100/98/98/0	
200	100	100/100/100/0	

GWT

Perm. (LU) 2,5 5,0 7,5

3,16 LU at 8,2 bar

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng **Óshlið - Óshyrna** **Corehole OK- 01 200 - 250 m**	JFS-69 Date Feb. 2006 Design AG	Drwg. A-1e Page **5** of **6** Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 311.363,2 Y: 634.107,8 Elev.: 17,7	Driller RFS	Drilled Feb. 2006

Description of corehole OK - 01

Elev. m a.s.l.	Depth m	Description	Core %	RQD % 10 / 30 / 50 /100	Q
	200	**Tholeiite basalt,** medium grey, rather fresh colour, very to extremely strong rock. Medium to closely spaced joints. Vesicular, approx. 7-8 % irregular vesicles <10 mm some are filled with zeolites, others empty. Jointed basalt with brownish alteration colour. 5 / 11,6 kN / 121 MPa. K-22, K-23	97	83/53/35/0	
	202		**99**	**88/64/59/0**	**Q = 6 - 20**
					$Q = \frac{88}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
-115,83			100	68/32/32/0	
-116,49	204	**Tectonic breccia,** brownish grey, intensely crushed, but recemented with zeolites and quartz. Jointed brownish rock.	75	10/0/0/0	
			100	35/0/0/0	
	206	**Tholeiite basalt** Medium dark grey, very strong, micropores and small pores, <3 % filled with black clay. Joint spacing medium. 11 / 51. 7 / 17,5 kN / 182 MPa	98	92/71/0/0	**Q = 6 - 21**
	208	Microporous flow banding, microporous bands with black clay.	**99**	**89/67/22/0**	
			100	92/74/25/0	
	210	K-23, K-24			
	212		100	90/61/46/0	
		Diffuse boundary - no weakness.			
	214	**Scoriaceous basalt,** dark grey, strong, vesicular approx. 5-10 %. Widely spaced joints. 6 / 4,2 kN / 44 MPa. Probably layer boundary.	92	92/92/0/0	
	216	**Scoriaceous basalt,** reddish brown, medium strong to strong rock, very well compressed and consolidated scoria, <10 % vesicles filled with zeolites. Almost no joints. 7 / 10,9 kN / 114 MPa. 7 / 44.	100	100/98/78/0	
		Diffuse boundary - no weakness.			
	218	**Tholeiite basalt,** medium grey, very strong. Approx. 5-8 % irregular vesicles <8 mm, mainly filled with zeolites. Few larger vesicles half filled with regular chabazite. Joints medium to widely spaced.	97	80/65/19/0	**Q = 6 - 21**
	220	K-24, K-25			
	222		99	93/88/62/34	
			99	**93/79/49/7**	
	224	15 / 53. 5 / 14,6 kN / 152 MPa	98	94/83/27/0	
	226				
		Sharp boundary.	100	100/66/66/0	
-131,97	228	K-25. Sediment, Red sandstone, 0,1-0,15 m			
	230	**Scoria - Scoriaceous basalt,** Red brown greyish in lower part. Strong rock. Very well compressed and consolidated. Porous and vesicular, approx.10 % vesicles filled with white zeolites. Joint spacing wide. 6 / 12 / 25. 6,7 kN / 70 MPa. K-26		100/92/92/0	
		Olivine -Tholeiite basalt, intermediate Medium grey, very strong, vesicular with approx. 10 % vesicles. Widely spaced joints. 14 / 47. 7 / 10,1 kN / 106 MPa	100		**Q = 7 - 22**
	232		**100**		$Q = \frac{99}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
			100	**99/96/83/30**	
	234			98/98/68/38	
			100	100/100/100/100	
-136,89	236	**Scoria,** red brown, strong rock, well consolidated.	99	99/83/83/0	
		Scoriaceous basalt, medium grey, very strong, vesicular with approx. 10 % irregular vesicles and vugs, filled with zeolites. Very competent rock with almost no joints. K-26, K-27. 8 / 7,4 kN / 77 MPa. 11 / 39.			**Q = 7 - 22**
	238				$Q = \frac{98}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
			99	99/83/40/0	
	240		**99**	**98/84/62/21**	
	242		100	100/100/76/76	
	244	Pattern of thin black veins, joints, well cemented by black clay.			
		K-27, K-28	97	94/70/57/0	
-143,91	246	Not sharp boundary, strong contact. 6 / 23. 7 / 5,1 kN / 53 MPa. **Scoriaceous basalt,** reddish brown. Strong to very strong rock.	93	93/0/0/0	**Q = 6 - 21**
	248		99		$Q = \frac{97}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
	250	**Tholeiite basalt,** slightly tectonized, well recemented by black clay.	**99**	95/57/18/0	

GWT: 1,36 LU at 12.8 bar; does not open max press. 13 bar

Perm. (LU) 2,5 5,0 7,5

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-1f
	Óshlið - Óshyrna	Date Feb. 2006	Page **6** of **6**
	Corehole OK - 01 250 - 283 m	Design ÁgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 311.363,2 Y: 634.107,8 Elev.: 17,7	Driller RFS	Drilled Feb. 2006

Description of corehole OK - 01

250 Joints medium to widely spaced, coated and cemented with black clay.

252

-147,98 Scoriaceous basalt, reddish brown, strong, porous ~10 % vesicles, half filled with zeolites and dark clay. Sediment 3 cm, reddish brown.

254 Olivine -Tholeiite basalt intermediate
Dark grey, very strong, vesicular, ~10 % vesicles, mainly filled with zeolites.
9 / 42 — 7 / 11,6 kN / 121 MPa — K-28 / K-29

256 The middle and lower part, of the basalt is scoriaceous olivine basalt.
Porous basalt <10 % vesicles, well filled with zeolites. Widely spaced joints, rough, undulating, and with no fillings.
Competent tunnelling rock.

258 4 / 4,6 kN / 48 MPa — 7 / 36

260

262 8 / 48 — 6 / 9,9 kN / 103 MPa

Unclear boundary, no contact.

264 Scoriaceous basalt, red brown, strong rock.
6 / 19 — 4 / 4,8 kN / 49 MPa — K-29 / K-30

Olivine basalt, dark grey, very strong.
Several large vesicles, half filled with chabazite.
Widely spaced joints. Competent rock.

266 -157,23 Sharp contact.

Sediment orange browntuff, very weak. waxy surface on core, argillaceous.

-157,69

268 Scoriaceous basalt Sharp contact.
Brownish grey. Strong. Vesicular, approx. 15 % irregular vugs filled with zeolites. Joint spacing medium. Competent tunnelling rock.

Unclear boundary.

270 Olivine basalt,
Medium grey, strong to very strong. Widely spaced joints, rough, undulating, and coated with zeolites.
14 / 50 — 7 / 11,9 kN / 123 MPa — K-30 / K-31

272

274

276 Unclear boundary.

Scoriaceous basalt, brownish grey.
Strong. Widely spaced joints. Competent tunnelling rock.

278 Probably layer boundary.
No joints.
11 / 41 — 5 / 9,0 kN / 94 MPa

280 Unclear boundary.

Porphyritic basalt, grey, very strong.
Competent tunnelling rock.
Approx. 10-15 % large, irregular plagioclase phenocrysts. Widely spaced joints.
12 / 53 — 7 / 18,1 kN / 188 MPa — K-31 / K-32

282 -167,7

Bottom of the hole at 282,6 m depth.

284

286

288

290

292

294

296

298

300

Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
250		**97/67/43/16**	
	100	100/85/72/34	
252			
		88/81/81/35	
254	100		***Q = 6 - 21***
			$Q=\frac{95}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
256			
	100	100/93/84/0	
258	**100**	**95/86/76/18**	
260	100	98/88/65/48	
262			
	100	93/82/69/0	
264			
	100	100/87/87/0	
266			
	100	39/0/0/0	
	100	100/100/0/0	
268			
	99	99/89/64/38	
270			***Q = 7 - 22***
			$Q=\frac{99}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
272	100	100/100/76/0	
	99	**99/96/79/51**	
274			
	99	99/95/63/46	
276			
	100	100/100/100/100	
278			
280			
	99	99/99/99/77	
282			
284			
286			
288			
290			
292			
294			
296			
298			
300			

GWT

Perm. (LU) 2,5 5,0 7,5

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-2
	Óshlið - Óshyrna	Date Feb. 2006	Page **1** of **1**
	Corehole OK - 02 0 - 28 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 311.494,4 Y: 633.966,9 Elev.: 38,9	Driller RFS	Drilled Feb. 2006

Description of corehole OK - 02

38,9 / 0 — The hole is drilled vertically through a step-platform approx. 20 m higher than the present road.

2 — NQ drilling rods, triple tube. Core diameter 45 mm.

4 — Surface of continuous rock.

33,9 / 6 — **Tholeiite basalt,** red grey at top then medium grey. Very hard and strong rock. Intensely jointed, joints closely spaced, rough, undulating, and coated with thin clay.

8 — Frequent microporous flow banding in the lower part.

10 — Relatively strong contact.

28,4 / 12 — Scoria, medium strong, red, well cemented. Joint spacing medium to close.
Scoriaceous basalt, medium to dark grey, strong, porous basalt. Joints medium spaced.

Olivine basalt, grey, very porous. K-1 / K-2
Vesicles 10-15 % half filled with zeolites and coated with black clay.
14 — Joints medium spaced, becoming closely spaced from 14m.

16 — Moderately strong contact.

22,9 — Scoria, red and red brown, medium strong.

18 — **Scoriaceous basalt**
Greyish brown, strong. Joints medium spaced.
Olivine basalt, dark grey, very strong.
Porous-vesicular, approx. 10 % vesicles. Joint spacing medium to close.
Competent tunnelling rock below 16m depth.

18,8 / 20 — **Scoriaceous basalt,** reddish brown grey.
Strong. Well compressed and consolidated. Joint spacing medium to close, competent tunnelling rock. Pores <10 %, all filled with zeolites. K-2 / K-3

22 — **Tholeiite basalt,** grey, very strong and hard rock.
24 — Joints medium spaced, rough undulating, coated with black clay.
Pattern of thin black veins of healed joints.

26

11,3 / 28 — Bottom of the hole at 27,6 m.

30 32 34 36 38 40 42 44 46 48 50

Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
0						
2						
4		0	0/0/0/0			
		0	0/0/0/0			
6	N	100	0/0/0/0			
		100	**47/0/0/0**			
		100	59/0/0/0	***Q = 3 - 10***		
8				$Q=\frac{47}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$		
		100	58/0/0/0			
10		100	53/0/0/0			
		100	70/0/0/0			
12		**100**	**79/23/0/0**			
		100	81/49/0/0	***Q = 5 - 18***		
14	N			$Q=\frac{79}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$		
		100	77/17/0/0			
16		100	90/0/0/0			
		100	86/32/0/0			
18	N			***Q = 6 - 19***		
		100	81/23/0/0	$Q=\frac{84}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$		
20		**100**	**84/29/0/0**			
		100	84/25/0/0	***Q = 6 - 19***		
22				$Q=\frac{84}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$		
		100	97/47/0/0			
24	R	**100**	**84/25/0/0**			
		100	78/0/0/0			
26						
		100	50/0/0/0			
28						
30						
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-3
	Óshlið - Óshyrna	Date Feb. 2006	Page **1** of **1**
	Corehole OK - 03 0 - 13 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 311.483,8 Y: 633.977,0 Elev.: 39,1	Driller RFS	Drilled Feb. 2006

Description of corehole OK - 03

39,1 m a.s.l. (0 m)

The hole is located on a step platform approx. 20 m higher than the present road.

NQ drilling rods, triple tube. Core diameter 45 mm. Vertically drilled.

Probably surface of bedrock.

34,9 m a.s.l. (4 m)

Intensely jointed and fractured rock mass, hard and brittle rock pieces.

Tholeiite basalt, more competent, light grey.
Very hard and brittle rock but with closely spaced joints, rough, undulating, and coated with clay.
Low rock mass quality.
Scoria, well compressed and consolidated. Strong.

30,3 m a.s.l. (8 m)

Sediment, red sandstone, weak; 0,2-0,3 m.
Scoriaceous basalt, dark grey, strong.

Olivine basalt, medium grey, very strong. K-1 / K-2
Very porous and vesicular, vesicles <7 mm ~10 %. Vesicles half filled with zeolites or coated with dark clay. Joints closely spaced.

26,3 m a.s.l. (12 m)

Bottom of the hole at 12,8 m.

Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
0–2	23	10/0/0/0	
	58	0/0/0/0	
2–4	27	17/0/0/0	
	70	0/0/0/0	
4–6	**79**	**54/14/0/0**	
	50	20/0/0/0	
	25	0/0/0/0	
6–8			***Q = 4 - 12***
			$Q=\frac{54}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
	95	72/21/0/0	
8–10	100	66/10/0/0	
			Q = 5 - 16
			$Q=\frac{72}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
10–12	**100**	**72/17/0/0**	
	100	97/43/0/0	

Perm. (LU) 2,5 5,0 7,5

GWT

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-4a
	Óshlið - Arafjall	Date Mar. 2006	Page **1** of **5**
	Corehole OK - 04 0 - 50 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 313.003,6 Y: 632.633,0 Elev.: 19,4	Driller RFS	Drilled Mar. 2006

Description of corehole OK - 04

19,4 m a.s.l. — 0 m

The hole is drilled on the sea side of the present road.
It is drilled 51° inclined from vertical towards SW.
Cased with 3,5" steel casing down to 7 m hole length (casing is under road surface).
NQ drilling rods, triple tube. Core diameter 45 mm.

15,0 — 8 m

Tholeiite basalt, medium grey, fine grained.
Very strong and hard, highly jointed down to 13 m depth. Joints both rough and smooth, undulating, and coated with black clay.
Frequent flow banding with stratified micropores.

Slightly tectonized from 9 m to 13 m.

Fewer joints, but joint spacing still close to medium.
Brownish alteration zones at some of the joints.

10 / 56 — 7 — 20,1 kN 209 MPa — K-1 / K-2

Slightly tectonized from 19,0 m to 19,7 m, and at the base (0,5 m).

4 — 20,8 kN 216 MPa

Several groups of thin black, parallel veins of healed joints, formed by stress.

K-2 / K-3

4,0 — 24 m

Sediment, light orange brown tuff.
Light yellowish brown acidic tephra layer consisting of argillaceous pumice.
Sediment of very low strength and probably with some swelling clay.
Pumice fragments up to 20-30 mm in the upper part, more fine grained in the lower part.

Dark red tuffaceous sediment. Waxy surface. Low strength.

0,6 — 30 m

Olivine basalt, medium grey, very strong and hard. Vesicular ~3 % in the uppermost 1 m, relatively dense basalt below. Zones of intensely jointed tectonized basalt.

32 m

Tectonized basalt - Fault breccia
Intensely jointed and brecciated basalt fragments, recemented with black clay. Great part of the core disintegrates.
Several short stumps of brecciated small fragments, well cemented with clay.

K-3 / K-4

Boundary of tectonic zone.

Olivine basalt - intermediate olivine-tholeiite basalt
Medium grey, very strong and hard basalt.

38 m — Fine-medium grained, very small micropores 1-2 %.

Closely to moderately spaced joints, rough, undulating, and coated with black clay.

11 / 58 — 9 — 24,8 kN 259 MPa

K-4 / K-5

11 / 58 — 7 — 25,4 kN 264 MPa

Sharp, welded boundary .

-11,6 — 50 m

Sediment, siltstone-claystone, dark brown, varying colour, light and dark

Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
0			
2			
4			
6			
8	77	61/25/0/0	
	94	50/50/0/0	
10	100	40/0/0/0	
	89	38/28/0/0	
12	100	35/0/0/0	
	96	0/0/0/0	
	100	61/24/0/0	
14	100	93/54/0/0	
			Q = 4 - 13
16			$Q = \frac{57}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
	98	70/43/32/0	
18	**94**	**57/24/10/0**	
	81	39/0/0/0	
	75	0/0/0/0	
20	80	0/0/0/0	
	95	79/0/0/0	
22	99	64/0/0/0	
	100	73/0/0/0	
24	100	75/0/0/0	
	100	42/0/0/0	
	62	20/0/0/0	
			Q = 0,4 - 1,4
26			$Q = \frac{32}{6\text{-}9} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{2,5}$
	99	49/18/0/0	
28	**84**	**32/6/0/0**	
	85	26/0/0/0	
30	100	0/0/0/0	
	92	51/0/0/0	
			Q = 0,03 - 0,4
32	87	0/0/0/0	
	80	**12/0/0/0**	
	94	13/0/0/0	
	100	40/0/0/0	
34			$Q = \frac{12}{15\text{-}20} \times \frac{1\text{-}4}{3\text{-}8} \times \frac{1}{2,5}$
	50	0/0/0/0	
	86	25/0/0/0	
36	100	73/31/0/0	
	100	40/0/0/0	
38	100	73/46/27/0	
	99	**64/38/13/0**	
	100	55/41/0/0	
40	99	78/59/23/0	
42	92	65/42/42/0	
44	96	75/0/0/0	
			Q = 4 - 14
46			$Q = \frac{64}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
48	100	63/48/0/0	
	100	18/0/0/0	
	100	0/0/0/0	
	100	0/0/0/0	
50	100	0/0/0/0	

GWT: 10 m

Perm. (LU) 2,5 5,0 7,5

2,7 LU at 2,3 bar

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-4b
	Óshlið - Arafjall	Date Mar. 2006	Page **2** of **5**
	Corehole OK - 04 50 - 100 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 313.003,6 Y: 632.633,0 Elev.: 19,4	Driller RFS	Drilled Mar. 2006

Description of corehole OK - 04

Elev. m a.s.l. | Depth m | Depth m | Rock column | Core % | RQD % 10 / 30 / 50 /100 | Q | GWT | Perm. (LU) 2,5 5,0 7,5

50 — Very weak, waxy. Slicken sides on joint planes. K-5 K-6 — 96 — 24/0/0/0

Olivine basalt ,dark grey, very strong. Sharp boundary.
Coarse grained microporous basalt. All vesicles completely filled with black clay. Scattered pattern of thin black veins of joints healed with black clay. Joint spacing medium to close, joint surfaces rough and undulating. Competent tunnelling rock.

52 — 100 — 100/0/0/0

54 — 100 — 71/26/0/0

11 / 45 — 8 / 12,1 kN / 126 MPa — **98** — **79/35/10/0** — ***Q = 5 - 18*** — $Q = \frac{79}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$

56 — Sharp cemented boundary. — 96 — 82/55/24/0

-16,3

Sediment, siltstone, claystone-lignite
Dark brown, weak rock, stratified with some 5-10 cm thick tephra layers. All well compressed and consolidated, the core is waxy on the surface and frequently with slicken sides on joint planes. Probably no original joints in the sediment. K-6 K-7

87 — 33/0/0/0

58 — 95 — 34/0/0/0

60 — 62 — 12/0/0/0 — ***Q = 0,4 - 1,4*** — $Q = \frac{32}{6\text{-}9} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{2,5}$

Very weak sediment, the core is crumbled and some core loss. — **71** — **32/8/8/0**

62 — More coarse grained and more competent sediment. — 65 — 52/23/23/0

Boundary zone-Sediment and highly altered scoriaceous top of basalt layer.

-20,2

Olivine basalt, dark and medium grey.
Very strong, porous-vesicular in the upper part, vesicles approx. 10-15 % <10-20 mm most are filled with white zeolites, blueish hard silica and brown clay. Joints medium spaced.

64 — 100 — 86/86/0/0

5 / 4,2 kN / 44 MPa — **66** — 100 — 95/74/17/0 — ***Q = 7 - 22*** — $Q = \frac{98}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$

Microporous, massive olivine basalt.
Porphyritic mainly filled with pyroxene and olivine phenocrysts, the olivine is oxidized and rusty, forming brown spots up to 5 mm diameter, approx. 10-15 %. K-7
Very few joints, massive competent rock. K-8

68 — 100 — 97/69/54/0

70 — does not open maxipress. 8bar

100 — 100/83/68/37

8 / 44 — 6 / 9,4 kN / 98 MPa — **72** — **100** — **98/77/53/6** — **0,0 LU at 8 bar**

74 — 100 — 100/92/92/0

Pyroxene and olivine phenocrysts up to 5 mm, approx. 15 %.

7 / 19,9 kN / 208 MPa — **76** — 100 — 100/85/49/0

10 / 51 — K-8 K-9 — **78**

80 — Scoriaceous basalt dark grey, strong, vesicular basalt. Vesicles ~10-15 %, <10 mm, coated with zeolites and filled with dark brown clay. Joints medium spaced. — 99 — 99/58/45/0

100 — **90/79/53/0**

Olivine basalt, medium-dark grey, very strong. 5 / 46 — ***Q = 6 - 20*** — $Q = \frac{90}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
Slightly microporous, approx. 5 % small olivine phenocrysts form rusty brown spots. Also Small pyroxene crystals. 9 / 11,5 kN / 120 MPa
Competent rock, with few original joints.

84 — 100 — 93/78/65/0

Sharp contact. No scoria. — 100 — 80/80/0/0

-34,2

Sediment - Tuffaceous claystone, bright orange brown weak, waxy surface on core, probably with some sensitive swelling clay. 4-5 approx. 5-10 cm thick zones of more coarse grained particles of pumice. All well compressed and consolidated but breaks during drilling and handling. K-9 K-10

86 — 100 — 84/57/0/0 — ***Q = 0,8 - 3*** — $Q = \frac{73}{6\text{-}9} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{2,5}$

88 — **100** — **73/41/0/0**

-36,2

100 — 47/0/0/0

Scoriaceous vesicular basalt, grey, strong. 11 / 23
Vesicles approx. 15 %, <15 mm filled with white zeolites.
Very few joints.

90 — 100 — 100/55/55/55

6 / 5,3 kN / 55 MPa
Porphyritic basalt, grey, very strong. Plagioclase phenocrysts approx.10 %, small crystals. Very few joints.
Competent tunnelling rock. 9 / 14,5 kN / 151 MPa

92 — 100 — 100/83/55/0 — ***Q = 7 - 22*** — $Q = \frac{98}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$

13 / 52

Scoriaceous zone in massive porphyritic basalt.
Widely spaced joints. Overall strong and competent rock. 15 / 32

94 — 100 — 100/76/76/50

96 — K-10 K-11

Porphyritic basalt, grey, very strong. 9 / 6,9 kN / 72 MPa — **0,03 LU at 12 bar**
Plagioclase phenocrysts ~7-10 %, <5 mm.
Widely spaced joints.

98 — 100 — 100/97/82/82

100

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-4c
	Óshlið - Arafjall	Date Mar. 2006	Page **3** of **5**
	Corehole OK - 04 100 - 150 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 313.003,6 Y: 632.633,0 Elev.: 19,4	Driller RFS	Drilled Mar. 2006

Description of corehole OK - 04

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
	100	Porphyritic basalt, medium grey, very to extremely strong and massive rock. Vesicular zone approx. 10 % large vesicles (<20 mm) filled with zeolites. Joints widely spaced.	100		100	100/97/70/0			
	102		102						
	104	More massive porphyritic basalt. Medium grey, extremely strong, widely to very widely spaced joints. Joints rough, undulating, and coated with zeolites and hard clay. 8 / 12,5 kN / 130 MPa	104		100	98/98/67/0			
	106	K-11 K-12 11 / 53	106		100	100/100/73/35			
	108	Vesicular, slightly scoriaceous zone. Several large vugs, coated and half filled with chabazite. Joint spacing medium. 12 / 34 6 / 7,3 kN / 75 MPa	108						
	110	Porphyritic basalt, medium grey, extremely strong with scattered vesicles filled with zeolites.	110		100	95/88/50/0			
	112	Medium spaced joints, rough undulating, filled with zeolites or coated with thin black clay.	112		100	94/69/54/33			
	114	Plagioclase phenocrysts approx. 10-12 %, <5 mm. K-12 K-13	114						
	116	Disperse irregular thin black and white veins of healed joints (healed with black clay or white zeolites.)	116		100	96/62/0/0			
	118	11 / 58 6 / 19,0 kN / 198 MPa	118		99	94/60/17/0			
	120		120						
		Unclear boundary.							
	122	Scoriaceous basalt, reddish brown. Strong to moderately strong. Vesicular, approx. 5-10 % vugs, filled with zeolites. Widely spaced joints. 8 / 12,3 kN / 128 MPa K-13 5 / 48 K-14	122		100	100/100/100/82			
	124	Diffuse boundary.	124		98	87/64/35/0			**0,44 LU at 11,5 bar**
	126	Porphyritic basalt, light to medium grey. Very to extremely strong rock, with approx. 10-15 % small plagioclase phenocrysts and 5-10 % large irregular vesicles, filled with zeolites. Medium to widely spaced joints, rough, undulating, and coated with zeolites. Competent tunnelling rock.	126		**100**	**98/89/58/24**			
	128	7 / 11,1 kN / 115 MPa	128		100	100/96/96/75			
	130		130		100	100/91/63/0			
	132	7 / 55 7 / 14,5 kN / 151 MPa K-14 K-15	132						
	134		134		100	100/74/74/0			
	136	Porphyritic basalt, light grey. Extremely strong and hard, plagioclase phenocrysts approx. 10 %, <5 mm size. Scattered vesicles 2-3 % up to 20 mm in diameter, half filled with zeolites and/or coated with black clay.	136		100	98/65/19/0			
-67,8	138	7 / 21,1 kN / 220 MPa	138						
	140	Tectonic joint, approx. 7 cm thick breccia, cemented with zeolites. 11 / 57	140		100	95/95/71/0			
	142	Widely spaced joints, rough, undulating, and coated with zeolites or thin black clay. K-15 K-16	142		100	96/70/70/0			
	144		144						
	146	11 / 60 5 / 23,8 kN / 248 MPa	146		100	82/37/0/0			
	148	5 / 22,8 kN / 237 MPa	148		100	100/94/67/43			
	150	17 / 60	150						

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-4d
	Óshlíð - Arafjall	Date Mar. 2006	Page **4** of **5**
	Corehole OK- 04 150 - 200 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 313.003,6 Y: 632.633,0 Elev.: 19,4	Driller RFS	Drilled Mar. 2006

Description of corehole OK - 04

150

Porphyritic basalt, with decreasing plagioclase. phenocryst content towards the bottom. Joint spacing medium. K-16 K-17

152

Core % 99 — RQD % 10 / 30 / 50 /100 Q: 94/44/0/0

Core % **99** — RQD % 10 / 30 / 50 /100 Q: **89/58/34/7**

Q = 6 - 20

$Q = \frac{89}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$

154

Slightly tectonized basalt. Crushed and recemented basalt, approx. 10 cm.

156

Microporous basalt, small pores coated with black clay. Joint spacing medium to close.

Core % 97 — RQD % 10 / 30 / 50 /100 Q: 79/33/19/0

158

Red sandstone, 3 cm, strong, well consolidated.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 69/17/0/0

-80,1

Scoriaceous basalt 12 / 38 — 9 — 7,4 kN 78 MPa K-17

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/87/87/0

Q = 6 - 21

$Q = \frac{94}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$

160

Porphyritic-olivine basalt, medium grey. Very to extremely strong, scattered large vesicles <5 cm, coated and half filled with zeolites. K-18

Few joints, rough, undulating, and coated with black clay.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 96/96/17/0

162

Core % **100** — RQD % 10 / 30 / 50 /100 Q: **94/79/24/0**

164

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 90/53/0/0

-84,2

Sediment, Red siltstone-claystone, very weak, waxy surface on the core. Argillaceous sediment.

Core % 94 — RQD % 10 / 30 / 50 /100 Q: 19/0/0/0 ***Q = 1,1-4***

Core % **97** — RQD % 10 / 30 / 50 /100 Q: **39/29/0/0**

-85,2

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 65/65/0/0 $Q = \frac{39}{6\text{-}9} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{1}$

166

Mix of scoria fragments and sediment.

Scoriaceous vesicular basalt, grey, strong. Vesicles approx.15 % mainly filled with zeolites. Joint spacing medium.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/71/51/0

168

Porphyritic basalt, grey, very strong. Plagioclase phenocrysts, approx. 10-12 %, < 6 mm. K-18 K-19

Core % **100** — RQD % 10 / 30 / 50 /100 Q: **100/65/48/0**

Q = 7 - 22

$Q = \frac{100}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$

170

Joints medium to closely spaced.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/59/46/0

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/100/0/0

-88,6

Sediment, Tuffaceous claystone, brown, weak, waxy surface.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/100/100/0

172

A mix of scoria segments and brown, tuffaceous claystone, infiltrated into the top of the lava. Sediment decreasing downwards, weak rock owing to sediment content. Scoriaceous basalt, 10 % vesicles filled with zeolites. Medium spaced joints.

Core % **100** — RQD % 10 / 30 / 50 /100 Q: **100/90/72/0**

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/85/70/0

Q = 1,1 - 4

$Q = \frac{100}{6\text{-}9} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{2,5}$

174

-90,5

Porphyritic basalt, medium grey, very strong.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/100/0/0

176

Brown tuff, 8-0 cm thick at 175,8 m depth.

Core % 96 — RQD % 10 / 30 / 50 /100 Q: 96/56/44/0

Relatively fine grained, plagioclase phenocrysts approx. 5-7 %, <5 mm. K-19 K-20

178

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 97/67/0/0

Q = 6 - 20

$Q = \frac{88}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$

Scattered vesicles up to 30 mm, half filled or filled with zeolites. Frequent flow banding in the middle part, thin stripes of micropores filled with black clay.

180

8 / 54 — 5 — 15,3 kN 159 MPa

Joints medium spaced. Relatively competent tunnelling rock.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 95/57/57/0

182

Core % **99** — RQD % 10 / 30 / 50 /100 Q: **88/49/27/0**

184

Several tectonic joints, most are healed with zeolites and black clay.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/43/18/0

186

K-20 K-21

Joints medium spaced. Sound porphyritic basalt.

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 97/53/37/0

188

5 — 14,6 kN 147 MPa

8 / 56

190

Core % 96 — RQD % 10 / 30 / 50 /100 Q: 40/10/0/0

Scoriaceous basalt, increasing vesicles filled with zeolites. Medium to closely spaced joints.

192

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 100/63/40/0

-102,6

194

Sediment, claystone-siltstone, dark brown, very weak, waxy surface on the core. Breaks during drilling. Probably slaking and swelling during moisture variations. K-21 K-22

Core % 100 — RQD % 10 / 30 / 50 /100 Q: 91/38/0/0

Q = 0,8 - 8

$Q = \frac{71}{6\text{-}9} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{1\text{-}2,5}$

196

Core % 98 — RQD % 10 / 30 / 50 /100 Q: 43/0/0/0

198

A mix of scoria and sediment infiltration.

Core % 86 — RQD % 10 / 30 / 50 /100 Q: 61/0/0/0

Core % **97** — RQD % 10 / 30 / 50 /100 Q: **71/34/16/16**

Scoriaceous basalt, dark greyish brown, medium to strong.

200

Core % 98 — RQD % 10 / 30 / 50 /100 Q: 94/94/64/64

GWT

Perm. (LU) 2,5 5,0 7,5

0,08 LU at 9 bar

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-4e
	Óshlið - Arafjall	Date Mar. 2006	Page **5** of **5**
	Corehole OK- 04 200 - 241 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 313.003,6 Y: 632.633,0 Elev.: 19,4	Driller RFS	Drilled Mar. 2006

Description of corehole OK - 04

-106,5 / 200 m — **Dyke,** grey, very strong, welded contacts.

Scoriaceous basalt, greyish brown.
Strong, massive rock, gradually changing downwards into basalt. Vesicular zone from 202,8m to 203,3m.
Few original joints, slightly increased owing to drilling and handling.
7 — 4,6 kN — 47 MPa
4 — 3 kN — 32 MPa
K-22
K-23

Tholeiite basalt, light-medium grey.
Extremely strong and hard rock, fine grained crystals, slightly microporous.
Medium to closely spaced joints, undulating, both rough and smooth, coated with thin clay. Additional thin black veins of joints healed with black clay.
7 — 18 kN — 187 MPa
10 — 61
K-23
K-24

The Tholeiite basalt becomes more microporous and contains very closely spaced micropore flow banding.
Closely spaced joints, mainly rough, undulating, and coated with black glossy clay.
5 — 18,7 kN — 195 MPa
10 — 57
K-24
K-25

Considerable core loss, highly broken and crushed. Probably Tectonic zone.
7 — 53
Closely spaced joints, rough and undulating.
4 — 19,0 kN — 198 MPa

Tholeiite basalt, medium to dark grey, fine grained hard and brittle basalt.
The lower part of the basalt is mainly closely to very closely jointed and all joints coated or healed with black clay, then forming a thin black vein pattern.
from 219,7m to 230m joint and vein wall rock is altered brown.
4 — 22,4 kN — 233 MPa
8 — 59

Sharp boundary

-125,8 — Sediment, claystone-siltstone, reddish; 0,3 cm at top then brown.
Very weak, argillaceous rock. Probably with some swelling clay content, shrinks slightly during drying.
The core is waxy, joints with slicken sides.
The rock breaks up and partly crumbles during drilling.
K-25
K-26

-129,7 — Tholeiite basalt dark grey,
very strong, vesicular in the upper part, very highly jointed and crushed rock. Some infiltration of weak sediment into the top of the basalt.

-132,1 — Bottom of the hole at 240,8 m.

Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
200	100	100/66/0/0	
202	98	98/80/80/0	
	97	49/0/0/0	
204	100	100/100/100/100	
	100	84/66/48/0	
206	96	77/27/0/0	
208	100	99/55/43/0	
210	**98**	**79/43/27/6**	
	100	81/65/29/0	***Q = 5 - 18*** $Q=\frac{79}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
212	99	90/56/0/0	
214	93	66/14/0/0	
216	100	81/55/41/0	
218	95	70/13/0/0	
220	100	55/0/0/0	
222	23	0/0/0/0	
224	96	47/27/0/0	***Q = 4 - 12*** $Q=\frac{54}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
226	97	73/59/34/0	
	99	65/21/0/0	
228	**97**	**54/27/7/0**	
	97	81/54/0/0	
	96	20/0/0/0	
230	100	33/0/0/0	
	100	21/0/0/0	
232	67	0/0/0/0	
	99	33/33/33/0	***Q = 0,10 - 0,8*** $Q=\frac{18}{6\text{-}9}\times\frac{1\text{-}2}{3\text{-}4}\times\frac{1}{2,5\text{-}5}$
234			does not open max press. 13 bar
236	75	22/0/0/0	
	65	**18/7/7/0**	
238	62	22/0/0/0	
	45	0/0/0/0	
240	100	14/0/0/0	
242			
244			
246			
248			
250			

GWT

Perm. (LU) 2,5 5,0 7,5

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-5
	Óshlíð - Seljadalur **Corehole OK - 05 0 - 38 m**	Date April 2006	Page **1** of **1**
		Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 313.250 Y: 632.184 Elev.: 46	Driller RFS	Drilled Mar. 2006

Description of corehole OK - 05

Elev. m a.s.l.	Depth m	Description
46,0	0	The hole is drilled on a track uphill from the Bolungavík road in Seljadalur. Coarse grained talus slope is surrounding the drill site.
	2	Percussion drilling with odex hammer and 3" steel rod casing. Vertically drilled. Drilled through coarse grained stone rich talus and zones of fine grained material (sandy-silty). Difficult drilling conditions.
	4	
	6	
	8	
	10	
	12	
	14	
	16	
	18	
36,5	20	Probably Scoriaceous basalt Not high resistance to drilling.
		Top of solid basalt. Start of the core drilling.
23,5	22	NQ drilling rods, triple tube. Core diameter 45 mm.
	24	Tholeiite basalt light-medium grey, Very hard, strong and brittle basalt. The rock is intensely jointed and fractured, joints mainly rough, undulating, and coated with black and reddish brown clay. Very low rock quality design and poor tunnelling rock.
	26	
	28	
	30	K-1 / K-2
	32	
	34	
11,2	36	Sediment, Dark red siltstone-claystone Pumiceous, very to extremely low strength and the rock crumbles to pieces, core loss. One scoriaceous lump approx. 25 cm.
8,4		Red clayey sediment of very low strength.
	38	Bottom of the hole at 37,6 m.
	40	
	42	
	44	
	46	
	48	
	50	

Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100 Q	GWT	Perm. (LU) 2,5 5,0 7,5
0					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24	R	79	0/0/0/0		
		100	30/0/0/0		
		100	26/0/0/0		
26		100	0/0/0/0		
		100	0/0/0/0		
28		100	0/0/0/0		
		98	**9/0/0/0**		
		88	21/0/0/0		
30	R	150	0/0/0/0		
		81	0/0/0/0		
32		100	0/0/0/0		
		113	18/0/0/0		
		100	34/0/0/0		
34		100	0/0/0/0		
		100	0/0/0/0		
		100	0/0/0/0		
36		29	0/0/0/0		
		57	**9/0/0/0**		
		100	23/0/0/0		
38					
40					
42					
44					
46					
48					
50					

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-6
	Óshlið - Syðridalur	Date July 2006	Page **1** of **1**
	Corehole OK - 06 0 - 34 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 309.252,2 Y: 632.415,3 Elev.: 83,4 m	Driller RFS	Drilled July 2006

Description of corehole OK - 06

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
83,4	0	The hole is located on the slope in Syðridalur approx. 80 m higher than the surface of Syðridalsvatn. Inclination of slope ~28-30 %.	0						
	2	The hole is drilled with an odex hammer and cased with 3" casing down to 6,7 m depth. The hole is approx. vertical. NQ drilling rods, triple tube. Core diameter 45 mm.	2						
	4	Probably surface of soft bedrock at 4 m depth.	4						
	6	Reddish soft material, probably sedimentary bedrock.	6						
76,7		Sediment, red siltstone-claystone			**59**	**9/0/0/0**			
	8	The rock is very weak with waxy surface on the core.	8		50	0/0/0/0			
74,9					67	0/0/0/0			
		Olivine basalt			100	0/0/0/0			
	10	Dark medium grey, intensely jointed and some core loss. Joint planes are rough, undulating, and coated with light brown clay. Additional white veins of healed joints, filled with zeolites and calcite.	10		100	0/0/0/0			
					100	0/0/0/0			
					100	0/0/0/0			
	12	The rock becomes more competent below 12 m depth.	12		100	0/0/0/0			
					84	22/0/0/0			
	14		14		100	21/0/0/0			
		Basalt, coarse grained, very strong but with a network of white healed joints. Short parts of core are intensely jointed with brown clay coatings on rough, undulating joint surfaces. K-1 K-2			100	90/0/0/0			
	16		16		**91**	**27/9/3/0**			
					83	44/28/0/0			
	18		18		30	0/0/0/0			
					75	0/0/0/0			
					100	0/0/0/0			
	20		20		100	80/40/25/0			
	22		22		100	19/0/0/0			
					86	0/0/0/0			
59,9					27	0/0/0/0			
	24	Sediment and tectonic breccia K-2 K-3	24		11	11/0/0/0			
		Dark violet brown, waxy sediment of low strength, mixed with angular basalt fragments.			**59**	**9/0/0/0**			
57,4	26		26		40	0/0/0/0			
		Fault breccia - Tectonized rock			100	0/0/0/0			
	28	Intensely jointed basalt, with brown zoned alteration veins at joints. Occasionally clayey sediment infilling.	28		69	19/0/0/0			
					100	35/0/0/0			
	30	A mix of dark brown sediment and angular basalt fragments. Very weak rock which disintegrates during drilling and handling.	30		100	x			
					26	0/0/0/0			
	32		32						
		Sediment, dark brown waxy rock. Weak rock that crumbles during drilling.			50	0/0/0/0			
50,0					100	0/0/0/0			
	34	Bottom of the hole at 33,4 m (19. July 2006).	34						
		Drilling cancelled due to difficult rock properties.							
	36		36						
	38		38						
	40		40						
	42		42						
	44		44						
	46		46						
	48		48						
	50		50						

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-7a
	Óshlið - Syðridalur	Date July 2006	Page **1** of **2**
	Corehole OK - 07 0 - 50 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 309.162,8 Y: 632.416,8 Elev.: 58,0	Driller RFS	Drilled July 2006

Description of corehole OK - 07 (OK - 08)

58,0 m a.s.l. / 0 m

OK-7 and OK-08 are combined into one core log. Actually OK-07 had been drilled with core barrel from the surface down to 9,5 m depth. OK-08 was percussion drilled and cased down to 9 m depth, then core drilled.

The hole is located in the slope east of Syðridalsvatn.

Coarse grained talus and debris.

The hole is inclined 8-9 ° from vertical into the slope.
NQ drilling rods, triple tube. Core diameter 45 mm. Vertically drilled.

Top of bedrock. — 50,5 m a.s.l. / 8 m

Tholeiite basalt

Light grey, very hard and extremely strong, slight microporous flow banding. Large, distributed vesicles are coated with black clay. K-1

Change from percussion to core drilling. K-2

The rock is intensely jointed into small hard basalt fragments.

Core %: 46, 100, 46, 30, 71, 18 — RQD % 10 / 30 / 50 /100 Q: 24/0/0/0, 58/0/0/0, 44/0/0/0, 0/0/0/0, 0/0/0/0, 0/0/0/0

45 — **15/0/0/0**

45,4 m a.s.l. / 12 m

Scoriaceous basalt

Reddish grey vesicular basalt. Extremely jointed rock. Joint planes undulating and rough, coated with black clay.
General core loss at all drilled intervals. Possibly tectonized rock zone.

Core %: 30, 34, 38, 33, 36 — RQD % 10 / 30 / 50 /100 Q: 0/0/0/0, **0/0/0/0**, 0/0/0/0, 0/0/0/0, 0/0/0/0

39,8 m a.s.l. / 18 m

Olivine basalt

Dark grey microporous rock. Highly jointed, very strong rock pieces.
Joint planes rough, undulating, and coated with black clay.
Few rock pieces longer than 15 cm.

5 — 13,5 kN — 141 MPa

K-2 / K-3

Core %: 50, 32, 46, 30, 60, 40, 34, 86, 30, 75, 39 — RQD % 10 / 30 / 50 /100 Q: 11/0/0/0, 8/0/0/0, 0/0/0/0, 30/0/0/0, 0/0/0/0, 40/0/0/0, 0/0/0/0, 0/0/0/0, 0/0/0/0, 0/0/0/0, 0/0/0/0

43 — **6/0/0/0**

Highly jointed rock, most rock pieces < 5 cm.

29,8 m a.s.l. / 28 m

Scoriaceous basalt probably mixed with sediment. — 29,1 m a.s.l.

Core %: 20 — RQD % 10 / 30 / 50 /100 Q: 0/0/0/0

Olivine basalt, vesicular at the top. Vesicles filled with zeolites.
Medium grey. Very strong and hard rock. Small vesicles approx. 5 % all well filled with zeolites. Joints closely spaced.

10 — 6,3 kN — 66 MPa

K-3 / K-4

13 — 42

6 — 11,7 kN — 121 MPa

Core %: 88, 96, 92, 86, 93 — RQD % 10 / 30 / 50 /100 Q: 29/0/0/0, 85/23/0/0, **49/14/0/0**, 45/27/0/0, 0/0/0/0

21,7 m a.s.l. / 36 m

Sediment, red brown silty sediment, very weak rock, waxy core surface. — 21,25 m a.s.l.

Core %: 78 — RQD % 10 / 30 / 50 /100 Q: 0/0/0/0

Scoriaceous basalt, crushed rock fragments.

Core %: 60 — RQD % 10 / 30 / 50 /100 Q: 0/0/0/0

Tholeiite basalt

Medium grey. Very strong basalt. Joint spacing close to medium, rough, undulating, and coated with grey clay.

Core %: 94, 100, 86, 100 — RQD % 10 / 30 / 50 /100 Q: 83/27/27/0, **63/17/7/0**, 55/0/0/0, 45/0/0/0, 77/31/0/0

K-4 / K-5

9 — 3,1 kN — 33 MPa

10 — 20

Scoriaceous basalt near the bottom.

12,95 m a.s.l. / 46 m

Sediment, red siltstone approx. 7 cm.

Scoriaceous tholeiite basalt

Medium grey. Strong rock. Vesicular approx. 5-10 % vesicles, filled with zeolites. Joint spacing close to medium.

Core %: 92 — RQD % 10 / 30 / 50 /100 Q: 71/49/28/0

8 — 6,0 kN — 62 MPa

50

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-7b
	Óshlið - Syðridalur **Corehole OK - 07 50 - 55 m**	Date July 2006	Page **2** of **2**
		Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 309.162,8 Y: 632.416,8 Elev.: 58,0	Driller RFS	Drilled July 2006

Description of corehole OK - 07 (OK - 08)

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
	50	Scoriaceous basalt with diffuse boundary. 11 / 34 K-5 K-6	50		99	94/77/42/0			
	52	Tholeiite basalt Medium grey, very strong basalt. Dispersed white vein pattern of healed basalt. Joint spacing medium. 11 / 51 7 / 15,8 kN / 164 MPa	52		**94**	**79/59/23/0**			
		Tectonized, jointed rock, recemented.							
3,5	54	Grey, solid basalt. Tectonized and recemented rock.	54		98	80/50/0/0			
		Bottom of the hole at 54,5 m (22. July 2006).							
	56		56						
	58		58						
	60		60						
	62		62						
	64		64						
	66		66						
	68		68						
	70		70						
	72		72						
	74		74						
	76		76						
	78		78						
	80		80						
	82		82						
	84		84						
	86		86						
	88		88						
	90		90						
	92		92						
	94		94						
	96		96						
	98		98						
	100		100						

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-9
	Óshlið - Syðridalur	Date July 2006	Page **1** of **1**
	Corehole OK - 09 0 - 7 m	Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 309.126,2 Y: 632.348,1 Elev.: 49,9	Driller RFS	Drilled July 2006

Description of corehole OK - 09

The hole is located in the slope east of Syðridalsvatn.
Drilled with core barrel through soil and talus scree material. Numerous short stumps and rock fragments of different rock types.
NQ drilling rods, triple tube. Core diameter 45 mm. Drilled vertically.

Top of bedrock, highly fractured rock. (44,8 m a.s.l.)

Tholeiite basalt — All rock fragments of same type. Hard and strong basalt.
Highly jointed bedrock, joint planes coated with brown clay. (43,8 m a.s.l.)

Core %: 100 73
RQD % 10 / 30 / 50 /100 Q: 0/0/0/0 60/0/0/0

Bottom of the hole at 6,1 m (24. July 2006).
The hole was drilled to detect the surface of the bedrock.

GWT

Perm. (LU) 2,5 5,0 7,5

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-10
	Óshlið - Syðridalur **Corehole OK - 10 0 - 14 m**	Date July 2006	Page **1** of **1**
		Design AgG	Drawn SK
Empl. **VEGAGERÐIN**	Coord. X: 309.093,7 Y: 632.308,5 Elev.: 43,3	Driller RFS	Drilled July 2006

Description of corehole OK - 10

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
43,3	0	The hole is located in the slope east of Syðridalsvatn. Drilled with core barrel from the top. NQ drilling rods, triple tube. Core diameter 45 mm. Drilled vertically.	0						
	2		2						
	4	Talus, stones and debris of various grain size Three stumps of basalt (10-20 cm) and a lot of small basalt fragments. (Tedious and time consuming to drill through loose material.)	4						
	6	Probably scoriaceous bedrock at 7-8 m depth.	6						
35,3	8	Top of solid bedrock.	8						
	10	Tholeiite basalt Medium grey, extremely strong and hard rock. Highly jointed and crumbled zones. Joint planes are coated with brownish clay and silt.	10		**30** 54 58 87 60	15/0/0/0 31/31/0/0 21/0/0/0 42/0/0/0	**11/3/0/0**		
31,7	12	The rock is intensely jointed and fractured, few fragments over 5 cm long.	12		35 53	0/0/0/0 0/0/0/0			
30,0	14	Bottom of the hole at 13,3 m (23.July2006).	14						
	16		16						
	18		18						
	20		20						
	22		22						
	24		24						
	26		26						
	28		28						
	30		30						
	32		32						
	34		34						
	36		36						
	38		38						
	40		40						
	42		42						
	44		44						
	46		46						
	48		48						
	50		50						

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-11a
	Hnífsdalur	Date Sept. 2006	Page **1** of **6**
	Corehole OK - 11 0 - 50 m	Design AgG	Drawn AgG
Empl. **VEGAGERÐIN**	Coord. X: 311.915,9 Y: 629.583,0 Elev.: 64,28 m	Driller RFS	Drilled Sept. 2006

Description of corehole OK - 11

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100 Q	GWT	Perm. (LU) 2,5 5,0 7,5
64,28	0	Drilled on a talus cone in the NW slope of Hnífsdalur. 3,5" steel casing down to 8 m. The hole is inclined 7° from vertical towards SE. NQ drilling rods, triple tube. Core diameter 45 mm. 0m to 8m drilled with percussion drill, no core recovery.	0					
56,34	8	**Porphyritic basalt** Slightly reddish at the top. Else medium grey, very strong. Approx. 20 % of large plagioclase phenocrysts. Vesicular from top down to 11 m depth. Joints closely spaced.	8		73	33/0/0/0		
	10		10		96	41/0/0/0 **Q = 3 - 9** $Q=\frac{39}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
	12	Massive slightly microporous porphyritic basalt. 9 / 46 5 / 15,0 kN / 156 MPa	12		100	66/0/0/0		
	14	4 / 16,6 kN / 173 MPa	14		91	10/0/0/0 **39/0/0/0**		
	16	Vesicular near base, along ~0,5 m, approx. 10 % vesicles.	16	R	100	36/0/0/0		
47,9					**92**	44/0/0/0		
	18	**Sediment,** light brown tuff, very weak, erodes during drilling - core loss. Waxy surface. Thin basalt or dyke.	18		**29**	0/0/0/0 **Q = 0,1 - 0,4** $Q=\frac{10}{6\text{-}9}x\frac{1\text{-}2}{3\text{-}4}x\frac{1}{2,5}$		
		Sediment and dyke, orange sediment with basalt dyke. Intensely jointed. K-1 / K-2			67	0/0/0/0		
	20	**Sediment,** weak, orange brown claystone, waxy surface to core. Breaks during drilling.	20		77	3/0/0/0 8/0/0/0		
43,73	22	**Scoria - Scoriaceous basalt** Very low strength. Closely jointed. At the top intensely jointed rock.	22	R A	100	0/0/0/0 43/10/0/0		
	24	**Tholeiite basalt** Light to medium grey, very hard and extremely strong. Slightly micropore flow banded and scattered small vesicles filled with black clay. Joint spacing medium to close. 4 / 18,3 kN / 190 MPa	24		100	100 **Q = 4 - 13** $Q=\frac{57}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
	26		26	R A	100	56/20/0/0 **57/22/0/0**		
	28	6 / 49 6 / 18,4 kN / 192 MPa K-2 / K-3	28		100	60/0/0/0		
	30	13 / 56	30	A R	100	87/47/0/0		
	32	Scoriaceous at the base, 0,2 m, and highly jointed. **Sediment, tuffaceous claystone** dark red colour. Very weak, erodes during drilling and hence core loss.	32		96 38	47/25/0/0 0/0/0/0 **Q = 0,06 - 0,2** $Q=\frac{10}{6\text{-}9}x\frac{1\text{-}2}{3\text{-}4}x\frac{1}{5}$		
	34	**Scoriaceous basalt** Dark purple grey. Vesicles and vugs more than 5 %. Strong. Joints closely spaced. The scoria is grading into massive basalt. 5 / 16 6 / 5,4 kN / 57 MPa	34		94	49/12/0/0 **Q = 2 - 7** $Q=\frac{30}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		**4,91 LU at 2 bar**
	36	**Tholeiite basalt** Light medium grey. Very strong, hard and brittle rock. Slightly microporous, intensely jointed. Frequent pattern of thin black veins of joints healed with black clay.	36	A R	100	18/0/0/0		
	38	K-3 / K-4	38		97 100	0/0/0/0 0/0/0/0 **30/7/5/0**		
	40		40		78 100	0/0/0/0 76/0/0/0		
	42	**Scoria - Scoriaceous basalt.** Purple brown. Weak rock. Vugs and vesicles up to 15 %. Zones of intensely jointed rock.	42		48 31 100	15/0/0/0 0/0/0/0 0/0/0/0		
	44	**Tholeiite basalt,** medium grey, very hard and strong rock. Vesicles ~3-5 % coated with black clay. Joints closely spaced.	44		84 100 100	69/69/69/0 29/0/0/0 48/0/0/0		
18,92	46	**Sediment,** At the top 5 cm almost black, else dark brown. Very waxy surface	46		79	0/0/0/0		
18,23		on the core. Core loss. **Scoria - Scoriaceous basalt,** reddish grey, medium strong, very well compressed and consolidated rock.			90	59/0/0/0		
	48		48		100	0/0/0/0		
		Tholeiite basalt, light grey, extremely hard and strong, highly jointed rock. K-4 / K-5			100	0/0/0/0		
	50		50		100	24/0/0/0		

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-11b
	Hnífsdalur	Date Sept. 2006	Page **2** of **6**
	Corehole OK - 11 50 - 100 m	Design AgG	Drawn AgG
Empl. **VEGAGERÐIN**	Coord. X: 311.915,9 Y: 629.583,0 Elev.: 64,28 m	Driller RFS	Drilled Sept. 2006

Description of corehole OK - 11

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
	50	**Tholeiite basalt** Light grey. Extremely hard and strong. But intensely jointed. Joints coated with greenish and blue grey clay.	50		100	37/0/0/0			
	52		52	R	100	84/0/0/0			
		Scoria - Scoriaceous basalt Brown and red - brown, medium strong. Slightly porous, but continuous rock. 18 / 20 — 10 — 5,6 kN — 58 MPa		R	100	96/0/0/0	***Q = 4 - 12*** $Q=\frac{54}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$		
	54	No sharp boundary.	54	R	92	61/29/29/0			
		Tholeiite basalt Light grey. Extremely hard and strong. But intensely jointed rock.							
	56	K-5	56		100	27/0/0/0			
	58	K-6	58		93	75/51/0/0	**54/24/14/0**		
		Tectonized rock. The basalt is intensely jointed and crushed but recemented with black clay.							
	60		60	A	92	42/22/0/0			
					100	0/0/0/0			
	62		62		100	48/22/0/0			
		Scoria - Scoriaceous basalt, brown-grey, compressed and consolidated. Joints medium spaced. 11 / 16 — 8 — 3,8 kN — 40 MPa		R	100	100/80/80/0			
	64		64		100	75/0/0/0			
		Tholeiite basalt Medium grey. Slightly scoriaceous. Strong rock. Joints closely spaced.		R	100	0/0/0/0			
					100	35/0/0/0			
-0,93	66	**Sediment** K-6 Weak, red sandstone - siltstone. 8 — 3,3 kN — 34 MPa — K-7	66		100	33/0/0/0			
		Scoria - Scoriaceous basalt Brownish grey strong rock. Well compressed and consolidated core. Joint spacing medium.		R	100	100/100/0/0	***Q = 5 - 16*** $Q=\frac{71}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$		
	68		68		100	79/23/0/0			
		Tholeiite basalt Medium grey. Extremely hard and brittle rock, very strong. Irregularly flow banded, small pores and micropores filled with black clay. Joint spacing medium to close.		R	100	17/0/0/0	**71/28/0/0**		
	70		70						
	72		72		100	80/40/0/0			
-7,68		**Sediment,** red siltstone. Waxy surface. Very weak.			100	100/0/0/0			
		Scoria - Scoriaceous basalt							
	74	Purple grey to brown. Strong, well compressed and consolidated continuous core. Approx. 5-10 % vugs and vesicles, filled with white zeolite. 9 — 5,4 kN — 56 MPa 16 / 25 — K-7	74		100	100/100/85/0			**0,61 LU at 3 bar**
	76	K-8	76		100	100/100/76/76			
		Tholeiite basalt							
	78	Light grey. Very fine grained hard and brittle, extremely strong basalt. Frequent flow banding.	78	R	100	58/40/0/0			
					70	0/0/0/0			
	80	Joints medium spaced with rough and undulating joint planes. Coated with black clay. Relatively closely spaced micropore flow banding causing dark thin bands.	80		100	90/40/0/0			
	82	12 / 54 — 7 — 18,0 kN — 187 MPa	82		100	89/42/17/0			
							87/69/50/12		
	84	10 / 55 — K-8	84						
		K-9				83/77/40/0			
	86	15 / 56 — 6 — 22,5 kN — 234 MPa	86		100		***Q = 6 - 19*** $Q=\frac{87}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$		
		Few joints, rough, undulating, and coated with black clay.							
	88		88		100	100/95/95/43			
	90		90						
	92		92	R	100	71/71/71/0			
-27,73		7 — 2,8 kN — 29 MPa							
		Sediment, red sandstone, 0,05 m. 7 / 12 **Scoria - Scoriaceous basalt,** Red - brown, well compressed and consolidated. Joint spacing medium to close.		R	100	99/99/0/0			
	94		94	R	100	84/0/0/0			
							44/21/0/0		
		K-9 K-10			100	10/0/0/0			
	96	**Tholeiite basalt** Medium - dark grey, microporous and vesicular. Tectonized, intensely jointed, with crushed zones. Great part of the joints is healed with black clay forming a very closely spaced pattern of black veins.	96	N	89	0/0/0/0	***Q = 3 - 10*** $Q=\frac{44}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$		
					68	40/0/0/0			
	98		98	N	100	0/0/0/0			
					100	65/65/0/0			
-34,38	100	**Sediment,** siltstone - claystone. Red at the top 0,2 m. Then brown tuff; 0,3 m.	100		100	75/0/0/0			

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-11c
	Hnífsdalur	Date Sept. 2006	Page **3** of **6**
	Corehole OK - 11 100 - 150 m	Design AgG	Drawn AgG
Empl. **VEGAGERÐIN**	Coord. X: 311.915,9 Y: 629.583,0 Elev.: 64,28 m	Driller RFS	Drilled Sept. 2006

Description of corehole OK - 11

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100 Q	GWT	Perm. (LU) 2,5 5,0 7,5
	100	**Sediment**	100		87	57/0/0/0		
		Light grey tuffaceous waxy sandstone. Very weak rock, crumbles and				***Q = 0,3 - 1,4*** $Q=\frac{31}{6\text{-}9}x\frac{1\text{-}2}{3\text{-}4}x\frac{1}{2,5}$		
	102	erodes slightly during drilling.	102		62	7/0/0/0 **31/0/0/0**		
-37,46		**Tectonic breccia**			100	0/0/0/0		
		Mixed with dyke veins. Dark grey angular basalt fragments		R	79	42/21/0/0 ***Q = 0,07 - 0,5*** $Q=\frac{27}{15\text{-}20}x\frac{1\text{-}2}{3\text{-}8}x\frac{1}{2,5}$		
	104	cemented K-10	104	A				
		in black clay matrix. K-11			93	34/0/0/0		
		The rock pieces are hard and brittle, but the cementing matrix		R	80	0/0/0/0 **27/6/0/0**		
	106	(approx. 30 %) is very weak.	106		78	24/0/0/0		
					50	0/0/0/0		
				R	100	29/0/0/0		
-42,82	108	**Tholeiite basalt**	108	N	97	56/0/0/0		
		Light grey. Very strong. Microporous, closely jointed, joints rough,			98	18/0/0/0 ***Q = 2 - 8*** $Q=\frac{36}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		**1,53 LU at 3 bar**
		undulating, and coated with black clay.			100	24/0/0/0		
	110	6 / 54	110		100	68/45/0/0		
	112	**Tectonic breccia,** mixed with dyke intrusions. Angular fragments of	112	N R	90	31/0/0/0 **36/7/0/0**		
-47,63		dark basalt and dyke cemented in black clayey matrix.			100	0/0/0/0		
		Sediment, brown, tuffaceous waxy rock. Very weak, joints with K-11 K-12			48	0/0/0/0		
		slicken sides.				19/0/0/0		
	114	Brown tuffaceous clayey sediment. Very weak rock. Slicken sides on	114		81	***Q = 0,3 - 1,4*** $Q=\frac{31}{6\text{-}9}x\frac{1\text{-}2}{3\text{-}4}x\frac{1}{2,5}$		
		joint planes.						
	116	Light greenish grey, consolidated waxy pumice.	116		95	**31/0/0/0**		
-51,85		Dark brown, tuffaceous waxy sediment. 11 / 16				42/0/0/0		
		Scoriaceous basalt, well compressed and consolidated 5 / 3,2 kN / 33 MPa		R	98	89/59/59/0		
	118	medium strong rock.	118	N	77	40/27/0/0		
		Porphyritic basalt						
		Medium grey. Very strong. Approx. 10 % plagioclase phenocrysts <10 mm.			92	29/0/0/0		
	120	Micropore flow banding in the lower part. Scattered vesicles and	120	N				
		micropores are filled with black clay.		R	96	18/0/0/0		
		Joint spacing medium to close, rough, undulating, and				**56/18/5/0**		
	122	coated with black clay.	122		100	60/21/0/0		
		Intensely jointed within the top 2m. K-12		R				
		K-13		N	100	82/0/0/0		
	124	8 / 17,6 kN / 184 MPa 13 / 53	124		99	78/19/0/0		
				N		***Q = 4 - 12*** $Q=\frac{56}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
	126		126	R				
-61,18		Sandstone - Siltstone, 0,1 m.						
		Scoriaceous basalt, reddish brown, strong rock. 4 / 2,4 kN / 25 MPa			98	84/44/0/0		
	128	Cumulative plagioclase crystals 15 - 20 % plagioclase phenocrysts < 15 mm.	128			***Q = 6 - 20***		
		Porphyritic basalt		R		$Q=\frac{88}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
		Medium grey. Very strong rock. Joint spacing wide to medium,						
	130	rough, undulating, and coated with black clay.	130		100	96/79/0/0		
		Thin white veins of joints						
		healed with zeolite. Big chabazite crystals in few large vesicles.		N				
	132	Overall strong competent tunnelling rock. K-13	132			**88/58/19/0**		
		K-14						
	134	8 / 11,2 kN / 116 MPa	134		100	76/50/50/0		
				N				
	136	5 / 14,6 kN / 152 MPa	136		100	97/62/31/0		
		15 / 47						
-72,69	138		138	A				
		Sediment, red brown, tuffaceous, very weak rock. Waxy surface on			100	100/0/0/0		
-73,78		core and slicken sides on joint planes.			95	10/0/0/0 **18/0/0/0**		
		Tholeiite basalt			100	100/0/0/0		
	140	Medium grey, very strong basalt, vesicular in the uppermost 2 m. 5 / 7,5 kN / 78 MPa	140	A	100	65/50/29/0		
		Highly jointed and fractured zones at 140,5 - 142,5 m, slightly						
		tectonized rock, healed with black clay forming thin black veins.			77	0/0/0/0		
	142	K-14 K-15	142	R	74	23/0/0/0		
				N	100	19/0/0/0		
	144		144		100	41/41/0/0		
					90	33/0/0/0		**0,89 LU at 2,2 bar**
		Frequent micropore flow banding in the lower part.				***Q = 3 - 9***		
	146		146		100	$Q=\frac{54}{9\text{-}10}x\frac{2\text{-}3}{2\text{-}3}x\frac{1}{1}$		
		5 / 19,4 kN / 202 MPa 12 / 54				67/14/0/0		
	148		148		100	59/0/0/0		
						54/23/6/0		
				N	100	77/54/0/0		
-84,50	150		150					

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-11d
	Hnífsdalur	Date Sept. 2006	Page **4** of **6**
	Corehole OK- 11 150 - 200 m	Design AgG	Drawn AgG
Empl. **VEGAGERÐIN**	Coord. X: 311.915,9 Y: 629.583,0 Elev.: 64,28 m	Driller RFS	Drilled Sept. 2006

Description of corehole OK - 11

-85,05 m a.s.l. / 150 m

Sediment, 0,5 m thick red siltstone. Very weak rock.

Porphyritic basalt
Medium grey. Cumulative plagioclase crystals approx. 20 % up to 20 mm in size. Widely spaced joints

7 / 8,4 kN / 87 MPa — 13 / 35
K-15
K-16

-88,18 m a.s.l. / 154 m

Sediment, 0,15 m thick red brown clayey siltstone.

Tholeiite basalt
Medium grey. Strong and very strong basalt. Vesicular above 156,5 m. Joints medium spaced.

Micropore flow banded. Very hard and brittle tholeiite basalt. Joint spacing close to medium.

9 / 48

Disperse pattern of joints, healed with black clay, forming thin black vein pattern.

8 / 14,5 kN / 151 MPa
K-16
K-17

-96,21 m a.s.l. / 162 m

Sediment, 0,15 m thick red, clayey siltstone.

Tholeiite basalt
Medium grey, flow-banded, vesicular. Joints closely spaced, coated with black clay forming thin black vein pattern.

-99,29 m a.s.l.

Sediment, brown tuffaceous siltstone/claystone. Very weak rock, slicken sides on joint planes.

-100,38 m a.s.l. / 166 m

Scoriaceous basalt, dark grey strong rock.

Tholeiite basalt
Medium grey. Strong rock. Intense irregular pattern of thin black veins of irregular joints, healed with clay. Probably a stress zone in the basalt. The basalt is highly jointed and crushed. Joint planes are rough, undulating and coated with black clay.

K-17
K-18

-107,83 m a.s.l. / 174 m

Sediment
Dark brown, red brown and red tuffaceous claystone/siltstone. Very weak rock with waxy surface and slicken sides on the few existing joints. Overall poor tunnelling rock.

-112,00 m a.s.l. / 178 m

Scoriaceous basalt
Dark purple grey. Well compressed and consolidated, strong rock. Joints medium spaced.

K-18
K-19

Tholeiite basalt
Medium - light grey. Very strong rock with abundant pattern of thin black veins of joints healed with black clay. Scattered vesicles filled with zeolite and black clay. Micropore flow banding in the lower part. Joints closely spaced.

6 / 14,1 kN / 147 MPa — 17 / 48

Scattered pattern of joints formed by stress but well cemented and healed with black clay and zeolite.

K-19
K-20

-125,59 m a.s.l. / 192 m

Sediment, red sandstone, 0,05 m thick.

Scoriaceous basalt
Purple brown. Well compressed and consolidated, strong tunnelling rock. Joint spacing medium to wide.

17 / 25
6 / 5,0 kN / 52 MPa

Tholeiite basalt - Porphyritic basalt
Medium grey. Very strong rock. Vesicles approx. 3 - 5 % filled with black clay and zeolite. Joints medium to closely spaced, rough, undulating, and coated with black clay. Abundant pattern of thin black veins of joints healed with black clay.

6 / 17,9 kN / 187 MPa

K-20
K-21

200 m

Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
150	100	100/0/0/0	
	100	100/0/0/0	
			Q = 7 - 22
			$Q = \frac{10}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
152			**100/95/95/79**
	100	100/100/100/83	
154	100	100/0/0/0	
	100	61/23/0/0	
156			***Q = 5 - 16***
			$Q = \frac{72}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
158	100	47/18/0/0	
			72/31/7/0
	100	100/26/0/0	
160	100	90/56/26/0	
162	100	98/71/0/0	
			51/21/0/0
164	99	34/0/0/0	
	100	28/0/0/0	
	100	39/0/0/0	
166	100	0/0/0/0	**25/0/0/0**
		67/37/22/0	
			Q = 4 - 8
168	100		$Q = \frac{38}{9\text{-}10} \times \frac{3\text{-}4}{2\text{-}3} \times \frac{1}{1}$
	100	29/0/0/0	
170			**38/13/8/0**
	100	20/0/0/0	
172	100	24/0/0/0	
	100	16/0/0/0	
	100	0/0/0/0	0/0/0/0
174	90	0/0/0/0	
	75	41/0/0/0	**61/10/0/0**
			Q = 0,7 - 3
176			$Q = \frac{61}{6\text{-}9} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{2,5}$
	100	75/14/0/0	
178	98	98/27/0/0	
180	100	100/38/0/0	
	100	89/40/0/0	
182			**82/36/13/0**
184	100	98/68/57/0	
			Q = 5 - 18
			$Q = \frac{82}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
186			
	100	52/10/0/0	
188			
190	100	39/0/0/0	
	100	86/43/0/0	
192	100	100/92/67/0	
194	100	76/58/58/58	
196			
	100	88/11/0/0	
198			
200	100	89/64/48/0	

GWT

Perm. (LU) 2,5 5,0 7,5

0,71 LU at 9 bar

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-11e
	Hnífsdalur	Date Sept. 2006	Page **5** of **6**
	Corehole OK- 11 200 - 250 m	Design AgG	Drawn AgG
Empl. **VEGAGERÐIN**	Coord. X: 311.915,9 Y: 629.583,0 Elev.: 64,28 m	Driller RFS	Drilled Sept. 2006

Description of corehole OK - 11

200 m

Tholeiite basalt - Porphyritic basalt
Plagioclase phenocrysts < 5 mm approx. 20 %.

202 m

204 m

10 / 20,4 kN / 212 MPa

206 m

23 / 54

208 m — K-21

-142,67 — K-22

Sediment, 0,05 m brown tuffaceous claystone.

Olivine basalt
Dark grey. Very strong microporous competent basalt. Joints medium to closely spaced, rough and undulating.

210 m

212 m

-146,93

Sediment, brown tuffaceous claystone. Very weak. Waxy surface on the core and slicken sides on joint planes.

214 m

-148,42

Scoriaceous basalt
Dark grey. Very well compressed and consolidated. Competent tunnelling rock. Joints medium spaced.

216 m

Tholeiite basalt
Dark grey. Strong microporous. The lower part of the basalt is tectonized and brecciated but cemented with black clay.

5 / 16 — 4,8 kN / 50 MPa — 8 — K-22 — K-23

218 m

-153,39

Sediment
Brown tuffaceous clay-stone. Very weak. Waxy surface on the core.

220 m

-155,17

Tholeiite basalt, dark grey, weak tectonized rock, angular fragments and stressed basalt. Cemented with black clay. All joint planes with black glossy clay.

Average Q-value 212,85m to 227,8m depth **Q = 0,3 - 0,9**

$Q = \frac{40}{12\text{-}15} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{2,5}$

222 m

224 m

-158,75

Sediment,
Red sandstone/siltstone. Very weak. Waxy surface on the core.

-160,13 — 226 m

A mix of scoria and sediment.

228 m — K-23 — K-24

Tholeiite basalt
Medium grey. Very strong rock. Pores approx. 2 - 3 % filled with black clay, also dispersed micropores filled with black clay.
Joints medium to closely spaced.

230 m

Dyke vein, dark grey, 0,2 m.

232 m

Tholeiite basalt

234 m

Dyke vein
Tholeiite basalt
Dyke vein, dark grey microporous basalt.
Tholeiite basalt

-169,56

Sediment, red siltstone. Very weak rock.
A mix of sediment and scoria. Medium weak rock.

236 m

Scoriaceous basalt, reddish grey. Joints medium to widely spaced

5 / 4,0 kN / 41 MPa — K-24 — K-25

13 / 23

238 m

Tholeiite basalt
Light - medium grey. Very strong rock. Vesicles approx. XXX. Joint spacing medium.

7 / 13,2 kN / 138 MPa

15 / 44

240 m

-174,43

Basaltic dyke vein, 0,2 m. Dark grey.

Tholeiite basalt - Porphyritic basalt
Medium grey. Very strong vesicular basalt. Most vesicles filled with zeolite and blue clay.

242 m

-176,81

Basaltic dyke, very dark grey. Very strong rock. Joint spacing close.

244 m

246 m — K-25 — K-26

-181,28

Sediment, dark grey, fine grained sandstone - conglomerate. Largest fractions of basalt ~ 8 mm, dark grey mainly subrounded, cemented in sandy matrix. Medium strong rock. Joint spacing medium to wide.

5 / 5,3 kN / 56 MPa

11 / 22

248 m

250 m

Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
200			**80/42/29/10**
202	92	55/27/0/0	***Q = 5 - 18*** $Q = \frac{80}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
204			
206	100	96/46/35/0	
208	100	51/0/0/0	
210	100	73/51/0/0	
	100		***Q = 3 - 10*** $Q = \frac{47}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
212	100	32/32/0/0	**47/31/0/0**
	100	25/0/0/0	
214	100	40/0/0/0	
	100	43/0/0/0	
216	100	83/67/0/0	
			66/41/11/0
218	89	53/28/28/0	
	100	49/0/0/0	
220	100	0/0/0/0	**34/17/0/0**
	97	41/20/0/0	
222	95	0/0/0/0	
	40	0/0/0/0	
	92	0/0/0/0	**6/0/0/0**
	73	16/0/0/0	
224	67	0/0/0/0	
226	71	0/0/0/0	
	93	0/0/0/0	**27/15/0/0**
	100	67/44/0/0	
228			***Q = 5 - 15*** $Q = \frac{68}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
230	100	68/15/0/0	**68/14/0/0**
232	100	50/0/0/0	
	100	75/0/0/0	
234	100	0/0/0/0	
	96	82/0/0/0	
	100	100/100/0/0	
236	100	100/87/87/51	
238	100	100/100/59/0	***Q = 7 - 22*** $Q = \frac{98}{9\text{-}10} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
240			
242			**98/84/57/14**
	100	95/61/28/0	
244	100	29/0/0/0	***Q = 2 - 9*** $Q = \frac{55}{12\text{-}15} \times \frac{2\text{-}4}{2\text{-}3} \times \frac{1}{1}$
246	97	71/27/27/0	**55/17/17/0**
	72	23/0/0/0	
248	100	82/74/28/0	***Q = 2 - 10*** $Q = \frac{88}{6\text{-}9} \times \frac{1\text{-}2}{3\text{-}4} \times \frac{1}{1}$
250			**88/80/50/32**

GWT

Perm. (LU) 2,5 5,0 7,5

0,14 LU at 9 bar

0,002 LU at 9 bar

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-11f
	Hnífsdalur	Date Sept. 2006	Page **6** of **6**
	Corehole OK - 11 250 - 283 m	Design AgG	Drawn AgG
Empl. **VEGAGERÐIN**	Coord. X: 311.915,9 Y: 629.583,0 Elev.: 64,28 m	Driller RFS	Drilled Sept. 2006

Description of corehole OK - 11

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
-184,65	250	Sediment, sandstone - conglomerate, very fine grained.	250		100	100/91/91/91			
-185,44		Basaltic dyke, dark grey, with varying microporous and dense zones.		A	100	53/0/0/0			
	252	Porphyritic basalt Brownish grey. Very strong, porous and microporous, approx. 10 % vesicles, all well filled with zeolite. Joints medium to widely spaced.	252	R	100	97/97/97/0			
	254	5 / 8,5 kN / 89 MPa; 8 / 34	254		100	99/90/73/52			
	256	K-26 / K-27	256		100	100/61/33/33			
						97/88/79/63			
	258	7 / 14,9 kN / 155 MPa; 15 / 50	258						
	260		260		100	100/100/100/100			
		Very massive porphyritic basalt. Medium grey. Very strong and competent, scattered small pores and micropores filled with black clay and zeolite.					***Q = 6 - 22***		
	262		262				$Q=\frac{97}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
		7 / 20,9 kN / 217 MPa; 12 / 56							
	264		264		98	95/95/95/95			
		K-27 / K-28							
	266		266		100	91/91/91/47			
-201,03		Unclear strong boundary.		R	100	83/0/0/0			
	268	Scoriaceous basalt Reddish brown. Well consolidated strong rock. All former vugs and vesicles well filled with zeolite. Joint spacing medium to close.	268	R	100	100/48/32/0			
		8 / 4,9 kN / 51 MPa							
-203,71	270	Olivine basalt Grey strong basalt. Small vesicles approx. 5 - 10 % coated with grey clay and filled with zeolite. Joint spacing medium to wide.	270		100	100/100/100/0			
					100	100/87/87/0	***Q = 6 - 21***		
	272	Scoriaceous olivine basalt Porous rock, but all vugs and vesicles filled with zeolite.	272		100	100/78/45/0	$Q=\frac{95}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
		9 / 5,1 kN / 54 MPa; 6 / 13,3 kN / 138 MPa		R	100	100/100/0/0			
	274	Olivine basalt Grey strong rock. Joints with spectacular chabazite zeolite. Joints widely spaced. Unclear boundary.	274		77	**95/86/71/18** 77/77/77/77			
		K-28 / K-29							
-209,17		A mix of scoriaceous basalt and red sandstone.			100	100/100/100/0			
	276	Sediment, reddish scoriaceous sandstone. Medium strong.	276		100	85/0/0/0			
		Olivine basalt		R		100/95/79/62			
		9 / 6,1 kN / 63 MPa					***Q = 6 - 21***		
	278	Medium grey, strong rock. All vesicles and vugs and some former joint pattern healed with white zeolite and black stiff clay. Overall strong competent tunnelling rock.	278		100		$Q=\frac{96}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$		
		17 / 25							
	280		280	R		**96/66/51/32**			
		8 / 13,9 kN / 145 MPa; 9 / 40			100	97/56/35/0			
		Reddish brown.							
	282	Scoriaceous basalt Medium strong, vesicular and all vesicles filled with zeolite. Sediment, red sandstone 0,1 - 0,15 m. Medium strong rock.	282		96	96/60/0/0			
-216,21		Olivine basalt							
		Bottom of the hole at 282,6 m depth.							
		11 / 15 for 281,4 to 281,8 m							
	284		284						
		6 / 4,9 kN / 51 MPa for 281,8 to 282,2 m							
	286		286						
	288		288						
	290		290						
	292		292						
	294		294						
	296		296						
	298		298						
	300		300						

Jarðfræðistofan Ehf / JFS Geological services	Óshlíðargöng	JFS-69	Drwg. A-12
	Hnífsdalur	Date Sept. 2006	Page **1** of **1**
	Corehole OK - 12 0 - 25 m	Design AgG	Drawn AgG
Empl. **VEGAGERÐIN**	Coord. X: 311.967,6 Y: 629.537,2 Elev.: 46,35	Driller RFS	Drilled Sept. 2006

Description of corehole OK - 12

Elev. m a.s.l.	Depth m	Description
46,35	0	The hole is located on a debris cone below a small creek. Grassland on the surface with scattered stones.
	2	The hole is vertically drilled with NQ triple tube rods from the surface. Core diameter 45 mm. No casing in the hole.
	4	The discontinuous core consists of well cut stones of various basalt types probably largely from a basal till.
	6	
	8	
	10	
	12	
	14	
		Top of bedrock.
30,85	16	**Tholeiite basalt**
		Medium grey. Extremely hard and strong rock, but intensely jointed and crushed rock pieces. The basalt is very fine grained with scattered plagioclase phenocrysts.
	18	
27,35		Less jointed and more massive basalt.
	20	
		K-1 / K-2
24,95	22	**Sediment, red sandstone**
		Dark reddish brown, very weak clayey sediment. Core loss ~1m. High water content.
22,15	24	
		Bottom of the hole at 24,2 m depth.
	26	
	28	
	30	
	32	
	34	
	36	
	38	
	40	
	42	
	44	
	46	
	48	
	50	

Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q
0				
2				
4				
6				
8				
10				
12				
14				
16	N	87	0/0/0/0	
18	A	**77**	**12/0/0/0**	
		95	19/0/0/0	
20		56	14/0/0/0	
	N			
22		82	0/0/0/0	
		85	0/0/0/0	
24		**84**	**0/0/0/0**	
26				
28				
30				
32				
34				
36				
38				
40				
42				
44				
46				
48				
50				

GWT

Perm. (LU) 2,5 5,0 7,5

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-13
	Hnífsdalur	Date Sept. 2006	Page **1** of **1**
	Corehole OK - 13 0 - 35 m	Design AgG	Drawn AgG
Empl. **VEGAGERÐIN**	Coord. X: 311.819 Y: 629.490 Elev.: 53 m	Driller RFS	Drilled Sept. 2006

Description of corehole OK - 13

53,00 m a.s.l. / 0 m — The hole is located at the east margin of a debris cone, below the creeks from Lambaskál. Grassland with distributed stones of various size and origin on the surface (overburden).

The hole is vertically drilled with NQ drilling rods, triple tube. Core diameter 45 mm. No casing.

49,75 m a.s.l. / 3,25 m

Tholeiite basalt or intermediate Olivine-Tholeiite basalt

Grey, very hard and strong, vesicular in the topmost meter, but dense with micropore flow pattern in the lower part. Moderately jointed, joints rough, undulating, and coated with light brown clay. 6 / 18,9 kN / 197 MPa; 10 / 51

Vesicular in the lowest 0,3 m. Sharp boundary to the underlying sediment.

42,70 m a.s.l. / 10,30 m

Sediment, dark red brown siltstone/ claystone. Very weak, waxy surface. The sediment is mixed with scoria in the lower part.

41,80 m a.s.l. / 11,20 m

Scoriaceous basalt, dark, reddish grey. Moderately strong, very well compressed and consolidated.

Tholeiite basalt

Medium dark brown - grey. Very hard and strong basalt. Most joint planes rough, undulating, and coated with thin brown and black clay. Intensely jointed and crushed rock forming a weak rock mass of poor tunnelling quality. Core loss at 14m ~0,5m. K-1 / K-2

34,60 m a.s.l. / 18,40 m

Sediment

Light brown and red. Very weak tuffaceous siltstone/claystone.

Scoriaceous basalt

Moderately strong. Dark grey. Well compressed and consolidated.

31,50 m a.s.l. / 21,50 m

Tholeiite basalt

Medium dark grey. Very hard and strong fine grained rock. But highly jointed. K-2 / K-3

Core loss.

Scoriaceous basalt

Mixed with tuffaceous sandstone. Dark brown grey and brown. Moderately weak rock.

Tholeiite basalt Moderately strong. Medium grey with a tectonic joint pattern.

24,60 m a.s.l. / 28,40 m

Sediment, Brown tuffaceous siltstone/claystone. Very weak. Stratified pumice. Waxy surface on the core.

24,10 m a.s.l. / 28,90 m

Scoriaceous basalt

Purple grey. Strong rock with few joints. Well compressed and consolidated.

Strong boundary. K-3 / K-4

Tholeiite basalt

Medium grey. Very hard and strong. Scattered large vesicles coated with black clay. Micropore flow banding near the bottom of the hole.

18,3 m a.s.l. / 34,70 m

Bottom of the hole at 34,7 m depth.

Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q
8	N	100	0/0/0/0	
		56		**19/12/0/0**
		100	59/41/0/0	
10	N	90	25/0/0/0	
		100	0/0/0/0	
		78 71	0/0/0/0	**0/0/0/0**
12		100	55/28/0/0	
	R	**81**		**13/5/0/0**
		99	0/0/0/0	
14		100	0/0/0/0	
		56	0/0/0/0	
		30	0/0/0/0	
16		100 100	0/0/0/0 0/0/0/0	
		81	7/0/0/0	
18	R	100	0/0/0/0	
		100	26/0/0/0	
		20	0/0/0/0	
		25	0/0/0/0	
20		75	0/0/0/0	
		84	42/25/0/0	
		68		**27/16/0/0**
22	R	64	29/12/0/0	
24		100	87/87/76/76	
	R	**83**		**55/43/33/33**
26				
28	N	89	36/0/0/0	
		100	0/0/0/0	
30	R	96	87/87/87/0	
		100	86/67/26/0	
32		**99**		**76/59/34/0**
34	N	98	71/25/0/0	
36				
38				
40				
42				
44				
46				
48				
50				

GWT

Perm. (LU) 2,5 5,0 7,5

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-14a
	Hnífsdalur - Skarfasker	Date July 2007	Page **1** of **5**
Empl. VEGAGERÐIN	**Corehole OK - 14 0 - 50 m**	Design AgG	Drawn EO
	Coord. X: 313.785,3 Y: 630.888,8 Elev.: 48,16	Driller RFS	Drilled June 2007

Description of corehole OK - 14

Elev. m a.s.l.	Depth m	Description	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q
48,2	0	The hole is located in steep talus scree, vertical hole				
		Percussion drilling and casing				
	2	5" casing down to 9 m depth and 3,5" casing down to 15 m depth				
	4					
	6					
	8					
	10					
	12					
	14	NQ triple tube core drilling from 15 m depth. Core diameter 44,5 mm.				
33,2	16	**Olivine basalt**, light red grey, very strong, slightly microporous, vesicles 5-15%. half filled with zeolites - chabazite. K-1	R	75 100	23/0/0/0 60/0/0/0	
31,7		Red sed. 1 cm				
		Scoriaceous basalt, red grey, strong, porous, vesicles half filled with chabazite. Diffuse boundary.		100	78/41/26/0	
	18	**Olivine basalt**, light pink grey, very strong, slightly microporous, with dark red, rusty olivine crystals.		100	39/21/0/0	
	20			100	**49/13/6/0** $Q=\frac{49}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$	
			R	100	47/0/0/0	
	22	Moderately jointed, joints rough, undulating, coated with opal and small zeolites. Joints irregularly spaced and oriented. 9 / 15,5 kN / 162 MPa		100	17/0/0/0	
		11 / 51 K-1 K-2		100	66/0/0/0 ***Q = 4 - 14***	
	24	Grey zone in the olivine basalt.		100	59/0/0/0	
23,2				100	20/0/0/0	
21,9	26	**Scoriaceous basalt**		100	20/0/0/0	
		Red sed. 2 cm				
		Scoriaceous basalt, moderately strong, brown		100	70/23/0/0	
		21 / 59				
	28			100	62/15/0/0	
		Olivine basalt, very strong, red grey in the upper part, mainly grey in the middle and lower part. Olivine phenocrysts <5 mm ~3%. Porous, approx 5-10%, vesicles half filled with zeolites and also with opal. Scattered small plagioclase phenocrysts.				
	30			100	36/0/0/0	
	32	Scattered joints, irregularly spaced, coated with hard clay and opal. Rough undulating. K-2 K-3	R	100	57/57/57/0	
	34	9 / 22,8 kN / 238 MPa		100	63/59/28/0 **53/20/9/0**	
	36			100	$Q=\frac{53}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$ ***Q = 4 - 14***	
	38			100	76/30/30/0 72/53/0/0	
	40	K-3 K-4		100	15/0/0/0	
				100	31/0/0/0	
	42	Three to four scoriaceous zones in the lowest 4-5 m. The basalt is red brown and grey with 5-10% vesicles <10 mm, coated and half filled with zeolites and light brown clay.		100	43/0/0/0	
	44			100	32/0/0/0	
	46			100	54/0/0/0	
0,1	48	**Sediment red siltstone**, weak, with scoria fragments, very weak rock, glossy waxy surface on core.		60	0/0/0/0	
-1,6	50	Scoriaceous basalt K-4		97 100	9/0/0/0 0/0/0/0	

GWT

Perm. (LU) 2,5 5,0 7,5

0,15 LU at 5,8 bar

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-14b
	Hnífsdalur - Skarfasker	Date July 2007	Page **2** of **5**
Empl. VEGAGERÐIN	**Corehole OK - 14 50 - 100 m**	Design AgG	Drawn EO
	Coord. X: 313.785,3 Y: 630.888,8 Elev.: 48,16	Driller RFS	Drilled June 2007

Description of corehole OK - 14

50 K-5

Scoriaceous basalt, red brown and grey brown, moderately strong, well compressed and consolidated. Few original joints but breaks during drilling and handling.

23 / 19

11 / 5,7 kN / 59 MPa

54 Unclear diffuse boundary

Tholeiite basalt medium grey, very hard and brittle strong, very fine grained with very fine veins of joints, healed with black clay.

Zones with thin micropore flow banding.

58 Joints irregularly spaced, and oriented, rough undulating, coated with thin black clay. K-5 K-6

60 11 / 55

62 12 / 17 kN / 177 MPa

Scoriaceous 0,2 m. red brown, moderately strong.

-15,8 64 Sediment, sandstone, dark red and red brown sandstone. Very weak, waxy surface on core. Breaks up during drilling. Light tephra 5 cm at the base.

-17,2 66 Scoriaceous basalt, grey and brown grey, well compressed and consolidated moderately strong rock.

Tholeiite basalt, medium grey, very hard and strong. K-6

68 Irregular large vesicles ~3-4% in the upper part. K-7

Scattered pattern of thin block veins of heeled joints, coated with black clay.

70 Scoriaceous basalt, with unclear layer boundary, brown porous, moderately strong.

72 Tholeiite basalt, medium grey, extremely hard, strong, micropore flow banded, vesicular in the upper part. Open joint with brown alteration zone. Joints rough, undulating, coated with black clay, joints frequently healed with black clay forming thin black veins.

74 Tholeiite basalt, medium grey, very hard and strong rock, fine grained, slightly microporous. 11 / 16,5 kN / 172 MPa

76 10 / 50 K-7

78 K-8 Vesicular zone, vesicles <30 mm ~5-10%.

80 14 / 49 — 11 / 13,7 kN / 143 MPa

Sharp boundary, no scoria.

-33,5 82 Sediment, orange brown at top, thin red brown, and brown. Very weak rock.

-34,4 Scoriaceous basalt, slightly red grey, well compressed and consolidated strong rock. Few original joints but several joints owing to drilling and handling.

84 K-8 K-9

86 Unclear boundary. Tholeiite basalt, Medium grey, extremely hard and brittle rock. Highly jointed due to former tectonic stress.

88 Slightly scoriaceous zone, well compressed and strong rock.

90 The tholeiite basalt is very hard and brittle, numerous joints, rough, undulating, both open and healed with black clay and some opal.

92 Several brown alteration zones of some joints, indicating flow of "thermal" water.

94

96 Scattered irregular pattern of thin block veins, joints formed by stress and healed with black clay

98

100 K-9 K-10

Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
50		100	88/35/35/0			
52		100	69/42/0/0			
54		100	0/0/0/0			
56		100	83/47/27/0			
58	R	**100**	**67/38/12/0** $Q=\frac{67}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$	***Q = 5 - 16***		
		100	64/34/0/0			
60		100	92/53/0/0			
62		98	68/57/23/0			
64		100	54/0/0/0			
		75	38/0/0/0			
		100	0/0/0/0			**0,7 LU at 9,2 bar**
66		100	73/30/0/0			
68	R	100	64/38/23/0			
70	R	99	67/44/19/0			
72	R	**100**	**63/41/21/0** $Q=\frac{63}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$	***Q = 5 - 15***		
74	R	100	58/35/23/0			
76						
78		100	69/50/25/0			
80		96	33/23/0/0			
		100	71/56/39/0			
82		86	58/0/0/0			
84	R	100	77/60/42/0			
86		100	56/44/27/0			**4,5 LU at 8 bar**
88	R		**71/47/25/6** $Q=\frac{71}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$			
90	R	100	63/47/20/0	***Q = 5 - 14***		
92		100	39/0/0/0			
94	N	**100**				
96		100	46/0/0/0			
98		100	68/59/0/0			
100		100	82/36/0/0			
		100	79/49/19/0			

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	Hnífsdalur - Skarfasker	Date July 2007	Page **3** of **5**
Empl. VEGAGERÐIN	**Corehole OK - 14 100 - 150 m**	Design AgG	Drawn EO
	Coord. X: 313.785,3 Y: 630.888,8 Elev.: 48,16	Driller RFS	Drilled June 2007

Description of corehole OK - 14

100

Tholeiite basalt, **medium grey very hard and brittle strong rock.** 11 16,5 kN 172 MPa
Very fine grained flow banded basalt. Scattered pattern of thin black veins of joints formed by stress. Filled with black clay. 18 54

102

Joint are randomly spread and oriented, joint planes, rough, undulating. K-10

104 K-11

-57,0 -57,4 Sediment, red waxy tuff, weak rock

106

Scoriaceous basalt, red brown, moderately strong, porous rock.
Vesicles approx 10%, irregular and of various size, empty or coated with small chabazites.

108

Tholeiite basalt, light brown, very hard and strong rock but highly jointed, most probably due to former stress.

110

Colour changes, brown to grey. 12 10 kN 104 MPa

112 16 46

Tholeiite basalt, light-medium grey. Extremely hard and brittle, scattered pattern of thin veins with black clay (chlorophaeit). K-11

114 K-12

Very hard and strong basalt.

116

19 53

10 10,5 kN 109 MPa

118

120

Scoriaceous basalt, grey brown, vesicular ~5-10% ves. almost empty.

-73,8 **122** K-12 K-13

Sediment, Sandstone-siltstone, dark red waxy, weak rock.
The lower half is mixed with fragments of angular scoria and porous basalt.

-75,8 **124**

Scoriaceous basalt, grey brown, very well compressed and consolidated, porous rock, but all pores filled with zeolites, forming moderately strong rock.

126 17 27

128 13 5,3 kN 56 MPa

130

Tholeiite basalt, light fresh grey, extremely hard and strong, K-13

132 fine grained basalt, moderately jointed, thin black veins of joints healed with black clay. Some joints with chabazite filling, indicating former tectonic stress and circulating warm water. K-14

134

-86,4 -86,8 Tectonic breccia, red sandstone, with basalt fragments

Tholeiite basalt, light-medium grey.

136 Tectonized rock with crushed rock zones with open joints and brown alteration zones indicating circulation of thermal water.

138

Tholeiite basalt, medium grey.
Extremely hard and strong, very fine grained basalt, thinly bedded micropore flow banding.

140

The rock is moderately jointed, in addition to thin black veins of joints healed with black clay K-14 K-15

142

144

146

Highly crushed rock, joints curved undulating, coated with glossy black clay.

148

Tholeiite basalt, light grey, extremely hard, strong and brittle

150

Depth m	Core %	RQD % 10 / 30 / 50 /100 Q
100	100	**95/76/55/15** $Q=\frac{95}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
102		92/64/49/49
	100	83/67/49/0
104		***Q = 6 - 21***
	100	100/93/93/0
	100	0/0/0/0
106	100	75/44/31/0
108	100	100/75/0/0
110	97	78/57/57/0
112	100	100/93/80/0
		85/68/45/16 $Q=\frac{85}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
114	**100**	***Q = 6 - 19***
116	98	86/57/37/37
118	100	175/65/0/0
120	100	100/100/100/100
122	98	96/64/0/0
	100	100/100/0/0
124	100	100/100/85/62
126		**96/91/83/56** $Q=\frac{96}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
	100	
128	100	***Q = 6 - 21***
130		100/100/100/50
	100	100/95/95/95
132	100	74/53/38/0
134	100	100/100/0/0
136	100	42/0/0/0
138	100	70/47/0/0
	100	37/0/0/0
140	100	91/39/23/0
142		**72/45/31/5** $Q=\frac{72}{9\text{-}10}\times\frac{2\text{-}4}{2\text{-}3}\times\frac{1}{1}$
	100	
144	99	79/49/33/33
	100	84/77/77/0
146		***Q = 5 - 14***
	100	69/44/44/0
148	100	0/0/0/0
	100	88/88/88/0
150	100	81/81/81/0

GWT

Perm. (LU) 2,5 5,0 7,5

1,2 LU at 12 bar

0,8 LU at 12 bar

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	Hnífsdalur - Skarfasker	Date July 2007	Page **4** of **5**
Empl. VEGAGERÐIN	**Corehole OK- 14 150 - 200 m**	Design AgG	Drawn EO
	Coord. X: 313.785,3 Y: 630.888,8 Elev.: 48,16	Driller RFS	Drilled June 2007

Description of corehole OK - 14

Elev. m a.s.l.	Depth m	Description	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100 Q	GWT	Perm. (LU) 2,5 5,0 7,5
	150	**Tholeiite basalt,** light grey, extremely hard and brittle, thin micropore flow banding. 13 / 22,5 kN / 235 MPa	150					
	152	Joints curved, undulating, with thin glossy black clay coating. 24 / 60	152		100	80/37/23/0		
		Sharp layer contact.		R	100	**0/0/0/0**		
-106	154	**Sediment,** red brown, very weak, waxy sediment with 0,3 m thick, light coloured pumice layer. Brown clayous tuff at the base. Argillaceous sediment.	154		100	65//0/0		
-107,6	156	Sharp layer contact	156		100	80/80/80/0		
		Porphyritic basalt, dark grey, strong rock with approx. 10% plag. phenocrysts <10mm.		R				
	158	18 / 20 K-16 K-17	158		100	83/83/70/0		**0 LU at 12 bar**
		Vesicular zones with 10-15% pores <10mm half filled and filled with chabazite zeolites. 10 / 3,3 kN / 34 MPa						
	160		160		100	65/48/20/0		
		Moderately tectonized zone, intense pattern of black veins of joints healed with black clay (chlorophaeite).						
	162		162		100	78/0/0/0		
		Dark grey porphyritic basalt, approx. 10% plag phenocrysts. Porous zone, approx. 5-10% filled with zeolites and black clay.		R				
	164		164		100	88/65/43/0		
	166		166		100	73/48/27/0		
		K-17 K-18			**100**	**84/73/60/36** $Q=\frac{84}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$		
	168		168	R	100			
	170	No weakness at layer boundary.	170			65/46/35/35		
-122,5		**Porphyritic basalt,** medium grey, very strong, cumulative amount of plagioclase crystals, (approx. 20-25% 20 <mm). Relatively coarse grained basalt, massive rock, few joints.		N	83	80/80/80/0		
	172		172		100	100/100/100/100		
	174	25 / 41	174					
		K-18 K-19						
	176	**Porphyritic basalt,** medium grey, very strong, approx. 3-5% vesicles filled with zeolites and black clay.	176		100	100/100/100/100		
		13 / 10 kN / 105 MPa						
	178		178		100	95/95/67/67		
	180		180	N				
-132,9		Sharp boundary.			100	100/100/100/0		
	182	**Sediment,** siltstone - claystone, dark red brown, very weak. Tuffaceous claystone. Waxy surface on core.	182		83	51/0/0/0		**2,2 LU at 12 bar Failure in packer**
-134,4		Sharp boundary.			100	100/100/100/100		
		Porphyritic basalt, medium grey, very strong, relatively coarse grained approx. 20-25% large plagioclase crystals <15mm. Vesicles approx. 3-5% filled with chabazite and black clay.		N		100/93/93/93		
	184		184		100	**99/96/96/61**		
		19 / 39 K-19 K-20				$Q=\frac{99}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$		
	186	9 / 8,3 kN / 86 MPa	186		**100**	***Q = 6 - 22***		
	188		188	N	100	96/96/96/0		
-140,7		No weakness at layer boundary.						
		Scoriaceous basalt, red grey, strong rock, very well compressed and consolidated, pores and vesicles 10-15% filled with zeolites. 9 / 4,7 kN / 49 MPa			100	100/100/100/0		
	190		190	N				
		Diffuse boundary 12 / 16			100	94/89/89/62		
	192	**Tholeiite basalt,** medium grey, very strong. scattered large vesicles (5-10% ves <30mm) mainly filled with black clay (celadonite).	192		**100**	**74/64/53/14**		
				N		$Q=\frac{74}{9-10}x\frac{2-4}{2-3}x\frac{1}{1}$		
	194	K-20 K-21	194		95	***Q = 5 - 14***		
						92/73/73/0		
	196		196		100	51/51/33/0		
		Intensely jointed tectonized zone. Joints rough, undulating coated with black clay (celadonite).			100	0/0/0/0		
	198		198		100	0/0/0/0		
		Micropore flow banding, dark bands of micropores filled with black clay.		N				
	200		200		100	81/70/33/0		

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	Hnífsdalur - Skarfasker	Date July 2007	Page **5** of **5**
Empl. VEGAGERÐIN	**Corehole OK- 14 200 - 250 m**	Design AgG	Drawn EO
	Coord. X: 313.785,3 Y: 630.888,8 Elev.: 48,16	Driller RFS	Drilled June 2007

Description of corehole OK - 14

200 m

Tholeiite basalt, medium grey, very hard and strong basalt. Highly jointed near the base. 11 / 20 kN / 209 MPa; 17 / 49

Sharp, weak boundary.

202 m (-153,9)

Sediment, dark red brown and brown tuffaceous claystone, very weak rock, with waxy surface. K-21 / K-22

204 m (-155,5)

Scoriaceous basalt, grey, well compressed and consolidated moderately strong rock. Mixed with sediment infiltration at the top.

206 m

Tholeiite basalt, medium grey, very strong, small pores approx 5% mainly filled with black clay, (celadonite). 7 / 15,6 kN / 162 MPa; 19 / 48

208 m

Highly jointed, joints coated with black clay.

210 m (-162,5)

Sharp layer contact.

Sediment, tuffaceous claystone, brown, very weak, Waxy rock which breaks up during drilling and handling. The rock shrinks during drilling (probably swelling clay), joints with slicken planes. K-22 / K-23

212 m

214 m

Green coarse grained pumice, waxy core, very weak rock.

216 m

Brown tuffaceous clayous sediment stratified with three to four layers of light grey pumice and several lenses of coarse grained yellow brown pumice. The rock shrinks during drying, (probably swelling claystone).

218 m

220 m

222 m (-174,9)

Sharp layer contact. K-23 / K-24

Olivine basalt, medium-dark grey, very hard and strong, basalt with strong more porous zones. 9 / 14,3 kN / 149 MPa

Small vesicles filled with calcite and zeolites.

224 m

226 m

Olivine basalt, medium-dark grey, very strong, Several vesicular zones, with approx 10% small pores filled with calcite and zeolites. 8 / 40

228 m

More massive microporous basalt.

230 m

Vesicular zone, pores filled with zeolites. K-24

232 m (-183,4)

Bottom of hole July 3 2007.

234 m

236 m

238 m

240 m

242 m

244 m

246 m

248 m

250 m

Depth m	Core %	RQD % 10 / 30 / 50 /100	Q
200			
	100	35/0/0/0	
202	100	78/49/0/0	
204	100	32/0/0/0	
	100	68/47/47/0	
	100	72/50/29/0	
206	**100**	**67/43/32/16**	$Q=\frac{67}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
208	100		***Q = 5 - 16***
		66/54/54/54	
210	100	75/27/0/0	
	100	0/0/0/0	
212	92	23/0/0/0	
	100	95/84/51/0	
214	94	62/0/0/0	
	92	87/48/28/0	
216	**95**	**62/25/10/0**	$Q=\frac{62}{6\text{-}9}x\frac{1\text{-}2}{3\text{-}4}x\frac{1}{2,5}$
218	98		***Q = 0,7 - 3***
		54/0/0/0	
220	97	73/36/0/0	
222	80	0/0/0/0	
	100	53/0/0/0	
224	100	100/100/100/100	
		94/85/85/39	
226		**92/80/75/57**	
	100		$Q=\frac{92}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$
228	**100**		***Q = 6 - 20***
230	97	87/64/52/47	
232			
234			
236			
238			
240			
242			
244			
246			
248			
250			

Jarðfræðistofan Ehf / JFS Geological services Ltd	Óshlíðargöng	JFS-69	Drwg. A-15a
	Hnífsdalur - Skarfasker	Date July 2007	Page **1** of **1**
Empl. VEGAGERÐIN	**Corehole OK - 15 0 - 38,7 m**	Design AgG	Drawn AgG
	Coord. X: 313.787,5 Y: 630.894,7 Elev.: 48,59	Driller RFS	Drilled July 2007

Description of corehole OK - 15

48,59 m a.s.l. (0 m)

The hole is located in a steep talus slope.
The hole is inclined 46° from vertical, towards NNW (300°).
3" steel casing drilled from the top down to 12m depth with ODEX hammer.

Core drilling from 12,6m depth with NQ triple tube core barrel.
Core diameter 44,5mm.

39,84 m a.s.l. (12 m)

Core drilling with no core recovery. Loose talus material.

37,68 m a.s.l. (16 m)

Scoriaceous basalt - Scoria
Red brown, with small sediment infiltrations. Moderately strong basalt.

36,5 m a.s.l. (18 m)

Scoriaceous basalt, Olivine basalt
More massive. Strong, vesicular, approx. 5-10% vesicles, coated and half-filled with zeolites (chabazite).

34,00 m a.s.l. (20 m)

Olivine basalt
Medium light grey, very strong, slightly microporous basalt with approx. 5% olivine phenocrysts.
Joints irregularly spaced, mainly rough, undulating, coated with thin black clay.
K-1 / K-2

28,79 m a.s.l. (28 m)

Olivine basalt
Light red grey, with red brown olivine phenocrysts, <5mm, (mainly 2-3mm).
Very strong, massive basalt. Moderately to intensely jointed, joints irregularly spaced, rough undulating, coated with hard, light grey clay and zeolites.
Moderately competent tunnelling rock.
K-2 / K-3

21,71 m a.s.l. (38 m)

Bottom of the hole at 38,7m depth (9th July 2007).

Depth m	Core %	RQD % 10 / 30 / 50 /100 Q
16	**97**	**51/12/0/0**
	97	51/12/0/0
18		
	100	48/0/0/0
20		
	100	10/0/0/0
22	95	58/0/0/0
	100	86/39/0/0
24	**97**	**46/11/0/0**
	93	51/26/0/0
26	98	39/26/0/0
28	98	48/30/0/0
	100	71/0/0/0
30	80	0/0/0/0
32	100	50/15/0/0
	100	0/0/0/0
34	91	27/0/0/0
36	100	27/0/0/0
	100	78/50/0/0
38	93	32/0/0/0

GWT

Perm. (LU) 2,5 5,0 7,5

Not tested

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	Bolungavík - Ós	Date July 2007	Page **1** of **2**
Empl. **VEGAGERÐIN**	**Corehole OK - 16 0 - 50 m**	Design AgG	Drawn SK/AgG
	Coord. X: 309.633,5 Y: 633.733,6 Elev.: 62,3	Driller RFS	Drilled July 2007

Elev. m a.s.l.	Depth m	Description of corehole OK - 16	Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q	GWT	Perm. (LU) 2,5 5,0 7,5
62,3	0	The hole is located in a steep slope on glacial debris.	0						
	2	The hole is drilled vertically. Percussion odex drilling with casing down to 13,5m depth.	2						
	4		4						
	6		6						
	8		8						
	10		10						
	12	Top of the bedrock at red sediment. NQ triple tube core drilling from 13,5 m depth. Core diameter 44,5mm.	12						
48,8	14	Scoriaceous basalt, grey brown, strong, vesicular basalt. Vesicles filled with zeolites. Core loss.	14		80	45/30/0/0			
	16	Olivine basalt Unclear boundary. Medium grey, very strong, vesicles 3-8% half-filled with black clay and white zeolites.	16	R	100	68/0/0/0			
	18	Scoriaceous basalt Zone, grey brown. Olivine basalt Grey, very strong, porous with 5-10% small vesicles, half-filled with zeolites.	18	R		***Q = 4 - 14***			
	20		20	R	100	71/29/17/0			
	22	Scoriaceous basalt Zone, grey brown. Olivine basalt Grey, very strong, porous with 5-10% small vesicles, half-filled with zeolites. K-1 / K-2	22	R	**98** 100	**68/33/23/7** $Q=\frac{68}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$			
	24	Scoriaceous basalt Zone, grey brown. Olivine basalt Grey, very strong, porous with 5-10% small vesicles, half-filled with zeolites.	24	R		65/22/22/0			
	26	Unclear boundary, strong contact.	26	R	100	62/45/37/0			
	28	Scoriaceous basalt Zone grey brown. Red grey at top, then brown grey, well compressed and consolidated, moderately strong basalt.	28		100	91/73/58/40			
	30		30						
	32	Tholeiite basalt Medium grey, very strong, hard and brittle basalt. Moderately jointed, joints irregularly spaced, rough, undulating, coated with black clay. K-2 / K-3 Some white veins of joints healed with zeolites.	32	R	100 100	63/16/0/0 37/0/0/0			
	34		34		**100**	**66/13/0/0**			**0,2 LU at 10,5 bar**
	36		36		100	70/11/0/0 ***Q = 4 - 14*** $Q=\frac{66}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$			
	38	Unclear boundary, strong contact.	38		100	74/18/0/0			
	40	Scoriaceous basalt Grey brown, well compressed and consolidated, moderately strong, porous basalt. Pores and vesicles half-filled with zeolites. K-3 / K-4	40		98	90/80/0/0 81/40/0/0			
	42	Porphyritic basalt Medium dark grey, very strong basalt. Approx. 10-15% plagioclase phenocrysts. Moderately jointed, joints rough, undulating, coated with thin black clay and sometimes zeolites	42	R	99 **100**	**64/33/15/0** ***Q = 4 - 14*** $Q=\frac{64}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$			
	44		44		100 100	37/14/0/0 54/0/0/0			
	46	Unclear boundary, strong contact.	46		100	58/14/0/0			
	48	Scoriaceous basalt zone, strong basalt.	48						
12,3	50	Porphyritic basalt Medium grey, very strong, approx. 15% plagioclase phenocrysts. K-4	50	R	100	80/59/45/0			

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	Bolungavík - Ós	Date July 2007	Page **2** of **2**
Empl. VEGAGERÐIN	**Corehole OK - 16 50 - 63,3 m**	Design AgG	Drawn SK/AgG
	Coord. X: 309.633,5 Y: 633.733,6 Elev.: 62,3	Driller RFS	Drilled July 2007

Description of corehole OK - 16

50 m

Porphyritic basalt K-5
Medium grey, very strong, moderately jointed with thin black veins of joints healed with black clay (chlorophaeite).

52 m

54 m

56 m

Sharp boundary, weak contact.

58 m (Elev. 12,3 / 4,3)

Sediment, red sandstone, 0,1-0,2m. Core loss 0,1m.
Scoriaceous basalt, red brown, strong basalt.

Tholeiite basalt
Medium grey, scoriaceous, strong basalt.

60 m

62 m (Elev. -1,0)

Bottom of the hole at 63,3 m depth (12th July 2007).

64 m

66 m

68 m

70 m

72 m

74 m

76 m

78 m

80 m

82 m

84 m

86 m

88 m

90 m

92 m

94 m

96 m

98 m

100

Depth m	Rock column	Core %	RQD % 10 / 30 / 50 /100	Q
50	R			
52		100	68/48/20/0	
54				
56	R	100	40/12/0/0	
58		100	100/0/0/0	
		50	0/0/0/0	
		98	76/63/63/0	
60	R		**73/59/54/0**	
		99	***Q = 5 - 17***	
	A		$Q=\frac{73}{9\text{-}10}x\frac{2\text{-}4}{2\text{-}3}x\frac{1}{1}$	
62		100	70/57/47/0	

GWT

Perm. (LU) 2,5 5,0 7,5