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HVAMMUR POWER PLANT

Geological report
Geological investigation 2007 and 2008

Landsvirkjun

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Abstract: The report contains information about the geology of the Hvammur power plant area at the lower Þjórsá area. Geological investigations were carried out in 2007 and 2008. The report consists of overview maps, geological sections, corelogs, percussion hole logs, tests performed on cores and logs from excavated trenches.

Keywords: Geology, Hvammsvirkjun, Percussion drilling, Coreholes, Corelogs, Permeability test, Þjórsá lava, Þjórsá, Test trenches, tectonic joint.

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HVAMMUR POWER PLANT

GEOLOGICAL REPORT
GEOLOGICAL INVESTIGATION 2007 AND 2008

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1 GEOLOGY OF THE PROJECT AREA

1.1 STRATIGRAPHY OF GEOLOGICAL UNITS

Geology of the project area has been described in "Hvammsvirkjun. Geological Report. Geological Investigations 2001 – 2006".[1] Investigations carried out in 2007 and 2008 do not differ the geological setting nor the stratigraphy as described in the earlier report. However, more detailed information on the layer boundaries and tectonics is now provided.

According to [1] series of tholeiite basalt layers, called the Skarðsfjall tholeiite group (STG), found in the southern part of Skarðsfjall are the oldest rocks in the project area. The basalt has normal magnetic polarity and estimated age is over 2.5 million years. These layers have been found in two boreholes, NK-9 and NK-12, in previous investigations. The Skarðsfjall tholeiite group is quite thick, possibly more than 200 m. The layers have a dip of some 2-7° towards northeast.

On top of STG lies a sedimentary horizon named "Þjórsárholt sedimentary series" (SH1). These are layers of siltstone, sandstone and conglomerate/tillite. Layers belonging to SH1 are found in the lowest section of NK-20 and NK-4 and they were also found in NK-33. Conglomerate in core hole NK-53, drilled in 2007, belongs to this geological unit.

On top of SH1 is the Skarðsfjall hyaloclastite (SH2). This geological unit was formed during a subglacial eruption near the present top of Skarðsfjall. This is a " móberg formation", a name commonly used for this kind of rock formation in Iceland. The powerhouse area, draft tubes and major part of the tailrace tunnel will be located in this rock unit. Several boreholes are drilled through the hyaloclastite.

Basalt layers belonging to Núpur tholeiite group (NTG) are found in the northern part of Skarðsfjall, resting directly on SH2, the Skarðsfjall hyaloclastite. These layers have reversed magnetic polarity. This basalt formation is found in the lower part of Núpur as seen in the middle and lower part of NK-8. Also the tholeiite basalt in borehole NK-74 belongs to this geological unit.

On top of the NTG group are several porphyritic basalt layers belonging to Skarðsfjall porphyritic group (SPG). This basalt outcrops in the northern part

[1] Almenna Consulting Engineers (2007). Hvammsvirkjun. Geological Report. Geological Investigations 2001-2006. Prepared for Landsvirkjun. LV-2007/053. July 2007.

of Skarðsfjall and is found in boreholes NK-75 and NK-74. They are also seen in outcrops and boreholes NK-48 and NK-49 on the west bank of Þjórsá where they form a part of the foundation for the main dam of Hvammur power plant. The porphyritic layers can be traced to the farm Minni-Núpur.

A large gap, hiatus, is in the geological stratigraphy after the formation of the porphyritic basalt SPG. Period of followed with glaciers and rivers scraping the surface. After the glacier had retreated from the area, Þjórsá river eroded a channel through the area into an old riverbed and thick layer of sand and gravel was deposited all over the area on a flood plane extending to the south coast of Iceland.

Some 8700 years ago the Þjórsá lava flowed over the flood plane and Þjórsá river was more or less forced to its present channel. The Þjórsá lava originates from an eruption in the Veiðivötn area and is the biggest postglacial lava known in Iceland, extending from Veiðivötn area to the coast at Eyrarbakki, a distance of 130 km. The lava is from 20 m thick to over 30 m thick in the Hvammur power plant area. The top 5-10 m of the lava is often scoriaceous but the lower part is a solid crystalline basalt.

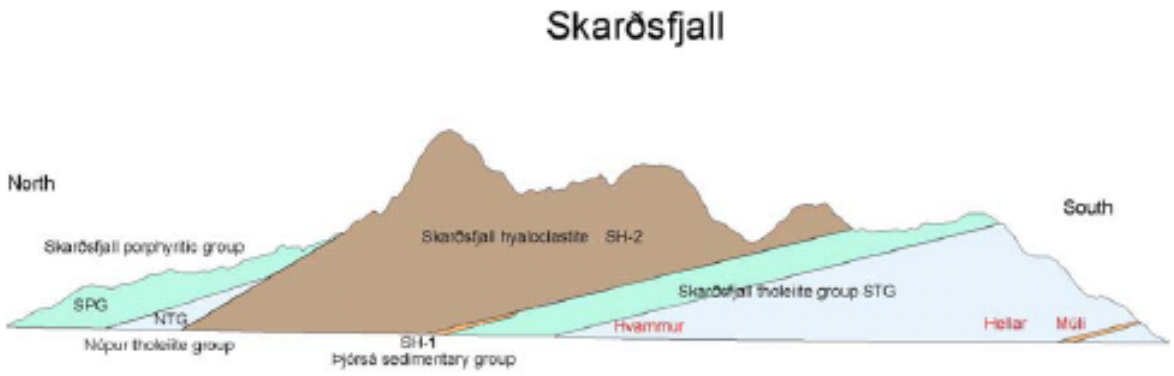

Figure 1. Geology of Skarðsfjall [1].

1.2 TECTONICS

Skarðsfjall is severely marked by tectonic movement[2]. Three sets of faults are most frequent; old north-easterly directed faults that are associated with the period of active volcanism in the area, and younger faults oriented in a northerly direction, probably associated with the active South Icelandic

[2] Maryam et.al. (2007). Hvammsvirkjun. Geological investigation on Skarðfjall in South Iceland Seismic Zone. Basement tectonics, Holexene surface rupture, leakage, and stratigraphy. ÍSOR-2007/017; LV-2007/65.

seismic zone. The third set has a variable direction of N70°A to N105°A. Faults of various types have been found, both strike–slip faults and normal faults.

2 GROUND INVESTIGATIONS 2007/2008

The aim of the investigation for Hvammsvirkjun Hydroelectric project during the winter 2007-2008 was to gather more detailed information on the layer boundaries and tectonics within the area. Trenches were excavated to locate and map recent tectonic movements in the subsurface materials and several boreholes drilled for the same purpose in the powerhouse area. Several holes were drilled to map the boundary of geological units in the tailrace tunnel route and the intake and dam foundation area.

In total 9 trenches were excavated in search of tectonic movements in the subsurface materials above the bedrock. A total of 23 cored boreholes and 20 percussion holes were drilled. One percussion hole was also drilled at the intake for standard penetration testing in the sediment underlying the Þjórsá basalt. Three holes were also drilled in the dam area on the west bank of Þjórsá for standard penetration testing in the overburden and to find the depth to bedrock. Excavation of trenches was done by the contractor Nesey hf. Drilling was carried out by the drilling contractor Ræktunarsamband Flóa og Skeiða (RSFS). RSFS also drilled and blasted a ditch in the powerhouse area to obtain basalt samples for concrete aggregate production testing.

2.1 EXPLORATION TRENCHES

Mapping of active faults and fissures have revealed signs of recent movements of some fractures in the area. Investigations in 2007 were thus concentrated on trying to locate these tectonic fractures within the powerhouse area. Trenches were excavated and boreholes drilled to locate tectonic joints and movements.

Of the 9 trenches excavated, trenches 1-3 were excavated near and by the proposed powerhouse location. Trenches 1 and 2 lie parallel east-west and trench 3 lies perpendicular crossing trenches 1 and 2. Trenches 4 and 5 were excavated across the proposed location of the penstock. Figure 2 shows trenches 1-4.

Trenches 6-8 were excavated at the intake area. Trenches 6 and 8 lie parallel east-west but trench 7 crosses them perpendicular. Locations and sections through the trenches are shown on drawing G-2007/08-001 and drawing G-2007/08-011.

Figure 2. Overview of the powerhouse area. Trenches 1-4 already excavated

In trenches 4 and 5 tectonic displacement of the soil layers was observed (see figures 3 and 4). Fractures were also encountered in the bedrock.

Figure 3. Tectonic movement in the subsurface soil in trench 4.

Figure 4. Tectonic movement in the subsurface soil in trench 5.

Although not as definite, fractures were also found in the bedrock with some soil disturbance in trenches 1 and 2 (see figure 5).

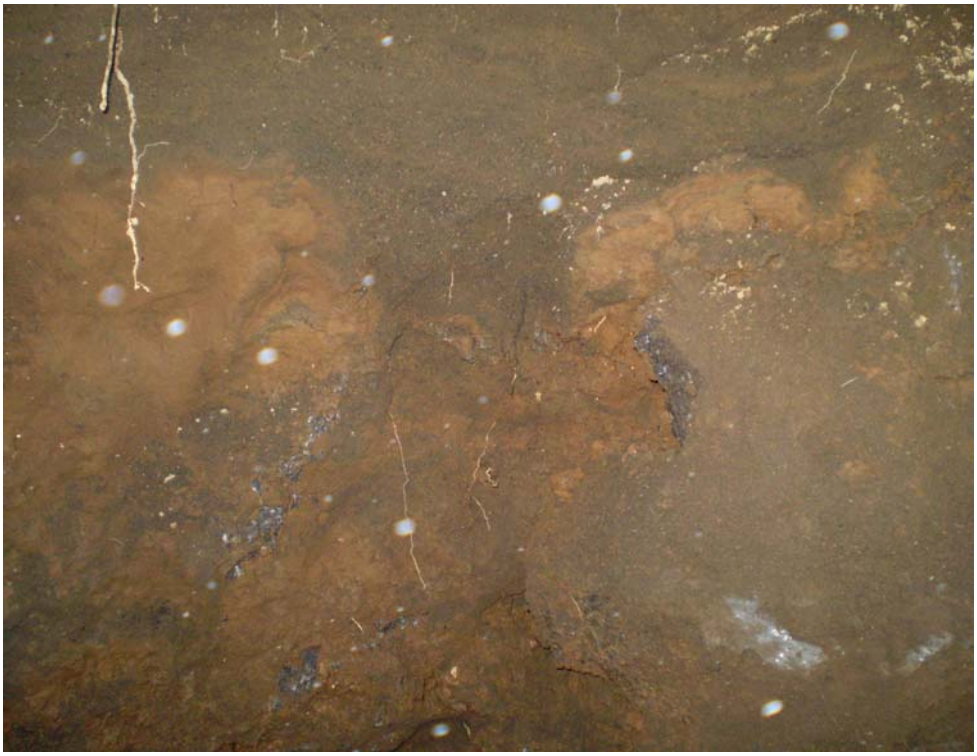

Figure 5. Disturbance in the subsurface soil in trench 1.

2.2 CORE HOLES

Logs of cored boreholes are presented in Appendix A. The core logs contain outline of lithology, core recovery, fracture intensity, RQD, Q-values for rock units and locations of permeability tests. Locations of core holes are shown in Table 1 and Drawings G-2007/08-001 to G-2007/08-003. Tables for Rock Mass Classification (Q-value) are found in Appendix C. Core Photos are found in Appendix D. Two Point Load Tests were performed on weak sediment below Þjórsá lava in Hole NK-73 and on hyaloclastite in hole NK-65. Additional UCS tests also were performed. Results for those are shown in Appendix E.

Table 1: Location and depth of core holes drilled at Hvammsvirkjun, 2007-2008.

Hole nr.	Construction area	Coordinates, ISNET93 X	Y	Elevation (m.a.s.l.)	Depth (m)	Groundwater Depth (m)	Inclination (°)	Direction (°)
NK-53	Tailrace Tunnel	444176.73	393155.40	104.36	51.72	4.6		
NK-54	Tailrace Tunnel	444016.24	393083.52	106.07	54.72	10.33		
NK-55	Tailrace Tunnel	444027.21	392977.10	107.56	54.72	12.5		
NK-56	Tailrace Tunnel	443809.33	393019.83	106.71	54.72	13.23		
NK-57	Tailrace Tunnel	443827.57	392923.18	107.30	39.72	14.01		
NK-58	Tailrace Tunnel	443624.40	392969.47	107.03	45.72	14.21		
NK-59	Tailrace Tunnel	443460.37	392874.38	100.85	33.72	9.13		
NK-60	Quarry area	446971.07	394352.32	115.37	30.72	12		
NK-61	Quarry area	447010.89	394548.58	115.25	21.72	6.8		
NK-62	Quarry area	447295.58	394515.21	115.74	24.72	6.33		
NK-63	Powerhouse	444918.11	394049.90	105.60	57.72	2.25		
NK-64	Powerhouse	444905.63	394041.12	105.7	63.48	3.48	44.5	127
NK-65	Powerhouse	444984.16	394035.44	105.06	90.53	2.74	45	278
NK-66	Tailrace Tunnel	444261.78	393280.17	104.15	15.72	4.27		
NK-67	Tailrace Tunnel	444449.13	393449.55	106.52	30.72	5.57		
NK-68	Tailrace Tunnel	444585.15	393593.80	106.07	29.44	4.42		
NK-69	Intake	444857.67	394292.32	112.76	33.72	8.75		
NK-70	Intake	444880.51	394327.81	112.4	42.72	8.64		
NK-71	Dam area	445248.64	394684.62	115.98	39.72	10.9		
NK-72	Dam area	446118.93	395071.40	118.04	39.8	11.16		
NK-73	Surge Tunnel	445050.50	393939.42	106.93	69.53	7.9	44.2	107
NK-74	Surge Tunnel	445174.31	393973.55	124.67	90.09	0.26	44.2	117
NK-75	Surge Tunnel	445172.39	393982.65	124.66	39.16		44.9	297
NK-76	Dam area	444655.49	394408.20	109.59	72.8	10	44	297

Twenty permeability tests were performed and results are summarized in table 2. Permeability tests are shown graphically in Appendix B.

Table 2: Permeability tests results, Lugeon units, in core holes at Hvammsvirkjun, 2007-2008

Hole Nr.	Rocktype	Depth		Test interval (m)	Permeability (LUGEON)
		From (m)	To (m)		
NK-53	Sediment (gravel)	14.72	21.72	7	17
NK-53	Sandstone and conglomerate	32.77	51.72	18.95	9
NK-54	Porph.basalt/Þjórsá lava	17.6	27.72	10.12	100
NK-54	Porph.basalt-Sediment (gravel)	27.1	33.72	6.62	75
NK-55	Sediment (gravel)	29.92	48.72	18.8	26
NK-56	Porph.basalt/Þjórsá lava	15.32	24.72	9.4	200
NK-56	Porph.basalt-Sediment	27.26	36.72	9.46	220
NK-57	Porph.basalt/Þjórsá lava	17.53	24.72	7.19	>400
NK-58	Porph.basalt/Þjórsá lava	15.12	24.72	9.6	45
NK-63	Porph.basalt-Sediment-Hyaloclastite	8.92	20.22	11.3	90
NK-63	Hyaloclastite	20.93	29.66	8.73	0.5
NK-63	Hyaloclastite	30.23	41.6	11.37	0.9
NK-63	Hyaloclastite-Tectonic breccia	44.84	54.72	9.88	0.6
NK-64	Porph.basalt-Sediment (gravel)	9.3	24.53	15.23	>400
NK-64	Hyaloclastite	27.3	63.48	36.18	10
NK-65	Porph.basalt-Sediment-Hyaloclastite	9.2	24.53	15.33	>400
NK-71	Porph.basalt/Þjórsá lava	6.62	15.65	9.03	150
NK-71	Porph.basalt-Sediment (gravel)	18.58	39.72	21.14	100
NK-72	Porph.basalt/Þjórsá lava	13.6	21.8	8.2	175
NK-72	Porph.basalt-Sediment (gravel)	22.5	38.94	16.44	125

2.3 PERCUSSION HOLES

Percussion holes were drilled to determine the Þjórsá lava thickness and the thickness of soil and scoria at the dam area. Eight holes were drilled through the Þjórsá lava. Ten holes were drilled through loose overburden and scoria and down to the dense part of Þjórsá lava. One hole was drilled in the intake area for standard penetration test (SPT) in the loose sediment below the Þjórsá lava. Three holes were also drilled in the dam area on the west bank of Þjórsá for standard penetration testing in the overburden and to find the depth to bedrock. Logs of Percussion holes are shown in Appendix F.

Table 3: Location and depth of percussion drilled holes at Hvammsvirkjun, 2007-2008.

Hole nr.	Construction area	Coordination ISNET X	Y	Elevation (m.a.s.l.)	Depth (m)	Groundwater Depth (m)	Casing (m)
NL-50	Dam area	444979.46	394418.74	111.99	15	7.05	5.5
NL-51	Dam area	445025.96	394507.06	112.65	29.6	7.55	4.5
NL-52	Dam area	445160.06	394646.82	113.11	13.8	7.34	5
NL-53	Dam area	445340.32	394732.28	114.34	17.4	N/A	6
NL-54	Dam area	445524.42	394810.10	113.09	35.4	6.62	8.65
NL-55	Dam area	445614.71	394857.87	112.94	21	6.11	8.6
NL-56	Dam area	445703.48	394888.99	112.83	35.4	6.0	7
NL-57	Dam area	445842.39	394953.45	113.37	21	6.25	6
NL-58	Dam area	445932.16	394992.32	112.98	21	5.7	7
NL-59	Dam area	446208.25	395107.57	117.14	37.5	9.3	9
NL-60	Dam area	446392.39	395193.44	114.58	21	6.7	12
NL-61	Dam area	446484.57	395233.20	112.18	33	3.89	7.9
NL-62	Dam area	446575.83	395275.11	117.03	21	9.78	11.9
NL-63	Dam area	446756.33	395353.48	120.15	39.8	11.18	13
NL-64	Dam area	447056.98	395372.44	115.85	18	5.08	9
NL-65	Dam area	447295.71	395311.29	118.99	38.3	7.82	12
NL-66	Dam area	447873.70	395165.87	118.57	18	6.64	9
NL-67	Dam area	448363.04	395061.50	116.38	33	3.87	9
NL-68	Intake	444882.00	394326.30	112.54	37	N/A	37
NL-99	Dam area	444453.23	394563.01	114.561	7.05	1.95	7.05
NL-100	Dam area	444452.42	394657.12	118.181	5.9	2	5.9
NL-101	Dam area	444484.85	394735.82	117.125	8.6	2.1	8.6
NL-102	Dam area	444522.54	394826.86	117.939	9	1.7	
NL-103	Dam area	444487.10	394914.47	119.757	21	1.95	

2.4 GROUNDWATER MEASUREMENTS

During and after drilling of the borholes water level was measured in the holes. Levels recorded are shown in tables 4 and 5.

Table 4. Groundwater measurements in core holes

Hole nr.	NK-53		NK-54		NK-55		NK-56		NK-57		NK-58	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
15.10.2007	6.60	97.76										
18.10.2007					13.33	94.23						
20.10.2007			10.69	95.37								
22.10.2007							13.62	93.09				
2.11.2007	4.28	100.08	10.06	96.00	12.24	95.32	12.98	93.73			13.94	93.09
12.11.2007	4.60	99.76	10.33	95.73	12.50	95.06	13.23	93.48	14.01	93.29	14.21	92.82
10.4.2008			12.88	93.59	14.73	93.06	15.44	91.65			16.30	91.08
3.6.2008	**Collapsed**		13.65	92.92	15.60	92.19	16.30	90.79	**Collapsed**		16.91	90.47
21.8.2008			14.83	91.64	16.80	90.99	17.38	89.71			17.97	89.41
3.12.2008			13.09	93.38	15	92.79	15.66	91.43			16.42	90.96

Hole nr.	NK-59		NK-60		NK-61		NK-62		NK-63		NK-64	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
2.11.2007	8.91	91.94										
12.11.2007	9.13	91.34							2.29	103.32		
14.11.2007							6.33	109.83				
19.11.2007					6.78	108.47	4.08	111.66				
29.11.2007											3.48	102.52
12.12.2007											2.92	103.10
10.4.2008	11.00	90.262			8.50	106.227			5.20	100.856	6.80	101.20
3.6.2008	11.55	89.71	**Collapsed**				**Collapsed**		6.18	99.88	8.08	100.29
21.8.2008	**Collapsed at 9,2 m**										9.40	99.3
3.12.2008	11.13	90.13							5.69	100.37	7.45	100.69

Hole nr.	NK-65		NK-66		NK-67		NK-68		NK-69		NK-70	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
19.11.2007									8.57	104.19	8.44	103.96
29.11.2007									9.42	103.34		
12.12.2007	2.74	103.50	3.99	99.88	5.24	101.28	4.03	102.04				
16.12.2007	2.96	103.35										
15.1.2008									9.19	103.57		
10.4.2008	5.85	101.30	7.14	97.28	8.00	98.85			11.90	101.04	10.90	101.70
3.6.2008	7.13	100.40	8.35	96.07	8.73	98.12	**Collapsed at 6.4 m**		11.90	101.04	11.70	100.90
21.8.2008	8.40	99.50	9.62	94.80	9.50	97.35			12.88	100.06	12.73	99.87
3.12.2008	6.50	100.84	7.64	96.78	8.32	98.53			11.51	101.43	11.38	101.22

Hole nr.	NK-71		NK-72		NK-73		NK-74		NK-75		NK-76	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
27.11.2007	10.67	105.31										
20.12.2007			11.16	106.88								
15.1.2008							0.92	124.40				
10.4.2008	12.23	103.98	12.10	105.94	7.90	99.29					7.10	99.73
3.6.2008	12.80	103.41	12.40	105.64	9.33	100.59					8.06	101.67
21.8.2008	13.88	102.33			10.78	99.46	0.85	124.63	5.15	119.51	9.75	99.98
3.12.2008	12.56	103.65			7.98	101.47	0.69	124.79	5.42	119.24	7.70	102.03

Table 5. Groundwater measurements in percussion holes

Hole nr.	NL-50		NL-51		NL-52		NL-53		NL-54	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
26.11.2007									6.50	106.59
28.11.2007	7.04	104.95	7.55	105.10	7.34	105.77			6.62	106.47
15.1.2008					7.62	105.49			6.84	106.25
10.4.2008	9.5	102.86	9.8	103.07	9.55	103.75			8.7	104.58
3.6.2008	10.3	102.06	10.61	102.26	10.25	103.05	Collapsed		9.04	104.24
21.8.2008	11.34	101.02	11.62	101.25	11.3	102			10	103.28
3.12.2008	9.93	102.43	10.24	102.63	9.9	103.4			8.76	104.52

Hole nr.	NL-55		NL-56		NL-57		NL-58	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
26.11.2007	6.11	106.82	6.00	106.84				
28.11.2007			6.03	106.81	6.25	107.12	5.70	107.28
15.1.2008								
10.4.2008			7.7	105.40			7.25	105.96
3.6.2008	8.45	104.64	8.25	104.85	Collapsed at 7,5 m		Collapsed at 7,6 m	
21.8.2008	9.5	103.59	Collapsed				13.3	99.91
3.12.2008	8.4	104.69	7.99	105.11	7.6	106.06	12.59	100.62

Hole nr.	NL-59		NL-60		NL-61		NL-62		NL-63	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
20.12.2007			6.70	107.88	4.27	107.92	9.78	107.25		
4.1.2008	9.311	107.829	6.39	108.19	3.89	108.30			11.18	108.97
10.4.2008	10.7	106.69			5.3	107.07	10.6	106.43	13	107.34
3.6.2008	11.12	106.27	7.95	106.78	5.45	106.92	10.75	106.28	12.65	107.69
21.8.2008	12.01	105.38	8.79	105.94	6.25	106.12	11.53	105.5	13.44	106.9
3.12.2008	11	106.39			5.33	107.04	11.85	105.18	12.57	107.77

Hole nr.	NL-64		NL-65		NL-66		NL-67	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
20.12.2007			7.82	111.17				
4.1.2008	5.083	110.769			6.637	111.935	3.87	112.507
10.4.2008	6.37	109.75	9.2	110.07	8	110.81	4.9	111.48
3.6.2008	6.4	109.72	9.2	110.07	8.25	110.56	5.12	111.26
21.8.2008	7.13	108.99	9.92	109.35	8.78	110.03	5.6	110.78
3.12.2008	6.3	109.82	9.08	110.19	8.01	110.8	4.91	111.47

Hole nr.	NL-99		NL-100		NL-101		NL-102		NL-103	
Date:	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.	Depth m	m a.s.l.
20.12.2007										
4.1.2008										
10.4.2008										
3.6.2008	1.95	112.611	2	116.181	2.1	115.025	1.7	116.239	1.95	117.807

2.5 TEMPERATURE MEASUREMENTS

Temperature and conductivity was measured in three holes, NK-28, NK-29 and NK-63. Results are found in Appendix H.

2.6 ROCK MASS PROPERTIES

In table 6 is a summary of rock mass classification from core logging of boreholes drilled in 2007 and 2008. See Appendix C for Q-value calculation in each borehole.

Table 6. Summary of Rock Mass Classification

SUMMARY ON ROCK CORE AND ROCK MASS CLASSIFICATION – TYPICAL VALUES -										
HVAMMSVIRKJUN HEP		ÞJÓRSÁ LAVA PORPHYRITIC BASALT	HYALOCLASTITE	DYKES	SCORIA	CONGLO-MERATE	TILLITE	SAND-STONE	THOLEIITE / BASALT ANDESITE	TECTONIC BRECCIA
BOREHOLES		NK-53 - NK-73 NK-76	NK-28 NK-34 NK-63 NK67 NK-29 NK-46 NK-64 NK-68 NK-30 NK-47 NK-65 NK-70 NK-32 NK-53 NK-66 NK-73 NK-76	NK-29 NK-46 NK-55 NK-73 NK-30 NK-47 NK-64 NK-74 NK-34 NK-53 NK-65 NK-75 NK-76	NK-53 NK-57 NK-59 NK-60 NK-62 NK-68 NK-74 NK-75	NK-53 NK-73	NK-53 NK-63	NK-53 NK-73 NK-74 NK-75	NK-74	NK-63
Q - SYSTEM	RQD	15 - 100	50 - 100	50 - 100						
	Jn	9 - 12	9 - 12	9 - 12						
	Jr	2 - 3	2	1 - 3						
	Ja	1	3 - 4	1 - 4						
	Jw	0.66 - 1	1	0.66 - 1						
	SRF	2.5 (++)	1 - 5	1 - 2.5 (++)						
	Q-value from rock cores	3.3 - 7	2.5 - 4.8	1 - 8	1 - 5.5	3.5 - 6.4	4.5 - 6.6	2 - 5.5	1.3 - 2.6	0.05 - 0.1
	Standard distribution	1.5 - 2.0	1.5 - 2.5	1.5 - 2.0						
	Derived Q-values for tunnel (typical values)	**1 - 6**	**0.8 - 3.4**	**0.9 - 4.0**	**1 - 3.5**	**1.6 - 3.0**	**2 - 3**	**1 - 3**	**1 - 2.5**	**0.05 - 0.1**
	Estimated rock support class	RSC1 (30%) RSC2 (60%) RSC3 (10%)	RSC1 (10%) RSC2 (70%) RSC3 (15%) RSC4 (5%)	RSC1 (15%) RSC2 (70%) RSC3 (10%) RSC4 (5%)	RSC 2-3 (100%)	RSC2 (100%)	RSC2 (100%)	RSC 2-3 (100%)	RSC 2-3 (100%)	RSC4 (100%)
GSI	GSI - value	65 - 75	45 - 55	50 - 70	65 - 35	55 - 45	55 - 50	55 - 40	65 - 55	45 - 40
	mi	25 - 30	17 - 20	15 - 20						

Few tests were performed on rock core samples, which are summarized in table 7. For further details on laboratory testing, see Appendix E and "Rock mechanical studies for a hydroelectric power station"[3]

Table 7. Summary of Laboratory testing on rock cores

Borehole	Depth (m)	Rock type	Density (kg/m^3)		USC (MPa)		PLI (MPa)	USC/PLI
			per test	average	per test	average		
NK-65	33,8	Hyaloclastite	2.317		15,2			
NK-65	33,95	Hyaloclastite	2.257		24,7			
NK-65	34,15	Hyaloclastite	2.207	2260,4	30,7	23,6	2,16	10,9
NK-73	25,6	Sandstone	1.951		13,1			
NK-73	26,1	Sandstone	1.916		5,8			
NK-73	26,3	Sandstone	1.917	1928,1	6,3	8,4	0,79	10,7
NK-74	30,7 - 31,9	Sandstone	2.094		5,1			
NK-74	30,7 - 31,9	Sandstone	2.231		6,6			
NK-74	30,7 - 31,9	Sandstone	2.072	2132,3	4,8	5,5	0,24	23,0
NK-74	32,3-32,5	Sandstone	1.958		8,1			
NK-74	32,3-32,5	Sandstone	1.953	1955,4	7,8	7,9	0,88	9,0

[3] Karen Kristjana Ernestsdóttir „Rock mechanical studies for a hydroelectric power station" MSc Thesis, February 2003.

2.7 STANDARD PENETRATION TEST

Standard Penetration Tests were done and samples taken from three drill holes at the dam site on the west bank of Þjórsá river and in one hole at the intake area.

Four SPT tests were done in hole NL-68 at the Intake area in gravel and sand below the Þjórsá lava at 33,5 to 37,4 m depth, see Appendix J.

Thirteen SPT tests were done in NL-99, NL-100 and NL-101 at the dam site on the west bank of Þjórsá river. Samples were taken from loose soil and subsurface sediments. Particle size distribution was tested on nine of these samples, see Appendix J for details.

3 SUMMARY

3.1 DAM SITE

Several percussion holes were drilled along with two core holes. The Þjórsá basalt in the dam site east of Þjórsá is over 30 m thick. The thickness of the scoriaceous part of the basalt varies from a few metres up to over 10 m. Generally the top two or three meters of the scoria is filled or partly filled with soil material. There is not a sharp boundary between the scoriaceous and the more solid part of the basalt. Usually the basalt gradually becomes less vesicular/scoriaceous with depth.

Underneath the basalt is sand and gravel, which is an ancient flood plane of the Þjórsá river. Thickness of these sediment layers are unknown. Locations of the drill holes are shown on drawing G-2007/08-002 and section through the boreholes is shown on drawing G-2007/08-005.

3.2 INTAKE

Three trenches were excavated to locate possible tectonic fractures and two holes were drilled through the basalt bedrock to find the thickness of the basalt.

No tectonic fractures were found in the exploration trenches.

Thickness of the basalt is approx. 30 m and below the basalt is sediment. Results from the SPT performed on the sediment indicate that the material has high density.

3.3 PENSTOCKS

Trench excavation crossing the proposed penstock area revealed a tectonic fracture. Displacement of soil materials and tephra layers indicate that this has occurred several times during the built-up of higher sediment layer. Based on tephra layers, seen in trench 4, displacement occurred last time between the formation of the tephra layer Landnámslagið (870) and Hekla (1104) eruption . In trench 5, a tephra layer (Hekla eruption from 1104) is disturbed but a black tephra layer from 14 to 15th century isn´t, indicating tectonic occurrence sometime between those periods.

The bedrock is fractured but normal faulting is not visible, indicating strike-slip faulting.

3.4 POWERHOUSE

Exploration trenches were excavated and three core holes were drilled in the area.

Results from this investigation and previous boreholes indicate that the powerhouse will be located in a relatively solid rock. Tectonic fractures and dikes are common but fractures are mostly cemented together with secondary minerals.

Open fractures with some water leakage were found in trenches east of the proposed powerhouse site (see drawing G 2007/08-001). This matches with quite fractured rock seen in boreholes NK-27 and NK-28. Tectonic fracture with open joints and orange-colored alteration is also found in borehole NK-63 west of the powerhouse.

Section through the boreholes in the powerhouse area is shown in drawing G-2007/08-007. Sediments and high water inflow is expected between the basalt and the underlying hyaloclastite.

3.5 TAILRACE TUNNEL

Ten boreholes were drilled to map the geology on the tailrace tunnel route. Results indicate hilly topography in the surface of the móberg formation. Submerged ridges, gullies or rifts are most likely present on the proposed tunnel route, not very different from the topography of the Skarðsfjall mountain side.

In the tunnel design, shape and size will be restricted by the low rock cover and sediments underlying the basalt.

Permeability tests in the basalt indicate high water inflow into the tunnel. To increase stability of the little rock cover in the basalt, grouting before tunneling should be evaluated.

3.6 ADIT AND SURGE TUNNEL

Three boreholes were drilled to map the geology of the adit and surge tunnel, see Appendix A and drawing G-2007/08-001 for logs and location.

Section through the boreholes are shown on drawing G-2007/08-009.

3.7 ROCK QUARRIES

Three boreholes were drilled to evaluate possible quarry area in the Þjórsá lava, between the dam site and present power line, see Appendix A and drawing G-2007/08-002 for logs and location. The upper part of the holes is too scoriaceous and depth to ground water too little for adequate quarry area.

Holes drilled in the proposed surge tunnel area were located to evaluate possible quarrying of porphyritic basaltic rock from northern part of the Skarðfjall. The tectonic jointing and degree of alteration was determined as too severe for rock quarry.

The most promising area for rock quarry is in the tailrace canal/tunnel area. RQD measurements of cores from holes in the area give some indication of stone size distribution from a quarry.

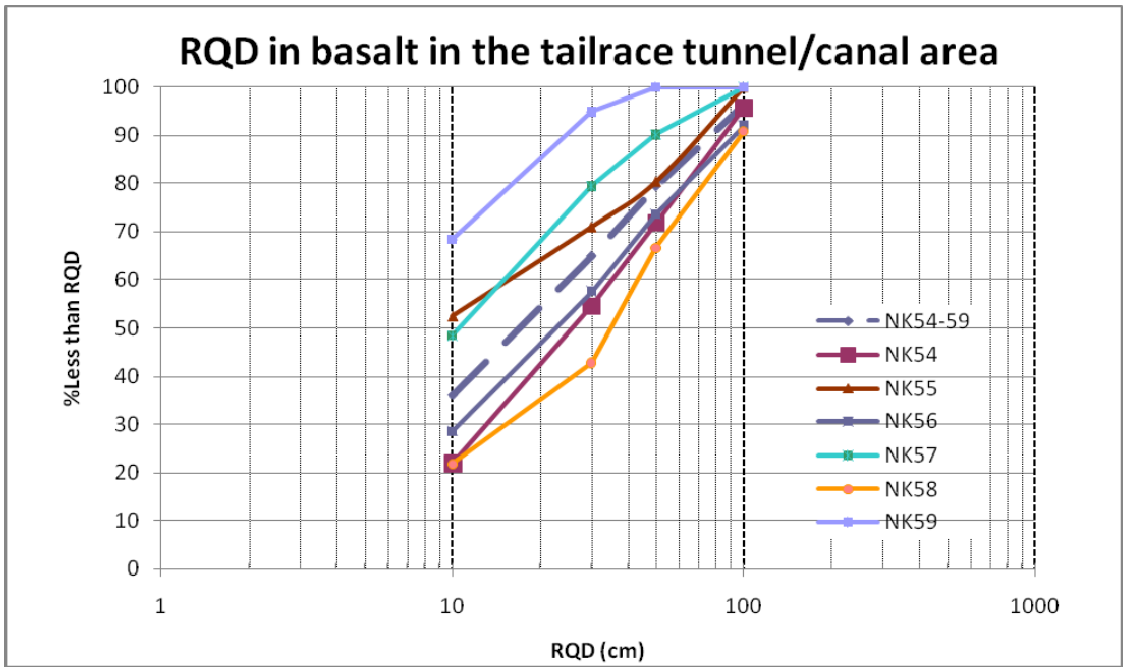

Figure 6. RQD in basalt from core holes in the tailrace area.

REFERENCES

[1] Almenna Consulting Engineers (2007). Hvammsvirkjun. Geological Report. Geological Investigations 2001-2006. Prepared for Landsvirkjun. LV-2007/053. July 2007

[2] Maryam et.al. (2007). Hvammsvirkjun. Geological investigation of Skarðfjall in South Iceland Seismic Zone. Basement tectonics, Holoxene surface ruptures, leakage, and stratigraphy. ÍSOR-2007/017; LV-2007/65.

[3] Karen Kristjana Ernestsdóttir (2003). Rock mechanical studies for a hydroelectric power station. MSc Thesis, February 2003.

DRAWINGS:

Drawing G-2007/08-001	Powerhouse Area. Location of Boreholes
Drawing G-2007/08-002	Dam Area. Location of Boreholes
Drawing G-2007/08-003	Tailrace Area. Location of Boreholes
Drawing G-2007/08-004	Geological Profile 1 Dam Site
Drawing G-2007/08-005	Geological Profile 2 Dam Area
Drawing G-2007/08-006	Geological Profile 3 Pressure Shafts
Drawing G-2007/08-007	Geological Profile 4 Powerhouse Area
Drawing G-2007/08-008	Geological Profile 5 Powerhouse Area
Drawing G-2007/08-009	Geological Profile 6 Surge Shaft
Drawing G-2007/08-010	Geological Profile 7 Tailrace Tunnel
Drawing G-2007/08-011	Exploration Trenches. Trenches 1-3
Drawing G-2007/08-012	Exploration Trenches. Trenches 4-5
Drawing G-2007/08-013	Exploration Trenches. Trenches 6-8
Drawing G-2007/08-014	Exploration Trenches. Trench 9

LEGEND

NK-xx	Cored boreholes, direction of drilling
NL-xx	Percussion boreholes
Trench X, AX, BX	Exploration trench, with cross marks were tectonic joints or disturbance was found
XA, XB	Geological Profile

10 0 10 20 30 40 50 m
SCALE

N

NK-21 NK-27 NK-28 NK-30 NK-31 NK-63 NK-64 NK-65 NK-68 NK-70 NK-73 NK-74 NK-75
NL-3 NL-4 NL-5 NL-16 NL-26 NL-27 NL-29 NL-30 NL-42
Trench 1 Trench 2 Trench 3 Trench 4 Trench 5 Trench 6 Trench 8
A1 A2 A3 A4 A5 A6 A7 A8 B1 B2 B3 B4 B5 B6 B7 B8
1A 1B 2A 3A 3B 4A 4B 5A 6A 6B 7A

MANNVIT ENGINEERING VERKÍS
NTH-60 Engineering Consultants

REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun
PROJ. HVAMMUR POWER PLANT

POWERHOUSE AREA
LOCATION OF BOREHOLES
MANNVIT

PROCESS = INSTALLATION + LOCATION +
NPC NUMBER | NPC REV. | BDL NTH
NUMBER 5.481.203 G-2007/08-001 | REV. C1 | SHEET | NEXT SH.

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NL-36
NL-63
NL-64
NL-38
NL-9
NL-65
NL-39
NL-62
NL-40
NL-61
NL-60
NL-35
NL-41
NL-66
NL-59
NK-72
NL-34
NL-67
2B
NL-58
NL-33
NL-57
NL-103
NL-56
NL-55
NL-102
NL-32
NL-54
NL-7
NL-101
NL-53
G-2007/08-003
NK-71
NL-100
NL-6
NL-52
NL-31
1A
NL-99
NK-49
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NK-2
NL-51
NL-50
NL-28
NK-76
NL-29
NK-70
NL-68
NL-4
NL-5
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NK-69
1B
2A
NL-30
NK-21
NK-27
NK-28
NK-75
NK-74
NK-73
NK-30
NK-10
NK-34
NK-47
NL-25
NL-24
NL-23
NK-46
NK-68
NK-32
NK-67
NK-1
NK-61
NK-62
NK-60

LEGEND

- NK-XX — Cored boreholes, direction of drilling
- NL-XX — Percussion boreholes
- Trench X, AX, BX — Exploratio trench, with cross marks were tectonic joints or disturbance was found
- XA, XB — Geological Profile

50 0 50 100 150 200 250 m
SCALE

N

MANNVIT ENGINEERING
VERKÍS
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REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
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APP. ML
PAPER SIZE A3

Landsvirkjun
PROJ. HVAMMUR POWER PLANT

DAM AREA
LOCATION OF BOREHOLES
MANNVIT

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G-2007/08-002 C1
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NL-100
NL-99
NK-49
NK-48
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NL-43
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1B
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3A
3B
4A
4B
5A
5B
6A
6B
7A
7B
G-2007/08-001
G-2007/08-002

LEGEND

NK-XX — Cored boreholes, direction of drilling

NL-XX — Percussion boreholes

Trench X AX BX — Exploration trench, with cross marks were tectonic joints or disturbance was found

XA XB — Geological Profile

50 0 50 100 150 200 250 m
SCALE

N

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NTH-60 Engineering Consultants

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DATE 06.06.2008
DES. HHA
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PAPER SIZE A3

Landsvirkjun
PROJ. HVAMMUR POWER PLANT

TAILRACE AREA
LOCATION OF BOREHOLES
MANNVIT

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G-2007/08-003
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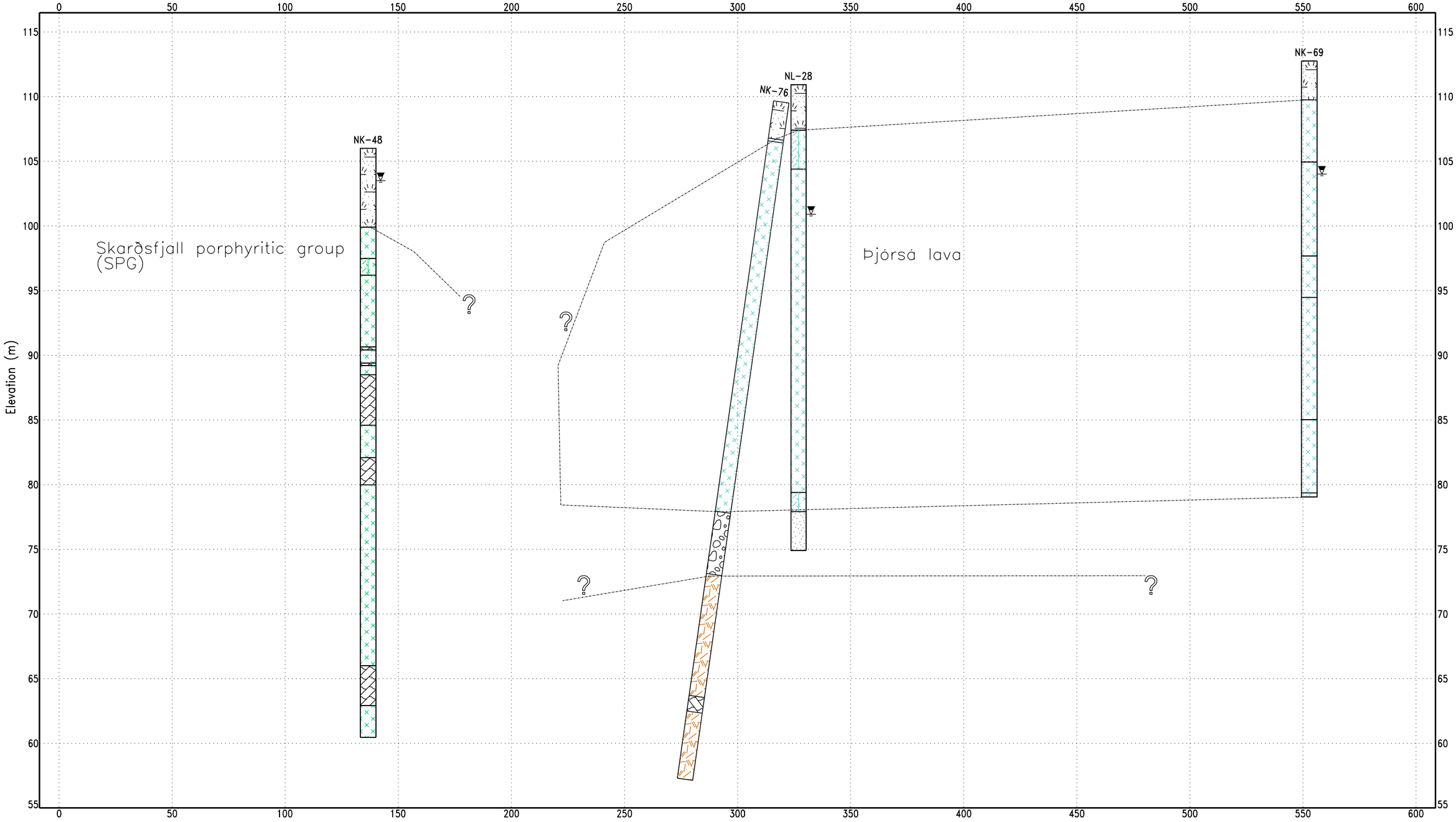

LEGEND

- Topsoil
- Scoria
- Porphyritic basalt
- Gravel, poorly graded
- Scoriaceous Porphyritic basalt
- Pillow lava breccia
- Basaltic Dyke Intrusion
- Sand, poorly graded

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DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun

PROJ. HVAMMUR POWER PLANT

GEOLOGICAL PROFILE 1
DAM SITE

MANNVIT

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NUMBER 5.481.203 | REV. C1 | SHEET G-2007/08-004

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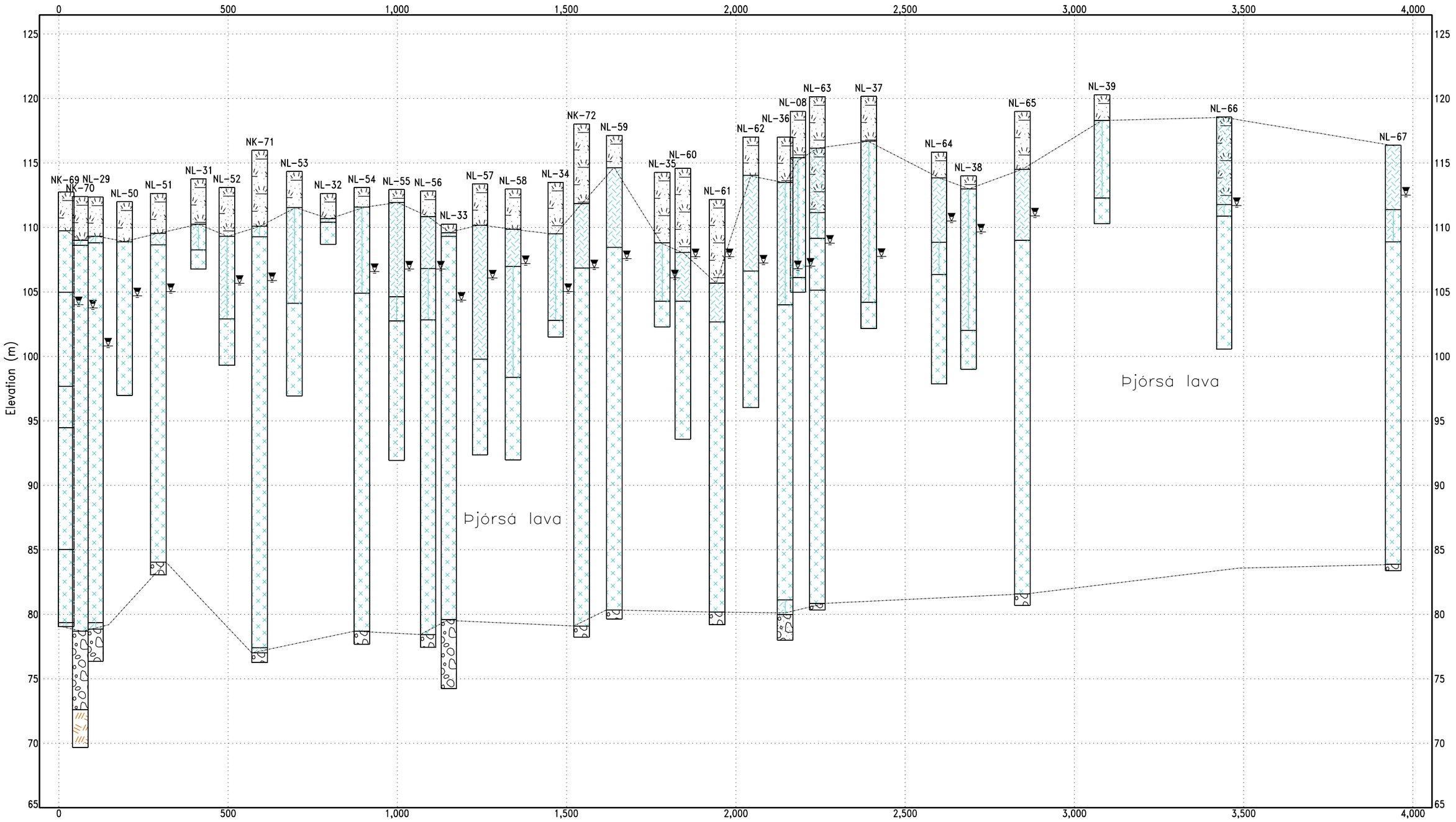
2A

2B



LEGEND

- Topsoil
- Móberg
- Porphyritic basalt
- Scoria
- Scoriaceous Porphyritic basalt
- Sand, poorly graded
- Gravel, poorly graded

MANNVIT ENGINEERING VERKÍS

NTH-60 Engineering Consultants

REV	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun

PROJ. HVAMMUR POWER PLANT

GEOLOGICAL PROFILE 2
DAM AREA

MANNVIT

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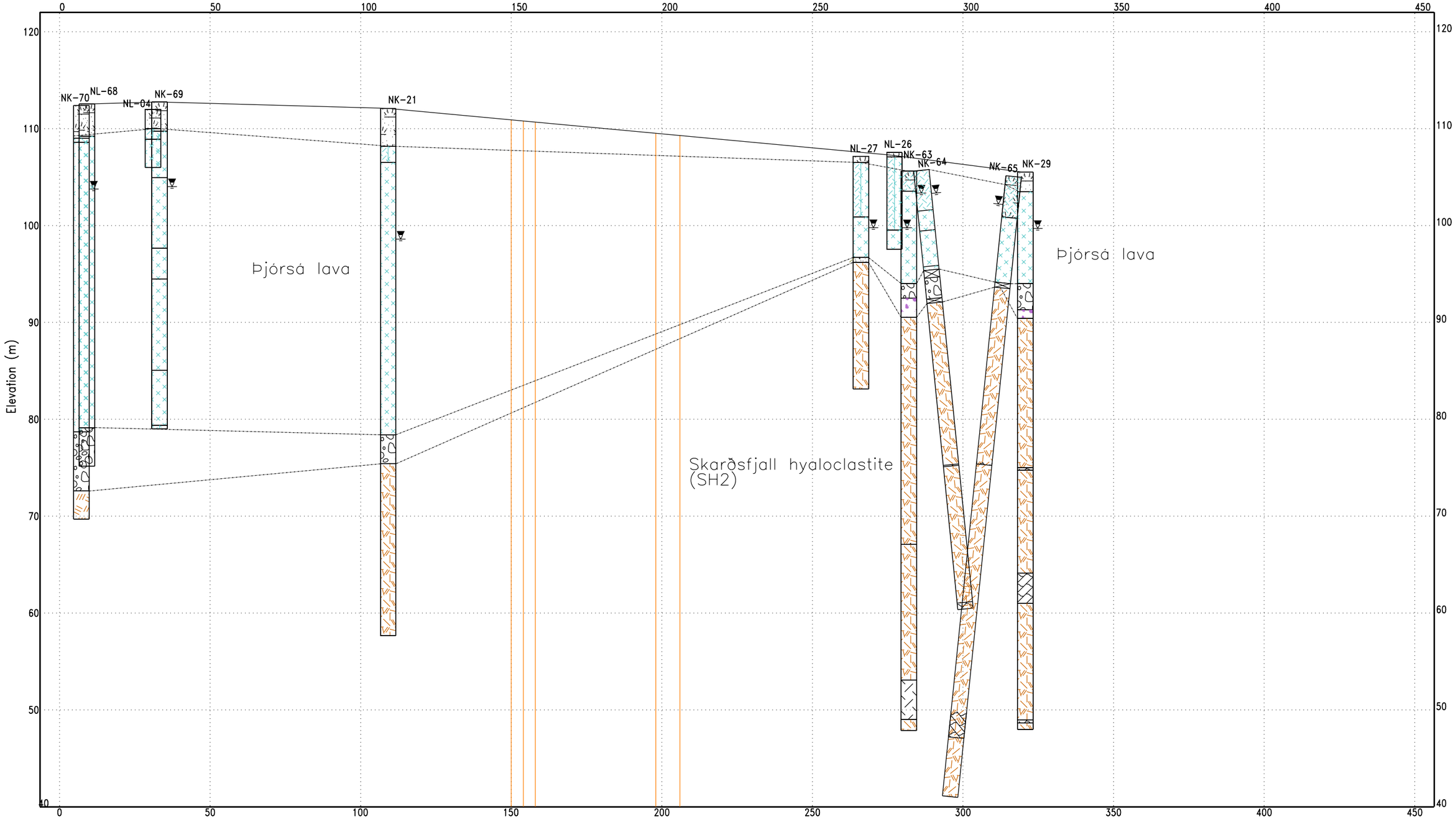
NPC NUMBER
NPC REV.
BDL NTH
NUMBER 5.481.203
REV.
SHEET
G-2007/08-005
C1
NEXT SH.

3A

3B



LEGEND

- Topsoil
- Pillow lava breccia
- Tectonic breccia
- Scoriaceous Porphyritic basalt
- Conglomerate
- Core loss
- Porphyritic basalt
- Basaltic Dyke Intrusion
- Pillow lava
- Gravel, poorly graded
- Scoria
- Sand, well graded
- Tectonic joints

MANNVIT ENGINEERING VERKÍS

NTH-60 Engineering Consultants

REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun

PROJ. HVAMMUR POWER PLANT

GEOLOGICAL PROFILE 3
PRESSURE SHAFTS

MANNVIT

PROCESS	INSTALLATION	LOCATION
=	+	+

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		NTH

NUMBER	REV.	SHEET
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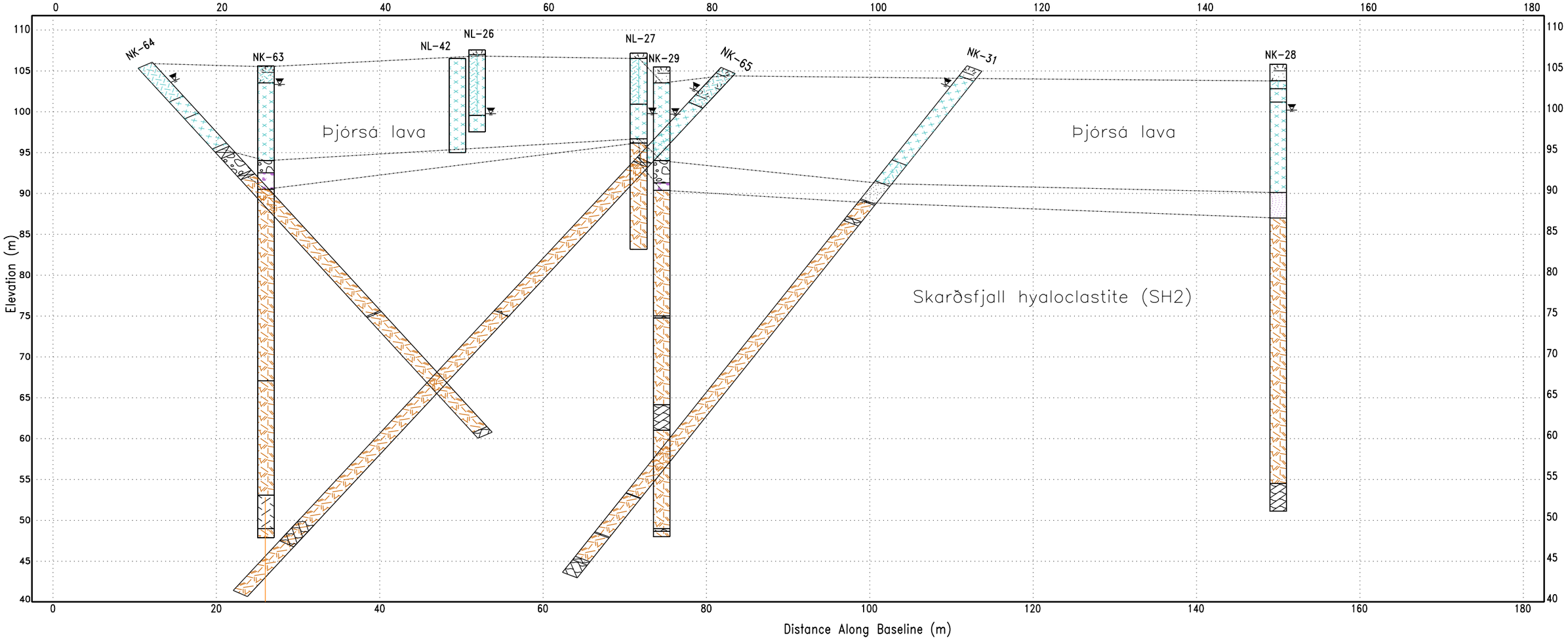
4A

4B



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NTH-60 Engineering Consultants

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DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun

PROJ. HVAMMUR POWER PLANT

GEOLOGICAL PROFILE 4
POWER HOUSE AREA

MANNVIT

PROCESS = INSTALLATION + LOCATION +
NPC NUMBER
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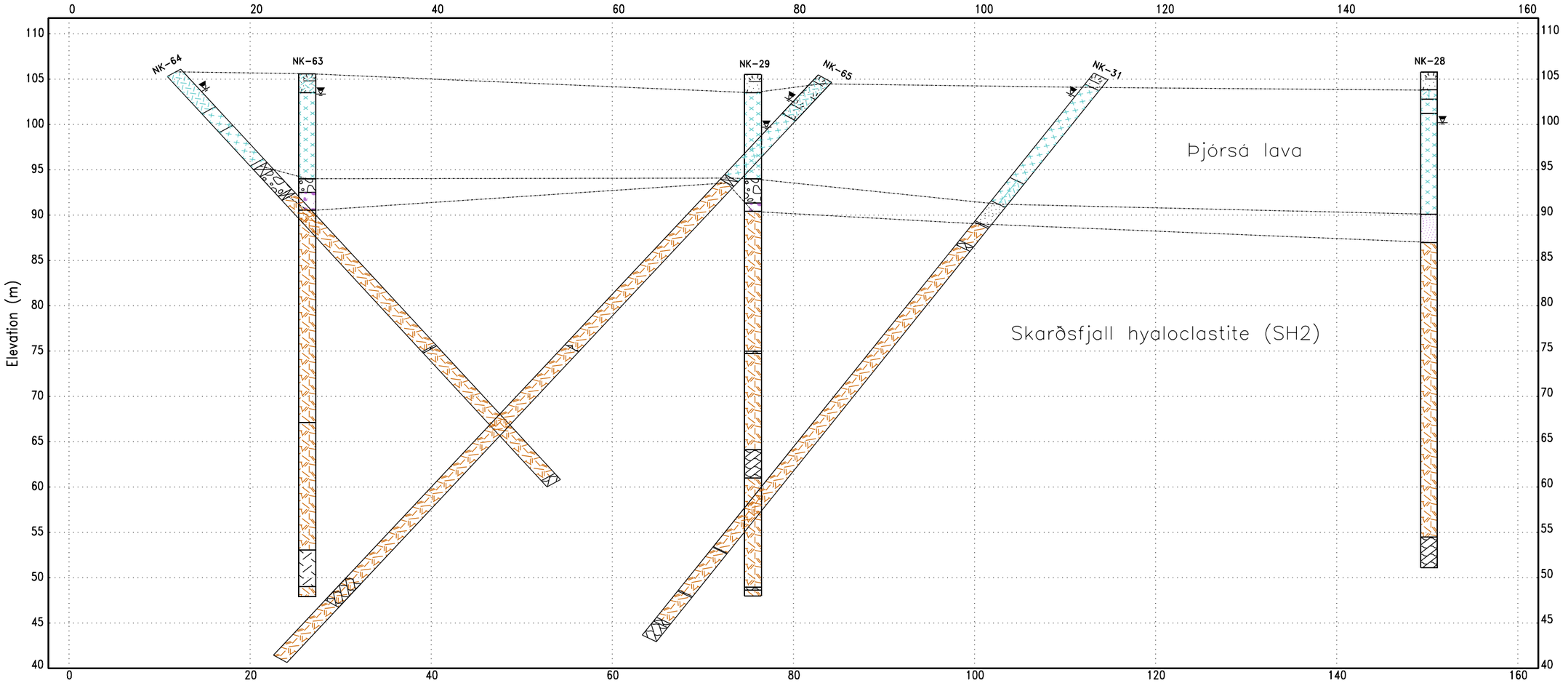
NUMBER 5.481.203
REV. C1
SHEET
NEXT SH.

G-2007/08-007

5A

5B



LEGEND

- Topsoil
- Pillow lava breccia
- Sand, poorly graded
- Scoriaceous Porphyritic basalt
- Basaltic Dyke Intrusion
- Scoria
- Porphyritic basalt
- Gravel, poorly graded
- Tectonic breccia
- Sandstone
- Conglomerate
- Core loss

MANNVIT ENGINEERING VERKÍS

NTH-60 Engineering Consultants

REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun

PROJ. HVAMMUR POWER PLANT

GEOLOGICAL PROFILE 5
POWERHOUSE AREA

MANNVIT

PROCESS = INSTALLATION + LOCATION +
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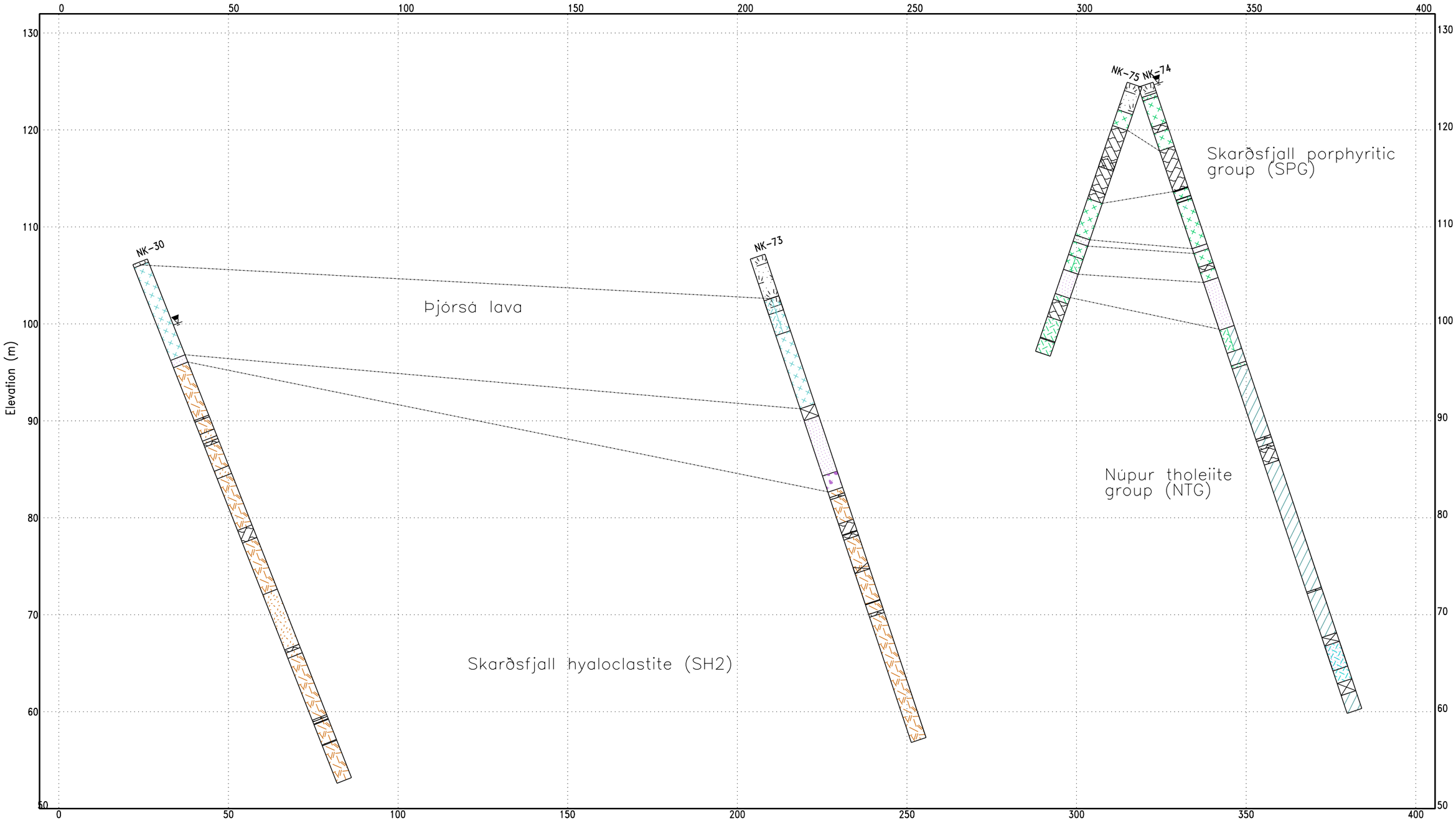
BDL NTH
NUMBER 5.481.203
REV. C1
SHEET
NEXT SH.
G-2007/08-008

6A

6B



LEGEND

- Topsoil
- Basaltic Dyke Intrusion
- Conglomerate
- Porphyritic basalt
- Tuff
- Scoria
- Sandstone
- Scoriaceus Porphyritic basalt
- Scoriaceous Tholeiite Basalt
- Pillow lava breccia
- Core loss
- Tholeiite Basalt

MANNVIT ENGINEERING VERKÍS

NTH-60 Engineering Consultants

REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun

PROJ. HVAMMUR POWER PLANT

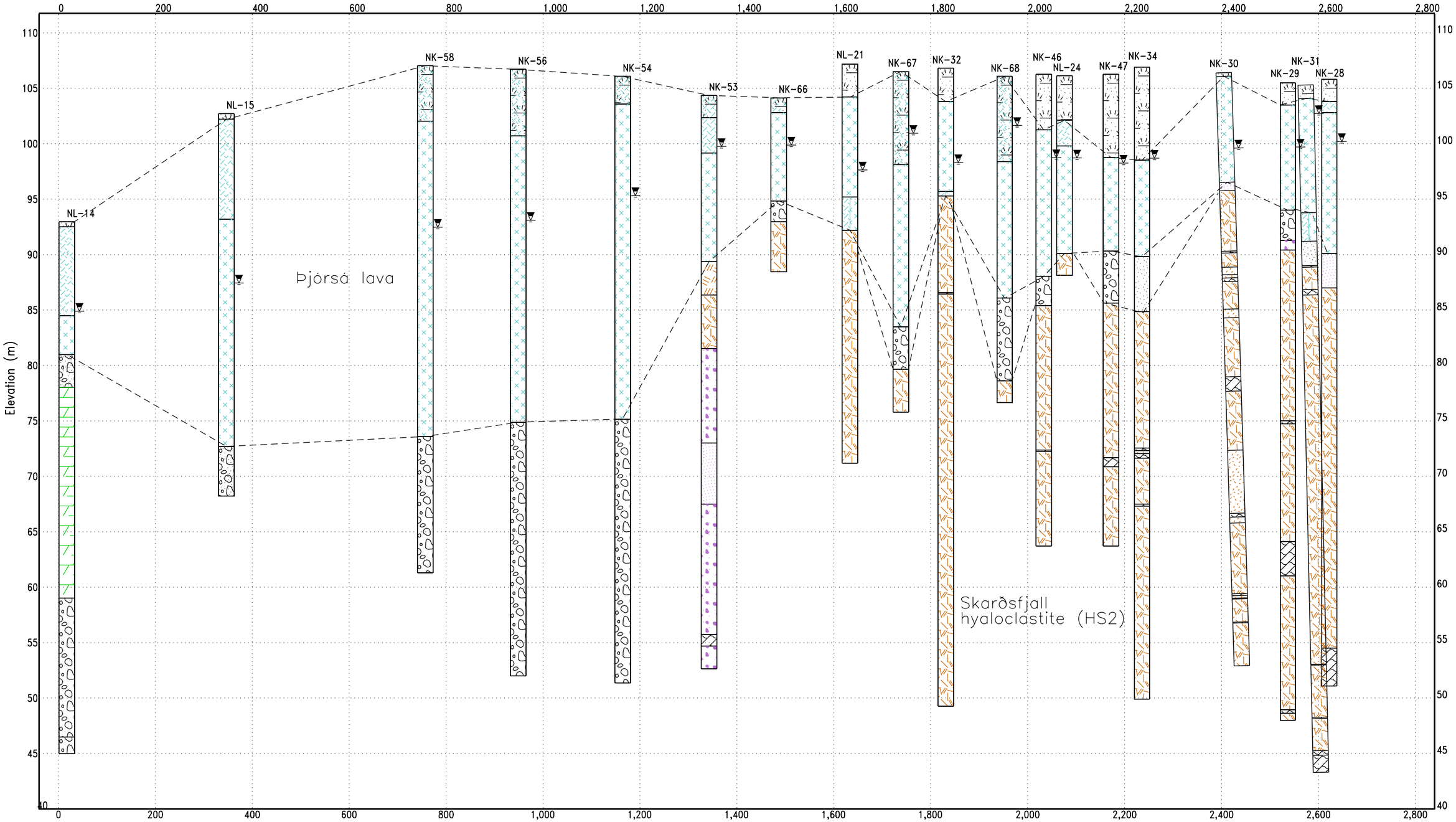
GEOLOGICAL PROFILE 6
SURGE SHAFT

MANNVIT

PROCESS = INSTALLATION + LOCATION +
NPC NUMBER | NPC REV. | BDL NTH
NUMBER 5.481.203 | REV. C1 | SHEET
G-2007/08-009 | NEXT SH.

7B

7A



LEGEND

- Topsoil
- Pillow lava breccia
- Tuff
- Tectonic breccia
- Scoriaceous Porphyritic basalt
- Basaltic Dyke Intrusion
- Sand, poorly graded
- Core loss
- Porphyritic basalt
- Gravel, poorly graded
- Scoria
- Olivine Basalt
- Sandstone
- Conglomerate
- Pillow lava
- Sand, well graded

Distance Along Baseline (m)

MANNVIT ENGINEERING

VERKÍS

NTH-60 Engineering Consultants

REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun

PROJ. HVAMMUR POWER PLANT

GEOLOGICAL PROFILE 7
TAILRACE TUNNEL

MANNVIT

PROCESS = | INSTALLATION + | LOCATION +

NPC NUMBER | NPC REV. | BDL NTH

NUMBER 5.481.203 | REV. C1 | SHEET | NEXT SH.

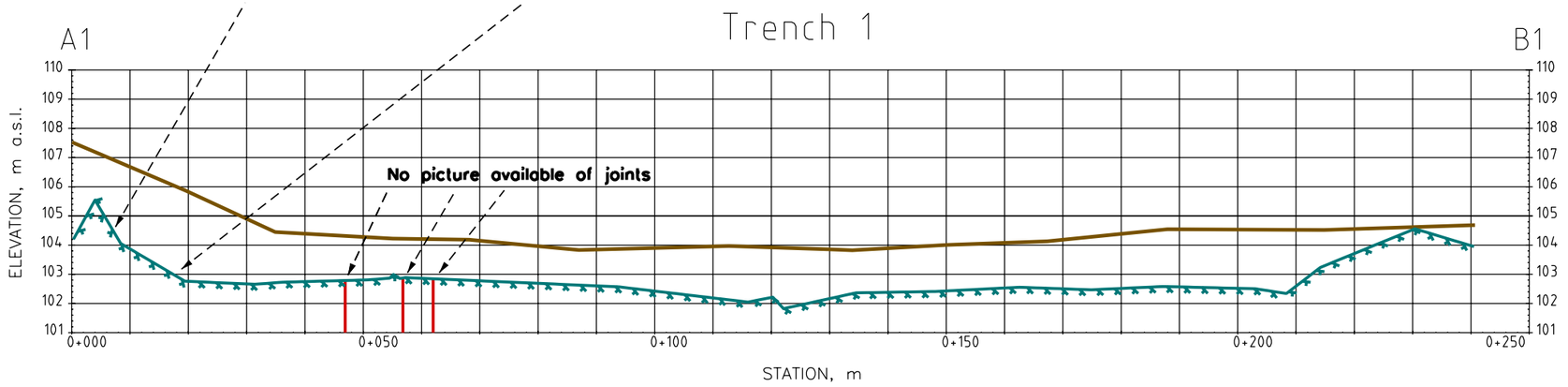
G-2007/08-010

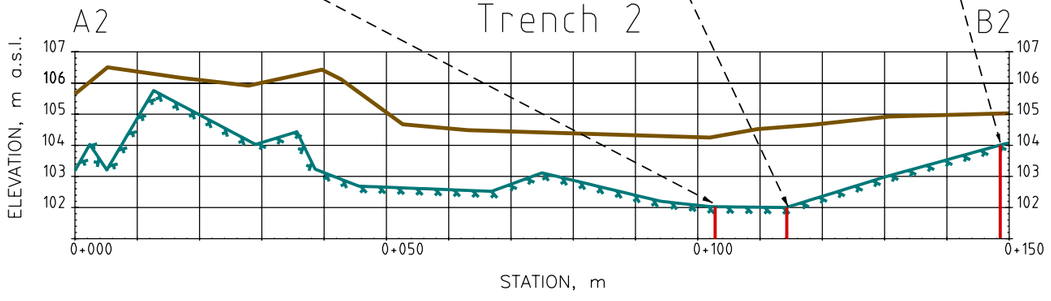
LEGEND

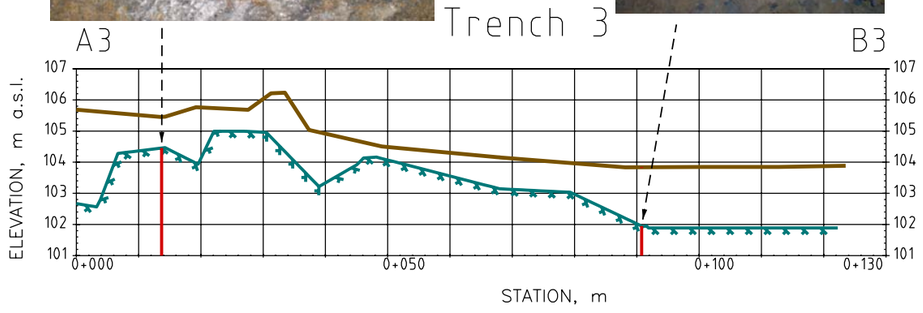
Joint in basalt or tectonic movement in soil

Bedrock surface

Land surface







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REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

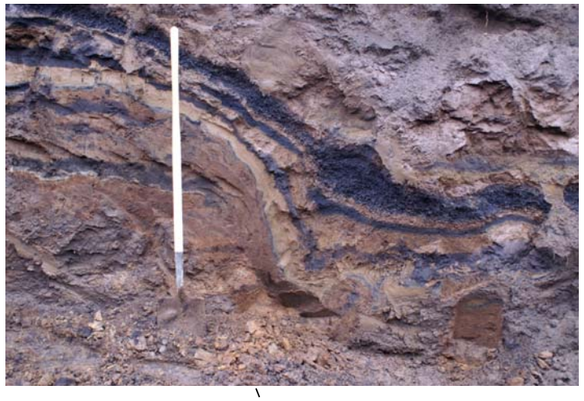
DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

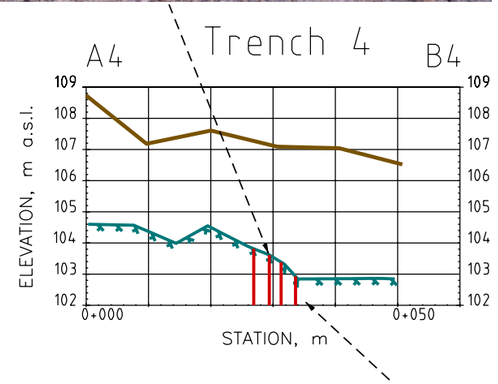
Landsvirkjun
PROJ. HVAMMUR POWER PLANT

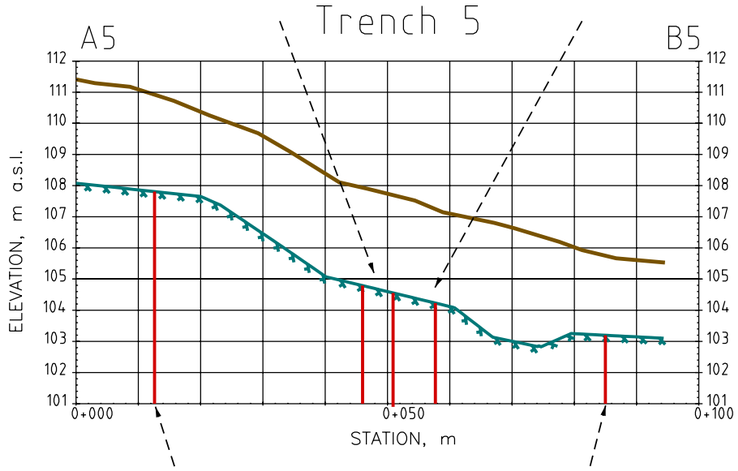
EXPLORATION TRENCHES
TRENCHES 1-3

MANNVIT

PROCESS = INSTALLATION + LOCATION +
NPC NUMBER | NPC REV. | BDL NTH
NUMBER 5.481.203 | REV. | SHEET
G-2007/08-011 | C1 | NEXT SH.







LEGEND

Joint in basalt or tectonic movement in soil

Bedrock surface

Land surface

REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun
PROJ. HVAMMUR POWER PLANT

MANNVIT ENGINEERING
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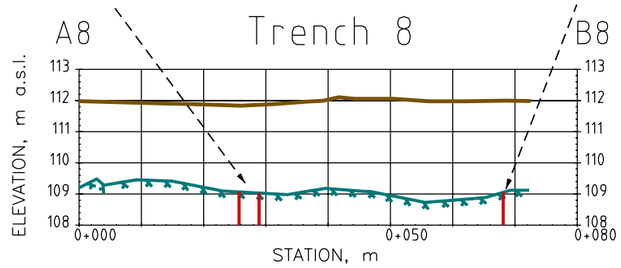
EXPLORATION TRENCHES
TRENCHES 4-5
MANNVIT

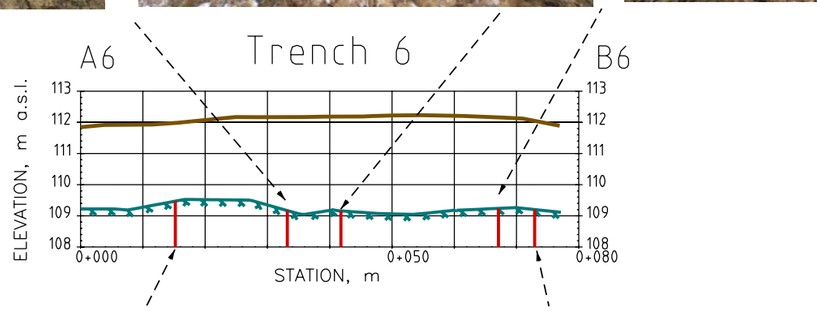
PROCESS	INSTALLATION	LOCATION
=	+	+

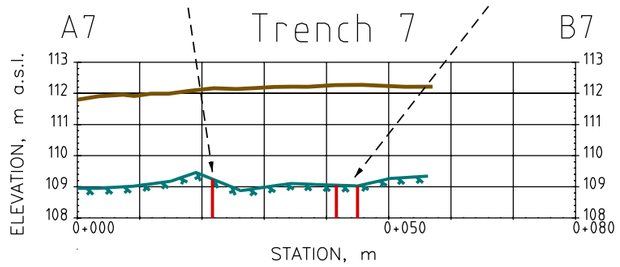
NPC NUMBER	NPC REV.	BDL
		NTH

NUMBER	REV.	SHEET
5.481.203 G-2007/08-012	C1	

NEXT SH.







LEGEND

Joint in basalt or tectonic movement in soil

Bedrock surface

Land surface

MANNVIT ENGINEERING VERKÍS

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REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

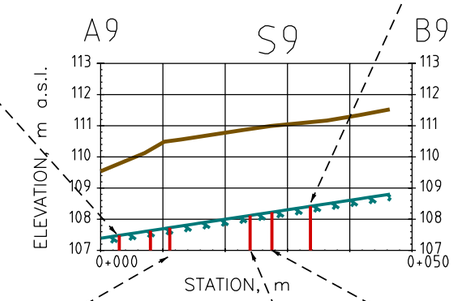
DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun
PROJ. HVAMMUR POWER PLANT

EXPLORATION TRENCHES
TRENCHES 6-8

MANNVIT

PROCESS = | INSTALLATION + | LOCATION +
NPC NUMBER | NPC REV. | BDL NTH
NUMBER 5.481.203 | REV. | SHEET
G-2007/08-013 | C1 | NEXT SH.



LEGEND

- Joint in basalt or tectonic movement in soil
- Bedrock surface
- Land surface

MANNVIT ENGINEERING VERKÍS

NTH-60 Engineering Consultants

REV	DESCRIPTION	DATE	DES.	CHK.	APP.	REV.	DESCRIPTION	DATE	DES.	CHK.	APP.

DATE 06.06.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun
PROJ. HVAMMUR POWER PLANT

EXPLORATION TRENCHES
TRENCH 9

MANNVIT

PROCESS = INSTALLATION + LOCATION +
NPC NUMBER
NPC REV.
BDL NTH
NUMBER 5.481.203
REV.
SHEET
G-2007/08-014
C1
NEXT SH.

Appendix A

Core logs of Boreholes drilled 2007-2008 (NK53-NK76)

Appendix B

Permeability Tests

Appendix C

Rock Mass Classification

Appendix D

Photos of cores NK53-NK76

Appendix E

Tests on cores

Appendix F

Logs of percussion drill holes (NL50-NL68 and NL99-NL103)

Appendix G

Test Trenches 1 to 9. Soil Sections and Tectonic

Appendix H

Temperature measurements

Appendix I

Groundwater measurements

Appendix J

Photos of SPT samples from NL99, NL-100 and NL101

Particle Size Distribution, of nine SPT samples from NL99, NL100 and NL101

Logs of percussion drill holes NL68, NL99, NL100 and NL101

Appendix A

Core logs of Boreholes drilled 2007-2008 (NK53-NK76)

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-53

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 10.10.2007 COMPLETED: 16.10.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel/Canal	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444176.73 Y: 393155.402 Z: 104.355	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	5
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	89 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	104.355 m a.s.l.
DEPTH OF HOLE:	51.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	99.76 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
104.0			Scoria and aeolian sand Percussion drilling down to 3 m.	0	N/A	0/0/0/0		
102.0	2.0		Scoria, porphyritic basalt Þjórsá lava Reddish gray at top, fine grained. ~5% plagioclase phenocrysts 3-7 mm 10-20% empty vesicles.	89	10	47/0/0/0		
100.0	4.0			82	4	64/35/35/35 64x2-3x0,66-1 9-12x1x2,5 Q=2.5-8.5		GWT2.11.2007 GWT12.11.2007
			Core loss, crushed rock.					
98.0	6.0		Porphyritic basalt, solid. Reddish gray, fine grained. ~5% plagioclase phenocrysts 3-7 mm 5-20% empty vesicles. Gray fresh basalt. Jointed, sometimes crushed core, joints are empty or coated with brown clay and oxidation.	39	3	22/10/0/0		GWT15.10.2007
96.0	8.0		Core loss, crushed rock.					
94.0	10.0			43	2	36/30/30/0 36x2-3x0,66 9-12x1x2,5 Q=1,6-3,2		
92.0	12.0		Core loss, crushed rock.	57	2	47/32/0/0		
90.0	14.0		Possible core loss	100	13	22/0/0/0		
88.0	16.0		Móberg/Cube jointed basalt Dark gray, medium grained with plagioclase needles. Jointed, joints empty to filled with white to clear secondary minerals and green clay coating. Some healed white veins.	100	7	64/24/0/0 64x2-3x1 9-12x2-3x2,5 Q=1,4-4,3		K1/K2
86.0	18.0		Hyaloclastite/Móberg/Pillow lava breccia Dark gray, fine grained basalt fragments with plagioclase needles, vesicular, vesicles coated-filled with clear secondary minerals. Well cemented in glassy breccia. Joints inclined, coated-filled with clear/white secondary minerals up to 4 mm thick.	97	4	84/46/20/0 84x2-3x1 9-12x2-3x2,5 Q=2-5,6	17	
84.0	20.0							
82.0	22.0			99	0	99/99/99/99		
80.0	24.0		Tillite Dark brown-gray sandy-silty groundmass. 15-20% small basalt pebbles, subangular, well cemented. Joints coated-filled with white secondary minerals and clay/silt. Few original joints.	100	4	94/70/29/0 94x2-3x0,66 9x2-3x1 Q=7-15,7		
					1	86/86/76/56		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-53

ELEVATION (m a.s.l.)	DEPTH (m)	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
78.0	26.0		98				K2/K3
76.0	28.0		100	3	98/81/69/54		
74.0	30.0	Coarser lense, 40-50% of small pebbles.	100	0	100/100/100/0		
72.0	32.0	Sandstone Fine grained, dark gray. Lenses of fine grained conglomerate 2-10 cm thick. Healed vertical white veins.	99	3	90/84/57/0		
70.0	34.0	Vertical joint splitting the core. White secondary mineral joint filling and thin clay coating, altered joint walls.	100	4	54/10/0/0 54x1-2x1 9x2-3x1 Q=2-6		K3/K4
68.0	36.0		100	8	0/0/0/0		
66.0	38.0	Conglomerate Dark greenish gray, fine grained conglomerate. 20-40% pebbles. Vugs filled with white secondary minerals and dark clay. Well cemented. Lenses of stratified sand at top. Joints rough and undulating, sometimes coated or healed with clay and white/clear secondary minerals up to 3 mm thick. Sometimes altered joint walls.	100	3	90/71/71/0		
64.0	40.0		100	2	94/88/38/0		
62.0	42.0		100	2	86/77/30/0	9	
60.0	44.0						K4/K5
58.0	46.0	Inclined lenses of sand.	100	3	90/90/90/0 90x1-2x1 9x2-4x1 Q=2,5-10		
56.0	48.0	Dyke Basaltic, massive, medium grained, microporous. Welded contacts.	100	10	0/0/0/0		
54.0	50.0	Conglomerate Dark greenish gray, fine grained conglomerate. Same as above the dyke.	100 98	0 3	100/100/100/0 90/78/32/0		
52.0							
50.0							

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-54

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 19.10.2007 COMPLETED: 20.10.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel/Canal	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444016.235 Y: 393083.523 Z: 106.068	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	4
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	54 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	106.474 m a.s.l.
DEPTH OF HOLE:	54.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	95.74 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
			Scoria and Sand Loose scoria fragments and aeolian sand. Percussian drilling and casing 3 m.	0	N/A	0/0/0/0		
104.0	2.0		Porphyritic basalt Þjórsá lava Fresh gray, fine grained. Vesicular down to 11 m, empty vesicles. ~5% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty-coated with brown silt/clay.	100	6	72/0/0/0		
102.0	4.0			100	6	64/15/0/0		
100.0	6.0			100	7	50/0/0/0 50x2-3x1 9-12x1x2,5 Q=3,6-6,7		
98.0	8.0							
96.0	10.0			100	4	92/25/0/0		GWT2.11.2007 GWT12.11.2007 GWT20.10.2007
94.0	12.0		More massive, microporous, ~10% plagioclase phenocrysts. Scattered olivine phenocrysts. Decreasing vesicles. Fine to medium grained. Joints rough and undulating, empty.					K1/K2
92.0	14.0		Scattered vesicles.	100	4	78/52/17/0		GWT10.4.2008 GWT3.6.2008
90.0	16.0			96	1	83/83/83/39 83x2-3x0,66 9-12x1x2,5 Q=3,7-7,3		
88.0	18.0			98	2	92/79/39/0		
86.0	20.0						100	K2/K3
84.0	22.0			100	2	81/64/64/0 81x2-3x0,66 9-12x1x2,5 Q=3,6-7		
82.0	24.0				4	92/58/37/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-54

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
80.0	26.0		3-5% plagioclase phenocrysts. Faint flow banding. 2-3% small vesicles. Joints are empty or with thin brown silt/clay coating.	100			100	
78.0	28.0			100	3	78/49/22/0		
76.0	30.0			100	6	0/0/0/0	76	
			Sediment Loose sediment. Pebbles of basalt and rhyolite come up.	7	N/A	0/0/0/0		
74.0	32.0							
72.0	34.0			5	N/A	0/0/0/0		
70.0	36.0							
				0	N/A	0/0/0/0		
68.0	38.0							
66.0	40.0							
64.0	42.0							
62.0	44.0							
60.0	46.0							
58.0	48.0							
56.0	50.0							
54.0	52.0							
52.0	54.0							

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-55

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 17.10.2007 COMPLETED: 19.10.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel/Canal	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444027.207 Y: 392977.1 Z: 107.562	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	4
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	60 %
CASING LENGTH:	7.55 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	107.788 m a.s.l.
DEPTH OF HOLE:	54.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	95.06 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
106.0	2.0		Scoria and aeolian sand. Percussion drilling and casing 7,55 m.	0	N/A	0/0/0/0		
104.0	4.0							
102.0	6.0							
100.0	8.0		Porphyritic basalt Þjórsá lava Fresh gray, fine grained. Vesicular zones down to 14 m, empty vesicles. ~5% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, some coated with thin brown clay, rough and undulating.	94	9	42/0/0/0		
98.0	10.0			100	9	26/0/0/0 26x2-3x0,66-1 9-12x1x2,5 Q=1,7-3,4		
96.0	12.0			94	7	58/0/0/0 58x2-3x0,66-1 9-12x1x2,5 Q=3,8-7,7		GWT2.11.2007 GWT12.11.2007
94.0	14.0		Loss of spill water Microporous basalt. Faint flow banding. 1-3% small and empty vesicles.	100	8	31/0/0/0		GWT18.10.2007 GWT10.4.2008
92.0	16.0			100	6	67/34/22/0		GWT3.6.2008 K1/K2
90.0	18.0		10-15% plagioclase phenocrysts. More massive microporous basalt Joints are rough and undulating, empty. Scattered empty vesicles.	100	2	97/88/75/0		
88.0	20.0							
86.0	22.0			100	3	89/39/39/0		
84.0	24.0				6	70/11/0/0		K2/K3

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-55

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
82.0	26.0		~5% plagioclase phenocrysts. ~3% small vesicles. Joints are rough and undulating, empty or with thin light brown clay coating.	100		70x2-3x0,66 / 9-12x1x2,5 Q=3-6,6		
80.0	28.0			100	2	98/81/38/0 98x2-3x0,66 / 9-12x1x2,5 Q=4,3-9		
78.0	30.0							
76.0	32.0			100	2	94/88/57/0		
74.0	34.0		0,1 m bottom scoria. Loose sediment Gravel, basalt pebbles in core.	10	N/A	0/0/0/0		K3/K4
72.0	36.0			1	N/A	0/0/0/0		
70.0	38.0							
68.0	40.0						27	
66.0	42.0							
64.0	44.0							
62.0	46.0							
60.0	48.0		Black tephra sand and gravel.					
58.0	50.0			3	N/A	0/0/0/0		
56.0	52.0		Dyke Dark gray, fresh, fine grained basaltic dyke. ~10% small vesicles, empty. Joints coated with thin clay/silt.	100	6	66/13/0/0 66x2-3x0,66 / 9-12x2-3x1 Q=2,4-7,7		
54.0	54.0							

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-56

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.10.2007 COMPLETED: 23.10.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel/Canal	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 443809.327 Y: 393019.834 Z: 106.709	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	3
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	53 %
CASING LENGTH:	6 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	107.094 m a.s.l.
DEPTH OF HOLE:	54.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	93.48 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
106.0			Scoria and aeolian sand. Percussion drilling and casing 6 m.	0	N/A	0/0/0/0		
	2.0							
104.0								
	4.0							
102.0								
	6.0		Porphyritic basalt Þjórsá lava Scoriaceous at top. Fresh gray, fine grained, microporous. 5% small, empty vesicles. 3-5% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, some coated with thin brown silt/clay, rough and undulating.	65	7	19/0/0/0		
100.0				97	6	62/12/0/0		
	8.0							
98.0								
	10.0			95	5	71/13/0/0		
96.0								
	12.0							
94.0				100	6	72/0/0/0 72x2-3x1 9-12x1x2,5 Q=4,8-9,6		GWT2.11.2007 GWT12.11.2007 GWT22.10.2007
	14.0							
92.0			More massive, microporous, faint flow banding. 10-15% plagioclase phenocrysts up to 20 mm but most are 5-8 mm.					K1/K2
	16.0			97	2	81/81/66/0		GWT10.4.2008 GWT3.6.2008
90.0								
	18.0							
88.0				100	2	68/68/55/36		
	20.0						196	
86.0								
	22.0			100	2	89/73/50/32		
84.0								
	24.0				5	80/47/0/0		K2/K3
82.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-56

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
80.0	26.0		5% plagioclase phenocrysts. Increasing joints.	100				
78.0	28.0			82	3	69/52/38/0 69x2-3x0,66 / 9-12x1x2,5 Q=2-4,6		
76.0	30.0		Cave/cavity Scoriaceous basalt High core loss.	68	N/A	49/49/49/0		
74.0	32.0		Loose sediment Basalt and rhyolite pebbles at top.	21	N/A	0/0/0/0	217	
72.0	34.0			12	N/A	0/0/0/0		
70.0	36.0			4	N/A	2/2/0/0		
68.0	38.0		Gray silt layer and black sand, very soft. Low core recovery.					
66.0	40.0							
64.0	42.0							
62.0	44.0							
60.0	46.0							
58.0	48.0							
56.0	50.0							
54.0	52.0							
52.0	54.0							

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-57

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 23.10.2007 COMPLETED: 24.10.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel/Canal	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 443827.567 Y: 392923.179 Z: 107.299	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	3
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	83 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	107.694 m a.s.l.
DEPTH OF HOLE:	39.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	93.29 m a.s.l. (24.10.2007)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
106.0	2.0		Scoria and aeolian sand. Percussion drilling and casing 3 m.	0	N/A	0/0/0/0		
104.0	4.0		Scoriaceous porphyritic basalt Þjórsá lava Fresh gray, fine grained. Vesicles 15-20%, empty vesicles. ~5% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, some coated with thin brown clay, rough and undulating.	100	3	85/85/0/0		
102.0	6.0		3,7-6,7 Cave in scoria causing high core loss.	8	N/A	6/0/0/0		
100.0	8.0		Porphyritic basalt, solid. Fresh gray, fine grained, faintly microporous. 1-5% vesicles, empty vesicles. Thin zones with 10-15% vesicles. ~5% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, rough and undulating.	100	8	39/0/0/0 39x2-3x1 9-12x1x2,5 Q=2,6-5,2		
98.0	10.0			100	7	42/10/0/0		
96.0	12.0			100	7	63/0/0/0 63x2-3x1 9-12x1x2,5 Q=4-8,4		
94.0	14.0 ▼							GWT12.11.2007
92.0	16.0		Increasing phenocrysts, decreasing vesicles.	92	4	63/33/22/0		K1/K2
90.0	18.0		More massive, microporous, faint flow banding. 10-15% plagioclase phenocrysts. Scattered vesicles.	100	3	94/66/31/0		
88.0	20.0						400	Permeability >400 LU
86.0	22.0		21,7 cavity in basalt causing high core loss.	57	4	26/0/0/0		
84.0	24.0		Jointed basalt, 3-5% plagioclase phenocrysts.		6	21/0/0/0		K2/K3

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-57

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
82.0	26.0			77		21x2-3x0,66 / 9-12x1x2,5 Q=0,9-1,8		
80.0	28.0		More massive. 1-3% small vesicles.	100	6	82/28/0/0 82x2-3x0.66 / 9-12x1x2,5 Q=3,6-7,2		
78.0	30.0			100	1	100/100/100/0		
76.0	32.0		Loose sediment. Rounded basalt pebbles.	11	N/A	0/0/0/0		
74.0	34.0			0	N/A	0/0/0/0		
72.0	36.0			0	N/A	0/0/0/0		
70.0	38.0							
68.0								
66.0								
64.0								
62.0								
60.0								
58.0								
56.0								
54.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-58

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 29.10.2007 COMPLETED: 30.10.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel/Canal	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 443624.401 Y: 392969.465 Z: 107.031	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	4
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	70 %
CASING LENGTH:	6 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	107.378 m a.s.l.
DEPTH OF HOLE:	45.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	92.82 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
106.0	2.0		Scoria and aeolian sand. Percussion drilling and casing 6 m.	0	N/A	0/0/0/0		
104.0	4.0							
102.0	6.0		Porphyritic basalt Þjórsá lava Fresh gray, fine grained, microporous. 1-7% vesicles down to 14,7 m depth, empty vesicles, decreasing downwards ~5% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, some coated with thin brown silt/clay, rough and undulating.	100	5	38/0/0/0		
100.0	8.0			97	6	51/0/0/0 51x2-3x1 9-12x1x2,5 Q=3,4-7		
98.0	10.0			98	5	60/21/0/0		
96.0	12.0							
94.0	14.0			100	6	49/42/0/0		GWT2.11.2007 GWT12.11.2007
92.0	16.0		More massive, microporous, faint flow banding. 10-15% plagioclase phenocrysts. Inclined joints, rough and undulating, empty.	100	2	97/97/73/41		K1/K2 GWT10.4.2008
90.0	18.0							GWT3.6.2008
88.0	20.0			100	2	99/94/94/43	45	
86.0	22.0			100	2	84/80/62/0		
84.0	24.0				5	94/52/17/0		K2/K3

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-58

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
80.0	26.0		3-7% plagioclase phenocrysts. Scattered small vesicles.	100				
78.0	28.0			94	3	88/79/39/0 88x2-3x0,66 9-12x1x2,5 Q=4-7,7		
76.0	30.0			100	4	97/71/26/0		
74.0	32.0							K3/K4
72.0	34.0		Loose sediment Subangular-subrounded basalt and rhyolite pebbles.	0 6	N/A N/A	0/0/0/0 0/0/0/0		
70.0	36.0							
68.0	38.0							
66.0	40.0							
64.0	42.0							
62.0	44.0							
60.0								
58.0								
56.0								
54.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-59

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 30.10.2007 COMPLETED: 31.10.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel/Canal	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 443460.37 Y: 392874.376 Z: 100.851	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	68 %
CASING LENGTH:	9 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	101.262 m a.s.l.
DEPTH OF HOLE:	33.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	91.72 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
100.0	0.0		Scoria and aeolian sand. Percussion drilling and casing 9 m.	0	N/A	0/0/0/0		
98.0	2.0							
96.0	4.0							
94.0	6.0		Porphyritic basalt Þjórsá lava					
92.0	8.0		Fresh gray, fine grained, microporous. Scattered, empty vesicles. ~5% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, some coated with thin brown silt/clay, rough and undulating.	83	11	0/0/0/0		GWT2.11.2007 GWT12.11.2007
90.0	10.0			100	6	71/0/0/0		GWT10.4.2008
88.0	12.0		Scoriaceous basalt. Partly crushed, high core loss. Vesicular with more massive zones.	11	N/A	0/0/0/0		GWT3.6.2008
86.0	14.0			82	7	27/0/0/0		
84.0	16.0		Porphyritic basalt, solid. Fresh gray, fine grained, microporous. Scattered small vesicles, empty vesicles. ~5% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, some coated with thin brown silt/clay, rough and undulating. Faint flow banding.	100	8	50/0/0/0		
82.0	18.0			100	6	65/10/0/0 65x2-3x0,66 9-12x1x2,5 Q=3-5,7		
80.0	20.0			100	7	50/11/0/0		K1/K2
78.0	22.0			100	8	49/21/0/0		
76.0	24.0			100	9	31/0/0/0 31x2-3x0,66 9-12x1x2,5 Q=1,4-2,7		
					6	50/13/0/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-59

SHEET 2 OF 2 SHEETS

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
74.0	26.0			100				
			Sand Thin dark sand layer. Low core recovery.	39	N/A	0/0/0/0		
72.0	28.0		Loose sediment Subangular basalt pebbles.	8	N/A	0/0/0/0		
70.0	30.0							
68.0	32.0							
66.0								
64.0								
62.0								
60.0								
58.0								
56.0								
54.0								
52.0								
50.0								
48.0								
46.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-60

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 08.11.2007 COMPLETED: 12.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Quarry area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 446971.074 Y: 394352.315 Z: 115.367	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	3
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	86 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	115.745 m a.s.l.
DEPTH OF HOLE:	30.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
114.0	2.0		Scoria and aeolian sand Loose material. Percussion drilling 3 m.	0	N/A	0/0/0/0		
112.0	4.0		Scoria, porphyritic basalt. Þjórsá lava Reddish gray scoria and vesicular scoriaceous basalt. At 3,7 to 9 m depth - high core loss. Fragments of scoria between scoriaceous vesicular basalt.	49	N/A	0/0/0/0		
				17	N/A	7/0/0/0		
110.0	6.0							
108.0	8.0			75	6	41/0/0/0		
106.0	10.0		Porphyritic basalt, solid. 3-5% plagioclase phenocrysts, fresh gray, fine grained, faintly microporous. 1-5% vesicles, empty. Joints rough and undulating, empty or coated with thin brown silt/clay coating.	100	2	28/0/0/0		
				100	8	50/0/0/0		
				97	8	45/0/0/0 45x2-3x1 9-12x1x2,5 Q=3-6		
104.0	12.0			100	8	60/0/0/0		
102.0	14.0			100	5	76/42/0/0		
100.0	16.0		More massive, microporous. Scattered olivine phenocrysts. 3-5% plagioclase phenocrysts. Scattered vesicles.	93	3	75/49/0/0		K1/K2
98.0	18.0							
96.0	20.0			100	2	85/85/61/0		
94.0	22.0		7-15% plagioclase phenocrysts, 4-7 mm, microporous massive basalt. ~1% olivine phenocrysts. Scattered small vesicles.	98	3	77/52/20/0 77x2-3x0,66 9-12x1x2,5 Q=3,4-7		
92.0	24.0				3	74/46/19/0		K2/K3

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-60

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
90.0	26.0		~3% plagioclase phenocrysts. Microporous, faint flow banding. ~1% small vesicles.	100				
88.0	28.0			100	7	74/0/0/0		
86.0	30.0							
84.0								
82.0								
80.0								
78.0								
76.0								
74.0								
72.0								
70.0								
68.0								
66.0								
64.0								
62.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-61

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 13.11.2007 COMPLETED: 13.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Quarry area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 447010.89 Y: 394548.583 Z: 115.252	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	94 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	114.727 m a.s.l.
DEPTH OF HOLE:	21.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	108.45 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
114.0	2.0		Scoria and aeolian sand Loose material. Percussion drilling 3 m.	0	N/A	0/0/0/0		
112.0	4.0		Porphyritic basalt, solid. Þjórsá lava Fresh gray, fine grained. 10-20% vesicles, empty. ~5% plagioclase phenocrysts.	76	8	33/0/0/0		
				72	4	44/14/0/0		
110.0	6.0		Scoriaceous zone High core loss.					
108.0	8.0		Porphyritic basalt, solid. Fresh gray, fine grained same as above. 10% vesicles, empty. 3% plagioclase phenocrysts, scattered olivine phenocrysts. Joints rough and undulating, empty or coated with thin brown silt/clay. 2-5% vesicles.	100	6	59/10/0/0 59x2-3x1 9-12x1x2,5 Q=3,9-8		GWT19.11.2007 GWT10.4.2008
106.0	10.0			100	8	58/11/0/0		
104.0	12.0			96	6	61/35/35/0		K1/K2
102.0	14.0		More massive basalt, microporous, less jointed. 5% plagioclase phenocrysts 3-5 mm.					
100.0	16.0			100	5	67/33/0/0 67x2-3x0,66 9-12x1x2,5 Q=3-9		
98.0	18.0							
96.0	20.0			100	4	86/57/35/0		
94.0			10% plagioclase phenocrysts 4-7 mm. Scattered olivine and pyroxene phenocrysts. Scattered vesicles. Microporous massive basalt.					
92.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-62

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 14.11.2007 COMPLETED: 14.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Quarry area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 447295.582 Y: 394515.214 Z: 115.735	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	3
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	86 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	116.159 m a.s.l.
DEPTH OF HOLE:	24.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	109.41 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
114.0	2.0		Scoria and Aeolian sand. Percussion drilling with casing 3 m.	0	N/A	0/0/0/0		
			Scoria, porphyritic basalt. Þjórsá lava Reddish gray, vesicular scoria. High core loss.	38	6	14/0/0/0		
112.0	4.0 ▼			15	N/A Crushed core	3/0/0/0		GWT19.11.2007
110.0	6.0 ▼							
108.0	8.0		Porphyritic basalt, solid. 15-20% vesicles, empty. ~5% plagioclase phenocrysts.	100	8	60/10/0/0		
106.0	10.0		Fresh gray, fine grained. 3% plagioclase phenocrysts, scattered olivine phenocrysts. Scattered vesicles, vesicles empty and small. Joints rough and undulating, empty or coated with thin brown silt/clay coating.	100	8	47/12/0/0 47x2-3x1 9-12x1x2,5 Q=3-6,2		
104.0	12.0							
102.0	14.0			100	6	61/23/0/0		
100.0	16.0		More massive basalt. Microporous, scattered vesicles. 5% plagioclase phenocrysts, 1-10 mm mostly 4-6 mm.	100	4	90/39/17/0		K1/K2
98.0	18.0							
96.0	20.0		10% plagioclase phenocrysts. ~1% olivine phenocrysts.	100	1	96/96/96/53 96x2-3x0,66 9-12x1x2,5 Q=4-8,4		
94.0	22.0			98	1	98/93/93/34		K2/K3
92.0	24.0							

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-63

SHEET 1 OF 3 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 01.11.2007 COMPLETED: 03.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Powerhouse	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444918.113 Y: 394049.896 Z: 105.603	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	6
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	79 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	106.056 m a.s.l.
DEPTH OF HOLE:	57.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	103.35 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
			Soil and scoria. Loose material. Percussion drilling.	0	N/A	0/0/0/0		
104.0	2.0							GWT12.11.2007
			Porphyritic basalt Þjórsá lava Vesicular 20%, fresh gray. Jointed, joints are rough and undulating empty or coated with brown silt/clay or oxidation. 3-5% plagioclase phenocrysts.	78	6	42/0/0/0		
102.0	4.0			100	5	85/25/0/0		
100.0	6.0		More massive, microporous basalt. Scattered vesicles. 5-7% plagioclase phenocrysts, scattered olivine phenocrysts. Joints, rough and undulating empty or coated with brown silt/clay or oxidation.	100	5	79/42/18/0 79x2-3x1 9-12x1x2,5 Q=5,3-10,5		GWT10.4.2008 GWT3.6.2008
98.0	8.0							
96.0	10.0		Vesicular at bottom 0,5 m, approx 20% vesicles.	100	3	92/67/28/0		
94.0	12.0		Sediment Loose sediment, few basalt pebbles come up.	4	N/A	0/0/0/0		
				26	N/A	0/0/0/0		K1/K2
92.0	14.0		Tillite Gray-brown well cemented conglomerate. ~15% pebbles in sandy-silty groundmass. Few joints.	100	3	93/80/62/0 93x1-3x1 9x2-4x2,5 Q=1-6	92	
90.0	16.0		Móberg Pillow lava breccia Greenish well cemented. Healed vertical veins with white secondary minerals. Light brown clay fillings in joints.	100	5	53/53/0/0		
				100	1	98/98/83/83 98x1-3x1 9-12x3-4x2,5 Q=0,8-4,4		
88.0	18.0							
86.0	20.0		Reddish breccia, jointed, red, brown and green clay in joints, shrinks during drying. Crushed rock, highly jointed, broken core.	100	8	48/26/26/0 48x1-3x1 9-12x3-4x2,5-5 Q=0,2-2		K2/K3
84.0	22.0		Green breccia and tuff breccia. Highly jointed. Geothermal alteration, orange coloured rock around joints from 18-27m.	100	5	70/0/0/0		
				98	6	51/18/18/0	1	
82.0	24.0		Reddish/orange coloured breccia, crushed zones. Core loss.		4	7/0/0/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-63

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
80.0	26.0		Greenish breccia, crushed rock. Core loss.	50			1	
78.0	28.0			82	8	23/0/0/0		
76.0	30.0			47	5	0/0/0/0		K3/K4
74.0	32.0			23	N/A	0/0/0/0 10x1-3x1 9-12x2-4x5 Q=0,04-0,3		
72.0	34.0		Core loss due to stone in drill rod.	10	N/A	5/0/0/0		
70.0	36.0						1	
68.0	38.0		More solid rock. 10-20% green tuff breccia. Vesicles filled with green clay and clear/white secondary minerals. Joint with 3-4 cm silt and clay filling. Basaltic dyke	100	5	76/40/0/0 76x1-3x1 9-12x2-4x5 Q=0,3-2,5		
66.0	40.0		Hyaloclastite/Móberg Pillow lava breccia Same as above.	100	6	63/43/27/0		
64.0	42.0		Some joints with grayish brown silt and clay fillings, rough and undulating. Well cemented rock.	96	3	50/35/0/0		
62.0	44.0			100	4	85/61/35/0		K4/K5
60.0	46.0			100	5	78/22/0/0		
58.0	48.0							
56.0	50.0			100	4	83/52/28/0	1	
54.0	52.0			100	2	86/74/74/0		K5/K6
52.0	54.0		Tectonic breccia Fragments of rock in reddish brown/orange sandy matrix. High core loss.	55	4	22/0/0/0 22x1-3x1 16x4-6x5 Q=0,02-0,1		
					N/A	0/0/0/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-63

SHEET 3 OF 3 SHEETS

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
50.0	56.0			24				
			Pillow lava breccia Same as above	100	7	35/0/0/0		
48.0								
46.0								
44.0								
42.0								
40.0								
38.0								
36.0								
34.0								
32.0								
30.0								
28.0								
26.0								
24.0								
22.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-64

SHEET 1 OF 3 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 26.11.2007 COMPLETED: 03.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Powerhouse	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 444905.63 Y: 394041.12 Z: 105.7	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	6
HOLE INCLINATION:	[ ] VERTICAL [X] INCLINED -45.5 INCLINATION	CORE RECOVERY:	86 %
CASING LENGTH:	6 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	106.00 m a.s.l.
DEPTH OF HOLE:	63.48 m DRILLING DIRECTION 127°	GROUNDWATER ELEVATION:	103.22 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
			Scoriaceous porphyritic basalt. Þjórsá lava. Percussion drilling down to 6 m.	0	N/A	0/0/0/0		
104.0	2.0							
								GWT12.12.2007
	4.0							GWT29.11.2007
102.0								
	6.0		Porphyritic basalt, solid. Fresh gray, fine grained. ~5% plagioclase phenocrysts (1-6 mm). Vesicular 5-15% vesicules are 1-10 mm. Joints are rough and undulating, empty or coated with silt/clay.	93	12	31/0/0/0		
				88	7	66/0/0/0		GWT10.4.2008
				40	N/A	0/0/0/0		
100.0	8.0			98	11	13/0/0/0 13x2-3x1 9-12x1x2,5 Q=0,9-1,4		GWT3.6.2008
			Decrease in vesicules, 1-5% vesicules. Microporous 3-5%.	100	6	44/0/0/0		
	10.0			97	7	66/26/0/0		
98.0								
	12.0			100	8	85/0/0/0		
				95	7	70/23/0/0 70x2-3x0,66-1 9-12x1x2,5 Q=3-9	400	
96.0								
	14.0		Increase in vesicules last 50 cm, 10-25% (1-15 mm).	100	N/A	0/0/0/0		
			Sediment No core recovery.	0	N/A	0/0/0/0		
	16.0		Sediment. Few basalt and ryolite pebbles come up. Short stumps of well cemented darkbrown conglomerate.	11	1	3/0/0/0		
94.0								
	18.0							
			Sediment Core loss	5	N/A	0/0/0/0		
92.0			Hyaloclastite Pillow lava breccia Altered hyaloclastite. Small grained. Dark gray colour with some slightly green spots . Vesicles and vugs ~15-25% are full or partly full of white secondary minerals and green clay. Joints are rough and undulating with clay coatings. Scattered white healed veins. Well cemented.	91	5	72/37/0/0		K1/K2
	20.0							
				61	4	85/62/0/0 85x2-3x1 9-12x2-4x2,5 Q=1,2-5		
90.0	22.0							
	24.0							
88.0			Core loss.	0	N/A	0/0/0/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

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ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
	26.0			100	4	96/63/46/46		
86.0	28.0			94	5	67/29/0/0		K2/K3
	30.0			100	2	100/96/67/0		
84.0	32.0							
82.0	34.0			97	2	94/80/48/2 94x2-3x1 9-12x2-4x1 Q=3,9-16		
80.0	36.0			100	1	100/88/70/0		
	38.0		Joint with 2-3 mm thick light brown clay filling, planar and rough.					K3/K4
78.0	40.0			97	2	95/70/40/0	10	
76.0	42.0							
			Basaltic dyke intrusion, ~20 cm thick.	100	2	97/76/26/0		
	44.0		Hyaloclastite Pillow lava breccia Same as above. Two joints filled with light brown-gray clay or silt.					
74.0	46.0			100	3	100/65/20/0		
			Joint with 20-30 mm thick green-brown clay or silt filling.					
72.0	48.0			100	4	81/60/18/0		K4/K5
70.0	50.0		Three joints with gray and brown clay and silt filling ~2-3 mm thick. Brown alteration around joint walls. Parallel joints.					
	52.0			100	2	100/86/76/0		
68.0	54.0			100	2	100/91/63/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-64

SHEET 3 OF 3 SHEETS

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
66.0	56.0							
				93	7	63/33/33/33 63x2-3x1 9-12x2-4x1 Q=2-11	10	K5/K6
64.0	58.0							
	60.0			75	2	72/51/0/0		
62.0	62.0							
			Basaltic dyke. Massive and fine grained. No vesicles. Joints are smooth and undulating, some healed white veins 1-2 mm thick.	100	6	98/32/0/0		
60.0								
58.0								
56.0								
54.0								
52.0								
50.0								
48.0								
46.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-65

SHEET 1 OF 4 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 04.12.2007 COMPLETED: 15.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Powerhouse	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 444984.16 Y: 394035.44 Z: 105.06	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	9
HOLE INCLINATION:	[ ] VERTICAL [X] INCLINED -45 INCLINATION	CORE RECOVERY:	95 %
CASING LENGTH:	6 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	105.44 m a.s.l.
DEPTH OF HOLE:	90.53 m DRILLING DIRECTION 278°	GROUNDWATER ELEVATION:	103.12 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
104.0	2.0		Topsoil and scoria Percussion drilling 6 m.	0	N/A	0/0/0/0		
								GWT12.12.2007 GWT16.12.2007
102.0	4.0							
	6.0		Porphyritic basalt The Þjórsá lava. Fine grained, fresh gray. 5-7% plagioclase phenocrysts (1-8mm). Scattered olivine phenocrysts. ~20% vesicles from 6-7,5 m, empty vesicles. Scattered vesicules below 7,5 m. Microporous. Joints are rough and undulating, with a very thin silt/clay or oxidation coating.	99	6	55/0/0/0		GWT10.4.2008
100.0				97	6	52/16/0/0		GWT3.6.2008
98.0	8.0							
	10.0			99	3	90/68/42/0		
96.0	12.0			98	4	75/48/0/0 75x2-3x0,66-1 9-12x1x2,5 Q=3,3-10		
	14.0			92	5	66/0/0/0		K1/K2
94.0	16.0		Sediment Core loss	0	N/A	0/0/0/0		
			Hyaloclastite Pillow lava breccia Small grained, well cemented. Dark grey with white secondary mineral. ~10% (<3 mm) vesicles and vugs filled with white secondary minerals.	100	3	88/59/27/0	400	
92.0	18.0			100	5	85/25/0/0 85x2-3x1 9-12x2-4x2,5 Q=1,4-6		
	20.0		Joint with some thin red coating.					
90.0	22.0			97	4	85/25/0/0		
			Joint with thin red and greenish clay coatings.					
88.0	24.0			100	4	76/31/19/0		K2/K3

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-65

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
	26.0							
86.0								
	28.0		Joints with orange and greenish clay fillings, up to 10 mm thick.	69	6	8/0/0/0		
				100	2	100/83/40/0		
84.0	30.0			82	4	54/20/0/0 54x2-3x1 9-12x2-4x1 Q=2-9		
	32.0			100	3	91/91/0/0		
82.0								
	34.0			100	4	94/53/0/0		K3/K4
80.0								
	36.0			100	3	100/67/22/0		
78.0	38.0							
				100	2	81/59/59/0		
	40.0							
76.0								
	42.0		Basaltic dyke intrusion, well cemented contact	100	6	56/0/0/0		
			Hyaloclastite cont.	100	2	78/0/0/0		
				99	3	88/70/45/0		
74.0	44.0		Joint filled 3-5 mm thick clay.					
				100	3	98/57/0/0		
	46.0		Three joints with brown and green clay fillings, up to 20 mm thick.					
72.0								
	48.0							
				98	2	98/87/56/0		
70.0	50.0							K5/K6
				98	2	98/73/52/0		
	52.0							
68.0								
	54.0			93	3	66/52/25/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

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ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
66.0	56.0		Few dark tuff zones 5-15 cm thick.					
				93	4	82/44/17/0		
64.0	58.0							
	60.0			100	3	98/46/0/0 98x2-3x1 9-12x2-4x1 Q=4-16		
62.0								K6/K7
	62.0			97	4	90/52/17/0		
60.0	64.0							
	66.0			97	6	56/0/0/0		
58.0								
	68.0		Joint with black clay/silt coating.					
56.0				89	6	69/28/0/0		
	70.0		Thin zones of dark green tuff, 5-10 cm thick.					
54.0	72.0			80	5	45/17/17/0 45x2-3x1 9-12x2-4x1 Q=2-7,5		K7/K8
	74.0							
52.0				81	5	51/0/0/0		
	76.0							
			Fractured core					
50.0	78.0		Basaltic dyke. Well cemented contacts. Fresh gray, fine grained, negligible vesicles. Joints are smooth and planar, coated to filled with white secondary minerals, 1-2 mm thick.	100	2	100/0/0/0		
				73	5	52/40/0/0 52x1-2x1 9-12x2x1 Q=2,2-6		
	80.0			100	9	38/0/0/0		
48.0								
				100	2	87/58/58/0		
	82.0		Hyaloclastite cont.	98	6	71/33/0/0		
46.0								
	84.0			95	4	91/33/0/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

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ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
44.0	86.0							
				100	5	85/32/22/0		
42.0	88.0							
	90.0							
40.0								
38.0								
36.0								
34.0								
32.0								
30.0								
28.0								
26.0								
24.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-66

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 05.11.2007 COMPLETED: 06.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444261.776 Y: 393280.172 Z: 104.149	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	85 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	104.424 m a.s.l.
DEPTH OF HOLE:	15.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	99.88 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
104.0			Topsoil Scoria and aeolian sand. Percussion drilling and casing 3 m.	0	N/A	0/0/0/0		
102.0	2.0		Porphyritic basalt Þjórsá lava Fresh gray, fine grained, microporous. Scattered vesicles, empty vesicles. Faint flow banding. ~3% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, some coated with thin brown silt/clay, rough and undulating.	92	1	92/53/0/0		
100.0	4.0			100	7	73/11/0/0 73x2-3x1 9-12x2-3x2,5 Q=1,6-5		GWT12.12.2007
98.0	6.0							
			Vesicular basalt, ~10-15% vesicles, empty. Microporous.	100	8	54/41/0/0		GWT10.4.2008
96.0	8.0							GWT3.6.2008
94.0	10.0		Loose sediment No core recovery.	0	N/A	0/0/0/0		
				0	N/A	0/0/0/0		
92.0	12.0		Hyaloclastite/Móberg Pillow lava breccia 10% small vesicles and vugs halffilled - filled with white secondary minerals and green clay. Joints are rough and undulating, coated-filled with white secondary minerals and green-brown clay up to 5 mm thick. Well cemented basalt fragments in gray and brownish gray glassy breccia.	100	9	29/0/0/0		
90.0	14.0			100	5	71/13/0/0 71x2-3x1 9-12x2-4x1 Q=3-12		K1/K2
88.0								
86.0								
84.0								
82.0								
80.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-67

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 06.11.2007 COMPLETED: 07.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444449.126 Y: 393449.554 Z: 106.515	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	3
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	85 %
CASING LENGTH:	9 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	106.848 m a.s.l.
DEPTH OF HOLE:	30.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	100.95 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
106.0			Soil and scoria. Percussion drilling 9 m.	0	N/A	0/0/0/0		
	2.0							
104.0								
	4.0							
102.0								
	6.0							GWT12.12.2007
100.0								
	8.0							GWT10.4.2008
98.0			Porphyritic basalt The Þjórsá lava Fresh gray, fine grained, microporous. Vesicular 3-7% down to 12,7 m, empty vesicles. ~3% plagioclase phenocrysts, scattered olivine phenocrysts. Joints empty, some coated with thin brown silt/clay, rough and undulating.					GWT3.6.2008
	10.0			85	6	57/42/0/0		
96.0				100	9	43/0/0/0 43x2-3x1 9-12x1x2,5 Q=4-8		
	12.0			100	9	23/0/0/0		
94.0			More massive ~7-10% plagioclase phenocrysts. Joints are rough and undulating, coated with reddish brown silt/clay and oxidation. Microporous basalt.	100	5	77/26/0/0		
	14.0							
92.0								
	16.0			100	1	95/85/85/85		
90.0								K1/K2
	18.0		2-5% plagioclase phenocrysts. Microporous, faint flow banding.					
88.0				100	3	80/71/58/34 80x2-3x0,66 9-12x1x2,5 Q=3,5-7		
	20.0							
86.0								
	22.0			100	2	100/100/100/0		
84.0								
	24.0		Loose sediment Brown and gray silt and soil and basalt pebbles.	18	N/A	0/0/0/0		
82.0					N/A	0/0/0/0		K2/K3

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-67

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
80.0	26.0			16				
			Hyaloclastite/Móberg Pillow lava breccia. Crushed at top.	100 90	N/A 5	0/0/0/0 57/0/0/0		
78.0	28.0		Dark gray, well cemented basalt fragments in glassy breccia. Vesicles and vugs are filled with white and clear secondary minerals and dark clay. Joints are rough and undulating, coated with clay.	100	3	97/75/28/0 97x2-3x1 9-12x2-4x1 Q=4-16		
76.0	30.0							
74.0								
72.0								
70.0								
68.0								
66.0								
64.0								
62.0								
60.0								
58.0								
56.0								
54.0								
52.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-68

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 04.11.2007 COMPLETED: 05.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Tailrace Tunnel	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444585.148 Y: 393593.798 Z: 106.068	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	64 %
CASING LENGTH:	6 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	106.461 m a.s.l.
DEPTH OF HOLE:	29.44 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	101.65 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
104.0	2.0		Scoria and aeolian sand Percussion drilling 6 m.	0	N/A	0/0/0/0		
102.0	4.0							GWT12.12.2007
100.0	6.0		Fragments of scoria, high core loss.	79	N/A	0/0/0/0		
				27	N/A	0/0/0/0		
98.0	8.0		Porphyritic basalt The Þjórsá lava Fresh gray, fine grained, microporous. Vesicular down to 12,8 m, empty vesicles, decreasing downwards. ~5% plagioclase phenocrysts, scattered olivine phenocrysts.	97	5	87/23/0/0		
96.0	10.0		Joints empty, some coated with thin brown silt/clay, rough and undulating.	100	9	55/20/0/0 55x2-3x0,66-1 9-12x1x2,5 Q=2,4-7,3		
94.0	12.0		More massive, 10% plagioclase phenocrysts, faint flow banding. Scattered vesicles.	100	3	89/66/53/34 89x2-3x0,66-1 9-12x1x2,5 Q=4-12		
92.0	14.0							
90.0	16.0		3% plagioclase phenocrysts. Scattered vesicles.	99	2	93/79/55/0		K1/K2
88.0	18.0							
			Core broken by drilling. Core dropped down from core barrel in the hole.	100	N/A Core broken by drilling	N/A/N/A/N/A/N/A		
86.0	20.0		Loose sediment Few basalt pebbles come up.	0	N/A	0/0/0/0		
84.0	22.0			0	N/A	0/0/0/0		
82.0	24.0				N/A	0/0/0/0		

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BOREHOLE LOG
CORE DRILLING

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ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
80.0	26.0			3				
			Hyaloclastite/Móberg Pillow lava breccia Vesicular basaltic fragments cemented in breccia. Vesicles filled with green clay and white secondary minerals. Joints filled with secondary minerals and clay.	71 100	11 9	0/0/0/0 52/0/0/0 52x2-3x1 12-15x2-4x1 Q=1,7-6,5		
78.0	28.0							
76.0								
74.0								
72.0								
70.0								
68.0								
66.0								
64.0								
62.0								
60.0								
58.0								
56.0								
54.0								
52.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-69

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 16.11.2007 COMPLETED: 17.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Intake	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444857.67 Y: 394292.32 Z: 112.76	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	4
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	97 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	112.94 m a.s.l.
DEPTH OF HOLE:	33.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	104.01 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
112.0			Topsoil Percussion drilling and casing 3 m.	0		0/0/0/0		
	2.0							
110.0			Porphyritic basalt Þjórsá lava Gray, fine grained. 7% plagioclase phenocrysts, 3-7 mm in diameter. 20% vesicles, empty, 5-15 mm in diameter.	47	4	25/0/0/0		
	4.0			99	5	77/52/18/0		
108.0			3% plagioclase phenocrysts, 15% vesicles, empty or partly coated. Microporous.					
	6.0			97	8	44/10/0/0		
106.0								
	8.0		7-10% plagioclase phenocrysts 3-10 mm. Vesicular (10%, decreases with depth), empty, 2-12 mm. Scattered olivine crystals. Joints are irregular (inclined, vertical and horizontal), joints are rough and undulating, empty or coated with brown silt/clay or oxidation.		8	44/10/0/0 44x2-3x1 9-12x1x2,5 Q=2-6		
104.0								GWT19.11.2007
								GWT15.1.2008 GWT29.11.2007
	10.0			94	4	54/41/0/0		
102.0								
	12.0							GWT3.6.2008 GWT10.4.2008
100.0				99	3	95/51/28/0		K1/K2
	14.0							
98.0			Scattered vesicles 3-15 mm 10% plagioclase phenocrysts. Massive and microporous basalt.					
	16.0			100	3	73/54/0/0		
96.0								
	18.0							
94.0			15% plagioclase phenocrysts. 1% olivine phenocrysts. Microporous, almost no vesicles. Massive basalt.	99	2	93/73/73/73 93x2-3x1 9-12x1x2,5 Q=4-12		
	20.0							
92.0								
	22.0			99	2	87/59/23/0		K2/K3
90.0								
	24.0							
88.0					2	75/59/23/0		

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BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-69

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
86.0	26.0			99				
84.0	28.0		Decrease in phenocrysts. ~5% plagioclase, scattered olivine. Scattered vesicules 1-2 mm	99	3	84/61/36/0 84x2-3x0,66 9-12x1x2,5 Q=3,7-7		
82.0	30.0			100	3	84/61/36/0		K3/K4
80.0	32.0		Scoria Vesicular scoriaceous basalt. ~20% vesicles.					
78.0								
76.0								
74.0								
72.0								
70.0								
68.0								
66.0								
64.0								
62.0								
60.0								
58.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-70

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 15.11.2007 COMPLETED: 16.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Intake	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444880.51 Y: 394327.81 Z: 112.4	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	4
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	85 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	112.6 m a.s.l.
DEPTH OF HOLE:	42.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	103.76 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
112.0			Soil Brown topsoil. Percussion drilling 3 m	0	N/A	0/0/0/0		
110.0	2.0							
	4.0		Scoria, porphyritic basalt. Þjórsá lava. High core loss, probably cave in the rock.	0	N/A	0/0/0/0		
108.0			Porphyritic basalt, solid. Scoriaceous at top 0,4 m. Fresh gray, vesicular basalt, 10%, 3-20 mm vesicles, empty. 1-3% plagioclase phenocrysts. Joints rough and undulating, empty or coated with thin brown silt/clay.	100	7	75/0/0/0		
106.0	6.0			100	8	46/10/0/0		
104.0	8.0		Smaller vesicles 2-5 mm. 5% plagioclase phenocrysts. Microporous massive basalt. Joints are empty or coated with discontinuous light brown silt/clay.					GWT19.11.2007
102.0	10.0			91	5	72/22/0/0 72x2-3x1 9-12x1x2,5 Q=5-10		GWT10.4.2008
100.0	12.0			100	4	81/21/0/0		GWT3.6.2008 K1/K2
98.0	14.0							
96.0	16.0		Scattered vesicles.	97	5	74/27/0/0		
94.0	18.0		Vertical joint splits the core. 10% plagioclase phenocrysts.	100	2	74/60/60/38 74x2-3x0,66-1 9-12x1x2,5 Q=3,2-10		
92.0	20.0							
90.0	22.0			100	2	96/87/35/0		K2/K3
88.0	24.0				5	77/53/53/0		

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BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

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ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
86.0	26.0		1-3% plagioclase phenocrysts. 1% small vesicles, faintly microporous.	100				
84.0	28.0			90	3	69/52/41/0		
82.0	30.0			100	1	100/97/97/97 100x2-3x0,66 9-12x1x2,5 Q=4,4-9		K3/K4
80.0	32.0							
78.0	34.0		Sediment Loose gravel, basalt pebbles come up.	19	N/A	0/0/0/0		
76.0	36.0			16	N/A	0/0/0/0		
74.0	38.0			17	N/A	0/0/0/0		
72.0	40.0		Hyaloclastite/Móberg Pillow lava breccia Well cemented greenish gray. Vugs and vesicles filled with green and brown clay and some white secondary minerals. Joints filled with clay and white secondary minerals, up to 10 mm thick fillings.	33 100	N/A 4	0/0/0/0 84/34/34/0 84x2-3x1 9-12x2-4x1 Q=3,5-14		
70.0	42.0							
68.0								
66.0								
64.0								
62.0								
60.0								
58.0								

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BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-71

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 23.11.2007 COMPLETED: 26.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445248.637 Y: 394684.623 Z: 115.98	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	4
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	97 %
CASING LENGTH:	6.5 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	116.207 m a.s.l.
DEPTH OF HOLE:	39.72 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	105.08 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
			Topsoil Percussion drilling 6,5 m.	0	N/A	0/0/0/0		
114.0	2.0							
112.0	4.0							
110.0	6.0		Scoria-Scoriaceous basalt					
			Porphyritic basalt The Þjórsá lava Fine grained. Core has a reddish oxidation colour. 3% plagioclase phenocrysts (2-5 mm). 10-20% vesicles (2-20 mm), vesicles have very thin oxidized coatings. Joints are rough and undulating, empty or with thin silt/clay coatings.	100	9	45/11/0/0 45x2-3x1 9-12x1x2,5 Q=3-6		
108.0	8.0							
106.0	10.0		Gray basalt. Decreased vesicles. 7-10% plagioclase phenocrysts (1-10mm) and scattered olivine phenocrysts.	99	4	82/28/17/0	150	GWT27.11.2007
104.0	12.0							GWT10.4.2008
				100	4	98/42/20/0 98x2-3x1 9-12x1x2,5 Q=7-13		GWT3.6.2008
102.0	14.0							K1/K2
100.0	16.0		Core is dense, microporous. Scattered vesicles (<5 mm). Core has a pale gray colour. Joints are undulating and rough, empty or with very thin silt/clay coatings.	100	6	62/32/32/32		
98.0	18.0			98	3	76/76/37/0		
96.0	20.0							
94.0	22.0			98	4	76/43/21/0 76x2-3x0,66 9-12x1x2,5 Q=3-7	100	
92.0	24.0		15-20% plagioclase phenocrysts (1-10 mm), 1-1,5% olivine phenocrysts (<3 mm). Joints are rough and undulating, empty.		5	73/49/23/0		K2/K3

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BOREHOLE LOG
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ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
90.0	26.0			100				
88.0	28.0		3-5% plagioclase phenocrysts, scattered olivine phenocrysts. Microporous, scattered micropore flow banding. Scattered small vesicles. Joints are rough and undulating.	100	8	67/17/17/0		
86.0	30.0			98	4	67/57/33/0		
84.0	32.0						100	K3/K4
82.0	34.0			100	4	54/31/0/0 54x2-3x0,66 9-12x1x2,5 Q=2,4-5		
80.0	36.0			100	4	48/21/0/0		
78.0	38.0		Increased vesicles last 0,4 m. Vesicles are mostly empty.					
76.0			Sediment Loose gravel.	9	N/A	0/0/0/0		
74.0								
72.0								
70.0								
68.0								
66.0								
64.0								
62.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-72

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 20.12.2007 COMPLETED: 20.12.1970
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 446118.932 Y: 395071.402 Z: 118.035	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	3
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	93 %
CASING LENGTH:	12 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	118.035 m a.s.l.
DEPTH OF HOLE:	39.8 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	106.88 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
			Topsoil Loose soil, percussion drilling 12 m.	0	N/A	0/0/0/0		
116.0	2.0							
114.0	4.0							
112.0	6.0							
			Scoria, porphyritic basalt. Þjórsá lava No core recovery. Percussion drilling.					
110.0	8.0							
108.0	10.0							
								GWT20.12.2007
106.0	12.0		Porphyritic basalt, solid. Fresh gray, fine grained. Scattered empty vesicles. 5% plagioclase phenocrysts. Highly jointed and sometimes crushed core. Joints are rough and undulating, empty or with thin brown silt/clay coating.	55	4	13/0/0/0		GWT10.4.2008 GWT3.6.2008
				90	N/A	37/11/0/0		
104.0	14.0							
102.0	16.0			77	N/A	0/0/0/0		
				96	N/A	20/0/0/0		
				92	12	14/0/0/0		
				94	14	11/0/0/0 11x2-3x1 9-12x1x2,5 Q=0,7-1,5	170	
100.0	18.0			89	7	41/0/0/0		
98.0	20.0			100	9	38/0/0/0		
			More massive basalt.	100	10	100/100/0/0		
96.0	22.0			100	6	75/14/0/0 75x2-3x0,66 9-12x1x2,5 Q=3,3-7		K1/K2
94.0	24.0			100	5	86/61/39/0	125	

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BOREHOLE LOG
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ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
92.0	26.0		7-10% plagioclase phenocrysts.					
				100	8	87/0/0/0		
90.0	28.0		Increasing joints, less massive basalt.					
				100	6	37/0/0/0		
88.0	30.0			100	4	61/10/0/0		K2/K3
86.0	32.0						125	
84.0	34.0		More massive basalt, 5% plagioclase phenocrysts. Scattered vesicles.	100	3	87/34/22/0 87x2-3x0,66 / 9-12x1x2,5 Q=3,7-7		
82.0	36.0							
				100	3	60/40/27/0		
80.0	38.0							
			Sediment Loose sediment, no core recovery	0	N/A	0/0/0/0		
78.0								
76.0								
74.0								
72.0								
70.0								
68.0								
66.0								
64.0								

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BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-73

SHEET 1 OF 3 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 16.12.2007 COMPLETED: 19.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Quarry area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 445050.5 Y: 393939.42 Z: 106.93	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	6
HOLE INCLINATION:	[ ] VERTICAL [X] INCLINED -45.8 INCLINATION	CORE RECOVERY:	90 %
CASING LENGTH:	15 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	107.19 m a.s.l.
DEPTH OF HOLE:	69.53 m DRILLING DIRECTION 107°	GROUNDWATER ELEVATION:	101.27 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
106.0	2.0		Soil Brown topsoil. Percussion drilling 15 m.	0	N/A	0/0/0/0		
104.0	4.0							
	6.0		Topsoil and fragments of scoria Scoriaceous porphyritic basalt Þjórsá lava. Percussion drilling.					
102.0	8.0							GWT10.4.2008
100.0	10.0							GWT3.6.2008
	12.0		Porphyritic basalt, solid.					
98.0	14.0							
96.0			Fine grained, fresh gray. ~5% plagioclase phenocrysts (1-10mm). ~1% Olivine phenocrysts. Scattered vesicles. Microporous, faint flow banding. Joints are rough and undulating with thin pale brown silt/clay coatings.	55	4	28/0/0/0		
	16.0			100	2	82/67/0/0 82x2-3x1 9-12x1x2,5 Q=5,5-11		
94.0	18.0			95	3	82/29/0/0		
	20.0							
92.0			~10-20% vesicles at bottom 0,7 m.	100	4	45/0/0/0		
	22.0		Core loss in loose sediment.	0				
90.0	24.0		Sandstone. Fine-medium grained, well cemented. Dark grey colour. Joints are planar-undulating, rather rough and have oxidation coatings and gray clay-silt fillings 1-3 mm.	100	9	100/30/0/0		
				99	5	84/47/0/0		

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BOREHOLE NO.:

NK-73

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
						84x1-2x1 9x2-4x1 Q=2,3-9		
	26.0							$UCS_{apparent}$ 11 MPa
88.0								K1/K2
			Joint with brown alteration around joint walls, 10 mm each side.					
				83	9	28/0/0/0 28x1-2x1 9x2-4x1 Q=0,8-3		
	28.0							
86.0			Few joints with altered joint walls, brown alteration, up to 10 cm thick but mostly 1-2 cm. Breaks during drilling.					
	30.0							
				74	6	43/17/17/0		
			Conglomerate. Stones are 2-60 cm, high proportion of boulders and pebbles in sandy groundmass.					
84.0	32.0							
			Hyaloclastite. Pillow lava breccia	100	7	98/16/0/0 98x1-3x1 12x3-4x1 Q=2-8		
	34.0		Basaltic dyke					
82.0			Pillow lava breccia Altered hyaloclastite. Dark gray colour with some slightly green spots . Vesicles and vugs 15-25% are halffilled to filled with white secondary minerals. Joints are rough, often with red, green or white thin clay coatings (<2mm). Several healed white veins. Joint with 2 mm gray clay coating Joint, green and reddish clay coatings.					
	36.0			99	3	96/42/0/0		K2/K3
80.0								
	38.0		Basaltic dyke Fresh gray, fine grained, scattered vesicles. Joints are rough and undulating, with clay coatings.	99	6	84/21/0/0		
				100	6	0/0/0/0		
	40.0		Pillow lava breccia	100	0	100/0/0/0		
78.0			Basaltic dyke 5% small vesicles.	100	8	66/0/0/0		
			Pillow lava breccia Dark gray, glassy breccia, altered. Vugs and vesicles filled with white secondary minerals. Jointed rock, net of healed white veins with 1 mm thick fillings.	66	4	29/0/0/0 29x1-3x1 9-12x3-4x1 Q=0,6-2,4		
	42.0			99	6	76/27/0/0		
76.0			Joints are rough and undulating with up to 20 mm thick clay and white secondary mineral fillings.	69	6	31/0/0/0		
	44.0		Broken core and joint with reddish clay coatings. Core loss					
				96	3	81/39/0/0 81x1-3x1 12x3-4x1 Q=1,7-7		
74.0	46.0							K3/K4
	48.0			98	5	67/20/20/0		
72.0			Joint, rough and undulating. Core has a red oxidation and greenish coloured 20 mm filling. Joint					
	50.0		Slickensided, smooth red clay surface. Joint width is ~1-2 mm. Basaltic dyke					
			Pillow lava breccia	100	3	87/87/87/0		
70.0			Basaltic dyke					
			Pillow lava breccia Several joints with clay and white secondary mineral fillings 2-10 mm thick, some red alteration.	100	5	79/13/0/0		
	52.0							
	54.0			91	4	61/20/20/0		
68.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-73

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
66.0	56.0							K4/K5
			Joint, thin red and greenish clay filling. Red and crushed core next 10 cm. Tectonic Fracture.	100	5	84/27/18/0		
64.0	58.0							
	60.0			100	3	67/16/0/0		
62.0	62.0			100	9	100/42/0/0		
				99	5	68/34/0/0 68x1-3x1 12x3-4x5 Q=0,3-1,2		
60.0	64.0		Some joints due to tectonic activity. Joint and crushed core with red and greenish clay fillings.					
	66.0			97	4	73/28/0/0		K5/K6
58.0	68.0							
56.0								
54.0								
52.0								
50.0								
48.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-74

SHEET 1 OF 4 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 03.01.2008 COMPLETED: 14.01.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Quarry area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 445174.31 Y: 393973.55 Z: 124.67	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	7
HOLE INCLINATION:	[ ] VERTICAL [X] INCLINED -45.8 INCLINATION	CORE RECOVERY:	85 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	125.48 m a.s.l.
DEPTH OF HOLE:	90.09 m DRILLING DIRECTION 117°	GROUNDWATER ELEVATION:	124.48 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
124.0			Loose soil and sand, and fragments of scoria	0	N/A	0/0/0/0		GWT15.1.2008
	2.0		Scoria					
			Porphyritic basalt Dark gray. ~1% small vesicules filled with black clay. Fine-medium grained, microporous and flowbanded. Higly Jointed. Joints are rough planar or undulating, coated with brown clay.	83	17	0/0/0/0		
122.0	4.0			69	12	0/0/0/0 10x2-3x1 12-15x2-4x2,5 Q=0,1-0,5		
				25	8	0/0/0/0		
				99	16	29/0/0/0		**R** POLARITY
	6.0		Basaltic dyke Dark gray. Healed white veins and joints with white zeolites.	92	10	14/0/0/0		
120.0				100	6	65/0/0/0		
			Porphyritic basalt Same as above.	72	12	9/0/0/0		
	8.0			86	12	80/0/0/0 80x2-3x1 12x2-4x2,5 Q=1,3-10		
118.0			Basaltic dyke. Gray, fine-medium grained. Microporous. Scattered small vesicles. Joints rough and undulating, some planar, coated with thin brown clay (oxidation) or empty. Some healed white veins.	95	7	68/22/0/0 68x2-3x1 12x2-4x2,5 Q=1,1-3,4		
	10.0							**R** POLARITY
116.0	12.0			100	7	66/35/0/0		
								K1/K2
	14.0							**R** POLARITY
114.0				100	0	100/100/0/0		
			Porphyritic basalt	100	2	91/0/0/0		
			Basaltic dyke					
	16.0		Porphyritic basalt. Gray colour. Vesicles ~10% half filled with white zeolites. Joints are rough and undulating coated with black clay.	100	5	84/45/18/0		
			Sandstone, Brown colour joint filling .					
112.0			Porphyritic basalt					
	18.0		Basaltic dyke, dark gray colour.					
			Porphyritic basalt. Gray colour. Fine grained. 5-10% vesicles, half filled whith white zeolites. Joints are rough and undulating, coated with clay.	93	7	62/23/0/0 62x2-3x1 12x2-4x2,5 Q=1-3		**R** POLARITY
	20.0			100	5	92/35/35/0 92x2-3x1 9-12x2-4x2,5 Q=1,5-5		
110.0								
	22.0			100	5	82/37/0/0		
								K2/K3
108.0			Sandstone. Fine grained, grayish brown colour.	85	9	22/0/0/0		
	24.0		Porphyritic basalt. Same as above. Gray colour. Fine grained. 5-10% vesicles, half filled whith white zeolites.	100	0	0/0/0/0		
				98	6	71/32/32/0 71x2-3x1 9-12x2-4x2,5		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-74

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
			Joints with sand fillings up to 4 cm thick.			Q=1,2-3,6		
106.0	26.0		Basaltic dyke. Dark gray, fine grained. Microporous with zeolites.	100	7	64/0/0/0		
				100	7	41/0/0/0		
			Porphyritic basalt. Same as above. Gray colour. Fine grained. 5-10% vesicles, half filled whith white zeolites. Joints are rough and undulating, coated with clay.	100	5	77/28/0/0		**R** POLARITY
	28.0			94	6	73/0/0/0		
104.0			Sandstone Joint filling. Green, medium grained. Scattered pebbles. Well consolidated. Breaks during drilling. Joints are rough and undulating, coated with clay and white secondary minerals.					
	30.0			93	3	80/47/36/36 80x1-2x1 9x2-4x1 Q=2,2-9		
102.0	32.0							K3/K4
	34.0			82	7	27/27/0/0 27x1-2x1 9x2-4x1 Q=0,8-3		
100.0								
			Scoria. Scoriaceous basalt. Gray colour. Fine grained, vesicular and dark scoria. Breaks during drilling.	100	0	100/0/0/0		
	36.0			97	7	66/0/0/0		
				98	5	78/23/0/0 78x2-3x1 12x2-3x1 Q=4,3-10		
98.0	38.0							
			Tholeiite / Basalt andesite Very fine grained. Gray colour, scattered vesicles microporous healed white veins. Joints are smooth and undulating, some are rough with clay coatings. Sharp contact	100	8	47/0/0/0 47x1-3x1 12x2-4x1 Q=1-4		
				94	8	62/0/0/0		
96.0	40.0		Thick green clay filling ~3 cm	71	11	0/0/0/0		
			Scoria Reddish gray. Broken.	100	10	63/0/0/0		
			Tholeiite basalt/ Basalt andesite Gray, very fine grained. scattered vesicles filled with zeolites at top. Flow banded. High core loss, probably scoria zone. Joints are smooth - rough, undulating, coated with dark clay.	21	4	0/0/0/0 10x1-3x1 12x3-4x1 Q=0,2-0,8		
94.0	42.0			98	8	38/25/0/0		K4/K5
	44.0			87	12	18/0/0/0		
				92	11	28/0/0/0		**R** POLARITY
92.0	46.0			84	8	48/26/0/0		
				73	9	32/0/0/0		
	48.0			74	9	19/0/0/0		
90.0				93	8	53/0/0/0 53x1-3x1 12x2-4x1 Q=1-4,4		**R** POLARITY
	50.0							
			Basaltic dyke. Dark gray colour.	100	19	0/0/0/0		
88.0			Tholeiite basalt / Basalt andesite Same as above.	100	15	31/0/0/0		
	52.0		Gray, very fine grained. scattered vesicles filled with zeolites at top. Flow banded. High core loss, probably scoria zone. Joints are smooth - rough, undulating, coated with dark clay.	34	5	14/0/0/0 14x1-3x1 12x2-4x1 Q=0,3-1,7		K5/K6
			Basaltic dyke. High core loss	93	12	60/0/0/0		
86.0	54.0		Basaltic dyke. 10% small vesicles	80	0	0/0/0/0		
			Tholeiite basalt / Basalt andesite	39	5	0/0/0/0		

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BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-74

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
			Gray, very fine grained. scattered vesicles filled with zeolites at top. Flow banded. High core loss, probably scoria zone. Joints are smooth - rough, undulating, some planar, coated with black clay.					
				96	15	11/0/0/0		
	56.0			81	12	40/0/0/0		
84.0				94	8	61/0/0/0 61x1-3x1 12x3-4x1 Q=1,3-5		**R** POLARITY
	58.0			98	6	51/0/0/0		
82.0								
	60.0			92	7	30/0/0/0		
	62.0			100	7	93/0/0/0		**R** POLARITY
80.0				94	6	67/15/0/0		K6/K7
	64.0							
78.0				63	13	0/0/0/0		
	66.0			100	11	21/0/0/0		
				60	8	0/0/0/0 10x1-3x1 12x3-4x1 Q=0,2-0,8		
				100	57	0/0/0/0		
76.0	68.0			88	6	54/29/0/0 54x1-3x1 9-12x3-4x1 Q=1,1-4,5		
				84	8	35/0/0/0		
	70.0			100	10	39/0/0/0		
74.0				83	11	19/0/0/0		
	72.0		Vertical joint with black clay coating.	62	4	31/0/0/0		
			Basaltic dyke.	100	14	0/0/0/0		
			Tholeiite basalt / Basalt andesite Faint flow banding, microporous.	94	11	0/0/0/0		
72.0				59	6	26/0/0/0		K7/K8
	74.0			68	8	0/0/0/0		
				100	100	0/0/0/0		
				65	7	0/0/0/0		
				100	7	86/0/0/0		
	76.0			99	9	22/0/0/0 22x1-3x1 12x3-4x1 Q=0,5-2		
70.0				76	12	20/0/0/0		
	78.0			100	10	0/0/0/0		
			Coreloss	0	N/A	0/0/0/0		
68.0								
	80.0							
			Scoria Fine grained. Well cemented, scatterded vesicles ~1%. Reddish colour. 5-10% white secondary minerals. Some vesicles are partly full or full of secondary minerals. Scattered healed white veins. Vugs are filled with red sandstone up to 50% of the core.	100	11	68/0/0/0		
				100	4	90/62/62/0		
66.0	82.0			90	6	55/10/0/0 55x2-3x1 12x2-3x1 Q=3-7		
	84.0							K8/K9
64.0			Less sedimentary fillings, gray with greenish and	42	4	16/0/0/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

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ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
			yellowish clay minerals. Vesicles with white secondary minerals.					
	86.0		Core loss, possible fault breccia.					
62.0								
	88.0		Tholeiite basalt / Basalt andesite Fine grained. Dense. Gray colour. Joints are undulating or planar. Joints coated with white secondary minerals or green and black clay.	80 63	40 7	0/0/0/0 13/0/0/0		
			3 cm thick green and yellow clay. Possible coreloss below.	41	7	17/0/0/0 17x1-3x1 12x3-4x1 Q=0,4-1,4		
	90.0		6 cm broken core, but cemented back together with black clay mineral.					
60.0								
58.0								
56.0								
54.0								
52.0								
50.0								
48.0								
46.0								
44.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-75

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 15.01.2008 COMPLETED: 16.01.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Quarry area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 445172.39 Y: 393982.65 Z: 124.66	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	4
HOLE INCLINATION:	[ ] VERTICAL [X] INCLINED -45.1 INCLINATION	CORE RECOVERY:	95 %
CASING LENGTH:	6 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	39.16 m DRILLING DIRECTION 297°	GROUNDWATER ELEVATION:	

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
124.0			Topsoil Loose gravel and soil. Percussion drilling 6 m.	0	N/A	0/0/0/0		
	2.0							
122.0	4.0		Porphyritic basalt Dark gray. Brown alteration at bottom.					
	6.0			100	3	60/0/0/0		
120.0			Basaltic dyke Gray, medium grained, massive and microporous. Scattered vesicles, half filled with white secondary minerals. 7,23 m depth, 3 cm of porphyritic basalt. 9,1 m depth, joint with brown soil filling > 2 cm thick.	60	10	0/0/0/0		
	8.0			92	6	75/0/0/0 75x2-3x1 12x3-4x2,5 Q=1,3-2,5		
118.0				96	5	76/52/31/0		
	10.0		Basaltic dyke Dyke intrusion into the other dyke. Dark gray, several healed white veins.					
116.0	12.0			97	5	80/41/0/0 80x2-3x1 12x3-4x2,5 Q=1,3-3		
	14.0							
114.0			3 cm basaltic dyke	97	2	96/84/64/64		K1/K2
	16.0		Welded contact.					
112.0	18.0		Porphyritic basalt Dark gray, medium grained, microporous. Scattered vesicles, half filled with white secondary minerals and black shrinking clay. Faint flow banding. Joints are rough and undulating, coated with black clay. 5% plagioclase phenocrysts.	100	5	50/0/0/0		
				100	3	99/71/0/0		
				100	6	85/23/0/0 85x2-3x1 12x3-4x2,5 Q=1,4-3		
	20.0							
110.0				100	6	77/0/0/0		
	22.0		Sandstone Dark, medium to coarse grained. Well cemented, but breaks during drilling. Joints coated with clay and white secondary minerals.	99	11	14/0/0/0 14x1-2x1 9x2-4x2,5 Q=0,2-0,6		
108.0				100	9	96/0/0/0		
	24.0		Porphyritic basalt Fine grained, gray basalt. 5-10% vesicles filled with white secondary minerals and clay.	100	3	100/65/0/0 100x2-3x1 12x2-4x2,5 Q=1,7-5		K2/K3
				100	4	80/80/0/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

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ELEVATION (m a.s.l.)	DEPTH (m)	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
106.0	26.0	Joints are rough and undulating, coated with clay and white secondary minerals. Porpyritic basalt/Scoria Scoriaceous vesicular basalt, well compacted with vugs filled with green clay-silt and white secondary minerals.	100	4	81/49/0/0 81x2-3x1 12x2-3x2,5 Q=1,8-4		
104.0	28.0 30.0	Sandstone Greenish gray, medium grained, well compacted with scattered boulders. Joints are rather smooth and planar-undulating, coated to filled with clay and white secondary minerals.	100 87	0 4	100/100/0/0 69/34/22/0 69x1-2x1 9x2-4x1 Q=2-8		
102.0	32.0	Scoria Well compacted, reddish gray. Basaltic dyke Gray, fine grained, welded contacts. Microporous, scattered vesicles. White vein pattern of healed joints, joints rough and undulating, coated - filled with clay and white secondary minerals.	100 100 97	0 4 3	100/0/0/0 100/100/67/0 97/68/30/0		
100.0	34.0 36.0	Scoria Reddish gray weak scoria, breaks during drilling and handling. Vugs filled with green clay.	100 94 73	5 7 5	83/41/0/0 57/0/0/0 55/18/0/0 55x2-3x1 12-15x2-3x1 Q=2,4-7		K3/K4
98.0	38.0	Basaltic dyke Scoria Reddish gray, same as above the dyke.					
96.0							
94.0							
92.0							
90.0							
88.0							
86.0							

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-76

SHEET 1 OF 3 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 07.01.2008 COMPLETED: 13.01.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Quarry area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 444655.49 Y: 394408.2 Z: 109.59	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	7
HOLE INCLINATION:	[ ] VERTICAL [X] INCLINED -46 INCLINATION	CORE RECOVERY:	87 %
CASING LENGTH:	6 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	109.73 m a.s.l.
DEPTH OF HOLE:	72.8 m DRILLING DIRECTION 297°	GROUNDWATER ELEVATION:	102.40 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
			Topsoil Percussion drilling with 6 m casing.	0	N/A	0/0/0/0		
108.0	2.0							
	4.0		Scoria and topsoil					
			Porphyritic basalt, Þjórsá Lava. Fresh gray, fine grained. 2-5% vesicules, empty 2-20 mm. 1-3% plagioclas phenocrysts. Jointed, joints are rough, undulating and empty					
106.0	6.0			63	3	39/0/0/0		
				89	6	42/0/0/0 42x2-3x1 9-12x1x2,5 Q=2,8-5,6		
104.0	8.0			96	10	20/0/0/0		
	10.0			89	9	14/0/0/0 14x2-3x1 9-12x1x2,5 Q=0,9-2		GWT10.4.2008
102.0								GWT3.6.2008
	12.0		High core loss	21	16	0/0/0/0		
			5% small empty vesicules 2-7 mm. 5% Plagioclas phenocrysts. Microporous.	84	N/A	54/17/0/0		
100.0	14.0			69	4	24/0/0/0		
				97	2	50/12/0/0		
98.0	16.0							K1/K2
	18.0			92	5	46/0/0/0		
96.0								
	20.0		Scatterd vesicules, microporous.	100	9	69/0/0/0		
94.0								
	22.0			100	5	69/20/0/0 69x2-3x0,66 9-12x1x2,5 Q=3-6		
	24.0							
92.0				99	11	26/0/0/0		

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BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-76

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
								K2/K3
	26.0			100	5	83/0/0/0		
90.0				100	6	71/0/0/0		
	28.0							
88.0	30.0			100	6	65/10/0/0 65x2-3x0,66 9-12x1x2,5 Q=3-6		
	32.0		1-3% Plagioclas phenocrysts. Less microporous, scatterd small vesicles. Joints are rough and undulating, empty or coated with thin brown silt/clay or oxidation.					
86.0				100	11	30/0/0/0		
	34.0							
				100	7	54/0/0/0		K3/K4
84.0	36.0							
				95	3	81/63/25/0		
	38.0							
82.0								
				100	3	87/50/21/0 87x2-3x0,66 9-12x1x2,5 Q=4-8		
	40.0							
80.0								
	42.0		10% vesicules at bottom.					
				100	4	89/64/0/0		
78.0	44.0		Sediment. Gravel, rounded and subrounded basalt and rhyolite pebbles. High core loss	0	N/A	0/0/0/0		K4/K5
	46.0			10	N/A	0/0/0/0		
76.0								
	48.0							
				21	N/A	0/0/0/0		
74.0	50.0							
			Hyaloclastite Pillow lava breccia, grayish brown at top. Vesicules and rugs well filled with white and clear secondary minerals. Secondary minerals ~10-15%. Joints are rough and undulating, coated-filled with white secondary minerals and green clay. Scattered healed white veins. Well cemented rock.	98	12	22/0/0/0		
				80	10	22/0/0/0 22x2-3x1 9-12x2-4x1 Q=0,7-3,7		
72.0	52.0			100	5	76/21/0/0		
	54.0			100	6	70/21/0/0		

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-76

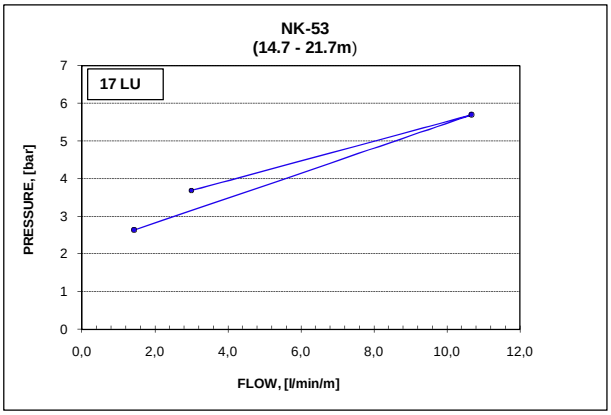
ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 10 100 3 30 300	COMMENTS
	56.0							
				99	7	69/16/0/0 69x2-3x1 9-12x2-4x1 Q=3-12		
68.0	58.0							
								K5/K6
	60.0							
66.0				90	6	60/45/45/0		
	62.0							
				100	3	95/44/44/0		
64.0								
	64.0		Basaltic dyke Gray, fine grained ~2% small vesicles and microporous. Vesicules filled with white secondary minerals.	100	0	100/0/0/0		
				100	4	89/68/30/0		
62.0	66.0		Hyaloclastite. Pillow lava breccia, same as above.	100	2	100/78/45/0		
				98	4	79/50/17/0 79x2-3x1 9-12x2-4x1 Q=3,3-13		
	68.0							K6/K7
60.0								
	70.0		3 cm green sandstone joint filling.	100	3	84/71/21/0		
58.0	72.0							
56.0								
54.0								
52.0								
50.0								

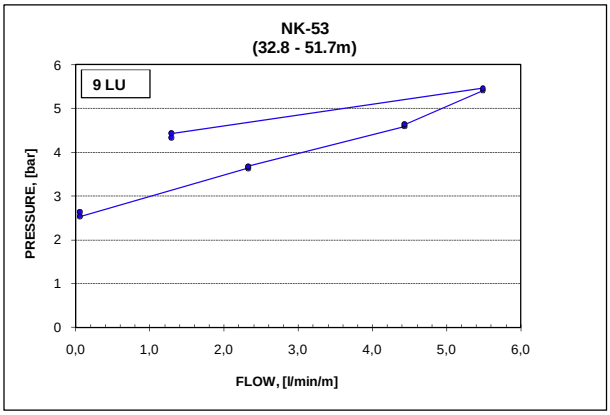
Appendix B

Permeability Tests

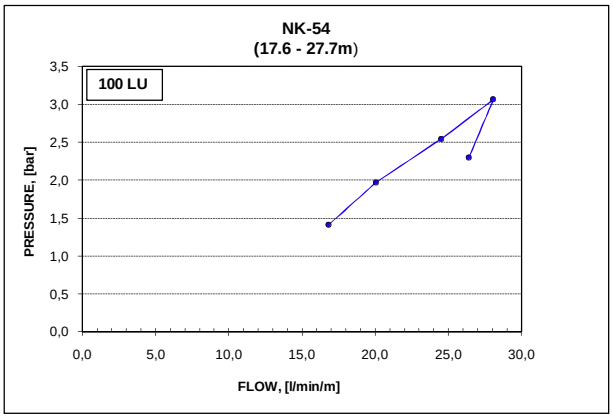
PACKER PERMEABILITY TEST

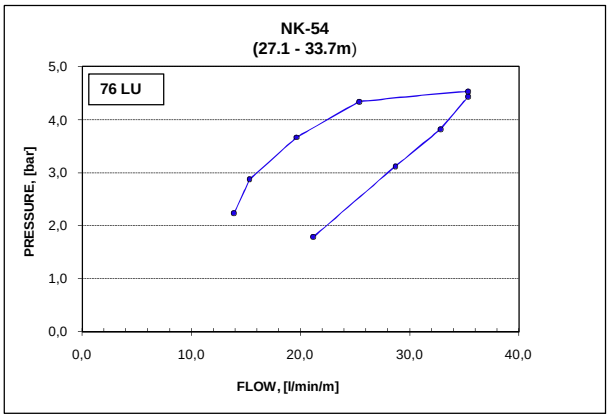
Borehole: NK-53



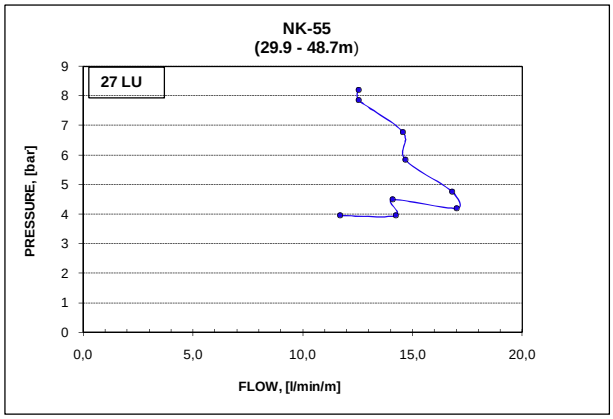


Borehole: NK-54

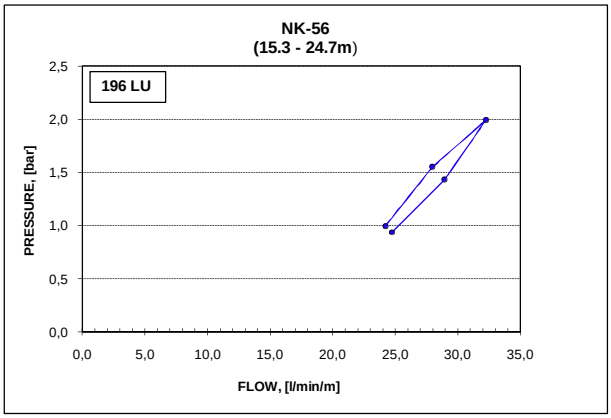




Borehole: NK-55

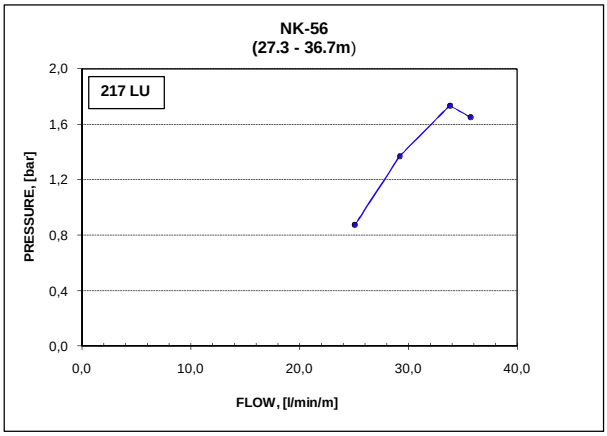


Borehole: NK-56

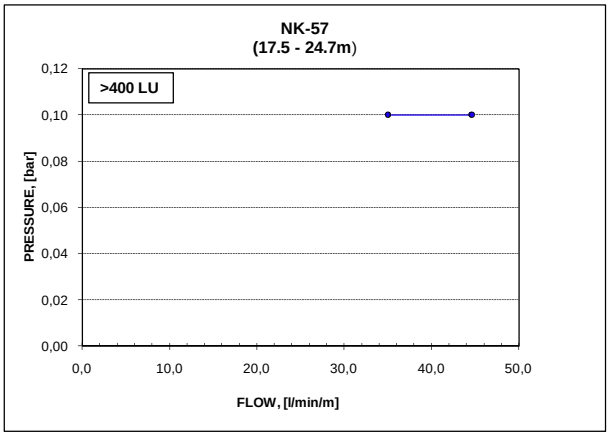


PACKER PERMEABILITY TEST

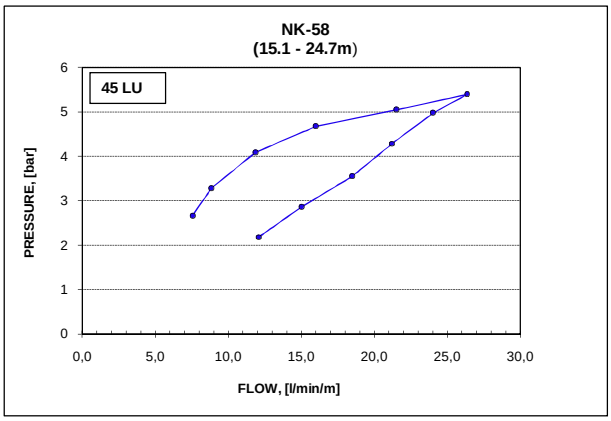
Borehole: NK-56



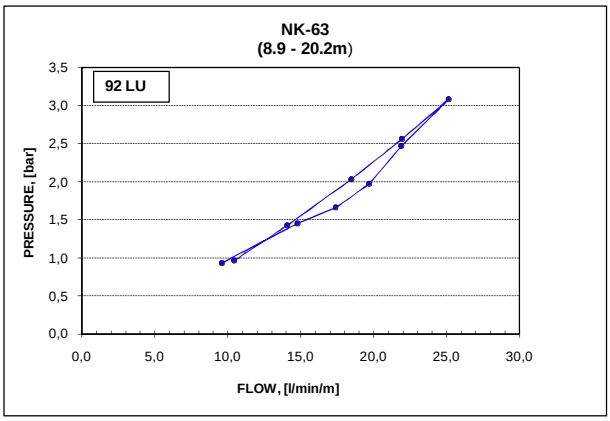
Borehole: NK-57



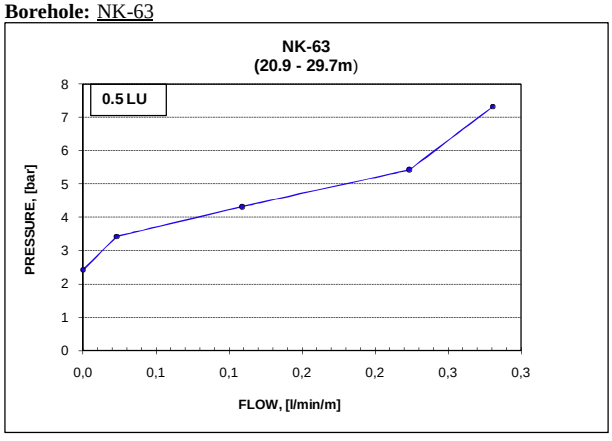
Borehole: NK-58

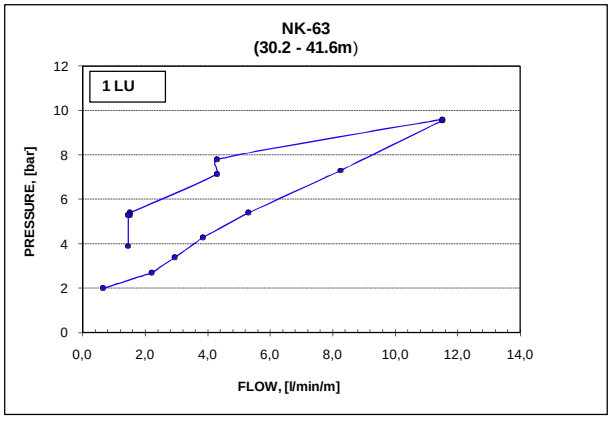


Borehole: NK-63



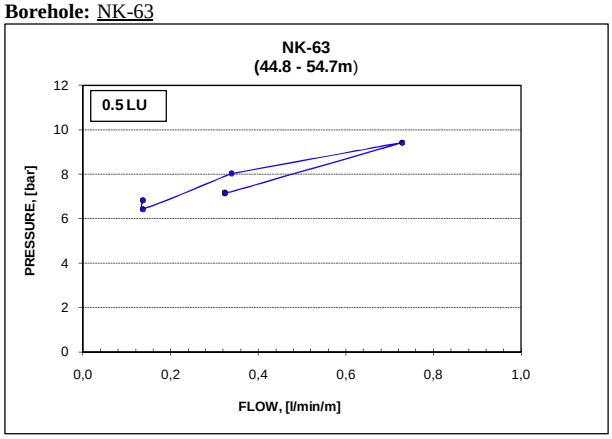
Borehole: NK-63



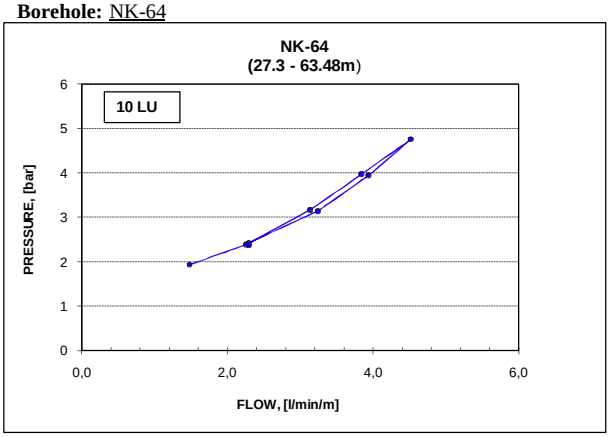


PACKER PERMEABILITY TEST

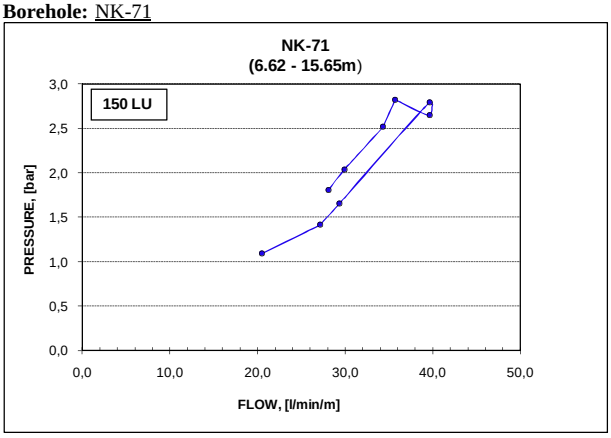
Borehole: NK-63

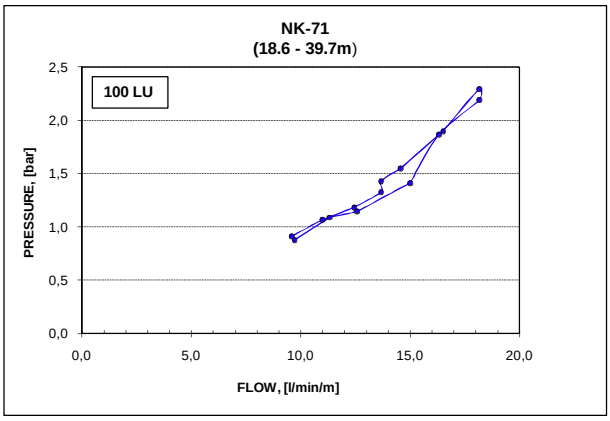


Borehole: NK-64

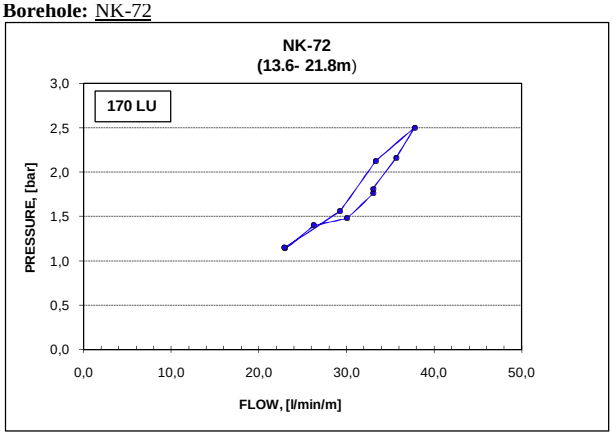


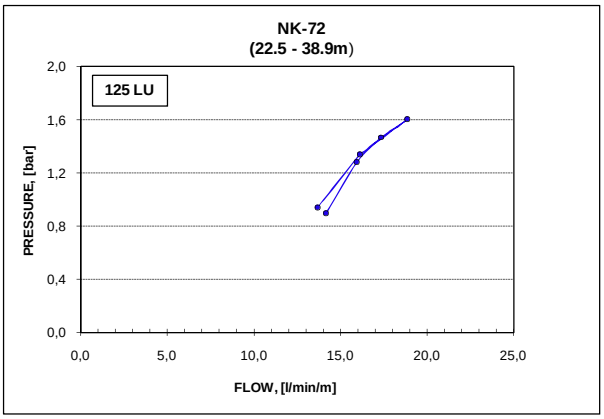
Borehole: NK-71





Borehole: NK-72





Appendix C

Rock Mass Classification

Borehole: **NK-28**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
From	To			RQD_{10}		Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
						Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
105,8	103,8		**Soil**																			
103,8	102,8		**Porphyritic basalt**																			
102,8	101,2		Þjórsá lava																			
101,2	90,1																					
90,1	87,0		**Sandstone**																			
87,0	76,9		**Hyaloclastite**																			
76,9	75,1		Tailrace tunnel/Power house	77		12	9	3	2	4	2	1	1	1	1	12,8	3,2	2,0	**6,4**	**1,6**	50	45
75,1	72,6			41		12	9	3	2	4	2	1	1	1	1	6,8	1,7	2,0	**3,4**	**0,9**	50	45
72,6	71,1			61		12	9	3	2	4	2	1	1	1	1	10,2	2,5	1,5	**6,8**	**1,7**	50	45
71,1	69,6			20		12	9	3	2	4	2	1	1	1	1	3,3	0,8	1,0	**3,3**	**0,8**	50	45
69,6	68,0			19		12	9	3	2	4	2	1	1	1	1	3,2	0,8	1,0	**3,2**	**0,8**	50	45
68,0	67,2			37		12	9	3	2	4	2	1	1	1	1	6,2	1,5	1,5	**4,1**	**1,0**	55	50
67,2	66,1			10	**	12	9	3	2	4	2	1	1	1	1	1,7	0,4	1,0	**1,7**	**0,4**	50	45
66,1	63,1			10	**	12	9	3	2	4	2	1	1	1	1	1,7	0,4	1,0	**1,7**	**0,4**	55	50
63,1	61,5			13		12	9	3	2	4	2	1	1	1	1	2,2	0,5	1,0	**2,2**	**0,5**	55	50
61,5	54,5																					
54,5	51,1		**Dyke**																			
51,1			Hole bottom																			

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-29**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
105,5	103,5		**Topsoil**																		
103,5	94,0		**Porphyritic basalt**																		
94,0	91,3		**Sand and Gravel**																		
91,3	90,4		**Conglomerate**																		
90,4	78,0		**Hyaloclastite**																		
78,0	75,0																				
75,0	74,8		**Dyke**	74	12	9	2	1	2	1	1	1	1	1	16,4	3,1	2,5	**6,6**	**1,2**	55	50
74,8	72,0		**Hyaloclastite cont.**	93	12	9	3	2	4	2	1	1	1	1	15,5	3,9	2,5	**6,2**	**1,6**	55	50
72,0	69,0			82	12	9	3	2	4	2	1	1	1	1	13,7	3,4	2,5	**5,5**	**1,4**	55	50
69,0	66,0		Tailrace tunnel/Power house	88	12	9	3	2	4	2	1	1	1	1	14,7	3,7	2,5	**5,9**	**1,5**	55	50
66,0	64,1			87	12	9	3	2	4	2	1	1	1	1	14,5	3,6	2,5	**5,8**	**1,5**	55	50
64,1	63,1		**Dyke**	57	12	9	2	1	2	1	1	1	1	1	12,7	2,4	2,5	**5,1**	**1,0**	55	50
63,1	62,0			55	12	9	2	1	2	1	1	1	1	1	12,2	2,3	2,5	**4,9**	**0,9**	55	50
62,0	61,0			10 **	12	9	2	1	2	1	1	1	1	1	2,2	0,4	1,0	**2,2**	**0,4**	55	50
61,0	49,0		**Hyaloclastite cont.**																		
49,0	48,6		**Dyke**																		
48,6	48,0		**Hyaloclastite cont.**																		
48,0			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-30**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
106,4	106,1		**Soil**																		
106,1	96,5		**Porphyritic basalt, Þjórsá-lava**																		
96,5	95,8		**Sand and gravel**																		
95,8	90,3		**Hyaloclastite**																		
90,3	90,1		**Dyke**																		
90,1	88,9		**Hyaloclastite cont.**																		
88,9	88,2		**Tuff**																		
88,2	87,9		**Hyaloclastite cont.**																		
87,9	87,6		**Dyke**																		
87,6	85,1		**Hyaloclastite cont.**																		
85,1	84,3		**Tuff**																		
84,3	79,0		**Hyaloclastite cont.**																		
79,0	77,7		**Dyke**																		
77,7	76,6		**Hyaloclastite cont.**																		
76,6	74,6			91	12	9	3	2	4	2	1	1	1	1	15,2	3,8	2,5	**6,1**	**1,5**	55	50
74,6	72,6			87	12	9	3	2	4	2	1	1	1	1	14,5	3,6	2,5	**5,8**	**1,5**	55	50
72,6	71,5		**Tuff**	68	12	9	3	2	4	2	1	1	2,5	2,5	4,5	1,1	2,5	**1,8**	**0,5**	55	50
71,5	70,6			85	12	9	3	2	4	2	1	1	2,5	2,5	5,7	1,4	2,5	**2,3**	**0,6**	55	50
70,6	68,7			98	12	9	3	2	4	2	1	1	2,5	2,5	6,5	1,6	2,5	**2,6**	**0,7**	55	50
68,7	66,6		Tailrace tunnel alignment	95	12	9	3	2	4	2	1	1	2,5	2,5	6,3	1,6	2,5	**2,5**	**0,6**	55	50
66,6	66,4		**Dyke**	99	12	9	2	1	2	1	1	1	1	1	22,0	4,1	2,5	**8,8**	**1,7**	55	50
66,4	65,1		**Tuff**	91	12	9	3	2	4	2	1	1	2,5	2,5	6,1	1,5	2,5	**2,4**	**0,6**	55	50
65,1	64,7		**Hyaloclastite cont.**	97	12	9	3	2	4	2	1	1	1	1	16,2	4,0	2,5	**6,5**	**1,6**	50	45
64,7	62,8			95	12	9	3	2	4	2	1	1	1	1	15,8	4,0	2,5	**6,3**	**1,6**	55	50
62,8	60,8			97	12	9	3	2	4	2	1	1	1	1	16,2	4,0	2,5	**6,5**	**1,6**	55	50
60,8	59,4		**Dyke**	85																	
59,4	59,2		**Hyaloclastite cont.**																		
59,2	59,0		**Dyke**																		
59,0	58,9		**Hyaloclastite cont.**																		
58,9	56,9		**Dyke**																		
56,9	56,8		**Hyaloclastite cont.**																		
56,8	52,9																				
52,9			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-32**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
106,8	103,8	Soil	
103,8	95,7	Porphyritic basalt, Þjórsá-lava	
95,7	95,3	Scoria	
95,3	86,6	Hyaloclastite	
86,6	86,5	Dyke	
86,5	49,3	Hyaloclastite	
103,8	104,8	Tailrace tunnel alignment	
101,8	103,8	Tailrace tunnel alignment	
101,8	103,8	Tailrace tunnel alignment	
103,8	104,8	Tailrace tunnel alignment	
101,8	103,8	Tailrace tunnel alignment	
101,8	103,8		
101,8			Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
94	12	9	3	2	4	2	1	1	1	1	15,7	3,9	2,5	**6,3**	**1,6**	55	50
84	12	9	3	2	4	2	1	1	1	1	14,0	3,5	2,5	**5,6**	**1,4**	55	50
94	12	9	3	2	4	2	1	1	1	1	15,7	3,9	2,5	**6,3**	**1,6**	55	50
99	12	9	3	2	4	2	1	1	1	1	16,5	4,1	2,5	**6,6**	**1,7**	55	50
87	12	9	3	2	4	2	1	1	1	1	14,5	3,6	2,5	**5,8**	**1,5**	55	50

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-34**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
106,9	98,5	**Soil**	
98,5	89,8	**Porphyritic basalt, Þjórsá-lava**	
89,8	84,9	**Sand and gravel**	
84,9	79,4	**Hyaloclastite**	
79,4	76,4		
76,4	73,4		
73,4	72,6	**Dyke**	
72,6	72,3		
72,3	72,0	Tailrace tunnel alignment	
72,0	71,6	**Dyke**	
71,6	70,4		
70,4	67,5		
67,5	67,3	**Dyke**	
67,3	64,4		
64,4	61,4		
61,4	49,9		
49,9		Hole bottom	

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
83	12	9	3	2	4	2	1	1	1	1	13,8	3,5	2,5	**5,5**	**1,4**	55	50
87	12	9	3	2	4	2	1	1	1	1	14,5	3,6	2,5	**5,8**	**1,5**	55	50
99	12	9	2	1	2	1	1	1	1	1	22,0	4,1	2,5	**8,8**	**1,7**	55	50
100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	2,5	**6,7**	**1,7**	55	50
100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	2,5	**6,7**	**1,7**	55	50
100	12	9	2	1	2	1	1	1	1	1	22,2	4,2	2,5	**8,9**	**1,7**	55	50
63	12	9	3	2	4	2	1	1	1	1	10,5	2,6	2,0	**5,3**	**1,3**	55	50
71	12	9	3	2	4	2	1	1	1	1	11,8	3,0	2,0	**5,9**	**1,5**	55	50
100	12	9	2	1	2	1	1	1	1	1	22,2	4,2	2,5	**8,9**	**1,7**	55	50
97	12	9	3	2	4	2	1	1	1	1	16,2	4,0	2,5	**6,5**	**1,6**	55	50
96	12	9	3	2	4	2	1	1	1	1	16,0	4,0	2,5	**6,4**	**1,6**	55	50

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-46**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
106,3	101,3	**Soil**	
101,3	88,0	**Porphyritic basalt, Þjórsá-lava**	
88,0	85,4	**Sand and gravel**	
85,4	78,8	**Hyaloclastite**	
78,8	75,8		
75,8	72,8		
72,8	72,4	Tailrace tunnel alignment	
72,4	72,3	**Dyke**	
72,3	69,8	**Hyaloclastite cont.**	
69,8	66,8		
66,8	63,7		
63,7		Hole bottom	

Q-value in rock core														Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}		Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
79		12	9	3	2	4	2	1	1	1	1	13,2	3,3	2,5	**5,3**	**1,3**	55	50
86		12	9	3	2	4	2	1	1	1	1	14,3	3,6	2,5	**5,7**	**1,4**	55	50
99		12	9	3	2	4	2	1	1	1	1	16,5	4,1	2,5	**6,6**	**1,7**	55	50
10	**	12	9	2	1	2	1	1	1	1	1	2,2	0,4	1,0	**2,2**	**0,4**	55	50
82		12	9	3	2	4	2	1	1	1	1	13,7	3,4	2,5	**5,5**	**1,4**	55	50
78		12	9	3	2	4	2	1	1	1	1	13,0	3,3	2,5	**5,2**	**1,3**	55	50
99		12	9	3	2	4	2	1	1	1	1	16,5	4,1	2,5	**6,6**	**1,7**	55	50

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-47**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
106,3	98,8		**Soil**																		
98,8	90,3		**Porphyritic basalt, Þjórsá-lava**																		
90,3	85,6		**Sand and gravel**																		
85,6	78,8		**Hyaloclastite**																		
78,8	75,8			73	12	9	3	2	4	2	1	1	1	1	12,2	3,0	2,5	**4,9**	**1,2**	55	50
75,8	72,8			55	12	9	3	2	4	2	1	1	1	1	9,2	2,3	2,5	**3,7**	**0,9**	55	50
72,8	71,7		Tailrace tunnel alignment	96	12	9	3	2	4	2	1	1	1	1	16,0	4,0	2,5	**6,4**	**1,6**	55	50
71,7	70,9		**Dyke**	94	12	9	2	1	2	1	1	1	1	1	20,9	3,9	2,5	**8,4**	**1,6**	55	50
70,9	69,8		**Hyaloclastite cont.**	78	12	9	3	2	4	2	1	1	1	1	13,0	3,3	2,5	**5,2**	**1,3**	55	50
69,8	66,8			68	12	9	3	2	4	2	1	1	1	1	11,3	2,8	2,5	**4,5**	**1,1**	55	50
66,8	63,7			10 **	12	9	3	2	4	2	1	1	1	1	1,7	0,4	1,0	**1,7**	**0,4**	55	50
63,7			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-53**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun/Tailrace tu

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
				RQD_{10}		Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
From	To					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
104,4	102,4		**Eolian sand scoria**																			
102,4	101,4		**Scoria**																			
101,4	100,6			47		12	9	4	3	3	2	1	1	2,5	2,5	4,2	1,6	2,0	**2,1**	**0,8**	65	60
100,6	97,6		**Porphyritic basalt**	64		12	9	3	2	1	1	1	0,7	2,5	2,5	8,5	2,8	2,0	**4,3**	**1,4**	75	70
97,6	94,6		Þjórsá lava	22		12	9	3	2	1	1	0,7	0,7	2,5	2,5	1,9	1,0	1,0	**1,9**	**1,0**	75	70
94,6	91,6			36		12	9	3	2	1	1	0,7	0,7	2,5	2,5	3,2	1,6	1,0	**3,2**	**1,6**	75	70
91,6	89,4			47		12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,1	2,1	1,5	**2,8**	**1,4**	75	70
89,4	88,6		**Hyaloclastite**	22		12	9	3	2	3	2	1	1	2,5	2,5	1,5	0,5	1,0	**1,5**	**0,5**	55	50
88,6	85,6			64		12	9	3	2	3	2	1	1	2,5	2,5	4,3	1,4	2,0	**2,1**	**0,7**	55	50
85,6	82,6			84		12	9	3	2	3	2	1	1	2,5	2,5	5,6	1,9	2,0	**2,8**	**0,9**	55	50
82,6	81,5		Tailrace tunnel alignment	99		12	9	3	2	3	2	1	1	2,5	1	16,5	2,2	2,0	**8,3**	**1,1**	55	50
81,5	79,6		**Conglomerate**	94		9	9	3	2	3	2	1	1	1	1	15,7	7,0	2,0	**7,8**	**3,5**	55	50
79,6	76,6		**Tillite**	86		9	9	3	1	3	2	1	1	1	1	14,3	3,2	2,5	**5,7**	**1,3**	55	50
76,6	73,6			98		9	9	3	1	3	2	1	1	1	1	16,3	3,6	2,5	**6,5**	**1,5**	55	50
73,6	73,0			100		9	9	3	1	3	2	1	1	1	1	16,7	3,7	2,5	**6,7**	**1,5**	55	50
73,0	70,6		**Sandstone**	90		9	9	2	1	3	2	1	1	1	1	10,0	3,3	2,0	**5,0**	**1,7**	55	50
70,6	67,6			54		9	9	2	1	3	2	1	1	1	1	6,0	2,0	1,0	**6,0**	**2,0**	55	50
67,6	67,5			10	**	9	9	2	1	3	2	1	1	1	1	1,1	0,4	1,0	**1,1**	**0,4**	55	50
67,5	64,6		**Conglomerate**	90		9	9	2	1	4	2	1	1	1	1	10,0	2,5	2,0	**5,0**	**1,3**	55	50
64,6	61,6			94		9	9	2	1	4	2	1	1	1	1	10,4	2,6	2,0	**5,2**	**1,3**	55	50
61,6	58,6			86		9	9	2	1	4	2	1	1	1	1	9,6	2,4	2,5	**3,8**	**1,0**	55	50
58,6	55,7			90		9	9	2	1	4	2	1	1	1	1	10,0	2,5	2,5	**4,0**	**1,0**	55	50
55,7	55,6		**Dyke**	10	**	12	9	3	2	3	2	1	1	1	1	1,7	0,6	1,0	**1,7**	**0,6**	60	55
55,6	54,7			100		12	9	3	2	3	2	1	1	1	1	16,7	5,6	2,5	**6,7**	**2,2**	60	55
54,7	52,6		**Conglomerate**	90		9	9	2	1	4	2	1	1	1	1	10,0	2,5	2,5	**4,0**	**1,0**	55	50
			Hole bottom																			

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-54**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun/Tailrace tu

Elevation*		Rocktype		Comments
From	To			
106,1	103,1		**Top soil and scoria**	
103,1	102,3		**Porphyritic basalt**	
102,3	99,3		Þjórsá lava	
99,3	96,3			
96,3	93,3			
93,3	90,3			
90,3	87,3		Tailrace tunnel alignment	
87,3	84,3			
84,3	81,3			
81,3	78,3			
78,3	75,3			
75,3	75,2			
75,2	72,3		**Sediment/Gravel**	Loose sediment
72,3	69,3			Little or no core recovery
69,3	51,3			
51,3				Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}		Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
72		12	9	3	2	1	1	1	1	2,5	2,5	9,6	4,8	1,5	**6,4**	**3,2**	70	65
64		12	9	3	2	1	1	1	1	2,5	2,5	8,5	4,3	1,5	**5,7**	**2,8**	70	65
50		12	9	3	2	1	1	1	1	2,5	2,5	6,7	3,3	1,5	**4,4**	**2,2**	70	65
92		12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,1	4,0	2,0	**4,0**	**2,0**	75	70
78		12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,9	3,4	2,0	**3,4**	**1,7**	75	70
83		12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,3	3,7	2,5	**2,9**	**1,5**	75	70
92		12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,1	4,0	2,5	**3,2**	**1,6**	75	70
81		12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,1	3,6	2,5	**2,9**	**1,4**	75	70
92		12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,1	4,0	2,5	**3,2**	**1,6**	75	70
78		12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,9	3,4	2,5	**2,7**	**1,4**	75	70
10	**	12	9	3	2	1	1	0,7	0,7	2,5	2,5	0,9	0,4	1,0	**0,9**	**0,4**	70	65

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-55**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core														Estimated Q-value in tunnels			GSI - Geological strength index	
				RQD_{10}		Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
From	To					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
107,6	100,0	**Top soil and scoria**																				
100,0	97,8	**Porphyritic basalt**		42		12	9	3	2	1	1	1	1	2,5	2,5	5,7	2,8	1,0	**5,7**	**2,8**	70	65
97,8	96,7	Þjórsá lava		26		12	9	3	2	1	1	1	1	2,5	2,5	3,4	1,7	1,0	**3,4**	**1,7**	75	70
96,7	94,8			58		12	9	3	2	1	1	1	1	2,5	2,5	7,7	3,8	2,0	**3,8**	**1,9**	75	70
94,8	91,8			31		12	9	3	2	1	1	0,7	0,7	2,5	2,5	2,9	1,4	1,0	**2,9**	**1,4**	75	70
91,8	88,8			67		12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,3	2,9	2,0	**3,1**	**1,5**	75	70
88,8	85,8			97		12	9	3	2	1	1	0,7	0,7	2,5	2,5	9,0	4,3	2,5	**3,6**	**1,7**	75	70
85,8	82,8			89		12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,3	3,9	2,5	**3,3**	**1,6**	75	70
82,8	79,8			70		12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,6	3,1	2,5	**2,6**	**1,2**	75	70
79,8	76,8			98		12	9	3	2	1	1	0,7	0,7	2,5	2,5	9,2	4,3	2,5	**3,7**	**1,7**	75	70
76,8	74,5			94		12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,8	4,1	2,5	**3,5**	**1,7**	75	70
74,5	73,8	**Sediment/Gravel**	Loose sediment	0																		
73,8	58,8		Little or no core recovery	0																		
58,8	55,6			0																		
55,6	52,8	**Basaltic Dyke**																				
52,8			Hole bottom	66		12	9	3	2	3	2	0,7	0,7	1	1	7,7	2,4	1,5	**5,1**	**1,6**	70	65

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-56**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
106,7	100,7	**Scoria and aeolian sand**	
100,7	100,0	**Porphyritic basalt**	
100,0	97,0	Þjórsá lava	
97,0	94,0		
94,0	91,0		
91,0	88,0		
88,0	85,1	Tailrace tunnel alignment	
85,1	82,0		
82,0	79,0		
79,0	76,0		
76,0	74,9		
74,9	73,0	**Sediment**	Loose sediment
73,0	70,0		Little or no core recovery
70,0	52,0		
52,0			Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
19	12	9	3	2	1	1	1	1	2,5	2,5	2,6	1,3	1,0	**2,6**	**1,3**	65	60
62	12	9	3	2	1	1	1	1	2,5	2,5	8,3	4,2	2,0	**4,2**	**2,1**	75	70
71	12	9	3	2	1	1	1	1	2,5	2,5	9,4	4,7	2,0	**4,7**	**2,4**	75	70
72	12	9	3	2	1	1	1	1	2,5	2,5	9,6	4,8	2,0	**4,8**	**2,4**	75	70
81	12	9	3	2	1	1	1	1	2,5	2,5	10,8	5,4	2,5	**4,3**	**2,2**	75	70
68	12	9	3	2	1	1	1	1	2,5	2,5	9,1	4,5	1,5	**6,0**	**3,0**	75	70
89	12	9	3	2	1	1	1	1	2,5	2,5	11,9	5,9	2,5	**4,7**	**2,4**	75	70
80	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,5	3,5	2,0	**3,7**	**1,8**	75	70
69	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,4	3,0	2,0	**3,2**	**1,5**	75	70
49	12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,6	2,2	2,0	**2,3**	**1,1**	75	70
0																	
0																	
2																	

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-57**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
107,3	104,3	**Scoria and aeolian sand**	
104,3	103,6	**Scoria**	
103,6	100,6		
100,6	97,6	**Porphyritic basalt**	
97,6	94,6	Þjórsá lava	
94,6	91,6		
91,6	88,6		
88,6	85,6		
85,6	82,6		
82,6	79,6		
79,6	76,6		
76,6	75,3		
75,3	73,6	**Sediment**	Loose sediment
73,6	70,6		Little or no core recovery
70,6	67,6		
67,6			Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
85	12	9	4	3	3	2	1	1	2,5	2,5	7,5	2,8	2,5	**3,0**	**1,1**	60	55
6	12	9	4	3	3	2	1	1	2,5	2,5	0,5	0,2	1,0	**0,5**	**0,2**	60	55
39	12	9	3	2	1	1	1	1	2,5	2,5	5,2	2,6	1,5	**3,5**	**1,7**	75	70
42	12	9	3	2	1	1	1	1	2,5	2,5	5,6	2,8	1,5	**3,8**	**1,9**	75	70
63	12	9	3	2	1	1	1	1	2,5	2,5	8,4	4,2	1,5	**5,6**	**2,8**	75	70
63	12	9	3	2	1	1	1	1	2,5	2,5	8,4	4,2	2,0	**4,2**	**2,1**	75	70
94	12	9	3	2	1	1	1	1	2,5	2,5	12,5	6,2	2,5	**5,0**	**2,5**	75	70
26	12	9	3	2	1	1	1	1	2,5	2,5	3,5	1,8	1,0	**3,5**	**1,8**	75	70
21	12	9	3	2	1	1	0,7	0,7	2,5	2,5	1,8	0,9	1,0	**1,8**	**0,9**	75	70
82	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,2	3,6	2,0	**3,6**	**1,8**	75	70
100	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,8	4,4	2,5	**3,5**	**1,8**	75	70

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-58**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype		Comments
From	To			
107,0	102,0		**Scoria and aeolian sand**	
102,0	101,3		**Porphyritic basalt**	
101,3	100,3		Þjórsá lava	
100,3	97,3			
97,3	94,3			
94,3	91,3			
91,3	88,3			
88,3	85,3		Tailrace tunnel alignment	
85,3	82,3			
82,3	79,3			
79,3	76,3			
76,3	73,6			
73,6	73,3		**Sediment**	Loose sediment
73,3	61,3			Little or no core recovery
61,3				Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
N/A																	
N/A																	
38	12	9	3	2	1	1	1	1	2,5	2,5	5,1	2,5	1,5	**3,4**	**1,7**	75	70
51	12	9	3	2	1	1	1	1	2,5	2,5	6,8	3,4	1,5	**4,5**	**2,3**	75	70
60	12	9	3	2	1	1	1	1	2,5	2,5	8,0	4,0	2,0	**4,0**	**2,0**	75	70
49	12	9	3	2	1	1	1	1	2,5	2,5	6,6	3,3	2,5	**2,6**	**1,3**	75	70
97	12	9	3	2	1	1	1	1	2,5	2,5	12,9	6,4	2,5	**5,2**	**2,6**	75	70
99	12	9	3	2	1	1	1	1	2,5	2,5	13,2	6,6	2,5	**5,3**	**2,6**	75	70
84	12	9	3	2	1	1	1	1	2,5	2,5	11,2	5,6	2,5	**4,5**	**2,2**	75	70
94	12	9	3	2	1	1	1	1	2,5	2,5	12,5	6,3	2,5	**5,0**	**2,5**	75	70
88	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,7	3,9	2,5	**3,1**	**1,5**	75	70
97	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,5	4,3	2,5	**3,4**	**1,7**	75	70
0																	
0																	

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-59**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
100,9	94,7	**Scoria and aeolian sand**	
94,7	91,9	**Porphyritic basalt**	
91,9	91,1	Þjórsá lava	
91,1	89,6		
89,6	88,1	**Scoria**	Scoraceous basalt
88,1	85,6		High coreloss
85,6	85,1	**Porphyritic basalt, solid.**	
85,1	82,1		
82,1	79,1		
79,1	77,7		
77,7	76,1		
76,1	73,8		
73,8	73,1	**Loose sediment**	Little or no core recovery
73,1	67,1		
67,2			Hole bottom

Q-value in rock core														Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}		Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
N/A																		
N/A																		
10	**	12	9	3	2	1	1	1	1	2,5	2,5	1,3	0,7	1,0	**1,3**	**0,7**	75	70
71		12	9	3	2	1	1	1	1	2,5	2,5	9,4	4,7	2,0	**4,7**	**2,4**	75	70
10	**	12	9	4	3	3	2	1	1	2,5	2,5	0,9	0,3	1,0	**0,9**	**0,3**	60	55
27		12	9	4	3	3	2	1	1	2,5	2,5	2,4	0,9	1,0	**2,4**	**0,9**	60	55
50		12	9	3	2	1	1	1	1	2,5	2,5	6,7	3,3	1,5	**4,4**	**2,2**	75	70
65		12	9	3	2	1	1	0,7	0,7	2,5	2,5	5,7	2,8	2,0	**2,8**	**1,4**	75	70
50		12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,4	2,2	2,0	**2,2**	**1,1**	75	70
49		12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,3	2,2	2,0	**2,2**	**1,1**	75	70
31		12	9	3	2	1	1	0,7	0,7	2,5	2,5	2,7	1,4	1,5	**1,8**	**0,9**	75	70
50		12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,4	2,2	2,0	**2,2**	**1,1**	75	70
0																		
0																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-60**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
115,4	112,9	**Scoria and aeolian sand**	
112,9	112,4	**Scoria**	
112,4	111,6		
111,6	108,6		
108,6	106,4		
106,4	105,9	**Porphyritic basalt**	
105,9	105,6	Þjórsá lava	
105,6	103,8		
103,8	102,6		
102,6	99,6		
99,6	96,6		
96,6	93,7		
93,7	90,6		
90,6	87,6		
87,6	84,6		
84,7			Hole bottom

Q-value in rock core														Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}		Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
N/A																		
N/A																		
10	**	12	9	4	3	1	1	1	1	2,5	2,5	1,8	1,0	1,0	**1,8**	**1,0**	50	45
10	**	12	9	4	3	1	1	1	1	2,5	2,5	1,8	1,0	1,0	**1,8**	**1,0**	60	55
41		12	9	4	3	1	1	1	1	2,5	2,5	7,3	4,1	1,5	**4,8**	**2,7**	45	40
28		12	9	3	2	1	1	1	1	2,5	2,5	3,8	1,9	2,0	**1,9**	**0,9**	75	70
50		12	9	3	2	1	1	1	1	2,5	2,5	6,7	3,3	2,0	**3,3**	**1,7**	75	70
45		12	9	3	2	1	1	1	1	2,5	2,5	6,1	3,0	2,0	**3,0**	**1,5**	75	70
60		12	9	3	2	1	1	1	1	2,5	2,5	8,0	4,0	2,0	**4,0**	**2,0**	75	70
76		12	9	3	2	1	1	1	1	2,5	2,5	10,1	5,0	2,0	**5,0**	**2,5**	75	70
75		12	9	3	2	1	1	1	1	2,5	2,5	10,0	5,0	2,0	**5,0**	**2,5**	75	70
85		12	9	3	2	1	1	1	0,7	2,5	2,5	11,3	3,7	2,5	**4,5**	**1,5**	75	70
77		12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,8	3,4	2,5	**2,7**	**1,4**	75	70
74		12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,5	3,3	2,5	**2,6**	**1,3**	75	70
74		12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,5	3,3	2,0	**3,3**	**1,6**	75	70

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borhola: **NK-61**	**Rock mass classification**	MANNVIT ENGINEERING

Verkkaupi: Landsvirkjun Vnr: 5.481.203
Mannvirki: Hvammsvirkjun

Elevation*		Rocktype		Comments
From	To			
115,3	112,9		**Scoria and aeolian sand**	
112,9	112,3		**Porphyritic basalt**	
112,3	111,5		Þjórsá lava	
111,5	108,5			Scoria zone at 4.5-5.5m
108,5	105,5			
105,5	102,8			
102,8	99,5			
99,5	96,5			
96,5	93,5			
93,6				Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
N/A																	
33	12	9	3	2	1	1	1	1	2,5	2,5	4,4	2,2	1,0	**4,4**	**2,2**	65	60
44	12	9	3	2	1	1	1	1	2,5	2,5	5,8	2,9	2,0	**2,9**	**1,5**	65	60
59	12	9	3	2	1	1	1	1	2,5	2,5	7,8	3,9	2,0	**3,9**	**2,0**	75	70
58	12	9	3	2	1	1	1	1	2,5	2,5	7,7	3,8	2,0	**3,8**	**1,9**	75	70
61	12	9	3	2	1	1	1	1	2,5	2,5	8,2	4,1	2,0	**4,1**	**2,0**	75	70
67	12	9	3	2	1	1	1	0,7	2,5	2,5	8,9	2,9	2,0	**4,4**	**1,5**	75	70
86	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,5	3,8	2,5	**3,0**	**1,5**	75	70

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-62**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
115,7	113,7	**Scoria and aeolian sand**	
113,7	112,7	**Scoria**	High core loss
112,7	112,0		
112,0	109,0		
109,0	106,0	**Porphyritic basalt**	
106,0	103,0	Þjórsá lava	
103,0	100,0		
100,0	97,0		
97,0	94,0		
94,0	91,0		
91,0			Hole bottom

Q-value in rock core													
	Jn		Jr		Ja		Jw		SRF		Q-value	
RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
N/A												
14	12	9	4	3	1	1	1	1	2,5	2,5	2,5	1,4
10 **	12	9	4	3	1	1	1	1	2,5	2,5	1,8	1,0
60	12	9	3	2	1	1	1	1	2,5	2,5	8,0	4,0
47	12	9	3	2	1	1	1	1	2,5	2,5	6,2	3,1
61	12	9	3	2	1	1	1	1	2,5	2,5	8,1	4,1
90	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,9	4,0
96	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,4	4,2
98	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,7	4,3

Estimated Q-value in tunnels			GSI - Geological strength index	
Deili-stuðull	Q-value			
	Max	Min	Max	Min
1,0	**2,5**	**1,4**	40	35
1,0	**1,8**	**1,0**	40	35
1,5	**5,3**	**2,7**	65	60
1,5	**4,1**	**2,1**	75	70
2,0	**4,1**	**2,0**	75	70
2,5	**3,2**	**1,6**	75	70
2,5	**3,4**	**1,7**	75	70
2,5	**3,5**	**1,7**	75	70

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-63**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
105,6	103,5		**Scoria and aeolian sand**	0																	
103,5	102,6		**Porphyritic basalt**	N/A																	
102,6	101,9		Þjórsá lava	42	12	9	3	2	1	1	1	1	2,5	2,5	5,6	2,8	2,0	**2,8**	**1,4**	75	70
101,9	98,9			85	12	9	3	2	1	1	1	1	2,5	2,5	11,4	5,7	2,0	**5,7**	**2,8**	75	70
98,9	95,9			79	12	9	3	2	1	1	1	1	2,5	2,5	10,5	5,3	2,0	**5,3**	**2,6**	75	70
95,9	94,0			92	12	9	3	2	1	1	1	0,7	2,5	2,5	12,3	4,0	2,5	**4,9**	**1,6**	75	70
94,0	92,9		**Loose sediment**	0																	
92,9	92,5			0																	
92,5	90,5		**Tillite**	93	9	9	3	1	4	2	1	1	2,5	2,5	6,2	1,0	2,0	**3,1**	**0,5**	55	50
90,5	89,9		**Hyaloclastite**	53	12	9	3	1	4	3	1	1	2,5	2,5	2,4	0,4	1,0	**2,4**	**0,4**	55	50
89,9	86,9			98	12	9	3	1	4	3	1	1	2,5	2,5	4,4	0,8	1,5	**2,9**	**0,5**	55	50
86,9	84,9			48	12	9	3	1	4	3	1	1	5	2,5	2,1	0,2	1,0	**2,1**	**0,2**	55	50
84,9	83,9			70	12	9	3	1	4	3	1	1	5	2,5	3,1	0,3	1,0	**3,1**	**0,3**	55	50
83,9	80,9			51	12	9	3	1	4	3	1	1	5	2,5	2,3	0,2	1,0	**2,3**	**0,2**	55	50
80,9	77,9			10 **	12	9	3	1	4	3	1	1	5	5	0,2	0,0	1,0	**0,2**	**0,0**	45	40
77,9	75,9			23	12	9	3	1	4	3	1	1	5	5	0,5	0,1	1,0	**0,5**	**0,1**	45	40
75,9	74,9			10 **	12	9	3	1	4	3	1	1	5	5	0,2	0,0	1,0	**0,2**	**0,0**	45	40
74,9	71,9			10 **	12	9	3	1	4	2	1	1	5	5	0,3	0,0	1,0	**0,3**	**0,0**	45	40
71,9	68,9			10 **	12	9	3	1	4	2	1	1	5	5	0,3	0,0	1,0	**0,3**	**0,0**	45	40
68,9	65,9			76	12	9	3	1	4	2	1	1	5	5	2,5	0,3	1,0	**2,5**	**0,3**	55	50
65,9	64,0			63	12	9	3	1	4	2	1	1	5	5	2,1	0,3	1,0	**2,1**	**0,3**	55	50
64,0	62,9			50	12	9	3	1	4	2	1	1	5	5	1,7	0,2	1,0	**1,7**	**0,2**	55	50
62,9	59,9			85	12	9	3	1	4	2	1	1	5	5	2,8	0,4	1,0	**2,8**	**0,4**	55	50
59,9	56,9			78	12	9	3	1	4	2	1	1	5	5	2,6	0,3	1,0	**2,6**	**0,3**	55	50
56,9	53,9			83	12	9	3	1	4	2	1	1	5	5	2,8	0,3	1,0	**2,8**	**0,3**	55	50
53,9	53,1			86	12	9	3	1	4	2	1	1	5	5	2,9	0,4	1,0	**2,9**	**0,4**	55	50
53,1	50,9		**Tectonic breccia**	22	16	16	3	1	6	4	1	1	5	5	0,20	0,05	1,0	**0,2**	**0,0**	45	40
50,9	49,0		High core loss	10 **	16	16	3	1	6	4	1	1	5	5	0,09	0,02	1,0	**0,1**	**0,0**	45	40
49,0	47,9		**Hyaloclastite cont.**	35	12	9	3	1	4	2	1	1	5	5	1,2	0,1	1,0	**1,2**	**0,1**	50	45
47,9			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-64**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
106,0	101,9	**Scoria**		0																	
101,9	101,4	**Porphyritic basalt**		31	12	9	3	2	1	1	1	1	2,5	2,5	4,1	2,1	1,0	**4,1**	**2,1**	75	70
101,4	100,8	Þjórsá lava		66	12	9	3	2	1	1	1	1	2,5	2,5	8,8	4,4	1,5	**5,9**	**2,9**	75	70
100,8	100,6			10 **	12	9	3	2	1	1	1	1	2,5	2,5	1,3	0,7	1,0	**1,3**	**0,7**	75	70
100,6	99,9			13	12	9	3	2	1	1	1	1	2,5	2,5	1,7	0,9	1,0	**1,7**	**0,9**	75	70
99,9	99,3			44	12	9	3	2	1	1	1	1	2,5	2,5	5,9	2,9	1,0	**5,9**	**2,9**	75	70
99,3	97,8			66	12	9	3	2	1	1	1	1	2,5	2,5	8,8	4,4	2,0	**4,4**	**2,2**	75	70
97,8	97,2			85	12	9	3	2	1	1	1	1	2,5	2,5	11,3	5,7	2,0	**5,7**	**2,8**	75	70
97,2	96,3			70	12	9	3	2	1	1	1	0,7	2,5	2,5	9,3	3,1	2,0	**4,7**	**1,5**	75	70
96,3	95,9			10 **	12	9	3	2	1	1	1	0,7	2,5	2,5	1,3	0,4	1,0	**1,3**	**0,4**	75	70
95,9	95,1	No core recovery		0																	
95,1	93,0	**Loose sediment**		3																	
93,0	92,6	No core recovery		0																	
92,6	90,9	**Hyaloclastite**		72	12	9	3	2	4	2	1	1	2,5	2,5	4,8	1,2	1,5	**3,2**	**0,8**	55	50
90,9	88,8			85	12	9	3	2	4	2	1	1	2,5	2,5	5,7	1,4	2,0	**2,8**	**0,7**	55	50
88,8	88,2			10 **	12	9	3	2	4	2	1	1	2,5	2,5	0,7	0,2	1,0	**0,7**	**0,2**	55	50
88,2	86,7			96	12	9	3	2	4	2	1	1	2,5	2,5	6,4	1,6	2,0	**3,2**	**0,8**	55	50
86,7	84,6			67	12	9	3	2	4	2	1	1	2,5	2,5	4,4	1,1	1,5	**3,0**	**0,7**	55	50
84,6	82,5			100	12	9	3	2	4	2	1	1	2,5	1	16,7	1,7	2,5	**6,7**	**0,7**	55	50
82,5	80,4			94	12	9	3	2	4	2	1	1	1	1	15,7	3,9	2,5	**6,3**	**1,6**	55	50
80,4	78,3			100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	2,5	**6,7**	**1,7**	55	50
78,3	76,2			95	12	9	3	2	4	2	1	1	1	1	15,9	4,0	2,5	**6,4**	**1,6**	55	50
76,2	74,1			97	12	9	3	2	4	2	1	1	1	1	16,2	4,0	2,5	**6,5**	**1,6**	55	50
74,1	72,0			100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	2,5	**6,7**	**1,7**	55	50
72,0	69,9			81	12	9	3	2	4	2	1	1	1	1	13,5	3,4	2,5	**5,4**	**1,4**	55	50
69,9	67,8			100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	2,5	**6,7**	**1,7**	55	50
67,8	65,7			100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	2,5	**6,7**	**1,7**	55	50
65,7	63,6			63	12	9	3	2	4	2	1	1	1	1	10,6	2,6	1,5	**7,0**	**1,8**	55	50
63,6	62,2			72	12	9	3	2	4	2	1	1	1	1	12,0	3,0	2,0	**6,0**	**1,5**	55	50
62,2	61,5	**Basaltic dyke**		98	12	9	2	1	2	1	1	1	1	1	21,8	4,1	2,0	**10,9**	**2,0**	55	50
61,5			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-65**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
105,4	101,2	**Topsoil and Scoria**		0																	
101,2	100,8	**Porphyritic basalt**		55	12	9	3	2	1	1	1	1	2,5	2,5	7,3	3,6	1,0	**7,3**	**3,6**	75	70
100,8	98,8	Þjórsá lava		52	12	9	3	2	1	1	1	1	2,5	2,5	6,9	3,5	1,5	**4,6**	**2,3**	75	70
98,8	96,6			90	12	9	3	2	1	1	1	1	2,5	2,5	11,9	6,0	2,0	**6,0**	**3,0**	75	70
96,6	95,4			75	12	9	3	2	1	1	1	0,7	2,5	2,5	10,0	3,3	2,0	**5,0**	**1,6**	75	70
95,4	94,5			66	12	9	3	2	1	1	1	0,7	2,5	2,5	8,8	2,9	1,5	**5,8**	**1,9**	75	70
94,5	93,9	**Loose sediment/Gravel**	High core loss																		
93,9	92,3	**Hyaloclastite**		88	12	9	3	2	4	2	1	1	2,5	2,5	5,9	1,5	2,0	**2,9**	**0,7**	50	45
92,3	90,2			85	12	9	3	2	4	2	1	1	2,5	2,5	5,7	1,4	2,0	**2,8**	**0,7**	50	45
90,2	88,1			85	12	9	3	2	4	2	1	1	2,5	2,5	5,7	1,4	2,0	**2,8**	**0,7**	50	45
88,1	86,0			76	12	9	3	2	4	2	1	1	2,5	2,5	5,0	1,3	2,0	**2,5**	**0,6**	50	45
86,0	85,0			10 **	12	9	3	2	4	2	1	1	2,5	2,5	0,7	0,2	1,0	**0,7**	**0,2**	50	45
85,0	83,9			100	12	9	3	2	4	2	1	1	2,5	2,5	6,7	1,7	2,0	**3,3**	**0,8**	55	50
83,9	82,6			54	12	9	3	2	4	2	1	1	1	1	9,0	2,2	1,5	**6,0**	**1,5**	50	45
82,6	81,7			91	12	9	3	2	4	2	1	1	1	1	15,1	3,8	2,0	**7,5**	**1,9**	55	50
81,7	79,6			94	12	9	3	2	4	2	1	1	1	1	15,7	3,9	2,0	**7,9**	**2,0**	55	50
79,6	77,5			100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	2,0	**8,3**	**2,1**	55	50
77,5	75,9			81	12	9	3	2	4	2	1	1	1	1	13,5	3,4	2,0	**6,7**	**1,7**	55	50
75,9	75,7	**Basaltic dyke**		56	9	9	2	1	2	2	1	1	1	1	6,2	3,1	1,5	**4,1**	**2,1**	75	70
75,7	75,4	**Hyaloclastite cont.**		78	12	9	3	2	4	2	1	1	1	1	13,0	3,3	2,0	**6,5**	**1,6**	55	50
75,4	73,3			88	12	9	3	2	4	2	1	1	1	1	14,6	3,7	2,0	**7,3**	**1,8**	55	50
73,3	71,1			98	12	9	3	2	4	2	1	1	1	1	16,3	4,1	2,0	**8,2**	**2,0**	55	50
71,1	69,0	Tailrace tunnel/Power house		98	12	9	3	2	4	2	1	1	1	1	16,4	4,1	2,0	**8,2**	**2,0**	55	50
69,0	66,9			98	12	9	3	2	4	2	1	1	1	1	16,3	4,1	2,0	**8,1**	**2,0**	55	50
66,9	64,8			66	12	9	3	2	4	2	1	1	1	1	11,1	2,8	2,0	**5,5**	**1,4**	55	50
64,8	62,6			82	12	9	3	2	4	2	1	1	1	1	13,7	3,4	2,0	**6,9**	**1,7**	55	50
62,6	60,5			98	12	9	3	2	4	2	1	1	1	1	16,3	4,1	2,0	**8,1**	**2,0**	55	50
60,5	58,4			90	12	9	3	2	4	2	1	1	1	1	15,0	3,8	2,0	**7,5**	**1,9**	55	50
58,4	56,6			56	12	9	3	2	4	2	1	1	1	1	9,4	2,4	1,5	**6,3**	**1,6**	50	45

Borehole: **NK-65 cont.**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
56,6	54,2		
54,2	52,1		
52,1	50,2		
50,2	49,9	**Basaltic dyke**	
49,9	49,2		
49,2	48,2		
48,2	47,5		
47,5	45,9	**Hyaloclastite cont.**	
45,9	43,6		
43,6	41,4		
41,4			Hole bottom

Q-value in rock core												
	Jn		Jr		Ja		Jw		SRF		Q-value	
RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
69	12	9	3	2	4	2	1	1	1	1	11,5	2,9
45	12	9	3	2	4	2	1	1	1	1	7,5	1,9
51	12	9	3	2	4	2	1	1	1	1	8,5	2,1
100	12	9	2	1	2	2	1	1	1	1	11,1	4,2
52	12	9	2	1	2	2	1	1	1	1	5,8	2,2
38	12	9	2	1	2	2	1	1	1	1	4,3	1,6
87	12	9	2	1	2	2	1	1	1	1	9,7	3,6
71	12	9	3	2	4	2	1	1	1	1	11,9	3,0
91	12	9	3	2	4	2	1	1	1	1	15,1	3,8
85	12	9	3	2	4	2	1	1	1	1	14,2	3,5

Estimated Q-value in tunnels		
Deili-stuðull	Q-value	
	Max	Min
1,5	**7,7**	**1,9**
1,5	**5,0**	**1,3**
1,5	**5,7**	**1,4**
2,0	**5,6**	**2,1**
1,5	**3,9**	**1,4**
1,0	**4,3**	**1,6**
1,5	**6,5**	**2,4**
1,5	**7,9**	**2,0**
1,5	**10,1**	**2,5**
1,5	**9,4**	**2,4**

GSI - Geological strength index	
Max	Min
55	50
55	50
55	50
65	60
60	55
60	55
60	55
55	50
55	50
55	50

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-66**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
104,1	101,1	**Scoria and aeolian sand**	
101,1	100,4	**Porphyritic basalt**	
100,4	97,4	Þjórsá lava	
97,4	94,8		
94,8	94,4	**Loose sediment**	Little or no core recovery
94,4	92,9		
92,9	91,4	**Hyaloclastite**	
91,4	88,4		
88,4			Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
0,0																	
92	12	9	3	2	3	2	1	1	2,5	2,5	6,1	2,0	2,0	**3,1**	**1,0**	70	65
73	12	9	3	2	3	2	1	1	2,5	2,5	4,9	1,6	1,5	**3,2**	**1,1**	70	65
54	12	9	3	2	3	2	1	1	2,5	2,5	3,6	1,2	1,0	**3,6**	**1,2**	70	65
29	12	9	3	2	4	2	1	1	1	1	4,8	1,2	1,0	**4,8**	**1,2**	55	50
71	12	9	3	2	4	2	1	1	1	1	11,8	2,9	1,5	**7,9**	**2,0**	55	50

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-67**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype		Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
						Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To				RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
106,5	98,1		**Scoria and aeolian sand**		0																	
98,1	97,5		**Porphyritic basalt**		N/A																	
97,5	96,8		Þjórsá lava		57	12	9	3	2	1	1	1	1	2,5	2,5	7,6	3,8	1,5	**5,1**	**2,5**	75	70
96,8	94,7				43	12	9	3	2	1	1	1	1	2,5	2,5	5,7	2,9	1,5	**3,8**	**1,9**	75	70
94,7	93,8				23	12	9	3	2	1	1	1	1	2,5	2,5	3,1	1,6	1,0	**3,1**	**1,6**	75	70
93,8	90,8				77	12	9	3	2	1	1	1	1	2,5	2,5	10,3	5,1	2,0	**5,1**	**2,6**	75	70
90,8	87,8				95	12	9	3	2	1	1	1	0,7	2,5	2,5	12,7	4,2	2,5	**5,1**	**1,7**	75	70
87,8	84,8				80	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,0	3,5	2,5	**2,8**	**1,4**	75	70
84,8	83,5				100	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,8	4,4	2,5	**3,5**	**1,8**	75	70
83,5	81,8		**Loose sediment**																			
81,8	79,7																					
79,7	79,4		**Hyaloclastite**		10 **	12	9	3	2	4	2	1	1	1	1	1,7	0,4	1,0	**1,7**	**0,4**	55	50
79,4	78,8				57	12	9	3	2	4	2	1	1	1	1	9,6	2,4	2,0	**4,8**	**1,2**	55	50
78,8	75,8				97	12	9	3	2	4	2	1	1	1	1	16,2	4,0	2,0	**8,1**	**2,0**	55	50
75,8				Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-68**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
106,1	100,1	**Scoria and aeolian sand**																			
100,1	99,4			10 **	12	9	4	3	3	2	1	1	2,5	2,5	0,9	0,3	1,0	**0,9**	**0,3**	45	40
99,4	98,4			10 **	12	9	4	3	3	2	1	1	2,5	2,5	0,9	0,3	1,0	**0,9**	**0,3**	45	40
98,4	96,3	**Porphyritic basalt**		87	12	9	3	2	1	1	1	0,7	2,5	2,5	11,6	3,8	1,5	**7,7**	**2,6**	75	70
96,3	93,3	Þjórsá lava		55	12	9	3	2	1	1	1	0,7	2,5	2,5	7,3	2,4	1,5	**4,9**	**1,6**	75	70
93,3	90,3			89	12	9	3	2	1	1	1	0,7	2,5	2,5	11,9	3,9	2,0	**6,0**	**2,0**	75	70
90,3	87,3			93	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,2	4,1	2,0	**4,1**	**2,1**	75	70
87,3	86,1			N/A																75	70
86,1	84,3	**Loose sediment**	High core loss																		
84,3	81,3																				
81,3	78,6																				
78,6	78,3	**Hyaloclastite**		10 **	12	12	3	2	4	2	1	1	1	1	1,3	0,4	1,0	**1,3**	**0,4**	45	40
78,3	76,6			52	12	12	3	2	4	2	1	1	1	1	6,5	2,2	1,5	**4,4**	**1,5**	45	40
76,6			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-69**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype		Comments
From	To			
112,8	109,8		**Scoria and aeolian sand**	
109,8	109,0		**Porphyritic basalt**	
109,0	106,0		Þjórsá lava	
106,0	103,0			
103,0	100,0			
100,0	97,0			
97,0	94,0			
94,0	91,0			
91,0	88,0			
88,0	85,0			
85,0	82,0			
82,0	79,0			
79,1			Scoriaceous basalt	Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
RQD_{10}	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
0																	
25	12	9	3	2	1	1	1	1	2,5	2,5	3,3	1,7	1,0	**3,3**	**1,7**	75	70
77	12	9	3	2	1	1	1	1	2,5	2,5	10,2	5,1	2,0	**5,1**	**2,6**	75	70
44	12	9	3	2	1	1	1	1	2,5	2,5	5,9	3,0	1,5	**3,9**	**2,0**	75	70
54	12	9	3	2	1	1	1	1	2,5	2,5	7,2	3,6	1,5	**4,8**	**2,4**	75	70
95	12	9	3	2	1	1	1	1	2,5	2,5	12,7	6,3	2,0	**6,3**	**3,2**	75	70
73	12	9	3	2	1	1	1	1	2,5	2,5	9,8	4,9	2,0	**4,9**	**2,4**	75	70
93	12	9	3	2	1	1	1	0,7	2,5	2,5	12,4	4,1	2,5	**5,0**	**1,6**	75	70
87	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,7	3,8	2,5	**3,1**	**1,5**	75	70
75	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,6	3,3	2,5	**2,7**	**1,3**	75	70
84	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,4	3,7	2,5	**3,0**	**1,5**	75	70
84	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,4	3,7	2,0	**3,7**	**1,9**	75	70

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-70**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
From	To			RQD_{10}	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-stuðull	Q-value		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
112,4	108,9	**Brown topsoil**		0																	
108,9	108,7	**Scoria**	High core loss																		
108,7	105,7	**Porphyritic basalt**		75	12	9	3	2	1	1	1	1	2,5	2,5	10,0	5,0	2,0	**5,0**	**2,5**	70	65
105,7	102,7	Þjórsá lava		46	12	9	3	2	1	1	1	1	2,5	2,5	6,1	3,0	1,5	**4,1**	**2,0**	75	70
102,7	99,7			72	12	9	3	2	1	1	1	1	2,5	2,5	9,6	4,8	2,0	**4,8**	**2,4**	75	70
99,7	96,7			81	12	9	3	2	1	1	1	1	2,5	2,5	10,8	5,4	2,0	**5,4**	**2,7**	75	70
96,7	93,7			74	12	9	3	2	1	1	1	1	2,5	2,5	9,9	5,0	2,0	**5,0**	**2,5**	75	70
93,7	90,7			74	12	9	3	2	1	1	1	0,7	2,5	2,5	9,8	3,2	2,0	**4,9**	**1,6**	75	70
90,7	87,7			96	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,4	4,2	2,0	**4,2**	**2,1**	75	70
87,7	84,7			77	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,7	3,4	2,0	**3,4**	**1,7**	75	70
84,7	81,7			69	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,1	3,1	2,0	**3,1**	**1,5**	75	70
81,7	78,7			100	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,8	4,4	2,5	**3,5**	**1,8**	75	70
78,7	77,4	**Loose sediment**		0																	
77,4	75,7			0																	
75,7	72,7			0																	
72,7	72,6			0																	
72,6	69,7	**Hyaloclastite**		84	12	9	3	2	4	2	1	1	1	1	14,0	3,5	2,0	**7,0**	**1,8**	55	50
69,7			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-71**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments
From	To		
116,0	109,3	**Topsoil,** scoria from 5.9 m	
109,3	106,3	**Porphyritic basalt**	
106,3	103,3	Þjórsá lava	
103,3	100,3		
100,3	97,3		
97,3	94,3		
94,3	91,3		
91,3	88,3		
88,3	85,3		
85,3	82,3		
82,3	79,3		
79,3	77,0		
77,0	76,3	**Loose sediment**	Gravel
76,3			Hole bottom

Q-value in rock core													Estimated Q-value in tunnels			GSI - Geological strength index	
	Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
0	0																
45	12	9	3	2	1	1	1	1	2,5	2,5	6,0	3,0	1,5	**4,0**	**2,0**	70	65
82	12	9	3	2	1	1	1	1	2,5	2,5	10,9	5,4	2,0	**5,4**	**2,7**	75	70
98	12	9	3	2	1	1	1	1	2,5	2,5	13,1	6,6	2,0	**6,6**	**3,3**	75	70
62	12	9	3	2	1	1	1	1	2,5	2,5	8,2	4,1	2,0	**4,1**	**2,1**	75	70
76	12	9	3	2	1	1	1	0,7	2,5	2,5	10,1	3,3	2,0	**5,0**	**1,7**	75	70
76	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,7	3,3	2,0	**3,3**	**1,7**	75	70
73	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,4	3,2	2,0	**3,2**	**1,6**	75	70
67	12	9	3	2	1	1	0,7	0,7	2,5	2,5	5,9	3,0	2,0	**3,0**	**1,5**	75	70
67	12	9	3	2	1	1	0,7	0,7	2,5	2,5	5,9	2,9	2,0	**2,9**	**1,5**	75	70
54	12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,8	2,4	2,0	**2,4**	**1,2**	75	70
48	12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,2	2,1	1,5	**2,8**	**1,4**	75	70
0																	

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-72**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
118,0	111,8	**Brown topsoil**		0																	
111,8	106,8	**Scoria**		0																	
106,8	106,0	**Porphyritic basalt**		N/A																	
106,0	105,2	Þjórsá lava		13	12	9	3	2	1	1	1	1	2,5	2,5	1,7	0,8	1,0	**1,7**	**0,8**	75	70
105,2	102,3			37	12	9	3	2	1	1	1	1	2,5	2,5	5,0	2,5	1,5	**3,3**	**1,7**	75	70
102,3	102,0			10 **	12	9	3	2	1	1	1	1	2,5	2,5	1,3	0,7	1,0	**1,3**	**0,7**	75	70
102,0	101,5			20	12	9	3	2	1	1	1	1	2,5	2,5	2,7	1,3	1,0	**2,7**	**1,3**	75	70
101,5	100,6			14	12	9	3	2	1	1	1	1	2,5	2,5	1,9	1,0	1,0	**1,9**	**1,0**	75	70
100,6	99,7			11	12	9	3	2	1	1	1	1	2,5	2,5	1,5	0,7	1,0	**1,5**	**0,7**	75	70
99,7	98,1			41	12	9	3	2	1	1	1	1	2,5	2,5	5,5	2,8	1,5	**3,7**	**1,8**	75	70
98,1	96,6			38	12	9	3	2	1	1	1	0,7	2,5	2,5	5,1	1,7	1,5	**3,4**	**1,1**	75	70
96,6	96,2			100	12	9	3	2	1	1	0,7	0,7	2,5	2,5	8,8	4,4	2,0	**4,4**	**2,2**	75	70
96,2	94,0			75	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,6	3,3	2,5	**2,7**	**1,3**	75	70
94,0	90,9			86	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,6	3,8	2,0	**3,8**	**1,9**	75	70
90,9	88,6			87	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,7	3,8	2,0	**3,8**	**1,9**	75	70
88,6	87,2			37	12	9	3	2	1	1	0,7	0,7	2,5	2,5	3,3	1,6	1,0	**3,3**	**1,6**	75	70
87,2	84,2			61	12	9	3	2	1	1	0,7	0,7	2,5	2,5	5,4	2,7	1,5	**3,6**	**1,8**	75	70
84,2	81,2			87	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,6	3,8	2,0	**3,8**	**1,9**	75	70
81,2	79,1			85	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,4	3,7	2,0	**3,7**	**1,9**	75	70
79,1	78,2	**Loose sediment**		0																	
78,2			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-73**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
107,2	103,0	**Soil**																			
103,0	101,6	**Soil** and scoria fragments																			
101,6	99,5	**Scoria**																			
99,5	96,7	**Porphyritic basalt**		N/A																	
96,7	96,4	Þjórsá lava		28	12	9	3	2	1	1	1	1	2,5	2,5	3,8	1,9	1,0	**3,8**	**1,9**	75	70
96,4	94,3			82	12	9	3	2	1	1	1	1	2,5	2,5	10,9	5,5	2,0	**5,5**	**2,7**	75	70
94,3	92,6			82	12	9	3	2	1	1	1	1	2,5	2,5	10,9	5,4	2,0	**5,4**	**2,7**	75	70
92,6	92,2			45	12	9	3	2	1	1	1	0,7	2,5	2,5	6,0	2,0	2,0	**3,0**	**1,0**	75	70
92,2	90,8	**Loose sediment**	Core loss																		
90,8	90,1	**Sandstone**		100	9	9	2	1	4	2	1	1	1	1	11,1	2,8	2,5	**4,4**	**1,1**	55	50
90,1	88,0			84	9	9	2	1	4	2	1	1	1	1	9,4	2,3	2,5	**3,7**	**0,9**	55	50
88,0	85,9			28	9	9	2	1	4	2	1	1	1	1	3,1	0,8	1,0	**3,1**	**0,8**	55	50
85,9	83,8	Conglomerate		43	9	9	2	1	4	2	1	1	1	1	4,8	1,2	2,0	**2,4**	**0,6**	50	45
83,8	81,7	**Hyaloclastite**		98	12	12	3	1	4	3	1	1	1	1	8,1	2,0	2,0	**4,1**	**1,0**	55	50
81,7	80,6			96	12	12	3	1	4	3	1	1	1	1	8,0	2,0	2,0	**4,0**	**1,0**	55	50
80,6	79,6	**Basaltic dyke**		84	12	9	3	2	3	2	1	1	1	1	13,9	4,6	2,0	**7,0**	**2,3**	60	55
79,6	79,5			10 **	12	9	3	2	3	2	1	1	1	1	1,7	0,6	1,0	**1,7**	**0,6**	60	55
79,5	79,4	**Hyaloclastite cont.**		100	12	12	3	1	4	3	1	1	1	1	8,3	2,1	2,0	**4,2**	**1,0**	55	50
79,4	79,0	**Basaltic dyke**		66	12	9	3	2	3	2	1	1	1	1	10,9	3,6	2,0	**5,5**	**1,8**	60	55
79,0	78,4	**Hyaloclastite cont.**		29	12	12	3	1	4	3	1	1	1	1	2,4	0,6	1,0	**2,4**	**0,6**	55	50
78,4	77,5			76	12	12	3	1	4	3	1	1	1	1	6,4	1,6	1,5	**4,2**	**1,1**	55	50
77,5	75,7			31	12	12	3	1	4	3	1	1	1	1	2,6	0,6	1,0	**2,6**	**0,6**	55	50
75,7	73,5			81	12	12	3	1	4	3	1	1	1	1	6,7	1,7	1,5	**4,5**	**1,1**	55	50
73,5	71,7			67	12	12	3	1	4	3	1	1	1	1	5,6	1,4	1,5	**3,7**	**0,9**	55	50
71,7	71,3			87	12	12	3	1	4	3	1	1	1	1	7,2	1,8	1,5	**4,8**	**1,2**	55	50
71,3	69,2			79	12	12	3	1	4	3	1	1	1	1	6,6	1,7	1,5	**4,4**	**1,1**	55	50
69,2	67,2			61	12	12	3	1	4	3	1	1	5	5	1,0	0,3	1,0	**1,0**	**0,3**	55	50
67,2	65,0			84	12	12	3	1	4	3	1	1	5	5	1,4	0,4	1,0	**1,4**	**0,4**	55	50
65,0	63,4			67	12	12	3	1	4	3	1	1	1	1	5,6	1,4	1,5	**3,7**	**0,9**	55	50
63,4	62,9			100	12	12	3	1	4	3	1	1	1	1	8,3	2,1	1,5	**5,6**	**1,4**	55	50
62,9	60,9			68	12	12	3	1	4	3	1	1	5	5	1,1	0,3	1,0	**1,1**	**0,3**	55	50
60,9	58,7			73	12	12	3	1	4	3	1	1	5	5	1,2	0,3	1,0	**1,2**	**0,3**	55	50
58,7			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-74**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
125,5	123,4	**Topsoil and Scoria**		0																	
123,4	123,0	**Porphyritic basalt**		10 **	15	12	3	2	4	2	1	1	2,5	2,5	0,5	0,1	1,0	**0,5**	**0,1**	55	50
123,0	122,1			10 **	15	12	3	2	4	2	1	1	2,5	2,5	0,5	0,1	1,0	**0,5**	**0,1**	55	50
122,1	122,0			10 **	15	12	3	2	4	2	1	1	2,5	2,5	0,5	0,1	1,0	**0,5**	**0,1**	55	50
122,0	121,4			29	15	12	3	2	4	2	1	1	2,5	2,5	1,5	0,4	1,0	**1,5**	**0,4**	55	50
121,4	120,9	**Basaltic dyke**		14	12	12	3	2	4	2	1	1	2,5	2,5	0,7	0,2	1,0	**0,7**	**0,2**	55	50
120,9	120,8	**Porphyritic basalt cont.**		65	15	12	3	2	4	2	1	1	2,5	2,5	3,2	0,9	1,0	**3,2**	**0,9**	55	50
120,8	120,0			10 **	15	12	3	2	4	2	1	1	2,5	2,5	0,5	0,1	1,0	**0,5**	**0,1**	55	50
120,0	119,1			80	12	12	3	2	4	2	1	1	2,5	2,5	4,0	1,3	1,0	**4,0**	**1,3**	60	55
119,1	116,7	**Basaltic dyke**		68	12	12	3	2	4	2	1	1	2,5	2,5	3,4	1,1	1,0	**3,4**	**1,1**	60	55
116,7	115,2			66	12	12	3	2	4	2	1	1	2,5	2,5	3,3	1,1	1,0	**3,3**	**1,1**	60	55
115,2	115,0			100	12	12	3	2	4	2	1	1	2,5	2,5	5,0	1,7	2,0	**2,5**	**0,8**	60	55
115,0	114,7	**Porphyritic basalt cont.**		91	12	12	3	2	4	2	1	1	2,5	2,5	4,5	1,5	2,0	**2,3**	**0,8**	60	55
114,7	112,6			84	12	12	3	2	4	2	1	1	2,5	2,5	4,2	1,4	2,0	**2,1**	**0,7**	60	55
112,6	111,5			62	12	12	3	2	4	2	1	1	2,5	2,5	3,1	1,0	1,0	**3,1**	**1,0**	60	55
111,5	110,5			92	12	12	3	2	4	2	1	1	2,5	2,5	4,6	1,5	2,0	**2,3**	**0,8**	60	55
110,5	109,3			82	12	12	3	2	4	2	1	1	2,5	2,5	4,1	1,4	1,0	**4,1**	**1,4**	60	55
109,3	108,8	**Sandstone**		22	9	9	2	1	4	2	1	1	2,5	2,5	1,0	0,2	1,0	**1,0**	**0,2**	55	50
108,8	108,8	**Porphyritic basalt cont.**		10 **	12	12	3	2	4	2	1	1	2,5	2,5	0,5	0,2	1,0	**0,5**	**0,2**	60	55
108,8	107,4			71	12	12	3	2	4	2	1	1	2,5	2,5	3,6	1,2	1,0	**3,6**	**1,2**	60	55
107,4	106,9	**Basaltic dyke**		64	12	12	3	2	4	2	1	1	2,5	2,5	3,2	1,1	1,0	**3,2**	**1,1**	60	55
106,9	106,7	**Porphyritic basalt cont.**		41	12	12	3	2	4	2	1	1	2,5	2,5	2,1	0,7	1,0	**2,1**	**0,7**	60	55
106,7	105,9			77	12	12	3	2	4	2	1	1	2,5	2,5	3,8	1,3	1,0	**3,8**	**1,3**	60	55
105,9	104,4	**Sandstone**	Joint filling	73	9	9	2	1	4	2	1	1	1	1	8,1	2,0	2,5	**3,3**	**0,8**	55	50
104,4	102,1			80	9	9	2	1	4	2	1	1	1	1	8,9	2,2	2,5	**3,6**	**0,9**	55	50
102,1	101,1			27	9	9	2	1	4	2	1	1	1	1	3,0	0,8	1,0	**3,0**	**0,8**	45	40
101,1	101,0			100	9	9	2	1	4	2	1	1	1	1	11,1	2,8	2,5	**4,4**	**1,1**	45	40

Borehole: **NK-74 cont.**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
101,0	100,0	**Scoria**		66	12	12	3	2	3	2	1	1	1	1	8,3	3,7	2,0	**4,1**	**1,8**	60	55
100,0	98,8			78	12	12	3	2	3	2	1	1	1	1	9,7	4,3	2,0	**4,9**	**2,2**	60	55
98,8	98,0	**Tholeiite/ Basalt andesite**		47	12	12	3	1	4	3	1	1	1	1	3,9	1,0	1,0	**3,9**	**1,0**	65	60
98,0	97,5			62	12	12	3	1	4	3	1	1	1	1	5,2	1,3	2,0	**2,6**	**0,7**	65	60
97,5	97,2	**Scoria**		10 **	12	12	3	2	3	2	1	1	1	1	1,3	0,6	1,0	**1,3**	**0,6**	50	45
97,2	96,6	**Tholeiite/ Basalt andesite**		63	12	12	3	1	4	3	1	1	1	1	5,3	1,3	2,0	**2,6**	**0,7**	65	60
96,6	95,8			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
95,8	94,9			38	12	12	3	1	4	3	1	1	1	1	3,1	0,8	1,0	**3,1**	**0,8**	65	60
94,9	94,3			18	12	12	3	1	4	3	1	1	1	1	1,5	0,4	1,0	**1,5**	**0,4**	65	60
94,3	93,7			28	12	12	3	1	4	3	1	1	1	1	2,4	0,6	1,0	**2,4**	**0,6**	65	60
93,7	92,9			48	12	12	3	1	4	3	1	1	1	1	4,0	1,0	1,5	**2,7**	**0,7**	65	60
92,9	92,0			32	12	12	3	1	4	3	1	1	1	1	2,7	0,7	1,0	**2,7**	**0,7**	65	60
92,0	91,5			19	12	12	3	1	4	3	1	1	1	1	1,6	0,4	1,0	**1,6**	**0,4**	65	60
91,5	90,2			53	12	12	3	1	4	3	1	1	1	1	4,4	1,1	1,5	**3,0**	**0,7**	65	60
90,2	89,8			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
89,8	89,4			31	12	12	3	1	4	3	1	1	1	1	2,6	0,6	1,0	**2,6**	**0,6**	65	60
89,4	88,2	**Basaltic dyke**		14	12	12	3	1	4	2	1	1	1	1	1,7	0,3	1,0	**1,7**	**0,3**	65	60
88,2	87,6			60	12	12	3	1	4	2	1	1	1	1	7,6	1,3	1,5	**5,0**	**0,8**	60	55
87,6	87,5	**Tholeiite/ Basalt andesite**		10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
87,5	87,0			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
87,0	86,3			11	12	12	3	1	4	3	1	1	1	1	0,9	0,2	1,0	**0,9**	**0,2**	65	60
86,3	85,5			40	12	12	3	1	4	3	1	1	1	1	3,3	0,8	1,0	**3,3**	**0,8**	65	60
85,5	84,4			61	12	12	3	1	4	3	1	1	1	1	5,0	1,3	1,5	**3,4**	**0,8**	65	60
84,4	83,4			51	12	12	3	1	4	3	1	1	1	1	4,3	1,1	1,5	**2,8**	**0,7**	65	60
83,4	81,7			30	12	12	3	1	4	3	1	1	1	1	2,5	0,6	1,0	**2,5**	**0,6**	65	60
81,7	81,2			93	12	12	3	1	4	3	1	1	1	1	7,7	1,9	2,0	**3,9**	**1,0**	65	60
81,2	79,8			67	12	12	3	1	4	3	1	1	1	1	5,6	1,4	2,0	**2,8**	**0,7**	65	60
79,8	79,5			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
79,5	79,1			21	12	12	3	1	4	3	1	1	1	1	1,7	0,4	1,0	**1,7**	**0,4**	65	60
79,1	78,4			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
78,4	78,4			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
78,4	77,4			54	12	12	3	1	4	3	1	1	1	1	4,5	1,1	1,5	**3,0**	**0,8**	65	60
77,4	76,7			35	12	12	3	1	4	3	1	1	1	1	2,9	0,7	1,0	**2,9**	**0,7**	65	60
76,7	76,0			39	12	12	3	1	4	3	1	1	1	1	3,2	0,8	1,0	**3,2**	**0,8**	65	60
76,0	75,4			19	12	12	3	1	4	3	1	1	1	1	1,6	0,4	1,0	**1,6**	**0,4**	65	60
75,4	74,8			31	12	12	3	1	4	3	1	1	1	1	2,6	0,6	1,0	**2,6**	**0,6**	65	60

Borehole: **NK-74 cont.**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
74,8	74,7	**Basaltic dyke**		10 **	12	9	3	1	4	2	1	1	1	1	1,7	0,2	1,0	**1,7**	**0,2**	65	60
74,7	74,4	**Tholeiite/ Basalt andesite**		10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
74,4	73,9			26	12	12	3	1	4	3	1	1	1	1	2,1	0,5	1,0	**2,1**	**0,5**	65	60
73,9	73,5			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
73,5	73,5			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
73,5	73,1			10 **	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
73,1	72,3			86	12	12	3	1	4	3	1	1	1	1	7,1	1,8	2,0	**3,6**	**0,9**	65	60
72,3	71,3			22	12	12	3	1	4	3	1	1	1	1	1,8	0,5	1,0	**1,8**	**0,5**	65	60
71,3	70,9			20	12	12	3	1	4	3	1	1	1	1	1,6	0,4	1,0	**1,6**	**0,4**	65	60
70,9	70,3			10	12	12	3	1	4	3	1	1	1	1	0,8	0,2	1,0	**0,8**	**0,2**	65	60
70,3	69,4	**Core loss**																			
69,4	69,3	**Scoria**		68	12	12	3	2	3	2	1	1	1	1	8,6	3,8	2,0	**4,3**	**1,9**	60	55
69,3	68,6			90	12	12	3	2	3	2	1	1	1	1	11,3	5,0	2,0	**5,6**	**2,5**	60	55
68,6	66,5			55	12	12	3	2	3	2	1	1	1	1	6,9	3,1	2,0	**3,4**	**1,5**	60	55
66,5	65,7			16	12	12	3	2	3	2	1	1	1	1	2,0	0,9	1,0	**2,0**	**0,9**	60	55
65,7	64,5	**Core loss**																			
64,5	64,4																				
64,4	63,5	**Tholeiite**		13	12	12	3	1	4	3	1	1	1	1	1,1	0,3	1,0	**1,1**	**0,3**	60	55
63,5	62,7			17	12	12	3	1	4	3	1	1	1	1	1,4	0,4	1,0	**1,4**	**0,4**	60	55
62,7																					

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-75**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
124,7	121,8	**Brown topsoil**		0																	
121,8	120,4	**Porphyritic basalt**		0																	
120,4	120,2			60	12	9	3	2	4	2	1	1	2,5	2,5	4,0	1,0	1,5	**2,7**	**0,7**	65	60
120,2	120,1	**Basaltic dyke**		10 **	12	12	3	2	4	3	1	1	2,5	2,5	0,3	0,2	1,0	**0,3**	**0,2**	65	60
120,1	118,3			75	12	12	3	2	4	3	1	1	2,5	2,5	2,5	1,3	1,0	**2,5**	**1,3**	65	60
118,3	116,0			76	12	12	3	2	4	3	1	1	2,5	2,5	2,5	1,3	1,0	**2,5**	**1,3**	65	60
116,0	113,8			80	12	12	3	2	4	3	1	1	2,5	2,5	2,7	1,3	1,0	**2,7**	**1,3**	65	60
113,8	112,7			96	12	12	3	2	4	3	1	1	2,5	2,5	3,2	1,6	1,0	**3,2**	**1,6**	65	60
112,7	112,6	**Porphyritic basalt cont.**		50	12	12	3	2	4	3	1	1	2,5	2,5	1,7	0,8	1,0	**1,7**	**0,8**	65	60
112,6	111,6			99	12	12	3	2	4	3	1	1	2,5	2,5	3,3	1,7	1,0	**3,3**	**1,7**	65	60
111,6	109,5			85	12	12	3	2	4	3	1	1	2,5	2,5	2,8	1,4	1,0	**2,8**	**1,4**	65	60
109,5	109,0			77	12	12	3	2	4	3	1	1	2,5	2,5	2,6	1,3	1,0	**2,6**	**1,3**	65	60
109,0	108,3	**Sandstone**		14	9	9	2	1	4	2	1	1	2,5	2,5	0,6	0,2	1,0	**0,6**	**0,2**	50	45
108,3	108,2	**Porphyritic basalt cont.**		96	12	12	3	2	4	2	1	1	2,5	2,5	4,8	1,6	2,0	**2,4**	**0,8**	65	60
108,2	107,3			100	12	12	3	2	4	2	1	1	2,5	2,5	5,0	1,7	2,0	**2,5**	**0,8**	65	60
107,3	107,0			80	12	12	3	2	4	2	1	1	2,5	2,5	4,0	1,3	1,5	**2,7**	**0,9**	65	60
107,0	105,4	Scoraceous basalt		81	12	12	3	2	3	2	1	1	2,5	2,5	4,1	1,8	1,5	**2,7**	**1,2**	65	60
105,4	105,2	**Sandstone**		100	9	9	2	1	4	2	1	1	1	1	11,1	2,8	2,5	**4,4**	**1,1**	55	50
105,2	103,1			69	9	9	2	1	4	2	1	1	1	1	7,6	1,9	2,5	**3,1**	**0,8**	55	50
103,1	103,0			100	9	9	2	1	4	2	1	1	1	1	11,1	2,8	2,5	**4,4**	**1,1**	55	50
103,0	102,4	**Scoria**		100	15	12	3	2	3	2	1	1	1	1	12,5	4,4	2,0	**6,3**	**2,2**	65	60
102,4	101,0	**Basaltic dyke**		97	12	9	3	2	3	2	1	1	1	1	16,2	5,4	2,5	**6,5**	**2,2**	65	60
101,0	99,9			83	12	9	3	2	3	2	1	1	1	1	13,9	4,6	2,5	**5,5**	**1,8**	65	60
99,9	98,9	**Scoria**		57	15	12	3	2	3	2	1	1	1	1	7,2	2,5	1,5	**4,8**	**1,7**	65	60
98,9	97,0			55	15	12	3	2	3	2	1	1	1	1	6,8	2,4	1,5	**4,6**	**1,6**	60	55
97,0			Hole bottom																		

* Meters above sea level

** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Borehole: **NK-76**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
109,6	106,8	**Soil**																			
106,8	106,6	**Scoria and soil**																			
106,6	105,4	**Porphyritic basalt**		N/A																	
105,4	104,9	Þjórsá lava		39	12	9	3	2	1	1	1	1	2,5	2,5	5,1	2,6	1,5	**3,4**	**1,7**	70	65
104,9	103,7			42	12	9	3	2	1	1	1	1	2,5	2,5	5,6	2,8	1,5	**3,7**	**1,9**	70	65
103,7	102,8			20	12	9	3	2	1	1	1	1	2,5	2,5	2,7	1,3	1,0	**2,7**	**1,3**	70	65
102,8	101,6			14	12	9	3	2	1	1	1	1	2,5	2,5	1,9	0,9	1,5	**1,3**	**0,6**	70	65
101,6	101,2			10 **	12	9	3	2	1	1	1	1	2,5	2,5	1,3	0,7	1,0	**1,3**	**0,7**	70	65
101,2	99,9			54	12	9	3	2	1	1	1	0,7	2,5	2,5	7,3	2,4	1,5	**4,8**	**1,6**	70	65
99,9	98,9			24	12	9	3	2	1	1	0,7	0,7	2,5	2,5	2,1	1,1	1,0	**2,1**	**1,1**	70	65
98,9	97,1			50	12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,4	2,2	1,5	**3,0**	**1,5**	75	70
97,1	95,4			46	12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,0	2,0	1,5	**2,7**	**1,3**	75	70
95,4	94,5			69	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,1	3,0	1,5	**4,1**	**2,0**	75	70
94,5	92,4			69	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,1	3,0	1,5	**4,0**	**2,0**	75	70
92,4	91,4			26	12	9	3	2	1	1	0,7	0,7	2,5	2,5	2,3	1,1	1,0	**2,3**	**1,1**	75	70
91,4	90,7			83	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,3	3,7	1,5	**4,9**	**2,4**	75	70
90,7	88,5			71	12	9	3	2	1	1	0,7	0,7	2,5	2,5	6,2	3,1	1,5	**4,1**	**2,1**	75	70
88,5	86,4			65	12	9	3	2	1	1	0,7	0,7	2,5	2,5	5,8	2,9	1,5	**3,8**	**1,9**	75	70
86,4	85,3			30	12	9	3	2	1	1	0,7	0,7	2,5	2,5	2,6	1,3	1,0	**2,6**	**1,3**	75	70
85,3	84,1			54	12	9	3	2	1	1	0,7	0,7	2,5	2,5	4,7	2,4	1,5	**3,2**	**1,6**	75	70
84,1	82,0			81	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,1	3,5	2,0	**3,5**	**1,8**	75	70
82,0	80,0			87	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,7	3,8	2,0	**3,8**	**1,9**	75	70
80,0	78,8		10% vesicular at bottom	89	12	9	3	2	1	1	0,7	0,7	2,5	2,5	7,9	3,9	2,0	**3,9**	**2,0**	75	70

Borehole: **NK-76 cont.**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Hvammsvirkjun

Elevation*		Rocktype	Comments	Q-value in rock core												Estimated Q-value in tunnels			GSI - Geological strength index	
					Jn		Jr		Ja		Jw		SRF		Q-value		Deili-	Q-value			
From	To			RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	stuðull	Max	Min	Max	Min
78,8	77,8		**Sediment**																		
77,8	75,6		Gravel High core loss																		
75,6	74,2																				
74,2	73,5		**Hyaloclastite**	22	15	9	3	2	4	2	1	1	1	1	3,7	0,7	1,0	**3,7**	**0,7**	50	45
73,5	72,8			22	12	9	3	2	4	2	1	1	1	1	3,7	0,9	1,0	**3,7**	**0,9**	50	45
72,8	71,5			76	12	9	3	2	4	2	1	1	1	1	12,7	3,2	1,5	**8,5**	**2,1**	50	45
71,5	70,5			70	12	9	3	2	4	2	1	1	1	1	11,7	2,9	1,5	**7,8**	**1,9**	55	50
70,5	67,4			69	12	9	3	2	4	2	1	1	1	1	11,6	2,9	1,5	**7,7**	**1,9**	55	50
67,4	66,0			60	12	9	3	2	4	2	1	1	1	1	9,9	2,5	1,5	**6,6**	**1,7**	55	50
66,0	65,1			95	12	9	3	2	4	2	1	1	1	1	15,9	4,0	1,5	**10,6**	**2,6**	55	50
65,1	65,0			100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	1,5	**11,1**	**2,8**	55	50
65,0	63,9		**Basaltic dyke**	89	12	9	3	2	3	2	1	1	1	1	14,8	4,9	2,0	**7,4**	**2,5**	70	65
63,9	63,0		**Hyaloclastite cont.**	100	12	9	3	2	4	2	1	1	1	1	16,7	4,2	2,0	**8,3**	**2,1**	55	50
63,0	61,0			79	12	9	3	2	4	2	1	1	1	1	13,2	3,3	2,0	**6,6**	**1,7**	55	50
61,0	58,8			84	12	9	3	2	4	2	1	1	1	1	14,0	3,5	1,5	**9,3**	**2,3**	55	50
58,8			Hole bottom																		

* Meters above sea level

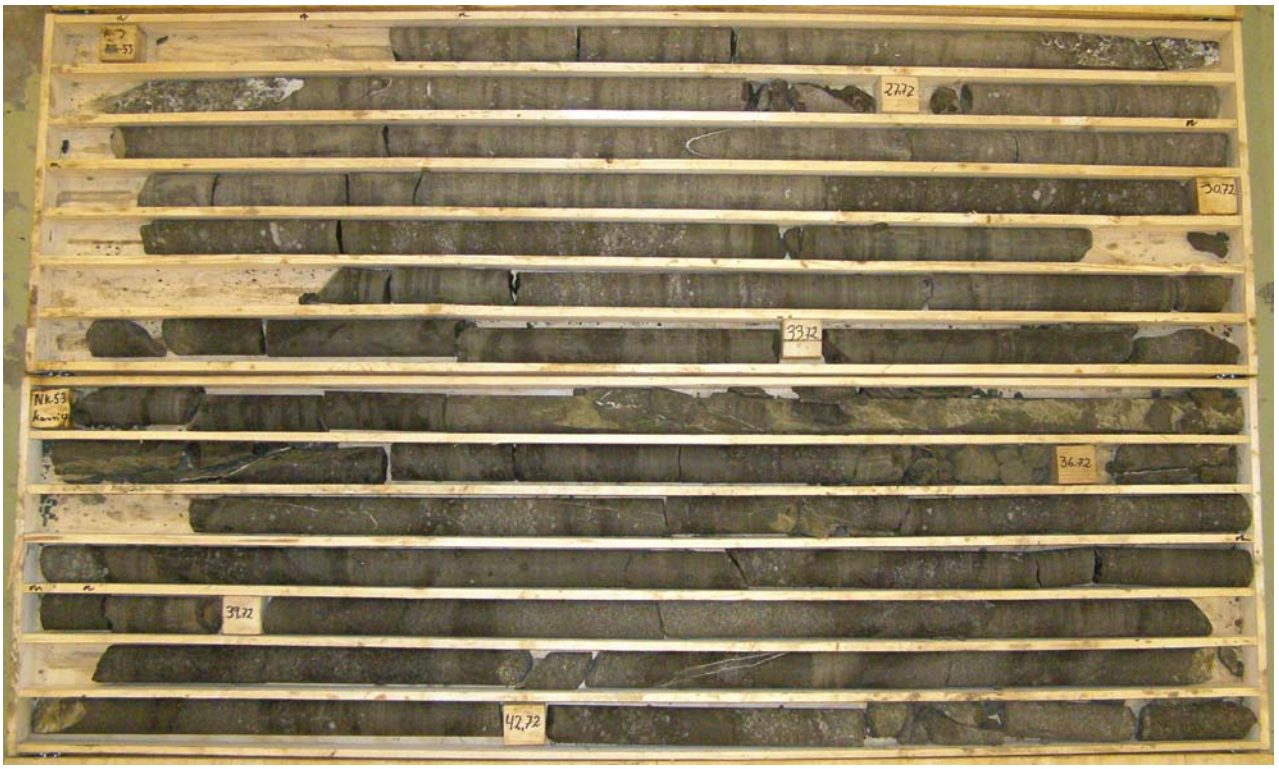
** Where RQD_{10} is reported or measured as ≤ 10 (including 0), a nominal value of 10 is used to evaluate Q.

Appendix D

Photos of cores NK53-NK76

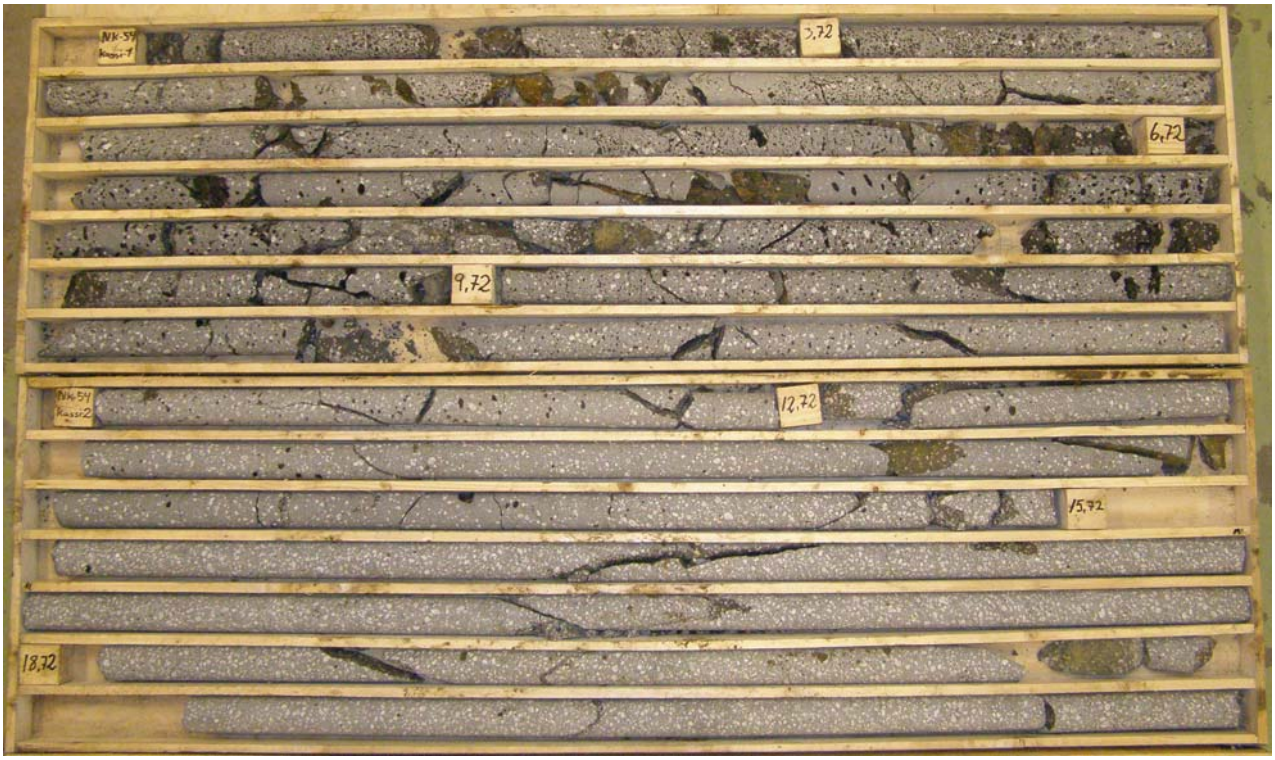
NK-53 BOREHOLE CORE PHOTO BOX 1-2

NK-53 BOREHOLE CORE PHOTO BOX 3-4



NK-53 BOREHOLE CORE PHOTO BOX 5

NK-54 BOREHOLE CORE PHOTO BOX 1-2

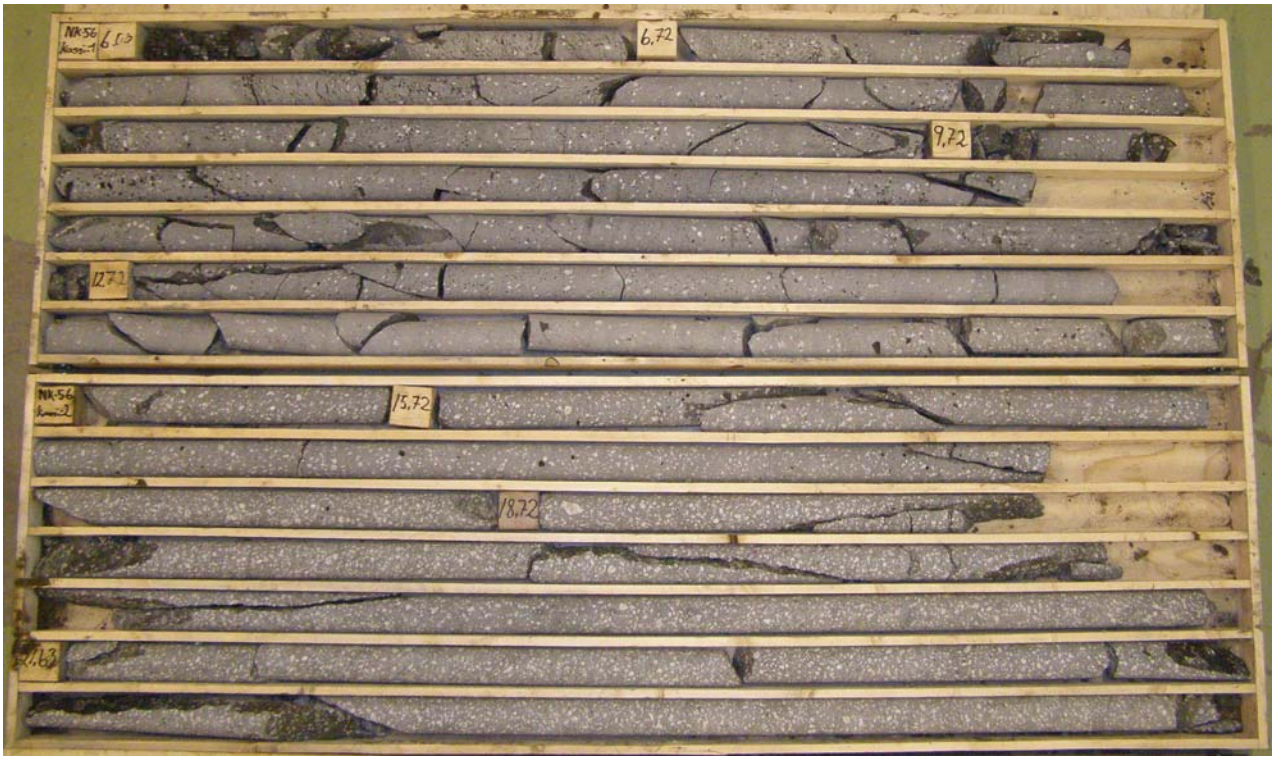


NK-54 BOREHOLE CORE PHOTO BOX 3-4

NK-55 BOREHOLE CORE PHOTO BOX 1-2

NK-55 BOREHOLE CORE PHOTO BOX 3-4

NK-56 BOREHOLE CORE PHOTO BOX 1-2

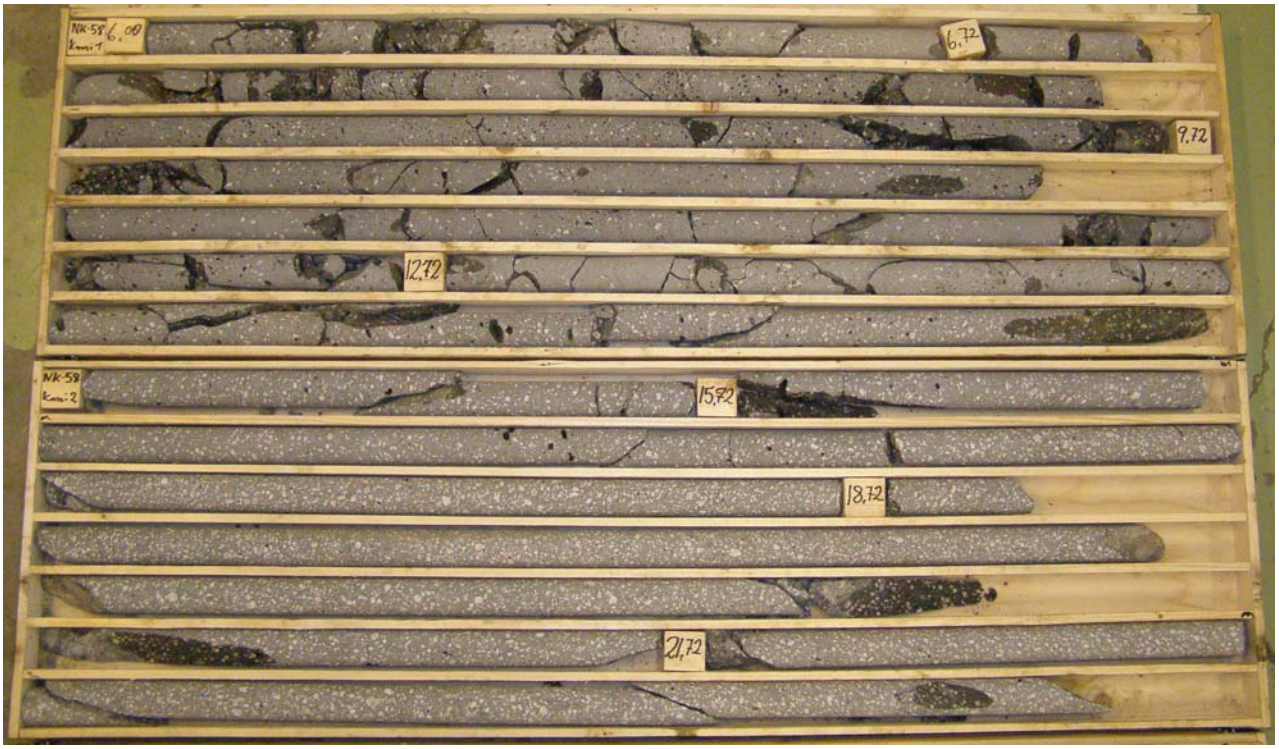


NK-56 BOREHOLE CORE PHOTO BOX 3

NK-57 BOREHOLE CORE PHOTO BOX 1-2

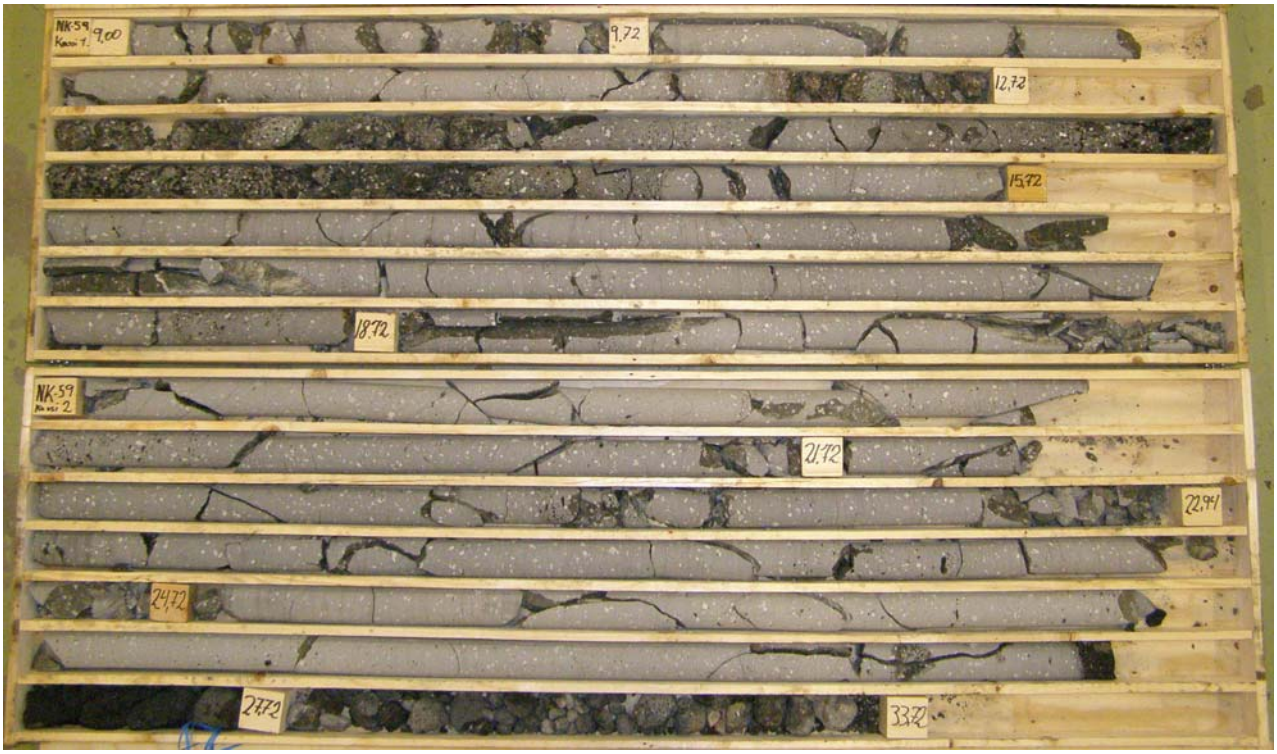
NK-57 BOREHOLE CORE PHOTO BOX 3

NK-58 BOREHOLE CORE PHOTO BOX 1-2



NK-58 BOREHOLE CORE PHOTO BOX 3-4

NK-59 BOREHOLE CORE PHOTO BOX 1-2



NK-60 BOREHOLE CORE PHOTO BOX 1-2

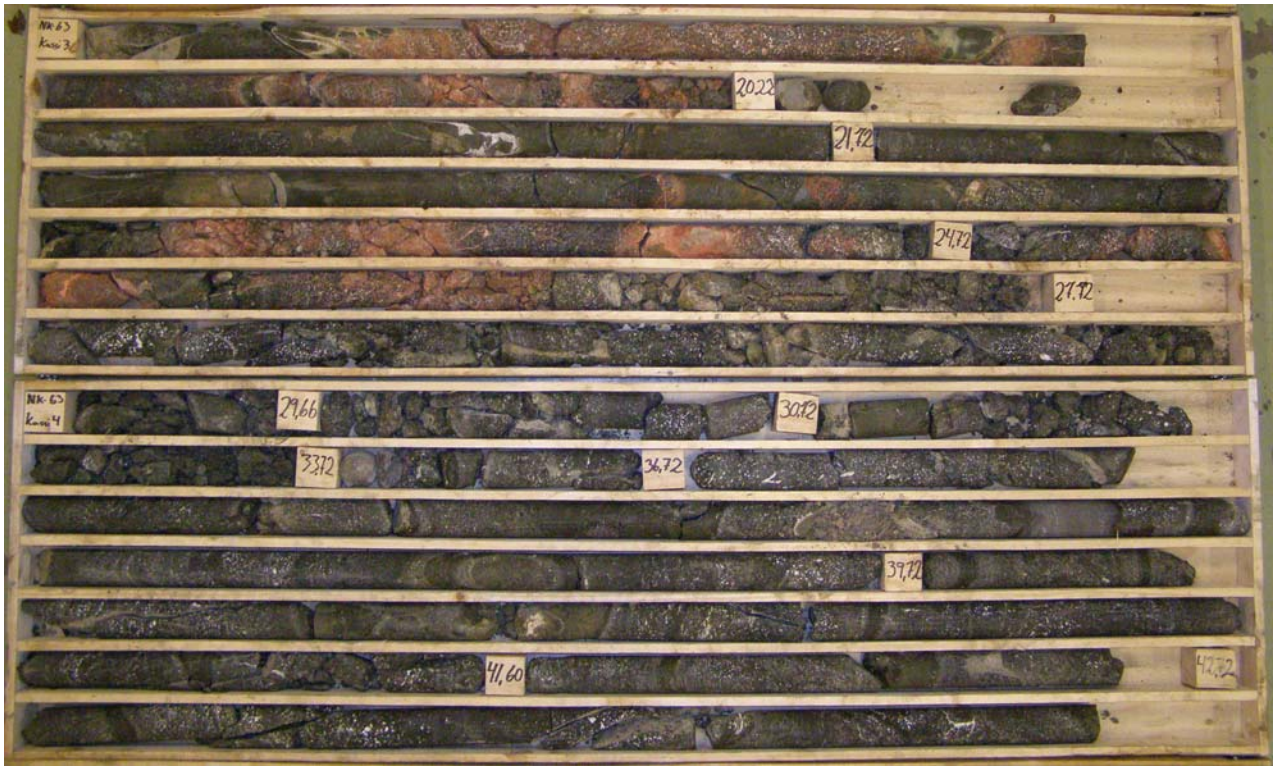
NK-60 BOREHOLE CORE PHOTO BOX 3

NK-61 BOREHOLE CORE PHOTO BOX 1-2

NK-62 BOREHOLE CORE PHOTO BOX 1-3

NK-63 BOREHOLE CORE PHOTO BOX 1-2

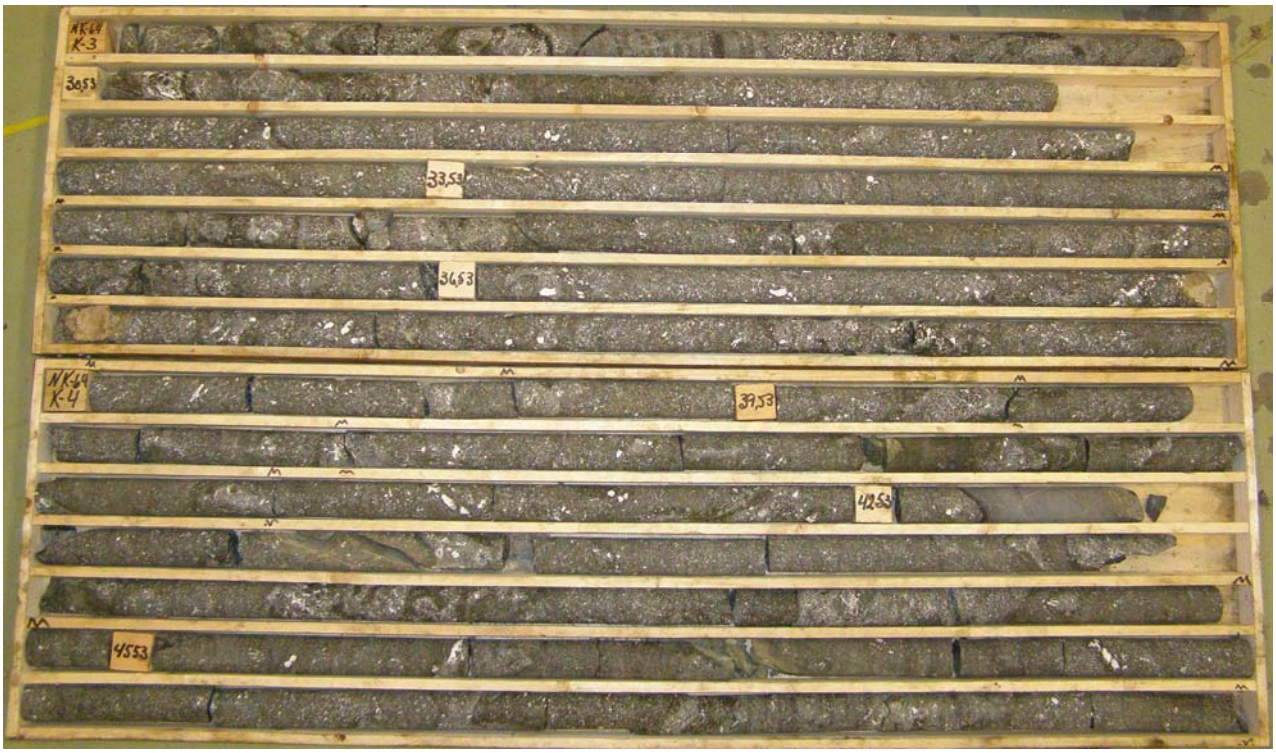
NK-63 BOREHOLE CORE PHOTO BOX 3-4



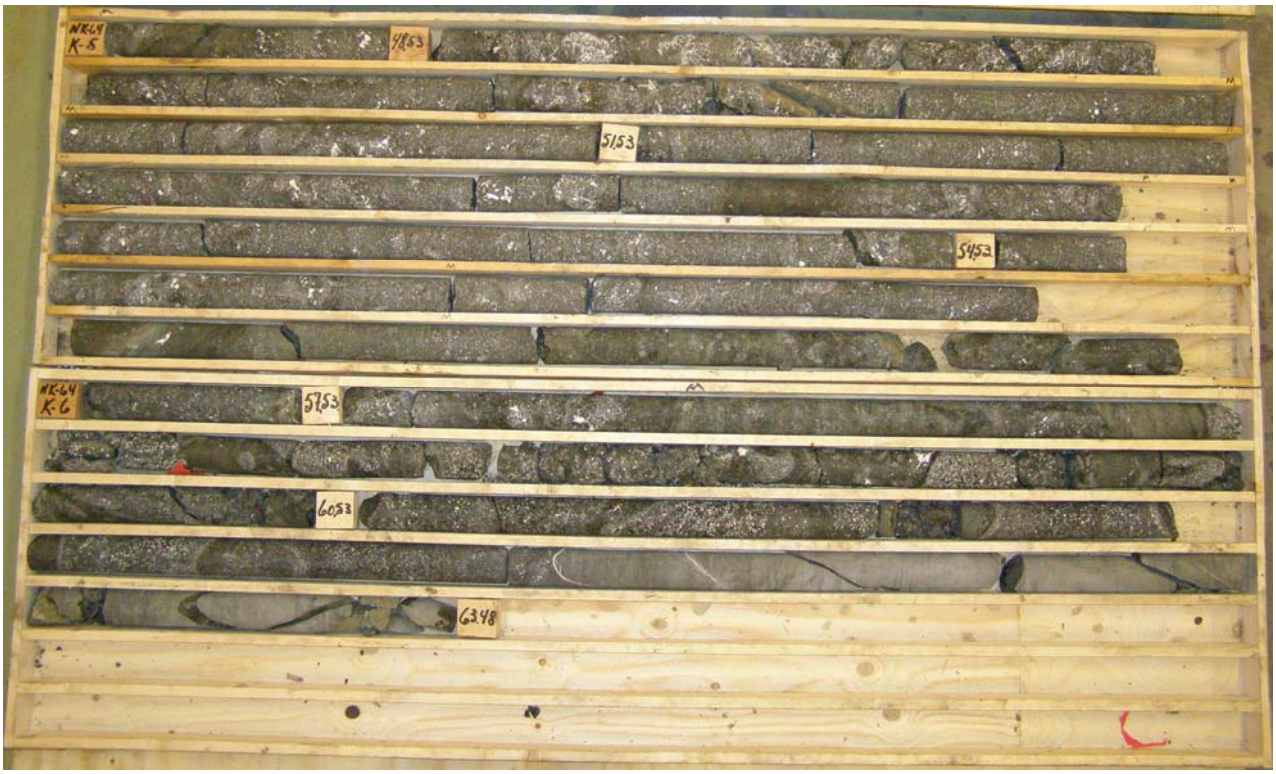
NK-63 BOREHOLE CORE PHOTO BOX 5-6

NK-64 BOREHOLE CORE PHOTO BOX 1-2

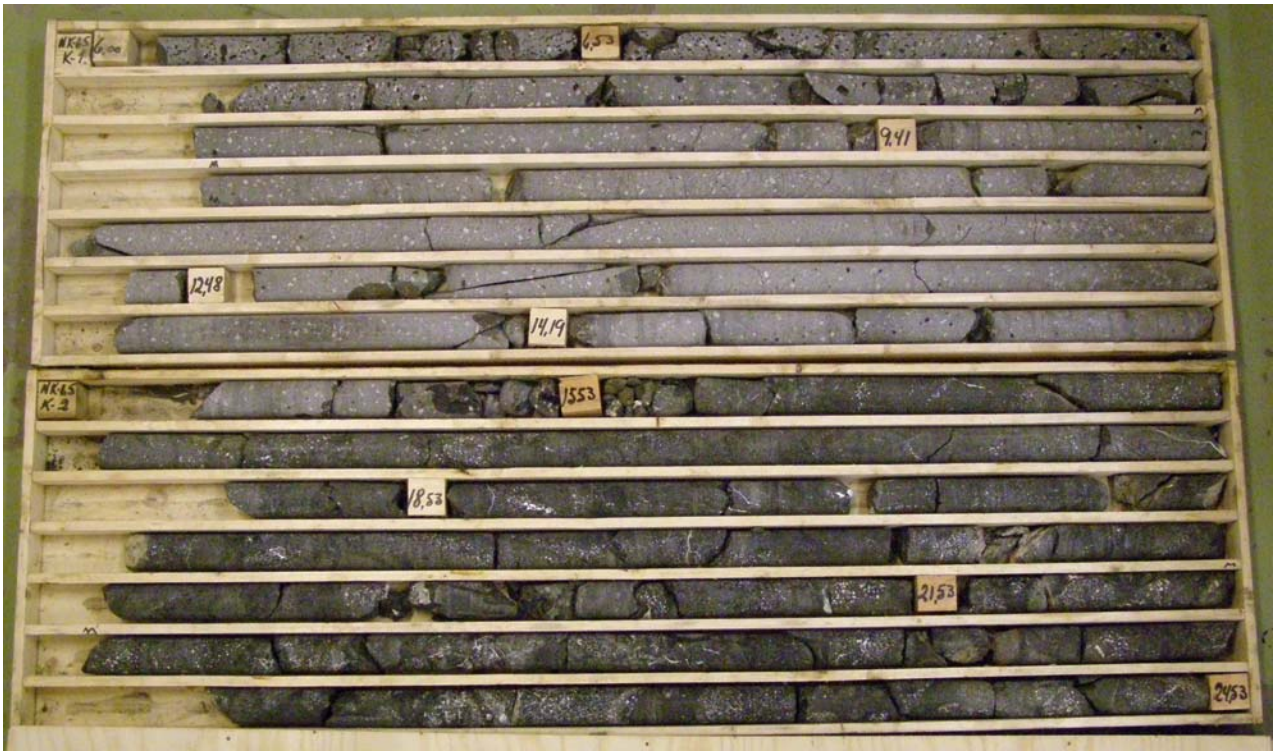
NK-64 BOREHOLE CORE PHOTO BOX 3-4



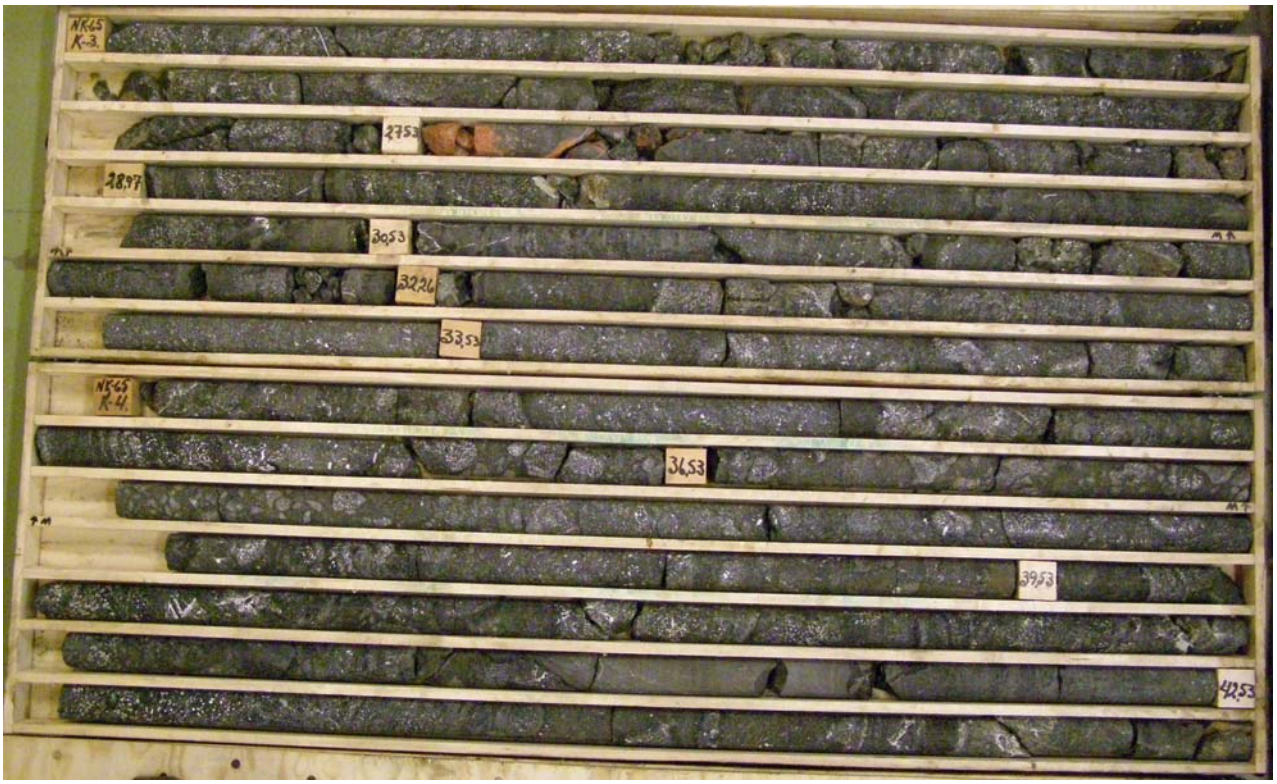
NK-64 BOREHOLE CORE PHOTO BOX 5-6



NK-65 BOREHOLE CORE PHOTO BOX 1-2



NK-65 BOREHOLE CORE PHOTO BOX 3-4



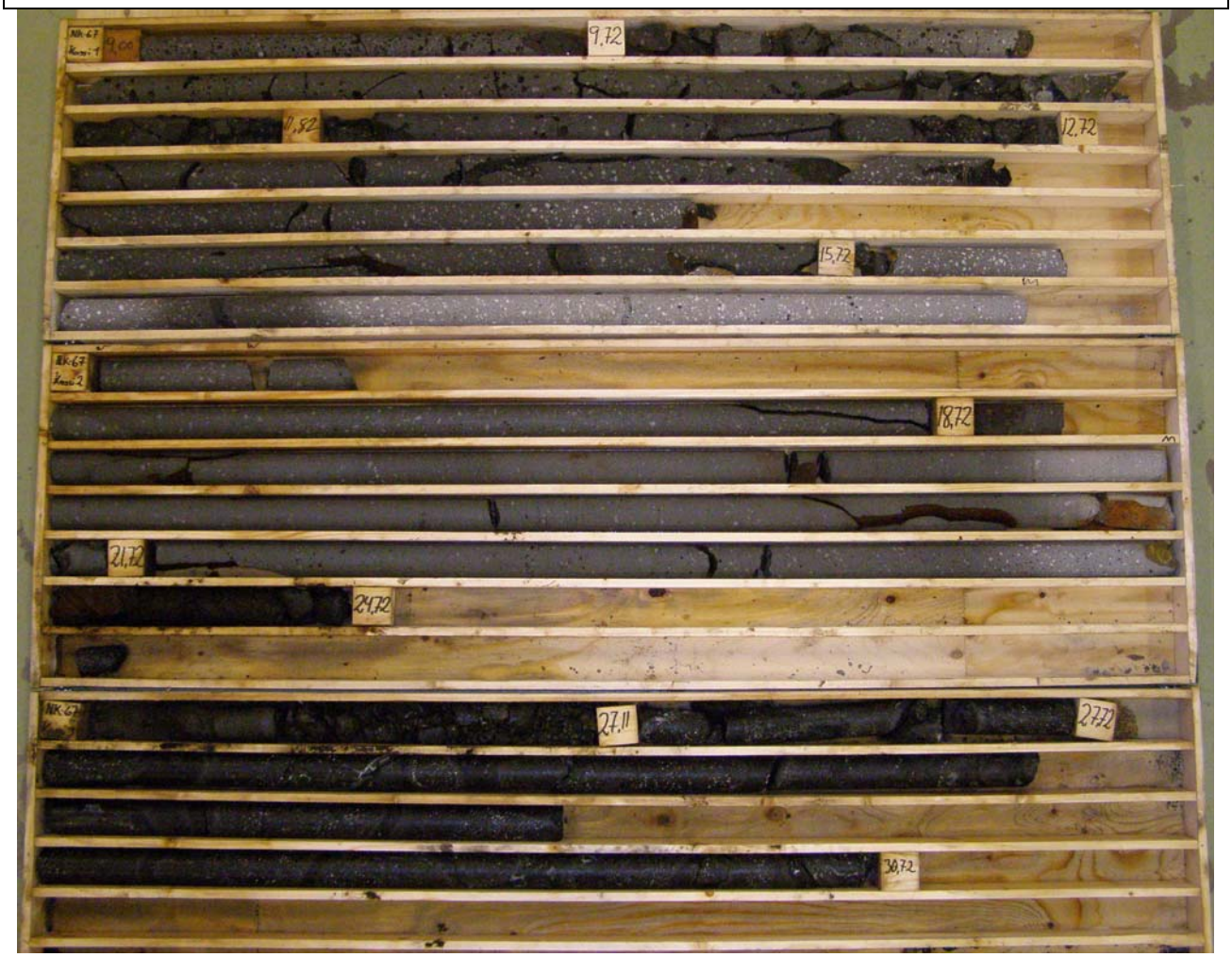
NK-65 BOREHOLE CORE PHOTO BOX 5-6

NK-65 BOREHOLE CORE PHOTO BOX 7-8

NK-65 BOREHOLE CORE PHOTO BOX 9

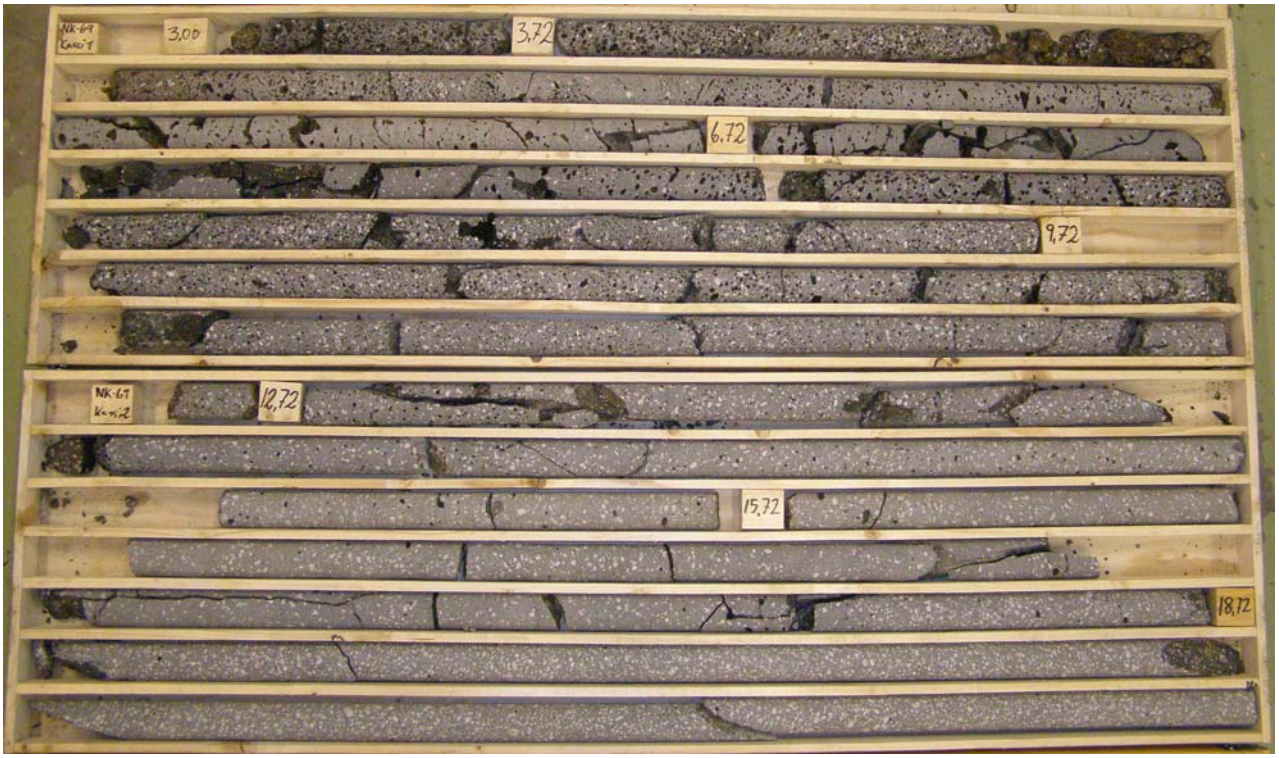
NK-66 BOREHOLE CORE PHOTO BOX 1-2

NK-67 BOREHOLE CORE PHOTO BOX 1-3



NK-68 BOREHOLE CORE PHOTO BOX 1-2

NK-69 BOREHOLE CORE PHOTO BOX 1-2



NK-69 BOREHOLE CORE PHOTO BOX 3-4

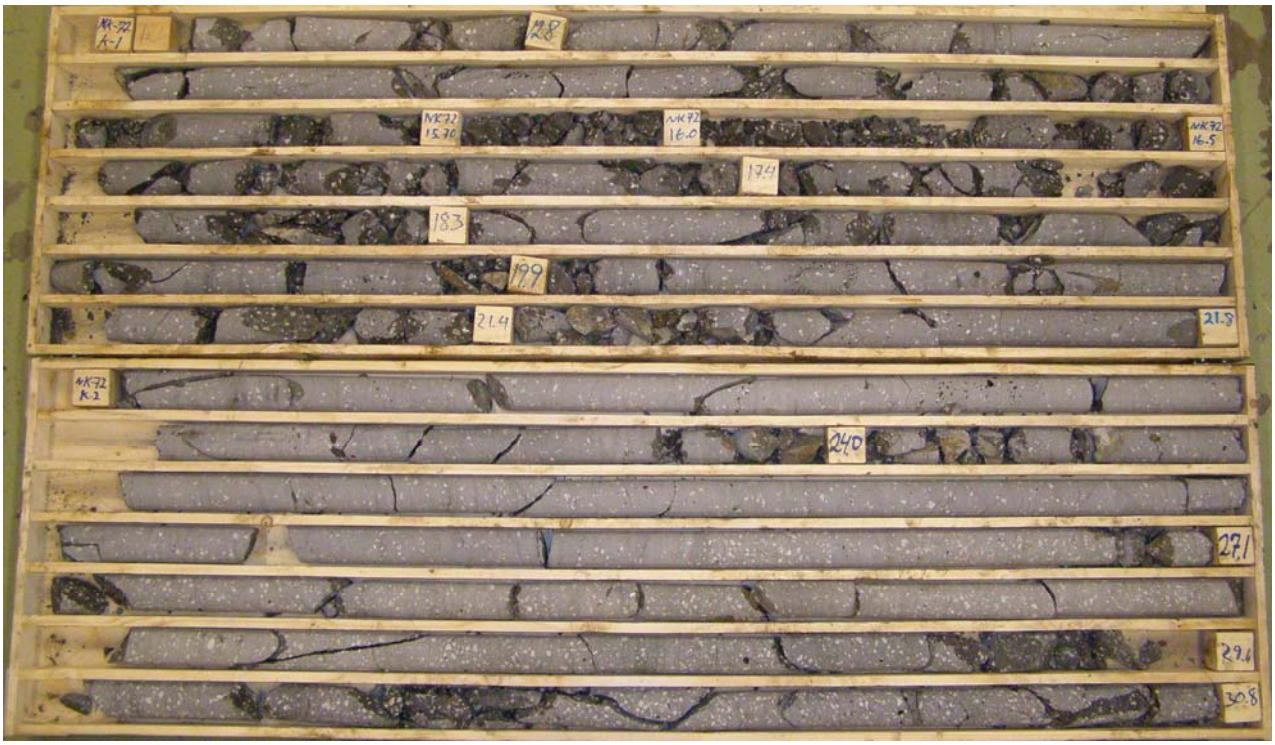
NK-70 BOREHOLE CORE PHOTO BOX 1-2

NK-70 BOREHOLE CORE PHOTO BOX 3-4

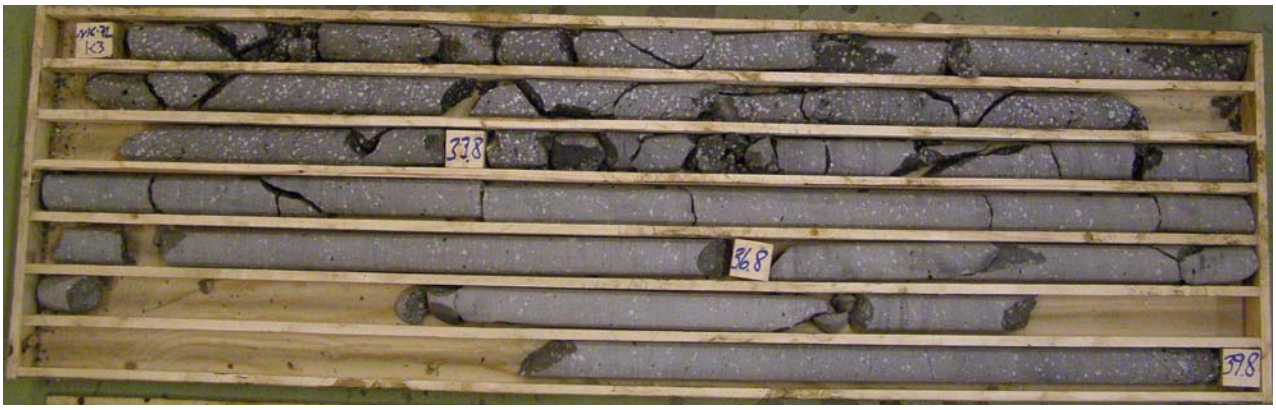
NK-71 BOREHOLE CORE PHOTO BOX 1-2

NK-71 BOREHOLE CORE PHOTO BOX 3-4

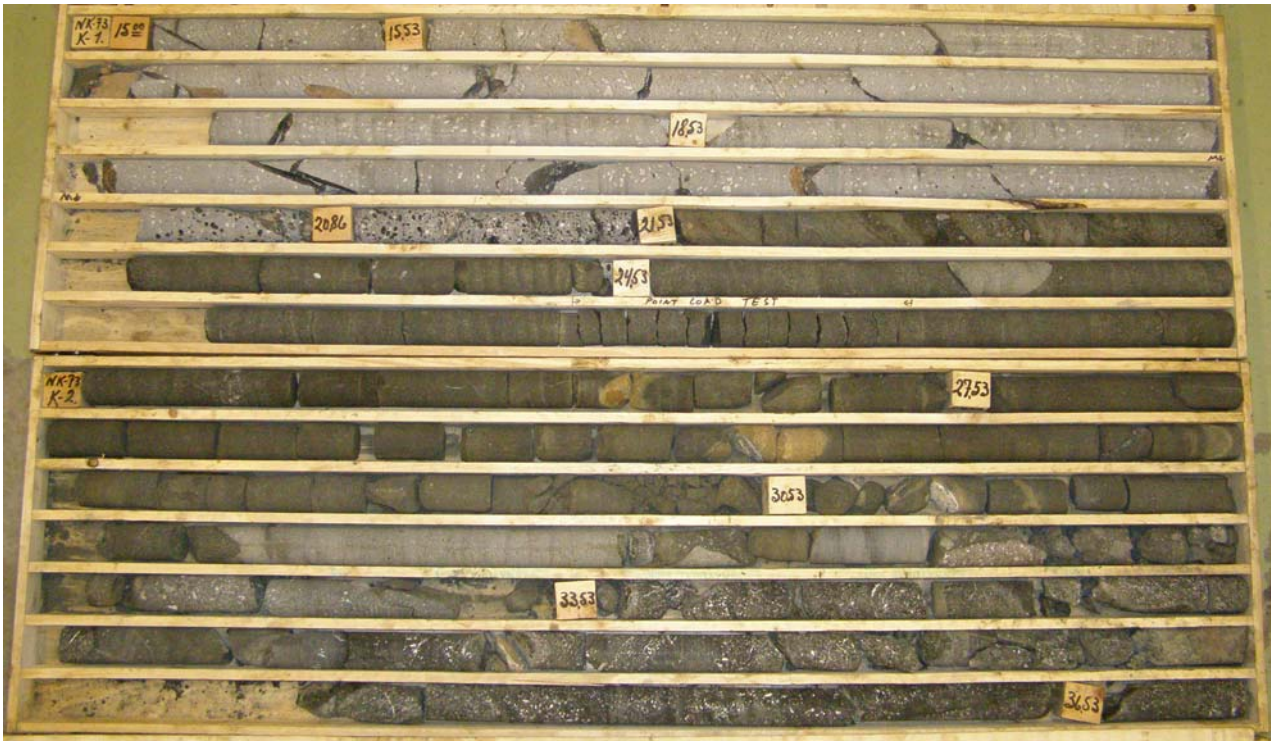
NK-72 BOREHOLE CORE PHOTO BOX 1-2



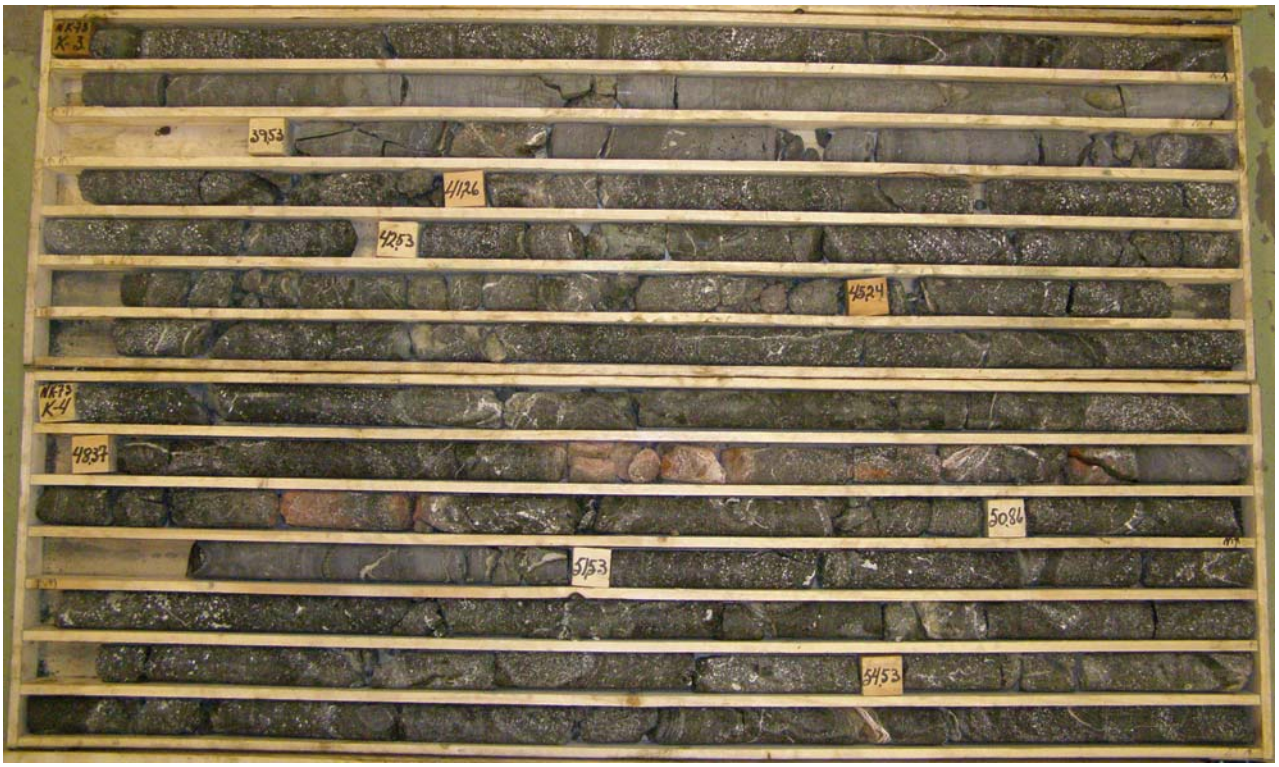
NK-72 BOREHOLE CORE PHOTO BOX 3



NK-73 BOREHOLE CORE PHOTO BOX 1-2



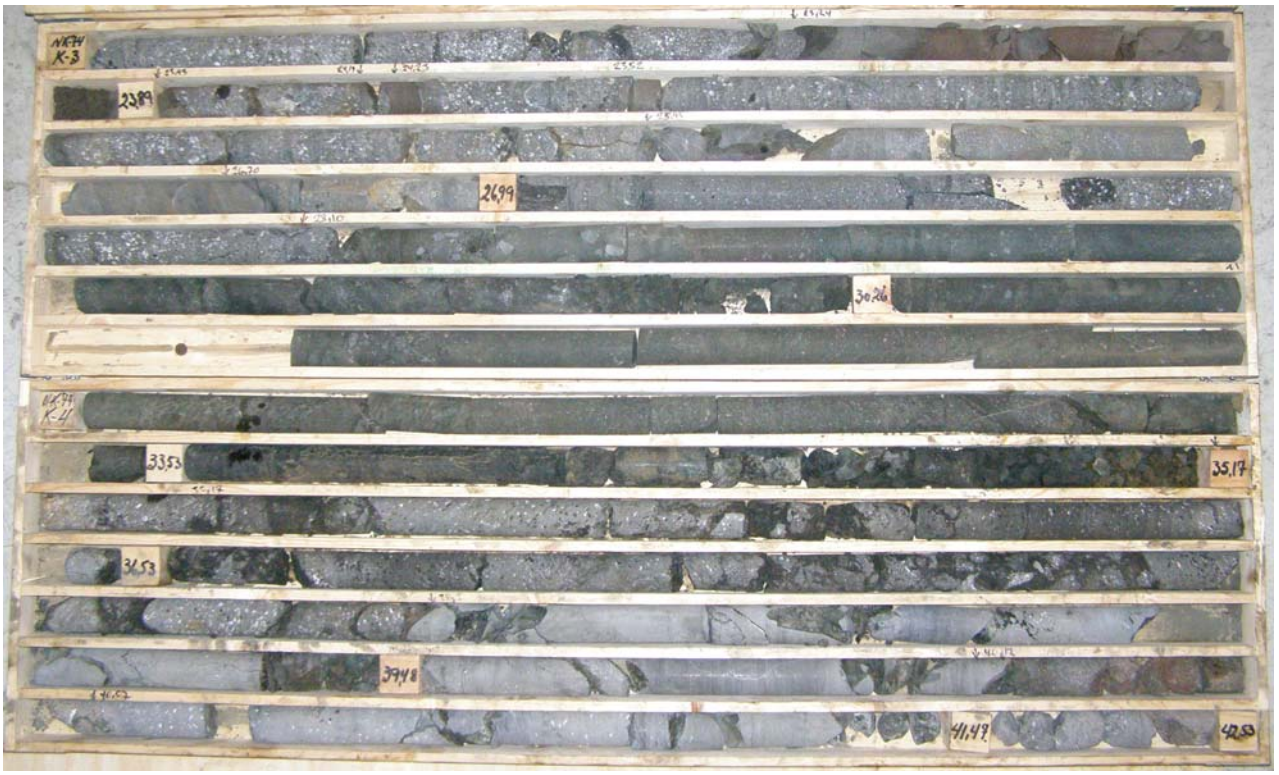
NK-73 BOREHOLE CORE PHOTO BOX 3-4



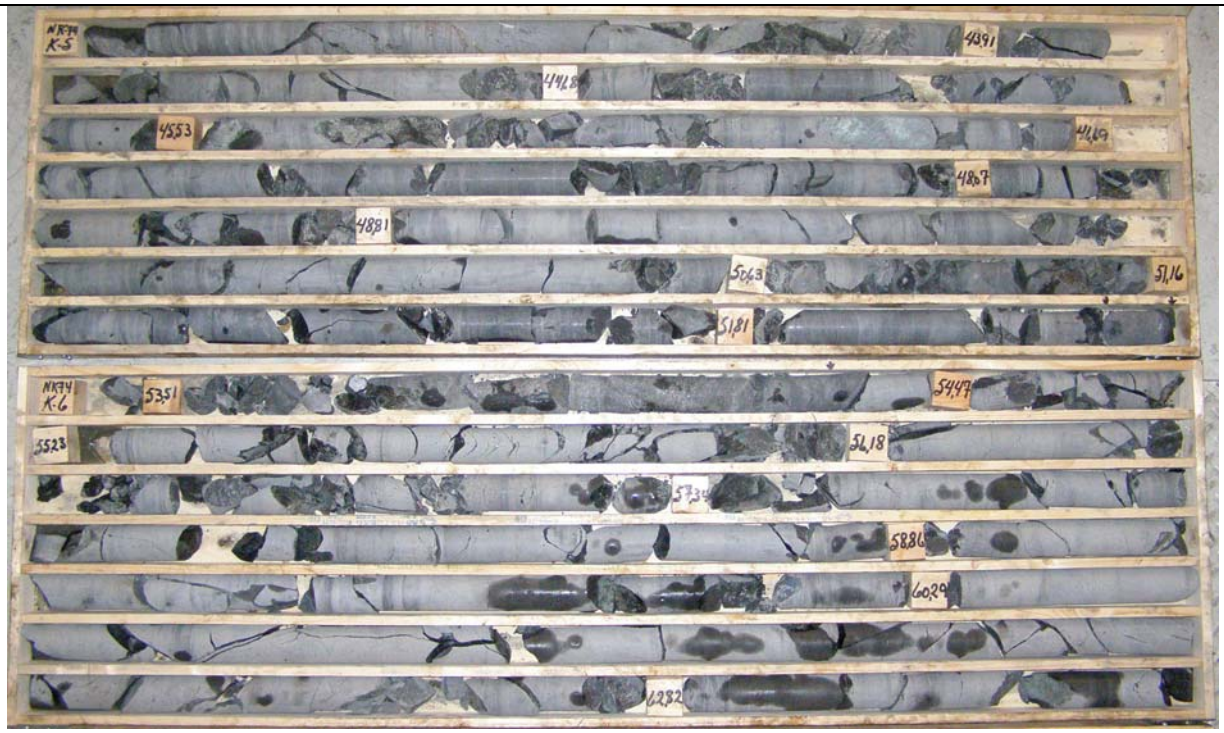
NK-73 BOREHOLE CORE PHOTO BOX 5-6

NK-74 BOREHOLE CORE PHOTO BOX 1-2

NK-74 BOREHOLE CORE PHOTO BOX 3-4

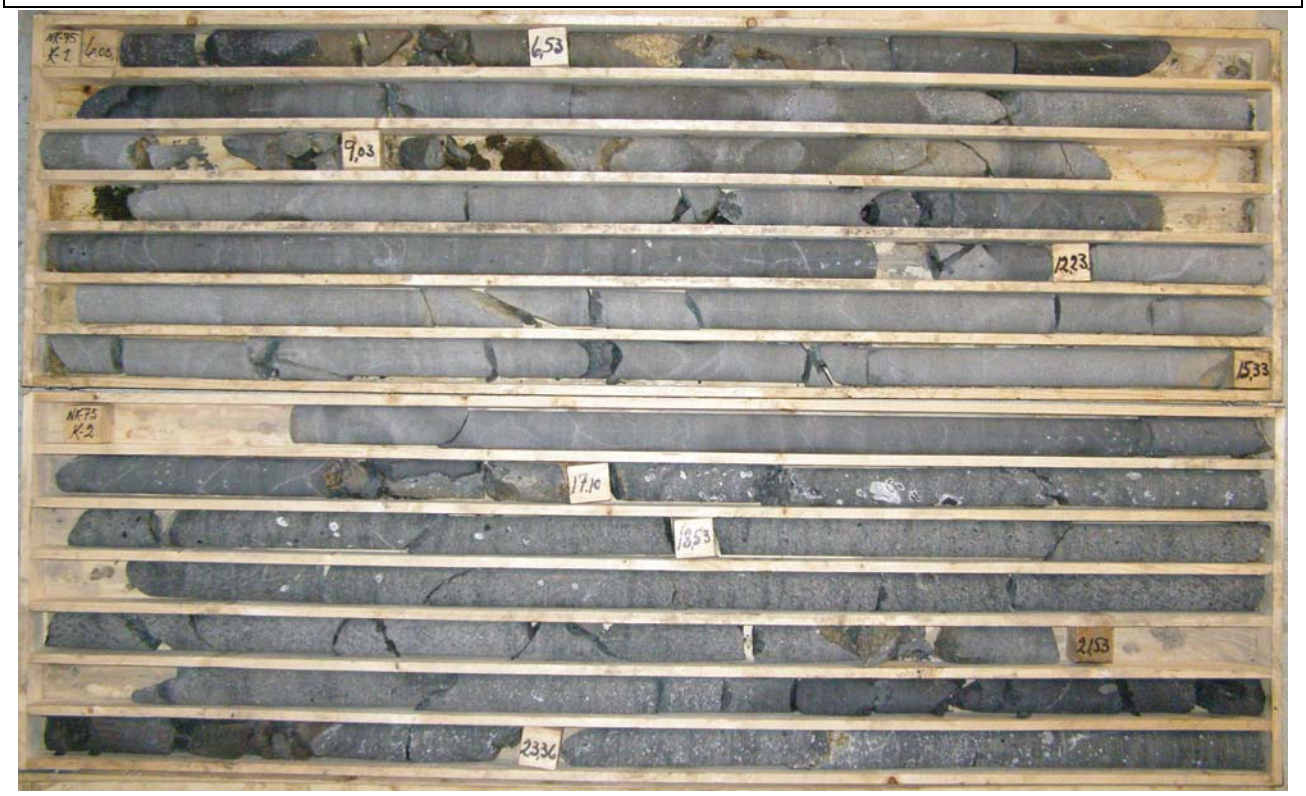


NK-74 BOREHOLE CORE PHOTO BOX 5-6



NK-74 BOREHOLE CORE PHOTO BOX 7-8-9

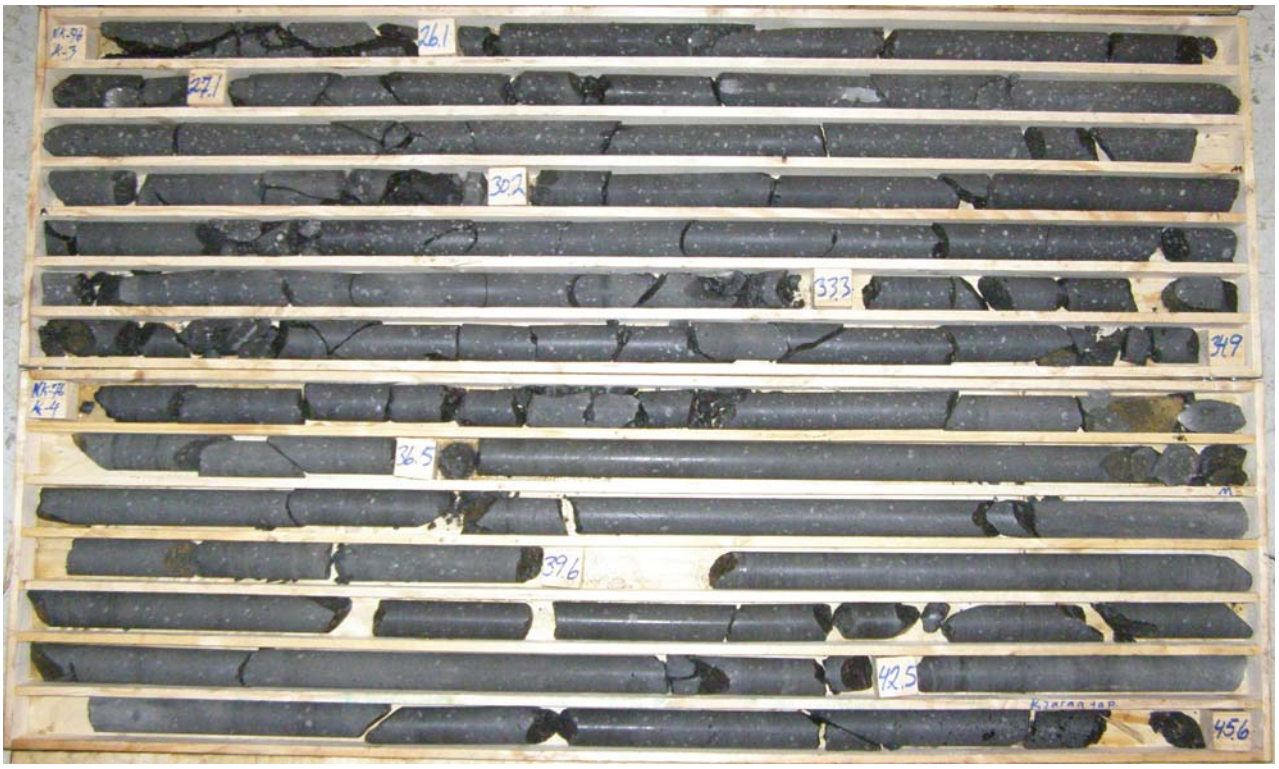
NK-75 BOREHOLE CORE PHOTO BOX 1-2



NK-75 BOREHOLE CORE PHOTO BOX 3-4

NK-76 BOREHOLE CORE PHOTO BOX 1-2

NK-76 BOREHOLE CORE PHOTO BOX 3-4



NK-76 BOREHOLE CORE PHOTO BOX 5-6-7

Appendix E

Tests on cores

Uniaxial compressive strength

MANNVIT ENGINEERING

Borehole-Sample	Date of test	Depth (m)	Elevation m a.s.l	Rock type	Length (mm)	Diameter (mm)	L/D	Density (kg/m^3)	Ax. load (kN)	UCS (Mpa)
NK-65-1	7.3.2008	33.8	81.54	Hyaloclastite	114.2	44.9	2.5	2317	24.1	15.2
NK-65-2	7.3.2008	33.95	81.43	Hyaloclastite	90.8	45.0	2.0	2257	38.9	24.7
NK-65-3	7.3.2008	34.15	81.29	Hyaloclastite	113.1	45.0	2.5	2207	48.9	30.7
NK-73-1	7.3.2008	25.6	89.09	Sandstone	109.9	44.7	2.5	1951	20.6	13.1
NK-73-2	7.3.2008	26.1	88.73	Sandstone	102.0	44.7	2.3	1916	9.18	5.8
NK-73-3	7.3.2008	26.3	88.59	Sandstone	96.0	44.7	2.1	1917	9.95	6.3
NK-74-1	15.8.2008	30.7-31.9	103	Sandstone	108.2	45.0	2.4	2094	8.26	5.1
NK-74-2	15.8.2008	30.7-31.9	103	Sandstone	112.4	45.0	2.5	2231	10.76	6.6
NK-74-3	15.8.2008	30.7-31.9	103	Sandstone	105.2	44.9	2.3	2072	7.81	4.8
NK-74-4	15.8.2008	32.3-32.5	101.4	Sandstone	113.0	45.0	2.5	1958	13.17	8.1
NK-74-5	15.8.2008	32.3-32.5	101.4	Sandstone	100.3	44.9	2.2	1953	12.54	7.8

Method: ISRM suggested methods for determining water content, porosity, absorption and related properties

Sample nr.	Rock type	Vatnsdrægni [%] (Water absorption)	Þurr rúmþyngd (Dry density)	Vot rúmþyngd (Wet density)	Holrýmd (Porosity)	Raki við brot [%] (Water content)
NK-65/33,85-34,26 - 1	Hyaloclastite	11.51	2107 kg/m3	2350 kg/m3	24.26%	11.39
NK-65/33,85-34,26 - 2	Hyaloclastite	15.25	1925 kg/m3	2219 kg/m3	29.37%	15.09
NK-65/33,85-34,26 - 3	Hyaloclastite	16.57	1885 kg/m3	2198 kg/m3	31.25%	16.28
NK-73/25,51-25,70 - 1	Sandstone	23.02	1621 kg/m3	1994 kg/m3	37.31%	20.67
NK-73/26,12-26,42 - 1	Sandstone	26.04	1541 kg/m3	1943 kg/m3	40.14%	24.38
NK-73/26,12-26,42 - 2	Sandstone	26.52	1539 kg/m3	1948 kg/m3	40.82%	24.97

Date:	06.03.2008	**TESTING REPORT**	MANNVIT ENGINEERING
Job number:	5 481 203	**Point Load Testing**	

Client:	Landsvirkjun				
Project:	Neðri Þjórsá				
Location:	Hvammsvirkjun				
Standard / method:	ASTM D 5731	Performed:	SÁ	Checked:	hha

Sample	D_1 mm	D_2 mm	D_{av} mm	L_{av} mm	P kN	D_e^2 mm^2	I_s MPa	$I_{s(50)}$ MPa	F	D_e	K_{50}	*UCS* *MPa*
NK-65 33.5-33.8	45	45	45	45	4.7	2025	2.33	2.223	0.9537	45	14	*31.1*
	45	45	45	45	4.7	2025	2.33	2.223	0.9537	45	14	*31.1*
	45	45	45	45	4.5	2025	2.22	2.119	0.9537	45	14	*29.7*
	45	45	45	45	4.8	2025	2.35	2.237	0.9537	45	14	*31.3*
	45	45	45	45	4.7	2025	2.32	2.214	0.9537	45	14	*31.0*
	45	45	45	45	4.6	2025	2.28	2.176	0.9537	45	14	*30.5*
	45	45	45	45	4.4	2025	2.18	2.077	0.9537	45	14	*29.1*
	45	45	45	45	4.4	2025	2.18	2.082	0.9537	45	14	*29.1*
	45	45	45	45	4.4	2025	2.18	2.077	0.9537	45	14	*29.1*
Average								2.159				30.220

Comments: The rock type is Móberg pillow lava breccia
Tested Diametrical on cores.
The core was weighted in air and water: 2260 kg/m3

Date:	10.01.2008	**TESTING REPORT**	MANNVIT ENGINEERING
Job number:	5 481 203	**Point Load Testing**	

Client:	Landsvirkjun				
Project:	Neðri Þjórsá				
Location:	Hvammsvirkjun				
Standard / method:	ASTM D 5731	Performed:	FP	Checked:	hha

Sample	D_1 mm	D_2 mm	D_{av} mm	L_{av} mm	P kN	D_e^2 mm^2	I_s MPa	$I_{s(50)}$ MPa	F	D_e	K_{50}	*UCS* *MPa*
NK-73 25.7-26.1	44.5	44.5	44.5		1.3	1980	0.66	0.623	0.9489	44.5	14	*8.7*
	44.5	44.5	44.5		1.3	1980	0.66	0.623	0.9489	44.5	14	*8.7*
	44.5	44.5	44.5		1.25	1980	0.63	0.599	0.9489	44.5	14	*8.4*
	44.5	44.5	44.5		1.42	1980	0.72	0.680	0.9489	44.5	14	*9.5*
	44.5	44.5	44.5		1.27	1980	0.64	0.609	0.9489	44.5	14	*8.5*
	44.5	44.5	44.5		1.3	1980	0.66	0.623	0.9489	44.5	14	*8.7*
	44.5	44.5	44.5		1.5	1980	0.76	0.719	0.9489	44.5	14	*10.1*
	44.5	44.5	44.5		1.5	1980	0.76	0.719	0.9489	44.5	14	*10.1*
	44.5	44.5	44.5		2.1	1980	1.06	1.006	0.9489	44.5	14	*14.1*
	44.5	44.5	44.5		2.2	1980	1.11	1.054	0.9489	44.5	14	*14.8*
	44.5	44.5	44.5		2.4	1980	1.21	1.150	0.9489	44.5	14	*16.1*
	44.5	44.5	44.5		2.1	1980	1.06	1.006	0.9489	44.5	14	*14.1*
	44.5	44.5	44.5		1.7	1980	0.86	0.815	0.9489	44.5	14	*11.4*
Average								0.787				11.0

Comments: The rock type is Sandstone
Tested Diametrical on cores.

Date:	12.08.2008	**TESTING REPORT**	MANNVIT ENGINEERING
Job number:	5 481 203	**Point Load Testing**	

Client:	Landsvirkjun				
Project:	Hvammsvirkjun				
Location:	NK-74, Depth; 31.1- 31,5 m, (102.5 - 102.1 m a.s.l)				
Standard / method:	ASTM D 5731	Performed:	FP	Checked:	hha

Sample	D_1 mm	D_2 mm	D_{av} mm	L_{av} mm	P kN	D_e^2 mm^2	I_s MPa	$I_{s(50)}$ MPa	F	D_e	K_{50}	*UCS* *MPa*
Depth 31.1-31.5 m	44.5	44.5	44.5		0.55	1980	0.28	0.264	0.9489	44.5	14	*3.7*
	44.5	44.5	44.5		0.6	1980	0.30	0.288	0.9489	44.5	14	*4.0*
	44.5	44.5	44.5		0.45	1980	0.23	0.216	0.9489	44.5	14	*3.0*
	44.5	44.5	44.5		0.45	1980	0.23	0.216	0.9489	44.5	14	*3.0*
	44.5	44.5	44.5		0.5	1980	0.25	0.240	0.9489	44.5	14	*3.4*
	44.5	44.5	44.5		0.55	1980	0.28	0.264	0.9489	44.5	14	*3.7*
	44.5	44.5	44.5		0.55	1980	0.28	0.264	0.9489	44.5	14	*3.7*
	44.5	44.5	44.5		0.45	1980	0.23	0.216	0.9489	44.5	14	*3.0*
	44.5	44.5	44.5		0.45	1980	0.23	0.216	0.9489	44.5	14	*3.0*
	44.5	44.5	44.5		0.42	1980	0.21	0.201	0.9489	44.5	14	*2.8*
	44.5	44.5	44.5		0.52	1980	0.26	0.249	0.9489	44.5	14	*3.5*
Average								0.239				3.3

Comments: The rock type is Sandstone
Tested Diametrical on cores.

Date:	12.08.2008	**TESTING REPORT**	MANNVIT ENGINEERING
Job number:	5 481 203	**Point Load Testing**	

Client:	Landsvirkjun				
Project:	Hvammsvirkjun				
Location:	NK-74, Depth; 32,3 - 32,51 m, (101.5 - 101.3 m a.s.l)				
Standard / method:	ASTM D 5731	Performed:	FP	Checked:	hha

Sample	D_1 mm	D_2 mm	D_{av} mm	L_{av} mm	P kN	D_e^2 mm^2	I_s MPa	$I_{s(50)}$ MPa	F	D_e	K_{50}	*UCS* *MPa*
Depth; 32,3 - 32,51 m	44.5	44.5	44.5		1.75	1980	0.88	0.839	0.9489	44.5	14	*11.7*
	44.5	44.5	44.5		1.5	1980	0.76	0.719	0.9489	44.5	14	*10.1*
	44.5	44.5	44.5		1.65	1980	0.83	0.791	0.9489	44.5	14	*11.1*
	44.5	44.5	44.5		2	1980	1.01	0.958	0.9489	44.5	14	*13.4*
	44.5	44.5	44.5		1.9	1980	0.96	0.910	0.9489	44.5	14	*12.7*
	44.5	44.5	44.5		2.1	1980	1.06	1.006	0.9489	44.5	14	*14.1*
	44.5	44.5	44.5		1.95	1980	0.98	0.934	0.9489	44.5	14	*13.1*
	44.5	44.5	44.5		1.75	1980	0.88	0.839	0.9489	44.5	14	*11.7*
Average								0.875				12.2

Comments: The rock type is Sandstone
Tested Diametrical on cores.

Appendix F

Logs of percussion drill holes (NL50-NL68 and NL99-NL103)

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-50

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 17.11.2007 COMPLETED: 19.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444979.456 Y: 394418.74 Z: 111.989	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	5.5 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	15.0 m	GROUNDWATER DEPTH:	7.04 m
		GROUNDWATER ELEVATION:	104.95 m a.s.l. (28.11.2007)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210		COMMENTS
111.0	1.0		Topsoil			Fraste
110.0	2.0					
109.0	3.0		Porphyritic basalt Þjórsá lava			
108.0	4.0					
107.0	5.0				1010	
106.0	6.0					
105.0	7.0					GWT28.11.2007
104.0	8.0					
103.0	9.0					
102.0	10.0					GWT10.4.2008 GWT3.12.2008 13:40:00 GWT3.6.2008
101.0	11.0					GWT21.8.2008 12:30:00
100.0	12.0					
99.0	13.0					
98.0	14.0				660	
97.0	15.0					
96.0	16.0					
95.0	17.0					
94.0	18.0					
93.0	19.0					
92.0	20.0					
91.0	21.0					
90.0	22.0					
89.0	23.0					
88.0	24.0					

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-51

CLIENT:	Landsvirkjun	DATE: STARTED: 20.11.2007	COMPLETED: 20.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445025.96 Y: 394507.055 Z: 112.651	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	4.5 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	29.6 m	GROUNDWATER DEPTH:	7.55 m
		GROUNDWATER ELEVATION:	105.1 m a.s.l. (28.11.2007)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
112.0	1.0		Topsoil		Fraste
111.0	2.0				
110.0	3.0		Scoriaceous porphyritic basalt Þjórsá lava		
109.0	4.0		Porphyritic basalt, solid.		
108.0	5.0				
107.0	6.0				
106.0	7.0				
105.0	8.0				GWT28.11.2007
104.0	9.0				
103.0	10.0				GWT10.4.2008
					GWT3.12.2008 13:37:00
102.0	11.0				GWT3.6.2008
101.0	12.0				GWT21.8.2008 12:26:00
100.0	13.0				
99.0	14.0				
98.0	15.0				
97.0	16.0				
96.0	17.0				
95.0	18.0				
94.0	19.0				
93.0	20.0				
92.0	21.0				
91.0	22.0				
90.0	23.0				
89.0	24.0				
88.0					

MANNVIT
ENGINEERING

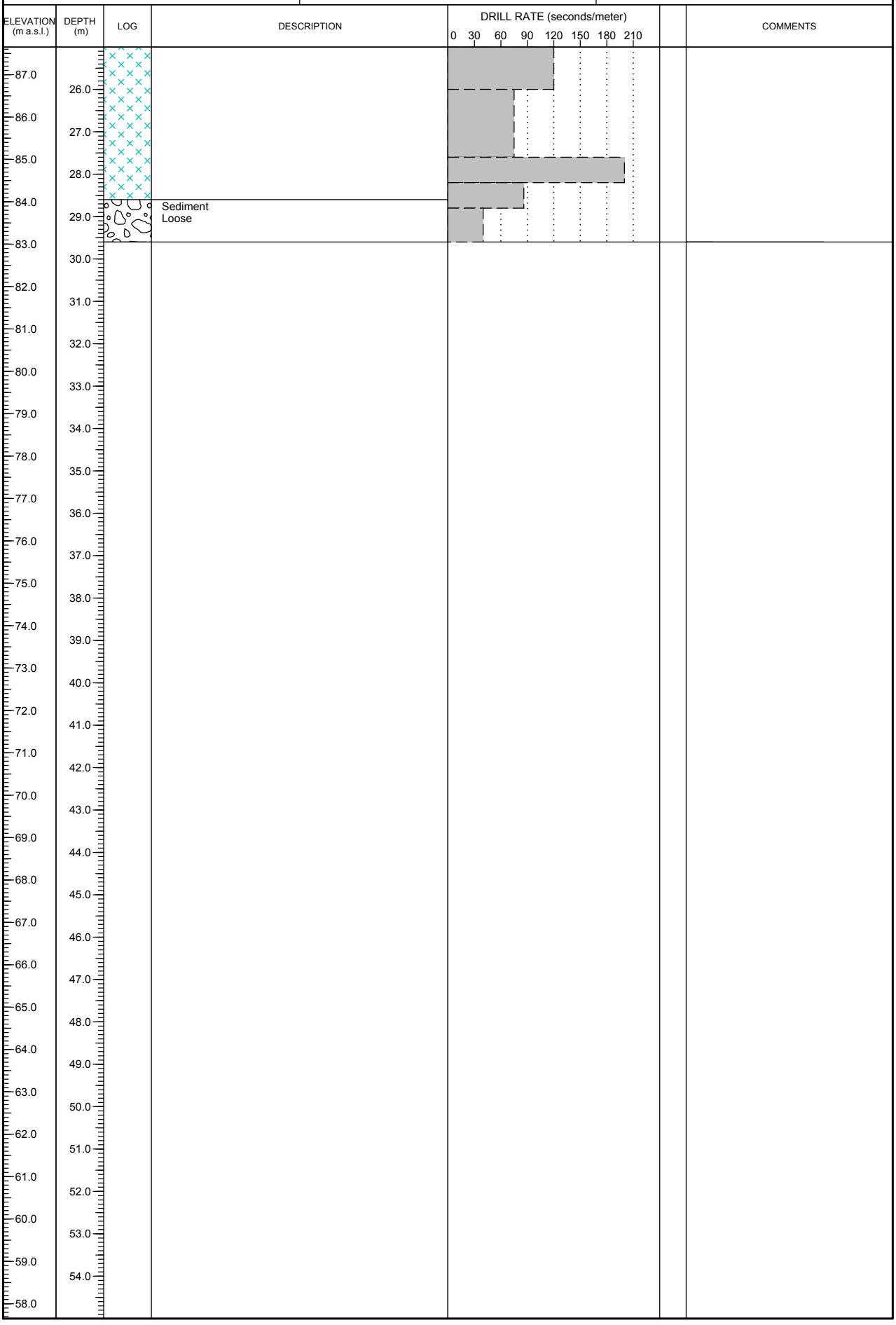
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-51

SHEET 2 OF 2



MANNVIT ENGINEERING

BOREHOLE LOG

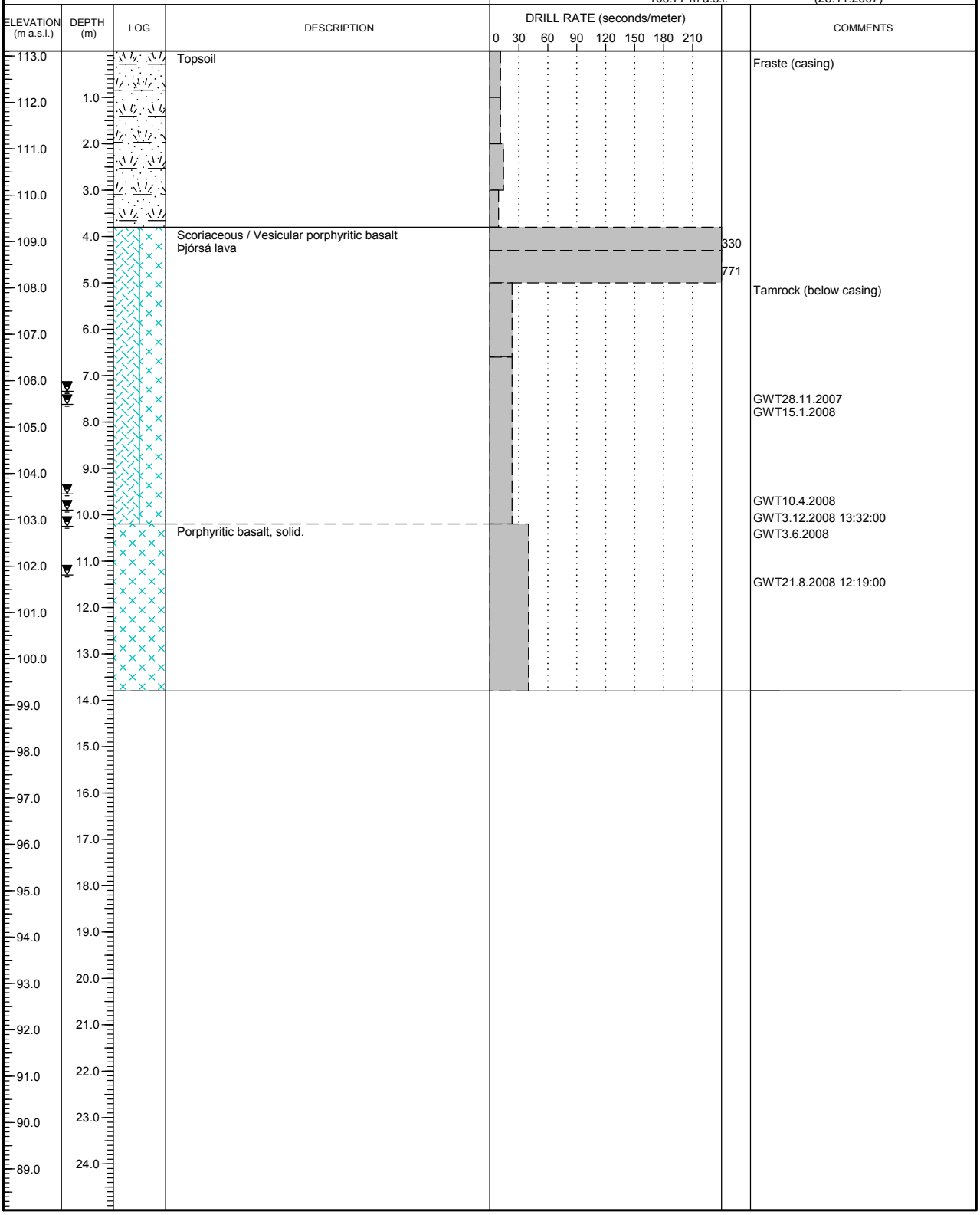
PERCUSSION DRILLING

BOREHOLE NO.:

NL-52

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 20.11.2007 COMPLETED: 21.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445160.056 Y: 394646.819 Z: 113.108	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	5.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	13.8 m	GROUNDWATER DEPTH:	7.34 m
		GROUNDWATER ELEVATION:	105.77 m a.s.l. (28.11.2007)



MANNVIT ENGINEERING

BOREHOLE LOG

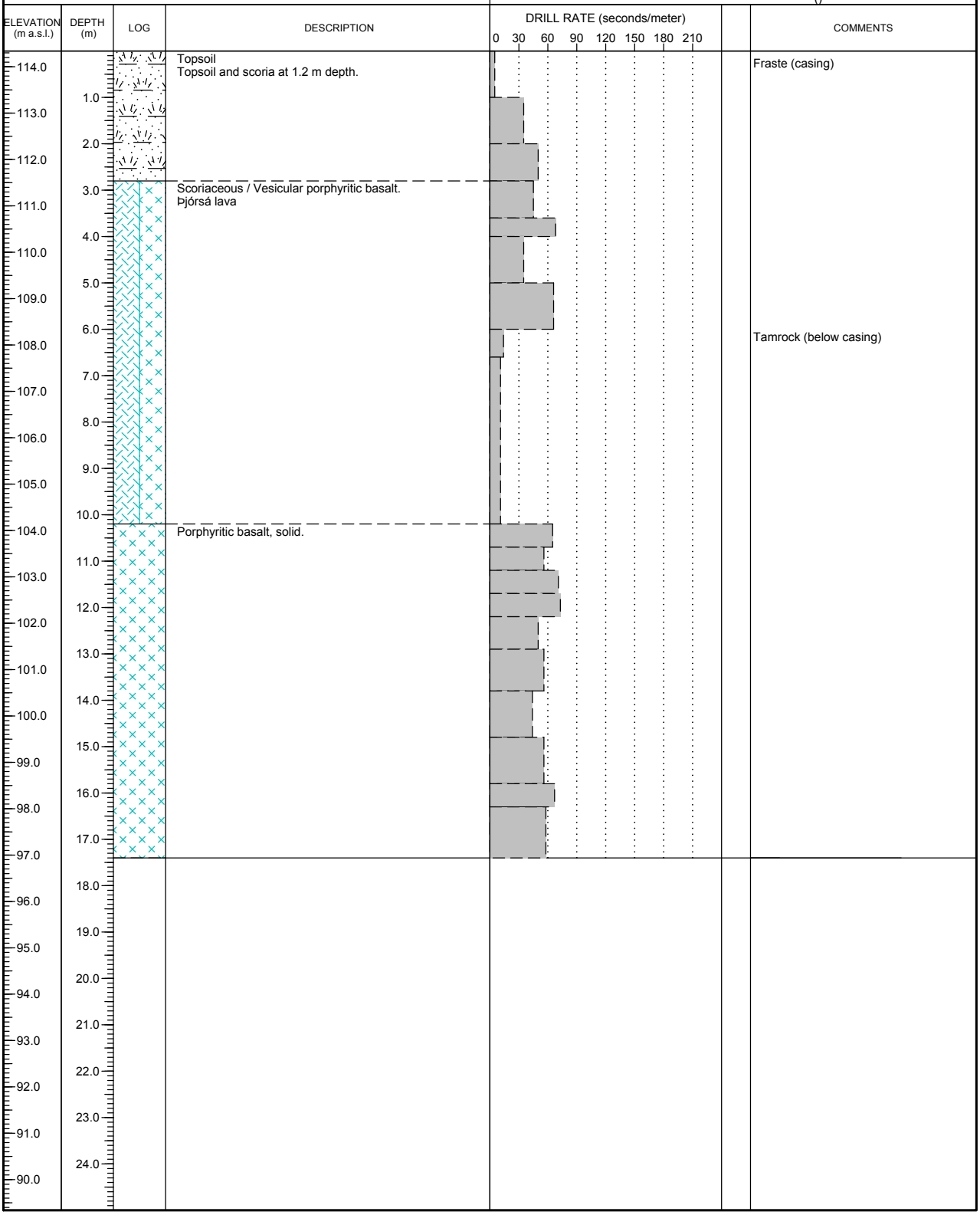
PERCUSSION DRILLING

BOREHOLE NO.:

NL-53

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.11.2007 COMPLETED: 21.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445340.317 Y: 394732.284 Z: 114.339	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	6.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	17.4 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	()



MANNVIT ENGINEERING

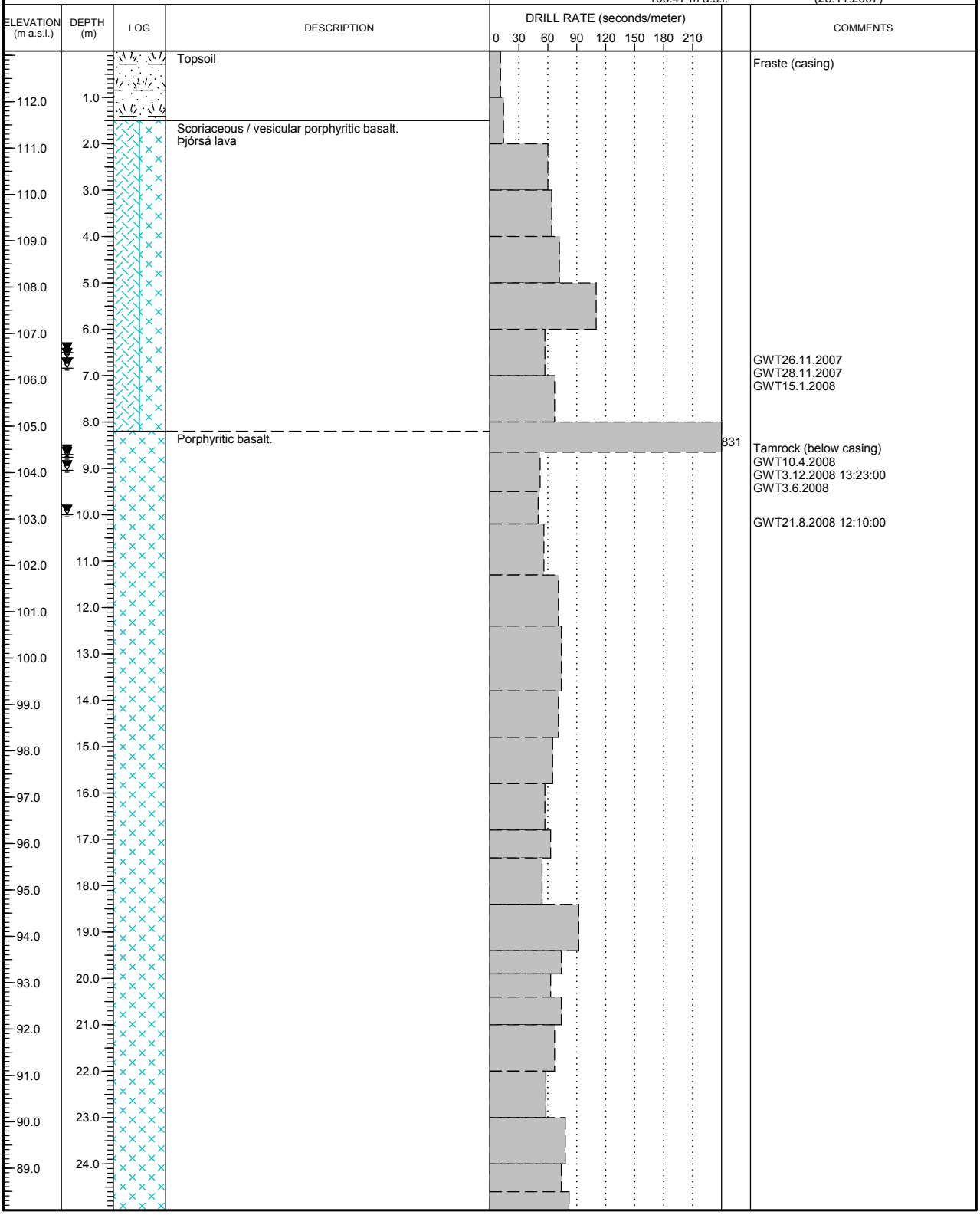
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-54

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.11.2007 COMPLETED: 21.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445524.418 Y: 394810.102 Z: 113.091	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	8.65 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	35.4 m	GROUNDWATER DEPTH:	6.62 m
		GROUNDWATER ELEVATION:	106.47 m a.s.l. (28.11.2007)



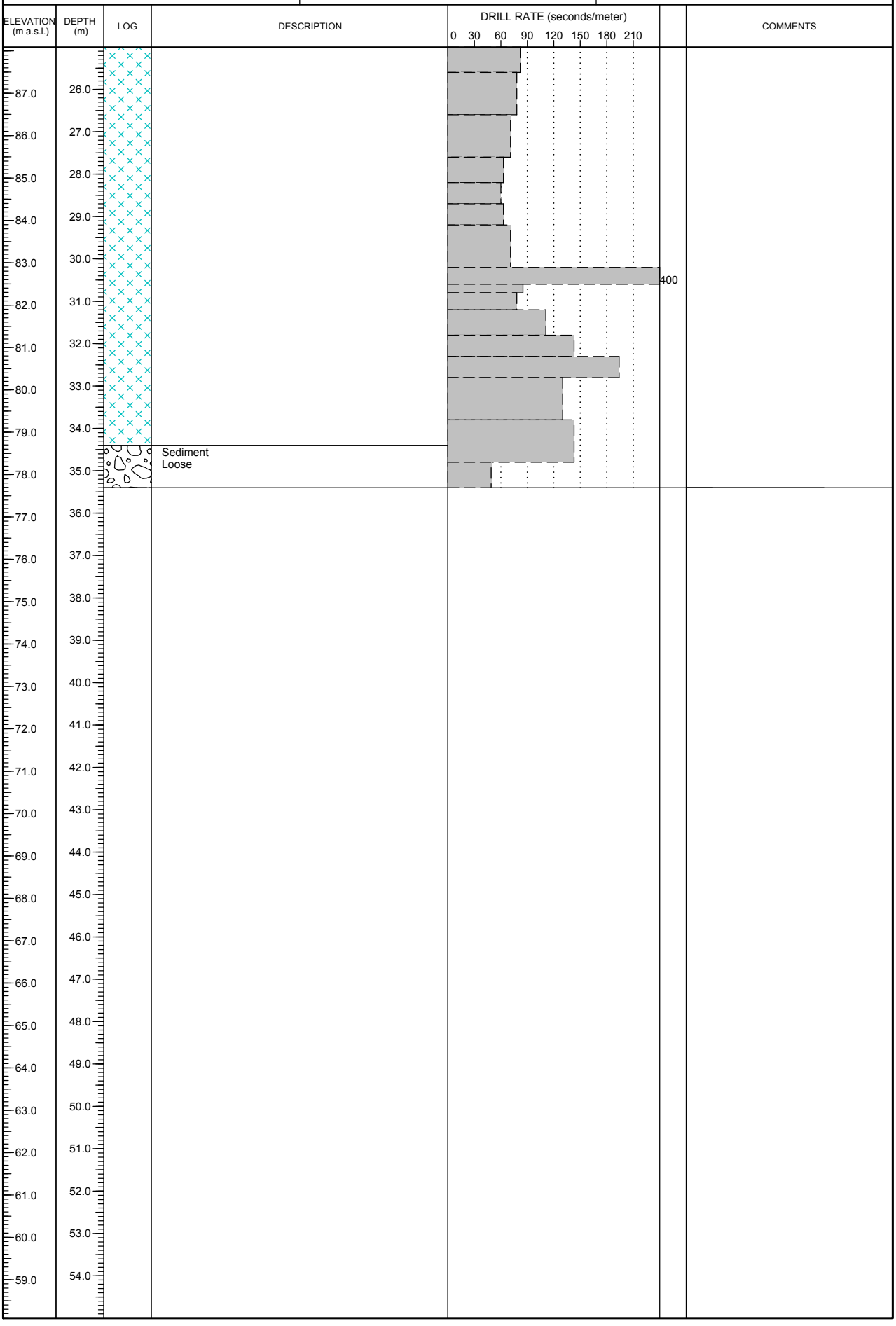
MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-54



MANNVIT ENGINEERING

BOREHOLE LOG

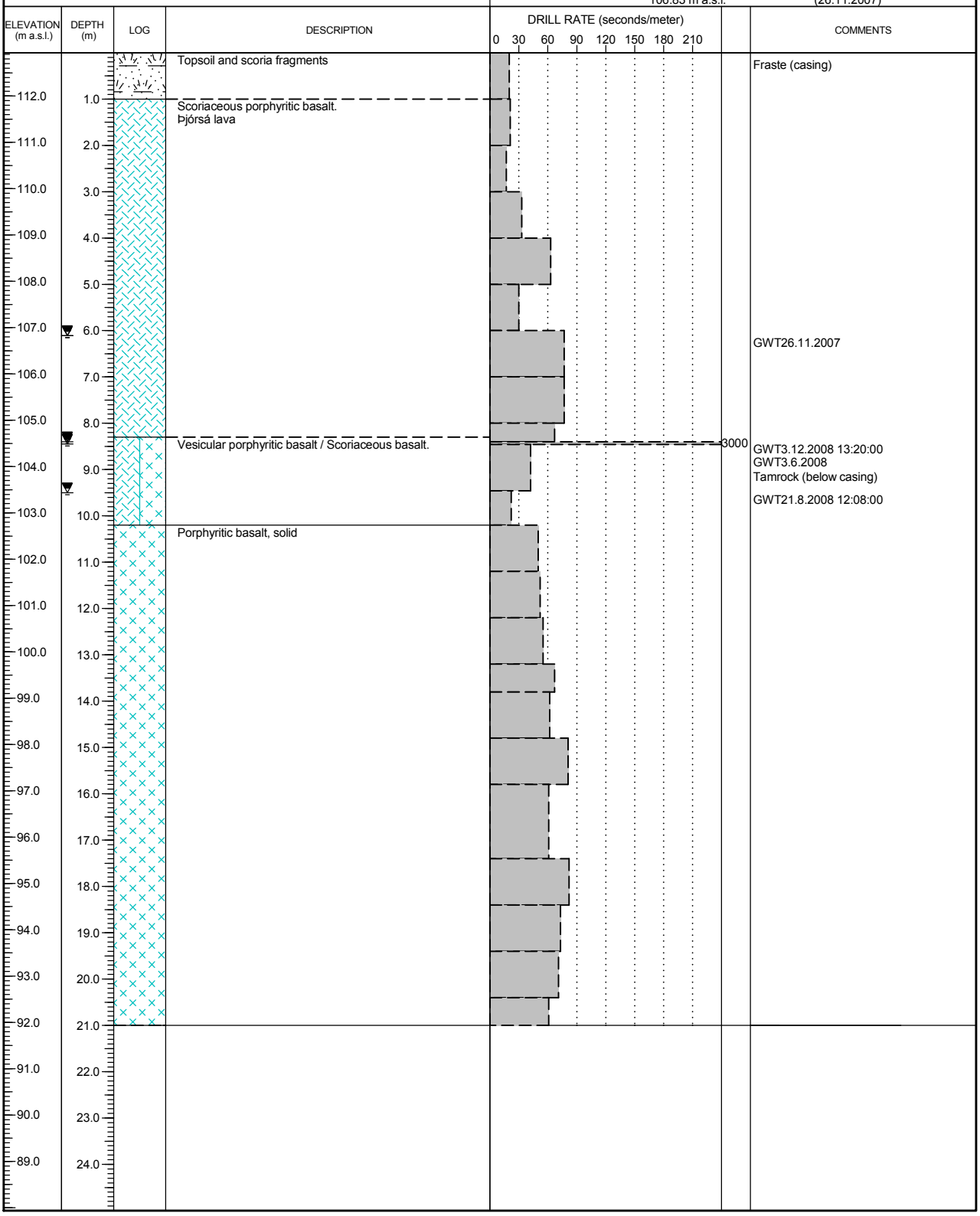
PERCUSSION DRILLING

BOREHOLE NO.:

NL-55

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE: STARTED:	21.11.2007 COMPLETED: 21.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445614.706 Y: 394857.869 Z: 112.935	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	8.6 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	21.0 m	GROUNDWATER DEPTH:	6.11 m
		GROUNDWATER ELEVATION:	106.83 m a.s.l. (26.11.2007)



MANNVIT ENGINEERING

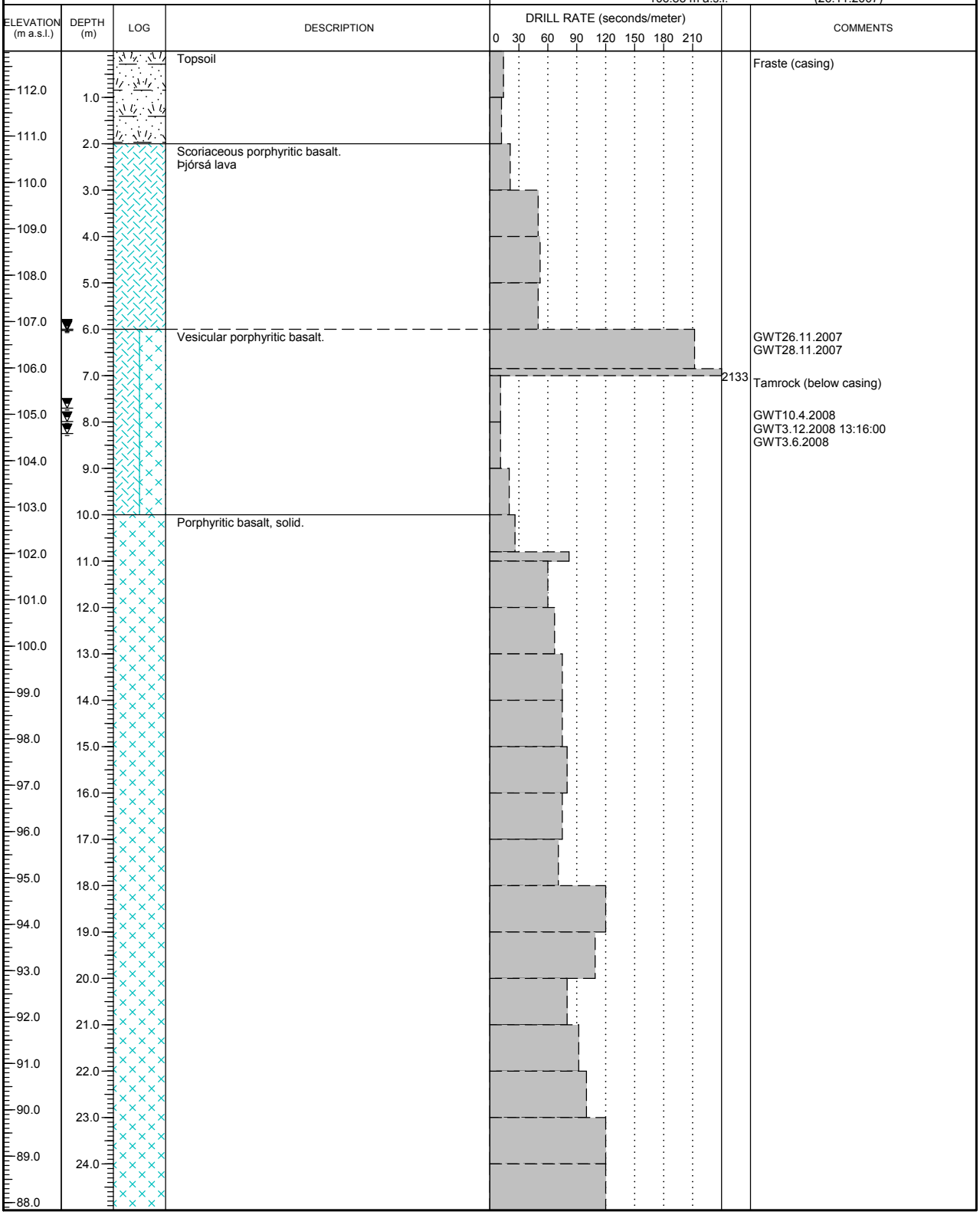
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-56

CLIENT:	Landsvirkjun	DATE:	STARTED: 22.11.2007 COMPLETED: 22.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445703.48 Y: 394888.99 Z: 112.833	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	7.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	35.4 m	GROUNDWATER DEPTH:	6.0 m
		GROUNDWATER ELEVATION:	106.83 m a.s.l. (26.11.2007)



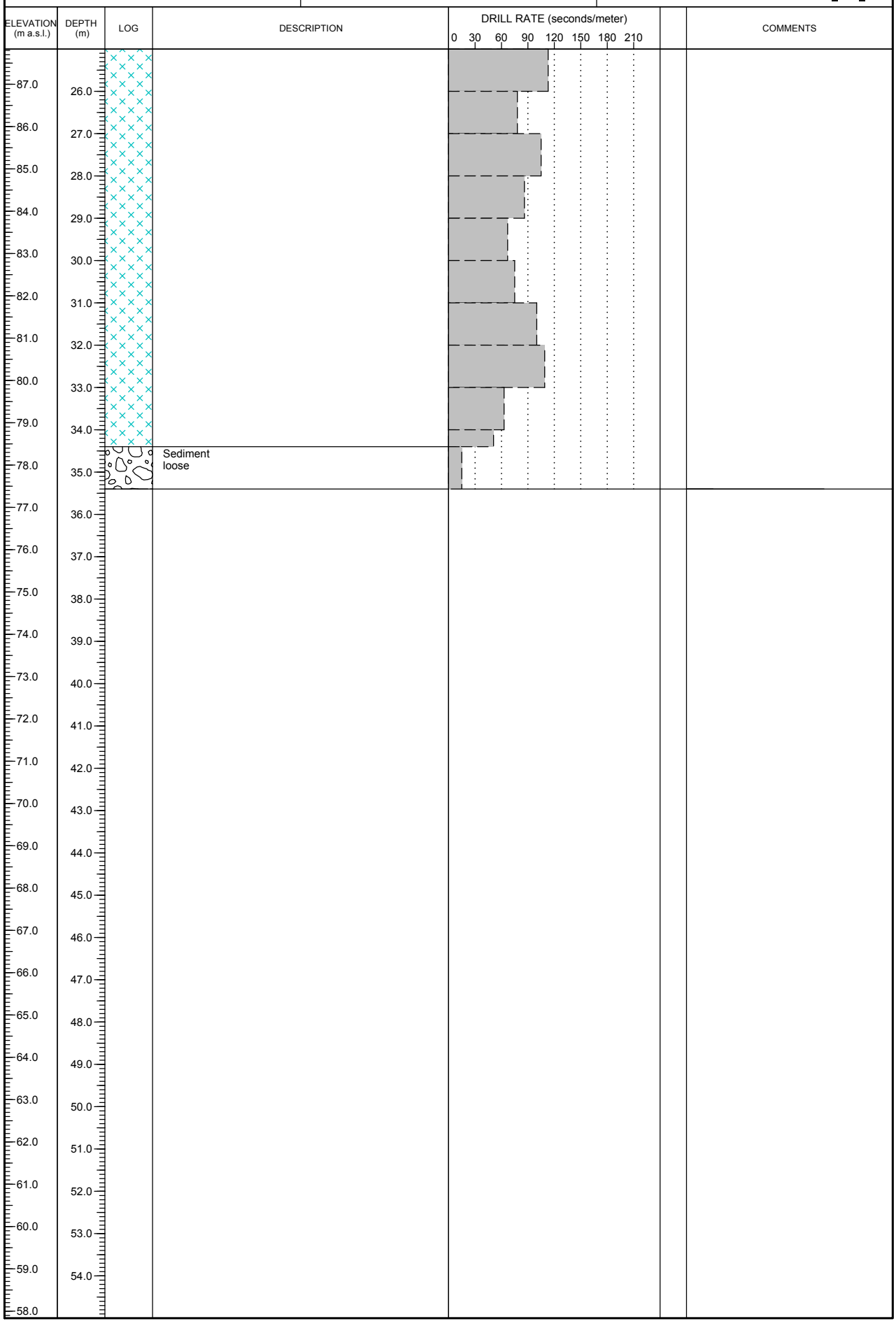
MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-56



MANNVIT ENGINEERING

BOREHOLE LOG

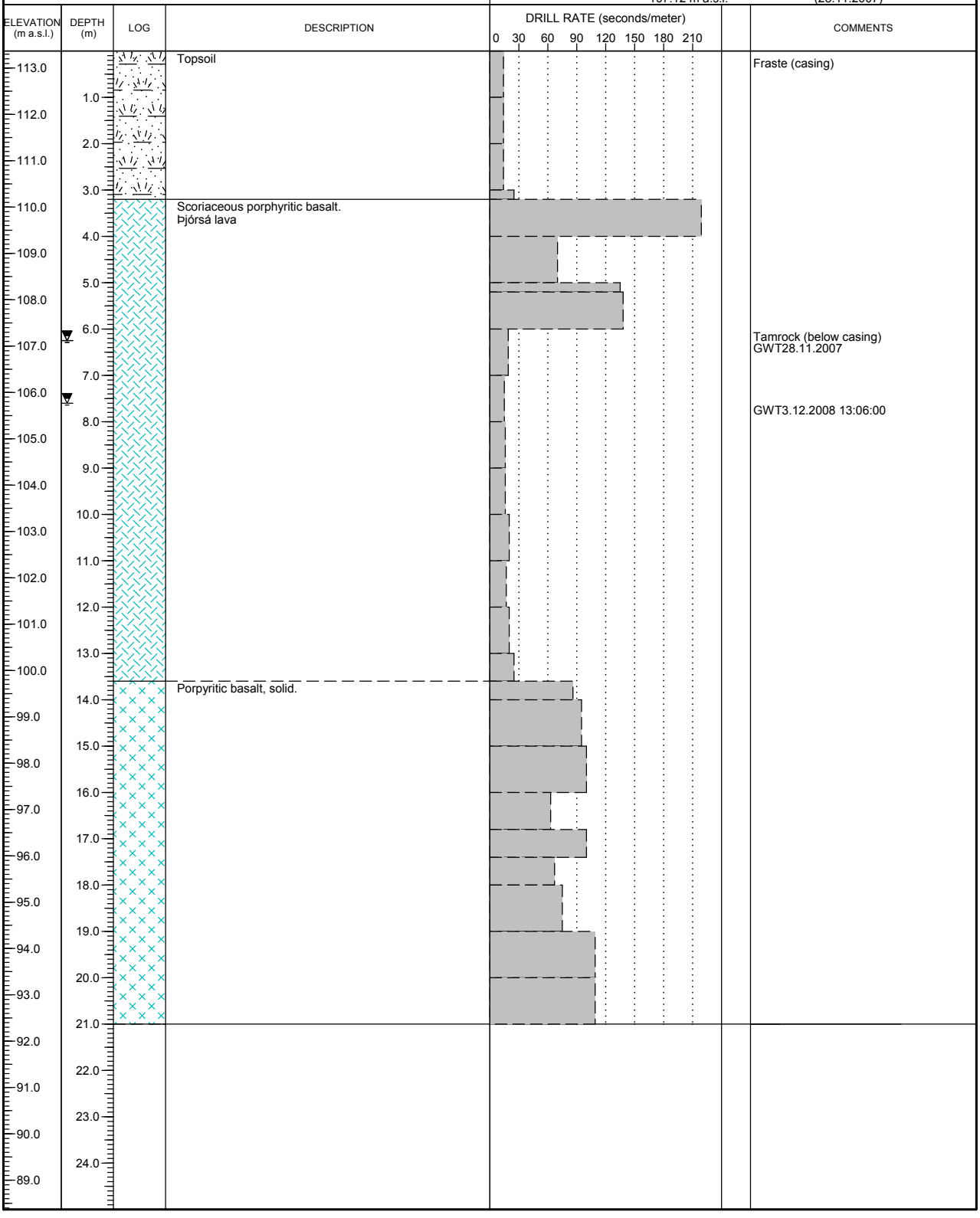
PERCUSSION DRILLING

BOREHOLE NO.:

NL-57

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 22.11.2007 COMPLETED: 22.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445842.385 Y: 394953.454 Z: 113.368	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	6.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	21.0 m	GROUNDWATER DEPTH:	6.25 m
		GROUNDWATER ELEVATION:	107.12 m a.s.l. (28.11.2007)



MANNVIT ENGINEERING

BOREHOLE LOG

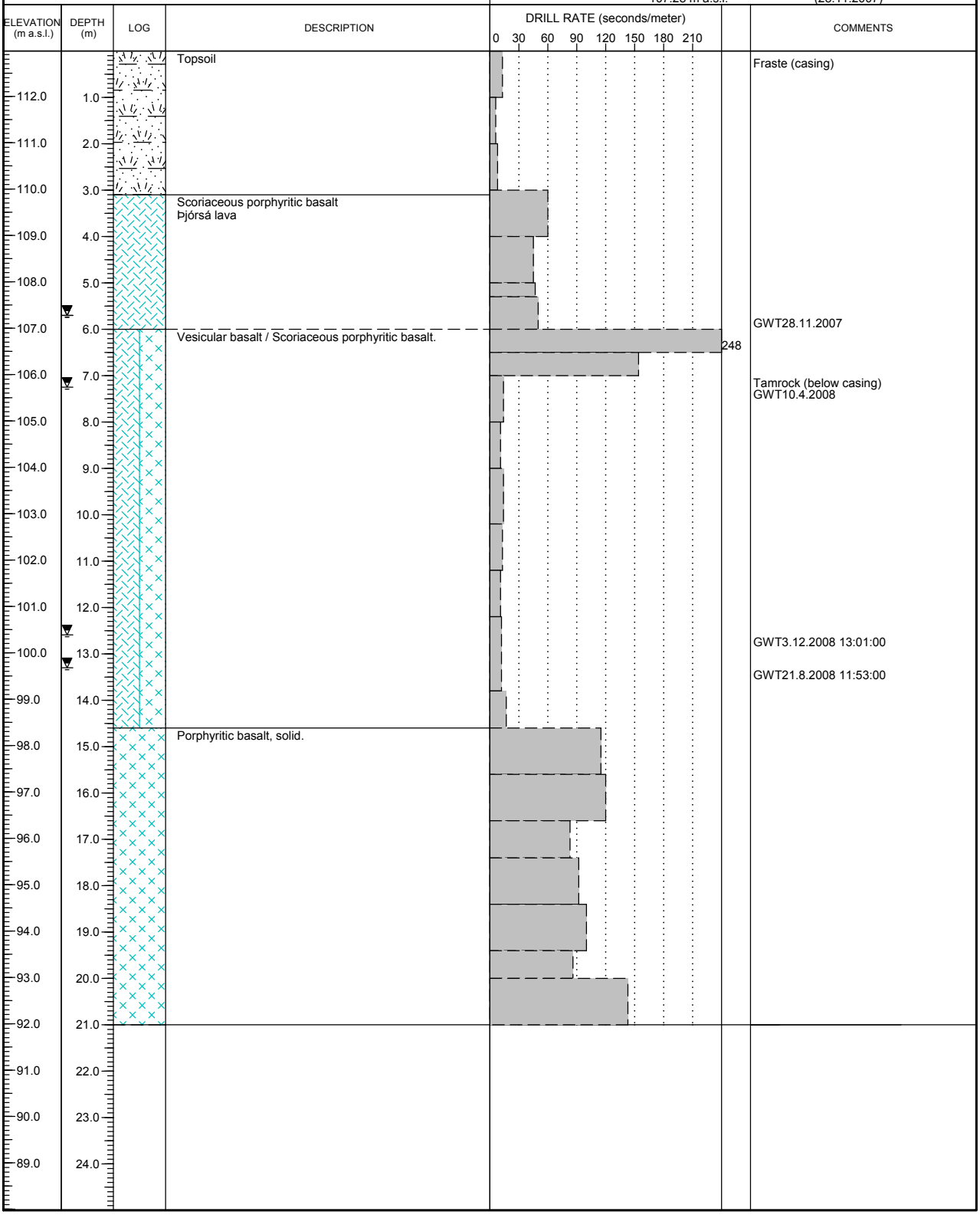
PERCUSSION DRILLING

BOREHOLE NO.:

NL-58

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 22.11.2007 COMPLETED: 22.11.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Ási
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 445932.157 Y: 394992.321 Z: 112.977	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	7.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	21.0 m	GROUNDWATER DEPTH:	5.7 m
		GROUNDWATER ELEVATION:	107.28 m a.s.l. (28.11.2007)



MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-59

CLIENT:	Landsvirkjun	DATE:	STARTED: 06.12.2007 COMPLETED: 06.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 446208.248 Y: 395107.571 Z: 117.14	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	9.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	37.5 m	GROUNDWATER DEPTH:	9.3 m
		GROUNDWATER ELEVATION:	107.84 m a.s.l. (4.1.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
117.0			Topsoil		Landráður
116.0	1.0				
115.0	2.0				
			Scoriaceous porphyritic basalt. Þjórsá lava		
114.0	3.0				
113.0	4.0				
112.0	5.0				
111.0	6.0				
110.0	7.0				
109.0	8.0				
			Porphyritic basalt, solid.	577	
108.0	9.0				GWT4.1.2008
107.0	10.0				
106.0	11.0				GWT10.4.2008 GWT3.12.2008 12:39:00 GWT3.6.2008
105.0	12.0				GWT21.8.2008 11:38:00
104.0	13.0				
103.0	14.0				
102.0	15.0				
101.0	16.0				
100.0	17.0				
99.0	18.0				
98.0	19.0				
97.0	20.0				
96.0	21.0				
95.0	22.0				
94.0	23.0				
93.0	24.0				

MANNVIT ENGINEERING

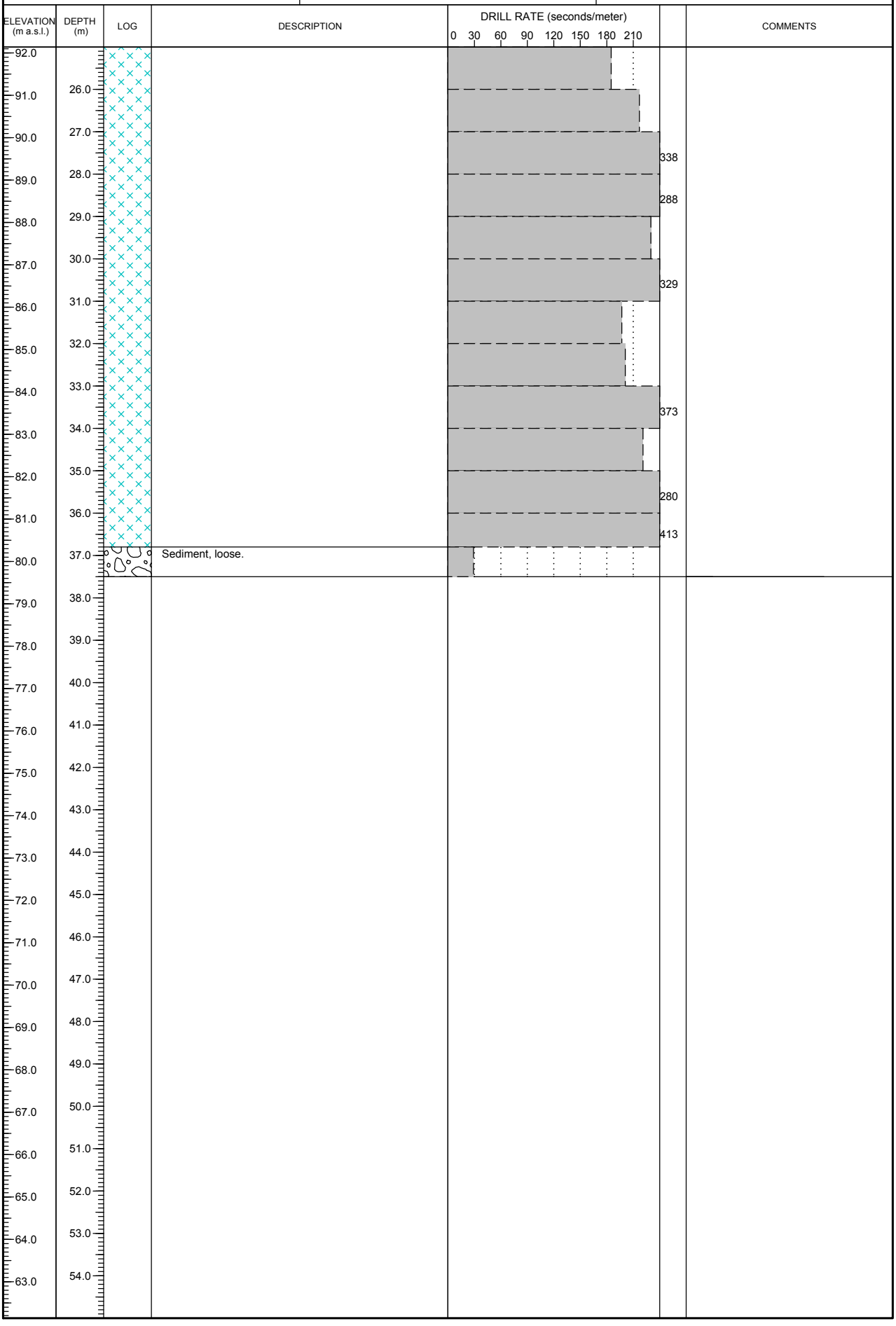
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-59

SHEET 2 OF 2



MANNVIT ENGINEERING

BOREHOLE LOG

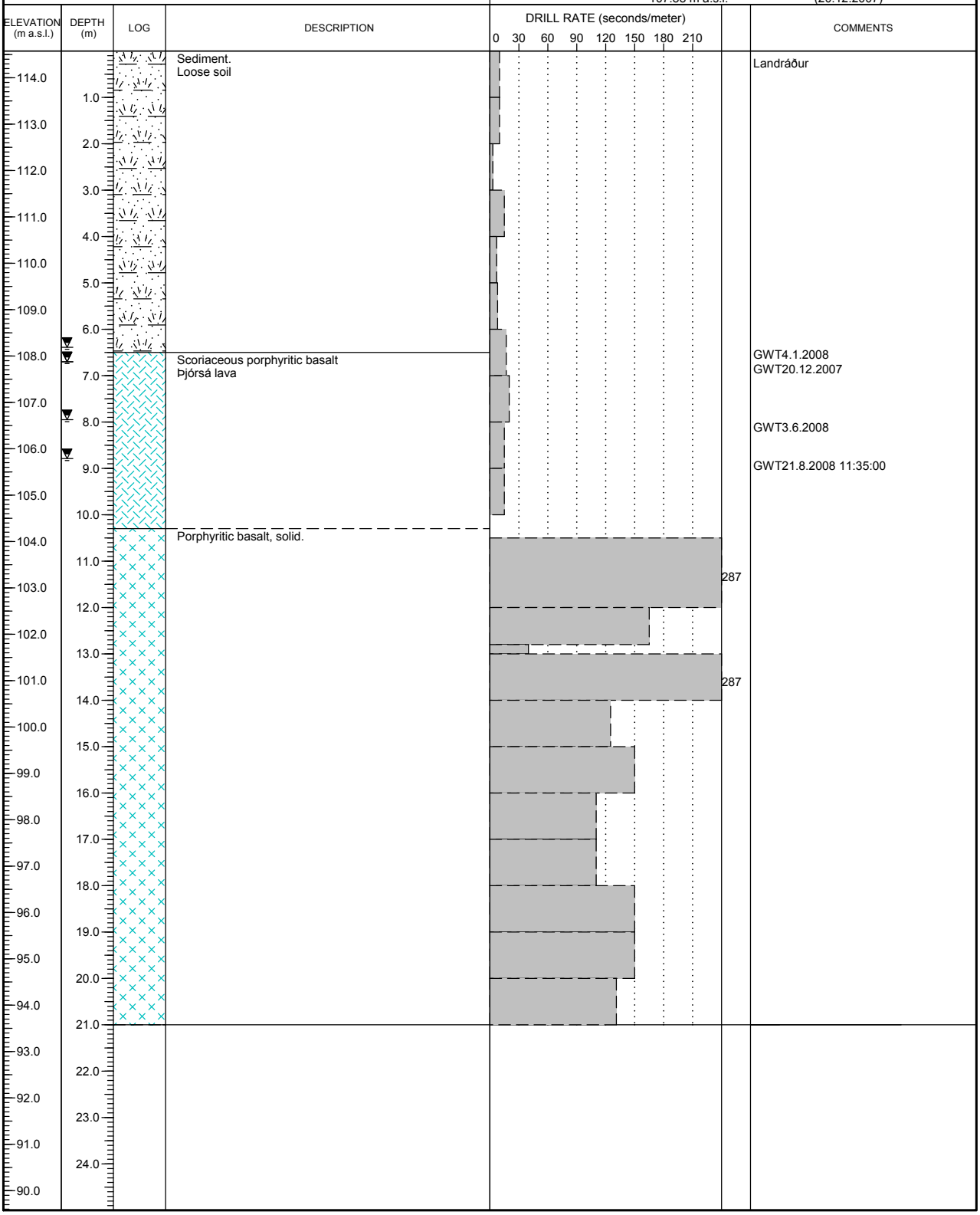
PERCUSSION DRILLING

BOREHOLE NO.:

NL-60

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 07.12.2007 COMPLETED: 07.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 446392.391 Y: 395193.441 Z: 114.577	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	12.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	21.0 m	GROUNDWATER DEPTH:	6.7 m
		GROUNDWATER ELEVATION:	107.88 m a.s.l. (20.12.2007)



MANNVIT ENGINEERING

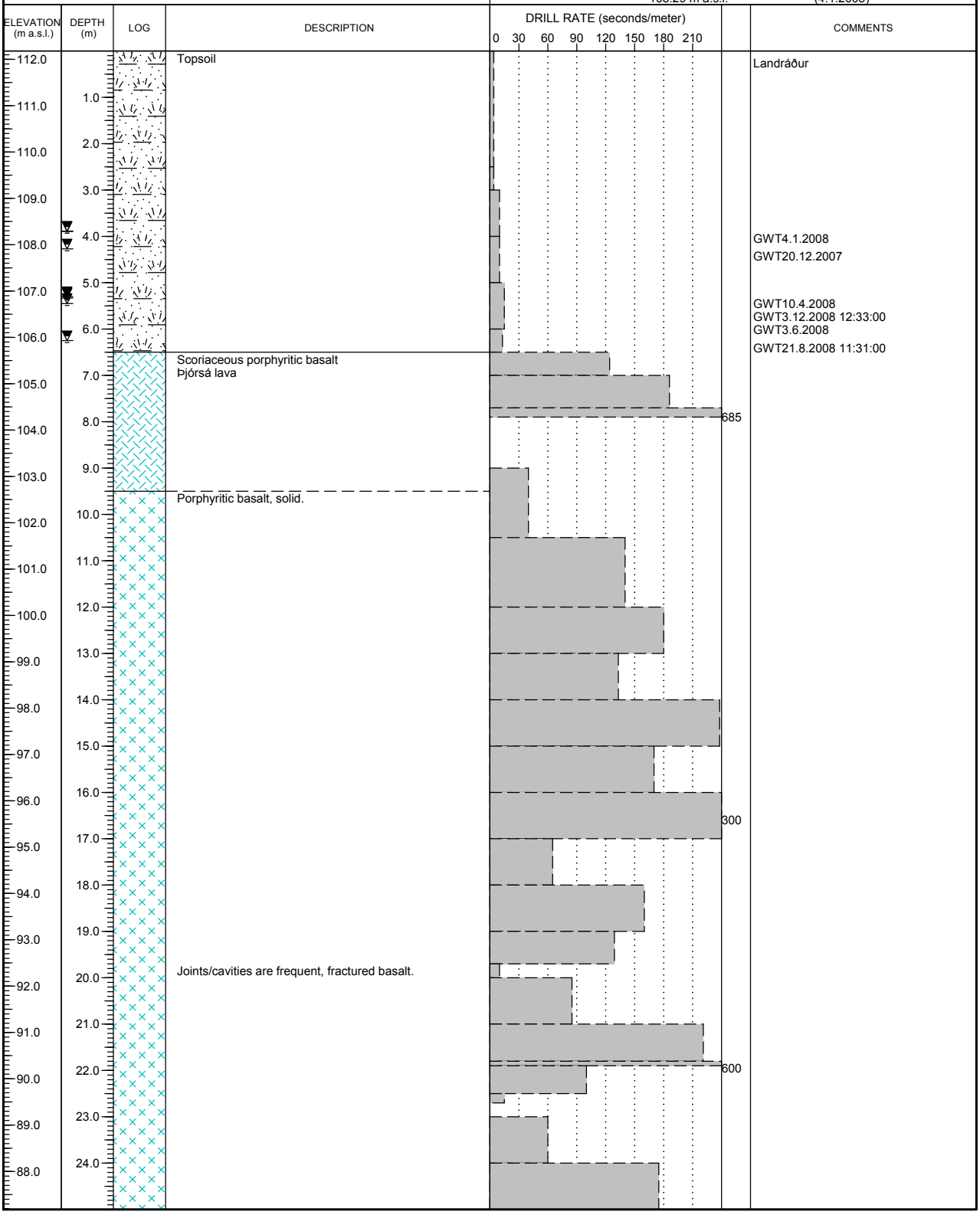
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-61

CLIENT:	Landsvirkjun	DATE: STARTED:	07.12.2007 COMPLETED: 07.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 446484.573 Y: 395233.199 Z: 112.18	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	7.9 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	33.0 m	GROUNDWATER DEPTH:	3.89 m
		GROUNDWATER ELEVATION:	108.29 m a.s.l. (4.1.2008)



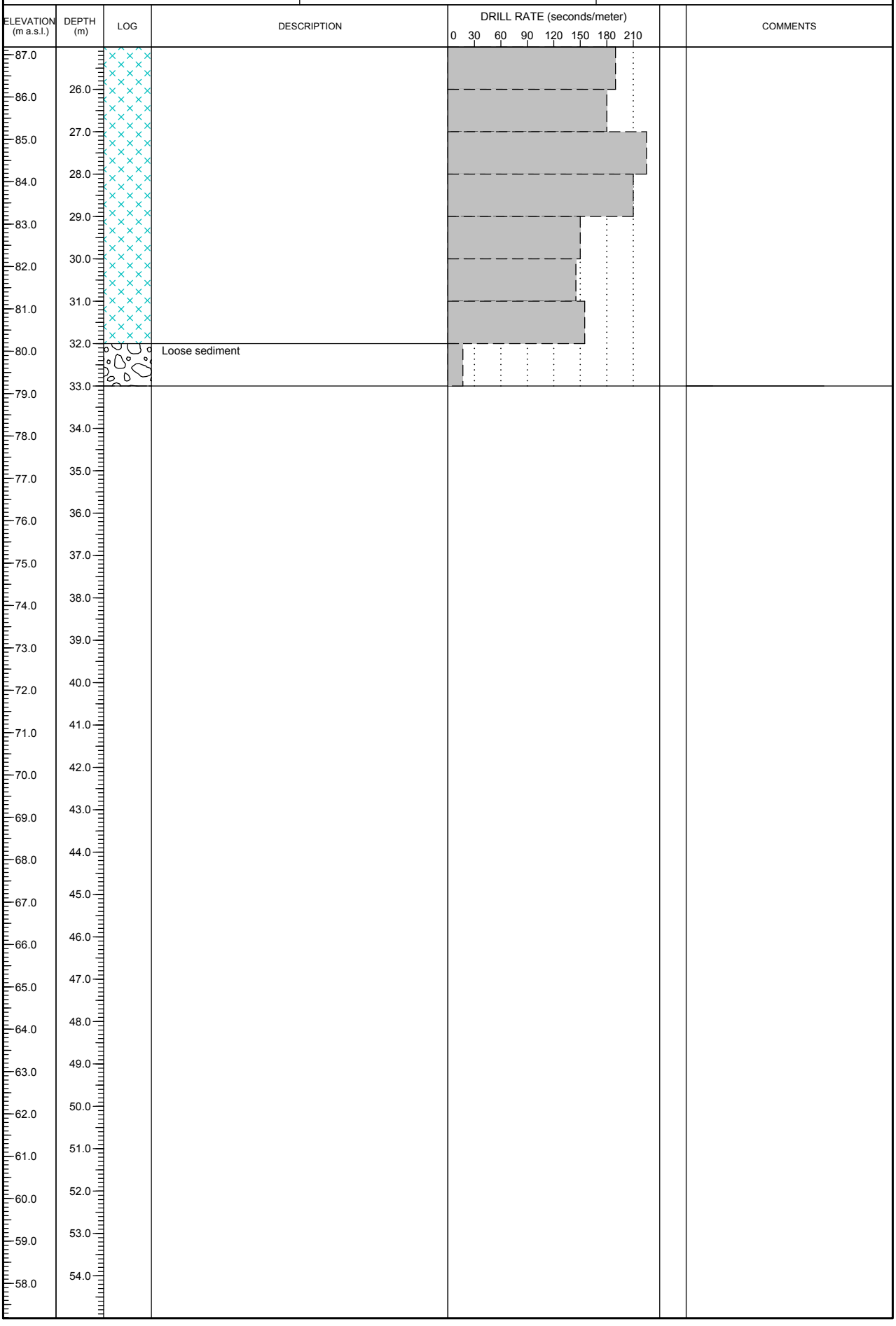
MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-61



MANNVIT ENGINEERING

BOREHOLE LOG

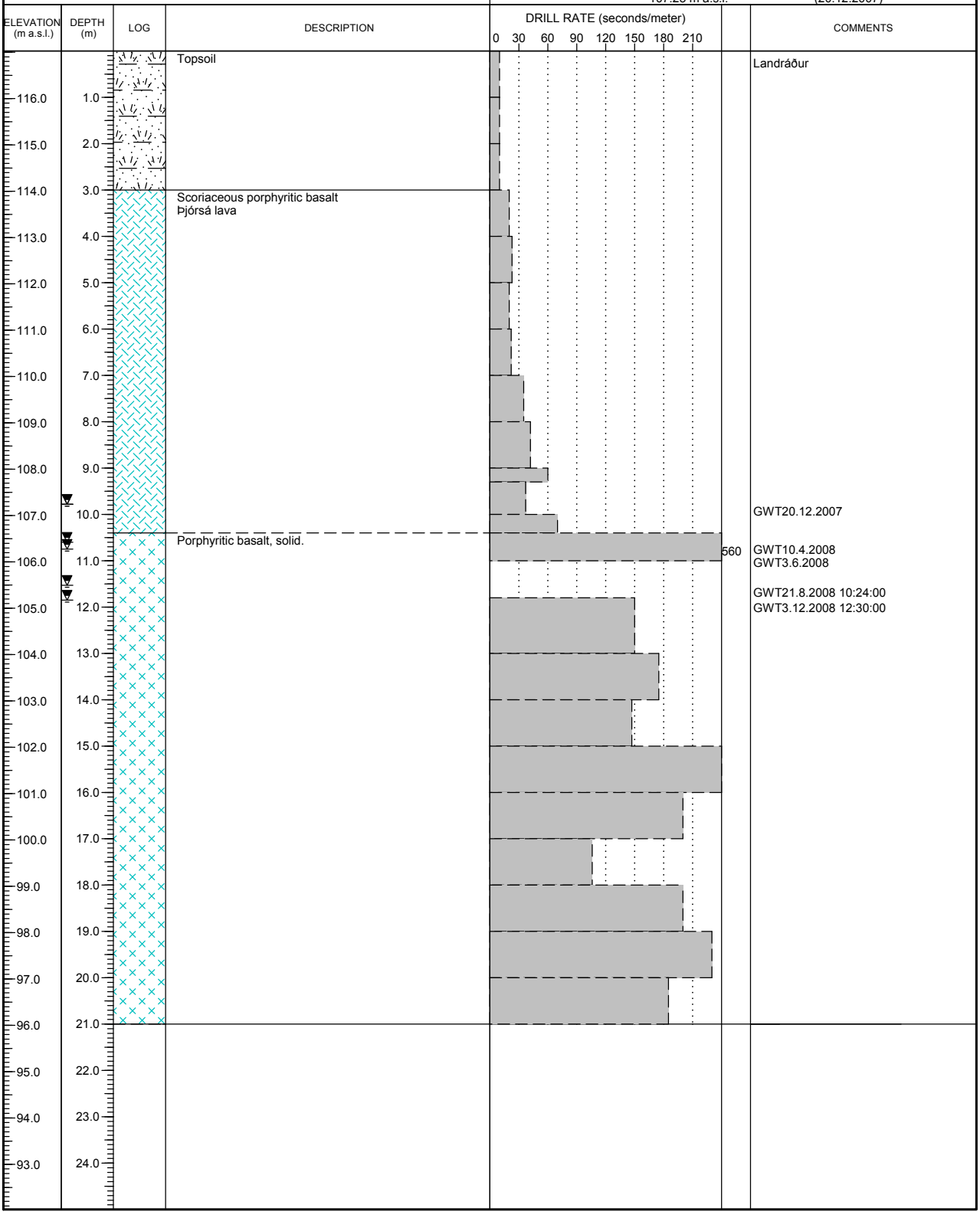
PERCUSSION DRILLING

BOREHOLE NO.:

NL-62

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 10.12.2007 COMPLETED: 10.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 446575.83 Y: 395275.109 Z: 117.025	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[x] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	11.9 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	21.0 m	GROUNDWATER DEPTH:	9.78 m
		GROUNDWATER ELEVATION:	107.25 m a.s.l. (20.12.2007)



MANNVIT ENGINEERING

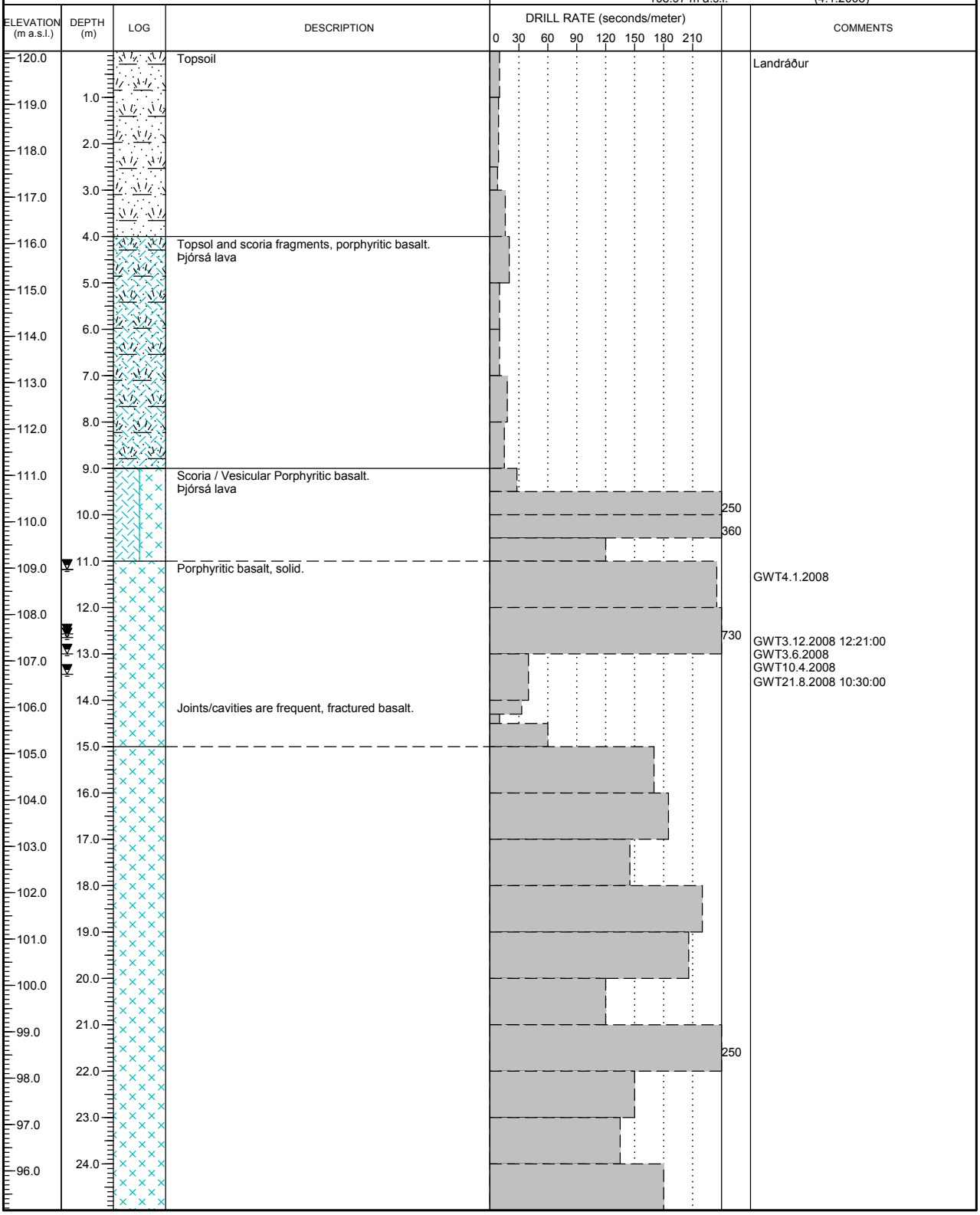
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-63

CLIENT:	Landsvirkjun	DATE: STARTED:	11.12.2007 COMPLETED: 11.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 446756.33 Y: 395353.482 Z: 120.151	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	13.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	39.8 m	GROUNDWATER DEPTH:	11.18 m
		GROUNDWATER ELEVATION:	108.97 m a.s.l. (4.1.2008)



MANNVIT ENGINEERING

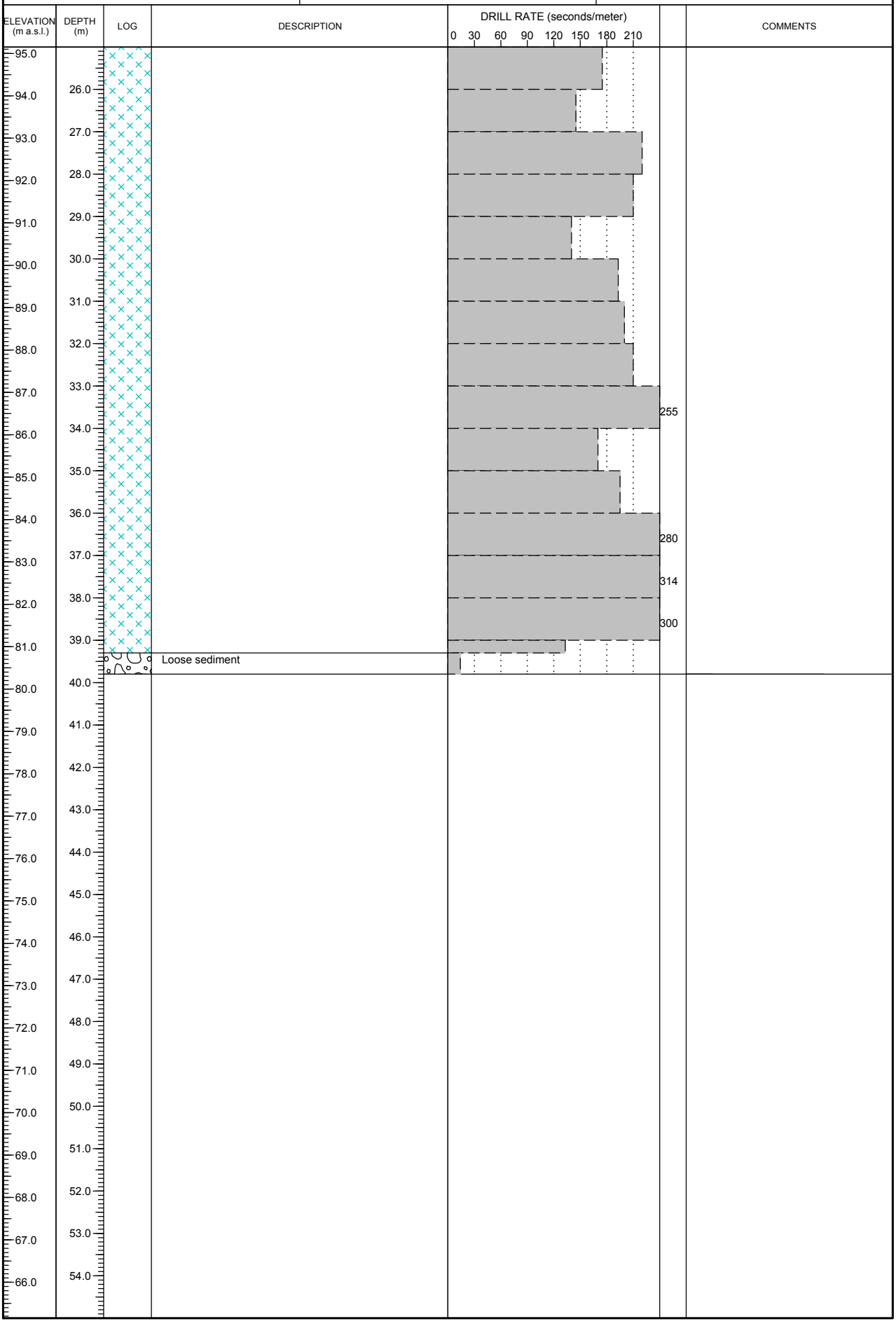
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-63

SHEET 2 OF 2



MANNVIT ENGINEERING

BOREHOLE LOG

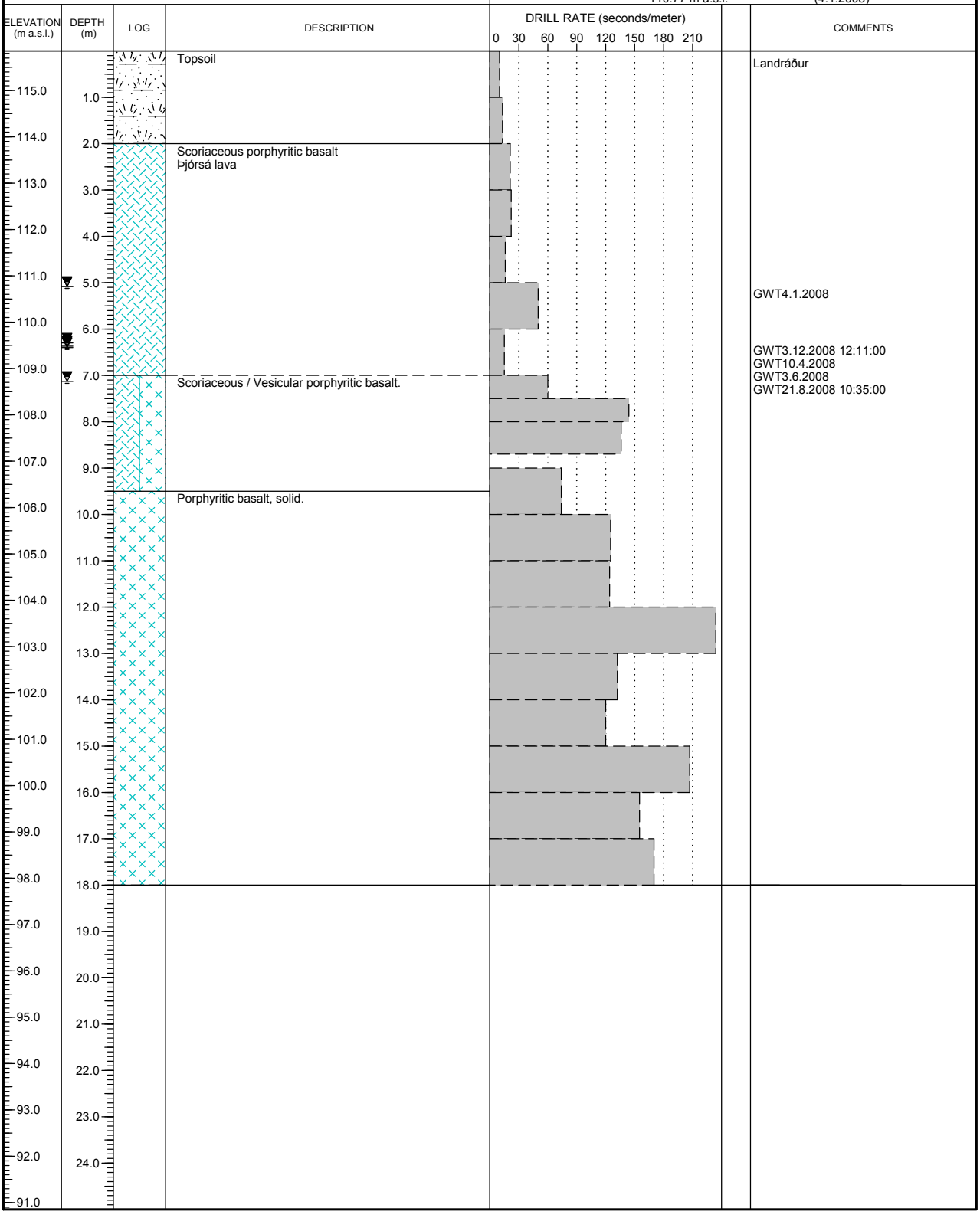
PERCUSSION DRILLING

BOREHOLE NO.:

NL-64

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 12.12.2007 COMPLETED: 12.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 447056.977 Y: 395372.443 Z: 115.852	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	9.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	18.0 m	GROUNDWATER DEPTH:	5.08 m
		GROUNDWATER ELEVATION:	110.77 m a.s.l. (4.1.2008)



MANNVIT ENGINEERING

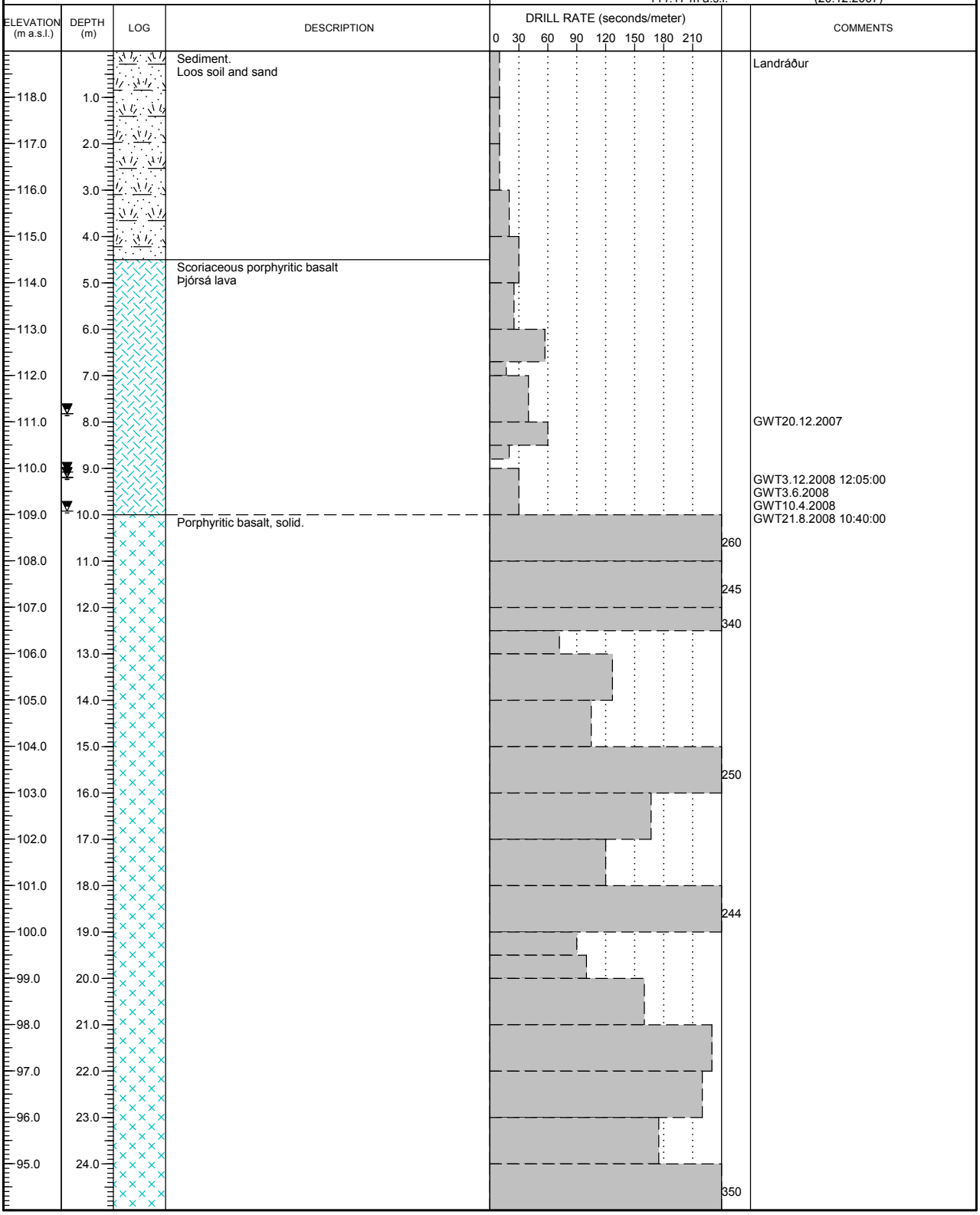
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-65

CLIENT:	Landsvirkjun	DATE:	STARTED: 12.12.2007 COMPLETED: 12.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 447295.712 Y: 395311.294 Z: 118.994	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	12.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	38.3 m	GROUNDWATER DEPTH:	7.82 m
		GROUNDWATER ELEVATION:	111.17 m a.s.l. (20.12.2007)



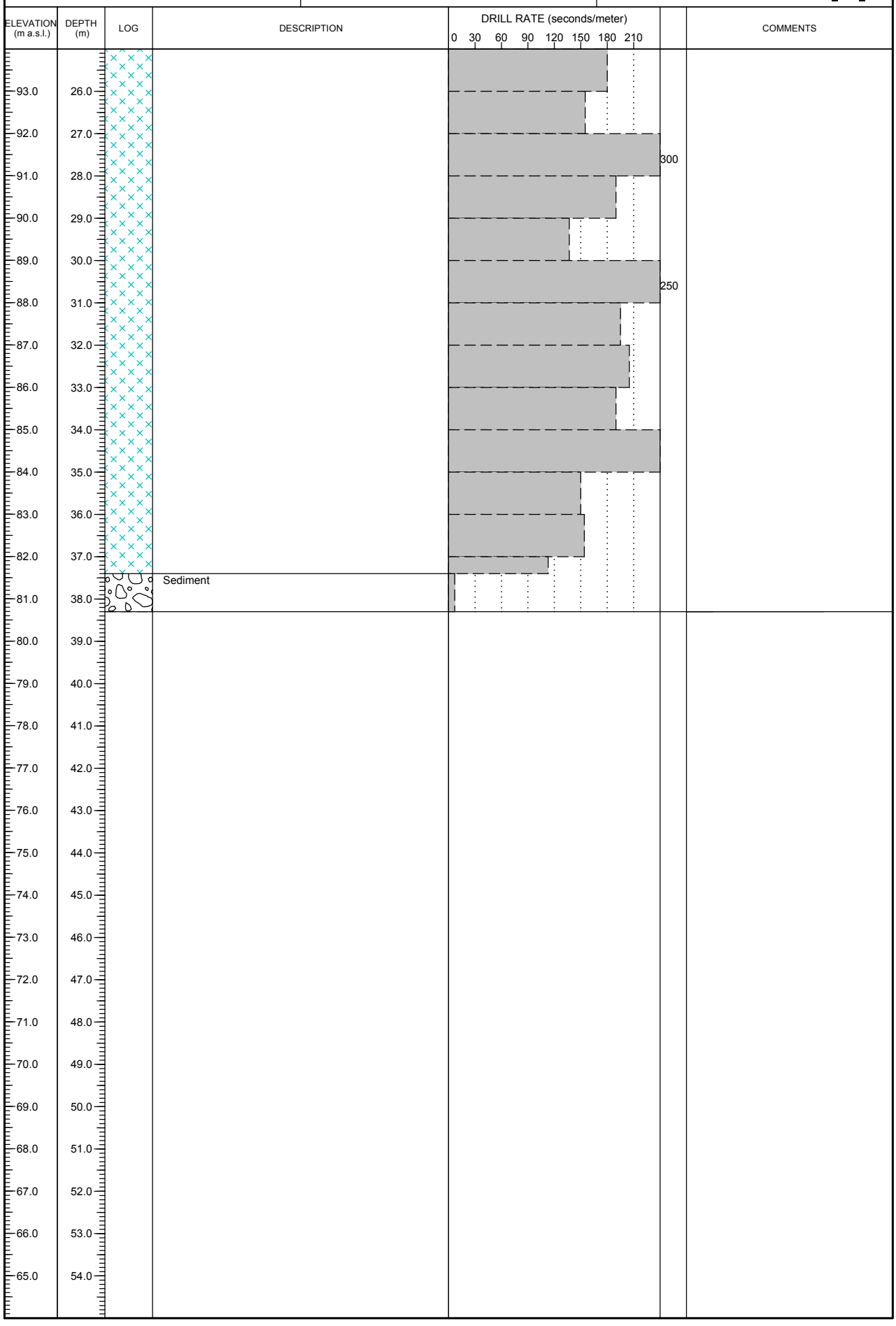
MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-65



MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-66

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 17.12.2007 COMPLETED: 17.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 447873.7 Y: 395165.872 Z: 118.572	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	9.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	18.0 m	GROUNDWATER DEPTH:	6.64 m
		GROUNDWATER ELEVATION:	111.93 m a.s.l. (4.1.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210		COMMENTS
118.0	1.0		Scoria and Topsoil			Landráður
117.0	2.0					
116.0	3.0					
115.0	4.0					
114.0	5.0					
113.0	6.0					
112.0	7.0		Scoriaceous / Vesicular porphyritic basalt. Þjórsá lava			GWT4.1.2008
111.0	8.0		Porphyritic basalt, solid.			GWT10.4.2008
110.0	9.0				340	GWT3.12.2008 11:51:00 GWT3.6.2008 GWT21.8.2008 10:50:00
109.0	10.0				340	
108.0	11.0					
107.0	12.0					
106.0	13.0					
105.0	14.0					
104.0	15.0					
103.0	16.0				260	
102.0	17.0				395	
101.0	18.0					
100.0	19.0					
99.0	20.0					
98.0	21.0					
97.0	22.0					
96.0	23.0					
95.0	24.0					
94.0						

MANNVIT ENGINEERING

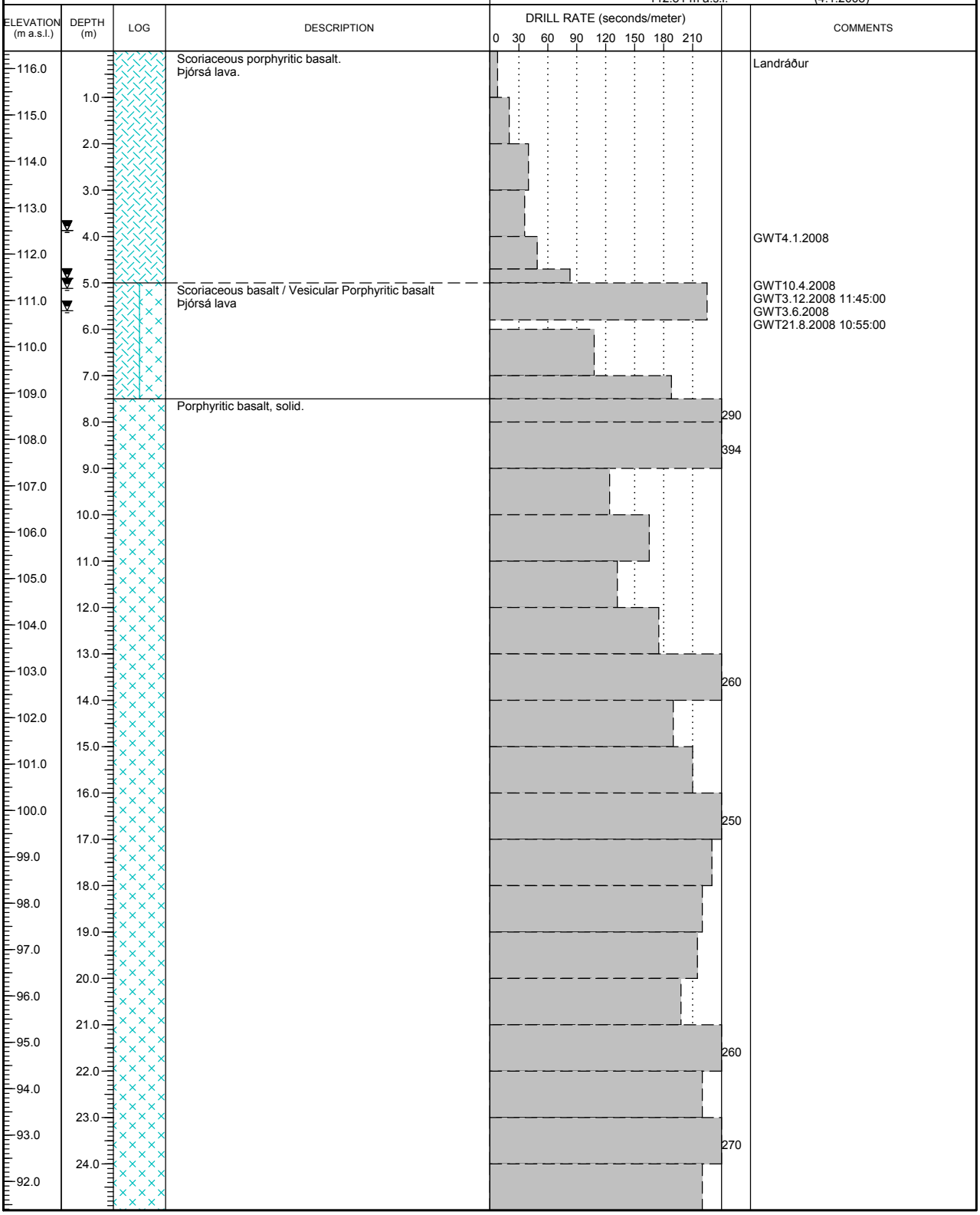
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-67

CLIENT:	Landsvirkjun	DATE:	STARTED: 17.12.2007 COMPLETED: 17.12.2007
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 448363.04 Y: 395061.495 Z: 116.377	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[x] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	9.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	33.0 m	GROUNDWATER DEPTH:	3.87 m
		GROUNDWATER ELEVATION:	112.51 m a.s.l. (4.1.2008)



MANNVIT ENGINEERING

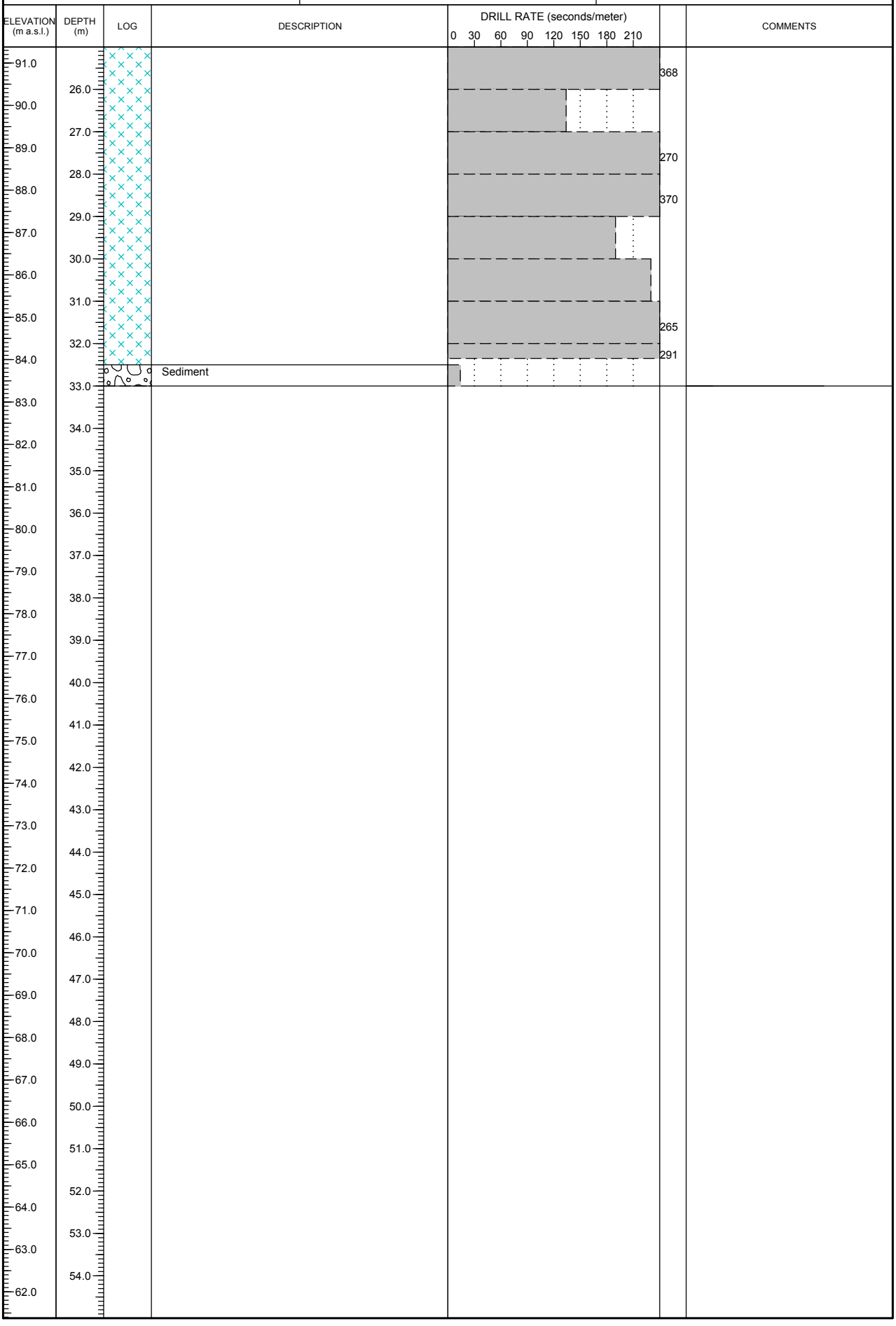
BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-67

SHEET 2 OF 2



MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-68

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.01.2008 COMPLETED: 26.01.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Intake	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444882.0 Y: 394326.3 Z: 112.54	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	SPT
CASING, LENGTH:	37.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	ASTM D1586
DEPTH OF HOLE:	37.39 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
112.0	1.0		Soil						Drilled by Landráður
111.0	2.0								
110.0	3.0								
109.0	4.0		Porphyritic basalt Þjórsá lava						
108.0	5.0								
107.0	6.0								
106.0	7.0								
105.0	8.0								
104.0	9.0								
103.0	10.0								
102.0	11.0								
101.0	12.0								
100.0	13.0								
99.0	14.0								
98.0	15.0								
97.0	16.0								
96.0	17.0								
95.0	18.0								
94.0	19.0								
93.0	20.0								
92.0	21.0								
91.0	22.0								
90.0	23.0								
89.0	24.0								
88.0									

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-68

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
87.0	26.0								
86.0	27.0								
85.0	28.0								
84.0	29.0								
83.0	30.0								
82.0	31.0								
81.0	32.0								
80.0	33.0								
79.0	34.0		Gravel Loose washed gravel with sand, basalt and rhyolit and pumice stones.	☒	NL-68 S1	300	9 - 11 - 31	42	
78.0	35.0			☒	NL-68 S2	280	19 - 55 - 58	R	SPT test stopped after 43 cm
77.0	36.0			⊠	NL-68 S3	40	54		
76.0	37.0			☒	NL-68 S4	240	21 - 37 - 55	92	SPT test stopped after 38.5 cm
75.0	38.0								
74.0	39.0								
73.0	40.0								
72.0	41.0								
71.0	42.0								
70.0	43.0								
69.0	44.0								
68.0	45.0								
67.0	46.0								
66.0	47.0								
65.0	48.0								
64.0	49.0								
63.0	50.0								
62.0	51.0								
61.0	52.0								
60.0	53.0								
59.0	54.0								
58.0									

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-99

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 14.05.2008 COMPLETED: 14.05.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444453.23 Y: 394563.01 Z: 114.561	DRILLBIT TYPE:	Casing shoe with roller-cone bit, 88 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	SPT
CASING, LENGTH:	7.05 m [X] CASING REMOVED	SAMPLING STANDARD:	ASTM D1586
DEPTH OF HOLE:	7.05 m	GROUNDWATER DEPTH:	1.95 m
		GROUNDWATER ELEVATION:	112.61 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
114.0	1.0		Sandy soil with organic remains.						
113.0	2.0		Sandy soil.	X	NL-99 S1	380	1 - 2 - 3	5	GWT3.6.2008
112.0	3.0		Sandy soil with organic remains.	X	NL-99 S2	210	1 - 1 - 0	1	
111.0	4.0								
110.0	5.0		Sandy soil with organic remains. More sandy in the lowest part of the sample.	X	NL-99 S3	570	1 - 1 - 1	2	The sampler penetrates 6 cm before testing.
109.0	6.0		Sand Dark rather fine grained with soil. Sand, fine-medium grained with some soil content.	X	NL-99 S4	220	4 - 3 - 3	6	
108.0	7.0		Porphyritic basalt High resistance, the old bedrock.						
107.0	8.0								
106.0	9.0								
105.0	10.0								
104.0	11.0								
103.0	12.0								
102.0	13.0								
101.0	14.0								
100.0	15.0								
99.0	16.0								
98.0	17.0								
97.0	18.0								
96.0	19.0								
95.0	20.0								
94.0	21.0								
93.0	22.0								
92.0	23.0								
91.0	24.0								
90.0									

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-100

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 14.05.2008 COMPLETED: 14.05.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444452.42 Y: 394657.12 Z: 118.181	DRILLBIT TYPE:	Casing shoe with roller-cone bit, 88 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	SPT
CASING, LENGTH:	5.9 m [X] CASING REMOVED	SAMPLING STANDARD:	ASTM D1586
DEPTH OF HOLE:	5.9 m	GROUNDWATER DEPTH:	2.0 m
		GROUNDWATER ELEVATION:	116.18 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
118.0			Sandy soil with organic remains. Increasing sand in lower part.						
117.0	1.0								
			Sandy soil, grayish brown.	☒	NL-100 S1	400	2 - 1 - 2	3	
116.0	2.0 ▼								GWT3.6.2008
115.0	3.0								The sampler penetrates 40 cm before testing.
			Sandy soil with light brown tephra layer and organic remains. Dark fine grained sand at the sample bottom, probably tephra layer.	☒	NL-100 S2	430	1 - 1 - 2	3	
114.0	4.0								
			Grayish brown silty/sandy soil.	☒	NL-100 S3	700	1 - 0 - 3	3	The sampler penetrates 20 cm before testing.
113.0	5.0								
			Porphyritic basalt The old bedrock.		NL-100 S4	0	50		
112.0	6.0								
111.0	7.0								
110.0	8.0								
109.0	9.0								
108.0	10.0								
107.0	11.0								
106.0	12.0								
105.0	13.0								
104.0	14.0								
103.0	15.0								
102.0	16.0								
101.0	17.0								
100.0	18.0								
99.0	19.0								
98.0	20.0								
97.0	21.0								
96.0	22.0								
95.0	23.0								
94.0	24.0								

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-101

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 14.05.2008 COMPLETED: 14.05.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444484.85 Y: 394735.82 Z: 117.125	DRILLBIT TYPE:	Casing shoe with roller-cone bit, 88 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	SPT
CASING, LENGTH:	8.6 m [X] CASING REMOVED	SAMPLING STANDARD:	ASTM D1586
DEPTH OF HOLE:	8.6 m	GROUNDWATER DEPTH:	2.1 m
		GROUNDWATER ELEVATION:	115.03 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
117.0			Sandy soil with organic remains.						
116.0	1.0								
115.0	2.0			[X]	NL-101 S1	470	1 - 1 - 0	1	The sampler penetrates 2 cm before testing. GWT3.6.2008
114.0	3.0			[X]	NL-101 S2	330	1 - 0 - 2	2	The sampler penetrates 5 cm before testing.
113.0	4.0								
112.0	5.0			[X]	NL-101 S3	450	1 - 0 - 1	1	The sampler penetrates 33 cm before testing.
111.0	6.0								
110.0	7.0			[X]	NL-101 S4	400	1 - 1 - 4	5	The sampler penetrates 41 cm before testing.
			Scoria with greenish silt and clay fillings. Scoria fragments cemented in greenish silt and clay.	[X]	NL-101 S5	390	18 - 29 - 50	79	
109.0	8.0		Bedrock Porphyritic basalt or scoriaceous basalt.						
108.0	9.0								
107.0	10.0								
106.0	11.0								
105.0	12.0								
104.0	13.0								
103.0	14.0								
102.0	15.0								
101.0	16.0								
100.0	17.0								
99.0	18.0								
98.0	19.0								
97.0	20.0								
96.0	21.0								
95.0	22.0								
94.0	23.0								
93.0	24.0								

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-102

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 15.05.2008 COMPLETED: 15.05.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Svanlaugur
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444522.54 Y: 394826.86 Z: 117.939	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	[ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	9.0 m	GROUNDWATER DEPTH:	1.7 m
		GROUNDWATER ELEVATION:	116.24 m a.s.l. (3.6.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
117.0	1.0		Sandy soil with organic remains.		
116.0	2.0				GWT3.6.2008
115.0	3.0				
114.0	4.0				
113.0	5.0		Bedrock Probably scoriaceous basalt. Water comes in.		
112.0	6.0				
111.0	7.0				
110.0	8.0				
109.0	9.0				
108.0	10.0				
107.0	11.0				
106.0	12.0				
105.0	13.0				
104.0	14.0				
103.0	15.0				
102.0	16.0				
101.0	17.0				
100.0	18.0				
99.0	19.0				
98.0	20.0				
97.0	21.0				
96.0	22.0				
95.0	23.0				
94.0	24.0				

MANNVIT ENGINEERING

BOREHOLE LOG

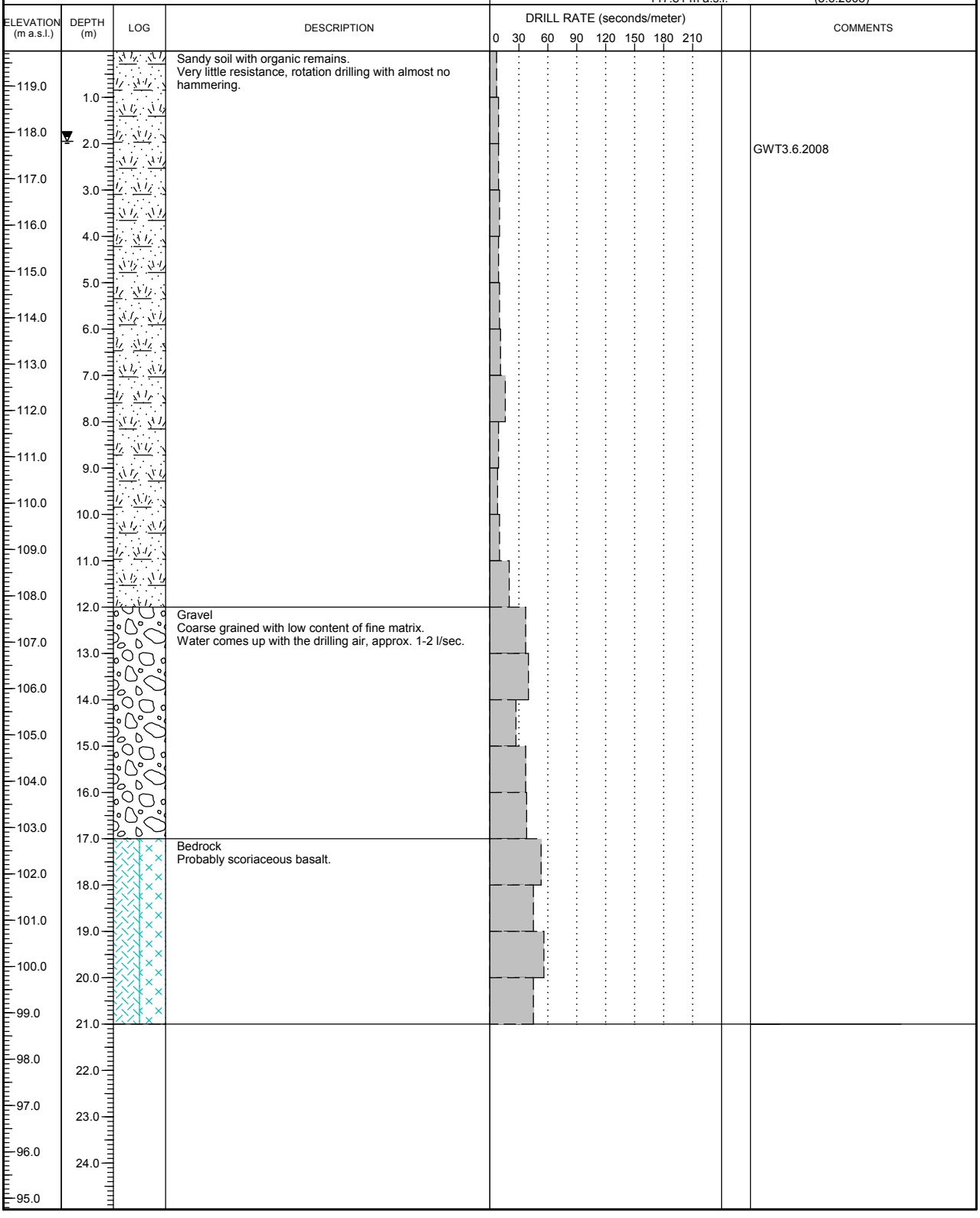
PERCUSSION DRILLING

BOREHOLE NO.:

NL-103

SHEET 1 OF 1

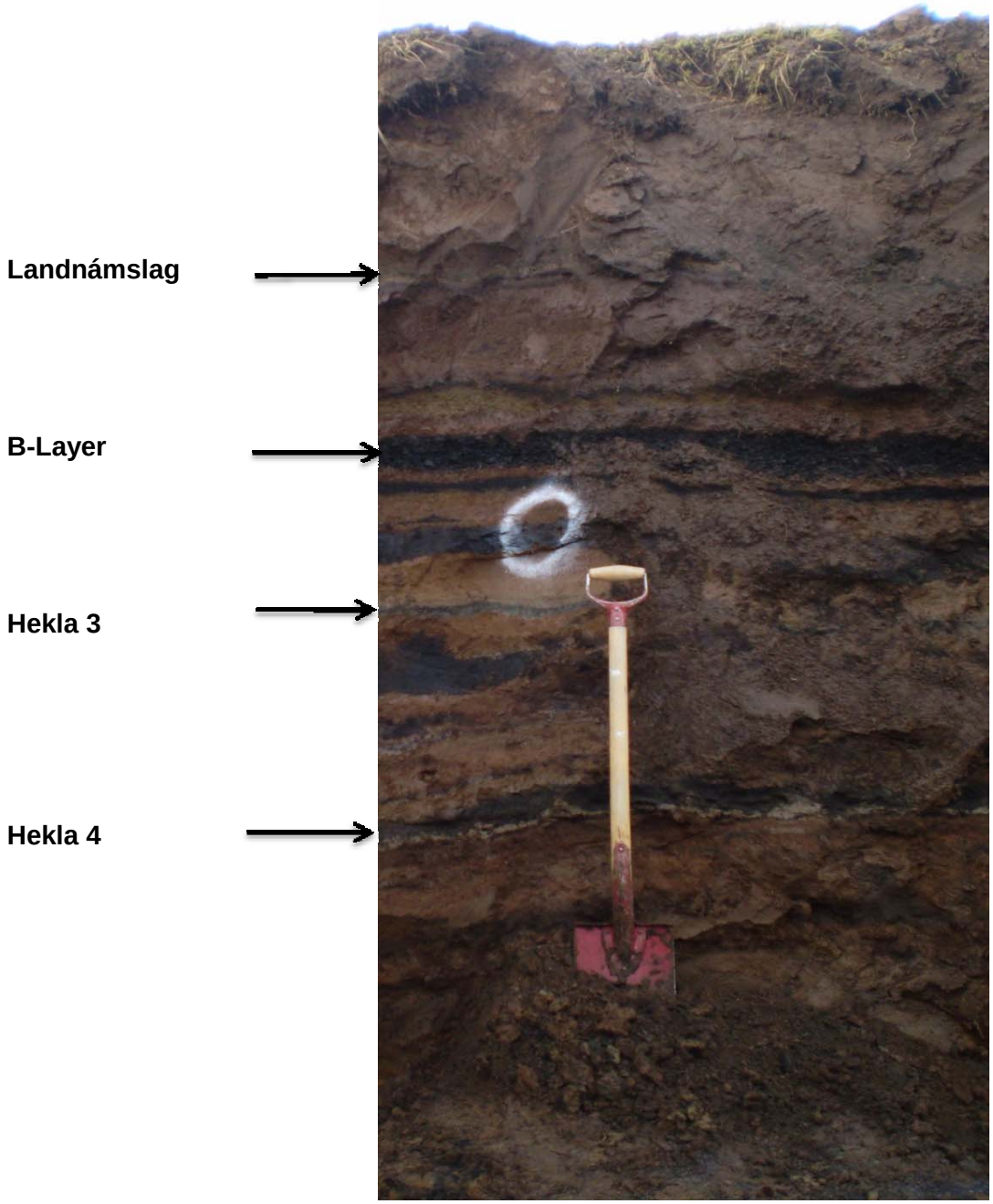
CLIENT:	Landsvirkjun	DATE:	STARTED: 15.05.2008 COMPLETED: 15.05.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Hvammsvirkjun	FOREMAN:	Svanlaugur
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444487.1 Y: 394914.47 Z: 119.757	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	[ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	21.0 m	GROUNDWATER DEPTH:	1.95 m
		GROUNDWATER ELEVATION:	117.81 m a.s.l. (3.6.2008)



Appendix G

Test Trenches 1 to 9
Soil Sections and tectonic

Tephra Layers

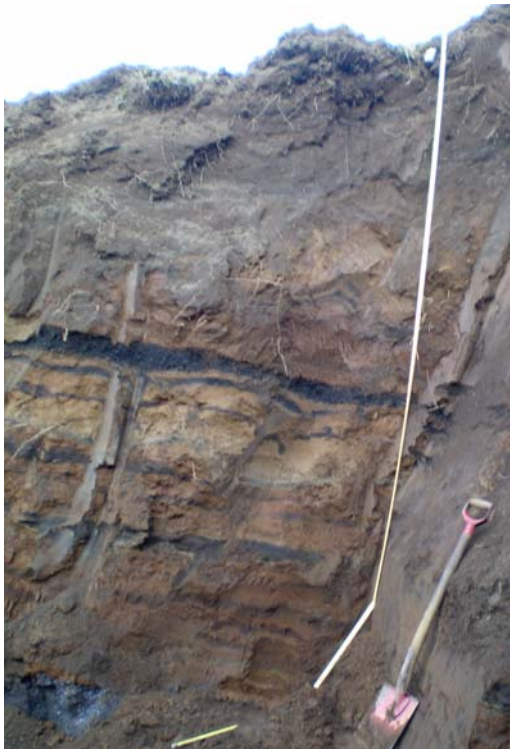


Trench 1

From East to West

Station 0

From	To	Thickness (cm)	
0	95	95	Sandy brown Soil
95	145	50	Redbrown Soil
145	146	1	Dark Tephra layer
146	148	2	Soil
148	155	7	Tephra layer, Dark-Light-Dark
155	170	15	Soil
170	174	4	Light brown Tephra layer
174	179	5	Soil
179	185	6	Dark coarse Tephra layer B-lagið
185	200	15	Light brown Soil
200	202	2	Dark sandy Tephra layer
202	221	19	Light brown Soil
221	222	1	Gray Tephra layer H3
222	241	19	Soil
241	243	2	Dark Tephra layer
243	255	12	Soil
255	266	11	Dark and Light Tephra layer H4
266	314	48	Soil
314	316	2	Light Tephra layer
316	327	11	Soil
327	327		Basalt



Station 10

From	To	Thickness (cm)	
0	74	74	Soil, Sandy, brown
74	79	5	Tephra layer Light
79	85	6	Soil, Light brown
85	91	6	Sandur darkbrown
91	98	7	Light Redbrown Soil
98	103	5	Sandur darkbrown
103	104	1	Light brown Soil
104	106	2	Gray Tephra layer H3
106	118	12	Light brown Soil
118	119	1	Dark Tephra layer
119	125	6	Light brown Soil
125	133	8	Dark Tephra layer H4
133	135	2	Light t Tephra layer H4
135	200	65	Soil Redbrown
200	200	0	Basalt

Station 30

From	To	Thickness (cm)	
0	56	56	Soil, Sandy, brown
56	62	6	Soil Light brown
62	66	4	Tephra layer Dark
66	78	12	Soil Light brown
78	80	2	Tephra layer Gray H3
80	94	14	Soil Light brown
94	95	1	Dark sand
95	104	9	Soil Light brown
104	106	2	Tephra layer Dark
106	122	16	Soil
122	130	8	Tephra layer Dark H4
130	133	3	Tephra layer Light brown H4
133	183	50	Soil
183	187	4	Tephra light brown, gray top and bottom
187	200	13	Soil
	200		Basalt

Station 50

From	To	Thickness (cm)	
0	24	24	Soil, Sandy, brown
24	27	3	Tephra layer Dark
27	88	61	Soil, Sandy, brown
88	89	1	Sand Dark
89	93	4	Soil
93	102	9	Tephra layer Dark
102	112	10	Soil
112	117	5	Tephra layer Dark H4
117	119	2	Tephra layer Light brown H4
119	175	56	Soil
175	180	5	Tephra light brown, gray top and bottom
180	210	30	Soil
210	210	0	Basalt

Station 70

From	To	Thickness (cm)	
0	39	39	Soil, Sandy, brown
39	41	2	Tephra layer Dark
41	108	67	Soil, Sandy, brown
108	109	1	Tephra layer Dark
109	112	3	Soil
112	115	3	Tephra layer Dark H4
115	116	1	Tephra layer Light t H4
116	137	21	Sand brown
137	147	10	Soil
147	149	2	Sand Redbrown
149	170	21	Soil
170	175	5	Tephra light brown, gray top and bottom
175	185	10	Soil
	185		Basalt

Station 90

From	To	Thickness (cm)	
0	18	18	Soil, Sandy, brown
18	19	1	Tephra layer Dark
19	63	44	Soil, Sandy, brown
63	64	1	Tephra layer Dark
64	70	6	Soil
70	71	1	Tephra layer Dark H4
71	74	3	Tephra layer Light t H4
74	104	30	Soil
104	112	8	Sand darkbrown
112	115	3	Soil
115	117	2	Sand darkbrown
117	140	23	Soil
140	145	5	Tephra light brown, gray top and bottom
145	154	9	Soil
	154		Basalt

Station 110

From	To	Thickness (cm)	
0	17	17	Soil, Sandy, brown
17	18	1	Tephra layer Dark
18	55	37	Soil, Sandy, brown
55	59	4	Tephra layer Dark
59	61	2	Soil
61	62	1	Tephra layer Dark
62	71	9	Soil
71	73	2	Tephra layer Dark - Light H4
73	95	22	Soil
95	98	3	Tephra layer Dark
98	106	8	Soil
106	108	2	Sand Redbrown
108	130	22	Soil
130	135	5	Tephra light brown, gray top - bottom
135	155	20	Soil
	155		Basalt

Station 130

From	To	Thickness (cm)	
0	9	9	Soil, Sandy, brown
9	10	1	Tephra layer Dark
10	53	43	Soil, Sandy, brown
53	56	3	Tephra layer Dark - Light
56	73	17	Soil
73	77	4	Sand brown
77	84	7	Soil
84	86	2	Sand Redbrown
86	105	19	Soil
105	109	4	Tephra light brown, gray top and bottom
109	123	14	Soil
123	140	17	Light Tephra layer, clay
140	190	50	Scoria
	190		Basalt

Station 150

From	To	Thickness (cm)	
0	16	16	Soil
16	17	1	Tephra layer Dark
17	35	18	Soil
35	38	3	Sand Dark
38	54	16	Soil
54	56	2	Tephra light brown, gray top and bottom
56	76	20	Soil
76	120	44	Scoria with Light brown clay fillings
	120		Basalt, vesicular

Station 170

From	To	Thickness (cm)	
0	15	15	Soil
15	16	1	Tephra layer Dark
16	40	24	Soil
40	60	20	Sand Dark
60	87	27	Soil
87	140	53	Scoria with soil
	140		Basalt, jointed

Station 190

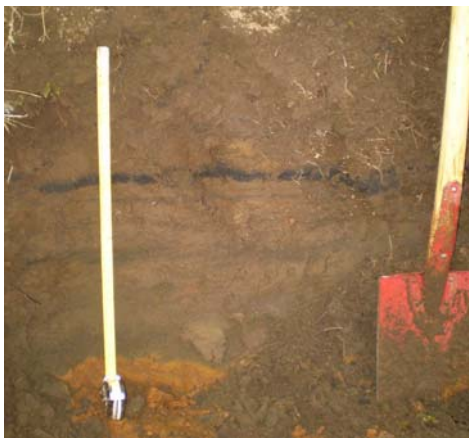
From	To	Thickness (cm)	
0	18	18	Soil
18	20	2	Tephra layer Dark
20	50	30	Soil, Light Tephra layer 30 cm depth
50	66	16	Soil Redbrown
66	68	2	Sand Redbrown
68	74	6	Soil
74	77	3	Tephra light brown, gray top and bottom
77	97	20	Soil
97	155	58	Scoria with soil
	155		Basalt

Station 210

From	To	Thickness (cm)	
0	17	17	Soil
17	18	1	Tephra layer Dark
18	29	11	Soil
29	31	2	Tephra layer brown and Light brown
31	44	13	Soil
44	45	1	Tephra layer Dark
45	88	43	Sand
88	150	62	Soil
150	220	70	Scoria with soil
	220		Basalt

Station 230

From	To	Thickness (cm)	
0	22	22	Soil
22	23	1	Tephra layer Dark
23	26	3	Soil
26	26,5	0,5	Tephra layer Dark
26,5	65	38,5	Soil
	65		Basalt

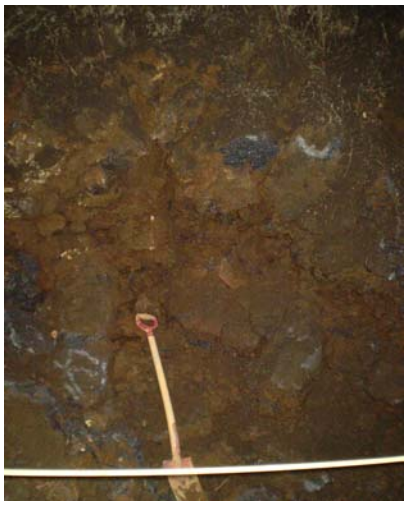


Trench 2

From West to East

Station 3.6

From	To	Thickness (cm)	
0	310	310	Scoria with soil
	310		Basalt, jointed



Station 33

From	To	Thickness (cm)	
0	29	29	Soil
29	30	1	Tephra dark
30	50	20	Soil
50	58	8	Tephra, light brown top, dark bottom H4
58	73	15	Soil
73	79	6	Sand brown (Tephra)
79	86	7	Soil
86	88	2	Sand redbrown (Tephra)
88	102	14	Soil
102	105	3	Tephra light brown, gray top and bottom
105	130	25	Soil
130	145	15	Basalt, jointed
	145		Basalt

Station 41

From	To	Thickness (cm)	
0	8	8	Soil
8	13	5	Sand brown (Tephra)
13	18	5	Soil
18	19	1	Sand redbrown (Tephra)
19	33	14	Soil
33	36	3	Tephra light brown, gray top and bottom
36	48	12	Soil
48	125	77	Basalt, jointed
	125		Basalt

Station 45

From	To	Thickness (cm)	
0	30	30	Soil
30	310	280	Scoria, jointed basalt
	310		Basalt

Station 70

From	To	Thickness (cm)	
0	24	24	Soil
24	25	1	Tephra dark
25	86	61	Soil
86	89	3	Sand brown (Tephra)
89	94	5	Soil
94	96	2	Sand redbrown (Tephra)
96	110	14	Soil
110	113	3	Tephra light brown, gray top and bottom
113	130	17	Soil
130	150	20	Scoria
	150		Basalt

Station 100

From	To	Thickness (cm)	
0	25	25	Soil
25	26	1	Tephra dark
26	68	42	Soil
68	71	3	Tephra, light brown pumice
71	74	3	Soil
74	85	11	Tephra dark, coarce pumice B-layer
85	88	3	Soil
88	91	3	Tephra dark, light brown bottom 1 cm
91	99	8	Soil
99	107	8	Tephra dark, hardened
107	119	12	Soil
119	122	3	Tephra gray
122	126	4	Soil
126	129	3	Tephra redbrown hardened
129	146	17	Soil
146	149	3	Tephra, light brown top, dark bottom H4
149	193	44	Soil
193	198	5	Sand brown (Tephra)
198	218	20	Soil
218	221	3	Tephra light brown, gray top and bottom
221	232	11	Soil
232	255	23	Clay, light yellowish brown
	255		Basalt

Station 120

From	To	Thickness (cm)	
0	10	10	Soil
10	12	2	Tephra dark
12	78	66	Soil
78	82	4	Tephra, light brown pumice
82	87	5	Soil
87	97	10	Tephra dark, coarce pumice B-layer
97	99	2	Soil
99	102	3	Tephra dark, light brown bottom 1 cm
102	106	4	Soil
106	110	4	Tephra dark, hardened
110	126	16	Soil
126	127	1	Tephra gray
127	135	8	Soil
135	145	10	Tephra dark brown
145	151	6	Soil
151	162	11	Tephra dark brown
162	163	1	Soil
163	164	1	Tephra dark
164	177	13	Soil
177	182	5	Tephra, light brown top, dark bottom H4
182	202	20	Soil
202	206	4	Sand brown (Tephra)
206	213	7	Soil
213	215	2	Sand redbrown (Tephra)
215	230	15	Soil
230	233	3	Tephra light brown, gray top and bottom
233	248	15	Soil
248	253	5	Clay yellow brown
	253		Basalt

Station 148

From	To	Thickness (cm)	
0	21	21	Soil
21	23	2	Tephra dark
23	60	37	Soil
60	63	3	Tephra dark
63	84	21	Soil
84	92	8	Tephra dark H4
92	96	4	Tephra light brown H4
96	112	16	Soil
112	116	4	Sand brown (Tephra)
116	123	7	Soil
123	125	2	Sand redbrown (Tephra)
125	147	22	Soil
147	151	4	Tephra light brown, gray top and bottom
151	159	8	Soil
	159		Basalt

Trench 3

From North to South

Station 02

From	To	Thickness (cm)	
0	44	44	Soil
44	45	1	Tephra dark
45	88	43	Soil
88	90	2	Tephra, light brown pumice
90	135	45	Soil
135	138	3	Soil light brown
138	140	2	Tephra dark
140	154	14	Soil light brown
154	155	1	Tephra dark
155	159	4	Soil light brown
159	164	5	Tephra dark H4
164	165	1	Tephra light brown H4
165	182	17	Soil
182	187	5	Sand brown (Tephra)
187	189	2	Soil
189	190	0,5	Tephra dark
189,5	191	1,5	Soil
191	193	2	Sand redbrown (Tephra)
193	197	4	Soil
197	198	1	Sand redbrown (Tephra)
198	200	2	Soil
200	202	2	Tephra dark
202	205	3	Soil
205	207	2	Tephra light brown, gray top and bottom
207	290	83	Scoria with soil
	290		Basalt

Station 20

From	To	Thickness (cm)	
0	32	32	Soil sandy
32	38	6	Soil
38	40	2	Tephra light brown, gray top and bottom
40	55	15	Scoria with soil
	55		Basalt

Station 40

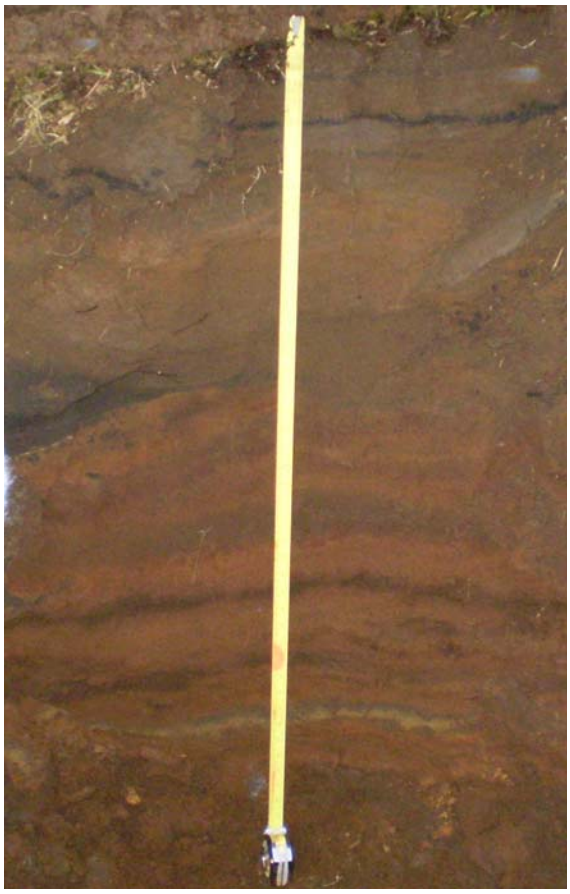
From	To	Thickness (cm)	
0	10	10	Soil
10	11	1	Tephra dark
11	17	6	Soil
17	18	1	Tephra dark
18	58	40	Soil
58	66	8	Soil redbrown
66	69	3	Tephra light brown, gray top and bottom
69	83	14	Soil redbrown
83	150	67	Scoria
	150		Basalt

Stöð 60

From	To	Thickness (cm)	
0	15	15	Soil
15	17	2	Tephra dark
17	40	23	Soil
40	42	2	Soil redbrown
42	44	2	Tephra light brown, gray top and bottom
44	52	8	Soil redbrown
52	56	4	Sand redbrown
56	60	4	Soil
	60		Basalt

Stöð 80

From	To	Thickness (cm)	
0	7	7	Soil
7	8	1	Tephra dark
8	12	4	Soil
12	13	1	Tephra dark
13	48	35	Soil
48	51	3	Tephra brown, light brown bottom H4
51	64	13	Soil
64	69	5	Sand brown (Tephra)
69	75	6	Soil
75	77	2	Sand redbrown (Tephra)
77	87	10	Soil
87	88	1	Sand redbrown (Tephra)
88	95	7	Soil
95	98	3	Tephra light brown, gray top and bottom
98	115	17	Soil
	115		Basalt



Stöð 100

From	To	Thickness (cm)	
0	8	8	Soil
8	9	1	Tephra dark
9	14	5	Soil
14	15	1	Tephra dark
15	49	34	Soil
49	50	1	Tephra gray H3
50	55	5	Tephra dark
55	63	8	Soil
63	64	1	Tephra dark
64	74	10	Soil
74	78	4	Tephra brown, light brown bottom H4
78	118	40	Soil
118	122	4	Sand brown (Tephra)
122	128	6	Soil
128	130	2	Sand redbrown (Tephra)
130	138	8	Soil
138	140	2	Sand redbrown (Tephra)
140	147	7	Soil
147	150	3	Tephra light brown, gray top and bottom
150	160	10	Soil with scoria fragments
160	173	13	Clay light yellow brown with scoria
	173		Basalt

Stöð 120

From	To	Thickness (cm)	
0	9	9	Soil
9	10	1	Tephra dark
10	22	12	Soil
22	68	46	light brown Soil
68	70	2	Tephra gray H3
70	71	1	Soil
71	79	8	Tephra dark
79	93	14	Soil
93	102	9	Tephra brown, light brown bottom H4
102	118	16	Soil
118	123	5	Sand brown (Tephra)
123	128	5	Soil
128	131	3	Sand redbrown (Tephra)
131	150	19	Soil
150	152	2	Tephra light brown, gray top and bottom
152	187	35	Soil with scoria fragments
	187		Basalt

Trench 4

From West to East
Station 10

From	To	Thickness (cm)	
0	70	70	Soil
70	72	2	Tephra dark
72	118	46	Soil
118	119	1	Tephra dark
119	133	14	Soil
133	136	3	Tephra light brown
136	140	4	Soil
140	151	11	Tephra dark, coarse B layer
151	153	2	Soil
153	156	3	Tephra dark
156	168	12	Soil light brown
168	178	10	Tephra dark
178	191	13	Soil light brown
191	193	2	Tephra gray H3
193	199	6	Soil
199	204	5	Tephra dark
204	211	7	Soil
211	214	3	Tephra dark
214	215	1	Soil
215	217	2	Tephra gray
217	228	11	Soil
228	229	1	Tephra light brown
229	234	5	Soil
234	241	7	Tephra dark
241	243	2	Tephra light brown
243	261	18	Soil
261	264	3	Sand brúnt
264	270	6	Soil
270	272	2	Sand redbrown
272	291	19	Soil
291	296	5	Tephra light brown, gray top and bottom
296	300	4	Soil
	300		Basalt

Station 40

From	To	Thickness (cm)	
0	40	40	Soil
40	42	2	Tephra dark
42	90	48	Soil
90	98	8	Light brown pumice and brown sand
98	120	22	Soil
120	121	1	Tephra dark
121	125	4	Soil
125	126	1	Tephra dark
126	145	19	Soil
145	147	2	Tephra dark, two thin together
147	152	5	Soil
152	155	3	Tephra dark
155	224	69	Soil
224	228	4	Tephra dark
228	230	2	Soil
230	232	2	Tephra dark
232	249	17	Soil
249	260	11	Tephra dark, coarse B layer
260	262	2	Soil
262	272	10	Tephra dark
272	282	10	Soil light brown
282	285	3	Tephra gray H3
285	288	3	Soil
288	293	5	Tephra dark
293	297	4	Soil
297	299	2	Tephra dark brown
299	310	11	Soil
310	319	9	Tephra dark H4
319	322	3	Tephra light brown H4
322	327	5	Soil
327	337	10	Sand brown
337	350	13	Soil
350	352	2	Sand redbrown
352	355	3	Soil
355	358	3	Tephra light brown, gray top and bottom
358	369	11	Soil
	369		Basalt

Trench 5

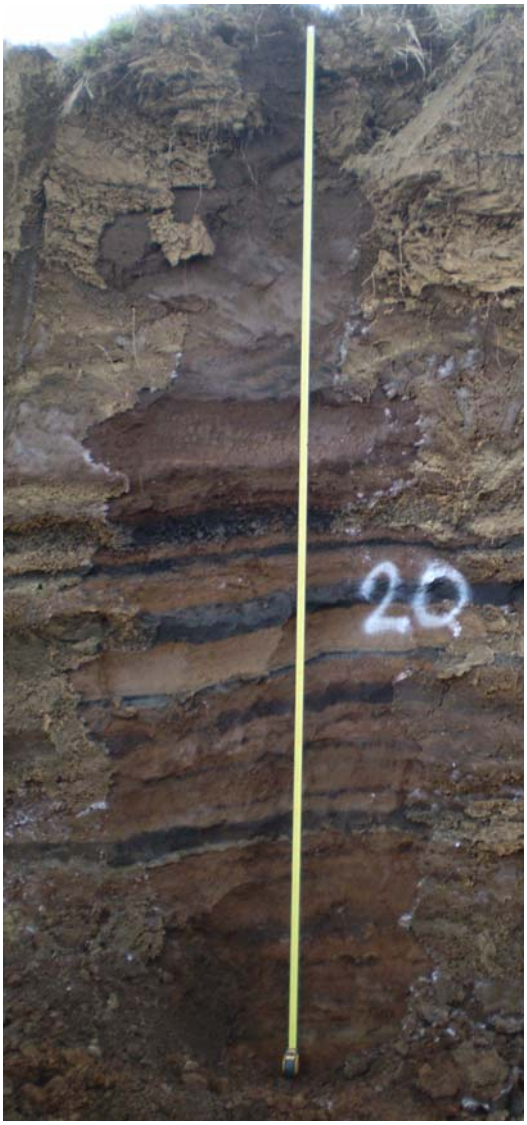
From West to East

Station 0

From	To	Þykkt (cm)	
0	55	55	Soil
55	56	1	Tephra dark
56	103	47	Soil
103	108	5	Sand, light brown
108	137	29	Soil
137	142	5	Tephra light brown
142	147	5	Soil
147	161	14	Tephra dark, coarse B layer
161	164	3	Soil
164	168	4	Tephra dark
168	169	1	Tephra light brown
169	177	8	Soil
177	185	8	Tephra dark
185	198	13	Soil
198	200	2	Tephra, gray H3
200	206	6	Soil
206	218	12	Tephra dark
218	225	7	Soil
225	233	8	Tephra dark
233	234	1	Soil
234	235	1	Tephra dark
235	249	14	Soil
249	250	1	Tephra dark
250	256	6	Soil
256	263	7	Tephra dark top, light brown bottom H4
263	284	21	Soil
284	290	6	Sand brown
290	296	6	Soil
296	298	2	Sand redbrown
298	320	22	Soil
320	325	5	Tephra light brown, gray top and bottom
325	340	15	Soil
	340		Basalt

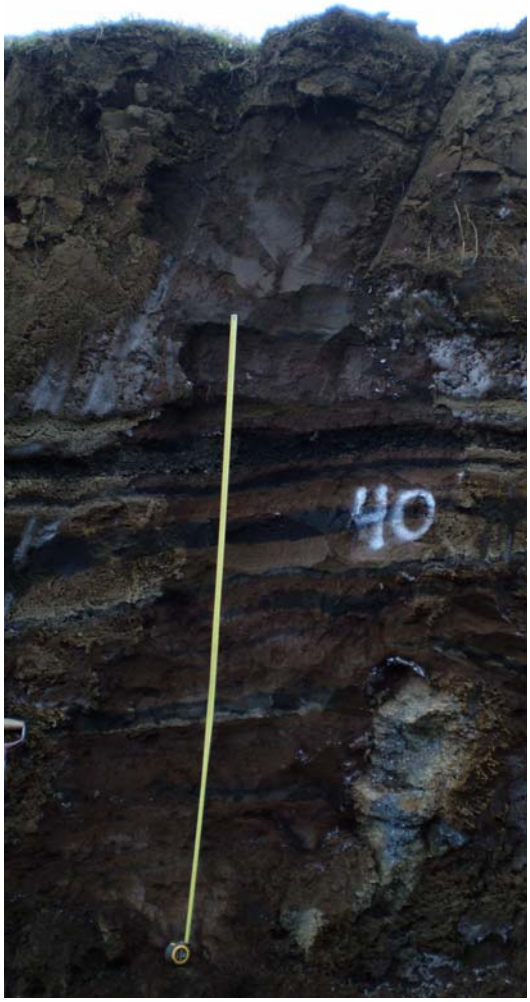
Station 20

From	To	Thickness (cm)	
0	14	14	Soil
14	15	1	Tephra dark
15	44	29	Soil
44	45	1	Tephra dark
45	90	45	Soil
90	98	8	Sand, light brown Tephra
98	122	24	Soil
122	127	5	Tephra light brown
127	133	6	Soil
133	141	8	Tephra dark, coarse B layer
141	144	3	Soil
144	148	4	Tephra dark, light brown bottom 1 cm
148	156	8	Soil
156	165	9	Tephra dark
165	178	13	Soil
178	180	2	Tephra, gray H3
180	187	7	Soil
187	191	4	Tephra dark
191	195	4	Soil
195	196	1	Tephra dark
196	201	5	Soil
201	202	1	Tephra dark
202	213	11	Soil
213	214	1	Tephra dark
214	219	5	Soil
219	227	8	Tephra dark top, light brown bottom H4
227	250	23	Soil
250	256	6	Sand brown
256	261	5	Soil
261	263	2	Sand redbrown
263	280	17	Soil
280	284	4	Tephra light brown, gray top and bottom
284	291	7	Soil
	291		Basalt



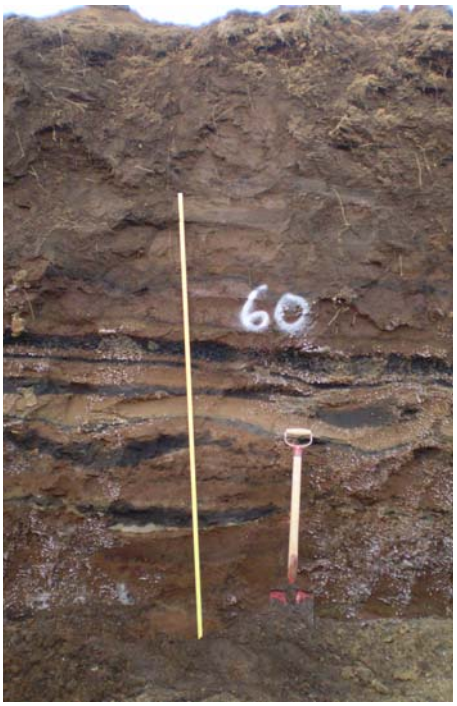
Station 40

From	To	Thickness (cm)	
0	100	100	Soil
100	105	5	Sand, light brown Tephra
105	128	23	Soil
128	135	7	Tephra light brown
135	140	5	Soil
140	155	15	Tephra dark, coarse B layer
155	157	2	Soil
157	161	4	Tephra dark, light brown bottom 1 cm
161	169	8	Soil
169	175	6	Tephra dark
175	186	11	Soil
186	188	2	Tephra, gray H3
188	195	7	Soil
195	197	2	Tephra dark
197	209	12	Soil
209	211	2	Tephra dark
211	222	11	Soil
222	223	1	Tephra dark
223	227	4	Soil
227	234	7	Tephra dark top, light brown bottom H4
234	251	17	Soil
251	256	5	Sand brown
256	261	5	Soil
261	263	2	Sand redbrown
263	275	12	Soil
275	277	2	Tephra light brown, gray top and bottom
277	300	23	Soil
300	330	30	Basalt
	330		Basalt



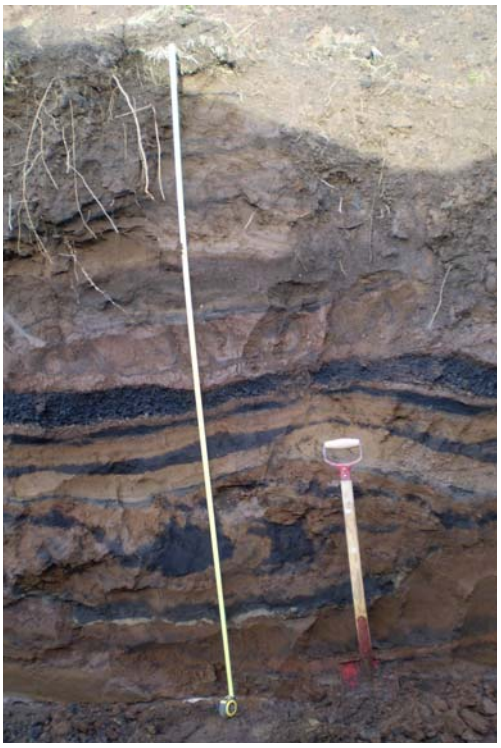
Station 60

From	To	Thickness (cm)	
0	167	167	Soil, few thin Tephra layers
167	171	4	Tephra light brown
171	176	5	Soil
176	184	8	Tephra dark, coarse B layer
184	187	3	Soil
187	190	3	Tephra dark, light brown bottom 1 cm
190	199	9	Soil
199	203	4	Tephra dark
203	214	11	Soil
214	215	1	Tephra, gray H3
215	223	8	Soil
223	230	7	Tephra dark
230	261	31	Soil
261	271	10	Tephra dark top, light brown bottom H4
271	284	13	Soil
284	288	4	Sand brown
288	309	21	Soil
309	312	3	Tephra light brown, gray top and bottom
312	333	21	Soil
	333		Basalt



Station 10 m from East end

From	To	Thickness (cm)	
0	14	14	Soil
14	15	1	Tephra dark
15	35	20	Soil
35	36	1	Tephra dark
36	80	44	Soil
80	100	20	Brown sand and dark Tephra at bottom
100	116	16	Soil
116	119	3	Pumice brown and dark Tephra
119	125	6	Soil
125	132	7	Tephra dark, coarse B layer
132	134	2	Soil
134	137	3	Tephra dark
137	143	6	Soil
143	150	7	Tephra dark
150	158	8	Soil
158	160	2	Tephra, gray H3
160	174	14	Soil
174	188	14	Tephra dark
188	203	15	Soil
203	211	8	Tephra dark top, light brown bottom H4
211	242	31	Soil
	242		Basalt

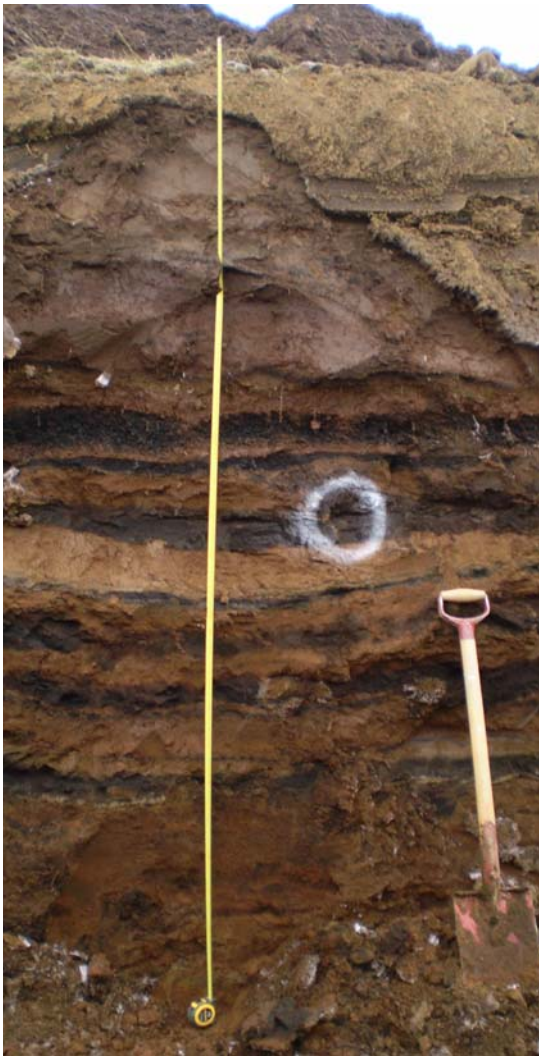


Trench 6

From West to East

Station 0

From	To	Thickness (cm)	
0	20	20	Soil
20	21	1	Tephra dark
21	58	37	Soil
58	62	4	Tephra dark and light brown
62	92	30	Soil
92	96	4	Tephra light brown, 1cm dark top
96	102	6	Soil
102	111	9	Tephra dark, coarse B layer
111	114	3	Soil
114	119	5	Tephra dark, light brown bottom
119	127	8	Soil
127	138	11	Tephra dark
138	151	13	Soil
151	154	3	Tephra, gray H3
154	160	6	Soil
160	167	7	Tephra dark
167	174	7	Soil
174	179	5	Tephra dark
179	180	1	Soil
180	181	1	Tephra dark
181	193	12	Soil
193	194	1	Tephra dark
194	197	3	Soil
197	204	7	Tephra dark top, light brown bottom H4
204	225	21	Soil
225	230	5	Sand brown
230	237	7	Soil
237	239	2	Sand redbrown
239	255	16	Soil
255	258	3	Tephra light brown, gray top and bottom
258	265	7	Soil
	265		Basalt



Station 40

From	To	Thickness (cm)	
0	91	91	Soil
91	95	4	Tephra light brown
95	128	33	Soil
128	134	6	Tephra light brown, dark top
134	138	4	Soil
138	148	10	Tephra dark, coarse B layer
148	150	2	Soil
150	153	3	Tephra dark, light brown bottom 1 cm
153	161	8	Soil
161	166	5	Tephra dark
166	180	14	Soil
180	182	2	Tephra, gray H3
182	191	9	Soil
191	199	8	Tephra dark
199	207	8	Soil
207	208	1	Tephra dark
208	219	11	Soil
219	220	1	Tephra dark
220	223	3	Soil
223	228	5	Tephra dark top, light brown bottom H4
228	253	25	Soil
253	258	5	Sand brown
258	263	5	Soil
263	265	2	Sand, redbrown
265	285	20	Soil
285	288	3	Tephra light brown, gray top and bottom
288	316	28	Soil
	316		Basalt

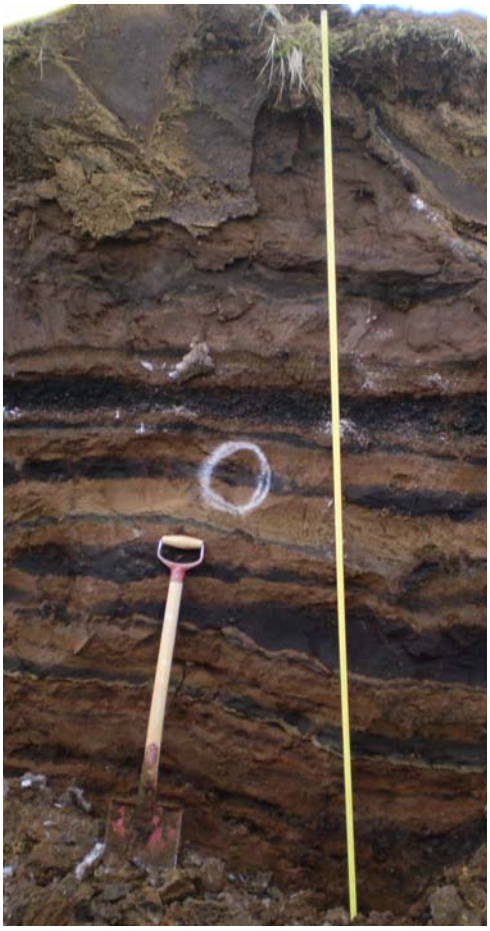
Station 70

From	To	Thickness (cm)	
0	84	84	Soil
84	87	3	Tephra dark, 0.5 cm light brown bottom
87	113	26	Soil
113	119	6	Tephra light brown, dark top
119	125	6	Soil
125	139	14	Tephra dark, coarse B layer
139	142	3	Soil
142	147	5	Tephra dark, light brown bottom 1 cm
147	155	8	Soil
155	166	11	Tephra dark
166	177	11	Soil
177	179	2	Tephra, gray H3
179	185	6	Soil
185	196	11	Tephra dark
196	199	3	Soil
199	200	1	Sand brown
200	202	2	Soil
202	204	2	Sand brown
204	205	1	Soil
205	206	1	Tephra dark
206	215	9	Soil
215	216	1	Tephra dark
216	220	4	Soil
220	227	7	Tephra dark top, light brown bottom H4
227	245	18	Soil
245	250	5	Sand brown
250	255	5	Soil
255	256	1	Sand, redbrown
256	272	16	Soil
272	275	3	Tephra light brown, gray top and bottom
275	286	11	Soil
286	300	14	Basalt, jointed
	300		Basalt

Trench 7

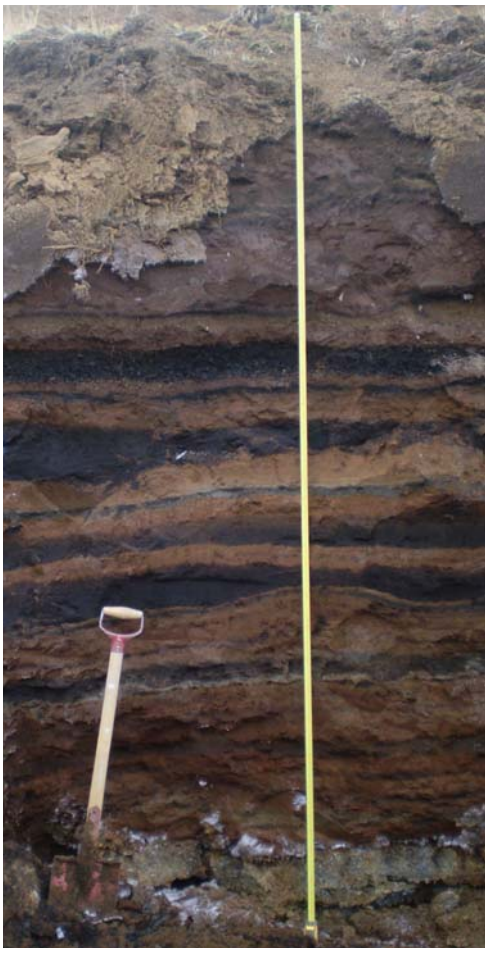
Station 0 **From North to South**

From	To	Thickness (cm)	
0	84	84	Soil
84	91	7	Tephra dark, 1cm light brown bottom
91	108	17	Soil
108	114	6	Tephra light brown, 1cm dark top
114	119	5	Soil
119	131	12	Tephra dark, coarse B layer
131	134	3	Soil
134	138	4	Tephra dark, 1-2 cm light brown bottom
138	147	9	Soil
147	151	4	Tephra dark
151	167	16	Soil
167	170	3	Tephra, gray H3
170	175	5	Soil
175	178	3	Tephra dark
178	184	6	Soil
184	202	18	Tephra dark
202	203	1	Soil
203	204	1	Tephra dark
204	213	9	Soil
213	214	1	Tephra dark
214	219	5	Soil
219	228	9	Tephra dark top, light brown bottom H4
228	247	19	Soil
247	252	5	Sand brown
252	258	6	Soil
258	261	3	Sand redbrown
261	285	24	Soil, remains of light Tephra at bottom
	285		Basalt



Station 49

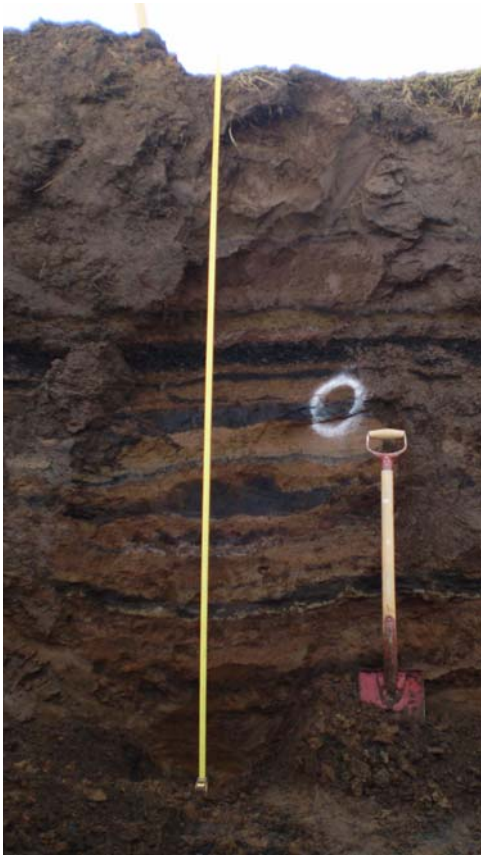
From	To	Thickness (cm)	
0	63	63	Soil
63	68	5	Tephra light brown og dark
68	100	32	Soil
100	105	5	Tephra light brown, 1cm dark top
105	110	5	Soil
110	121	11	Tephra dark, coarse B layer
121	124	3	Soil
124	127	3	Tephra dark, 1 cm light brown bottom
127	135	8	Soil
135	145	10	Tephra dark
145	156	11	Soil
156	158	2	Tephra, gray H3
158	165	7	Soil
165	174	9	Tephra dark
174	181	7	Soil
181	187	6	Tephra dark
187	188	1	Soil
188	189	1	Tephra dark
189	200	11	Soil
200	202	2	Tephra dark, slitrótt
202	209	7	Soil
209	217	8	Tephra dark top, light brown bottom H4
217	236	19	Soil
236	241	5	Sand brown
241	246	5	Soil
246	247	1	Sand redbrown
247	261	14	Soil
261	265	4	Tephra light brown, gray top and bottom
265	271	6	Soil
271	300	29	Basalt jointed
	300		Basalt



Trench 8

Station 0 **From West to East**

From	To	Thickness (cm)	
0	79	79	Soil
79	83	4	Tephra dark og light brown
83	106	23	Soil
106	110	4	Tephra light brown
110	116	6	Soil
116	125	9	Tephra dark, coarse B layer
125	127	2	Soil
127	131	4	Tephra dark, light brown bottom
131	140	9	Soil
140	148	8	Tephra dark
148	162	14	Soil
162	164	2	Tephra, gray H3
164	169	5	Soil
169	182	13	Tephra dark
182	187	5	Soil
187	192	5	Tephra dark
192	193	1	Soil
193	194	1	Tephra dark
194	205	11	Soil
205	206	1	Tephra dark
206	210	4	Soil
210	217	7	Tephra dark top, light brown bottom H4
217	237	20	Soil
237	242	5	Sand brown
242	269	27	Soil
269	271	2	Tephra light brown, gray top and bottom
271	275	4	Soil
	275		Basalt



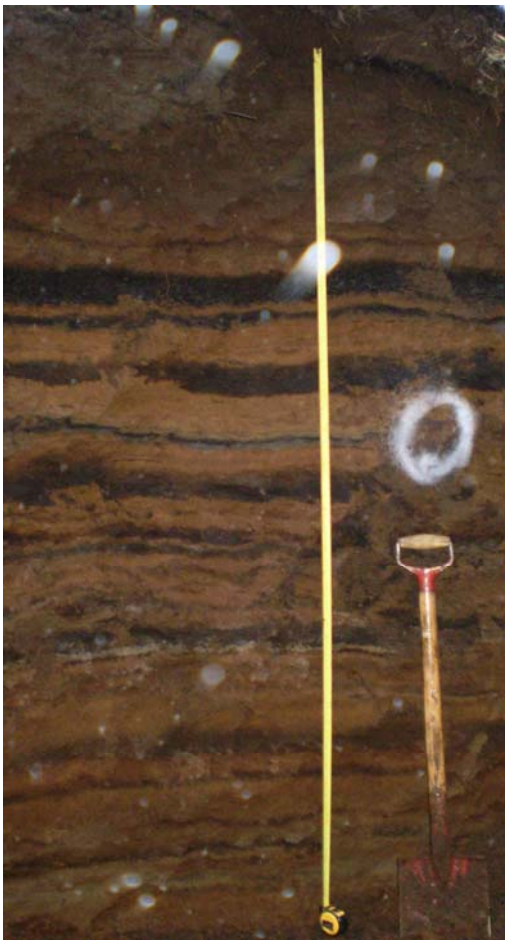
Station 50

From	To	Thickness (cm)	
0	90	90	Soil
90	93	3	Tephra light brown
93	124	31	Soil
124	130	6	Tephra light brown
130	137	7	Soil
137	148	11	Tephra dark, coarse B layer
148	150	2	Soil
150	154	4	Tephra dark, light brown bottom 1 cm
154	162	8	Soil
162	168	6	Tephra dark
168	181	13	Soil
181	183	2	Tephra, gray H3
183	190	7	Soil
190	195	5	Tephra dark
195	202	7	Soil
202	203	1	Tephra dark
203	212	9	Soil
212	213	1	Tephra dark
213	219	6	Soil
219	225	6	Tephra dark top, light brown bottom H4
225	243	18	Soil
243	248	5	Sand brown
248	253	5	Soil
253	255	2	Sand, redbrown
255	268	13	Soil
268	270	2	Tephra light brown, gray top and bottom
270	280	10	Soil
280	350	70	Basalt, jointed
	350		Basalt

Trench 9

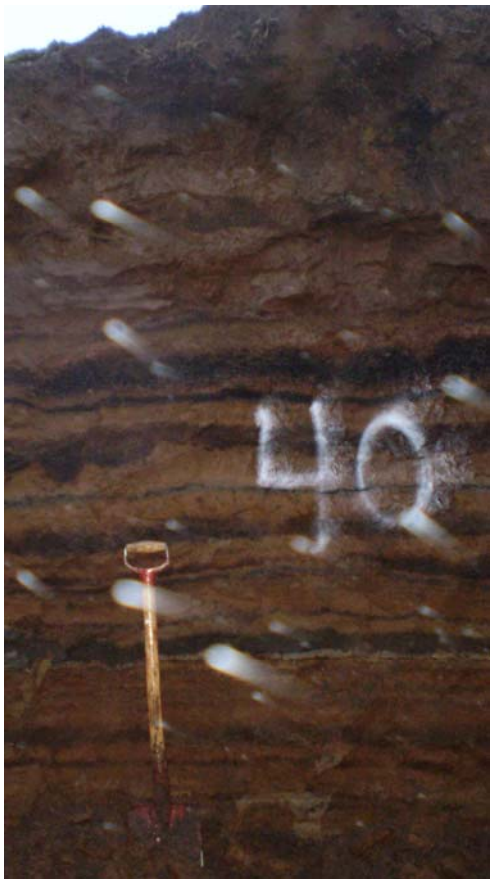
Station 0 **From West to East**

From	To	Thickness (cm)	
0	50	50	Soil
50	54	4	Tephra light brown
54	58	4	Soil
58	66	8	Tephra dark, coarse B layer
66	68	2	Soil
68	70	2	Tephra dark, 1 cm light brown bottom
70	81	11	Soil
81	89	8	Tephra dark
89	101	12	Soil
101	103	2	Tephra, gray H3
103	110	7	Soil ljós
110	118	8	Tephra dark
118	127	9	Soil
127	133	6	2 Tephra layer 1 cm Soil between
133	143	10	Soil
143	145	2	Tephra dark
145	149	4	Soil
149	156	7	Tephra dark top, light brown bottom H4
156	176	20	Soil
176	182	6	Sand brown
182	186	4	Soil
186	188	2	Sand brown
188	206	18	Soil
206	208	2	Redbrown layer Tephra?
208	214	6	Soil
214	217	3	Tephra light brown, gray top and bottom
217	227	10	Soil
	227		Basalt



Station 40

From	To	Thickness (cm)	
0	97	97	Soil
97	104	7	Tephra light brown
104	120	16	Tephra dark, coarse B layer
120	123	3	Soil
123	126	3	Tephra dark, light brown bottom
126	133	7	Soil
133	140	7	Tephra dark
140	152	12	Soil
152	154	2	Tephra, gray H3
154	162	8	Soil
162	169	7	Tephra dark
169	177	8	Soil
177	179	2	Tephra dark
179	180	1	Soil
180	182	2	Tephra dark
182	193	11	Soil
193	194	1	Tephra dark
194	199	5	Soil
199	206	7	Tephra dark top, light brown bottom H4
206	226	20	Soil
226	233	7	Sand brown
233	237	4	Soil
237	239	2	Redbrown layer Tephra?
239	260	21	Soil
260	263	3	Tephra light brown, gray top and bottom
263	274	11	Soil
	274		Basalt



Trench 1

Station	Description
6.7-8.5	Movement in Soil and tephra layers, jointed basalt in the bottom.

18	Subsidence in tephra layers, jointed basalt in the bottom.

46.9-62	Joints in basalt, not up to the soil, possibly tectonic. No picture available.

Trench 2

Station	Description
101	Joint in basalt, irregularity in tephra layers.

110,3	Joints in basalt.
110-116	Irregularity in tephra layers, up to the B layer.
146	Open joint in basalt, not in the Soil.

Trench 3

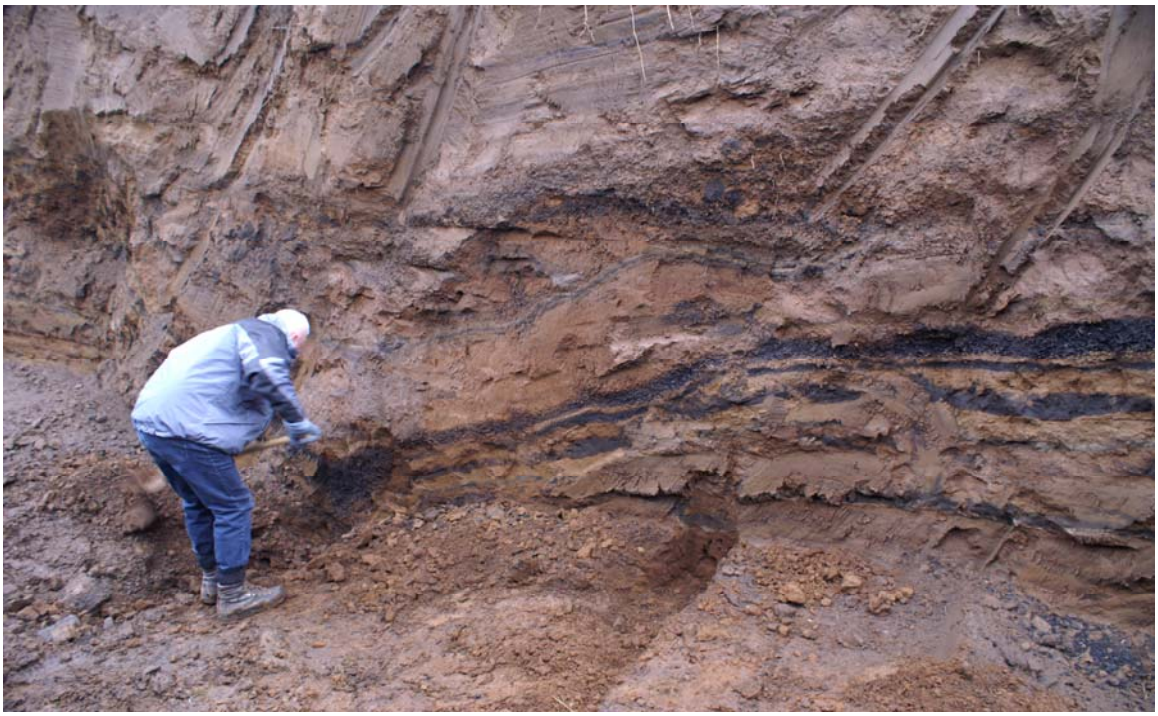
Station Description

13,5 Joint in basalt, 8 cm wide.

94 Irregularity in tephra layers.

Trench 4

Station	Description
31	Open joint in basalt, subsidence in tephra layers, older than H3.

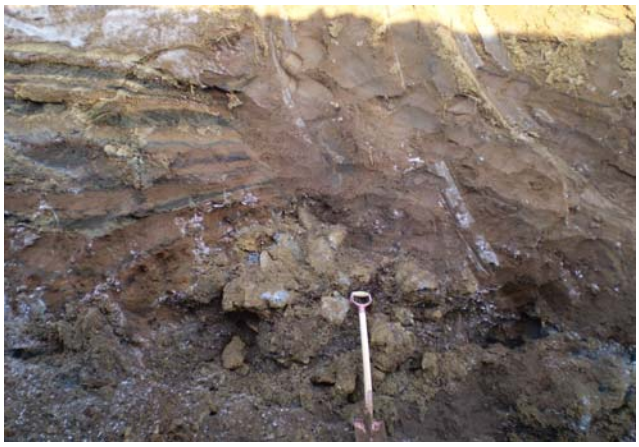


Trench 5

Station Description

13 Joints in Soil.

41-46 Subsidense and erosion in Soil and joints in basalt.



85 Joint in basalt.

Trench 6

Station Description

15 Joint in basalt 5 cm.

32 Possible movement in soil.

42 Irregularity in tephra layer.

Station	Description
67	Subsidense in tephra layer H4.

73	Subsidense in tephra layer H4.

Trench 7

Station	Description
22	Irregularity in tephra layers below H4

42-46	Irregularity in tephra layers below H3

Trench 8

Station	Description
27-32	Irregularity in tephra layers.

68	Irregularity in tephra layers.

Trench 9

Station	Description
2	Joint in basalt.

5-10	Joint in basalt 5-10 cm wide.

24	Joint in basalt 10-20 cm wide.

Station Description

28 Joint in basalt 3-5 cm, irregularity in Soil below H3.

34 Joint in basalt 5 cm, irregularity in Soil.

Appendix H

Temperature measurements

Temperature and Conductivity in Boreholes

Borehole: NK-63
Date: 3.6.2008
Water level:

Depth m	Elevation m a.s.l.	Conductivity µS	Temperature °C
6,2	99,9	87	6
11,0	95,1	85	5,6
16,0	90,1		6,7
21,0	85,1	108	7,4
26,0	80,1	165	8,4
31,0	75,1	175	9,2
36,0	70,1	176	10,2
41,0	65,1	182	11,1
46,0	60,1	182	12,1
51,0	55,1	184	13
53,0	53,1	179	13,1

Borehole: NK-28
Date: 3.6.2008
Water level:

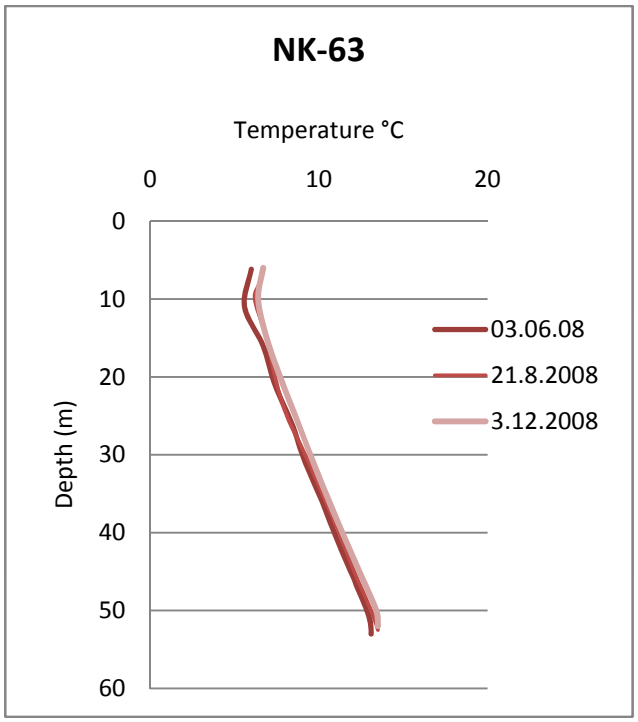
Depth m	Elevation m a.s.l.	Conductivity µS	Temperature °C
5,4	100		
5,5	100	96	5,5
11,0	95	135	6,7
14,5	91	135	7,2

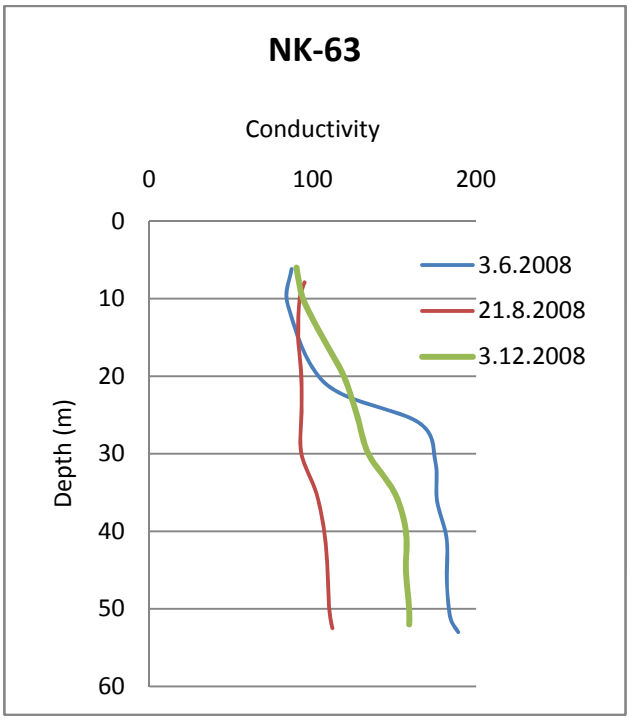
Borehole: NK-29
Date: 3.6.2008
Water level:

Depth m	Elevation m a.s.l.	Conductivity µS	Temperature °C
5,2	100,3	111	12,2
10,0	95,5	116	9,5
15,0	90,5	115	11,2
20,0	85,5	116	11,9
25,0	80,5	115	12
30,0	75,5	116	12,1
35	70,5	116	12,4
40	65,5	115	12,7
45	60,5	116	12,7
50	55,5	115	13,1
55	50,5	117	13,9
57,5	48,0	116	16,9

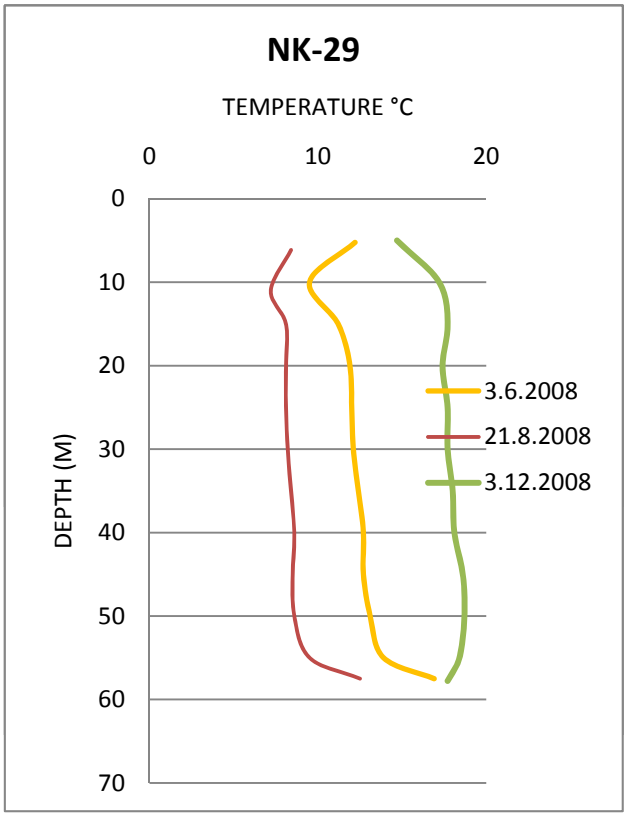
Temperature and Conductivity Measurements

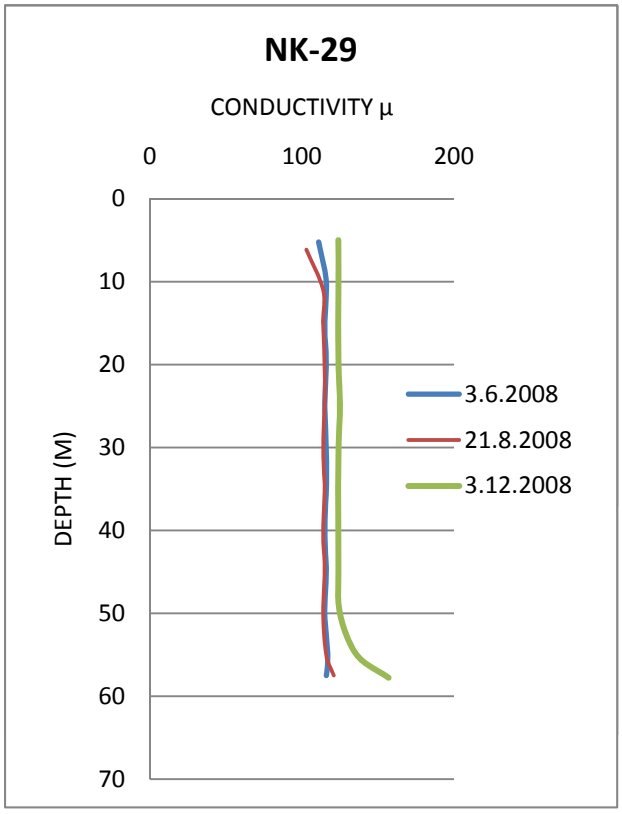
Borehole NK-63



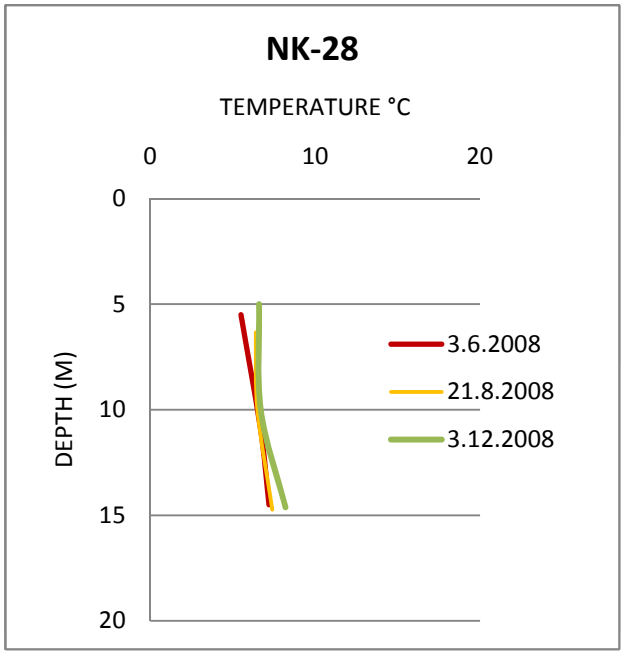


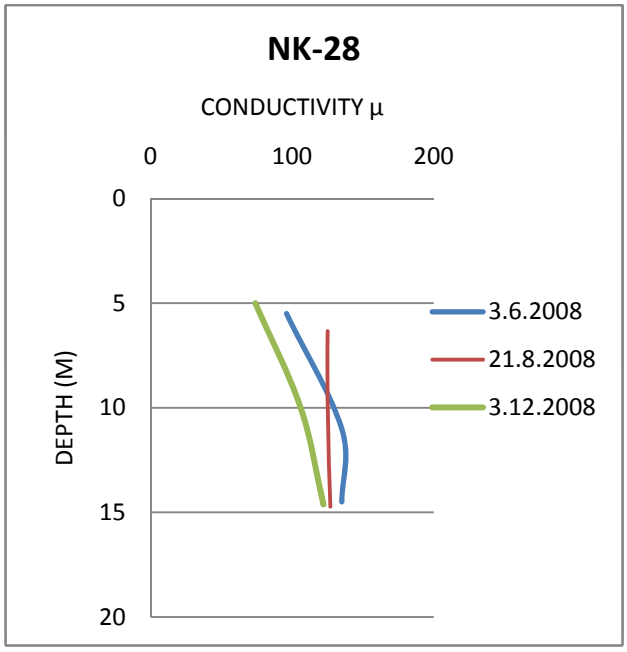
Borehole NK-29





Borehole NK-28



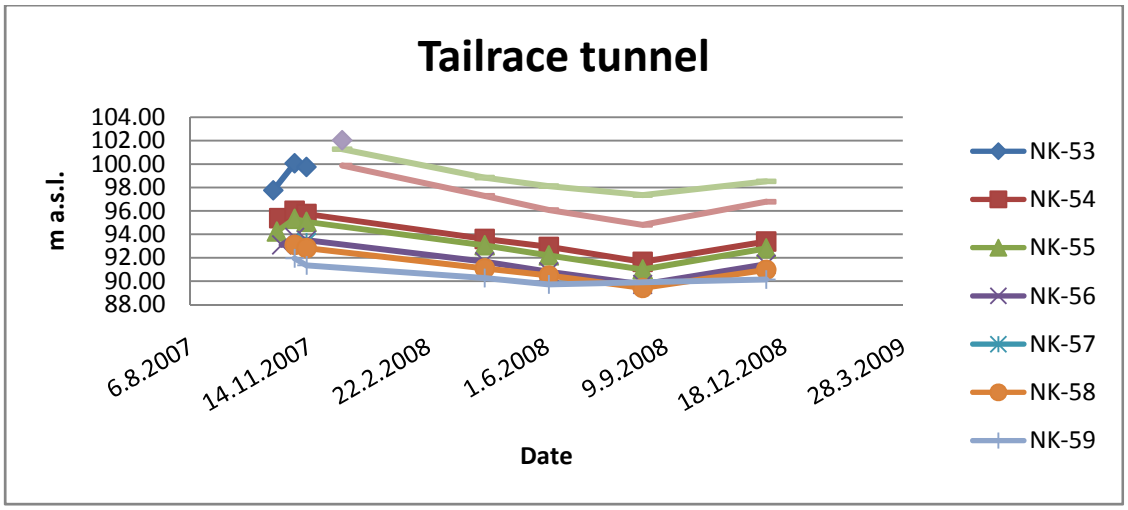


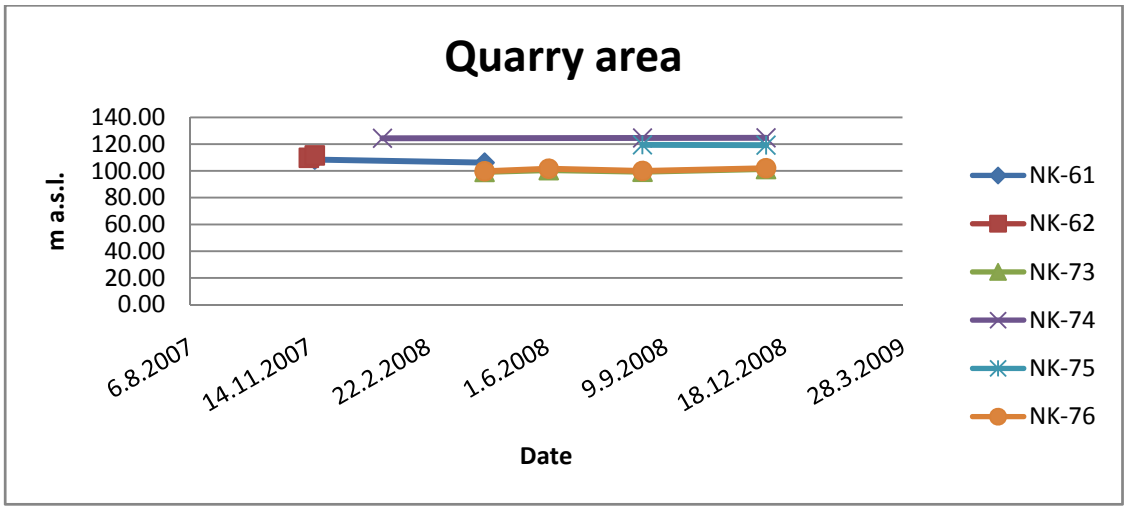
Appendix I

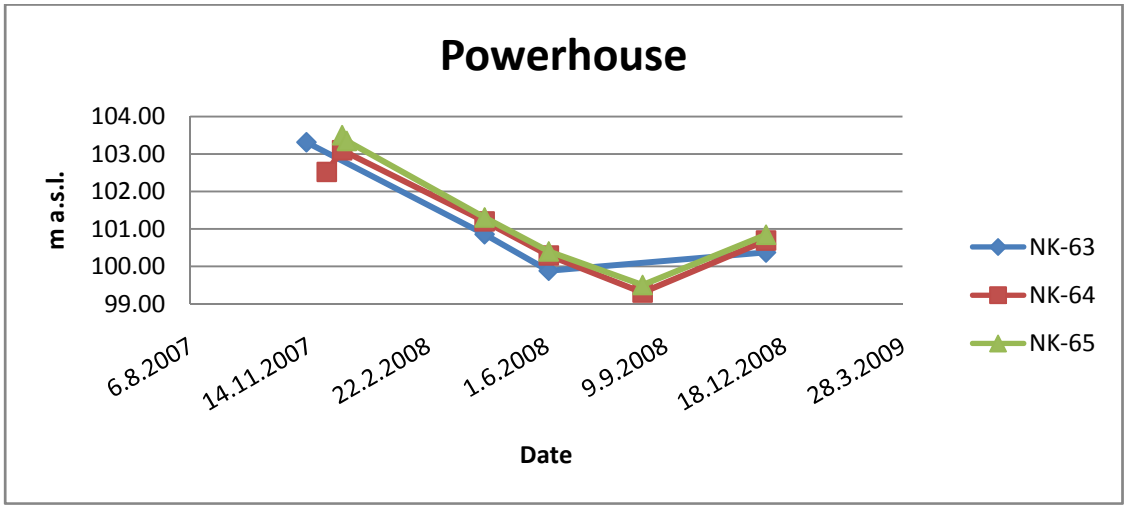
Groundwater measurements

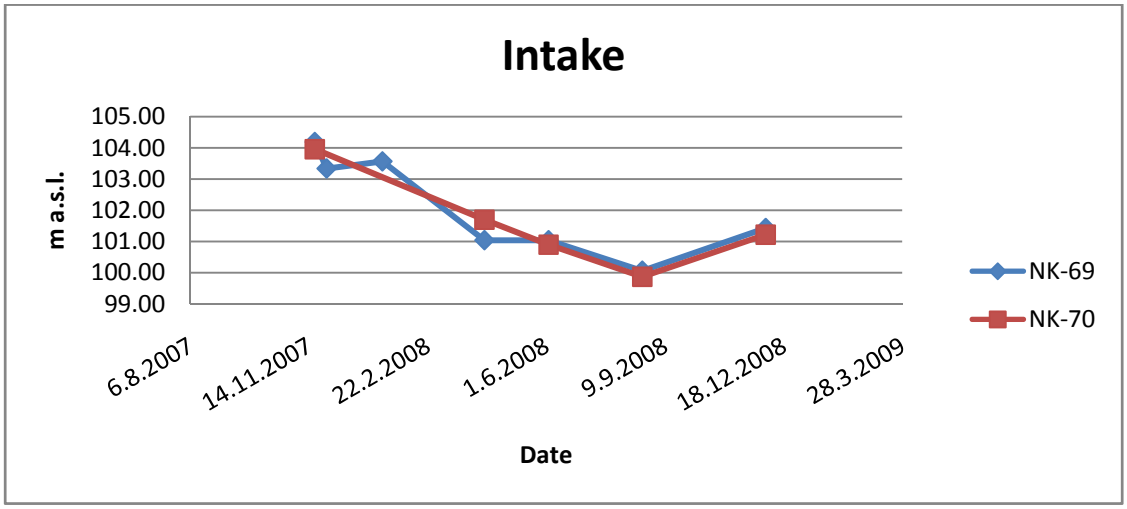
MANNVIT ENGINEERING

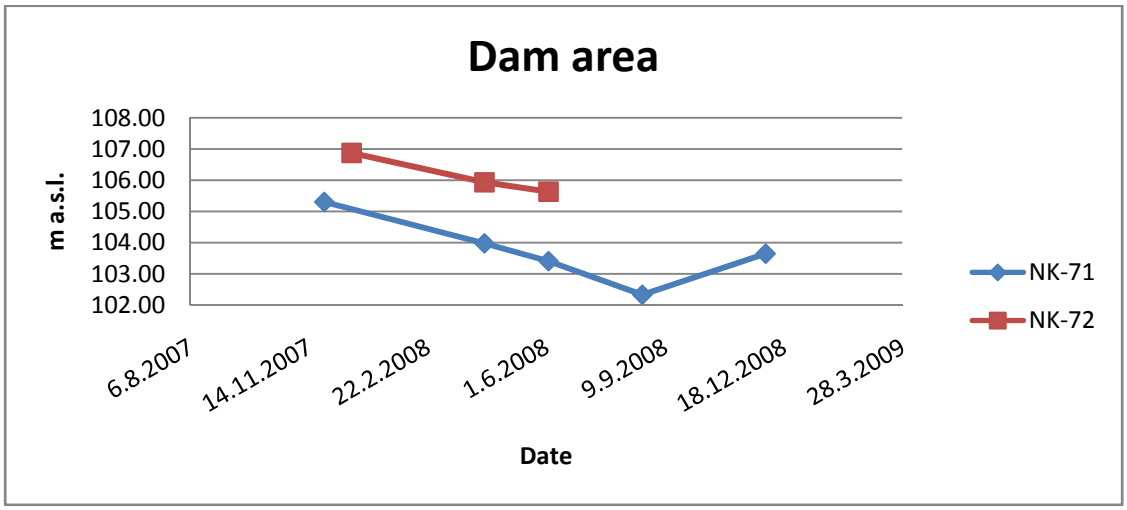
Hvammsvirkjun: Groundwater measurement.

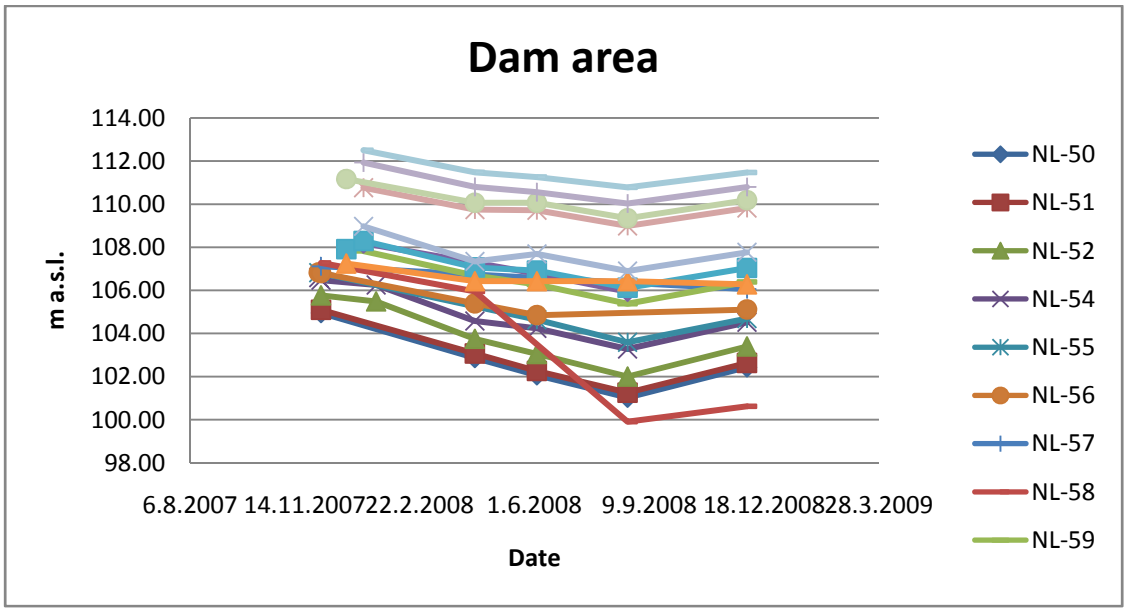







Intake
105.00
104.00
103.00
102.00
101.00
100.00
99.00
m a.s.l.
6.8.2007
14.11.2007
22.2.2008
1.6.2008
9.9.2008
18.12.2008
28.3.2009
Date
NK-69
NK-70


Dam area
108.00
107.00
106.00
105.00
104.00
103.00
102.00
m a.s.l.
6.8.2007
14.11.2007
22.2.2008
1.6.2008
9.9.2008
18.12.2008
28.3.2009
Date
NK-71
NK-72


Dam area
114.00
112.00
110.00
108.00
106.00
104.00
102.00
100.00
98.00
m a.s.l.
6.8.2007
14.11.2007
22.2.2008
1.6.2008
9.9.2008
18.12.2008
28.3.2009
Date
NL-50
NL-51
NL-52
NL-54
NL-55
NL-56
NL-57
NL-58
NL-59

Appendix J

Photos of SPT samples from NL99, NL-100 and NL101

Particle Size Distribution, of nine SPT samples from NL99, NL100 and NL101

Logs of percussion drill holes NL68, NL99, NL100 and NL101

NL-99 BOREHOLE SPT SAMPLE S1 1,66 m

NL-99 BOREHOLE SPT SAMPLE S2 2,97 m

NL-99 BOREHOLE SPT SAMPLE S3 4,5 m

NL-99 BOREHOLE SPT SAMPLE S4 6,0 m

NL-100 BOREHOLE SPT SAMPLE S1 1,57 m

NL-100 BOREHOLE SPT SAMPLE S2 2,97 m

NL-100 BOREHOLE SPT SAMPLE S3 4,54 m

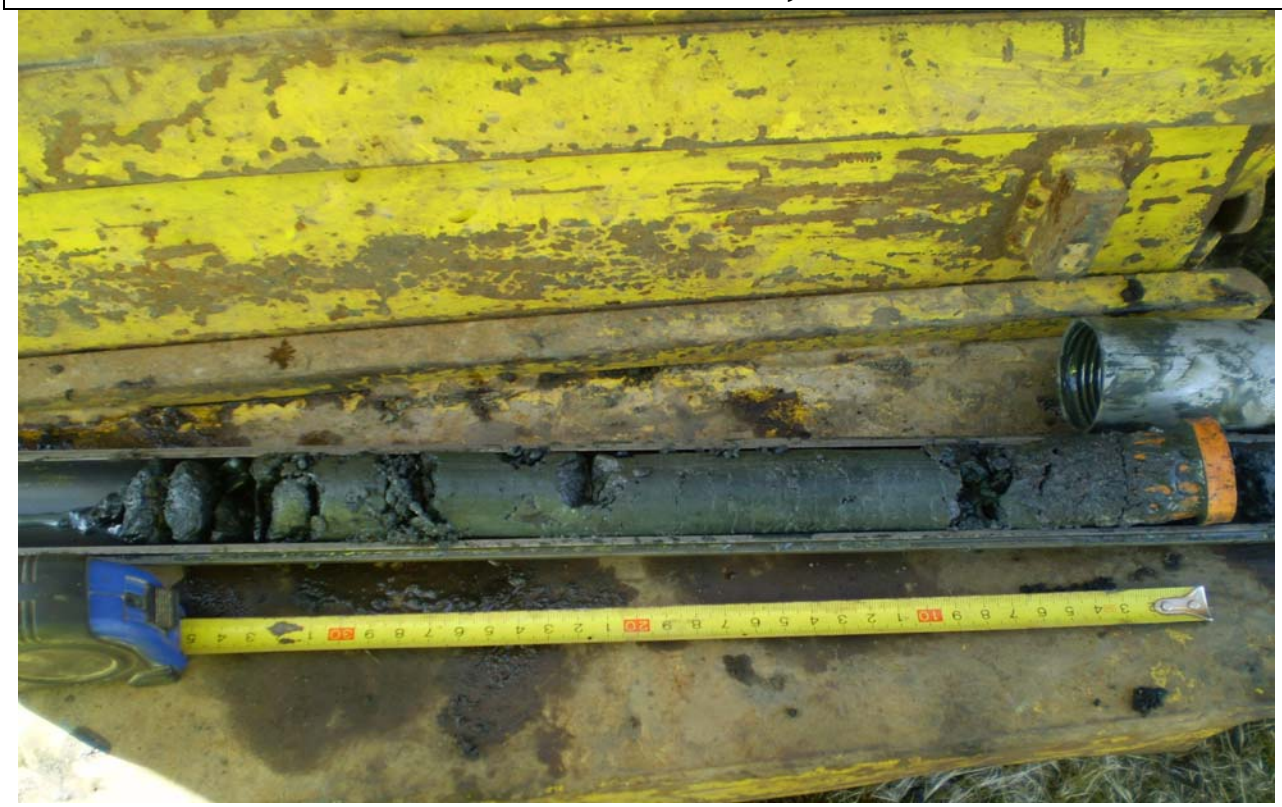
NL-101 BOREHOLE SPT SAMPLE S1 1,48 m

NL-101 BOREHOLE SPT SAMPLE S2 3,2 m

NL-101 BOREHOLE SPT SAMPLE S3 4,65 m

NL-101 BOREHOLE SPT SAMPLE S4 6,09 m

NL-101 BOREHOLE SPT SAMPLE S5 7,48 m



Date:	**27.02.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-99/S1 (ISNET93: X,Y,Z = 444453.23, 394563.01, 114.561) Sample retrieved at elev. 112.5 m

Source: Holt Power Plant, bridge

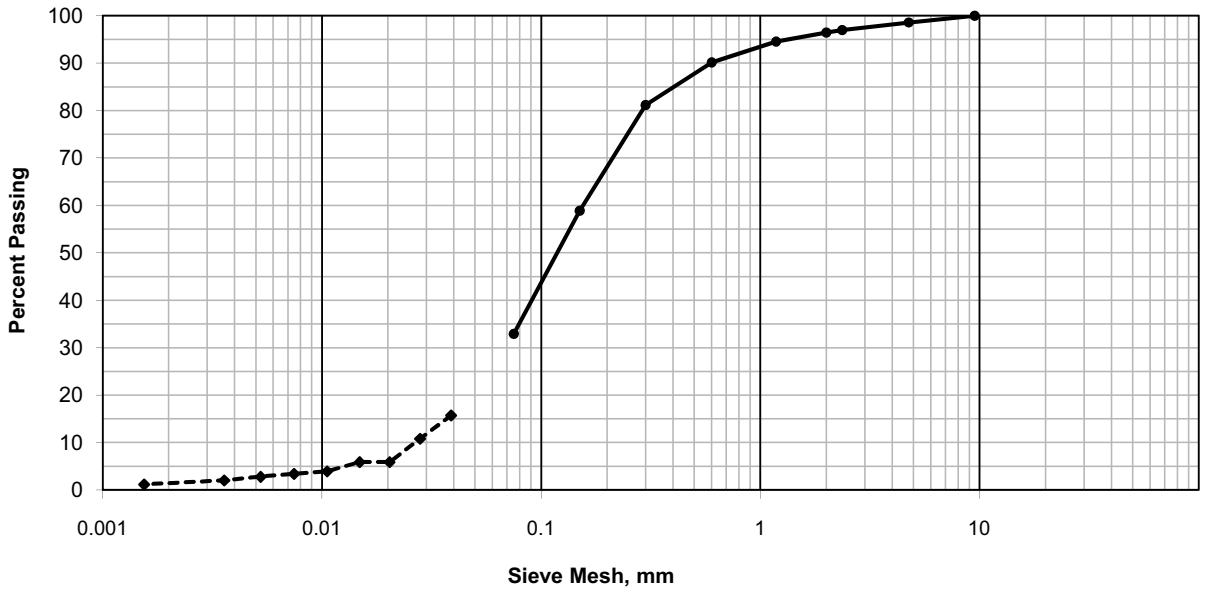
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	69.1 %	2.46

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.002	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5			
Percent Passing	**1.3**	**3.0**	**5.9**	**32.9**	**58.9**	**81.2**	**90.1**	**94.5**	**96.4**	**97.0**	**98.6**	**100.0**			



	mm
D_5	0.013
D_{10}	0.027
D_{15}	0.037

	mm
D_{30}	0.050
D_{50}	0.118
D_{60}	0.155

	mm
D_{85}	0.40
D_{90}	0.59

Cu	5.8
Cc	0.6

Comments: _____

Date:	**27.02.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-99/S3 (ISNET93: X,Y,Z = 444453.23,394563.01,114.561) Sample retrieved at elev. 109.8 m

Source: Holt Power Plant, bridge

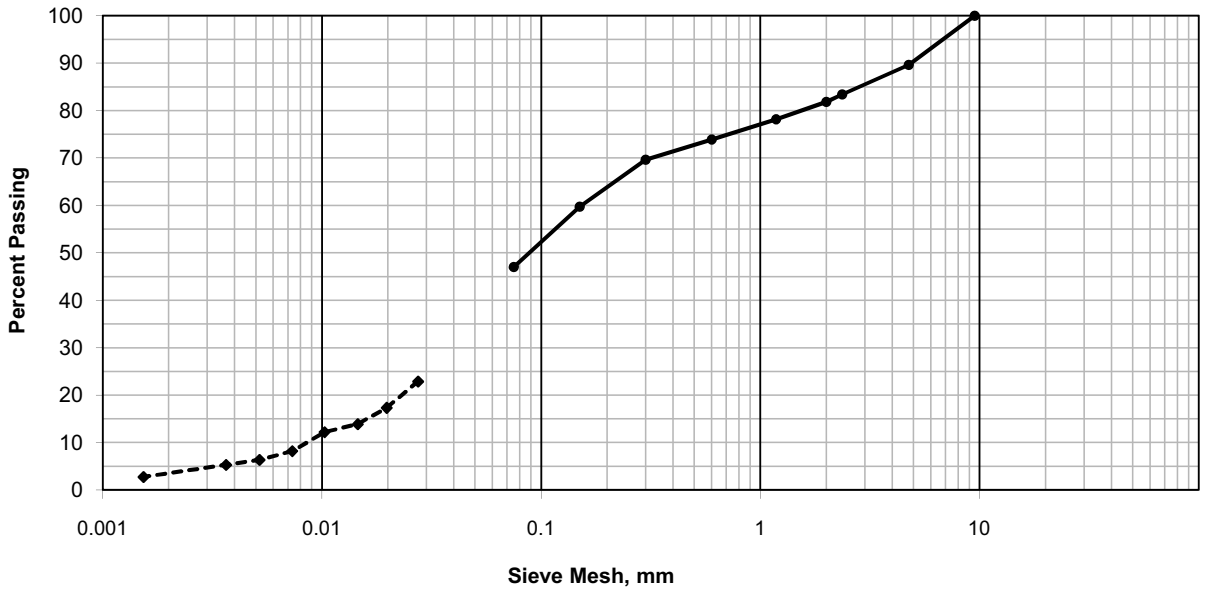
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	190.6 %	2.49

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.002	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5			
Percent Passing	**3.1**	**7.0**	**17.5**	**47.0**	**59.7**	**69.6**	**73.9**	**78.2**	**81.8**	**83.4**	**89.6**	**100.0**			



	mm
D_5	0.003
D_{10}	0.009
D_{15}	0.016

	mm
D_{30}	0.031
D_{50}	0.040
D_{60}	0.153

	mm
D_{85}	2.83
D_{90}	4.87

Cu	17.9
Cc	0.7

Comments: _____

Date:	**27.02.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-99/S4 (ISNET93: X,Y,Z = 444453.23, 394563.01, 114.561) Sample retrieved at elev. 108.5 m

Source: Holt Power Plant, bridge

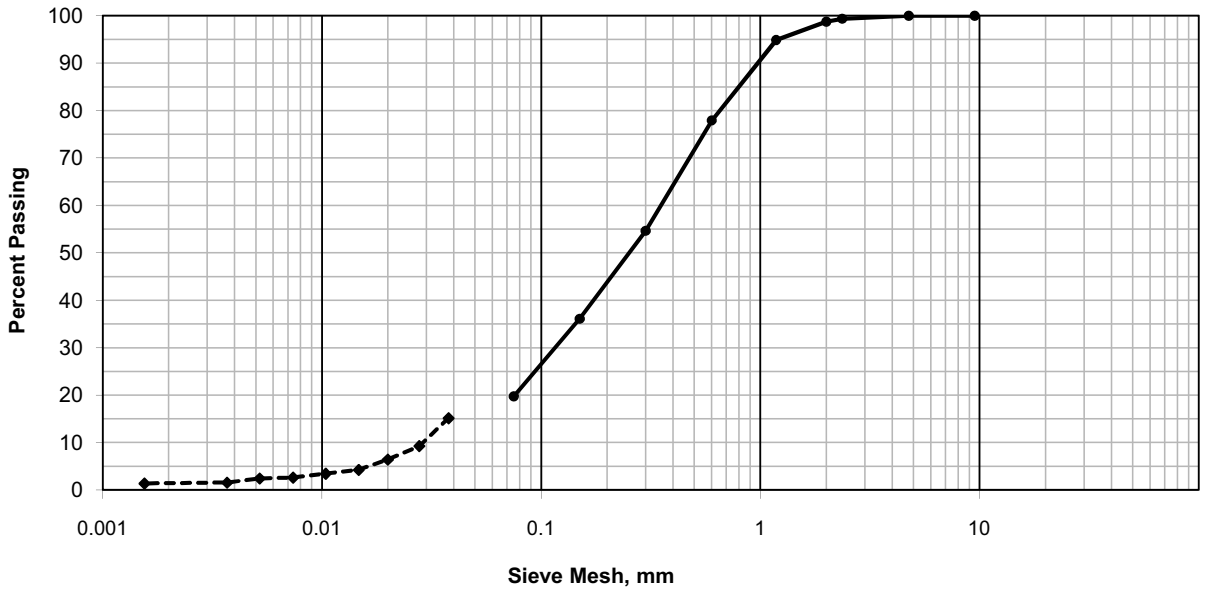
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	41.0 %	2.48

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.002	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5			
Percent Passing	**1.4**	**2.5**	**6.4**	**19.7**	**36.1**	**54.6**	**77.9**	**94.9**	**98.7**	**99.4**	**100.0**	**100.0**			



	mm
D_5	0.016
D_{10}	0.029
D_{15}	0.038

	mm
D_{30}	0.116
D_{50}	0.252
D_{60}	0.352

	mm
D_{85}	0.80
D_{90}	0.97

Cu	12.2
Cc	1.3

Comments: _____

Date:	**02.03.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-100/S1 (ISNET93: X,Y,Z = 444452.42, 394657.12, 118.181) Sample retrieved at elev. 116.5 m

Source: Holt Power Plant, bridge

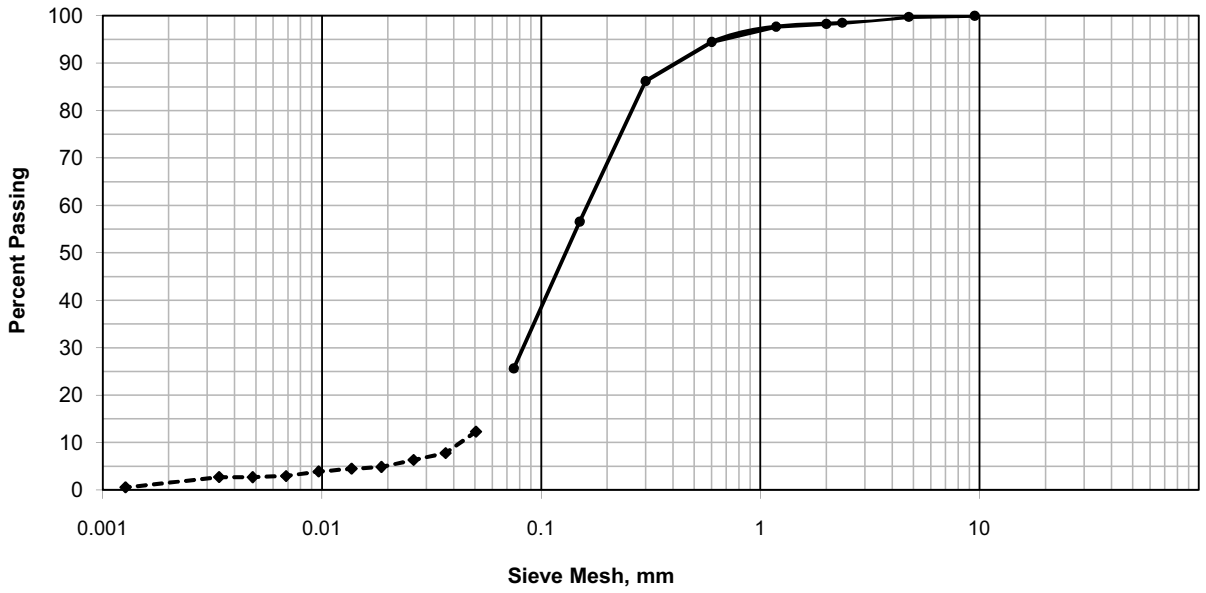
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	57.5 %	2.71

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.002	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5			
Percent Passing	**0.9**	**2.8**	**5.1**	**25.6**	**56.6**	**86.2**	**94.5**	**97.7**	**98.3**	**98.5**	**99.8**	**100.0**			



	mm
D_5	0.019
D_{10}	0.043
D_{15}	0.055

	mm
D_{30}	0.083
D_{50}	0.129
D_{60}	0.162

	mm
D_{85}	0.29
D_{90}	0.41

Cu	3.8
Cc	1.0

Comments: _____

Date:	**02.03.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-100/S2 (ISNET93: X,Y,Z = 444452.42, 394657.12, 118.181) Sample retrieved at elev. 114.5 m

Source: Holt Power Plant, bridge

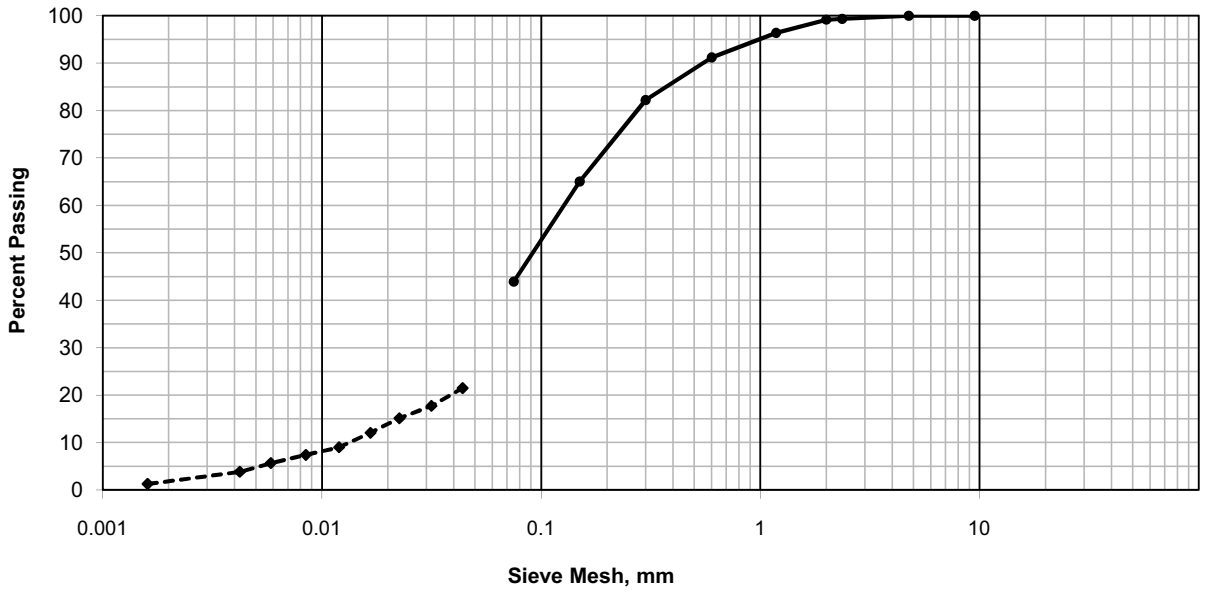
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	99.3 %	2.09

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.002	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5			
Percent Passing	**1.5**	**5.7**	**13.7**	**43.9**	**65.1**	**82.2**	**91.2**	**96.4**	**99.2**	**99.4**	**100.0**	**100.0**			



	mm
D_5	0.005
D_{10}	0.013
D_{15}	0.022

	mm
D_{30}	0.050
D_{50}	0.092
D_{60}	0.127

	mm
D_{85}	0.37
D_{90}	0.55

Cu	9.5
Cc	1.5

Comments: _____

Date:	**02.03.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-100/S3 (ISNET93: X,Y,Z = 444452.42, 394657.12, 118.181) Sample retrieved at elev. 113.3 m

Source: Holt Power Plant, bridge

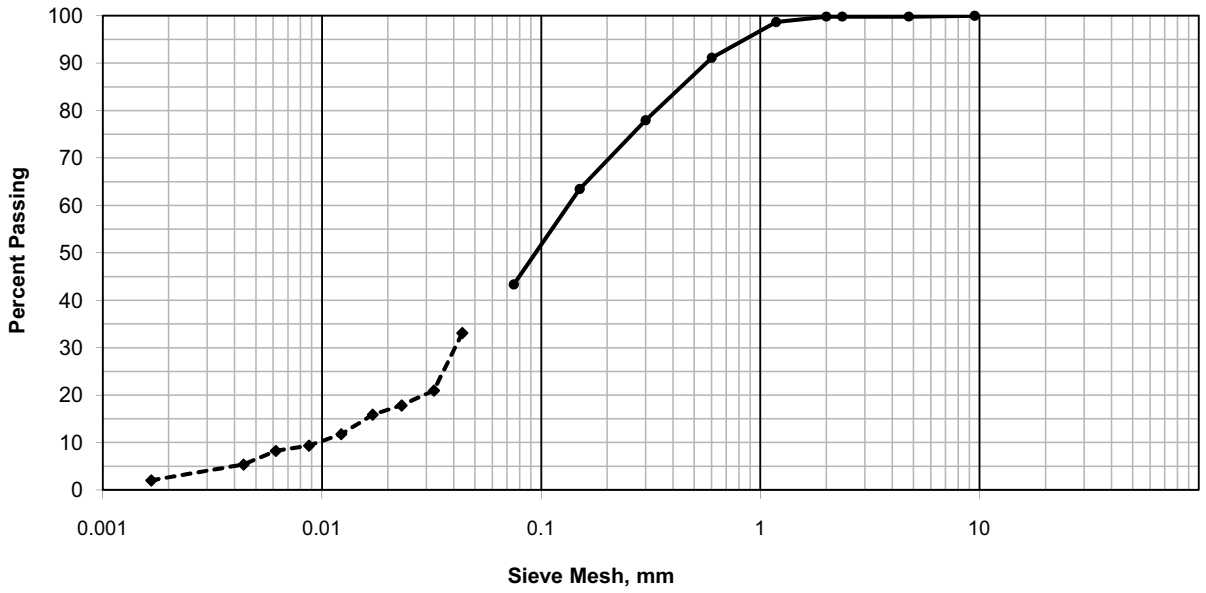
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	150.0 %	2.02

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.002	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5			
Percent Passing	**2.3**	**7.9**	**16.8**	**43.3**	**63.5**	**77.9**	**91.1**	**98.7**	**99.8**	**99.8**	**99.8**	**100.0**			



	mm
D_5	0.004
D_{10}	0.010
D_{15}	0.016

	mm
D_{30}	0.041
D_{50}	0.051
D_{60}	0.133

	mm
D_{85}	0.43
D_{90}	0.57

Cu	13.9
Cc	1.3

Comments: _____

Date:	**03.03.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-101/S1 (ISNET93: X,Y,Z = 444484.85, 394735.82, 117.125) Sample retrieved at elev. 115.3 m

Source: Holt Power Plant, bridge

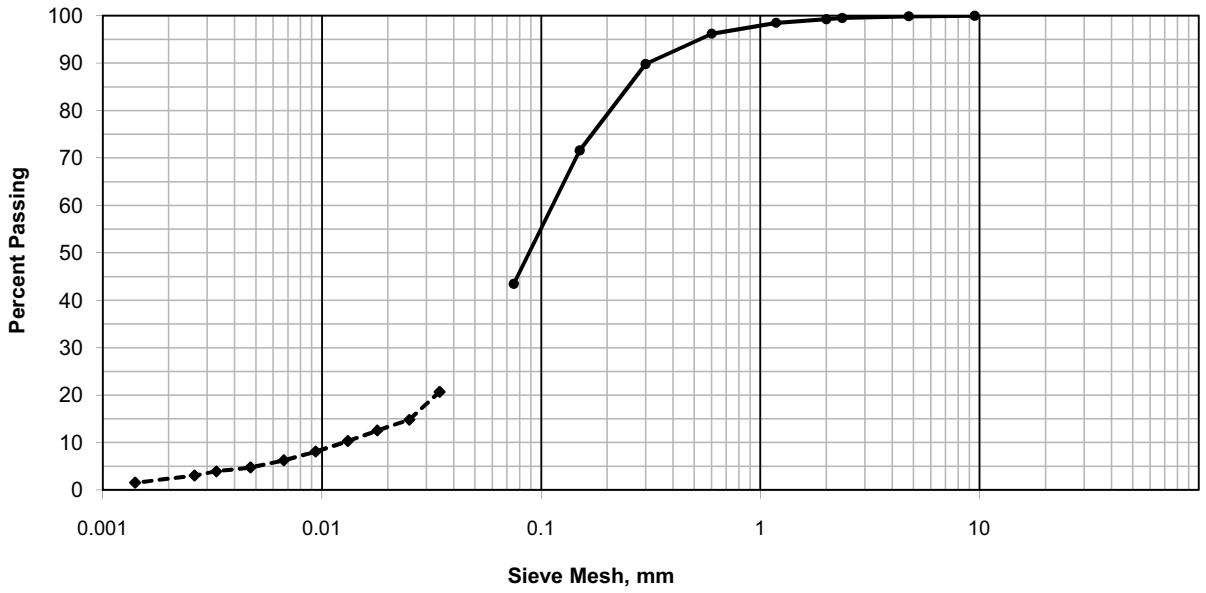
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	120.9 %	2.79

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.002	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5			
Percent Passing	**2.1**	**5.6**	**13.1**	**43.4**	**71.6**	**89.8**	**96.2**	**98.5**	**99.3**	**99.5**	**99.9**	**100.0**			



	mm
D_5	0.005
D_{10}	0.013
D_{15}	0.025

	mm
D_{30}	0.041
D_{50}	0.088
D_{60}	0.113

	mm
D_{85}	0.25
D_{90}	0.31

Cu	9.0
Cc	1.2

Comments: _____

Date:	**03.03.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-101/S3 (ISNET93: X,Y,Z = 444484.85, 394735.82, 117.125) Sample retrieved at elev. 111.8 m

Source: Holt Power Plant, bridge

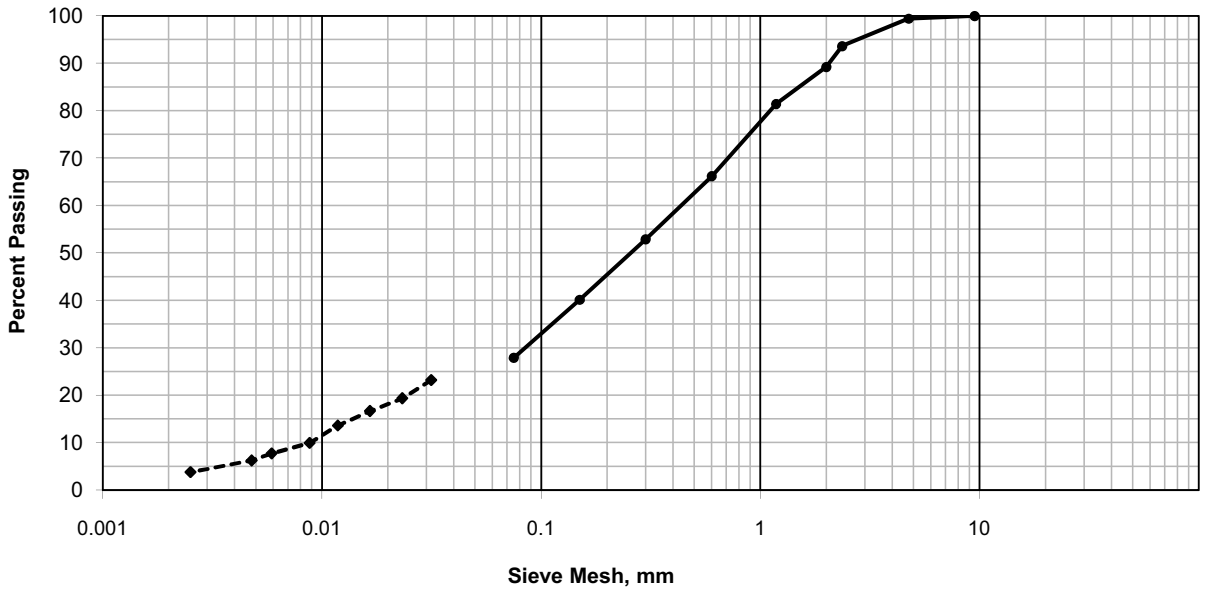
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	214.1 %	1.56

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.003	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5			
Percent Passing	**4.2**	**7.8**	**18.0**	**27.9**	**40.2**	**52.9**	**66.2**	**81.5**	**89.3**	**93.6**	**99.4**	**100.0**			



	mm
D_5	0.004
D_{10}	0.009
D_{15}	0.014

	mm
D_{30}	0.034
D_{50}	0.029
D_{60}	0.074

	mm
D_{85}	1.60
D_{90}	1.72

Cu	8.4
Cc	1.8

Comments: Traces of organics in sample

Date:	**03.03.2009**	**Test Report** **Particle Size Distribution**	MANNVIT ENGINEERING
Job No.:	**7 010 498-01**		
Performed:	**BÓS / SÁ**		

Client: **Foss ráðgjöf ehf.**

Address: Ármúla 4, 108 Reykjavík

Information on Sample:

Job: **Neðri Þjórsá**

Sample No.: NL-101/S5 (ISNET93: X,Y,Z = 444484.85 , 394735.82, 117.125) Sample retrieved at elev. 109.5 m

Source: Holt Power Plant, bridge

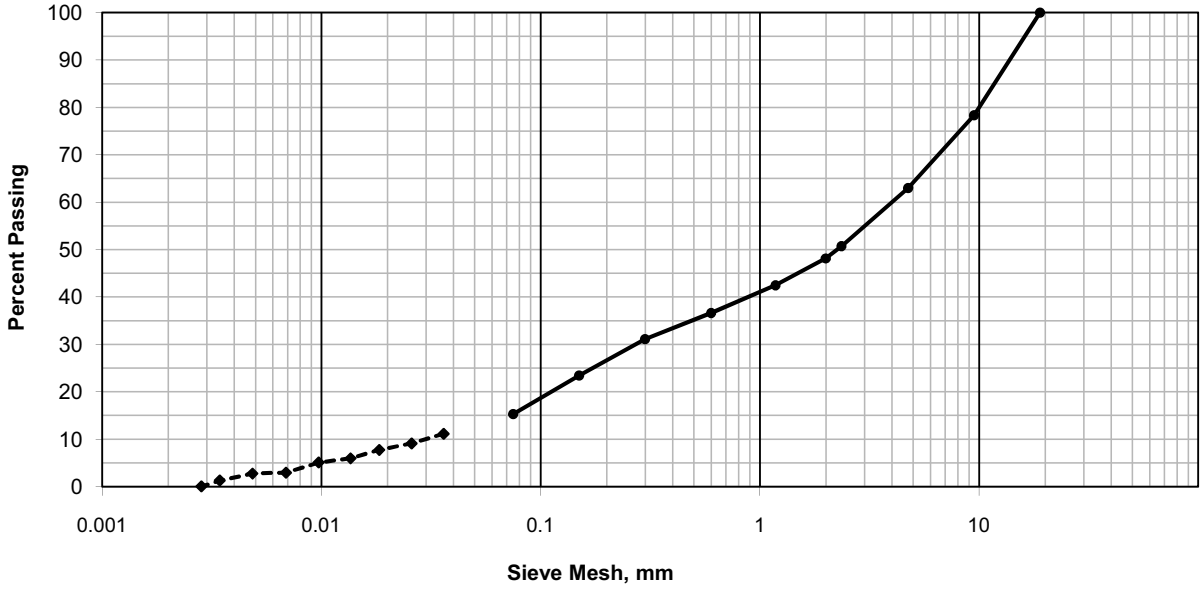
Sampling: Haraldur Hallsteinsson, Mannvit hf.

Sample Properties	Moisture Content ASTM D 2216	Specific Gravity ASTM D 854
Total	27.5 %	2.70

Particle Size Distribution

ASTM D 422, wet sieving and hydrometer

Sieve Mesh (mm)	0.003	0.006	0.02	0.075	0.15	0.300	0.60	1.18	2.00	2.36	4.75	9.5	19.0		
Percent Passing	**0.1**	**2.9**	**8.0**	**15.3**	**23.5**	**31.2**	**36.7**	**42.5**	**48.2**	**50.7**	**63.0**	**78.3**	**100**		



	mm
D_5	0.01
D_{10}	0.03
D_{15}	0.07

	mm
D_{30}	0.27
D_{50}	2.25
D_{60}	4.00

	mm
D_{85}	11.76
D_{90}	13.80

Cu	133.9
Cc	0.6

Comments: _____

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-68

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.01.2008 COMPLETED: 26.01.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Intake	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444882.0 Y: 394326.3 Z: 112.54	DRILLBIT TYPE:	Percussion drilling 3" button bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	SPT
CASING, LENGTH:	37.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	ASTM D1586
DEPTH OF HOLE:	37.39 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
112.0	1.0		Soil						Drilled by Landráður
111.0	2.0								
110.0	3.0								
109.0	4.0		Porphyritic basalt Þjórsá lava						
108.0	5.0								
107.0	6.0								
106.0	7.0								
105.0	8.0								
104.0	9.0								
103.0	10.0								
102.0	11.0								
101.0	12.0								
100.0	13.0								
99.0	14.0								
98.0	15.0								
97.0	16.0								
96.0	17.0								
95.0	18.0								
94.0	19.0								
93.0	20.0								
92.0	21.0								
91.0	22.0								
90.0	23.0								
89.0	24.0								
88.0									

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-68

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
87.0	26.0								
86.0	27.0								
85.0	28.0								
84.0	29.0								
83.0	30.0								
82.0	31.0								
81.0	32.0								
80.0	33.0								
79.0	34.0		Gravel Loose washed gravel with sand, basalt and rhyolit and pumice stones.	☒	NL-68 S1	300	9 - 11 - 31	42	
78.0	35.0			☒	NL-68 S2	280	19 - 55 - 58	R	SPT test stopped after 43 cm
77.0	36.0			⊠	NL-68 S3	40	54		
76.0	37.0			☒	NL-68 S4	240	21 - 37 - 55	92	SPT test stopped after 38.5 cm
75.0	38.0								
74.0	39.0								
73.0	40.0								
72.0	41.0								
71.0	42.0								
70.0	43.0								
69.0	44.0								
68.0	45.0								
67.0	46.0								
66.0	47.0								
65.0	48.0								
64.0	49.0								
63.0	50.0								
62.0	51.0								
61.0	52.0								
60.0	53.0								
59.0	54.0								
58.0									

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-99

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 14.05.2008 COMPLETED: 14.05.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444453.23 Y: 394563.01 Z: 114.561	DRILLBIT TYPE:	Casing shoe with roller-cone bit, 88 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	SPT
CASING, LENGTH:	7.05 m [X] CASING REMOVED	SAMPLING STANDARD:	ASTM D1586
DEPTH OF HOLE:	7.05 m	GROUNDWATER DEPTH:	1.95 m
		GROUNDWATER ELEVATION:	112.61 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
114.0	1.0		Sandy soil with organic remains.						
113.0	2.0		Sandy soil.	X	NL-99 S1	380	1 - 2 - 3	5	GWT3.6.2008
112.0	3.0		Sandy soil with organic remains.	X	NL-99 S2	210	1 - 1 - 0	1	
111.0	4.0								
110.0	5.0		Sandy soil with organic remains. More sandy in the lowest part of the sample.	X	NL-99 S3	570	1 - 1 - 1	2	The sampler penetrates 6 cm before testing.
109.0	6.0		Sand Dark rather fine grained with soil. Sand, fine-medium grained with some soil content.	X	NL-99 S4	220	4 - 3 - 3	6	
108.0	7.0		Porphyritic basalt High resistance, the old bedrock.						
107.0	8.0								
106.0	9.0								
105.0	10.0								
104.0	11.0								
103.0	12.0								
102.0	13.0								
101.0	14.0								
100.0	15.0								
99.0	16.0								
98.0	17.0								
97.0	18.0								
96.0	19.0								
95.0	20.0								
94.0	21.0								
93.0	22.0								
92.0	23.0								
91.0	24.0								
90.0									

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-100

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 14.05.2008 COMPLETED: 14.05.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444452.42 Y: 394657.12 Z: 118.181	DRILLBIT TYPE:	Casing shoe with roller-cone bit, 88 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	SPT
CASING, LENGTH:	5.9 m [X] CASING REMOVED	SAMPLING STANDARD:	ASTM D1586
DEPTH OF HOLE:	5.9 m	GROUNDWATER DEPTH:	2.0 m
		GROUNDWATER ELEVATION:	116.18 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
118.0			Sandy soil with organic remains. Increasing sand in lower part.						
117.0	1.0								
			Sandy soil, grayish brown.	☒	NL-100 S1	400	2 - 1 - 2	3	
116.0	2.0 ▼								GWT3.6.2008
115.0	3.0								The sampler penetrates 40 cm before testing.
			Sandy soil with light brown tephra layer and organic remains. Dark fine grained sand at the sample bottom, probably tephra layer.	☒	NL-100 S2	430	1 - 1 - 2	3	
114.0	4.0								
			Grayish brown silty/sandy soil.	☒	NL-100 S3	700	1 - 0 - 3	3	The sampler penetrates 20 cm before testing.
113.0	5.0								
			Porphyritic basalt The old bedrock.		NL-100 S4	0	50		
112.0	6.0								
111.0	7.0								
110.0	8.0								
109.0	9.0								
108.0	10.0								
107.0	11.0								
106.0	12.0								
105.0	13.0								
104.0	14.0								
103.0	15.0								
102.0	16.0								
101.0	17.0								
100.0	18.0								
99.0	19.0								
98.0	20.0								
97.0	21.0								
96.0	22.0								
95.0	23.0								
94.0	24.0								

MANNVIT ENGINEERING

BOREHOLE LOG

BOREHOLE NO.:

NL-101

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 14.05.2008 COMPLETED: 14.05.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Svanlaugur
STRUCTURE:	Dam area	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 444484.85 Y: 394735.82 Z: 117.125	DRILLBIT TYPE:	Casing shoe with roller-cone bit, 88 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	SPT
CASING, LENGTH:	8.6 m [X] CASING REMOVED	SAMPLING STANDARD:	ASTM D1586
DEPTH OF HOLE:	8.6 m	GROUNDWATER DEPTH:	2.1 m
		GROUNDWATER ELEVATION:	115.03 m a.s.l.

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	RECOVERY (mm)	BLOWS pr. 150 mm	N-VALUE	COMMENTS
117.0			Sandy soil with organic remains.						
116.0	1.0								
115.0	2.0			[X]	NL-101 S1	470	1 - 1 - 0	1	The sampler penetrates 2 cm before testing. GWT3.6.2008
114.0	3.0			[X]	NL-101 S2	330	1 - 0 - 2	2	The sampler penetrates 5 cm before testing.
113.0	4.0								
112.0	5.0			[X]	NL-101 S3	450	1 - 0 - 1	1	The sampler penetrates 33 cm before testing.
111.0	6.0								
110.0	7.0			[X]	NL-101 S4	400	1 - 1 - 4	5	The sampler penetrates 41 cm before testing.
			Scoria with greenish silt and clay fillings. Scoria fragments cemented in greenish silt and clay.	[X]	NL-101 S5	390	18 - 29 - 50	79	
109.0	8.0		Bedrock Porphyritic basalt or scoriaceous basalt.						
108.0	9.0								
107.0	10.0								
106.0	11.0								
105.0	12.0								
104.0	13.0								
103.0	14.0								
102.0	15.0								
101.0	16.0								
100.0	17.0								
99.0	18.0								
98.0	19.0								
97.0	20.0								
96.0	21.0								
95.0	22.0								
94.0	23.0								
93.0	24.0								