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HOLT POWER PLANT

Geological report
Geological investigations 2008

Landsvirkjun

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Co operators:	

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

Keywords: Geology, Holtavirkjun, Holt power plant, Percussion drilling, Coreholes, Corelogs, Permeability test, Þjórsá lava, Þjórsá.

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HOLT POWER PLANT

GEOLOGICAL REPORT
GEOLOGICAL INVESTIGATIONS 2007 & 2008

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1 GEOLOGY OF THE PROJECT AREA

1.1 STRATIGRAPHY OF GEOLOGICAL UNITS

General geology of the project area is described in "Holtavirkjun. Geological Report. Geological Investigations 2001 – 2006".[1] Investigations carried out in 2007 and 2008 do not differ the geological setting nor general stratigraphy of layers as described in previous reports. However more detailed information on the layer thickness, boundaries and tectonics is given. The following geological group units are found within the Holt Power Plant HEP project site.

1.1.1 Skarðsfjall tholeiite group (STG)

The oldest rock in the project area is a series of olivine and tholeiite basalt. Same formation is found in the southern site of Skarðsfjall, see "Hvammur Power Plant Geological Report". These basalt layers are of estimated age over 2.5 million years. Layers of this group are exposed on the bank of Þjórsá river, just downstream of Búði waterfall and in Akbrautarholt[1]. Basalts of the Stóra-Laxá central volcano belong to this group, which are found in the lower parts of the proposed powerhouse site.

1.1.2 Interglacial silt deposits (LTS)

After the volcanic activity of the Stórá-Laxá central volcano ceased, a period of erosion followed with glaciers and rivers scraping the surface. After the glaciers had retreated from the area, Þjórsá formed a river valley through the area. Thick layers of sand, silt and gravel were deposited all over the area on a floodplain extending to the south coast of Iceland.

1.1.3 Akbraut Interglacial Basalt (HIB)

This basalt group is found in Akbrautarholt. Boreholes NK 41 and 42 in the proposed powerhouse area are drilled through this basalt formation. The powerhouse will therefore be excavated into this basalt formation. It is also found in the lower part of core holes NK-38 and NK-40, located in the proposed dam site[1]. The basalt also outcrops at Hestafoss and in Lækjarey.

[1] Almenna Consulting Engineers (2007). Holtavirkjun. Geological Report. Geological Investigations 2001-2006. Prepared for Landsvirkjun. LV-2007/054. December 2007

1.1.4 Hreppar interglacial tholeiite

This formation is found in the area around Flagbjarnarholt and Þingholt east of Þjórsá. It is also found in Lækjarey and was found in core holes NK-77, NK-78 and NK-79 drilled in 2008.

1.1.5 Holosen sediments (UTS and TS)

Beneath the Þjórsá basalt area fluvial and/or glacial-fluvial sediments. These sediments are deposited in an ancient valley or floodplain as described in chapter 1.1.2. These sediments are found in boreholes, NK-36, NK-37, NK-38 and NK-40 in the proposed dam site drilled in 2006 and in holes NK-81 to NK-86 drilled in 2008. In these holes loose sand and gravel is 2-4 m beneath the lava. Underneath are compacted and weakly cemented silt and sand. Thickness of this siltstone/sandstone layer is generally between 10 and 16 m. However, in NK-39 it is only 3 m thick.

1.1.6 Þjórsá lava (THB)

Some 8700 years ago the Þjórsá lava inundated the Þjórsá river floodplain. Þjórsá river was basicly 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 thickness of the lava in the construction area in Árnes, in the dam area northeast of Hestafoss in NL-81 and at Búði in NL-83 is commonly from 10 m to over 20 m. . The top 2-5 m of the lava is often scoriaceous whereas the lower part is a solid crystalline basalt with exceptions where thick scoriaceous zones are through the lava.

1.2 TECTONICS

The project site is an active tectonic area with fractures opened near Akbrautarholt and Árnes in the year 2000 earthquakes[2]. Many faults and fractures have been pointed out in the project site. Some are clearly seen from surface mapping but others presumed based on lineations, springs and anomalies in magnetic surveying.

[2] Maryam et.al. (2007). Holtavirkjun. Preliminary map of fractures in Akbraut in Holt and Laugar in Landsveit.

2 GROUND INVESTIGATIONS 2007 AND 2008

The aim of the investigations for the Holt Power Plant was to gather more detailed information on the layer boundaries within the area. Several holes were drilled to map boundaries of geological units in the dam site areas and in possible rock quarry areas.

A total of 12 core boreholes were drilled (see table 1) and 24 percussion holes (see table 3). Drilling was carried out by the drilling contractor Ræktunarsamband Flóa og Skeiða (RSFS).

2.1 EXPLORATION TRENCHES

To investigate possible existence of tectonic fractures in the powerhouse area an exploration trench was excavated across the powerhouse site in Akbrautarholt from northwest to southeast. Location of the exploration trench in shown in drawing G-2008-002.

The trench was excavated to look for evidence of fractures and faults in the subsurface material on the bedrock surface. In short no evidence was found. Location of the trench is shown in drawing G-2008-002 and section of the trench is shown in drawing G-2008-007.

In late 2007, several pits were excavated at the proposed dam site in order to locate the edge of the Þjórsá lava. Drawing G-2008-002 shows the location of the pits made along with the estimated edge of the Þjórsá lava. Furthermore, Appendix I shows the logs from those pits.

2.2 CORE HOLES

Logs of core holes are presented in Appendix A. The core logs contain outline of lithology, core recovery, fracture intensity, RQD, Q-values for rock units and location of permeability tests. Location of core holes are shown in table 1 and on drawings G-2008-001 and G-2008-002. Tables for rock mass classification (Q-value) are shown in Appendix C. Core photos are shown in Appendix D. One point load test and UCS test was performed on weak sediment below Þjórsá lava in Hole NK-80. Results of those are shown in Appendix E.

Table 1: Location and depth of core holes drilled 2008**.**

Hole nr.	Construction	Coordinates, ISNET93		Elevation m a.s.l.	Depth (m)	Groundwater Depth (m)
		X	Y			
NK-77	Quarry area	435059.91	388590.78	79.71	12.8	1.65
NK-78	Quarry area	434870.45	388958.62	87.21	21.8	3.5
NK-79	Quarry area	434885.98	388656.11	87.45	15.7	1.65
NK-80	Dam area Búði	438003.92	390484.84	72.65	18.7	0.5
NK-81	Dam area Akbraut	434134.01	390952.33	67.04	18.6	4.1
NK-82	Dam area Akbraut	433869.81	391020.91	65.58	24.6	1.78
NK-83	Dam area Búði	437806.28	390582.48	72.80	33.8	
NK-84	Dam area Akbraut	435214.01	390056.91	69.18	21.7	2.46
NK-85	Quarry area	434964.38	389933.46	68.87	9.7	
NK-86	Quarry area	434933.50	390091.36	67.69	9.7	1.16
NK-87	Quarry area	434835.83	389995.35	67.70	9	
NK-88	Quarry area	434867.78	390226.58	68.77	9.8	

Three permeability tests were performed and results are shown in Table 2. Permeability tests are also shown graphically in Appendix B.

Table 2: Permeability tests results, Lugeon units, in core holes

Hole nr.	Depth		Test interval (m)	Permeability (LUGEON)	Rocktype
	From	To (m)			
NK-81	3.4	18.6	15.2	186	Þjórsá lava, sand and siltstone
NK-82	2.2	12.6	10.4	94	Þjórsá lava, sand and siltstone
NK-84	7.7	21.7	14	107	Þjórsá lava and sandstone

2.3 PERCUSSION HOLES

Percussion holes were drilled to determine the thickness of the Þjórsá lava, soil and scoria at the dam area. Four holes were drilled through the Þjórsá lava at the dam site at Búði. Twenty holes were drilled through loose overburden, scoria and through the Þjórsá lava in the dam area in Árnes close to Akbraut. Logs of percussion holes are shown in Appendix F.

Table 3: Location and depth of percussion holes drilled 2008.

Hole nr.	Construction	Coordination ISNET		Elevation m a.s.l.	Depth (m)	Groundwater Depth (m)	Casing (m)
		X	Y				
NL-69	Dam area Búði	437744.13	390430.13	72.40	9.0	0.99	3
NL-70	Dam area Búði	437843.12	390558.78	72.61	12.0	1.10	3
NL-71	Dam area Búði	437662.18	390267.31	72.00	8.0	2.22	3
NL-72	Dam area Búði	437637.39	390286.96	72.64	6.0	1.97	3
NL-73	Dam area Akbraut	435547.61	389930.09	72.94	17.0	7.69	5.5
NL-74	Dam area Akbraut	435469.06	389932.65	70.45	14.7	5.26	2.3
NL-75	Dam area Akbraut	435373.71	389955.36	70.16	6.0		0
NL-76	Dam area Akbraut	435289.60	389993.62	70.87	14.7	4.95	3
NL-77	Dam area Akbraut	435134.53	390117.99	72.00	15.0	7.35	6
NL-78	Dam area Akbraut	435442.97	390037.68	69.96	9.0	4.82	0
NL-79	Dam area Akbraut	435305.51	390070.92	70.15	15.0	5.17	3
NL-80	Dam area Akbraut	435062.27	390178.49	72.40	21.0	7.76	6
NL-81	Dam area Akbraut	434987.48	390246.31	71.42	21.0	6.07	3
NL-82	Dam area Akbraut	434904.88	390310.09	70.46	12.0	5.86	5
NL-83	Dam area Akbraut	434752.42	390443.11	71.14	18.0	6.98	6
NL-84	Dam area Akbraut	434673.78	390505.91	70.38	18.0	6.62	6
NL-85	Dam area Akbraut	434601.05	390568.93	71.24	18.0	7.74	6
NL-86	Dam area Akbraut	434526.80	390630.88	70.89	15.0	7.48	6
NL-87	Dam area Akbraut	434369.88	390760.10	70.86	18.0	7.85	6
NL-88	Dam area Akbraut	434297.09	390829.60	67.91	17.6	4.80	0
NL-89	Dam area Akbraut	434219.06	390891.05	68.17	21.0	5.24	3
NL-90	Dam area Akbraut	434054.78	390988.41	67.49	18.0	4.71	3
NL-91	Dam area Akbraut	433966.20	391010.25	65.98	12.0	3.18	3
NL-92	Dam area Akbraut	433766.04	391004.48	65.57	17.0	2.97	3

2.4 TEMPERATURE MEASUREMENTS

Temperature and conductivity was measured in seven drill holes in the proposed Akbraut dam site area close to Hestafoss; core hole NK-84 and in six percussion holes NL-73, NL-74, NL-76, NL-77, NL-78 and NL-79. Results are shown in Appendix G.

2.5 GROUNDWATER MEASUREMENTS

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

Table 4. Groundwater measurements in percussion holes

Hole nr.	NL-69		NL-70		NL-71		NL-72		NL-73		NL-74	
	Depth	m	Depth	m	Depth	m	Depth	m	Depth	m	Depth	m
Date:	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.
4.4.2008	0.99	71.64	1.1	71.77	2.22	69.9	1.97	71.06	7.66	65.4	5.22	65.34
6.4.2008									7.69	65.37	5.26	65.3
7.4.2008									7.77	65.29	5.26	65.3
4.6.2008									7.93	65.13	5.45	65.11
20.8.2008									Collapse at 8,2 m		5.65	64.91

Hole nr.	NL-75		NL-76		NL-77		NL-78		NL-79		NL-80	
	Depth	m	Depth	m	Depth	m	Depth	m	Depth	m	Depth	m
Date:	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.
4.4.2008	Collapsed		4.84	66.37	7.3	65.05	4.75	65.35	5.1	65.35	7.7	64.89
6.4.2008	Collapsed		4.95	66.26	7.35	65	4.82	65.28	5.17	65.28	7.76	64.83
7.4.2008	Collapsed		5	66.21	7.37	64.98	4.85	65.25	5.2	65.25		
4.6.2008	Collapsed		5.3	65.91	7.55	64.8	5.03	65.07	5.35	65.07	7.9	64.69
20.8.2008			5.47	65.74	7.8	64.55	5.25	64.85	5.6	64.85	8.15	64.44

Hole nr.	NL-81		NL-82		NL-83		NL-84		NL-85		NL-86	
	Depth	m	Depth	m	Depth	m	Depth	m	Depth	m	Depth	m
Date:	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.
4.4.2008	6.09	65.53	5.82	64.64	6.95	64.32						
6.4.2008	6.07	65.55	5.86	64.6	6.98	64.29	6.62	64	7.74	63.75	7.48	63.65
4.6.2008	5.94	65.68	5.95	64.51	7.08	64.19	6.73	63.89	7.85	63.64	7.63	63.5
20.8.2008	6.25	65.37	6.2	64.26	8.29	62.98	6.95	63.67	8.05	63.44	7.85	63.28

Hole nr.	NL-87		NL-88		NL-89		NL-90		NL-91		NL-92	
	Depth	m	Depth	m	Depth	m	Depth	m	Depth	m	Depth	m
Date:	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.	m	a.s.l.
6.4.2008	7.85	63.16										
8.4.2008			4.8	63.11	5.24	63.12	4.71	63.04	3.18	63.03	2.97	62.61
4.6.2008	8	63.01	Collapse at 4,73		5.37	62.99	Collapse at 4,7		3.33	62.88	3.1	62.48
20.8.2008	8.2	62.81			5.6	62.76			3.55	62.29	3.29	62.29

Table 5. Groundwater measurements in core holes

Hole nr.	NK-77		NK-78		NK-79		NK-80	
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.
4.4.2008	1.65	78.06	3.5	83.71	1.65	85.8		
8.4.2008							0.5	72.15
4.6.2008							Collapsed	

Hole nr.	NK-81		NK-82		NK-84		NK-85	
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.
6.4.2008					2.46	67.06		
8.4.2008	4.1	63.17	1.78	64.02				
4.6.2008	4.35	62.92	2.77	63.03	2.75	66.77	Collapsed	
20.8.2008	4.58	62.69	3.08	62.72	2.95	66.57		

Hole nr.	NK-86		NK-87		NK-88		NK-83	
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.
6.4.2008	1.16	66.53					Collapsed	
4.6.2008	1	66.69	0.42	67.28	4.2	64.57		
20.8.2008	1.3	66.39	0.7	67	4.25	64.52		

3 SUMMARY

3.1 BÚÐI DAM SITE

Four percussion holes were drilled with two core holes. Drawing G-2008-001 shows the location of the holes. Generally the loose overburden is 1-3 m thick in the area. The Þjórsá basalt in the dam foundation at Búði is 26 m thick (see NK-83). The thickness of the basalt decreases considerably towards NL-70 where the basalt is 10 m thick and 4 m thick in hole NK-80 at the east bank of Þjórsá. Further south in NL-72 the Þjórsá lava is very thin and in NL-71 where it is just 0,5 m.

The top scoria of the Þjórsá basalt is generally 0,5 to 1 m thick in this area. There is not a sharp boundary between the scoriaceous part and the more solid part of the basalt. Usually the basalt becomes gradually less vesicular/scoriaceous from surface downward.

Underneath the basalt is sand and gravel, ancient floodplain of the Þjórsá river. Thickness of these loose sediments is about 3 m in NK-80 and greater in NK-83. Underneath the loose sediments is a well cemented fine grained sandstone, more than 9 m thick in NK-80.

3.2 ÁRNES DAM SITE

Three core holes and twenty percussion holes were drilled at the proposed dam site, most of them through the Þjórsá lava to find the thickness of scoriaceous and more solid part of the lava.

Thickness of overburden at borehole sites is up to 5 m, which is top soil material, sand and gravel.

The thickness of the Þjórsá lava is generally from 10 m to over 20 m in the dam area. The top 2 - 5 m of the lava is often scoriaceous but the lower part is a solid crystalline basalt with few exceptions were there are thick scoriaceous zones within the more solid sections of the lava. There is no clear boundary between the scoriaceous and more solid lava, rather gradual change from scoria to vesicular and more solid basalt.

Below the Þjórsá lava are loose sediments, sand and gravel, which are up to more than 5 m thick. These loose sediments rest on cemented sediments, siltstone and sandstone; see boreholes NK-81, NK-82 and NK-84.

3.3 QUARRY AREAS

Three core holes were drilled at Lækjarey and four at the area east of Hestafoss. The rock in Lækjarey is not suitable for quarrying slope protection stones or wave protection for the dam. The upper part is cube jointed basalt and in the lower section joint spacing is too narrow for quarrying large stones. See holes NK-77, NK-78 and NK-79 in Appendix A.

The rock at Hestafoss is a larger columnar porphyritic basalt. It is thus considered a suitable source for slope protection material. The suitable rock is limited due to the narrow area alongside the river. In hole NK-85 there is no basalt whereas in NK-86 the basalt is very thin. See Appendix A and D for core logs and core photos. By measuring RQD values, a stone size distribution can be evaluated to estimate what sizes of rocks can likely be obtained from the location in question. For the area at Hestafoss, two methods were used to obtain RQD values for the rock. One was by examining the core logs and the other was by measuring fracture spacing at outcrop near Hestafoss. The measurement was done at two different locations. Fracture spacing at the first location was measured over a length of 9,4 m whereas the second location was about 13,8 m in length. The measurements are marked in figure 1 and table 6 as “Sections at Hestafoss”. Figure 1 and table 6 show the assumed stone size distribution of the rock quarry at Hestafoss.

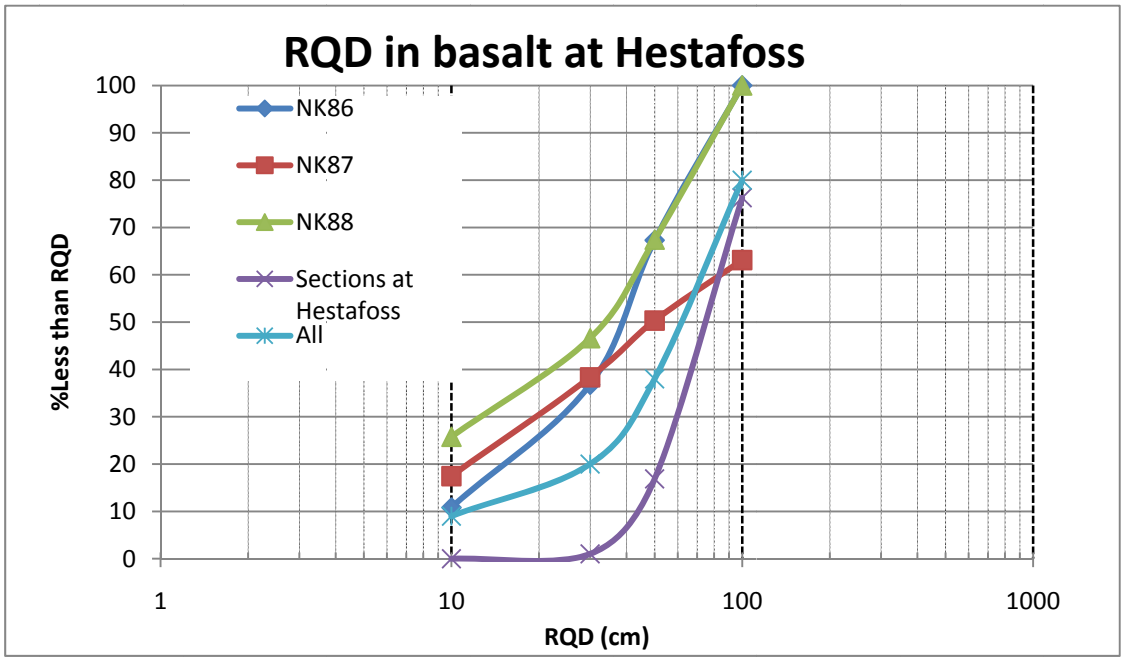

Figure 1. RQD evaluation in core holes and sections at Hestafoss area.

Table 6. RQD values in core holes and sections at Hestafoss area

RQD-Rock size (cm)	10	30	50	100
Holes/location	Percentage passing (%)			
NK86	11	37	67	100
NK87	17	38	50	63
NK88	26	47	67	100
Sections at Hestafoss	0	1	17	76
All	9	20	38	80

REFERENCES

[1] Almenna Consultin Engineers (2007). Holtavirkjun. Geological Report. Geological Investigations 2001-2006. Prepared for Landsvirkjun. LV-2007/054. December 2007

[2] Maryam et. Al. (2007). Holtavirkjun. Preliminary map of fractures in Akbraut in Holt and Laugar in Landsveit.

DRAWINGS:

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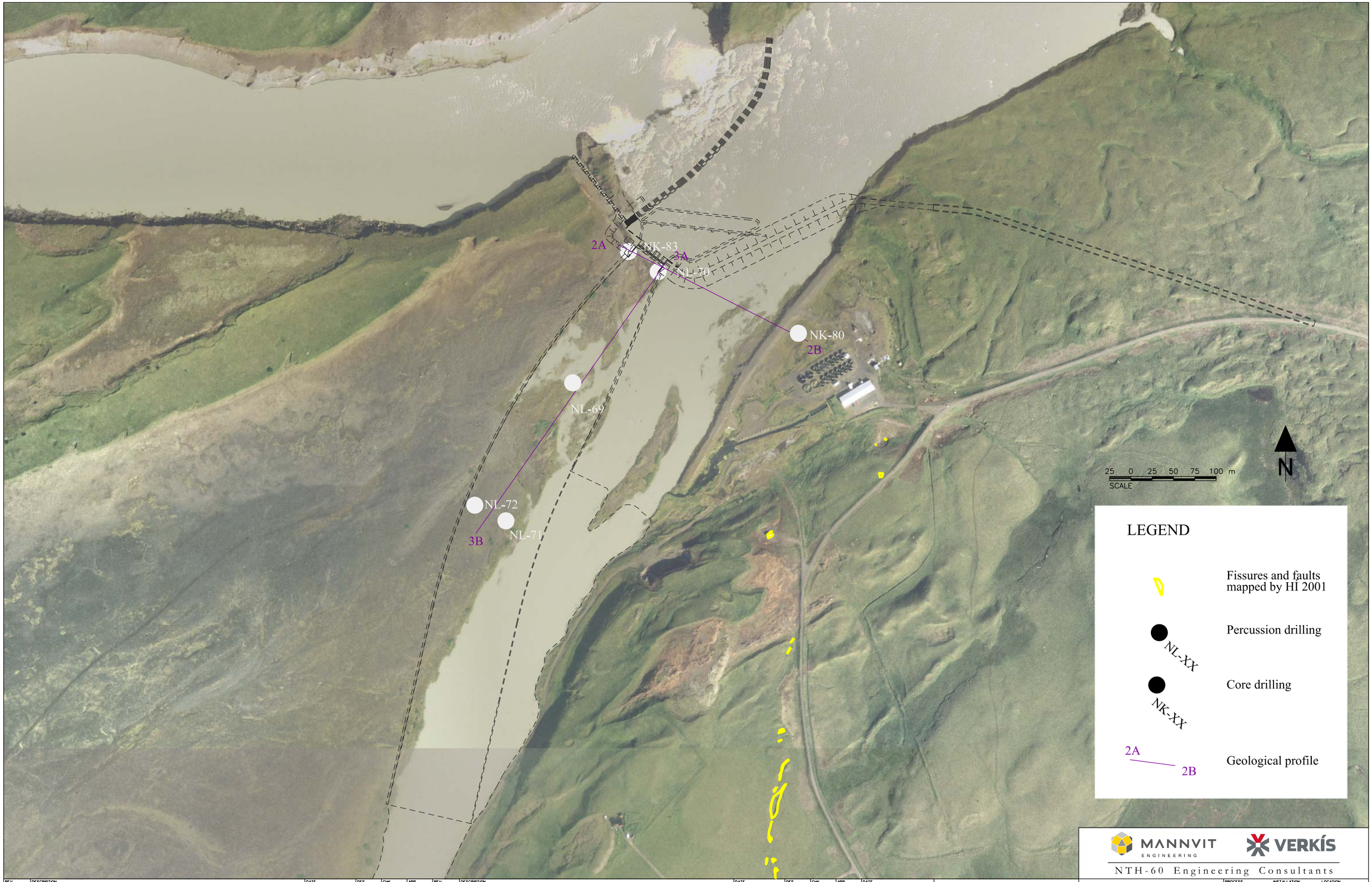
Drawing G-2008-007	Powerhouse area, Exploration trench, Section.



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MANNVIT ENGINEERING
VERKÍS
NTH-60 Engineering Consultants

GEOLOGICAL INVESTIGATION
ÞJÓRSÁ RIVER
DAM AREA AT BÚÐI

MANNVIT

PROCESS	INSTALLATION	LOCATION
-	-	-

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		NTH

NUMBER	REV.	SHEET
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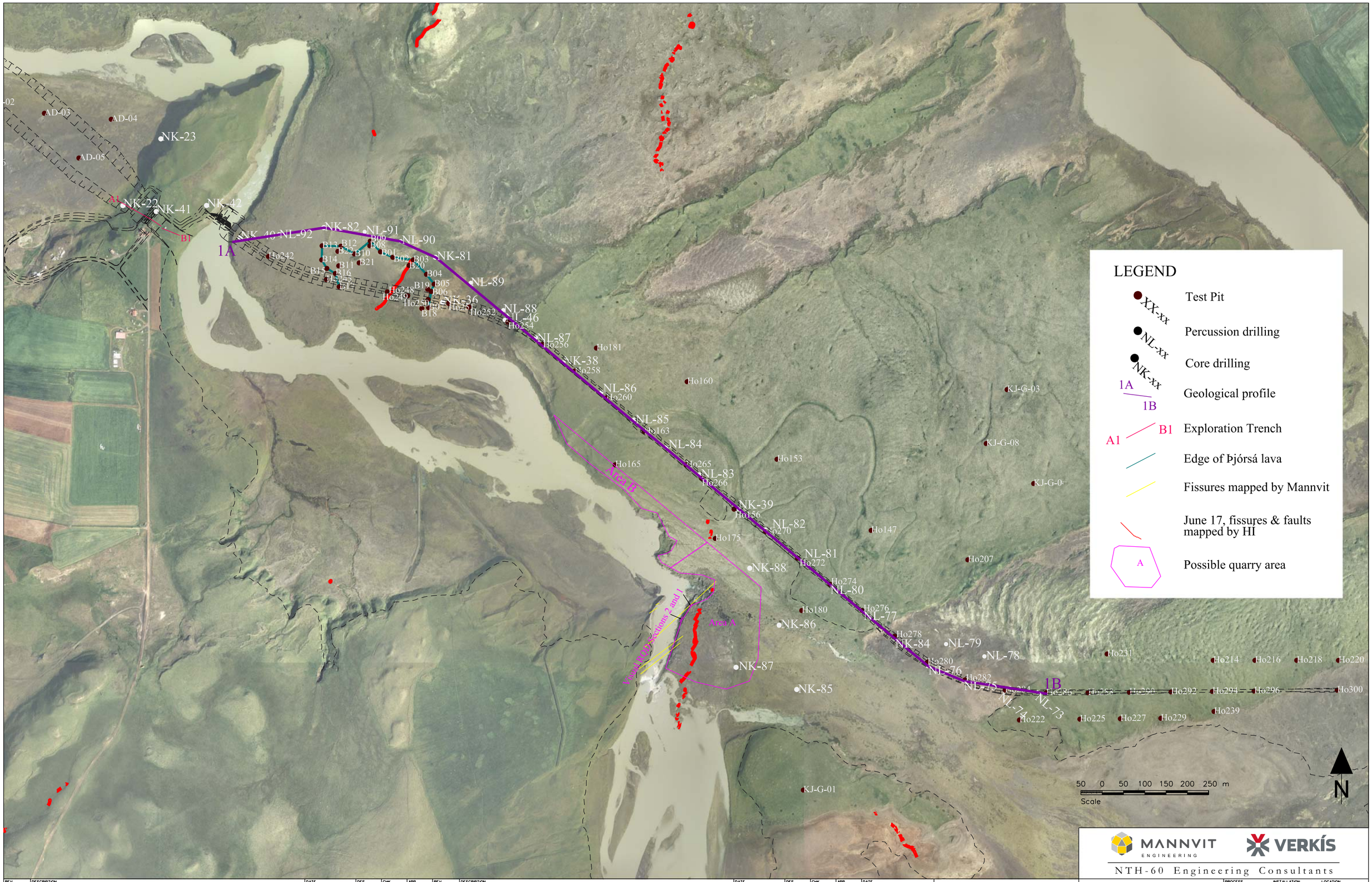

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GEOLOGICAL INVESTIGATION
ÞJÓRSÁ RIVER
DAM AREA AT AKBRAUT

MANNVIT

PROCESS	INSTALLATION	LOCATION
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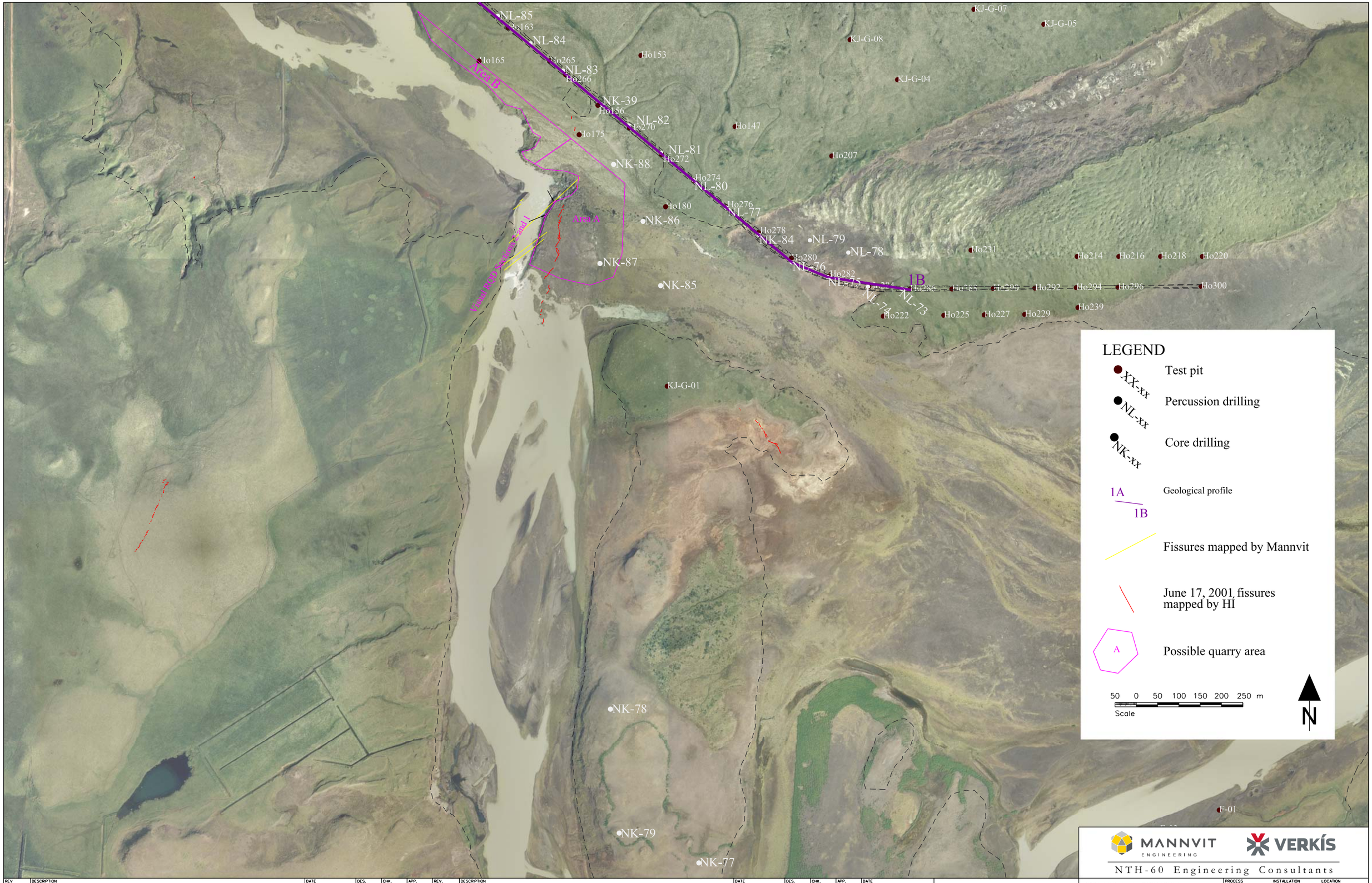

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GEOLOGICAL INVESTIGATION
ÞJÓRSÁ RIVER
QUARRY AREAS

MANNVIT

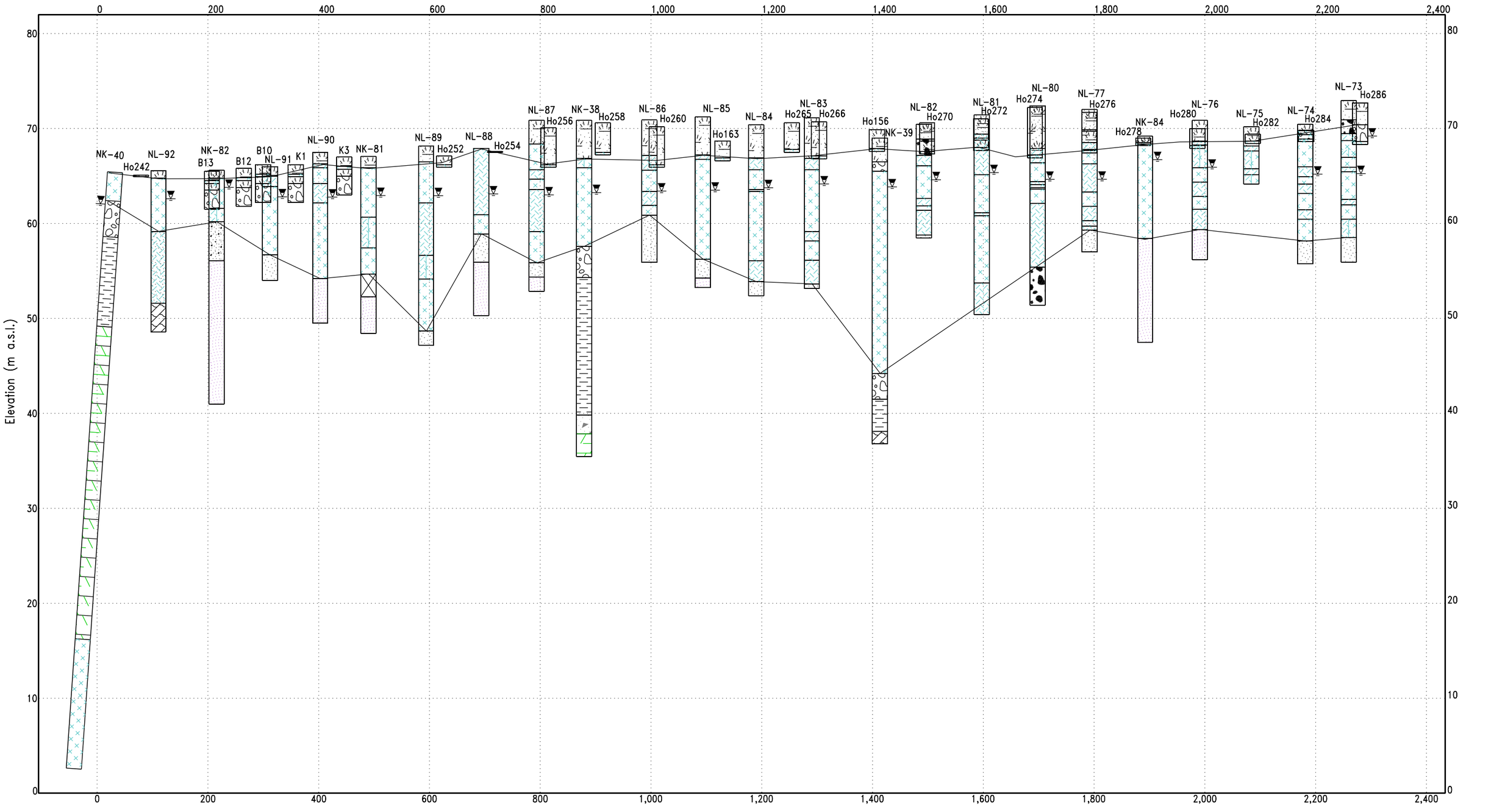
PROCESS	INSTALLATION	LOCATION
-	+	+

NPC NUMBER	NPC REV.	BDL
		NTH

NUMBER	REV.	SHEET
5.481.203 G-2008-003	C1	NEXT SH.

1A

1B



LEGEND

- Topsoil
- Silt
- Core loss
- Scoriaceous Porphyritic Basalt
- Glacial Till
- Sandstone
- Porphyritic Basalt
- Olivine Basalt
- Sand, well graded
- Gravel, poorly graded
- Basaltic Dyke Intrusion
- Scoria-Porphyritic Basalt
- Gravel, well graded
- Sand, poorly graded

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. HOLT POWER PLANT

GEOLOGICAL PROFILE 1
AKBRAUT DAM AREA

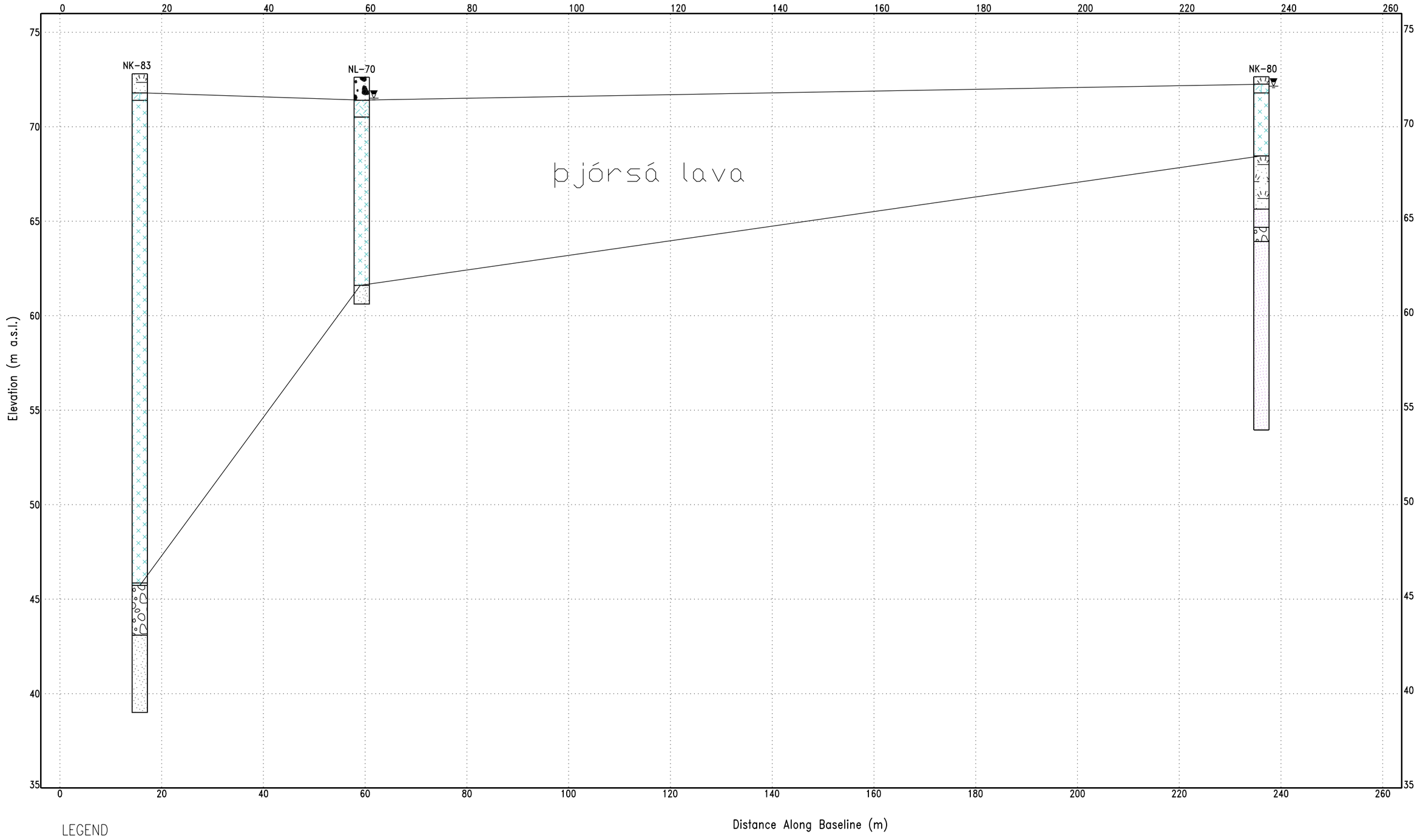
MANNVIT

PROCESS = INSTALLATION + LOCATION +

NPC NUMBER	NPC REV.	BDL
		NTH
NUMBER 5.481.203	REV.	SHEET
G-2008-004	C1	NEXT SH.

2A

2B



LEGEND

- Topsoil
- Gravel, poorly graded
- Scoriaceous porphyritic basalt
- Sand, poorly graded
- Porphyritic basalt
- Gravel, well graded
- Sandstone
- Scoria

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

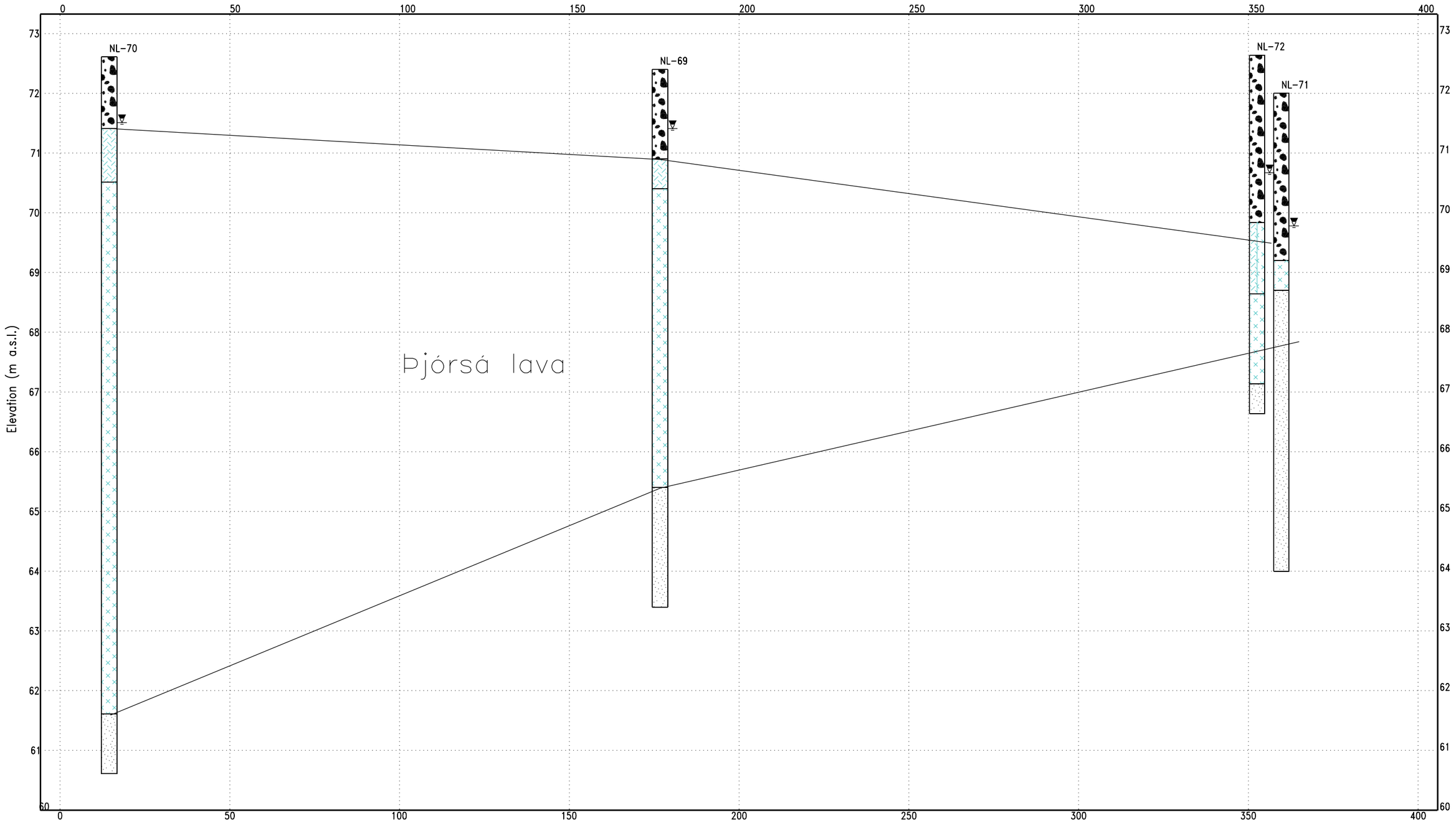
Landsvirkjun
PROJ. HOLT POWER PLANT

GEOLOGICAL PROFILE 2
BÚÐI DAM AREA
MANNVIT

PROCESS = INSTALLATION + LOCATION +
NPC NUMBER
NPC REV.
BDL NTH
NUMBER 5.481.203
G-2008-005
REV. C1
SHEET
NEXT SH.

3A

3B



LEGEND

- Topsoil
- Gravel, poorly graded
- Scoriaceous porphyritic basalt
- Sand, poorly graded
- Porphyritic basalt
- Gravel, well graded
- Sandstone
- Scoria

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

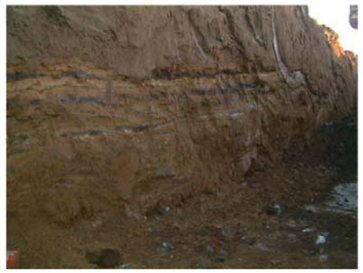
Landsvirkjun

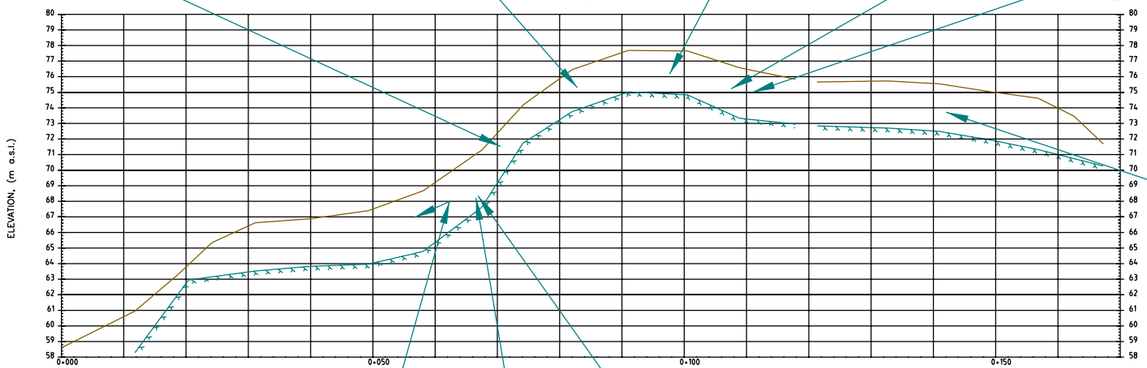
PROJ. HOLT POWER PLANT

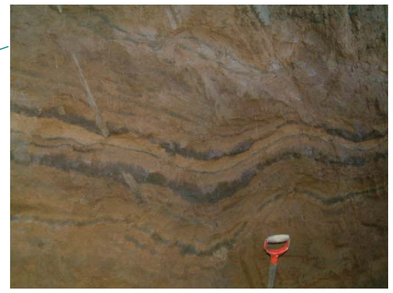
GEOLOGICAL PROFILE 3
BÚÐI AREA

MANNVIT

PROCESS = INSTALLATION + LOCATION +
NPC NUMBER
NPC REV.
BDL NTH
NUMBER 5.481.203
REV.
SHEET
G-2008-006
C1
NEXT SH.







MANNVIT ENGINEERING VERKÍS

NTH-60 Engineering Consultants

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

DATE 19.12.2008
DES. HHA
APP. ML
PAPER SIZE A3

Landsvirkjun

PROJ. HOLT POWER PLANT

GEOLOGICAL INVESTIGATION
þJÓRSÁ RIVER
POWERHOUSE AREA
EXPLORATION TRENCH SECTION

MANNVIT

PROCESS	INSTALLATION	LOCATION
=	+	+
NPC NUMBER	NPC REV.	BDL
		NTH
NUMBER	REV.	SHEET
5.481.203 G-2008-007	C1	NEXT SH.

Appendix A

Core logs of boreholes drilled in 2008 (NK77-NK88)

Appendix B

Permeability Tests

Appendix C

Rock Mass Classification

Appendix D

Photos of cores NK77-NK88

Appendix E

Tests on cores

Appendix F

Logs of percussion bore holes drilled in 2008 (NL69-NL92)

Appendix G

Temperature measurements in boreholes

Appendix H

Groundwater measurements

Appendix I

Logs of excavation pits (B01-B22)

Appendix A

Core logs of boreholes drilled in 2008 (NK77-NK88)

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-77

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 03.04.2008 COMPLETED: 03.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Quarry area Lækjarey	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435059.91 Y: 388590.78 Z: 79.71	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	83 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	12.8 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	78.06 m a.s.l. (4.4.2008)

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
			Gravel Subrounded basalt pebbles 1-4 cm.	21	N/A	0/0/0/0		
78.0	2.0		Sand. Course grained, black and brown sand.	60	N/A	0/0/0/0		GWT4.4.2008 13:38:00
			Gravel. Subrounded basalt pebbles.	13	N/A	0/0/0/0		
76.0	4.0		Tillite Gray colour. Dense, well cemented. 1-20 mm basalt fragments (~3-5%). Joints are rather rough and undulating with ~2 mm gray clay coating. Core splits horazontally during drilling.	92	8	53/32/0/0 53x1-2x1 9-12x3-4x1 Q=1,1-4		
				83	5	0/0/0/0		
74.0	6.0		Tholeiite basalt, vesicular. Fine grained. Gray colour. Vesicles 1-30 mm, empty or partly filled with brown clay. Joints are rather smooth and undulating, coated with <2 mm brown clay. More dense basalt. Gray colour, fine grained and microporous. Joints are rough and undulating with brown oxidation.	100	5	80/51/0/0		
72.0	8.0		Most joints from 6.8-12.8 m are smooth and undulating, some are rough and undulating. Joints are coated with black and/or grayish silt/clay <2 mm.	100	7	56/20/0/0 56x2-3x1 9-12x2-3x1 Q=3-9		
70.0	10.0			100	9	50/0/0/0		K1/K2
68.0	12.0			88	4	65/26/0/0 65x2-3x1 9-12x2-3x1 Q=3,6-11		
66.0								
64.0								
62.0								
60.0								
58.0								
56.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-78

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 02.04.2008 COMPLETED: 02.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Quarry area Lækjarey	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434870.45 Y: 388958.62 Z: 87.21	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	89 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	21.8 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	83.71 m a.s.l. (4.4.2008)

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	23	N/A	0/0/0/0		
			Loose stony and sandy soil.	100	N/A	0/0/0/0		
			(No casing.)	63	9	13/0/0/0		
86.0			Olivine basalt / Cube jointed basalt. Fresh gray, fine grained cube jointed basalt. Microporous.					
	2.0		Highly jointed. Joints are rough and undulating, coated/filled with brown-greenish clay/silt, up to 10 cm thick fillings but most <2 mm.	92	17	33/0/0/0 33x2-3x1 12-15x3x1 Q=1,5-2,8		
84.0			Rapidly cooled basalt.	100		0/0/0/0		GWT4.4.2008 13:33:00
	4.0			100	21	16/0/0/0		
82.0				100	13	39/0/0/0		
	6.0		4 cm thick joint grown together with silt and sand.					
80.0				12	N/A	0/0/0/0		
	8.0			80	N/A	0/0/0/0		
78.0				100	7	48/23/0/0		
	10.0			96	7	37/30/0/0		K1/K2
76.0				0	N/A	0/0/0/0		
	12.0		Tholeiite basalt	90	10	0/0/0/0		
			Dark gray colour. Fine grained. Vesicular (20%) vesicles are 1-15 mm. Some vesicles are filled or partly filled with green clay/silt.	77	3	68/39/0/0 68x2-3x1 9-12x2-3x1 Q=3,8-11		
74.0			Joints are rough and undulating, some have brown clay coating or fillings.	100	4	70/34/0/0		
	14.0		Scattered vesicles. Microporous. Faint flow banding.					
72.0			Joints are rather smooth and undulating but some are planar. Thin brownish and greenish clay coating.					
	16.0		Black sand.	100	N/A	0/0/0/0		
			Possibly a joint filling.	100	7	67/0/0/0 67x2-3x1 9-12x2-3x1 Q=3,7-11		
70.0			Tholeiite cont.					
	18.0			100	5	38/0/0/0		
68.0				96	5	78/38/25/0		
	20.0							
66.0								
64.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-79

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 02.04.2008 COMPLETED: 02.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Quarry area Lækjarey	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434885.98 Y: 388656.11 Z: 87.45	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	81 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	15.7 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	85.80 m a.s.l. (4.4.2008)

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
86.0	2.0		Olivine basalt / Cube jointed basalt (no casing). Fresh gray, fine grained. Higly jointed, joints rough and undulating. Most are coated with pale brown or white stainings or thin clay/silt. Some joints are coated with thin dark gray coatings 1-2 mm.	95	18	0/0/0/0		
				45	N/A	0/0/0/0		
				100	16	21/0/0/0 21x2-3x1 12-15x2-3x1 Q=0,9-2,7		GWT4.4.2008 13:36:00
84.0	4.0			92	16	6/0/0/0		
82.0	6.0			50	10	0/0/0/0		
			Crushed core	86	N/A	0/0/0/0		
80.0	8.0			97	11	0/0/0/0 10x2-3x1 12-15x2-3x1 Q=0,4-1,3		
			8.05 - 8.25 partly healed fractured core with white veins. 8.25 - 8.35 pillow breccia with 10 cm thick sandy/silt filling.	57	6	33/0/0/0 33x2-3x1 12-15x2-3x1 Q=1,4-4,1		
78.0	10.0			76	10	19/0/0/0		K1/K2
			10.3 Joint with 1 cm thick black clay filling.					
76.0	12.0		Tholeiite basalt Gray colour, fine grained and microporous. Vesicles ~10-15% (1-20 mm) empty or partly filled with brown clay. Joints are rough and undulating coated with brown clay.	100	11	0/0/0/0		
				59	3	43/33/0/0 43x2-3x1 9-12x2-3x1 Q=2,4-7		
74.0	14.0		More dense basalt, scattered vesicles. Microporous. Joints are rough and undulating, some with brown stains or brown clay/silt fillings <2 mm.	100	5	87/47/0/0 87x2-3x1 9-12x2-3x1 Q=5-14		
72.0								
70.0								
68.0								
66.0								
64.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-80

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 26.03.2008 COMPLETED: 26.03.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Dam area Búði	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 438003.92 Y: 390484.84 Z: 72.65	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	79 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	18.7 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	72.15 m a.s.l. (8.4.2008)

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
72.0			Topsoil and gravel	0	N/A	0/0/0/0		
			No casing.	65	N/A	0/0/0/0		
			Scoriaceous basalt Þjórsá lava. Fragments of vesicular basalt and scoria. 10% empty vesicles. 3% plagioclase phenocrysts.	100	2	99/77/61/0 99x2-3x1 9-12x1-2x1 Q=8-33		
70.0	2.0		Porphyritic basalt Þjórsá lava Fresh gray colour, massive, microporous. Scattered vesicles. Joints are rough and undulating, empty or coated with light brown clay.	74	6	57/0/0/0		
	4.0		Vesicular, 10% empty vesicles in the lowest part of lava.	91	9	43/0/0/0		
68.0				100	N/A	0/0/0/0		
			Soil/Sand Remains of brown and sandy soil. Almost complete core loss.	0	N/A	0/0/0/0		
	6.0							
66.0								
			Sandstone Brown. Medium grained. Stratified, breaks horizontally during drilling.	92	22	0/0/0/0 10x1-2x1 9-12x2-3x1 Q=0,3-0,8		
	8.0		Gravel Porous subrounded basalt pebbles.	71	0	0/0/0/0		
64.0				85	N/A	0/0/0/0		
			Sandstone. Gray colour, fine grained. Horizontally and some inclined joints. Empty planar and smooth joints. Poorly graded sandstone, well cemented.	100	27	0/0/0/0		
				83		0/0/0/0		
	10.0			100	0	73/42/0/0 73x1-2x1 12x2-3x1 Q=0,3-0,8		
62.0								
	12.0			100	11	43/0/0/0		K1/K2
60.0				100	7	79/52/36/36 79x1-2x1 12x2-3x1 Q=2,2-6,6		
	14.0		0,3 m light gray basalt boulder.					
58.0			Joints, brown alteration 10-15 mm in jointwalls. Healed white vein ~1,5 cm brown alteration.					
	16.0			97	0	48/33/23/0 48x1-2x1 12x2-3x1 Q=1,3-4		
56.0			Core breaks horizontally during drilling.					
	18.0							
54.0								
52.0								
50.0								
48.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-81

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 08.04.2008 COMPLETED: 08.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434134.01 Y: 390952.33 Z: 67.04	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	70 %
CASING LENGTH:	2.2 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	67.27 m a.s.l.
DEPTH OF HOLE:	18.6 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	62.94 m a.s.l. (8.4.2008)

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
66.0			Topsoil Aeolian sand with stones.	0	N/A	0/0/0/0		
	2.0		Porphyritic basalt Þjórsá lava ~10% vesicles, empty or coated with brown clay. 5% plagioclase phenocrysts, scattered olivine phenocrysts.	100	N/A	64/31/0/0 64x2-3x1 9-12x1-2x1 Q=5-21		
64.0			Fresh gray, fine grained, scattered vesicles. Microporous. Joints, rough and undulating, coated with brown clay or oxidation.	95	4	85/48/25/0		
	4.0							GWT8.4.2008 13:08:00 GWT4.6.2008
62.0								
	6.0		Scoriaceous basalt zone 15-20% vesicles.	64	6	29/0/0/0 29x2-3x1 9-12x1-2x1 2,4-10		
60.0				84	5	75/41/0/0		
	8.0							
58.0								
	10.0		Porphyritic basalt Same as above. ~10% vesicles.	85	9	24/0/0/0		
56.0				100	10	50/0/0/0	186	
	12.0							
			Core loss Probably loose sediment, sand.	0	N/A	0/0/0/0		K1/K2
54.0				0	N/A	0/0/0/0		
	14.0							
52.0			Sandstone, silty Grayish brown, fine grained silty sandstone. Vertical joints at top but mostly well cemented with crushed zones. Joints rough and undulating, some smooth and planar, empty.	100	14	0/0/0/0		
	16.0			53	5	34/0/0/0 34x2-3x1 9-12x1-2x1 0,9-2,8		
50.0								
	18.0							
48.0								
46.0								
44.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-82

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 07.04.2008 COMPLETED: 07.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 433869.81 Y: 391020.91 Z: 65.58	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	59 %
CASING LENGTH:	1.7 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	65.80 m a.s.l.
DEPTH OF HOLE:	24.6 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	63.80 m a.s.l. (8.4.2008)

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 Aeolian sand with stones.	0	N/A	0/0/0/0		
64.0	2.0		Porphyritic basalt Þjórsá lava 5-20% vesicles, increasing downwards, gray, fine grained, microporous basalt. Joints rough and undulating, coated with yellowish brown soft clay. 5% plagioclase phenocrysts, scattered olivine phenocrysts.	86	3	75/61/37/0 75x2-3x1 9-12x1-2x1 Q=6-25		GWT8.4.2008 10:31:00 GWT4.6.2008
62.0	4.0		Scoriaceous basalt Vesicular, vesicles empty.	98	3	87/78/57/0		
60.0	6.0		Sand Red, grayish brown. Coarse grained, well graded. Very high core loss.	0	N/A	0/0/0/0		
58.0	8.0			4	N/A	0/0/0/0	94	
56.0	10.0		Sandstone, silty Some rounded basalt pebbles at top. Horizontally stratified, breaks and erodes during drilling.	100 33	0 5	100/0/0/0 100x1-2x1 12x2-3x1 Q=2,8-8 11/0/0/0		
54.0	12.0			13	N/A	0/0/0/0		
52.0	14.0							
50.0	16.0		Breaks horizontally, planar and smooth, empty joints.	93	14	46/0/0/0		
48.0	18.0							
46.0	20.0		Vertical joints splitting the core, smooth and planar, empty. Several horizontal joints, breaks sometimes into thin sheets.	94	28	22/0/0/0 22x1-2x1 12x2-3x1 Q=0,6-1,8		K1/K2
44.0	22.0			98	24	30/0/0/0		
42.0	24.0							

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-83

SHEET 1 OF 2 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 31.03.2008 COMPLETED: 01.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Dam area Búði	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 437806.28 Y: 390582.48 Z: 72.8	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	3
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	68 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	33.8 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) 10 100 3 30 300	COMMENTS
72.0			Gravel, sandy well graded. (No casing)	0	N/A	0/0/0/0		
			Scoria.	100	N/A	0/0/0/0		
			Þjórsá lava.	100	N/A	81/49/0/0 81x2-3x1 9-12x1-2x1 Q=7-27		
70.0	2.0		Porphyritic basalt. Þjórsá lava. Fresh gray and fine grained. 15-20% vesicles, empty or with thin light brown clay coatings. Joints are rough and undulating, empty or coated with light brown clay.					
	4.0			100	N/A	88/52/0/0		
68.0			Decreasing vesicles 5-10% ~3% plagioclase phenocrysts. Scattered olivine and pyroxene phenocrysts.					
	6.0		Scattered vesicles ~1%, microporous basalt. Faint flow banding.					
66.0				100	10	55/10/0/0 55x2-3x1 9-12x1-2x1 Q=5-18		
	8.0							
64.0								
	10.0			100	9	62/0/0/0		
62.0								
	12.0							
60.0			12.8 - 15.8 Almost complete coreloss, stone in drill bit. Core broken by drilling.	27	N/A	8/0/0/0		
	14.0							
58.0								
	16.0		Stone/gravel from surface falling down from top of hole.	60	7	58/0/0/0		Drilling rods pulled up to check drill bit.
56.0								
	18.0							
54.0				100	1	90/90/90/0 90x2-3x1 9-12x1-2x1 Q=7-30		
	20.0		Vertical joint splitting the core.					
52.0				100	3	95/95/43/0		K1/K2
	22.0			89	2	79/55/55/0		
50.0								
	24.0		Core falls down from inner rod to drillrod.	20	6	0/0/0/0		
				100	8	46/0/0/0 46x2-3x1 9-12x1-2x1 Q=3,8-15		
48.0				100	2			

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-83

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
46.0	26.0		3% small vesicles.	100	3	100/0/0/0 100/82/31/0 100x2-3x1 9-12x1-2x1 Q=8-33		
			Scoria/vesicular scoriaceous basalt.	100	7	0/0/0/0		
			Gravel.	7	N/A	0/0/0/0		
44.0	28.0		Basalt pebbles and boulders, finer materials are washed away.	25	N/A	11/0/0/0		
				14	N/A	0/0/0/0		
42.0	30.0		Sand Dark grey poorly graded sand.	12	N/A	0/0/0/0		
40.0	32.0		Three basalt boulders/pebbles.					
38.0								
36.0								
34.0								
32.0								
30.0								
28.0								
26.0								
24.0								
22.0								
20.0								
18.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-84

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 05.04.2008 COMPLETED: 05.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Freyr Pálsson
COORDINATES:	X: 435214.01 Y: 390056.91 Z: 69.18	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	2
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	90 %
CASING LENGTH:	3 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	69.52 m a.s.l.
DEPTH OF HOLE:	21.7 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	66.72 m a.s.l. (6.4.2008)

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
68.0			Topsoil Gravel and sand	0	0	0/0/0/0		
	2.0		Porphyritic basalt. Þjórsá lava Fresh gray, fine grained and massive. Vesicular up to 20-30% below 4 m depth, vesicles are empty or partly filled with pale brown clay. Joints are rough and undulating with thin light yellowish brown clay/silt coating. Thin scoriaceous zones.					GWT6.4.2008 17:10:00 GWT4.6.2008
66.0				22	2	57/43/0/0 57x3x1 9-12x1-2x1 Q=5-19		
	4.0			100	2	78/53/41/0 78x1-3x1 9-12x1-2x1 Q=6-26		
64.0								
	6.0							
62.0				83	2	56/47/33/0		
	8.0							
60.0								
	10.0		Core loss on layer boundaries.	100	2	99/99/67/0 99x1-3x1 9-12x1-2x1 Q=8-33		
58.0			Sandstone. Very dense and well cemented. Medium grained. Gray and brown colour, brown due to geothermal activity. Joints are rough and undulating. Some have pale brown clay fillings but most are empty.	57	6	19/0/0/0 19x2-3x1 9x3x1 Q=1,4-2,1		
	12.0			65	2	23/0/0/0		
56.0				100	3	69/24/0/0		K1/K2
	14.0						107	
54.0								
	16.0			82	4	69/43/17/0 69x2-3x1 9x3x1 Q=5-8		
52.0								
	18.0							
50.0				100	4	69/23/23/0		
	20.0							
48.0								
46.0								

MANNVIT ENGINEERING

BOREHOLE LOG
CORE DRILLING

BOREHOLE NO.:

NK-85

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 07.04.2008 COMPLETED: 07.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Quarry area Hestafoss	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434964.38 Y: 389933.46 Z: 68.87	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	1
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	24 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	9.7 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
68.0			Gravel Well graded sandy gravel. Basalt and rhyolite pebbles and boulders in sand. Rounded-subrounded pebbles.	16	N/A	7/0/0/0		
	2.0							
66.0								
	4.0			16	N/A	0/0/0/0		
64.0								
	6.0							
62.0				50	N/A	0/0/0/0		
	8.0			17	N/A	0/0/0/0		
60.0				0	N/A	0/0/0/0		
			Silt/clay in core. No solid core.	100	2	88/88/0/0		
			Sandstone Gray, poorly graded, well cemented, medium grained.					
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-86

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 07.04.2008 COMPLETED: 07.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Quarry area Hestafoss	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434933.5 Y: 390091.36 Z: 67.69	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	1
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	78 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	9.7 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	66.53 m a.s.l. (6.4.2008)

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	2.0		Porphyritic lava Þjórsá lava Gray, fine grained, 5-7% plagioclase and scattered olivine phenocrysts. 7-15% vesicles decreasing downwards. More massive ~1% vesicles, microporous. Joints rough and undulating, empty or coated with yellowish brown clay.	100	3	97/65/40/0		GWT4.6.2008 GWT6.4.2008 17:20:00
				100	4	57/57/0/0		
64.0	4.0		Gravel Well graded, boulders and pebbles of basalt in black sand.	25	N/A	8/0/0/0		
62.0	6.0		Sandstone, silty Grayish brown, fine grained silty sandstone. Small tectonic displacement at 6.7 m. Dark gray below 7,1 m. Breaks and erodes during drilling, poorly graded.	100	5	100/0/0/0		
60.0	8.0			100	9	67/17/0/0		
				56	6	26/0/0/0		
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-87

SHEET 1 OF 1 SHEETS

CLIENT:	Landsvirkjun	DATE:	STARTED: 07.04.2008 COMPLETED: 07.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Quarry area Hestafoss	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434835.83 Y: 389995.35 Z: 67.7	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	1
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	99 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	9 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	67.28 m a.s.l. (4.6.2008)

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	2.0		Porphyritic basalt Þjórsá lava No casing. Basalt at surface. Fresh gray, fine grained. 5-15% vesicles, decreasing downwards. 5% plagioclase and scattered olivine phenocrysts. Joints are rough and undulating, coated with yellowish brown clay. Scattered vesicles below 2,6 m.	97	3	75/65/42/42		GWT4.6.2008
				100	9	49/0/0/0		
64.0	4.0			100	4	80/38/38/0		
62.0	6.0							
			Steeply inclined joints splitting the core. Massive microporous basalt.	100	1	100/94/80/80		
60.0	8.0							
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-88

SHEET 1 OF 1 SHEETS

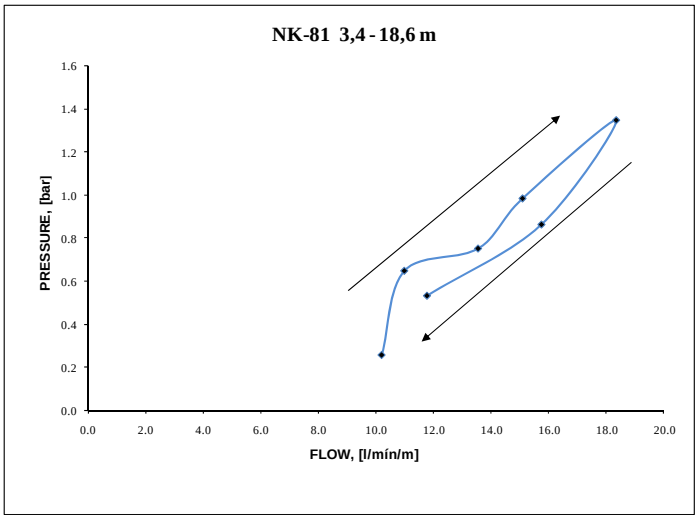
CLIENT:	Landsvirkjun	DATE:	STARTED: 08.04.2008 COMPLETED: 08.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Baldur
STRUCTURE:	Quarry area Hestafoss	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434867.79 Y: 390226.59 Z: 68.77	DRILLBIT TYPE:	76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	NUMBER OF CORE BOXES:	1
HOLE INCLINATION:	[X] VERTICAL [ ] INCLINED _____ INCLINATION	CORE RECOVERY:	73 %
CASING LENGTH:	0 m [ ] CASING REMOVED	TOP OF CASING, ELEV.:	
DEPTH OF HOLE:	9.8 m DRILLING DIRECTION °	GROUNDWATER ELEVATION:	64.57 m a.s.l. (4.6.2008)

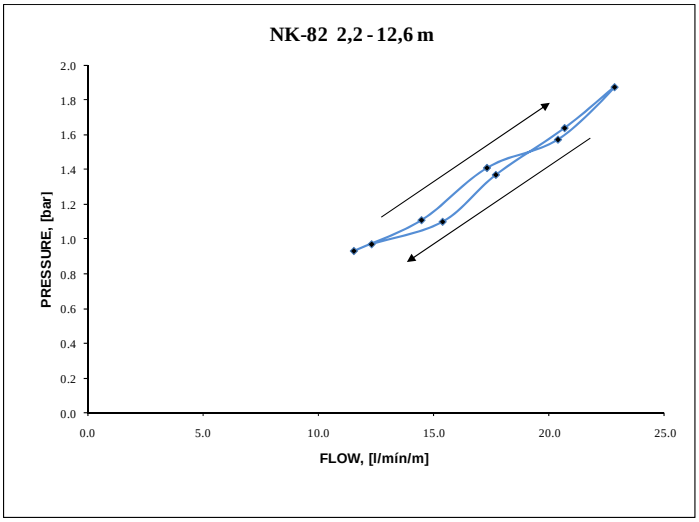
ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	CORE RECOVERY (%)	FRACTURE-INTENSITY (FRACT/M)	RQD 10/30/50/100 Q = RQD x Jr x Jw / Jn x Ja x SRF	PERMEAB (LU) 3 10 30 100 300	COMMENTS
68.0			Topsoil	0	N/A	0/0/0/0		
	2.0		Porphyritic basalt Þjórsá lava Fresh gray, fine grained, 10% vesicles. Scattered vesicles below 2,5 m, microporous. 5-7% plagioclase and scattered olivine phenocrysts. Joints rough and undulating, empty or coated with yellowish brown clay.	100	2	96/85/46/0		
66.0				70	0	70/70/70/0		
	4.0 ▼			100	4	89/48/32/0		GWT4.6.2008
64.0								
	6.0		Scoria zone Reddish gray vesicular scoria/scoriaceous basalt.	8	N/A	0/0/0/0		
62.0				50	Crushed	0/0/0/0		
	8.0		Porphyritic basalt continued. 2% small vesicles.	100	3	100/77/36/0		
60.0			Scoria zone Dark gray, high core loss.	34	3	16/0/0/0		
58.0								
56.0								
54.0								
52.0								
50.0								
48.0								
46.0								
44.0								

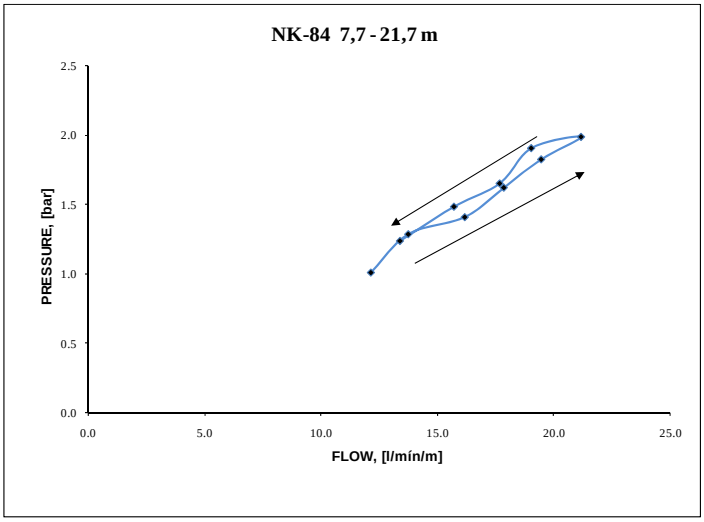
Appendix B

Permeability Tests

Packer Permeability Tests







Appendix C

Rock Mass Classification

Borehole: **NK-77**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Holtavirkjun

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
79.7	78.3		**Gravel**																			
78.3	77.8		**Sand**																			
77.8	77.1		**Gravel**																			
77.1	75.9		**Sandstone**		53	12	9	2	1	4	3	1	1	1	1	4.0	1.1	1.0	**4.0**	**1.1**	40	35
75.9	75.6				10 **	12	9	2	1	4	3	1	1	1	1	0.7	0.2	1.0	**0.7**	**0.2**	40	35
75.6	72.9		**Tholeiite basalt**		80	12	9	3	2	2	2	1	1	1	1	13.3	6.7	1.5	**8.9**	**4.4**	70	65
72.9	69.9				56	12	12	3	2	2	2	1	1	1	1	7.0	4.7	1.5	**4.7**	**3.1**	70	65
69.9	68.2				50	12	12	3	2	2	2	1	1	1	1	6.3	4.2	1.5	**4.2**	**2.8**	70	65
68.2	66.9				65	12	12	3	2	2	2	1	1	1	1	8.1	5.4	1.5	**5.4**	**3.6**	70	65
66.9				Hole bottom																	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-78**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Holtavirkjun

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
87.2	86.9		**Topsoil**	0																		
86.9	86.6		**Cubic Basalt**	10	**	15	12	3	2	3	3	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	55	50
86.6	85.8			13		15	12	3	2	3	3	1	1	1	1	1.0	0.6	1.0	**1.0**	**0.6**	55	50
85.8	84.0			33		15	12	3	2	3	3	1	1	1	1	2.8	1.5	1.0	**2.8**	**1.5**	55	50
84.0	83.4			10	**	15	12	3	2	3	3	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	55	50
83.4	82.0			16		15	15	3	2	3	3	1	1	1	1	1.0	0.7	1.0	**1.0**	**0.7**	55	50
82.0	80.4			39		15	12	3	2	3	3	1	1	1	1	3.3	1.8	1.0	**3.3**	**1.8**	55	50
80.4	79.5			10	**	15	12	3	2	3	3	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	55	50
79.5	79.0			10	**	15	12	3	2	3	3	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	55	50
79.0	77.4			48		15	12	3	2	3	3	1	1	1	1	4.0	2.1	1.0	**4.0**	**2.1**	55	50
77.4	76.1			37		15	12	3	2	3	3	1	1	1	1	3.1	1.6	1.0	**3.1**	**1.6**	55	50
76.1	75.7			10	**	15	12	3	2	3	3	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	55	50
75.7	75.6		**Tholeiite basalt**	10	**	12	12	3	2	2	2	1	1	1	1	1.3	0.8	1.0	**1.3**	**0.8**	55	50
75.6	74.4			68		12	9	3	2	2	2	1	1	1	1	11.4	5.7	1.5	**7.6**	**3.8**	70	65
74.4	71.4			70		12	9	3	2	2	2	1	1	1	1	11.6	5.8	1.5	**7.7**	**3.9**	70	65
71.4	71.3		**Black sand**	10	**																	
71.3	68.6		**Tholeiite basalt cont.**	67		12	9	3	2	2	2	1	1	1	1	11.1	5.5	1.5	**7.4**	**3.7**	70	65
68.6	67.8			38		12	9	3	2	2	2	1	1	1	1	6.3	3.1	1.0	**6.3**	**3.1**	70	65
67.8	65.4			78		12	9	3	2	2	2	1	1	1	1	13.1	6.5	1.5	**8.7**	**4.4**	70	65
			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-79**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Urriðafossvirkjun

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
87.5	86.4	**Cubic Basalt**		10	**	15	15	3	2	3	2	1	1	1	1	1.0	0.4	1.0	**1.0**	**0.4**	55	50
86.4	85.6			10	**	15	15	3	2	3	2	1	1	1	1	1.0	0.4	1.0	**1.0**	**0.4**	55	50
85.6	84.0			21		15	15	3	2	2	2	1	1	1	1	2.1	1.4	1.0	**2.1**	**1.4**	55	50
84.0	82.3			10	**	15	15	3	2	3	2	1	1	1	1	1.0	0.4	1.0	**1.0**	**0.4**	55	50
82.3	80.8			10	**	15	15	3	2	3	2	1	1	1	1	1.0	0.4	1.0	**1.0**	**0.4**	55	50
80.8	80.1			10	**	15	15	3	2	3	2	1	1	1	1	1.0	0.4	1.0	**1.0**	**0.4**	55	50
80.1	79.0			10	**	15	15	3	2	3	2	1	1	1	1	1.0	0.4	1.0	**1.0**	**0.4**	55	50
79.0	77.8			33		15	12	3	2	2	2	1	1	1	1	4.1	2.2	1.0	**4.1**	**2.2**	55	50
77.8	75.9			19		15	15	3	2	3	2	1	1	1	1	1.9	0.8	1.0	**1.9**	**0.8**	55	50
75.9	75.9	**Tholeiite basalt**		10	**	12	9	3	2	3	2	1	1	1	1	1.7	0.6	1.0	**1.7**	**0.6**	70	65
75.9	74.8			43		12	9	3	2	3	2	1	1	1	1	7.1	2.4	1.5	**4.7**	**1.6**	70	65
74.8	71.8			87		12	9	3	2	2	2	1	1	1	1	14.4	7.2	2.0	**7.2**	**3.6**	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-80**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Holtavirkjun

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
72.7	72.3	**Topsoil**		0																		
72.3	71.8	**Scoria**		10	**	12	9	3	2	2	1	1	1	1	1	3.3	0.8	1	**3.3**	**0.8**	65	60
71.8	69.7	**Porphyritic basalt**		100		12	9	3	2	2	1	1	1	1	1	33.3	8.3	2.0	**16.7**	**4.2**	75	70
69.7	69.0	Þjórsá lava		55		12	9	3	2	2	1	1	1	1	1	18.3	4.6	1.5	**12.2**	**3.1**	75	70
69.0	68.5			45		12	9	3	2	2	1	1	1	1	1	15.0	3.8	1.5	**10.0**	**2.5**	75	70
68.5	68.5			10	**	12	12	3	2	2	1	1	1	1	1	2.5	0.8	1.0	**2.5**	**0.8**	75	70
68.5	65.7	**Brown and sandy soil**		0																		
65.7	64.7	**Sandstone, brown.**		10	**	12	12	2	1	3	2	1	1	1	1	0.8	0.3	1.0	**0.8**	**0.3**	50	45
64.7	64.3	**Gravel**		0																		
64.3	63.9	**Sandstone**		10	**	12	12	2	1.5	3	2	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	40	35
63.9	63.6			10	**	12	12	2	1.5	3	2	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	40	35
63.6	63.0			10	**	12	12	2	1.5	3	2	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	40	35
63.0	60.9			73		12	12	2	1.5	3	2	1	1	1	1	6.1	3.0	1.5	**4.1**	**2.0**	55	50
60.9	60.0			43		12	12	2	1.5	3	2	1	1	1	1	3.6	1.8	1.0	**3.6**	**1.8**	55	50
60.0	57.0			79		9	9	2	1.5	3	2	1	1	1	1	8.8	4.4	1.5	**5.9**	**2.9**	55	50
57.0	54.0			48		9	9	2	1.5	3	2	1	1	1	1	5.3	2.7	1.0	**5.3**	**2.7**	50	45

* 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-81**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Holtavirkjun

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
67.0	65.8		**Topsoil**	Percussion drilling																			
65.8	64.8		**Porphyritic basalt**	Percussion drilling																			
64.8	63.4		Þjórsá lava		64		12	9	3	3	2	1	1	1	1	1	21.3	8.0	1.5	**14.2**	**5.3**	75	70
63.4	60.4				85		12	9	3	3	2	1	1	1	1	1	28.3	10.6	2.0	**14.2**	**5.3**	75	70
60.4	59.0		**Scoriaceous basalt**		29		12	9	2	2	2	1	1	1	1	1	6.4	2.4	1.5	**4.3**	**1.6**	70	65
59.0	57.4				75		12	9	3	3	2	1	1	1	1	1	25.0	9.4	1.5	**16.7**	**6.3**	70	65
57.4	56.0		**Porphyritic basalt**		24		12	9	2	2	2	1	1	1	1	1	5.3	2.0	1.5	**3.6**	**1.3**	75	70
56.0	54.7				50		12	9	3	3	2	1	1	1	1	1	16.7	6.3	1.5	**11.1**	**4.2**	75	70
54.7	54.4		**Loose sediment**																				
54.4	52.3																						
52.3	51.4		**Sandstone silty**		10	**	12	12	1.5	1	3	2	1	1	1	1	0.6	0.3	1.0	**0.6**	**0.3**	40	35
51.4	48.4				34		12	12	1.5	1	3	2	1	1	1	1	2.1	0.9	1.0	**2.1**	**0.9**	40	35

* 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-82**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Holtavirkjun

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
65.6	64.8	**Topsoil**	Percussion drilling																		
64.8	63.9	**Porphyritic basalt**	Percussion drilling																		
63.9	62.0	Þjórsá lava		75	9	9	3	2	2	1	1	1	1	1	25.0	8.3	1.5	**16.7**	**5.6**	75	70
62.0	60.2	**Scoriaceous basalt**		87	9	9	3	2	2	1	1	1	1	1	29.0	9.7	1.5	**19.3**	**6.4**	75	70
60.2	59.0	**Loose sediment**																			
59.0	56.1																				
56.1	56.0	**Sandstone silty**		100	12	12	2	1.5	3	2	1	1	1	1	8.3	4.2	2.0	**4.2**	**2.1**	45	40
56.0	53.0			11	12	12	2	1.5	3	2	1	1	1	1	0.9	0.5	1.0	**0.9**	**0.5**	40	35
53.0	50.0			10 **	12	12	2	1.5	3	2	1	1	1	1	0.8	0.4	1.0	**0.8**	**0.4**	40	35
50.0	47.0			46	12	12	2	1.5	3	2	1	1	1	1	3.8	1.9	1.5	**2.6**	**1.3**	45	40
47.0	44.0			22	12	12	2	1.5	3	2	1	1	1	1	1.8	0.9	1.0	**1.8**	**0.9**	45	40
44.0	41.0			30	12	12	2	1.5	3	2	1	1	1	1	2.5	1.3	1.0	**2.5**	**1.3**	45	40

* 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-83**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun Vnr: 5.481.203
Structure: Holtavirkjun

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
72.8	71.8	**Gravel**	Sandy																			
71.8	71.4																					
71.4	69.0	**Porphyritic Basalt**		81		9	9	3	2	2	1	1	1	1	1	27.1	9.0	2.0	**13.5**	**4.5**	75	70
69.0	66.0	**Þjórsá lava**		88		9	9	3	2	2	1	1	1	1	1	29.2	9.7	2.0	**14.6**	**4.9**	75	70
66.0	63.0			55		12	12	3	2	2	1	1	1	1	1	13.8	4.6	1.5	**9.2**	**3.1**	75	70
63.0	60.0			62		12	9	3	2	2	1	1	1	1	1	20.6	5.1	1.5	**13.7**	**3.4**	75	70
60.0	57.0			10	**	12	12	3	2	2	1	1	1	1	1	2.5	0.8	1.0	**2.5**	**0.8**	75	70
57.0	54.0			58		12	9	3	2	2	1	1	1	1	1	19.4	4.9	1.5	**13.0**	**3.2**	75	70
54.0	52.6			90		9	9	3	2	2	1	1	1	1	1	29.9	10.0	2.0	**14.9**	**5.0**	75	70
52.6	51.0			95		9	9	3	2	2	1	1	1	1	1	31.6	10.5	2.0	**15.8**	**5.3**	75	70
51.0	49.4			79		9	9	3	2	2	1	1	1	1	1	26.5	8.8	2.0	**13.2**	**4.4**	75	70
49.4	48.9			10	**	12	12	3	2	2	1	1	1	1	1	2.5	0.8	1.0	**2.5**	**0.8**	75	70
48.9	48.4			46		12	12	3	2	2	1	1	1	1	1	11.5	3.8	1.5	**7.7**	**2.6**	75	70
48.4	48.0			100		9	9	3	2	2	1	1	1	1	1	33.3	11.1	2.0	**16.7**	**5.6**	75	70
48.0	45.9			100		9	9	3	2	2	1	1	1	1	1	33.3	11.1	2.0	**16.7**	**5.6**	75	70
45.9	45.7			10	**	12	12	3	2	2	1	1	1	1	1	2.5	0.8	1.0	**2.5**	**0.8**	75	70
45.7	45.0	**Gravel**		10	**																	
45.0	43.8			11																		
43.8	43.1	**Sand**		10	**																	
43.1	39.0			10	**																	

* 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-84**	**Rock mass classification**	MANNVIT ENGINEERING

Client: Landsvirkjun
Structure: Holtavirkjun
Vnr: 5.481.203

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-stuðull	Q-value			
From	To				RQD_{10}	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
69.2	66.2		**Topsoil**		0																	
66.2	65.5		**Porphyritic basalt**		57	12	9	3	2	2	1	1	1	1	1	19.0	4.8	1.5	**12.7**	**3.2**	75	70
65.5	62.5		Þjórsá lava		78	9	9	3	2	2	1	1	1	1	1	26.1	8.7	1.5	**17.4**	**5.8**	75	70
62.5	59.5				56	12	9	3	2	2	1	1	1	1	1	18.7	4.7	1.0	**18.7**	**4.7**	75	70
59.5	58.4				99	9	9	3	2	2	1	1	1	1	1	33.0	11.0	2.0	**16.5**	**5.5**	75	70
58.4	57.1		**Sandsstone**		19	9	9	2	2	3	3	1	1	1	1	1.4	1.4	1.0	**1.4**	**1.4**	55	50
57.1	56.5				23	9	9	2	2	3	3	1	1	1	1	1.7	1.7	1.0	**1.7**	**1.7**	55	50
56.5	53.5				69	9	9	2	2	3	3	1	1	1	1	5.1	5.1	1.5	**3.4**	**3.4**	55	50
53.5	50.5				69	9	9	2	2	3	3	1	1	1	1	5.1	5.1	1.5	**3.4**	**3.4**	55	50
50.5	47.5			Hole bottom	69	9	9	2	2	3	3	1	1	1	1	5.1	5.1	1.5	**3.4**	**3.4**	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.

Appendix D

Photos of cores NK77-NK88

NK-77 BOREHOLE CORE PHOTO BOX 1-2

NK-78 BOREHOLE CORE PHOTO BOX 1-2

NK-78 BOREHOLE CORE PHOTO BOX 3

NK-79 BOREHOLE CORE PHOTO BOX 1-2

NK-80 BOREHOLE CORE PHOTO BOX 1-2

NK-81 BOREHOLE CORE PHOTO BOX 1-2

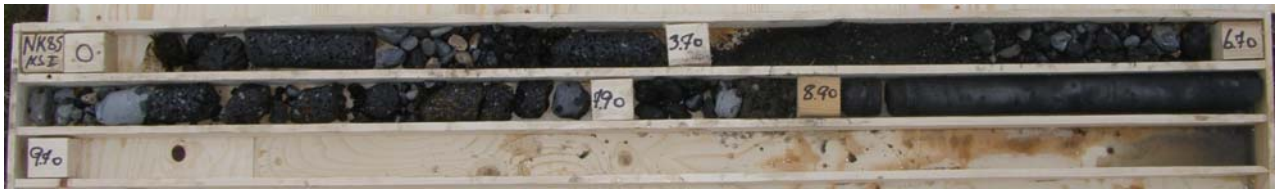
NK-82 BOREHOLE CORE PHOTO BOX 1-2

NK-83 BOREHOLE CORE PHOTO BOX 1-2

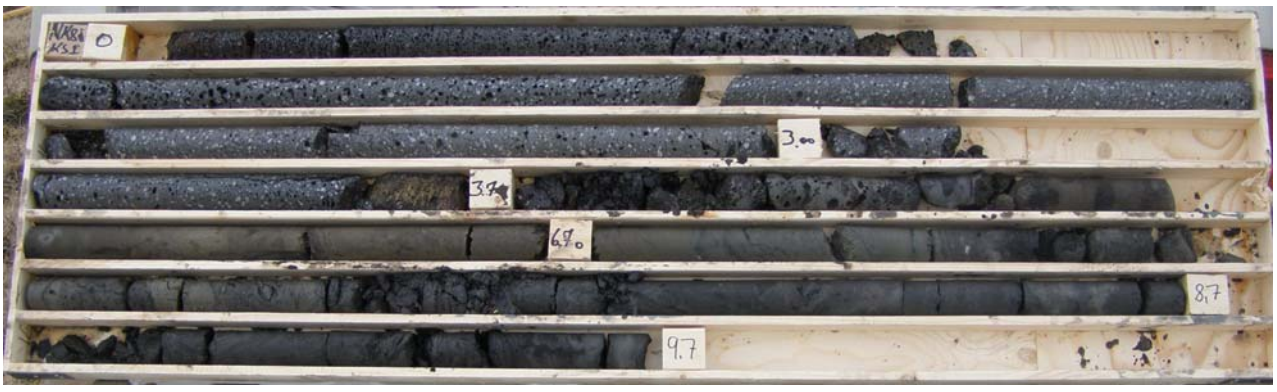
NK-83 BOREHOLE CORE PHOTO BOX 3

NK-84 BOREHOLE CORE PHOTO BOX 1-2

NK-85 BOREHOLE CORE PHOTO BOX 1



NK-86 BOREHOLE CORE PHOTO BOX 1



NK-87 BOREHOLE CORE PHOTO BOX 1

NK-88 BOREHOLE CORE PHOTO BOX 1

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	Weights in water	Ax. load (kN)	UCS (Mpa)
NK-80 15,70-16,33 m-1	21.4.2008	15.7	56.95	Sandstone	107	45	2.4	2,110	25	**15.8**
NK-80 15,70-16,33 m-2	21.4.2008	15.7	56.95	Sandstone	105	45	2.4	2,166	23	**14.3**
NK-80 15,70-16,33 m-3	21.4.2008	15.7	56.95	Sandstone	108	45	2.4	2,145	39	**24.4**
NK-80 15,70-16,33 m-4	21.4.2008	15.7	56.95	Sandstone	108	45	2.4	2,142	27	**16.5**
NK-80 15,70-16,33 m-5	21.4.2008	15.7	56.95	Sandstone	104	45	2.3	2,046	24	**15.1**
NK-80 14,88-15,33 m-1	21.4.2008	14.9	57.75	Sandstone	109	45	2.4	2,056	34	**21.0**
NK-80 14,88-15,33 m-2	21.4.2008	14.9	57.75	Sandstone	108	45	2.4	2,042	32	**19.7**

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

Sample nr.	Rock type	Water absorption (%)	Dry density (kg/m^3)	Wet density (kg/m^3)	Porosity	Water content at failure (%)
NK-80 15,7-16,33 m - 1	Sandstone	23.0	1662	2044	0.382	22.8
NK-80 15,7-16,33 m - 2	Sandstone	19.9	1820	2182	0.361	19.6
NK-80 15,7-16,33 m - 3	Sandstone	19.6	1846	2207	0.361	19.4
NK-80 15,7-16,33 m - 4	Sandstone	20.7	1768	2135	0.367	20.7
NK-80 15,7-16,33 m - 5	Sandstone	22.0	1671	2038	0.367	21.9
NK-80 14,88-15,33 m - 1	Sandstone	21.7	1694	2060	0.367	21.5
NK-80 14,88-15,33 m - 2	Sandstone	21.6	1700	2068	0.368	21.4

Date:	03.04.2008
Job number:	5 481 203

TESTING REPORT

Point Load Testing

MANNVIT ENGINEERING

Client:	Landsvirkjun
Project:	Neðri Þjórsá
Location:	Holtavirkjun Hola NK-80 dýpi 15,2-15,7
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-80-/15,2-15,7	45	45	45	45	2.4	2025	1.19	1.130	0.9537	45	14	*15.8*
	45	45	45	45	2.0	2025	0.96	0.918	0.9537	45	14	*12.9*
	45	45	45	45	3.0	2025	1.48	1.413	0.9537	45	14	*19.8*
	45	45	45	45	3.1	2025	1.53	1.460	0.9537	45	14	*20.4*
	45	45	45	45	2.3	2025	1.14	1.083	0.9537	45	14	*15.2*
	45	45	45	45	2.8	2025	1.38	1.319	0.9537	45	14	*18.5*
	45	45	45	45	2.2	2025	1.09	1.036	0.9537	45	14	*14.5*
	45	45	45	45	2.6	2025	1.28	1.224	0.9537	45	14	*17.1*
	45	45	45	45	2.3	2025	1.14	1.083	0.9537	45	14	*15.2*
	45	45	45	45	2.5	2025	1.23	1.177	0.9537	45	14	*16.5*
	45	45	45	45	2.6	2025	1.28	1.224	0.9537	45	14	*17.1*
	45	45	45	45	2.6	2025	1.28	1.224	0.9537	45	14	*17.1*
	45	45	45	45	1.8	2025	0.89	0.848	0.9537	45	14	*11.9*
	45	45	45	45	2.5	2025	1.23	1.177	0.9537	45	14	*16.5*
	45	45	45	45	2.8	2025	1.38	1.319	0.9537	45	14	*18.5*
Average								1.176				16.5

Comments The core was weighted in air and water: 2007 kg/m3
Sandstone, grayish brown

Appendix F

Logs of percussion drill holes 2008 (NL69-NL92)

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-69

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 31.03.2008 COMPLETED: 31.03.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Búði	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 437744.13 Y: 390430.13 Z: 72.4	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	9.0 m	GROUNDWATER DEPTH:	0.99 m
		GROUNDWATER ELEVATION:	71.41 m a.s.l. (4.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
72.0	1.0		Gravel, sandy.		GWT4.4.2008 13:21:00
71.0	2.0		Scoria		
70.0	3.0		Þjórsá lava Porphyritic basalt		
69.0	4.0				
68.0	5.0		15 cm zone of low resistance.		
67.0	6.0		Short zone of low resistance, lot of yellowish brown clay. Probably scoria pockets.		
66.0	7.0				
65.0	8.0		Sand Very soft to drill.		
64.0	9.0				
63.0	10.0				
62.0	11.0				
61.0	12.0				
60.0	13.0				
59.0	14.0				
58.0	15.0				
57.0	16.0				
56.0	17.0				
55.0	18.0				
54.0	19.0				
53.0	20.0				
52.0	21.0				
51.0	22.0				
50.0	23.0				
49.0	24.0				
48.0					

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-70

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 31.03.2008 COMPLETED: 31.03.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Búði	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 437843.12 Y: 390558.78 Z: 72.61	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	12.0 m	GROUNDWATER DEPTH:	1.1 m
		GROUNDWATER ELEVATION:	71.51 m a.s.l. (4.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
72.0	1.0		Gravel Stony gravel with sand.		
71.0	2.0		Þjórsá lava Scoria		GWT4.4.2008 13:17:00
70.0	3.0		Porphyritic basalt Þjórsá lava		
69.0	4.0				
68.0	5.0		Zone of low resistance, scoriaceous basalt.		
67.0	6.0				
66.0	7.0				
65.0	8.0				
64.0	9.0				
63.0	10.0				
62.0	11.0		Sand Rather fine grained.		
61.0	12.0				
60.0	13.0				
59.0	14.0				
58.0	15.0				
57.0	16.0				
56.0	17.0				
55.0	18.0				
54.0	19.0				
53.0	20.0				
52.0	21.0				
51.0	22.0				
50.0	23.0				
49.0	24.0				
48.0					

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-71

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 31.03.2008 COMPLETED: 31.03.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Búði	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 437662.18 Y: 390267.31 Z: 72.0	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	8.0 m	GROUNDWATER DEPTH:	2.22 m
		GROUNDWATER ELEVATION:	69.78 m a.s.l. (4.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
71.0	1.0		Gravel Sandy, with stones.		
70.0	2.0				GWT4.4.2008 13:24:00
69.0	3.0		Þjórsá lava Porphyritic basalt Possibly large stone.		
68.0	4.0		Sand Sand and Gravelly sand, very soft to drill.		
67.0	5.0				
66.0	6.0				
65.0	7.0				
64.0	8.0				
63.0	9.0				
62.0	10.0				
61.0	11.0				
60.0	12.0				
59.0	13.0				
58.0	14.0				
57.0	15.0				
56.0	16.0				
55.0	17.0				
54.0	18.0				
53.0	19.0				
52.0	20.0				
51.0	21.0				
50.0	22.0				
49.0	23.0				
48.0	24.0				

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-72

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 31.03.2008 COMPLETED: 31.03.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Búði	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 437637.39 Y: 390286.96 Z: 72.64	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	6.0 m	GROUNDWATER DEPTH:	1.97 m
		GROUNDWATER ELEVATION:	70.67 m a.s.l. (4.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
72.0	1.0		Gravel		
71.0	2.0				GWT4.4.2008 13:26:00
70.0	3.0		Porphyritic basalt, scoriaceous. Þjórsá lava		
69.0	4.0		Þjórsá lava Porphyritic basalt.		
68.0	5.0				
67.0	6.0		Sand and soil.		
66.0	7.0				
65.0	8.0				
64.0	9.0				
63.0	10.0				
62.0	11.0				
61.0	12.0				
60.0	13.0				
59.0	14.0				
58.0	15.0				
57.0	16.0				
56.0	17.0				
55.0	18.0				
54.0	19.0				
53.0	20.0				
52.0	21.0				
51.0	22.0				
50.0	23.0				
49.0	24.0				
48.0					

MANNVIT ENGINEERING

BOREHOLE LOG

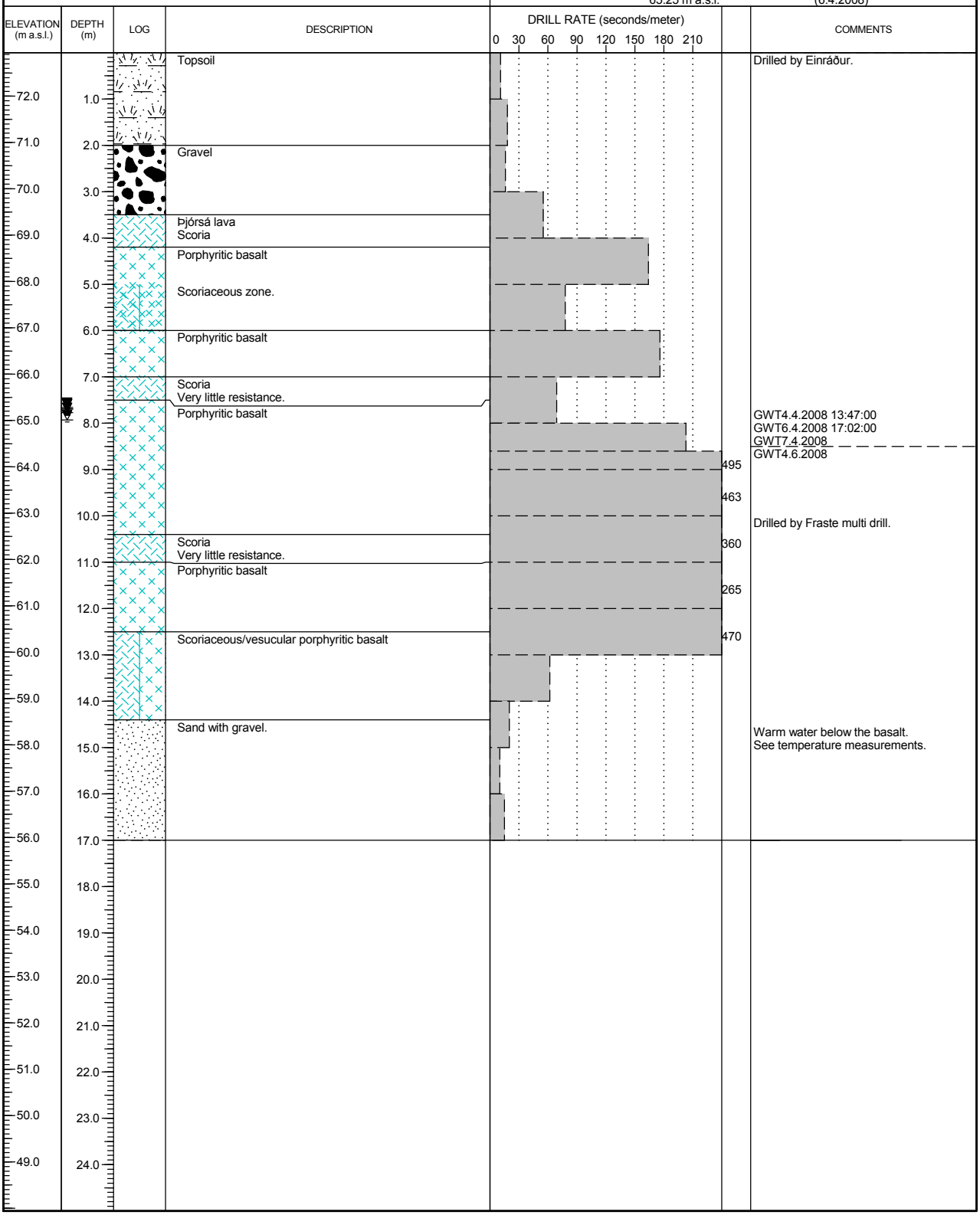
PERCUSSION DRILLING

BOREHOLE NO.:

NL-73

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 01.04.2008 COMPLETED: 01.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla/Baldur
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435547.61 Y: 389930.09 Z: 72.94	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	5.5 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	17.0 m	GROUNDWATER DEPTH:	7.69 m
		GROUNDWATER ELEVATION:	65.25 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

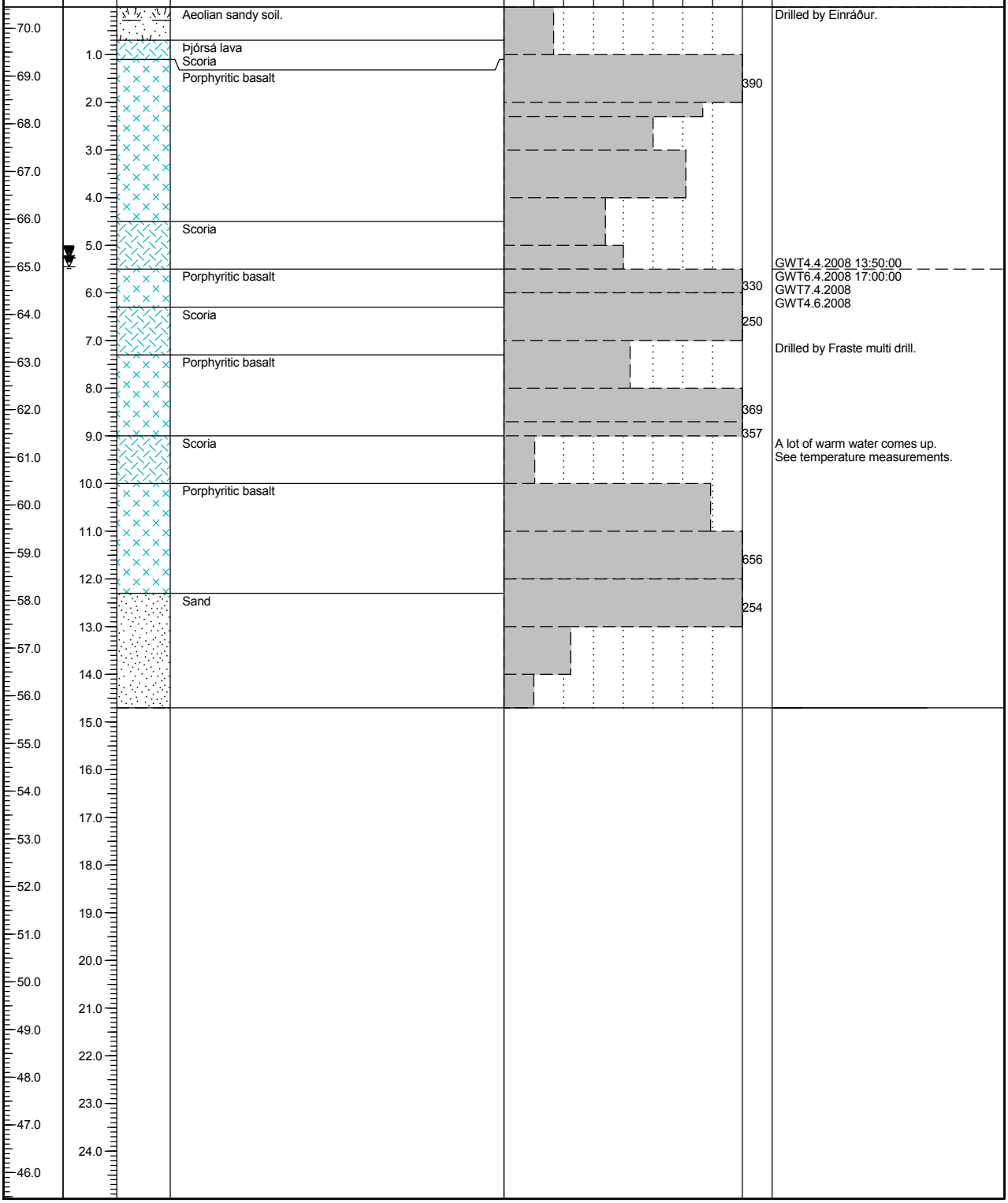
PERCUSSION DRILLING

BOREHOLE NO.:

NL-74

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 01.04.2008 COMPLETED: 01.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla/Baldur
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435469.06 Y: 389932.65 Z: 70.45	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	2.3 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	14.7 m	GROUNDWATER DEPTH:	5.26 m
		GROUNDWATER ELEVATION:	65.19 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-75

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 01.04.2008 COMPLETED: 01.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435373.71 Y: 389955.36 Z: 70.16	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	0.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	6.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	()

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
70.0					
69.0	1.0		Aeolian sandy soil with scoria fragments and gravel.		
68.0	2.0		Þjórsá lava Scoria		
67.0	3.0		Scoriaceous porphyritic basalt		
66.0	4.0		Scoria		
65.0	5.0		Scoriaceous porphyritic basalt		
64.0	6.0				
63.0	7.0				
62.0	8.0				
61.0	9.0				
60.0	10.0				
59.0	11.0				
58.0	12.0				
57.0	13.0				
56.0	14.0				
55.0	15.0				
54.0	16.0				
53.0	17.0				
52.0	18.0				
51.0	19.0				
50.0	20.0				
49.0	21.0				
48.0	22.0				
47.0	23.0				
46.0	24.0				

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-76

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 01.04.2008 COMPLETED: 01.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla/Baldur
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435289.6 Y: 389993.62 Z: 70.87	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	14.7 m	GROUNDWATER DEPTH:	4.95 m
		GROUNDWATER ELEVATION:	65.92 m a.s.l. (6.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210		COMMENTS
70.0	1.0		Topsoil with sand and gravel.			Drilled by Einráður.
69.0	2.0		Þjórsá lava			
			Scoria			
68.0	3.0		Scoriaceous porphyritic basalt			
67.0	4.0					
66.0	5.0		Porphyritic basalt			GWT4.4.2008 13:56:00 GWT6.4.2008 16:58:00
					272	GWT7.4.2008
65.0	6.0				622	GWT4.6.2008
64.0	7.0		Scoria			
63.0	8.0		Porphyritic basalt, vesicular basalt.			Drilled by Fraste multi drill.
					486	
62.0	9.0					
					308	
61.0	10.0		Scoria			
60.0	11.0					
59.0	12.0		Sandstone or sand.			
58.0	13.0					
57.0	14.0					
56.0	15.0					
55.0	16.0					
54.0	17.0					
53.0	18.0					
52.0	19.0					
51.0	20.0					
50.0	21.0					
49.0	22.0					
48.0	23.0					
47.0	24.0					
46.0						

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-77

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 01.04.2008 COMPLETED: 01.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435134.53 Y: 390117.99 Z: 72.0	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	6.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	15.0 m	GROUNDWATER DEPTH:	7.35 m
		GROUNDWATER ELEVATION:	64.65 m a.s.l. (6.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
71.0	1.0		Topsoil, sandy.		
70.0	2.0				
69.0	3.0				
68.0	4.0		Þjórsá lava Scoria		
67.0	5.0		Porphyritic basalt		
66.0	6.0		Scoria		
65.0	7.0				GWT4.4.2008 14:07:00 GWT6.4.2008 17:12:00 GWT7.4.2008 GWT4.6.2008
64.0	8.0				
63.0	9.0		Porphyritic basalt		
62.0	10.0		Scoria		
61.0	11.0				
60.0	12.0		Porphyritic basalt		
59.0	13.0		Scoria Sand Very soft to drill.		
58.0	14.0				
57.0	15.0				
56.0	16.0				
55.0	17.0				
54.0	18.0				
53.0	19.0				
52.0	20.0				
51.0	21.0				
50.0	22.0				
49.0	23.0				
48.0	24.0				

MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-78

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 02.04.2008 COMPLETED: 02.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435442.97 Y: 390037.68 Z: 69.96	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	0.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	9.0 m	GROUNDWATER DEPTH:	4.82 m
		GROUNDWATER ELEVATION:	65.14 m a.s.l. (6.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
69.0	1.0		Topsoil		
			Þjórsá lava Scoria		
68.0	2.0		Scoriaceous porphyritic basalt		
67.0	3.0				
66.0	4.0		Scoria		
65.0	5.0				GWT4.4.2008 14:00:00 GWT6.4.2008 17:06:00 GWT7.4.2008 GWT4.6.2008
64.0	6.0		Porphyritic basalt		
63.0	7.0		Scoria A lot of yellowish brown clay.		
62.0	8.0				
61.0	9.0				
60.0	10.0				
59.0	11.0				
58.0	12.0				
57.0	13.0				
56.0	14.0				
55.0	15.0				
54.0	16.0				
53.0	17.0				
52.0	18.0				
51.0	19.0				
50.0	20.0				
49.0	21.0				
48.0	22.0				
47.0	23.0				
46.0	24.0				

MANNVIT ENGINEERING

BOREHOLE LOG

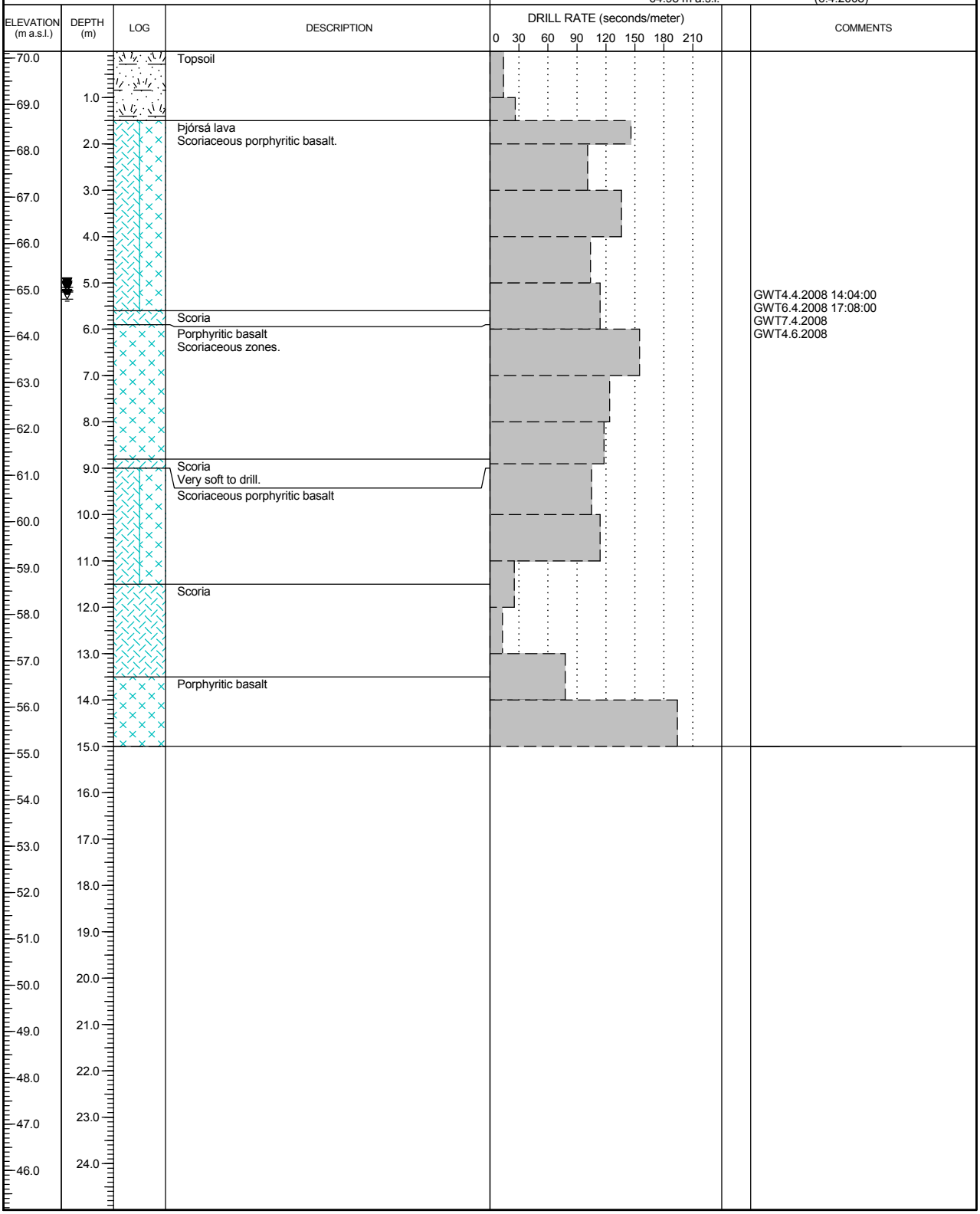
PERCUSSION DRILLING

BOREHOLE NO.:

NL-79

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 02.04.2008 COMPLETED: 02.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435305.51 Y: 390070.92 Z: 70.15	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	15.0 m	GROUNDWATER DEPTH:	5.17 m
		GROUNDWATER ELEVATION:	64.98 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

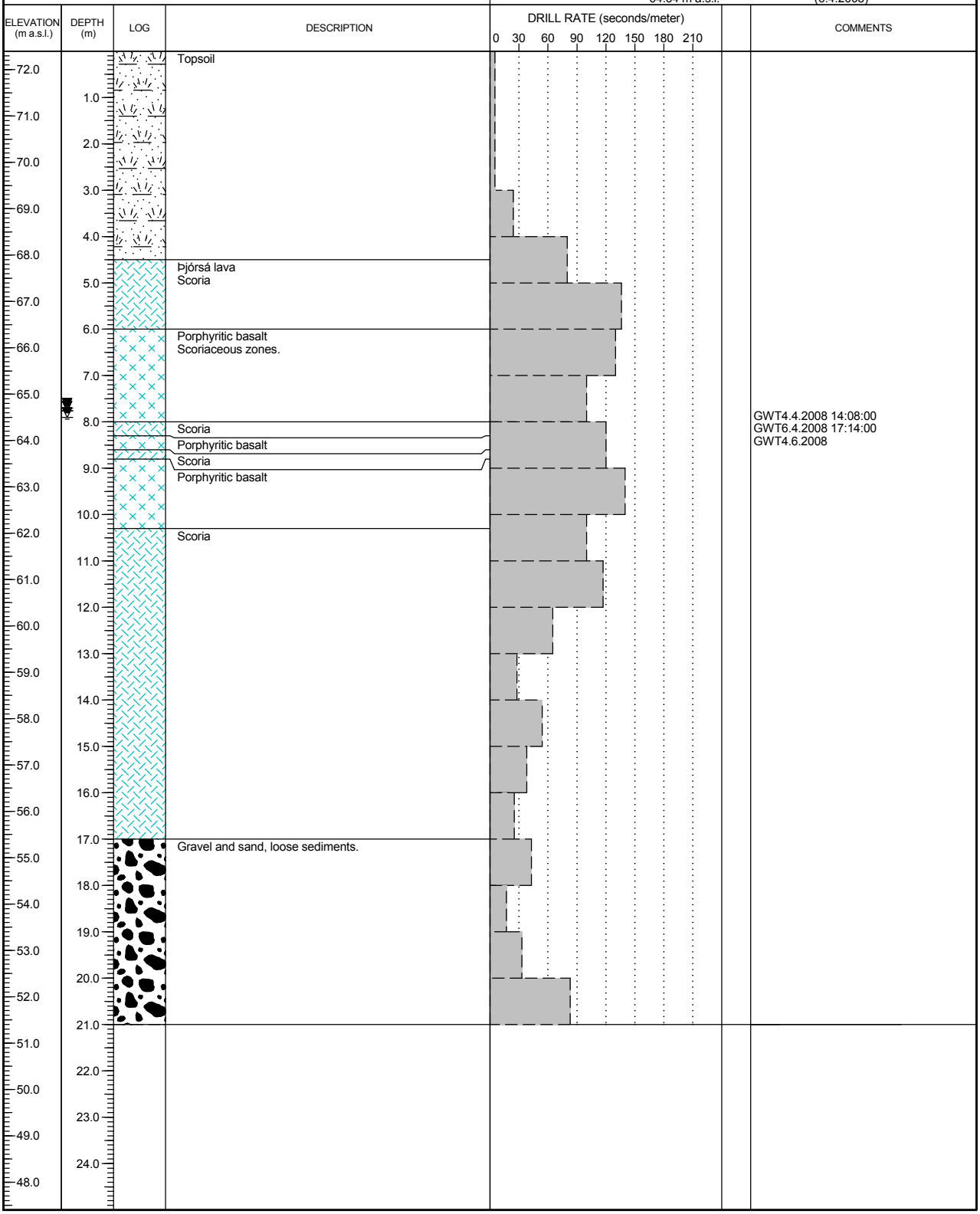
PERCUSSION DRILLING

BOREHOLE NO.:

NL-80

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 02.04.2008 COMPLETED: 02.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 435062.27 Y: 390178.49 Z: 72.4	DRILLBIT TYPE:	Percussion drilling 3" cross 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:	7.76 m
		GROUNDWATER ELEVATION:	64.64 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

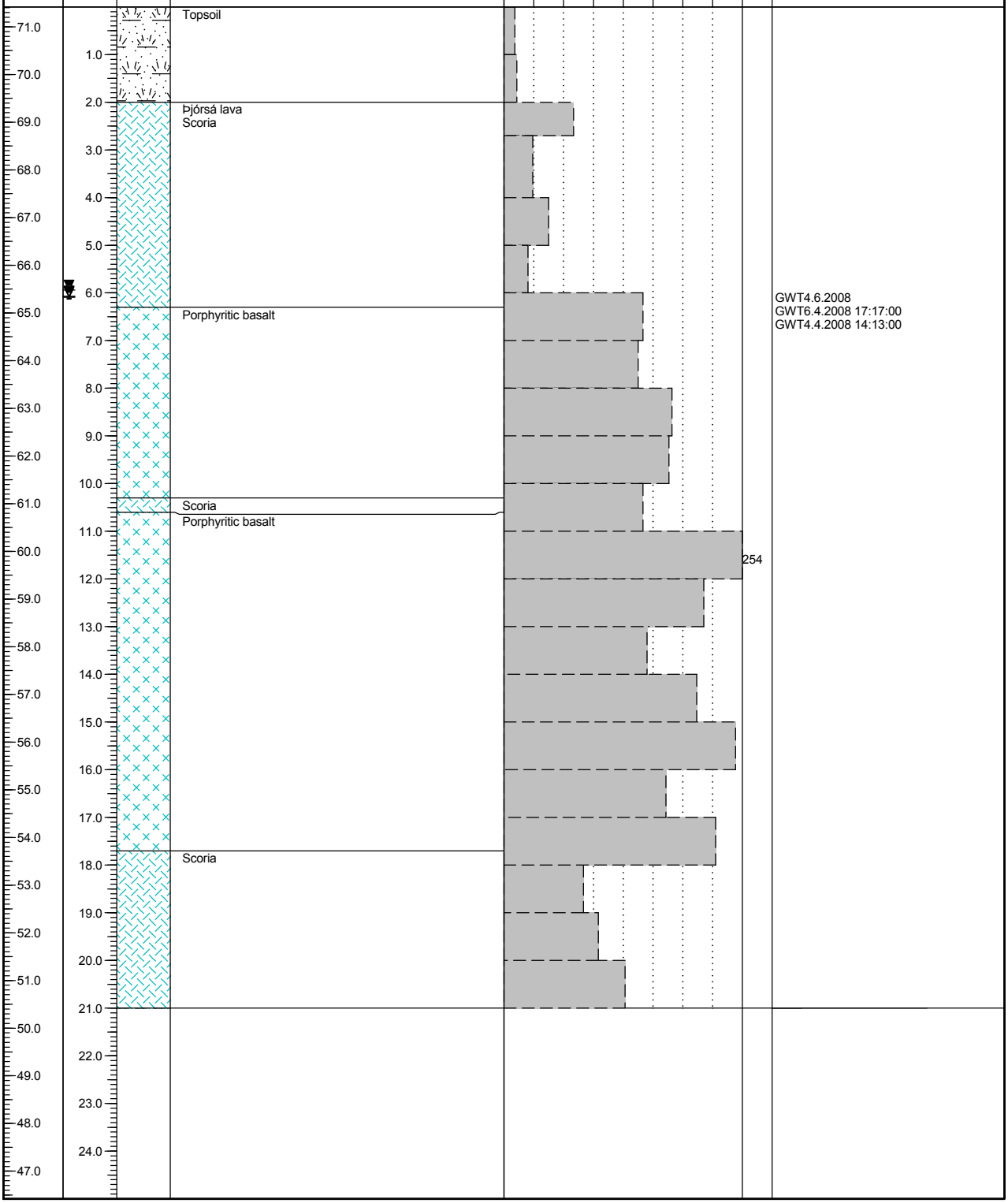
PERCUSSION DRILLING

BOREHOLE NO.:

NL-81

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 03.04.2008 COMPLETED: 03.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434987.48 Y: 390246.31 Z: 71.42	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	21.0 m	GROUNDWATER DEPTH:	6.07 m
		GROUNDWATER ELEVATION:	65.35 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

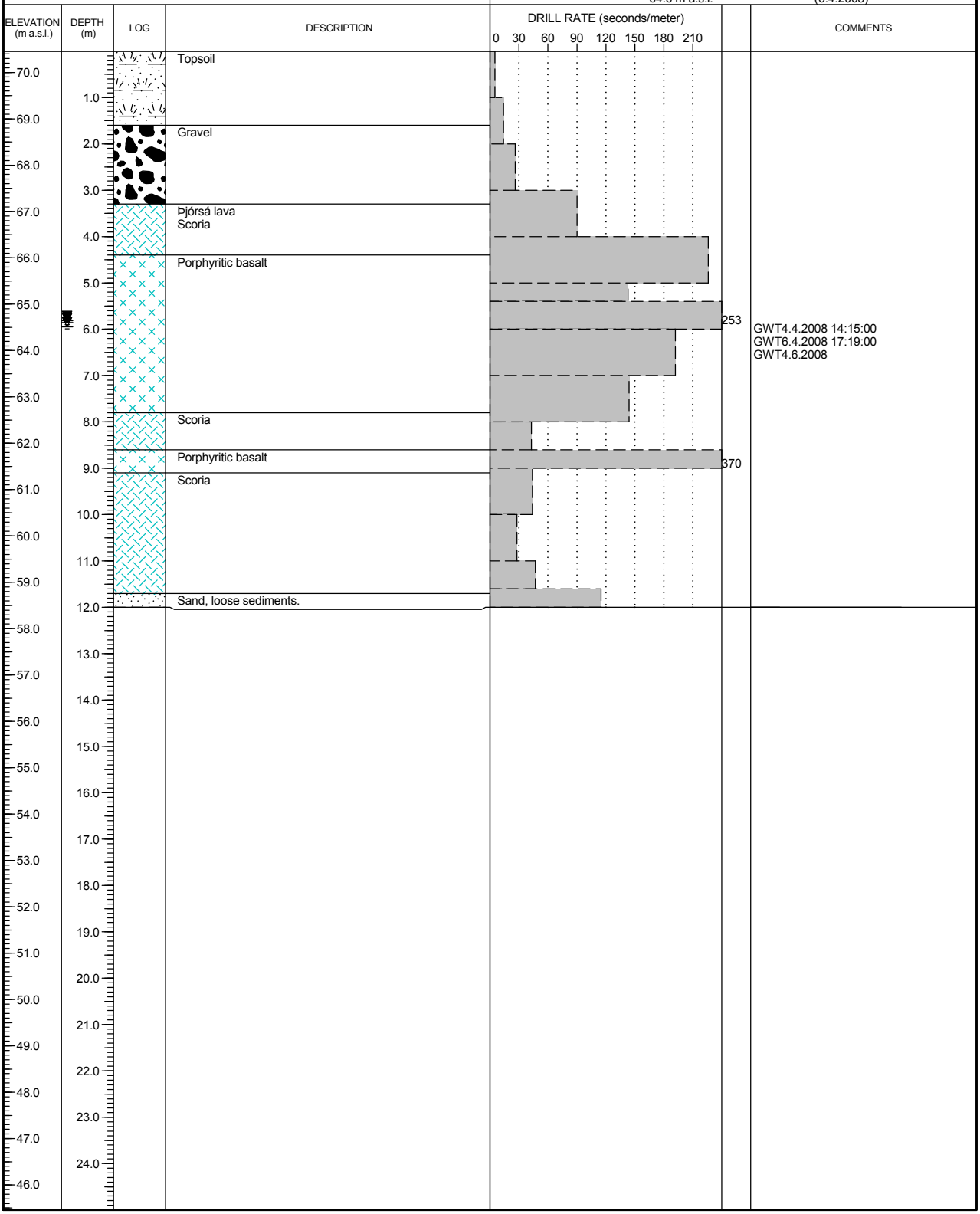
PERCUSSION DRILLING

BOREHOLE NO.:

NL-82

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 03.04.2008 COMPLETED: 03.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434904.88 Y: 390310.09 Z: 70.46	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	5.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	12.0 m	GROUNDWATER DEPTH:	5.86 m
		GROUNDWATER ELEVATION:	64.6 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-83

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 03.04.2008 COMPLETED: 03.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434752.42 Y: 390443.11 Z: 71.14	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	6.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	18.0 m	GROUNDWATER DEPTH:	6.98 m
		GROUNDWATER ELEVATION:	64.16 m a.s.l. (6.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210	COMMENTS
71.0	0.0		Topsoil		
70.0	1.0				
69.0	2.0				
68.0	3.0				
67.0	4.0		Þjórsá lava Scoria		
66.0	5.0				
65.0	6.0		Porphyritic basalt		
64.0	7.0				GWT4.4.2008 14:19:00 GWT6.4.2008 17:22:00 GWT4.6.2008
63.0	8.0				
62.0	9.0				
61.0	10.0				
60.0	11.0				
59.0	12.0		Scoria		
58.0	13.0		Porphyritic basalt		
57.0	14.0				
56.0	15.0		Scoria		
55.0	16.0				
54.0	17.0				
53.0	18.0		Sand and gravel.		
52.0	19.0				
51.0	20.0				
50.0	21.0				
49.0	22.0				
48.0	23.0				
47.0	24.0				

MANNVIT ENGINEERING

BOREHOLE LOG

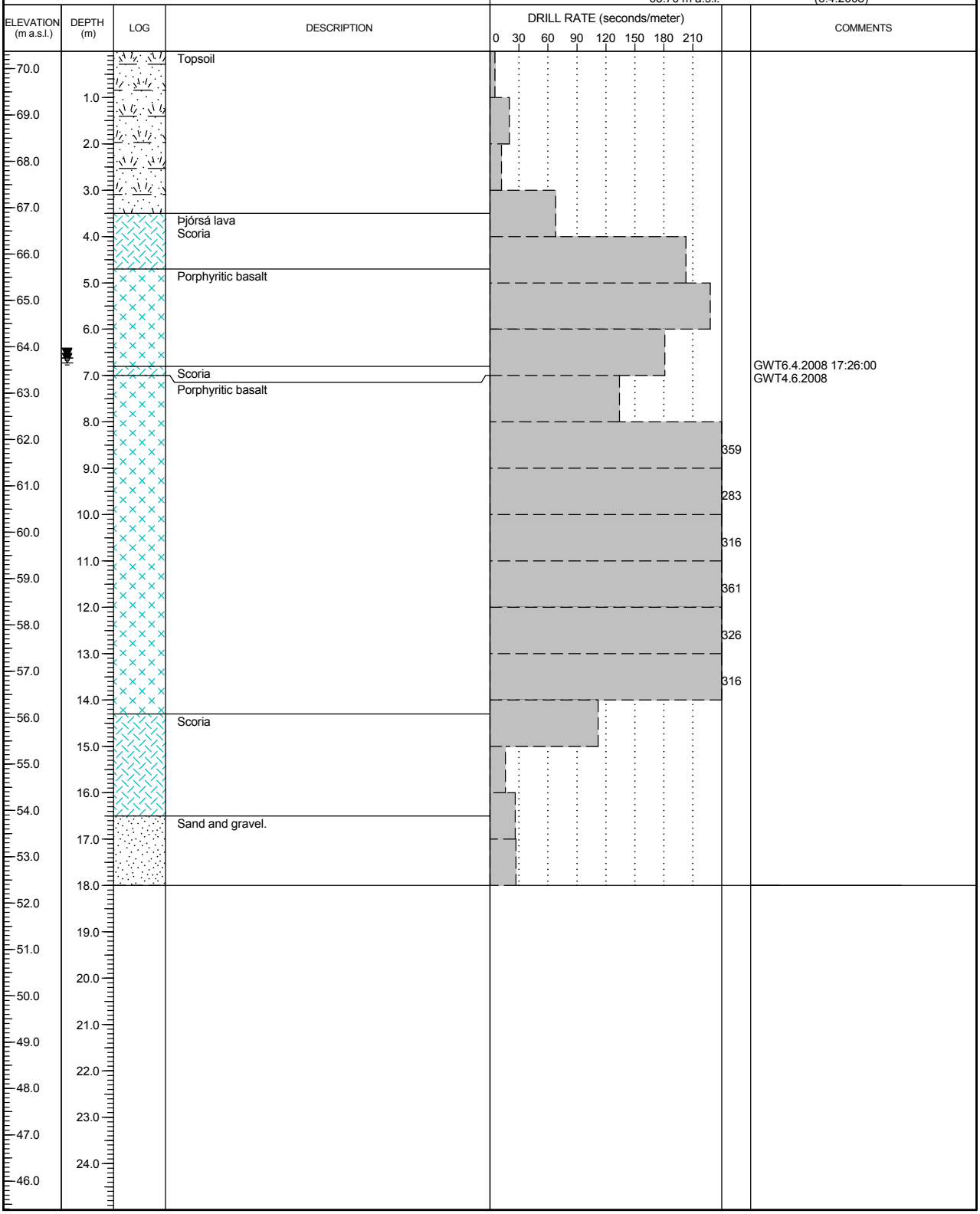
PERCUSSION DRILLING

BOREHOLE NO.:

NL-84

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 04.04.2008 COMPLETED: 04.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434673.78 Y: 390505.91 Z: 70.38	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	6.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	18.0 m	GROUNDWATER DEPTH:	6.62 m
		GROUNDWATER ELEVATION:	63.76 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

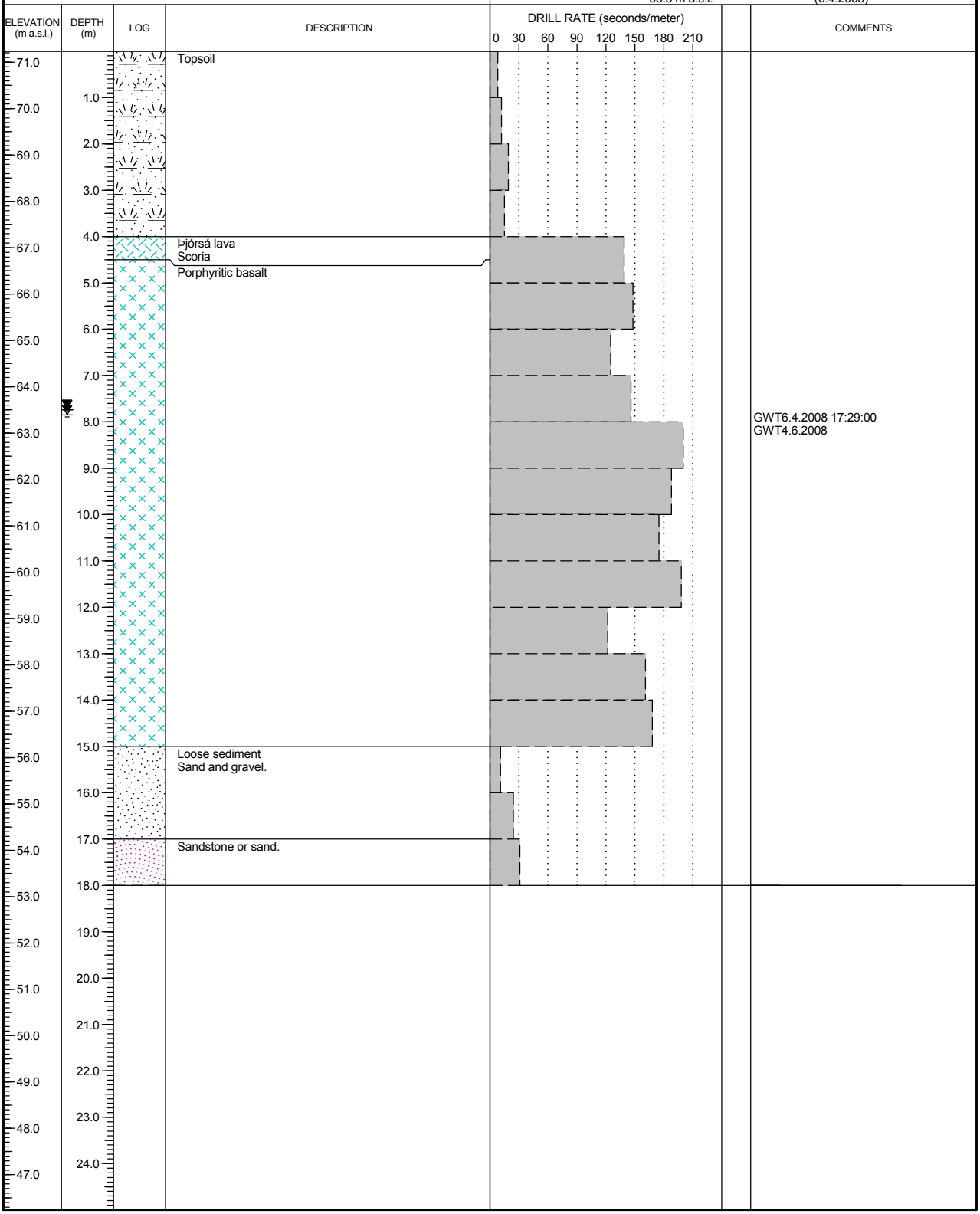
PERCUSSION DRILLING

BOREHOLE NO.:

NL-85

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 04.04.2008 COMPLETED: 04.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434601.05 Y: 390568.93 Z: 71.24	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	6.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	18.0 m	GROUNDWATER DEPTH:	7.74 m
		GROUNDWATER ELEVATION:	63.5 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

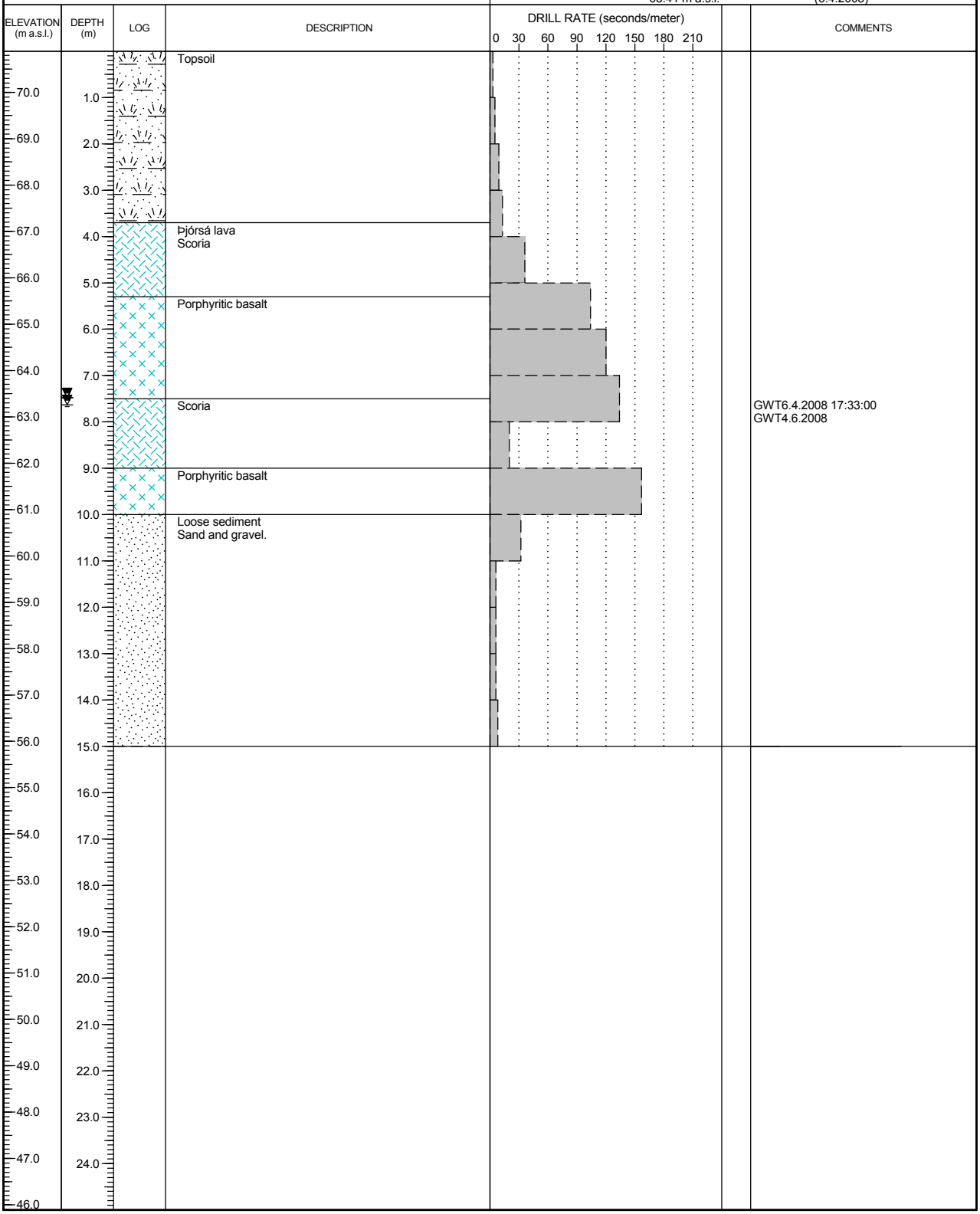
PERCUSSION DRILLING

BOREHOLE NO.:

NL-86

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 04.04.2008 COMPLETED: 04.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434526.8 Y: 390630.88 Z: 70.89	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	6.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	15.0 m	GROUNDWATER DEPTH:	7.48 m
		GROUNDWATER ELEVATION:	63.41 m a.s.l. (6.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-87

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 05.04.2008 COMPLETED: 05.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434369.88 Y: 390760.1 Z: 70.86	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	6.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	18.0 m	GROUNDWATER DEPTH:	7.85 m
		GROUNDWATER ELEVATION:	63.01 m a.s.l. (6.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210		COMMENTS
70.0	1.0		Topsoil			
69.0	2.0					
68.0	3.0		Þjórsá lava Porphyritic basalt			
67.0	4.0					
66.0	5.0					
65.0	6.0		Scoria			
64.0	7.0		Porphyritic basalt			
63.0	8.0		Scoria			GWT6.4.2008 17:37:00 GWT4.6.2008
62.0	9.0					
61.0	10.0					
60.0	11.0					
59.0	12.0		Porphyritic basalt			
58.0	13.0					
57.0	14.0					
56.0	15.0		Loose sediment Sand and gravel		262	
55.0	16.0					
54.0	17.0		Sandstone/Siltstone or sand.			
53.0	18.0					
52.0	19.0					
51.0	20.0					
50.0	21.0					
49.0	22.0					
48.0	23.0					
47.0	24.0					
46.0						

MANNVIT ENGINEERING

BOREHOLE LOG

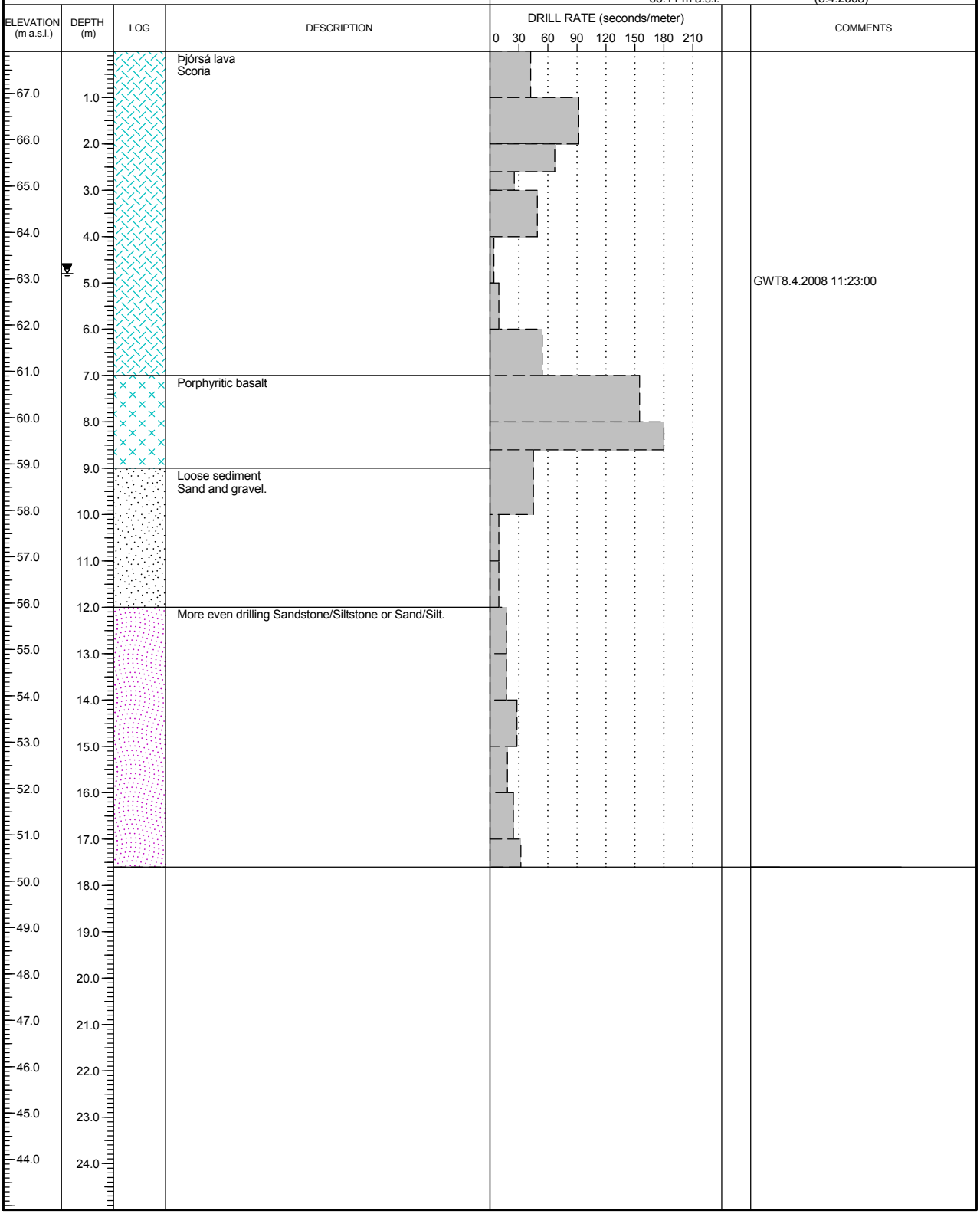
PERCUSSION DRILLING

BOREHOLE NO.:

NL-88

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 05.04.2008 COMPLETED: 05.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434297.09 Y: 390829.6 Z: 67.91	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	0.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	17.6 m	GROUNDWATER DEPTH:	4.8 m
		GROUNDWATER ELEVATION:	63.11 m a.s.l. (8.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

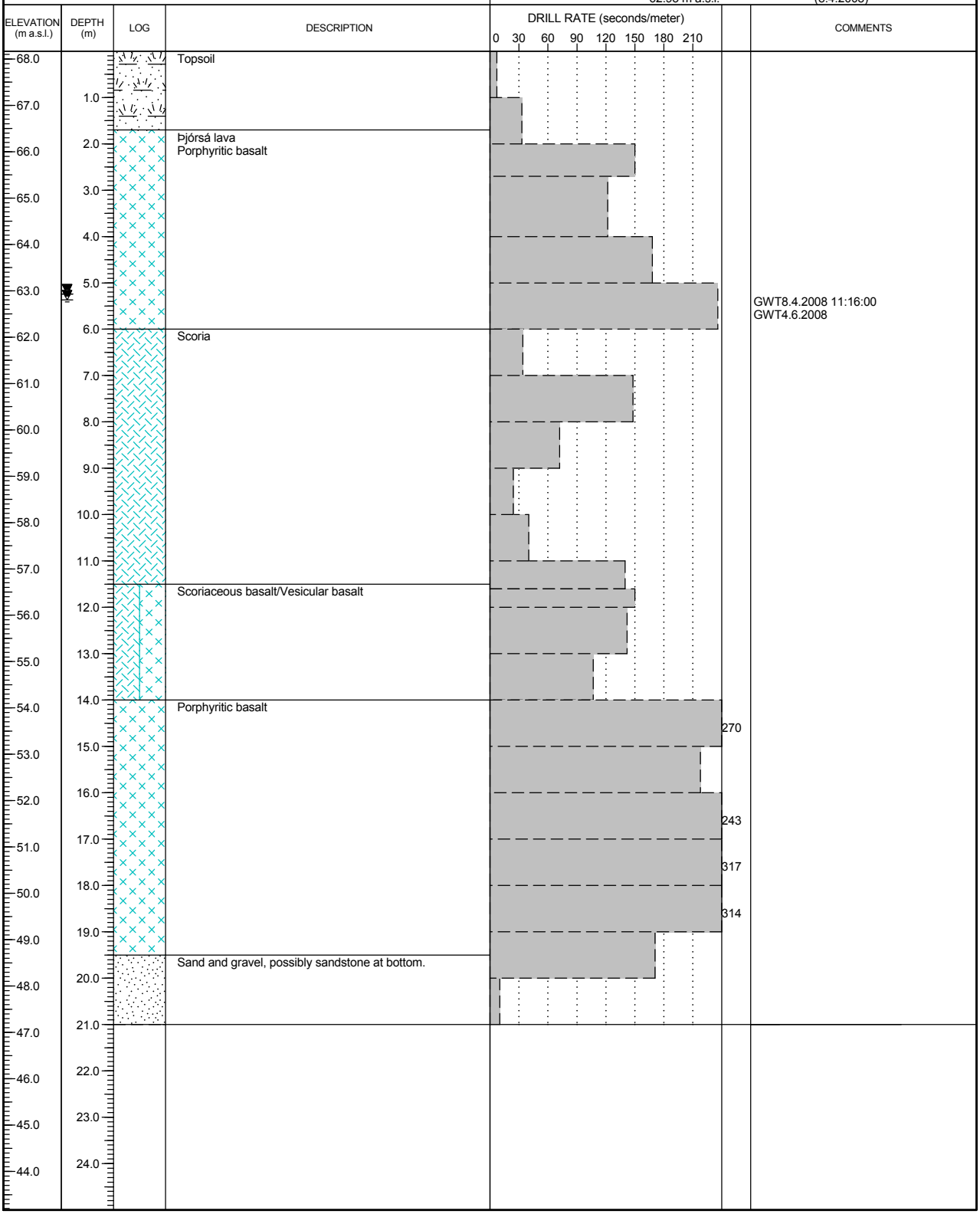
PERCUSSION DRILLING

BOREHOLE NO.:

NL-89

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 05.04.2008 COMPLETED: 05.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434219.06 Y: 390891.05 Z: 68.17	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	21.0 m	GROUNDWATER DEPTH:	5.24 m
		GROUNDWATER ELEVATION:	62.93 m a.s.l. (8.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

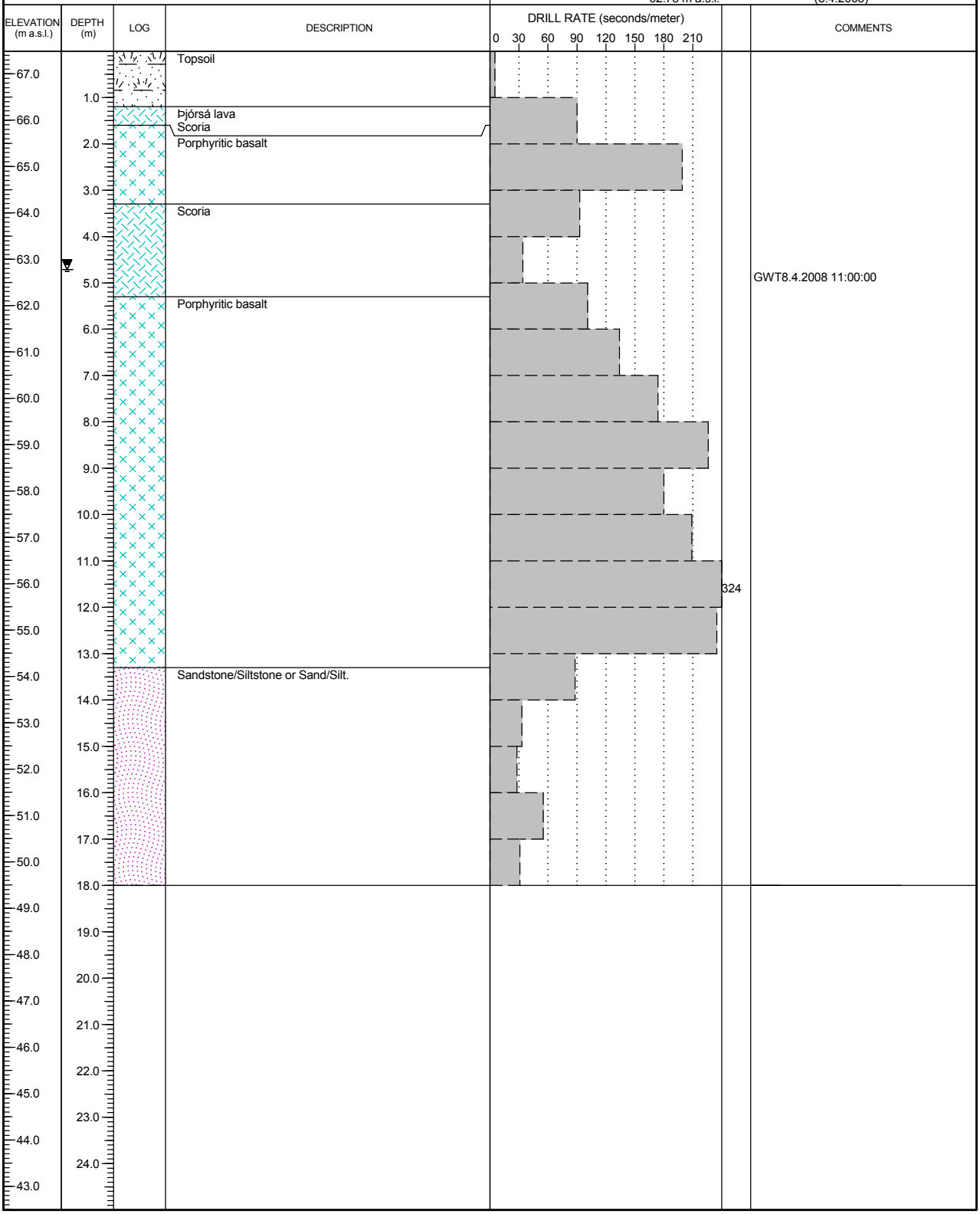
PERCUSSION DRILLING

BOREHOLE NO.:

NL-90

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 05.04.2008 COMPLETED: 05.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 434054.78 Y: 390988.41 Z: 67.49	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	18.0 m	GROUNDWATER DEPTH:	4.71 m
		GROUNDWATER ELEVATION:	62.78 m a.s.l. (8.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

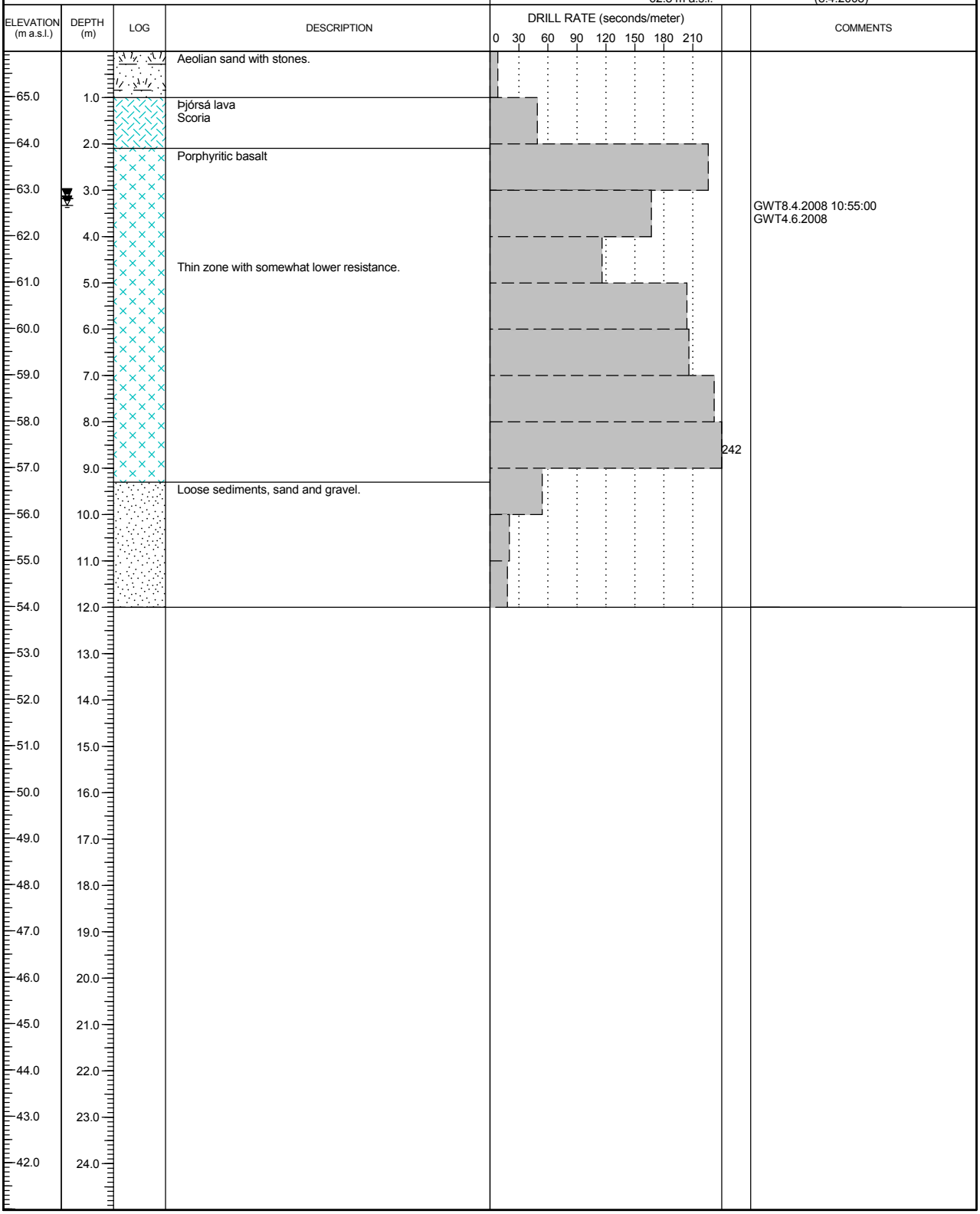
PERCUSSION DRILLING

BOREHOLE NO.:

NL-91

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 05.04.2008 COMPLETED: 05.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 433966.2 Y: 391010.25 Z: 65.98	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	12.0 m	GROUNDWATER DEPTH:	3.18 m
		GROUNDWATER ELEVATION:	62.8 m a.s.l. (8.4.2008)



MANNVIT ENGINEERING

BOREHOLE LOG

PERCUSSION DRILLING

BOREHOLE NO.:

NL-92

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 06.04.2008 COMPLETED: 06.04.2008
PROJECT:	Neðri Þjórsá	DRILLED BY:	Ræktunarsamband Flóa og Skeiða
LOCATION:	Holtavirkjun bridge	FOREMAN:	Maggi Gísla
STRUCTURE:	Dam area Akbraut	SUPERVISION:	Haraldur Hallsteinsson
COORDINATES:	X: 433766.04 Y: 391004.48 Z: 65.57	DRILLBIT TYPE:	Percussion drilling 3" cross bit, 76 mm
COORDINATE SYSTEM:	[X] ISNET [ ]	SAMPLING METHOD:	
CASING, LENGTH:	3.0 m [ ] CASING REMOVED	SAMPLING STANDARD:	
DEPTH OF HOLE:	17.0 m	GROUNDWATER DEPTH:	2.97 m
		GROUNDWATER ELEVATION:	62.6 m a.s.l. (8.4.2008)

ELEVATION (m a.s.l.)	DEPTH (m)	LOG	DESCRIPTION	DRILL RATE (seconds/meter) 0 30 60 90 120 150 180 210		COMMENTS
65.0			Topsoil			
	1.0		Þjórsá lava Porphyritic basalt			
64.0						
	2.0					
63.0						
	3.0					GWT8.4.2008 10:29:00 GWT4.6.2008
62.0						
	4.0					
61.0						
	5.0					
60.0						
	6.0					
59.0			Scoria/Sediment Scoria fragments and sand.			
	7.0					
58.0						
	8.0					
57.0						
	9.0					
56.0						
	10.0					
55.0						
	11.0					
54.0						
	12.0					
53.0						
	13.0					
52.0						
	14.0		Dyke/Basalt Dark gray drill cuttings with green clay on some surfaces.			
51.0						
	15.0					
50.0						
	16.0					
49.0					248	
	17.0					
48.0						
	18.0					
47.0						
	19.0					
46.0						
	20.0					
45.0						
	21.0					
44.0						
	22.0					
43.0						
	23.0					
42.0						
	24.0					
41.0						

Appendix G

Temperature measurements in boreholes

Temperature and conductivity in boreholes

Borehole: NK-84
Date: 7.4.2008
Water level: 2.5 m

Depth (m)	Elevation (m.a.s.l.)	Conductivity (µS)	Temperature (°C)
2.5	67.0	116	8.6
5.0	64.5	121	10.6
6.0	63.5	118	12.1
7.0	62.5	119	13.2
8.0	61.5	120	14
9.0	60.5	118	13.5
10	59.5	119	13.5
11	58.5	119	13.5
12	57.5	119	13.5
13	56.5	119	13.5
14	55.5	119	13.5
15	54.5	119	13.5
16	53.5	119	13.5
17	52.5	119	13.5
18	51.5	119	13.5
19	50.5	119	13.5
20	49.5	119	13.5
21	48.5	119	14.9
22	47.5	121	16

Borehole: NL-73
Date: 7.4.2008
Water level: 7.77 m

Depth (m)	Elevation (m.a.s.l.)	Conductivity (µS)	Temperature (°C)
2.5	70.6	0	13.5
5.0	68.1	0	13.7
6.0	67.1	0	14.2
7.0	66.1	0	19.1
7.8	65.3	355	31.7
7.9	65.2	414	32.2

Borehole: NL-74
Date: 7.4.2008
Water level: 5.26 m

Depth (m)	Elevation (m.a.s.l.)	Conductivity (µS)	Temperature (°C)
2.5	68.1	0	12.1
5.0	65.6	0	12.7
5.3	65.3	147	22.7
6.0	64.6	153	23.9
6.3	64.3	154	24.5

Temperature and conductivity in boreholes

Borehole: NL-76
Date: 7.4.2008
Water level: 5 m

Depth (m)	Elevation (m.a.s.l.)	Conductivity (µS)	Temperature (°C)
2.5	68.7	0	8.6
5.0	66.2	101	12.6
6.0	65.2	102	14.2
7.0	64.2	103	16
8.0	63.2	103	17.4
8.2	63.0	104	17.7

Borehole: NL-77
Date: 7.4.2008
Water level: 7.37 m

Depth (m)	Elevation (m.a.s.l.)	Conductivity (µS)	Temperature (°C)
1.0	71.4	0	10.5
2.0	70.4	0	10
3.0	69.4	0	9.6
4.0	68.4	0	9.5
5.0	67.4	0	9.4
6.0	66.4	0	9.4
7.0	65.4	0	9.5
7.4	65.0	119	11.9
8.0	64.4	117	12.4
9.0	63.4	120	13.2
10.0	62.4	125	14.2
11.0	61.4	141	15.6
12.0	60.4	162	17.1
13.0	59.4	161	18.5
13.5	58.9	92	19.9

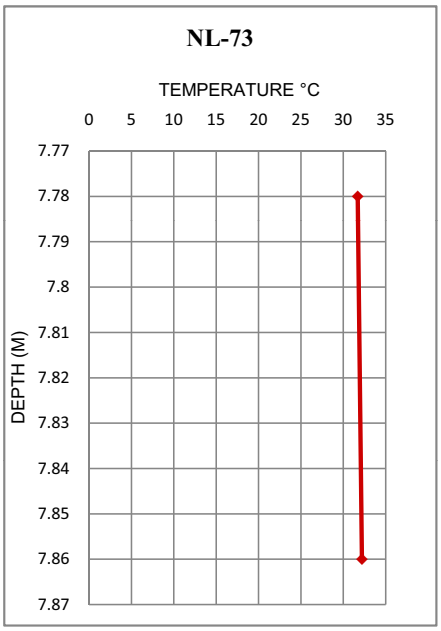
Temperature and conductivity in boreholes

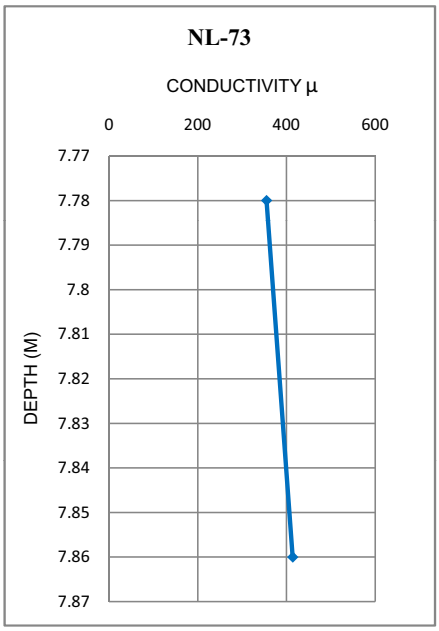
Borehole:	NL-78		
Date:	7.4.2008		
Water level:	4.85 m		
Depth (m)	Elevation (m.a.s.l.)	Conductivity (µS)	Temperature (°C)
1.0	69.1	0	11.1
3.0	67.1	0	11.4
4.0	66.1	0	11.9
4.9	65.3	99	25.6
6.0	64.1	167	27.4
7.0	63.1	167	26.7
8.0	62.1	163	26.2
8.5	61.6	164	26.1

Borehole:	NL-79		
Date:	7.4.2008		
Water level:	5.2 m		
Depth (m)	Elevation (m.a.s.l.)	Conductivity (µS)	Temperature (°C)
1.0	69.5	0	10.1
2.0	68.5	0	10.1
3.0	67.5	0	10.1
4.0	66.5	0	10.2
5.0	65.5	0	10.2
5.2	65.3	94	14.1
6.0	64.5	91	14.9
7.0	63.5	95	15.2
8.0	62.5	99	16.1
9.0	61.5	107	17
10.0	60.5	114	17.7
11.0	59.5	116	19
11.9	58.6	115	19.5

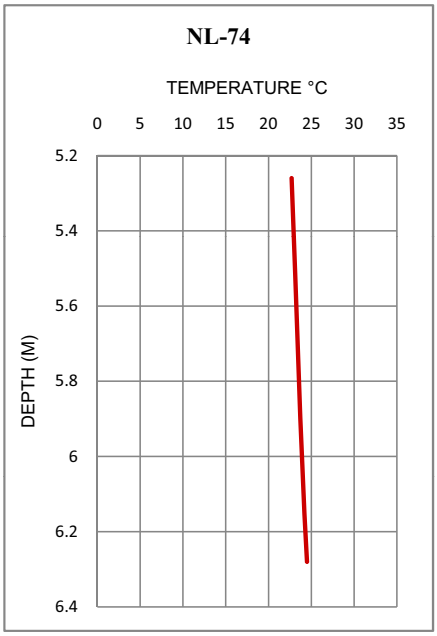
Temperature and conductivity measurements

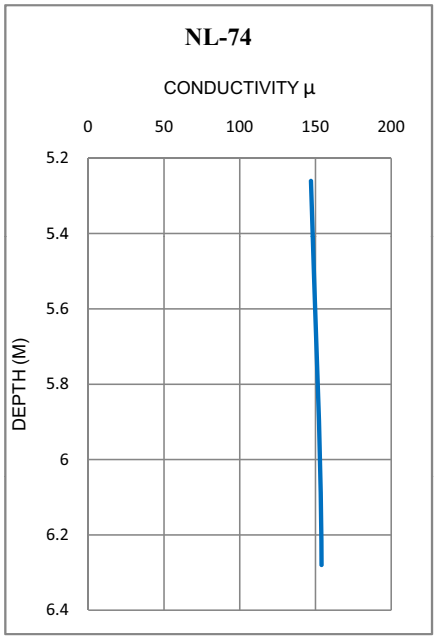
Borehole: NL-73





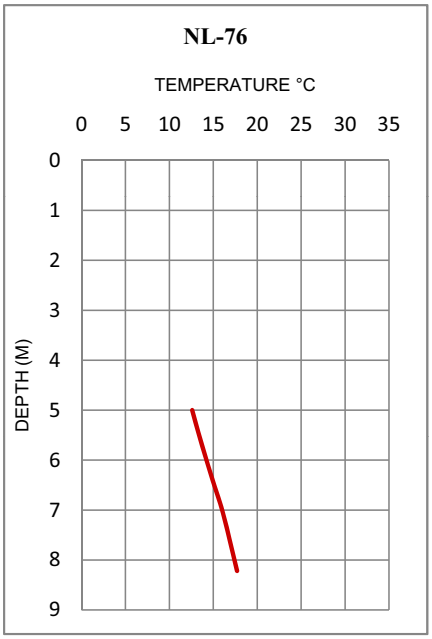
Borehole: NL-74

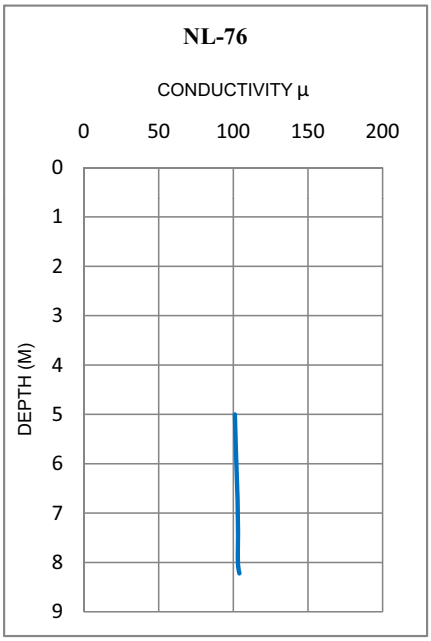




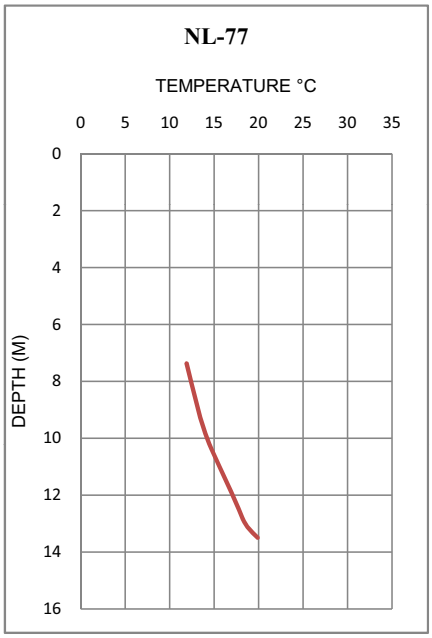
Temperature and conductivity measurements

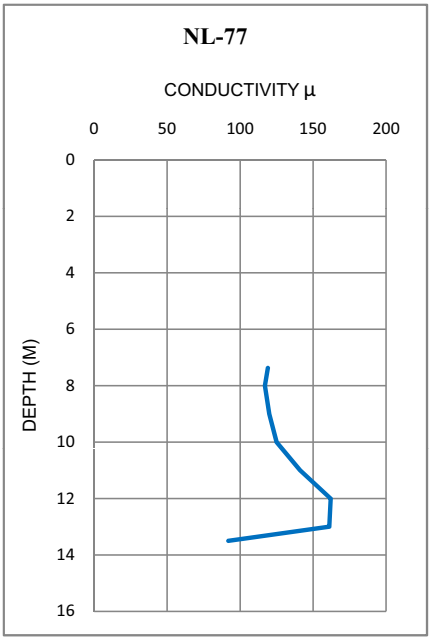
Borehole: NL-76





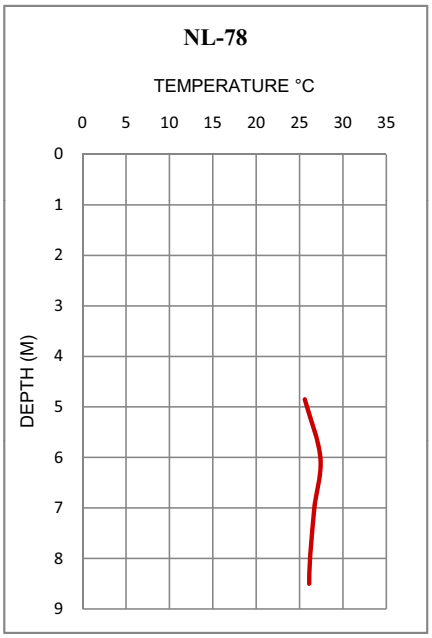
Borehole: NL-77

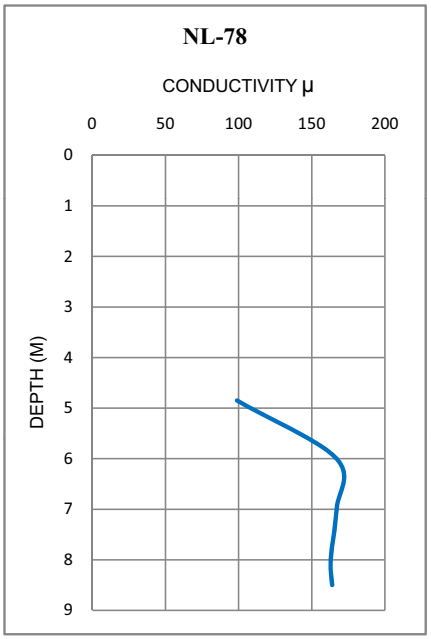




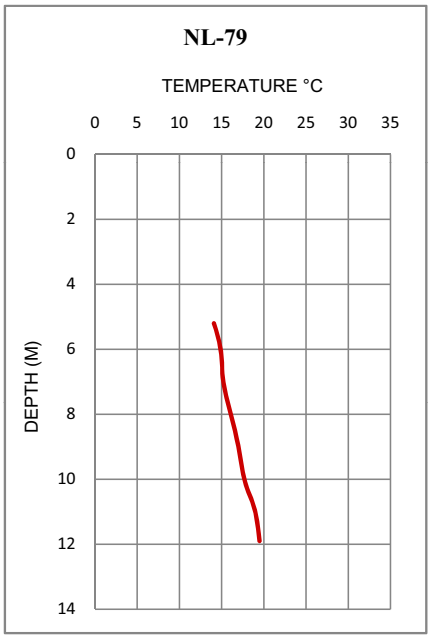
Temperature and conductivity measurements

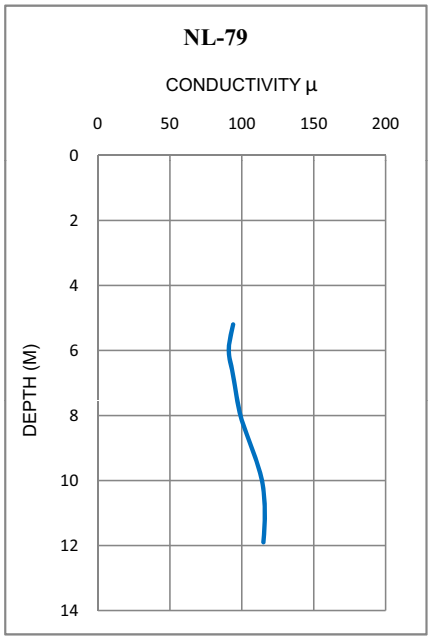
Borehole: NL-78





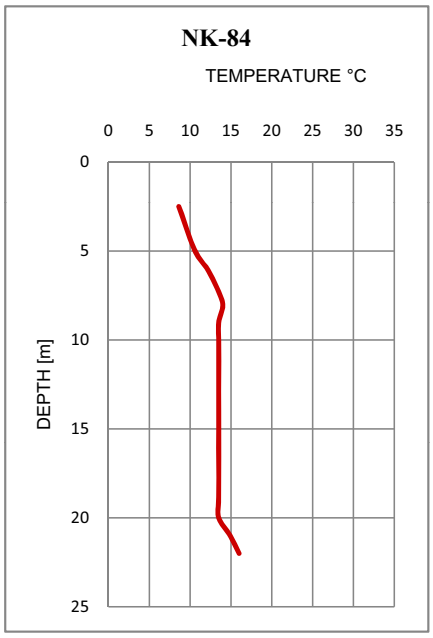
Borehole: NL-79

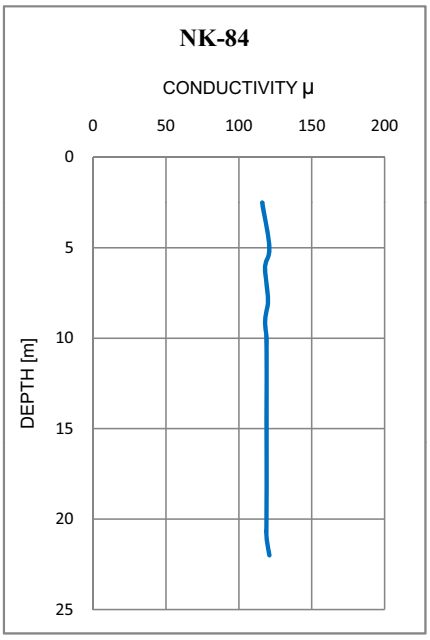




Temperature and conductivity measurements

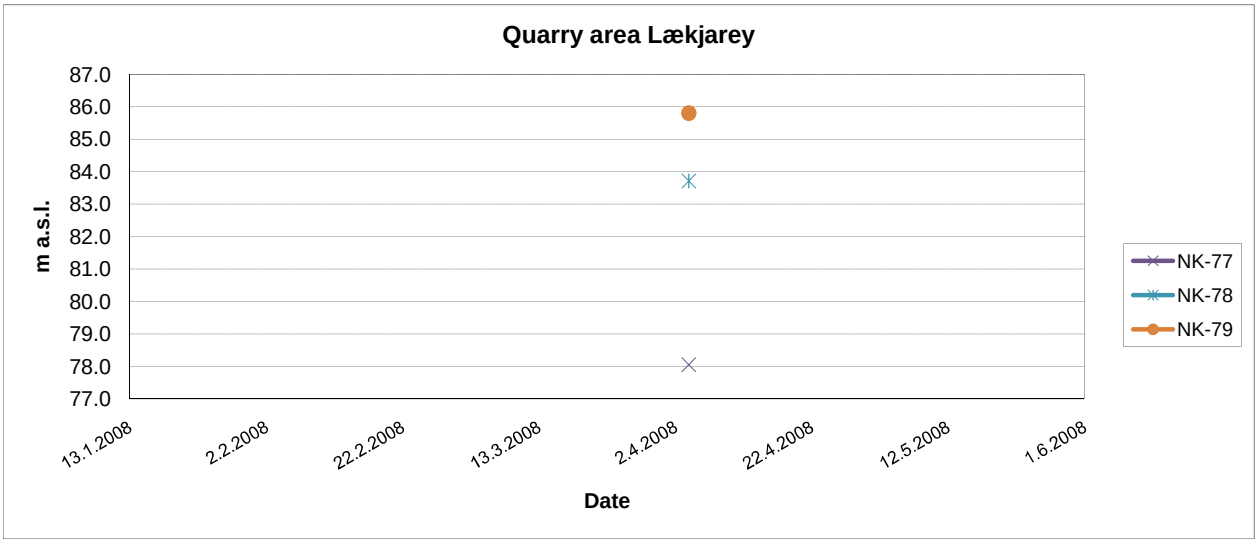
Borehole: NK-84

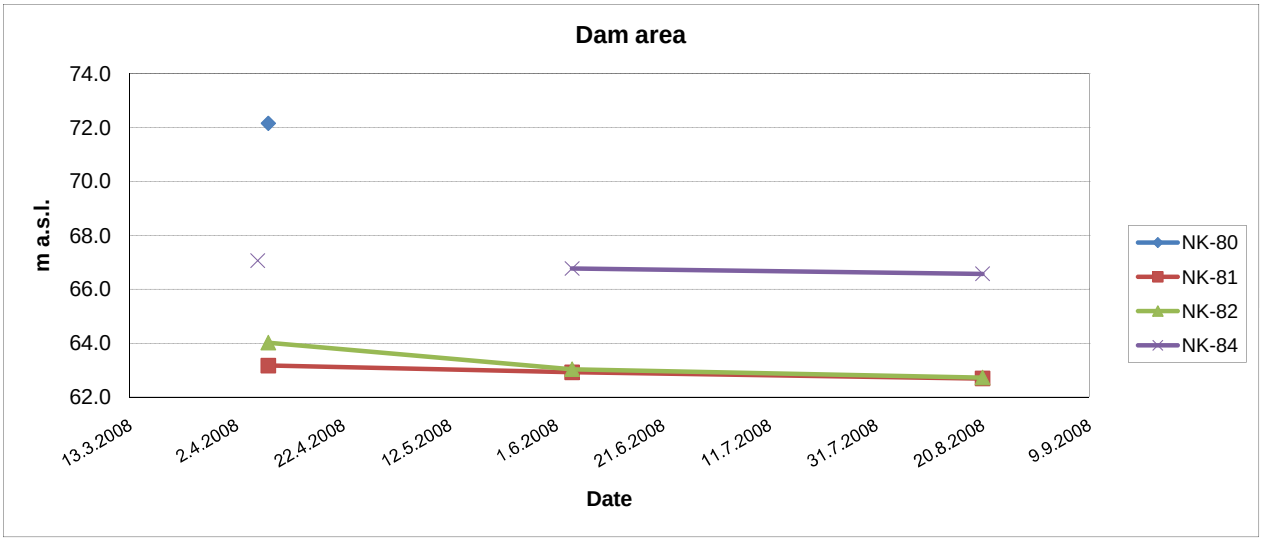


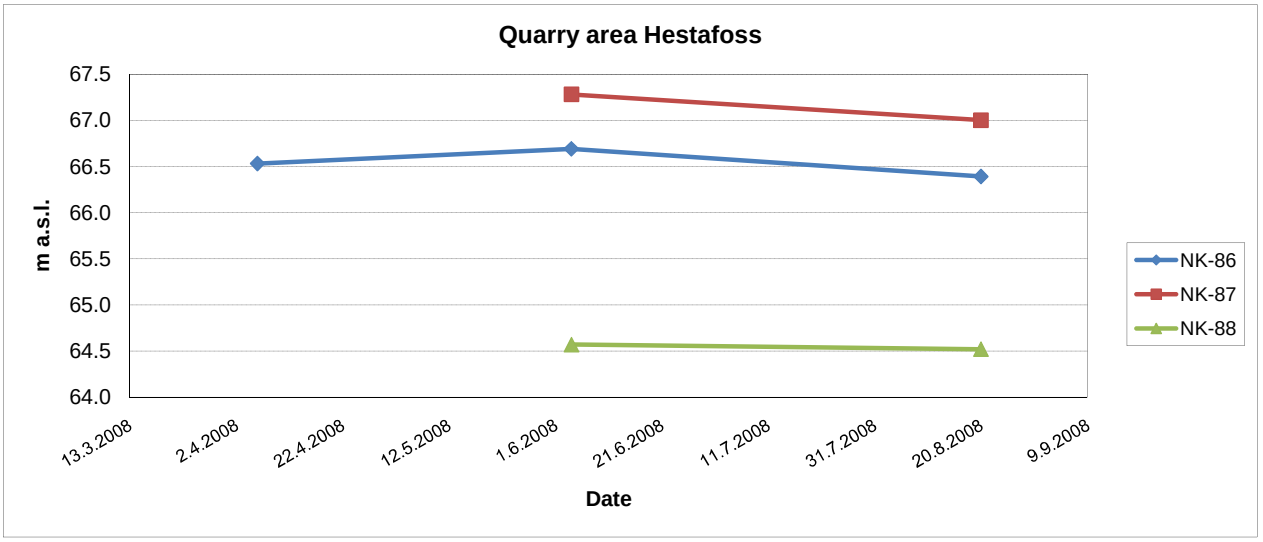


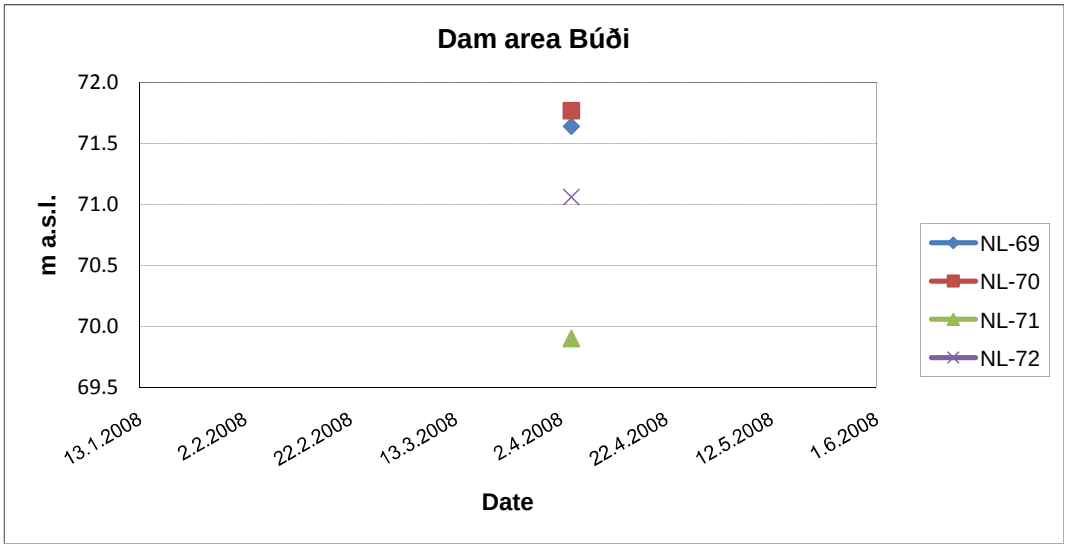
Appendix H

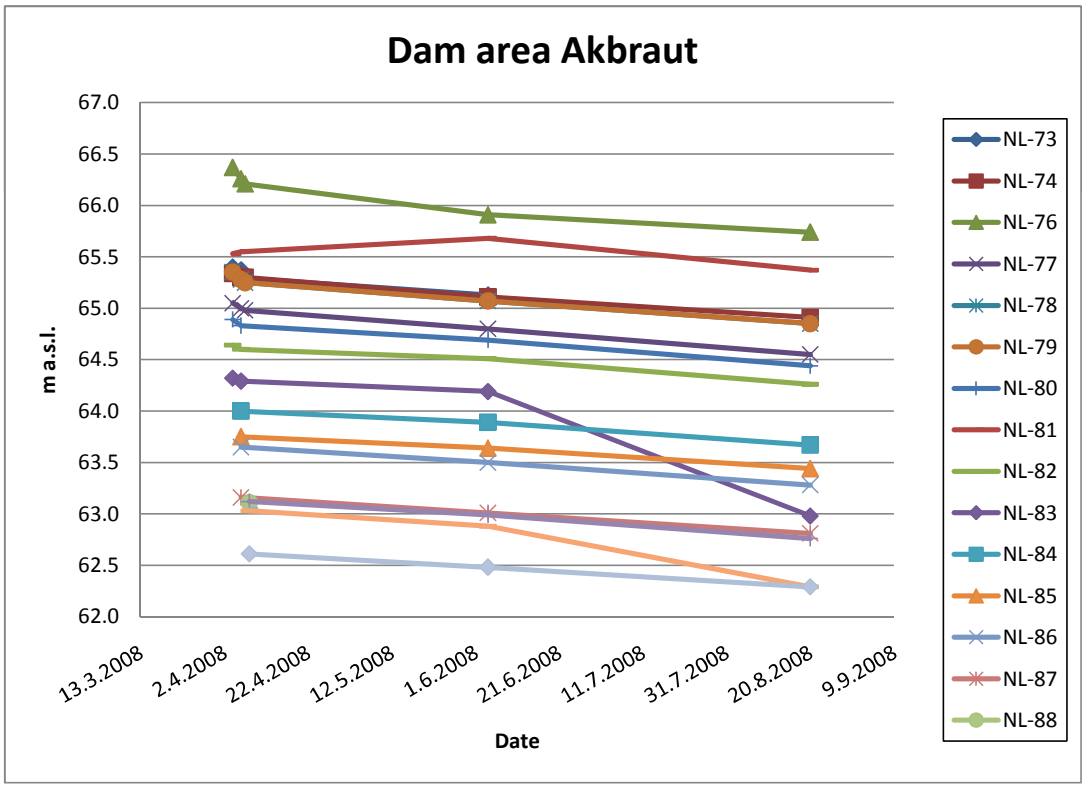
Groundwater measurements


Quarry area Lækjarey
87.0
86.0
85.0
84.0
83.0
82.0
81.0
80.0
79.0
78.0
77.0
m a.s.l.
13.1.2008
2.2.2008
22.2.2008
13.3.2008
2.4.2008
22.4.2008
12.5.2008
1.6.2008
Date
NK-77
NK-78
NK-79


Dam area
74.0
72.0
70.0
68.0
66.0
64.0
62.0
m a.s.l.
13.3.2008
2.4.2008
22.4.2008
12.5.2008
1.6.2008
21.6.2008
11.7.2008
31.7.2008
20.8.2008
9.9.2008
Date
NK-80
NK-81
NK-82
NK-84


Quarry area Hestafoss
67.5
67.0
66.5
66.0
65.5
65.0
64.5
64.0
m a.s.l.
13.3.2008
2.4.2008
22.4.2008
12.5.2008
1.6.2008
21.6.2008
11.7.2008
31.7.2008
20.8.2008
9.9.2008
Date
NK-86
NK-87
NK-88


Dam area Búði
72.0
71.5
71.0
70.5
70.0
69.5
m a.s.l.
13.1.2008
2.2.2008
22.2.2008
13.3.2008
2.4.2008
22.4.2008
12.5.2008
1.6.2008
Date
NL-69
NL-70
NL-71
NL-72


Dam area Akbraut
67.0
66.5
66.0
65.5
65.0
64.5
64.0
63.5
63.0
62.5
62.0
m a.s.l.
13.3.2008
2.4.2008
22.4.2008
12.5.2008
1.6.2008
21.6.2008
11.7.2008
31.7.2008
20.8.2008
9.9.2008
Date
NL-73
NL-74
NL-76
NL-77
NL-78
NL-79
NL-80
NL-81
NL-82
NL-83
NL-84
NL-85
NL-86
NL-87
NL-88

Appendix I

Logs of excavation pits (B01-B22)

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B01

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 434005.0 Y: 390963.0 Z: 66.2	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0			Soil			
	1.0		Þjórsá Lava			
65.0			Soil			
	2.0		Sand and gravel			
64.0						
	3.0					
63.0						
	4.0					
62.0						
	5.0					
61.0						
	6.0					
60.0						
	7.0					
59.0						
	8.0					
58.0						
	9.0					
57.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B02

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 434034.0 Y: 390950.0 Z: 66.5	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0	0.0		Soil			
	1.0		Þjórsá Lava			
65.0			Soil			
	2.0		Sand and gravel			
64.0						
	3.0					
63.0						
	4.0					
62.0						
	5.0					
61.0						
	6.0					
60.0						
	7.0					
59.0						
	8.0					
58.0						
	9.0					
57.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B03

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 434082.0 Y: 390944.0 Z: 67.0	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0	1.0		Soil			
			Þjórsá Lava			
			Soil			
65.0	2.0		Sand and gravel			
64.0	3.0					
63.0	4.0					
62.0	5.0					
61.0	6.0					
60.0	7.0					
59.0	8.0					
58.0	9.0					

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B04

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 434113.0 Y: 390910.0 Z: 66.8	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0	1.0		Soil			
			Þjórsá Lava			
65.0	2.0		Soil			
			Sand and gravel			
64.0	3.0					
63.0	4.0					
62.0	5.0					
61.0	6.0					
60.0	7.0					
59.0	8.0					
58.0	9.0					
57.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B05

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 434131.0 Y: 390887.0 Z: 67.0	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0	1.0		Soil			
			Þjórsá Lava			
			Soil			
65.0	2.0		Sand and gravel			
64.0	3.0					
63.0	4.0					
62.0	5.0					
61.0	6.0					
60.0	7.0					
59.0	8.0					
58.0	9.0					

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B06

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 434124.0 Y: 390870.0 Z: 66.8	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0	1.0		Soil			
			Þjórsá Lava			
65.0	2.0		Soil			
			Sand and gravel			
64.0	3.0					
63.0	4.0					
62.0	5.0					
61.0	6.0					
60.0	7.0					
59.0	8.0					
58.0	9.0					
57.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B07

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 434118.0 Y: 390832.0 Z: 66.2	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0			Soil			
	1.0		Þjórsá Lava			
65.0			Soil			
	2.0		Sand and gravel			
64.0						
	3.0					
63.0						
	4.0					
62.0						
	5.0					
61.0						
	6.0					
60.0						
	7.0					
59.0						
	8.0					
58.0						
	9.0					
57.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B08

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 433980.0 Y: 390977.0 Z: 66.0	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	1.0		Soil			
			Þjórsá Lava			
			Soil			
64.0	2.0		Sand and gravel			
63.0	3.0					
62.0	4.0					
61.0	5.0					
60.0	6.0					
59.0	7.0					
58.0	8.0					
57.0	9.0					

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B09

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holt Power Plant	SUPERVISION:	EFE
COORDINATES:	X: 433981.0 Y: 390988.0 Z: 66.0	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	1.0		Soil			
			Þjórsá Lava			
			Soil			
64.0	2.0		Sand and gravel			
63.0	3.0					
62.0	4.0					
61.0	5.0					
60.0	6.0					
59.0	7.0					
58.0	8.0					
57.0	9.0					

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B10

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433944.0 Y: 390958.0 Z: 66.2	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0			Soil			
	1.0		Þjórsá Lava			
65.0			Soil			
	2.0		Sand and gravel			
64.0						
	3.0					
63.0						
	4.0					
62.0						
	5.0					
61.0						
	6.0					
60.0						
	7.0					
59.0						
	8.0					
58.0						
	9.0					
57.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B11

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433907.0 Y: 390930.0 Z: 65.8	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	1.0		Soil			
64.0	2.0		Sand and gravel			
63.0	3.0					
62.0	4.0					
61.0	5.0					
60.0	6.0					
59.0	7.0					
58.0	8.0					
57.0	9.0					
56.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B12

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433912.0 Y: 390976.0 Z: 65.8	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	1.0		Soil			
			Þjórsá Lava			
64.0	2.0		Soil			
			Sand and gravel			
63.0	3.0					
62.0	4.0					
61.0	5.0					
60.0	6.0					
59.0	7.0					
58.0	8.0					
57.0	9.0					
56.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B13

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433868.0 Y: 390977.0 Z: 65.5	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	0.0		Soil			
	1.0		Þjórsá Lava			
64.0			Soil			
	2.0		Sand and gravel			
63.0						
	3.0					
62.0						
	4.0					
61.0						
	5.0					
60.0						
	6.0					
59.0						
	7.0					
58.0						
	8.0					
57.0						
	9.0					
56.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B14

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433867.0 Y: 390944.0 Z: 65.5	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	0.0		Soil			
	1.0		Þjórsá Lava			
64.0			Soil			
	2.0		Sand and gravel			
63.0						
	3.0					
62.0						
	4.0					
61.0						
	5.0					
60.0						
	6.0					
59.0						
	7.0					
58.0						
	8.0					
57.0						
	9.0					
56.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B15

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433879.0 Y: 390924.0 Z: 65.6	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	1.0		Soil			
			Þjórsá Lava			
64.0	2.0		Soil			
			Sand and gravel			
63.0	3.0					
62.0	4.0					
61.0	5.0					
60.0	6.0					
59.0	7.0					
58.0	8.0					
57.0	9.0					
56.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B16

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433899.0 Y: 390912.0 Z: 65.6	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	0.0		Soil			
	1.0		Þjórsá Lava			
64.0			Soil			
	2.0		Sand and gravel			
63.0						
	3.0					
62.0						
	4.0					
61.0						
	5.0					
60.0						
	6.0					
59.0						
	7.0					
58.0						
	8.0					
57.0						
	9.0					
56.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B17

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433908.0 Y: 390881.0 Z: 65.2	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0			Soil			
	1.0		Þjórsá Lava			
64.0			Soil			
	2.0		Sand and gravel			
63.0						
	3.0					
62.0						
	4.0					
61.0						
	5.0					
60.0						
	6.0					
59.0						
	7.0					
58.0						
	8.0					
57.0						
	9.0					
56.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B18

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 434102.0 Y: 390830.0 Z: 65.4	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0			Soil			
	1.0					
64.0						
	2.0		Sand and gravel			
63.0						
	3.0					
62.0						
	4.0					
61.0						
	5.0					
60.0						
	6.0					
59.0						
	7.0					
58.0						
	8.0					
57.0						
	9.0					
56.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B19

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 434116.0 Y: 390875.0 Z: 66.6	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0	1.0		Soil			
65.0	2.0		Sand and gravel			
64.0	3.0					
63.0	4.0					
62.0	5.0					
61.0	6.0					
60.0	7.0					
59.0	8.0					
58.0	9.0					
57.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B20

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 434072.0 Y: 390931.0 Z: 66.7	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
66.0	1.0		Soil			
65.0	2.0		Sand and gravel			
64.0	3.0					
63.0	4.0					
62.0	5.0					
61.0	6.0					
60.0	7.0					
59.0	8.0					
58.0	9.0					
57.0						

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B21

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433955.0 Y: 390937.0 Z: 66.0	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	1.0		Soil			
64.0	2.0		Sand and gravel			
63.0	3.0					
62.0	4.0					
61.0	5.0					
60.0	6.0					
59.0	7.0					
58.0	8.0					
57.0	9.0					

MANNVIT ENGINEERING

TEST PIT LOG

TEST PIT NO.:

B22

SHEET 1 OF 1

CLIENT:	Landsvirkjun	DATE:	STARTED: 21.12.2007 COMPLETED: 21.12.2007
PROJECT:	Neðri Þjórsá	EXCAVATED BY:	Nesey
LOCATION:	Akbraut	FOREMAN:	
STRUCTURE:	Holtavirkjun Dam Area	SUPERVISION:	EFE
COORDINATES:	X: 433905.0 Y: 390964.0 Z: 65.7	EXCAVATOR, TYPE, SIZE:	
COORDINATE SYSTEM:	[X] ISNET [ ]	SHOVEL, TYPE, SIZE:	
EXCAVATED DEPTH:	4.0 m	GROUNDWATER DEPTH:	
		GROUNDWATER ELEVATION:	

ELEVATION (m A.S.L.)	DEPTH (m)	LOG	DESCRIPTION	SAMPLE	SAMPLE ID	COMMENTS
65.0	1.0		Soil			
64.0	2.0		Sand and gravel			
63.0	3.0					
62.0	4.0					
61.0	5.0					
60.0	6.0					
59.0	7.0					
58.0	8.0					
57.0	9.0					
56.0						