P-06-92

Forsmark site investigation

Description, sampling and analyses of Quaternary deposits in connection with groundwater monitoring wells, pumping wells and BAT filter tips

Hanna Lokrantz, Anna Hedenström
Sveriges Geologiska Undersökning

October 2006

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Keywords: AP PF 400-05-134, Wetland, Peat, Clay, Gyttja, Quaternary deposits, Organic carbon.

Abstract

Lithostratigraphical description, sampling and sample analyses of Quaternary deposits were conducted on cores at three different types of wetlands and at some locally elevated areas in the Forsmark area. This work was conducted in connection with supplementary installations of groundwater monitoring wells, pumping wells and BAT filter tips to assess hydrological, hydraulic, geochemical and hydrochemical properties of Quaternary deposits in assumed groundwater discharge areas. Samples were analysed for grain-size distribution, hydraulic conductivity, $CaCO_3$ content and organic carbon.

Sammanfattning

Litostratigrafisk beskrivning, provtagning och analyser av kvartära avlagringar utfördes på borrkärnor från tre typer av våtmarker och några lokala höjdlägen i Forsmarksområdet. Detta arbete utfördes i samband med kompletterande installationer av grundvattenrör, jord-bergbrunnar och BAT-spetsar för att karaktärisera de hydrologiska, hydrauliska, geokemiska och hydrokemiska egenskaperna hos de kvartära avlagringarna i förmodade utströmningsområden. Proverna analyserades för att erhålla kornstorleksfördelning, hydraulisk konduktivitet, kalkhalt och organiskt kol.

Contents

1 Introduction

This document reports the results gained by the investigation *Kompletterande borrningar i jord, installationer av grundvattenrör, jord-bergbrunnar och BAT-spetsar samt provtagning och analyser*, which is one of the activities performed within the site investigation at Forsmark. The work was carried out in accordance with activity plan AP PF 400-05-134. In Table 1-1 controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents.

The work was conducted in February 2006 in connection with complementary installations of groundwater wells, pumping wells and BAT filter tips. It encompasses lithostratigraphical descriptions and analytical results from borings in three different types of wetlands and at some locally elevated areas in the Forsmark area (Figure 1-1).

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

Activity plan	**Number**	**Version**
Kompletterande borrningar i jord, installationer av grundvattenrör, jord-bergbrunnar och BAT-spetsar samt provtagning och analyser	AP PF 400-05-134	1.0
Method documents	**Number**	**Version**
Metodbeskrivning för jordartskartering	SKB MD 131.001	1.0
Metodbeskrivning för torvmarksundersökningar	SKB MD 131.002	1.0

Figure 1-1. *Location of investigation areas and separate SFM-sites within the activity.*

2 Objective and scope

This work was carried out in connection with installation of groundwater monitoring wells, pumping wells and BAT filter tips to assess hydrological, hydraulic, geochemical and hydrochemical properties of Quaternary deposits in assumed groundwater discharge areas and some locally elevated areas, see /Werner et al. 2006/. The hydraulic contact between wetlands and their surroundings may vary depending on the type of wetland. In the Forsmark area, two main types of wetlands are defined: those located in a basin with a continuous layer of clay and wetlands without clay. Additionally, the wetlands may be further divided according to their age into young wetlands situated at altitudes below 5 m above sea level and older wetlands, situated at higher altitudes, containing a surface layer of > 0.5 m peat. The investigated sites represent three different types of wetlands. Additionally investigated points are located at locally elevated areas within the Forsmark candidate area.

At each site, the stratigraphical succession was documented in cores taken with a Russian peat corer and/or machine driven corers. Probing along a cross-section in the bog at wetland 3 was also conducted. Samples from minerogenic sediments were collected for laboratory analyses of grain size distribution, hydraulic conductivities and $CaCO_3$ content, while organic sediments were sampled for $CaCO_3$ and organic content. The geometry and physical properties of the sediments are important for hydrogeological modelling, and hydraulic properties can be calculated from the grain size distribution.

3 Equipment

3.1 Description of equipment/interpretation tools

The equipment mainly used in this fieldwork is a Russian peat corer, which was described in P-03-24 /Hedenström 2003/. For the equipment used when installing groundwater wells, abstraction wells and BAT filter tips, see /Werner et al. 2006/.

Analyses of grain size and calculation of hydraulic conductivities, colour, analyses of $CaCO_3$ content and organic content were carried out at SWECO Geolab according to /SIS 1990, 1992ab, Munsell 1994/, and /Talme and Almén 1975/, respectively.

4 Execution

4.1 General

An initial inventory of wetland types was performed in August 2005. The inventory included simplified stratigraphical descriptions based on probings and corings at 25 sites concentrated to the area close to Lake Bolundsfjärden. The sites were classified according to wetland type and used as a base for the selection of the wetlands for further investigation.

At the three selected sites, representing different types of wetlands, cores from ground level down to till were taken with a Russian peat corer (Figure 4-1), and the cores were lithostratigraphically described and samples were collected. Furthermore, auger drilling with a track-driven geotechnical drilling rig in connection with the installations of groundwater monitoring wells, pumping wells and BAT filter tips enabled description and sampling of the till in the wetland areas as well as in locally elevated areas outside the three wetland areas /Werner et al. 2006/.

Figure 4-1*. Coring with a Russian peat corer in the bog at Wetland 3.*

4.2 Data handling/post processing

Unique id codes were assigned to the sites for the installation of groundwater wells, pumping wells and BAT filter tips (SFM-series) and to other observation points (PFM-series). All geological data are stored in SGU's database (Jorddagboken 5.4.3), exported to Excel-files and delivered to SKB. Data from analyses (grain size distribution, $CaCO_3$ content, hydraulic conductivities and organic content) are stored in the SICADA database and are traceable by the activity plan number.

4.3 Analyses and interpretations

The lithostratigraphy from corings was described directly in the field and samples were selected for grain size and $CaCO_3$ analyses and analyses of organic content. Grain size analyses on material < 20 mm were carried out at SWECO Geolab in Stockholm according to /SIS 1992a/ and the hydraulic conductivities were calculated from the grain size distribution. The grain size distribution of coarse material (0.063–20 mm) was determined by sieving and finer material (< 0.063 mm) with a hydrometer /SIS 1992b/. The content of $CaCO_3$ was determined at SWECO Geolab on all samples, both on organic and minerogenic material (grain sizes < 0.063 mm), using Passons apparatus /Talme and Almén 1975/. The organic carbon content was analysed at SWECO Geolob, using loss on ignition method /SIS 1990/. The colour of the sediment was classified according to standard soil colour charts by /Munsell 1994/. The analytical data are stored in the SKB SICADA database and are traceable by the activity plan number.

4.4 Nonconformities

No till sample could be retrieved at SFM0095.

5 Results

The initial inventory of 25 sites has been interpreted into simplified lithostratigraphies, presented in Appendix 1. In summary, 13 sites contained a clay layer and at 12 sites the organic sediment was resting directly on coarse minerogenic material, often till (Figure 5-1).

The lithostratigraphy from three cores from wetland areas, one from each investigation area and six cores from locally elevated areas outside the wetland areas was described and selected samples were analysed for grain size distribution, $CaCO_3$ content and organic content. A general stratigraphy for each wetland is summarised in Table 5-1 and stratigraphical descriptions from each coring site are stored in SICADA. Analytical results of $CaCO_3$ and organic content as well as hydraulic conductivities are shown in Table 5-2 and graphs showing the grain size distributions are presented in Appendix 2.

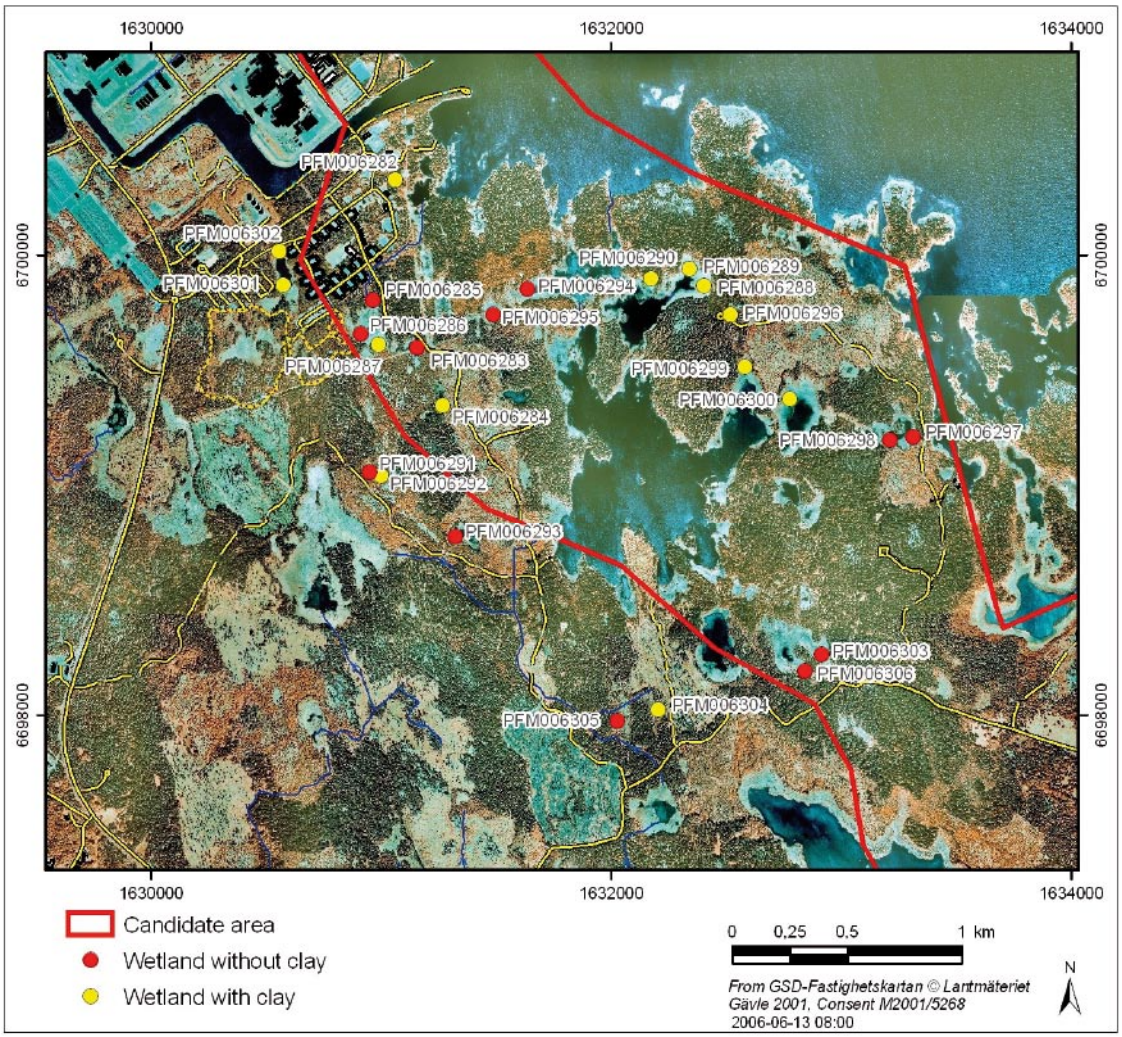

Figure 5-1. *The location of the initially invented sites. Each probing/coring site is classified according to absence or presence of a clay layer.*

5.1 Stratigraphy

In summary, the cores reveal a sediment succession of six lithostratigraphical units that are listed in Table 5-1. The stratigraphy of each investigation site is described below, from top to bottom.

Wetland 1

A core taken with a Russian peat corer down to the till surface at 2.46 m depth revealed a reddish/grey varved clay, that upwards gradually becomes homogenous and grey. The clay is erosively cut by a fining-upward gravelly sand (Figure 5-2). The sand is superimposed by clayey gyttja that sometimes is enriched with seaweed. At the top, a layer of fine detritus gyttja rests.

Table 5-1. Generalised lithostratigraphy of the three wetlands. For location of the wetlands, see Figure 1-1.

Deposit	Wetland 1 (SFM0084)	Wetland 2 (SFM0091)	Wetland 3 (SFM0095)
Peat thickness	None	None	0.10–1.65 m/1.55 m
Gyttja (depth interval/thickness)	0.35–0.80 m/0.45 m	0.45–0.82 m/0.37 m	1.65–1.85 m/0.20 m
Clayey gyttja (depth interval/thickness)	0.80–1.29 m/0.49 m	0.82–1.15 m/0.33 m	1.85–2.12 m/0.27 m
Sand (depth interval/thickness)	1.29–1.74 m/0.45 m	1.15–1.25 m/0.10 m	Patchy
Clay (depth interval/thickness)	1.74–2.46 m/0.72 m	1.25–1.31 m/0.06 m	2.12–2.96 m/0.84 m
Till (depth interval/thickness)		1.3–2.7 m	3–5 m

Figure 5-2*. Section of core (1.5–2.0 m depth) at SFM0084 showing how the sand is erosively cut into the underlying clay.*

Wetland 2

Samples were taken by auger drilling at SFM0094 through till at the edge of the wetland down to bedrock at 2.7 m using the drilling rig. The samples displayed a heterogeneous sandy diamicton with stringers of clay (Figure 5-3), which upwards becomes a sandy diamicton.

Out in the wetland (at SFM0091), coring with a Russian peat corer extracted a thin layer of clay, resting directly on till at approximately 1.3 m depth. The clay is overlain by a sand layer. The lithological boundary between the clay and sand is sharp and erosive, with gravel directly above the contact, while the upper contact of the sand is gradual with increasing organic material and finer grain size up to the overlying layer of clayey gyttja. Gyttja was encountered above the clayey gyttja.

***Figure 5-3**. Heterogeneous diamicton (2.2–2.5 m depth) at SFM0094.*

Wetland 3

Samples were taken in the bog through 3 m of organic and sorted sediments with a Russian peat corer and through till down to bedrock at 5 m depth by auger drilling using the drilling rig.

Coring down to the till surface at 3 m depth revealed an almost 1 m thick unit of varved clay at the bottom, red in the lower part and grey at the top. Several corings, separated by less than half a metre, revealed a patchy sand cover. The clay and/or sand are overlain by a grey clayey gyttja that is greenish at the top and then gradually transforms into a gyttja (Figure 5-4). The gyttja is a red algal gyttja. Upwards, it becomes rich in coarse detritus, such as sedge. The gyttja is capped by a thin layer of reed peat gradually merging into a more than 1.5 m layer of sphagnum peat.

Probing down to till along a cross-section, trending E-W generated a depth profile of the bog (Figure 5-5). Coring site SFM0095 is situated in the middle of the cross-section. The profile shows that the bog is situated within a sedimentary basin with an observed maximum depth of approximately 4 m covering the till.

Other sites

Lithological profiles are presented in /Werner et al. 2006/ and the analytical results are shown in Table 5-2. Generally, a sandy diamicton is stratigraphically overlying a clayey till.

Figure 5-4. *Part of core SFM0095 (1.5–2.5 m depth) showing the succession of peat/reed peat/algal gyttja/clayey gyttja/sand/varved clay. Note that in this core 5 cm of sand is present on top of the clay.*

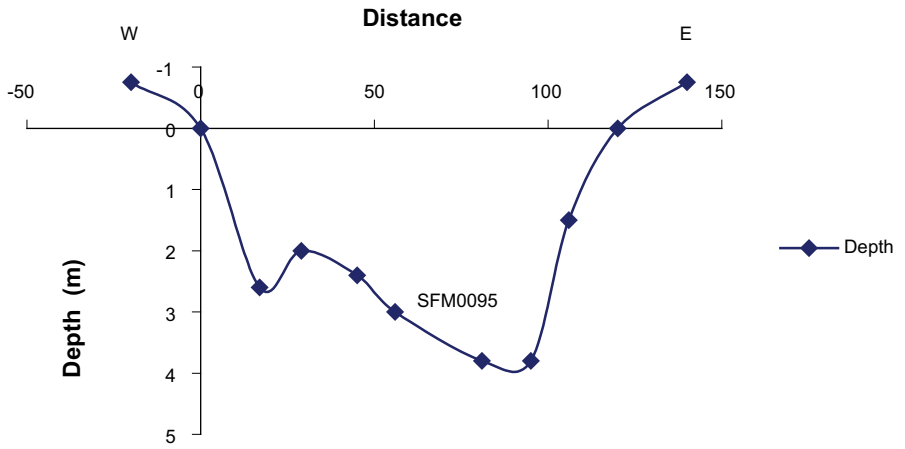

Figure 5-5. *Profile along the bog at wetland 3. The blue line shows the upper surface of coarse minerogenic material, probably till.*

5.2 Analyses

5.2.1 $CaCO_3$ content

All samples contain $CaCO_3$, minerogenic samples to a higher degree than the organic samples. Sample results are listed in Table 5-2.

The highest $CaCO_3$ concentrations are found within clay, having a content > 30%. One exception is the thin clay layer at SFM0084 in Wetland 1, showing a content of 7%. Sandy clayey tills generally exhibit high $CaCO_3$ values, 20–ca. 30%, while sandy tills show contents of approximately 10–20%.

Peat, gyttja and clayey gyttja from all three wetlands generally contain less than 2% $CaCO_3$. One exception is the topmost sample of gyttja from SFM0091 in Wetland 2, having a content of 4.5% $CaCO_3$. Sand also displays a low $CaCO_3$ content. Two out of three samples have a content around 1%, while the sand from SFM0091 in Wetland 2 contains 9% $CaCO_3$.

Table 5-2. Analytical results of organic content, $CaCO_3$ content and hydraulic conductivities. Hydraulic conductivities are calculated from grain size analyses.

Coring ID	Depth	Lithology (*see grain size diagram in Appendix 2)	Hydraulic conductivity (m/s)	Loss of ignition (weight %)	Colour Munsell	$CaCO_3$ content Passon (%)
Wetland 1						
SFM0084	0.35–0.50	Gyttja		36.7	5Y3/1	1.5
	0.50–0.60	Gyttja		25.3	5Y3/2	0.9
	0.70–0.75	Gyttja		24.1	5Y3/2	2.5
	0.85–0.90	Clayey gyttja		20.7	5Y3/2	1.0
	0.95–1.00	Clayey gyttja		19.5	5Y3/2	1.1
	1.15–1.20	Clayey gyttja		21.9	2.5Y3/2	0.4
	1.20–1.25	Clayey gyttja		(7.8)	10YR5/1	35
	1.25–1.28	Clayey gyttja		9.8	5Y3/2	2.2
	1.40–1.50	Sand*	3.38 E–04		5Y3/1	0.7
	1.55–1.70	Sandy gravel*	9.67 E–06		5Y3/1	1.2
	1.85–1.90	Clay*			5Y4/1	7

Coring ID	Depth	Lithology (*see grain size diagram in Appendix 2)	Hydraulic conductivity (m/s)	Loss of ignition (weight %)	Colour Munsell	$CaCO_3$ content Passon (%)
Wetland 2						
SFM0091	0.55–0.64	Gyttja		30.1	5Y3/2	4.5
	0.68–0.75	Gyttja		20.5	5Y3/2	1.0
	0.85–0.90	Clayey gyttja		19.4	5Y3/2	0.4
	0.94–1.00	Clayey gyttja		17.5	5Y3/2	0.5
	1.18–1.24	Sandy gravel*	1.23 E–03		5Y3/2	9
	1.26–1.31	Clay*			5Y4/1	35
SFM0094	0.9–1.30	Clayey sandy diamicton*	5.06 E–07		5Y5/2	26
	1.60–1.90	Clayey sandy diamicton*	1.16 E–07		5Y5/2	20
	2.20–2.70	Clayey sandy diamicton*	9.09 E–08		2.5Y5/2	21
Wetland 3						
SFM0095	0.15–0.25	Peat		95.2	5YR3/2	1.6
	0.45–0.55	Peat		95.2	5YR3/2	0.4
	0.90–1.00	Peat		95.6	5YR3/2	0.8
	1.10–1.20	Peat		95.6	5YR3/2	0.4
	1.35–1.45	Peat		90.6	5YR3/2	0.9
	1.50–1.60	Peat		94.8	5YR3/1	0.5
	1.68–1.73	Algal gyttja		94.2	5YR2.5/2	
	1.76–1.81	Algal gyttja		89.9	5YR2.5/2	
	1.86–1.90	Clayey gyttja		87.3	5Y3/2	1.1
	1.93–1.98	Clayey gyttja		19.1	5Y3/1	0.4
	2.04–2.09	Clayey gyttja		16.5	5Y3/1	0.5
	2.21–2.31	Silty clay*		15.7	5Y3/1	32
	2.80–2.90	Clay*			10YR5/2	36
SFM0103	3.0–5.0	Flushed sample. Gravelly diamicton*	4.42 E–07		5Y5/2	24
Other sites						
SFM0081	2.1–4.4	Sandy till*	1.39 E–05		10YR4/3	10
SFM0104	5.5–6.5	Sandy till*	1.22 E–07		5Y5/3	18
SFM0105	0.5–1	Sandy till*	8.64 E–08		5Y5/3	26
	1.6–2.1	Clayey sandy till*	7.26 E–08		5Y5/3	29
SFM0106	0.6–0.9	Clayey sandy silty till*	1.26 E–08		2.5Y4/2	23
	3.0–3.6	Clayey sandy till*	1.48 E–08		5Y4/2	32
SFM0107	3.4–4.0	Sandy till*	1.23 E–07		5Y5/3	19
	4.0–4.3	Sandy till*	1.76 E–07		5YR5/2	14
SFM0108	0.5–0.9	Sandy till*	8.76 E–07		2.5Y4/4	10

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Appendix 1

Simplified stratigraphical descriptions of sites invented in August, 2005

Site	Depth from (m)	Depth to (m)	Layer no	Quaternary deposit
PFM006282	0.00	0.20	1	fen peat
	0.20	0.50	2	sand
	0.50	1.00	3	clay
	1.00		4	till
PFM006283	0.00	0.30	1	peat
	0.30	0.60	2	clay gyttja – gyttja clay
	0.60		3	till
PFM006284	0.00	0.70	1	water
	0.70	0.80	2	gyttja
	0.80	1.20	3	clay
	1.20		4	till
PFM006285	0.00	0.30	1	peat
	0.30	0.70	2	clay gyttja – gyttja clay
	0.70		3	till
PFM006286	0.00	0.70	1	peat
	0.70	1.00	2	gyttja
	1.00		3	till
PFM006287	0.00	0.60	1	gyttja
	0.60	1.00	2	clay gyttja
	1.00	1.15	3	sand
	1.15	1.30	4	clay
	1.30	1.85	5	clay
	1.85		6	till
PFM006288	0.00	0.30	1	peat
	0.30	0.70	2	gyttja
	0.70	1.20	3	clay gyttja – gyttja clay
	1.20	1.65	4	sand
	1.65	1.70	5	clay
	1.70	2.40	6	glacial clay
	2.40		7	till
PFM006289	0.00	1.20	1	gyttja
	1.20	1.50	2	sand
	1.50	1.80	3	clay
	1.80		4	till
PFM006290	0.00	0.80	1	gyttja
	0.80	1.20	2	sand
	1.20	1.50	3	clay
	1.50		4	till
PFM006291	0.00	0.40	1	peat
	0.40	0.55	2	gyttja
	0.55		3	till
PFM006292	0.00	0.30	1	peat
	0.30	0.40	2	gyttja

	0.40	1.05	3	sand
	1.05	1.30	4	clay
	1.30		5	till
PFM006293	0.00	0.40	1	gyttja
	0.40		2	till
PFM006294	0.00	0.40	1	gyttja
	0.40		2	till
PFM006295	0.00	1.00	1	gyttja
	1.00		2	till
PFM006296	0.00	0.70	1	gyttja
	0.70	1.00	2	sand
	1.00	1.30	3	clay
	1.30		4	till
PFM006297	0.00	0.70	1	gyttja
	0.70	2.10	2	till
PFM006298	0.00	0.70	1	gyttja
	0.70	1.20	2	till
PFM006299	0.00	0.80	1	gyttja
	0.80	1.00	2	sand
	1.00	1.20	3	clay
	1.20		4	till
PFM006300	0.00	1.00	1	gyttja
	1.00	1.30	2	sand
	1.30	1.60	3	clay
	1.60		4	till
PFM006301	0.00	1.50	1	gyttja
	1.50	1.60	2	sand
	1.60	2.20	3	clay
	2.20	2.30	4	clay
	2.30	3.80	5	clay
	3.80		6	till
PFM006302	0.00	0.30	1	fen peat
	0.30	1.50	2	gyttja
	1.50	1.90	3	sand
	1.90	2.60	4	clay
	2.60	2.90	5	sand
	2.90	3.60	6	clay
	3.60	3.80	7	sand
	3.80	3.90	8	clay
	3.90		9	till
PFM006303	0.00	0.90	1	gyttja
	0.90	1.40	2	till
PFM006304	0.00	0.50	1	gyttja
	0.50	1.10	2	sand
	1.10	1.40	3	clay
	1.40	1.60	4	till
PFM006305	0.00	0.50	1	gyttja
	0.50	0.80	2	till
PFM006306	0.00	0.50	1	gyttja
	0.50	1.10	2	sand
	1.10		3	till

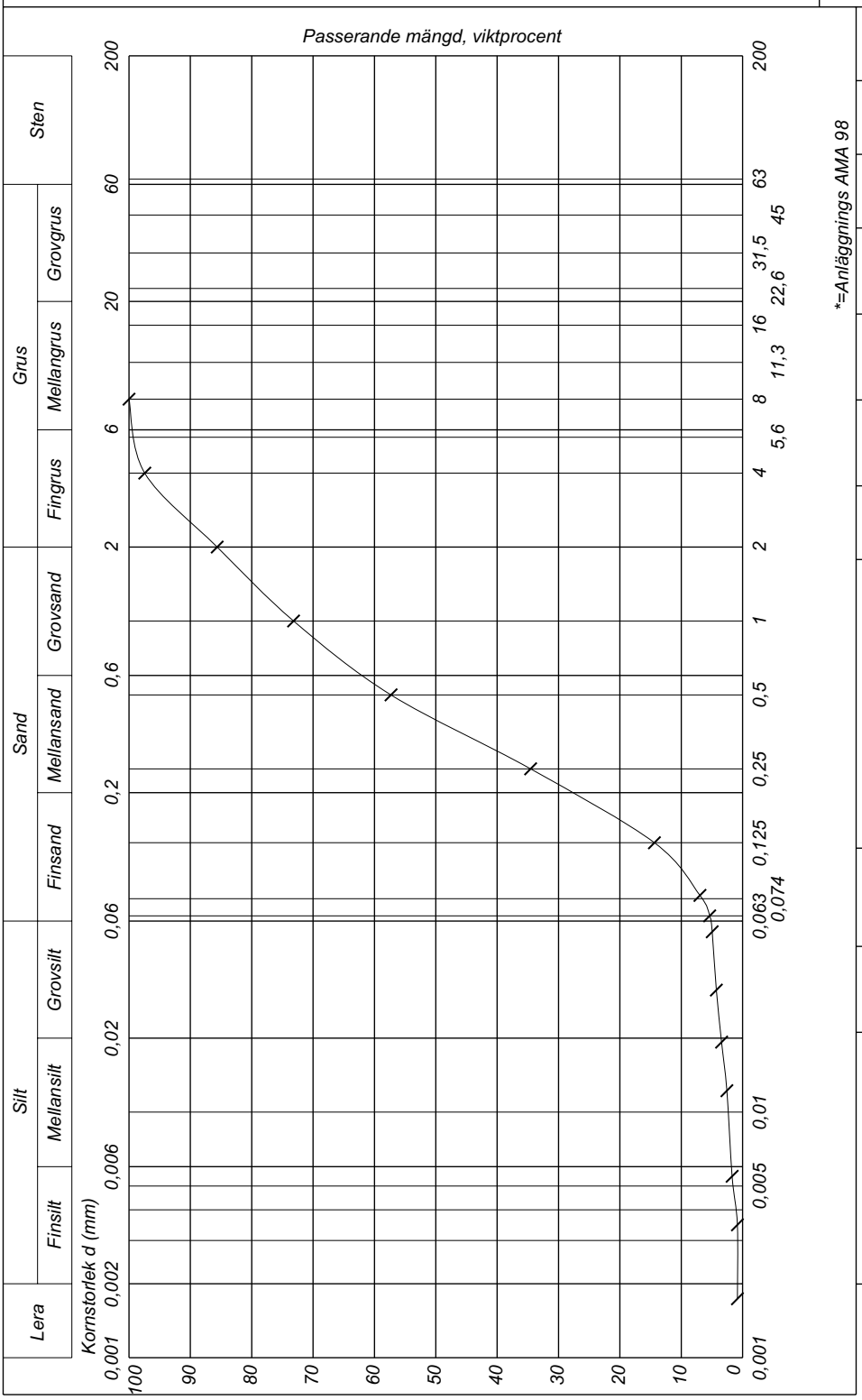
Appendix 2

Grain size distribution curves

Kornfördelning
enl. SS027123 och SS027124

SWECO GEOLAB

Projekt: **Forsmark, våtmark**	*Datum:* 2006-04-07
Uppdragsnr:	*Provtagningsdatum:* 2006-01-25 — *Löp-nr:* 14935
Uppdragsgivare: SGU, Uppsala	*Gransk./Sign:*



*=Anläggnings AMA 98

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0081	—/—		2,1-4,4	Sandig morän (SGU serie Ae) (Uppspolat prov)	466			2/1*	0,093	0,563	2,586

SWECO GEOLAB, Gjörwellsgatan 22, Box 34044
100 26 STOCKHOLM, Tel 08-695 60 00, Fax 08-695 63 60
geolab@sweco.se, www.sweco.se/geolab, Ingår i SWECO VBB AB

https://geolab.sweco.se/WebServices/GeoWebService.asmx?op=GetProject(14935)

Kornfördelning
enl. SS027123 och SS027124

SWECO GEOLAB

Projekt: **Forsmark, våtmark**		*Datum:* 2006-03-07
Uppdragsnr:	*Provtagningsdatum:* 2006-02-13	*Löp-nr:* 14935
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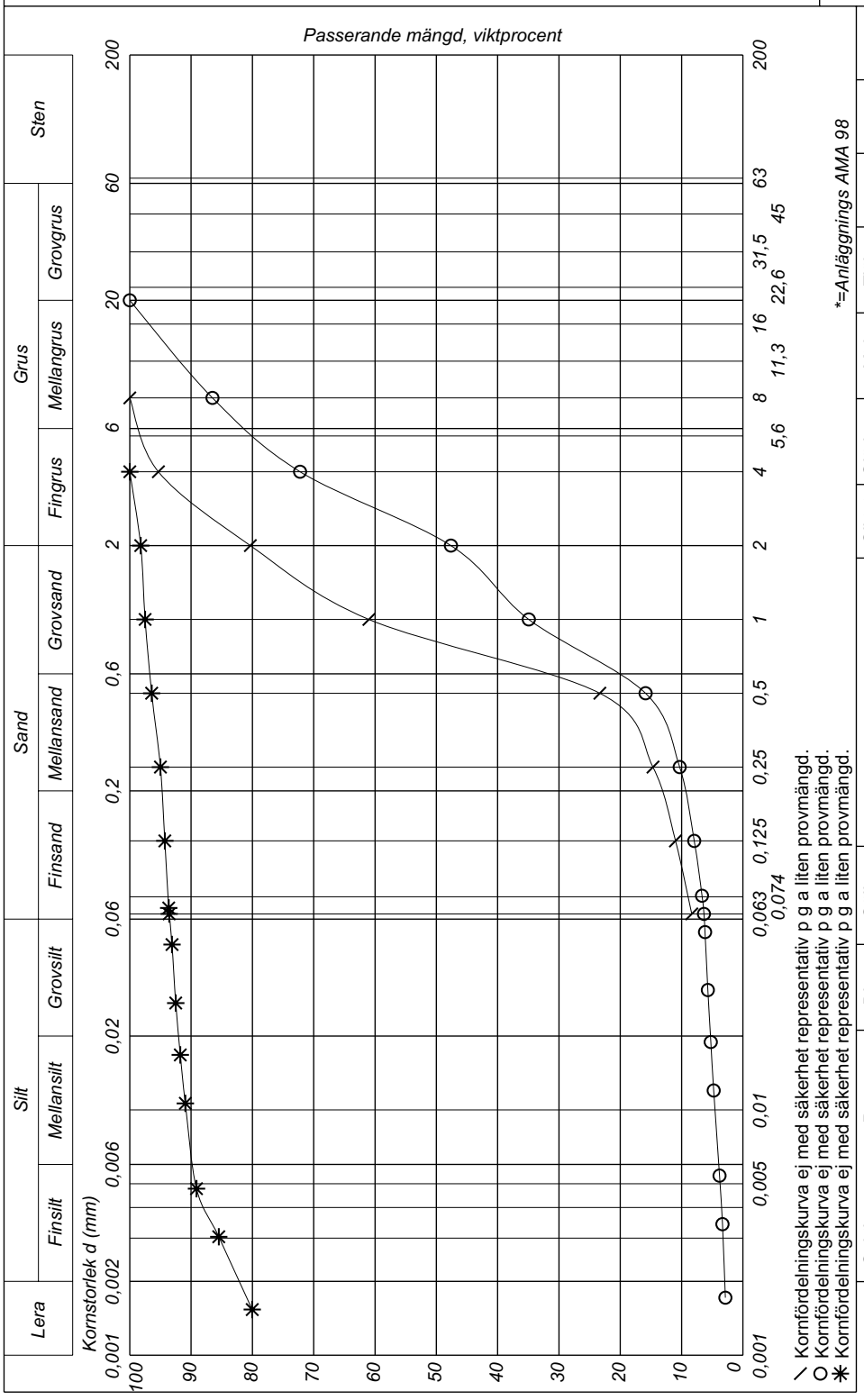

\ Kornfördelningskurva ej med säkerhet representativ p g a liten provmängd.
O Kornfördelningskurva ej med säkerhet representativ p g a liten provmängd.
✳ Kornfördelningskurva ej med säkerhet representativ p g a liten provmängd.

*=Anläggnings AMA 98

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0084	\		1,4-1,5	Sand (SGU serie Ae)	30			2/1*	0,097	0,982	3,126
SFM0084	O		1,55-1,7	Sandigt grus (SGU serie Ae)	126			2/1*	0,228	2,835	10,141
SFM0084	✳		1,85-1,9	Styv lera (SGU serie Ae)	28			4B/3*			0,007

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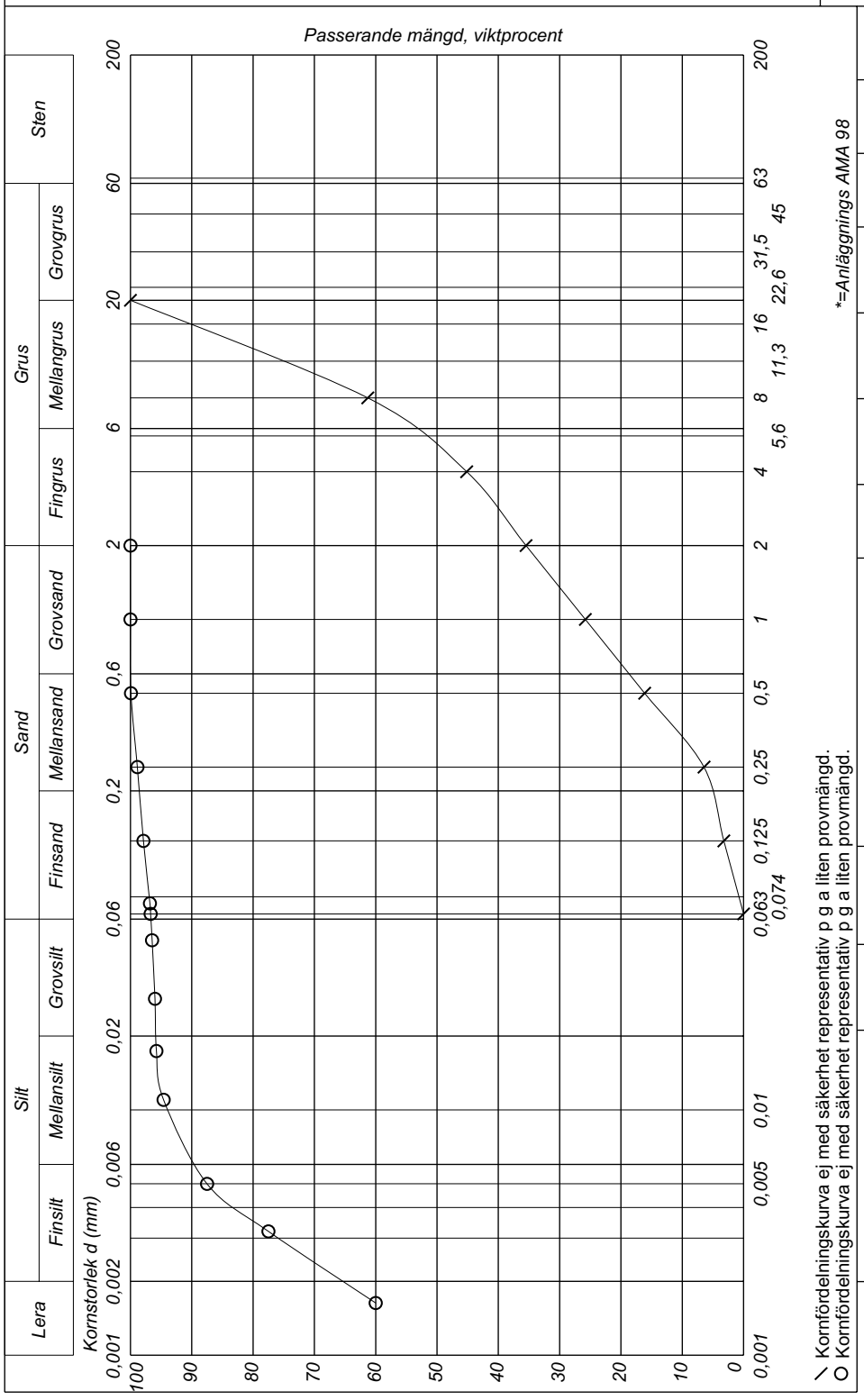
Kornfördelning
enl. SS027123 och SS027124

SWECO GEOLAB

Projekt: **Forsmark, våtmark**		*Datum:* 2006-03-07
Uppdragsnr:	*Provtagningsdatum:* 2006-02-14	*Löp-nr:* 14935
Uppdragsgivare: SGU, Uppsala		*Gransk./Sign:*



\ Kornfördelningskurva ej med säkerhet representativ p g a liten provmängd.
O Kornfördelningskurva ej med säkerhet representativ p g a liten provmängd.

**=Anläggnings AMA 98*

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0091	\		1,18-1,24	Sandigt grus (SGU serie Ae)	31		35>20	2/1*	0,322	7,568	15,784
SFM0091	O		1,26-1,31	Styv lera (SGU serie Ae)	22			4B/3*			0,007

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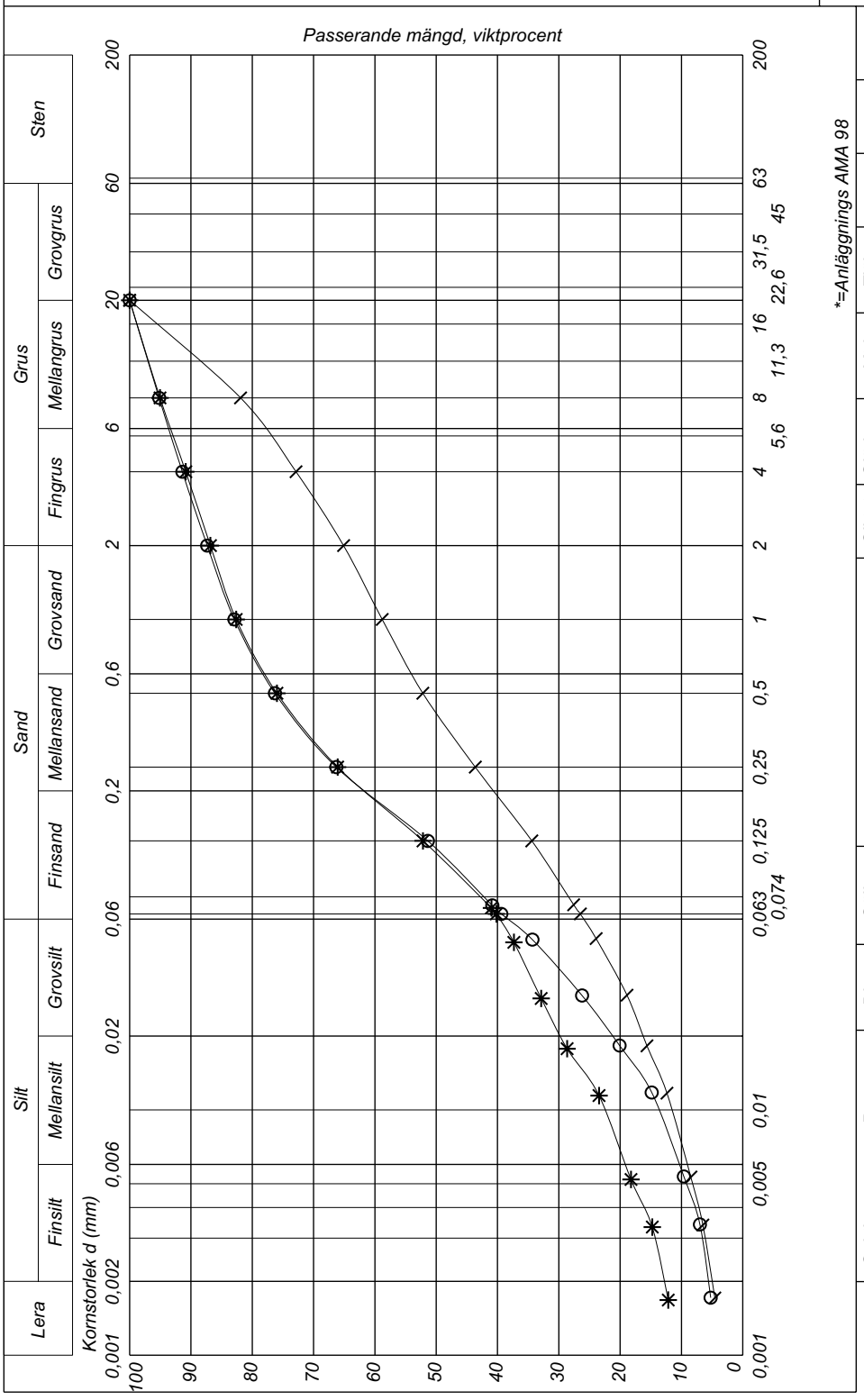
Uppdragsgivare: SGU, Uppsala		*Gransk./Sign:*



*=Anläggnings AMA 98

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0094			0,9-1,3	Lerig sandig morän (SGU serie Ae)	619		13>20	3B/2*	0,007	1,141	12,053
SFM0094			1,6-1,9	Lerig sandig morän (SGU serie Ae)	1059		2>20	4A/3*	0,006	0,187	3,146
SFM0094			2,2-2,7	Lerig sandig morän (SGU serie Ae)	1070		5>20	4A/3*		0,185	3,460

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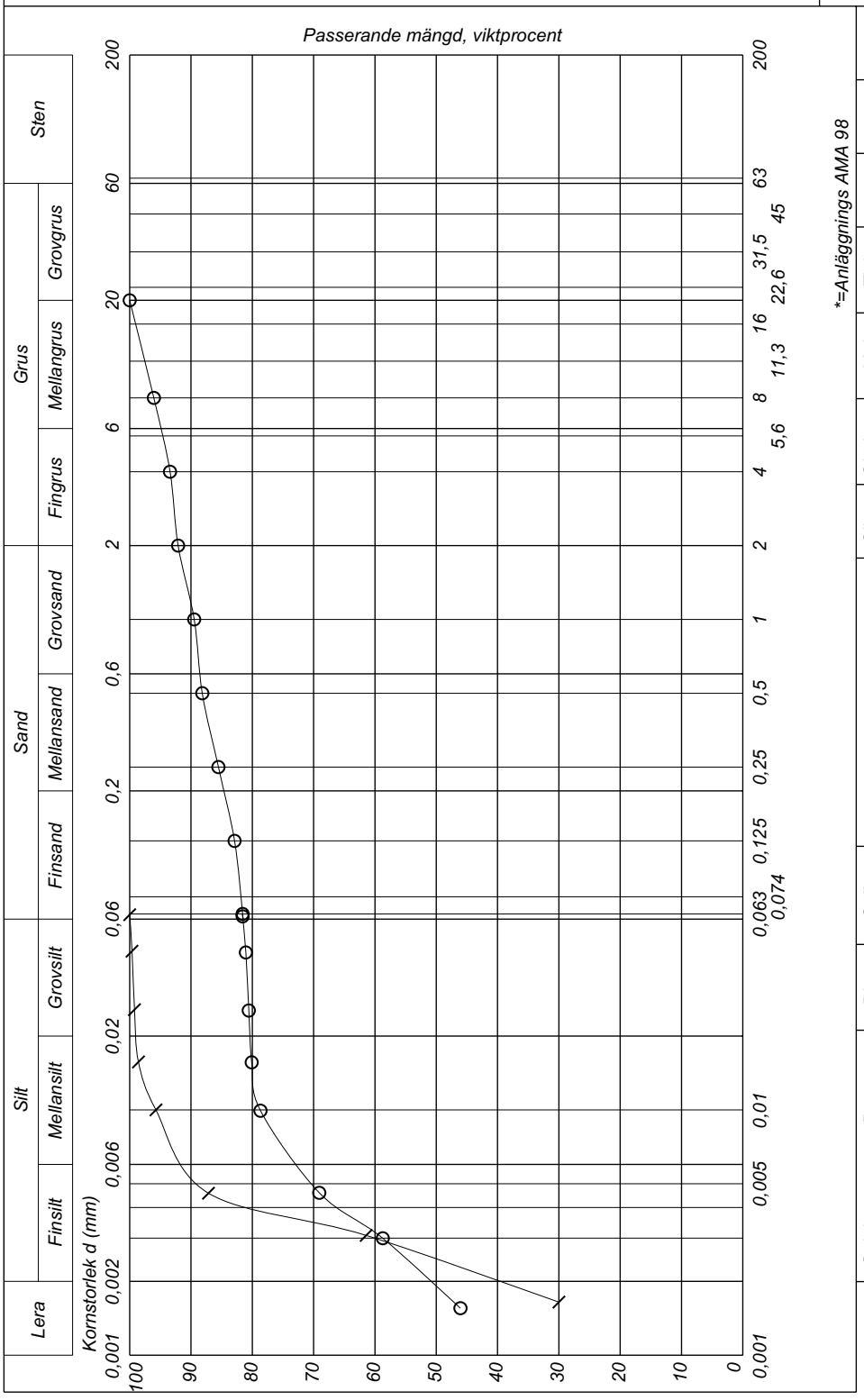
Uppdragsgivare: SGU, Uppsala		*Gransk./Sign:*



*=Anläggnings AMA 98

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0095			2,21-2,31	Mellanlera (SGU serie Ae)				5A/4*		0,003	0,006
SFM0095			2,8-2,9	Styv lera (SGU serie Ae)	76			4B/3*		0,003	1,149

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Projekt: **Forsmark, våtmark**		*Datum:* 2006-03-07
Uppdragsnr:	*Provtagningsdatum:* 2006-02-16	*Löp-nr:* 14935
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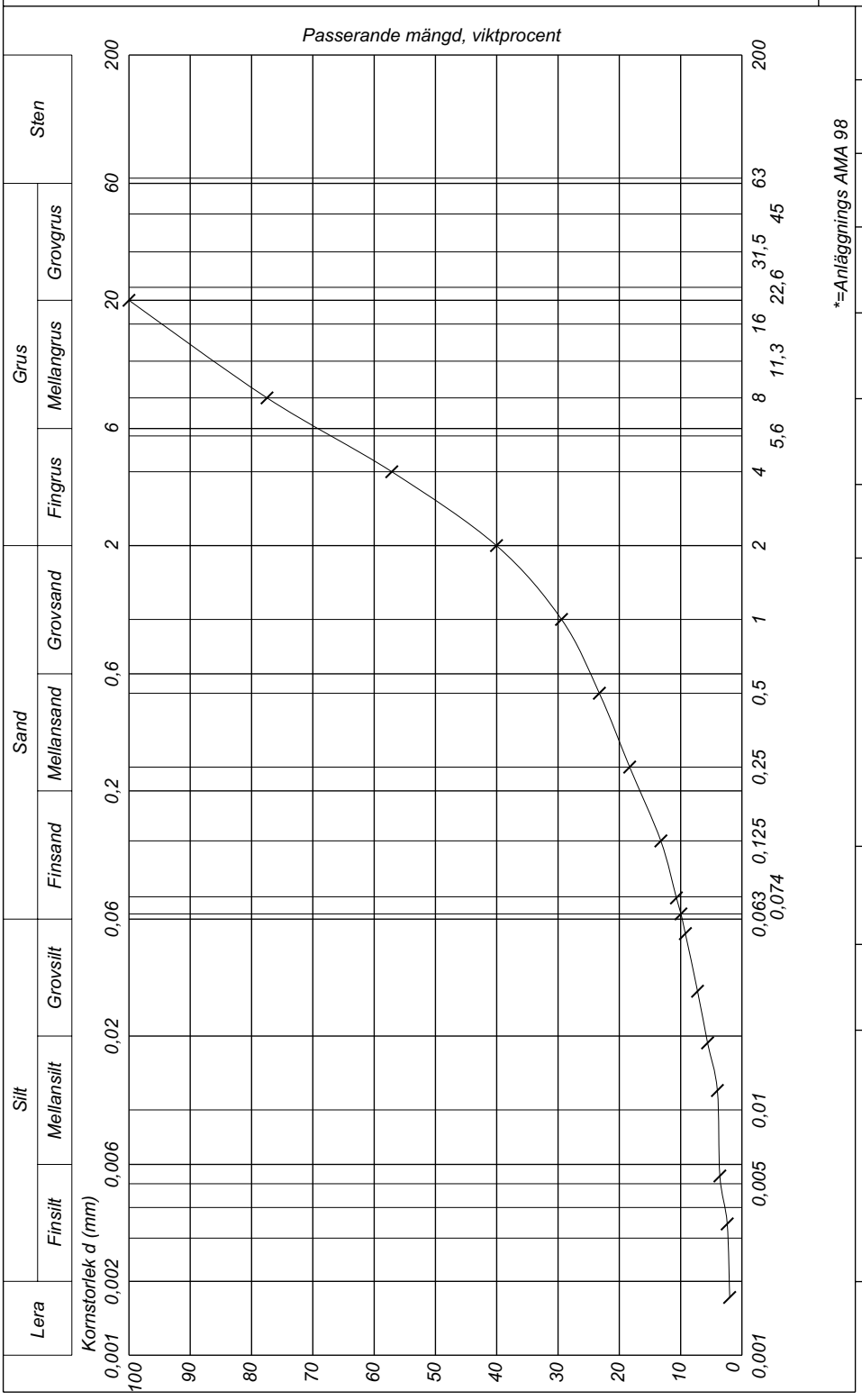

*=Anläggnings AMA 98

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0103	—/—		3,0-5,0	Grusig morän (SGU serie Ae)	1376			2/1*	0,064	4,412	13,317

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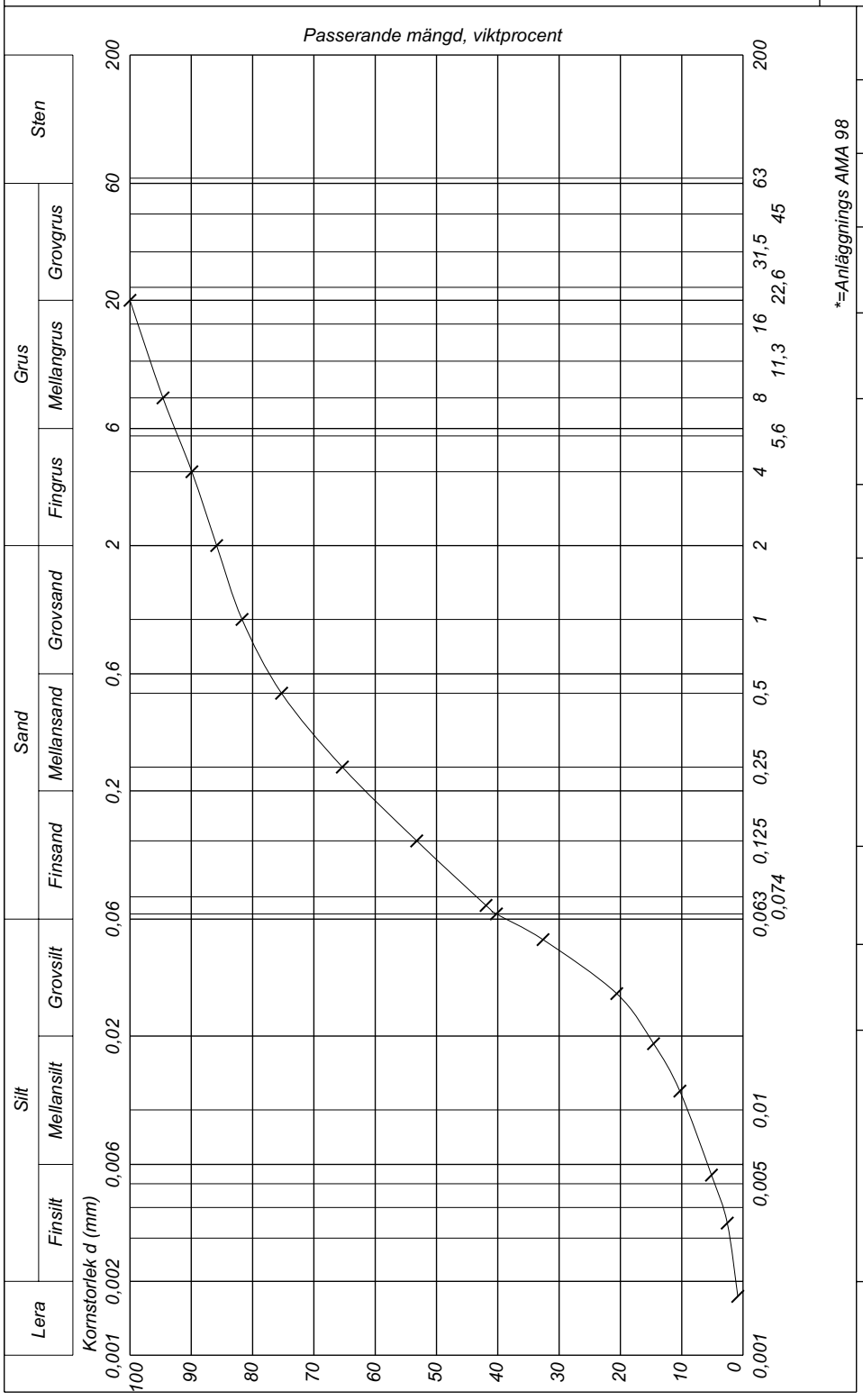
Uppdragsgivare: SGU, Uppsala		*Gransk./Sign:*



**=Anläggnings AMA 98*

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0104	—/—		5,5-6,5	Sandig morän (SGU serie Ae)	1039			4A/3*	0,011	0,184	4,063

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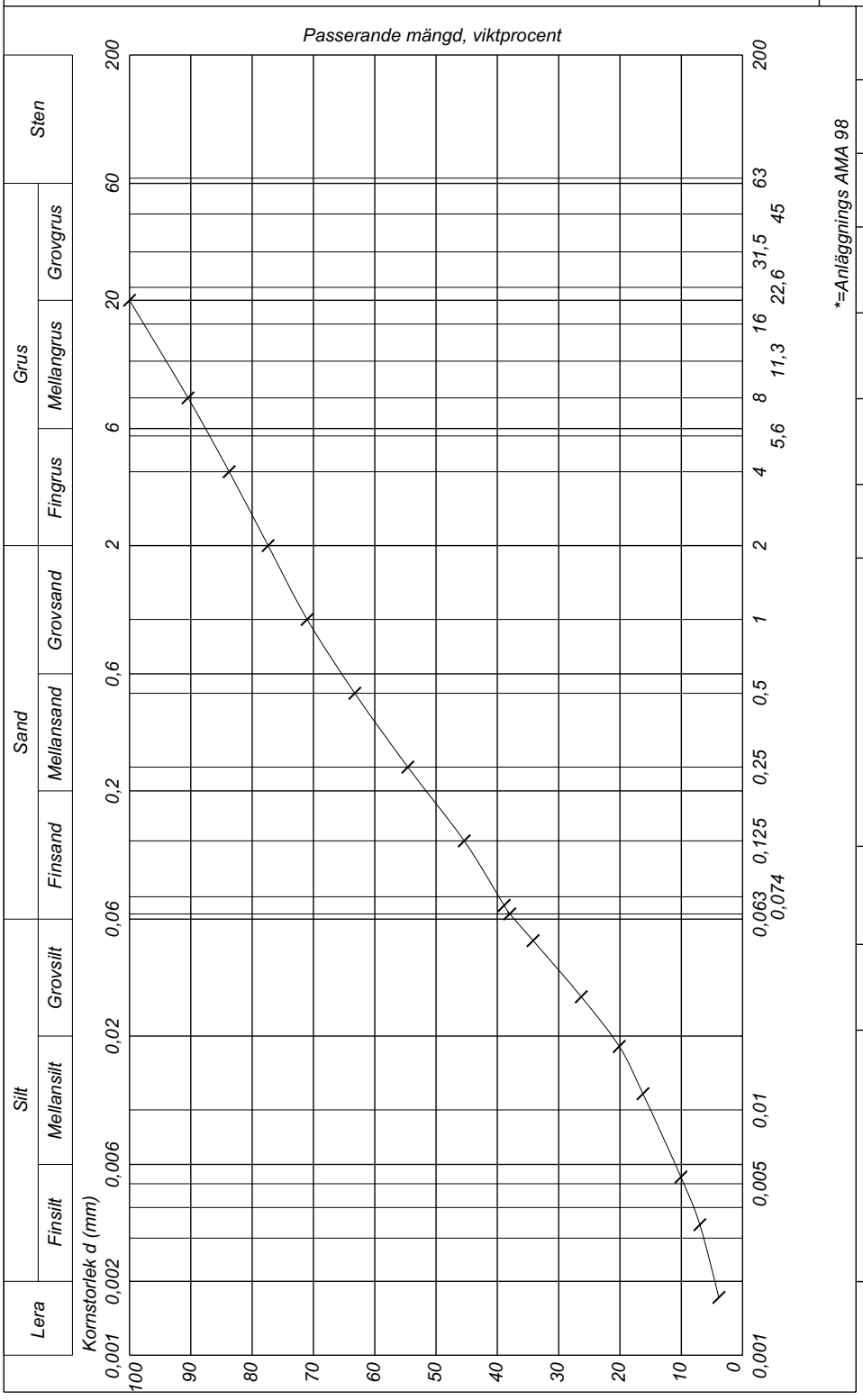
Uppdragsgivare: SGU, Uppsala		*Gransk./Sign:*



**=Anläggnings AMA 98*

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0105	— / —		0.5-1,0	Sandig morän (SGU serie Ae)	566			4A/3*	0,005	0,385	7,629

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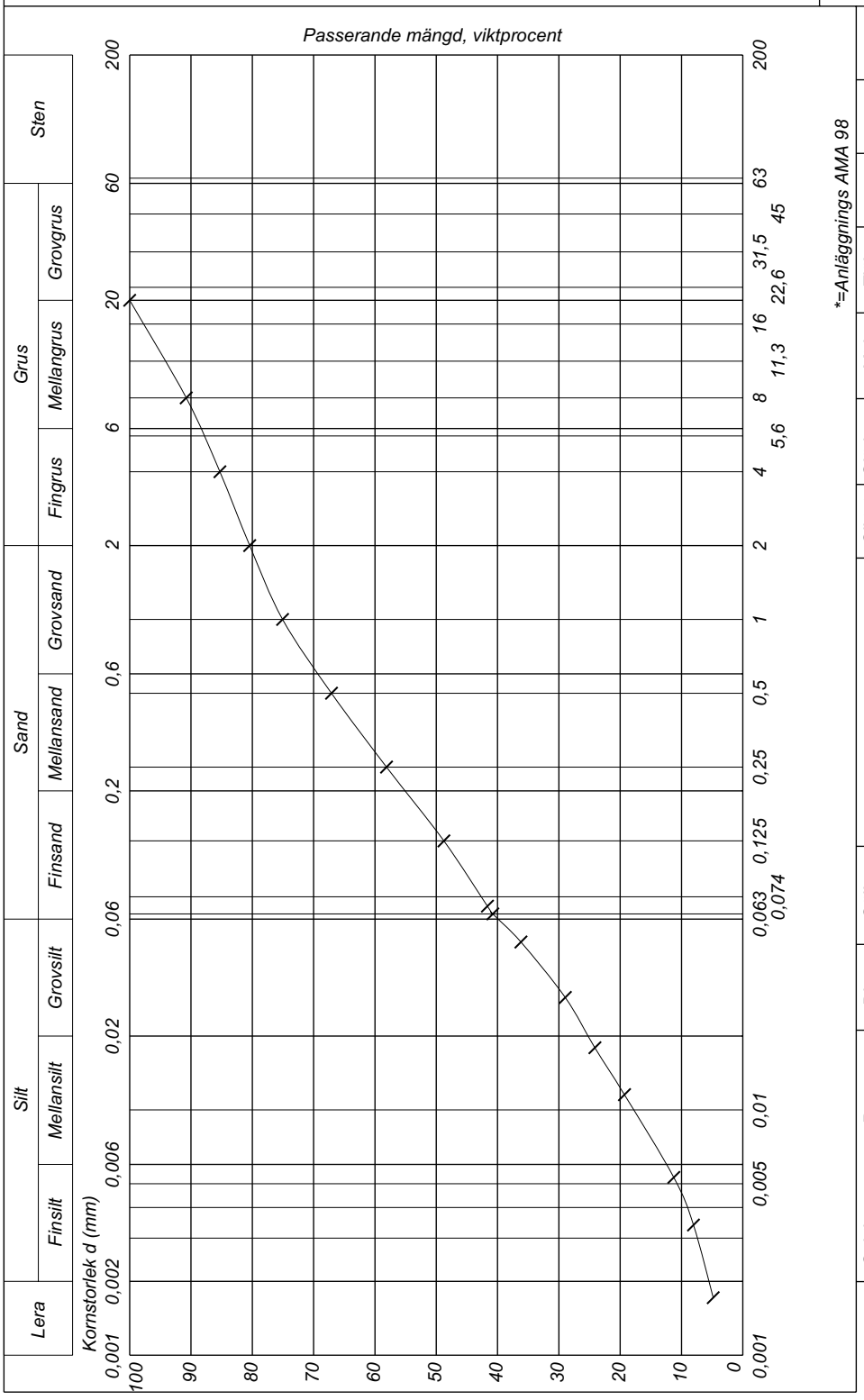
Uppdragsgivare: SGU, Uppsala		*Gransk./Sign:*



*=Anläggnings AMA 98

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0105	—		1,6-2,1	Lerig sandig morän (SGU serie Ae)	802			4A/3*	0,004	0,289	7,256

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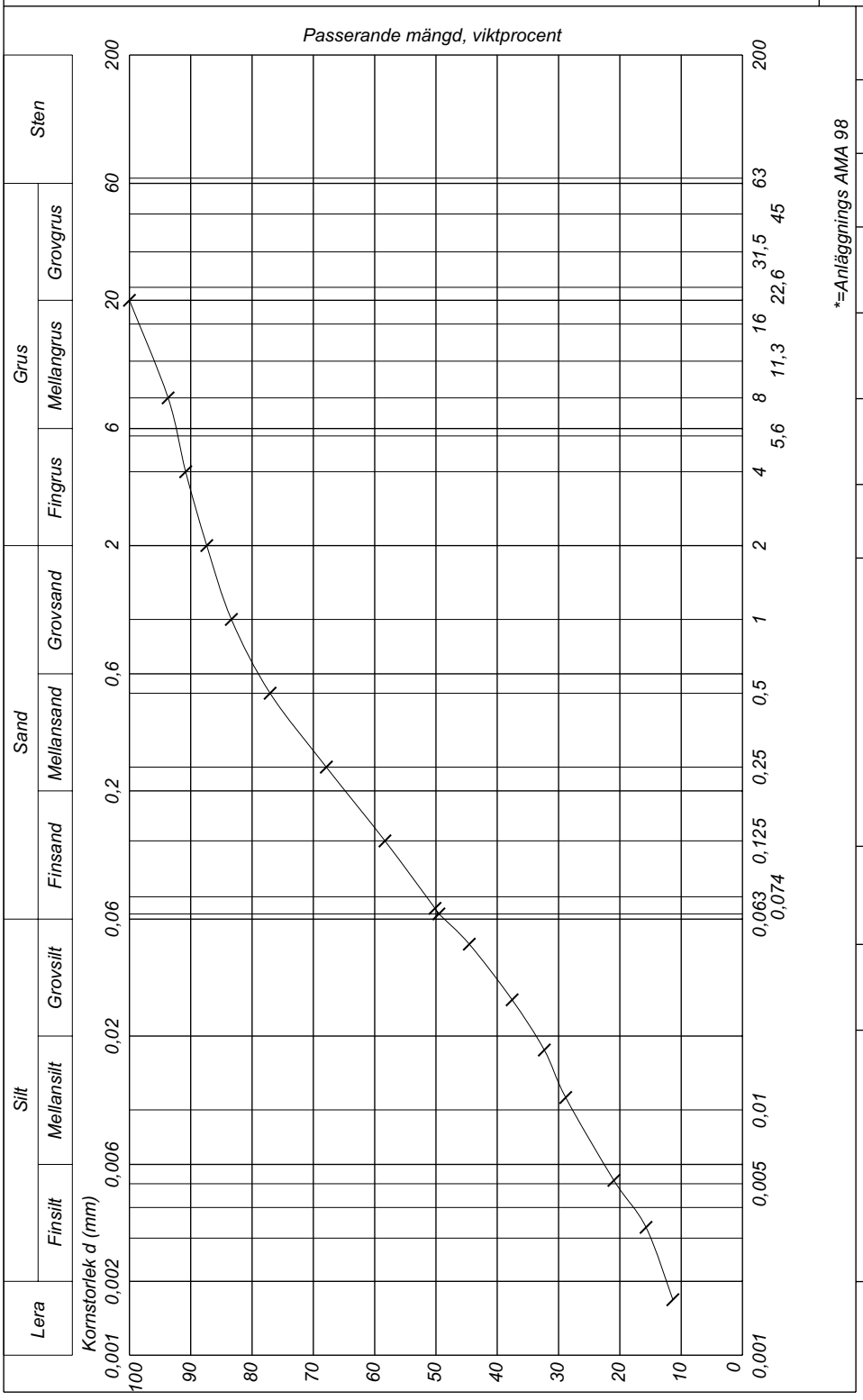

**=Anläggnings AMA 98*

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0106	—/—		0,6-0,9	Lerig sandig-siltig morän (SGU serie Ae)	523			5A/4*		0,141	3,390

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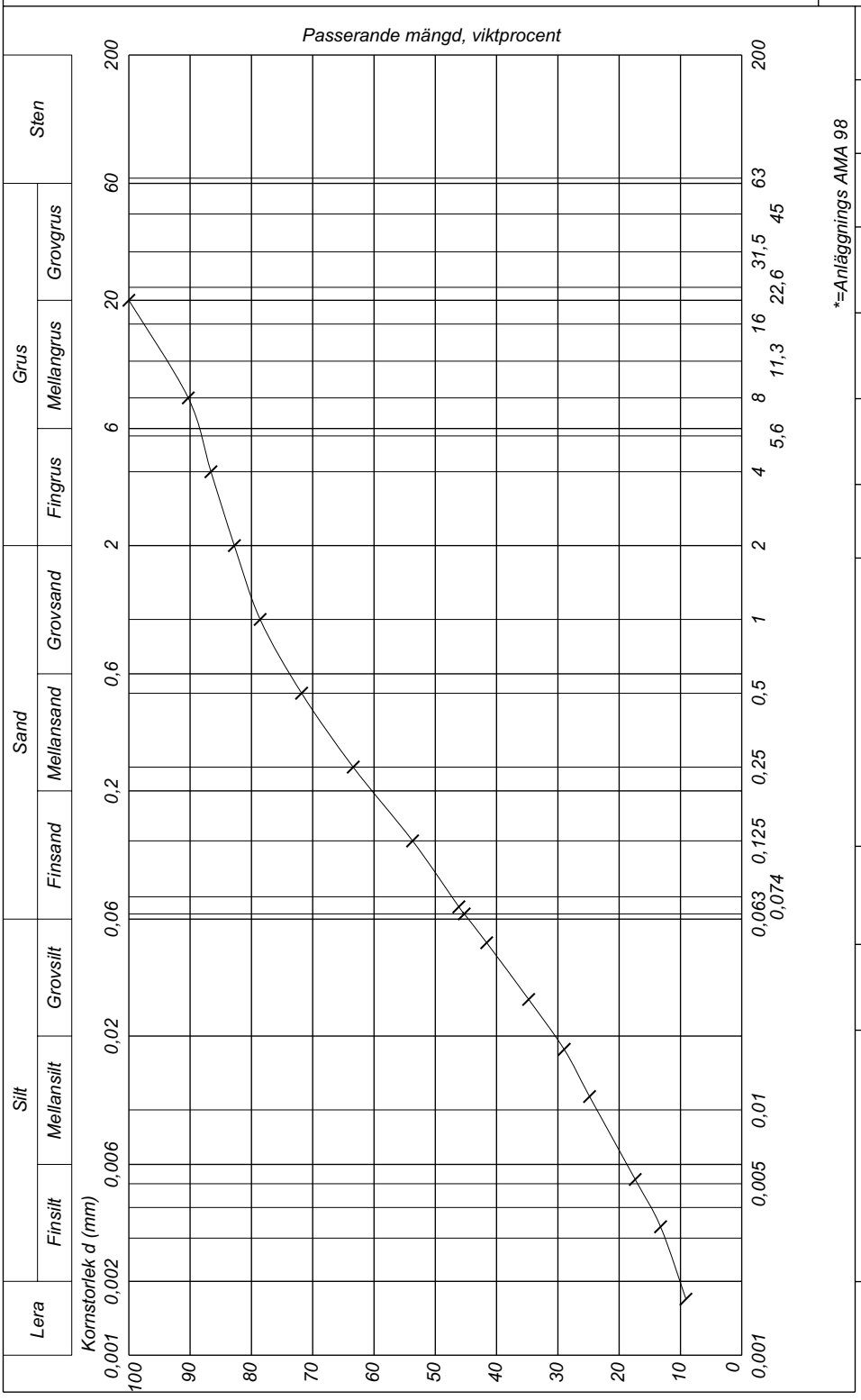
Uppdragsgivare: SGU, Uppsala		*Gransk./Sign:*



**=Anläggnings AMA 98*

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0106	—/—		3,0-3,6	Lerig sandig morän (SGU serie Ae)	784		5>20	5A/4*	0,002	0,196	7,554

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Projekt: **Forsmark, våtmark**	*Datum:* 2006-04-07
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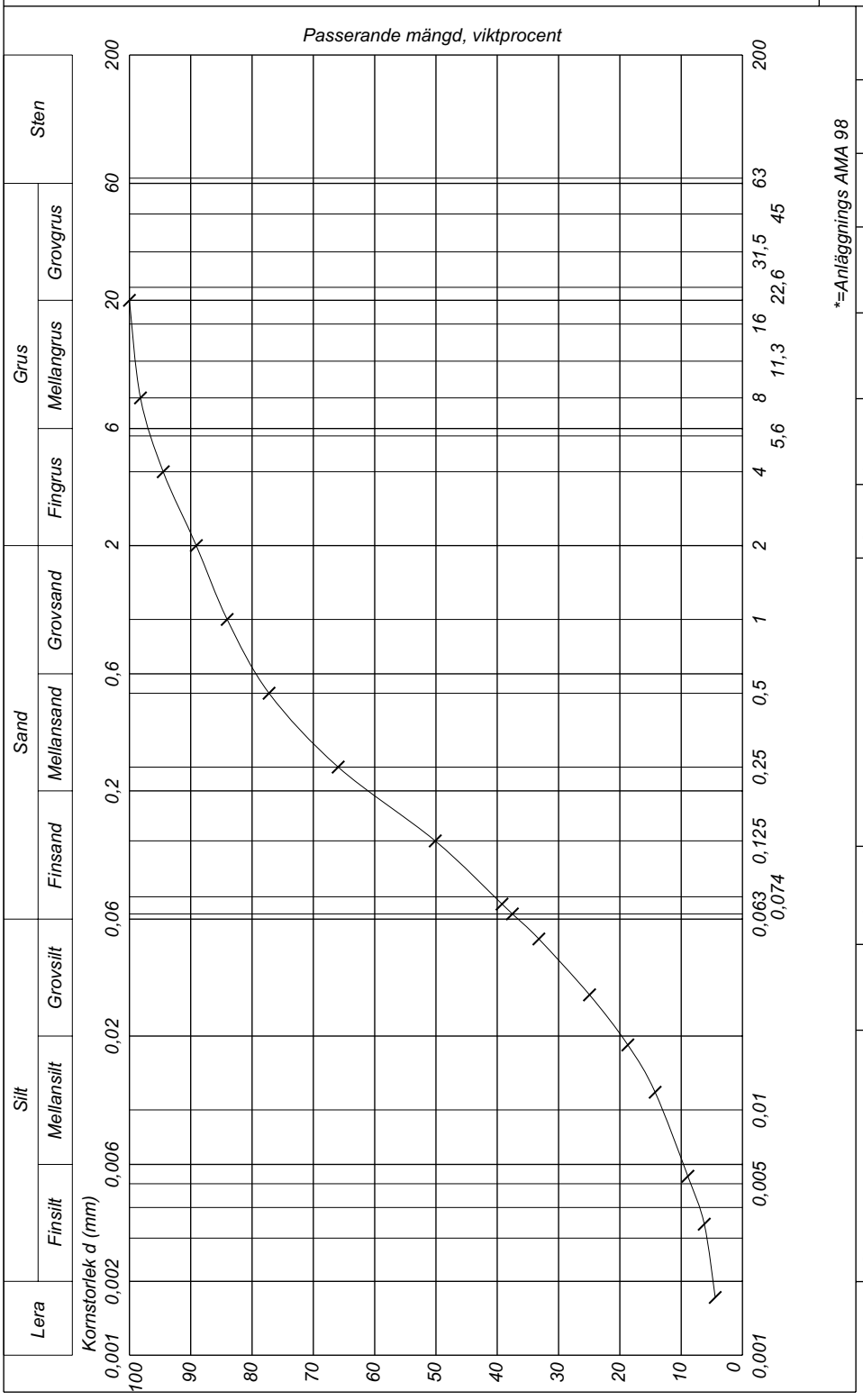

**=Anläggnings AMA 98*

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0107	—/—		3,4-4,0	Sandig morän (SGU serie Ae)	834			4A/3*	0,006	0,193	2,248

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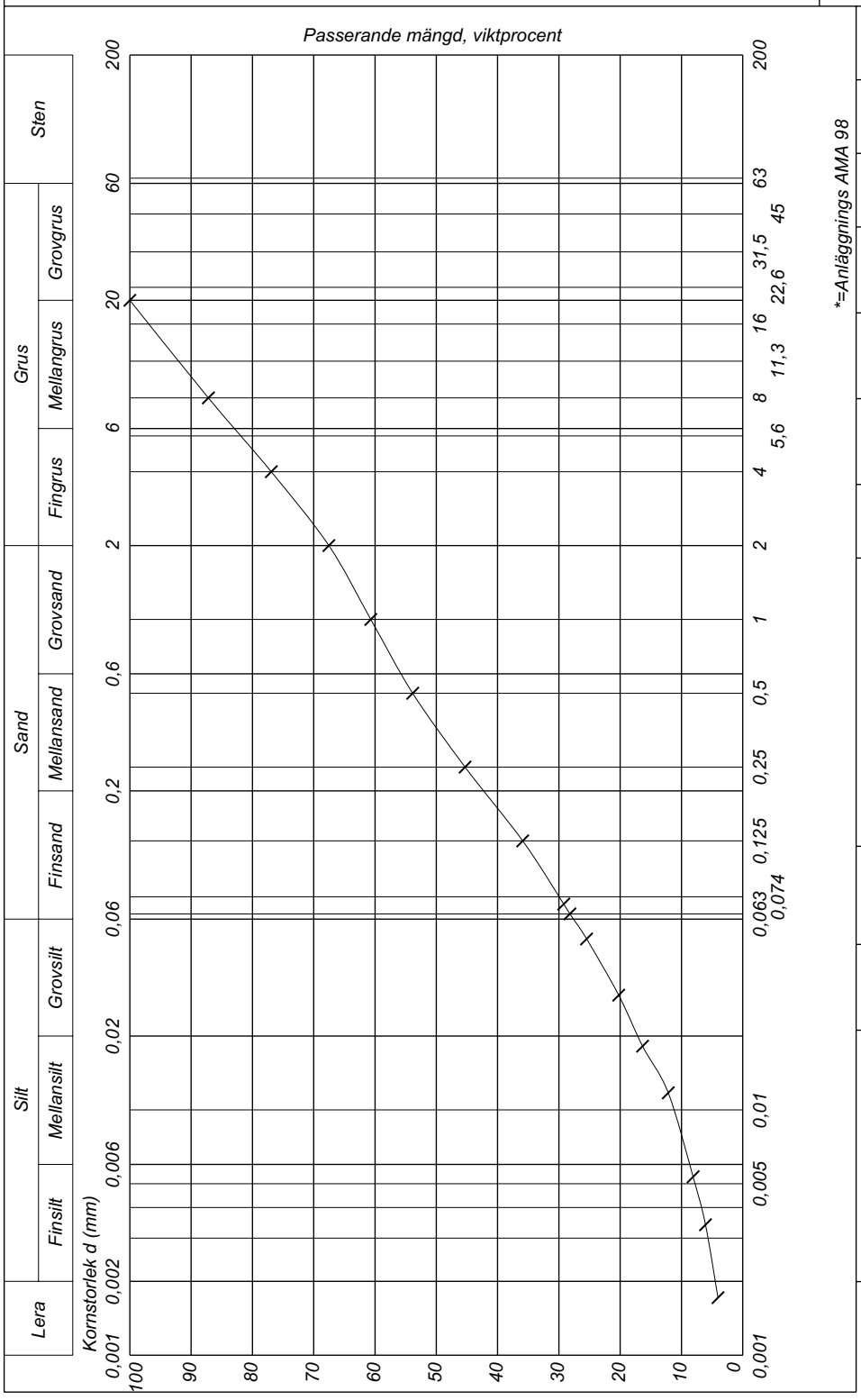

*=Anläggnings AMA 98

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0107	—		4,0-4,3	Sandig morän (SGU serie Ae)	117			3B/2*	0,008	0,933	9,787

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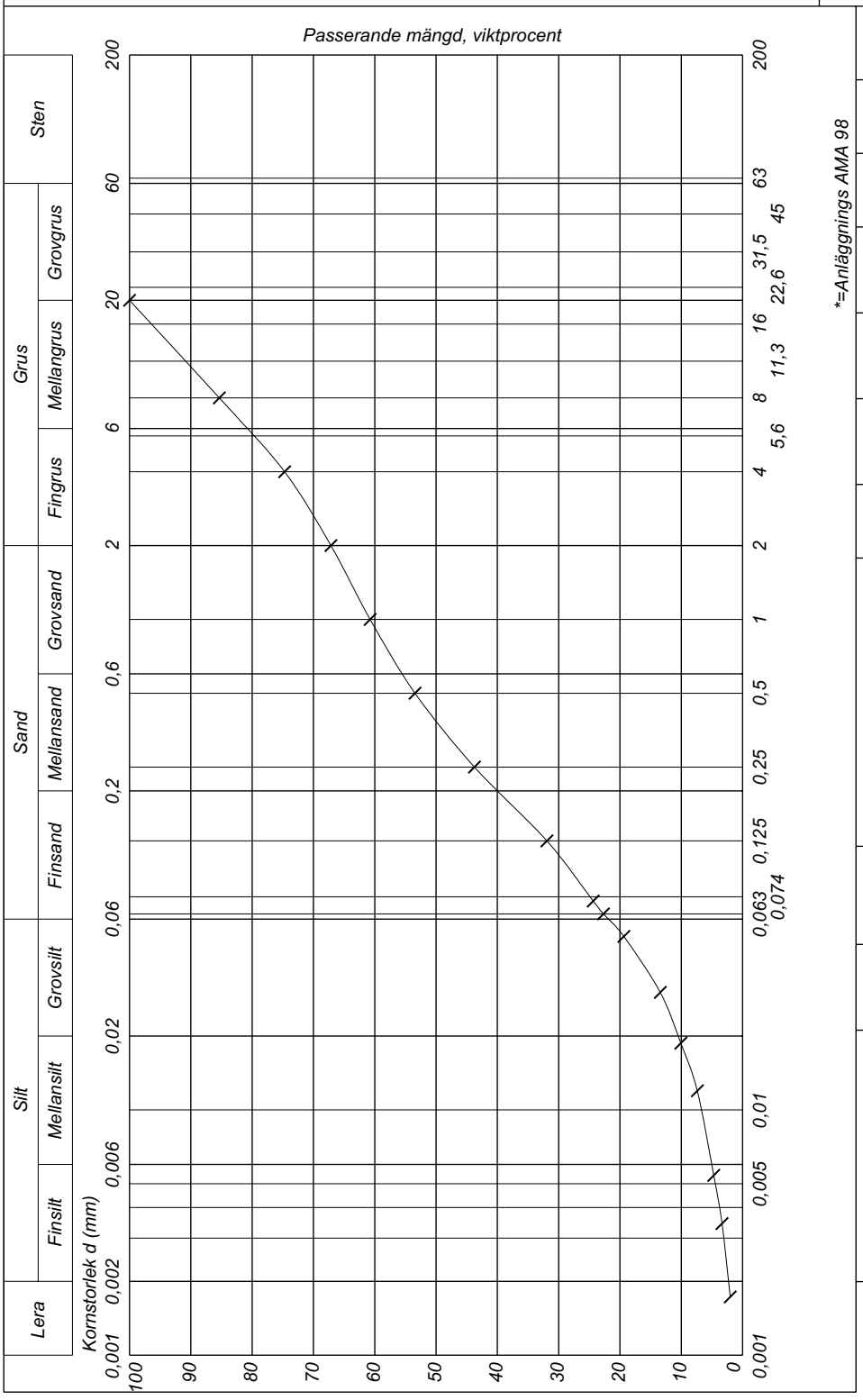
Uppdragsgivare: SGU, Uppsala		*Gransk./Sign:*



*=Anläggnings AMA 98

Sektion Borrhål	Prov-beteckning	Djup (m)	Gäller mellan (m)	Benämning	Siktat Prov (g)	Glödgn.-förlust %	Mtrl % > mm	Tjäl-farlighet	d10	d60	d90
SFM0108	—/—		0.5-0,9	Sandig morän (SGU serie Ae)	423		8>20	3B/2*	0,019	0,931	10,704

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