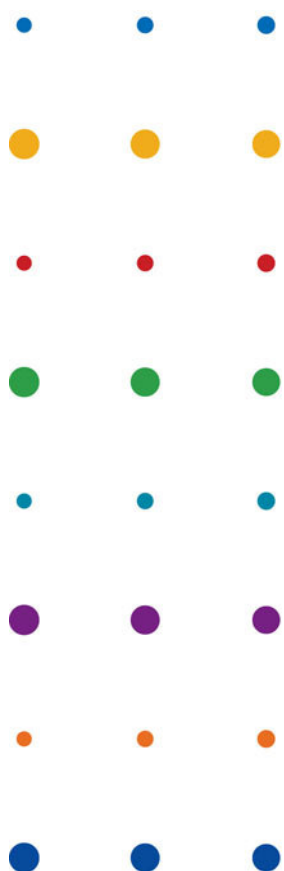


MLA-terrein Infiltratieonderzoek



Maasbree

MLA-terrein

Infiltratieonderzoek

Maasbree

dossier : A0944

registratienummer : LI20061943

versie : 1

juli 2006
A0944-01-001

INHOUD

BLAD

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BIJLAGEN

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2	Locatieschets
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1 INLEIDING

In opdracht van Cycloon Holland B.V. te Venlo heeft DHV B.V. in juni 2006 een infiltratieonderzoek uitgevoerd op het toekomstige 'MLA-terrein' (Micro Light Aircrafts) te Maasbree.

De aanleiding voor het onderzoek is een vergunningaanvraag voor de geplande nieuwbouw en de wijziging van het bestemmingsplan. Het infiltratieonderzoek heeft tot doel de waterdoorlatendheidscoëfficiënt (k -waarde) van de bodem op de onderzoekslocatie te bepalen. Op basis van deze bepaling kan worden vastgesteld of het aanleggen van een effectieve infiltratievoorziening voor overtollig hemelwater tot de mogelijkheden behoort.

Het veldwerk is uitgevoerd volgens de geldende NEN -normen en / of richtlijnen, waaronder de BRL SIKB 2000 "Veldwerk bij milieuhygiënisch bodemonderzoek".

2 METHODE

De k -waarde wordt bepaald met behulp van de constant -head permeameter. Hierbij wordt met behulp van een overdruksysteem een constant waterniveau gerealiseerd in het boorgat. Na verzadiging wordt het debiet gemeten waarbij er water geïnfiltreerd kan worden in de desbetreffende bodemlaag. Het betreft hier alléén in -situ proeven in de onverzadigde zone.

Hierna kan er met behulp van de “Glover Solution” de k -waarde van de desbetreffende bodemlaag berekend worden. Indien er geen slecht, of niet doorlaatbare bodemlagen, aanwezig zijn binnen een afstand van 2 x de waterkolom (H) in het boorgat, dan kan met behulp van de “Glover Solution” welke hieronder in formulevorm is weergegeven de k -waarde berekend worden:

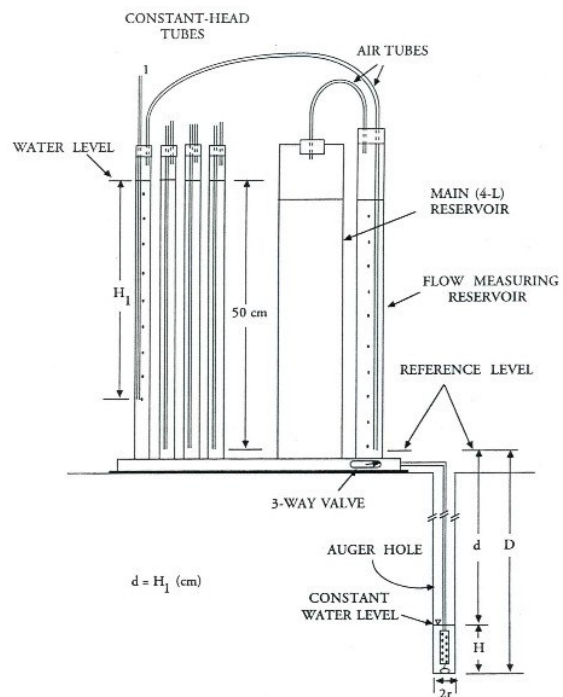
$$K_{sat} = \frac{\left(\operatorname{hypsin}^{-1} \frac{H}{r} \right) - \left(\sqrt{\left(\frac{r}{H} \right)^2 + 1} \right) + \left(\frac{r}{H} \right)}{2\pi * H^2} * Q$$

De parameters H en r zijn in tekening 1 schematisch weergegeven.

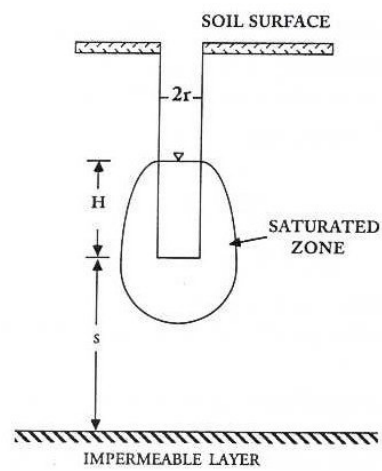
Indien er wél slecht, of niet doorlaatbare bodemlagen, aanwezig zijn binnen een afstand van 2 x de waterkolom (H) in het boorgat, dan kan met behulp van de “Glover Solution” welke hieronder in formulevorm is weergegeven de k -waarde berekend worden:

$$K_{sat} = \frac{3 * \ln \frac{H}{r}}{\pi * H * ((3 * H) + (2 * s))} * Q$$

De parameters H en r zijn in tekening 1 weergegeven en de parameter s is in tekening 2 schematisch weergegeven.



Tekening 1.



Tekening 2.

3 VELDWERK

3.1 Algemeen

Het veldwerk is uitgevoerd op 22 juni 2006.

In het totaal zijn er met behulp van een edelmanboor (diameter 6 centimeter) 6 boringen tot maximaal 1,13 m -mv geplaatst. De meetpunten zijn gekozen op basis van het bestaande ontwerp -inrichtingsplan en geplaatst daar waar ruimte is om een infiltratievoorziening te realiseren. Van het opgeboorde materiaal is een boorbeschrijving conform de NEN 5104 gemaakt (zie bijlage 3). De metingen zijn verricht op een diepte tussen de 0,39 en 1,30 meter beneden maaiveld.

3.2 Zintuiglijke waarneming

De bovengrond bestaat voornamelijk uit zwak humeus, matig siltig, matig fijn zand. De ondergrond bestaat uit zwak tot matig siltig, zeer fijn tot matig fijn zand. Zintuiglijk zijn geen verontreinigingen waargenomen.

3.3 Infiltratieproef

Naar aanleiding van de boorprofielen is er voor gekozen om ter plaatse van de, in tabel I weergegeven bodemlagen, de infiltratieproef uit te voeren.

Tabel I. Overzicht van de bodemlagen, bodemtype en debiet

Boring	Bodemlaag [m -mv]	Grondwaterstand [m -mv]	Bodemtype	Debiet (Q) [cm ³ /cm]
16	0,54-0,88	± 1,70	zand, matig fijn, matig siltig	20
22	0,92-1,16	± 1,70	zand, zeer fijn, zwak siltig	105
61	0,49-0,83	± 1,70	zand, matig fijn, matig siltig	105
68	0,49-0,83	± 1,70	zand, matig fijn, matig siltig	105
106	0,39-0,73	± 1,70	zand, zeer fijn tot matig fijn, matig siltig, zwak humeus	20
120	0,96-1,30	± 1,70	zand, zeer fijn, matig siltig	105

4 RESULTATEN

De tabellen II t/m VII geven de resultaten weer zoals deze in -situ zijn gemeten, verder wordt er per laag een k -waarde berekend met behulp van de "Glover Solution" alsmede een gemiddelde k -waarde per bodemlaag.

Tabel II. Resultaten boring 16

Boring 16			
	laag 1		
laagbegin [cm -mv]	54		
laageinde [cm -mv]	88		
Q [cm ³ /cm]	20		
H [cm]	17		
r [cm]	3		
D [cm -mv]	71		
	metingen	k-waarde	
	hoogte	t [s]	[m/dag]
meting 0 t = 0 [cm]	40,7	0 -	
meting 1 t = 1 [cm]	39,8	30	0,4557705
meting 2 t = 2 [cm]	39	60	0,4051294
meting 3 t = 3 [cm]	38,3	90	0,3544882
meting 4 t = 4 [cm]	37,6	120	0,3544882
meting 5 t = 5 [cm]	36,9	150	0,3544882
meting 6 t = 6 [cm]	36,2	180	0,3544882
Gemiddelde K-waarde [m/dag]	0,3798088		

Tabel III. Resultaten boring 22

Boring 22			
	laag 1		
laagbegin [cm -mv]	92		
laageinde [cm -mv]	126		
Q [cm ³ /cm]	105		
H [cm]	17		
r [cm]	3		
D [cm -mv]	109		
	metingen	k-waarde	
	hoogte	t [s]	[m/dag]
meting 0 t = 0 [cm]	36,8	0 -	
meting 1 t = 1 [cm]	36,3	30	1,3293307
meting 2 t = 2 [cm]	35,9	60	1,0634646
meting 3 t = 3 [cm]	35,6	90	0,7975984
meting 4 t = 4 [cm]	35,3	120	0,7975984
meting 5 t = 5 [cm]	35	150	0,7975984
meting 6 t = 6 [cm]	34,7	180	0,7975984
meting 7 t = 7 [cm]	34,4	210	0,7975984
meting 8 t = 8 [cm]	34,1	240	0,7975984
meting 9 t = 9 [cm]	33,8	270	0,7975984
Gemiddelde K-waarde [m/dag]	0,8862205		

Tabel IV. Resultaten boring 61

Boring 61			
	laag 1		
laagbegin [cm -mv]	49		
laageinde [cm -mv]	83		
Q [cm ³ /cm]	105		
H [cm]	17		
r [cm]	3		
D [cm -mv]	66		
	metingen		k-waarde
	hoogte	t [s]	[m/dag]
meting 0 t = 0 [cm]	41,5	0 -	
meting 1 t = 1 [cm]	40,4	30	2,9245275
meting 2 t = 2 [cm]	39,5	60	2,3927953
meting 3 t = 3 [cm]	38,8	90	1,861063
meting 4 t = 4 [cm]	38,4	120	1,0634646
meting 5 t = 5 [cm]	37,6	150	2,1269291
meting 6 t = 6 [cm]	36,6	180	2,6586614
meting 7 t = 7 [cm]	35,7	210	2,3927953
meting 8 t = 8 [cm]	34,6	240	2,9245275
meting 9 t = 9 [cm]	33,6	270	2,6586614
Gemiddelde K-waarde [m/dag]	2,3337139		

Tabel V. Resultaten boring 68

Boring 68			
	laag 1		
laagbegin [cm -mv]	49		
laageinde [cm -mv]	83		
Q [cm ³ /cm]	105		
H [cm]	17		
r [cm]	3		
D [cm -mv]	66		
	metingen		k-waarde
	hoogte	t [s]	[m/dag]
meting 0 t = 0 [cm]	27,2	0 -	
meting 1 t = 1 [cm]	26,8	30	1,0634646
meting 2 t = 2 [cm]	26,4	60	1,0634646
meting 3 t = 3 [cm]	26	90	1,0634646
meting 4 t = 4 [cm]	25,6	120	1,0634646
meting 5 t = 5 [cm]	25,1	150	1,3293307
meting 6 t = 6 [cm]	24,7	180	1,0634646
meting 7 t = 7 [cm]	24,3	210	1,0634646
meting 8 t = 8 [cm]	23,8	240	1,3293307
meting 9 t = 9 [cm]	23,4	270	1,0634646
Gemiddelde K-waarde [m/dag]	1,1225459		

Tabel VI. Resultaten boring 106

Boring 106			
	laag 1		
laagbegin [cm -mv]	39		
laageinde [cm -mv]	73		
Q [cm ³ /cm]	20		
H [cm]	17		
r [cm]	3		
D [cm -mv]	56		
	metingen		k-waarde
	hoogte	t [s]	[m/dag]
meting 0 t = 0 [cm]	28,8	0 -	
meting 1 t = 1 [cm]	28,1	30	0,3544882
meting 2 t = 2 [cm]	27,3	60	0,4051294
meting 3 t = 3 [cm]	26,7	90	0,303847
meting 4 t = 4 [cm]	26,1	120	0,303847
meting 5 t = 5 [cm]	25,5	150	0,303847
meting 6 t = 6 [cm]	24,9	180	0,303847
meting 7 t = 7 [cm]	24,2	210	0,3544882
meting 8 t = 8 [cm]	23,6	240	0,303847
meting 9 t = 9 [cm]	22,9	270	0,3544882
Gemiddelde K-waarde [m/dag]			0,331981

Tabel VII. Resultaten boring 120

Boring 120			
	laag 1		
laagbegin [cm -mv]	96		
laageinde [cm -mv]	130		
Q [cm ³ /cm]	105		
H [cm]	17		
r [cm]	3		
D [cm -mv]	113		
	metingen		k-waarde
	hoogte	t [s]	[m/dag]
meting 0 t = 0 [cm]	40	0 -	
meting 1 t = 1 [cm]	38,6	30	3,722126
meting 2 t = 2 [cm]	37,2	60	3,722126
meting 3 t = 3 [cm]	35,8	90	3,722126
meting 4 t = 4 [cm]	34,4	120	3,722126
meting 5 t = 5 [cm]	33	150	3,722126
meting 6 t = 6 [cm]	31,7	180	3,4562598
meting 7 t = 7 [cm]	30,3	210	3,722126
meting 8 t = 8 [cm]	28,8	240	3,9879921
meting 9 t = 9 [cm]	27,5	270	3,4562598
Gemiddelde K-waarde [m/dag]			3,6925853

Uit de bovenstaande resultaten kan geconcludeerd worden dat de doorlatendheid op de onderzoekslocatie op het traject tussen 0,39 - 1,30 m -mv varieert tussen de 0,33 m/dag en 3,69 m/dag. Er bestaat geen eenduidig verband tussen de situering van het meetpunt en de ter plaatse gemeten bodemdoorlatendheid.

5 COLOFON

Opdrachtgever	: Cycloon Holland B.V.
Project	: MLA -terrein Maasbree
Dossier	: A0944
Omvang rapport	: 10 pagina's
Auteur	: R.P.A. Paulussen Bc.
Bijdrage	:
Projectleider	: R.P.A. Paulussen Bc.
Projectmanager	: drs. L.E.J. De Loo
Datum	: 20 juli 2006
Naam / Paraaf	:

DHV B.V.

Horsterweg 18/A

6199 AC Maastricht Airport

Postbus 302

6199 ZN Maastricht Airport

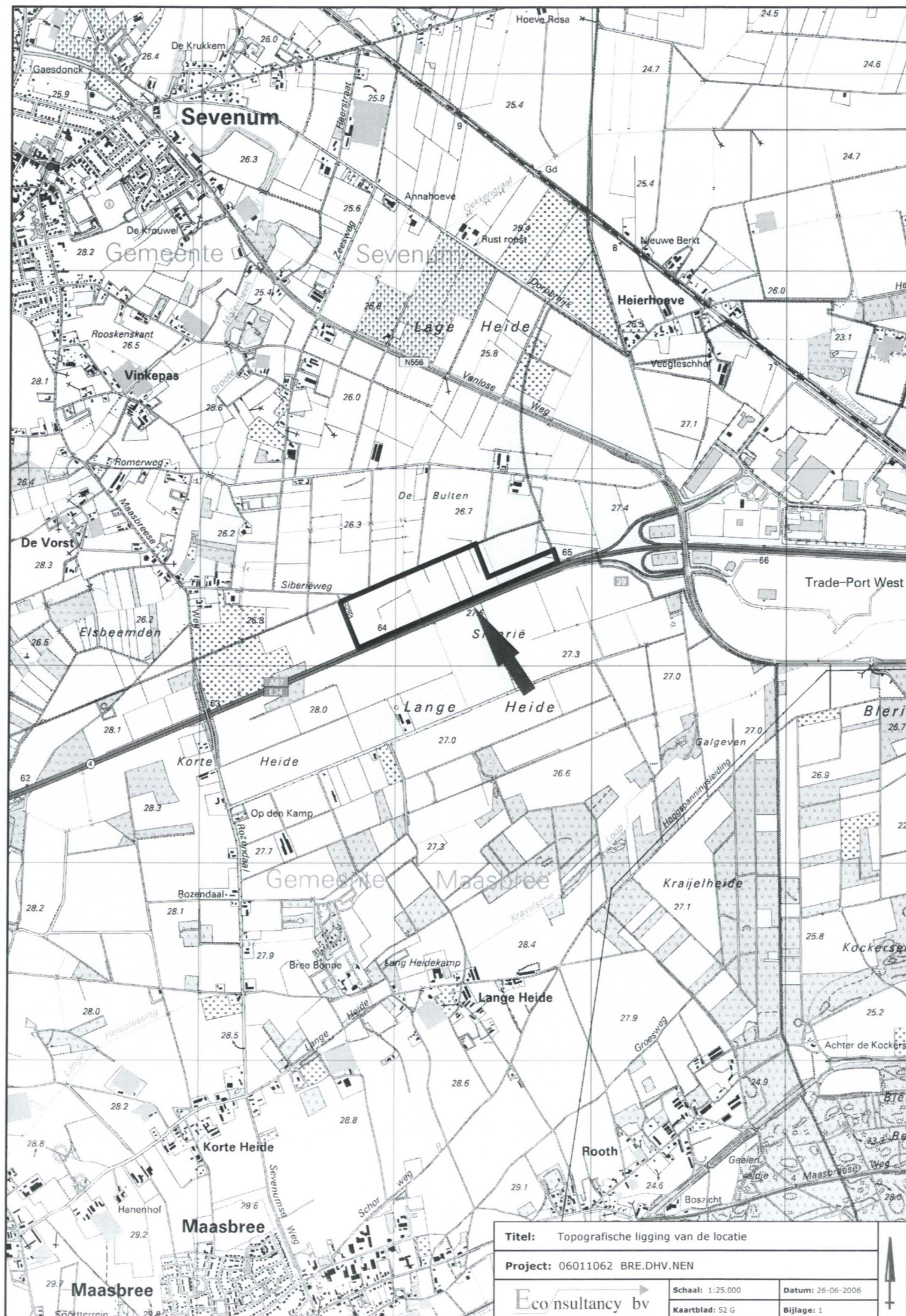
T (043) 329 48 48

F (043) 329 48 99

E maastricht@dhv.nl

www.dhv.nl

BIJLAGE 1 Topografische ligging van de locatie



BIJLAGE 2 Locatieschets met meetpunten



locatiegrens

perceel is opgehoogd
t.o.v. Overige percelen

Romijnstuw

Lage Heide

Rijksweg 607

Rijksweg 607

Teelt onder plastic ten
tijde van terreininspectie

legenda:

- Silbmonster
- boring 0,0 - 0,5 m -mv
- boring 0,0 - 1,25 m -mv
- boring 0,0 - 2,0 m -mv
- peilbuis
- perceelnummer
- Afwateringsgeul
- Afwateringsgeul gelijk met maaltveld
- boom
- struiken



Titel: locatieschets

Project: 06011062 BRE.DHV.NEN

Schaal: 1:3.000

Datum: 04-05-2006

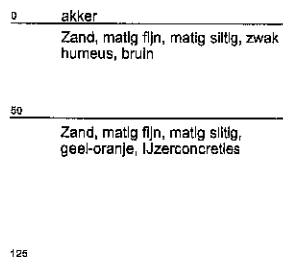
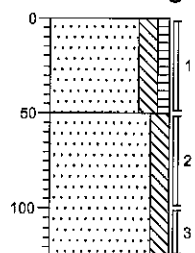
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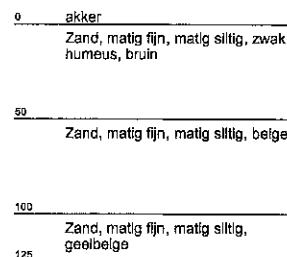
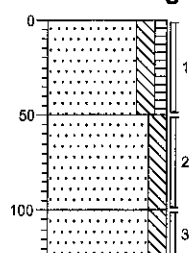
A3

BIJLAGE 3 Boorprofielen

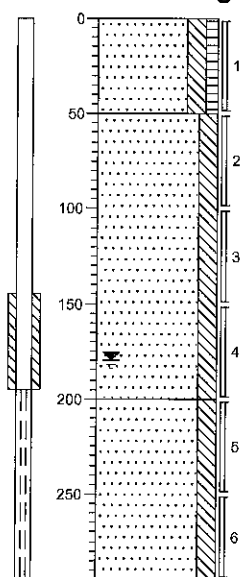
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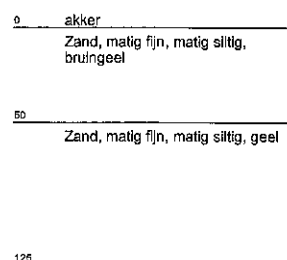
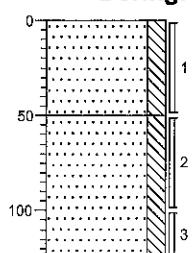
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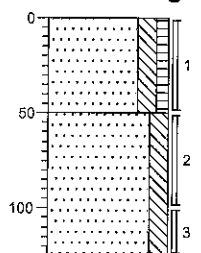
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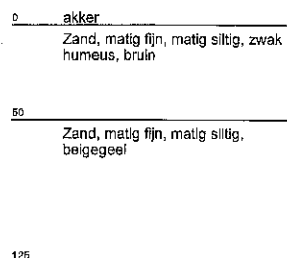
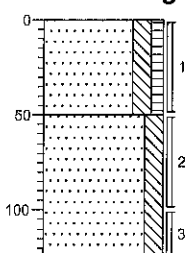
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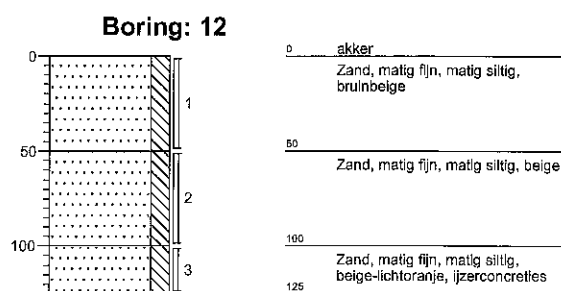
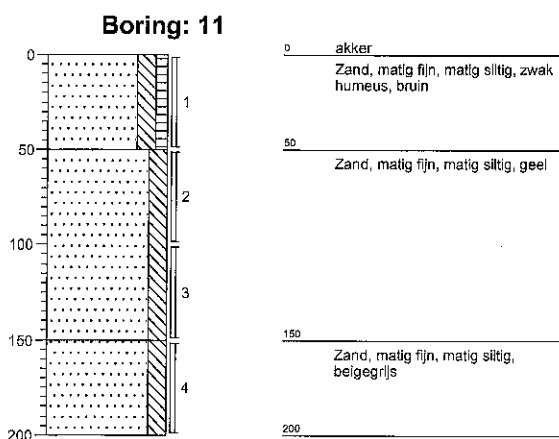
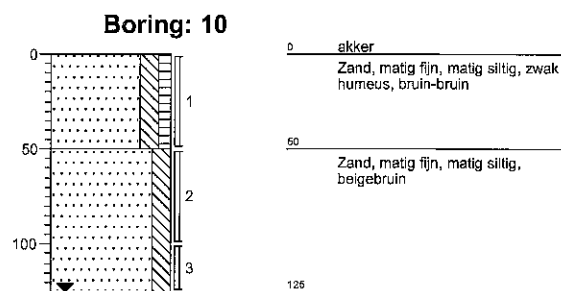
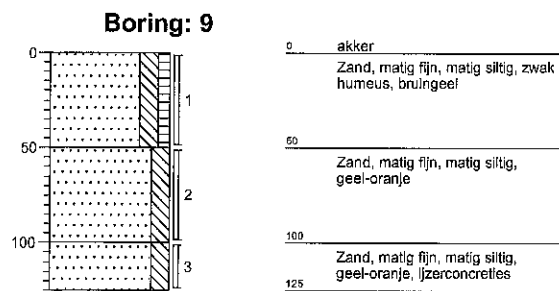
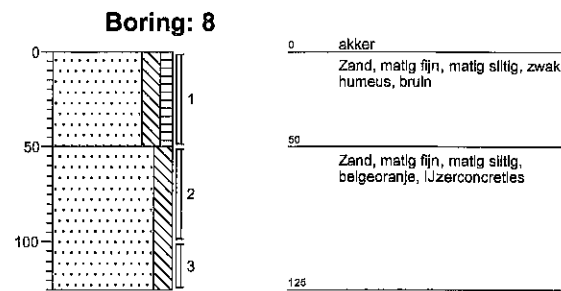
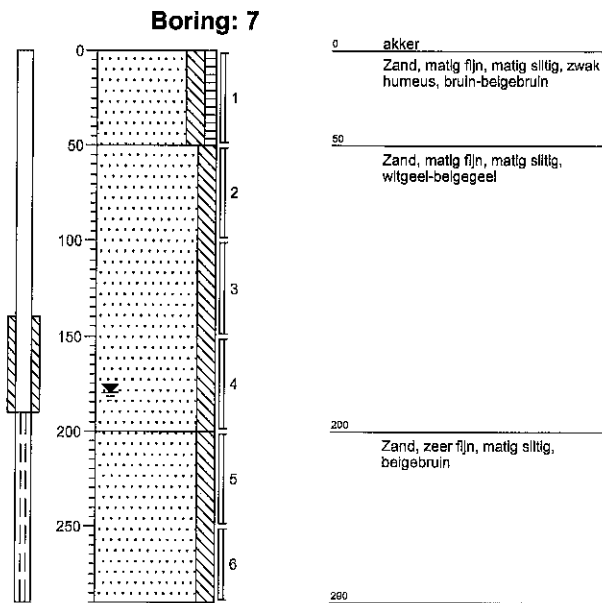


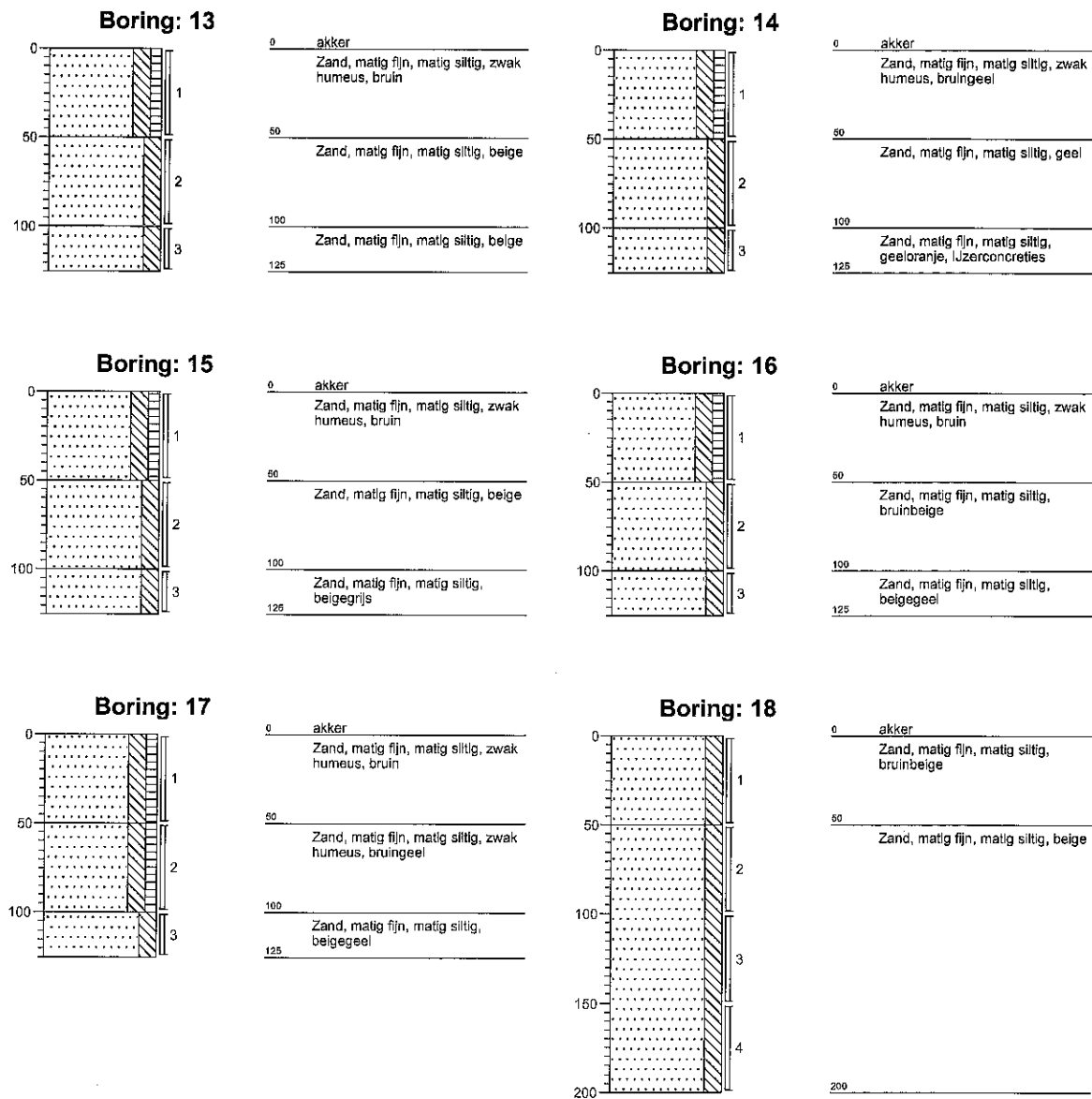
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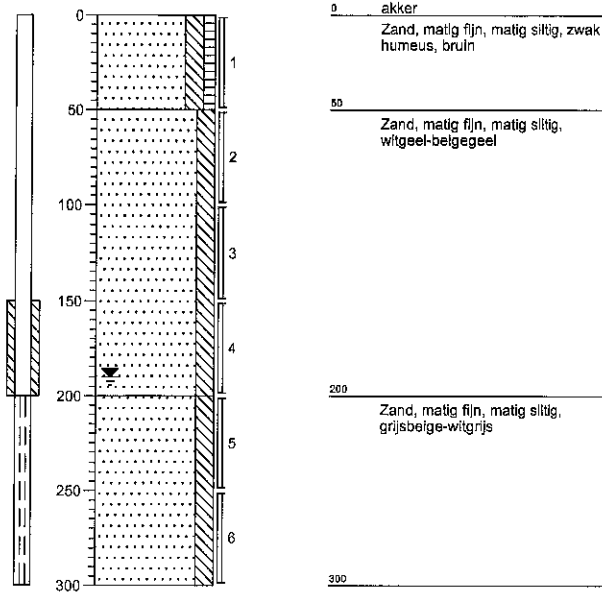
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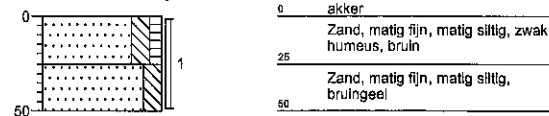




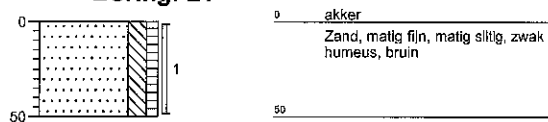
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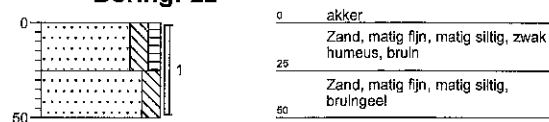
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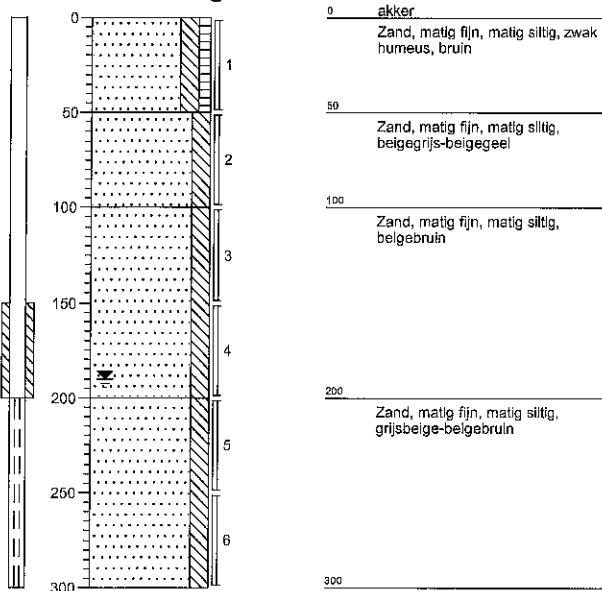
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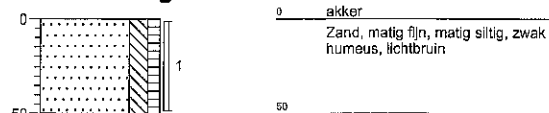
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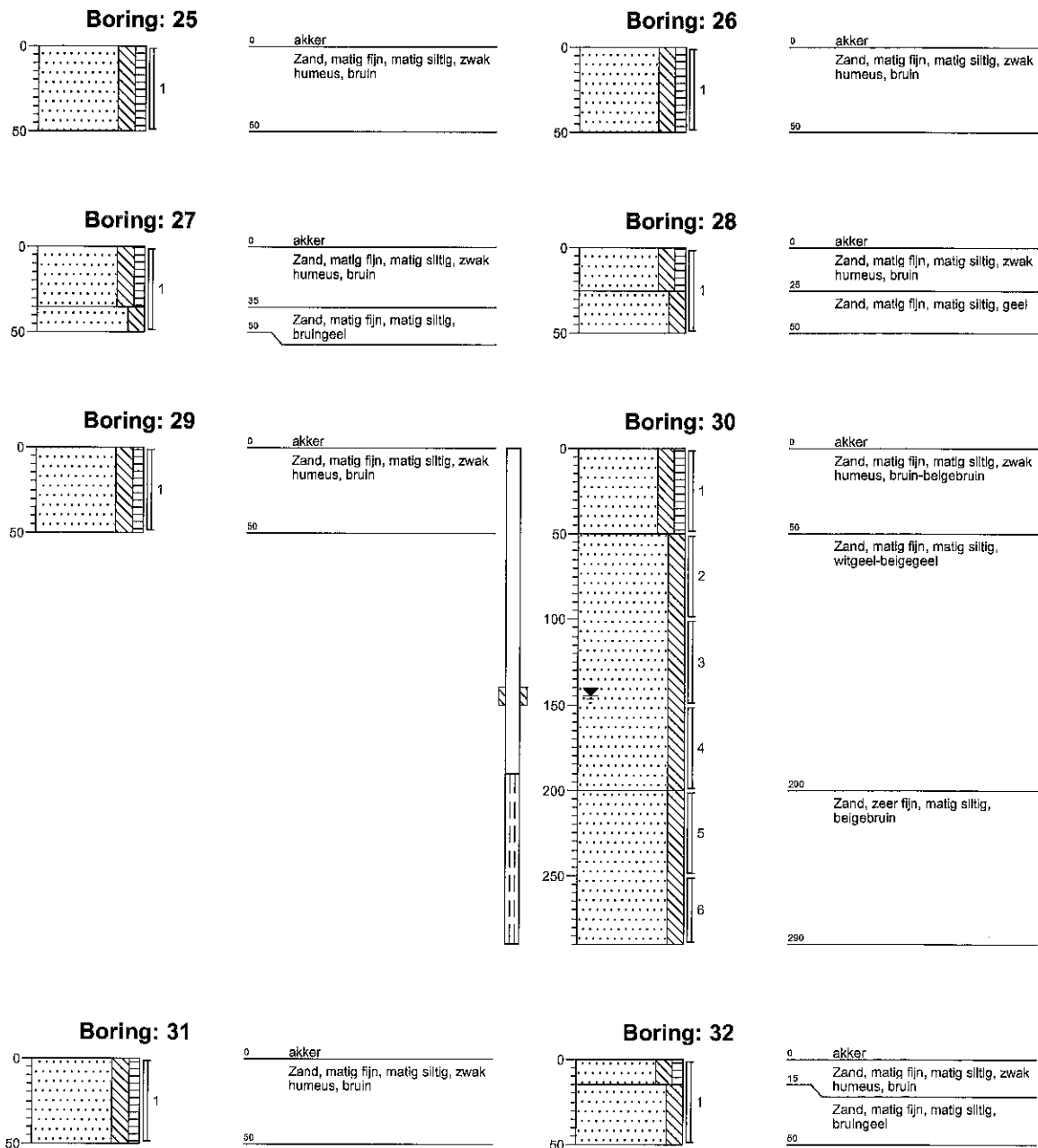


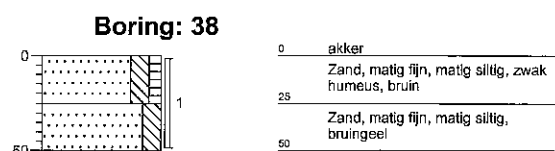
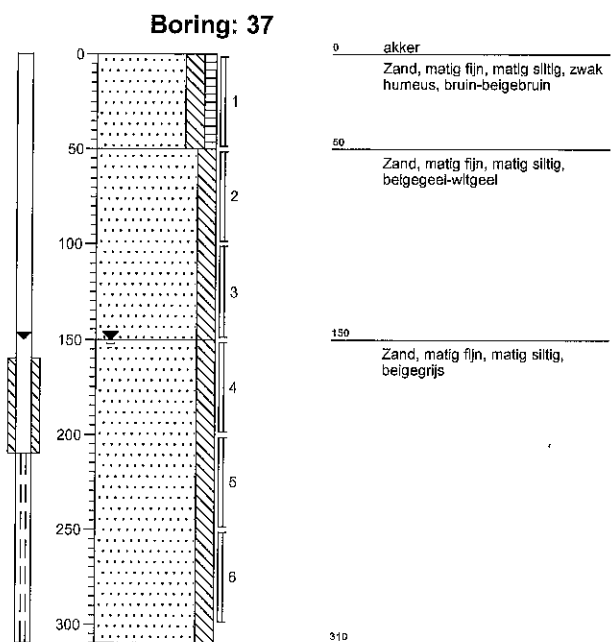
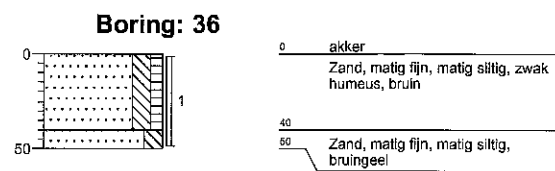
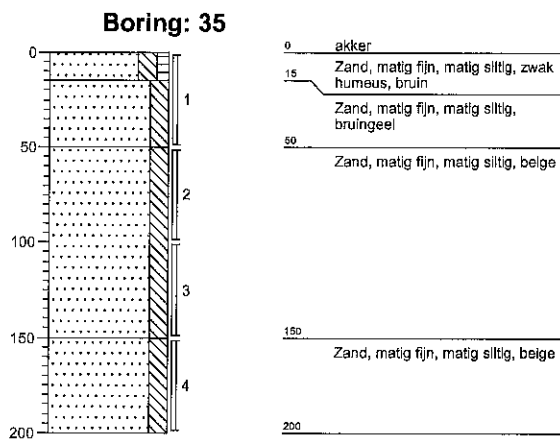
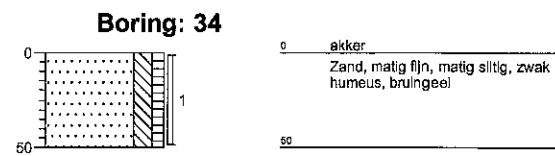
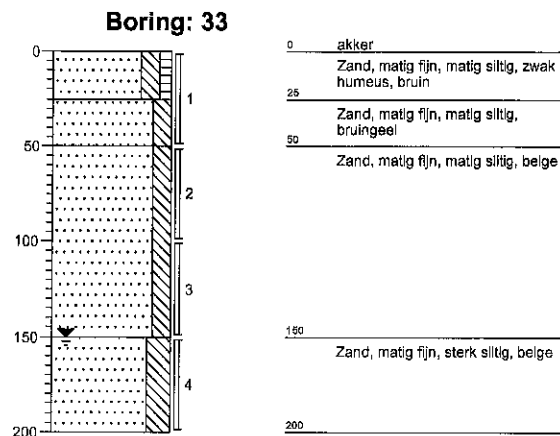
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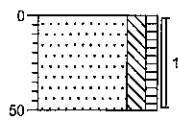
Boring: 24





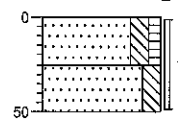


Boring: 39



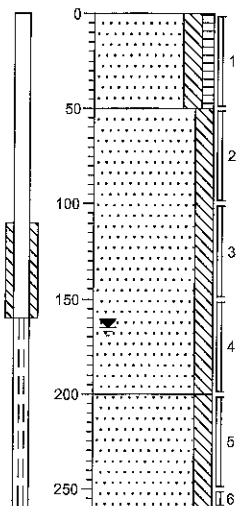
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	Zand, matig fijn, matig siltig, zwak humeus, bruingeel
50	

Boring: 40



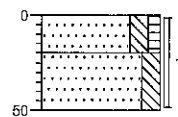
0	akker
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	Zand, matig fijn, matig siltig, bruingeel
50	

Boring: 41



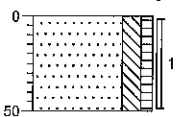
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50	
	Zand, matig fijn, matig siltig, witgeel-beigegeel
200	
	Zand, zeer fijn, matig siltig, beigebruin-belegrijs
250	

Boring: 42



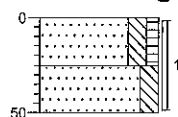
0	akker
	Zand, matig fijn, matig siltig, zwak humeus, bruin
20	
	Zand, matig fijn, matig siltig, lichtbruin-beige
50	

Boring: 43



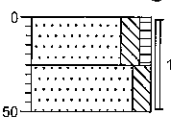
0	akker
	Zand, matig fijn, matig siltig, zwak humeus, bruingeel
50	

Boring: 44



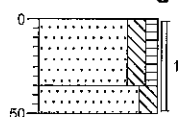
0	akker
	Zand, matig fijn, matig siltig, zwak humeus, bruin
25	
	Zand, matig fijn, matig siltig, bruinbeige
50	

Boring: 45

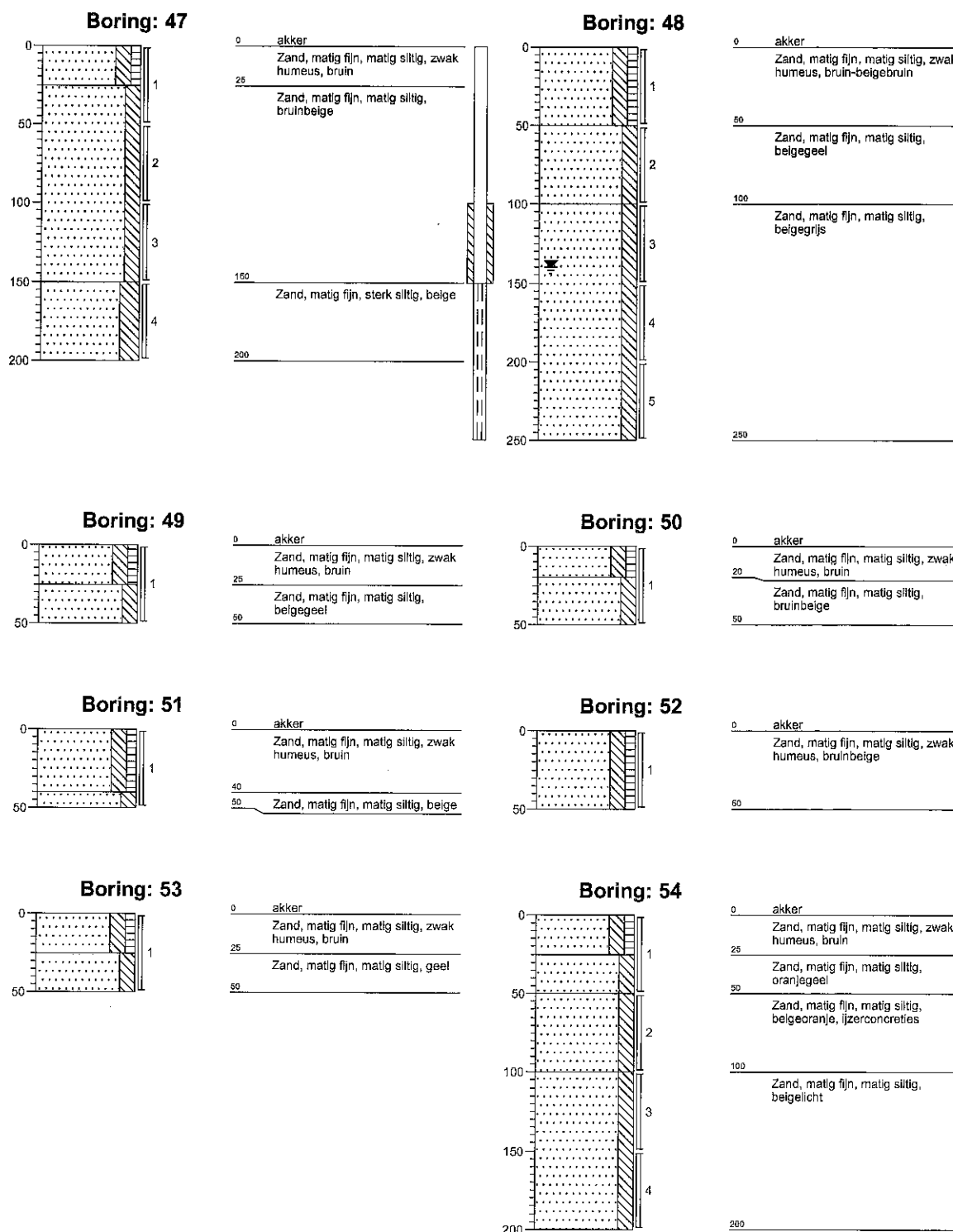


0	akker
	Zand, matig fijn, matig siltig, zwak humeus, bruin
25	
	Zand, matig fijn, matig siltig, geelbeige
50	

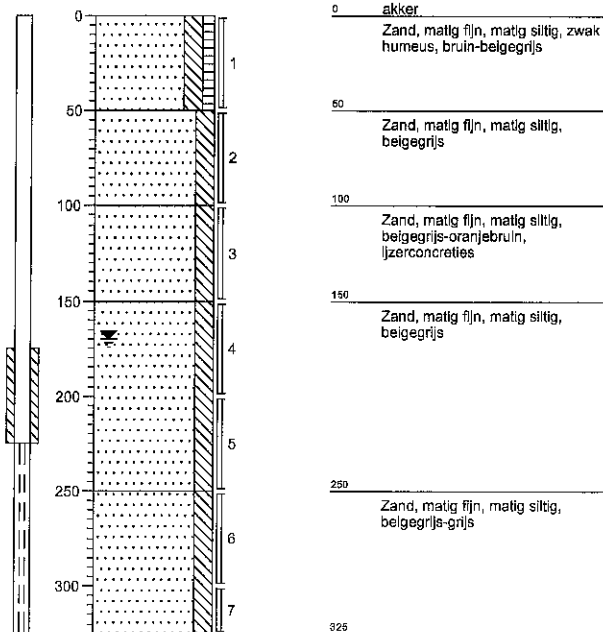
Boring: 46



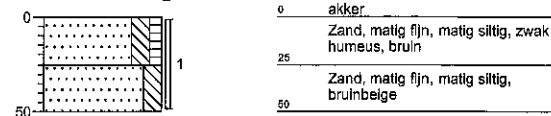
0	akker
	Zand, matig fijn, matig siltig, zwak humeus, bruin
35	
	Zand, matig fijn, matig siltig, bruinbeige
60	



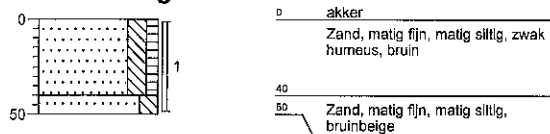
Boring: 55



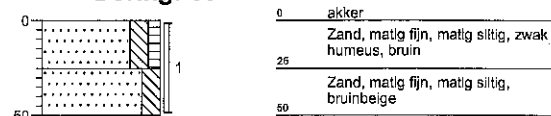
Boring: 56



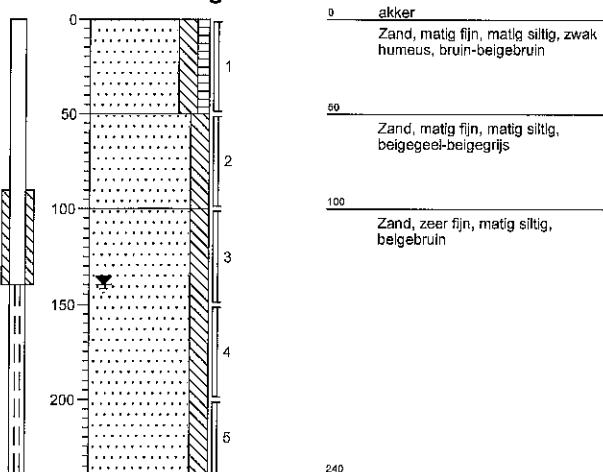
Boring: 57



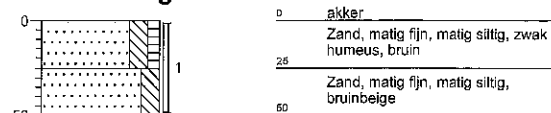
Boring: 58

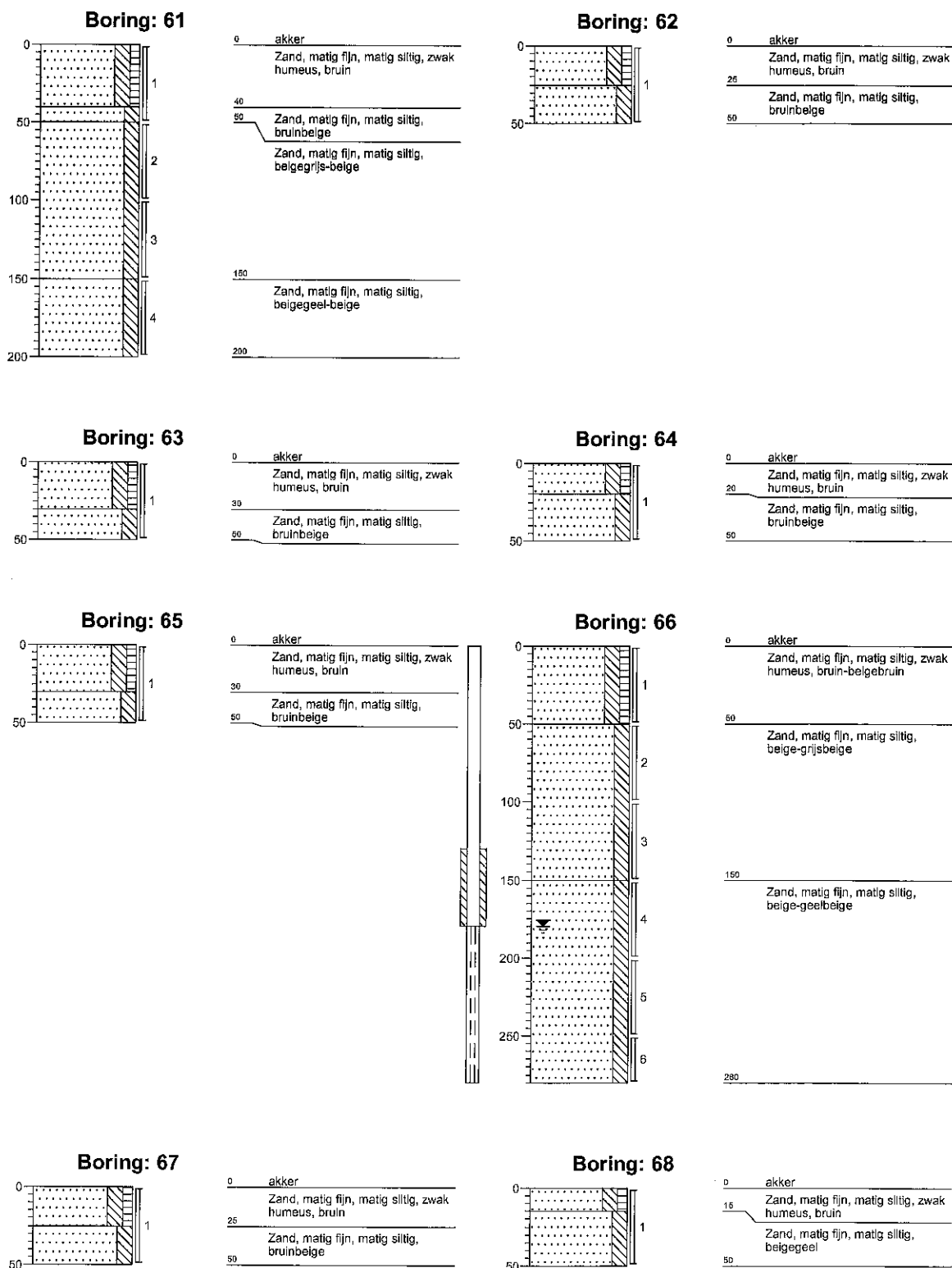


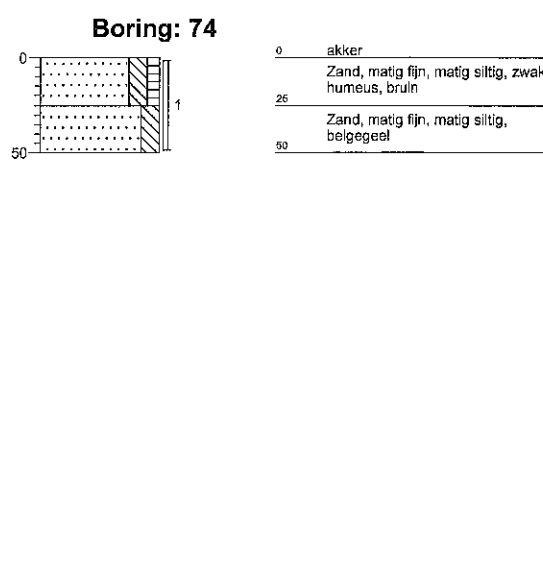
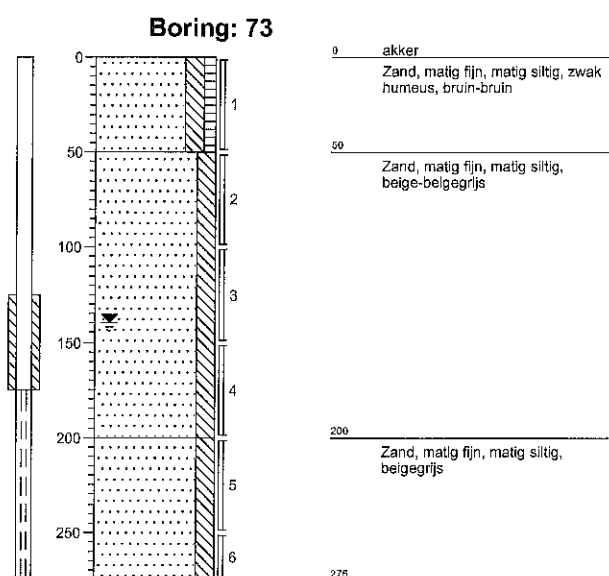
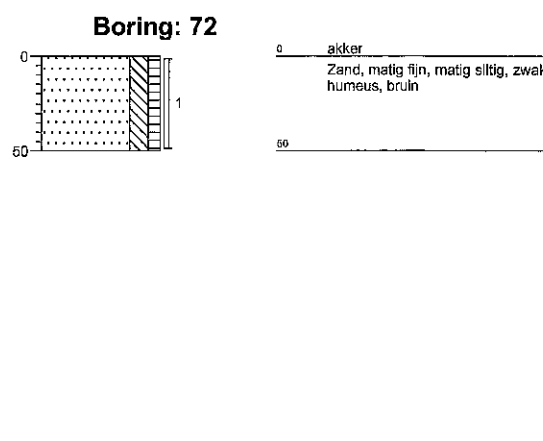
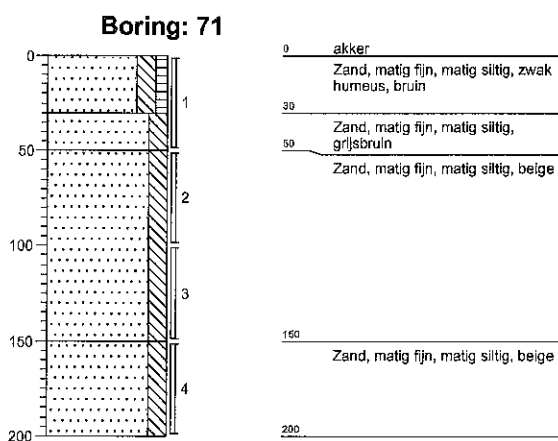
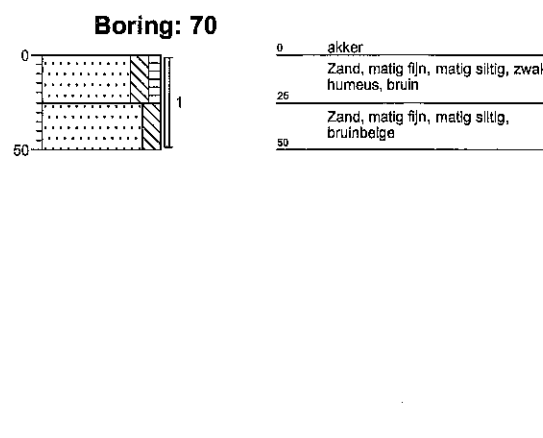
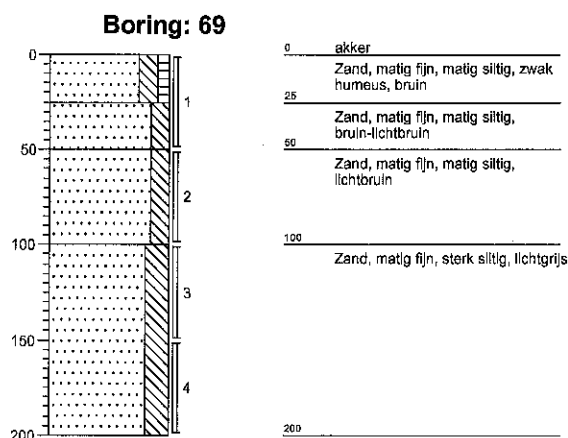
Boring: 59



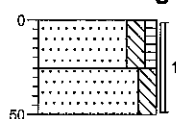
Boring: 60





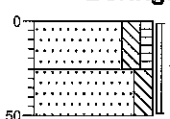


Boring: 75



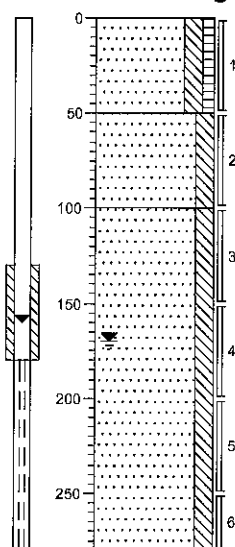
0	akker
25	Zand, matig fijn, matig siltig, zwak humeus, bruin
50	Zand, matig fijn, matig siltig, bruinbeige

Boring: 76



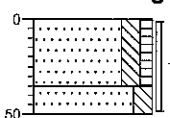
0	akker
25	Zand, matig fijn, matig siltig, zwak humeus, bruin
50	Zand, matig fijn, matig siltig, bruinbeige

Boring: 77



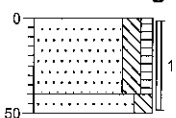
0	akker
25	Zand, matig fijn, matig siltig, zwak humeus, bruin-beigebruin
50	Zand, matig fijn, matig siltig, beigegeel-witbeige
100	Zand, matig fijn, matig siltig

Boring: 78



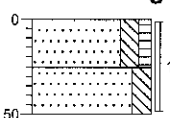
0	akker
35	Zand, matig fijn, matig siltig, zwak humeus, bruin
50	Zand, matig fijn, matig siltig, bruinbeige

Boring: 79



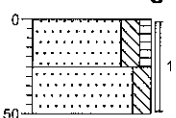
0	akker
40	Zand, matig fijn, matig siltig, zwak humeus, bruin
50	Zand, matig fijn, matig siltig, bruinbeige

Boring: 80



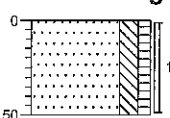
0	akker
25	Zand, matig fijn, matig siltig, zwak humeus, bruin
50	Zand, matig fijn, matig siltig, bruingeel

Boring: 81

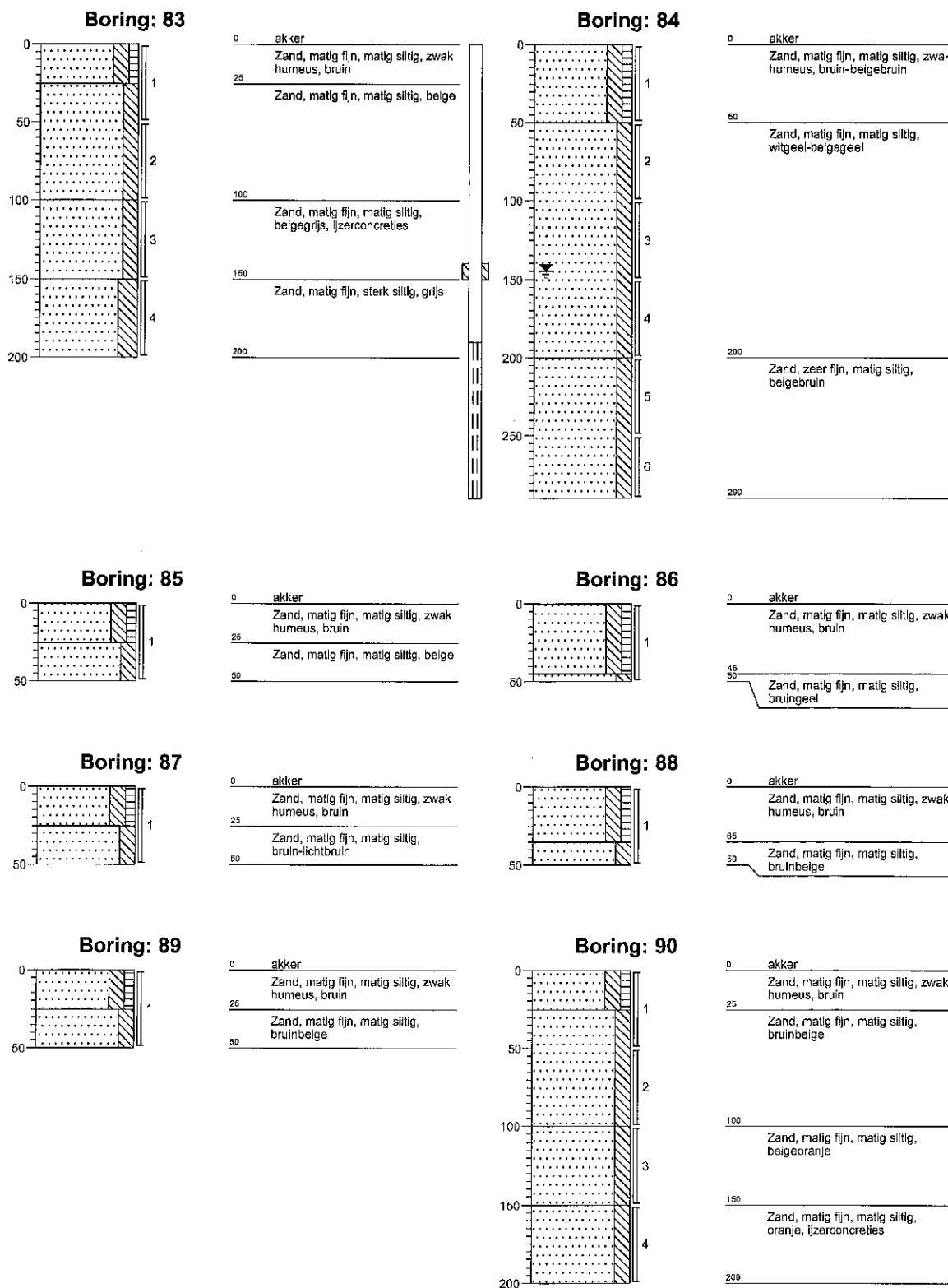


0	akker
25	Zand, matig fijn, matig siltig, zwak humeus, bruin
50	Zand, matig fijn, matig siltig, bruinbeige

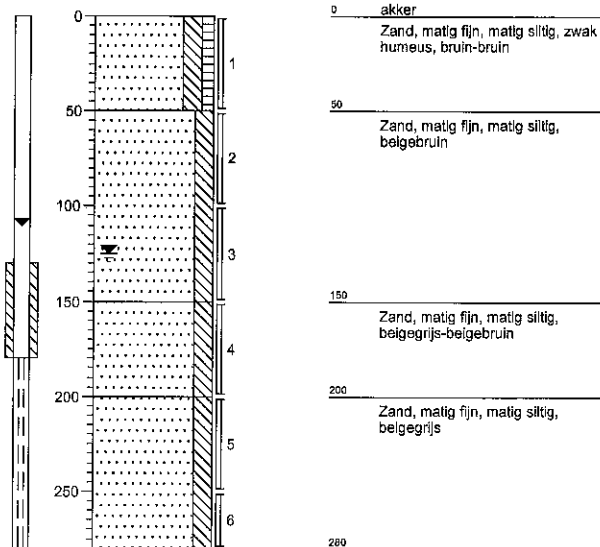
Boring: 82



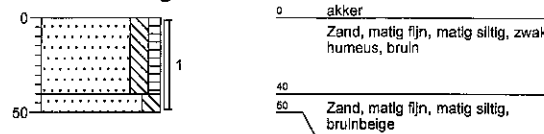
0	akker
25	Zand, matig fijn, matig siltig, zwak humeus, bruin
50	



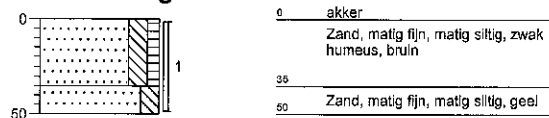
Boring: 91



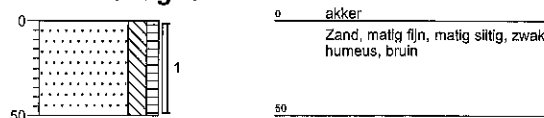
Boring: 92



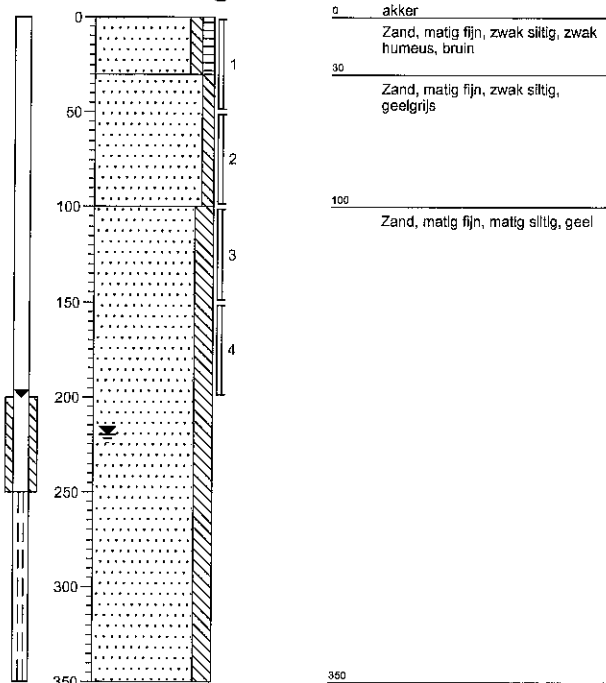
Boring: 93



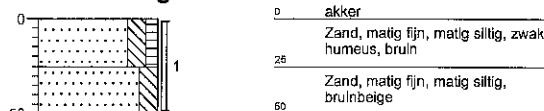
Boring: 94

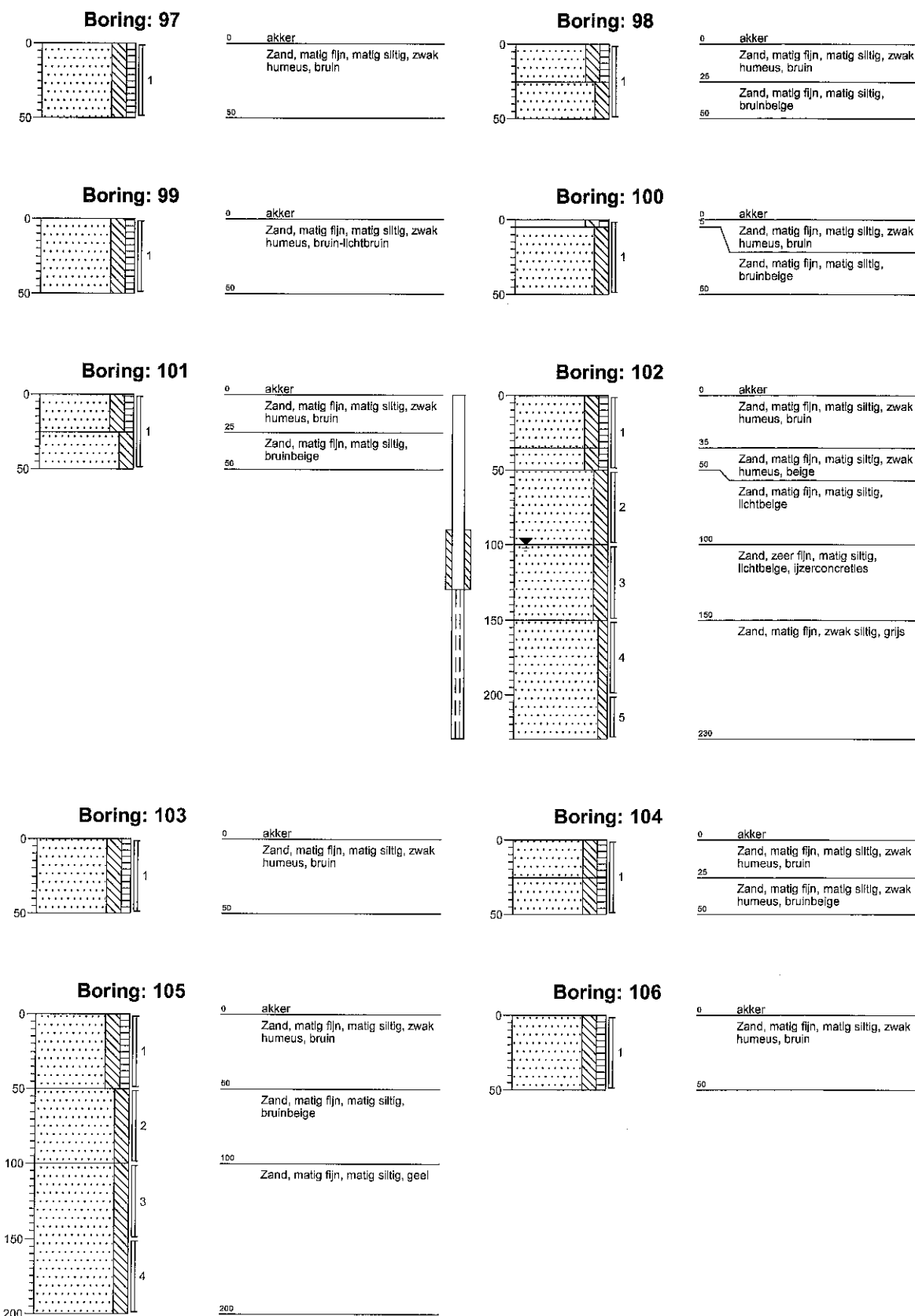


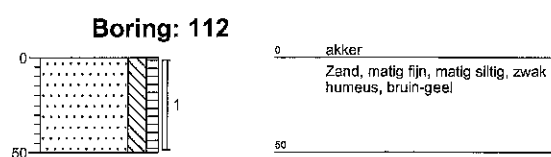
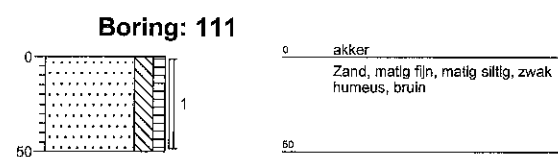
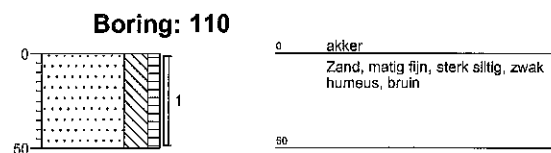
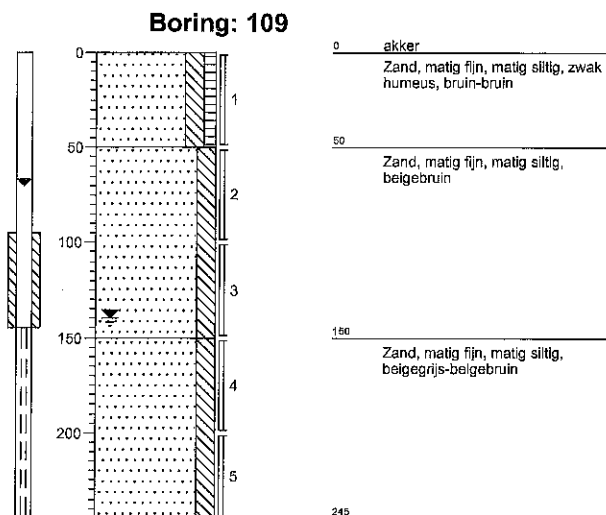
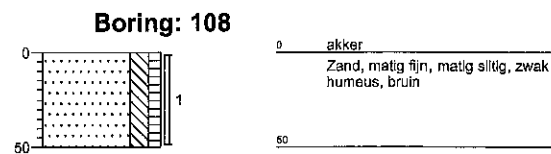
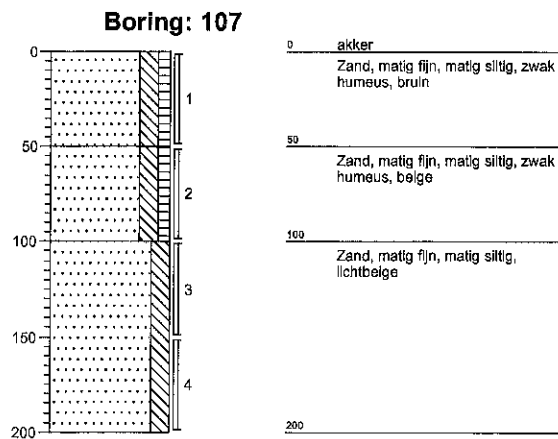
Boring: 95



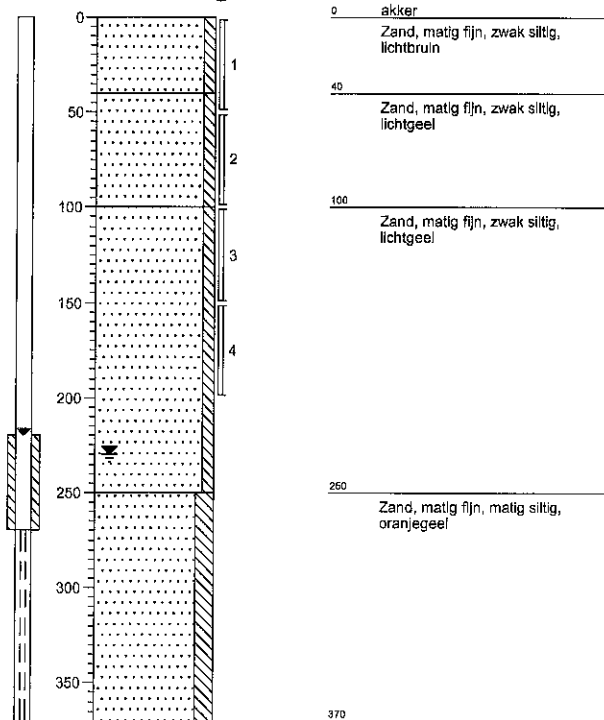
Boring: 96



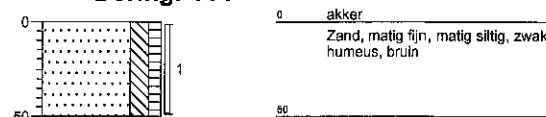




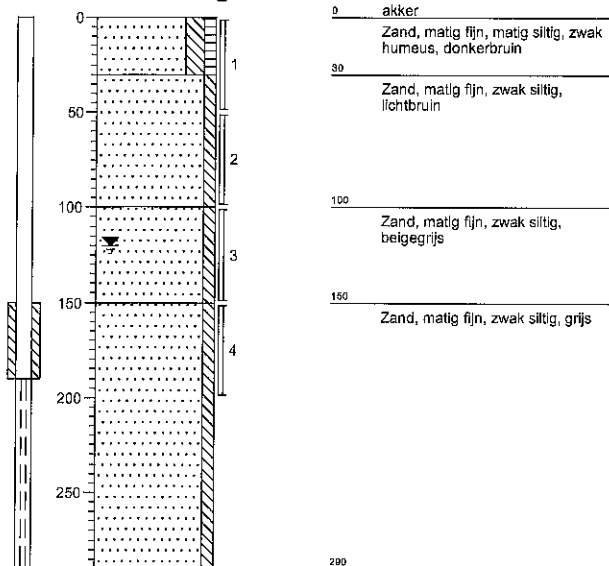
Boring: 113



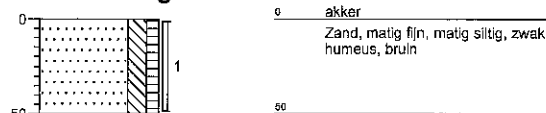
Boring: 114



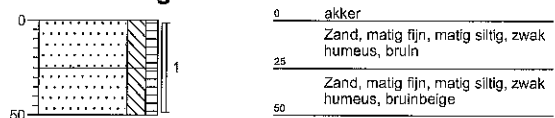
Boring: 115



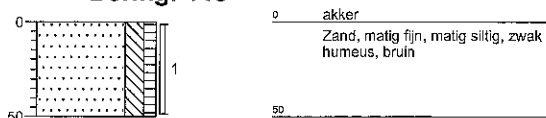
Boring: 116

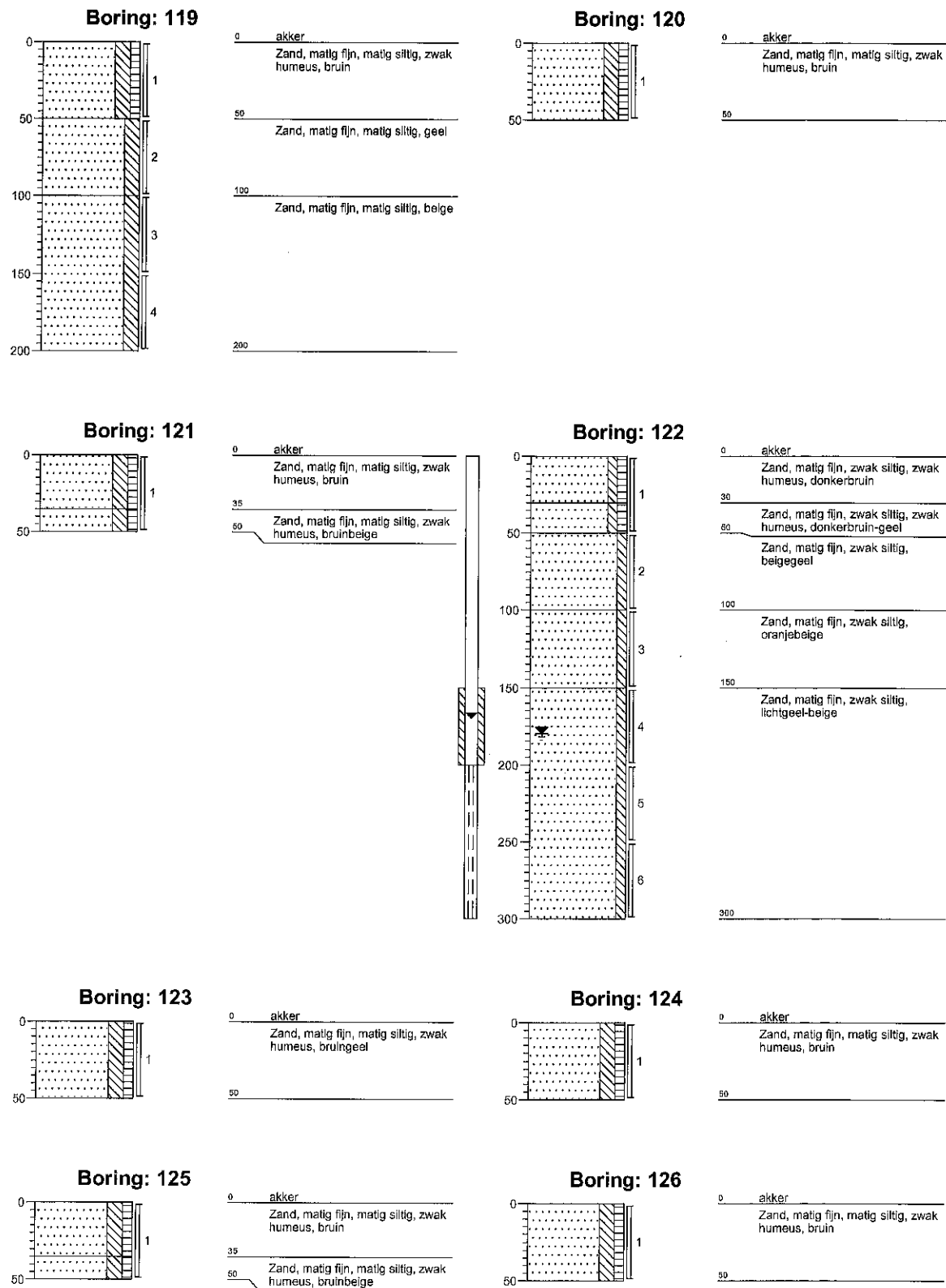


Boring: 117

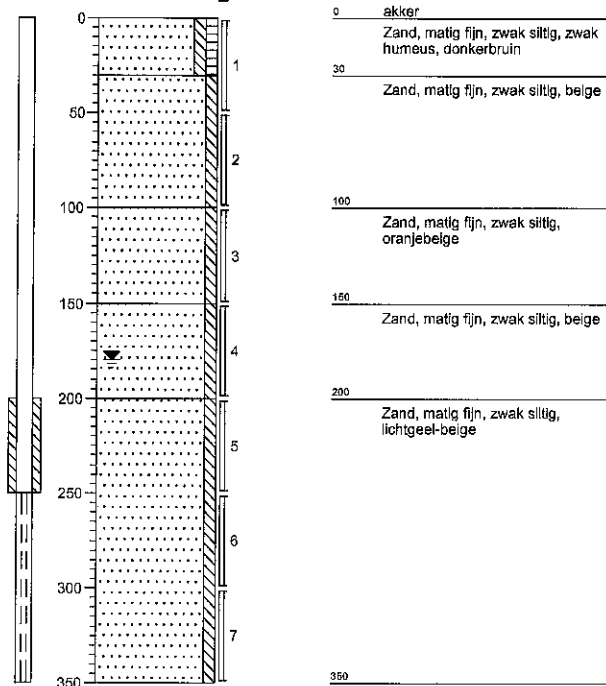


Boring: 118

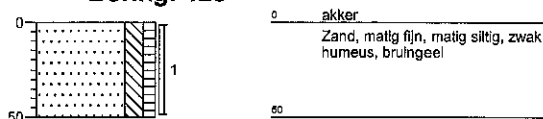




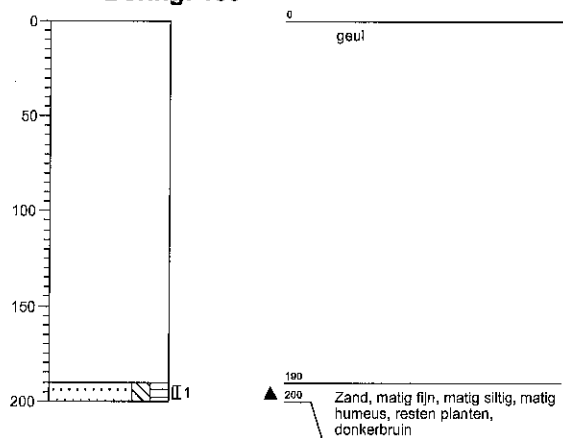
Boring: 127



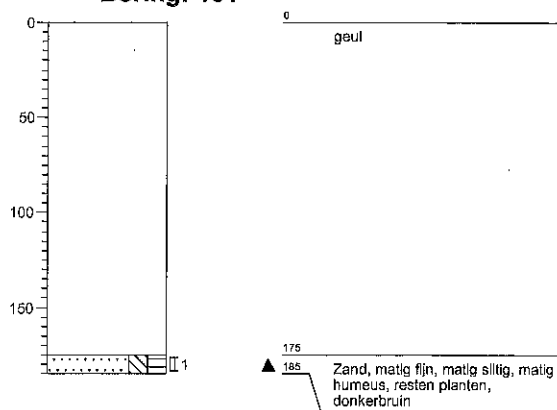
Boring: 128

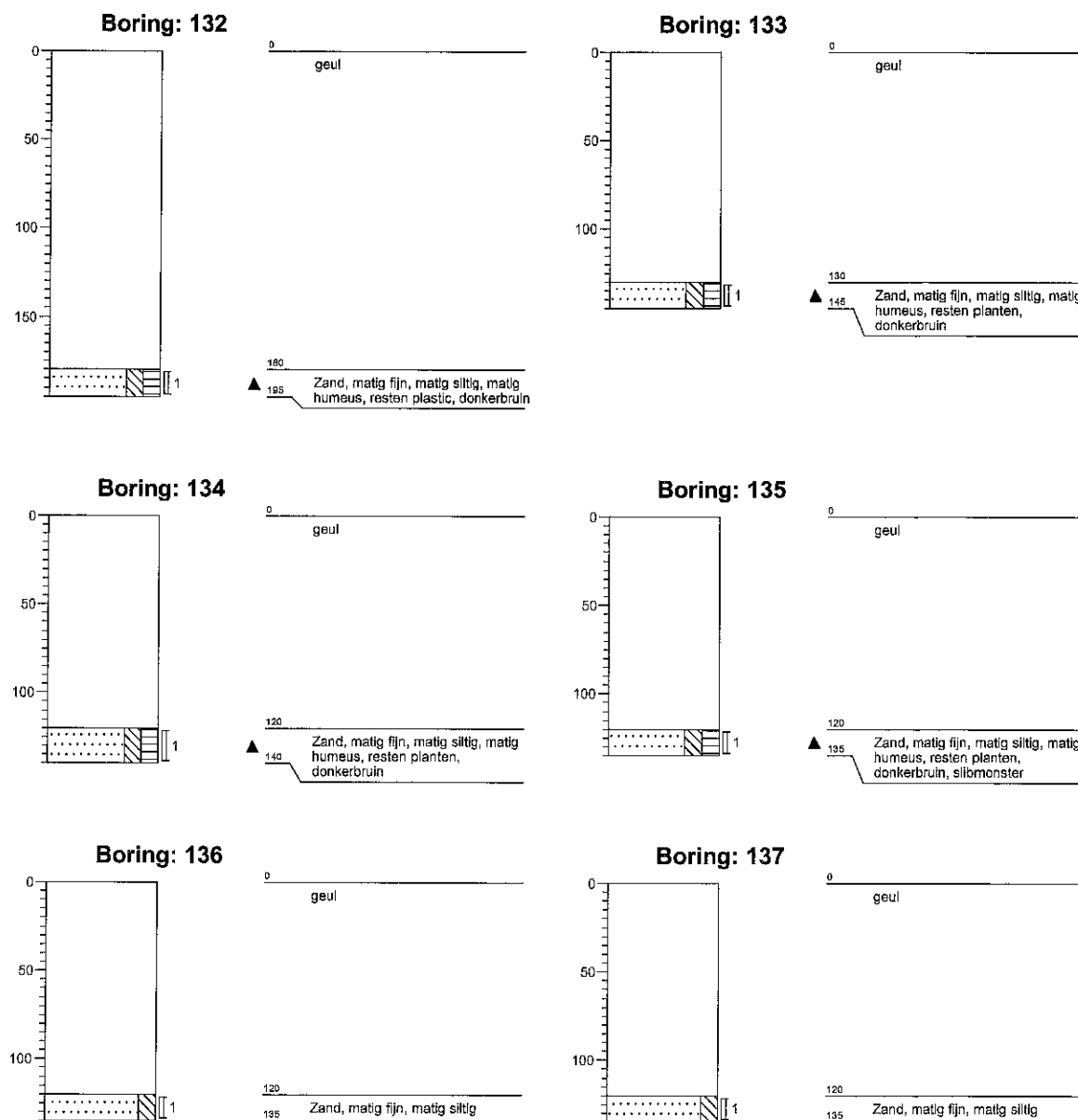


Boring: 130

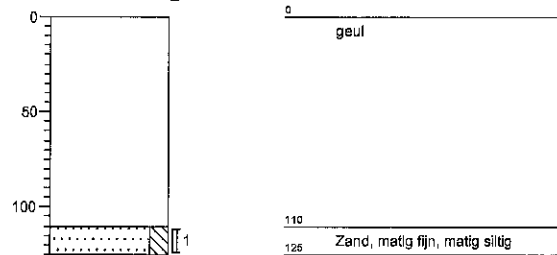


Boring: 131

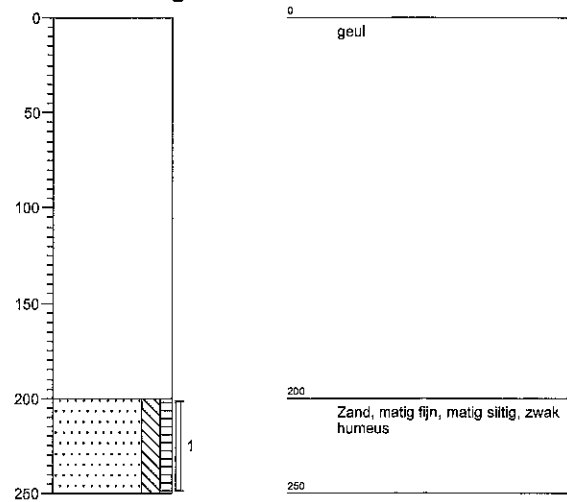




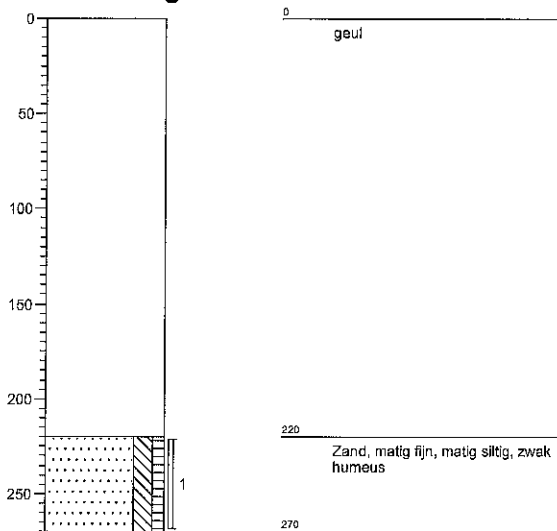
Boring: 138



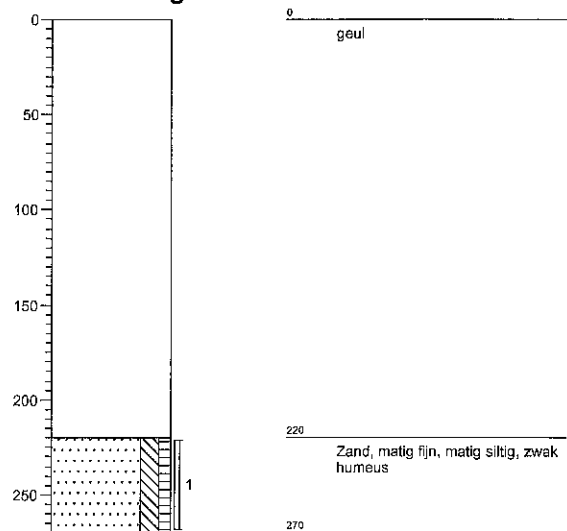
Boring: 139

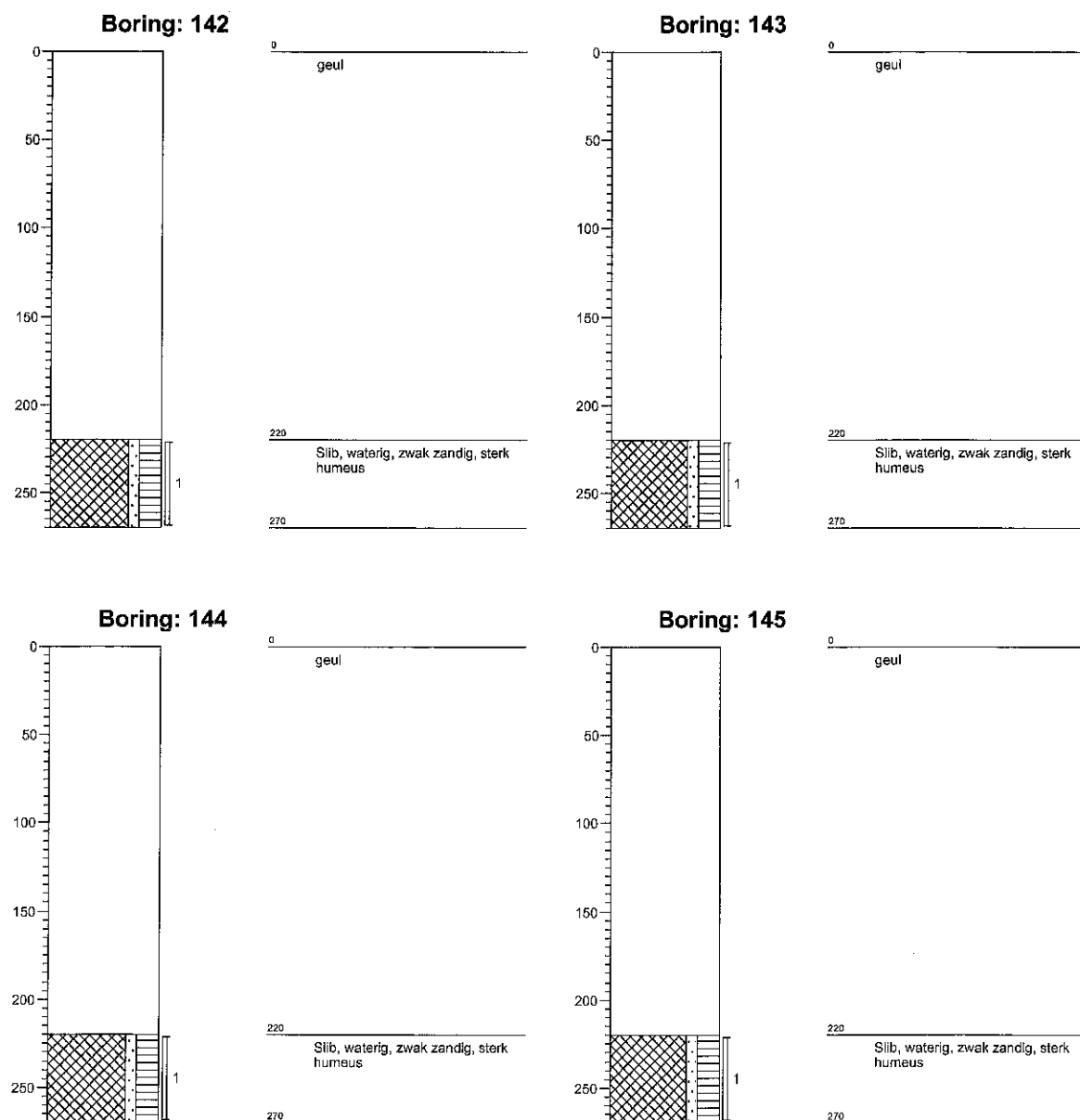


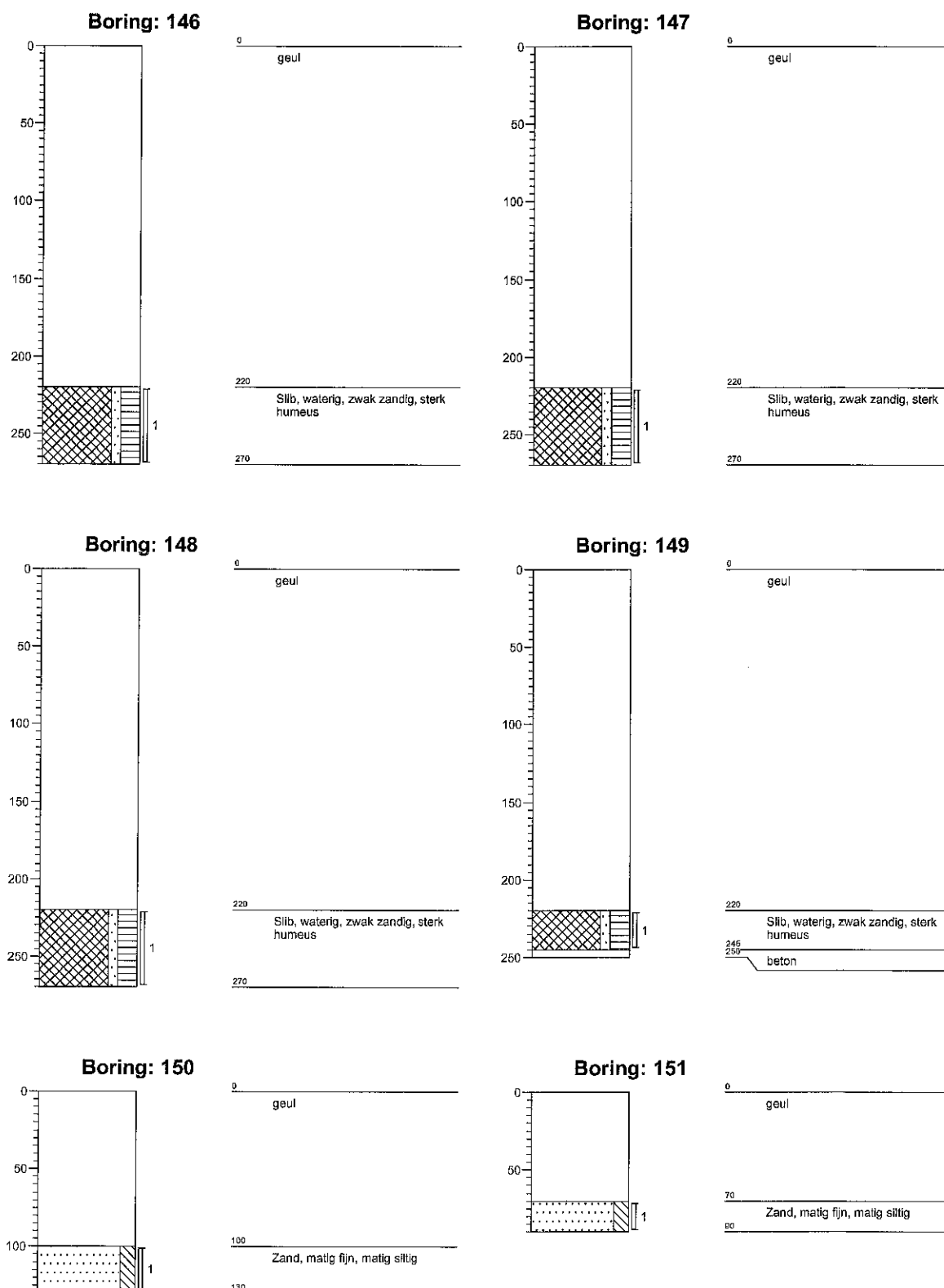
Boring: 140

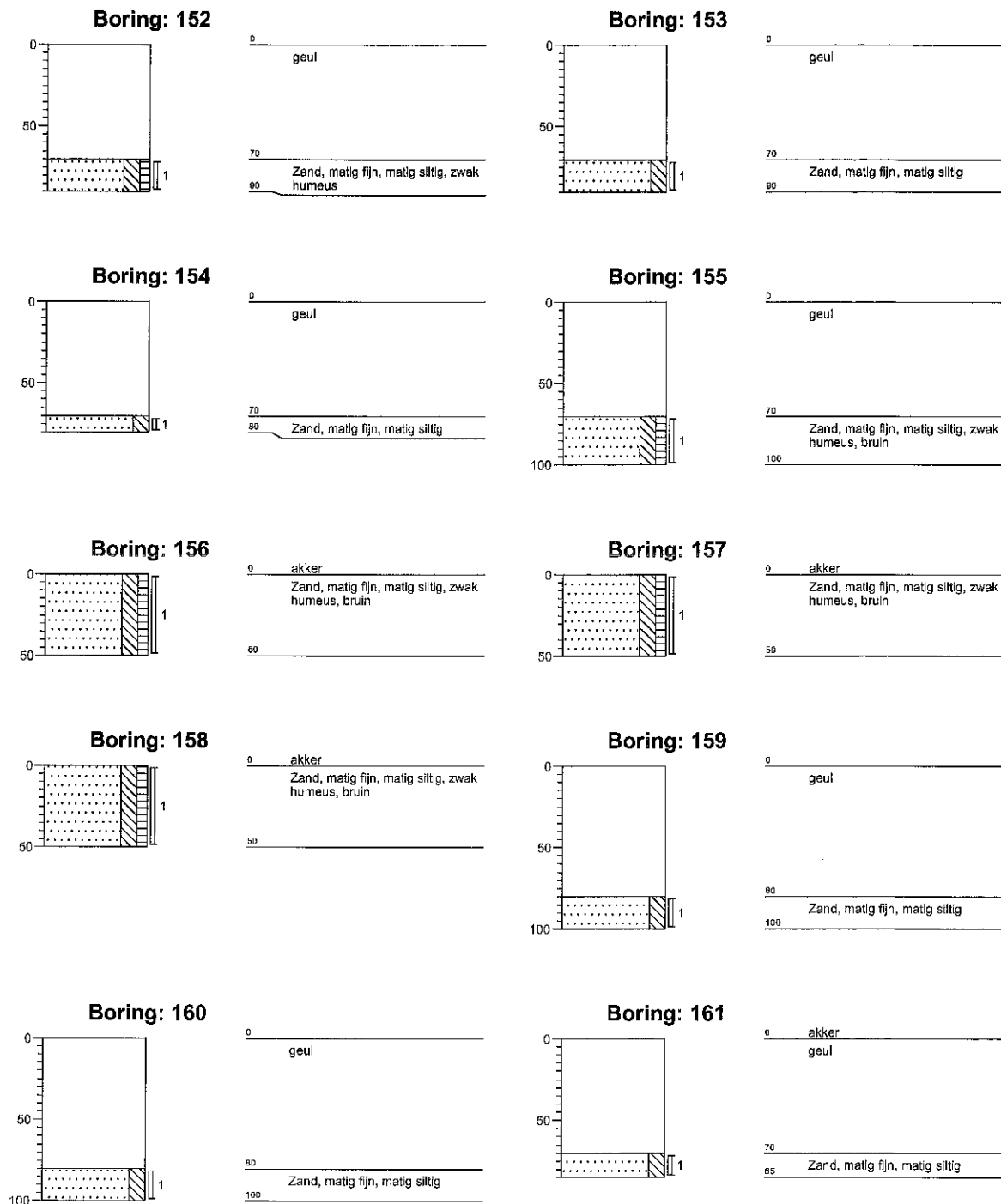


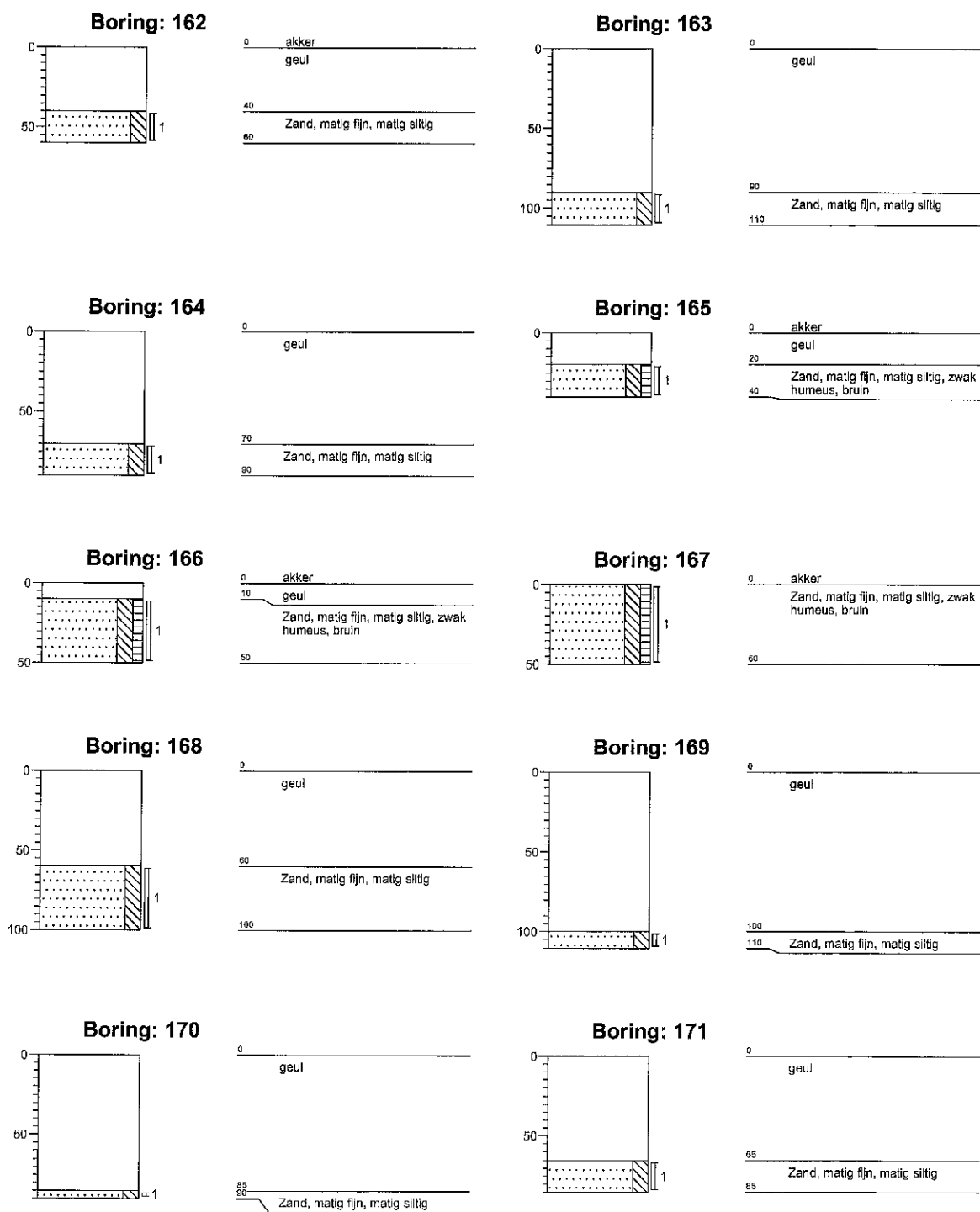
Boring: 141



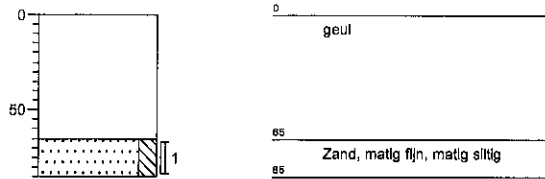




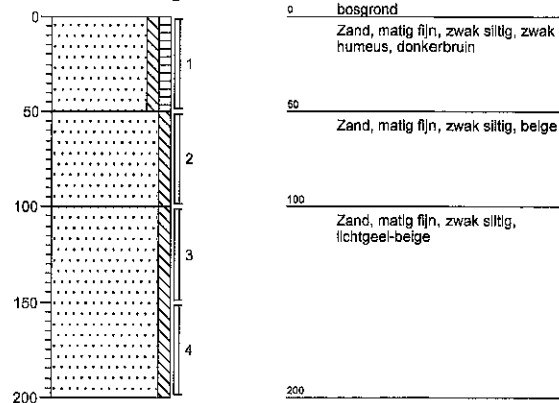




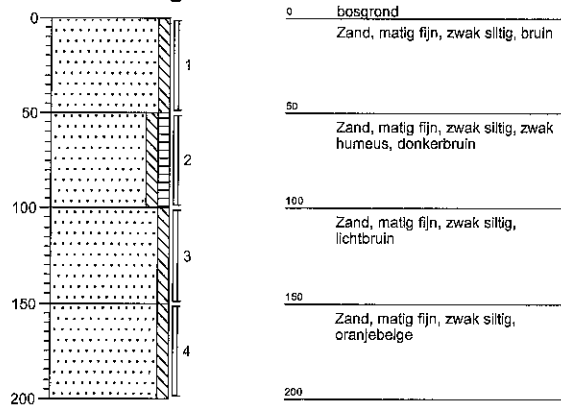
Boring: 172



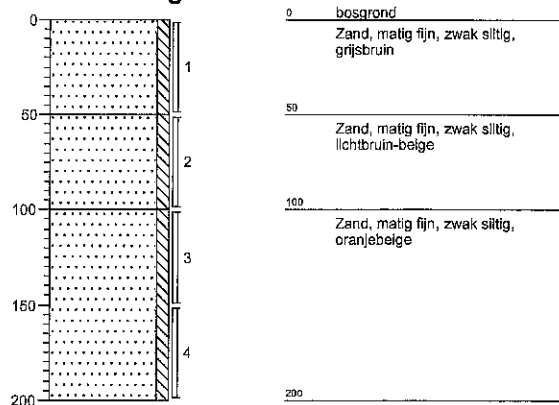
Boring: 178



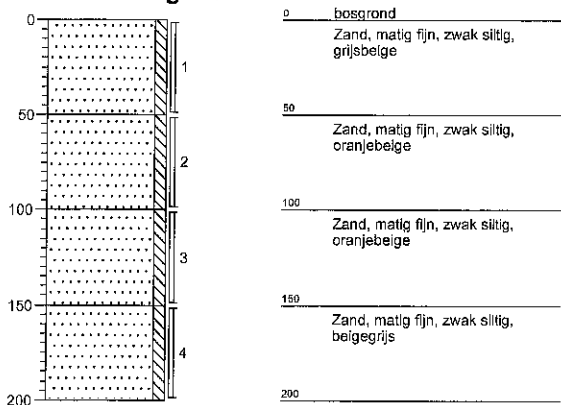
Boring: 179



Boring: 180



Boring: 181



Boring: 182

