

# **Geological description of vibrocores from the Nini-3 site, Store Fisker Banke area, Danish North Sea**

Peter Konradi and Tibor Czakó

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND  
MINISTRY OF ENVIRONMENT



**G E U S**

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# **Geological description of vibrocores from the NINI-3 site, Store Fisker Banke area, Danish North Sea**

This report includes a desription of a vibrocore from the NINI-2 site, the Appendix.

## **Location**

The vibrocoring was carried out as part of a site surveys at the NINI-3 hydrocarbon well site by Gardline Surveys Ltd. (2001) for Dong Efterforskning og Produktion A/S. The site is indicated on the location map, Enclosure 1.

The cores have been delivered to GEUS by DONG according to law no. 293, § 34, of 10. June 1981 and no. 13 of 7. January 1991.

The positions of the cores are indicated on the table, Enclosure 15 and on the map, Enclosure 16.

## **Geological setting**

According to the industrial report (Gardline Survey Ltd. 2001) the sea floor at the NINI-3 site is rather flat. The seismic investigations identified a first reflector at a depth of < 1m - 3.5 m below seabed and is suspected to represent a shelly, gravelly layer. The sediment above is indicated as silty sand with shell and gravel content. Below the first reflector sandy sediments persist. A second reflector is identified ranging from 4.5 - 9.5 m below seabed. Below the second reflector two channels are observed, reaching 55m and 200 m below seabed respectively.

## **Sedimentological core log**

The result of the geological description of core **560510.4** (Havb 131-31-590002, Gardline Survey NINI-3 VC) is given in Enclosure 3.

The top 22 cm of the core is made up of fine to medium sand followed by 10 cm of sandy clay overlying 80 cm of medium sand. This section of the core includes shells and shell fragments. The lower 2.28 m of the core is made up of laminated fine sand with charred organic particles. No shells or shell fragments are seen.

The result of the geological description of core **560510.5** (Havb 131-31-590003, Gardline Survey NINI-3 VC2) is given in Enclosure 4.

The upper 10 cm of the core is medium and coarse sand overlying 20 cm of slightly sandy clay. This is followed by 1.13 m of fine sand with small rounded shells. The lower 64 cm of the core is slightly gravelly, coarse sand with large shells.

The result of the geological description of core **560510.6** (Havb 131-31-590004, Gardline Survey NINI-3 VC3) is given in Enclosure 5.

The upper 5 cm of the core is medium sand overlying 40 cm of clay, increasing sandy in the upper 10 cm. The lower 1.65 m of the core is made up of medium sand with some gravel at the base. The sediments in the core hold shells and shell fragments.

The result of the geological description of core **560510.7** (Havb 131-31-590005, Gardline Survey NINI-3 VC4) is given in Enclosure 6.

The upper 35 cm of this core is made up of a sandy, slightly silty clay, overlying 65 cm of medium sand. Both sediments include shells and shell fragments. The lower 3.25 cm of the cores is laminated fine sand with charred organic particles.

The result of the geological description of core **560510.8** (Havb 131-31-590006, Gardline Survey NINI-3 VC5) is given in Enclosure 7.

This core has 20 cm of fine sand at the top overlying 10 cm of clay. The lower 4.3 m of the core is made up mainly of medium sand, slightly coarsening up in the lower 1½ m, and with few gravel clasts and one stone in the top. The sediments in this core hold shells.

## Core photos

The photos of core 560510.4 are seen in Enclosure 8a - 8b.

The photos of core 560510.5 are seen in Enclosure 9.

The photos of core 560510.6 are seen in Enclosure 10.

The photos of core 560510.7 are seen in Enclosure 11a - 11b.

The photos of core 560510.8 are seen in Enclosure 12a - 12b.

## Correlation between cores

In all five cores, Enclosure 13, an upper section of mostly sandy clay is seen, which in four of the cores is topped by a layer of sand. The clay is overlying a section of mostly medium sand with shells. In core 560510.5 this sand is divided into an upper part of fine sand with small rounded shells and a lower part of coarse, slightly gravelly sand with large shells. In cores 560510.4 and 560510.7 the medium sand is overlying a lower section of laminated fine sand with silt partings and charred fine organic particles. No shells are seen in this sand.

## Correlation with seismics

Apparently there are no unambiguous correlation between the sediments in the cores and the first reflector identified in the seismic. It is the opinion of Gardline Survey Ltd. (2001) that the first reflector represents a shelly, gravelly layer. This might be true for the two cores 560510.5 and 560510.6. In two other cores, 560510.4 and 560510.7, the top of the laminated fine sand with silt partings might as well represent the reflector whereas in core 560510.8 the reflector does not seem to be mirrored in the slightly gravelly, medium sand.

Probably the top of the more dense laminated fine sand will act as the first seismic reflector.

## **Interpretation of genesis**

The upper sandy clay and sandy layer above are marine sediments. The shelly, medium to coarse sand is also a marine sediment. The laminated fine sand without fossils but with charred fine organic particles is supposed to originate in a periglacial lake deposit or the distal part of a sandur plain.

## **Nearby cores**

The NINI-1 site (Gardline Survey Ltd. 2000a) is situated about 8 km and the NINI-2 site (Gardline Survey 2000b) about 9½ km to the Southwest of the NINI-3 site (Enclosure 1).

At the NINI-1 site as well as at the NINI-2 site a first reflector is found at 2.5 - 3 m below sea bed. This is probably equivalent to the first reflector at the NINI-3 site. A second reflector at the NINI-1 and NINI-2 sites, possibly reflecting an erosion event, as found at 5 - 18 m below seabed. This is probably equivalent to the second reflector at the NINI-3 site. Below this reflector several channels occur with a base down to 275 m below seabed. The base of the Quaternary is possibly situated around 170-180 m below seabed. This might agree with the supposed base Quaternary at 130 m at the NINI-3 site.

A vibrocore from the NINI-1 site include fining up silty fine sand and fine to medium sand (Enclosure 14). A vibrocore at the NINI-2 site is described in the Appendix. The core includes an upper silty clay and a lower silty, fine sand with a layer of coarsing up medium to coarse sand. The lowermost part of the core is made up of laminated fine sand with charred organic particles. These sediments compare to the sediments found in the vibrocores from the NINI-3 site, described above.

## **Conclusion and suggested correlation to stratigraphy**

The upper section of the cores, the sandy clay with a cover of fine sand, as well as the fine sand with shells of core 560510.5, is suggested to represent the Late Holocene comparable to the Nieuw Zeeland Gronden Formation (Laban, C. et al. 1995). The next section of the cores, the medium to coarse sand with shells, is suggested to represent the Early Holocene comparable to the Elbow Formation. The third section, the laminated fine sand with charred fine organic particles, is suggested to be an equivalent to the Twente Formation (Cameron et al. 1989).

Holocene	Nieuw Zeeland Gronden Formation
	Elbow Formation
Weichselian	Twente Formation

Table 1: Generalised stratigraphy of the Late Weichselian and Holocene of the North Sea (after Cameron et al. 1989 and Laban et al. 1995).

In the industrial report (Gardline Survey Ltd. 2001) two channels are indicated, reaching 55 m and 200 m below seabed respectively. The channel reaching 55 m probably include sediments of the Coal Pit Formation, whereas the channel reaching 200 m presumably include sediments that can be referred to the Ling Bank Formation.

The base of the Quaternary is possibly a slightly westward dipping reflector around 130 m below seabed possibly representing the Pliocene low stand.

The general Quaternary stratigraphy of the North Sea in the British and Dutch sectors are given in the table below.

Dutch sector & British sector South of 55° N	British sector North of 55° N	
Nieuw Zeeland Gronden Formation	Forth Formation	Whitethorn Member
Elbow Formation		
Botney Cut Formation		Fitzroy Member
Twente Formation	Only identified in Dutch sector	
Bolders Bank Fm. & Dogger Bank Fm.	Wee Bankie Fm. & Marr Bank Fm.	
Eem Formation	Coal Pit Formation	
Cleaver Bank Formation	Fisher Formation	
Egmond Ground Formation	Ling Bank Formation	
Yarmouth Road Formation	Aberdeen Ground Formation	

Table 2: Correlation of the North Sea Quaternary formations in the Dutch sector & British sector south of 55° N and the British sector north of 55° N.

## Stored core

The core 560510.5 is stored at the GEUS core store for future stratigraphic investigation.

## Literature

- Cameron, T.D.J., Schüttenhelm, R.T.E. & Laban, C. 1989: Middle and Upper Pleistocene and Holocene stratigraphy in the southern North Sea between 52° and 54° N, 2° to 4° E. In: Henriet J.P. & de Moor, G. (Eds.) The Quaternary and Tertiary geology of the Southern Bight, North Sea.
- Gardline Survey Limited 2000a: Dong Efterforskning og Produktion A/S, NINI-1 (5605/10-1) site survey, May 2000, Survey report. GEUS Report File no 17936
- Gardline Survey Limited 2000b: Dong Efterforskning og Produktion A/S, NINI-2 site survey, Danish Block 5605/10, October 2000, Survey report. GEUS Report File no 18108
- Gardline Survey Limited 2001: Dong Efterforskning og Produktion A/S, NINI-3 site survey, Danish Block 5605/10, November 2000, Survey report. GEUS Report File no 18109
- Jeffery, D., Graham, C., Wright, S., Laban, C. and Schüttenhelm, R.T.E. 1990: Dogger. Sheet 55°N–2°E. Sea bed sediments and Holocene geology. Holocene en oppervlaktesedimenten. British Geological Survey and Rijks Geologische Dienst, 1:250.000 series.
- Laban, C. et al., van der Klugt, P.C.M. & Frantsen, P.J. 1995: Oyster Grounds. Sheet 54°N – 4°E. Holocene en oppervlaktesedimenten. Rijks Geologische Dienst, 1:250.000 series.

## **Appendix**

# **Geological description of a vibrocore from the NINI-2 site, Store Fisker Banke area**

## **Location**

The vibrocoring was carried out as part of a site surveys at the NINI-2 hydrocarbon well site (Gardline Survey Ltd. 2000a). The core is situated at the position 56° 37' 53" N, 05° 17' 59" E.

## **Sedimentological core log**

The result of the geological description of the core **DGU Well File no. 560510.3** (Havb 131-31-590 001, Gardline Survey NINI-2 VC), is given in Enclosure 17.

Except for an upper sandy layer, the top 2 m of the core is made up of silty clay with an increasing amount of sand in the upper 27 cm. Below this clay 1.45 m of silty fine sand is found, including, in the middle part, a layer of about 25 cm of coarsing up medium to coarse sand with some gravel. This upper parts of the core holds shells and shell fragments. The lowermost 0.35 m of the core is laminated fine and very fine sand with a varying content of silt and with charred, fine organic particles.

## **Core photos**

The photos of the core are seen in Enclosure 18a & 18b.

## **Interpretation of genesis**

The upper clayey part of the core with shells is a marine deposit. The middle, shelly fine sand unit is also a marine deposit. The laminated fine sand without fossils but with charred fine organic particles is supposed to originate in a periglacial lake deposit or the distal part of a sandur plain.

## **Nearby cores**

In six vibrocores at the NOLDE-1 site (Seateam (UK) Ltd. 1996) a toplayer of silty clays is seen above silty, fine to medium sands, Enclosure 19 - 25. The sediment compare to the sediments in core 560510.3.

## **Conclusion and suggested correlation to stratigraphy**

The upper clayey section of the core is suggested to represent the Late Holocene comparable to the Nieuw Zeeland Gronden Formation (Laban *et al.* 1995). The next section of the cores, the fine sand with a layer of medium to coarse sand with shells, is suggested to represent the Early Holocene comparable to the Elbow Formation. The third section, the laminated fine sand with charred fine organic particles, is suggested to be an equivalent to the Twente Formation (Cameron *et al.* 1989).

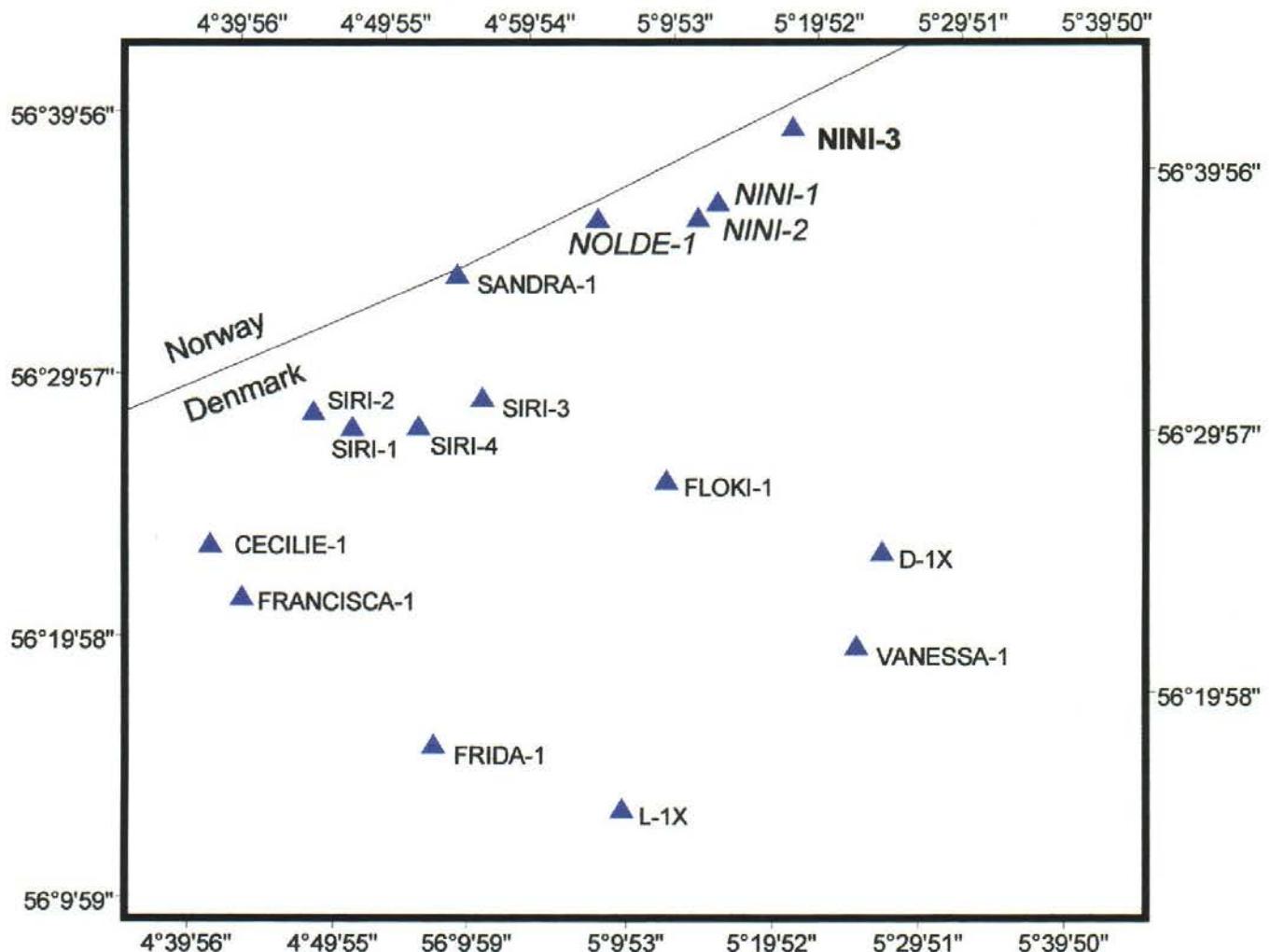
## Literature

- Cameron, T.D.J., Schüttenhelm, R.T.E. & Laban, C. 1989: Middle and Upper Pleistocene and Holocene stratigraphy in the southern North Sea between 52° and 54° N, 2° to 4° E. In: Henriet J.P. & de Moor, G. (Eds.) The Quaternary and Tertiary geology of the Southern Bight, North Sea.
- Gardline Survey Limited 2000a: Dong Efterforskning og Produktion A/S, NINI-1 (5605/10-1) site survey, May 2000, Survey report. GEUS Report File no 17936
- Laban, C. et al., van der Klugt, P.C.M. & Frantsen, P.J. 1995: Oyster Grounds. Sheet 54° N - 4° E. Holocene en oppervlaktesedimenten. Rijks Geologische Dienst, 1:250.000 series.
- Seateam (UK) Ltd. 1997: Dansk Operatørselskab i-s (DANOP). Site Survey. North Sea Danish Sector. Site 5605/9-1 - NOLDE-1 - Site Survey report. GEUS Report File no.14023

## **Enclosures**

Enclosure 1:

Location map of Store Fisker Banke area, Danish North Sea.



Scale: 1:500000

0            10 Kilometers

▲ Hydrocarbon wells



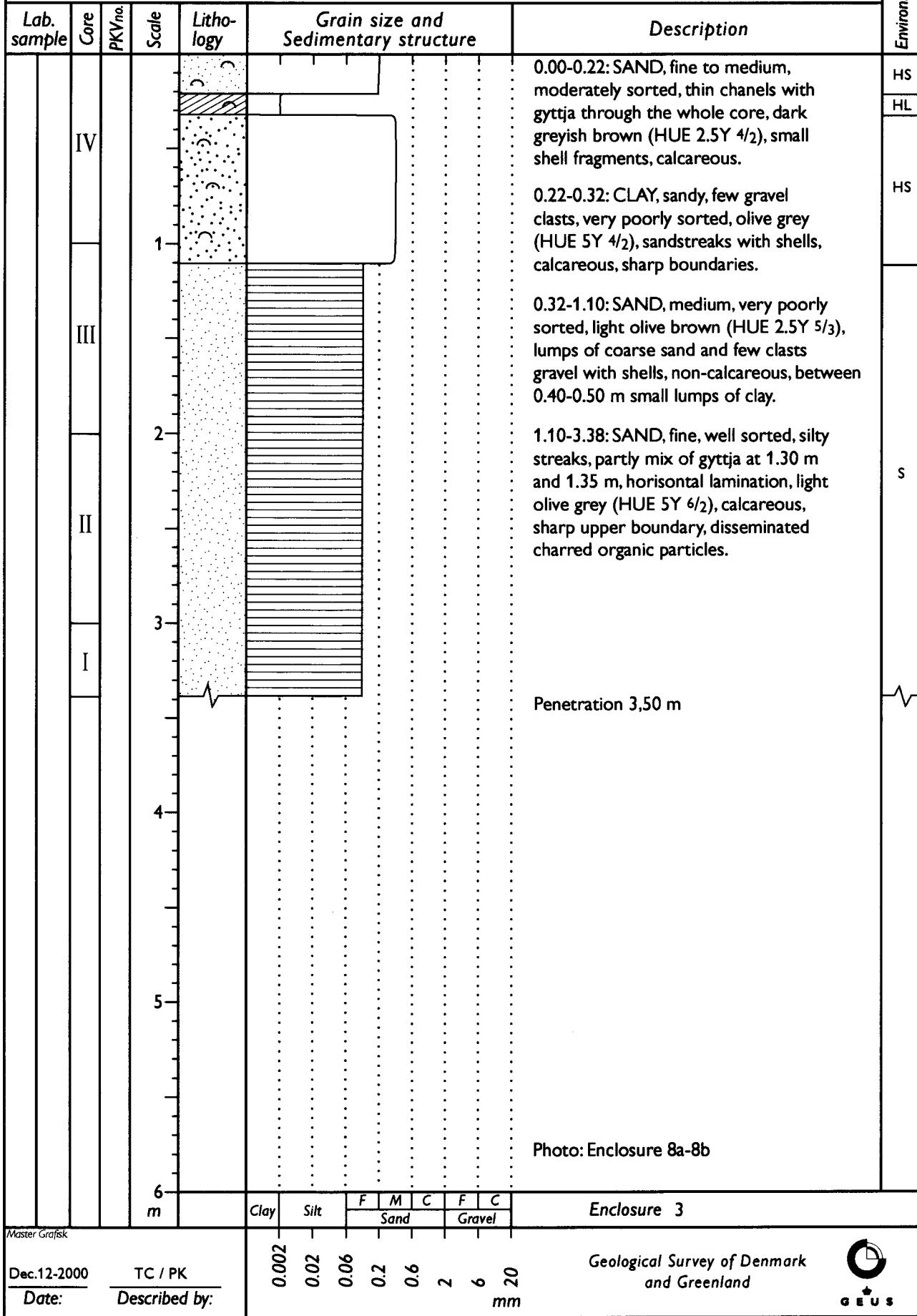
## LEGEND

LITHOLOGY	PRIMARY SEDIMENT STRUCTURES	ENVIRONMENT AND AGE		
	Gravel		Parallel lamination	HL : Holocene marine clay
	Sand and gravel (conglomeratic)		Indistinct parallel lamination	HS : Holocene marine sand
	Sand, coarse		Disturbed parallel lamination	S : Periglacial lacustrine sand
	Sand, medium	—	Sharp boundary	
	Sand, fine	— — —	Gradual boundary	
	Heterolith, clay/fine sand		Unconformity, (erosions boundary, hiatus)	
	Heterolith, clay/silt	FOSSILS		
	Silt		Shells	
	Clay			

Enclosure 2

# SEDIMENTOLOGICAL CORE LOG

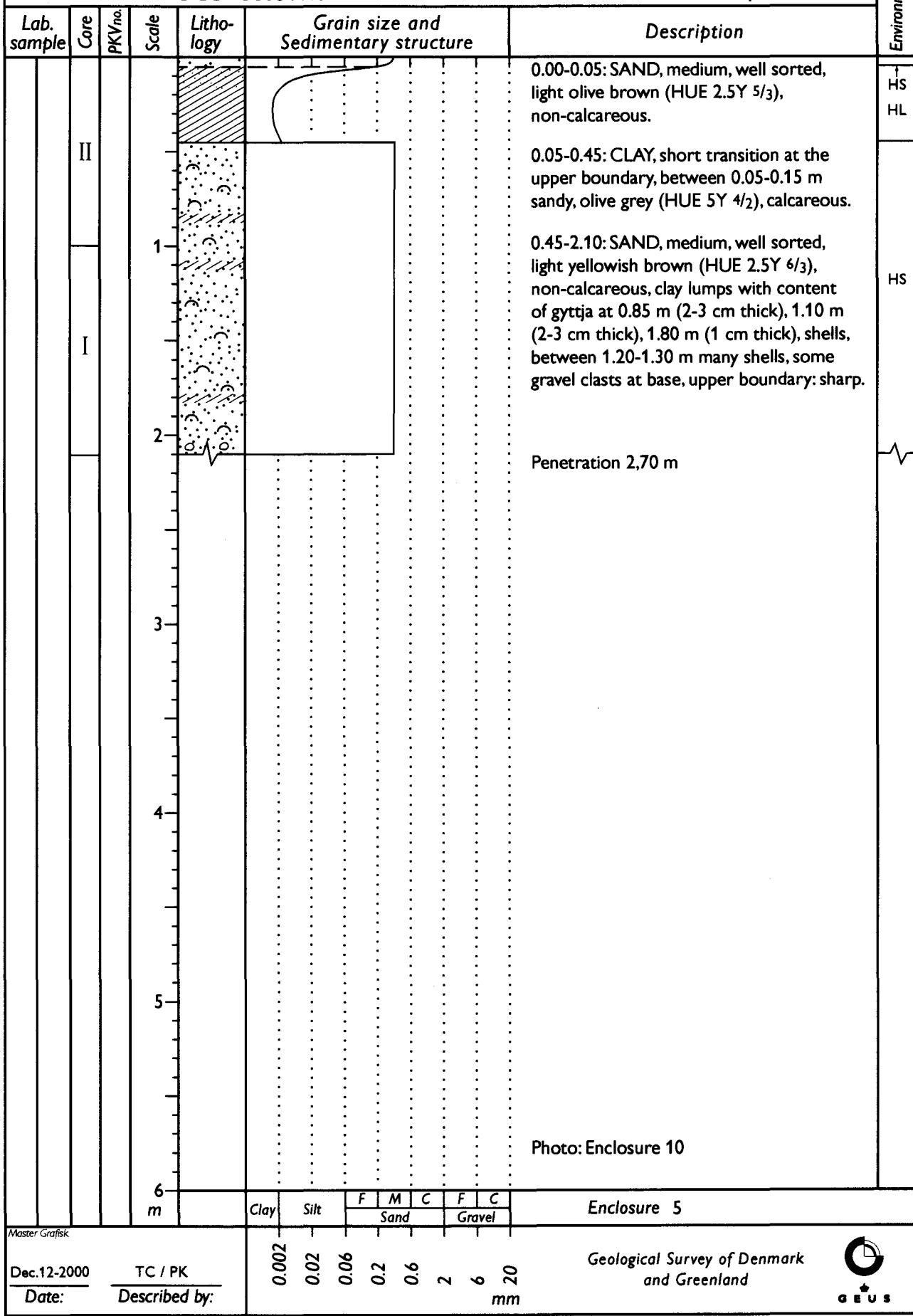
CORE NO.: Havb 131-31-590002 POSITION: 56°41'32" N  
DGU 560510.4 5°24'12" E Water depth: 58,3 m



SEDIMENTOLOGICAL CORE LOG								Environment and age			
CORE NO.:		Havb 131-31-590003	POSITION:		56°42'10" N	Water depth:	57,7 m				
Lab. sample	Core	PKV no.	Scale	Litho-logy	Grain size and Sedimentary structure			Description			
II I	II	203383	0.00-0.10: 0.10-0.30: 0.30-1.43: 1.43-2.07: Penetration 2.30 m		0.00-0.10: 0.10-0.30: 0.30-1.43: 1.43-2.07: Penetration 2.30 m			HS HL HS			
					0.00-0.10: 0.10-0.30: 0.30-1.43: 1.43-2.07: Penetration 2.30 m						
					0.00-0.10: 0.10-0.30: 0.30-1.43: 1.43-2.07: Penetration 2.30 m						
	I	203384			0.00-0.10: 0.10-0.30: 0.30-1.43: 1.43-2.07: Penetration 2.30 m			HS			
					0.00-0.10: 0.10-0.30: 0.30-1.43: 1.43-2.07: Penetration 2.30 m						
					0.00-0.10: 0.10-0.30: 0.30-1.43: 1.43-2.07: Penetration 2.30 m						
Master Grafisk				6 m	Clay	Silt	F M C F C Sand Gravel	Photo: Enclosure 9			
Dec.12-2000		TC / PK	Described by:	0.002	0.02	0.06	0.2	0.6 2 6 mm 20	Enclosure 4		
Date:		TC / PK		0.002	0.02	0.06	0.2	0.6 2 6 mm 20	Geological Survey of Denmark and Greenland GEUS		

# SEDIMENTOLOGICAL CORE LOG

CORE NO.: Havb 131-31-590004 POSITION: 56°41'40" N  
 DGU 560510.6 5°23'51" E Water depth: 58,4 m



# SEDIMENTOLOGICAL CORE LOG

CORE NO.: Havb 131-31-590005 DGU 560510.7					POSITION: 56°11'29" N 5°24'02" E	Water depth: 58,1 m	Environment and age	
Lab. sample	Core	PKY no.	Scale	Lithology	Grain size and Sedimentary structure		Description	
							0.00-0.35: CLAY, sandy, slightly silty, very poorly sorted, olive grey (HUE 5Y 4/2), calcareous.	HL
	V						0.35-1.00: SAND, medium, moderately sorted, light olive brown (HUE 2.5Y 5/3), shells, calcareous, sharp boundaries.	HS
	IV						1.00-4.25: SAND, fine, well sorted, light olive grey (HUE 5Y 6/2), non-calcareous, between 3-4 m near horizontal lamination, at 1.65 m lamination with 60 degree dip, at 4.15 m streak of organic material, disseminated charred organic particles.	S
	III							
	II							
	I						Penetration 4,30 m	
							Photo: Enclosure 11a-11b	
							Enclosure 6	
Master Grafisk					Clay	Silt	F M C F C	
							Sand Gravel	
Dec.11-2000	TC / PK	0.002	0.02	0.06	0.2	0.6	2 6 20	mm
Date:	Described by:							
					Geological Survey of Denmark and Greenland			

# SEDIMENTOLOGICAL CORE LOG

CORE NO.:		Havb 131-31-590006 DGU 560510.8		POSITION: 56°41'36" N 5°24'43" E		Water depth: 58,5 m	Environment and age	
Lab. sample	Core PKV no.	Scale	Lithology	Grain size and Sedimentary structure			Description	
	V						0.00-0.20: SAND, fine, well sorted, olive grey (HUE 5Y 4/2), shells, calcareous.	HS
							0.20-0.30: CLAY, moderately sticky, olive grey (HUE 5Y 5/2), calcareous, sharp boundaries.	HL
							0.30-4.60: SAND, medium, moderately sorted, below 3 m slightly more coarse, at 0.35 m few gravel clasts, at 0.55-0.60 m 1 cobble (75mm diameter), light olive grey (HUE 5Y 6/2), shells, slightly calcareous.	HS
							Penetration 5,00 m	
							Photo: Enclosure 12a-12b	
							Enclosure 7	
Master Grafisk		6 m		Clay	Silt	F M C F C		
Dec.11-2000								
Date:	TC			0.002	0.02	0.06	0.2	0.6
	Described by:						2	6
							mm	20

Geological Survey of Denmark  
and Greenland





Enclosure 8a



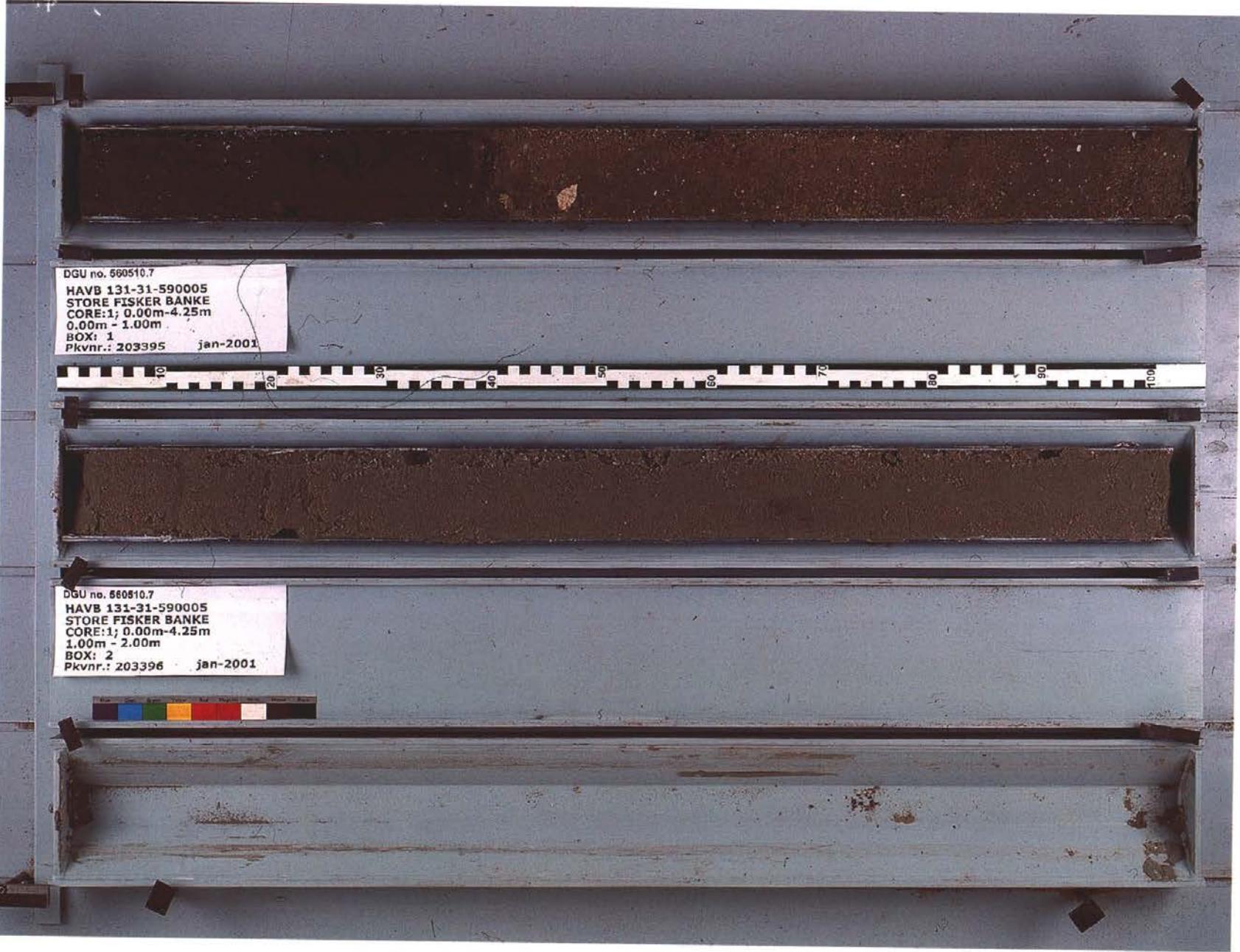
Enclosure 8b



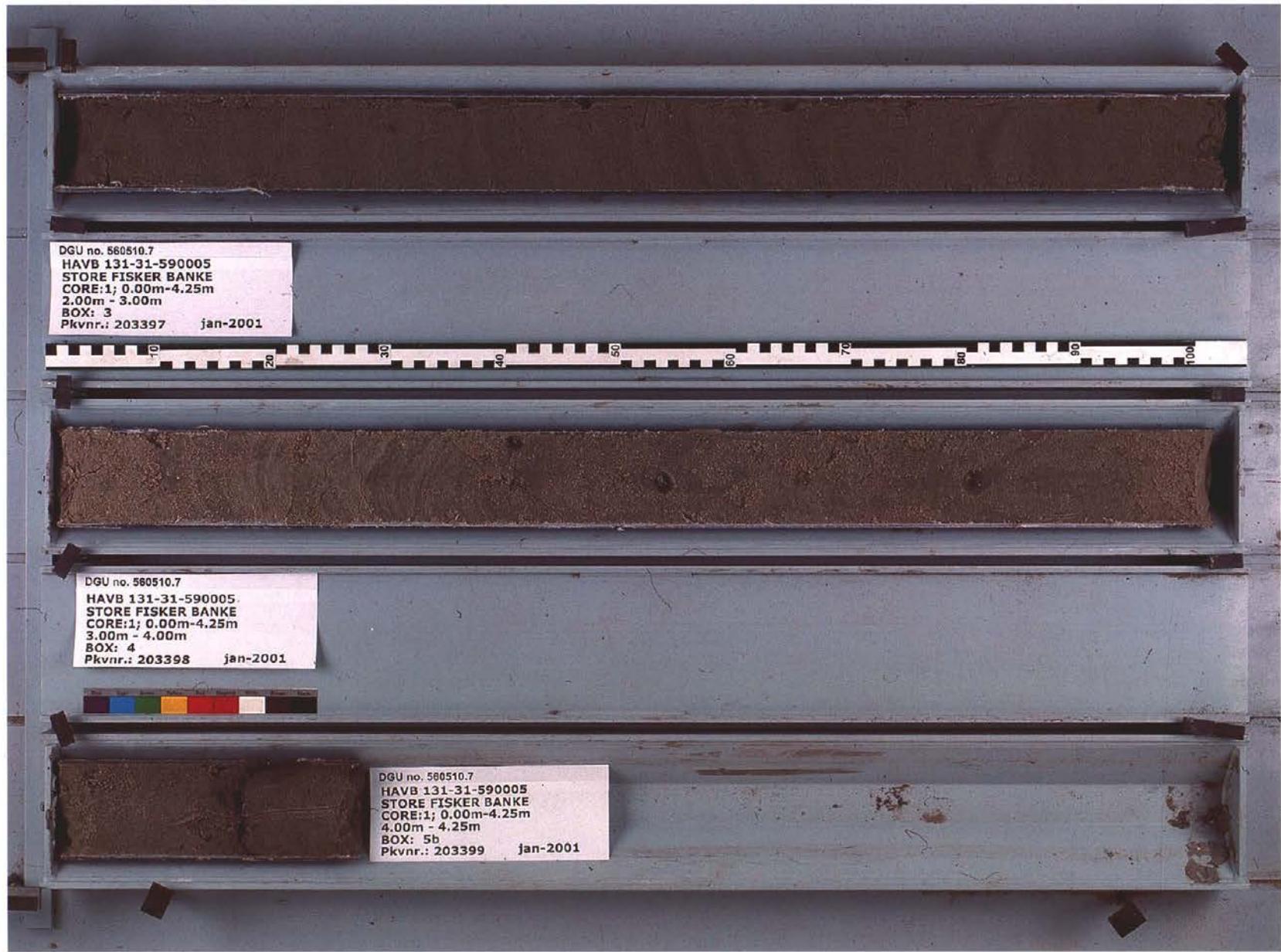
Enclosure 9



Enclosure 10



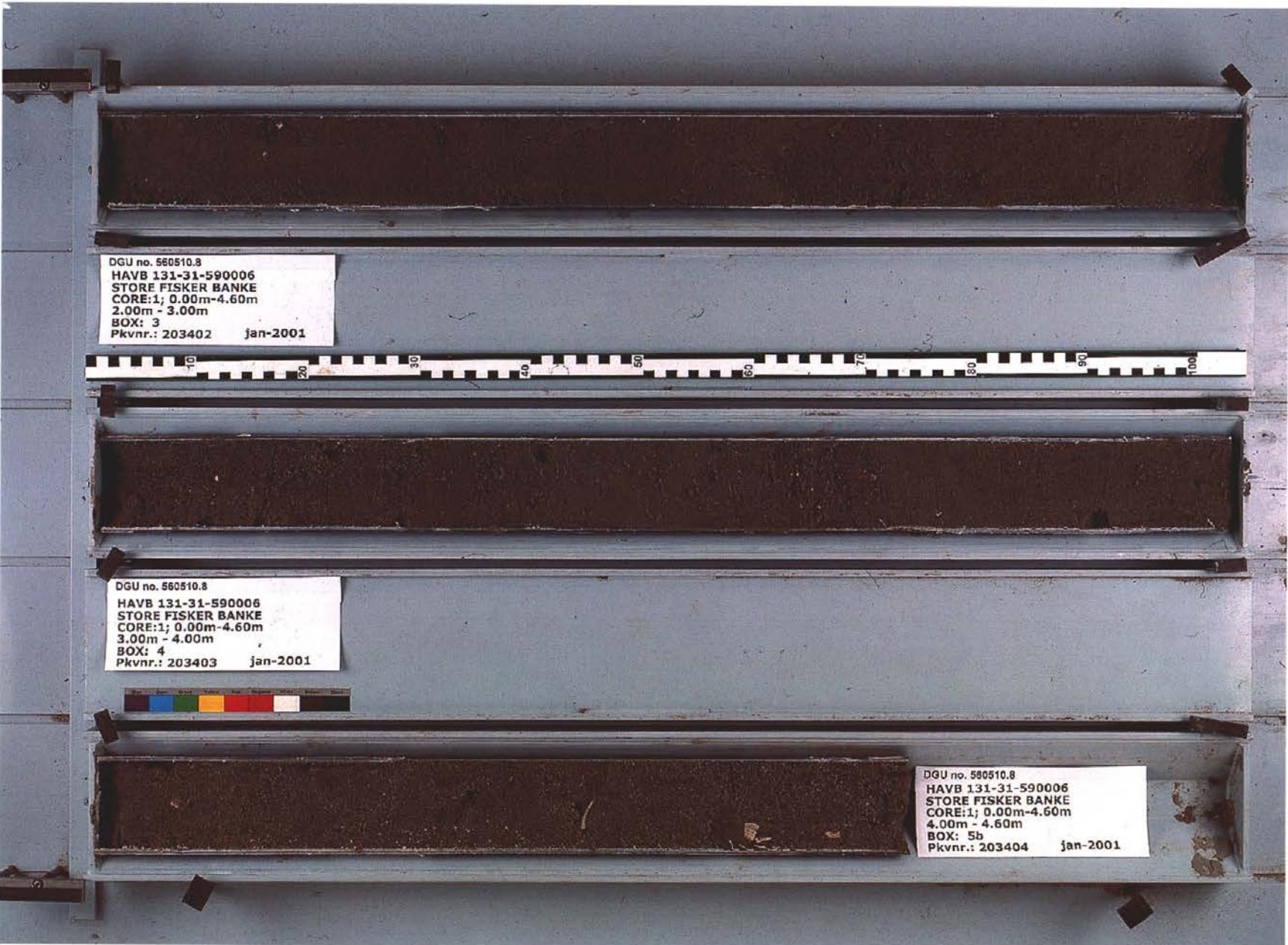
Enclosure 11a



Enclosure 11b

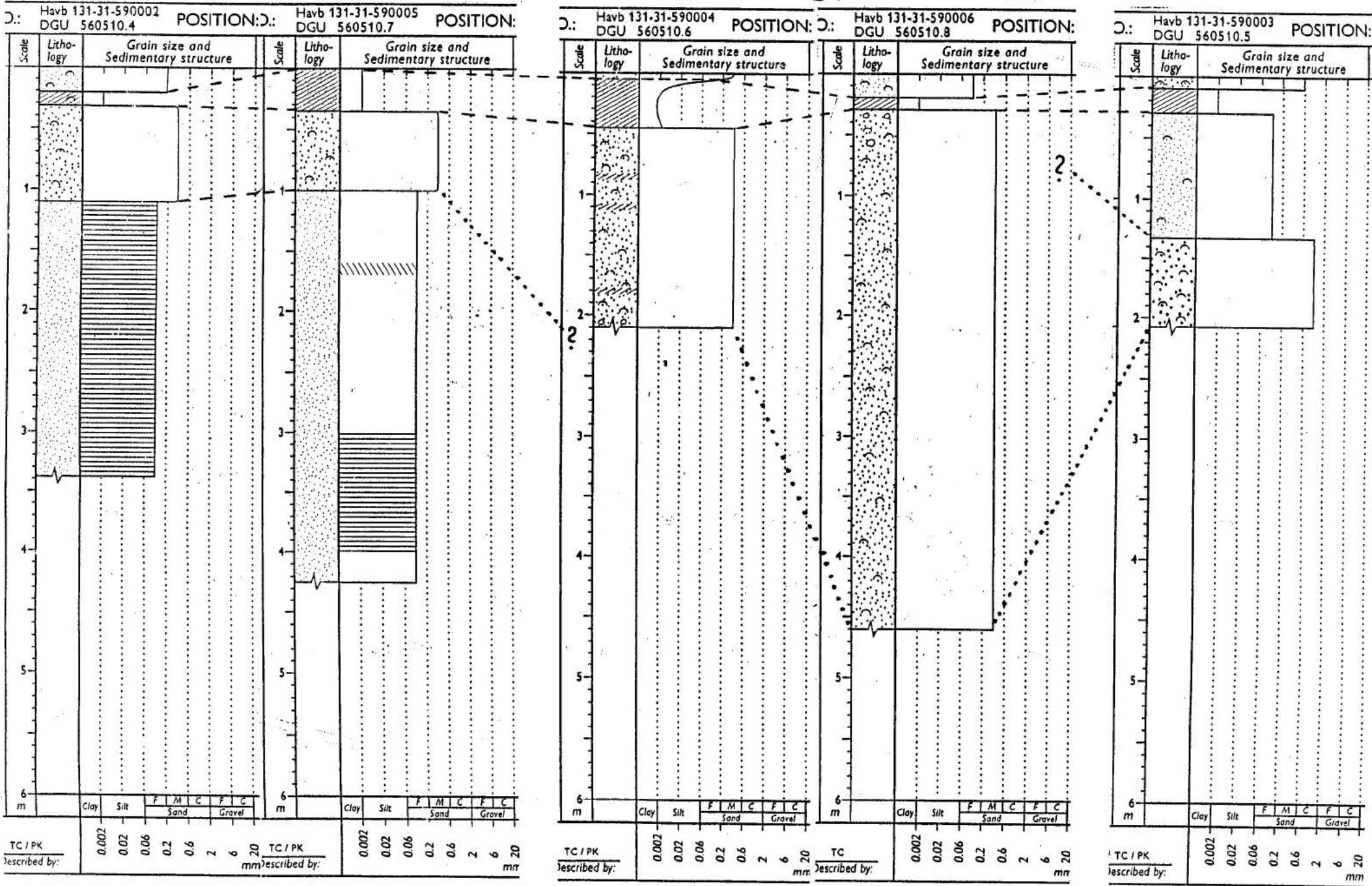


Enclosure 12a



Enclosure 12b

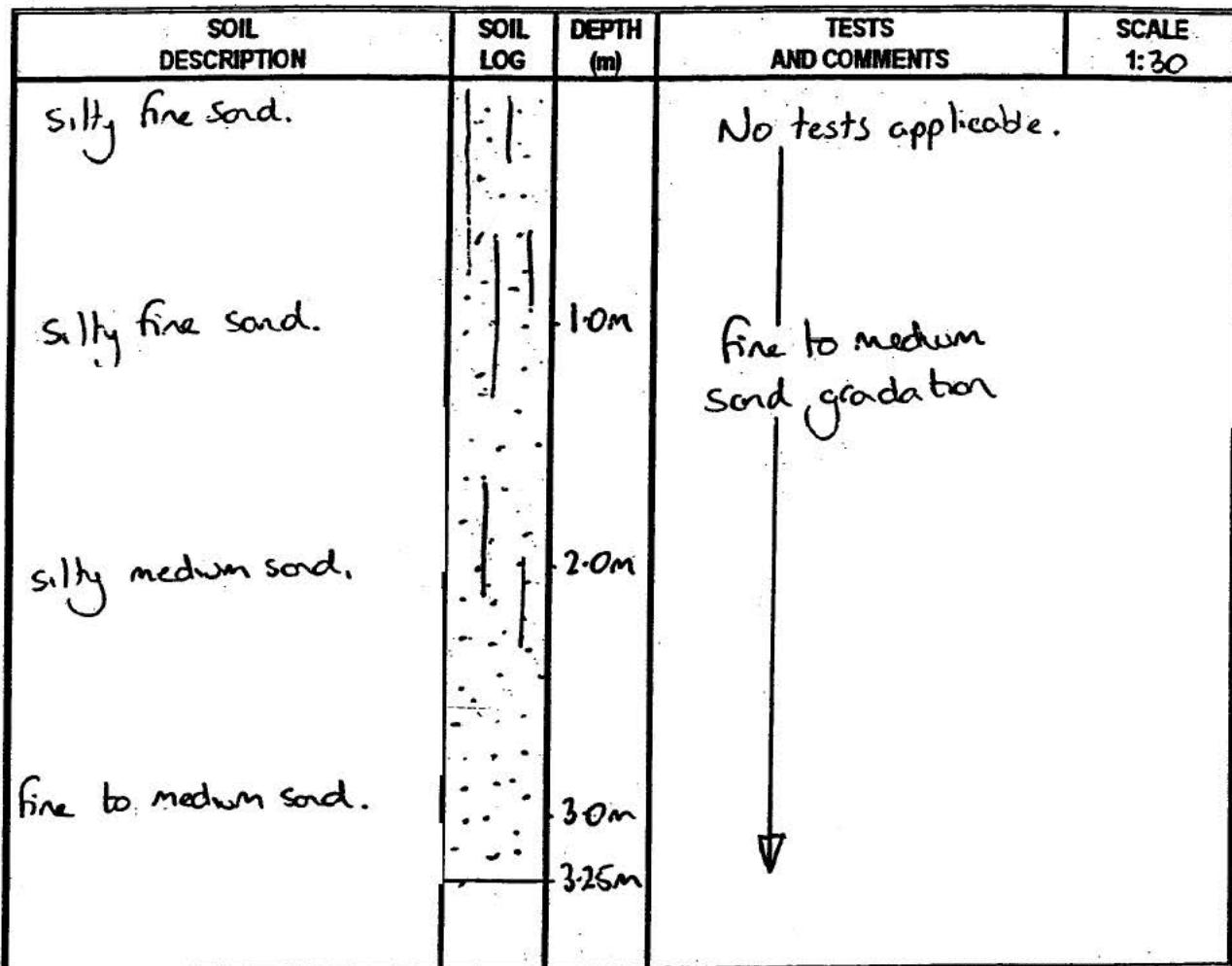
**Enclosure 13 :**  
**Correlation between sedimentological core logs, NINI-3 Vibrocores**



## GARDLINE SURVEYS LTD

## SEABED SAMPLING LOG

Client: DANOP	Job No: 5466	Type: Vibrocoring
Project: Nina-1 Site Survey	Area: DCS 5605/10-1	Vessel: Sea Surveyor
NINI-1		DGU no 560510.9
Sample No: 1	Fix No: 1	Date: 28/5/00 Time: 14:49 Hrs
Easting: 642357.07	Northing: 6280076.30	Lat: 56° 38' 31.1"N Long: 5° 19' 15.8"E
Geo Datum: EDE50	Ellipsoid: INTERNATIONAL	Projection: UTM ZONE 31 Water Depth: 58.9 m
Vib'n Time: 8 mins	Drop Ht: N/A	Recovery: 3.25 m Penetration: 4.06 m



Notes: Sample cut into 1metre sections and retained.

Drawn By: A.Hull

Date: 28/05/2000

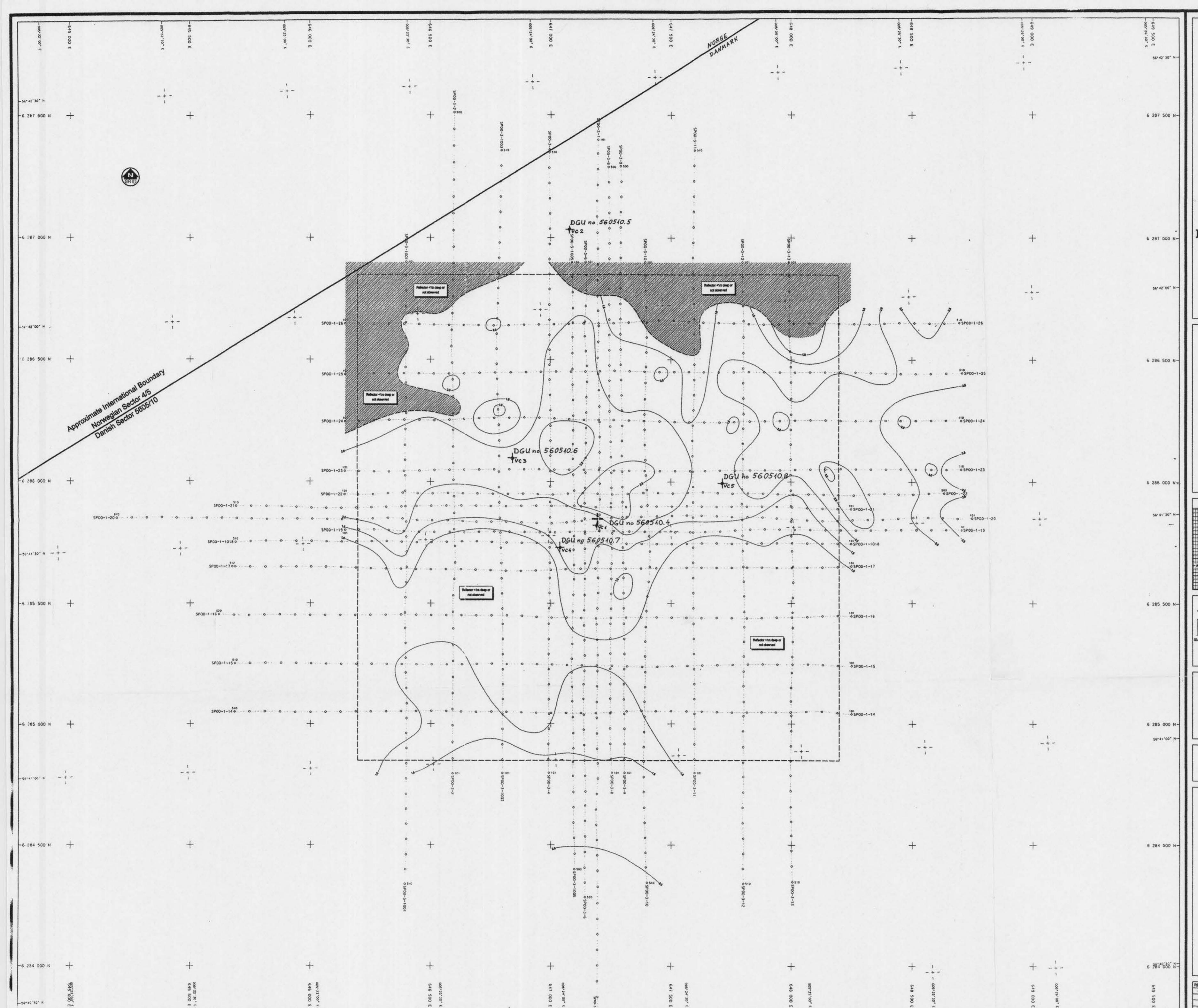
Checked By:

Date:

## Vibrocores from NINI-2 and NINI-3 site, Store Fisker Banke area, Danish North Sea

Guardlines original numbering	Recovery	Water depth(m)	UTM 3d E		Geographical position	DGU Well File no in Jupiter database	Danish North Sea Well no in Samba database	Sample PKV no	storage Box no
		depth(m)	Easting	Northing	Latitude	Longitude			
NINI-2	0.00-1.00	59.4	641075.5	6278867.7	56d37'53"N	5d17'59"E	560510.3	HAVB 131-31-590001	
	1.00-2.00								
	2.00-3.00								
	3.00-3.80								
NINI-3 VC	0.00-1.00	58.3	647184.5	6285824.9	56d41'32"N	5d24'12"E	560510.4	HAVB 131-31-590002	
	1.00-2.00								
	2.00-3.00								
	3.00-3.38								
NINI-3 VC2	0.00-1.00	57.7	647081	6287030	56d42'10"N	5d24'08"E	560510.5	HAVB 131-31-590003	203383
	1.00-2.07							203384	1 2b
NINI-3 VC3	0.00-1.00	58.4	646827.5	6286097.5	56d41'40"N	5d23'51"E	560510.6	HAVB 131-31-590004	
	1.00-2.10								
NINI-3 VC4	0.00-1.00	58.1	647031.8	6285738.3	56d41'29"N	5d24'02"E	560510.7	HAVB 131-31-590005	
	1.00-2.00								
	2.00-3.00								
	3.00-4.25								
NINI-3 VC5	0.00-1.00	58.5	647714.5	6285999.5	56d41'36"N	5d24'43"E	560510.8	HAVB 131-31-590006	
	1.00-2.00								
	2.00-3.00								
	3.00-4.00								
	4.00-4.60								

Enclosure 15

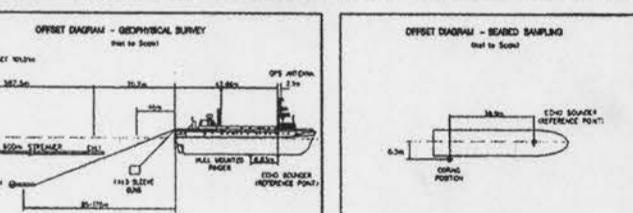
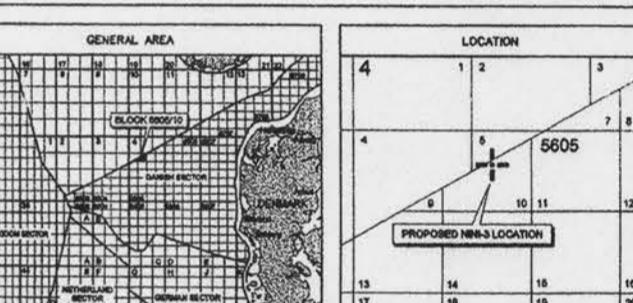
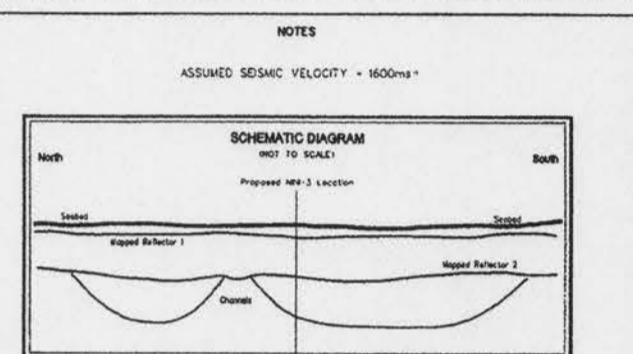


**Enclosure 16 :**

### **Location Map of NINI-3 Vibrocores**

Scale 1:10 000

GEUS Report 2002/2



GEODETIC REFERENCE SYSTEM		PRIMARY POSITIONING CONTROL	
SODI	INTERNATIONAL (1924)	DGPS SYSTEM	SAYK
SECTION	UTM NORTH ZONE 31	REF. STATION	ABERDEEN, FLAMBOURG,
ETC DATUM	CENTRAL MERIDIAN 3° EAST		DEN HELDER, SUNBURG,
	EUROPEAN DATUM 1950 (ED50)	OPERATOR	& BERGEN, RACAL SURVEY
	TRANSFORMATION FROM WGS84 TO ED50		
	dx = -88.5 dy = -93.8 dz = -123.1		
AP CENTRE	TX: 0 YY: 10 ZZ: 100.156 Date: 1-12pm		
1 FACTOR			
EMERGENCE	0.99986559 02° 00' 32" WEST		
SECONDARY POSITIONING CONTROL		SKYVIEW/VERPOS	
		DGPS SYSTEM	
		REF. STATIONS	ABERDEEN, FLAMBOURG,
			DEN HELDER, SUNBURG,
		OPERATOR	VICQ & BERGEN
			RACAL SURVEY & SUBSEA

Scale 1:5 000

**GARDLINE SURVEYS**

ENDEAVOUR HOUSE ADMIRALTY ROAD GREAT YARMOUTH NORFOLK NR30 3NG  
TELEPHONE : +44(0)1493 845600 FAX : +44(0)1493 852106 WEBSITE : [WWW.GARDLINE.CO.UK](http://WWW.GARDLINE.CO.UK)

CLIENT

**PROJECT TITLE**

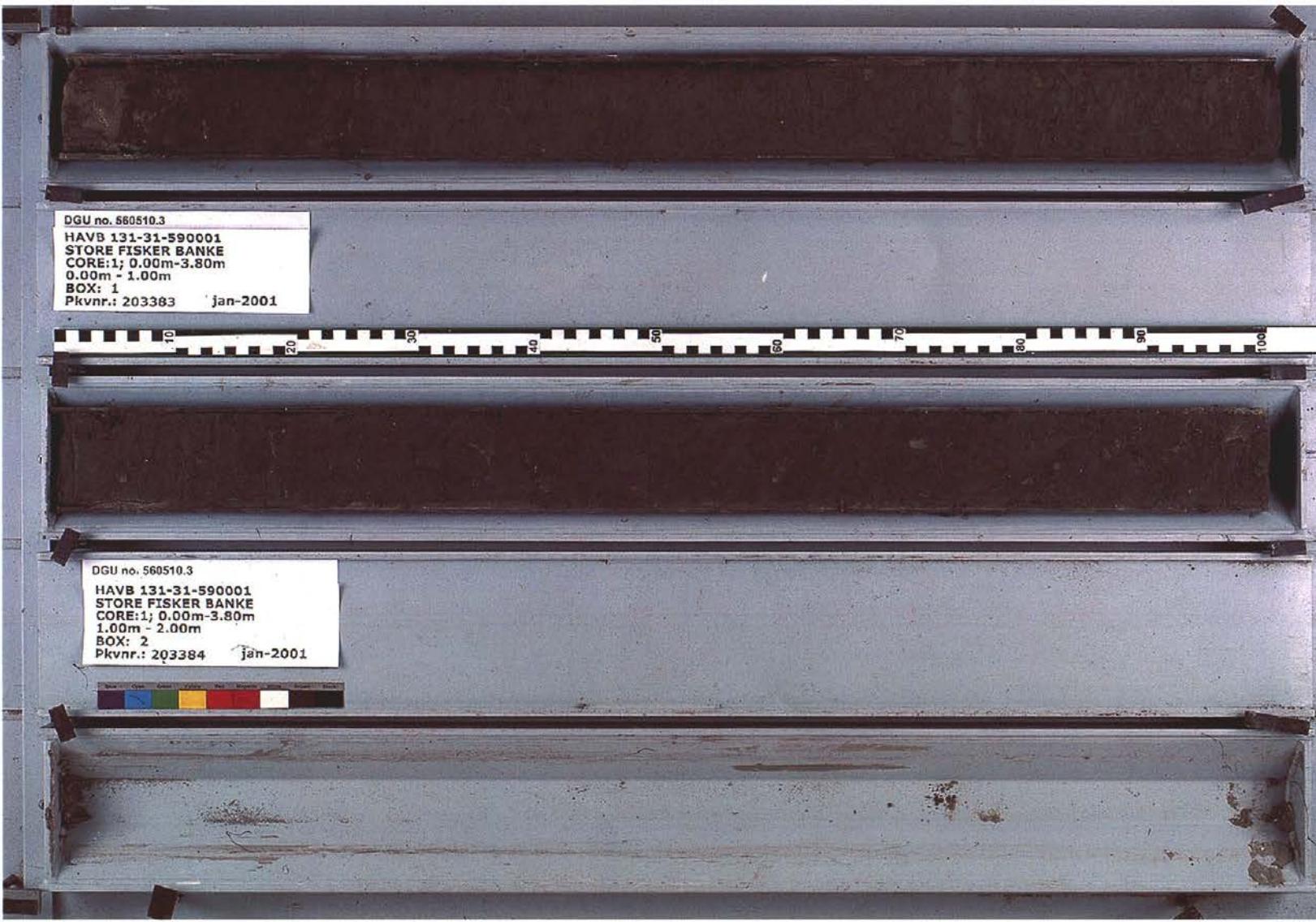
DRAWING TITLE

Chart 6					Report file no enclosure 18109(6/11)
DATE	REMARKS	AUTHOR	DRAWN	CHECKED	APPROVED
20.12.00	DRAFT	XH	AP	DC	XPG
03.01.01	FINAL			DC <i>JL</i>	XPG <i>JL</i>

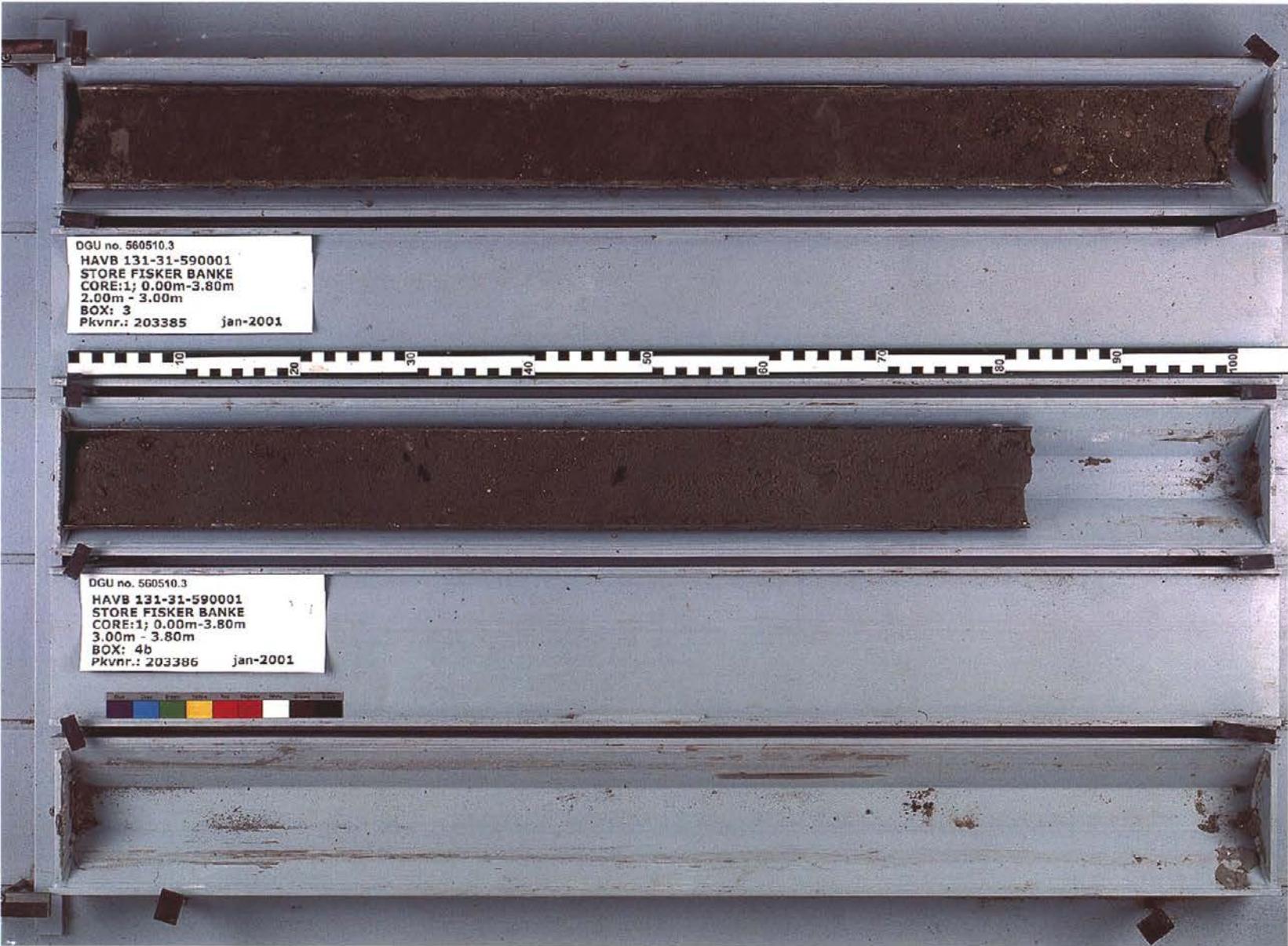
# SEDIMENTOLOGICAL CORE LOG

CORE NO.: Havb 131-31-590001 POSITION: 56°37'53" N  
 DGU 560510.3 5°17'59" E Water depth: 59,4 m

Lab. sample	Core PKV no.	Scale	Litho-logy	Grain size and Sedimentary structure	Description	Environment and age
	IV				0.00-0.06: SAND, fine, silty, olive grey (HUE 5Y 4/2), shells, calcareous. 0.06-2.00: CLAY, silty, olive grey (HUE 5Y 4/2), shells, calcareous. between 0.06-0.27 m sandy, gradual transition, between 1.00-2.00 m silty, slightly sandy.	↑ HS
	III					HL
	II				2.00-2.75: SAND, fine, silty, olive grey (HUE 5Y 4/2), shells, calcareous, between 2.00-2.10 m clayey, gradual transition.	HS
	I				2.75-3.00: SAND, medium and coarse, with gravel, very poorly sorted, coarsely up, olive grey (HUE 5Y 5/2) many shells, broken shells, calcareous, sharp upper boundary.	HS
					3.00-3.45: SAND, fine, silty, few gravels at 3.28 m, light olive grey (HUE 5Y 6/2), broken shells, calcareous, upper boundary with short transition.	HS
					3.45-3.80: SAND, fine and very fine, varying silt content, horizontal lamination, black charred organic particles, light brown grey (HUE 10YR 6/3), upper boundary tilted.	S
					Penetration 4,65 m	
					Photo: Enclosure 18a-18b	
		6 m		Clay Silt F M C F C Sand Gravel	Enclosure 17	
Master Grafisk						
Dec.13-2000	TC / PK			0.002 0.02 0.06 0.2 0.6 2 6 20 mm	Geological Survey of Denmark and Greenland	
Date:	Described by:					G E U S



Enclosure 18a



Enclosure 18b

# ALLUVIAL MINING LIMITED

Milner Road, Chilton Industrial Estate  
Sudbury, Suffolk. CO10 6XG

Tel : +44 01787 880218  
Fax : +44 01787 312320

Station :

**LOC. 1**

DGU no 560509.1

Client : DANOP

Project : DANISH BLOCK 5605/9-1

NOLDE-1

Sampling Method : 4 metre Vibrocorer

Coordinates :

E : 633975  
N : 6278159

Water Depth (m) : 61

Date : 28/11/1996

## Soil Description

Legend  
(m)

Tests Undertaken :

Very soft, dark olive grey, clayey, fine to medium SAND

0.10

MC AL PSD PD

Very soft, dark olive grey, silty CLAY with sandy laminae  
and occasional shell

sandy (f) 0.44-0.56 m

sandy (fm) 0.74-1.29 m

PSD

Dark olive grey, slightly shelly, silty, fine to medium  
SAND

1.29

PSD PD SB

Light yellowish brown, fine to medium SAND with  
occasional shell

2.45

PSD

RECOVERY = 2.67 m (no shoe sample)

2.67

Penetration = 3.30 m

3.30

**Enclosure 19**

Prepared by: MAB

Checked by: JAW

Contract No: C6573

# ALLUVIAL MINING LIMITED

Milner Road, Chilton Industrial Estate  
Sudbury, Suffolk. CO10 6XG

Tel : +44 01787 880218

Fax : +44 01787 312320

Station :

**LOC. 2**

DGU no 560509.2

**Client : DANOP**

**Project : DANISH BLOCK 5605/9-1 NOLDE-1**

**Sampling Method : 4 metre Vibrocorer**

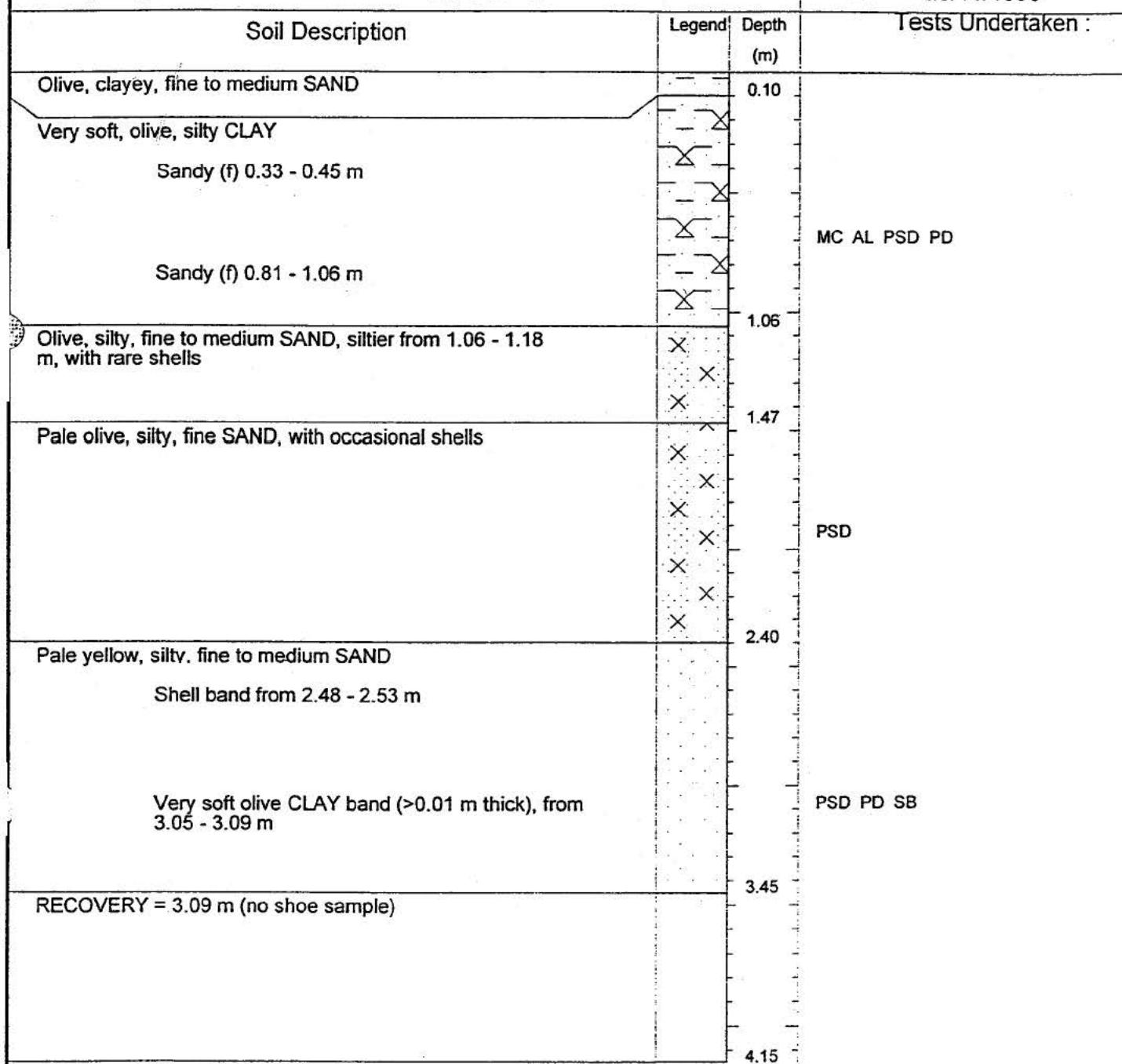
**Coordinates :**

E : 634096

N : 6278165

**Water Depth (m) : 61**

**Date : 28/11/1996**



**Enclosure 20**

Prepared by: MPB

Checked by: JAW

Contract No: C6573

# ALLUVIAL MINING LIMITED

Milner Road, Chilton Industrial Estate  
Sudbury, Suffolk. CO10 6XG

Tel : +44 01787 880218  
Fax : +44 01787 312320

Station :

**LOC. 3**

DGU no 560509.3

**Client : DANOP**

**Project : DANISH BLOCK 5605/9-1**

NOLDE-1

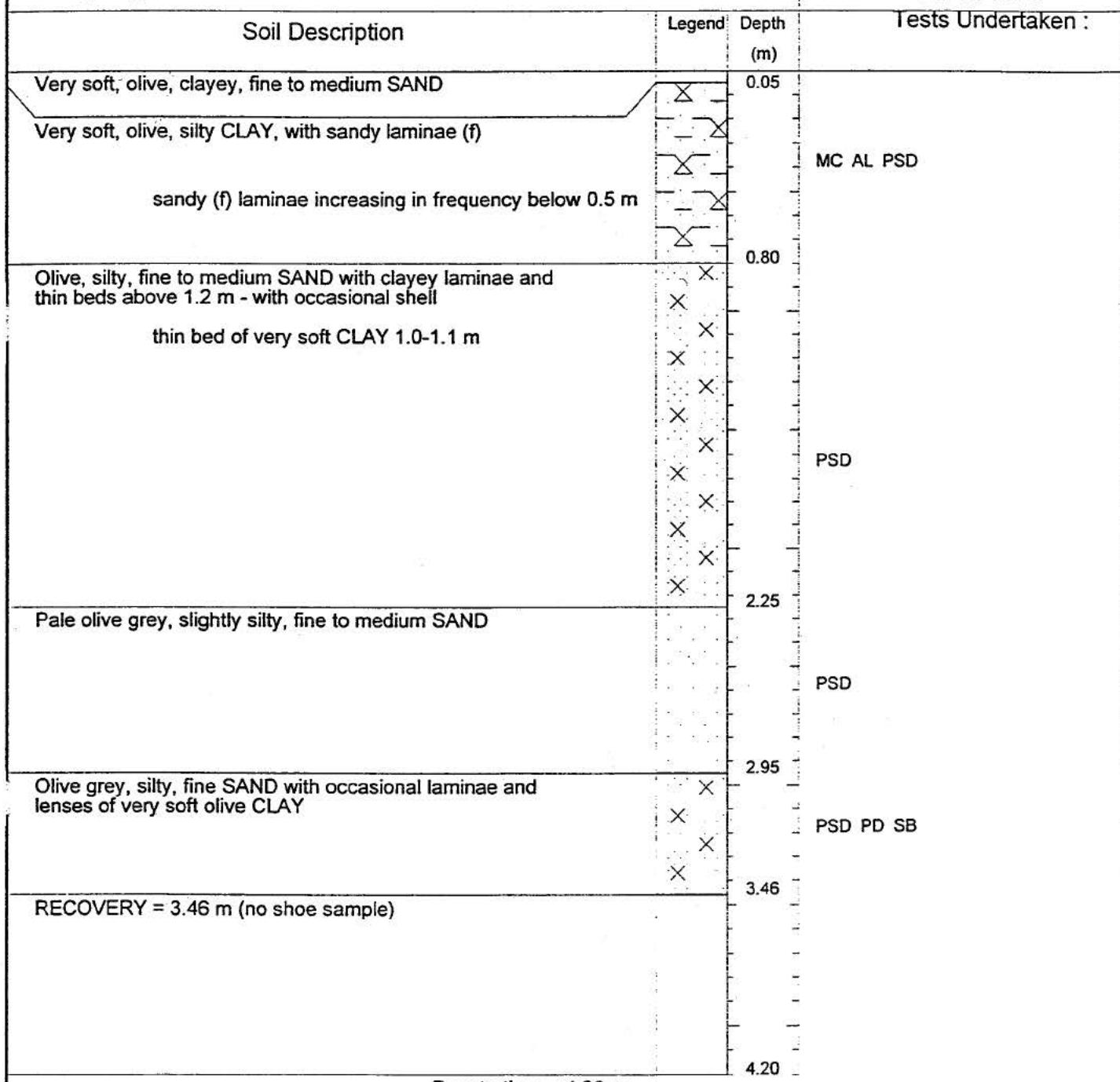
**Sampling Method : 4 metre Vibrocorer**

**Coordinates :**

E : 633873  
N : 6278157

**Water Depth (m) : 61**

**Date : 27/11/1996**



**Enclosure 21**

Prepared by: *MPB*  
Checked by: *JRW*  
Contract No: C6573

# ALLUVIAL MINING LIMITED

Milner Road, Chilton Industrial Estate  
Sudbury, Suffolk. CO10 6XG

Tel : +44 01787 880218  
Fax : +44 01787 312320

Station :

**LOC. 4**

DGU no 560509.4

**Client : DANOP**

**Project : DANISH BLOCK 5605/9-1**

NOLDE-1

**Sampling Method : 4 metre Vibrocorer**

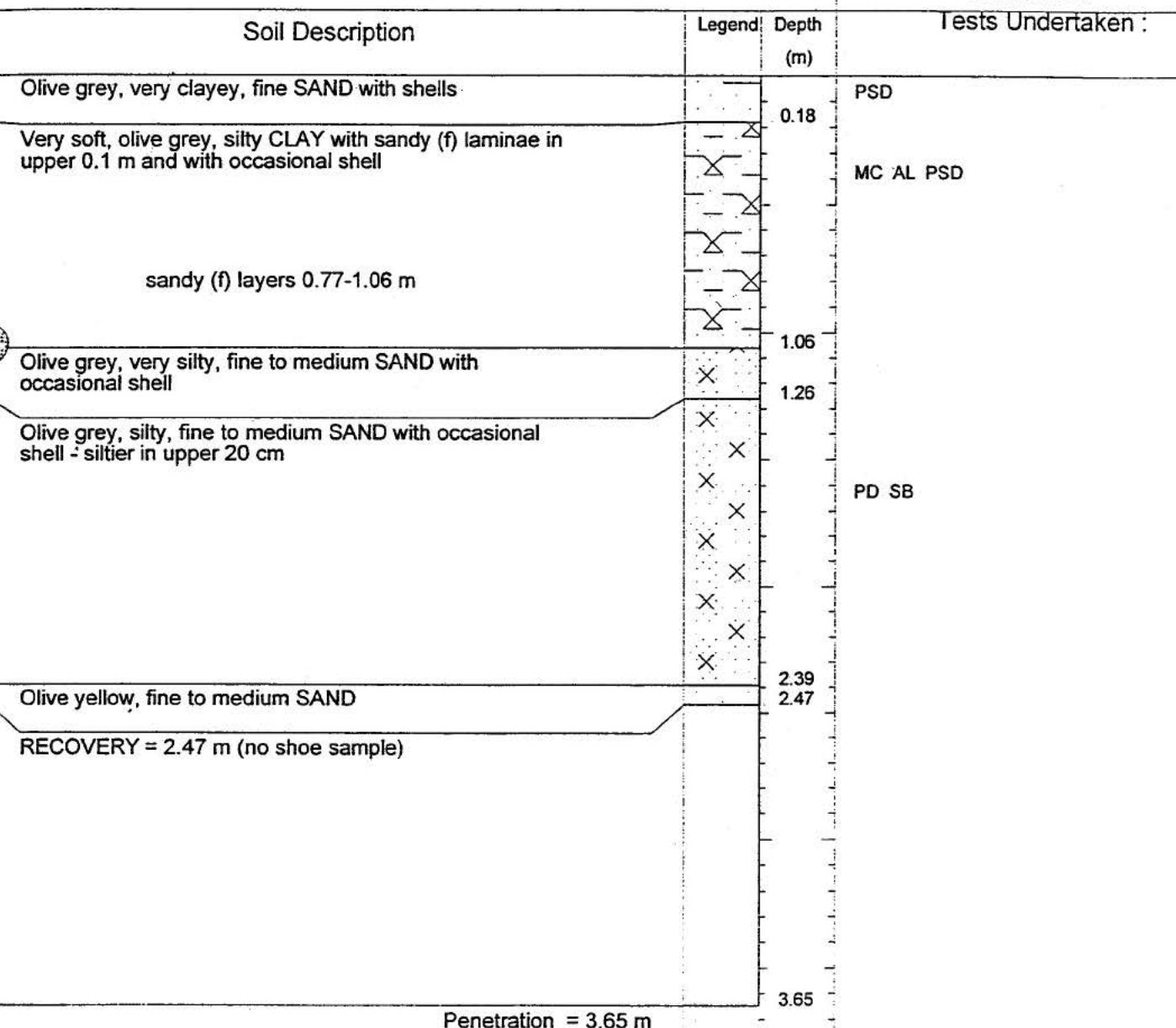
**Coordinates :**

E : 633975  
N : 6278056

**Water Depth (m) : 61**

**Date : 28/11/1996**

**Tests Undertaken :**



**Enclosure 22**

Prepared by:

*MPB*

Checked by:

*JAW*

Contract No: C6573

# ALLUVIAL MINING LIMITED

Milner Road, Chilton Industrial Estate  
Sudbury, Suffolk. CO10 6XG

Tel : +44 01787 880218  
Fax : +44 01787 312320

Station :

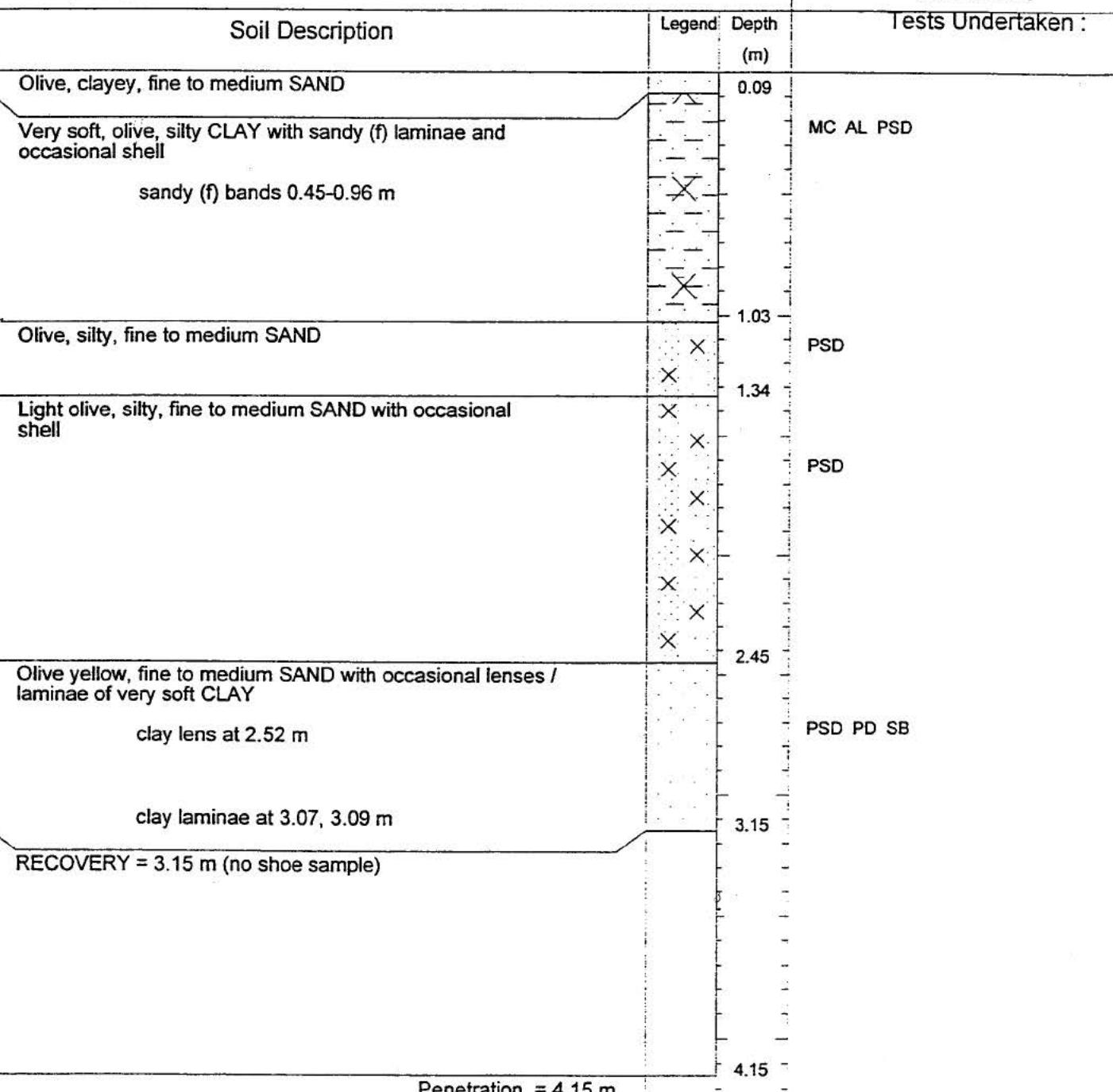
**LOC. 5**

DGU no 560509.5

Client : DANOP

Project : DANISH BLOCK 5605/9-1 NOLDE-1

Sampling Method : 4 metre Vibrocorer



**Enclosure 23**

Prepared by:

*MPB*

Checked by:

*JTH*

Contract No.: C6573

# ALLUVIAL MINING LIMITED

Milner Road, Chilton Industrial Estate  
Sudbury, Suffolk. CO10 6XG

Tel : +44 01787 880218

Fax : +44 01787 312320

Station :

**LOC. 6**

DGU no 560509.6

**Client : DANOP**

**Project : DANISH BLOCK 5605/9-1**

NOLDE-1

**Sampling Method : 4 metre Vibrocorer**

**Coordinates :**

E : 633333

N : 6278154

**Water Depth (m) : 62**

**Date : 28/11/1996**

Soil Description	Legend	Depth (m)	Tests Undertaken :
Olive, very clayey, fine to medium SAND		0.19	PSD SG
Very soft, olive, silty, sandy (f) CLAY, becoming sandier (f) with depth. Rare shells		0.72	MC AL PSD
Olive, clayey, silty, fine SAND, with rare shells	X	1.01	
Olive, silty, fine SAND, with occasional shells	X	2.61	PSD PD SB
Pale yellow, silty, fine to medium SAND		2.99	PSD
RECOVERY = 2.99 m (no shoe sample)		3.75	

Penetration = 3.75 m

**Enclosure 24**

Prepared by:

*MPB*

Checked by:

*JAW*

Contract No: C6573

# ALLUVIAL MINING LIMITED

Milner Road, Chilton Industrial Estate  
Sudbury, Suffolk, CO10 6XG

Tel : +44 01787 880218  
Fax : +44 01787 312320

Station :

## KEY

Coordinates :  
E : 0  
N : 0

Water Depth (m) :  
Date : / /

Client :

Project : Key

NOLDE-1

Sampling Method :

Soil Description	Legend	Depth (m)	Tests Undertaken :
COBBLES	○		Abbreviations for tests undertaken
	○	0.50	MC Moisture Content
GRAVEL	○		AL Atterberg Limits
	○	1.00	BD Bulk Density
SAND	· · · · ·		PD Particle Density
	· · · · ·	1.50	PSD Particle Size Distribution
SILT	X X X X X		HYD Hydrometer
	X X X X X	2.00	SB Shear Box
CLAY	— — — — —		PPT Pocket Penetrometer
	— — — — —	2.50	SV Hand Shear Vane
PEAT	— — — — —		FC Fall Cone
	— — — — —	3.00	TV Torvane
Composite: Silty sandy GRAVEL	○ ○ ○ ○ ○		UUT Unconsolidated Undrained Triaxial
	○ ○ ○ ○ ○	3.50	ER Electrical Resistivity
	○ ○ ○ ○ ○		TC Thermal Conductivity
	○ ○ ○ ○ ○		OED One Dimensional Consolidation
	○ ○ ○ ○ ○		CHEM Chemical Tests
	Penetration = 3.50 m		
			Enclosure 25
			Operator :
			Prepared by :
			Checked by :