

# **Description of vibrocores from three well sites in the Danish North Sea**

Geological description of vibrocores from the  
CECILIE-1 and CONNIE-1 well sites,  
from the FLOKI-1 well site and from  
the VANESSA-1 well site,  
Store Fiske Banke area,  
Danish North Sea

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# Description of vibrocores from three well sites in the Danish North Sea

## Geological description of vibrocores from the CECILIE-1 & CONNIE-1 well sites, from the FLOKI -1 well site and from the VANESSA -1 well site Store Fisker Banke area, Danish North Sea

Seven vibrocorings were carried out as part of site surveys by Gardline Surveys Ltd. for DONG Efterforskning og Produktion A/S in the Danish Block Danish Blocks 5604/19 & 20 (Gardline Surveys Ltd. 2000a), in the Danish Block 5605/18 (Gardline Surveys Ltd. 2000b) and in the Danish Block 5605/23 (Gardline Surveys Ltd. 2000c).

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.

### Location

DONG E & P A/S presented three vibrocores from the blocks 5604/19 & 20 from the CECILIE-1 and CONNIE-1 well sites situated at 56° 24' 20.15" N 04° 45' 41.15" E and at 56° 24' 28.31" N 04° 42' 30.42" E respectively.

Three vibrocores were from block 5605/18 from the FLOKI-1 well site situated at 56° 27' 48.58" N 05° 16' 47.07" E, with a proposed deviated drilling position at 56° 27' 42.77" N 05° 17' 08.71" E.

Finally two vibrocores were from from block 5605/23 from the VANESSA-1 well site situated at 56° 21' 52.15" N 05° 30' 26.42" E.

The sites are indicated on the location map, Enclosure 1.

The positions of the vibrocores are indicated on the table below.

Site	Vibrocore no.	Northing	Easting
CECILIE-1 & CONNIE-1	C vc 1	6252912.36	605474.48
	C vc 2	6252866.72	606836.63
	C vc 3	6252745.14	608667.00
FLOKI-1	F vc 1	6260140.79	640467.57
	F vc 2	6259971.52	640838.34
	F vc 3	6260135.67	640468.94
VANESSA-1	V vc 2	6249610.64	654886.51
	V vc 3	6249611.73	655485.01

**Table 1.** The positions of the investigated vibrocores (UTM 31 N, ED 50)

The vibrocores will be described according to the individual well sites.

## Vibrocores from the CECILIE-1 & CONNIE-1 sites

These vibrocores are situated as indicated on the map, Enclosure 2a and Enclosure 2b.

### Geological setting

According to the industrial report (Gardline Surveys Ltd. 2000a) water depths in the survey area is around 61 m and the seabed is essentially flat, shoaling very slightly eastward.

An upper unit of fine silty sand with clay and peat intercalations has a thickness of 1 - 10 m. The base is an irregular surface with possible gravel lag. The second unit is a stiff clay with silt interbeds and sands with several channelling events followed downwards of interbedded sands and clays. The base Quaternary is an erosional surface on gently westerly dipping Plio-Miocene strata at 334 m below sea bed.

### Sedimentological core log

A legend to the lithologies of the cores is found in Enclosure 3.

The result of the geological description of the core **DGU no. 560419/1**, Gardline Survey Cecilie and Connie, vc 1, is given in Enclosure 4.

This 2.52 m core is situated at the Connie-1 site, and it is made up of an upper 0.62 m layer of bioturbated, silty, very fine sand with shells and shell fragments. This is followed down-core by 1.63 m of slightly silty, very fine sand with few shell fragments in the upper part, with laminae rich in organic material and shells at the base. The lower 0.27 m of the core is alternating silty peat and shelly, very fine sand.

The result of the geological description of the core **DGU no. 560419/2**, Gardline Survey Cecilie and Connie, vc 2, is given in Enclosure 5.

This core is 4.05 m and situated midway between the two sites. The uppermost 0.48 m is a bioturbated, silty, very fine sand with shells and shell fragments. The next 3.29 m is made up of slightly silty, very fine sand with very few shell fragments and clayey laminae in the lower part. The lower 0.20 m of the core is laminated, medium and fine sand and 8 cm of silty, very fine sand at base.

The result of the geological description of the core **DGU no. 560420/35**, Gardline Survey Cecilie and Connie, vc 3, is given in Enclosure 6.

The core is 2.20 m and positioned at the Cecilie-1 site. The upper 0.67 m is a very fine sand with a varying content of silt, with few big shells at ~10 cm depth, and the rest of the section is bioturbated with few shells fragments. The rest of the core is laminated, silty, very fine sand with a certain content of organic material or even peaty.

### **Correlation between the cores**

The upper layer of bioturbated, very fine sand with a varying content of silt and shells and shell fragments correlate well. The lower beds of very fine sand with few shell fragments and possibly clayey laminae and organic material also seem to correlate. The silty, very fine sand at the base in core 560419.2 can not correlate to the two other cores.

### **Interpretation of genesis**

The upper sequence of bioturbated, very fine sands with marine shells and a varying content of silt are thought to reflect the present Holocene, marine sedimentation at this locality. The lower sequence of very fine sand with few shell fragments and possibly clayey laminae and organic material is expected to reflect the early Holocene marine inundation in a tidal setting with partly washed together peaty beds in core 560419/1. The silty, very fine sand at the base in core 560419.2 is thought to reflect deposition in a lacustrine setting.

### **Correlation with seismics**

The sedimentological sequences are not discerned in the seismic and the lengths of the cores do not reach the base of the upper seismic unit indicated in the industrial report. Therefore correlation between the cores and the seismic is meaningless.

### **Correlation to nearby cores**

Correlation to the vibrocores at the CECILIE-2 site (Konradi 2003) seems reasonable. They all have an upper part of silty, fine sand with shells. A lower part is made up of fine sand with a faint lamination or includes clayey laminae with peaty streaks. A counterpart to the silty, very fine sand at the base in core 560419.2 is not identified at the CECILIE-2 site.

A correlation to the vibrocores at the SIRI sites (e.g. Konradi 2003) is possible for the upper silty, bioturbated fine sand, whereas the firm clay at the SIRI site is not identified at the CECILIE-2 site.

## **Vibrocores from the FLOKI-1 site**

The vibrocores are situated as indicated on the map, Enclosure 7.

### **Geological setting**

According to the industrial report (Gardline Surveys Ltd. 2000b) the seabed is slightly rising to the north. The water depths in the survey area range from 50.7 to 53.4 m.

The seabed comprises an upper unit of fine to medium sand with occasional gravel and shells with a persistent thickness of 5 - 7 m. The next unit is interpreted to be channel sands and clay with occasional channelling events with coarser lag deposits at channel base. A pronounced channel base reflector is indicated at 196 to 362 m below seabed. Underneath that are interbedded sand and clay prone sediments with generally flat lying reflectors with a gentle southeasterly dip. The probable base Quaternary reflector is indicated around 400 m below seabed.

### **Sedimentological core log**

A legend to the lithologies of the cores is found in Enclosure 3.

The result of the geological description of the core **DGU no. 560518.1**, Gardline Survey FLOKI-1 Site Survey, vc 1, is given in Enclosure 8.

This 1 m core is made up of an upper 0.65 layer of bioturbated, medium and fine sand with many shell fragments. The next layer is 0.33 m of faintly laminated very fine sand with clayey laminae and few shell fragments. The lower 2 cm of the core is fine and medium sand with one clast and shell fragments.

The result of the geological description of the core **DGU no. 560518.2**, Gardline Survey FLOKI-1 site survey, vc 2, is given in Enclosure 9.

This core is 3.20 m and made up of an upper 0.30 m layer of fine to medium sand with few shells and shell fragments, followed by 18 cm of medium to coarse, shelly sand with rounded clasts. The lower 2.72 m of the core is made up of laminated fine and very fine sand with few gravel-size clasts and few shell fragments.

The result of the geological description of the core **DGU no. 560518.3**, Gardline Survey FLOKI-1 Site Survey, vc 3, is given in Enclosure 10.

The 3.00 m core holds an upper 20 cm layer of shelly, fine to medium sand. The lower 2.80 m of the core is laminated, fine and medium sand with few shell fragments and few gravel-size clasts.

### **Correlation between cores**

The three cores at the site correlates well. Core 560518.1 and core 560518.3 are cored almost at the same position. All cores have an upper unit of interbedded fine and medium sands with shells and shell fragments. In core 560518.2 this bed includes a basal layer of medium to coarse, shelly sand with clasts. The lower sequences of the cores also correlate and are made up of laminated, fine and fine to medium sands with a few gravel-size clasts, few shell fragments and occasional clay laminae or thin beds with medium sand.

### **Interpretation of genesis**

The upper unit of the cores, the interbedded fine and medium sand with marine shells, is a marine deposit of Holocene age and expected to reflect the present sedimentation at the site. The shelly, gravelly sand at its base in core 560518.2 most probably reflects the base of a new hydrographic situation with a higher energy level. The lower unit, which may include clayey laminae, is expected to reflect sedimentation in a tidal setting of Early Holocene age.

### **Correlation with seismic**

The upper unit in the cores is less than two thirds of a metre and is not discerned in the seismic. In the industrial report (Gardline Surveys Ltd. 2000b) it is grouped with the lower sedimentological unit and they make up the upper seismic unit, indicated as a generally persistent unit of 5 - 7 m of fine to medium sand with occasional gravel and shell.

### **Correlation to nearby cores**

No description of vibrocores exist in the vicinity of the FLOKI-1 site.

## Vibrocores from the VANESSA-1 site

The vibrocores are situated as indicated on the map, Enclosure 11.

### Geological setting

According to the industrial report (Gardline Surveys Ltd. 2000c) the water depths in the survey area ranges from 54 m to 57 m with a trough in the east. The sea bed comprises occasionally shelly, silty sand.

An upper seismic unit display continuous parallel reflectors in silty sand and has a thickness of 0 - >10 m, dipping to the west. The second unit is fine to medium sand with a restricted seismic penetration. A glacial channel is seen around 50 m below seabed and is followed downwards by interbedded sands and clays. No base Quaternary is identified.

### Sedimentological core log

A legend to the lithologies of the cores is found in Enclosure 3.

The result of the geological description of the core **DGU no. 560419.3**, Gardline Survey, VANESSA-1 site survey, vc 2, is given in Enclosure 12.

This 4.32 m core is made up of an upper 0.30 m of homogeneous, very fine and fine sand with shells and shell fragments. The next 0.79 m is a faintly laminated fine and very fine sand with few shell fragments. This is followed downcore by 2.09 m of laminated, silty, very fine sand with layers of clay and laminae rich in fragile shell fragments and laminae rich in plant fragments. The lower 1.14 m of the core is faintly laminated fine and medium sand with few gravel-size clasts and shells and shell fragments.

The result of the geological description of the core **DGU no. 560419.4**, Gardline Survey, VANESSA-1 site survey, vc 3, is given in Enclosure 13.

This core is 2.20 m and the top is 12 cm of fine and medium sand followed downcore by 0.31 m a heterolith of silty clay and fine to medium sand, which is bioturbated with many shell fragments and large big shells. Below this is 12 cm of laminated very fine sand with a clay bed at base. The lower 1.65 m of this core is laminated, silty, very fine sand except for a 32 cm contorted interval around 1 m below top.

## **Dating**

A sample of the lower sand in core 560419.3, from 3.90 m below top of core, was investigated for its content of foraminifers. The foraminifer assemblage unambiguously dated this sample to the Eemian, and this sandy section belongs to the Eemian.

## **Correlation between the cores**

These two cores do not immediately correlate, even though the upper 0.43 m of core 560419.4 most probably correlate to the upper 1.09 m or so of core 560419.3. The section of laminated, very fine sand from 0.43 to 0.55 m in core 560419.4, is expected to correlate to the section from 1.09 to 3.18 m of core 560419.3. The sequence of Eemian age in core 560419.3 can not be correlated to any known nearby vibrocores.

## **Interpretation of genesis**

The upper section of the cores, the fine sand with shells in core 560419.3 and the shelly fine to medium sand and the heterolith of core 560419.4 are expected to reflect the current marine sedimentation in the area. The second section of the vibrocores, the fine sand with clayey laminae in core 560419.3 and the laminated fine sand in core 560419.4, is expected to reflect sedimentation in a tidal environment in the Early Holocene. The laminated, silty, very fine and fine sand in the lower part of core 560419.4 is interpreted to reflect sedimentation in a periglacial lacustrine environment. The fine and medium sand of Eemian age in core 560419.3 is expected to reflect a nearshore to shoreface marine environment.

## **Correlation with seismics**

Apparently the sedimentologic sections of the cores can not be correlated to the interpretation of the seismic given in the industrial report (Gardline Surveys Ltd. 2000b). This must be due to lack of resolution in the seismic.

## **Correlation to nearby cores**

No description of vibrocores exist in the vicinity of the VANESSA-1 site. The sequence of Eemian age in core 560419.3 can not be correlated to any known nearby vibrocores but to the geotechnical borehole DGO2-SIRI-BH30-01 at the SIRI-5 well site, where sands of Eemian age is encountered, in a depth of 18.12 to 24.10 below seabed (Konradi 2003).

## Conclusion and suggested correlation to stratigraphy

The upper unit in the vibrocores, the bioturbated very fine sands at the CECILIE-1 & CONNIE-1 sites, the interbedded fine and medium sand at the FLOKI-1 site and the fine and fine to medium sand and a heterolith at the VANESSA-1 site all include marine shells. These beds are of Holocene age and expected to be equivalent to the Terschellingbank Member of the Nieuw Zeeland Gronden Formation (Cameron *et al.* 1989, Laban *et al.* 1995). The second unit in the vibrocores, the laminated, very fine sand often with clayey laminae is believed to correlate to the Elbow Formation (Oele 1969, Laban *et al.* 1995). The third unit, seen in core 560419.4, at the VANESSA-1 site, the laminated, silty, very fine sand with minute organic particles is believed to be equivalent to the Twente Formation (Cameron *et al.* 1989, Jeffery *et al.* 1991). The shelly fine and medium sand in the lower part of core 560419.3, at the VANESSA-1 site, is dated to the Eemian by foraminifers and belong to the Eem Formation (Cameron *et al.* 1989, Jeffery *et al.* 1991).

The existing generalised lithostratigraphy of the southern North Sea is given in table 2.

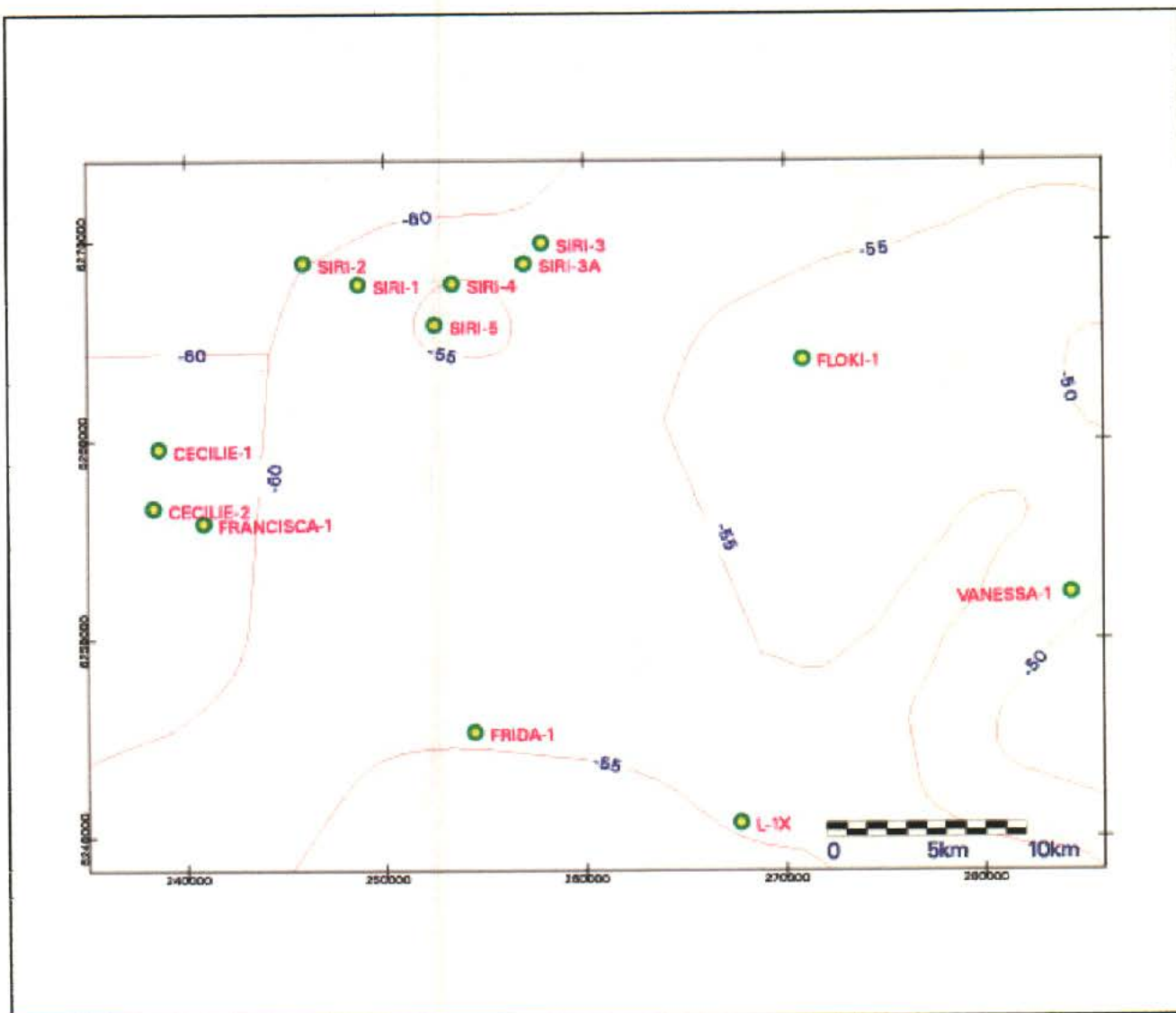
Holocene	Nieuw Zeeland Gronden Formation	Terschellingbank Member
	Elbow Formation	
Weichselian	Twente Formation	
Eemian	Eem Formation	

**Table 2.** Generalised stratigraphy of the Late Quaternary of the North Sea (after Cameron *et al.* 1992).

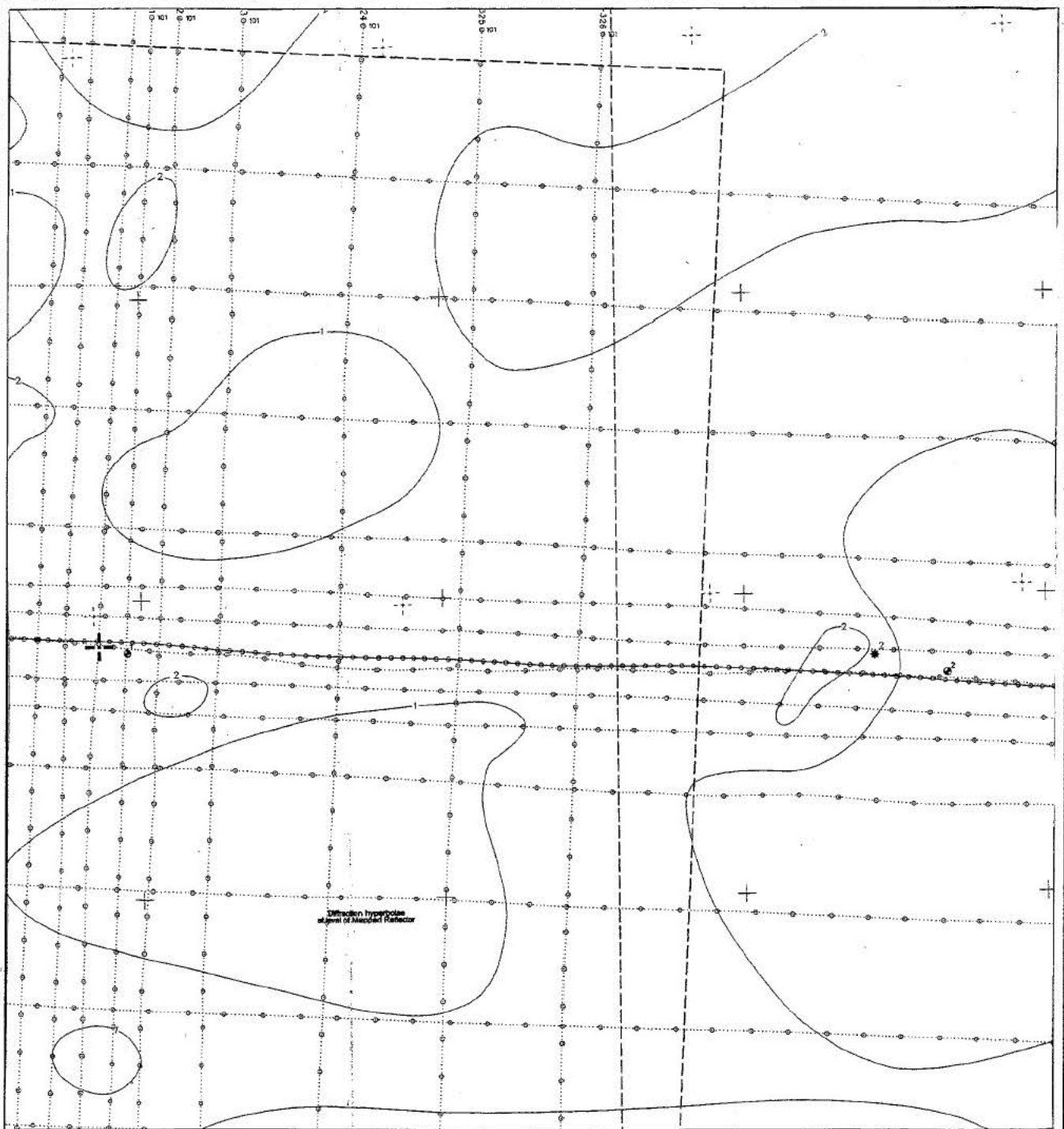
## Literature

- Cameron, T.D.J., Crosby, A.; Balson, P.S., Jeffery, D.H., Lott, G.K., Bulat, J. and Harrison, J. 1992: The Geology of the southern North Sea, United Kingdom Offshore Regional Report, British Geological Survey
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**Enclosures**



Enclosure 1



### SHALLOW SOILS (Extract of Chart 6a)



PROPOSED CONNIE WELL LOCATION (605 426.5 E, 6 252 923.5 N)



REFERENCE POINT TRACK DURING ECHO SOUNDER, SIDESCAN SONAR AND SUB-BOTTOM PROFILER LINES



DEPTHS IN METRES BELOW SEABED (CONTOURED AT 1METRE INTERVALS) TO MAPPED REFLECTOR 1

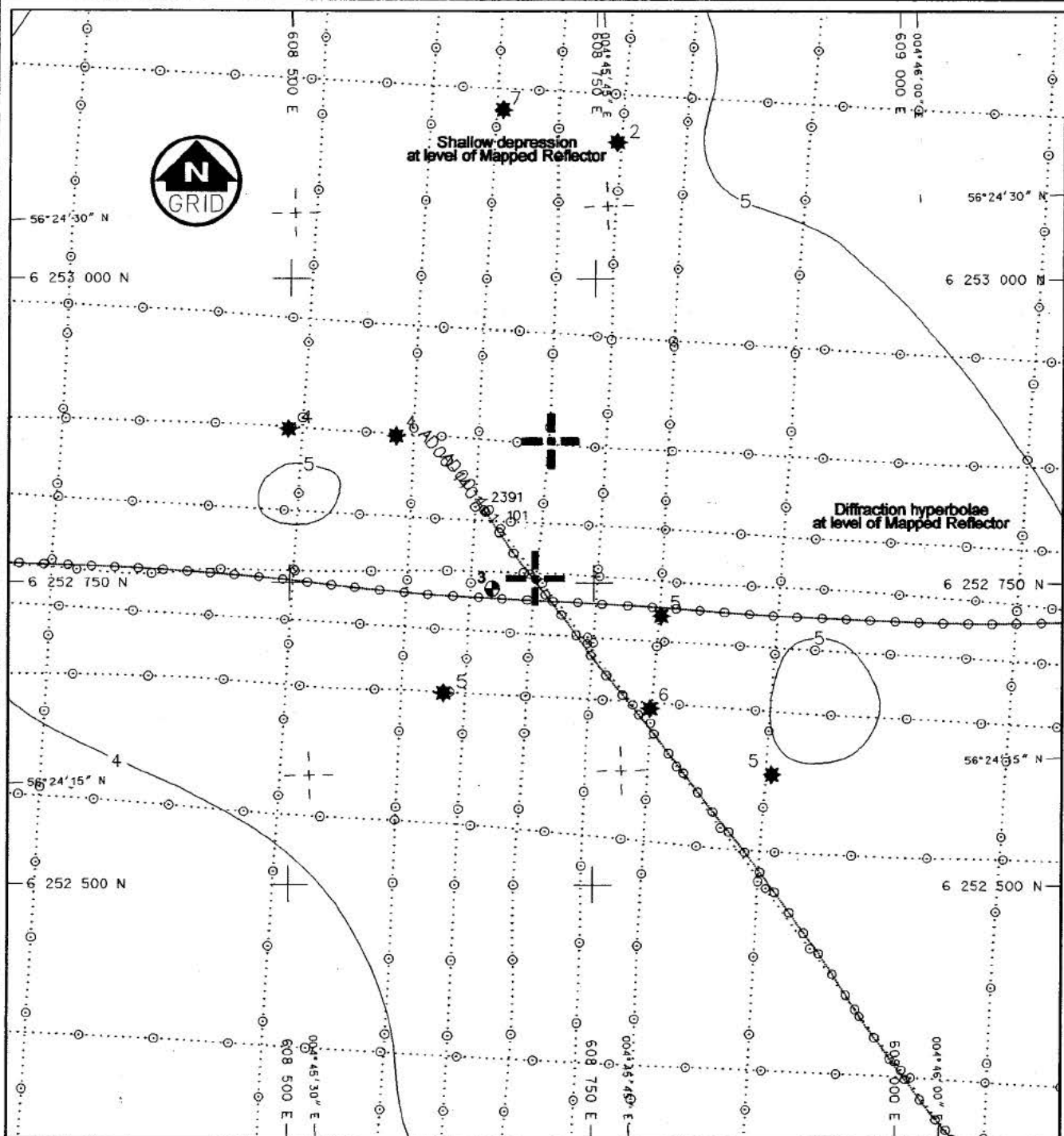


CORE LOCATION WITH SAMPLE NUMBER

Scale 1 : 10 000



Enclosure 2a



### SHALLOW SOILS (Extract of Chart 6b)



PROPOSED CECILIE WELL LOCATION (608 702 E, 6 252 753.9 N)

PROPOSED ALTERNATIVE WELL LOCATION (608 714E, 6 252 867N)



REFERENCE POINT TRACK DURING ECHO SOUNDER, SIDESCAN SONAR AND SUB-BOTTOM PROFILER LINES



DEPTHS IN METRES BELOW SEABED (CONTOURED AT 1 METRE INTERVALS) TO MAPPED REFLECTOR 1



DISTINCT DIFFRACTION HYPERBOLA - PRESUMED BOULDER WITH DEPTH TO FEATURE IN METRES BELOW SEABED

Scale 1 : 5 000



Enclosure 2b

## LEGEND

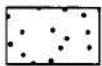
### LITHOLOGY



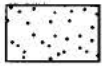
Gravel



Sand and gravel  
(conglomeratic)



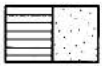
Sand, coarse



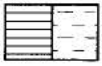
Sand, medium



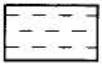
Sand, fine



Heterolith,  
clay/fine sand



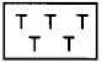
Heterolith,  
clay/silt



Silt

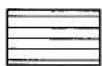


Clay



Peat

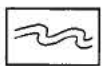
### PRIMARY SEDIMENT STRUCTURES



Parallel lamination



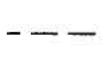
Indistinct  
parallel lamination



Disturbed  
parallel lamination



Sharp boundary

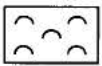


Gradual boundary

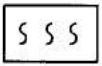


Unconformity,  
(erosions boundary, hiatus)

### FOSSILS



Shells



Bioturbation

### ENVIRONMENT AND AGE

HL : Holocene marine clay

HS : Holocene marine sand

HV : Holocene marine  
clay and sand

FS : Holocene freshwater  
sand

FV : Holocene freshwater  
clay and sand

TL : Lateglacial clay

TS : Lateglacial sand

DL : Glacial clay

DI : Glacial silt

DS : Glacial sand

Enclosure 3

# SEDIMENTOLOGICAL CORE LOG

Company: DONG, site survey CONNIE-1, BH VC 1

Borehole id.: DGU nr. 560419.1

Water depth: 61.5 m

Position: 56° 24' 27,909" N 04° 42' 33,198" E

Core	Core depth m	Litho-logy	Grain size & sediment structures							Description	Env iron & age		
			Clay	Silt	Sand							Gr	Pb
					vf	f	m	c	vc				
I												0.0-0.62: SAND, very fine, silty to very silty, bioturbated, shells and shellfragments, grey 5Y 5/2	HS
	1.0											- 2.25: SAND, very fine, slightly silty, homogenous, few shellfragments, bioturbated in top, at 1.40: layer rich in organic material (seaweed), at 1.80-2.00: laminae rich in charred organic material, at base: many shellfragments, laminated, dark grey 5Y 4/1	HS
1.43													
II	2.0												
	2.52											- 2.52: Alternating: PEAT, silty, finesandy and SAND, very fine, rich in shell debris, very dark greyish brown and grey 2.5Y 3/2 and 5/1	HT / HS
	3.0												
	4.0												
	5.0												
	6.0												

Enclosure 4

Date: 17.10.2003

Described by: PK



GEUS

Geological Survey of Denmark and Greenland

# SEDIMENTOLOGICAL CORE LOG

Company: DONG, site survey CECILIE-1, BH VC 2, mid core

Borehole id.: DGU nr. 560419.2

Water depth: 61 m

Position: 56° 24' 25.33" N 04° 43' 52.56" E

[illegible]

Enclosure 5

Date: 17.10.2003

Described by: PK



Geological Survey of Denmark and Greenland

# SEDIMENTOLOGICAL CORE LOG

Company: DONG, site survey CECILIE-1, BH VC 3

Borehole id.: DGU nr. 560420.35

Water depth: 61.0 m

Position: 56° 24' 19.899" N 04° 45' 39.097" E

Core	Core depth m	Litho-logy	Grain size & sediment structures							Description	Env iron & age
			Clay	Silt	Sand				Gr Pb		
					vf	f	m	c	vc		
I	1.20	1.0								0.0-0.67: SAND, very fine, varying content of silt, faintly laminated, at 0.05-0.09: clayey pot, at ~0.10: rich in big shells (Arctica, a.o.), below 0.12: bioturbated, few shellfragments, grey 5Y 5/1	HS
										- 0.79: SAND, very fine, rich in silt, peaty, few fragile shellfragments, contorted, grey and very dark grey 5Y 5/1 and 5Y 3/1	FS
										- 1.50: SAND, very fine, silty, faintly laminated, dark vertical streaks of organic material (roots?), grey 5Y 5/1	FS
										- 2.20: SAND, fine and very fine, silty, laminated, few black specks of organic material, grey 10YR 6/1	FS
II	2.20	2.0									
		3.0									
		4.0									
		5.0									
		6.0									

Enclosure 6

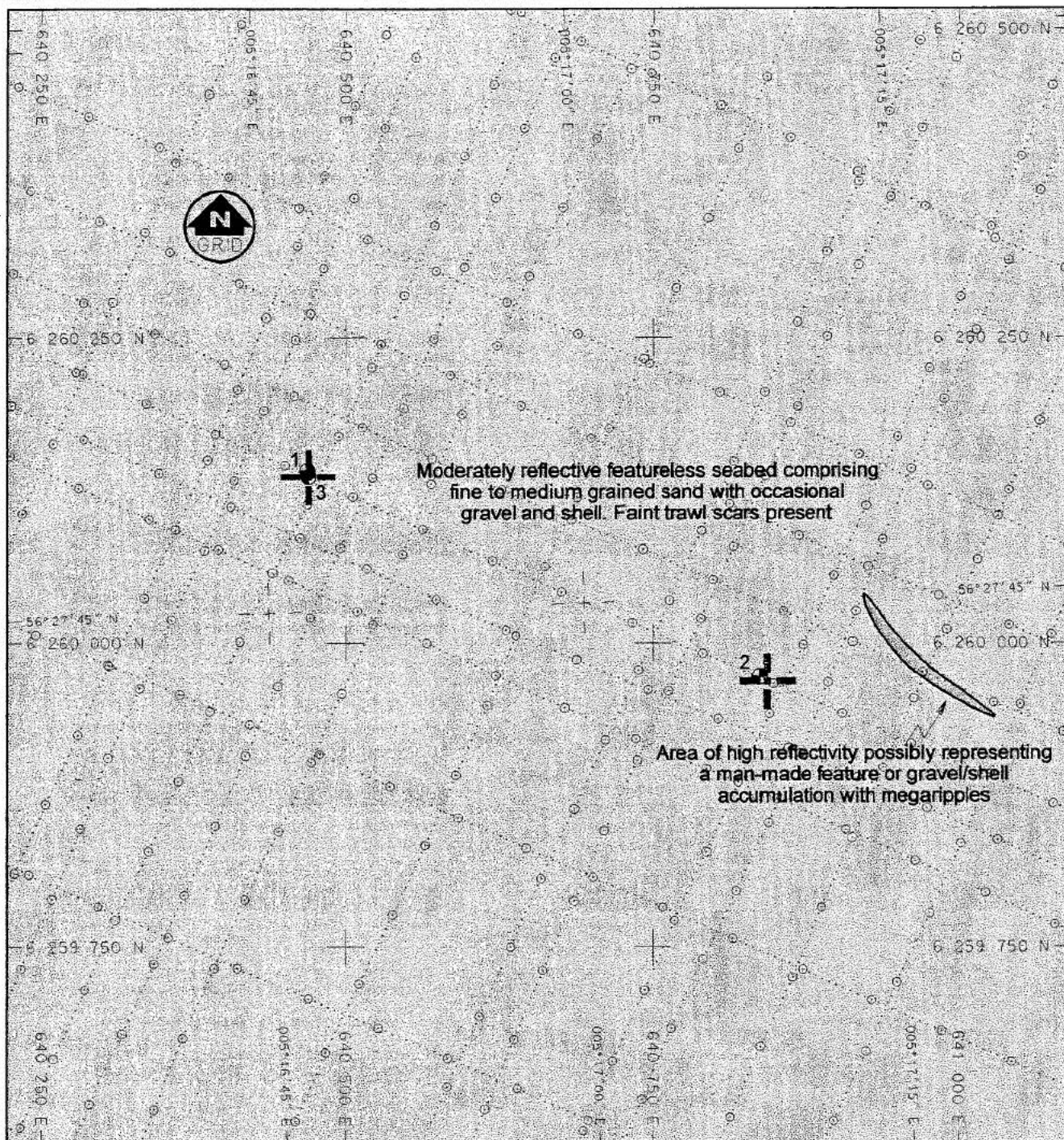
Date: 12.11.2003

Described by: PK



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Geological Survey of Denmark and Greenland



### SEABED FEATURES (Extract of Chart 5)



PROPOSED 5605/18-1 VERTICAL DRILLING LOCATION  
(640 469 E, 6 260 136 N)

PROPOSED 5605/18-1 DEVIATED DRILLING LOCATION  
(640 844 E, 6 259 968 N)

SIDESCAN SONAR TRACK



MODERATELY REFLECTIVE FEATURELESS SEABED COMPRISING  
FINE TO MEDIUM GRAINED SAND WITH OCCASIONAL  
GRAVEL AND SHELL. FAINT TRAWL SCARS PRESENT

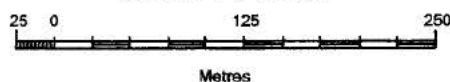


AREA OF HIGH REFLECTIVITY POSSIBLY REPRESENTING A MAN-MADE  
FEATURE OR GRAVEL/SHELL ACCUMULATION WITH MEGARIPPLES



CORE SAMPLE POSITION

Scale 1 : 5 000



Enclosure 7

# SEDIMENTOLOGICAL CORE LOG

Company: KERR McGEE, site survey FLOKI-1, BH VC 1

Borehole id.: DGU nr. 560518.1

Water depth: 51.5 m

Position: 57°27'48.81" N 05°16'46.67" E

Core	Core depth m	Litho-logy	Grain size & sediment structures							Description	Env iron & age
			Clay	Silt	Sand			Gr	Pb		
					vf	f	m	c	vc		
I										0.0-0.65: SAND, medium and fine, mottled, bioturbated, many shell fragments, dark greyish brown 2.5Y 4/2 and grey 2.5Y 5/1	HS
										- 0.98: SAND, very fine, faintly laminated, in lower part: clay laminae, few shell fragments, grey 2.4Y 5/1 and black 2.5Y 2.5/1	HS
	1.00									- 1.00: SAND, fine and medium, 1 gravel-size clast, shell fragments, yellowish brown 10YR 5/4	HS
	1.0										
	2.0										
	3.0										
	4.0										
	5.0										
	6.0										

Enclosure 8

Date: 09.12.2003

Described by: PK



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# SEDIMENTOLOGICAL CORE LOG

Company: KERR McGEE, site survey FLOKI-1, BH VC 2

Borehole id.: DGU nr. 560518.2

Water depth: 52.1 m

Position: 56°27'43" N 05°17'08" E

Core	Core depth m	Litho- logy	Grain size & sediment structures							Description	Env iron & age	
			Clay	Silt	Sand				Gr			Pb
					vf	f	m	c	vc			
I											0.0-0.30: SAND, fine to medium, few shells and shellfragments, dark yellowish brown 10YR 4/4	HS
											- 0.48: SAND, medium to coarse, with rounded gravel size clasts, increasing number downcore, many shells and shellfragments, dark yellowish brown 10YR 4/4	HS
	1.00	1.0									- 3.20: SAND, fine and very fine, laminated, few layers of medium sand, very few gravel-size clasts, few shellfragments, grey 2.5Y 6/1	HS
II												
2.00	2.0											
III												
3.20	3.0											
	4.0											
	5.0											
	6.0											

Enclosure 9

Date: 12.11.2003

Described by: PK



GEUS

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# SEDIMENTOLOGICAL CORE LOG

Company: KERR McGEE, site survey FLOKI-1, BH VC 3

Borehole id.: DGU nr. 560518.3

Water depth: 51.9 m

Position: 56°27'49" N 05°16'47" E

Core	Core depth m	Litho- logy	Grain size & sediment structures							Description	Env iron & age
			Clay	Silt	Sand			Gr	Pb		
					vf	f	m	c	vc		
I										0.0-0.20: SAND, fine to medium, shellfragments, dark yellowish brown 10YR 4/4	HS
										• 3.00: SAND, fine and medium, laminated, few shellfragments, at 0.45 & 0.72 clay layer of ~1 cm thickness, few gravel-size clasts, few gravel-size clay clasts, downcore fewer shellfragments, grey grey 2.5Y 6/1	HS
1.00	1.0										
II											
2.00	2.0										
III											
3.00	3.0										
	4.0										
	5.0										
	6.0										

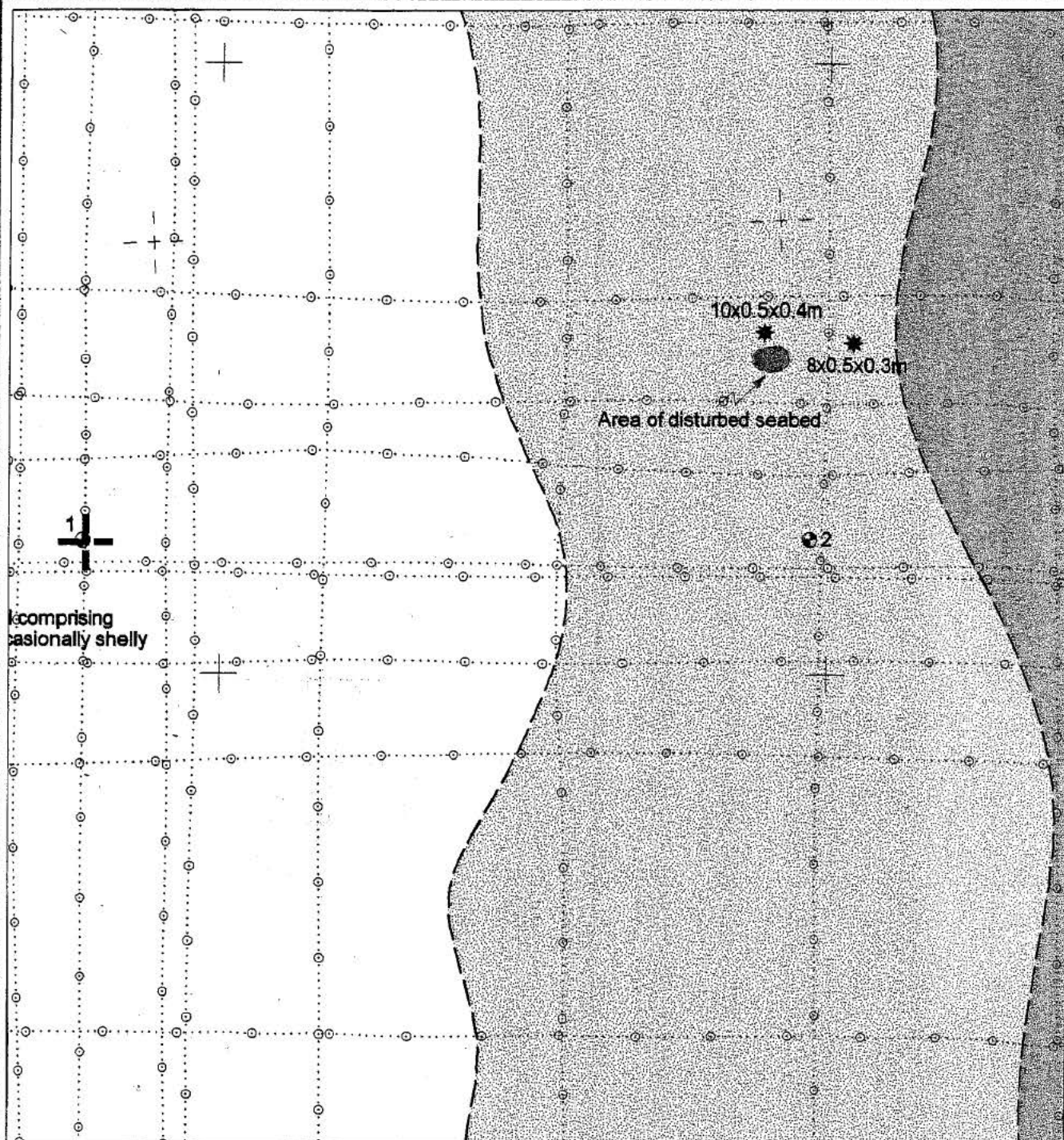
Enclosure 10

Date: 12.11.2003

Described by: PK



Geological Survey of Denmark and Greenland



### SEABED FEATURES (Extract of Chart 5)



PROPOSED VANESSA-1 LOCATION (654 890 E, 6 249 608 N)



SIDESCAN SONAR TRACK



AREA OF GENERALLY FEATURELESS SEABED COMPRISING FINE TO MEDIUM GRAINED SAND, OCCASIONALLY SHELLY

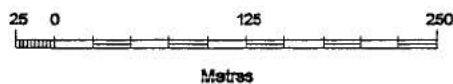


AREA OF PATCHY RIPPLED SAND



CORE SAMPLE POSITION

Scale 1 : 5 000



Enclosure 11

# SEDIMENTOLOGICAL CORE LOG

Company: CLAM, site survey VANESSA-1, BH vc 2

Borehole id.: DGU nr. 560419.3

Water depth: 53.8 m

Position: 56°21' 52" N 05° 30' 26" E

Core	Core depth m	Litho-logy	Grain size & sediment structures							Description	Env iron & age
			Clay	Silt	Sand				Gr Pb		
					vf	f	m	c	vc		
I										0.0-0.30: SAND, very fine and fine, homogeneous, shells and shellfragments large shell ( <i>Arctica islandica</i> ) near base, brown 10YR 4/3	HS
										- 1.09: SAND, fine and very fine, faintly laminated, few shell fragments, grey 2.5Y 5/1 - 6/1	HS
	1.00	1.0									HS
										- 3.18: SAND, very fine, silty, laminated with layers of clay, silty, laminae rich in fragile shell fragments, laminae rich in organic (plants) fragments, grey 5Y 6/1 ? dark grey 5Y 4/1	HS / FS
II											
	2.00	2.0									
III											
	3.00	3.0									
IV										- 4.32: SAND, fine and medium, faintly laminated, very few gravel-size clasts, few shells and shell fragments, light brownish grey 2.5Y 6/2	QS
	4.32										
	5.0										
	6.0										

Enclosure 12

Date: 09.12.2003

Described by: PK



GEUS

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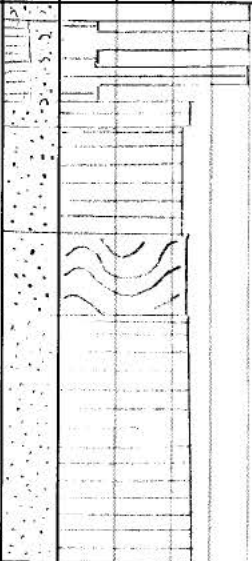
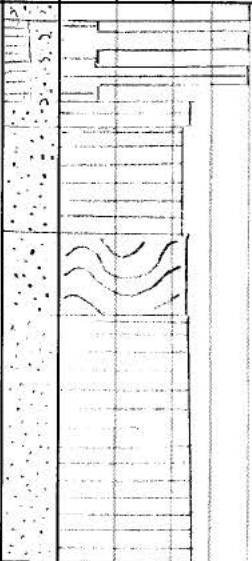
# SEDIMENTOLOGICAL CORE LOG

Company: CLAM, site survey VANESSA-1, BH vc 3

Borehole id.: DGU nr. 560419.4

Water depth: 56.7 m

Position: 56°21' 56" N 05° 32' 01" E

Core	Core depth m	Litho-logy	Grain size & sediment structures							Description	Env iron & age		
			Clay	Silt	Sand			Gr	Pb				
					vf	f	m	c	vc				
I	1.10										0.0-0.12: SAND, fine and medium, slightly silty, homogeneous, shells and shell fragments, brown 10YR 4/3	HS	
												- 0.43: Heterolith: CLAY, silty and SAND, fine - medium, few finegravel-size clasts, few pieces of wood, bioturbated, many shell fragments and few large shells, dark grey 5Y 4/1	HV
II	2.20										-0.55: SAND, very fine, laminated, at base 2 mm clay bed, olive yellow 2.5Y 6/6	FS	
												- 0.97: SAND, very fine, very silty, laminated, minute organic particles, grey 2.5Y 6/1	TS
												- 1.30: SAND, very fine, silty, contorted, several organic specs, grey 2.5Y 5/1	TS
												- 2.20: SAND, very fine, varying content of silt, laminated, grey 2.5Y 5-6/1	TS

Enclosure 13

Date: 09.12.2003

Described by: PK



**G E U S**

Geological Survey of Denmark and Greenland