



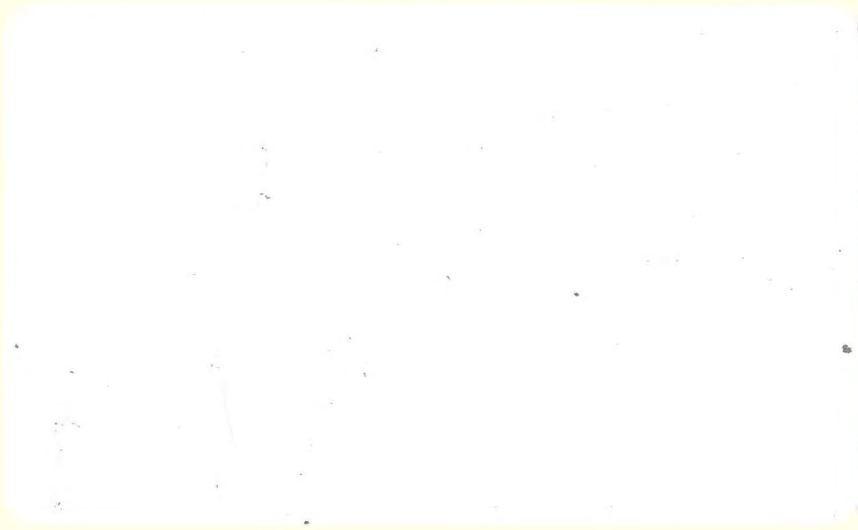
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ORKLA INDUSTRIER A/S

SEISMIC PROSPECTING FOR
SULPHIDE ORE AT LØKKEN WEST, 1981

Report 4034.06 Oslo, 18 June 1982

Prepared by

A/S GEOTEAM

Wm. Thranesgt. 98

Oslo 1

NORWAY

ORKLA INDUSTRIER A/S

SEISMIC PROSPECTING FOR
SULPHIDE ORE AT LØKKEN WEST, 1981

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1. INTRODUCTION

The data of the results presented in this report were recorded jointly by A/S GEOTEAM and NTNF/NORSAR in June 1981 and by A/S GEOTEAM in October 1981.

ORKLA INDUSTRIER A/S prepared the seismic lines, assisted in data acquisition and surveyed the seismic lines.

The field work was carried out according to procedures and parameters given in A/S GEOTEAM's report 4034.05 of 15 May 1981.

The programme reported comprises recording of conventional reflection seismic lines, dual line recording with two instruments, and seismic velocity logging in a prospecting diamond core drillhole drilled to a depth of about 1030 metres.

The seismic measurements form the extension of the 1980 seismic programme for sulphide ore prospecting described in A/S GEOTEAM's report 4034.05.

A chart showing previously measured lines (1980 programme) and those currently reported is given in Appendix 2.1.

2. DATA ACQUISITION

2.1 Conventional Reflection Seismic Lines

Three conventional reflection seismic lines have been recorded, and denoted Line 81 I, 81 VI and 81 VII respectively.

Line 81 I is located easterly in the area.

Line 81 VI is the extension of the 80 III line towards north.

Both these lines were recorded June 1981.

Line 81 VII is the westernmost line, and was recorded October 1981.

2.2 Dual Line Recording

The June 1981 recording was carried out jointly by A/S GEOTEAM and NTNF/NORSAR.

Shots were fired along line 79 III starting from the southern end. A/S GEOTEAM recorded along Line 80 III creating depth coverage inbetween Line 79 III and 80 III. This new line is denoted Line 81 V.

NTNF/NORSAR recorded simultaneously perpendicularly to Line 79 III/80 III. Those data will be permanently reported by Norsar as a part of their current research programme for reflection seismics in metamorphic rocks.

Dual line recording was also performed by NTNF/NORSAR along Line 80 IV based on shots fired by A/S GEOTEAM along Line 81 I.

These recordings comprise Line 81 II, presented here in.

2.3 Seismic Velocity Logging

Borehole 1 is a 1030 m deep borehole drilled in Line 80 IIB. The location of the borehole is shown in Appendix 2.2.

This hole was used for direct seismic velocity measurements which was carried out in October 1981.

A single unclamped vertical velocity borehole geophone of the type Geo Space HSJLP3D was used as pick up. Shots were fired in shallow boreholes at the surface, 5-10 m from top of the hole. Readings were taken at 100 m and 200 m depth, and every 10 m from 300 m - 990 m depth.

Recording was done with the DFS-V recording system. Also 11 surface mounted geophones along Line 80 VA were recorded simultaneously for each shot fired. Charge sizes as for reflection seismic measurements were used.

3. DATA PROCESSING AND RESULTS

3.1 Processing of Data

The basic data processing has been carried out by NTN/NORSAR using software specially developed by NORSAR integrated with the Megaseis processing system.

Final filtering, scaling and plotting have been done by A/S GEOTEAM using VAX 11/780 and DISCO-software.

Processing sequence and type of processing are given in the side labels of each individual seismic section presented.

3.2 Seismic Line Identification

The seismic lines are defined and determined in terms of their respective reflection point distributions displayed in Appendix 2.2.

The coordinate system used is according to ORKLA INDUSTRIER A/S's local system, however, of the Y-axis is chosen in the opposite direction.

The line coordinate numbering in the seismic sections corresponds to the X-coordinate in the local system.

Local system zero point corresponds to $X = 572000$ of the Geographical Survey of Norway, Axis III.

3.3 Seismic Sections

The seismic sections are presented in Appendices 3.1 - 3.8.

A dip compensated stack and/or a dip compensated stack with automatic static corrections is shown for each line.

3.4 Velocities Based On Seismic Velocity Logging, Borehole 1

A display of seismic borehole data is given in Appendix 3.9.

The data shown offer the possibility to compute average seismic velocities and average times for downwards travelling seismic P-waves.

Also interval times may be computed, however, such computations have not been included in this report.

The average seismic P-wave velocity is somewhat higher than previously measured in Løkken Mine east of Orkla River.

In Borehole 1 an average P-wave velocity of 6200 m/s is obtained.

Several later phases associated with "Tube Waves" travelling along the water column of the borehole are very strong.

These waves mask possible reflected waves which are of much lower intensity. The origin of some of the "Tube Waves" is associated with the travel of the direct P-wave, however the mechanism which generates the "Tube Waves" is not obvious in this case.

3.5 Impedance Contrasts from Borehole Samples, Borehole 1

Borehole 1 in Sugustadmarka was aiming at penetrating the sharpest reflector of Line 80 IIB around line metres 1200 - 1300, and 0.27 seconds TWT (two-way-time).

At a depth of 674 metres in the borehole a contact between overlying gabbro and an underlying soapstone-layer of approximately 5 metres in thickness was encountered.

Laboratory measurements including sonic velocity (54 kHz) and density were carried out at The Technical University of Norway (NTH) for 18 samples centered around this gabbro/soapstone contact. Results of the velocity/density measurements along with the computed impedances are given in Appendix 3.10.

The average impedances as shown in Appendix 3.10 give a negative reflection coefficient of 0.07 for the gabbro/soapstone contact, which justifies the reflections obtained in terms of reflection coefficients. Using the 6200 m/s velocity measured in the borehole, the migrated (time-to-depth converted) reflector of Line 80 IIB is in very good accordance with the gabbro/soapstone contact.

3.6 Results and Interpretation

In general, the seismic sections are greatly improved by automatic static processing.

This in fact is in accordance with earlier observations of the 1976 Test Line, where a coherency stack procedure was applied to achieve significant reflections.

The sections obtained with and without automatic statics in this report indicates that automatic static processing routinely should be applied to improve SNR (Signal - to - noise ratio).

The reflections obtained in Lines 81 I and 81 II show a pattern resembling earlier reflectivity patterns obtained in Lines 80 II, 80 V, and 80 IV, presented in A/S GEOTEAM report 4034.05 of 15 May 1981.

In view of the seismic results, there is reason to believe that the geological structure determined by the 1980 seismic programme and Borehole 1 extends eastwards in the area of Lines 81 I and 81 II.

The structures seem to be generally deepening towards east, and the north-south dip of the upper reflecting structures less steep than in Lines 80 II, 80 V and 80 IV.

The Line 81 VI, which is the extension of Line 80 III, shows no significant reflectivity and fits in with the northern termination of Line 80 III where no obvious reflections were found.

The southernmost part of Line 80 III runs through an area of mainly greenstone at the surface.

Borehole 2 in Sugustadmarka aimed at the reflector in Line 80 III, line metres 800, TWT 0.3 seconds.

This drillhole revealed a shallow greenstone/gabbro contact, too shallow (40-50 metres) to be detected by the current lay-out of the reflection seismic measurements. The borehole further revealed a gabbro/greenstone contact at a depth of approximately 895 metres. Preliminary density determinations indicate a contrast of 2,83/2,62 which give a reflection coefficient of 0.04 with no change in velocity across the contact.

Lines 81 V and 81 VII are located approximately 500 metres east and west of Line 80 III respectively.

Seismic sections from these lines are shown in Appendix 3.5, and Appendices 3.7 - 3.8.

Line 81 VII is very much resembling Line 80 III. We believe that differences with respect to continuity and SNR are mainly due to processing refinements.

Line 81 V show an anomaleous structure in the northern part, where a reflector at about 0.2 seconds appears to dip slightly north. The depth to this reflector should be about 600 metres. When compared to Line 80 VC, the composite picture shows a resonable continuous, however, rather complex structure in this area.

4. COMMENTS AND CONCLUSIONS

The seismic reflection measurements carried out in Sugustadmarka, Løkken West, 1981, seem to support a geological model which divides the area covered by seismic lines into two different blocks.

The northeastern part of the area forms a block where in general three reflection levels appear in the seismic sections. The outstanding reflector is the middle level, which according to borehole information corresponds to an approximately 5 m thick layer of soapstone. Overlying and underlying reflectors are explained as greenstone bodies in the gabbro massif.

The western part of the area shows less reflection levels, in general only one main reflector preliminary interpreted as the gabbro/greenstone contact at 700 - 900 m depth. This contact is steeply dipping southwards in the northern part of the block, less dipping and appearing to flatten out towards south.

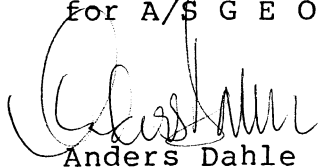
The boundary zone between these blocks is not very distinctive in view of the seismic data. The composite line consisting of Line 80 VC and Line 81 V show a rather complex reflection pattern and may probably represent such a zone. In the northern termination of Line 81 V an anomalous reflection is found. The reflection is anomalous in the sense that it appears to dip slightly north, while the general direction of dip is to the south.

Laboratory measured velocities and densities from samples of Borehole 1 show a distinct drop at the contact between gabbro and soapstone at a depth of hole of 674 metres. The impedance contrast calculated imply a reflection coefficient of -0.07 . Preliminary density analysis of Borehole 2 indicate a reflection coefficient of 0.04 of a gabbro/greenstone contact. The values of reflection coefficients obtained by samples from Borehole 1 and 2, are quite commonly encountered in seismic studies in sedimentary rocks. The seismic reflections and subsequent borehole control in Løkken West confirm that also rock type boundaries in crystalline rocks may be mapped by reflection seismics with an accuracy of a few per cent of the actual depth from the surface.

Velocity measurements in Borehole 1 give an average velocity of 6200 m/s. This velocity is currently the best estimate to be used for time - to - depth calculations in Løkken West.

Oslo, 18 June 1982

for A/S G E O T E A M

A handwritten signature in dark ink, appearing to read 'Anders Dahle', is written over the printed name.

Anders Dahle

STAT. NO.	XCOORD	YCOORD	ZCOORD
1	293.27	- 730.80	199.72
2	301.09	- 736.37	202.09
3	310.41	- 740.01	205.75
4	319.53	- 745.39	206.70
5	327.98	- 747.86	208.50
6	333.63	- 755.73	208.22
7	342.58	- 759.36	210.59
8	350.87	- 753.79	209.19
9	359.37	- 767.37	209.71
10	369.52	- 775.91	212.39
11	380.32	- 772.57	215.67
12	388.02	- 775.47	217.05
13	394.71	- 786.40	216.00
14	403.45	- 794.81	217.00
15	407.90	- 798.68	215.07
16	456.21	- 864.27	222.29
17	465.24	- 866.47	225.26
18	473.89	- 869.31	227.85
19	477.54	- 882.00	229.56
20	485.85	- 892.22	231.86
21	488.56	- 898.17	233.13
22	485.99	- 906.44	231.27
23	495.22	- 913.78	231.71
24	531.41	- 932.41	235.68
25	538.66	- 938.70	237.02
26	547.51	- 943.34	237.85
27	557.59	- 944.02	239.13
28	567.25	- 944.89	240.55
29	576.32	- 949.92	241.53
30	586.35	- 954.20	242.34
31	596.60	- 951.41	244.45
32	605.98	- 953.45	244.71
33	610.27	- 974.57	241.23
34	610.10	- 986.52	242.42
35	616.02	- 990.73	244.56
36	624.23	- 996.43	243.40
37	634.85	-1000.62	242.02
38	643.55	- 999.79	241.85
39	659.60	- 999.62	240.69
40	666.77	- 997.65	239.77
41	681.39	- 997.31	241.54
42	706.69	- 999.11	246.32
43	719.89	- 992.76	249.75
44	729.25	- 997.52	250.26
45	745.25	- 994.08	251.69
46	754.45	- 994.07	251.89
47	759.32	- 990.96	251.68
48	766.83	- 983.83	251.60

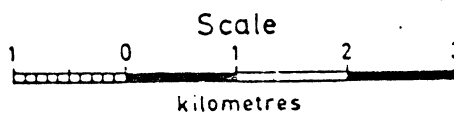
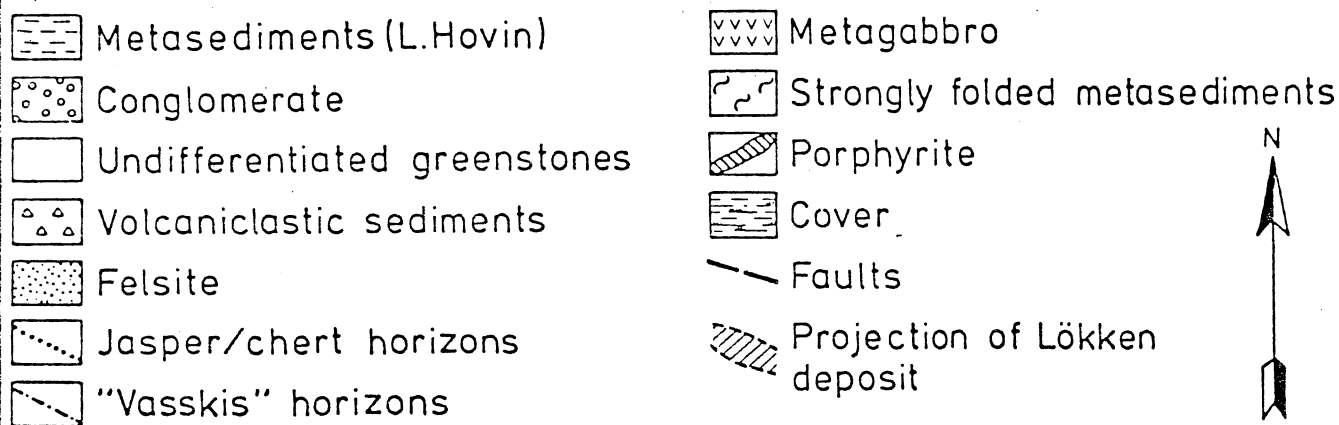
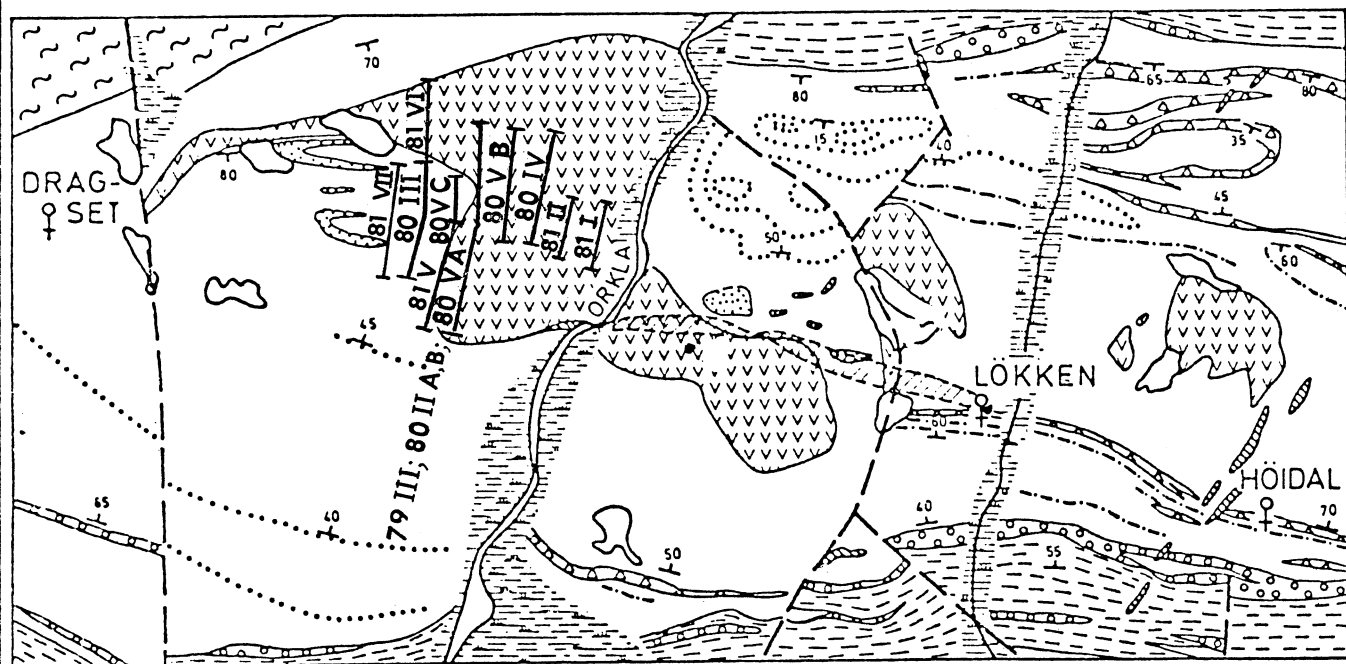
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4	1415.31	299.86	384.91
5	1425.08	284.98	383.90
6	1431.68	282.74	384.04
7	1442.72	281.46	385.57
8	1450.10	276.07	387.51
9	1456.19	269.78	386.87
10	1468.31	271.27	387.31
11	1480.38	252.25	388.25
12	1491.59	249.68	393.20
13	1495.04	237.93	393.74
14	1502.79	238.03	398.28
15	1510.77	234.29	399.89
16	1519.97	227.20	399.17
17	1534.78	238.43	398.20
18	1552.47	248.08	395.85
19	1564.65	256.48	395.29
20	1576.67	258.31	396.52
21	1596.37	256.75	397.82
22	1596.36	237.02	395.95
23	1590.64	222.39	391.60
24	1586.58	198.14	386.85
25	1593.89	193.16	388.10
26	1600.02	188.95	386.82
27	1610.97	185.54	387.22
28	1619.38	181.71	384.89
29	1628.82	177.08	380.15
30	1637.66	176.62	371.75
31	1646.78	170.74	369.16
32	1655.37	171.29	366.10
33	1660.08	162.99	360.81
34	1671.97	164.81	357.69
35	1681.42	163.05	353.84
36	1691.01	156.34	351.45
37	1696.95	155.07	348.66
38	1843.27	60.98	330.52
39	1847.73	59.42	331.16
40	1850.15	57.68	331.18

STAT. NO.	XCOORD	YCOORD	ZCOORD
15 N	1490.66	640.34	350.09
14 N	1483.38	631.41	353.93
13 N	1476.91	620.21	357.10
12 N	1474.75	600.93	360.25
11 N	1473.73	586.55	361.34
10 N	1456.45	563.46	360.40
7 N	1443.94	559.93	358.47
8 N	1430.98	557.11	353.31
7 N	1412.18	555.95	350.13
6 N	1396.71	549.34	347.68
5 N	1359.76	560.19	344.51
4 N	1346.78	557.44	347.98
3 N	1334.57	560.30	350.72
2 N	1322.98	550.78	350.87
1 N	1315.01	550.98	353.18
1	1306.28	551.88	354.56
2	1300.22	561.30	356.57
3	1291.33	560.53	357.75
4	1281.76	568.27	355.86
5	1281.75	582.14	354.28
6	1273.79	594.88	353.79
7	1262.30	597.92	353.76
8	1253.57	599.97	354.02
9	1246.91	600.76	354.07
10	1235.01	608.91	353.98
11	1227.58	609.73	354.20
12	1216.59	615.15	353.28
13	1203.81	614.11	352.20
14	1196.75	611.71	351.81
15	1170.53	661.34	350.00
16	1167.14	670.31	351.47
17	1158.28	677.29	351.72
18	1150.65	681.04	353.31
19	1140.18	682.63	355.31
20	1128.90	694.18	358.13
21	1119.00	695.62	358.82
22	1110.57	697.47	361.37
23	1104.20	699.52	362.72
24	1098.43	707.65	362.89
25	1092.70	713.24	361.69
26	1083.78	723.34	359.77
27	1066.93	718.97	359.24
28	1057.69	719.78	361.20
29	1047.95	716.88	361.43
30	1038.87	710.98	360.81

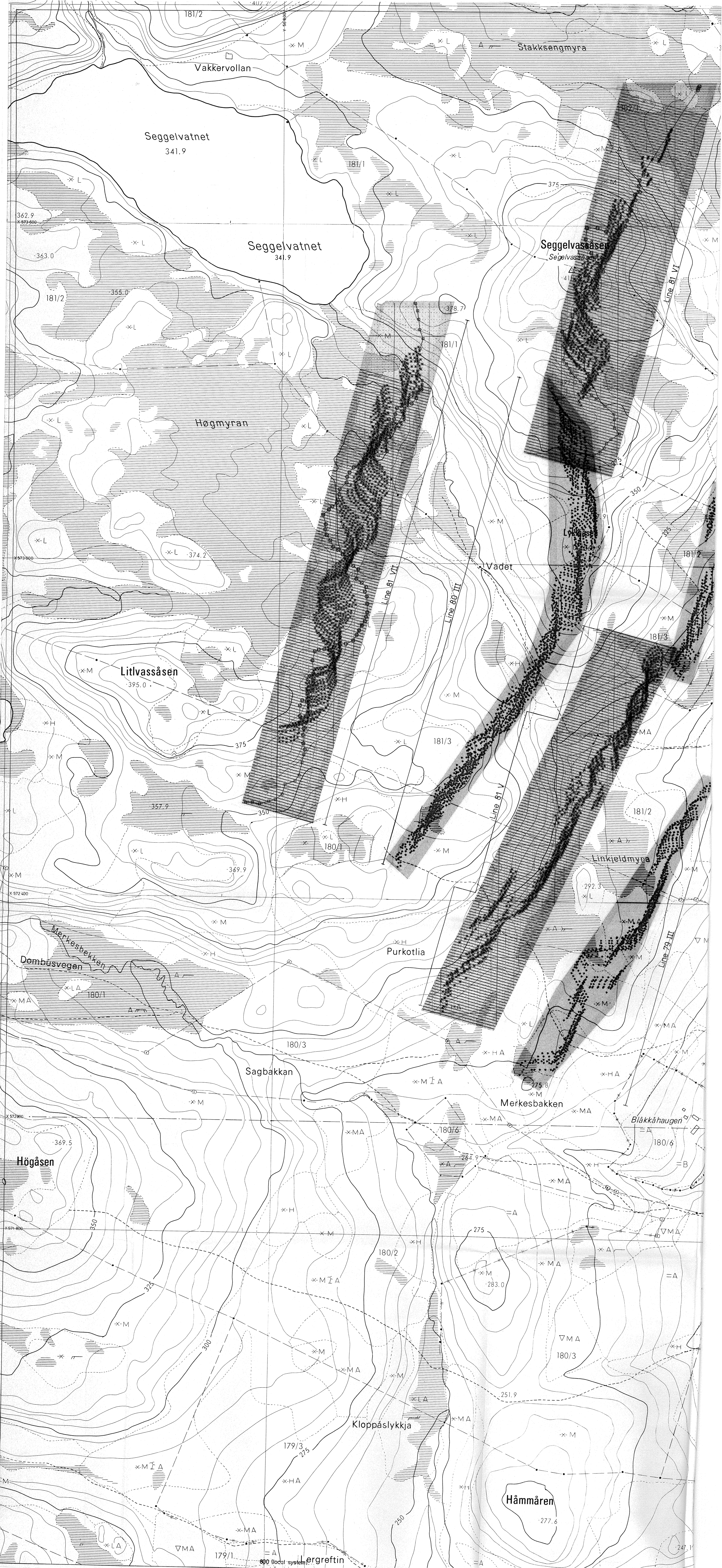
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32	1022.20	696.84	360.29
33	1014.10	688.29	358.40
34	1003.22	679.38	356.54
35	994.78	669.58	357.00
36	998.15	660.52	358.27
37	971.41	663.62	360.43
38	964.28	653.40	361.95
39	956.91	648.48	364.03
40	948.56	647.26	365.92
41	939.11	644.91	366.79
42	926.54	643.14	368.43
43	911.40	643.19	370.18
44	903.66	645.00	372.17
45	895.42	647.94	371.69
46	888.17	652.18	370.74
47	879.37	657.23	371.55
48	871.83	661.33	373.17
49	861.95	667.65	371.82
50	855.55	680.01	371.43
51	854.50	691.16	371.31
52	849.67	701.96	371.43
53	844.61	709.89	370.97
54	845.61	718.99	371.42
55	844.85	728.03	371.67
56	841.21	735.87	370.56
57	825.02	739.97	370.65
58	802.02	737.52	370.37
59	789.71	737.81	372.87
60	779.58	733.47	370.40
61	773.71	738.80	371.51
62	759.90	740.06	370.47
63	752.93	748.08	371.79
64	754.18	756.01	373.02
65	745.76	760.29	370.81
66	726.92	760.47	367.93
67	719.67	756.40	368.55
68	714.90	757.22	367.32
69	704.99	753.90	365.00
70	693.70	754.51	364.26
72	678.95	753.65	360.83
73	667.53	750.38	355.66
74	622.72	760.09	355.85
75	612.52	767.40	356.45
76	605.05	785.14	355.82
77	588.12	890.55	354.25
78	578.12	802.97	351.27
79	575.18	814.91	348.45
80	570.87	830.29	348.66
81	573.85	843.10	349.74
82	572.73	855.36	349.67

STAT. NO.	XCOORD	YCOORD	ZCOORD
1	1215.01	- 223.48	299.94
2	1215.51	- 225.68	300.38
3	1218.14	- 225.82	301.17
4	1219.21	- 223.73	301.32
5	1218.05	- 220.61	301.15
6	1220.72	- 222.23	301.69
7	1223.10	- 221.63	302.35
8	1222.31	- 224.29	302.06
9	1228.71	- 226.99	303.02

Reflection Seismic Lines Løkken West Approximate Location



79 III Seismic line



Vakkervollan

Seggelvatnet
341.9

Seggelvatnet
341.9

Stakksengmyra

Seggelvassåsen
Seggelvassåsen

Høgmyran

Litlvassåsen
395.0

Vadet

Purkotlia

Sagbakken

Merkjesbakken

Blåkkåhaugen

Høgåsen

Kloppåslykkja

Håmmåren

Lergreftin

○ - SHOT POINT
□ - STATION
* - CDP
X - L
X - M
X - H
X - A
X - B
X - C
X - D
X - E
X - F
X - G
X - I
X - J
X - K
X - L
X - M
X - N
X - O
X - P
X - Q
X - R
X - S
X - T
X - U
X - V
X - W
X - X
X - Y
X - Z
X - AA
X - AB
X - AC
X - AD
X - AE
X - AF
X - AG
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X - AI
X - AJ
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X - AR
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X - AT
X - AU
X - AV
X - AW
X - AX
X - AY
X - AZ
X - BA
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X - BO
X - BP
X - BQ
X - BR
X - BS
X - BT
X - BU
X - BV
X - BW
X - BX
X - BY
X - BZ
X - CA
X - CB
X - CC
X - CD
X - CE
X - CF
X - CG
X - CH
X - CI
X - CJ
X - CK
X - CL
X - CM
X - CN
X - CO
X - CP
X - CQ
X - CR
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X - CT
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X - CV
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X - GG
X - GH
X - GI
X - GJ
X - GK
X - GL
X - GM
X - GN
X - GO
X - GP
X - GQ
X - GR
X - GS
X - GT
X - GU
X - GV
X - GW
X - GX
X - GY
X - GZ
X - HA
X - HB
X - HC
X - HD
X - HE
X - HF
X - HG
X - HH
X - HI
X - HJ
X - HK
X - HL
X - HM
X - HN
X - HO
X - HP
X - HQ
X - HR
X - HS
X - HT
X - HU
X - HV
X - HW
X - HX
X - HY
X - HZ
X - IA
X - IB
X - IC
X - ID
X - IE
X - IF
X - IG
X - IH
X - II
X - IJ
X - IK
X - IL
X - IM
X - IN
X - IO
X - IP
X - IQ
X - IR
X - IS
X - IT
X - IU
X - IV
X - IW
X - IX
X - IY
X - IZ
X - JA
X - JB
X - JC
X - JD
X - JE
X - JF
X - JG
X - JH
X - JI
X - JJ
X - JK
X - JL
X - JM
X - JN
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X - JQ
X - JR
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X - JV
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X - KF
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X - QU
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X - WB
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X - WN
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X - WQ
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X - WV
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X - WX
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X - YJ
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X - YR
X - YS
X - YT
X - YU
X - YV
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X - YY
X - YZ
X - ZA
X - ZB
X - ZC
X - ZD
X - ZE
X - ZF
X - ZG
X - ZH
X - ZI
X - ZJ
X - ZK
X - ZL
X - ZM
X - ZN
X - ZO
X - ZP
X - ZQ
X - ZR
X - ZS
X - ZT
X - ZU
X - ZV
X - ZW
X - ZX
X - ZY
X - ZZ

Line 80 V A
Line 80 II B
Line 80 V B
Line 80 IV
Line 81 II
Line 81 I

BOREHOLE 1

Myrhusaugen

Storgrendskleva

Storspeilet

Blåkkågdjerdet

Misjonshåggån

Gammelgarden

Kjerkhulludalsmoen

Hulludalsmoen

Rognmoen

Jo-egga

Blåkkåegginn

ORKLA

Segla

Oran (nedl)

Brattegginn

Skulstuggu

Moen

2/1 m. fl.

179/3

179/10

179/5

179/1

180/1

180/2

180/3

180/4

180/5

180/6

180/7

180/8

180/9

180/10

181/1

181/2

181/3

181/4

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198/1

198/2

198/3

198/4

198/5

198/6

198/7

198/8

198/9

198/10

199/1

199/2

199/3

199/4

COORD
850

900

ORKLA 81 I

950

1000

1050

1100

1150

CDP

16

20

24

28

32

36

40

44

48

52

56

60

64

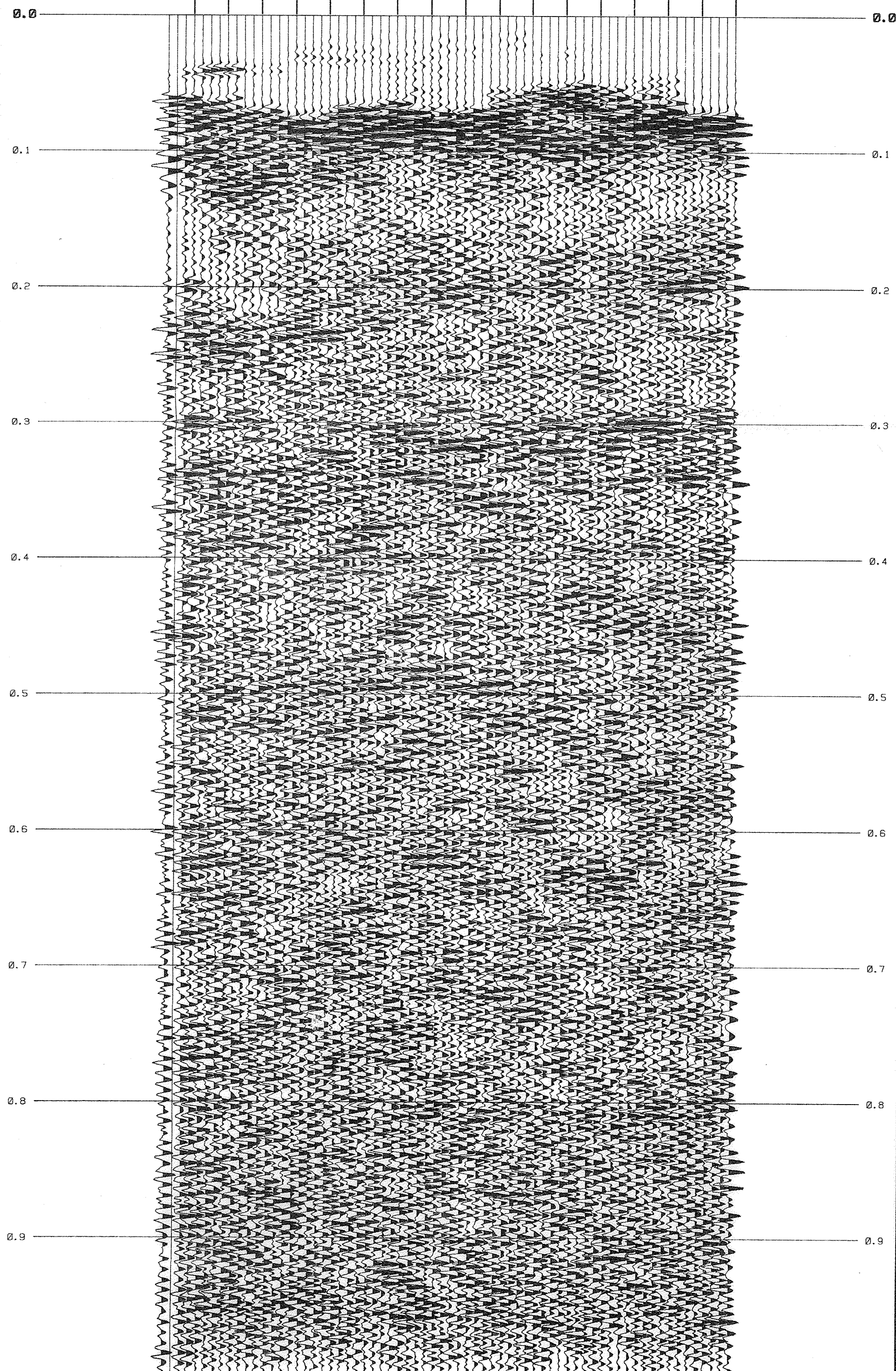
68

72

76

80

CDP

LINE ORKLA 81 I
SUGUSTADMARKA

RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM FILTER : HIGH CUT 256HZ
LOW CUT 115HZ
DATE SHOT : JUNE 1981 NO OF GROUPS : 24
NO OF GEOPH. PR. GROUP : 1
ENERGY SOURCE : C4 EXPLOSIVES TYPE OF GEOPH. : SM-7/50HZ
SHOT POINT INTERVAL : 10 METERS
RECORDING SYSTEM : DFS-V
RECORD LENGTH : 1.0 S
SAMPLE RATE : 1 MS

PROCESSING SEQUENCE

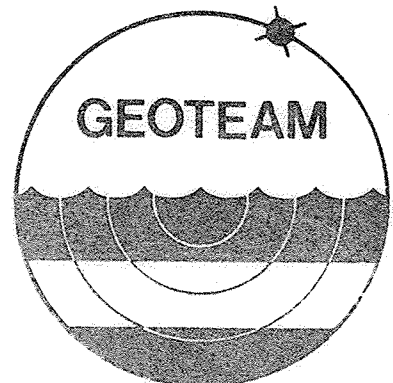
PROCESSED BY : NTN/NORSAR
DATE PROCESSED : MARCH 1982
DMX/EDIT : INDIVIDUAL STATION COORD.
SPECIFICATION
CDP-SORTING : AREAL DISTR. AND LINE PROJ.
CDF SELECTION
NMO CORRECTIONS
STATICS : REF. LEVEL 300M.
BP FILTER : 120-250HZ SLOPE 24/36
SCALE : TIME/AMP. BALANCE B. STACK W=150MS
MAX. 21 FOLD

STACKING VEL.	
TIME	VEL
0	5000
50	5500
200	8000
MSEC	M/SEC

DISPLAY

SCALING : AGC. GATE : 150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL

PLOTTED BY A/S GEOTEAM

	LINE 81 I	
	DIP - COMPENSATED STACK	
	Client ORKLA INDUSTRIER A/S	
	Measured : June 1981	Map no
	Calculated : March 1982	Scale 1:2000
	Drawn : June 1982	Project no 4034.06
	Controlled :	Appendix no 3.1

COORD
850

900

950

1000

1050

1100

1150

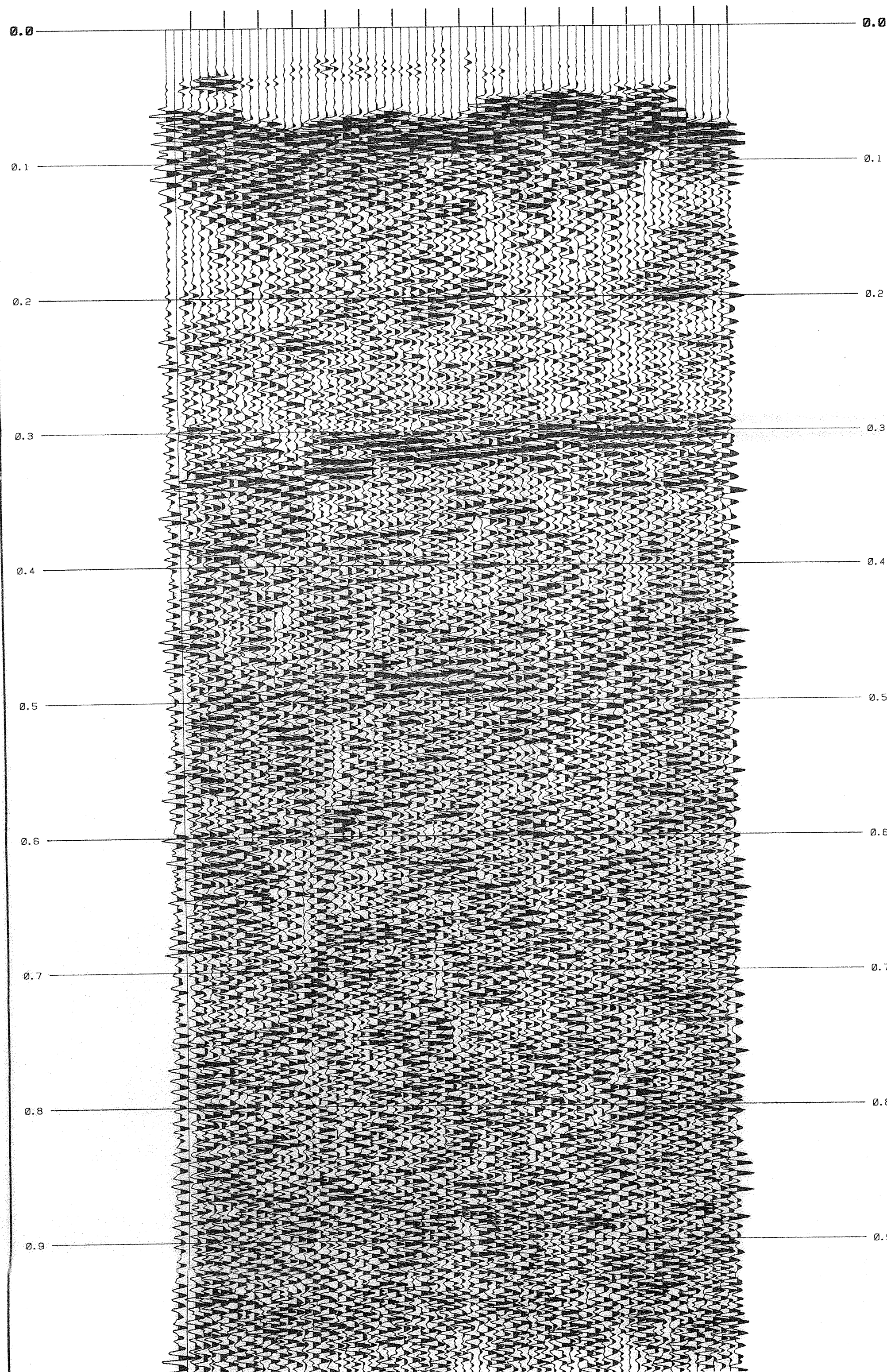
ORKLA 81 I

LINE ORKLA 81 I
SUGUSTADMARKA

CDP

16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80

CDP



RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM FILTER : HIGH CUT 256HZ
LOW CUT 115HZ
DATE SHOT : JUNE 1981 NO OF GROUPS : 24
NO OF GEOPH.PR.GROUP: 1
ENERGY SOURCE : C4 EXPLOSIVES TYPE OF GEOPH.: SM-7/50HZ
SHOT POINT INTERVAL: 10 METERS
RECORDING SYSTEM : DFS-V
RECORD LENGTH : 1.0 S
SAMPLE RATE : 1 MS

PROCESSING SEQUENCE

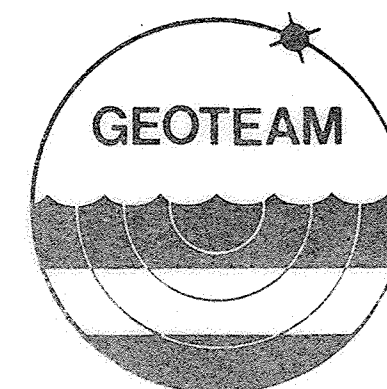
PROCESSED BY : NTNF/NORSAR
DATE PROCESSED : MARCH 1982
DMX/EDIT : INDIVIDUAL STATION COORD.
SPECIFICATION
CDP-SORTING: AREAL DISTR.AND LINE PROJ.
CDF SELECTION
NMO CORRECTIONS
STATICS : REF.LEVEL 300M.AUTOSTATICS
BP FILTER : 120-250HZ SLOPE 24/36
SCALE : TIME/AMP.BALANCE B.STACK W=150MS
MAX.21 FOLD

STACKING VEL.	
TIME	VEL
0	5000
50	5500
200	8000
MSEC	M/SEC

DISPLAY

SCALING : AGC. GATE: 150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL

PLOTTED BY A/S GEOTEAM



LINE 81 I

DIP-COMPENSATED STACK
WITH AUTOMATIC STATICS

Client

ORKLA INDUSTRIER A/S

Measured	June 1981
Calculated	March 1982
Drawn	June 1982
Controlled	

Map no	Scale 1:2000
Project no	4034.06
Appendix no	3.2

COORD.

450

500

550

600

650

700

750

800

ORKLA 81 II

LINE ORKLA 81 II
SUGUSTADMARKA

CDP

22

25

29

33

37

41

45

49

53

57

61

65

69

73

77

81

85

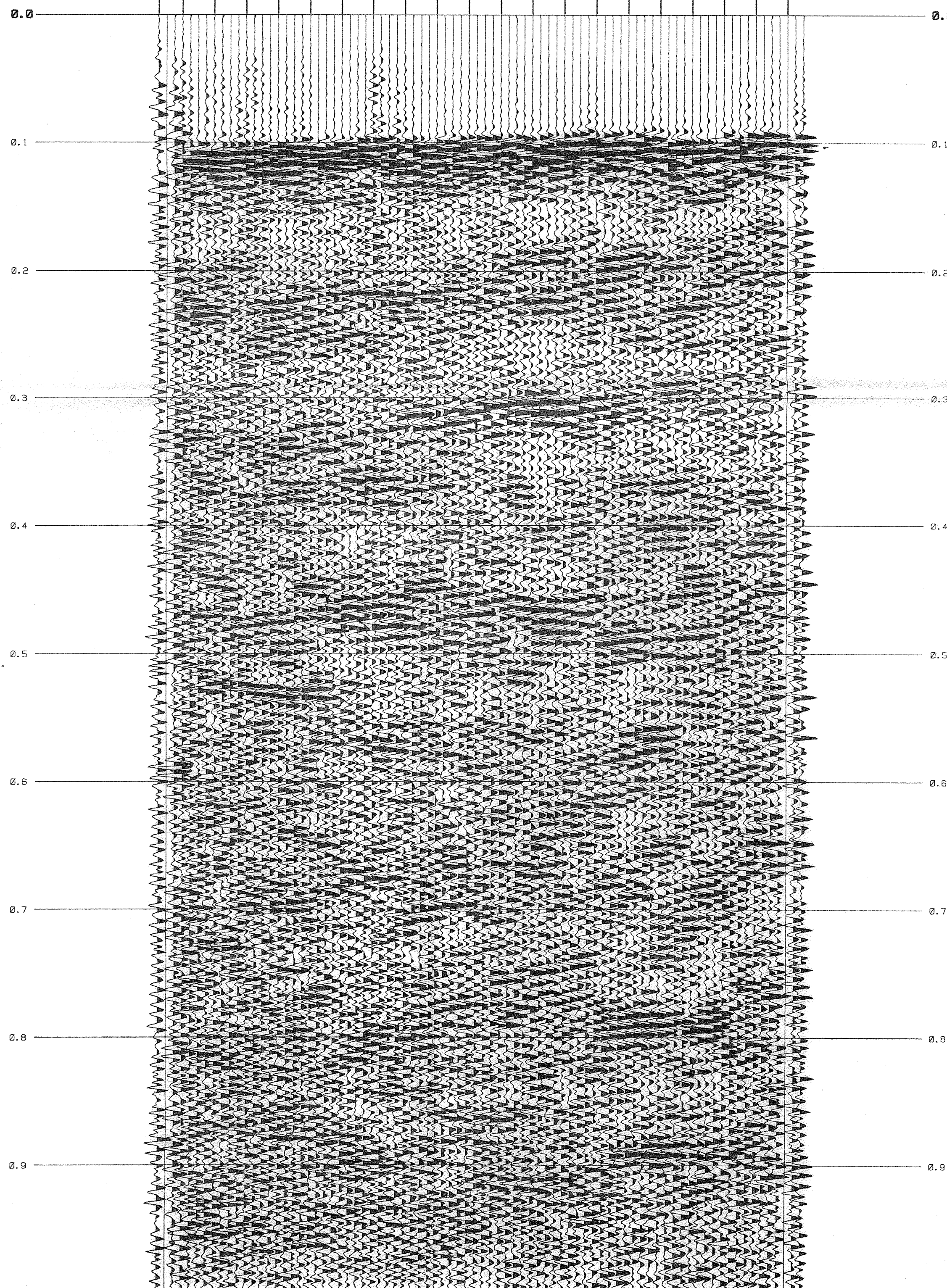
89

93

97

101

CDP



RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM FILTER : HIGH CUT 256HZ
DATE SHOT : JUNE 1981 NO OF GROUPS : 24
NO OF GEOPH.PR.GROUP: 1
ENERGY SOURCE : C4 EXPLOSIVES TYPE OF GEOPH.: 60HZ MARKS
SHOT POINT INTERVAL: 10 METERS DUAL LINE SHOOTING
RECORDING SYSTEM : DFS-V
RECORD LENGTH : 1.0 S
SAMPLE RATE : 1 MS

PROCESSING SEQUENCE

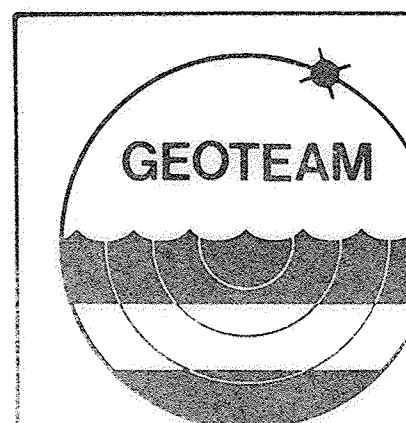
PROCESSED BY : NTNF/NORSAR
DATE PROCESSED : MARCH 1982
DMX/EDIT : INDIVIDUAL STATION COORD.
SPECIFICATION
CDP-SORTING: AREAL DISTR.AND LINE PROJ.
CDF SELECTION
NMO CORRECTIONS
STATICS : REF.LEVEL 300M.
BP FILTER : 120-250HZ SLOPE 24/36
SCALE : TIME/AMP.BALANCE B.STACK W=150MS
MAX.15 FOLD

STACKING VEL.	
TIME	VEL
0	5000
50	5500
200	8000
MSEC	M/SEC

DISPLAY

SCALING : AGC. GATE:150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL

PLOTTED BY A/S GEOTEAM



LINE 81 II

DIP-COMPENSATED STACK

Client

ORKLA INDUSTRIER A/S

Measured June 1981

Calculated March 1982

Drawn June 1982

Controlled:

Map no

Scale 1:2000

Project no 4034.06

Appendix no

3.3

COORD.
450

500

550

600

650

700

750

800

ORKLA 81 II

CDP

22

25

29

33

37

41

45

49

53

57

61

65

69

73

77

81

85

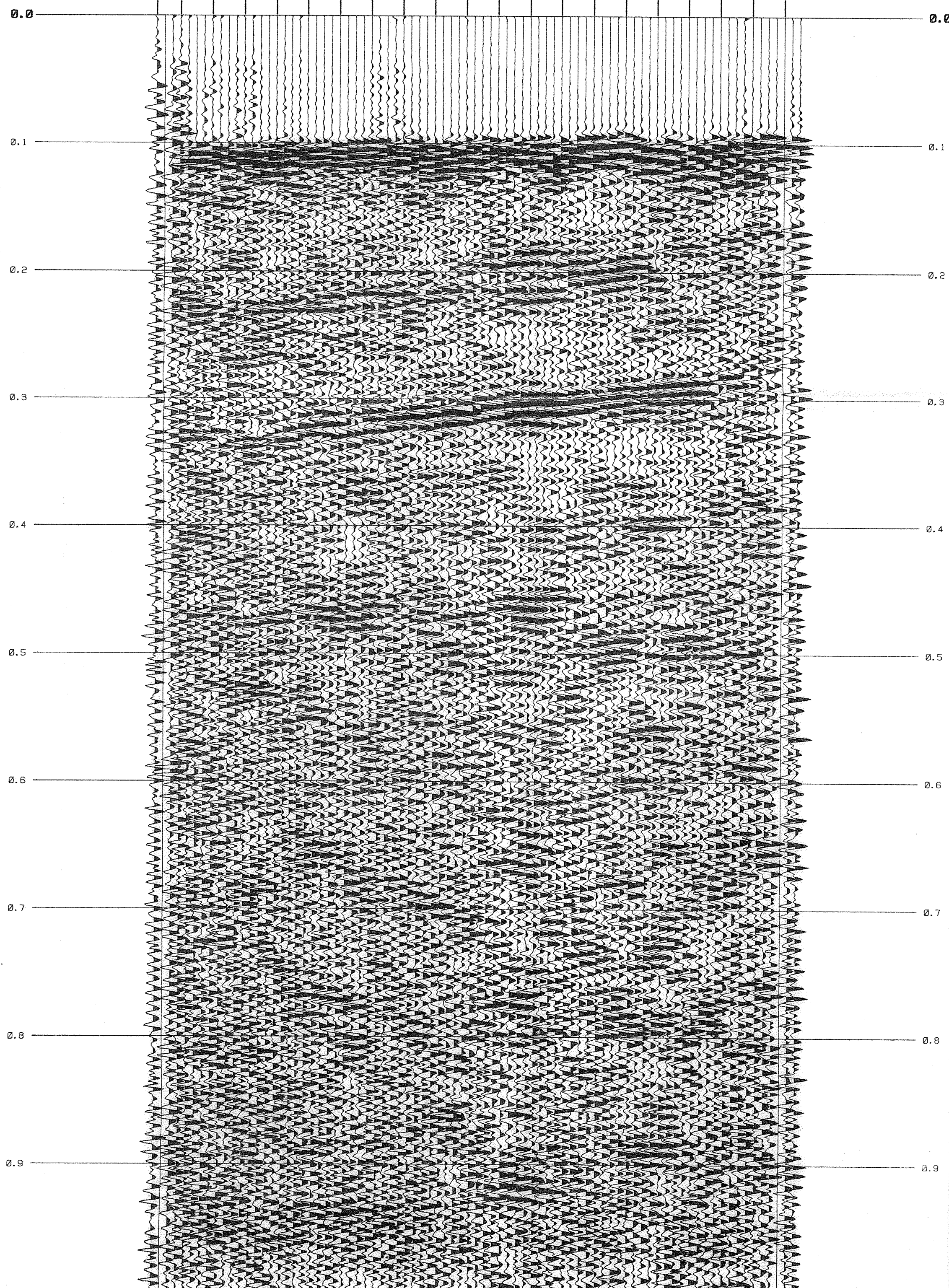
89

93

97

101

CDP

LINE ORKLA 81 II
SUGUSTADMARKA

RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM FILTER : HIGH CUT 256HZ
DATE SHOT : JUNE 1981 NO OF GROUPS : 24
ENERGY SOURCE : C4 EXPLOSIVES NO OF GEOPH. PR. GROUP : 1
SHOT POINT INTERVAL : 10 METERS TYPE OF GEOPH. : 60HZ MARKS
RECORDING SYSTEM : DFS-V DUAL LINE SHOOTING
RECORD LENGTH : 1.0 S
SAMPLE RATE : 1 MS

PROCESSING SEQUENCE

PROCESSED BY : NTN/NORSAR
DATE PROCESSED : MARCH 1982
DMX/EDIT : INDIVIDUAL STATION COORD.
SPECIFICATION
CDP-SORTING: AREAL DISTR. AND LINE PROJ.
CDF SELECTION
NMO CORRECTIONS
STATICS : REF. LEVEL 300M. AUTOSTATICS
BP FILTER : 120-250HZ SLOPE 24/36
SCALE : TIME/AMP. BALANCE B. STACK W=150MS
MAX. 15 FOLD

STACKING VEL.	
TIME	VEL
0	5000
50	5500
200	8000
MSEC	M/SEC

DISPLAY

SCALING : AGC. GATE: 150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL

PLOTTED BY A/S GEOTEAM



LINE 81 II

DIP-COMPENSATED STACK
WITH AUTOMATIC STATICS

Client

ORKLA INDUSTRIER A/S

Measured June 1981

Calculated: March 1982

Drawn: June 1982

Controlled:

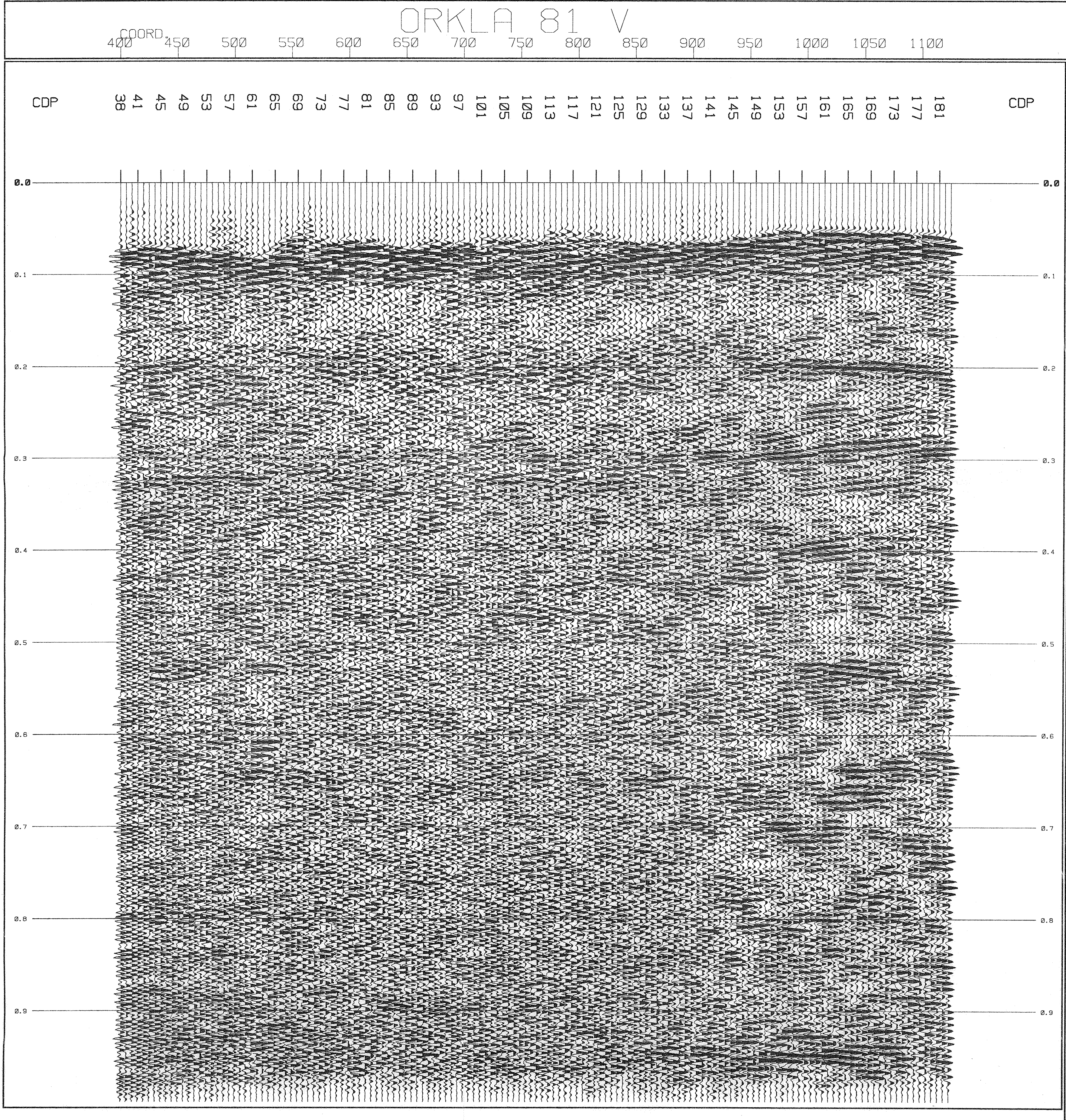
Map no

Scale 1:2000

Project no 4034.06

Appendix no

3.4



LINE ORKLA 81 V
SUGUSTADMARKA

RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM
DATE SHOT : JUNE 1981
ENERGY SOURCE : C4 EXPLOSIVES
SHOT POINT INTERVAL : 10 METERS
DUAL LINE SHOOTING
FILTER : HIGH CUT 256HZ
NO OF GROUPS : 24
NO OF GEOPH. PR. GROUP : 1
TYPE OF GEOPH. : SM-7/50HZ
GEOPHONE SPACING : 10 METERS
RECORDING SYSTEM : DFS-V
RECORD LENGTH : 1.0 S
SAMPLE RATE : 1 MS
CLIENT : ORKLA INDUSTRIER A/S

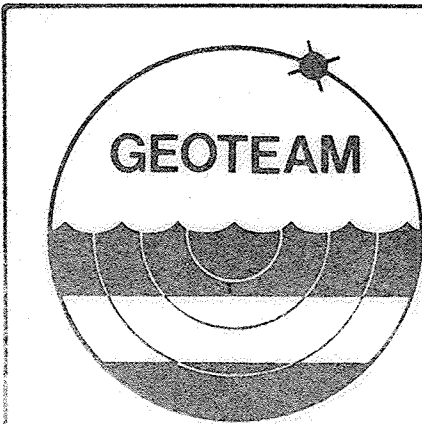
PROCESSING SEQUENCE

PROCESSED BY : NTN F/NORSAR
DATE PROCESSED : MARCH 1982
DMX/EDIT : INDIVIDUAL STATION COORD.
SPECIFICATION
CDP-SORTING : AREAL DISTR. AND LINE PROJ.
CDF SELECTION
NMO CORRECTIONS
STATICS : REF. LEVEL 300M.
BP FILTER : 120-250HZ SLOPE 24/36
SCALE : TIME/AMP. BALANCE B. STACK W=150MS
MAX. 15 FOLD

STACKING VEL.	
TIME	VEL
0	5000
50	5500
200	8000
MSEC	M/SEC

DISPLAY

SCALING : AGC. GATE: 150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL
PLOTTED BY A/S GEOTEAM



LINE 81 V
DIP- COMPENSATED STACK

Client
ORKLA INDUSTRIER A/S

Measured	June	1981
Calculated	March	1982
Drawn	June	1982
Controlled		

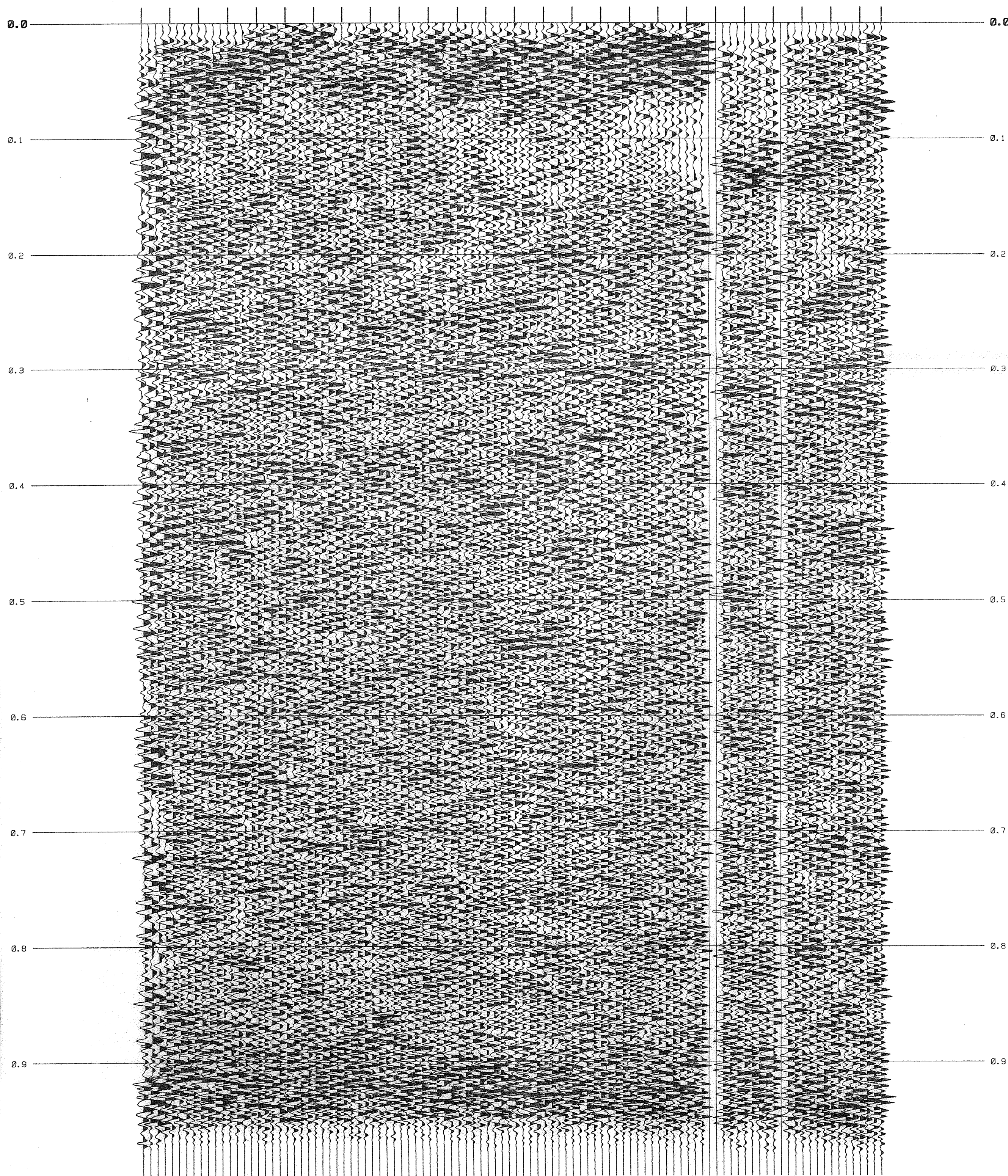
Map no	Scale	1:2000
Project no		4034.06
Appendix no		3.5

ORKLA 81 VI

1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 COORD.

LINE ORKLA 81 VI
SUGUSTADMARKA

CDP 14 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97 101 105 109 113 117 CDP



RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM FILTER : HIGH CUT 250HZ
DATE SHOT : JUNE 1981 LOW CUT 115HZ
ENERGY SOURCE : C4 EXPLOSIVES NO OF GROUPS : 24
SHOT POINT INTERVAL: 10 METERS NO OF GEOPH. PR. GROUP: 1
TYPE OF GEOPH.: SM-7/50HZ
RECORDING SYSTEM : DFS-V
RECORD LENGTH : 1.0 S
SAMPLE RATE : 1 MS

PROCESSING SEQUENCE

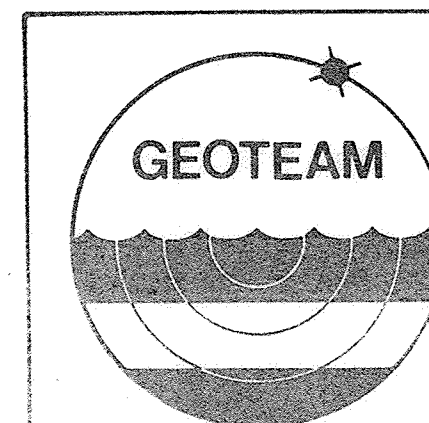
PROCESSED BY : NTFN/NORSAR
DATE PROCESSED : MARCH 1982
DMX/EDIT : INDIVIDUAL STATION COORD.
SPECIFICATION
CDP-SORTING: AREAL DISTR. AND LINE PROJ.
CDF SELECTION
NMO CORRECTIONS
STATICS : REF. LEVEL 300M.
BP FILTER : 120-250HZ SLOPE 24/36
SCALE : TIME/AMP. BALANCE B. STACK W=150MS
MAX. 21 FOLD

STACKING VEL.	
TIME	VEL
0	5000
50	5500
200	8000
MSEC	M/SEC

DISPLAY

SCALING : AGC. GATE: 150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL

PLOTTED BY A/S GEOTEAM



LINE 81 VI
DIP COMPENSATED STACK

Client

ORKLA INDUSTRIER A/S

Measured June 1981
Calculated March 1982
Drawn June 1982
Controlled:

Map no

Scale 1:2000

Project no 4034.06

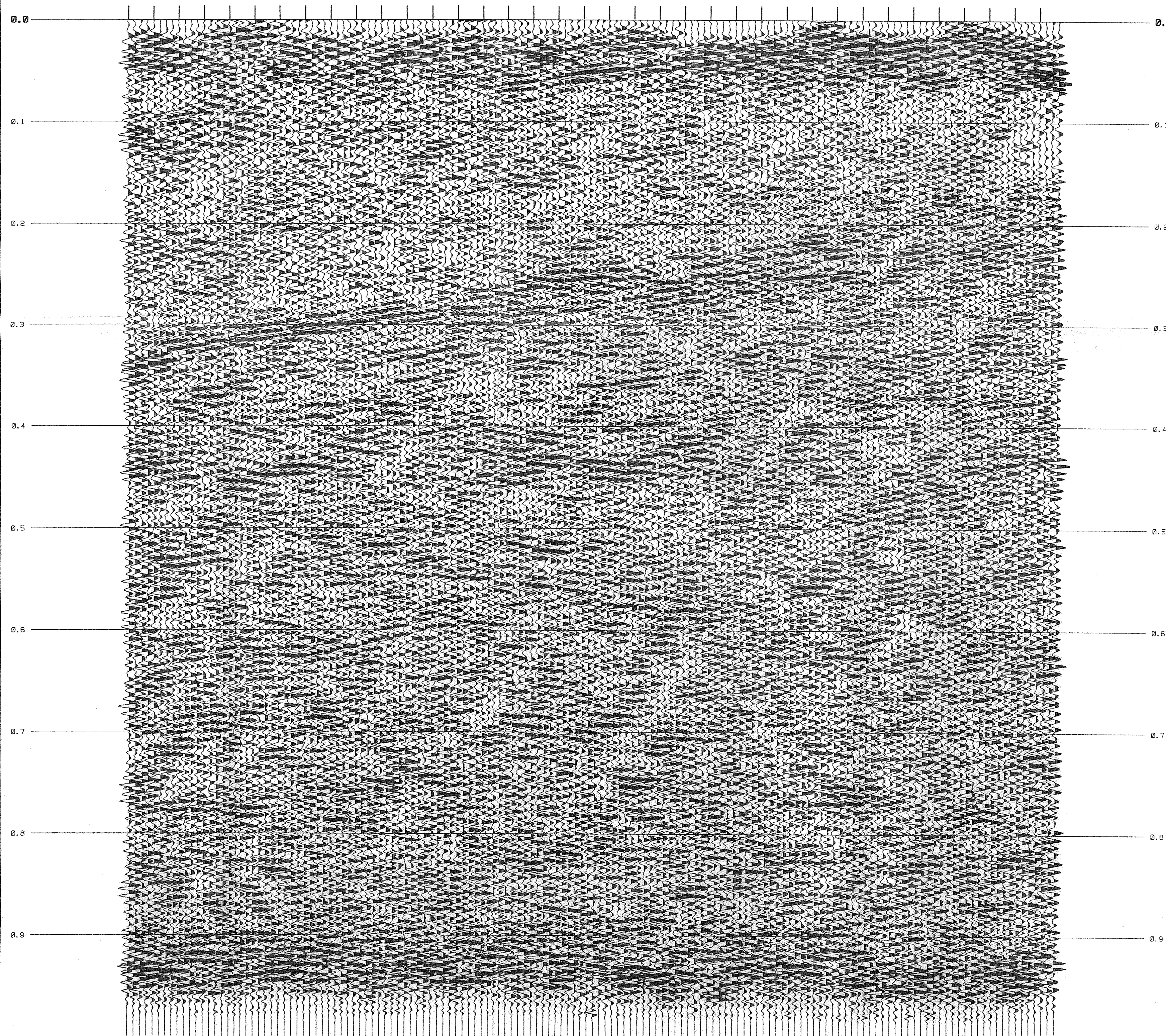
Appendix no

3.6

ORKLA 81 VII

800 850 900 950 1000 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 COORD.

CDP 192 188 184 180 176 172 168 164 160 156 152 148 144 140 136 132 128 124 120 116 112 108 104 100 96 92 88 84 80 76 72 68 64 60 56 52 48 CDP



LINE ORKLA 81 VII
SUGUSTADMARKA

RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM FILTER : HIGH CUT 256HZ
DATE SHOT : OCT 1981 NO OF GROUPS : 24
NO OF GEOPH.PR.GROUP: 1
ENERGY SOURCE : C4 EXPLOSIVES TYPE OF GEOPH.: SM-7/50HZ
SHOT POINT INTERVAL: 10 METERS
RECORDING SYSTEM : DFS-V
RECORD LENGTH : 1.0 S
SAMPLE RATE : 1 MS

PROCESSING SEQUENCE

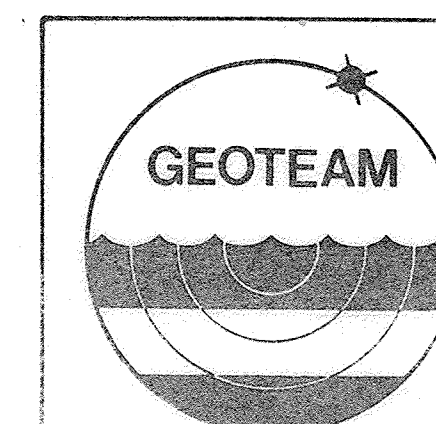
PROCESSED BY : NTNF/NORSAR
DATE PROCESSED : MARCH 1982
DMX/EDIT : INDIVIDUAL STATION COORD.
SPECIFICATION
CDP-SORTING: AREAL DISTR.AND LINE PROJ.
CDF SELECTION
NMO CORRECTIONS
STATICS : REF.LEVEL 300M.
BP FILTER : 120-250HZ SLOPE 24/36
SCALE : TIME/AMP.BALANCE B.STACK W=150MS
MAX.30 FOLD

STACKING VEL.	
TIME	VEL
0	5000
50	5500
200	8000
MSEC	M/SEC

DISPLAY

SCALING : AGC. GATE:150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL

PLOTTED BY A/S GEOTEAM



LINE 81 VII
DIP COMPENSATED STACK

Client

ORKLA INDUSTRIER A/S

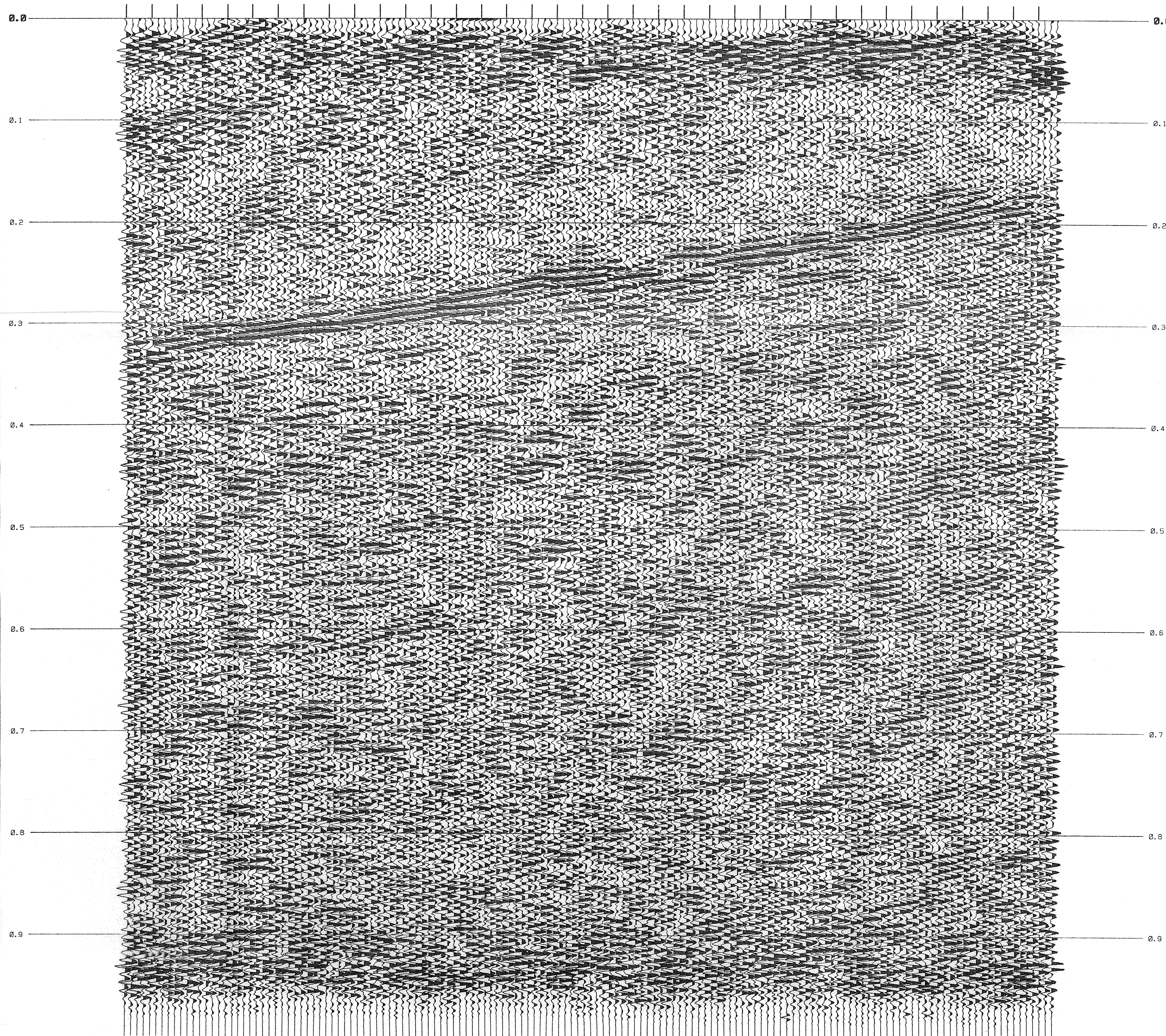
Measured	Oct. 1981
Calculated	March 1982
Drawn	June 1982
Controlled	

Map no	Scale	1 2000
Project no	4034.06	
Appendix no	3.7	

ORKLA 81 VII

800 850 900 950 1000 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 COORD.

CDP 192 188 184 180 176 172 168 164 160 156 152 148 144 140 136 132 128 124 120 116 112 108 104 100 96 92 88 84 80 76 72 68 64 60 56 52 48 CDP



LINE ORKLA 81 VII SUGUSTADMARKA

RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM FILTER : HIGH CUT 256HZ
DATE SHOT : OCT 1981 NO OF GROUPS : 24
ENERGY SOURCE : C4 EXPLOSIVES NO OF GEOPH. PR. GROUP : 1
SHOT POINT INTERVAL : 10 METERS TYPE OF GEOPH. : SM-7/50HZ
RECORDING SYSTEM : DFS-V
RECORD LENGTH : 1.0 S
SAMPLE RATE : 1 MS

PROCESSING SEQUENCE

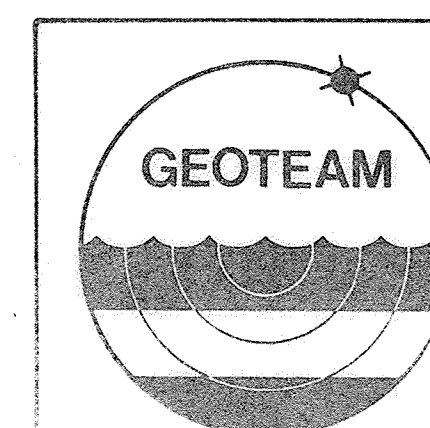
PROCESSED BY : NTN/NORSAR
DATE PROCESSED : MARCH 1982
DMX/EDIT : INDIVIDUAL STATION COORD.
SPECIFICATION
CDP-SORTING: AREAL DISTR. AND LINE PROJ.
CDF SELECTION
NMO CORRECTIONS
STATICS : REF. LEVEL 300M. AUTOSTATICS
BP FILTER : 120-250HZ SLOPE 24/36
SCALE : TIME/AMP. BALANCE B. STACK W=150MS
MAX. 30 FOLD

STACKING VEL.	
TIME	VEL
0	5000
50	5500
200	8000
MSEC	M/SEC

DISPLAY

SCALING : AGC. GATE: 150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL

PLOTTED BY A/S GEOTEAM



LINE 81 VII

DIP COMPENSATED STACK
WITH AUTOMATIC STATICS

Client

ORKLA INDUSTRIER A/S

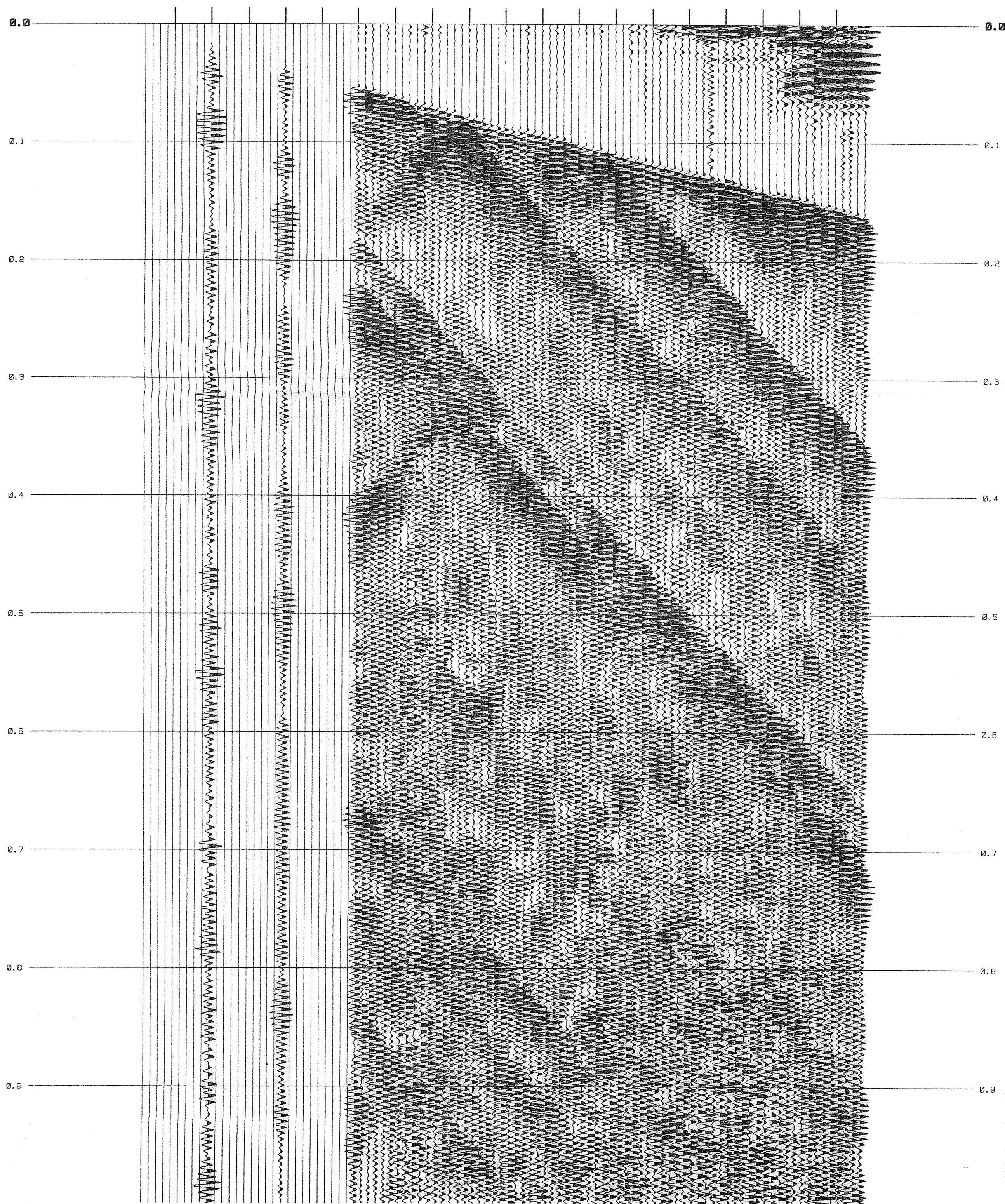
Measured Oct. 1981
Calculated March 1982
Drawn June 1982
Controlled:

Map no Scale 1:2000
Project no 4034.06
Appendix no 3.8

S.P 100 200 300 400 500 600 700 800 900 S.P

BOREHOLE I

SHOT 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 SHOT



BOREHOLE I SUGUSTADMARKA

RECORDING PARAMETERS

SHOT BY : A/S GEOTEAM FILTER : HIGH CUT 256HZ
DATE SHOT : OCTOBER 1981
ENERGY SOURCE : C4 EXPLOSIVES TYPE OF GEOPH. : HSJLP3D
RECORDING INTERVAL : 10 M
RECORDING SYSTEM : DFS-V
RECORD LENGTH : 1.0 S CLIENT :
SAMPLE RATE : 1 MS ORKLA INDUSTRIER A/S

PROCESSING SEQUENCE

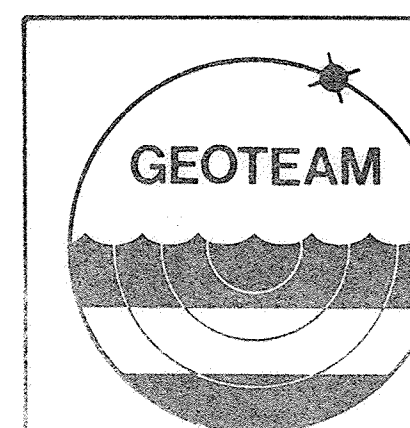
PROCESSED BY : NTN/NORSAR
DATE PROCESSED : MARCH 1982

BP FILTER : 120-250HZ SLOPE 24/36

DISPLAY

SCALING : AGC. GATE: 150
VERTICAL SCALE : 40CM PR SEC
HORIZONTAL SCALE : 4 TRACES PR CM
POLARITY NORMAL

PLOTTED BY A/S GEOTEAM



BOREHOLE 1, LØKKEN WEST
DATA DISPLAY OF
SEISMIC VELOCITY LOGGING

Client

ORKLA INDUSTRIER A/S

Measured	Oct 1981
Calculated	March 1982
Drawn	June 1982
Controlled	

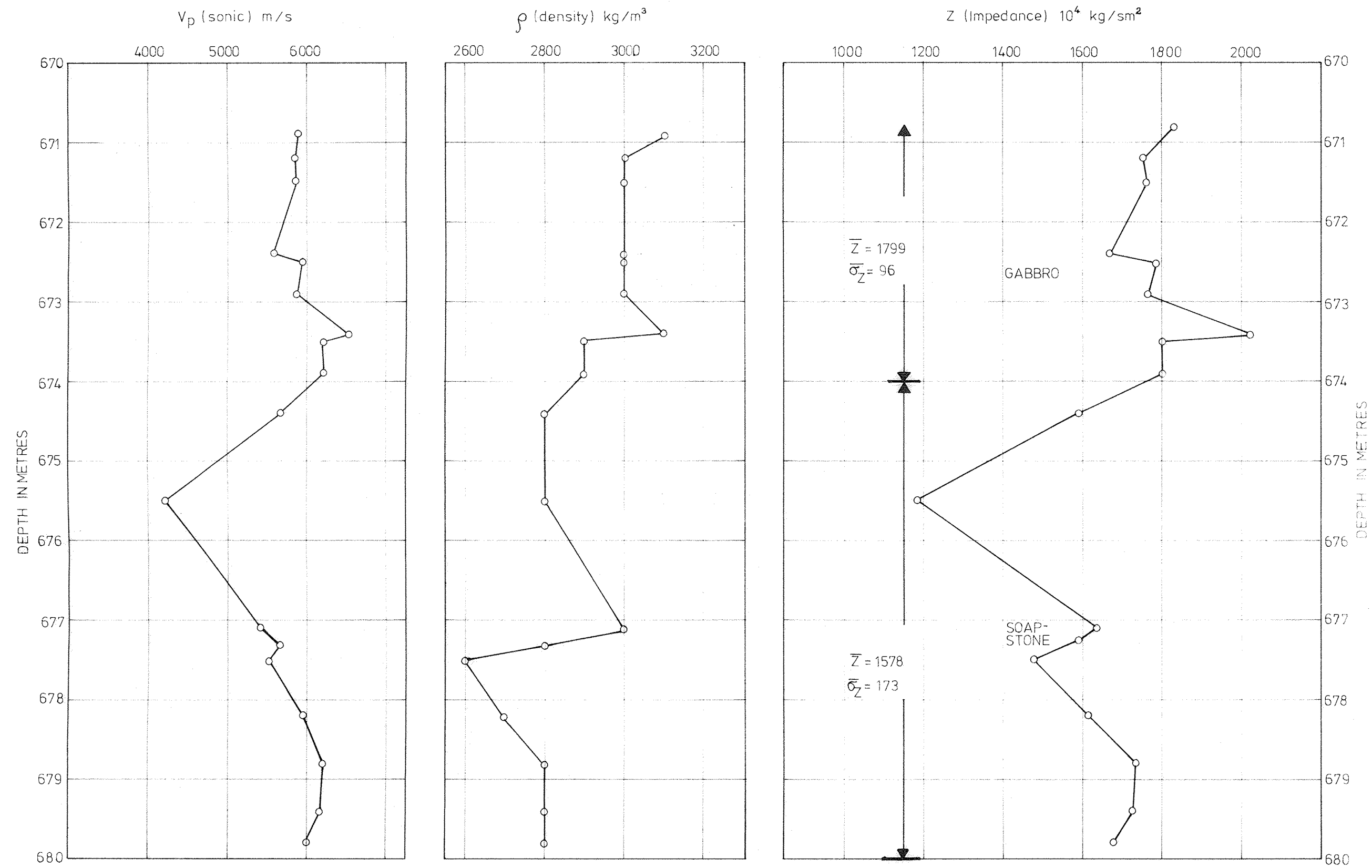
Map no

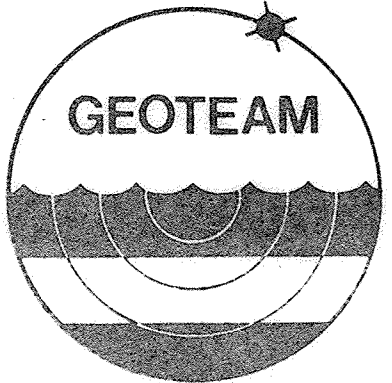
Scale

Project no 4034.06

Appendix no

3.9



	BOREHOLE 1, LØKKEN WEST	
	LABORATORY MEASURED IMPEDANCES	
	Client	
	ORKLA INDUSTRIER A/S	
Measured	Map no	Scale
Calculated		Project no 4034.06
Drawn June 1982		Appendix no
Controlled		3.10