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TITLE
BLOCK 5604/20 IN THE NORTH SEA, DANISH SECTOR.
NUMBER OF OCCURRENCES OF SPECIFIED WEATHER CONDITIONS IN
OCTOBER AND NOVEMBER.

AUTHOR

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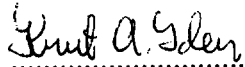
PROJECT CONTRACTOR

KVÆRNER OIL & GAS, PROJECT NO. 3760

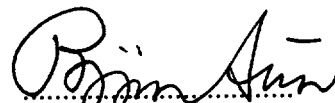
SUMMARY

6 hourly values of significant wave heights from the point 1258 (1955-1996) in the Norwegian hindcast archive are analysed with regard to 4 specified weather conditions during a 72 hours period. The number of occurrences are plotted against the different years together with the average waiting time.

SIGNATURE



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APPENDIX 1

Contingency tables of wave height/period (HM0/TP) for Hindcast point 1258 for the months October and November.

APPENDIX 2

The specification of cases given by Kværner in telefax of 30.5.97.

Summary

6 hourly values of significant wave heights from the point 1258 (1955-1996) in the Norwegian hindcast archive are analysed with regard to 4 specified weather conditions during a 72 hours period. The number of occurrences are plotted against the different years together with the average waiting time.

1. Introduction

Statistical Weather information are very helpful when a feasible plan for conducting an installation offshore is made. However, meteorological and oceanographic observations offshore are not plentiful. For the actual position at block 5604/20, the nearest location with such data is Ekofisk. Here the measurements started in 1980. Missing data are occurring in this data series. This makes these data series unsuitable for the analysis needed without an infill procedure for generating the missing data.

2. About the data used

The data used is time series of waves (HM0) from the Norwegian hindcast archive. This is data generated from 6 hourly pressure fields for the period 1955-1996. The source of the pressure fields are until 1981 digitised weather maps and thereafter the numerical weather prediction system. From the pressure maps wind speed and direction are modelled. Through a hindcast technique, the wave fields are computed from the wind fields by our wave model WINCH 2.

The grid of the model is 75 km. The nearest grid point is the point 1258 (56.3°N,4.9°E) The position for the block 5604/20 where the weather information is sought is :

56°28'59''N
4°54'43''E

The point 1258 is thus very close to the actual position.

3. Results

For each weather condition defined below two periods of the year are analysed. These are October and November. Thus, for each weather condition definition two sets of figures are presented. The figures should be self-explanatory.

The counting of the weather conditions is done discrete. This means, a 72 hour period fulfilling the criterion will only appear once in the counting. Each wave height is given a duration of 6 hour.

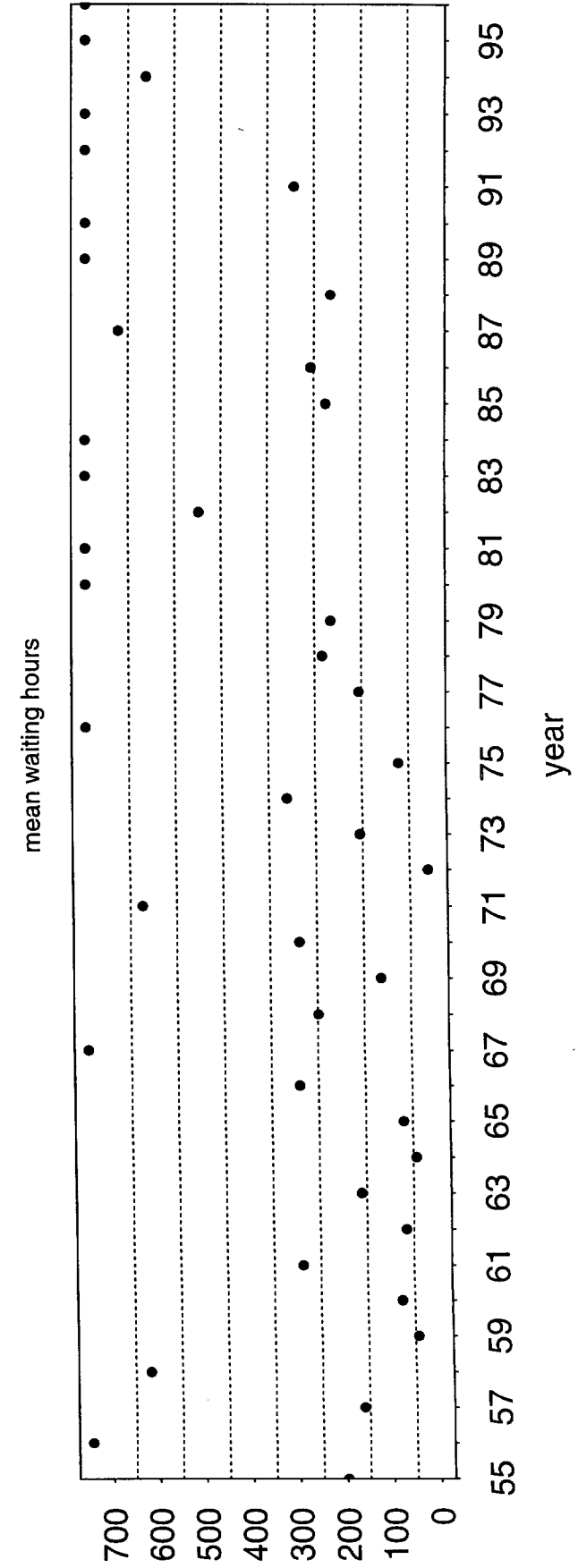
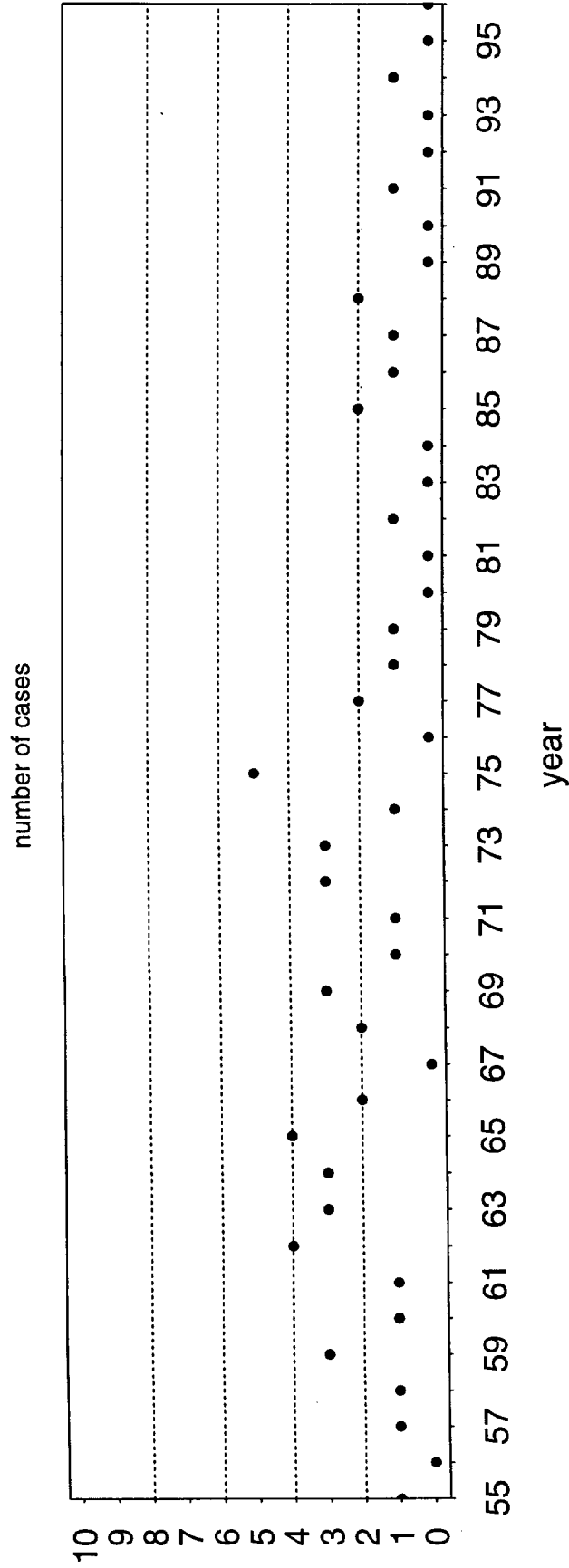
The waiting time for the first occurrence of an individual month is computed from the starting point of the month. The waiting time for the second occurrence is computed from the end of the first and so on. No occurrence will give the number of days in the month or in the period analysed (Oct.-Nov.) as the waiting time.

3.1.1 Definition of weather condition 1

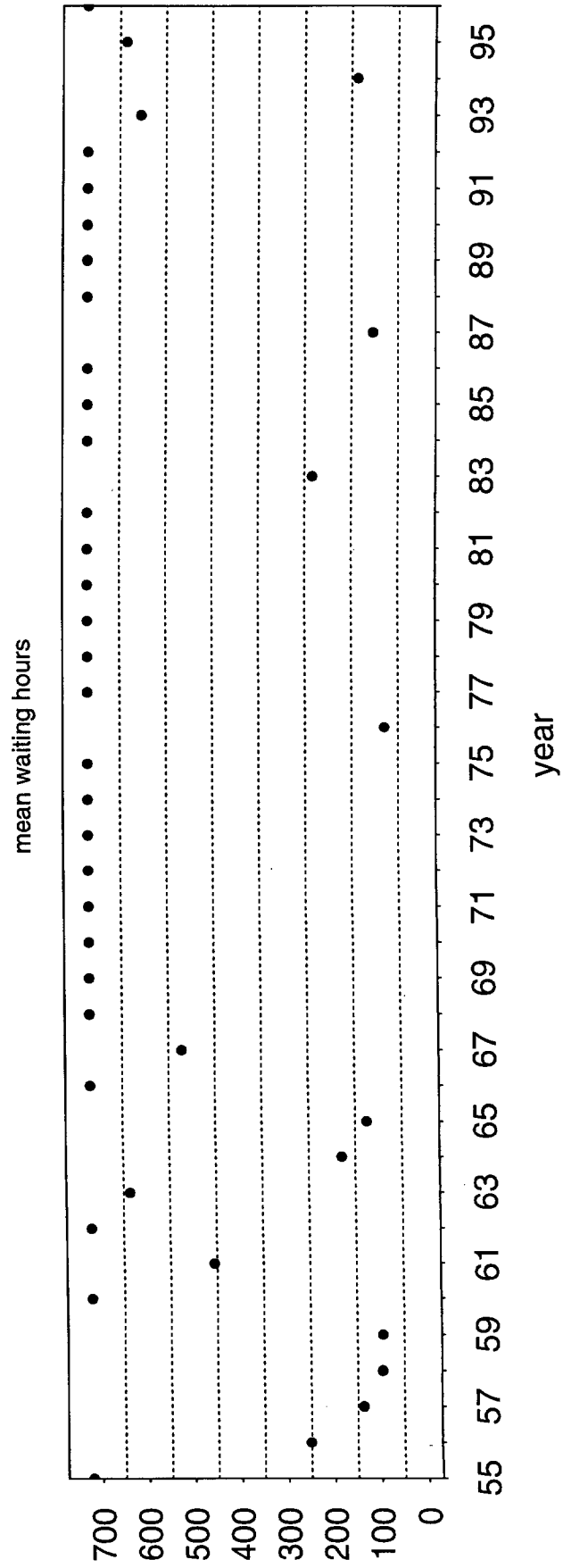
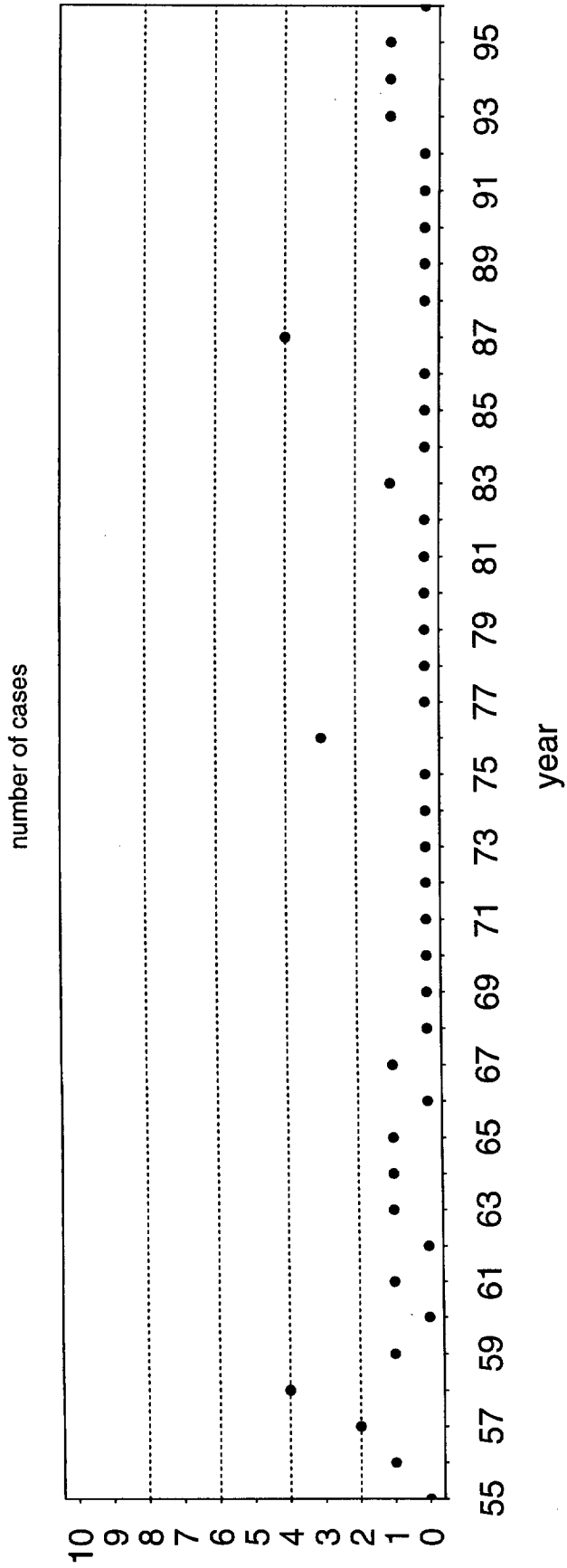
Hs below 1.5 m for a period of 72 hours.

3.1.2 Number of occurrences - condition 1

CONDITION NO. 1 (1/2 HOURS WITH FIMO < 1.3M)



CONDITION NO. 1 (1/2 HOURS WITH FIMO < 1.5m)

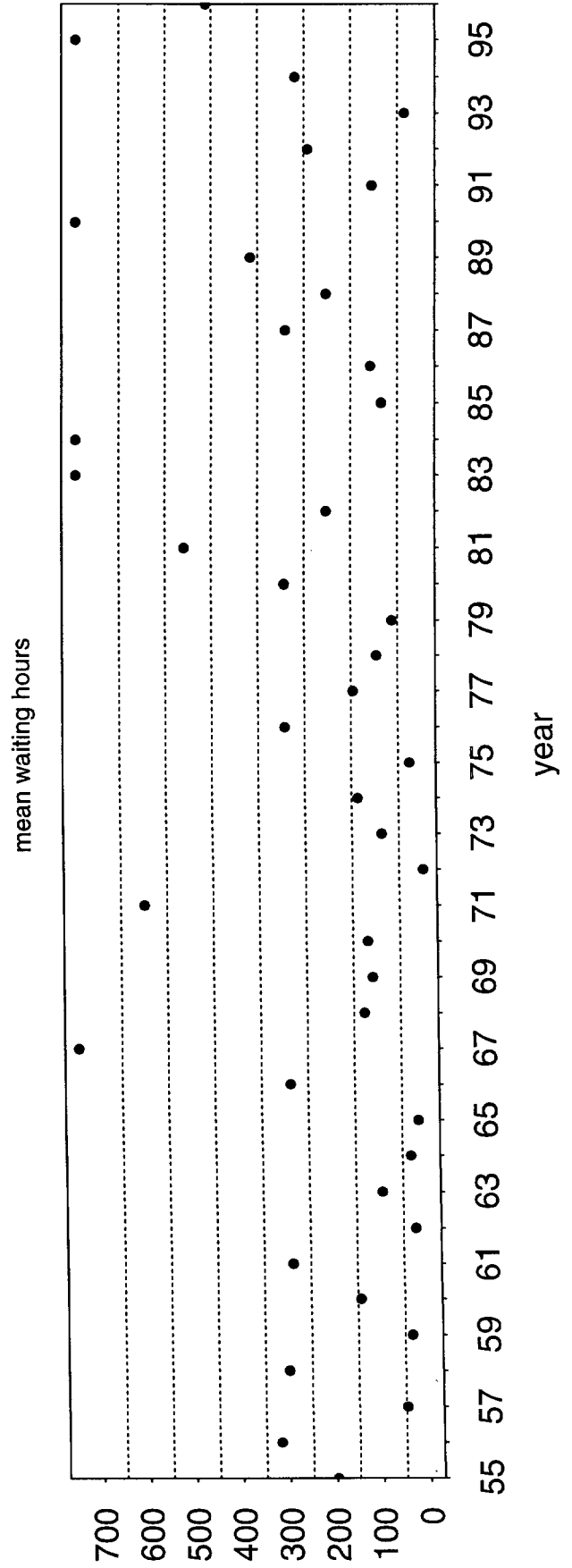
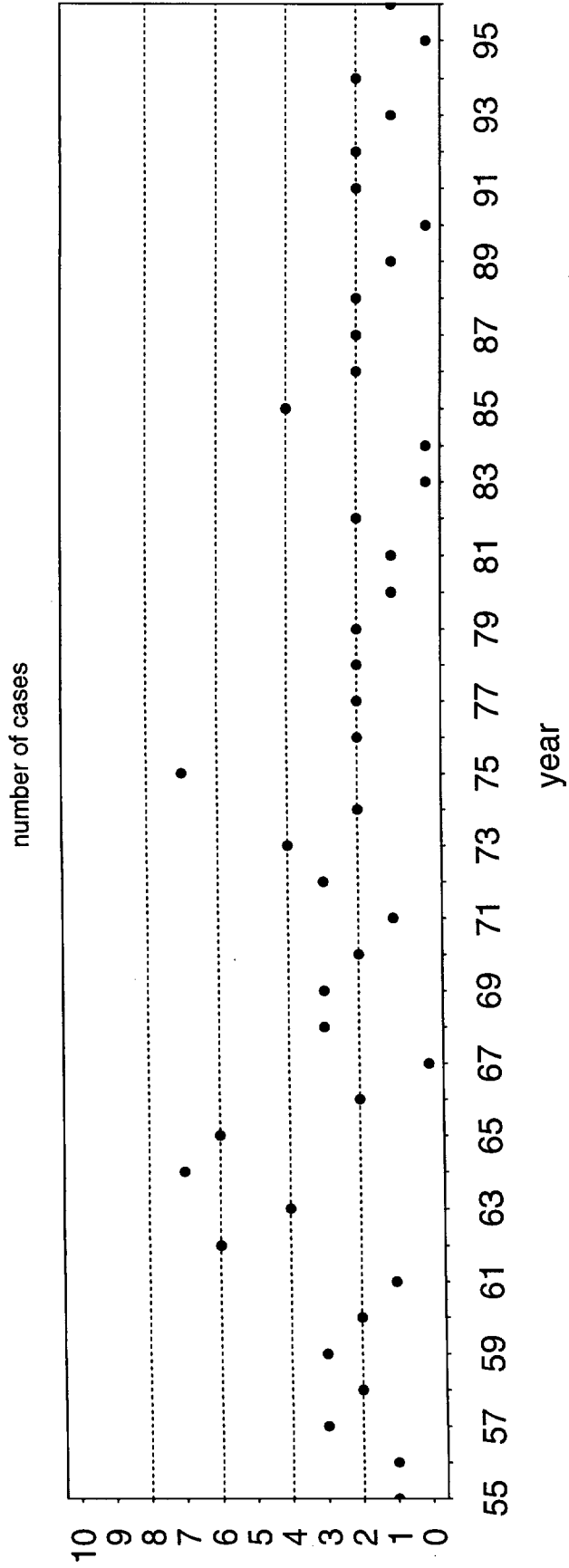


2.2.1 Definition of weather condition 2

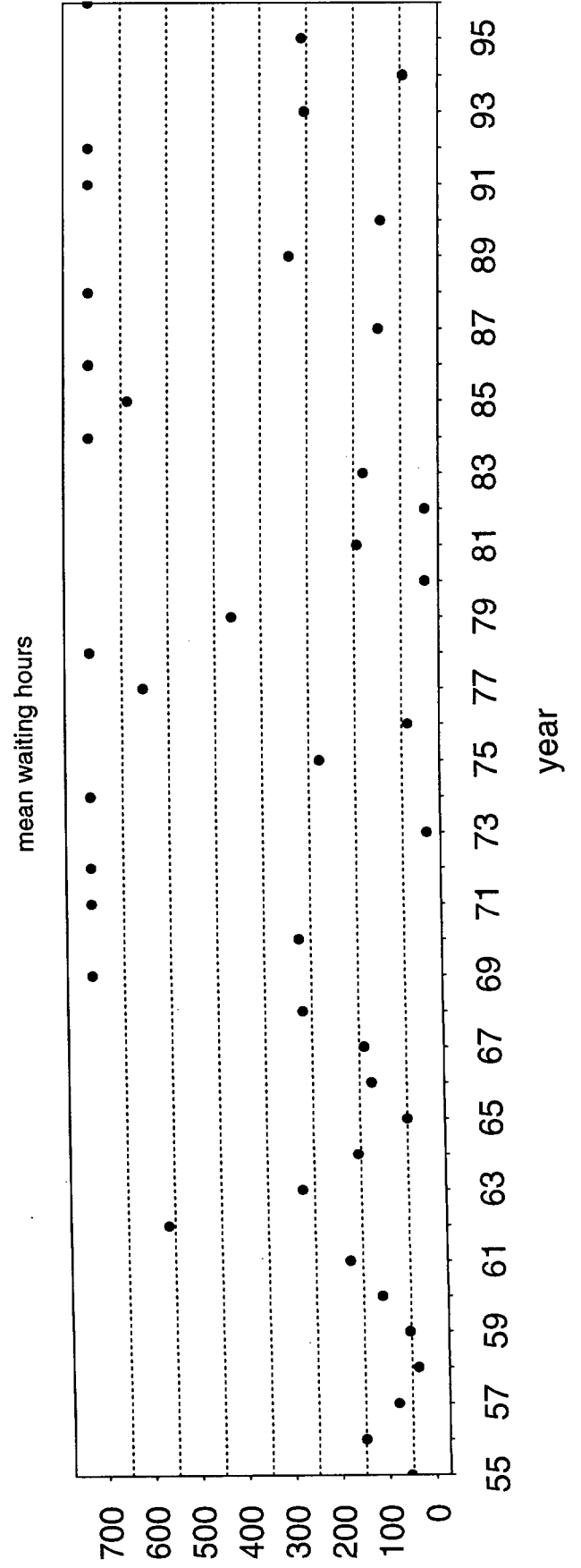
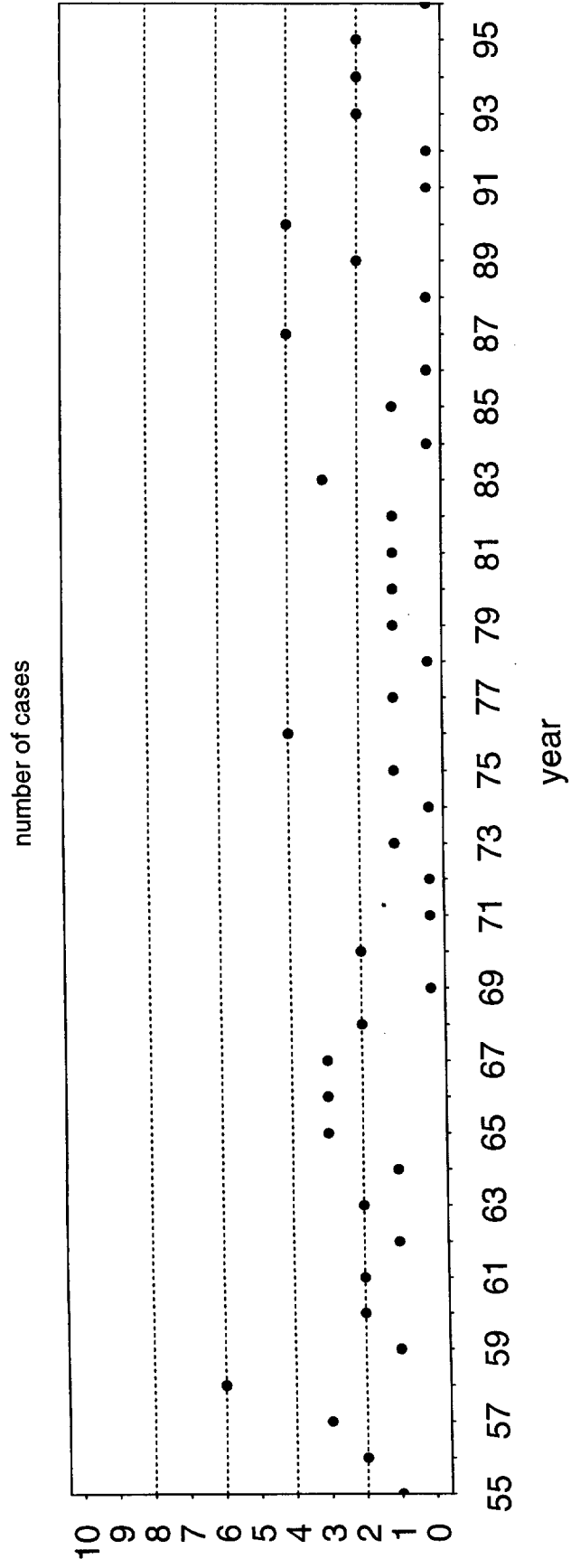
Hs below 3 m for a period of 48 hours, decreasing to Hs 1.5 m for 24 hours (Total 72 hours).

3.2.2 Number of occurrences - condition 2

CONDITION NO.2(48 HOURS WITH FIMO < 3.0M + 24 HOURS WITH FIMO < 1.3M)



CONDITION NO.2(48 hours with FIMO < 3.0M + 24 hours with FIMO < 1.5M)

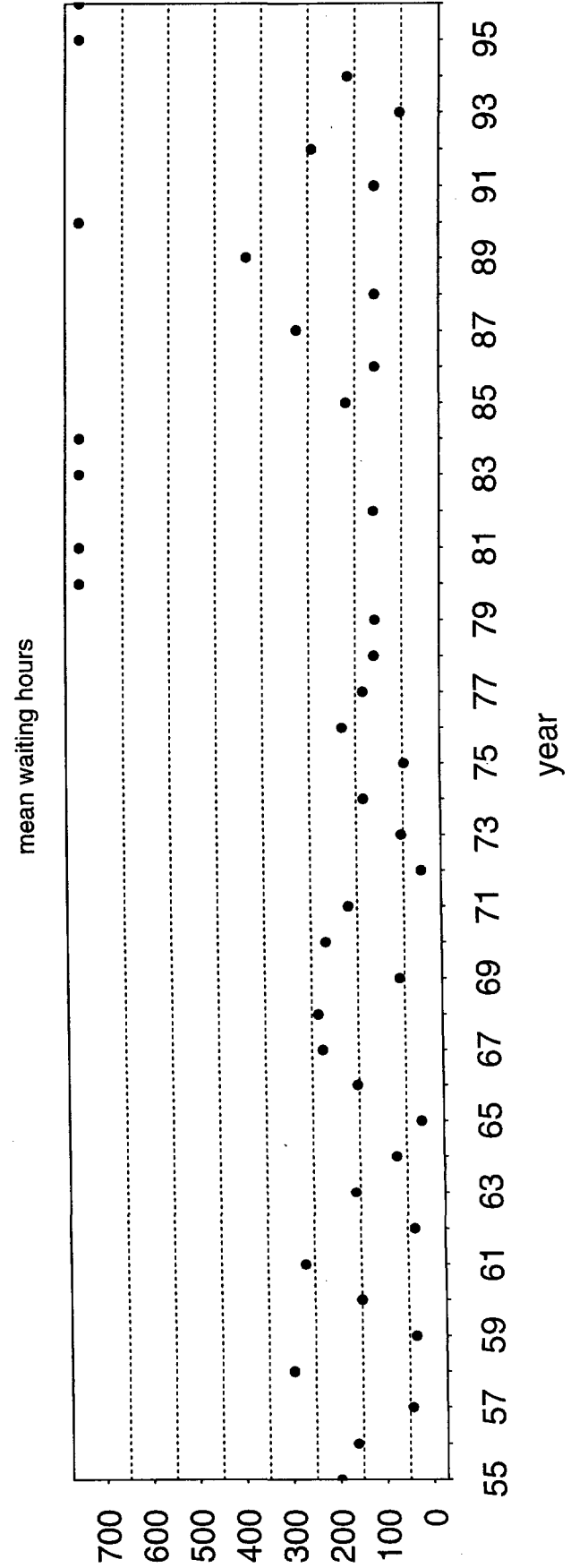
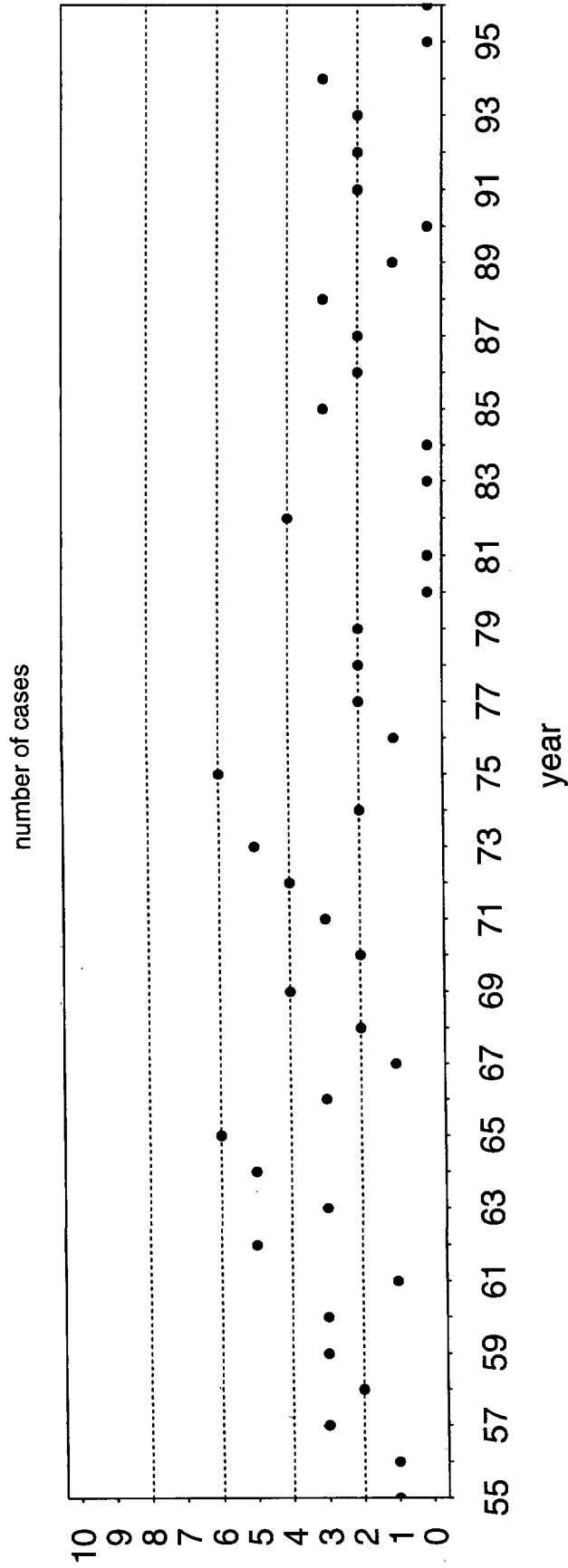


3.3.1 Definition of weather condition 3

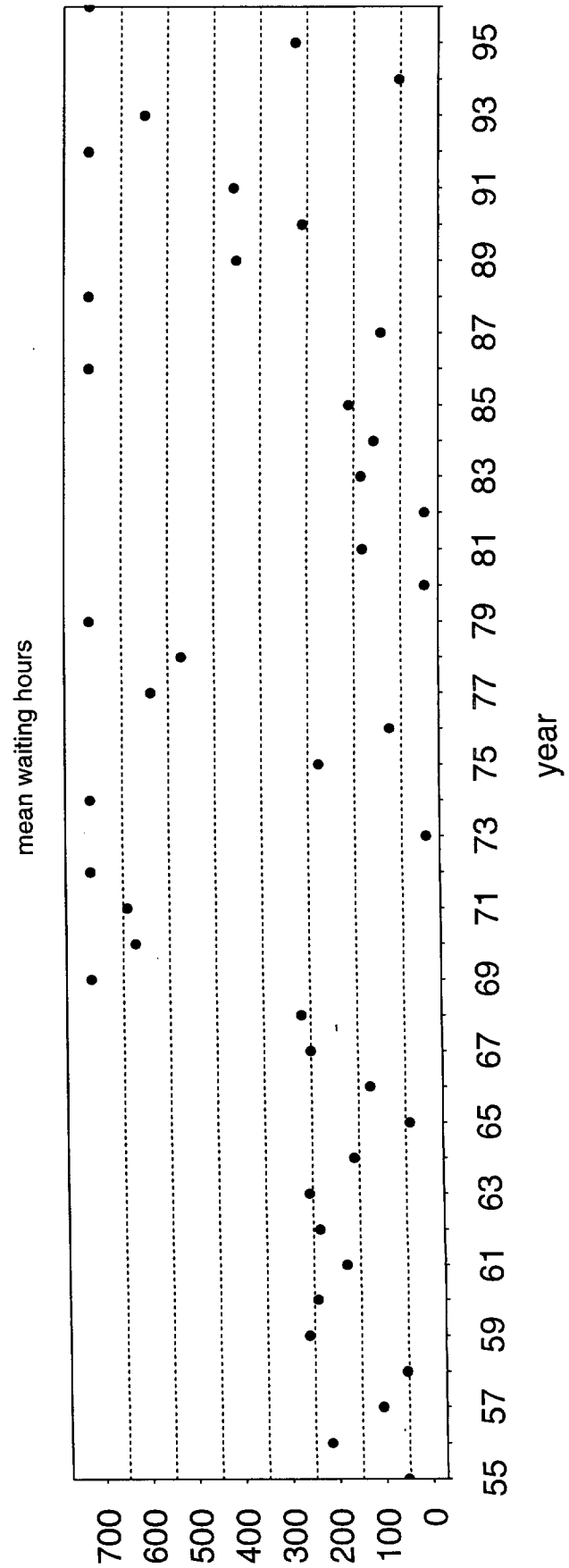
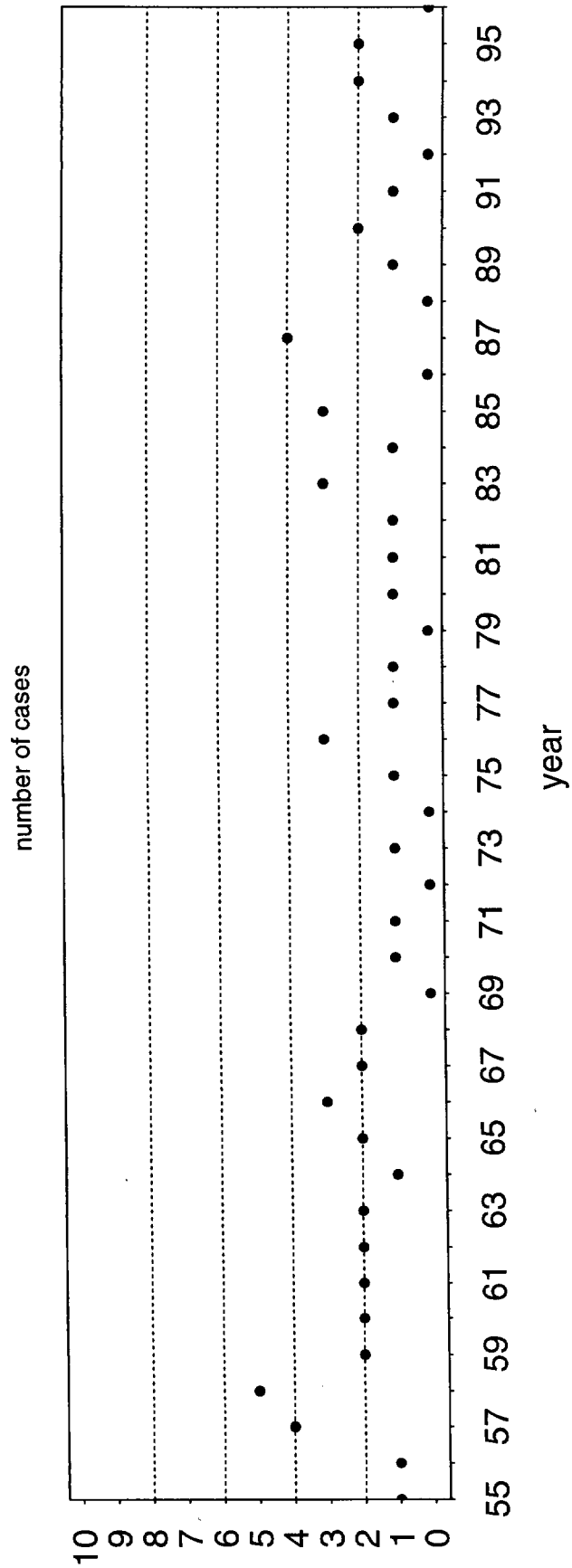
Hs below 5 m for a period of 48 hours decreasing to Hs 1.5 for 24 hours (Total 72 hours).

3.3.2 Number of occurrences - condition 3

CONDITION NO.3



CONDITION NO.3(48 HOURS WITH FIMO < 3.0M + 24 HOURS WITH FIMO, 1-3M)

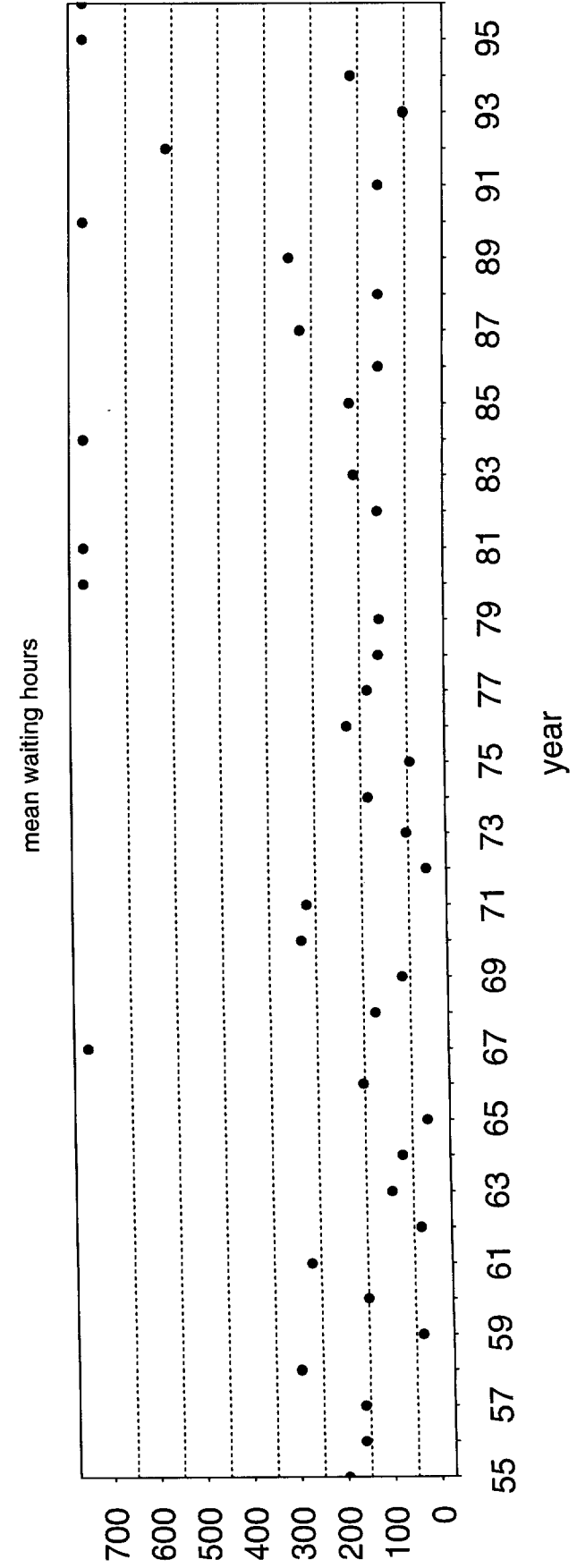
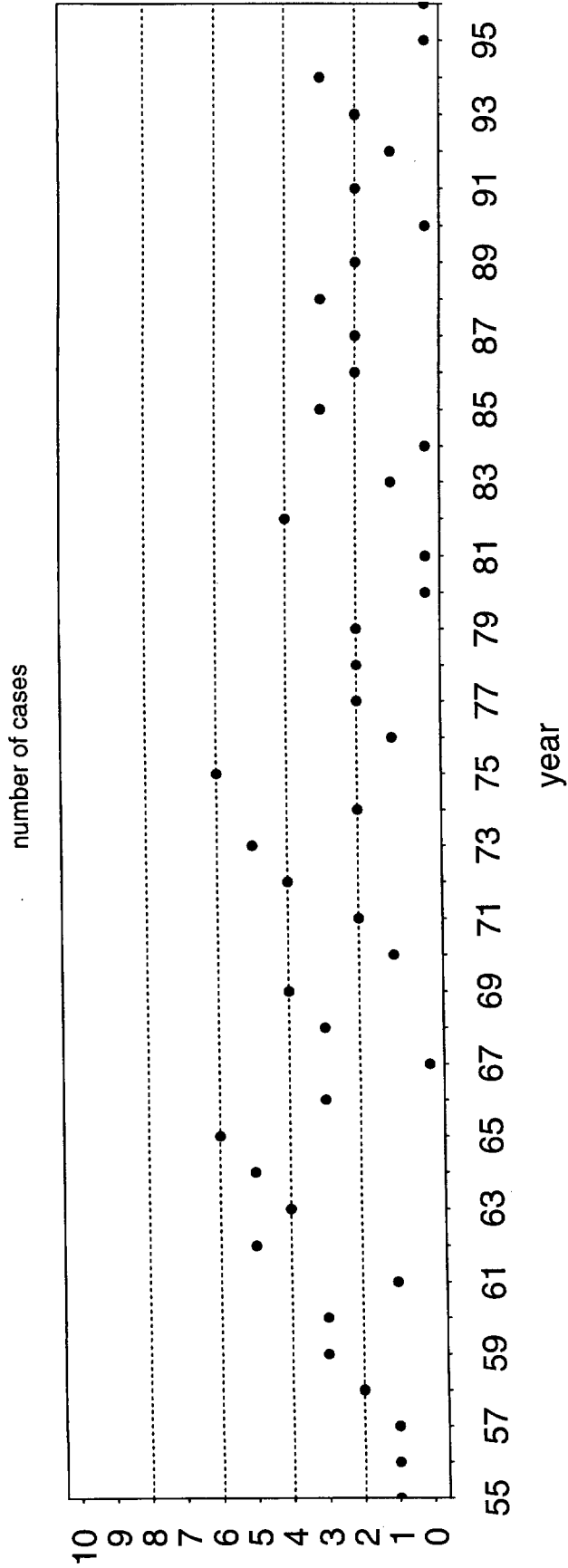


3.4.1 Definition of weather condition 4

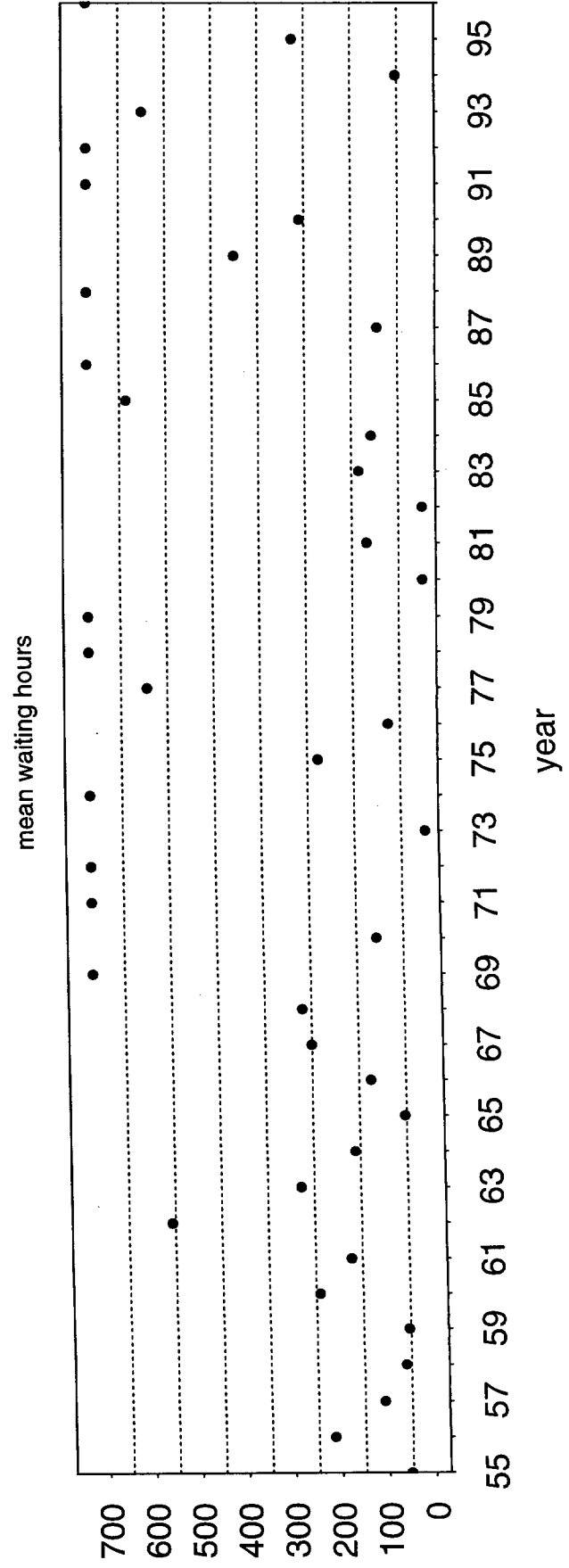
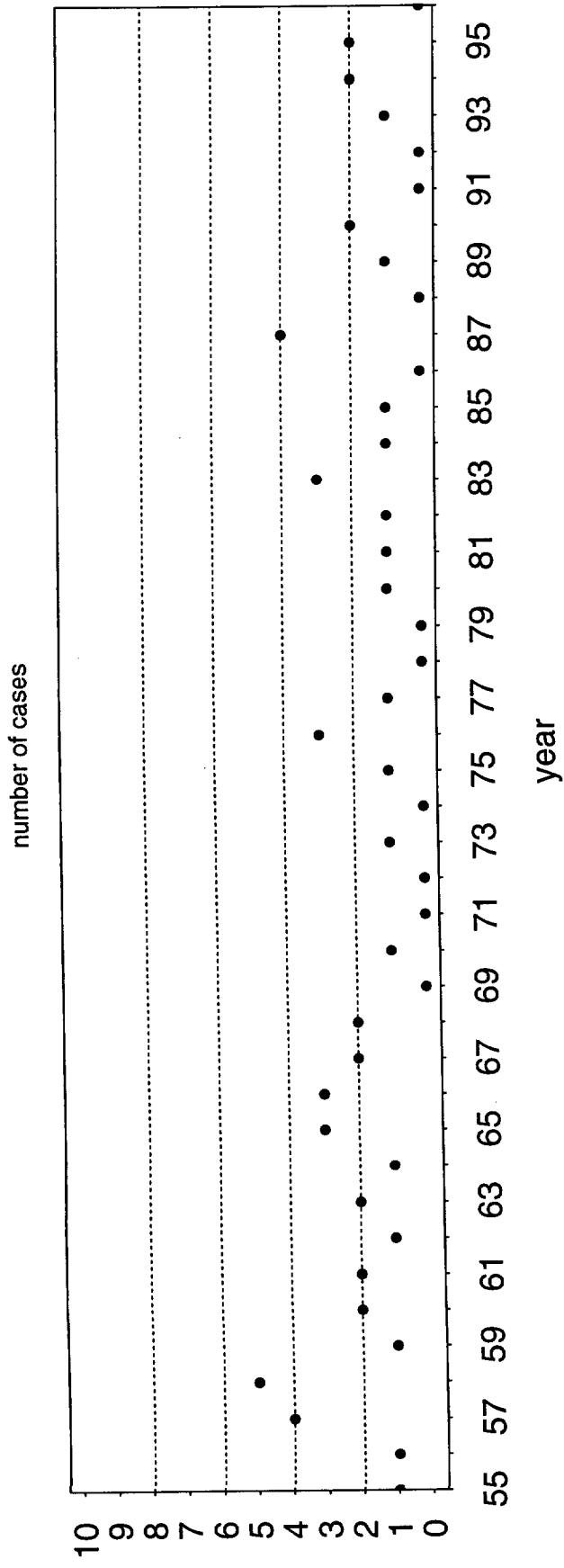
Hs Below 8.5 m for a period of 48 hours, decreasing to Hs 1.5 m for 24 hours (Total 72 hours).

3.4.2 Number of occurrences - condition 4

CONDITION NO.4(40 HOURS WITH TIME < 0.5M + 24 HOURS WITH TIME < 1.5M)



CONDITION NO.4(48 hours with FIMU < 8.3M + 24 hours with FIMU < 1.3M)



APPENDIX 1

Contingency tables of wave height/period (HMO/TP) for Hindcast point 1258 for the months of October and November.

FREQUENCY TABLE: TOTAL SEA HMO/TP
 HINDCAST DATA POINT : 1258
 POSITION: 56.3 N 4.9 E

TP(s)	OCTOBER										SUM	MARG. PROB.	CUM. PROB.	MEAN TP	STDEV. TP					
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0						10.0	11.0	12.0	13.0	13.9	>=14.0
0.0-0.9	5	9	43	113	255	61	19	51	61	30	19	20	27	29	16	758	14.55	14.5545	6.19	3.29
1.0-1.9	.	.	.	.	169	440	522	97	136	114	92	90	47	43	43	1793	34.43	48.9823	7.46	2.57
2.0-2.9	.	.	.	.	12	384	589	183	183	65	68	96	58	55	33	1543	29.63	78.6098	8.41	2.12
3.0-3.9	.	.	.	.	.	1	166	247	247	98	33	40	35	21	23	664	12.75	91.3595	9.31	1.85
4.0-4.9	.	.	.	.	.	.	1	60	60	82	45	26	21	11	13	259	4.97	96.3326	10.32	1.63
5.0-5.9	.	.	.	.	.	.	.	2	2	14	46	23	12	4	10	111	2.13	98.4639	11.20	1.47
6.0-6.9	.	.	.	.	.	.	.	.	.	.	11	16	8	6	4	45	0.86	99.3280	11.92	1.24
7.0-7.9	.	.	.	.	.	.	.	.	.	.	.	4	10	7	3	24	0.46	99.7888	12.96	1.08
8.0-8.9	.	.	.	.	.	.	.	.	.	.	.	.	2	1	7	10	0.19	99.9808	14.81	1.53
9.0-9.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	0.02	100.0000	14.70	0.00
10.0-10.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.00	100.0000		
11.0-11.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.00	100.0000		
12.0-12.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.00	100.0000		
13.0-13.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.00	100.0000		
>=14.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.00	100.0000		
SUM	5	9	43	113	424	513	926	904	689	403	314	315	220	177	153	5208				
MARG. PROB.	0.10	0.17	0.83	2.17	8.14	9.85	17.78	17.36	13.23	7.74	6.03	6.05	4.22	3.40	2.94					
CUM. PROB.	0.10	0.27	1.09	3.26	11.41	21.26	39.04	56.39	69.62	77.36	83.39	89.44	93.66	97.06	100.00					
MAX. HMO	0.04	0.15	0.36	0.64	1.79	2.09	3.05	4.06	5.07	5.52	6.53	7.99	8.96	8.33	9.70					
MEAN HMO	0.01	0.11	0.26	0.51	0.97	1.37	1.92	2.44	2.68	2.81	3.07	2.89	2.98	2.60	3.07					
STDV. HMO	0.02	0.03	0.06	0.08	0.23	0.32	0.42	0.67	1.07	1.35	1.63	1.62	1.89	1.75	2.06					

MEAN HMO = 2.23m MEAN TP = 8.09s
 ST.DEV. HMO = 1.27m ST.DEV.TP = 2.74s
 MAX. HMO = 9.7m, 70 10 20 18, TP = 14.7s
 MAX. TP = 17.5s, 92 10 23 18, HMO = 1.5m
 THE NORWEGIAN METEOROLOGICAL INSTITUTE,
 THE ENVIRONMENTAL DATA CENTER, P.O. BOX 43 BLINDERN,
 N 0313 OSLO , NORWAY.

FREQUENCY TABLE: TOTAL SEA HMO/TP
 HINDCAST DATA POINT : 1258
 POSITION: 56.3 N 4.9 E

TP(s)	NOVEMBER 1955 - 1996												SUM	MARG. PROB.	CUM. PROB.	MEAN TP	STDEV. TP			
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0						12.0	13.0	>=14.0
0.0-0.9	3	4	15	53	117	16	27	52	34	29	26	24	13	16	17	446	8.85	8.8492	7.06	3.43
1.0-1.9	137	328	424	83	103	85	72	88	43	57	50	1470	29.17	38.0159	7.70	2.80
2.0-2.9	11	327	621	221	72	70	82	64	34	41	1543	30.62	68.6310	8.44	2.09
3.0-3.9	4	224	390	138	43	65	34	40	25	963	19.11	87.7381	9.24	1.75
4.0-4.9	1	78	134	82	35	17	8	18	373	7.40	95.1389	10.16	1.57
5.0-5.9	16	59	27	17	19	7	145	2.88	98.0159	11.33	1.41
6.0-6.9	10	14	6	6	2	38	0.75	98.7698	11.81	1.18
7.0-7.9	8	9	12	9	38	0.75	99.5238	13.10	1.19
8.0-8.9	1	4	3	2	10	0.20	99.7222	13.13	0.99
9.0-9.9	1	2	3	6	0.12	99.8413	14.04	0.71
10.0-10.9	1	1	2	0.04	99.8810	15.27	1.82
11.0-11.9	1	2	3	0.06	99.9405	14.69	0.82
12.0-12.9	2	2	0.04	99.9802	15.29	0.52
13.0-13.9	1	1	0.02	100.0000	16.08	0.00
>=14.0	0	0.00	100.0000	16.08	0.00

MAR. PROB.	CUM. PROB.	MAX. HMO	MEAN HMO	STDV. HMO
0.06	0.06	0.03	0.02	0.02
0.06	0.12	0.03	0.02	0.02
0.06	0.18	0.03	0.02	0.02
0.06	0.24	0.03	0.02	0.02
0.06	0.30	0.03	0.02	0.02
0.06	0.36	0.03	0.02	0.02
0.06	0.42	0.03	0.02	0.02
0.06	0.48	0.03	0.02	0.02
0.06	0.54	0.03	0.02	0.02
0.06	0.60	0.03	0.02	0.02
0.06	0.66	0.03	0.02	0.02
0.06	0.72	0.03	0.02	0.02
0.06	0.78	0.03	0.02	0.02
0.06	0.84	0.03	0.02	0.02
0.06	0.90	0.03	0.02	0.02
0.06	0.96	0.03	0.02	0.02
0.06	1.02	0.03	0.02	0.02
0.06	1.08	0.03	0.02	0.02
0.06	1.14	0.03	0.02	0.02
0.06	1.20	0.03	0.02	0.02
0.06	1.26	0.03	0.02	0.02
0.06	1.32	0.03	0.02	0.02
0.06	1.38	0.03	0.02	0.02
0.06	1.44	0.03	0.02	0.02
0.06	1.50	0.03	0.02	0.02
0.06	1.56	0.03	0.02	0.02
0.06	1.62	0.03	0.02	0.02
0.06	1.68	0.03	0.02	0.02
0.06	1.74	0.03	0.02	0.02
0.06	1.80	0.03	0.02	0.02
0.06	1.86	0.03	0.02	0.02
0.06	1.92	0.03	0.02	0.02
0.06	1.98	0.03	0.02	0.02
0.06	2.04	0.03	0.02	0.02
0.06	2.10	0.03	0.02	0.02
0.06	2.16	0.03	0.02	0.02
0.06	2.22	0.03	0.02	0.02
0.06	2.28	0.03	0.02	0.02
0.06	2.34	0.03	0.02	0.02
0.06	2.40	0.03	0.02	0.02
0.06	2.46	0.03	0.02	0.02
0.06	2.52	0.03	0.02	0.02
0.06	2.58	0.03	0.02	0.02
0.06	2.64	0.03	0.02	0.02
0.06	2.70	0.03	0.02	0.02
0.06	2.76	0.03	0.02	0.02
0.06	2.82	0.03	0.02	0.02
0.06	2.88	0.03	0.02	0.02
0.06	2.94	0.03	0.02	0.02
0.06	3.00	0.03	0.02	0.02
0.06	3.06	0.03	0.02	0.02
0.06	3.12	0.03	0.02	0.02
0.06	3.18	0.03	0.02	0.02
0.06	3.24	0.03	0.02	0.02
0.06	3.30	0.03	0.02	0.02
0.06	3.36	0.03	0.02	0.02
0.06	3.42	0.03	0.02	0.02
0.06	3.48	0.03	0.02	0.02
0.06	3.54	0.03	0.02	0.02
0.06	3.60	0.03	0.02	0.02
0.06	3.66	0.03	0.02	0.02
0.06	3.72	0.03	0.02	0.02
0.06	3.78	0.03	0.02	0.02
0.06	3.84	0.03	0.02	0.02
0.06	3.90	0.03	0.02	0.02
0.06	3.96	0.03	0.02	0.02
0.06	4.02	0.03	0.02	0.02
0.06	4.08	0.03	0.02	0.02
0.06	4.14	0.03	0.02	0.02
0.06	4.20	0.03	0.02	0.02
0.06	4.26	0.03	0.02	0.02
0.06	4.32	0.03	0.02	0.02
0.06	4.38	0.03	0.02	0.02
0.06	4.44	0.03	0.02	0.02
0.06	4.50	0.03	0.02	0.02
0.06	4.56	0.03	0.02	0.02
0.06	4.62	0.03	0.02	0.02
0.06	4.68	0.03	0.02	0.02
0.06	4.74	0.03	0.02	0.02
0.06	4.80	0.03	0.02	0.02
0.06	4.86	0.03	0.02	0.02
0.06	4.92	0.03	0.02	0.02
0.06	4.98	0.03	0.02	0.02
0.06	5.04	0.03	0.02	0.02
0.06	5.10	0.03	0.02	0.02
0.06	5.16	0.03	0.02	0.02
0.06	5.22	0.03	0.02	0.02
0.06	5.28	0.03	0.02	0.02
0.06	5.34	0.03	0.02	0.02
0.06	5.40	0.03	0.02	0.02
0.06	5.46	0.03	0.02	0.02
0.06	5.52	0.03	0.02	0.02
0.06	5.58	0.03	0.02	0.02
0.06	5.64	0.03	0.02	0.02
0.06	5.70	0.03	0.02	0.02
0.06	5.76	0.03	0.02	0.02
0.06	5.82	0.03	0.02	0.02
0.06	5.88	0.03	0.02	0.02
0.06	5.94	0.03	0.02	0.02
0.06	6.00	0.03	0.02	0.02
0.06	6.06	0.03	0.02	0.02
0.06	6.12	0.03	0.02	0.02
0.06	6.18	0.03	0.02	0.02
0.06	6.24	0.03	0.02	0.02
0.06	6.30	0.03	0.02	0.02
0.06	6.36	0.03	0.02	0.02
0.06	6.42	0.03	0.02	0.02
0.06	6.48	0.03	0.02	0.02
0.06	6.54	0.03	0.02	0.02
0.06	6.60	0.03	0.02	0.02
0.06	6.66	0.03	0.02	0.02
0.06	6.72	0.03	0.02	0.02
0.06	6.78	0.03	0.02	0.02
0.06	6.84	0.03	0.02	0.02
0.06	6.90	0.03	0.02	0.02
0.06	6.96	0.03	0.02	0.02
0.06	7.02	0.03	0.02	0.02
0.06	7.08	0.03	0.02	0.02
0.06	7.14	0.03	0.02	0.02
0.06	7.20	0.03	0.02	0.02
0.06	7.26	0.03	0.02	0.02
0.06	7.32	0.03	0.02	0.02
0.06	7.38	0.03	0.02	0.02
0.06	7.44	0.03	0.02	0.02
0.06	7.50	0.03	0.02	0.02
0.06	7.56	0.03	0.02	0.02
0.06	7.62	0.03	0.02	0.02
0.06	7.68	0.03	0.02	0.02
0.06	7.74	0.03	0.02	0.02
0.06	7.80	0.03	0.02	0.02
0.06	7.86	0.03	0.02	0.02
0.06	7.92	0.03	0.02	0.02
0.06	7.98	0.03	0.02	0.02
0.06	8.04	0.03	0.02	0.02
0.06	8.10	0.03	0.02	0.02
0.06	8.16	0.03	0.02	0.02
0.06	8.22	0.03	0.02	0.02
0.06	8.28	0.03	0.02	0.02
0.06	8.34	0.03	0.02	0.02
0.06	8.40	0.03	0.02	0.02
0.06	8.46	0.03	0.02	0.02
0.06	8.52	0.03	0.02	0.02
0.06	8.58	0.03	0.02	0.02
0.06	8.64	0.03	0.02	0.02
0.06	8.70	0.03	0.02	0.02
0.06	8.76	0.03	0.02	0.02
0.06	8.82	0.03	0.02	0.02
0.06	8.88	0.03	0.02	0.02
0.06	8.94	0.03	0.02	0.02
0.06	9.00	0.03	0.02	0.02
0.06	9.06	0.03	0.02	0.02
0.06	9.12	0.03	0.02	0.02
0.06	9.18	0.03	0.02	0.02
0.06	9.24	0.03	0.02	0.02
0.06	9.30	0.03	0.02	0.02
0.06	9.36	0.03	0.02	0.02
0.06	9.42	0.03	0.02	0.02
0.06	9.48	0.03	0.02	0.02
0.06	9.54	0.03	0.02	0.02
0.06	9.60	0.03	0.02	0.02
0.06	9.66	0.03	0.02	0.02
0.06	9.72	0.03	0.02	0.02
0.06	9.78	0.03	0.02	0.02
0.06	9.84	0.03	0.02	0.02
0.06	9.90	0.03	0.02	0.02
0.06	9.96	0.03	0.02	0.02
0.06	10.02	0.03	0.02	0.02
0.06	10.08	0.03	0.02	0.02
0.06	10.14	0.03	0.02	0.02
0.06	10.20	0.03	0.02	0.02
0.06	10.26	0.03	0.02	0.02

APPENDIX 2

The specification of cases given by Kværner in telefax of 30.5.97.

Kværner Oil & Gas Norway

Kværner Rosenberg a.s, Kværner Engineering a.s

SIRI CENTRAL FIELD DEVELOPMENT PROJECT

TELEFAX

Date: 30.05.97

To Company: DNMI

Fax no.: 22 96 30 50

Att: Knut A. Iden

From: Siri Central Field Development Project Team
c/o Kværner Engineering a.s.
P.O. Box 222
1324 Lysaker
Norway
Telefax No. (+47) 67 59 47 50
Telephone: (+ 47) 67 59 50 50

Name: Jan Skjong/Knut Olav Haakonsen

Subject: Hindcast for Siri Field

Our Ref.: C080-FAX-KV-MI-00022

Project. No.: 3760

No. of Pages 1 + this page

Reference: Wave occurrence investigation for block 5604/20 in the Danish sector 56deg 28' 59" North 4deg 54' 43" East

Please perform an analysis in order to give occurrence of a specified weather pattern over the year from 1955- 1994 taking into account that the waves need time to settle

- Condition 1 Below 1,5 m Hs for a period of 72 Hours
- Condition 2 Below 3 m Hs for a period of 48 hours decreasing to 1,5 m Hs for 24 Hours (Total 72 hours)
- Condition 3 Below 5 m Hs for a period of 48 hours decreasing to 1,5 m Hs for 24 Hours (Total 72 hours)
- Condition 4 Below 8,5 m Hs for a period of 48 hours decreasing to 1,5 m Hs for 24 hours (Total 72 hours)

The analysed months shall be October and November

KVÆRNER

SIRI PROJECT

Kværner Oil & Gas Norway
Kværner Rosenberg a.s, Kværner Engineering a.s

SIRI CENTRAL FIELD DEVELOPMENT PROJECT

TELEFAX

Reporting:

Reporting language: English

The report shall present the results:

- 1 Number of occurrence pr month
- 2 Maximum waiting time until the condition is met

The analysis shall be performed on a agreed hourly rate up to an agreed limit of hour.

Invoice:

Siri Central Field Development Project Team
c/o Kværner Engineering a.s.
P.O. Box 222
1324 Lysaker
Norway

Delivery : 5th. of June 1997

If any clarification is required please contact undersigned 67 59 48 82

Best regards


Jan Skjong

KVÆRNER

SIRI PROJECT

NR. 789 S. 2/2

SIRI PROJECT 47 67594882

30. MAI. 1997 7:54