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KONINKLIJKE/SHELL EXPLORATIE EN PRODUKTIE LABORATORIUM

RIJSWIJK, THE NETHERLANDS

(Shell Research B.V.)

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SOURCE ROCK ANALYSIS OF CORES AND CUTTING SAMPLES FROM INTERVAL 3000 - 4662 M FROM WELL 30/11-3, NORWAY

by
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code: 774.10300

Investigation

9.5.4570

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CONTENTS

1.0 INTRODUCTION

A source rock evaluation has been carried out on cores and cutting samples from well 30/11-3, NORWAY. The approximate location is shown in Figure 1.
The samples are taken from interval 3000m - 4662m, i.e Jurassic to Upper Cretaceous.
Total depth was reached at 4662 m b.d.f..

The purpose of the investigation was:

1. to detect the presence (or absence) of source rocks in the samples.
2. to determine the quality of the organic matter, as well as its distribution.
3. to establish the degree of organic metamorphism (level of maturity).

A source rock is identified by measuring the amount of temperature reactive ("live") organic matter present, i.e. the amount of organic matter that yields hydrocarbons upon pyrolysis. The method excludes any ("dead") organic matter such as inertinites.

In addition, the total organic carbon content can be determined which gives the sum of "live" and "dead" organic carbon. Rocks containing less than 0.5%wt organic carbon are not considered to have a potential for commercial oil accumulations.

The source rock indications (SRI), which are a measure of the amount of pyrolysable organic matter, are determined on the original samples and in certain cases also after extraction with organic solvents. A systematically lower value after extraction is due to the presence of extractable hydrocarbons. These may consist of trapped oil, oil generated in situ by a source rock, or e.g. gasoil used in the drilling fluid.

In general, samples with source rock indications of 30 or less do not represent (immature or mature) source rocks. Values between 30 and 100 generally indicate marginal source rocks, while values above 100 commonly indicate good source rocks.

Intervals or samples with high source rock indications are investigated under a microscope to ensure that the high values indicate genuine source rock properties and are not due to contaminants of an organic nature such as lost circulation material.

The quality of a source rock for oil/gas generation depends on the type of organic matter present. Five categories of organic matter can be distinguished, viz.: humic, mainly humic, mixed, mainly kerogenous , kerogenous. This classification is based on the hydrogen content of the organic matter.

Source rocks with organic matter of kerogenous, mainly kerogenous and/or mixed type generate predominantly oil. Organic matter of humic type generates gas only. Strata with organic matter of mainly humic quality generate either gas, or gas and oil.

In addition to the type and the concentration of the organic matter , the source rock quality is also characterised by the distribution of the typical organic constituents, or macerals(1), in the sediments. The maceral distribution can be used to further qualify the source rock, especially when mainly humic quality is found. For this purpose a microscopic investigation on polished rock fragments is carried out.

The "maturity" of source rocks is expressed in terms of degree of organic metamorphism. With increasing degree of organic metamorphism the organic matter is gradually carbonised while generating hydrocarbons. With increasing carbonification the light reflectance of vitrinite, one of the coal macerals, increases. The degree of organic metamorphism can be assessed by measuring this reflectance.

1)maceral: an organic constituent which can be recognised with the microscope (with objectives 25x to 50x)

2.0 RESULTS

The results are listed in Table I (source rock indications, total organic carbon content, type of organic matter), Table II (maceral description, comment lines), Figs. 2-23 (vitrinite reflectance histograms) and Fig. 24 (vitrinite reflectance/depth plot). All chemically obtained results are summarised in Enclosure 1 (Geochemical log).

3.0 DISCUSSION

3.1 Interval 3000 to 3283 m

All samples of this interval show insignificant source rock indication (SRI) values. The maceral descriptions of samples 3004 and 3241 m show only (very) small amounts of sapropelic organic matter (SOM).

This interval cannot be regarded as source rock.

3.2 Interval 3292 to 3319 m (Kimmeridge clay formation)

All samples of this interval reveal good to excellent SRI-values together with high amounts of organic carbon (9.5%wt).

The maceral description shows fair amounts of partly micrinised SOM in a distribution which is favourable for oil expulsion. Next to the SOM sporinite, liptodetrinite, microplankton and fusinite have been detected.

The type of organic matter determined on samples 3301 and 3313m is "kerogenous" which is in agreement with the observed maceral content.

This interval is concluded to contain good to excellent source rock for oil.

3.3 Interval 3328 - 3436m (Heather formation)

Samples of this interval show fairly good SRI-values at the base of the interval grading into good values towards it's top, but seem to be partly contaminated by caved material derived from the overlying Kimmeridge clay formation. For sample 3364m an organic carbon content of 3.7%wt was obtained.

The maceral composition within this interval (sample 3364m) resembles very much that of interval 3292 - 3319m (Kimmeridge clay formation), although somewhat poorer with less SOM present. Moreover, the distribution of the SOM is less favourable for oil expulsion. The type of organic matter is "kerogenous to mainly kerogenous".

This interval might be regarded as fairly good source rock for oil and gas. However, the possible presence of caved material may downgrade the source rock potential of this interval.

3.4 Interval 3445.0 - 3451.2m

Core samples of this interval show excellent SRI-values and an organic carbon content of 61.8 %wt for sample 3450.3m.

The maceral description of this layer reveals high amounts of telocollinite and vitrinite-2 (desmocollinite) in layers and lenses and fair amounts of sporinite, cutinite, liptodetrinite and exsudatinite. The determined type of organic matter (mixed) is in agreement with the observed maceral distribution.

Vitrinite reflectance measurements on samples 3450.3 and 3451.2m give VR-values of 0.78 and 0.74 (DOM:64/65 and 63/64). These values indicate a mature stage for oil generation.

This interval is an excellent source rock for gas.

3.5 Interval 3481 - 3688m (Hugin formation)

Samples of this interval reveal marginal to good SRI-values together with Ct-values of 3.1 and 5.5 %wt for sample 3526 and 3634m, respectively.

The maceral description shows predominantly vitrinite-2 that grades into SOM which is locally micrinised.

The type of organic matter is "mixed to mainly humic" for sample 3526m and "mainly humic to mixed" for sample 3634m.

The lower part of the interval (3598 - 3688m) is somewhat richer and seems to reflect the abandonment phase of the coal deposition of the foregoing Sleipner formation.

Vitrinite reflectance measurements obtained from telocollinite of samples 3526 and 3622m reveal VR-values of 0.69 and 0.76 (DOM:62 and 64) ; (just) mature for oil generation.

This interval is regarded as fairly good source rock for gas.

3.6 Interval 3697 - 4162m (Sleipner formation and Upper Dunlin group)

Samples of this interval show in general excellent SRI-values and organic carbon contents in the range of 12.6%wt at the base of this interval (4093m) to 60.9%wt at the top (3703m).

The maceral composition reveals as main constituents fair amounts of SOM predominatly in a distribution which is not favourable for oil generation and telocollinite, and relative high quantities of vitrinite-2 that grades into SOM. The SOM is partly micrinised and oxidised. Other macerals such as sporinite, liptodetrinite, exsudatinite, fusinite and micrinite are present.

The type of organis matter is "mainly humic" and "mainly humic to humic".

Vitrinite reflectance measurements have been carried out on telocollinite of 12 samples over this interval. The VR-values obtained range from 0.80 to 1.03 (DOM:65 - 71) and increase to depth indicating an advanced to post-mature stage of organic metamorphism for oil source rocks.

Based on these data it is concluded that interval 3697 - 4162m contains excellent source rock for gas. Some samples of this interval (3904 and 4003m) may have been source rocks for oil and gas when immature.

3.7 Interval 4171 - 4642m (Dunlin group)

Samples from this interval are highly contaminated by caved material from the overlying coaly interval and by mud additives.

The SRI-values determined decrease from good at the top of the interval towards marginal at the base. Only some samples at the base of the interval (samples 4477 - 4549m) reveal fairly good to good SRI-values. These higher readings are possibly also caused by contamination.

The organic carbon content determined for three samples (4351, 4513 and 4594m) is 3.6, 4.7 and 2.5%wt respectively.

The maceral composition resembles in general that of the overlying interval. SOM is present in a distribution which is not favourable for oil generation.

Vitrinite reflectance measurements on telocollinite give scattered and relatively low VR-values in the range of 0.80 to 0.96 (DOM:65 - 69), confirming the presence of caved material. Only the VR-value of 1.12 (DOM:73) for sample 4207m seems to complement the trend of vitrinite reflectance measurements retrieved from the overlying interval and indicates a post-mature stage of organic metamorphism for oil source rocks.

This interval probably contains no source rock. The marginal to good SRI-values obtained in this interval are probably due to caving and by mud additives.

4.0 CONCLUSIONS

Interval 3292 - 3319m (Kimmeridge clay formation) contains good to excellent source rock for oil.

Interval 3328 - 3436m (Heather formation) might be regarded as fairly good source rock for oil and gas. However, the possible presence of caved material may downgrade the source rock potential of this interval.

Interval 3445,0 - 3451,2m is an excellent source rock for gas.

Interval 3481 - 3688m (Hugin formation) is regarded as fairly good source rock for gas.

Interval 3697 - 4162m (Sleipner formation and Upper Dunlin group) contains excellent source rock for gas.

Interval 4171 - 4642m (Dunlin group) probably contains no source rock; the marginal to good SRI-values obtained in this interval are probably due to caving and mud additives.

Vitrinite reflectance measurements on telocollinite in cores and cutting samples from intervals 3445.0 - 3451.2m and 3481 - 3688m indicate a just mature to mature stage for oil generation (VR:0.69 - 0.78 / DOM:62 - 64/65).

Vitrinite reflectance measurements on telocollinite from cutting samples from the interval 3697 - 4162m show an increasing VR with depth from 0.80 (DOM:65) at the top to 1.03 (DOM:71) at the base of this interval.

The reflectance measurements on cutting samples below 4171m are unreliable due to caving.

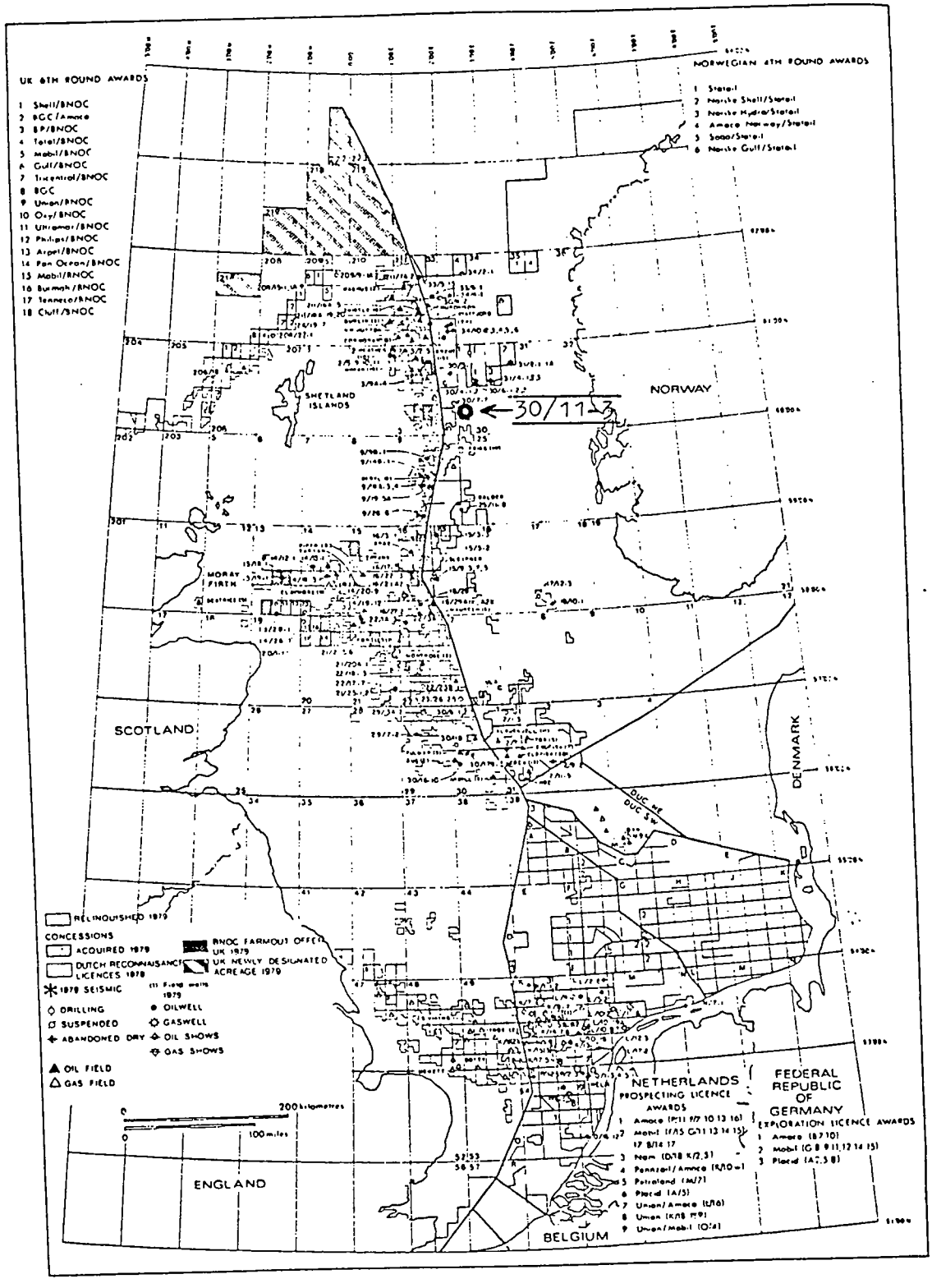

UK 6TH ROUND AWARDS
1 Shell/BNOC
2 BGC/Amoco
3 BP/BNOC
4 Total/BNOC
5 Mobil/BNOC
6 Gulf/BNOC
7 Tricentrol/BNOC
8 BGC
9 Union/BNOC
10 Oxy/BNOC
11 Ultramar/BNOC
12 Phillips/BNOC
13 Arpet/BNOC
14 Pan Ocean/BNOC
15 Mobil/BNOC
16 Burmah/BNOC
17 Tenneco/BNOC
18 Cluff/BNOC
NORWEGIAN 6TH ROUND AWARDS
1 Statoil
2 Norske Shell/Statoil
3 Norske Hydro/Statoil
4 Amoco Norway/Statoil
5 Saga/Statoil
6 Norske Gulf/Statoil
30/11-3
NORWAY
SHETLAND ISLANDS
MORAY FIRTH
SCOTLAND
DENMARK
ENGLAND
BELGIUM
RELINQUISHED 1979
CONCESSIONS
ACQUIRED 1979
DUTCH RECONNAISSANCE LICENCES 1978
1978 SEISMIC
DRILLING
SUSPENDED
ABANDONED DRY
OIL FIELD
GAS FIELD
BNOC FARMOUT OFFER UK 1979
UK NEWLY DESIGNATED ACREAGE 1979
(1) Field wells 1979
OILWELL
GASWELL
OIL SHOWS
GAS SHOWS
200 kilometres
100 miles
NETHERLANDS PROSPECTING LICENCE AWARDS
FEDERAL REPUBLIC OF GERMANY EXPLORATION LICENCE AWARDS

Figure 1

REFLECTANCE HISTOGRAM

COUNTRY	: NORWAY	MEAN	: 0.78
WELL/OUTCROP	: 30/11-3	DEVIATION	: 0.03
DEPTH/SAMPLE NR.	: 3450 M	MODE	: 0.79
SAMPLE TYPE	: CORE SAMPLE	MEASUREMENTS	: 50

ANALYST: VBS D.D. : 25-MAY-83

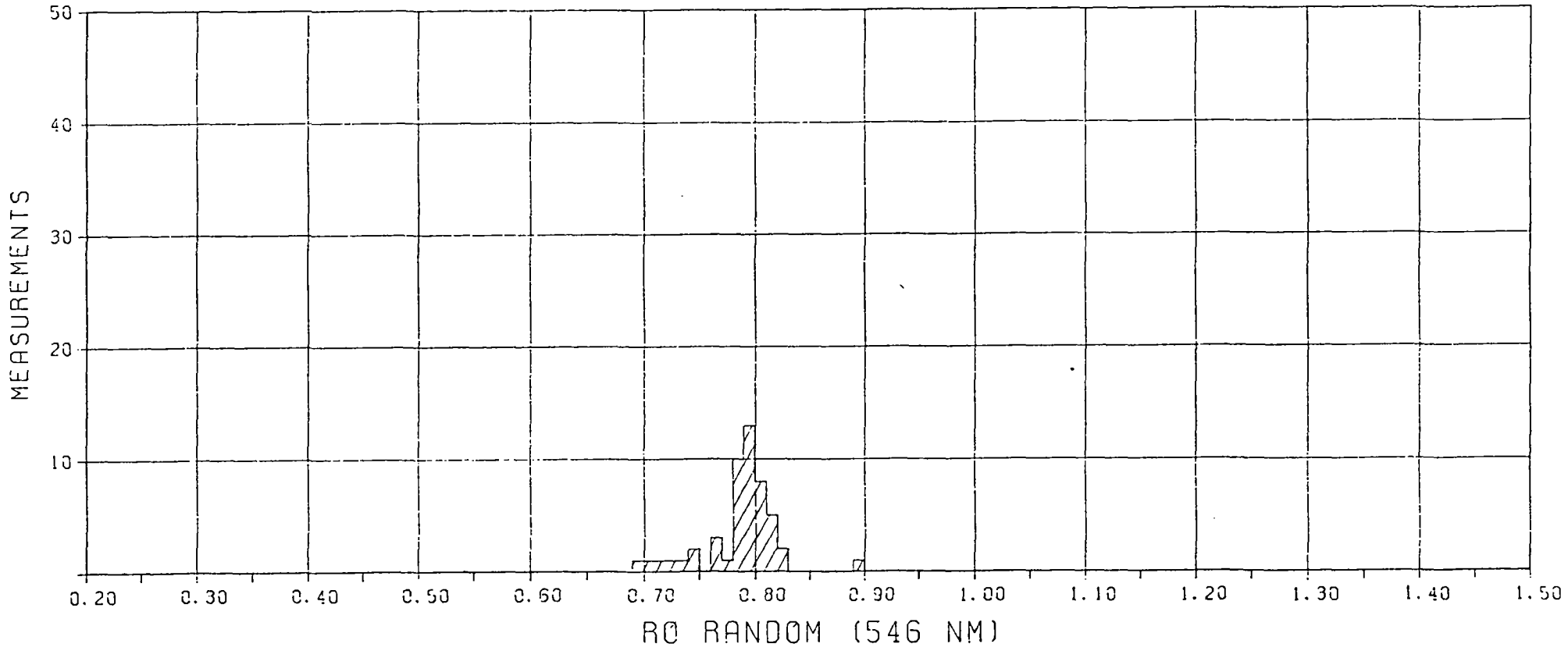


Figure 2

TELOCOLLINITE ; SAMPLE: 3450.3 M

REFLECTANCE HISTOGRAM

COUNTRY	: NORWAY	MEAN	. 0.74
WELL/OUTCROP	. 30/11-3	DEVIATION	: 0.02
DEPTH/SAMPLE NR.	3451 M	MODE	. 0.74
SAMPLE TYPE	. CORE SAMPLE	MEASUREMENTS	. 50

ANALYST: BTX D.D. : 11-MAY-83

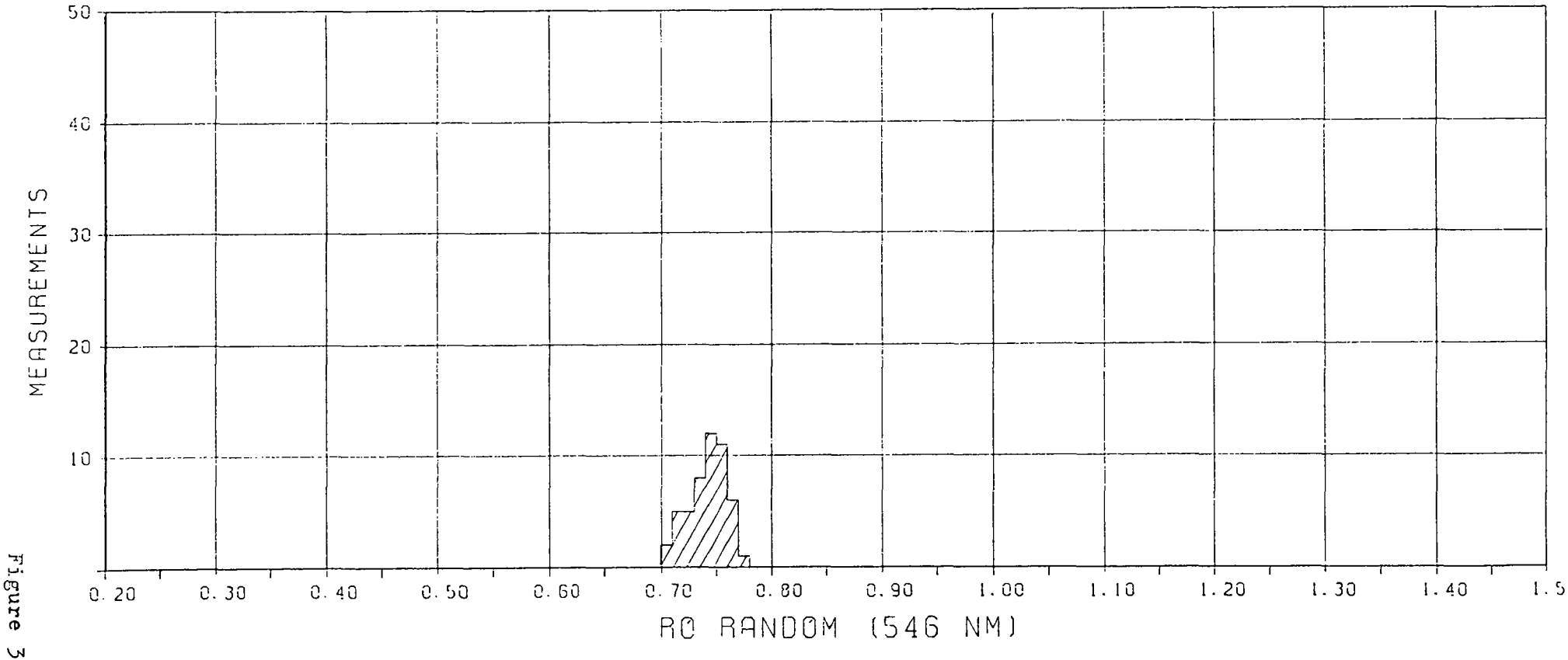


Figure 3

VITRINITE-1 , SAMPLE 3451.2 M

REFLECTANCE HISTOGRAM

COUNTRY	. NORWAY	MEAN	: 0.69
WELL/OUTCROP	. 30/11-3	DEVIATION	. 0.03
DEPTH/SAMPLE NR.	3526 M	MODE	. 0.67
SAMPLE TYPE	. CUTTING SAMPLE	MEASUREMENTS	. 25

ANALYST . BTX D.D. 13-JUN-83

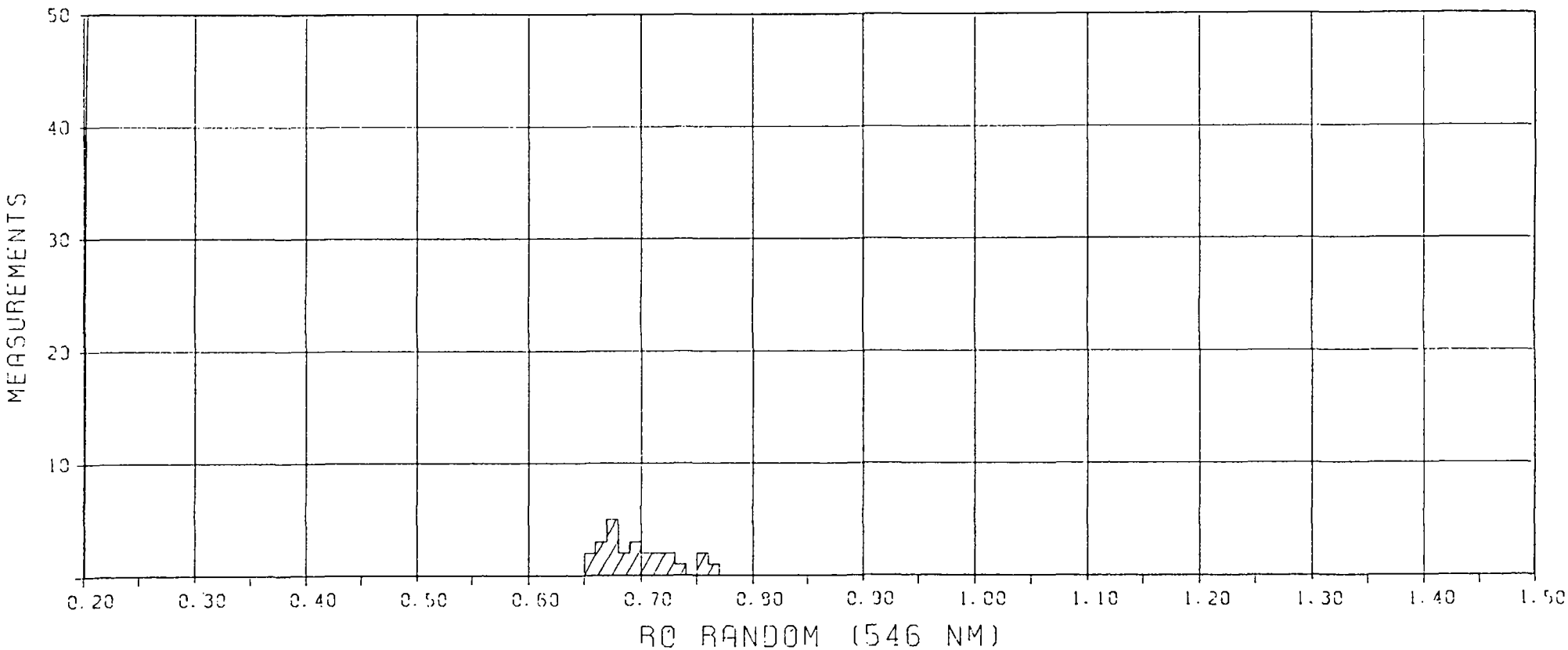


Figure 4

TELOCOLLINITE

REFLECTANCE HISTOGRAM

COUNTRY	: NORWAY	MEAN	: 0.76
WELL/OUTCROP	: 30/11-3	DEVIATION	: 0.03
DEPTH/SAMPLE NR.	3622 M	MODE	: 0.76
SAMPLE TYPE	: CUTTING SAMPLE	MEASUREMENTS	: 29

ANALYST: BTX D.D. 11-MAY-83

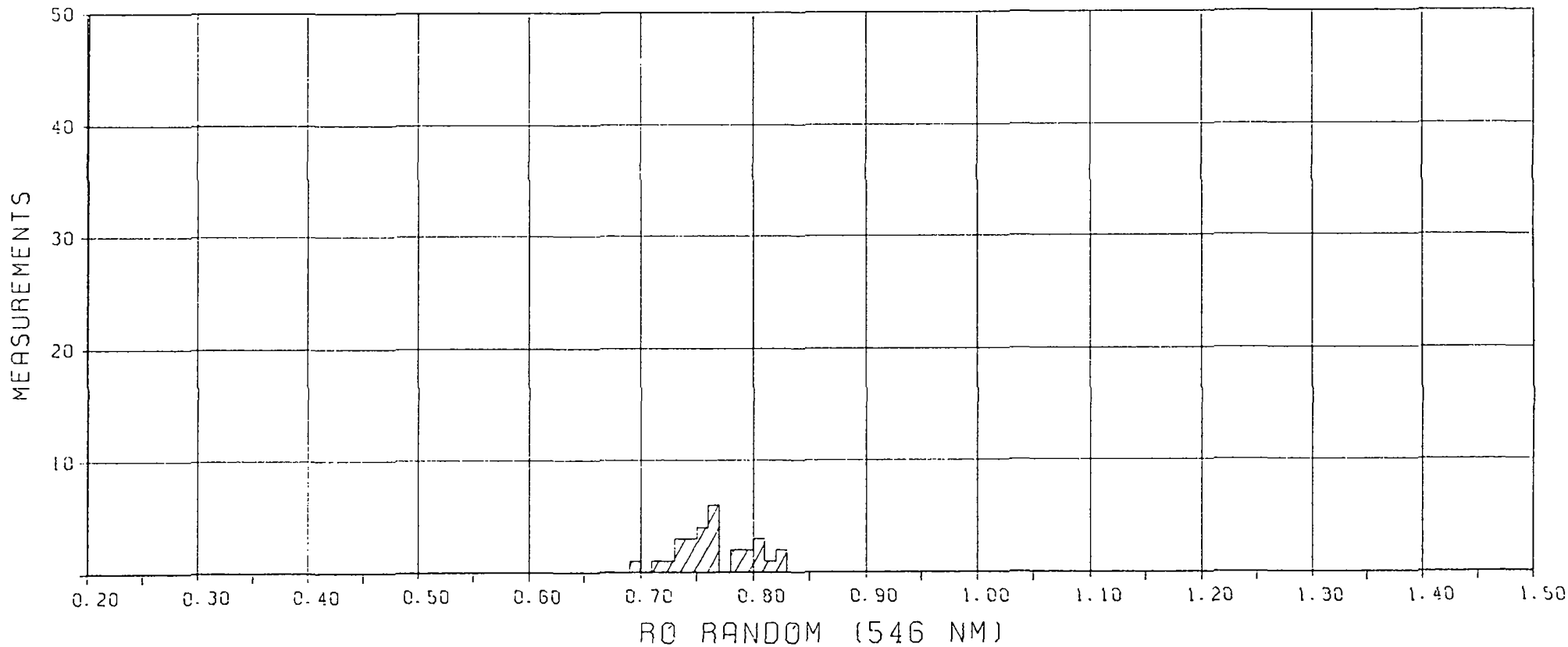


Figure 5

TELOCOLLINITE + CAVING ?

REFLECTANCE HISTOGRAM

COUNTRY	. NORWAY	MEAN	. 0.83
WELL/OUTCROP	. 30/11-3	DEVIATION	: 0.05
DEPTH/SAMPLE NR.	3703 M	MODE	: 0.77
SAMPLE TYPE	. CUTTING SAMPLE	MEASUREMENTS	. 21

ANALYST. BTX D.D. 13-JUN-83

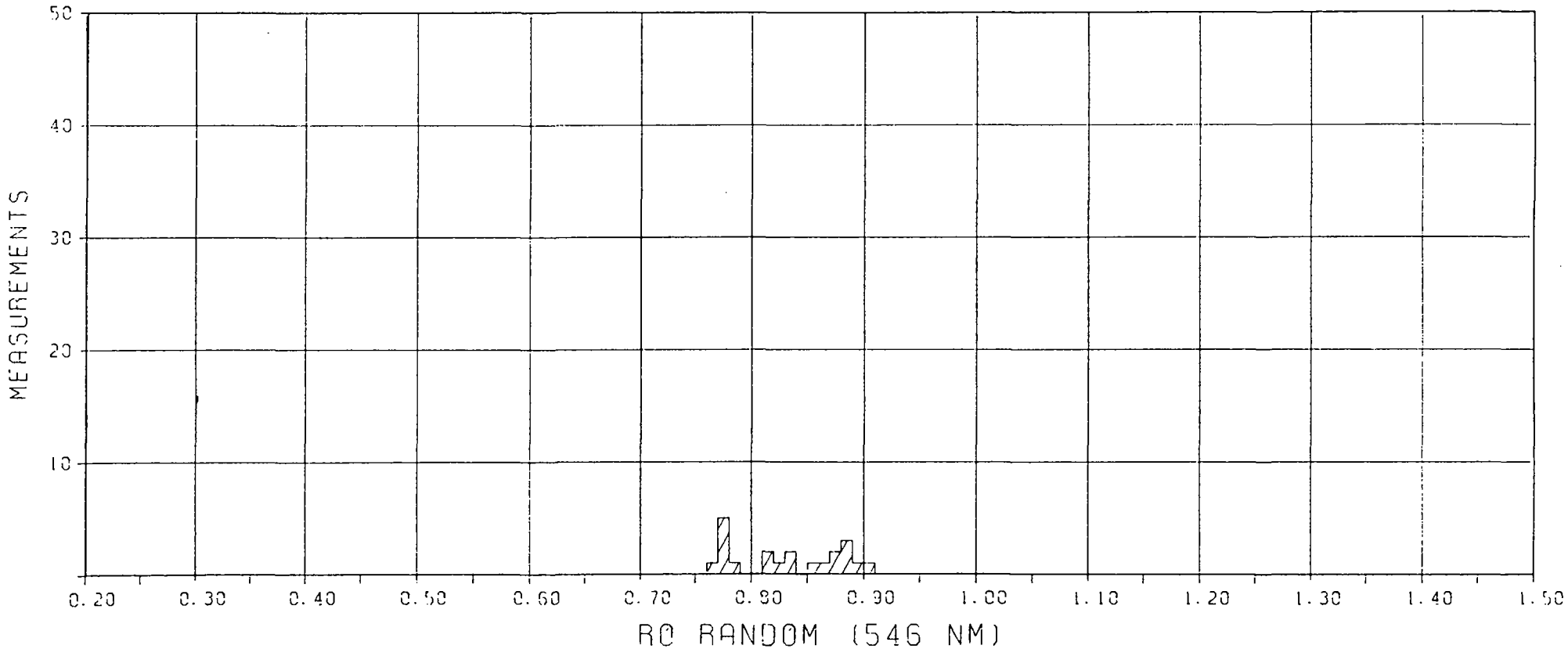


figure 9

TELOCOLLINITE PARTLY OXIDISED

REFLECTANCE HISTOGRAM

COUNTRY : NORWAY
WELL/OUTCROP : 30/11-3
DEPTH/SAMPLE NR. 3706 M
SAMPLE TYPE . CUTTING SAMPLE

MEAN : 0.80
DEVIATION . 0.03
MODE : 0.82
MEASUREMENTS: 50

ANALYST: BTX D.D. 11-MAY-83

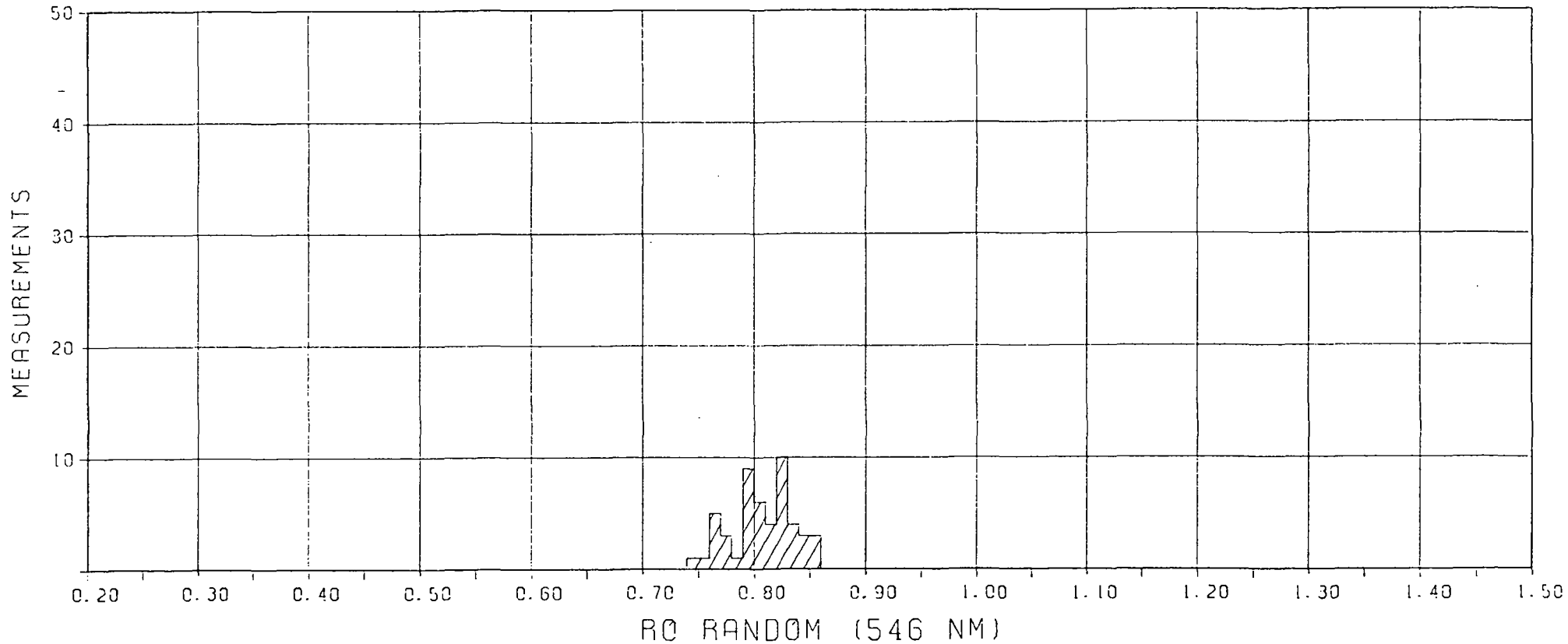


figure 7

TELOCOLLINITE (SLIGHTLY OXIDISED ?)

REFLECTANCE HISTOGRAM

COUNTRY	: NORWAY	MEAN	: 0.84
WELL/OUTCROP	: 30/11-3	DEVIATION	: 0.03
DEPTH/SAMPLE NR.	3748 M	MODE	: 0.84
SAMPLE TYPE	: CUTTING SAMPLE	MEASUREMENTS	: 50

ANALYST: BTX D.D. 11-MAY-83

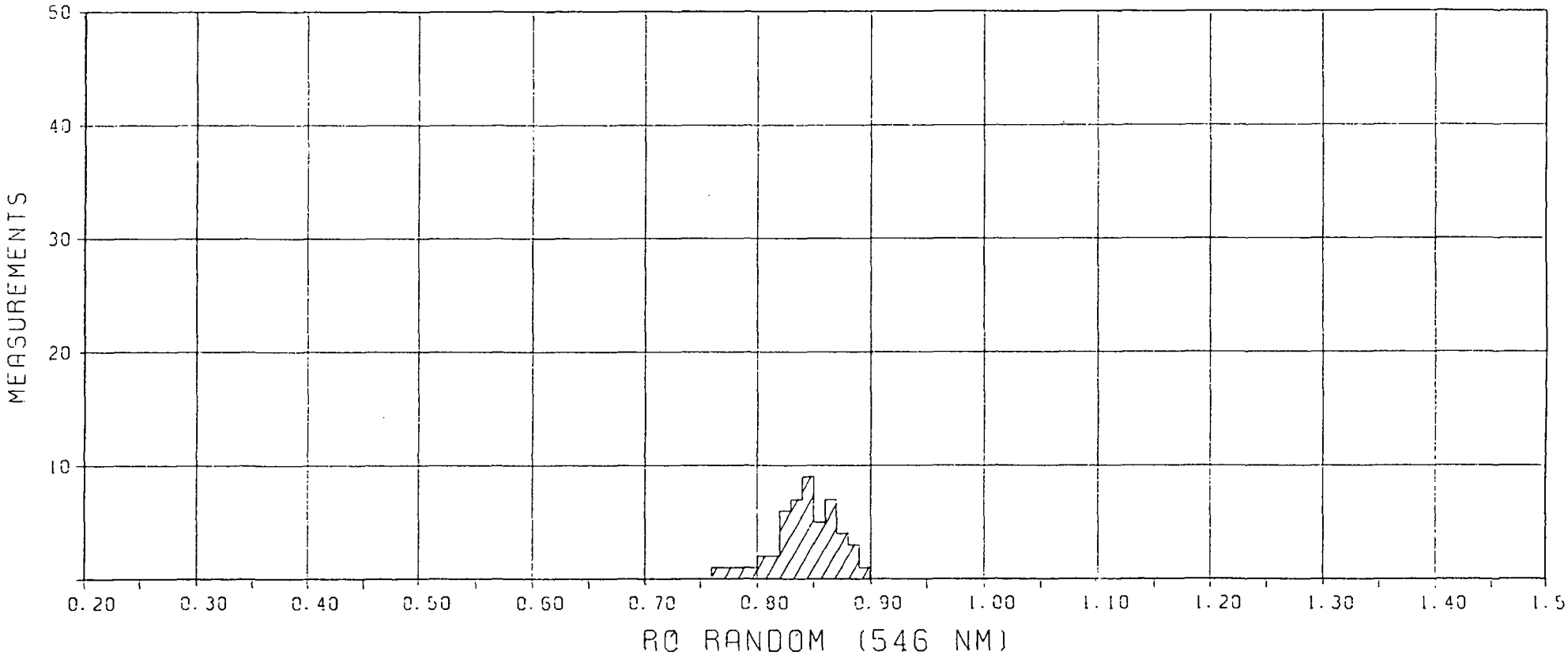


figure 9

TELOCOLLINITE

REFLECTANCE HISTOGRAM

COUNTRY	. NORWAY	MEAN	: 0.83
WELL/OUTCROP	. 30/11-3	DEVIATION	: 0.04
DEPTH/SAMPLE NR.	3769 M	MODE	. 0.84
SAMPLE TYPE	. CUTTING SAMPLE	MEASUREMENTS	. 50

ANALYST . BTX D.D. 11-MAY-83

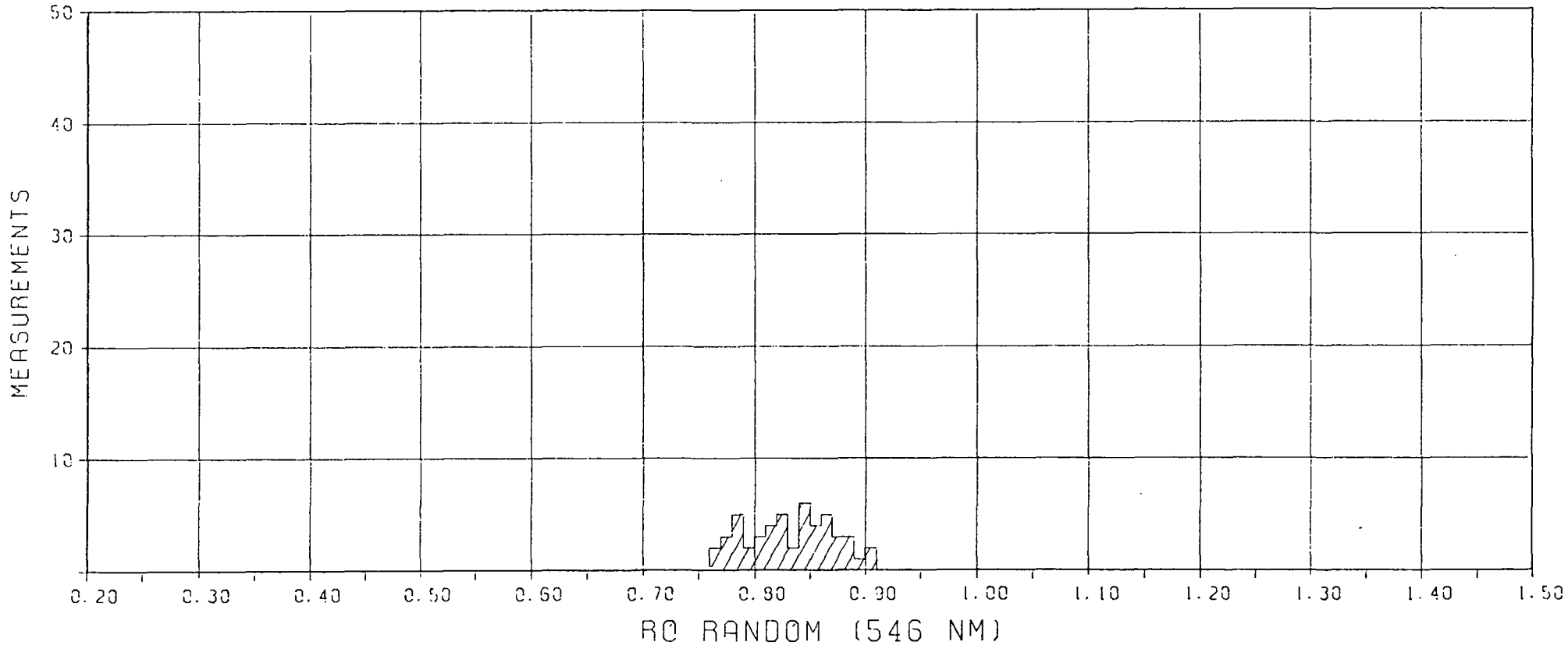


figure 10

TELOCOLLINITE

REFLECTANCE HISTOGRAM

COUNTRY	: NORWAY	MEAN	: 0.84
WELL/OUTCROP	: 30/11-3	DEVIATION	: 0.03
DEPTH/SAMPLE NR.	: 3829 M	MODE	: 0.83
SAMPLE TYPE	: CUTTING SAMPLE	MEASUREMENTS	: 50

ANALYST: BTX D.D. : 11-MAY-83

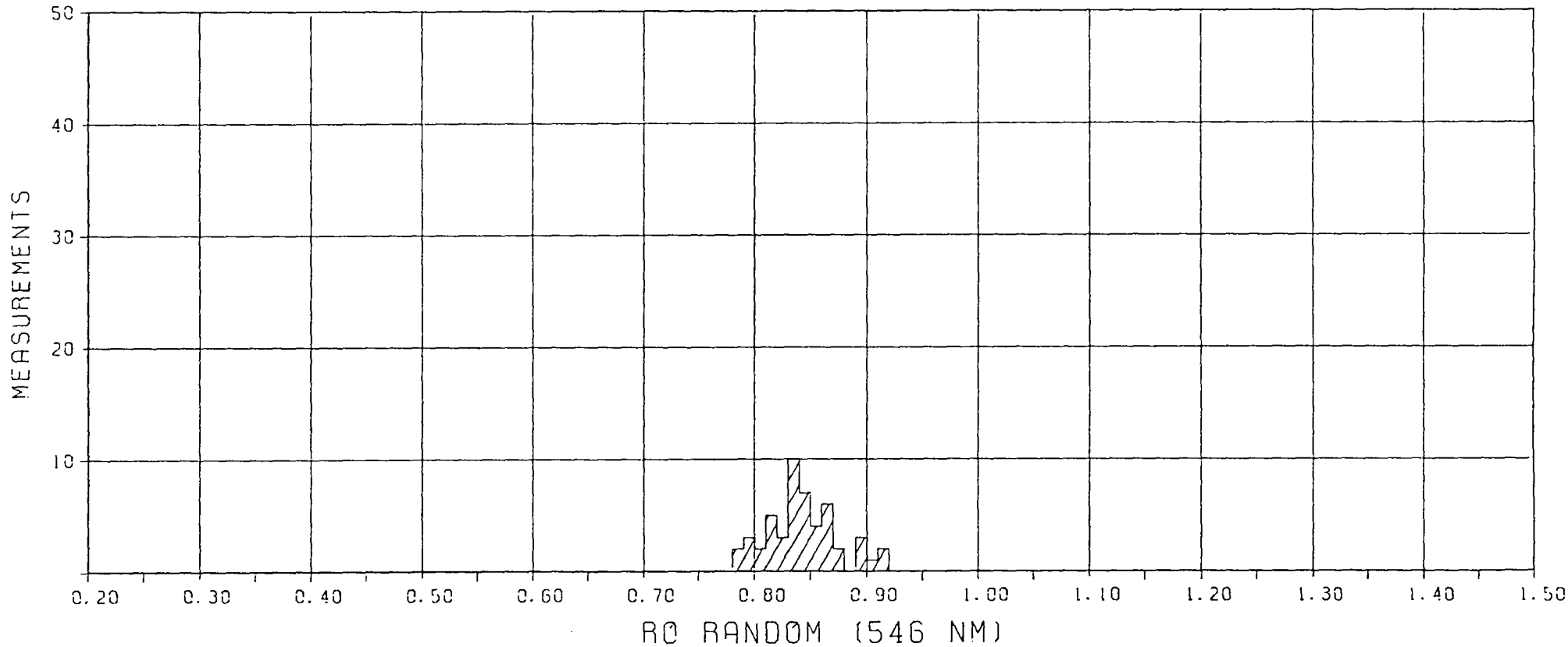


figure 12

TELOCOLLINITE

REFLECTANCE HISTOGRAM

COUNTRY	: NORWAY	MEAN	: 0.99
WELL/OUTCROP	: 30/11-3	DEVIATION	: 0.07
DEPTH/SAMPLE NR.	: 4003 M	MODE	: MULTI
SAMPLE TYPE	: CUTTING SAMPLE	MEASUREMENTS	: 50

ANALYST: BTX D.D. 13-JUN-83

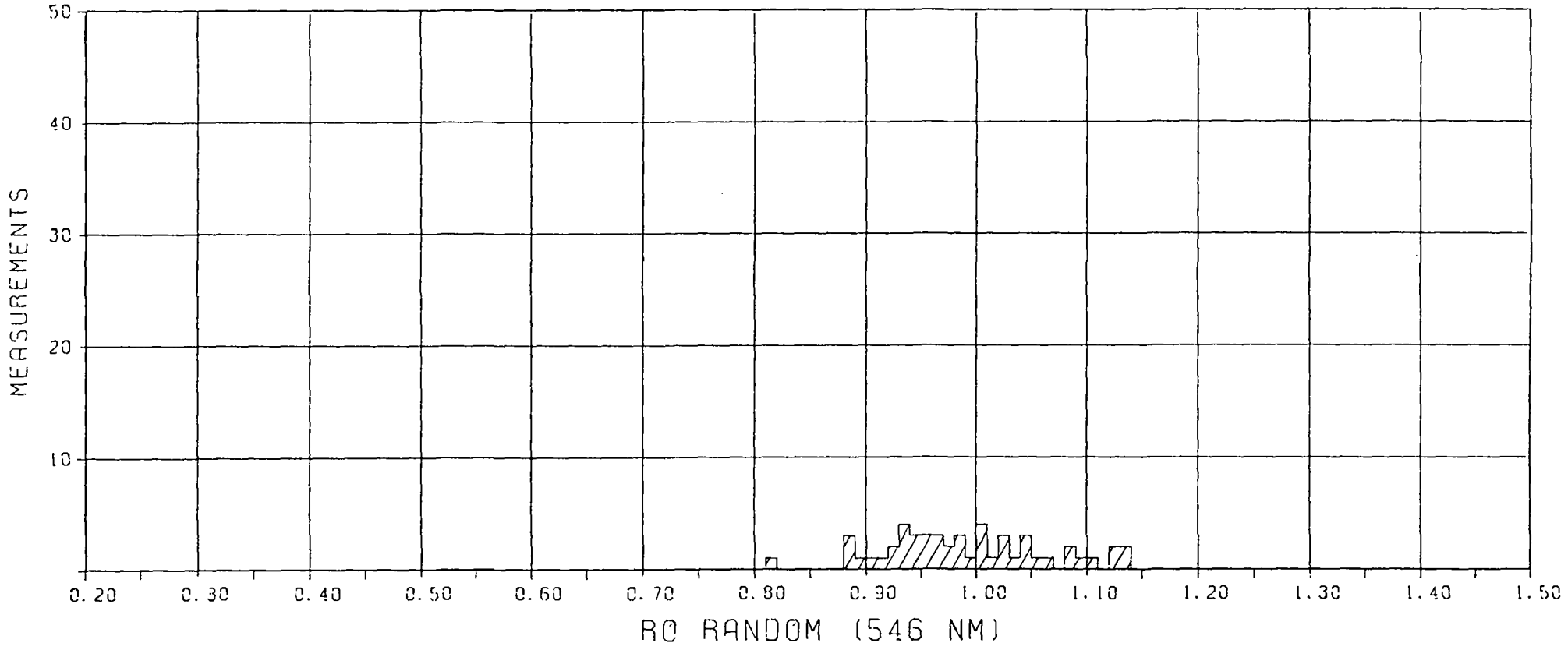


figure 16

TELOCOLLINITE

REFLECTANCE HISTOGRAM

COUNTRY	: NORWAY	MEAN	: 0.93
WELL/OUTCROP	: 30/11-3	DEVIATION	: 0.05
DEPTH/SAMPLE NR.	: 4240 M	MODE	: 0.96
SAMPLE TYPE	: CUTTING SAMPLE	MEASUREMENTS	: 48

ANALYST: VBS D.D. : 25-MAY-83

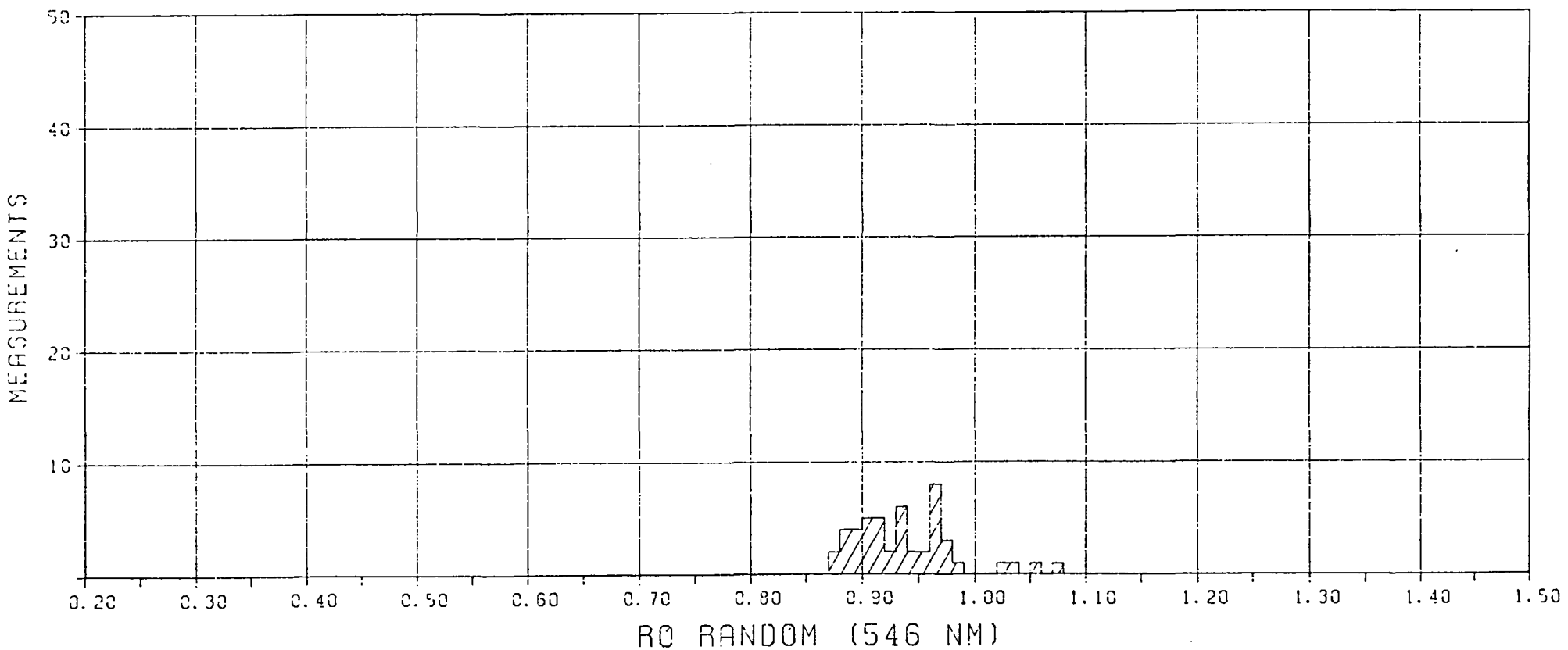


figure 19

TELOCOLLINITE

REFLECTANCE HISTOGRAM

COUNTRY : NORWAY
WELL/OUTCROP : 30/11-3
DEPTH/SAMPLE NR. 4525 M
SAMPLE TYPE : CUTTING SAMPLE

MEAN : 0.92
DEVIATION : 0.05
MODE : MULTI
MEASUREMENTS : 48

ANALYST: BTX D.D. 11-MAY-83

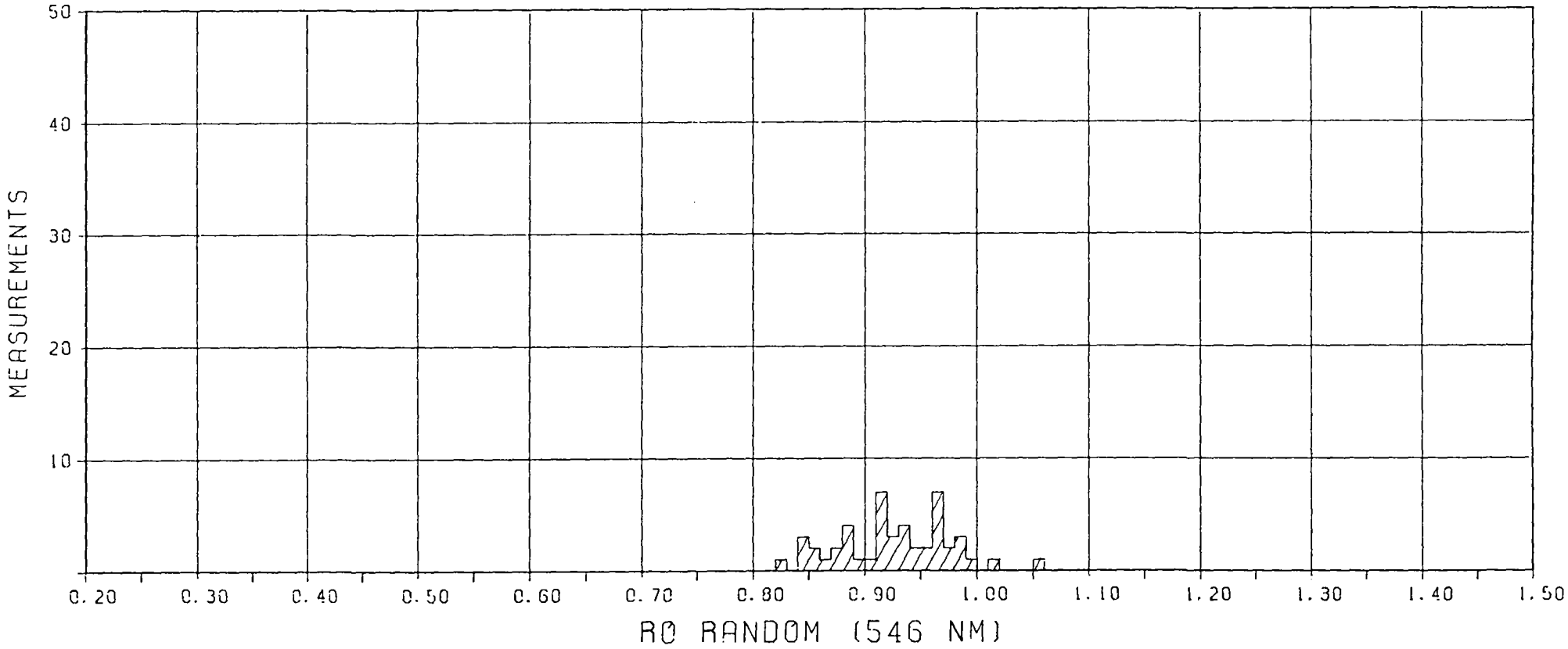
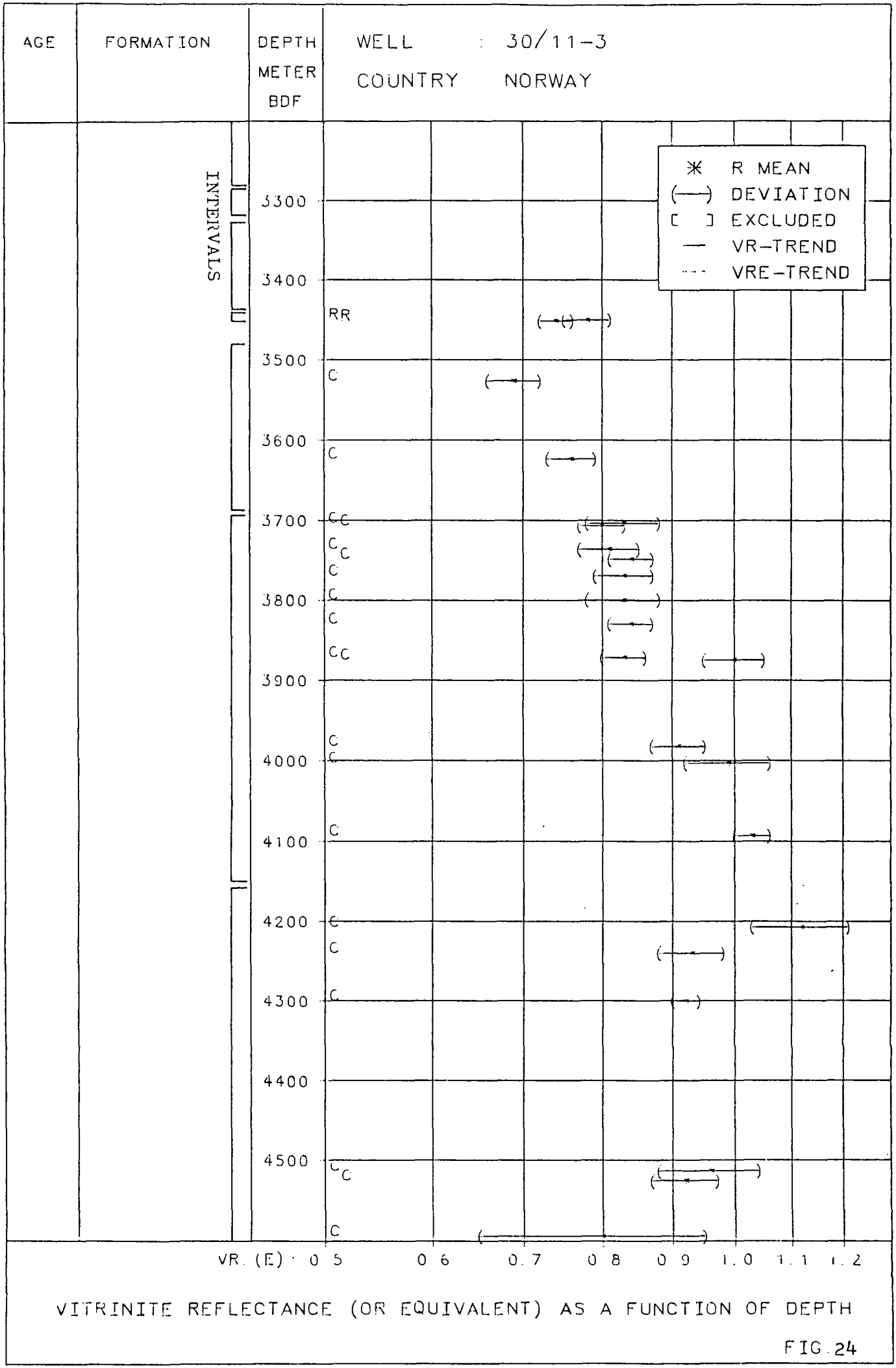


figure 22

TELOCOLLINITE PARTLY CAVING ?



VITRINITE REFLECTANCE (OR EQUIVALENT) AS A FUNCTION OF DEPTH

FIG. 24

GEOCHEMICAL SOURCE ROCK DATA

TABLE I (PART 2) WELL: 30/11-3

DEPTH M	TYPE OF SAMPLE	SOURCE ROCK INDICATION BEFORE EXTR.	SOURCE ROCK INDICATION AFTER EXTR.	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT %W
3265	C	5	-		-
3274	C	15	-		-
3283	C	5	-		-
3292 x	C	625	550		-
3301 x	C	> 900	> 900	K	9.5
3310 x	C	640	515		-
3313 x	C	0	-	K	-
3319	C	645	500		-
3328	C	455	295		-
3337	C	330	240		-
3346	C	155	120		-
3355	C	215	165		-
3364	C	510	360	K/MK	3.7
3373	C	325	255		-
3382	C	185	170		-
3391	C	180	155		-
3400	C	220	175		-
3409	C	145	125		-
3418	C	165	130		-
3427	C	305	245		-
3436	C	90	80		-
3445	C	105	85		-
3445	R	> 900	> 900	M/MH	-
3450.30	R	> 900	> 900	M	61.8
3451.20	R	> 900	> 900		-
3481	C	125	110		-
3490	C	90	85		-
3499	C	35	35		-
3508	C	35	35		-
3517	C	60	55		-

GEOCHEMICAL SOURCE ROCK DATA

TABLE I (PART 4) WELL: 30/11-3

DEPTH M	TYPE OF SAMPLE	SOURCE ROCK INDICATION BEFORE EXTR.	SOURCE ROCK INDICATION AFTER EXTR.	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT %W
3781	C	> 900	> 900		-
3790	C	> 900	> 900		-
3799	C	> 900	> 900	MH	23.2
3808	C	> 900	> 900		-
3817	C	> 900	> 900		-
3826	C	> 900	> 900		-
3835	C	> 900	> 900		-
3844	C	> 900	> 900		-
3853	C	> 900	> 900		-
3862	C	315	315		-
3868	C	> 900	> 900		-
3877	C	> 900	> 900		-
3886	C	> 900	> 900		-
3895	C	> 900	> 900		-
3904	C	= 900	= 900	MH	26.6
3913	C	545	545		-
3922	C	> 900	> 900		-
3931	C	> 900	> 900		-
3940	C	640	620		-
3949	C	460	460		-
3958	C	395	395		-
3967	C	> 900	> 900		-
3976	C	> 900	> 900		-
3985	C	> 900	> 900		-
3994	C	715	715		-
4003	C	> 900	> 900	MH	14.7
4012	C	775	775		-
4021	C	710	710		-
4027	C	555	555		-
4030	C	470	470		-

GEOCHEMICAL SOURCE ROCK DATA

TABLE I (PART 5) WELL: 30/11-3

DEPTH M	TYPE OF SAMPLE	SOURCE ROCK INDICATION BEFORE EXTR.	SOURCE ROCK INDICATION AFTER EXTR.	TYPE OF ORGANIC MATTER	ORGANIC CARBON CONTENT %W
4039	C	> 900	> 900		-
4048	C	620	620		-
4057	C	745	745		-
4066	C	700	670		-
4075	C	715	720		-
4084	C	> 900	> 900		-
4093	C	> 900	> 900	MH/H	12.6
4102	C	560	555		-
4111	C	510	530		-
4120	C	635	640		-
4129	C	210	205		-
4135	C	435	445		-
4144	C	625	640		-
4153	C	415	410		-
4162	C	> 900	> 900		-
4171	C	205	175		-
4180	C	375	365		-
4189	C	200	200		-
4198	C	245	260		-
4207	C	505	450	MH	7.1
4216	C	270	280		-
4225	C	310	295		-
4234	C	355	360		-
4243	C	610	635		-
4252	C	170	170		-
4261	C	280	260		-
4270	C	80	90		-
4279	C	160	170		-
4288	C	100	80		-
4297	C	420	360		-
4468	C	85	75		-

MACERAL DESCRIPTION OF 41 SAMPLES FROM WELL 30/11-3, NORWAY

DEPTH IN M	SAMPLE TYPE
3004.0	CTGS
3241.0	CTGS
3298.0	CTGS
3301.0	CTGS
3313.0	CTGS
3364.0	CTGS
3445.0	CORE
3450.3	CORE
3451.2	CORE
3451.2	CORE
3526.0	CTGS
3622.0	CTGS
3634.0	CTGS
3703.0	CTGS
3706.0	CTGS
3736.0	CTGS
3748.0	CTGS

INTERVALS

	ORGANIC																			INORG.			
	VITR.			LIPTINITE				ALGAE				INERT.											
	SAPROPELIC ORG. MATTER	TELOCOLLINITE	TELINITE	DESMOCOLLINITE	SPORINITE	CUTINITE	RESINITE	LIPTODETRINITE	BOTRYOCOCCUS	TASMANITES	OTHER ALGAE	MICROPLANKTON	EXSUDATINITE	SCLEROTINITE	FUSINITE	MACRINITE	MICRINITE	UNDEFINED MINERALS	FRAMBOIDAL PYRITE	AGGREGATES OF PYRITE	CRYSTALS OF PYRITE
3004.0	-			-				-							-			*	/	-	-
3241.0	/			-				-				-			-		/	*	/	-	-
3298.0	+			-	/			+				/			/		+	*	+	/	+
3301.0	+			-	/			+		/		/	-		/		+	*	+	/	+
3313.0	+			-	/			+				/			+		+	*	+	/	+
3364.0	+				-			+				+	-		/		+	*	+	/	/
3445.0				+	+	/		/							*			/	/	*	+
3450.3			/	+	+	/	-	+					/		*			-	-		-
3451.2			*	+	/	-	-	/					-		+			/	-		
3451.2			*	+	/	-	-	/					-		+			/	-		
3526.0	+	-	-	+	/			+					/		/		/		*	-	-
3622.0	+	/		*	/	-		/					/		+		+	*	/	/	/
3634.0	/			+	/	-		/					/		/		+	*	/	/	/
3703.0	/	+		+	+	/		+					/		*		/	+	/	-	/
3706.0	/	+		*	+	-		/					-		+		/	+	/	-	/
3736.0	/	+		*	/			/					/		*		+	+	/	-	/
3748.0	/	/		*	/			/					-		*		+	*	-	-	/

L E G E N D	
*	ABUNDANT
+	COMMON
/	FEW
-	RARE

TABLE : IIa

COMMENT LINES FROM WELL/OUTCROP : 30/11-3

Table IId

3004.0 M : SAMPLE SLIGHTLY OXIDISED

3241.0 M : SAMPLE SLIGHTLY OXIDISED
INITIAL MICRINISATION S.O.M.

3298.0 M : INITIAL MICRINISATION S.O.M.

3301.0 M : INITIAL MICRINISATION S.O.M.
FOSSIL REMAINS

3313.0 M : INITIAL MICRINISATION S.O.M.

3364.0 M : INITIAL MICRINISATION S.O.M.
FOSSIL REMAINS
FEW ACRITARCHS

3445.0 M : CANNEL COAL CONTAINING ABUND. ALLOCHTHONOUS FUS./SEMI-FUS.
GROUND MASS IS BROWN FLUORESCING

3430.3 M : SEMI-FUSINITE/FUSINITE ; RARE CRANSICUTINITES
GROUND MASS IS BROWN FLUORESCING

3401.2 M : VITRINITE SHOWS OXIDATION FEATURES
GROUND MASS IS BROWN FLUORESCING

3401.2 M : VITRINITE SHOWS OXIDATION FEATURES
GROUNDMASS IS BROWN FLUORESCING

3026.0 M : INITIAL MICRINISATION S.O.M.
DARK FLUORESCING VITRINITE

3622.0 M : S.O.M. PARTLY MICRINISED
VITRINITE-2 GRADES INTO S.O.M. ASSOCIATED WITH FRAM PYRITE
SAMPLE SLIGHTLY OXIDISED
+ CAVING ?

3634.0 M : S.O.M. PARTLY MICRINISED
SAMPLE SLIGHTLY OXIDISED
VITRINITE-2 GRADES INTO S.O.M. ASSOCIATED WITH FRAM PYRITE

3703.0 M : S.O.M. PARTLY MICRINISED
SAMPLE PARTLY OXIDISED
TELOCOLLINITE GRADES INTO SEMI-FUSINITE/FUSINITE
DIFFICULT TO MEASURE VR

3706.0 M : S.O.M. PARTLY MICRINISED
VITRINITE-2 GRADES INTO S.O.M. ASSOCIATED WITH FRAM PYRITE
SAMPLE SLIGHTLY OXIDISED

3736.0 M : PYRITE SHOWS OXIDATION FEATURES
S.O.M. PARTLY MICRINISED
VITRINITE-2 GRADES INTO S.O.M. ASSOCIATED WITH FRAM PYRITE
SAMPLE PARTLY OXIDISED

3748.0 M : S.O.M. PARTLY MICRINISED
VITRINITE-2 GRADES INTO S.O.M.
SAMPLE PARTLY OXIDISED

3769.0 M : S.O.M. PARTLY MICRINISED
VITRINITE-2 GRADES INTO S.O.M. ASSOCIATED WITH FRAM PYRITE

4300.0 M : CONTAMINATED
S.O.M. PARTLY MICRINISED
ABUNDANT COAL CONTAMINATION WITH VR ABOUT .20-.30
RARE AUTOCHTHONOUS COAL PARTICLES ? ; SOME CAVING

4300.0 M : CONTAMINATED
S.O.M. PARTLY MICRINISED
ABUNDANT COAL CONTAMINATION (WITH VR ABOUT .20-.30)
SOME CAVING ; RARE AUTOCHTHONOUS COAL PARTICLES ?

4330.0 M : CONTAMINATED
S.O.M. PARTLY MICRINISED
SOME COAL CONTAMINATION WITH VR ABOUT .20-.30
SOME CAVING

4351.0 M : CONTAMINATED
S.O.M. PARTLY MICRINISED
NO ACCURATE DESCRIPTION POSSIBLE
COAL CONTAMINATION VR IS ABOUT .20-.30+CAVED MATERIAL

4354.0 M : CONTAMINATED
ABUNDANT COAL CONTAMINATION WITH VR ABOUT .20-.30
NO ACCURATE DESCRIPTION POSSIBLE ; SOME CAVING

4465.0 M : S.O.M. PARTLY MICRINISED
SAMPLE SLIGHTLY OXIDISED
CONTAMINATED
SOME COAL CONTAMINATION WITH VR ABOUT .20-.30
CAVED MATTER PRESENT

4515.0 M : CONTAMINATED
S.O.M. PARTLY MICRINISED
CONTAINS CAVED MATERIAL (INCLUDING Coal ?)
RARE COAL CONTAMINATION VR IS ABOUT .20-.30(MUD ADDITIVE)

4520.0 M : CONTAMINATED
CONTAINS COAL CONTAM.(VR ABOUT .20-.30)?CAVED MATTER PRESENT
CONTAINS COAL CONTAM. AUTOCHTHONOUS(?)VR MEASURED?CAVING ??

4594.0 M : S.O.M. PARTLY MICRINISED
CONTAINS CAVED MATERIAL

4642.0 M : S.O.M. PARTLY MICRINISED
CAVED MATERIAL PRESENT

INITIAL DISTRIBUTION

5 copies area

GEOCHEMICAL LOG

WELL 30/11-3

SCALE 1:5000

LOCATION

REGEO IDENTIFIER

AGE: UPPER CRETACEOUS — SHETLAND GROUP

JURASSIC — VESTLAND GROUP — SLEIPNER FM

JURASSIC — DUNLIN GROUP

FORMATION: KI CLAY FM; VIKING GROUP — HEATHER FM; HUGIN FM; SLEIPNER FM

STATFJORD

TD 4662

DEPTH IN M: 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000

MACERAL DESCRIPTION OF 41 SAMPLES

DOM(VR): VR=0.78; VR=0.69; VR=0.76; VR=0.83; VR=0.80; VR=0.81; VR=0.84; VR=0.83; VR=0.83; VR=0.84; VR=0.83; VR=1.00; VR=0.91; VR=0.99; VR=1.03; VR=1.12; VR=0.93; VR=0.92; VR=0.86; VR=0.92; VR=0.80

SOURCE ROCK INDICATION OF ORIGINAL SAMPLE — 100 200 300 400 500 600 — TYPE OF SAMPLE

SOURCE ROCK INDICATION OF SAMPLE AFTER EXTRACTION WITH CHLOROFORM — 100 200 300 400 500 600 — CONTAMINATION

VALUES SMALLER THAN 30 ARE CONSIDERED NOT TO BE OF SIGNIFICANCE

INTERVAL 3292-3319M (KICLAYFM) IS CONCLUDED TO CONTAIN GOOD TO EXCELLENT SOURCE ROCK FOR OIL

INTERVAL 3328-3436M MIGHT BE REGARDED AS FAIRLY GOOD SOURCE ROCK FOR OIL AND GAS (CAVING?)

INTERVAL 3445.0-3451.2M IS AN EXCELLENT SOURCE ROCK FOR GAS

INTERVAL 3481-3688M (HUGIN FM) IS REGARDED AS FAIRLY GOOD SOURCE ROCK FOR GAS

INTERVAL 3697-4162M (SLEIPNER FM AND UPPER DUNLIN GP) CONTAINS EXCELLENT SOURCE ROCK FOR GAS

INTERVAL 4171-4642M (DUNLIN GP) PROBABLY CONTAINS NO SOURCE ROCK; MARGINAL TO GOOD SRI-VALUES ARE PROBABLY DUE TO CAVING AND MUD ADDITIVES

CONTAMINATION INTERVALS

DEPTH IN M: 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000

ORG.CARBON (PCT. WT): 9.5; 3.7; 61.8; 3.1; 5.5; 60.9; 23.2; 26.6; 14.7; 12.6; 7.1; 3.6; 4.7; 2.5

TYPE OF ORGANIC MATTER: KEROGENOUS KEROGENOUS; KEROGENOUS TO MAINLY KEROGENOUS; MIXED TO MAINLY HUMIC; MIXED TO MAINLY HUMIC; MAINLY HUMIC TO MIXED; MAINLY HUMIC; MAINLY HUMIC; MAINLY HUMIC; MAINLY HUMIC; MAINLY HUMIC TO HUMIC; MAINLY HUMIC; MAINLY HUMIC; MAINLY HUMIC

NUMBER OF SAMPLES ANALYSED 190

NUMBER OF SAMPLES ANALYSED 155

LEGEND

TYPE OF SAMPLE: ⊖ = CORE; ▸ = SIDEWALL SAMPLE

CONTAMINATION: C = UNSPECIFIED; W = WALNUTS; E = CELLOPHANE; F = FIBRES; P = PLASTIC OR PAINT

KONINKLYKE/SHELL
EXPLORATIE EN PRODUKTIE LABORATORIUM

GEOCHEMICAL LOG

COUNTRY : NORWAY
WELL : 30/11-3
INTERVAL : 3000 - 5000 M.
SCALE 1:5000

AUTHOR: KRUEGER DATE: AUGUST 1983

REF: 83/171/115 ENCL: 1 DRAW.NO: