VOLCANICLASTIC SEDIMENTATION IN A CARADOCIAN MARGINAL BASIN, NORTH WALES

D. Phil. thesis
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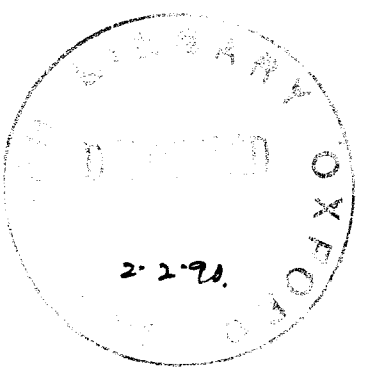

VOLUME 3: Appendices

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LOCATION and STRATIGRAPHIC UNIT(S) OF SEDIMENTARY SECTIONS.

AREA A: CAPEL CURIG ANTICLINE, west

Section A1:	SH 7061 5764 to 7052 5791.	Capel Curig Volcanic Fm.
Section A2:	SH 7085 5781 to 7094 5795	Capel Curig Volcanic Fm.
Section A3:	SH 7100 5789 to 7104 5796.	Capel Curig Volcanic Fm.
Section A4:	SH 7072 5983 to 7069 5790.	Capel Curig Volcanic Fm.

AREA B: CAPEL CURIG ANTICLINE, east

Section B1:	SH 7055 5593 to 7070 5577	Lower Cwm Eigiau Fm.
Section B2:	SH 6973 5537 to 6980 5529	4TH MBR. of CCVF.
Section B3:	SH 6950 5650 to 6918 5663	Lower to Upper Racks Mbrs.
Section B4:	SH 6973 5626 to 6946 5593	Moel Siabod Mbr., Tryfan Fm.

AREA C: TRYFAN ANTICLINE

Section C1:	SH 6720 5974 to 5985 6674	Tryfan Fm.
Section C2:	SH 6733 5915 to 6758 5887	Ddeugwm Fm.
Section C3:	SH 6770 5853 to 6798 5893	Tryfan Fm.
Section C4:	SH 6806 5978 to 6821 5975	Ddeugwm Fm.
Section C5a:	SH 6715 5917 to 6686 5923	Ddeugwm Fm.
Section C5b:	SH 6682 5924 to 6666 5927	Tryfan Fm.
Section C6:	SH 6721 6000 to 6706 6000	Tryfan Fach Mbr., Tryfan Fm.
Section C7:	SH 6684 5939 to 6680 5941	Tryfan Fach Mbr., Tryfan Fm.
Section C8:	SH 6695 5855 to 6702 5847	Tryfan Fm.
Section C9:	SH 6720 5860 to 6780 5827	Tryfan Fm.
Section C10:	SH 6880 5973 to 6897 5963	Moel Siabod Mbr., Tryfan Fm.
Section C11:	SH 6700 5991 to 6681 5995.	Capel Curig Mbr., Tryfan Fm.

AREA D: IDWAL SYNCLINE:

Section D1:	SH 6542 5882 to 6495 5923	Lower and Upper Cwm Eigiau Fm.
Section D2:	SH 6485 5845 to 6459 5870	Upper Cwm Eigiau Fm.

AREA E: LLANBERIS PASS:

Section E1:	SH 6305 5644 to 6313 5649	Upper Cwm Eigiau Fm.
Section E2:	SH 6295 5642 to 6295 5641	Upper Cwm Eigiau Fm.
Section E3:	SH 6265 5640 to 6264 5638	Upper Cwm Eigiau Fm.
Section E4:	SH 6268 5679 to 6286 5654	Lower Cwm Eigiau Fm.
Section E5:	SH 6317 5683 to 6325 5697	Upper Cwm Eigiau Fm.
Section E6:	SH 6177 5854 to 6182 5880	Gwastadnant Mbr.
Section E7:	SH 6170 5823 to 6174 5818	Gwastadnant Mbr.
Section E8:	SH 6434 5651 to 6429 5646	Gwastadnant Mbr.
Section E9:	SH 6429 5659 to 6421 5647	Gwastadnant/ Bochlwyd Mbrs.

Section E10:	SH 6417 5679 to 6407 5674	Gwastadnant Mbr.
Section E11:		
Section E12:	SH 6426 5649 to 6422 5649	Gwastadnant Mbr.
Section E13:	SH 6550 5632 to 6549 5628	Pitts Head Tuff Fm.

AREA F: NE OF A5

Section F1:	SH 6877 6435 to 6900 6420	Tryfan Fm.
Section F2:	SH 6940 6320 to 6980 6305	Lower Cwm Eigiau Fm.
Section F3:	SH 7047 6277 to 7083 6273	Upper Cwm Eigiau Fm.
Section F4:		Upper Cwm Eigiau Fm.
Section F5:	SH 7090 6269 to 7125 6260	Upper Cwm Eigiau Fm.
Section F6:		Upper Cwm Eigiau Fm.
Section F7a:	SH 6750 6340 to 6755 6322	Tryfan/ Ddeugwm Fms.
Section F7b:	SH 6675 6313 to 6672 6305	Tryfan Fm.
Section F8:	SH 6804 6315 to 6890 6307	Tryfan / Ddeugwm Fms.
Section F9:	SH 6582 6210 to 6572 6200	4TH MBR. CCVF.

AREA G: CAPEL HILL

Sections G2 to G8:	SH 7232 5822 to 7266 5841	Upper Cwm Eigiau Fm.

AREA H: LLYN COWLYD

Section H1:	SH 7166 6130 to 7163 6139	Upper Cwm Eigiau Fm.
Section H2:	SH 7166 6146 to 7157 6165	Upper Cwm Eigiau Fm.
Section H3:	SH 7164 6163 to 7162 6169	Upper Cwm Eigiau Fm.
Section H4:		
Section H5:	SH 7182 6190 to 7169 6205	Upper Cwm Eigiau Fm.

AREA J: CAE'R GORS

Section J1:	SH 5817 5092 to 5806 5098	Cae'r Gors Mbr. Lower Cwm Eig.
Section J2:	SH 5980 5226 to 5967 5240	Cae'r Gors Mbr.
Section J3:	SH	Upper Cwm Eigiau Fm.
Section J4:	SH	Upper Cwm Eigiau Fm.

AREA L: MOEL HEBOG

Section L1:	SH 5706 4733 to 5673 4734	Hebog Mbr.
Section L2:	SH 5708 4662 to 5683 4686	Hebog Mbr.
Section L3:	SH 5616 4567 to 5610 4572	Cwmystradllyn Mbr.
Section L4:	SH 5528 4622 to 5530 4622	Upper Cwm Eigiau Fm.
Section L5:	SH 5725 4590 to 5787 4618	Prenteg Fm.

AREA M: MOEL DDU

Section M1:	SH 5861 4440 to 5876 4447	Upper Moel Ddu Mbr.
Section M2:	SH 5891 4437 to 5878 4432	Lower/Upper Moel DDu Fms.
Section M3:	SH 5924 4370 to 5883 4396	Lower/Upper Moel DDu Fms.

AREA P: DOLWYDDELAN

Sections P1 to P3:	SH 6830 4970 to 6831 5050	complete sequence

AREA S: TAL-Y-FAN

Section S2:	SH 7220 7259 to 7224 7248	Tryfan Fm.
Section S4:	SH 7283 7306 to 7312 7290	Lower/ Upper Cwm Eigiau Fms.

AREA T: LLYN DULYN

Section T1:	SH 6983 6625 to 6993 6620	Tryfan Fm:

AREA U: OGWEN COTTAGE

Section U1:	SH 6350 5964 to 6350 5956	Lower Cwm Eigiau Fm.
Section U2	SH 6358 5947 to 6357 5941	Upper Cwm Eigiau Fm.
Section U3:	SH 6397 5975 to 6396 5967	Lower Cwm Eigiau Fm.
Section U4:	SH 6480 6093 to 6493 6043	Lower/ Upper Cwm EIgiau Fm.
Section U5:	SH 6500 6127 to 6525 6170	CCVF and Lower Cwm Eigiau Fm.
Section U6:	SH 6504 6223 to 6514 6222	Tryfan Fm.
Section U7:	SH	Tryfan Fm./Lower Cwm Eigiau.

AREA V: NANTMOR

Section V1:	SH 6372 4924 to 6385 4913	Lower Cwm Eigiau Fm.
Section V2:	SH 6378 4907 to 6387 4902	Lower Cwm Eigiau Fm.
Section V3:	SH 6393 4904 to 6427 4885	Pitts Head tuff/ Upper Cwm Eig

APPENDIX 1.1

PREPARATION AND ANALYSIS OF PELLETS AND BEADS FOR XRF

A. SAMPLE PREPARATION

Samples of approximately 2kg weight were collected in the field from a wide variety of locations. Samples were cut using the horizontal rock saw into a series of ca. 5mm thick slabs. Weathered edges, which often reached 2cm in thickness, were then removed using the vertical rock saw. Any obvious fractures, which usually contained calcite, were also eliminated by separating slabs into numerous fragments along these lines of weakness. All edges of resulting pieces were ground to remove any possible contamination by saw blades. Samples were then cleaned in an ultrasonic bath for 2 periods of 20 minutes, to remove all "grunge" trapped within pores. They were then dried at 80°C for 12-24 hours to ensure that powders produced would not stick together.

B. PREPARATION OF XRF PELLETS

Approximately 10 grams of powder were mixed with 1 ml. of MOVIOL solution in an agate crucible. When desired texture was obtained, mixture was placed in stainless steel mould and pressed at ca. 3 kilobars for approximately 5 seconds. Pellets were removed from mould and dried overnight at 80°C before processing.

C. PREPARATION OF XRF FUSION BEADS

The flux used for the fusion beads was $Li_2B_4O_7$ (Johnson Matthey Spectroflux 100) and was dried at 600°C for over 4 hours within Ni crucibles and then cooled to room temperature and stored in a dessicator.

Approximately 2gms. of sample powders were ignited at 1000°C for 2-24 hours in porcelain crucibles; upon removal from the furnace, they were allowed to cool within a dessicator for at least 2 hours to room temperature before proceeding further.

Five(5.0000) gms of dried flux was weighed accurately into a ZGS Pt/Au alloy crucible. Exactly one(1.0000) gram of ignited rock powder was then added to the top of the flux. The two components were completely mixed using a PTFE rod.

The crucible was placed in a furnace at 1225°C until the mixture melted. It was removed and swirled several(3 to 4) times until a homogenous melt resulted. The furnace was allowed to regain its full temperature before removing the crucible the last time.

Melt was removed from furnace and poured into heated casting mould. The mould was removed from furnace and placed over an air jet to cool bead as fast as possible. Beads were then tipped onto tissues and labeled.

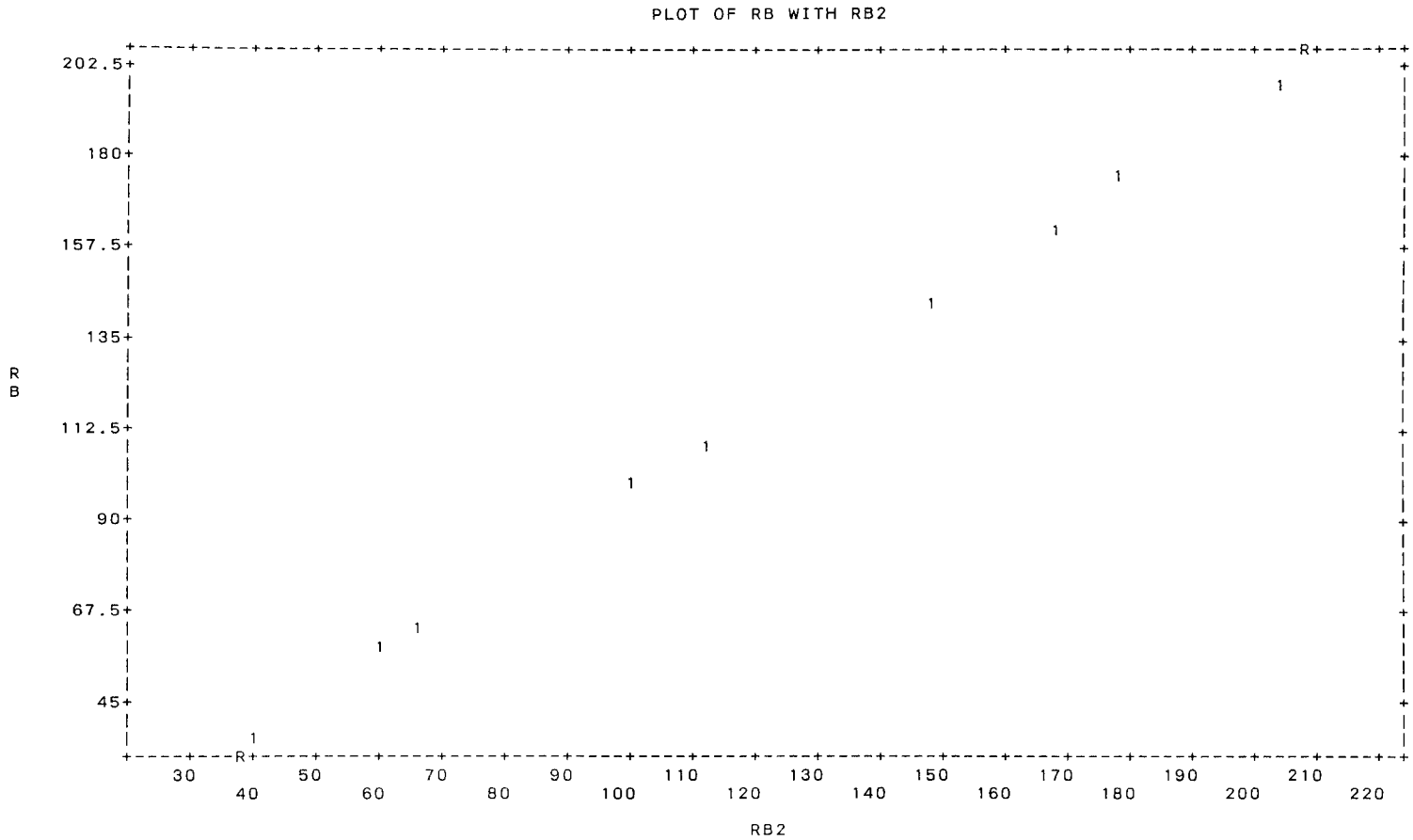
Crucibles were completely cleaned using hot 50% HCl and rinsed with water between samples to avoid cross-contamination.

APPENDIX 1.2

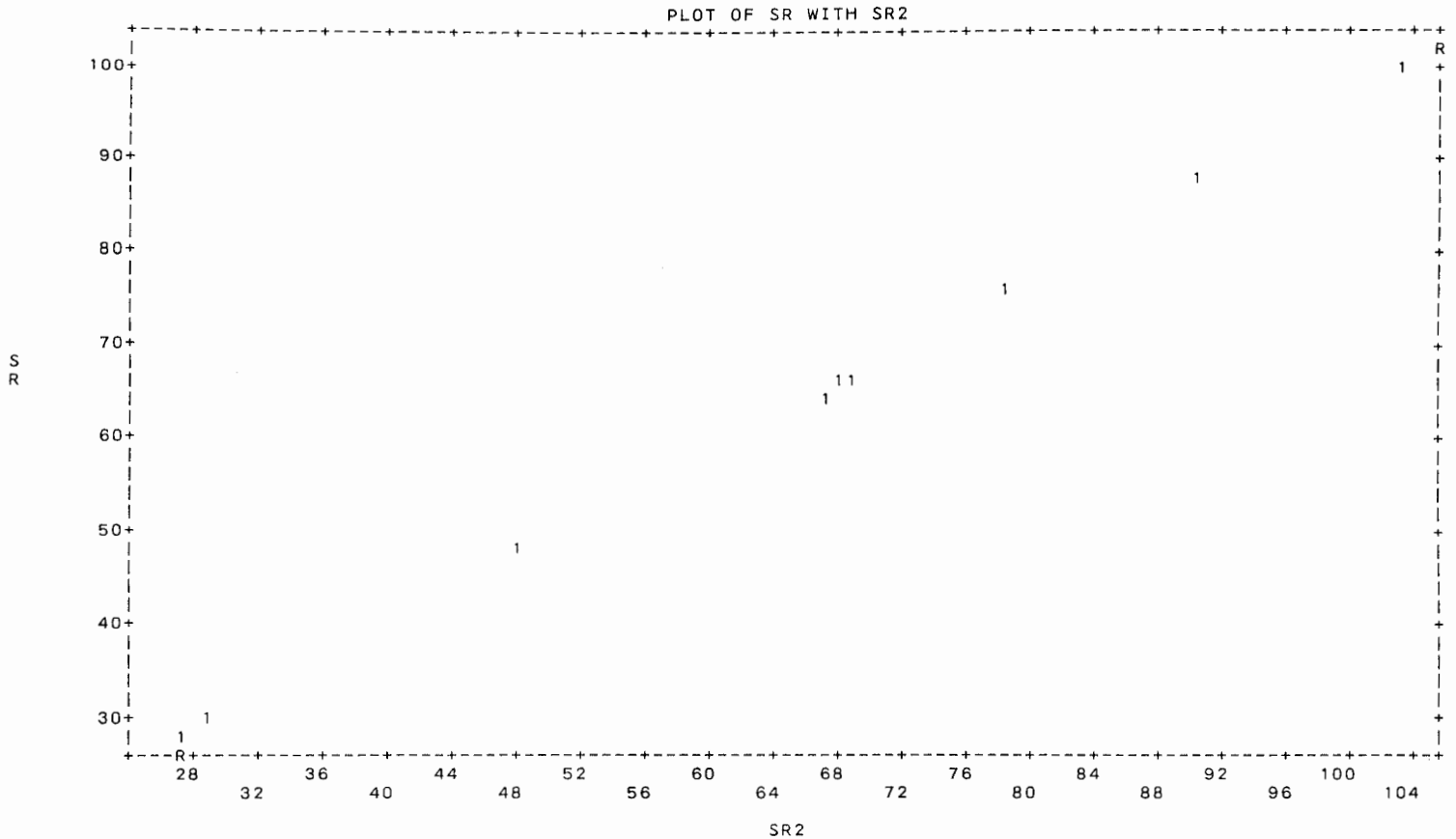
COMPARISON OF TRACE ELEMENT CONCENTRATIONS FOR SAMPLES ANALYSED BY BOTH THE OXFORD UNIVERSITY and BGS NOTTINGHAM LABS

SECOND ANALYSIS (B) IS BGS ANALYSIS

SAMPLE	RB	SR	Y	ZR	NB	PB	ZN	CU	NI	CO	CR	V	BA
KB660	173.30	30.10	28.60	238.00	19.20	9.10	63.50	6.90	2.60	1.40	6.80	8.10	1156.70
KB660b	178.00	29.00	31.00	237.00	23.00	8.00	54.00	12.00	.00	5.00	.00	12.00	1264.00
KB661	199.50	28.10	24.70	262.10	23.60	29.40	97.40	10.70	2.10	.40	9.90	9.40	998.30
KB661b	204.00	27.00	27.00	268.00	24.00	26.00	94.00	20.00	.00	.00	8.00	14.00	1135.00
TL32	142.80	65.40	49.70	297.90	23.70	10.90	42.60	7.80	1.60	-1.40	4.40	9.00	1682.50
TL32b	147.00	68.00	54.00	317.00	27.00	15.00	36.00	5.00	4.00	4.00	.00	9.00	1732.00
TL33	97.90	64.20	69.20	318.00	25.40	19.10	42.50	7.80	4.10	1.40	4.40	19.30	896.30
TL33b	100.00	67.00	76.00	336.00	30.00	19.00	32.00	4.00	5.00	7.00	7.00	19.00	947.00
TL34	106.20	47.00	40.20	244.20	16.70	21.40	29.30	5.50	.20	-3.10	6.80	6.30	985.00
TL34b	112.00	48.00	41.00	267.00	20.00	20.00	24.00	2.00	10.00	.00	3.00	3.00	1023.00
TL35	163.90	66.20	42.10	276.40	23.40	7.70	19.80	9.20	1.70	-2.40	4.80	8.30	1548.20
TL35b	167.00	69.00	49.00	297.00	27.00	10.00	3.00	8.00	4.00	3.00	.00	13.00	1509.00
TL60	58.00	76.50	55.60	320.50	24.90	11.20	42.40	7.30	.90	-2.20	6.80	8.10	546.40
TL60b	59.00	78.00	53.00	331.00	28.00	12.00	33.00	.00	.00	.00	5.00	8.00	584.00
TL61	64.40	87.20	51.70	269.20	22.10	12.90	56.30	11.60	1.70	-1.70	20.10	6.70	761.90
TL61b	66.00	90.00	49.00	411.00	24.00	11.00	54.00	5.00	2.00	.00	26.00	220.00	764.00
TL63	35.30	100.60	28.90	231.00	18.10	31.50	28.50	12.80	.40	-4.60	10.60	7.90	112.80
TL63b	39.00	103.00	31.00	145.00	21.00	29.00	95.00	3.00	.00	3.00	8.00	213.00	94.00

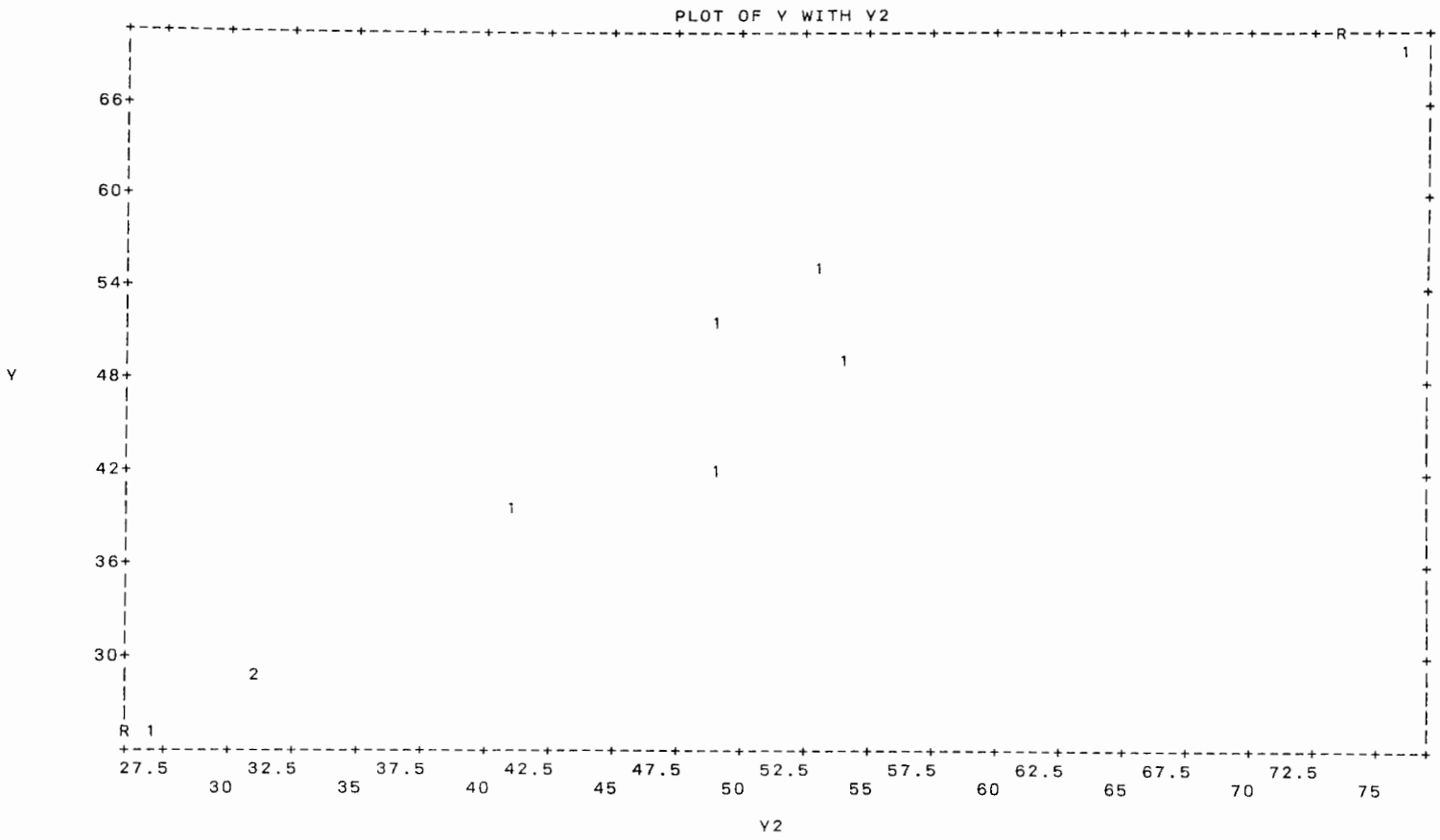


9 cases plotted. Regression statistics of RB on RB2:
Correlation .99973 R Squared .99946 S.E. of Est 1.42436 2-tailed Sig. .0000
Intercept(S.E.) -1.64078(1.13621) Slope(S.E.) .98514(.00867)



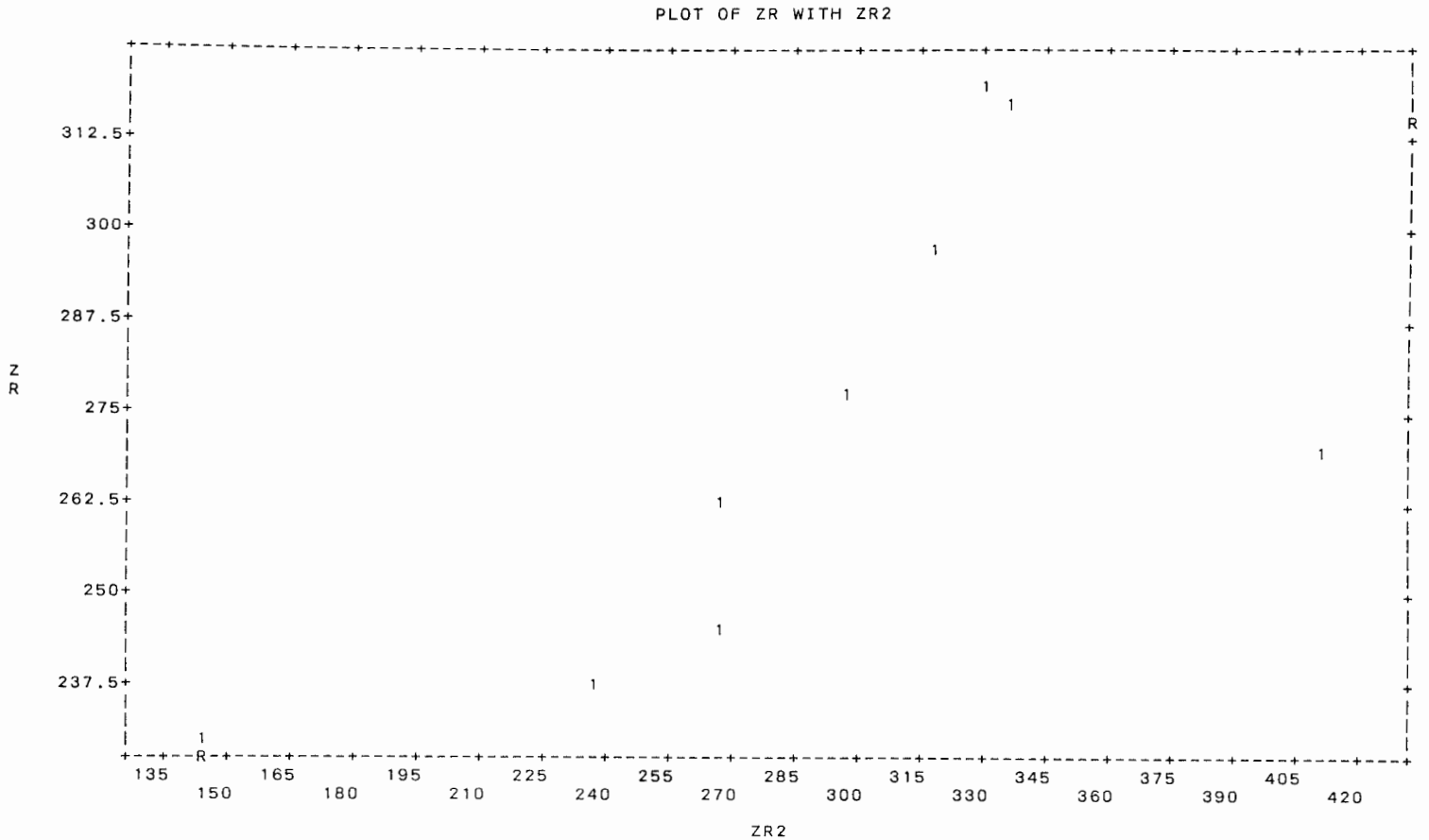
9 cases plotted. Regression statistics of SR on SR2:

Correlation	.99935	R Squared	.99870	S.E. of Est	.93838
2-tailed Sig.	.0000				
Intercept(S.E.)	1.86748(	.88686)	Slope(S.E.)	.94731(	.01290)

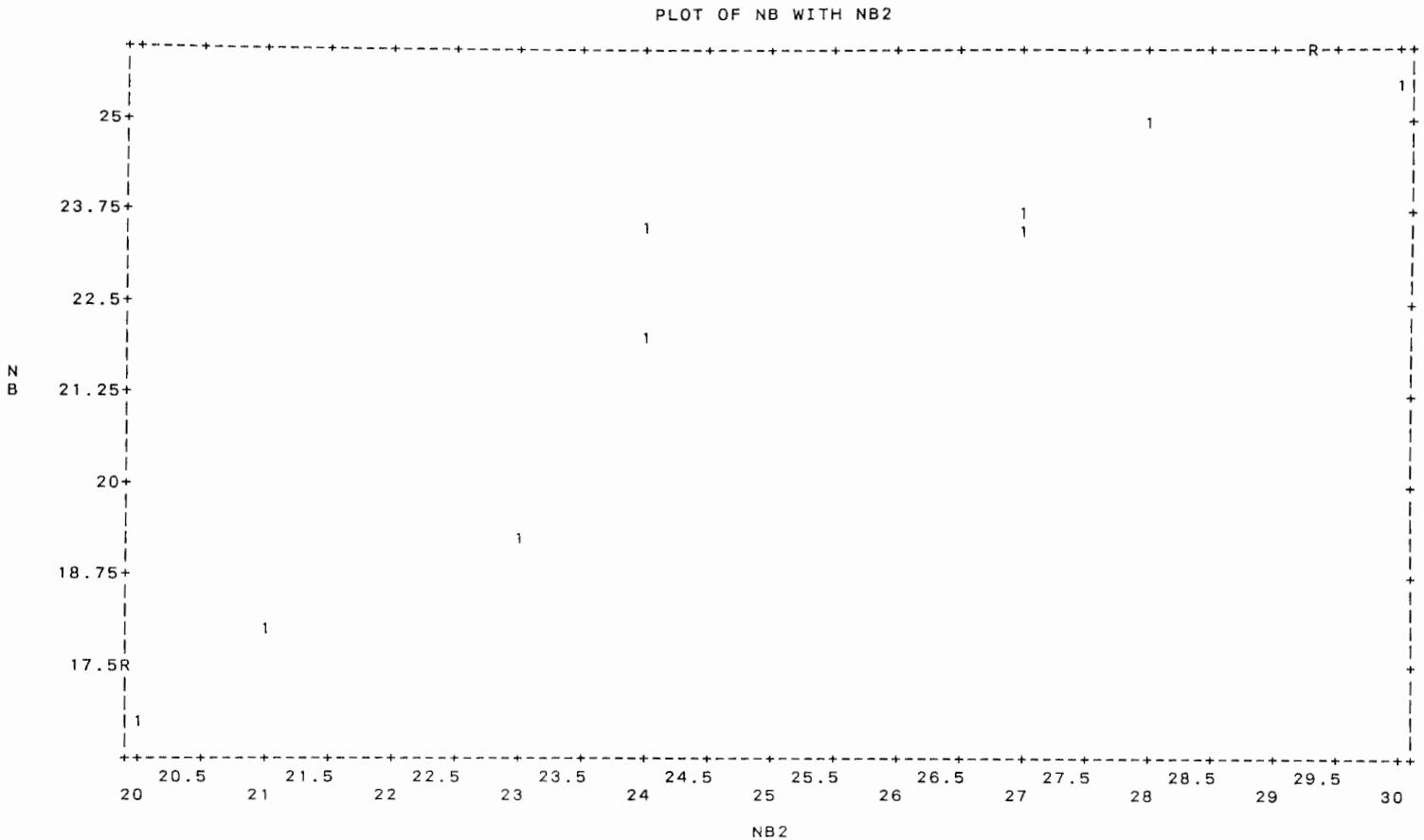


9 cases plotted. Regression statistics of Y on Y2:

Correlation	.97387	R Squared	.94842	S.E. of Est	3.55394
Intercept(S.E.)	.78807(3.93944)	Slope(S.E.)	.93335(.08227)	2-tailed Sig.	.0000

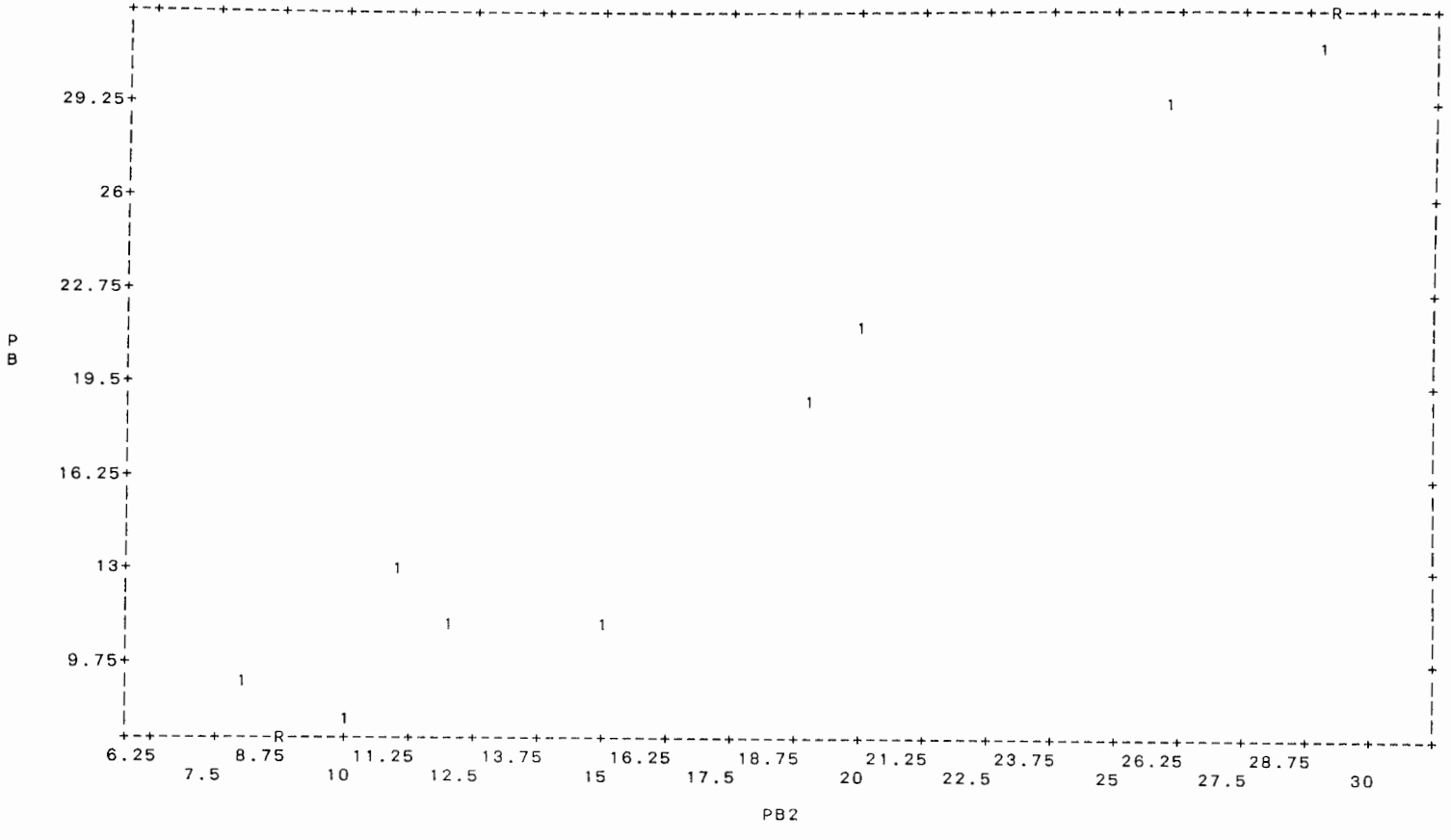


9 cases plotted. Regression statistics of ZR on ZR2:
Correlation .66289 R Squared .43942 S.E. of Est 26.64375 2-tailed Sig. .0517
Intercept(S.E.) 186.84189(37.85180) Slope(S.E.) .29733(.12693)



9 cases plotted. Regression statistics of NB on NB2:
Correlation .93172 R Squared .86811 S.E. of Est 1.21570 2-tailed Sig. .0003
Intercept(S.E.) .11600(3.23478) Slope(S.E.) .87525(.12894)

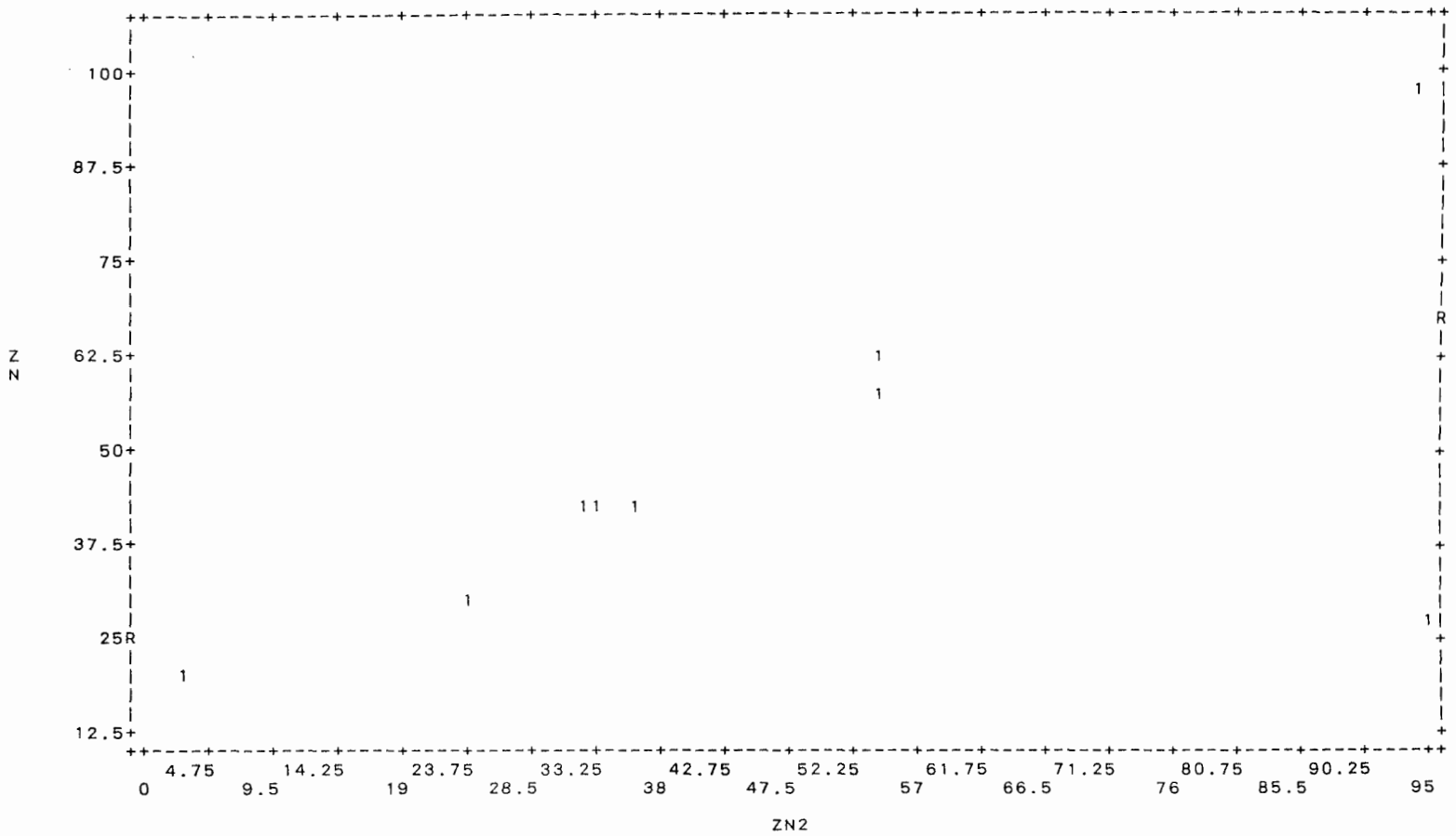
PLOT OF PB WITH PB2



9 cases plotted. Regression statistics of PB on PB2:

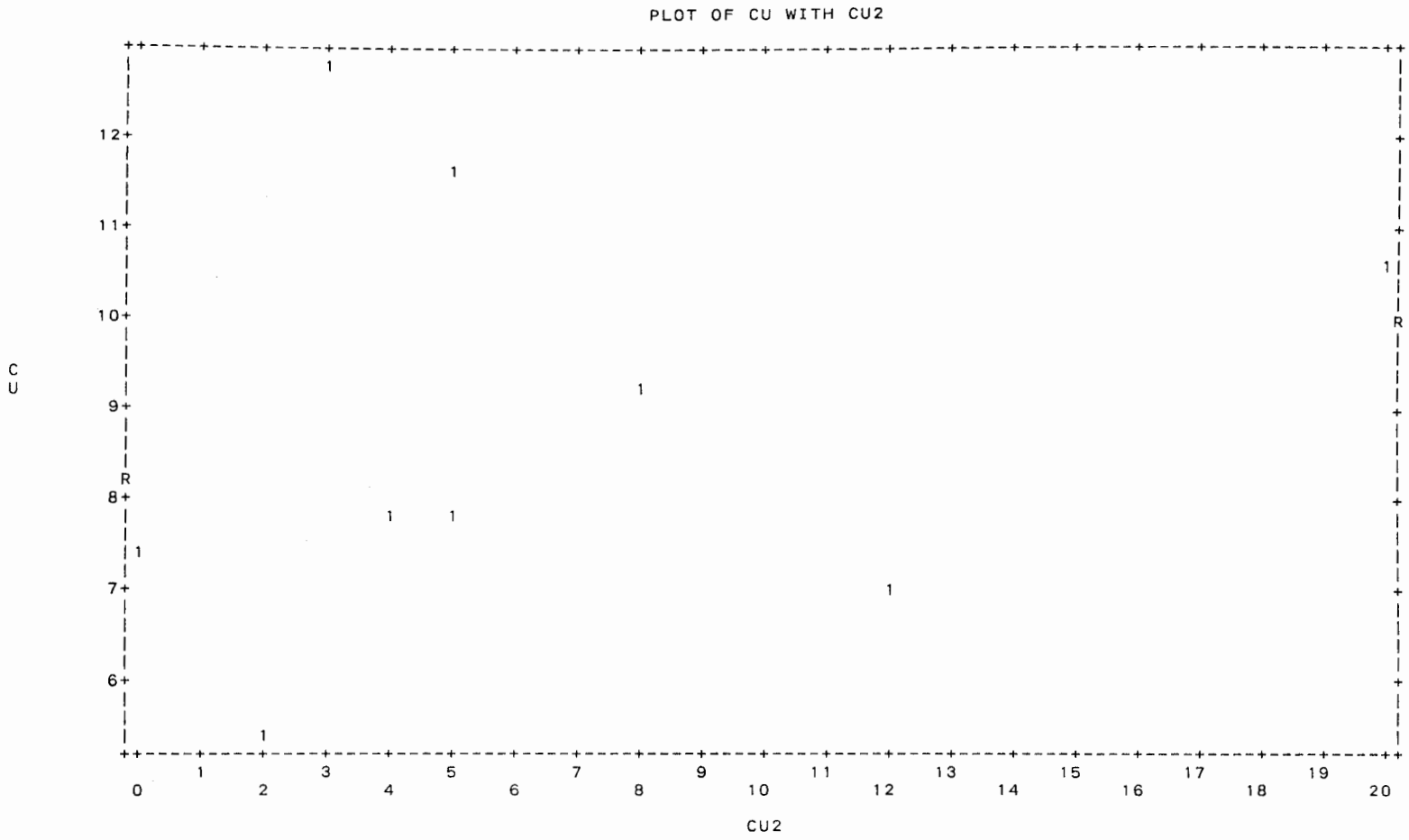
Correlation	.97252	R Squared	.94579	S.E. of Est	2.19883
Intercept(S.E.)	-2.46337(1.90946)	Slope(S.E.)	1.16914(.10579)	2-tailed Sig.	.0000

PLOT OF ZN WITH ZN2

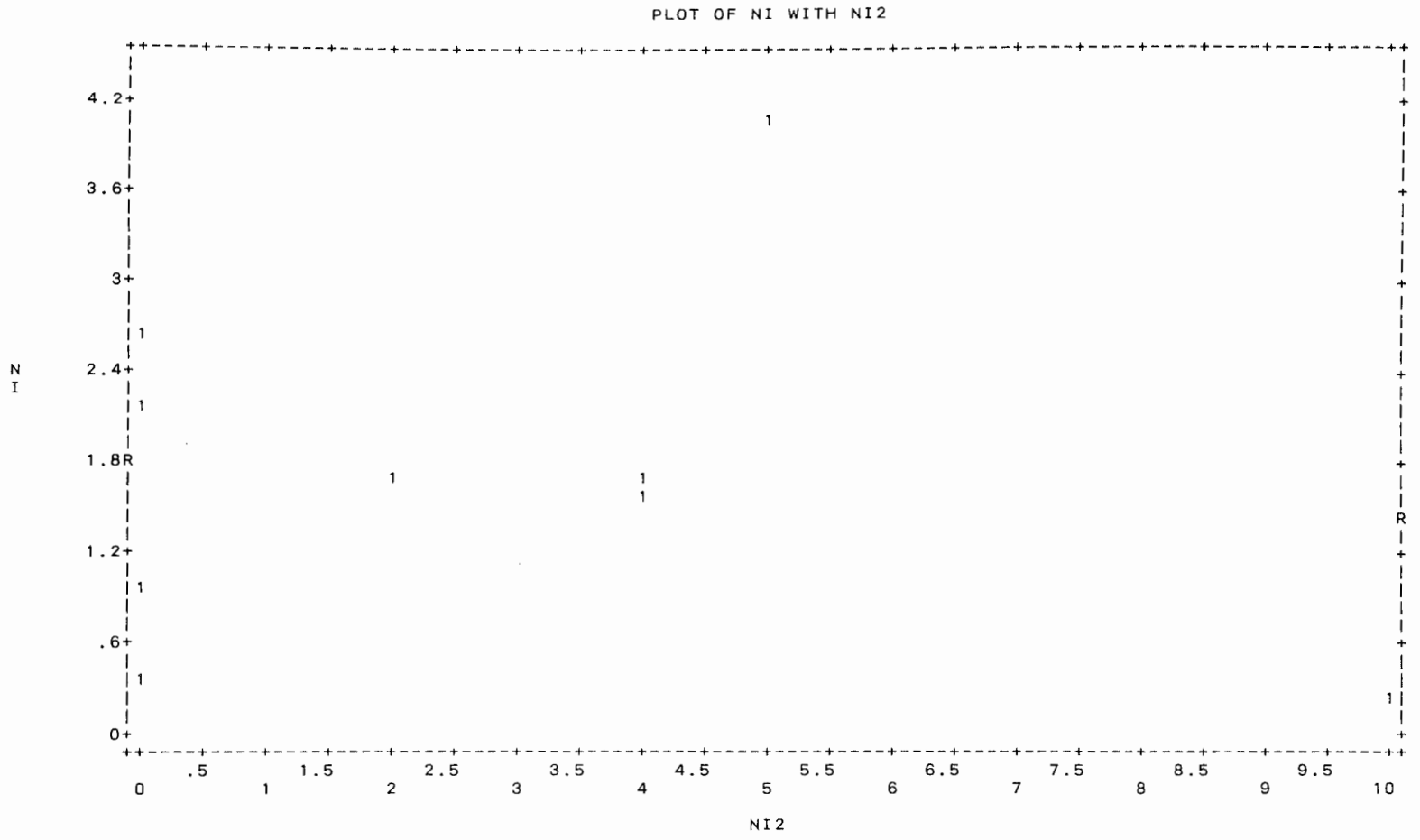


9 cases plotted. Regression statistics of ZN on ZN2:

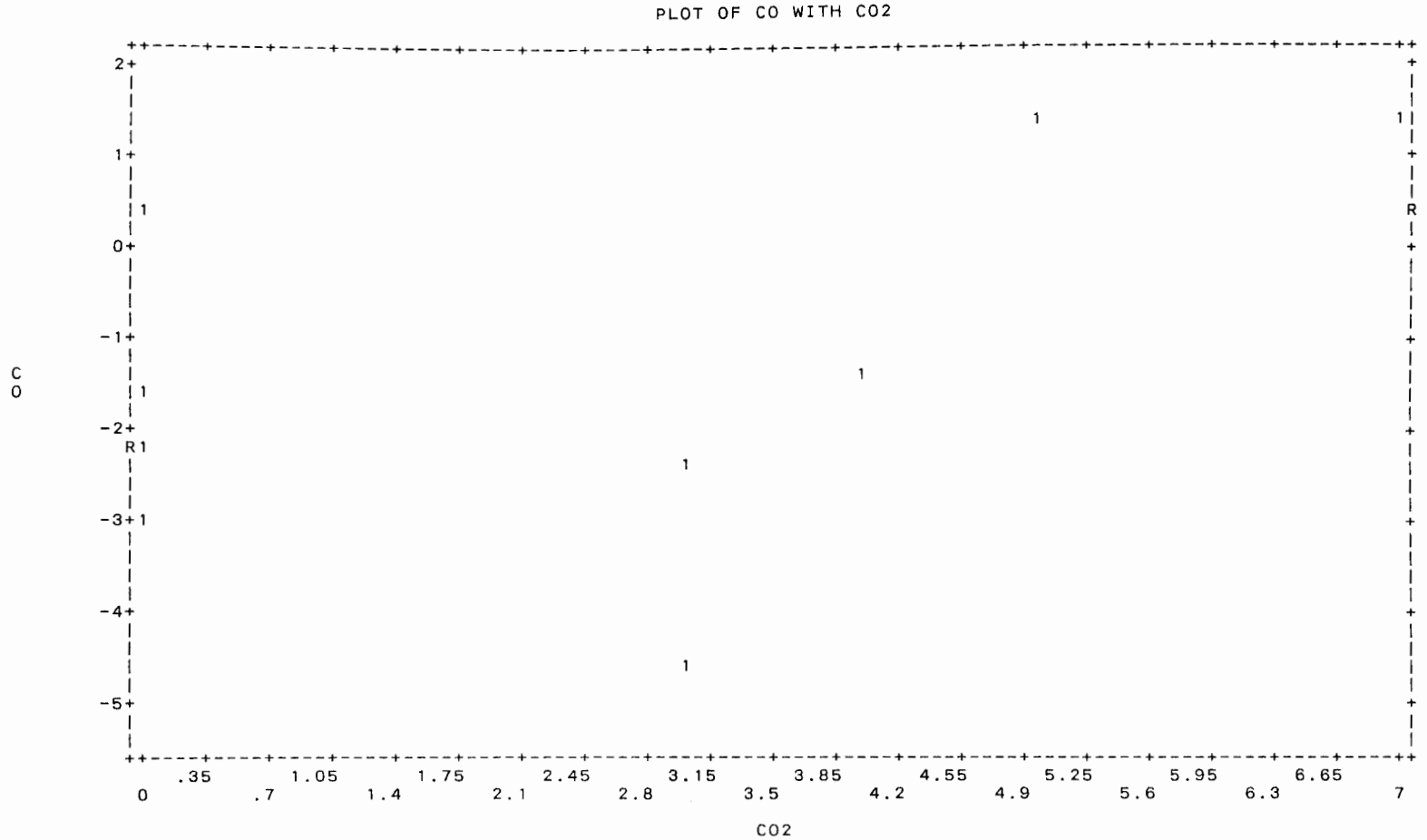
Correlation	.59825	R Squared	.35790	S.E. of Est	19.98688	2-tailed Sig.	.0888
Intercept(S.E.)	25.56153(12.70147)	Slope(S.E.)	.45234(.22900)		

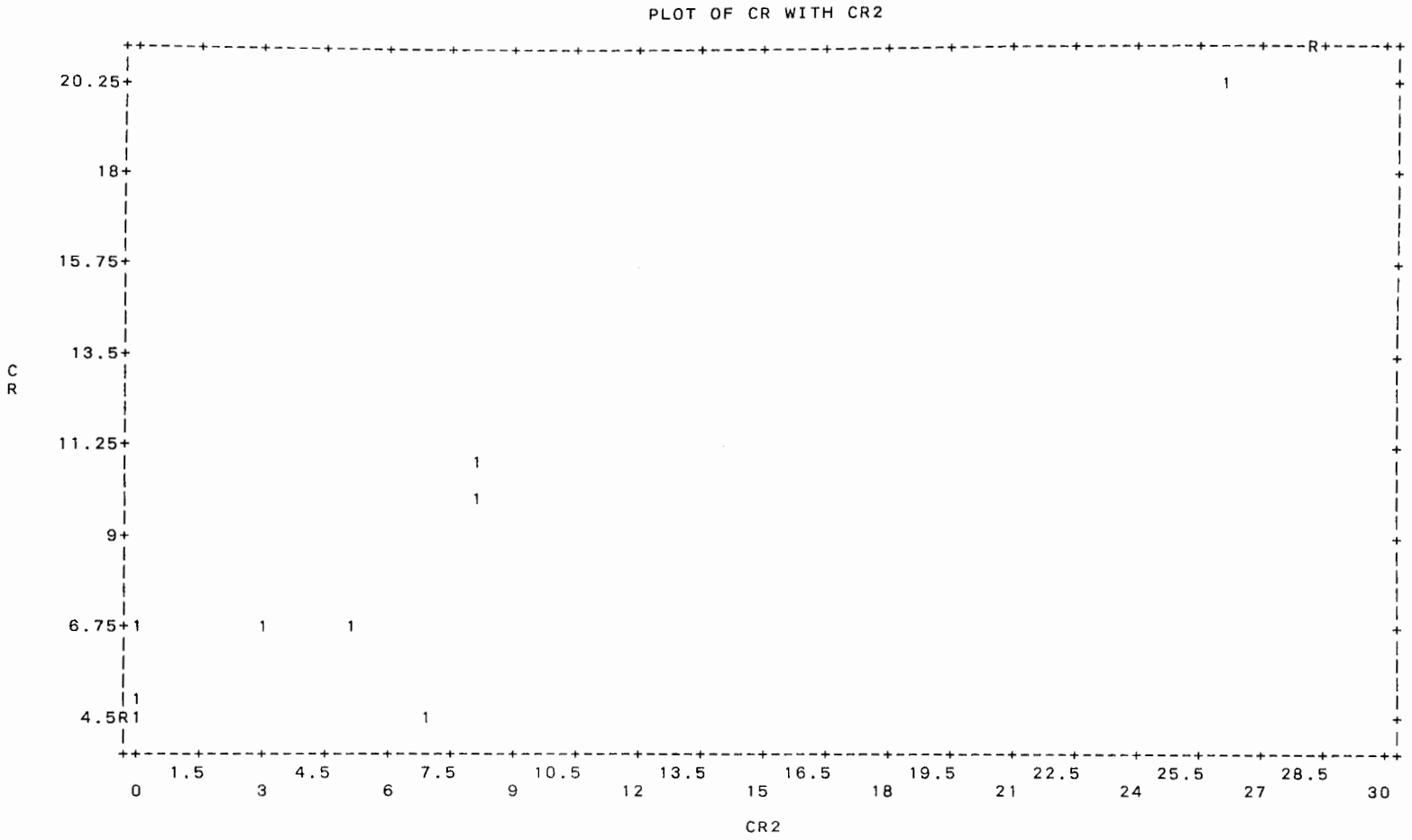


9 cases plotted. Regression statistics of CU on CU2:
Correlation .22193 R Squared .04925 S.E. of Est 2.50883 2-tailed Sig. .5660
Intercept(S.E.) 8.27283(1.26505) Slope(S.E.) .08719(.14479)



9 cases plotted. Regression statistics of NI on NI2:
Correlation -.10561 R Squared .01115 S.E. of Est 1.26456 2-tailed Sig. .7868
Intercept(S.E.) 1.80316(.55897) Slope(S.E.) -.03714(.13216)

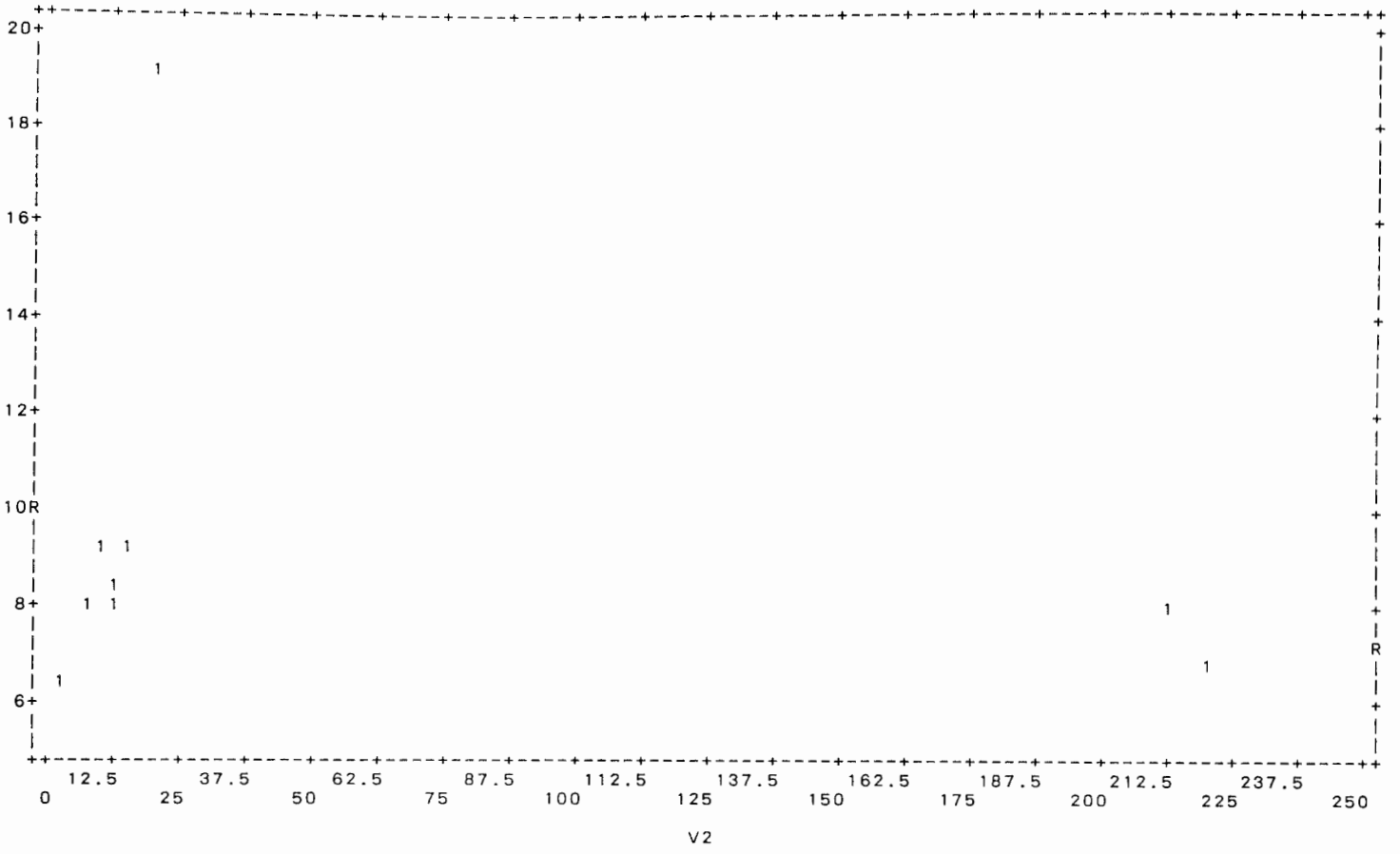

PLOT OF CO WITH CO2
2+
1+
0+
-1+
-2+
-3+
-4+
-5+
C
O
R
1
1
1



9 cases plotted. Regression statistics of CR on CR2:

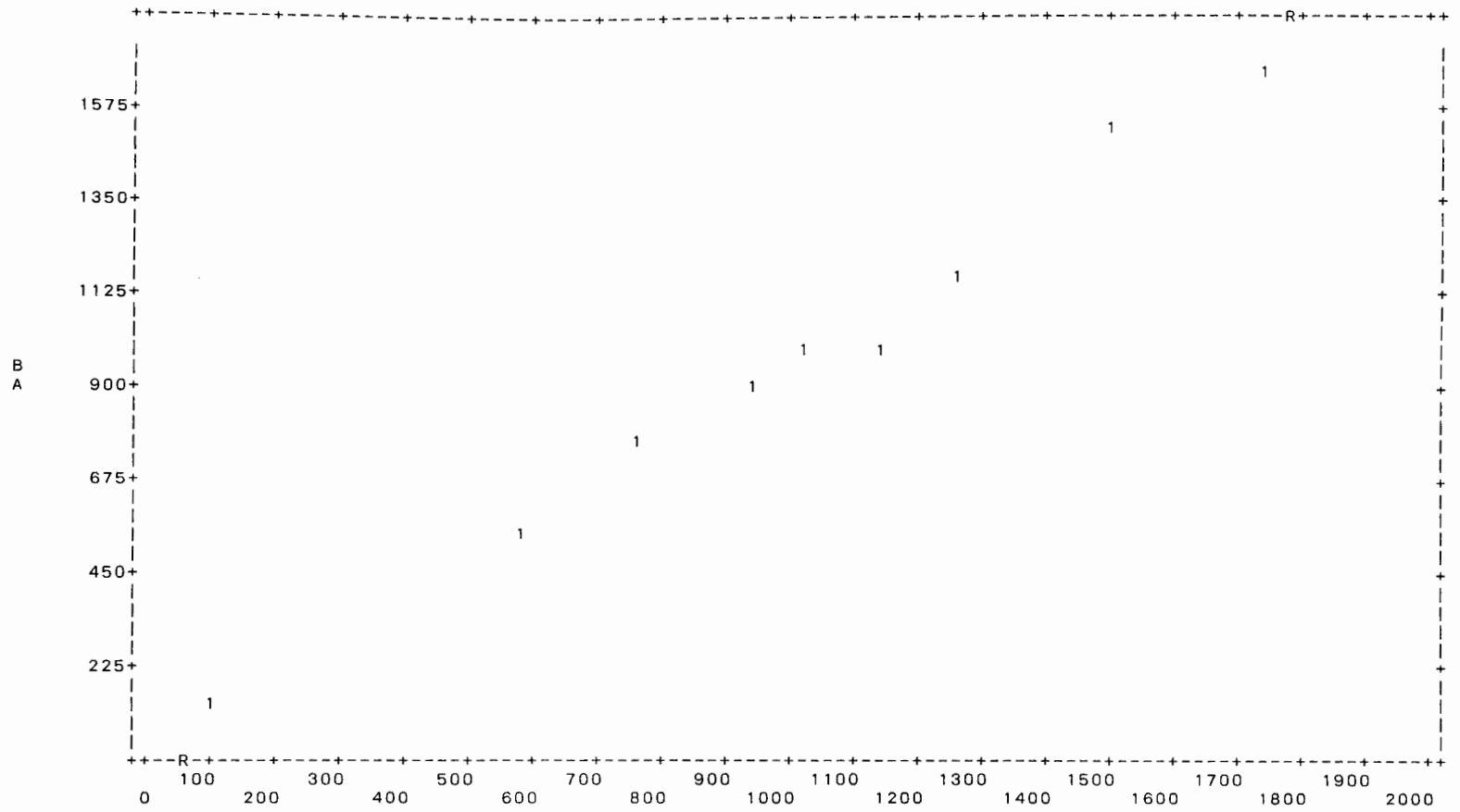
Correlation	.93105	R Squared	.86685	S.E. of Est	1.93338	2-tailed Sig.	.0003
Intercept(S.E.)	4.68475(| .83689)	Slope(S.E.)	.56907(| .08430)		

PLOT OF V WITH V2



9 cases plotted. Regression statistics of V on V2:

Correlation	-.24512	R Squared	.06009	S.E. of Est	4.04175
2-tailed Sig.	.5250				
Intercept(S.E.)	9.83187(1.61730)	Slope(S.E.)	-.01054(.01576)		



9 cases plotted. Regression statistics of BA on BA2:
Correlation .99362 R Squared .98729 S.E. of Est 57.81348 2-tailed Sig. .0000
Intercept(S.E.) -9.23143(46.02527) Slope(S.E.) .96898(.04156)

APPENDIX 1.3

LOCATION, STRATIGRAPHIC POSITION, CRYSTAL CONTENTS
and
MACROSCOPIC FEATURES OF ASH FLOW TUFFS

OBS	REGION	SAMPLE	LOCALITY	SECTION	GRID REF.	TUFF	POS.	CRYSTAL CONTENT	MACROSCOPIC FEATURES
1	1	G03	Llynnau Mymbyr		70625770	GARTH	+18	2%	no fp crystals, fine grained, Fe filled fractures
2	1	G037	Llynnau Mymbyr		69455597	GARTH	+3m	2%	fine-grained, visible feldspar/lithics, welded
3	1	G038	Llynnau Mymbyr		69455597	GARTH	+8m	3%	fine-grained, pithy, flattened pumice
4	1	G04	Llynnau Mymbyr		70625770	GARTH	+22m	3%	fine-grained, occ. rexll., a few fp crystals
5	1	G05	Llynnau Mymbyr		70625770	GARTH	+25m	2%	recrystallized, occ. fp crystal
6	1	G06	Llynnau Mymbyr		70625770	GARTH	+28m	2%	coarse-grained, extremely recystallized, Q, P, K xls
7	1	G07	Llynnau Mymbyr		70625770	GARTH	+32m	10%	medium-grained, occ. rhy. lithic, small fp. crystals
8	1	G08	Llynnau Mymbyr		70625770	GARTH	+36m	3%	medium-grained, feldspathic
9	1	G09	Llynnau Mymbyr		70625770	GARTH	+40m	5%	heterolithic
10	1	G01	Llynnau Mymbyr		70625770	GARTH	+10m	2%	coarse zones of recrystallization
				---					
11	2	G012	Llynnau Mymbyr	---	70575785	RACKS	+5m	2%	dark grey-green, microfractures, occ. k fp
12	2	G013	Llynnau Mymbyr	---	70575785	RACKS	+10m	3%	fine-grained, unwelded tuff
13	2	G014	Llynnau Mymbyr	---	70575785	RACKS	+15m	5%	occ. microfracture, slightly crystalline, fp. xl.
14	2	G015	Llynnau Mymbyr	---	70575785	RACKS	+20m	1%	medium-grained, unwelded, no fp xls.
15	2	G016	Llynnau Mymbyr	---	70575785	RACKS	+25m	2%	medium-grained, occ. green lithics
16	2	G017	Llynnau Mymbyr	---	70575785	RACKS	+30m	3%	altered, <1mm lithic fragments
17	2	G018	Llynnau Mymbyr	---	70575785	RACKS	+10m	2%	conchoidal fracture, 5mm feldspar crystals
18	2	G016r	Llynnau Mymbyr	---	70575785	RACKS	+25m	3%	heterolithic, varied tuff
19	3	X5	Gallt yr Ogof	---	68535880	3rd CCVF		5%	k feldspar crystals visible
20	3	X6	Gallt yr Ogof	---	68535880	3rd CCVF		5%	
21	4	X10	Gallt yr Ogof	---	SH688585	4th CCVF		15%	plagioclase/k feldspar crystals
22	4	X22	Gallt yr Ogof	---	68705875	4th CCVF		15%	
23	4	X7	Gallt yr Ogof	---	68705875	4th CCVF		15%	plagioclase rich
24	4	X8	Gallt yr Ogof	---	68705875	4th CCVF		15%	plagioclase rich
25	4	X9A	Gallt yr Ogof	---	68705875	4th CCVF	---		
26	4	X9B	Gallt yr Ogof	---	68705875	4th CCVF	---		

27	51	G072	Pont-y-Gromlech	---	63015652	PHT	+10m	0	fine-grained, parataxitic texture, no fp, xls.
28	51	G073	Pont-y-Gromlech	---	63015652	PHT	+12m	2%	parataxitic texture, microfractures
29	51	G074	Pont-y-Gromlech	---	63015652	PHT	+25m	?	fine-medium grained, parataxitic texture
30	51	G076	Pont-y-Gromlech	---	63015652	PHT	+30m	1%	microcrystalline, no fp. xl visible
31	51	G077	Pont-y-Gromlech	---	63015652	PHT	top	1%	airfall, medium-grey, heterolithic, 1.2mm fp. xls.
32	51	G077B	Pont-y-Gromlech	---	63015652	PHT	op	3%	airfall, as above
33	51	G078	Pont-y-Gromlech	---	63015652	PHT	top	0	airfall, cleaved grey-green silicic dust.
34	52	G056B	Gribin Ridge	---	65255892	PHT	BOT	15%	chloritic, airfall, with fp xls.
35	52	G057	Gribin Ridge	---	65255892	PHT	BOT	15%	fine grained, chloritic, with fp crystals
36	52	G058P	Gribin Ridge	---	65255892	PHT	+1m	10%	chloritic, fine-grained, fp and pumice rich
37	52	G059	Gribin Ridge	---	65255892	PHT	+3m	7%	heterolitic, feldspar crystals
38	52	G060	Gribin Ridge	---	65255892	PHT	+8m	5%	feldspathic, pumiceous
39	52	G061	Gribin Ridge	---	65255892	PHT	+10m	2%	yellow-cream weathering, Fe filled fractures
40	52	G062	Gribin Ridge	---	65255892	PHT	+12m	3%	fine-grained, chloritic, feldspathic
41	52	G064	Gribin Ridge	---	65255892	PHT	+20m	3%	with cholritic pumice
42	52	G065	Gribin Ridge	---	65255892	PHT	+25m	3%	occ. chloritic pumice, microfractures
43	52	G066	Gribin Ridge	---	65255892	PHT	+29m	5%	fine grained, common feldspar crystals
44	52	G068	Gribin Ridge	---	65255892	PHT	+35m	4%	occ. recrystallized zone, flattened pumice
45	52	G069	Gribin Ridge	---	65255892	PHT	+38m	5%	occ. fp crystals
46	52	G070	Gribin Ridge	---	65255892	PHT	+39m	?	pithy Fe rich altered zones, occ, crystal

OBS	REGION	SAMPLE	LOCALITY	SECTION	GRID REF.	TUFF	POS.	CRYSTAL CONTENT	MACROSCOPIC FEATURES
47	53	GO79	Llyn Idwal	---	64105969	PHT	+5m	0%	coarse-grained, heterolithic, Fe patches.
48	53	GO80	Llyn Idwal	---	64105969	PHT	+9m	5%	occ. flattened pumice
49	53	GO81	Llyn Idwal	---	64105969	PHT	+15m	3%	fractured, thick (1.5cm) weathered margin
50	53	GO82	Llyn Idwal	---	64105969	PHT	+25m	2%	feldspar crystals, lithic fragments
51	53	GO83	Llyn Idwal	---	64105969	PHT	+30m	5%	fine-grained, unfractured, vis. fp. xls.
52	53	GO84	Ogwen Cottage	---	65016057	PHT	+25m	3%	feldspar crystals, good eutaxitic foliation
53	53	GO85	Ogwen Cottage	---	65016057	PHT	+15m	5%	fractured, visible feldspar crystals.
54	54	KB660	Cwm Ystradllyn	---	SH560457	PHT			
55	54	KB661	Cwm Ystradllyn	---	SH560457	PHT			
56	55	TL32	Pont-y-Gromlech	---	63015652	PHT			
57	55	TL33	Pont-y-Gromlech	---	63015652	PHT			
58	55	TL34	Pont-y-Gromlech	---	63015652	PHT			
59	55	TL35	Pont-y-Gromlech	---	63015652	PHT			
60	56	TL60	Ogwen Cottage	---	65016057	PHT			
61	56	TL61	Ogwen Cottage	---	65016057	PHT			
62	56	TL63	Ogwen Cottage	---	65016057	PHT			
63	101	GO56RO	Rolwyd	---	76445086	Lledr	BOT	2%	yellow/white bleached, recrystallized
64	101	GO58RO	Rolwyd	---	76445086	Valley	BOT	2%	yellow/white bleached, recrystallized
65	102	GO90	Nantmor Valley	V3 26.7m	63844906	Nantmor 1	+10m	1%	extremely fine-grained, 2cm alteration margin
66	102	GO91	Nantmor Valley	V3 26.7m	63844906	Nantmor 1	----	1%	small microfractures, dark grey.
67	102	GO9491	Nantmor Valley	V3 26.5m	63844906	Nantmor 1	----	0	small microfractures filled with Fe.
68	105	GO95	Carnedd Dafydd	top F7	65706305	? GARTH	+2m	1%	micro eutaxitic foliation
69	103	GO111	River Conwy	---	76615422	Lledr	----	?	
70	103	GO112	Lledr Valley	---	76615422	Valley	BOT	2%	small feldspar crystals
71	104	GOC2	Moel Ddu	M1 18.6m	58714443	Moel Ddu	----		
72	201	GO118	Lledr Valley	---	771054300	Lledr Val	----		
73	202	X17	Fynnon Lloer	f9 65 m	65736203	Fynnon 1	+3m	5%	numerous feldspar crystals
74	202	X18	Fynnon Lloer	F9 65m	65736203	Fynnon 1	+8m	5%	numerous feldspar crystals
75	203	X20	Fynnon Lloer	F9 65m	65736203	Fynnon 2	+3m	5%	
76	501	GO147	Llyn cym-y-fynno	L 13	65645638	?PHT	+	20%	extremely crystal rich, from base of multiple flow
77	501	GO148	Llyn cym-y-fynno	L13	65645638	?PHT	+	15%	common plagioclase crystals
78	501	X12	Llyn cym-y-fynno	L 13	65645638	?PHT	+	?	
79	501	X13	Llyn cym-y-fynno	L 13	65645638	?PHT	+	?	crystals of plagioclase, unwelded, apilite lithics
80	501	X14	Llyn cym-y-fynno	L 13	65645638	?PHT	+	25%	blotchy texture, common plagioclase crystals
81	501	X15	Llyn cym-y-fynno	L 13	65645638	?PHT	+		heterolithic, numerous mud. frag., part. welded
82	502	GO127	Penyrhelgi-du	top F2	69786312	F2	+		
83	502	X23	Penyrhelgi-du	top F2	69786312	F2	+		shards visible, slightly welded
84	502	X24	Penyrhelgi-du	top F2	69786312	F2	+		microcrystalline texture
85	502	X25	Penyrhelgi-du	top F2	69786312	F2	+		numerous shards visible, unwelded
86	502	X26	Penyrhelgi-du	top F2	69786312	F2	+		perlitic fracture, feldspar crystals
87	503	GO130	Bwlch Trimarchog	F3 69 m	70696273	F3	+	15%	heterolitic, common feldspar crystals
88	503	GO131	Bwlch Trimarchog	F3 69 m	70696273	F3	+	3%	
89	504	GO133	Bwlch Trimarchog	F4 28 m	70946265	F4	+2m	0	
90	504	GO134	Bwlch Trimarchog	F4 28 m	70946265	F4	+3m	0	white weathering vitric rich ash flow

OBS	REGION	SAMPLE	LOCALITY	SECTION	GRID REF.	TUFF	POS.	CRYSTAL CONTENT	MACROSCOPIC FEATURES
91	505	GO136	Bwlch Trimarchog	F5 56m	71056263	F5		2%	vitric rich ash flow tuff
92	505	GO137	Bwlch Trimarchog	F5 57 m	71056263	F5		0%	vitric rich ash flow tuff
93	505	GO138	Bwlch Trimarchog	F5 58m	71056263	F5		0%	vitric rich ash flow tuff
94	511	GO139	Llyn Colwyd	H1 24 m	71606131	Colwyd 1	+3m	0%	vitric rich volcaniclastic turbidite
95	511	GO140	Llyn Colwyd	H1 25 m	71606131	Colwyd 1	+7m	0%	vitric rich volcaniclastic turbidite
96	511	GO141	Llyn Colwyd	H1 26 m	71606131	Colwyd 1	+10m	0%	vitric rich volcaniclastic turbidite
97	512	GO142	Llyn Colwyd	H4 2m	71606131	Colwyd 2	base	2%	vitric rich massive ash flow
98	512	GO143	Llyn Colwyd	H4 3.5m	71606131	Colwyd 2		5%	small feldspar crystals
99	512	GO144	Llyn Colwyd	H4 5m	71606131	Colwyd 2		1%	streaky weathering texture
100	512	GO145	Llyn Colwyd	H4 6 m	71606131	Colwyd 2	---		
101	512	GO146	Llyn Colwyd	H4 6 m	71606131	Colwyd 2	---		
102	522	GO43	Capel Hill	G2 20m	72325832	G2	+5m	0	fine grained vitric rich turbidite
103	522	GO44	Capel Hill	G2 21m	72325832	G2	+8m	0	fine grained vitric rich turbidite
104	526	GO46	Capel Hill	G6 10m	72485831	G6	+1m	0	bedded vitric rich, minute fractures
105	526	GO47	Capel Hill	G6 10.5	72485831	G6	+2m	1%	fine grained, recrystallized
106	526	GO48	Capel Hill	G6 11m	72485831	G6	+3m	1%	recrystallized, 2cm wide altered margin
107	526	GO50	Capel Hill	G6 12m	72485831	G6	+2m	5%	microcrystalline, small fp. crystals, 2cm alt marg.
108	526	GO51	Capel Hill	G6 12 m	72485831	G6	+3m	1%	fine grained, 5mm wide altered margin
109	526	GO51A	Capel Hill	G6 12 m	72485831	G6	+3m	1%	fine grained, 5mm wide altered margin
110	526	GO52	Capel Hill	G6 12.5	72485831	G6	+4m	1%	mottled, 4cm bleached margin, pyrite inclusions
111	526	GO52A	Capel Hill	G6 13m	72485831	G6	+4m	1%	mottled, 4cm bleached margin, pyrite inclusions
112	526	GO54	Capel Hill	G6 13 m	72485831	G6	+5m	0	microcrystalline, 3cm altered margin, brown piths
113	526	GO55	Capel Hill	G6 13 m	72485831	G6	+6m	0	dark mottled patches, 2cm altered margin
114	530	GO71	Gribin Ridge	D1	65175891	top PHT		75%	chloritic tuffite, numerous plag, quartz crystals.
115	531	GO87	Nantmor Valley	V2 13 m	64004910	Nantmor 2	+2m	5%	heterolithic, recrystallized, medium grained
116	531	GO88	Nantmor Valley	V2 14 m	64004910	Nantmor 2	+3m	3%	microcrystalline, occ. Fe filled fracture
117	531	GO89	Nantmor Valley	V2 15 m	64004910	Nantmor 2	+6m		medium grained tuffaceous sandstone
118	999	GO63	Gribin Ridge	D1 74m	65255892	sandstone			fine to medium sandstone dyke
119	5111	GO75	Pont-y-Gromlech	---	63015652	PHT	+25m	0	5mm altered margin, vitric-rich ash flow
120	5111	GO75B	Pont-y-Gromlech		63015652	PHT	+25m	0	5mm altered margin, vitric-rich ash flow
121	5111	GO75C	Pont-y-Gromlech		63015652	PHT	+25m	0	5mm altered margin, vitric-rich ash flow
122	5111	GO75D	Pont-y-Gromlech		63015652	PHT	+25m	0	5mm altered margin, vitric-rich ash flow
123	5111	GO75E	Pont-y-Gromlech		63015652	PHT	+25m	0	5mm altered margin, vitric-rich ash flow
124	9999	G-1	USGS STANDARD						

NOTE: position within ash flow visually estimated in field

NOTE: crystal contents estimated from hand specimens or thin sections.

APPENDIX 1.4
XRF ANALYSIS OF MAJOR ELEMENTS FROM TUFF/TUFFITE SAMPLES
(concentrations given in percent)

SAMPLE	REGION	SIO2	TIO2	AL2O3	CR2O3	FE2O3	MNO	MGO	CAO	NA2O	K2O	P2O5	TOTAL
G03	1.00	71.51	.16	11.83	.00	2.18	.06	.13	.15	1.79	6.43	.10	94.35
G04	1.00	81.11	.16	12.27	.00	2.55	.08	.12	.16	1.53	6.33	.11	104.42
G05	1.00	79.36	.21	12.85	.00	1.76	.04	.20	.14	.75	6.84	.11	102.26
G07	1.00	73.84	.23	12.64	.00	2.82	.12	.20	.69	1.76	6.99	.14	99.43
G08	1.00	72.02	.20	12.12	.00	2.77	.20	1.07	1.38	.46	5.23	.11	95.57
G09	1.00	70.49	.36	18.07	.00	5.13	.14	.83	.27	2.03	5.09	.17	102.59
G01	1.00	74.73	.16	12.65	.00	1.71	.16	.13	.91	1.83	6.80	.11	99.17
G03	1.00	74.24	.16	12.20	.00	1.60	.06	.09	.14	1.80	6.44	.10	96.86
G06	1.00	67.85	.22	13.15	.00	2.02	.11	.27	.39	1.18	6.14	.12	91.45
G012	2.00	72.71	.17	10.99	.00	3.25	.14	.23	.53	1.72	5.63	.11	95.48
G013	2.00	70.06	.17	11.28	.00	2.95	.18	.19	.97	1.19	6.23	.12	93.33
G014	2.00	72.37	.18	11.81	.00	2.15	.06	.22	.18	.99	5.45	.12	93.52
G015	2.00	78.66	.18	12.44	.00	2.75	.09	.19	.13	.16	7.92	.12	102.64
G016	2.00	79.01	.16	10.75	.00	2.76	.07	.25	.14	2.93	2.49	.11	98.68
G072	51.00	68.86	.22	11.37	.00	1.83	.06	.61	.28	3.33	4.07	.03	90.66
G073	51.00	69.95	.24	12.95	.00	2.43	.08	.69	.14	2.75	5.34	.03	94.60
G074	51.00	78.15	.20	10.20	.00	1.97	.06	.43	.18	1.66	5.66	.03	98.54
G075	51.00	71.35	.29	13.57	.00	1.90	.06	.52	.17	1.69	7.37	.03	96.96
G076	51.00	79.12	.22	11.15	.00	2.11	.08	.90	1.02	1.03	3.71	.02	99.34
G077	51.00	59.48	.28	13.03	.00	3.52	.13	1.93	.26	1.24	4.49	.03	84.38
G059	52.00	68.36	.18	10.58	.00	1.75	.05	.34	.22	5.09	1.03	.02	87.62
G060	52.00	78.03	.22	11.76	.00	1.90	.05	.26	.16	5.63	1.22	.02	99.25
G061	52.00	77.08	.28	14.07	.00	2.58	.07	.56	.47	4.21	2.85	.03	102.19
G062	52.00	73.01	.27	13.21	.00	2.89	.21	.96	2.77	.50	5.00	.03	98.84
G064	52.00	76.90	.22	10.49	.00	2.02	.06	.26	.08	4.73	2.07	.02	96.85
G066	52.00	69.16	.19	17.04	.00	2.30	.05	.30	.30	4.43	2.28	.02	96.07
G068	52.00	75.01	.22	10.70	.00	1.94	.04	.23	.17	3.94	3.05	.02	95.33
G069	52.00	73.37	.24	12.40	.00	2.33	.05	.25	.47	5.11	2.82	.03	97.07
G070	52.00	74.24	.17	10.06	.00	1.77	.04	.19	.27	3.38	3.81	.02	93.95
G065	52.00	66.12	.25	14.40	.00	2.38	.42	.80	7.11	.47	7.42	.03	99.40

APPENDIX 1.5

REASONS FOR USE OF NORMALISED CONCENTRATIONS OF MAJOR ELEMENTS

Although total percentages for the test basalt analyzed (Appendix 1.4: samples A11 A12 A13) are very close to 100 (*eg.* 99.99, 99.94, 100.65), analyses of rhyolitic rocks by the same technique, fall far short of 100 with the percent of total oxides often in the low 90's or high 80's. In an attempt to discover the source of this variation, and correct the experimental technique, 8 different portions of powder from sample G06, were analyzed with different times allowed for both ignition to remove volatiles at 1000°C and melting at 1225°C to prepare beads. Results from this analysis are presented below:

SAMPLE	IGNITION TIME (Hours)	MELTING TIME (minutes)	TOTAL PERCENT OXIDES
6A	2	15	100.83
6B	4	15	101.83
6C	5.5	15	98.45
6D	5.5	20	105.34
6G	17	15	100.40
6H	17	20	100.13
6E	24	15	97.73
6F	24	20	97.34

The lack of any systematic pattern to the total percent oxides and either ignition or melting time provided no clues as to the cause of different oxide totals. The variation was probably a function of loss of flux during melting (high totals), rehydration of glass after ignition but before weighing powders to fuse beads (low oxide totals), and a complex interaction between flux and major element cations during melting (low analyzed totals). Several other workers (*eg.* D. Bailey) have reported similar problems. It is encouraging that normalization of oxide percentages to total 100 percent, yields consistent oxide percentages for most elements for all G06 samples, as tabulated below:

SAMP.	SiO_2	TiO_2	Al_2O_3	FE_2O_3	MgO	CaO	Na_2O	K_2O	P_2O_5
6A	74.56	.23	14.18	2.70	.29	.40	1.22	6.19	.13
6B	74.38	.24	14.31	2.75	.27	.41	1.16	6.25	.13
6C	74.33	.23	14.26	2.74	.25	.42	1.19	6.33	.13
6D	74.91	.23	14.29	2.66	.27	.38	1.13	5.91	.12
6E	73.90	.24	14.15	2.75	.12	.41	1.67	6.36	.12
6F	74.23	.24	14.27	2.76	.11	.42	1.23	6.31	.13
6G	74.41	.24	14.17	2.69	.12	.40	1.41	6.17	.13
6H	74.65	.23	14.18	2.71	.24	.40	1.18	6.16	.13
mean	74.42	.23	14.23	2.72	.27	.40	1.27	6.21	.13
std dev.	0.30	.004	0.06	0.037	.016	.014	0.18	0.14	.014

Normalised oxide percentages (Appendix 2.5) thus appear to provide a good representation of sample chemistry, and will be used in all statistical calculations involving major elements.

APPENDIX 1.6
XRF ANALYSIS OF MAJOR ELEMENTS FROM TUFF/TUFFITE SAMPLES
NORMALIZED TO 100 PERCENT
(concentrations given in percent)

SAMPLE	REGION	SIO2	TIO2	AL2O3	CR2O3	FE2O3	MNO	MGO	CAO	NA2O	K2O	P2O5	TOTAL
G03	1.00	75.79	.17	12.54	.00	2.31	.06	.14	.16	1.90	6.82	.11	100.00
G04	1.00	77.68	.15	11.75	.00	2.44	.08	.11	.15	1.47	6.06	.11	100.00
G05	1.00	77.61	.21	12.57	.00	1.72	.04	.20	.14	.73	6.69	.11	100.00
G07	1.00	74.26	.23	12.71	.00	2.84	.12	.20	.69	1.77	7.03	.14	100.00
G08	1.00	75.36	.21	12.68	.00	2.90	.21	1.12	1.44	.48	5.47	.12	100.00
G09	1.00	68.71	.35	17.61	.00	5.00	.14	.81	.26	1.98	4.96	.17	100.00
G01	1.00	75.36	.16	12.76	.00	1.72	.16	.13	.92	1.85	6.86	.11	100.00
G03	1.00	76.65	.17	12.60	.00	1.65	.06	.09	.14	1.86	6.65	.10	100.00
G06	1.00	74.19	.24	14.38	.00	2.21	.12	.30	.43	1.29	6.71	.13	100.00
G012	2.00	76.15	.18	11.51	.00	3.40	.15	.24	.56	1.80	5.90	.12	100.00
G013	2.00	75.07	.18	12.09	.00	3.16	.19	.20	1.04	1.28	6.68	.13	100.00
G014	2.00	77.38	.19	12.63	.00	2.30	.06	.24	.19	1.06	5.83	.13	100.00
G015	2.00	76.64	.18	12.12	.00	2.68	.09	.19	.13	.16	7.72	.12	100.00
G016	2.00	80.07	.16	10.89	.00	2.80	.07	.25	.14	2.97	2.52	.11	100.00
G072	51.00	75.95	.24	12.54	.00	2.02	.07	.67	.31	3.67	4.49	.03	100.00
G073	51.00	73.94	.25	13.69	.00	2.57	.08	.73	.15	2.91	5.64	.03	100.00
G074	51.00	79.31	.20	10.35	.00	2.00	.06	.44	.18	1.68	5.74	.03	100.00
G075	51.00	73.59	.30	14.00	.00	1.96	.06	.54	.18	1.74	7.60	.03	100.00
G076	51.00	79.65	.22	11.22	.00	2.12	.08	.91	1.03	1.04	3.73	.02	100.00
G077	51.00	70.49	.33	15.44	.00	4.17	.15	2.29	.31	1.47	5.32	.04	100.00
G059	52.00	78.02	.21	12.07	.00	2.00	.06	.39	.25	5.81	1.18	.02	100.00
G060	52.00	78.62	.22	11.85	.00	1.91	.05	.26	.16	5.67	1.23	.02	100.00
G061	52.00	75.43	.27	13.77	.00	2.52	.07	.55	.46	4.12	2.79	.03	100.00
G062	52.00	73.87	.27	13.37	.00	2.92	.21	.97	2.80	.51	5.06	.03	100.00
G064	52.00	79.40	.23	10.83	.00	2.09	.06	.27	.08	4.88	2.14	.02	100.00
G066	52.00	71.99	.20	17.74	.00	2.39	.05	.31	.31	4.61	2.37	.02	100.00
G068	52.00	78.68	.23	11.22	.00	2.04	.04	.24	.18	4.13	3.20	.02	100.00
G069	52.00	75.58	.25	12.77	.00	2.40	.05	.26	.48	5.26	2.91	.03	100.00
G070	52.00	79.02	.18	10.71	.00	1.88	.04	.20	.29	3.60	4.06	.02	100.00
G065	52.00	66.52	.25	14.49	.00	2.39	.42	.80	7.15	.47	7.46	.03	100.00

APPENDIX 1.6 continued

XRF ANALYSIS OF MAJOR ELEMENTS FROM TUFF/TUFFITE SAMPLES
NORMALIZED TO 100 PERCENT
(concentrations given in percent)

SAMPLE	REGION	SIO2	TIO2	AL2O3	CR2O3	FE2O3	MNO	MGO	CAO	NA2O	K2O	P2O5	TOTAL
G090	102.00	78.34	.38	10.08	.01	6.20	.31	1.67	.10	.38	2.49	.06	100.00
G0118	201.00	79.93	.16	11.24	.00	2.39	.06	.32	.23	3.41	2.13	.13	100.00
G0147	501.00	68.72	.31	14.61	.00	4.42	.12	1.19	2.61	5.69	2.29	.03	100.00
G0131	503.00	83.34	.15	8.88	.00	2.18	.05	.45	.54	3.34	.93	.11	100.00
G0134	504.00	77.58	.21	14.17	.00	1.46	.03	.37	.35	5.51	.19	.13	100.00
G0136	505.00	81.09	.17	10.02	.00	3.10	.07	.57	.46	2.73	1.69	.10	100.00
G0137	505.00	78.93	.18	10.85	.00	3.37	.08	.56	.41	4.52	.99	.10	100.00
G0139	511.00	77.31	.21	12.41	.00	2.49	.09	.59	.50	4.67	1.57	.14	100.00
G0140	511.00	79.65	.17	10.80	.00	2.04	.03	.42	.38	4.43	1.97	.10	100.00
G0145	512.00	76.52	.16	12.28	.00	2.98	.08	.67	1.34	3.50	2.36	.10	100.00
G0146	512.00	80.05	.20	10.23	.00	2.45	.05	.43	1.33	4.18	.96	.12	100.00
G0143	512.00	79.55	.25	11.54	.00	2.06	.05	.49	.43	4.69	.80	.13	100.00
G043	522.00	75.83	.24	12.84	.00	3.48	.06	.63	.64	4.72	1.39	.15	100.00
G044	522.00	78.85	.13	8.48	.00	2.25	.16	.40	5.48	3.15	1.00	.10	100.00
G046	526.00	80.27	.19	9.91	.00	3.66	.06	.54	.35	4.32	.59	.09	100.00
G047	526.00	80.90	.15	10.65	.00	1.28	.02	.11	.35	6.28	.18	.10	100.00
G048	526.00	81.01	.16	10.54	.00	1.74	.03	.24	.41	5.19	.58	.09	100.00
G050	526.00	80.49	.18	10.85	.00	1.38	.02	.13	.60	5.93	.32	.10	100.00
G051	526.00	78.97	.15	11.62	.00	1.72	.03	.21	.37	6.49	.33	.10	100.00
G052A	526.00	78.99	.26	11.49	.00	2.13	.03	.27	.46	6.15	.10	.13	100.00
G054	526.00	80.67	.18	10.47	.00	1.67	.03	.19	.40	6.19	.09	.11	100.00
G071	530.00	59.78	1.36	15.42	.02	8.18	.15	5.11	3.40	3.74	2.64	.22	100.00
G063	999.00	74.46	.46	11.12	.01	5.78	.29	.95	1.50	3.16	2.15	.10	100.00
G06A	1000.00	74.56	.23	14.18	.00	2.70	.12	.29	.40	1.22	6.19	.13	100.00
G06B	1000.00	74.38	.24	14.31	.00	2.75	.12	.27	.41	1.16	6.25	.13	100.00
G06C	1000.00	74.33	.23	14.26	.00	2.74	.11	.25	.42	1.19	6.33	.12	100.00
G06D	1000.00	74.91	.23	14.29	.00	2.66	.11	.27	.38	1.13	5.91	.12	100.00
G06E	1000.00	73.90	.24	14.15	.00	2.75	.12	.27	.41	1.67	6.36	.12	100.00
G06F	1000.00	74.23	.24	14.27	.00	2.76	.11	.29	.42	1.23	6.31	.13	100.00
G06G	1000.00	74.41	.24	14.17	.00	2.69	.12	.26	.40	1.41	6.17	.13	100.00
G06H	1000.00	74.65	.23	14.18	.00	2.71	.11	.24	.40	1.18	6.16	.13	100.00
A11	9998.00	46.82	3.24	16.15	.00	15.05	.25	4.49	8.25	4.33	.91	.50	100.00
A12	9998.00	46.53	3.25	16.11	.00	15.14	.24	4.54	8.38	4.39	.92	.51	100.00
A13	9998.00	46.77	3.24	16.12	.00	15.11	.24	4.47	8.33	4.32	.89	.50	100.00
SAMPLE	REGION	SIO2	TIO2	AL2O3	CR2O3	FE2O3	MNO	MGO	CAO	NA2O	K2O	P2O5	TOTAL

APPENDIX 1.7
XRF ANALYSIS OF TRACE ELEMENTS
(concentrations in parts per million)

OBS	REGION	SAMPLE	RB	SR	Y	ZR	NB	PB	ZN	CU	NI	CO	CR	V	BA
1	1	G03	196.7	30.5	76.5	154.6	17.0	8.0	45.2	3.4	1.8	14.6	3.5	8.2	1297.3
2	1	G037	57.4	114.7	66.3	147.7	14.8	45.2	63.7	2.8	1.7	11.2	5.3	6.2	394.0
3	1	G038	53.9	106.7	63.6	155.0	16.2	37.3	56.2	2.9	0.8	11.5	4.4	4.6	363.0
4	1	G04	188.2	27.1	60.6	148.1	15.4	6.7	44.0	2.5	1.8	18.8	3.4	8.5	1297.6
5	1	G05	243.9	22.9	70.4	173.1	15.5	5.8	27.1	3.9	3.1	11.7	6.6	11.2	1333.7
6	1	G06	257.9	20.8	84.2	200.5	20.8	8.0	49.2	4.8	3.1	9.1	6.2	10.0	974.3
7	1	G07	200.8	39.8	70.2	164.2	16.0	5.4	72.7	1.3	5.3	16.8	12.3	16.4	1050.3
8	1	G08	244.7	18.0	72.8	159.8	16.5	8.7	60.8	4.7	3.3	5.9	7.7	11.2	704.9
9	1	G09	286.6	41.6	117.2	254.9	25.7	5.5	80.6	3.4	7.8	5.3	12.2	21.5	624.7
10	1	g01	196.4	31.5	73.4	151.2	15.1	5.2	32.2	2.6	1.9	16.0	3.6	7.0	1151.0
11	2	G012	142.0	86.2	75.2	201.3	17.9	4.7	122.8	6.9	1.7	15.3	4.1	7.1	1680.1
12	2	G013	166.1	102.1	79.2	205.8	19.7	8.6	55.0	6.4	2.6	12.8	2.1	9.1	2534.4
13	2	G014	197.2	56.4	85.8	215.1	19.9	73.7	399.2	2.9	1.7	10.3	3.2	9.6	1350.4
14	2	G015	212.4	87.6	76.0	209.9	20.0	134.5	114.8	2.8	2.1	16.2	3.5	8.6	2504.3
15	2	G016	84.7	50.2	63.1	185.6	15.6	12.5	72.3	9.9	0.8	16.2	5.4	8.4	686.0
16	2	G017	204.4	66.1	93.6	200.6	19.8	12.6	1546.9	5.2	3.3	14.7	6.7	10.3	2267.1
17	2	G018	194.0	96.0	77.8	207.0	19.8	103.3	185.5	7.7	1.2	15.0	4.8	8.8	2553.3
18	2	G016	85.0	50.6	62.5	187.2	15.6	13.0	72.2	11.5	1.2	13.2	4.2	8.3	701.0
19	3	X5	2.7	64.6	65.9	288.2	18.5	24.7	50.0	7.0	0.6	17.6	6.4	4.9	44.1
20	3	X6	102.7	70.9	80.4	438.7	22.2	9.6	67.7	5.4	3.4	17.1	7.0	12.7	1429.2
21	4	X10	126.2	136.3	62.4	314.6	20.7	19.1	45.6	12.0	5.4	9.0	13.9	19.7	332.2
22	4	X22	105.7	75.6	67.6	447.7	21.8	8.3	39.4	5.4	2.2	24.2	7.0	9.3	1263.1
23	4	X7	82.7	74.1	65.4	430.1	23.7	31.2	75.6	8.6	10.3	10.0	17.0	28.8	810.1
24	4	X8	27.8	39.3	76.2	382.4	20.8	9.5	55.1	8.7	7.3	16.4	17.3	23.3	329.9
25	4	X9A	98.2	62.6	72.6	338.6	20.5	21.3	67.8	12.2	8.0	13.0	23.9	31.6	709.5
26	4	X9B	143.1	64.9	93.6	344.0	22.7	19.2	137.0	10.0	7.7	8.3	15.5	25.0	1032.5
27	51	G072	105.8	60.2	62.1	277.8	22.4	3.4	25.7	3.2	1.8	14.8	4.1	9.8	604.1
28	51	G073	142.6	50.6	63.1	290.4	24.2	7.5	42.8	5.9	1.9	7.0	-0.1	11.7	1042.8
29	51	G074	105.9	45.0	40.0	224.3	18.3	7.5	26.7	2.9	0.8	13.7	3.4	7.7	966.4
30	51	G076	161.3	44.3	38.4	225.2	17.8	17.1	31.4	5.5	1.0	13.2	4.6	12.6	546.8
31	51	G077	203.0	27.5	43.0	314.0	22.1	6.8	79.2	3.0	4.1	6.9	4.7	28.9	620.0
32	51	G077B	188.7	32.4	45.5	307.4	23.1	4.8	66.5	1.9	2.8	5.7	6.0	29.2	597.8
33	51	G078	141.6	8.4	83.3	75.3	12.0	3.0	44.7	2.6	11.7	14.6	33.3	38.1	427.5
34	52	G056B	234.7	44.5	54.0	387.6	31.3	17.6	55.9	4.3	1.7	6.6	2.2	15.8	499.1
35	52	G057	136.6	45.0	47.2	209.0	17.8	19.4	57.1	8.3	1.3	3.8	2.6	9.6	301.6
36	52	G058P	143.9	22.9	44.4	231.6	18.9	13.0	66.3	4.0	0.9	7.9	4.1	9.0	306.4
37	52	G059	43.0	157.7	40.6	226.4	19.9	14.7	24.4	4.5	0.2	8.0	3.6	7.6	200.9
38	52	G060	24.0	137.9	43.9	251.0	20.6	16.4	35.1	3.3	0.3	14.8	4.3	8.1	283.8
39	52	G061	102.6	139.2	67.0	302.7	25.6	29.8	42.4	3.6	1.3	13.5	3.1	10.6	440.6
40	52	G062	206.8	50.6	60.9	288.4	23.7	57.7	50.8	2.5	2.9	4.0	4.5	11.0	490.2

OBS REGION SAMPLE RB SR Y ZR NB PB ZN CU NI CO CR V BA

APPENDIX 1.7 continued
XRF ANALYSIS OF TRACE ELEMENTS
(concentrations in parts per million)

OBS	REGION	SAMPLE	RB	SR	Y	ZR	NB	PB	ZN	CU	NI	CO	CR	V	BA
41	52	G064	38.7	62.8	35.9	262.7	19.1	10.8	29.8	6.2	0.7	14.9	4.5	9.1	298.5
42	52	G065	238.5	114.3	65.8	271.8	24.7	12.4	48.2	2.8	2.5	6.0	6.9	9.1	864.1
43	52	G066	63.1	78.9	51.8	279.6	20.9	13.1	71.8	2.9	0.4	11.1	2.2	9.3	388.4
44	52	G068	74.9	69.9	43.1	269.3	19.5	28.3	55.7	8.3	0.3	13.3	4.2	8.4	480.2
45	52	G069	56.1	69.4	50.0	307.8	22.9	15.7	55.4	2.3	0.9	19.5	3.9	9.3	445.4
46	52	G070	75.8	76.6	40.3	208.3	15.3	11.2	20.8	3.4	0.7	16.2	4.5	6.7	575.5
47	53	G079	97.2	35.3	54.7	309.9	23.3	10.7	31.6	3.9	1.3	9.2	4.2	11.5	520.8
48	53	G080	88.2	59.8	58.6	292.0	22.9	6.1	31.5	1.8	1.3	12.9	2.5	11.5	916.2
49	53	G081	85.6	78.5	45.9	247.2	19.6	5.2	23.3	2.1	0.2	10.8	7.1	8.9	618.1
50	53	G082	88.4	62.6	48.8	273.8	22.3	7.9	25.0	3.4	1.2	13.3	3.9	9.8	1108.6
51	53	G083	40.6	74.9	51.3	280.0	22.1	7.6	30.5	2.9	0.7	16.9	5.8	7.9	494.8
52	53	G084	69.4	73.0	53.9	290.8	23.8	18.0	57.7	3.0	0.9	14.1	5.9	8.3	783.6
53	53	G085	106.3	58.5	45.7	300.1	23.5	15.9	48.4	4.2	0.7	12.2	2.5	10.9	1116.1
54	54	KB660	173.3	30.1	28.6	238.0	19.2	9.1	63.5	6.9	2.6	1.4	6.8	8.1	1156.7
55	54	KB661	199.5	28.1	24.7	262.1	23.6	29.4	97.4	10.7	2.1	0.4	9.9	9.4	998.3
56	55	TL32	142.8	65.4	49.7	297.9	23.7	10.9	42.6	7.8	1.6	-1.4	4.4	9.0	1682.5
57	55	TL33	97.9	64.2	69.2	318.0	25.4	19.1	42.5	7.8	4.1	1.4	4.4	19.3	896.3
58	55	TL34	106.2	47.0	40.2	244.2	16.7	21.4	29.3	5.5	0.2	-3.1	6.8	6.3	985.0
59	55	TL35	163.9	66.2	42.1	276.4	23.4	7.7	19.8	9.2	1.7	-2.4	4.8	8.3	1548.2
60	56	TL60	58.0	76.5	55.6	320.5	24.9	11.2	42.4	7.3	0.9	-2.2	6.8	8.1	546.4
61	56	TL61	64.4	87.2	51.7	269.2	22.1	12.9	56.3	11.6	1.7	-1.7	20.1	6.7	761.9
62	56	TL63	35.3	100.6	28.9	231.0	18.1	31.5	28.5	12.8	0.4	-4.6	10.6	7.9	112.8
63	101	G056R0	34.3	119.3	80.8	176.1	22.6	11.9	35.6	3.9	1.1	10.5	3.5	7.4	257.7
64	101	G058R0	75.7	80.9	73.6	142.5	15.8	11.7	38.0	4.1	1.3	13.2	4.6	5.6	1126.4
65	102	G090	91.7	10.2	51.6	110.2	12.3	328.4	76.0	7.9	14.7	9.8	36.5	37.9	369.4
66	102	G091	129.4	16.5	28.6	189.2	16.4	160.6	85.4	4.9	19.4	7.1	41.5	49.8	502.7
67	102	G09491	99.7	19.9	29.4	192.8	13.1	96.7	80.2	4.4	16.6	15.3	29.3	39.7	391.8
68	105	G095	130.0	51.0	81.2	148.1	16.3	13.3	48.2	4.4	1.5	10.5	4.0	7.5	854.7
69	103	G0111	55.8	69.2	68.3	179.7	16.8	8.3	44.3	3.9	0.8	6.3	3.8	6.9	328.7
70	103	G0112	72.4	121.4	75.1	164.9	15.0	8.0	18.7	6.6	1.3	9.6	6.6	6.7	553.2
71	104	G0C2	109.5	9.8	32.9	84.1	10.6	62.1	177.6	7.1	22.6	18.0	40.4	42.4	374.1
72	201	G0118	57.0	63.7	73.0	181.0	16.3	14.1	76.8	3.1	0.9	8.6	4.1	6.9	214.5
73	202	X17	100.0	74.8	77.1	288.4	18.1	22.5	64.4	5.7	5.3	14.5	9.2	14.2	1056.6
74	202	X18	102.8	79.0	67.7	271.5	16.0	22.6	46.3	7.5	4.7	10.3	9.1	17.2	1084.9
75	203	X20	68.0	79.0	78.3	292.5	18.1	10.6	64.5	7.9	3.4	13.9	10.0	13.5	695.4
76	501	G0147	45.4	76.2	101.7	483.8	24.0	6.0	55.4	37.9	3.3	9.8	6.6	11.4	440.3
77	501	G0148	30.8	65.4	73.1	360.2	17.8	4.0	66.6	4.0	1.0	8.5	3.7	8.2	186.9
78	501	X12	43.0	65.8	82.9	457.0	21.1	6.0	44.0	15.6	2.8	9.9	9.4	12.2	403.0
79	501	X13	109.5	61.3	70.6	514.3	22.4	6.2	49.1	6.8	4.6	7.8	11.2	16.6	678.4
80	501	X14	49.6	70.9	107.3	536.7	25.8	6.4	61.0	6.4	1.8	9.2	4.3	6.6	318.8
81	501	X15	57.4	71.7	89.3	421.5	20.9	33.2	125.6	9.2	2.2	8.0	6.1	7.7	292.9
OBS	REGION	SAMPLE	RB	SR	Y	ZR	NB	PB	ZN	CU	NI	CO	CR	V	BA

APPENDIX 1.7 continued
XRF ANALYSIS OF TRACE ELEMENTS
(concentrations in parts per million)

OBS	REGION	SAMPLE	RB	SR	Y	ZR	NB	PB	ZN	CU	NI	CO	CR	V	BA
82	502	G0127	86.3	103.3	42.4	281.5	22.8	17.4	43.9	4.4	4.3	10.7	5.7	12.7	211.1
83	502	X23	82.8	97.0	34.7	270.3	20.9	14.4	48.7	7.0	6.0	8.4	6.2	10.4	206.0
84	502	X24	97.1	119.0	44.8	290.0	19.5	6.4	75.4	6.4	15.9	13.5	3.4	8.0	251.6
85	502	X25	118.1	148.9	50.4	272.2	20.6	18.8	33.3	6.2	1.5	8.9	7.1	9.9	286.2
86	502	X26	30.0	77.6	55.3	260.4	20.2	15.8	47.7	6.3	0.5	14.4	4.0	8.5	110.5
87	503	G0130	33.6	122.4	25.3	144.0	8.9	42.4	45.7	6.0	2.6	11.4	10.2	16.7	200.2
88	503	G0131	34.0	94.7	24.5	80.1	7.8	19.5	54.0	3.0	0.1	12.3	6.9	11.2	174.0
89	504	G0133	13.6	93.8	46.5	219.4	10.2	7.9	67.1	12.2	3.4	15.8	15.3	24.7	109.1
90	504	G0134	3.9	76.0	27.7	123.2	9.2	5.5	14.0	2.2	1.9	15.0	11.2	16.9	62.5
91	505	G0136	68.0	92.6	27.1	83.3	7.9	21.9	35.6	8.1	1.9	11.0	6.1	14.5	239.6
92	505	G0137	37.9	139.6	25.1	82.4	8.3	23.3	51.7	9.9	2.4	13.2	8.0	9.5	137.1
93	505	G0138	76.1	111.6	34.6	99.6	9.7	39.1	40.2	10.6	3.3	9.4	9.1	13.9	267.8
94	511	G0139	52.5	98.8	34.7	113.3	9.5	19.5	36.1	5.1	1.8	11.2	9.9	16.2	329.2
95	511	G0140	49.8	92.7	29.5	74.0	7.9	4.6	21.0	3.8	1.3	11.6	8.8	12.1	567.6
96	511	G0141	18.2	87.5	28.7	100.2	7.1	57.9	20.2	6.6	1.1	13.9	6.6	9.9	536.1
97	512	G0142	-1.4	163.0	32.6	114.2	9.3	35.0	30.8	22.2	1.7	21.2	8.9	14.2	54.4
98	512	G0143	32.7	245.0	32.0	132.4	9.9	14.5	28.3	4.9	2.2	10.4	10.7	15.9	222.5
99	512	G0144	33.5	246.4	36.9	107.6	8.4	18.0	30.6	8.9	1.2	15.0	12.3	14.8	224.0
100	512	G0145	88.8	186.4	20.8	76.6	7.4	4.8	34.4	5.6	1.6	10.1	6.5	21.7	413.3
101	512	G0146	37.4	232.4	28.5	96.6	8.1	26.3	31.5	6.3	1.0	10.6	7.8	12.5	216.3
102	522	G043	54.5	98.9	32.3	143.4	9.2	30.0	43.2	8.4	2.6	13.3	9.6	17.9	175.6
103	522	G044	40.7	166.5	52.3	63.1	6.8	14.0	40.3	9.0	2.8	8.8	4.8	8.4	144.2
104	526	G046	23.4	96.4	27.1	83.5	7.7	16.4	34.7	3.2	2.9	9.0	12.6	12.8	102.0
105	526	G047	2.2	129.2	26.2	75.2	7.2	11.0	19.0	5.3	-0.2	16.5	5.1	7.7	69.2
106	526	G048	22.9	123.7	29.5	76.8	7.2	20.1	33.0	7.3	0.9	16.7	5.8	7.8	100.5
107	526	G050	10.1	139.2	27.8	90.9	7.4	22.6	109.3	8.8	0.5	16.8	7.0	10.3	70.4
108	526	G051	9.5	151.8	25.5	76.4	6.9	12.4	22.7	5.1	0.6	14.9	8.7	7.2	74.6
109	526	G051A	17.4	107.2	26.0	77.0	7.3	17.9	19.0	3.3	1.8	18.6	9.7	11.5	89.1
110	526	G052	0.8	126.2	32.4	134.6	9.9	20.2	28.5	17.2	2.1	13.6	9.1	14.6	51.8
111	526	G052A	0.0	123.1	32.7	132.5	10.0	19.3	28.0	18.0	2.0	6.9	11.6	15.3	45.2
112	526	G054	-1.0	111.6	28.1	88.9	7.4	15.1	26.4	7.6	1.2	12.9	6.8	10.1	44.7
113	526	G055	3.4	119.3	22.5	79.7	7.2	8.6	12.7	6.2	-0.2	16.5	6.9	7.4	58.0
114	530	G071	54.5	223.1	45.4	279.8	12.9	7.3	60.5	25.1	42.0	23.2	118.2	132.6	420.6
115	531	G087	58.4	49.8	45.1	109.4	10.7	128.4	63.7	7.6	3.4	11.0	10.8	12.1	183.7
116	531	G088	50.8	41.9	58.8	129.8	12.1	30.0	132.5	2.2	5.2	12.7	12.7	16.4	159.1
117	531	G089	38.8	47.6	36.1	116.0	10.1	22.4	70.2	2.7	8.4	11.4	22.1	22.7	142.0
118	999	G063	51.5	122.3	20.4	151.8	8.8	13.5	60.0	14.0	20.5	22.0	51.4	49.3	317.1
119	5111	G075	164.5	88.9	52.1	329.5	27.8	8.0	27.0	3.3	1.2	11.2	4.3	12.4	1624.5
120	5111	G075B	164.4	89.4	52.3	332.1	28.2	7.9	26.2	2.6	1.8	11.5	4.3	13.0	1644.8
121	5111	G075C	163.2	88.7	52.7	329.0	28.1	5.3	25.7	4.0	0.7	11.9	1.1	12.4	1622.8
122	5111	G075D	163.4	88.4	50.6	328.9	27.7	5.4	26.3	3.4	1.9	11.1	2.3	12.4	1644.8
123	5111	G075E	163.2	87.8	52.2	332.8	28.1	7.5	26.8	3.1	1.2	12.3	4.4	12.3	1633.5
124	9999	G1	201.3	243.9	15.5	210.5	20.6	48.1	47.7	17.1	1.7	1.2	21.4	21.1	1002.9
OBS	REGION	SAMPLE	RB	SR	Y	ZR	NB	PB	ZN	CU	NI	CO	CR	V	BA

APPENDIX 1.8

CLASSIFICATION OF KNOWN SAMPLES

1 = GARTH TUFF
2 = RACKS TUFF
3 = 3rd MEMBER CCVF
4 = 4th MEMBER CCVF
5 = PITTS HEAD TUFF

CASE SEQNUM	ACTUAL TUFF	HIGHEST PROBABILITY GROUP	P(D/G)	P(G/D)	2ND HIGHEST GROUP	P(G/D)	DISCRIMINANT SCORES...			
1	1	1	0.5216	0.9999	2	0.0001	-2.3384	3.9506	-1.2290	-0.3079
2	1	1	0.8793	0.9988	5	0.0012	-1.2698	2.0653	-1.1928	-0.2317
3	1	1	0.4899	0.9880	5	0.0119	-2.3898	1.7018	-0.8252	-0.5178
4	1	1	0.7955	0.9999	5	0.0000	-2.3233	2.9180	-1.0302	0.3083
5	1	1	0.8861	1.0000	2	0.0000	-0.5605	2.9697	-2.2790	0.1312
6	1	1	0.9909	1.0000	5	0.0000	-1.7914	2.9816	-2.2876	0.0652
7	1	1	0.4863	0.9978	5	0.0022	-1.0442	1.2389	-2.2682	1.2609
8	1	1	0.9183	1.0000	5	0.0000	-1.8957	2.5129	-2.8987	0.1791
9	1	1	0.1980	1.0000	5	0.0000	-0.2102	2.2041	-3.7672	1.1421
10	1	1	0.8154	1.0000	2	0.0000	-1.5506	3.6909	-2.2548	-0.4415
11	2	2	0.6214	0.9950	1	0.0050	0.9942	3.8183	0.3130	0.1148
12	2	2	0.7153	0.9997	1	0.0003	0.2960	4.4592	1.2540	1.0403
13	2	2	0.3830	0.9939	1	0.0061	-0.1270	4.3551	0.7516	-1.1799
14	2	2	0.8121	1.0000	1	0.0000	1.1393	5.3094	2.7151	0.2571
15	2	2	0.4960	0.9986	1	0.0014	1.4314	3.1995	0.6294	-0.4883
16	2	2	0.2145	1.0000	1	0.0000	1.6726	5.7775	3.7503	0.2038
17	2	2	0.0869	1.0000	1	0.0000	2.2474	6.1109	3.8735	0.2346
18	2	2	0.5575	0.9997	1	0.0003	1.8909	3.4382	0.6219	-0.1028
19	3	3	0.1222	1.0000	5	0.0000	3.2466	0.2529	-0.7206	-2.4437
20	3	3	0.1222	0.9031	4	0.0969	8.5397	-0.6549	-1.2149	-2.5038
21	4	4	0.2981	0.9999	3	0.0001	6.7192	-1.0583	-0.3275	2.3039
22	4	4	0.0247	0.6783	3	0.3217	9.2346	-1.3931	-1.2198	-2.3704
23	4	4	0.0388	1.0000	3	0.0000	9.1340	-4.1667	-0.6637	2.2239
24	4	4	0.7192	0.9966	3	0.0034	8.1179	-2.3263	-1.0470	-0.4738
25	4	4	0.5452	1.0000	3	0.0000	8.1286	-1.5562	1.1564	1.4020
26	4	4	0.1791	0.9528	3	0.0472	6.9286	0.5906	-0.3955	0.7304

APPENDIX 1.8 continued
CLASSIFICATION OF KNOWN SAMPLES

1 = GARTH TUFF
2 = RACKS TUFF
3 = 3rd MEMBER CCVF
4 = 4th MEMBER CCVF
5 = PITTS HEAD TUFF

CASE SEQNUM	ACTUAL TUFF	HIGHEST PROBABILITY GROUP	P(D/G)	P(G/D)	2ND HIGHEST GROUP	P(G/D)	DISCRIMINANT SCORES...			
27	5	5	0.7933	0.9976	1	0.0024	-1.1894	-0.7449	-0.6418	-0.4697
28	5	5	0.5728	0.9901	1	0.0099	-1.4922	0.2338	0.5269	0.0410
29	5	5	0.7461	0.9996	1	0.0004	-2.7217	-0.8635	0.0320	-0.2330
30	5	5	0.8205	0.9986	1	0.0014	-0.9955	-0.4475	0.1824	0.4809
31	5	5	0.3582	1.0000	1	0.0000	-0.8631	-2.9446	0.7058	1.2375
32	5	5	0.2033	1.0000	1	0.0000	-2.7449	-3.1703	1.4511	0.3428
33	5***	1	0.0031	0.6497	5	0.3503	-0.9897	-0.0547	-2.0393	3.0637
34	5	5	0.4206	1.0000	1	0.0000	-2.1715	-3.2381	0.5833	0.4193
35	5	5	0.3107	0.7361	1	0.2638	-1.2247	0.5693	-0.4225	0.2829
36	5	5	0.4333	0.9982	1	0.0018	-2.7398	-1.0233	-0.9978	-0.6690
37	5	5	0.8110	1.0000	1	0.0000	-2.3457	-1.8223	0.4199	0.8406
38	5	5	0.9741	1.0000	1	0.0000	-1.5754	-1.9468	0.7190	0.2420
39	5	5	0.7529	0.9998	1	0.0002	-0.4144	-0.7319	0.4885	0.3766
40	5	5	0.4912	0.9933	1	0.0067	-1.4360	-0.9973	-1.4952	-0.0031
41	5	5	0.7988	1.0000	1	0.0000	-0.3781	-1.8881	0.7026	-0.1826
42	5	5	0.1950	0.9752	1	0.0248	-1.8910	-0.8886	-1.7890	1.1033
43	5	5	0.8460	1.0000	1	0.0000	-1.4379	-1.4278	0.0266	-1.1609
44	5	5	0.0647	0.9995	2	0.0003	1.1233	-0.4083	1.1603	-0.3302
45	5	5	0.7917	1.0000	1	0.0000	-0.7384	-2.1649	0.4279	-0.7790
46	5	5	0.6085	0.9923	1	0.0077	-0.6665	-0.5228	-0.7420	-0.2562
47	5	5	0.7519	1.0000	1	0.0000	-1.6064	-1.9299	0.0227	-1.2812
48	5	5	0.8539	1.0000	1	0.0000	-2.1434	-1.2109	0.3591	-0.9494
49	5	5	0.5156	1.0000	1	0.0000	-2.7970	-1.9883	-0.1245	-1.0795
50	5	5	0.8909	1.0000	1	0.0000	-2.2788	-1.3436	0.9778	-0.2217
51	5	5	0.8928	1.0000	1	0.0000	-1.6906	-1.9745	0.3524	-0.9105
52	5	5	0.8496	1.0000	1	0.0000	-2.0933	-1.8047	0.8529	-0.7822
53	5	5	0.7240	1.0000	1	0.0000	-1.8259	-1.5049	1.6596	-0.3186
54	5	5	0.5425	1.0000	1	0.0000	-2.3063	-2.1130	-0.4438	1.2000
55	5	5	0.1083	1.0000	1	0.0000	-2.4806	-2.5603	1.5928	1.9133
56	5	5	0.8780	1.0000	1	0.0000	-1.5891	-1.0088	1.2905	-0.0013
57	5	5	0.4066	1.0000	1	0.0000	-0.0635	-0.6941	1.3102	0.5335
58	5	5	0.3377	0.9999	1	0.0001	-1.8136	-1.3702	-0.5089	-1.9631
59	5	5	0.7214	1.0000	1	0.0000	-2.1080	-1.1898	1.1520	0.9380
60	5	5	0.5007	1.0000	1	0.0000	-1.8189	-2.5623	0.5098	-1.4227
61	5	5	0.4891	1.0000	1	0.0000	-0.2744	-2.5053	0.8440	-0.7245
62	5	5	0.5729	1.0000	1	0.0000	-0.4374	-2.1469	1.4109	0.1869

PD 72/68 Capel Curig anticline

PD 72/68

REPORT ON ORDOVICIAN SHELLY FOSSILS FROM
1" SHEET 106, 6" SHEET SH75 NW
By A.W.A. Rushton

done.

need map!!

1. Crag 300 yd N57°E of St. Curig's Church, Capel Curig. NGR 7255 5825
Hard gritty sandstone with cleaved shells preserved in calcite or as moulds: RV 3390-3410

Clwn Eglwys

Placoiscya multiplicata Bancroft [common]
Sowerbyella sp.

Capel Hill. Pgo ss. (log: G3 11.7m)

According to Bancroft P.multiplicata marks a horizon at the top of the Soudleyan stage

2. Forestry track S. of Capel Curig. Strongly cleaved shale with distorted dalmanellids RV 6551-7 NGR 7182 5737

intervening.

Clwn Eglwys above

CCVF Radio-nucleus.

Age and stage indeterminate

3. Forestry track S. of Capel Curig, cleaved shale, partly calcareous. RV 6558-65 NGR 7195 5735

Dinorthis sp.
Sowerbyella sp
Columnals [circular]

location?? mrg?

Age and stage indeterminate

4. Crags S. of river opposite Plas Curig Y.H., Capel Curig RV 6566-71. Highly cleaved silty shale. NGR 7257 5775

Dalmanella?
Howellites sp.
Sowerbyella sp.

above ZB

Age and stage indeterminate

5. Crags by stream S. of Bryn-y-gefeiliau RV 6572-4 (preservation very poor) NGR 7471 5655

Dalmanellid and Sowerbyellid fragments.

Age and stage indeterminate

to south beneath LRT

NGR

6. Crag SW of Dol-bryn-ooch. Fine-grained calcareous sandstone. RV 6575-83. NGR 7413 5690
Fossils abound but are distorted:

Longvillian

Encrusting bryozoan
Dalmanella sp.
Howellites sp.
Broeggerolithus cf. nicholsoni (Reed)
Kloucekia sp.
Tentaculitids
Crinoid columnals [circular]

This fauna is reminiscent of the Gelli-grin Calcareous Ashes of Bala but is much less diverse. The Longvillian stage is indicated.

7. Crag north of Siabod Villa, NW of Pont Cyfyng. Cleaved sandstone: RV 6584-96 NGR 7332 5730

Howellites?
Sowerbyella sp. [common]

CCVF-LRT

Age and stage indeterminate

8. Cutting 435 yd N13°W of Dol-gam. Cleaved calcareous mudstone: RV6663-6724. NGR 7442 5788

Bryozoa
Dinorthis sp.
Dolerorthis sp.
Howellites?
Leptestiina cf. cepiki (Whittington)
Nicolella sp. [abundant]
Sericoidea?
Skenidioides sp.
Sowerbyella sp.
Floxicalymene cf. caractaci (Salter) [common]
Platylichas cf. nodulosus (McCoy)
Trinucleid fragments
Lepidocoleus succicus Moberg
Primitiid ostracods
Tentaculitids
Crinoid columnals [pentagonal-rounded & circular]
Reuschella sp. [abundant]

calc. mudstone within LRT.

Compared with the succession in the Bala area the fauna appears to be Longvillian, and is correlated with the Gelli-grin calcareous Ashes

9. Crag N. of Llyn Mymbyr and W. of Capel Curig. NGR 7095 5789
Cleaved siltstone and fine sandstone.
RV 6725-54 &
RV 6953-70

Bryozoan [stick-like]
Dalmanella sp. [in siltstone]
Dinorthis cf. berwynensis (Whittington) [in siltstone & sandstone]
Howellites sp. [in siltstone]
Macrocoelia sp. [in sandstone]
Salopia cf. globosa (Williams)
[chiefly in sandstone]

The fauna is not fully diagnostic, but recalls the assemblages at the top of the Allt-ddu Mudstones of Bala (Soudleyan stage)

10. Crag N. of Llyn Mymbyr and W of Capel Curig. NGR 7135 5802
RV 6755-66
Cleaved sandstone:

Dalmanellid?
Dinorthis cf. berwynensis (Whittington)
Macrocoelia sp.
Rafinesquinid [small]
Salopia globosa (Williams)

This fauna may be of Soudleyan age but is not fully diagnostic.

PD/80/12

PD 80/12

Faunas from sediments associated with the Capel Curig Tuffs:

One-inch sheet 106 (Bangor)

By S.P. Tunnicliff and A.W.A. Rushton

1. Cwm Llafar, below Black Ladders, 930 m at 60° from Cairn on Carnedd Dafydd (SH 6628 6304), 4 km SE of Bethesda, Gwynedd

   6": SH 66 SE/NW NGR: SH 6742 6338 loc.18

   DJ 1831-1863 Below Capel Curig Tuff, collected from blocks fallen from below thin dolerite.

   Rostricellula sp. [large sp.] [common]

   Colpomya faba (Emmons) [1 specimen]

   gastropod indet.

2. 2090 m at 155° from Maescaradog (SH 6350 6249), 4 km south of Bethesda, Gwynedd.

   6": SH 66 SW/SE NGR: SH 6440 6075 loc.14

   DJ 1804-1807 Below Capel Curig Tuff, muddy sandstones below pale quartzitic beds.

   Rostricellula sp. [large sp.]

3. Crags to south and south-east of barn, close to river below Blaen-y-nant, 2165 m at 156° from Maescaradog (SH 6350 6260), 4 km south of Bethesda, Gwynedd.

   6": SH 66 SW/SE NGR: SH 6438 6071 loc.A6(1)

   DJ 1244-1280 Rotting sandy siltstone band below Capel Curig Tuff.

   ?Macrocoelia sp.

   Rostricellula sp. [large sp.] [common]

   Cyrtodonta sp.

4. South side of gulley on line between bend in fence line and mountain rescue post, 247° m at 161° from Maescaradog (SH 6350 6260), 4 km south of Bethesda, Gwynedd.

   6": SH 66 SW/SE NGR: SH 6440 6045 loc.A7(1)

   DJ 1290-1333 Below Capel Curig Tuff, sandstone bands.

   Rostricellula sp. [large sp.] [common]

   bryozoan fragments.

5. Nant Gwern y Gof stream section, 990 m at 63½° from Tryfan summit (SH6640 5940), 7 km SE of Bethesda, Gwynedd.

   6":SH 65 NE/NW NGR: SH 6728 5982 loc.37

   DJ 2321-2359 Below Capel Curig Tuff, grey cleaved siltstone.

   Dinorthis sp. [common]

   bryozoan indet.

6. Crags uphill from sheep fold approx. due south of Gwern Gof Isaf, 2020 m at 76° from Tryfan summit (SH 6640 5940), 7 km SE of Bethesda, Gwynedd.

   6": SH 65 NE/NE NGR: SH 6837 5989 loc.27

   DJ 2390-2400 Below Capel Curig Tuff.

   Rostricellula sp. [large sp.]

7. Ridge above Ffynon Loer, 1150 m at 233° from cairn on Carnedd Dafydd (SH 6628 6304), 4 km SE of Bethesda, Gwynedd.

   6" SH 66 SE/SW NGR: SH 6550 6220 loc.19

   DJ 1864-1939, within the Capel Curig Tuffs.

   Brachiopoda

   Dicuspina spiriferoides (McCoy)

   Dinorthis berwynensis (Whittington)

   Macrocoelia sp.

   rhynchonellid?

Gastropoda

Archinacella?

Lophospira cf. cancellatula (McCoy)

Lophospira sp.

Raphistoma sp. [possibly lenticularis Salter]

Trochonema?

Bivalvia

Ambonychia cf. radiata (Hall)

Colpomya faba (Emmons) [common, with many variations in shape]

Cyrtodonta quadrata (Salter)

Cyrtodonta sp. [common]

Deceptrix sp.

Modiolodon sp.

Modiolopsis sp.

Orthonota sp.

Similodonta cf. varicosa Salter

Other groups

Calymenid [pyg.]

trilobite cheek

cf. 'Tallinella' complicata (Salter)

bryozoan [stick-like fragments]

Lepidocoleus sp.

Note: Cyrtodonta quadrata was described by Salter, 1866, from Beltws-y-Coed: it is in Old Survey Collections from Waterloo Bridge (Betws-y-Coed) and Pant-y-Pwll (SH 8060 5555). Salter (1866) recorded trinucleid trilobites from this neighbourhood but no specimen has been seen, either in the field or in old Survey Collections.

The age of this fauna is not certain but may correspond to the Allt-ddu Mudstones (Soudleyan) of the Bala area.

8. Prominent bedding plane in stream of Afon Lloer just above point where stream divides, 1420 m at 161° from cairn on Carnedd Dafydd (SH 6628 6304), 4 km SE of Bethesda, Gwynedd.

6": SH 66 SE/SE NGR: SH 6670 6106 loc.20

DJ 1975-2005 within the Capel Curig Tuff, tough, fine siliceous mudstone.

Dalmanella sp.

Dinorthis berwynensis (Whittington) [common]

Howellites sp.

Macrocoelia sp.

Parabasilicus? [fragments]

bryozoans indet.

9. Afon Lloer, 1730 m at 164° from cairn on Carnedd Dafydd (SH 6628 6304), 4 km SE of Bethesda, Gwynedd.

6": SH 66SE/SE NGR: SH 6675 6137 loc.29

DJ 2006-2030 within Capel Curig Tuffs, sandstones between dykes?

Dalmanella sp.

Dinorthis sp.

Howellites sp. [common]

Macrocoelia sp.

Lepidocoleus sp.

bryozoan indet.

10. East side of Tryfan, on Heather Terrace, 600 m at 34° from Tryfan summit (SH 6640 5940), 7 km SE of Bethesda, Gwynedd.

6": SH 65 NE/NW NGR: SH 6672 5992 loc.47A

DJ 2360-5 Within Capel Curig Tuff, sandy siltstone with sparse fauna.

Dinorthis sp.

Lophospira sp. (large)

Ambonychia sp. (small)

Ostracod

bryozoan fragments.

11. as above, but a little higher stratigraphically and topographically loc.47B

DJ 2366-2378 Within the Capel Curig Tuffs. NGR SH 6672 5935

Dinorthis?

dalmanellids [common fragments]

12. Heather Terrace, Tryfan, 480 m at 45° from Tryfan summit (SH 6640 5940), 7 km SE of Bethesda, Gwynedd.

6": SH 65 NE/NW NGR: SH 6670 5974 loc.48

DJ 2379-2389 Within the Capel Curig Tuffs, siltstone

Dinorthis sp. [common]

Macrocoelia sp.

Lophospira sp.

?Modiolodon sp.

13. Lowest crags below Gallt yr Ogof on left of stream, 2920 m at 85½° from Tryfan summit (SH 6640 5940), 7 km SE of Bethesda, Gwynedd.

6": SH 65 NE/NE NGR: SH 6930 5966 loc.41

DJ 2401-2418 Within the Capel Curig Tuffs.

Dalmanella sp. Garth-Rocks

Dinorthis sp.

Howellites? sp.

crinoid columnals

bryozoans indet.

14. Beds in stream and gulley below and to west of cave, about half way up steep part of hillside, 2880 m at 86° from summit of Tryfan (SH 6640 5940), 7 km SE of Bethesda, Gwynedd.

6": SH 65 NE/NE NGR: SH 6929 5961 loc.28B (main stream)

DJ 2419-2431 Within Capel Curig Tuffs, poor fauna, badly preserved.

dalmanellids indet.

bryozoans [stick-like indet.]

15. as above but in gulley, c.3 m stratigraphically higher. loc.28B (gulley)

DJ 2432-45 Within Capel Curig Tuffs.

Dalmanella sp. [common]

Dinorthis sp.

nuculoid bivalve > Garth

gastropods indet.

bryozoan fragments.

16. Exposure north of peat-scrape or pond above Gallt yr Ogof, 2500 m at 96° from Tryfan summit (SH 6640 5940), 7 km SE of Bethesda, Gwynedd.

6": SH 65 NE/NE NGR: SH 6890 5915 loc.42

DJ 2446-7 Within the Capel Curig Tuffs, cleaved siltstone.

?dalmanellids indet.

17. Just north of path, near pond, in a patch of rubbly, thinly vegetated, peaty ground with solid just below surface, 2100 m at 120° from Tryfan summit (SH 6640 5940), 7 km SE of Bethesda, Gwynedd.

6": SH 65 NE/NE NGR: SH 6823 5835 loc.40

DJ 2448-2608 Within Capel Curig Tuff, rich, shelly mudstone.

Lingulasma? [in life position]

Dalmanella sp. [common, especially on certain planes]

Lophospira sp. [common] Garth

Raphistoma sp. > garth.

?Actinodonta sp.

Cleiothychia sp.

Cyrtodonta sp.

Lyrodesma sp. [elongate cf. subplanum Ulrich]

Lyrodesma sp. [rounded]

Modiolopsis sp.

?Nuculites sp.

Orthonota sp.

Pterinea sp.

indet taxa-lonts

cf. 'Tallinella' complicata (Salter)

bryozoans [stick-like, indet.]

18. Pen-yr-ole-wen, west face below ridge, 1250 m at 224° from cairn on Carnedd Dafydd (SH 6628 6304), 4 km SE of Bethesda, Gwynedd.

6": SH 66 SE/SW NGR: SH 6540 6208 loc.31A

DJ 1940-1971 Above Capel Curig Tuff, collected from scree of fossiliferous siltstone overlying tuff.

Brachiopoda

Bicuspina spiriferoides (McCoy)

Dinorthis berwynensis (Whittington) [common]

?lingulid

Macrocoelia sp.

Gastropoda

Lophospira sp.

?Raphistoma sp.

Bivalvia

Ambonychia cf. radiata (Hall)

Colpomya faba (Emmons)

Modiolodon sp. [common]

Modiolopsis sp.

Other groups

?orthocone nautiloid

cf. 'Tallinella' complicata (Salter)

'T'. complicata decorata (Jones)

'Beyrichia' strangulata? (Salter)

Lepidocoleus sp.

bryozoans indet.

19. as above but 30 m above base of sandstone overlying the siltstones. loc.31B

DJ 1972-4 Above Capel Curig Tuff.

Macrocoelia sp.

bryozoans indet.

SS above 4th MBR.

20. On south side of road to west of Idwal Cottage, in small enclosure, 2620 m at 152° from Maescaradog (SH 6350 6269), 4 km south of Bethesda, Gwynedd.

6": SH 66 SW/SE NGR: SH 6474 6038 loc.A8 (2)

DJ 1346-78 Above Capel Curig Tuff, below Pitt's Head Tuff, in sandstone.

Dinorthis sp.

Macrocoelia sp. [common]

Rostricellula? sp.

dalmanellid

crinoid columnals

beneath PHT.

21. Opposite and above bend in road near mountain rescue centre, 1620 m at 158° from Maescaradog (SH 6305 6249), 4 km south of Bethesda, Gwynedd.

6": SH 66 SW/SE NGR: SH 6453 6022 loc.15

DJ 1808-1815 Above Capel Curig Tuff.

Dinorthis berwynensis (Whittington)

Modiolodon?

bryozoan fragments.

beneath PHT.

22. Crags, 1000 m at 80° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda, Gwynedd.

6": SH 65 NW/NE NGR: SH 6408 5975 loc.H 1

DJ 1379-1392 Raft of sandstone within Pitt's Head Tuff, presumably derived from above Capel Curig Tuff.

Macrocoelia expansa (J. de C. Sowerby) [common]

Dalmanella sp.

23. Blocks in scree, 430 m at 92° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda, Gwynedd.

6": SH 65 NW/NE NGR: SH 6350 5956 loc.S 8 loose

DJ 1429-1443 derived from above Capel Curig Tuff.

Dinorthis? [rare]

Plaesiomys multifida (Salter) [common]

Macrocoelia sp.

Rostricellula? [rare]

Sowerbyella sp.

burrows.

24. **Blocks in scree approx. halfway up scree slope between Llyn Clyd and ridge, 260 m at 94° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda, Gwynedd.**

6": SH 65 NW/NE NGR: SH 6334 5954 loc.S 7 loose

DJ 1419-1428 derived from above Capel Curig Tuff.

Plaesiomys multifida (Salter) [common]

Macrocoelia sp.

cf. 'Tallinella' complicata (Salter)

trilobite fragments.

25. Roadside south of Llyn Ogwen, 1950 m at 203° from cairn on Carnedd Dafydd (SH 6628 6304), 4 km SE of Bethesda, Gwynedd.

6": SH 66 SE/SW NGR: SH 6514 6031 loc.38

DJ 2613-23 Above Capel Curig Tuff.

Dinorthis berwynensis (Whittington) [common]

Sowerbyella sp.

calymenid [cranidium]

Remarks. Much of the material reported on here is too poorly preserved to yield specific determinations. However the generic constitution allows comparison with certain postulated ecologically significant assemblages or communities. (Wright 1978; Pickerill & Brenchley 1979).

Below the Capel Curig Tuffs the faunas (items 1-6 above) are dominated by Rostricellula (in one case only by Dinorthis). Pickerill & Brenchley (1979) identified a Dinorthis community and associated Rostricellula with the Macrocoelia sub-community thereof (p.243). We suspect that the present Rostricellula assemblages represent a variant of the Dinorthis community and indicates an environment of shallow water (25 m depth or less), turbulent but not muddy, generally with a coarse-grained substrate. However, the shells may have been transported after death of the animals at some of the localities.

Of the localities within the Capel Curig Tuffs those around Tryfan and to the west (items 7-12 above) tend to be dominated by Dinorthis (except no.9 where dalmanellids dominate). These generally indicate a shallow-water high-energy environment but grading into the quieter, more off-shore Dalmanella community. Item 7 above contains numerous bivalves interpreted as of epifaunal or semi-infaunal habit (i.e. living and feeding on the sea-floor or only partly buried within it), with few burrowing infaunal forms. The preservation suggests little post mortem transport.

Farther to the south-east, on Gallt yr Ogof dalmanellids (Dalmanella and Howellites) dominate but Dinorthis is rare. These suggest the presence of Pickerill & Brenchley's Dalmanella community, living in shallow water, but quieter and farther off shore than the Dinorthis community. Bryozoa abound in some beds. The most southerly locality (item 17) yielded another bivalve-rich fauna, in fine-grained beds with abundant Dalmanella. There the abundance of infaunal Lyrodesma and semi-infaunal cryrtodontids indicates a more stable substrate and slower rate of sedimentation. Farther east Rushton reported elements of the Dinorthis Macrocoelia community in sandstone at SH 7071 5785 (PD 73/22) and also, associated with dalmanellids, at 7095 5789 and 7135 5802 (PD 72/68). These localities presumably indicate a local area of higher energy sedimentation.

Above the Capel Curig Tuff (items 19-25 above) Dinorthis and Macrocoelia again dominate and in the north-west (item 18) is a fauna very similar to that within the Tuffs (item 7). We have no collection above the Tuffs from the area south-east of Gallt yr Ogof but Bancroft (in Lamont, 1946) recorded Dinorthis, Dalmanella and Macrocoelia and others from that area. This suggest a gradation towards the Dalmanella community.

Conclusions. According to the palaeoecology of the shelly faunas, before the emplacement of the Capel Curig Tuffs, shallow-water high-energy marine conditions obtained from around Llyn Ogwen to east of Tryfan, at least. After the emplacement of part of the Tuffs the sea was still shallow but less turbulent to the south-east (Gallt yr Ogof) than the north-west (Ogwen). After the last tuff had been emplaced conditions apparently remained much as they had been during the formation of the tuffs.

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Lamont, A. 1946. Quarry Manager's Journal, vol.30, no.4., pp.235-9.

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Copies to
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Drs Howells and Leveridge
Dr. Ramsbottom
1"sheet file 106.

S.P. Tunnicliff and A.W.A. Rushton,
Palaeontology Unit.
24th. March, 1980.

PD 80/20

PD/80/20

Faunas from Six-inch sheet SH 66 SW/SE

One-inch sheet 106 (Bangor), Gwynedd

by S.P. Tunnicliff and A.W.A. Rushton

This report partly supercedes report PD/80/12

1. 2470 m at 161° from Maescaradog (SH 6350 6269) 4 km south of Bethesda.

NGR: SH 6429 6034

DJ1290—1333, ON1-10 Below Capel Curig Tuff.

Rostricellula sp. A [large sp.] [common]

bryozoan fragments

This collection partly reported previously, PD/80/12 item 4.

2. 2090 m at 155° from Maescaradog (SH 6350 6249) 4 km south of Bethesda.

NGR: SH 6440 6079

DJ1804-1807, ON200-214 Below Capel Curig Tuff.

Rostricellula sp.A
bryozoan.

This collection partly reported previously, PD/80/12 item 2.

3. 2770 m at 152.5° from Maescaradog (SH 6350 6269), 4 km south of Bethesda.

NGR: SH 6478 6022

DJ1334-1345 Fine, tuffaceous sandstone above Pitt's Head Tuff.

Macrocoelia?

Note: Macrocoelia? common but too poorly preserved to be identified with certainty. Suggestive of shallow water conditions.

4. Small hummocky crags on right bank of stream from Llyn Idwal, 51 paces from stream, 3000 m at 151° from Maescaradog (SH 6350 6249), 4 km south of Bethesda.

NGR: SH 6484 6001

DJ1783-1803 Coarse sandstone above Pitt's Head Tuff.

Dinorthis berwynensis (Whittington)

Lophospira? sp.

crinoid columnals

Note: D. berwynensis suggests a Soudleyan age and shallow water conditions.

5. Ridge below Y Garn, 2660 m at 198° from Maescaradog.

NGR: SH 6272 6012

DJ1816-1830 and ON22-24. Grey slate.

Climacograptus cf. antiquus Lapworth

Cryptograptus?

Dicellograptus sp.

Orthograptus cf. apiculatus Elles & Wood?

These fossils suggest a low Caradoc horizon, possibly the multidens Zone. However, D. Williams (Q.J.G.S., vol.86, p.199) recorded a poor fauna from the same locality which he thought represented the Llandeilo Series. Probably the presence of Dicellograptus and O. cf. apiculatus in the new collections should cause Williams' assessment to be revised.

A.W.A. Rushton

S.P. Tunnicliff

Palaeontology Unit.

6th June, 1980

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PD/80/21

PD/80/21

Tryfan anticline

Shelly faunas from Six-inch sheet SH 66SE/SE and 75

One-inch sheet 106 (Bangor), Gwynedd

by S.P. Tunnicliff

towards CCYF.

This report partly supplements report PD/80/12

how far is important.

1. Exposure 50 m NNE of Bodesi, Llyn Ogwen.

6": SH 66 SE/SE NGR: SH 6764 6094

GF 7532-7574 Cleaved siltstone: below the Capel Curig Tuff.

dalmanellid? indet.

Dinorthis?

Rostricellula sp.A [common]

crinoid columnals

bryozoa

Note: see general comments in PD/80/12.

check on 1:50000

check for palaeogogy

2. Crag 260 m SE of Bodesi, Llyn Ogwen,

6": SH 66 SE/SE NGR: SH 6783 6078

GF 7575-7602 Cleaved siltstone: below the Capel Curig Tuff.

Rostricellula sp.A. [common]

Note: see general comments in PD/80/12.

check on 1:50000

3. Exposure 40 m NW of Gwern-gof-isaf, Llyn Ogwen, Gwynedd.

6": SH 66 SE/SE NGR: SH 6850 6012

GF 7603-7623 Cleaved siltstone: below the Capel Curig Tuff.

Rostricellula sp. [common]

Note: see general comments in PD/80/12.

4. Exposure on hillside below leat 350 m NNW of Tal-y-braichuchaf, Llyn Ogwen,

6": SH 66 SE/SE NGR: SH 6968 6067

check. Rest will get 1:10000

within W.

GF 7624-7637 Within the Capel Curig Tuff: cleaved siltstone.

Brachiopoda

Dalmanella?

Reuschella?

Macrocoelia?

Mollusca

gastropods indet.

Concavodonta sp.

Praenucula sp.

Modiolodon sp.

Modiolopsis sp.

bryozoa

Note: see general comments in PD/80/12. Mollusc rich fauna characteristic of those from within the Capel Curig Tuff. Concavodonta is common in the Longvillian to the east, around Betws-y-coed.

5. Loose blocks in scree immediately below crags on north side of Tryfan, 3000m at 177° from cairn on Carnedd Dafydd (SH 6628 6304), 4 km south of Bethesda,

6": SH 66 SE/SW NGR: SH 6641 6006 loc.49

DJ 2609-2612 Tough, silicous siltstone with many fragmentary fossils, within the Capel Curig Tuff.

indet. fragments: brachiopod, gastropod, crinoid columnals.

Note: see general comments in PD/80/12 and items 10-12 in that report.

Remarks: specimens Zs 4662-76 from Old Survey collections recorded as from Llyn Ogwen are Rostricellula sp. but cannot be accurately localised. Salter referred this species to Rhynchonella (M.G.S. 1866) and gave the locality as "the lower fossil bands near the foot of the lake".

In the same collection are Zs 4677-86 labelled from Braich dda [probably now Braich tu-du]: these are bivalves and gastropods as reported in the collection DJ 1940-71, item 18 of PD/80/12.

S.P. Tunnicliff

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Palaeontology Unit.
6th June, 1980

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PD/80/22

PD/80/22

Shelly faunas from One-inch sheet 119 (Snowdon) * ✓
for 106 (Bangor), Gwynedd

by S.P. Tunnicliff

LRT. etc.
CLOGWYN Dyne Arddu

of 1:25.000 mg

1. Loose from scree slopes above west end of Llyn Dur Arddu and below cliffs of Clogwyndur Arddu, 3520 m at 81° from Snowdon Ranger Hostel (SH5650 5506) north of Beddgelert,

6": SH 55 NE/SE NGR: SH 5999 5563 loc 36

DJ 2211-2217 with LRT

Reuschella horderleyensis Bancroft

Sowerbyella sp.

Brongniartella sp.

Note: R. horderleyensis is recorded by Williams from the Allt Ddu Group (Soudleyan) of Bala.

2. Slope south and downhill from Clogwyn Station, Snowdon Railway, 2360 m at 254° from Pont y Gromllech, Llanberis.

6": SH 65 NW/SW NGR: SH 6070 5587 loc.50A

DJ 2218-2224 ?Bedded Pyroclastics.

Dinorthis sp. Bed Pyro

as above but loose

DJ 2225-2231 loc. 50B

?dalmanellid fragments

Oxoplecia? sp.

crinoid columnals

S. P. Tunnicliff

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Dr. Ramsbottom
1" sheet files 106, [illegible]

S.P. Tunnicliff
Palaeontology Unit
6th June, 1980

Pont-y-Gromlech

PD/80/23

Shelly faunas from Six-inch sheet SH 65 NW/SE

One-inch sheet 106 (Bangor), Gwynedd

by S.P. Tunnicliff

* PONT y GROMLECH

1. Close to Dinas y Gromllech, 350 m at 357° from Pont-y-Gromllech, Llanberis.

NGR: SH 6298 5694 loc.17

DJ 2251-2284 Above Pitt's Head Tuff.

Bicuspina spiriferoides (McCoy) [rare]

Dinorthis berwymensis? (Whittington) [common]

Macrocoelia expansa (J. de C. Sowerby) [common]

d use in Malcolm's reply.

2. North side of Llanberis Pass, 320 m at 8° from Pont y Gromllech, Llanberis.

NGR: SH 6303 5690 loc.16

DJ 2285-2295 Above Pitt's Head Tuff.

dalmanellid indet.

Macrocoelia expansa (J. de C. Sowerby) [common]

crinoid columnals

3. North side of Llanberis Pass above Pont-y-Gromllech and below Bryndu, 340 m at 37° from Pont y Gromllech, Llanberis.

NGR: SH 6318 5684 loc.45

DJ 2296-2301 Above Pitt's Head Tuff: probably same sandstone horizon as DJ 2285-2295 (above).

Macrocoelia expansa (J. de C. Sowerby)

4. North side of Llanberis Pass, 730 m at 89° from Pont-y-Gromllech, Llanberis.

NGR: SH 6371 5659 loc.46

DJ 2302-2312 Above Pitt's Head Tuff

Dalmanella?

Dinorthis sp.

gastropod? fragments

bryozoa indet.

crinoid columnals

5. Loose blocks from scree above left bank of stream, upstream from Pont-y-Gromllech 570 m at 118° from Pont y Gromllech, Llanberis,

NGR: SH 6348 5631 loc.44

DJ 2313-2320 Above Pitt's Head Tuff: scree derived from area of DJ 2302-2312 (item above)

Dinorthis sp.

Sowerbyella sp.

Remarks: M. expansa and B. spiriferoides are recorded by Williams from the Longvillian of the Bala area. All the above faunas represent the Dinorthis-Macrocoelia community referred to in PD/80/12 as indicating a shallow water, high energy environment.

S.P. Tunnicliff

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6th June, 1980

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PD/80/24

PD/80/24

Faunas from Six-inch sheet SH 65 NW/SW

One-inch sheet 106 (Bangor)

by S.P. Tunnicliff & A.W.A. Rushton

Passes

1. Ridge above Halfway House, Llechog.

NGR SH 6011 5730 DJ 2241-2248

Grey slate

Orthograptus? [cf. calcaratus group]

The fossils are very poorly preserved. They do not indicate a definite age but could be Llandeilo or Caradoc. H. Williams (Q.J.G.S. vol.83, p.359) recorded a good fauna from beds at a comparable horizon at the head of Llyn Cwellyn. His fauna is referable to the gracilis or possibly peltifer Zone, near the base of the Caradoc Series.

2. Ridge above Halfway House, Llechog, 2980 m at 284.5° from Pont y Gromllech, Llanberis, Gwynedd.

6": SH 65 NW/SW NGR: SH 6020 5729 loc.34B

DJ 2249-50 Ordovician, ?Llanvirn, grey slate.

bivalve

Note: although not sufficiently well preserved to be determined with confidence this specimen bears close resemblance to some of those described and figured by Salter, 1866, as Palaearca socialis Salter (pl.11A figs.13, 13b, ?non 13a) from TyObry, Tremadoc. Some of the specimens in our collections have subsequently been determined as Ctenodonta but the true nature of these is as doubtful as DJ 2249-50

3. Loose blocks on crags north of railway on Llechog, 2470 m at 277° from Pont y Gromllech, Llanberis, Gwynedd.

6": SH 65 NW/SW NGR: SH 6049 5683 loc.51

DJ 2232-2238 Above Pitt's Head Tuff.

Dinorthis berwynensis? (Whittington)

Macrocoelia? fragment

Note: D. berwynensis suggests a Soudleyan or possibly Longvillian age. The Dinorthis-Macrocoelia community suggests a shallow water, high energy environment, see PD/80/12, general comments.

A.W.A. Rushton

S.P. Tunnicliff,

Palaeontology Unit

6th June, 1980

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1" sheet file 106

Area F PD/80/25

PD/80/25

Shelly faunas from Six-inch sheet SH 66 SE/NE

One-inch sheet 106 (Bangor), Gwynedd

by S.P. Tunnicliff

CRAIG YR YSFA. section F top.

1. Exposures on North side of summit of Penyrhelgi-du, Capel Curig.

6": SH 66 SE/NE NGR: SH 6999 6291

GF 8485-8492 Fine and silty cleaved mudstones, above Capel Curig Tuff.

paterulid

Howellites sp.

Liospira? sp.

Brongniartella sp.

trinucleid fragment, indet.

Tallinnella sp. ostracod.

crinoid columnals

2. Exposures half way down footpath from Penyrhelgi-du to saddle of Pen y waun-wen, Capel Curig.

6": SH 66 SE/NE NGR: SH 6975 6307

GF 8493-8496 Fine, grey, cleaved mudstone, above Capel Curig Tuff.

dalmanellids indet.

Broeggerolithus?

3. Exposure near top of scree below saddle N.W. of Penyrhelgi-du, Capel Curig.

6": SH 66 SE/NE NGR: SH 6977 6325

GF 8497 Fine grey cleaved mudstone, above Capel Curig Tuff.

trinucleid indet.

4. Exposure just SE of point where footpath from Ffynnon Llugwy joins saddle between Penyrhelgi-du and Penywaun-wen, Capel Curig.

6": SH 66 SE/NE NGR: SH 6952 6331

GF 8498-8517 Grey slatey mudstone, above the Capel Curig Tuff.

inarticulate brachiopod

dalmanellids indet. [common]

Dinorthis sp. [common]

Remarks: none of the faunas in items 1-4 above is closely indicative of age.

S.P. Tunnicliff

S.P. Tunnicliff

Palaeontology Unit.

6th June, 1980

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Drs. Howells and Leveridge,
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1" sheet file 106.

PD/80/26 Gallt-yr-Ogof

PD/80/26

Shelly faunas from Six-inch sheet SH 65 NE/NE

One-inch sheet 106 (Bangor), Gwynedd

by S.P. Tunnicliff

1. Crags on eastern end of Gallt-yr-ogof, Capel Curig.

NGR: SH 6962 5861

GF 7965-7976 Siltstones above the Capel Curig Tuff

dalmanellids indet.

Rhynchotrema?

cf. Gyronema sp.

Balacrinus?

bryozoa

Rhynchotrema is rare in N. Wales but is listed by Pickerell and Brenchley from the Lower Longvillian of the Berwyns.

2. Crags on S.W. side of Gallt-yr-ogof, Capel Curig.

NGR: SH 6855 5869 to 6841 5850

GF 7977-8015 Silty mudstone within the Capel Curig Tuffs.

Bicuspina spiriferoides (McCoy) [rare]

Dinorthis berwynensis (Whittington) [common]

Dalmanella sp.

Howellites sp.

large indet. bivalve

Clathrospira?

Tallinnella?

Lepidocoleus sp.

3. Exposures on SW side of Gallt-yr-ogof, Capel Curig.

NGR: SH 6837 5866 to 6833 5860

GF 8016-8031 Silty mudstones within the Capel Curig Tuffs.

Dalmanella sp.

Dinorthis berwynensis (Whittington)

Howellites?

Macrocoelia? [fragments]

gastropod fragments indet.

Tallinnella?

Lepidocoleus sp.

1 and 2 above are both dominated by dalmanellids, with a high proportion of Dinorthis, particularly at 2. This accords with the interpretation given in PD/80/12 that faunas from these horizons (items 14 - 17 of that report) were indicative of an off-shore environment.

S.P. Tunnicliff

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Palaeontology Unit.

10th June, 1980.

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1" sheet file 106

PD/80/27 Cwm Cneifion AREA D

PD/80/27

Shelly faunas from Six-inch sheet SH 65 NW/NE

One-inch sheet 106 (Bangor), Gwynedd

by S.P. Tunnicliff

IDWAL-OGWEN. +CWM CNEIFION.

Localities are listed in approximate stratigraphic order.

1. Crags 900 m at 88.5° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6399 5960 loc.S10

DJ1393-1401 c.25 m above local top of Pitt's Head Tuff.

dalmanellid

Dinorthis sp.

Macrocoelia sp.

Plaesiomys multifida (Salter) Sould

Sowerbyella sp.

2. On path on ridge above Cwm Clyd south of Y Garn (SH 6309 5958) 7 km south of Bethesda.

NGR: SH 6328 5936 ?? loc.S1

DJ1402-1418 Above Pitt's Head Tuff.

Dinorthis sp. [common]

Howellites sp.

Sowerbyella?

trilobite? fragment

bryozoa?

3. In gulley below south cliff of Cwm Idwal 1350 m at 126° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6417 5877 loc.33

DJ1767-1771 Lower Rhyolitic Tuffs

indet. fragments: crinoid columnals, bryozoan, trilobite?

4. Waterfalls in the more northerly of the two streams to north of quartzite mass in centre of lowest slopes of Cwm wall, Cwm Cneifio, 2090 m at 124° from Y Garn summit, Bethesda.

NGR: SH 6483 5840 loc.6

DJ1587-1612 cleaved silticeous siltstone, above Pitt's Head Tuff.

Dinorthis sp.

Reuschella cf. oblonga Whittington

Whittington described R. oblonga from beds of Lower Soudleyan age in the Berwyns.

5. c.20 paces north of southernmost stream in Cwm Cneifio, 2010 m at 124.5° from Y Garn summit, Bethesda.

NGR: SH 6474 5841 loc.7

DJ1613-1624 lightgrey cleaved siltstone above Pitt's Head Tuff.

Dinorthis sp. fragments [common and very distorted]

6. Right bank of small V-shaped gulley to the south of the more southerly of two streams, Cwm Cneifio, 1920 m at 125° from Y Garn summit, Bethesda.

NGR: SH 6466 5846 loc.8

DJ1625-1630 ashy, grey cleaved siltstone, above Pitt's Head Tuff.

Plaesiomys multifida (Salter) [common, distorted] Soudleyan

7. Right bank of stream at foot of south wall of Cwm Cneifio, 2030 m at 128° from Y Garn summit, Bethesda.

NGR: SH 6470 5832 loc.3

DJ1557-1559 Tuffaceous sandstone above Pitt's Head Tuff.

Plaesiomys?

8. North side of scar just right of cliff, Cwm Cneifio, 1890 m at 125° from Y Garn summit, Bethesda.

NGR: SH 6463 5848 loc.9

DJ1631-1637 cindery weathering band of cleaved grey siltstone, above Pitt's Head Tuff.

dalmanellids? [common but too poorly preserved and distorted for determination]

9. Shell bands running down south side of scar, Cwm Cneifio, 1890 m at 125° from Y Garn summit, Bethesda.

NGR: SH 6463 5848 loc.10

DJ1638-1659 blocky, siliceous grey siltstone, above Pitt's Head Tuff.

Sowerbyella cf. soudleyensis Jones

Note: from 1-2 m stratigraphically higher than DJ1631-1637: soudleyensis s.s. suggests a Lower Longvillian age.

10. To left of dry boulder strewn shallow gulley following the line of fossil horizon, Cwm Cneifio, 1940 m at 130° from summit of Y Garn, Bethesda.

NGR: SH 6458 5832 loc.4

DJ1560-1586 Tuffaceous sandstone above Pitt's Head Tuff

Heterorthis?

Sowerbyella cf. musculosa Williams

Strophemenoid fragments

bryozoan? -dome shaped mass

S. musculosa is described by Williams from the Allt Ddu Mudstones (Soudleyan) of Bala.

11. South side of gulley in basal crags of south wall of Cwm Cneifio, 1920 m at 128.5° from Y Garn summit, Bethesda.

NGR: SH 6459 5836 loc.5

DJ1660-1686 blocky, tough grey ashy siltstone, above Pitt's Head Tuff.

dalmanellids indet.

Sowerbyella sp.

cf. "Parabasilicus" cf. powisii (Murchison) of Whittington

12. Base of crags, south wall of Cwm Cneifio, 1870 m at 124° from Y Garn summit, Bethesda.

NGR: SH 6464 5852 loc.11

DJ1687-1696 Above Pitt's Head Tuff.

cf. "Parabasilicus" cf. powisii (Murchison) of Whittington

bellerophontacean gastropod?

13. South side of Cwm Cneifio, just above threshold on line of crags in front of main cwm wall, 1840 m at 118.5° from Y Garn summit (SH 6309 5958), Bethesda.

NGR: SH 6470 5869 loc.2

DJ1554-1556 Above Pitt's Head Tuff

dalmanellids indet.

bryozoans indet.

14. Close to outer end of south wall of Cwm Cneifio, 1820 m at 118° from Y Garn summit, Bethesda.

NGR: SH 6470 5873 locs.12, 13

DJ1697-1736 tuffaceous sandstone, above Pitt's Head Tuff.

Dalmanella?

Howellites?

Dinorthis?

Sowerbyella sp.

Concavodonta?

gastropod indet.

trinucleid fragments.

crinoid columnals.

15. Gulley above and west of Cwm Idwal, 790 m at 108.5° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6384 5932 loc.59

DJ1449-1468 Tuffaceous slightly calcareous, sandstone band in Lower

Rhyolitic Tuffs.

Dinorthis berwynensis (Whittington) [common]

16. Cwm Idwal, at south end where path crosses stream and scree slope a little higher in the Cwm than Idwal Slabs, 1480 m at 116° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6440 5888 loc.22

DJ1739-1757 Lower Rhyolitic Tuffs.

Sowerbyella sp.

sowerbyellids indet. [common]

dalmanellids indet.

trilobite fragment indet.

crinoid columnals.

LRT.

? Longvillian

17. Cwm Idwal, gulley 1500 m at 120° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6437 5881 loc.32

DJ1758-1766 Lower Rhyolitic Tuffs: calcareous

brachiopod fragments indet.

trilobite fragments

crinoid columnals

bryozoan fragments

18. Loose blocks in stream gulley high up side of Cwm Idwal, 810 m at 123° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6377 5914 loc.S5

DJ1469-1481A, 1737-8 ? below Bedded Pyroclastics.

plectambonitid brachiopod?

Liospira sp.

Lophospira?

gastropod fragments indet.

solitary coral indet.

19. At ford on path up from Llyn Idwal to Twll Ddu, 1080 m at 116° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6405 5908 loc.35

DJ1772-1781 blue-grey slightly calcareous mudstone, Lower Rhyolitic Tuffs.

Sericoidea sp. [common]

graptolite fragments?

20. Loose block in scree, 850 m at 124° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6381 5909 loc.S4, H2

DJ1503-4 Lower Rhyolitic Tuffs - Bedded Pyroclastics.

trinucleids indet.

21. Loose blocks in stream at top of scree bank immediately below gulley following fault plane, 910 m at 125° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6384 5906 loc.S3

DJ1482-1486 ?below Bedded Pyroclastics.

Brongniartella sp. fragments.

22. 980 m at 125.5° from Y Garn summit (SH 6309 5958), 7 km south of Bethesda.

NGR: SH 6389 5900 loc.S6

DJ1498-1502 Below the Bedded Pyroclastics. (a little higher stratigraphically than DJ1487-1497 from SH 6387 5903 which are all indet. and probably not fossil).

Sericoidea?

trinucleid fragment.

23. Above Twll Ddu, at south end of Cwm Idwal, 1220 m at 136° from Y Garn summit (SH 6309 5958) 7 km south of Bethesda.

NGR: SH 6393 5870 loc.H3

DJ1505-1551, 1553 Banded Pumice Tuffs, Bedded Pyroclastics.

Kjerulfina? or Leptaena?

Macrocoelia sp.

Sowerbyella?

Strophomena sp.

gastropod indet.

Atractopyge celtica Dean [common]

Brongniartella cf. bisulcata (McCoy)

Broeggerolithus [fragments]

Encrinurus sp.

cf. Platylichas nodulosus (McCoy)

Note: see Dean, 1965, Geol. J. p.301-314 locs.1-3, where a Longvillian age (probably Lower) is suggested for this fauna.

Old survey collections Zs4646-57 from Twll ddu contain indet. solitary coral, Deceptrix sp., gastropod and 'Palaeaster'. Zs4639-45 labelled as from Cwm Idwal are crinoid fragments and bellerophontacean gastropods.

Remarks: The faunas reported here range from just above the Pitt's Head Tuff to the Banded Pumice Tuffs of the Bedded Pyroclastic Series in Cwm Idwal. Faunas below the Pitt's Head Tuff were reported and discussed in PD/80/12 where, in this area, they were all referred to the Dinorthis-Macrocoelia faunal community, suggesting a shallow water, high energy environment. Above the Pitt's Head Tuff the same forms continue for some thickness, with Dinorthis and Plaesiomys particularly evident, but giving way towards the base of the Lower Rhyolitic Tuffs to faunas dominated by sowerbyellids and dalmanellids: this is particularly apparent on the eastern limb of the Idwal Syncline, in Cwm Cneifio. The change in fauna reflects a change in environment from the shallow water high energy type to a more offshore (though possibly not deeper) and quieter environment. There is also a hint of a change from a Soudleyan fauna (D. herwynensis, Plaesiomys multifida etc.) towards a Longvillian fauna (Sowerbyella cf. soudleyensis). This agrees with the base shown for the Lower Rhyolitic Tuffs in the Snowdon area by Williams and others (Geol. Soc. Spec. Rept.3). However, within the early Lower Rhyolitic Tuffs there appears to have been some difference in environment between the western and eastern limbs of the Idwal Syncline. To the west (item 15) Dinorthis persists in tuffaceous sandstones while to the east (items 16, 17) sowerbyellids continue associated with trilobite and crinoid fragments. Higher in the Lower Rhyolitic Tuffs trinucleid trilobites and the brachiopod Sericoidea occur in fine, dark mudstones, suggesting quieter water, possibly deeper and farther off-shore than the dalmanellid-sowerbyellid association. The fauna from the Banded Pumice Tuffs (item 23) has been identified by Dean as Longvillian, probably Lower.

S.P. Tunnicliff,

Palaeontology Unit

10th June, 1980

Copies to
Mr. I.P. Stevenson
Drs. Howells and Leveridge
Dr. Ramsbottom
1" sheet file 106

PD/85/213 Dolwyddelan syncline

PD/85/213

1" 119
PA7200

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Caradoc (Soudleyan-Longvillian) fossils from Snowdonia
Sheet SH75

1:50,000 Sheet 119

by S.P.Tunnicliff

1. Crags and twmps 850m at 137° from Gorddinan, Roman Bridge, Gwynedd.
Cwm Eigiau Formation.
NGR SH 7091 5063 6" SH75SW/SW 1" 119
specs. DJ 5700-5704 loc.36A

Dalmanella sp.
trilobite fragment indet.
orthocone nautiloid fragment indet.
crinoid columnal

2. Twmp on south side of flat area between ridges, 710m at 175° from Gorddinan, Roman Bridge, Gwynedd.
Cwm Eigiau Formation.
NGR SH 7098 5076 6" SH75SW/SW 1" 119
specs. DJ 5705-5711 loc.36F

dalmanellids indet.
Sinuites sp.
spired gastropod
cushion bryozoan

3. Twmp on south side of flat area between ridges, 670m at 175° from Gorddinan, Roman Bridge, Gwynedd.
Cwm Eigiau Formation.
NGR SH 7099 5073 6" SH75SW/SW 1" 119
specs. DJ 5712-5724 loc.36E

Coverbyella musculosa Williams (common)
lingulid indet.
crinoid columnals

4. Twmp 615m at 175° from Gorddinan, Roman Bridge, Gwynedd.
Cwm Eigiau Formation.
NGR SH 7096 5084 6" SH75SW/SW 1" 119
specs. DJ 5725-5728 loc.36D

Bicuspina sp.
Coverbyella musculosa Williams
dalmanellid indet.

5. Twmp by track and between tracks at junction, 690m at199° from Gorddinan, Roman Bridge, Gwynedd.
Cwm Eigiau Formation.
NGR SH 7070 5080 6" SH75SW/SW 1" 119
specs. DJ 5729-5748 loc.36B

Dinorthis berwynensis angusta Williams
Howellites sp.
?Leptaena sp.
Macrocoelia sp. (cf. *prolata*)
Flexicalymene cf. *limba* (Shirley)
crinoid columnals

6. Twmps 700m at 205° from Gorddinan, Roman Bridge, Gwynedd.
Cwm Eigiau Formation.
NGR SH 7062 5082 6" SH75SW/SW 1" 119
specs. DJ 5749-5757 loc.36C

Broeggerolithus cf. *broeggeri* (Bancroft)
Brongniartella sp. (*?minor*)
calymenid pygidium
Reuschella sp.
Tentaculites sp.
crinoid columnals

7. Sandstone at base of south end of section in roadside cutting, east side of road, 520m at 163° from Gorddinan, Roman Bridge, Gwynedd.
Cwm Eigiau Formation.
NGR SH 7106 5098 6" SH75SW/SW 1" 119
specs. DJ 5758-5760 loc.37A

Dinorthis berwynensis angusta Williams
Howellites antiquior (McCoy)
trinucleid fragments indet.
crinoid cup and columnals

8. as above, but c.2m stratigraphically higher, siltstone
specs. DJ 5761-5762 loc.37B

Dinorthis sp.
crinoid columnals
indeterminable shell debris

9. Roadside exposure opposite and a little north of forestry road entrance, 720m at 173° from Gorddinan, Roman Bridge, Gwynedd.
Cwm Eigiau Formation.
NGR SH 7100 5078 6" SH75SW/SW 1" 119
Specs. DJ 5763-5795 loc.DKW188

Ricuspina sp.
Leptaena cf. *ventricosa* Williams
Macrocoelia sp.
Sowerbyella musculosa Williams
dalmanellids indet.
Flexicalymene cf. *planimarginata* (Reed)
trinucleid fragments indet.
crinoid columnals

Discussion. Elements of these faunas suggest a Longvillian age. The faunal lists recorded by Diggens and Romano and by D.K.Wright tend to support this view. This is the problematic Dolwyddelan area. However, were a probable position for the Soudleyan-Longvillian boundary required, then the sandstones with *Dinorthis berwynensis angusta* at nos.5 and 7 above might be seen as an equivalent of the *Plaesiomys multifida* horizon elsewhere. This conclusion might be supported by the presence of *Sinuites*-rich beds at no2. (cf. discussion of PD/85/210). Unfortunately, the expectation would be that these forms would appear in the reverse of the stratigraphic order seen here. The Sinuites beds are very close to the local Capel Curig Tuff pods.

S.P.Tunnicliff
Biostratigraphy Research Group, CS23
Keyworth.
13th November, 1985

REGION=1

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	2	31.05	2.76	29.10	33.00	1.95
QMS	2	9.30	4.67	6.00	12.60	3.30
QP	2	10.95	11.24	3.00	18.90	7.95
CHERT	2	0.50	0.71	0.00	1.00	0.50
CHALC	2	0.00	0.00	0.00	0.00	0.00
PLAG	2	8.85	2.62	7.00	10.70	1.85
KFELD	2	3.45	2.05	2.00	4.90	1.45
RHY	2	4.85	5.44	1.00	8.70	3.85
BAS	2	0.00	0.00	0.00	0.00	0.00
TRACH	2	0.00	0.00	0.00	0.00	0.00
LVOTH	2	0.50	0.71	0.00	1.00	0.50
SCHT	2	24.55	17.61	12.10	37.00	12.45
SLT	2	3.75	4.60	0.50	7.00	3.25
SS	2	0.50	0.71	0.00	1.00	0.50
SOTH	2	0.00	0.00	0.00	0.00	0.00
IGN	2	0.25	0.35	0.00	0.50	0.25
META	2	0.25	0.35	0.00	0.50	0.25
OPAQ	2	1.25	0.35	1.00	1.50	0.25
HVY	2	0.00	0.00	0.00	0.00	0.00
BIO	2	0.00	0.00	0.00	0.00	0.00
MUS	2	0.00	0.00	0.00	0.00	0.00
HEM	2	0.00	0.00	0.00	0.00	0.00
PERCTOT	2	43.70	11.74	35.40	52.00	8.30
QPM	2	0.00	0.00	0.00	0.00	0.00
QS	2	25.45	34.72	0.90	50.00	24.55
CHL	2	17.45	21.85	2.00	32.90	15.45
HEMM	2	0.80	1.13	0.00	1.60	0.80
CALC	2	0.25	0.35	0.00	0.50	0.25
PF	2	0.73	0.06	0.69	0.78	0.05
LVL	2	0.22	0.25	0.04	0.39	0.17

REGION=1

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	2	13.76	11.14	5.88	21.64	7.88
Q	2	52.48	12.79	43.43	61.52	9.04
F	2	12.46	4.77	9.09	15.84	3.37
L	2	35.06	17.56	22.64	47.47	12.42
Q2	2	51.97	13.50	42.42	61.52	9.55
F2	2	12.46	4.77	9.09	15.84	3.37
L2	2	35.56	18.28	22.64	48.48	12.92
QM2	2	40.86	2.08	39.39	42.34	1.47
F3	2	12.46	4.77	9.09	15.84	3.37
LT	2	46.67	6.85	41.83	51.52	4.84
QP2	2	27.43	27.70	7.84	47.01	19.59
LV	2	12.78	12.53	3.92	21.64	8.86
LS	2	59.79	40.23	31.34	88.24	28.45
QP3	2	26.45	29.09	5.88	47.01	20.57
QM3	2	77.01	5.99	72.77	81.25	4.24
P	2	16.63	2.89	14.58	18.67	2.05
K	2	6.36	3.10	4.17	8.55	2.19
LP	2	2.24	3.17	0.00	4.48	2.24
LV3	2	21.63	24.58	4.26	39.01	17.38
LS3	2	76.12	27.75	56.50	95.74	19.62
LP2						
LV4	2	23.55	24.46	6.25	40.85	17.30
LS4	2	76.45	24.46	59.15	93.75	17.30
LVB	2	0.00	0.00	0.00	0.00	0.00
LVR	2	22.63	23.17	6.25	39.01	16.38
LSLP	2	77.37	23.17	60.99	93.75	16.38
QPM2	2	0.00	0.00	0.00	0.00	0.00
QS2	2	49.35	66.19	2.54	96.15	46.81
CHLM	2	50.65	66.19	3.85	97.46	46.81
QM5	2	63.30	21.60	48.02	78.57	15.28
QMS5	2	17.54	4.60	14.29	20.79	3.25
QP5	2	19.17	17.00	7.14	31.19	12.02
QM6	2	62.38	20.31	48.02	76.74	14.36
QMS6	2	17.37	4.84	13.95	20.79	3.42
QP6	2	20.25	15.48	9.30	31.19	10.94

---------- REGION=2 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	8	27.70	10.23	15.00	40.00	3.62
QMS	8	11.06	5.11	4.00	18.30	1.81
QP	8	9.70	6.65	5.00	24.00	2.35
CHERT	8	5.08	4.82	0.00	15.00	1.70
CHALC	8	0.00	0.00	0.00	0.00	0.00
PLAG	8	10.86	3.85	6.70	17.00	1.36
KFELD	8	6.66	3.13	3.00	11.00	1.11
RHY	8	2.83	2.53	0.00	7.60	0.90
BAS	8	0.69	0.84	0.00	2.00	0.30
TRACH	8	0.11	0.21	0.00	0.50	0.07
LVOTH	8	0.63	0.52	0.00	1.00	0.18
SCHT	8	8.16	11.12	0.00	28.00	3.93
SLT	8	7.10	7.92	0.00	22.00	2.80
SS	8	1.93	3.01	0.00	8.00	1.06
SOTH	8	0.00	0.00	0.00	0.00	0.00
IGN	8	0.50	0.71	0.00	2.00	0.25
META	8	0.88	2.47	0.00	7.00	0.88
OPAQ	8	4.50	8.50	0.00	25.00	3.01
HVY	8	0.06	0.18	0.00	0.50	0.06
BIO	8	0.06	0.18	0.00	0.50	0.06
MUS	8	0.65	1.48	0.00	4.20	0.52
HEM	8	0.84	1.08	0.00	3.00	0.38
PERCTOT	8	21.55	9.28	11.30	40.60	3.28
QPM	8	0.48	1.04	0.00	3.00	0.37
QS	8	6.73	5.54	3.00	19.70	1.96
CHL	8	10.13	8.17	0.00	21.60	2.89
HEMM	8	0.76	1.42	0.00	3.40	0.50
CALC	8	3.95	6.74	0.00	20.30	2.38
PF	8	0.62	0.16	0.45	0.85	0.06
LVL	8	0.24	0.18	0.03	0.50	0.06

---------- REGION=2 ----------

LV2	8	27.83	20.92	2.82	70.83	7.40
Q	8	56.32	11.62	32.21	73.20	4.11
F	8	18.61	3.06	15.27	22.68	1.08
L	8	25.06	13.44	4.12	51.68	4.75
Q2	8	51.05	8.27	32.21	59.18	2.93
F2	8	18.61	3.06	15.27	22.68	1.08
L2	8	30.34	9.77	19.59	51.68	3.45
QM2	8	40.83	8.62	25.50	52.58	3.05
F3	8	18.61	3.06	15.27	22.68	1.08
LT	8	40.56	9.88	24.74	58.39	3.49
QP2	8	42.50	23.73	11.76	83.33	8.39
LV	8	11.41	6.55	2.82	20.00	2.32
LS	8	46.08	27.45	8.33	82.35	9.71
QP3	8	26.08	14.29	11.76	53.33	5.05
QM3	8	68.26	5.22	61.29	75.88	1.85
P	8	20.02	7.67	10.77	30.36	2.71
K	8	11.72	4.34	5.36	16.39	1.53
LP	8	5.27	12.19	0.00	35.29	4.31
LV3	8	24.37	18.22	3.34	50.00	6.44
LS3	8	70.36	21.45	39.22	94.98	7.58
LP2	8	6.57	16.03	0.00	46.15	5.67
LV4	8	39.95	28.34	3.40	89.47	10.02
LS4	8	60.05	28.34	10.53	96.60	10.02
LVB	8	3.07	3.83	0.00	9.52	1.35
LVR	8	34.85	28.00	3.34	89.47	9.90
LSLP	8	62.09	28.23	10.53	96.66	9.98
QPM2	8	2.76	5.03	0.00	14.29	1.78
QS2	8	40.21	29.29	12.20	89.55	10.36
CHLM	8	57.03	29.12	10.45	87.80	10.30
QM5	8	57.80	17.32	29.31	78.43	6.12
QMS5	8	22.31	8.19	11.76	37.04	2.90
QP5	8	19.89	11.05	8.93	41.38	3.91
QM6	8	52.87	16.02	27.42	71.43	5.66
QMS6	8	20.37	7.28	10.71	32.11	2.58
QP6	8	26.75	10.58	11.44	45.16	3.74

---------- REGION=3 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	2	27.25	0.49	26.90	27.60	0.35
QMS	2	7.95	0.64	7.50	8.40	0.45
QP	2	7.15	1.20	6.30	8.00	0.85
CHERT	2	23.65	0.49	23.30	24.00	0.35
CHALC	2	0.00	0.00	0.00	0.00	0.00
PLAG	2	3.95	1.06	3.20	4.70	0.75
KFELD	2	1.00	0.28	0.80	1.20	0.20
RHY	2	2.40	1.70	1.20	3.60	1.20
BAS	2	0.00	0.00	0.00	0.00	0.00
TRACH	2	0.00	0.00	0.00	0.00	0.00
LVOTH	2	1.60	1.70	0.40	2.80	1.20
SCHT	2	2.80	0.00	2.80	2.80	0.00
SLT	2	0.00	0.00	0.00	0.00	0.00
SS	2	11.50	5.52	7.60	15.40	3.90
SOTH	2	0.20	0.28	0.00	0.40	0.20
IGN	2	1.80	0.28	1.60	2.00	0.20
META	2	0.00	0.00	0.00	0.00	0.00
OPAQ	2	7.20	8.49	1.20	13.20	6.00
HVY	2	0.00	0.00	0.00	0.00	0.00
BIO	2	0.20	0.28	0.00	0.40	0.20
MUS	2	0.60	0.85	0.00	1.20	0.60
HEM	2	0.80	1.13	0.00	1.60	0.80
PERCTOT	2	16.20	0.71	15.70	16.70	0.50
QPM	2	0.15	0.21	0.00	0.30	0.15
QS	2	15.80	0.71	15.30	16.30	0.50
CHL	2	0.20	0.28	0.00	0.40	0.20
HEMM	2	0.00	0.00	0.00	0.00	0.00
CALC	2	0.00	0.00	0.00	0.00	0.00
PF	2	0.80	0.00	0.80	0.80	0.00
LVL	2	0.18	0.08	0.12	0.24	0.06

---------- REGION=3 ----------

LV2	2	56.29	2.68	54.40	58.18	1.89
Q	2	72.74	9.47	66.05	79.44	6.70
F	2	5.38	1.00	4.67	6.09	0.71
L	2	21.88	8.47	15.89	27.86	5.99
Q2	2	46.70	6.65	42.00	51.40	4.70
F2	2	5.38	1.00	4.67	6.09	0.71
L2	2	47.92	5.65	43.93	51.91	3.99
QM2	2	38.78	4.64	35.50	42.06	3.28
F3	2	5.38	1.00	4.67	6.09	0.71
LT	2	55.84	3.63	53.27	58.41	2.57
QP2	2	63.47	13.09	54.21	72.73	9.26
LV	2	7.68	5.72	3.64	11.72	4.04
LS	2	28.85	7.37	23.64	34.07	5.21
QP3	2	14.86	4.70	11.54	18.18	3.32
QM3	2	87.68	3.28	85.36	90.00	2.32
P	2	9.83	2.59	8.00	11.66	1.83
K	2	2.49	0.69	2.00	2.98	0.49
LP	2	9.59	3.08	7.41	11.76	2.18
LV3	2	17.73	8.44	11.76	23.70	5.97
LS3	2	72.68	5.36	68.89	76.47	3.79
LP2	2	4.29	0.21	4.14	4.44	0.15
LV4	2	66.30	6.80	61.49	71.11	4.81
LS4	2	33.70	6.80	28.89	38.51	4.81
LVB	2	0.00	0.00	0.00	0.00	0.00
LVR	2	63.57	6.39	59.05	68.09	4.52
LSLP	2	36.43	6.39	31.91	40.95	4.52
QPM2	2	0.90	1.28	0.00	1.81	0.90
QS2	2	97.82	0.52	97.45	98.19	0.37
CHLM	2	1.27	1.80	0.00	2.55	1.27
QM5	2	64.41	2.38	62.73	66.09	1.68
QMS5	2	18.76	0.47	18.43	19.09	0.33
QP5	2	16.83	1.91	15.48	18.18	1.35
QM6	2	41.31	1.02	40.59	42.03	0.72
QMS6	2	12.04	0.45	11.72	12.35	0.32
QP6	2	46.65	0.57	46.25	47.06	0.40

REGION=4

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	7	12.31	6.98	3.70	20.40	2.64
QMS	7	6.76	4.91	3.10	16.70	1.86
QP	7	9.69	4.67	5.00	18.00	1.77
CHERT	7	9.06	6.20	2.80	20.50	2.34
CHALC	7	0.00	0.00	0.00	0.00	0.00
PLAG	7	8.89	13.61	1.20	38.20	5.14
KFELD	7	6.46	3.37	1.60	10.20	1.27
RHY	7	16.99	14.53	4.30	47.30	5.49
BAS	7	3.80	3.52	0.00	10.20	1.33
TRACH	7	0.29	0.76	0.00	2.00	0.29
LVOTH	7	1.89	1.91	0.00	4.50	0.72
SCHT	7	4.00	5.25	0.00	14.40	1.99
SLT	7	5.39	9.13	0.00	20.60	3.45
SS	7	9.11	15.49	0.00	38.80	5.86
SOTH	7	0.00	0.00	0.00	0.00	0.00
IGN	7	1.99	3.14	0.00	8.90	1.19
META	7	0.17	0.21	0.00	0.40	0.08
OPAQ	7	1.47	2.09	0.00	5.80	0.79
HVY	7	0.47	1.04	0.00	2.80	0.39
BIO	7	0.00	0.00	0.00	0.00	0.00
MUS	7	0.11	0.30	0.00	0.80	0.11
HEM	7	0.51	0.79	0.00	2.00	0.30
PERCTOT	7	16.51	4.15	11.00	24.00	1.57
QPM	7	2.61	4.56	0.00	11.30	1.72
QS	7	9.50	6.31	2.30	20.70	2.39
CHL	7	3.37	2.04	0.30	7.00	0.77
HEMM	7	0.27	0.48	0.00	1.30	0.18
CALC	7	0.73	1.37	0.00	3.70	0.52
PF	7	0.42	0.22	0.15	0.79	0.08
LVL	7	0.56	0.33	0.11	0.98	0.12

REGION=4

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	7	55.15	19.94	36.52	84.60	7.54
Q	7	38.84	14.85	18.88	58.76	5.61
F	7	16.07	16.87	2.84	51.05	6.37
L	7	45.09	13.64	30.06	63.32	5.16
Q2	7	29.54	13.04	15.93	48.83	4.93
F2	7	16.07	16.87	2.84	51.05	6.37
L2	7	54.39	16.24	33.02	77.10	6.14
QM2	7	19.55	10.85	8.43	36.88	4.10
F3	7	16.07	16.87	2.84	51.05	6.37
LT	7	64.38	15.79	39.45	84.19	5.97
QP2	7	31.24	9.38	23.34	49.38	3.54
LV	7	40.74	25.75	6.81	76.66	9.73
LS	7	28.02	22.22	0.00	56.23	8.40
QP3	7	16.83	8.27	7.25	31.97	3.13
QM3	7	60.80	27.54	15.68	82.05	10.41
P	7	21.05	24.55	3.88	66.55	9.28
K	7	18.14	6.09	10.26	29.05	2.30
LP	7	4.66	5.26	0.00	15.70	1.99
LV3	7	55.56	32.60	10.51	97.53	12.32
LS3	7	39.78	31.68	0.00	86.80	11.97
LP2	7	4.44	5.77	0.00	16.92	2.18
LV4	7	67.01	24.63	39.38	100.00	9.31
LS4	7	32.99	24.63	0.00	60.63	9.31
LVB	7	13.77	10.28	11.85	0.00	32.59	4.48
LVR	7	54.30	21.71	35.73	97.75	8.20
LSLP	7	35.42	24.98	2.25	61.35	9.44
QPM2	7	15.74	26.82	0.00	62.09	10.14
QS2	7	59.19	28.19	12.64	89.94	10.65
CHLM	7	25.07	14.70	10.06	51.09	5.56
QM5	7	40.99	14.24	23.70	64.77	5.38
QMS5	7	22.98	9.39	14.77	37.36	3.55
QP5	7	36.02	13.46	18.57	54.91	5.09
QM6	7	30.17	7.80	18.47	38.10	2.95
QMS6	7	18.09	9.35	9.17	32.30	3.53
QP6	7	51.74	11.49	29.59	64.86	4.34

REGION=5

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	6	8.20	4.96	2.70	15.30	2.02
QMS	6	2.75	2.03	0.00	6.10	0.83
QP	6	8.70	7.69	0.40	20.50	3.14
CHERT	6	2.15	2.19	0.00	5.50	0.89
CHALC	6	0.00	0.00	0.00	0.00	0.00
PLAG	6	12.22	11.02	1.60	32.20	4.50
KFELD	6	9.47	7.07	1.60	21.60	2.88
RHY	6	30.87	22.80	1.20	53.50	9.31
BAS	6	10.13	12.56	0.00	29.10	5.13
TRACH	6	0.40	0.51	0.00	1.20	0.21
LVOTH	6	0.50	1.22	0.00	3.00	0.50
SCHT	6	0.13	0.33	0.00	0.80	0.13
SLT	6	0.00	0.00	0.00	0.00	0.00
SS	6	1.10	2.09	0.00	5.30	0.85
SOTH	6	0.35	0.42	0.00	0.90	0.17
IGN	6	0.55	0.82	0.00	2.10	0.34
META	6	1.17	1.98	0.00	5.00	0.81
OPAQ	6	9.62	9.29	0.40	22.50	3.79
HVY	6	1.12	1.16	0.40	3.40	0.47
BIO	6	0.00	0.00	0.00	0.00	0.00
MUS	6	0.07	0.16	0.00	0.40	0.07
HEM	6	0.13	0.33	0.00	0.80	0.13
PERCTOT	6	18.17	4.42	13.30	24.30	1.80
QPM	6	1.17	1.81	0.00	3.70	0.74
QS	6	3.15	5.48	0.00	13.40	2.24
CHL	6	12.53	8.31	0.00	23.00	3.39
HEMM	6	0.00	0.00	0.00	0.00	0.00
CALC	6	1.38	1.88	0.00	4.70	0.77
PF	6	0.54	0.17	0.35	0.79	0.07
LVL	6	0.92	0.06	0.81	0.99	0.03

REGION=5

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	6	81.82	15.18	54.47	98.52	6.20
Q	6	25.84	13.76	12.13	46.21	5.62
F	6	23.55	17.65	4.26	56.75	7.21
L	6	50.62	12.20	31.12	64.14	4.98
Q2	6	23.21	12.20	12.13	43.54	4.98
F2	6	23.55	17.65	4.26	56.75	7.21
L2	6	53.25	12.29	31.12	64.14	5.02
QM2	6	12.99	7.40	2.69	23.37	3.02
F3	6	23.55	17.65	4.26	56.75	7.21
LT	6	63.47	16.32	35.34	79.58	6.66
QP2	6	19.55	11.83	7.96	37.94	4.83
LV	6	77.53	15.27	51.10	91.30	6.23
LS	6	2.91	4.06	0.00	10.96	1.66
QP3	6	15.27	11.59	0.74	34.57	4.73
QM3	6	39.59	26.30	12.23	79.22	10.74
P	6	32.33	16.58	10.39	52.53	6.77
K	6	28.08	17.12	10.39	56.59	6.99
LP	6	3.43	3.84	0.00	9.46	1.57
LV3	6	92.36	6.31	81.45	99.20	2.58
LS3	6	4.21	6.60	0.00	17.47	2.69
LP2	6	3.46	4.00	0.00	10.15	1.63
LV4	6	95.95	6.32	83.25	100.00	2.58
LS4	6	4.05	6.32	0.00	16.75	2.58
LVB	6	26.01	31.92	0.68	74.23	13.03
LVR	6	66.77	36.67	8.16	98.51	14.97
LSLP	6	7.22	5.94	0.75	17.60	2.42
QPM2	6	7.61	12.17	0.00	27.61	4.97
QS2	6	23.36	40.84	0.00	100.00	16.67
CHLM	6	69.03	37.27	0.00	100.00	15.22
QM5	6	44.79	26.80	14.84	84.11	10.94
QMS5	6	14.48	9.94	0.00	30.43	4.06
QP5	6	40.73	28.97	2.65	85.16	11.83
QM6	6	39.10	20.46	14.84	66.84	8.35
QMS6	6	13.30	10.12	0.00	30.43	4.13
QP6	6	47.60	23.01	22.63	85.16	9.40

REGION=6

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	18	19.43	14.13	0.00	51.80	3.33
QMS	18	16.03	12.06	2.50	41.90	2.84
QP	18	8.12	3.41	2.20	13.60	0.80
CHERT	18	7.20	5.47	0.00	21.10	1.29
CHALC	18	0.56	1.51	0.00	6.20	0.36
PLAG	18	11.22	8.27	1.20	25.80	1.95
KFELD	18	7.05	6.23	0.80	23.00	1.47
RHY	18	6.91	7.98	0.00	33.60	1.88
BAS	18	0.71	0.86	0.00	3.70	0.20
TRACH	18	0.39	0.40	0.00	1.20	0.10
LVOTH	18	2.86	4.02	0.00	16.60	0.95
SCHT	18	5.42	9.93	0.00	36.20	2.34
SLT	18	1.65	3.33	0.00	13.20	0.79
SS	18	6.20	9.81	0.00	31.70	2.31
SOTH	18	0.74	2.15	0.00	7.70	0.51
IGN	18	1.56	1.52	0.00	5.10	0.36
META	18	0.14	0.42	0.00	1.30	0.10
OPAQ	18	1.58	3.18	0.00	12.30	0.75
HVY	18	0.19	0.49	0.00	1.50	0.12
BIO	18	0.02	0.09	0.00	0.40	0.02
MUS	18	0.94	1.66	0.00	5.50	0.39
HEM	18	0.62	1.03	0.00	4.20	0.24
PERCTOT	18	18.82	8.72	0.00	33.70	2.05
QPM	18	5.01	7.50	0.00	28.00	1.77
QS	18	7.90	9.46	0.00	30.60	2.23
CHL	18	6.24	6.89	0.00	20.70	1.62
HEMM	18	0.34	0.79	0.00	2.60	0.19
CALC	18	0.88	1.30	0.00	4.80	0.31
PF	18	0.60	0.23	0.09	0.87	0.05
LVL	18	0.47	0.25	0.11	0.96	0.06

REGION=6

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	18	47.70	22.70	9.42	88.69	5.35
Q	18	53.49	13.72	27.68	70.95	3.23
F	18	18.81	10.11	3.36	34.57	2.38
L	18	27.69	17.85	5.27	67.96	4.21
Q2	18	45.99	13.63	19.84	66.22	3.21
F2	18	18.81	10.11	3.36	34.57	2.38
L2	18	35.20	18.31	10.92	76.81	4.32
QM2	18	37.00	14.33	10.58	59.80	3.38
F3	18	18.81	10.11	3.36	34.57	2.38
LT	18	44.18	18.51	16.42	86.06	4.36
QP2	18	43.91	19.76	13.06	72.75	4.66
LV	18	27.12	15.99	9.01	64.25	3.77
LS	18	28.97	25.72	0.00	77.52	6.06
QP3	18	23.32	14.39	7.71	51.75	3.39
QM3	18	67.16	14.48	41.97	92.26	3.41
P	18	19.05	11.31	4.80	44.56	2.67
K	18	13.79	12.59	1.55	48.02	2.97
LP	18	9.58	12.20	0.00	41.80	2.88
LV3	18	47.03	25.50	10.50	95.95	6.01
LS3	18	43.40	30.64	0.00	89.44	7.22
LP2	18	8.85	13.44	0.00	46.36	3.17
LV4	18	63.96	29.63	10.84	100.00	6.98
LS4	18	36.04	29.63	0.00	89.16	6.98
LVB	18	3.86	3.17	0.00	11.60	0.75
LVR	18	54.45	25.90	10.50	95.05	6.10
LSLP	18	41.69	26.18	2.97	89.50	6.17
QPM2	18	28.60	33.98	0.00	83.09	8.01
QS2	18	35.11	34.84	0.00	94.74	8.21
CHLM	18	36.30	35.22	0.00	96.76	8.30
QM5	18	42.92	22.43	0.00	84.87	5.29
QMS5	18	36.22	25.04	8.84	92.49	5.90
QP5	18	20.86	11.40	3.53	46.67	2.69
QM6	18	35.61	18.89	0.00	72.65	4.45
QMS6	18	31.91	23.94	6.94	89.53	5.64
QP6	18	32.48	15.28	10.47	63.12	3.60

REGION=7

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	15	27.47	11.43	11.30	51.80	2.95
QMS	15	10.11	4.66	3.40	20.80	1.20
QP	15	6.22	5.28	0.00	19.70	1.36
CHERT	15	6.59	6.69	0.00	20.90	1.73
CHALC	15	0.03	0.10	0.00	0.40	0.03
PLAG	15	6.88	4.29	2.80	18.70	1.11
KFELD	15	5.26	2.62	1.30	9.70	0.68
RHY	15	4.21	5.79	0.00	19.00	1.50
BAS	15	1.12	1.17	0.00	3.40	0.30
TRACH	15	0.08	0.17	0.00	0.40	0.04
LVOTH	15	1.23	1.42	0.00	4.70	0.37
SCHT	15	9.25	10.02	0.00	31.10	2.59
SLT	15	3.73	5.06	0.00	12.80	1.31
SS	15	3.85	6.56	0.00	22.80	1.69
SOTH	15	1.22	2.90	0.00	8.90	0.75
IGN	15	1.20	1.45	0.00	4.00	0.37
META	15	0.20	0.67	0.00	2.60	0.17
OPAQ	15	7.40	8.14	0.00	22.60	2.10
HVY	15	0.88	1.70	0.00	6.00	0.44
BIO	15	0.05	0.21	0.00	0.80	0.05
MUS	15	2.68	7.25	0.00	27.10	1.87
HEM	15	0.15	0.36	0.00	1.30	0.09
PERCTOT	15	24.35	7.73	8.70	40.00	2.00
QPM	15	4.18	7.80	0.00	22.50	2.01
QS	15	13.46	10.88	1.30	35.00	2.81
CHL	15	6.29	9.75	0.00	35.40	2.52
HEMM	15	0.29	0.51	0.00	1.30	0.13
CALC	15	0.31	0.86	0.00	3.30	0.22
PF	15	0.56	0.14	0.31	0.73	0.04
LVL	15	0.33	0.25	0.04	0.84	0.06

REGION=7

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	15	40.12	23.87	5.44	86.73	6.16
Q	15	58.00	17.52	21.96	89.05	4.52
F	15	14.01	6.96	5.04	29.67	1.80
L	15	28.00	17.84	1.30	53.00	4.61
Q2	15	50.49	15.55	21.96	77.71	4.02
F2	15	14.01	6.96	5.04	29.67	1.80
L2	15	35.51	16.71	12.65	58.58	4.31
QM2	15	43.48	15.66	21.96	74.71	4.04
F3	15	14.01	6.96	5.04	29.67	1.80
LT	15	42.51	16.90	15.65	67.80	4.36
QP2	15	42.38	26.50	0.00	91.67	6.84
LV	15	16.26	12.55	2.72	44.90	3.24
LS	15	41.36	27.23	0.00	87.34	7.03
QP3	15	18.52	14.92	0.00	44.67	3.85
QM3	15	75.34	11.52	42.54	88.56	2.97
P	15	13.84	8.18	4.33	38.24	2.11
K	15	10.83	5.61	3.53	21.04	1.45
LP	15	5.05	6.14	0.00	20.60	1.59
LV3	15	32.56	25.14	3.70	84.00	6.49
LS3	15	62.39	28.95	0.00	95.77	7.47
LP2	15	4.10	6.47	0.00	25.41	1.67
LV4	15	50.55	29.79	8.12	100.00	7.69
LS4	15	49.45	29.79	0.00	91.88	7.69
LVB	15	4.66	7.71	0.00	31.31	1.99
LVR	15	43.79	28.97	4.06	95.40	7.48
LSLP	15	51.55	28.68	2.30	91.88	7.41
QPM2	15	17.10	30.61	0.00	87.55	7.90
QS2	15	54.84	37.49	5.91	97.22	9.68
CHLM	15	28.06	33.53	0.00	94.09	8.66
QM5	15	62.96	16.97	21.81	86.91	4.38
QMS5	15	23.10	8.20	9.23	40.15	2.12
QP5	15	13.94	11.29	0.00	38.03	2.91
QM6	15	54.99	16.12	21.61	83.65	4.16
QMS6	15	20.49	8.64	8.05	39.77	2.23
QP6	15	24.52	13.36	0.00	45.22	3.45

REGION=9

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	2	46.65	0.92	46.00	47.30	0.65
QMS	2	5.30	0.00	5.30	5.30	0.00
QP	2	3.55	2.47	1.80	5.30	1.75
CHERT	2	0.00	0.00	0.00	0.00	0.00
CHALC	2	0.00	0.00	0.00	0.00	0.00
PLAG	2	10.70	1.70	9.50	11.90	1.20
KFELD	2	3.65	1.77	2.40	4.90	1.25
RHY	2	1.50	2.12	0.00	3.00	1.50
BAS	2	0.50	0.14	0.40	0.60	0.10
TRACH	2	0.00	0.00	0.00	0.00	0.00
LVOTH	2	0.81	0.58	0.40	1.22	0.41
SCHT	2	19.45	13.22	10.10	28.80	9.35
SLT	2	4.45	6.29	0.00	8.90	4.45
SS	2	0.00	0.00	0.00	0.00	0.00
SOTH	2	0.00	0.00	0.00	0.00	0.00
IGN	2	0.00	0.00	0.00	0.00	0.00
META	2	0.00	0.00	0.00	0.00	0.00
OPAQ	2	0.00	0.00	0.00	0.00	0.00
HVY	2	0.00	0.00	0.00	0.00	0.00
BIO	2	0.00	0.00	0.00	0.00	0.00
MUS	2	3.25	4.60	0.00	6.50	3.25
HEM	2	0.00	0.00	0.00	0.00	0.00
PERCTOT	2	34.50	13.29	25.10	43.90	9.40
QPM	2	0.00	0.00	0.00	0.00	0.00
QS	2	21.65	4.60	18.40	24.90	3.25
CHL	2	0.20	0.28	0.00	0.40	0.20
HEMM	2	1.00	1.41	0.00	2.00	1.00
CALC	2	11.65	7.42	6.40	16.90	5.25
PF	2	0.75	0.06	0.71	0.80	0.04
LVL	2	0.11	0.12	0.03	0.20	0.09

REGION=9

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	2	9.55	9.90	2.55	16.55	7.00
Q	2	57.61	6.00	53.37	61.85	4.24
F	2	14.80	2.95	12.71	16.88	2.09
L	2	27.60	3.04	25.44	29.75	2.15
Q2	2	57.61	6.00	53.37	61.85	4.24
F2	2	14.80	2.95	12.71	16.88	2.09
L2	2	27.60	3.04	25.44	29.75	2.15
QM2	2	53.87	3.27	51.56	56.18	2.31
F3	2	14.80	2.95	12.71	16.88	2.09
LT	2	31.33	0.32	31.10	31.56	0.23
QP2	2	11.97	8.82	5.73	18.20	6.23
LV	2	9.55	9.90	2.55	16.55	7.00
LS	2	78.48	18.72	65.25	91.72	13.24
QP3	2	11.97	8.82	5.73	18.20	6.23
QM3	2	78.44	4.40	75.33	81.55	3.11
P	2	16.10	1.94	14.73	17.47	1.37
K	2	5.46	2.46	3.72	7.20	1.74
LP	2	0.00	0.00	0.00	0.00	0.00
LV3	2	11.47	12.40	2.70	20.24	8.77
LS3	2	88.53	12.40	79.76	97.30	8.77
LP2	2	0.00	0.00	0.00	0.00	0.00
LV4	2	11.47	12.40	2.70	20.24	8.77
LS4	2	88.53	12.40	79.76	97.30	8.77
LVB	2	1.94	0.83	1.35	2.52	0.58
LVR	2	9.53	11.57	1.35	17.72	8.18
LSLP	2	88.53	12.40	79.76	97.30	8.77
QPM2	2	0.00	0.00	0.00	0.00	0.00
QS2	2	95.22	3.75	92.57	97.87	2.65
CHLM	2	4.78	3.75	2.13	7.43	2.65
QM5	2	84.16	3.49	81.69	86.63	2.47
QMS5	2	9.57	0.59	9.15	9.98	0.41
QP5	2	6.27	4.08	3.39	9.15	2.88
QM6	2	84.16	3.49	81.69	86.63	2.47
QMS6	2	9.57	0.59	9.15	9.98	0.41
QP6	2	6.27	4.08	3.39	9.15	2.88

REGION=10

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	3	17.00	7.65	9.20	24.50	4.42
QMS	3	1.83	0.47	1.30	2.20	0.27
QP	3	3.03	0.84	2.50	4.00	0.48
CHERT	3	20.93	18.21	0.00	33.10	10.51
CHALC	3	0.27	0.46	0.00	0.80	0.27
PLAG	3	21.70	6.05	16.90	28.50	3.49
KFELD	3	6.87	3.04	3.60	9.60	1.75
RHY	3	2.70	2.21	0.40	4.80	1.27
BAS	3	4.67	4.16	0.00	8.00	2.40
TRACH	3	0.13	0.23	0.00	0.40	0.13
LVOTH	3	0.40	0.69	0.00	1.20	0.40
SCHT	3	14.20	15.97	0.40	31.70	9.22
SLT	3	4.67	8.08	0.00	14.00	4.67
SS	3	0.37	0.64	0.00	1.10	0.37
SOTH	3	0.00	0.00	0.00	0.00	0.00
IGN	3	0.13	0.23	0.00	0.40	0.13
META	3	0.00	0.00	0.00	0.00	0.00
OPAQ	3	0.50	0.56	0.00	1.10	0.32
HVY	3	0.13	0.23	0.00	0.40	0.13
BIO	3	0.00	0.00	0.00	0.00	0.00
MUS	3	0.00	0.00	0.00	0.00	0.00
HEM	3	1.27	1.63	0.00	3.10	0.94
PERCTOT	3	16.37	6.16	11.90	23.40	3.56
QPM	3	0.00	0.00	0.00	0.00	0.00
QS	3	10.33	7.39	3.90	18.40	4.26
CHL	3	6.30	1.54	5.00	8.00	0.89
HEMM	3	0.00	0.00	0.00	0.00	0.00
CALC	3	0.00	0.00	0.00	0.00	0.00
PF	3	0.77	0.05	0.73	0.82	0.03
LVL	3	0.25	0.15	0.07	0.36	0.09

REGION=10

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	3	56.42	23.48	29.31	70.00	13.56
Q	3	43.71	24.11	16.03	60.21	13.92
F	3	28.89	8.91	20.42	38.18	5.14
L	3	27.40	17.20	11.71	45.79	9.93
Q2	3	22.46	6.72	16.03	29.43	3.88
F2	3	28.89	8.91	20.42	38.18	5.14
L2	3	48.65	7.98	42.49	57.67	4.61
QM2	3	19.13	7.76	11.22	26.74	4.48
F3	3	28.89	8.91	20.42	38.18	5.14
LT	3	51.98	7.58	45.18	60.16	4.38
QP2	3	47.64	33.84	9.50	74.08	19.54
LV	3	14.80	12.94	1.83	27.72	7.47
LS	3	37.56	21.85	24.08	62.77	12.61
QP3	3	6.02	1.88	4.17	7.92	1.08
QM3	3	40.08	15.04	22.72	48.77	8.68
P	3	45.77	10.73	37.24	57.81	6.19
K	3	14.15	5.24	9.00	19.47	3.02
LP	3	0.54	0.93	0.00	1.61	0.54
LV3	3	24.53	15.34	7.08	35.89	8.86
LS3	3	74.93	15.95	62.50	92.92	9.21
LP2	3	0.23	0.40	0.00	0.70	0.23
LV4	3	59.75	24.19	31.83	74.39	13.97
LS4	3	40.25	24.19	25.61	68.17	13.97
LVB	3	9.51	8.15	0.98	17.20	4.70
LVR	3	50.07	31.21	14.62	73.41	18.02
LSLP	3	40.41	24.06	25.61	68.17	13.89
QPM2	3	0.00	0.00	0.00	0.00	0.00
QS2	3	57.00	23.04	32.77	78.63	13.30
CHLM	3	43.00	23.04	21.37	67.23	13.30
QM5	3	75.14	13.22	60.53	86.27	7.63
QMS5	3	9.25	4.34	4.58	13.16	2.51
QP5	3	15.61	9.34	9.15	26.32	5.39
QM6	3	43.69	13.12	31.40	57.50	7.57
QMS6	3	6.24	5.49	2.24	12.50	3.17
QP6	3	50.07	17.95	30.00	64.61	10.37

REGION=11

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	6	13.48	4.68	8.30	19.30	1.91
QMS	6	9.47	2.33	6.70	12.40	0.95
QP	6	4.72	2.34	2.30	8.80	0.95
CHERT	6	13.90	6.93	7.00	24.40	2.83
CHALC	6	0.00	0.00	0.00	0.00	0.00
PLAG	6	10.67	11.52	3.00	33.70	4.70
KFELD	6	6.43	3.42	3.30	13.00	1.39
RHY	6	2.98	2.41	0.40	5.60	0.98
BAS	6	19.77	16.63	4.20	40.40	6.79
TRACH	6	1.92	2.50	0.00	6.80	1.02
LVOTH	6	5.12	5.34	0.00	15.00	2.18
SCHT	6	2.92	4.52	0.00	8.80	1.84
SLT	6	4.55	5.31	0.00	11.70	2.17
SS	6	0.80	1.36	0.00	3.30	0.56
SOTH	6	0.00	0.00	0.00	0.00	0.00
IGN	6	0.88	1.24	0.00	3.30	0.50
META	6	0.35	0.68	0.00	1.70	0.28
OPAQ	6	0.78	1.41	0.00	3.60	0.58
HVY	6	0.15	0.37	0.00	0.90	0.15
BIO	6	0.00	0.00	0.00	0.00	0.00
MUS	6	0.68	1.16	0.00	2.80	0.47
HEM	6	0.18	0.45	0.00	1.10	0.18
PERCTOT	6	16.68	6.28	11.00	26.20	2.56
QPM	6	0.00	0.00	0.00	0.00	0.00
QS	6	5.80	9.11	0.00	22.20	3.72
CHL	6	10.37	10.09	0.00	26.20	4.12
HEMM	6	0.43	1.06	0.00	2.60	0.43
CALC	6	0.23	0.57	0.00	1.40	0.23
PF	6	0.55	0.17	0.34	0.83	0.07
LVL	6	0.77	0.16	0.51	1.00	0.06

REGION=11

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	6	77.62	7.85	65.22	88.54	3.20
Q	6	42.41	11.97	29.19	62.08	4.89
F	6	17.46	12.59	6.36	41.31	5.14
L	6	40.13	19.67	18.26	64.44	8.03
Q2	6	28.25	6.52	19.60	37.72	2.66
F2	6	17.46	12.59	6.36	41.31	5.14
L2	6	54.29	16.30	29.24	71.52	6.65
QM2	6	23.46	5.74	16.16	28.94	2.34
F3	6	17.46	12.59	6.36	41.31	5.14
LT	6	59.08	16.02	33.03	77.47	6.54
QP2	6	35.41	19.01	17.15	65.48	7.76
LV	6	51.10	17.61	28.01	67.30	7.19
LS	6	13.49	9.54	0.00	26.81	3.90
QP3	6	8.89	4.96	3.95	17.36	2.02
QM3	6	60.70	12.30	38.32	72.19	5.02
P	6	22.87	14.62	13.45	51.45	5.97
K	6	16.43	6.18	10.23	26.69	2.52
LP	6	2.76	2.32	0.00	5.17	0.95
LV3	6	76.96	15.50	51.25	100.00	6.33
LS3	6	20.28	15.07	0.00	46.25	6.15
LP2	6	2.02	1.98	0.00	4.89	0.81
LV4	6	85.44	10.15	70.87	100.00	4.14
LS4	6	14.56	10.15	0.00	29.13	4.14
LVB	6	38.38	21.86	10.77	64.46	8.93
LVR	6	45.42	24.74	14.64	79.63	10.10
LSLP	6	16.20	10.41	0.00	30.23	4.25
QPM2	6	0.00	0.00	0.00	0.00	0.00
QS2	6	35.43	50.25	0.00	100.00	20.51
CHLM	6	64.57	50.25	0.00	100.00	20.51
QM5	6	47.99	8.71	42.47	64.51	3.56
QMS5	6	34.89	7.78	25.66	43.06	3.18
QP5	6	17.12	6.96	7.85	26.94	2.84
QM6	6	32.82	9.54	24.70	51.08	3.89
QMS6	6	23.42	5.13	15.59	31.55	2.09
QP6	6	43.76	10.29	27.03	53.38	4.20

---------- REGION=12 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	2	22.80	3.39	20.40	25.20	2.40
QMS	2	10.40	0.00	10.40	10.40	0.00
QP	2	6.70	1.84	5.40	8.00	1.30
CHERT	2	14.40	7.64	9.00	19.80	5.40
CHALC	2	0.00	0.00	0.00	0.00	0.00
PLAG	2	14.75	3.04	12.60	16.90	2.15
KFELD	2	6.50	3.54	4.00	9.00	2.50
RHY	2	2.35	0.49	2.00	2.70	0.35
BAS	2	9.35	4.31	6.30	12.40	3.05
TRACH	2	0.00	0.00	0.00	0.00	0.00
LVOTH	2	3.25	4.60	0.00	6.50	3.25
SCHT	2	1.75	2.47	0.00	3.50	1.75
SLT	2	1.00	1.41	0.00	2.00	1.00
SS	2	1.60	2.26	0.00	3.20	1.60
SOTH	2	2.00	2.83	0.00	4.00	2.00
IGN	2	0.25	0.35	0.00	0.50	0.25
META	2	0.00	0.00	0.00	0.00	0.00
OPAQ	2	4.35	1.63	3.20	5.50	1.15
HVY	2	0.20	0.28	0.00	0.40	0.20
BIO	2	0.00	0.00	0.00	0.00	0.00
MUS	2	0.00	0.00	0.00	0.00	0.00
HEM	2	0.00	0.00	0.00	0.00	0.00
PERCTOT	2	29.50	4.95	26.00	33.00	3.50
QPM	2	0.35	0.49	0.00	0.70	0.35
QS	2	0.50	0.71	0.00	1.00	0.50
CHL	2	28.65	3.75	26.00	31.30	2.65
HEMM	2	0.00	0.00	0.00	0.00	0.00
CALC	2	0.00	0.00	0.00	0.00	0.00
PF	2	0.70	0.16	0.58	0.81	0.11
LVL	2	0.67	0.16	0.56	0.78	0.11

---------- REGION=12 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	2	69.23	0.47	68.89	69.57	0.34
Q	2	55.83	8.25	50.00	61.66	5.83
F	2	21.88	0.03	21.86	21.91	0.02
L	2	22.28	8.28	16.43	28.14	5.85
Q2	2	41.08	0.70	40.59	41.58	0.50
F2	2	21.88	0.03	21.86	21.91	0.02
L2	2	37.03	0.74	36.51	37.55	0.52
QM2	2	34.16	2.75	32.22	36.11	1.94
F3	2	21.88	0.03	21.86	21.91	0.02
LT	2	43.95	2.78	41.99	45.92	1.97
QP2	2	50.02	15.34	39.17	60.87	10.85
LV	2	34.95	18.68	21.74	48.16	13.21
LS	2	15.03	3.34	12.67	17.39	2.36
QP3	2	15.74	3.81	13.04	18.43	2.69
QM3	2	60.91	1.88	59.57	62.24	1.33
P	2	27.36	7.54	22.03	32.69	5.33
K	2	11.74	5.65	7.74	15.73	4.00
LP	2	0.93	1.31	0.00	1.86	0.93
LV3	2	66.63	15.66	55.56	77.70	11.07
LS3	2	32.45	16.97	20.45	44.44	12.00
LP2	2	0.71	1.00	0.00	1.41	0.71
LV4	2	82.23	3.16	80.00	84.46	2.23
LS4	2	17.77	3.16	15.54	20.00	2.23
LVB	2	26.02	12.05	17.50	34.54	8.52
LVR	2	55.62	9.73	48.75	62.50	6.88
LSLP	2	18.36	2.32	16.71	20.00	1.64
QPM2	2	1.06	1.50	0.00	2.12	1.06
QS2	2	1.52	2.14	0.00	3.03	1.52
CHLM	2	97.42	3.64	94.85	100.00	2.58
QM5	2	57.02	6.28	52.58	61.46	4.44
QMS5	2	26.08	1.02	25.37	26.80	0.72
QP5	2	16.89	5.27	13.17	20.62	3.72
QM6	2	42.06	0.87	41.45	42.68	0.62
QMS6	2	19.43	3.29	17.11	21.76	2.33
QP6	2	38.51	4.16	35.56	41.45	2.94

REGION=13

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	7	38.27	17.00	24.40	74.20	6.42
QMS	7	16.67	9.32	0.00	28.80	3.52
QP	7	7.09	3.85	0.50	12.70	1.45
CHERT	7	14.03	4.23	8.10	17.60	1.60
CHALC	7	0.00	0.00	0.00	0.00	0.00
PLAG	7	8.23	3.14	4.30	13.60	1.19
KFELD	7	4.46	1.98	2.30	8.20	0.75
RHY	7	3.11	2.28	0.00	6.20	0.86
BAS	7	0.74	0.77	0.00	1.90	0.29
TRACH	7	0.77	0.90	0.00	2.20	0.34
LVOTH	7	1.23	0.79	0.00	2.00	0.30
SCHT	7	0.00	0.00	0.00	0.00	0.00
SLT	7	1.87	1.53	0.00	3.90	0.58
SS	7	0.17	0.45	0.00	1.20	0.17
SOTH	7	0.00	0.00	0.00	0.00	0.00
IGN	7	1.09	0.66	0.00	2.00	0.25
META	7	0.06	0.15	0.00	0.40	0.06
OPAQ	7	0.43	0.50	0.00	1.20	0.19
HVY	7	0.07	0.19	0.00	0.50	0.07
BIO	7	0.21	0.42	0.00	1.10	0.16
MUS	7	1.11	1.18	0.00	3.10	0.45
HEM	7	0.20	0.38	0.00	1.00	0.14
PERCTOT	7	15.53	9.19	2.70	30.00	3.48
QPM	7	0.00	0.00	0.00	0.00	0.00
QS	7	8.57	6.24	1.30	18.70	2.36
CHL	7	0.00	0.00	0.00	0.00	0.00
HEMM	7	0.04	0.11	0.00	0.30	0.04
CALC	7	6.90	6.08	0.00	12.70	2.30
PF	7	0.65	0.07	0.56	0.76	0.02
LVL	6	0.63	0.08	0.58	0.78	0.03

REGION=13

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	7	70.52	13.61	57.48	97.02	5.14
Q	7	77.80	7.87	71.00	93.14	2.97
F	7	12.93	4.57	6.86	18.86	1.73
L	7	9.26	5.38	0.00	15.51	2.03
Q2	7	63.49	7.62	53.27	76.46	2.88
F2	7	12.93	4.57	6.86	18.86	1.73
L2	7	23.58	3.91	16.68	28.60	1.48
QM2	7	56.22	9.87	46.02	75.95	3.73
F3	7	12.93	4.57	6.86	18.86	1.73
LT	7	30.84	6.71	17.20	37.32	2.54
QP2	7	74.81	14.16	57.14	100.00	5.35
LV	7	18.61	11.37	0.00	34.52	4.30
LS	7	6.58	4.31	0.00	13.27	1.63
QP3	7	22.89	11.36	2.98	37.80	4.29
QM3	7	80.92	7.39	71.74	91.72	2.79
P	7	12.41	5.16	5.32	21.35	1.95
K	7	6.66	3.01	2.97	12.20	1.14
LP	6	12.89	1.54	11.11	15.38	0.63
LV3	6	63.47	7.66	57.69	78.38	3.13
LS3	6	23.65	8.04	8.11	29.63	3.28
LP2	7	5.11	3.11	0.00	9.57	1.18
LV4	7	91.12	5.82	81.25	100.00	2.20
LS4	7	8.88	5.82	0.00	18.75	2.20
LVB	7	6.26	5.37	0.00	15.28	2.03
LVR	7	80.58	11.32	65.33	100.00	4.28
LSLP	7	13.17	7.42	0.00	24.89	2.80
QPM2	7	0.00	0.00	0.00	0.00	0.00
QS2	7	98.93	2.83	92.50	100.00	1.07
CHLM	7	1.07	2.83	0.00	7.50	1.07
QM5	7	60.11	18.87	46.12	99.33	7.13
QMS5	7	28.11	15.86	0.00	45.00	5.99
QP5	7	11.78	6.22	0.67	19.72	2.35
QM6	7	49.38	16.78	34.61	81.54	6.34
QMS6	7	22.50	12.06	0.00	35.51	4.56
QP6	7	28.12	5.64	18.46	35.18	2.13

---------- REGION=15 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERRC MEAN
QM	2	18.20	13.72	8.50	27.90	9.70
QMS	2	7.70	3.82	5.00	10.40	2.70
QP	2	3.75	0.21	3.60	3.90	0.15
CHERT	2	33.85	16.05	22.50	45.20	11.35
CHALC	2	0.00	0.00	0.00	0.00	0.00
PLAG	2	4.70	2.12	3.20	6.20	1.50
KFELD	2	2.65	1.20	1.80	3.50	0.85
RHY	2	13.65	6.15	9.30	18.00	4.35
BAS	2	0.40	0.57	0.00	0.80	0.40
TRACH	2	0.40	0.57	0.00	0.80	0.40
LVOTH	2	1.10	0.42	0.80	1.40	0.30
SCHT	2	4.45	6.29	0.00	8.90	4.45
SLT	2	1.15	1.63	0.00	2.30	1.15
SS	2	0.40	0.57	0.00	0.80	0.40
SOTH	2	0.00	0.00	0.00	0.00	0.00
IGN	2	0.65	0.35	0.40	0.90	0.25
META	2	0.00	0.00	0.00	0.00	0.00
OPAQ	2	5.85	8.27	0.00	11.70	5.85
HVY	2	1.50	0.42	1.20	1.80	0.30
BIO	2	0.00	0.00	0.00	0.00	0.00
MUS	2	0.00	0.00	0.00	0.00	0.00
HEM	2	0.00	0.00	0.00	0.00	0.00
PERCTOT	2	19.60	8.34	13.70	25.50	6.85
QPM	2	6.35	8.98	0.00	12.70	6.35
QS	2	10.95	15.49	0.00	21.90	0.00
CHL	2	2.20	1.70	1.00	3.40	0.50
HEMM	2	0.00	0.00	0.00	0.00	0.00
CALC	2	0.00	0.00	0.00	0.00	0.00
PF	2	0.64	0.00	0.64	0.64	0.00
LVL	2	0.70	0.23	0.54	0.86	0.16

---------- REGION=15 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	2	84.18	4.91	80.71	87.66	3.47
Q	2	68.24	0.15	68.13	68.34	0.11
F	2	7.76	2.81	5.77	9.75	1.99
L	2	24.00	2.96	21.91	26.10	2.09
Q2	2	32.53	13.60	22.91	42.15	9.62
F2	2	7.76	2.81	5.77	9.75	1.99
L2	2	59.71	10.79	52.08	67.34	7.63
QM2	2	28.49	13.43	18.99	37.99	9.50
F3	2	7.76	2.81	5.77	9.75	1.99
LT	2	63.75	10.62	56.24	71.26	7.51
QP2	2	62.12	10.64	54.60	69.65	7.52
LV	2	28.59	16.96	16.60	40.59	12.00
LS	2	9.29	6.33	4.81	13.76	4.47
QP3	2	6.53	1.41	5.53	7.53	1.00
QM3	2	76.45	14.65	66.08	86.81	10.36
P	2	15.06	9.36	8.44	21.68	6.62
K	2	8.49	5.30	4.75	12.24	3.74
LP	2	2.91	1.52	1.83	3.98	1.07
LV3	2	69.76	22.75	53.67	85.84	16.09
LS3	2	27.34	24.27	10.18	44.50	17.16
LP2	2	1.32	1.02	0.60	2.04	0.72
LV4	2	90.12	6.62	85.44	94.80	4.68
LS4	2	9.88	6.62	5.20	14.56	4.68
LVB	2	1.19	1.69	0.00	2.39	1.19
LVR	2	87.72	7.33	82.54	92.90	5.18
LSLP	2	11.08	5.64	7.10	15.07	3.99
QPM2	1	92.70	.	92.70	92.70	.
QS2	1	0.00	.	0.00	0.00	.
CHLM	1	7.30	.	7.30	7.30	.
QM5	2	56.86	27.69	37.28	76.44	19.58
QMS5	2	29.66	22.57	13.70	45.61	15.96
QP5	2	13.48	5.12	9.86	17.11	3.62
QM6	2	29.89	24.60	12.50	47.29	17.39
QMS6	2	11.88	4.82	8.47	15.29	3.41
QP6	2	58.22	19.78	44.24	72.21	13.98

---------- REGION=16 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	2	15.90	1.27	15.00	16.80	0.90
QMS	2	4.00	0.99	3.30	4.70	0.70
QP	2	3.45	0.21	3.30	3.60	0.15
CHERT	2	23.20	21.92	7.70	38.70	15.50
CHALC	2	0.40	0.57	0.00	0.80	0.40
PLAG	2	11.55	4.31	8.50	14.60	3.05
KFELD	2	4.70	1.98	3.30	6.10	1.40
RHY	2	27.10	23.90	10.20	44.00	16.90
BAS	2	0.55	0.78	0.00	1.10	0.55
TRACH	2	0.00	0.00	0.00	0.00	0.00
LVOTH	2	0.55	0.78	0.00	1.10	0.55
SCHT	2	0.00	0.00	0.00	0.00	0.00
SLT	2	2.10	0.42	1.80	2.40	0.30
SS	2	0.00	0.00	0.00	0.00	0.00
SOTH	2	0.00	0.00	0.00	0.00	0.00
IGN	2	0.20	0.28	0.00	0.40	0.20
META	2	0.00	0.00	0.00	0.00	0.00
OPAQ	2	1.05	0.21	0.90	1.20	0.15
HVY	2	0.20	0.28	0.00	0.40	0.20
BIO	2	0.00	0.00	0.00	0.00	0.00
MUS	2	4.35	2.47	2.60	6.10	1.75
HEM	2	0.20	0.28	0.00	0.40	0.20
PERCTOT	2	13.35	6.58	8.70	18.00	4.65
QPM	2	3.65	5.16	0.00	7.30	3.65
QS	2	7.50	10.61	0.00	15.00	7.50
CHL	2	1.50	2.12	0.00	3.00	1.50
HEMM	2	0.20	0.28	0.00	0.40	0.20
CALC	2	0.65	0.92	0.00	1.30	0.65
PF	2	0.70	0.17	0.58	0.82	0.12
LVL	2	0.90	0.07	0.85	0.95	0.05

---------- REGION=16 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	2	90.32	0.17	90.21	90.44	0.12
Q	2	49.65	23.48	33.04	66.25	16.61
F	2	17.31	1.81	16.03	18.59	1.28
L	2	33.05	25.29	15.16	50.93	17.89
Q2	2	25.33	1.04	24.59	26.06	0.74
F2	2	17.31	1.81	16.03	18.59	1.28
L2	2	57.37	2.85	55.35	59.39	2.02
QM2	2	21.21	1.58	20.09	22.33	1.12
F3	2	17.31	1.81	16.03	18.59	1.28
LT	2	61.49	3.39	59.09	63.89	2.40
QP2	2	47.57	38.60	20.27	74.87	27.30
LV	2	48.77	37.94	21.95	75.60	26.83
LS	2	3.65	0.66	3.19	4.12	0.47
QP3	2	6.02	0.50	5.67	6.37	0.35
QM3	2	55.10	0.75	54.57	55.62	0.53
P	2	31.45	7.93	25.84	37.06	5.61
K	2	13.46	7.19	8.38	18.54	5.08
LP	2	1.37	1.94	0.00	2.74	1.37
LV3	2	89.88	7.00	84.93	94.83	4.95
LS3	2	8.75	5.06	5.17	12.33	3.58
LP2	2	0.38	0.53	0.00	0.76	0.38
LV4	2	96.11	0.69	95.63	96.60	0.48
LS4	2	3.89	0.69	3.40	4.37	0.48
LVB	2	1.03	1.46	0.00	2.06	1.03
LVR	2	94.72	1.29	93.81	95.63	0.91
LSLP	2	4.25	0.17	4.13	4.37	0.12
QPM2	2	47.40	67.04	0.00	94.81	47.40
QS2	2	41.67	58.93	0.00	83.33	41.67
CHLM	2	10.93	8.11	5.19	16.67	5.74
QM5	2	68.19	1.78	66.93	69.44	1.26
QMS5	2	17.00	2.44	15.28	18.73	1.72
QP5	2	14.81	0.66	14.34	15.28	0.47
QM6	2	38.08	16.62	26.33	49.83	11.75
QMS6	2	9.17	2.54	7.37	10.96	1.80
QP6	2	52.75	19.16	39.20	66.30	13.55

---------- REGION=17 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
QM	7	33.99	16.84	14.70	63.50	6.37
QMS	7	8.30	5.51	0.80	14.50	2.08
QP	7	5.46	7.25	0.00	19.60	2.74
CHERT	7	9.93	13.62	0.00	37.10	5.15
CHALC	7	0.06	0.15	0.00	0.40	0.06
PLAG	7	10.36	6.57	3.60	21.30	2.48
KFELD	7	7.27	5.24	2.10	15.10	1.98
RHY	7	9.70	19.69	0.80	54.20	7.44
BAS	7	0.57	0.63	0.00	1.50	0.24
TRACH	7	0.00	0.00	0.00	0.00	0.00
LVOTH	7	0.37	0.64	0.00	1.50	0.24
SCHT	7	8.43	9.29	0.00	22.80	3.51
SLT	7	0.73	1.28	0.00	3.10	0.49
SS	7	2.76	3.70	0.00	9.10	1.40
SOTH	7	0.00	0.00	0.00	0.00	0.00
IGN	7	0.06	0.15	0.00	0.40	0.06
META	7	0.00	0.00	0.00	0.00	0.00
OPAQ	7	0.70	0.89	0.00	2.50	0.34
HVY	7	0.39	0.58	0.00	1.50	0.22
BIO	7	0.06	0.15	0.00	0.40	0.06
MUS	7	0.67	0.99	0.00	2.70	0.37
HEM	7	0.17	0.31	0.00	0.80	0.12
PERCTOT	7	15.07	5.88	7.70	25.00	2.22
QPM	7	6.26	7.88	0.00	15.70	2.98
QS	7	6.67	7.07	0.00	18.00	2.67
CHL	7	0.67	0.85	0.00	2.00	0.32
HEMM	7	0.00	0.00	0.00	0.00	0.00
CALC	7	1.54	3.61	0.00	9.70	1.36
PF	7	0.59	0.13	0.43	0.79	0.05
LVL	7	0.42	0.38	0.03	1.00	0.14

---------- REGION=17 ----------

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR MEAN
LV2	7	48.94	36.23	6.15	100.00	13.69
Q	7	59.11	20.08	25.88	89.50	7.59
F	7	17.93	10.93	6.91	33.47	4.13
L	7	22.96	20.60	2.37	66.10	7.79
Q2	7	48.89	12.05	25.88	66.70	4.55
F2	7	17.93	10.93	6.91	33.47	4.13
L2	7	33.19	16.14	17.48	66.10	6.10
QM2	7	43.28	14.45	25.18	66.29	5.46
F3	7	17.93	10.93	6.91	33.47	4.13
LT	7	38.79	14.04	26.80	66.80	5.31
QP2	7	44.07	32.43	1.05	94.16	12.26
LV	7	20.26	28.87	3.08	83.63	10.91
LS	7	35.67	29.77	0.00	92.31	11.25
QP3	7	15.39	18.59	0.00	44.95	7.03
QM3	7	70.76	15.75	50.00	90.56	5.95
P	7	16.71	8.52	6.48	29.30	3.22
K	7	12.53	8.86	2.96	28.28	3.35
LP	7	0.23	0.62	0.00	1.64	0.23
LV3	7	41.92	38.11	3.23	100.00	14.40
LS3	7	57.85	37.92	0.00	96.77	14.33
LP2	7	0.24	0.63	0.00	1.67	0.24
LV4	7	55.04	34.85	6.25	100.00	13.17
LS4	7	44.96	34.85	0.00	93.75	13.17
LVB	7	2.36	2.80	0.00	6.82	1.06
LVR	7	52.64	34.88	6.25	98.98	13.18
LSLP	7	45.00	34.89	-0.00	93.75	13.19
QPM2	7	42.25	52.71	0.00	100.00	19.92
QS2	7	52.97	49.88	0.00	100.00	18.85
CHLM	7	4.78	6.70	0.00	18.18	2.53
QM5	7	70.19	23.89	31.75	98.15	9.03
QMS5	7	18.18	10.91	1.24	29.35	4.12
QP5	7	11.63	15.44	0.00	42.33	5.84
QM6	7	59.39	21.95	31.75	96.95	8.30
QMS6	7	16.03	10.26	1.22	27.15	3.88
QP6	7	24.58	16.66	1.83	42.69	6.30

OBS	SAMPLE	REGION	Q	F	L	Q2	F2	L2
1	C34	1	61.5228	15.8376	22.6396	61.5228	15.8376	22.6396
2	C34r	1	43.4343	9.0909	47.4747	42.4242	9.0909	48.4848
3	C46	2	60.4454	16.1188	23.4358	52.3860	16.1188	31.4952
4	C54	2	73.1959	22.6804	4.1237	57.7320	22.6804	19.5876
5	C60	2	54.2770	15.2749	30.4481	54.2770	15.2749	30.4481
6	C64	2	63.2653	19.3878	17.3469	59.1837	19.3878	21.4286
7	C65	2	53.3333	20.5128	26.1538	50.2564	20.5128	29.2308
8	C66	2	56.9892	22.5806	20.4301	50.5376	22.5806	26.8817
9	C67	2	56.8528	16.2437	26.9036	51.7766	16.2437	31.9797
10	C69	2	32.2148	16.1074	51.6779	32.2148	16.1074	51.6779
11	S2	3	79.4393	4.6729	15.8879	51.4019	4.6729	43.9252
12	S6	3	66.0475	6.0888	27.8638	42.0021	6.0888	51.9092
13	C56	4	18.8819	51.0549	30.0633	15.9283	51.0549	33.0169
14	C8	4	24.0000	23.5676	52.4324	18.7027	23.5676	57.7297
15	F10A	4	48.3007	5.6643	46.0350	27.1885	5.6643	67.1473
16	F10B	4	33.8399	2.8369	63.3232	20.0608	2.8369	77.1023
17	F7	4	58.7639	11.1449	30.0912	48.8349	11.1449	40.0203
18	F8	4	52.3810	12.4620	35.1570	45.2888	12.4620	42.2492
19	F9	4	35.7069	5.7792	58.5139	30.7534	5.7792	63.4675
20	C10	5	18.1275	17.7291	64.1434	18.1275	17.7291	64.1434
21	C12	5	46.2051	4.2610	49.5340	43.5419	4.2610	52.1971
22	C13	5	12.1308	56.7511	31.1181	12.1308	56.7511	31.1181
23	C14	5	39.5913	17.8799	42.5287	32.5670	17.8799	49.5530
24	C15A	5	22.2222	19.6491	58.1287	17.6608	19.6491	62.6901
25	C15B	5	16.7347	25.0000	58.2653	15.2041	25.0000	59.7959
26	B30	6	55.7360	29.1371	15.1269	53.4010	29.1371	17.4619
27	B32	6	52.9949	20.3046	26.7005	49.0355	20.3046	30.6599
28	B33	6	65.2959	22.4674	12.2367	61.3842	22.4674	16.1484
29	B33r	6	70.9453	23.7811	5.2736	62.6866	23.7811	13.5323
30	B34	6	48.0412	28.5567	23.4021	41.6495	28.5567	29.7938
31	B37	6	51.1089	19.0524	29.8387	46.4718	19.0524	34.4758
32	B38	6	57.7065	7.2750	35.0185	55.8570	7.2750	36.8681
33	B39	6	63.5796	23.4131	13.0073	59.5213	23.4131	17.0656
34	C17	6	48.1481	34.5679	17.2840	37.9630	34.5679	27.4691
35	C20	6	50.2703	27.3514	22.3784	34.7027	27.3514	37.9459
36	C22	6	27.6813	29.5199	42.7988	27.6813	29.5199	42.7988
37	F14	6	40.1222	8.8595	51.0183	34.6232	8.8595	56.5173
38	F15	6	65.1911	21.7304	13.0785	43.9638	21.7304	34.3058
39	F16	6	67.6531	22.8571	9.4898	66.2245	22.8571	10.9184
40	F17A	6	28.6877	3.3571	67.9552	19.8372	3.3571	76.8057
41	F17A2	6	34.4828	4.1582	61.3590	25.7606	4.1582	70.0811
42	T8	6	67.1291	4.2689	28.6019	54.8559	4.2689	40.8751
43	T9	6	68.1143	8.0000	23.8857	52.1143	8.0000	39.8857
44	B41	7	53.5099	21.4570	25.0331	52.4503	21.4570	26.0927
45	B42	7	67.2156	20.3593	12.4251	64.8204	20.3593	14.8204
46	B48	7	80.6878	13.0952	6.2169	71.0317	13.0952	15.8730
47	B50	7	74.6450	13.6917	11.6633	70.5882	13.6917	15.7201
48	B51	7	59.6725	14.5343	25.7932	42.8864	14.5343	42.5793
49	C143	7	89.0482	9.6480	1.3038	77.7053	9.6480	12.6467
50	C144	7	56.5072	14.0156	29.4772	49.9444	14.0156	36.0400
51	C26	7	53.9175	15.0515	31.0309	53.4021	15.0515	31.5464
52	C27	7	74.0260	22.7273	3.2468	54.6753	22.7273	22.5974
53	CC46	7	21.9641	29.6727	48.3633	21.9641	29.6727	48.3633
54	F19	7	43.6769	7.6514	48.6716	36.4506	7.6514	55.8980
55	F25	7	45.5293	7.1942	47.2765	34.2240	7.1942	58.5817
56	T11	7	62.8081	5.0375	32.1543	40.4073	5.0375	54.5552

OBS	QM2	F	LT	QP2	LV	LS	QP3	LV2
1	42.3350	15.8376	41.8274	47.015	21.6418	31.3433	47.0149	21.642
2	39.3939	9.0909	51.5152	7.843	3.9216	88.2353	5.8824	5.882
3	39.1304	16.1188	44.7508	47.630	18.9573	33.4123	29.6209	36.967
4	52.5773	22.6804	24.7423	83.333	8.3333	8.3333	20.8333	70.833
5	48.0652	15.2749	36.6599	17.183	2.8169	80.0000	17.1831	2.817
6	34.6939	19.3878	45.9184	62.222	17.7778	20.0000	53.3333	26.667
7	36.9231	20.5128	42.5641	49.231	20.0000	30.7692	40.0000	29.231
8	43.0108	22.5806	34.4086	41.270	7.9365	50.7937	22.2222	26.984
9	46.7005	16.2437	37.0558	27.397	9.5890	63.0137	13.6986	23.288
10	25.5034	16.1074	58.3893	11.765	5.8824	82.3529	11.7647	5.882
11	42.0561	4.6729	53.2710	72.727	3.6364	23.6364	18.1818	58.182
12	35.5005	6.0888	58.4107	54.212	11.7216	34.0659	11.5385	54.396
13	9.4937	51.0549	39.4515	24.054	74.8649	1.0811	16.4865	82.432
14	8.4324	23.5676	68.0000	23.339	76.6613	0.0000	15.3971	84.603
15	22.0391	5.6643	72.2966	36.957	6.8116	56.2319	7.2464	36.522
16	12.9686	2.8369	84.1945	24.789	30.6859	44.5247	8.4236	47.052
17	30.5978	11.1449	58.2573	49.378	34.1030	16.5187	31.9716	51.510
18	36.8794	12.4620	50.6586	32.008	26.5690	41.4226	17.3640	41.213
19	16.4087	5.7792	77.8122	28.120	35.4887	36.3910	20.9023	42.707
20	2.6892	17.7291	79.5817	20.000	78.9677	1.0323	20.0000	78.968
21	16.2450	4.2610	79.4940	37.943	51.0961	10.9612	34.5700	54.469
22	7.9114	56.7511	35.3376	11.940	85.3731	2.6866	11.9403	85.373
23	23.3716	17.8799	58.7484	28.929	69.0205	2.0501	16.4009	81.549
24	17.1930	19.6491	63.1579	7.963	91.2963	0.7407	0.7407	98.519
25	10.5102	25.0000	64.4898	10.554	89.4464	0.0000	7.9585	92.042
26	45.0761	29.1371	25.7868	50.971	47.0874	1.9417	39.8058	58.252
27	37.2589	20.3046	42.4365	39.642	34.7826	25.5754	23.7852	50.639
28	49.5486	22.4674	27.9840	68.860	31.1404	0.0000	51.7544	48.246
29	59.8010	23.7811	16.4179	72.727	23.3766	3.8961	14.2857	81.818
30	37.0103	28.5567	34.4330	32.822	50.9202	16.2577	13.8037	69.939
31	35.9879	19.0524	44.9597	33.937	64.2534	1.8100	9.5023	88.688
32	51.6646	7.2750	41.0604	14.715	9.0090	76.2763	10.2102	13.514
33	48.9074	23.4131	27.6795	60.256	23.0769	16.6667	41.8803	41.453
34	25.0000	34.5679	40.4321	57.692	34.6154	7.6923	32.3077	60.000
35	24.4324	27.3514	48.2162	55.841	27.5701	16.5888	22.1963	61.215
36	21.4505	29.5199	49.0296	13.062	9.4218	77.5161	13.0621	9.422
37	24.0326	8.8595	67.1079	24.420	11.4374	64.1422	16.0742	19.784
38	30.2817	21.7304	47.9879	72.746	16.7715	10.4822	28.5115	61.006
39	55.5102	22.8571	21.6327	57.488	11.5942	30.9179	50.7246	18.357
40	10.5799	3.3571	86.0631	21.787	41.1261	37.0869	11.1383	51.775
41	17.4442	4.1582	78.3976	22.703	16.6216	60.6757	11.0811	28.243
42	50.9072	4.2689	44.8239	36.627	25.5422	37.8313	7.7108	54.458
43	41.1429	8.0000	50.8571	54.005	9.8398	36.1556	21.9680	41.876
44	39.6026	21.4570	38.9404	35.714	2.7211	61.5646	32.9932	5.442
45	54.6407	20.3593	25.0000	50.299	34.1317	15.5689	40.7186	43.713
46	70.3704	13.0952	16.5344	62.400	4.0000	33.6000	4.0000	62.400
47	60.0406	13.6917	26.2677	56.693	15.7480	27.5591	40.9449	31.496
48	40.2252	14.5343	45.2405	44.186	12.5581	43.2558	5.1163	51.628
49	74.7066	9.6480	15.6454	91.667	4.1667	4.1667	19.1667	76.667
50	40.1557	14.0156	45.8287	36.386	5.1980	58.4158	21.7822	19.802
51	33.0928	15.0515	51.8557	45.805	44.8980	9.2971	44.6712	46.032
52	51.2987	22.7273	25.9740	89.286	10.7143	0.0000	13.2653	86.735
53	21.9641	29.6727	48.3633	0.000	12.6638	87.3362	0.0000	12.664
54	24.5484	7.6514	67.8002	30.100	27.0903	42.8094	18.7291	38.462
55	30.6269	7.1942	62.1788	25.261	2.9617	71.7770	6.0976	22.125
56	34.4051	5.0375	60.5573	47.662	22.3022	30.0360	10.0719	59.892

OBS	QM3	P	K	LP	LV3	LS3	LP2	LV4
1	72.7749	18.6736	8.5515	4.4843	39.013	56.5022	4.6948	40.845
2	81.2500	14.5833	4.1667	0.0000	4.255	95.7447	0.0000	6.250
3	70.8253	13.8196	15.3551	0.0000	36.199	63.8009	0.0000	52.525
4	69.8630	15.0685	15.0685	0.0000	50.000	50.0000	0.0000	89.474
5	75.8842	10.7717	13.3441	1.6722	3.344	94.9833	1.7007	3.401
6	64.1509	30.1887	5.6604	0.0000	47.059	52.9412	0.0000	57.143
7	64.2857	30.3571	5.3571	35.2941	25.490	39.2157	46.1538	48.718
8	65.5738	18.0328	16.3934	2.6316	13.158	84.2105	2.0408	34.694
9	74.1935	16.1290	9.6774	0.0000	13.208	86.7925	0.0000	26.984
10	61.2903	25.8065	12.9032	2.5974	6.494	90.9091	2.6667	6.667
11	90.0000	8.0000	2.0000	11.7647	11.765	76.4706	4.4444	71.111
12	85.3598	11.6625	2.9777	7.4074	23.704	68.8889	4.1408	61.491
13	15.6794	66.5505	17.7700	1.4035	97.193	1.4035	1.2945	98.706
14	26.3514	44.5946	29.0541	2.4742	97.526	0.0000	2.2989	100.000
15	79.5539	4.4610	15.9851	2.6846	10.515	86.8009	1.8750	39.375
16	82.0513	7.6923	10.2564	0.0000	40.800	59.2000	0.0000	51.380
17	73.3010	3.8835	22.8155	4.0404	64.646	31.3131	3.1332	75.718
18	74.7433	9.0349	16.2218	6.3401	36.599	57.0605	5.5696	49.873
19	73.9535	11.1628	14.8837	15.6966	41.623	42.6808	16.9202	53.992
20	13.1707	30.2439	56.5854	3.7267	95.031	1.2422	3.8710	98.710
21	79.2208	10.3896	10.3896	1.0753	81.452	17.4731	1.0309	83.247
22	12.2349	52.5285	35.2365	0.0000	96.949	3.0508	0.0000	96.949
23	56.6563	15.7895	27.5542	6.3063	90.991	2.7027	5.7221	97.548
24	46.6667	42.2222	11.1111	0.0000	99.195	0.8048	0.0000	99.254
25	29.5977	42.8161	27.5862	9.4571	90.543	0.0000	10.1504	100.000
26	60.7387	31.8741	7.3871	32.2148	65.101	2.6846	38.7097	96.774
27	64.7266	21.6931	13.5802	10.2662	51.711	38.0228	9.0604	66.443
28	68.8022	22.9805	8.2173	41.8033	58.197	0.0000	46.3636	100.000
29	71.5476	20.7143	7.7381	20.7547	67.925	11.3208	8.3333	95.455
30	56.4465	37.7358	5.8176	3.5242	73.128	23.3480	2.8470	81.139
31	65.3846	28.9377	5.6777	1.3514	95.946	2.7027	1.0000	98.000
32	87.6569	9.2050	3.1381	0.0000	10.563	89.4366	0.0000	15.050
33	67.6259	22.7338	9.6403	25.6000	43.200	31.2000	23.5294	71.324
34	41.9689	44.5596	13.4715	1.7857	80.357	17.8571	1.1364	88.636
35	47.1816	4.8017	48.0167	8.6957	57.005	34.2995	5.4054	78.679
36	42.0842	18.4369	39.4790	3.1026	10.501	86.3962	3.2020	10.837
37	73.0650	12.6935	14.2415	2.3952	14.770	82.8343	2.2099	23.573
38	58.2205	11.6054	30.1741	0.0000	61.538	38.4615	0.0000	85.337
39	70.8333	19.6615	9.5052	5.3763	25.806	68.8172	4.9020	37.255
40	75.9124	15.3285	8.7591	4.3413	50.299	45.3593	3.9945	58.264
41	80.7512	5.6338	13.6150	5.4545	20.331	74.2149	5.0152	31.763
42	92.2631	6.1896	1.5474	1.8657	39.552	58.5821	1.3055	59.008
43	83.7209	8.1395	8.1395	3.8278	20.574	75.5981	2.3460	53.666
44	64.8590	14.0998	21.0412	0.0000	4.233	95.7672	0.0000	8.122
45	72.8543	8.3832	18.7625	0.0000	68.675	31.3253	0.0000	73.737
46	84.3106	9.0333	6.6561	0.0000	10.638	89.3617	0.0000	65.000
47	81.4305	11.6919	6.8776	4.3478	34.783	60.8696	3.3333	53.333
48	73.4579	14.9533	11.5888	4.7619	21.429	73.8095	2.9412	54.412
49	88.5626	4.3277	7.1097	0.0000	50.000	50.0000	0.0000	94.845
50	74.1273	18.8912	6.9815	3.0189	7.925	89.0566	2.5316	25.316
51	68.7366	15.6317	15.6317	20.5980	65.781	13.6213	25.4098	83.197
52	69.2982	22.2807	8.4211	16.0000	84.000	0.0000	2.3529	100.000
53	42.5358	38.2413	19.2229	0.0000	12.664	87.3362	0.0000	12.664
54	76.2376	9.2409	14.5215	8.7336	35.371	55.8952	8.2305	47.325
55	80.9783	9.5109	9.5109	6.7391	3.696	89.5652	5.7514	23.562
56	87.2283	9.2391	3.5326	3.0000	41.333	55.6667	1.8000	66.600

OBS	LS4	LVB	LVR	LSLP	QPM2	QS2	CHLM	QM5
1	59.1549	0.0000	39.013	60.9865	0.000	2.542	97.458	48.0198
2	93.7500	0.0000	6.250	93.7500	0.000	96.154	3.846	78.5714
3	47.4747	1.3468	51.178	47.4747	2.500	72.500	25.000	37.6518
4	10.5263	0.0000	89.474	10.5263	0.000	19.075	80.925	69.6429
5	96.5986	0.0000	3.344	96.6555	0.000	20.290	79.710	65.6660
6	42.8571	9.5238	47.619	42.8571	14.286	19.048	66.667	29.3103
7	51.2821	8.7719	24.561	66.6667	0.000	30.114	69.886	48.9796
8	65.3061	2.0000	32.000	66.0000	0.000	12.195	87.805	70.2128
9	73.0159	1.5873	25.397	73.0159	0.000	89.545	10.455	78.4314
10	93.3333	1.2987	5.195	93.5065	5.263	58.947	35.789	62.5000
11	28.8889	0.0000	68.085	31.9149	1.807	98.193	0.000	62.7273
12	38.5093	0.0000	59.046	40.9543	0.000	97.452	2.548	66.0934
13	1.2945	32.5879	64.856	2.5559	0.000	76.923	23.077	24.5033
14	0.0000	0.0000	97.753	2.2472	0.000	62.626	37.374	23.6994
15	60.6250	0.0000	38.650	61.3497	0.000	48.905	51.095	64.7727
16	48.6202	3.5480	47.832	48.6202	46.853	37.063	16.084	48.9899
17	24.2820	18.4810	54.937	26.5823	62.088	12.637	25.275	42.3237
18	50.1266	11.5108	35.731	52.7578	1.250	86.250	12.500	44.0716
19	46.0076	5.8537	40.325	53.8211	0.000	89.937	10.063	38.5906
20	1.2903	11.9565	83.075	4.9689	0.000	40.146	59.854	14.8352
21	16.7526	74.2347	8.163	17.6020	0.000	100.000	0.000	18.6544
22	3.0508	10.1695	86.780	3.0508	0.000	0.000	100.000	34.7826
23	2.4523	58.2474	34.021	7.7320	0.000	0.000	100.000	60.0000
24	0.7463	0.7463	98.507	0.7463	18.033	0.000	81.967	84.1060
25	0.0000	0.6826	90.102	9.2150	27.612	0.000	72.388	56.3758
26	3.2258	2.3256	67.442	30.2326	50.000	50.000	0.000	16.3498
27	33.5570	4.9231	56.000	39.0769	22.059	68.382	9.559	31.0870
28	0.0000	7.4534	60.870	31.6770	66.667	0.000	33.333	48.0392
29	4.5455	2.0979	86.014	11.8881	77.228	2.970	19.802	83.1461
30	18.8612	5.5363	73.356	21.1073	79.755	4.294	15.951	18.3168
31	2.0000	1.9802	95.050	2.9703	60.150	12.782	27.068	22.0551
32	84.9498	1.6722	13.378	84.9498	0.000	94.737	5.263	0.0000
33	28.6765	4.7619	52.976	42.2619	63.492	31.746	4.762	32.0423
34	11.3636	5.6180	82.022	12.3596	4.032	16.935	79.032	34.1463
35	21.3213	1.4245	73.219	25.3561	0.000	89.121	10.879	43.6137
36	89.1626	0.0000	10.501	89.4988	0.000	8.811	91.189	33.9483
37	76.4273	2.8829	20.180	76.9369	1.554	5.181	93.264	52.3529
38	14.6628	4.3988	80.938	14.6628	83.086	10.979	5.935	58.5812
39	62.7451	9.3458	26.168	64.4860	1.145	72.137	26.718	60.5547
40	41.7355	0.0000	56.026	43.9735	1.622	1.622	96.757	40.5128
41	68.2371	2.3155	27.931	69.7540	3.955	12.994	83.051	48.4252
42	40.9922	11.5979	46.649	41.7526	0.000	58.824	41.176	84.8723
43	46.3343	1.1461	51.289	47.5645	0.000	90.417	9.583	64.4737
44	91.8782	4.0609	4.061	91.8782	0.000	84.483	15.517	52.0202
45	26.2626	31.3131	42.424	26.2626	0.000	7.089	92.911	56.5820
46	35.0000	0.0000	65.000	35.0000	0.000	97.222	2.778	86.4060
47	46.6667	3.2258	48.387	48.3871	2.357	88.552	9.091	62.2126
48	45.5882	4.2857	48.571	47.1429	81.323	13.619	5.058	73.4940
49	5.1546	0.0000	94.845	5.1546	0.000	95.238	4.762	86.9128
50	74.6835	0.0000	24.691	75.3086	0.000	96.618	3.382	65.4788
51	16.8033	2.6144	63.725	33.6601	3.488	26.744	69.767	21.8147
52	0.0000	2.2989	95.402	2.2989	52.790	33.047	14.163	64.6081
53	87.3362	6.5502	6.114	87.3362	87.549	6.226	6.226	83.6538
54	52.6749	1.5209	42.205	56.2738	13.529	39.412	47.059	47.5219
55	76.4378	2.9825	19.298	77.7193	15.417	84.583	0.000	69.6697
56	33.4000	1.5717	63.851	34.5776	0.000	5.909	94.091	57.8249

OBS	QMS5	QP5	QP5	QM6	QMS6	QP6
1	20.7921	31.1881	31.1881	48.0198	20.7921	31.188
2	14.2857	7.1429	7.1429	76.7442	13.9535	9.302
3	37.0445	25.3036	25.3036	32.6316	32.1053	35.263
4	21.4286	8.9286	8.9286	54.9296	16.9014	28.169
5	22.8893	11.4447	11.4447	65.6660	22.8893	11.444
6	29.3103	41.3793	41.3793	27.4194	27.4194	45.161
7	24.4898	26.5306	26.5306	46.1538	23.0769	30.769
8	14.8936	14.8936	14.8936	62.2642	13.2075	24.528
9	11.7647	9.8039	9.8039	71.4286	10.7143	17.857
10	16.6667	20.8333	20.8333	62.5000	16.6667	20.833
11	19.0909	18.1818	18.1818	40.5882	12.3529	47.058
12	18.4275	15.4791	15.4791	42.0313	11.7188	46.250
13	35.0993	40.3974	40.3974	20.6704	29.6089	49.720
14	21.3873	54.9133	54.9133	18.4685	16.6667	64.864
15	16.2879	18.9394	18.9394	36.4606	9.1684	54.371
16	15.6566	35.3535	35.3535	29.0419	9.2814	61.676
17	20.3320	37.3444	37.3444	35.1724	16.8966	47.931
18	37.3602	18.5682	18.5682	38.1044	32.3017	29.593
19	14.7651	46.6443	46.6443	33.2370	12.7168	54.046
20	0.0000	85.1648	85.1648	14.8352	0.0000	85.164
21	18.6544	62.6911	62.6911	17.5793	17.5793	64.841
22	30.4348	34.7826	34.7826	34.7826	30.4348	34.782
23	11.7647	28.2353	28.2353	49.3548	9.6774	40.967
24	13.2450	2.6490	2.6490	66.8421	10.5263	22.631
25	12.7517	30.8725	30.8725	51.2195	11.5854	37.195
26	68.0608	15.5894	15.5894	15.6648	65.2095	19.125
27	48.6957	20.2174	20.2174	27.3946	42.9119	29.693
28	32.6797	19.2810	19.2810	45.1613	30.7220	24.116
29	13.3226	3.5313	3.5313	72.6508	11.6410	15.708
30	70.5446	11.1386	11.1386	15.8798	61.1588	22.961
31	67.4185	10.5263	10.5263	17.3570	53.0572	29.585
32	92.4945	7.5055	7.5055	0.0000	89.5299	10.470
33	50.7042	17.2535	17.2535	29.7872	47.1358	23.076
34	31.7073	34.1463	34.1463	26.9231	25.0000	48.076
35	26.7913	29.5950	29.5950	30.1075	18.4946	51.397
36	43.5424	22.5092	22.5092	33.9483	43.5424	22.509
37	17.0588	30.5882	30.5882	45.1777	14.7208	40.101
38	10.2975	31.1213	31.1213	39.5062	6.9444	53.549
39	23.2666	16.1787	16.1787	59.2760	22.7753	17.948
40	12.8205	46.6667	46.6667	28.0142	8.8652	63.120
41	19.2913	32.2835	32.2835	36.1765	14.4118	49.411
42	8.8409	6.2868	6.2868	68.6804	7.1542	24.165
43	14.4737	21.0526	21.0526	49.3289	11.0738	39.597
44	23.4848	24.4949	24.4949	50.9901	23.0198	25.990
45	27.7136	15.7044	15.7044	54.5657	26.7261	18.708
46	12.6629	0.9311	0.9311	76.0656	11.1475	12.786
47	22.8448	14.9425	14.9425	58.8315	21.6033	19.565
48	21.2048	5.3012	5.3012	52.3156	15.0943	32.590
49	9.2282	3.8591	3.8591	75.8419	8.0527	16.105
50	14.9220	19.5991	19.5991	57.8740	13.1890	28.937
51	40.1544	38.0309	38.0309	21.6061	39.7706	38.623
52	29.2162	6.1758	6.1758	47.7193	21.5789	30.701
53	16.3462	0.0000	0.0000	83.6538	16.3462	0.000
54	19.8251	32.6531	32.6531	39.6594	16.5450	43.795
55	19.8198	10.5105	10.5105	52.3702	14.8984	32.731
56	27.3210	14.8541	14.8541	37.2014	17.5768	45.221

OBS	SAMPLE	REGION	Q	F	L	Q2	F2	L2
57	T12	7	48.3283	7.3961	44.2756	48.3283	7.3961	44.2756
58	T15	7	38.4298	8.5744	52.9959	38.4298	8.5744	52.9959
59	A18	9	53.3668	16.8844	29.7487	53.3668	16.8844	29.7487
60	A19	9	61.8458	12.7110	25.4433	61.8458	12.7110	25.4433
61	A40	10	54.8805	20.4183	24.7012	21.9124	20.4183	57.6693
62	A40r	10	60.2073	28.0829	11.7098	29.4301	28.0829	42.4870
63	A71	10	16.0321	38.1764	45.7916	16.0321	38.1764	45.7916
64	L1	11	29.1919	6.3636	64.4444	22.1212	6.3636	71.5152
65	L13	11	33.9394	10.3030	55.7576	19.5960	10.3030	70.1010
66	L14	11	38.6625	10.8673	50.4702	30.6165	10.8673	58.5162
67	L16	11	50.4167	16.2500	33.3333	30.0000	16.2500	53.7500
68	L2	11	62.0758	19.6607	18.2635	37.7246	19.6607	42.6148
69	L3	11	40.1840	41.3088	18.5072	29.4479	41.3088	29.2434
70	J3	12	50.0000	21.8619	28.1381	40.5858	21.8619	37.5523
71	J4	12	61.6633	21.9067	16.4300	41.5822	21.9067	36.5112
72	D10	13	83.4362	11.2140	5.3498	65.8436	11.2140	22.9424
73	D12	13	70.9970	18.1269	10.8761	53.2729	18.1269	28.6002
74	D12r	13	75.2275	14.6613	10.1112	57.7351	14.6613	27.6036
75	D13	13	93.1423	6.8577	0.0000	76.4585	6.8577	16.6837
76	D67	13	72.8195	18.8641	8.3164	59.0264	18.8641	22.1095
77	D68	13	75.9958	8.4906	15.5136	67.5052	8.4906	24.0042
78	D8	13	72.9979	12.3203	14.6817	64.5791	12.3203	23.1006
79	J30	15	68.3417	9.7487	21.9095	22.9146	9.7487	67.3367
80	J31	15	68.1293	5.7737	26.0970	42.1478	5.7737	52.0785
81	D27	16	33.0406	16.0263	50.9330	24.5884	16.0263	59.3853
82	D30	16	66.2513	18.5877	15.1610	26.0644	18.5877	55.3479
83	D39B	17	71.3689	15.5695	13.0617	52.9781	15.5695	31.4525
84	D45	17	47.5359	27.4127	25.0513	47.5359	27.4127	25.0513
85	D48	17	53.0288	33.4657	13.5055	49.0566	33.4657	17.4777
86	D53	17	89.4954	8.1359	2.3687	51.2873	8.1359	40.5767
87	D61	17	67.5258	6.9072	25.5670	66.7010	6.9072	26.3918
88	D63	17	25.8776	8.0241	66.0983	25.8776	8.0241	66.0983
89	D91	17	58.9613	25.9674	15.0713	48.7780	25.9674	25.2546
90	D123	99	74.4980	13.7550	11.7470	57.3293	13.7550	28.9157
91	F2	99	52.5941	29.1963	18.2096	40.2848	29.1963	30.5188
92	S10B	99	75.8342	11.5268	12.6390	63.5996	11.5268	24.8736

OBS	QM2	F	LT	QP2	LV	LS	QP3	LV2
57	40.0203	7.3961	52.5836	16.769	22.6994	60.5317	16.7689	22.699
58	36.5702	8.5744	54.8554	3.448	22.0307	74.5211	3.4483	22.031
59	51.5578	16.8844	31.5578	5.732	2.5478	91.7197	5.7325	2.548
60	56.1846	12.7110	31.1045	18.201	16.5522	65.2473	18.2005	16.552
61	19.4223	20.4183	60.1594	59.333	14.8333	25.8333	4.1667	70.000
62	26.7358	28.0829	45.1813	74.083	1.8349	24.0826	5.9633	69.954
63	11.2224	38.1764	50.6012	9.505	27.7228	62.7723	7.9208	29.307
64	16.1616	6.3636	77.4747	17.575	67.3025	15.1226	8.0381	76.839
65	16.3636	10.3030	73.3333	24.822	62.7675	12.4108	4.5649	83.024
66	28.2132	10.8673	60.9195	17.153	62.7787	20.0686	3.9451	75.986
67	25.4167	16.2500	58.3333	43.478	29.7101	26.8116	7.9710	65.217
68	28.9421	19.6607	51.3972	65.483	28.0079	6.5089	17.3570	76.134
69	25.6646	41.3088	33.0266	43.963	56.0372	0.0000	11.4551	88.545
70	32.2176	21.8619	45.9205	39.171	48.1567	12.6728	18.4332	68.894
71	36.1055	21.9067	41.9878	60.870	21.7391	17.3913	13.0435	69.565
72	60.5967	11.2140	28.1893	83.459	11.2782	5.2632	19.1729	75.564
73	46.0222	18.1269	35.8510	72.093	18.6047	9.3023	20.9302	69.767
74	51.7695	14.6613	33.5693	72.500	18.7500	8.7500	18.4375	72.813
75	75.9468	6.8577	17.1955	100.000	0.0000	0.0000	2.9762	97.024
76	49.2901	18.8641	31.8458	76.568	17.4917	5.9406	31.6832	62.376
77	54.1929	8.4906	37.3166	61.905	34.5238	3.5714	37.7976	58.631
78	55.7495	12.3203	31.9302	57.143	29.5918	13.2653	29.2517	57.483
79	18.9950	9.7487	71.2563	69.645	16.5957	13.7589	5.5319	80.709
80	37.9908	5.7737	56.2356	54.603	40.5858	4.8117	7.5314	87.657
81	20.0878	16.0263	63.8858	20.275	75.6014	4.1237	5.6701	90.206
82	22.3261	18.5877	59.0862	74.867	21.9469	3.1858	6.3717	90.442
83	50.9927	15.5695	33.4378	60.938	12.8125	26.2500	5.9375	67.813
84	27.4127	27.4127	45.1745	44.954	8.2569	46.7890	44.9541	8.257
85	38.7289	33.4657	27.8054	51.429	24.2857	24.2857	37.1429	38.571
86	51.2873	8.1359	40.5767	94.162	5.8376	0.0000	0.0000	100.000
87	66.2887	6.9072	26.8041	4.615	3.0769	92.3077	1.5385	6.154
88	25.1755	8.0241	66.8004	1.051	83.6336	15.3153	1.0511	83.634
89	43.0754	25.9674	30.9572	51.316	3.9474	44.7368	17.1053	38.158
90	51.1044	13.7550	35.1406	70.606	15.4545	13.9394	18.7879	67.273
91	34.3845	29.1963	36.4191	50.565	27.1186	22.3164	16.3842	61.299
92	49.8483	11.5268	38.6249	71.389	27.5000	1.1111	37.7778	61.111

OBS	QM3	P	K	LP	LV3	LS3	LP2	LV4
57	84.4017	8.3333	7.2650	6.8650	25.400	67.7346	7.37101	27.273
58	81.0069	13.7300	5.2632	1.7544	22.417	75.8285	1.78571	22.817
59	75.3304	17.4743	7.1953	0.0000	2.703	97.2973	0.00000	2.703
60	81.5504	14.7287	3.7209	0.0000	20.235	79.7649	0.00000	20.235
61	48.7500	42.2500	9.0000	1.6129	35.887	62.5000	0.69565	73.043
62	48.7713	37.2401	13.9887	0.0000	7.080	92.9204	0.00000	74.390
63	22.7181	57.8093	19.4726	0.0000	30.635	69.3654	0.00000	31.828
64	71.7489	13.4529	14.7982	5.1724	77.429	17.3981	4.88889	83.556
65	61.3636	17.8030	20.8333	4.5290	79.710	15.7609	3.73692	86.996
66	72.1925	15.7754	12.0321	0.0000	75.776	24.2236	0.00000	79.107
67	61.0000	25.0000	14.0000	2.5000	51.250	46.2500	1.57480	70.866
68	59.5483	13.7577	26.6940	4.3716	77.596	18.0328	1.90931	92.124
69	38.3206	51.4504	10.2290	0.0000	100.000	0.0000	0.00000	100.000
70	59.5745	32.6886	7.7369	1.8587	77.695	20.4461	1.41243	84.463
71	62.2378	22.0280	15.7343	0.0000	55.556	44.4444	0.00000	80.000
72	84.3840	9.7421	5.8739	15.3846	57.692	26.9231	3.72093	93.488
73	71.7425	21.3501	6.9074	11.1111	59.259	29.6296	4.41176	88.235
74	77.9300	14.3075	7.7626	12.0000	60.000	28.0000	4.59770	89.272
75	91.7182	5.3152	2.9666	.	.	.	0.00000	100.000
76	72.3214	15.4762	12.2024	13.4146	64.634	21.9512	5.31401	91.304
77	86.4548	9.6990	3.8462	13.5135	78.378	8.1081	9.56938	94.258
78	81.9005	11.0106	7.0890	11.8881	60.839	27.2727	8.17308	81.250
79	66.0839	21.6783	12.2378	1.8349	53.670	44.4954	0.60060	85.435
80	86.8074	8.4433	4.7493	3.9823	85.841	10.1770	2.03620	94.796
81	55.6231	25.8359	18.5410	0.0000	94.828	5.1724	0.00000	95.628
82	54.5685	37.0558	8.3756	2.7397	84.932	12.3288	0.75614	96.597
83	76.6091	18.5243	4.8666	0.0000	32.800	67.2000	0.00000	72.093
84	50.0000	21.7228	28.2772	1.6393	14.754	83.6066	1.66667	15.000
85	53.6451	29.2985	17.0564	0.0000	50.000	50.0000	0.00000	61.364
86	86.3085	7.7990	5.8925	0.0000	100.000	0.0000	0.00000	100.000
87	90.5634	6.4789	2.9577	0.0000	3.226	96.7742	0.00000	6.250
88	75.8308	10.8761	13.2931	0.0000	84.522	15.4780	0.00000	84.522
89	62.3894	22.2714	15.3392	0.0000	8.108	91.8919	0.00000	46.032
90	78.7926	13.3127	7.8947	17.0940	43.590	39.3162	7.46269	82.836
91	54.0800	22.5600	23.3600	2.2346	53.631	44.1341	1.35135	73.311
92	81.2191	16.3097	2.4712	17.6000	79.200	3.2000	9.82143	98.214

OBS	LS4	LVB	LVR	LSLP	QPM2	QS2	CHLM	QM5
57	72.7273	7.7803	17.620	74.5995	0.000	52.232	47.768	49.4759
58	77.1825	1.7544	20.663	77.5828	0.000	91.667	8.333	66.6667
59	97.2973	1.3514	1.351	97.2973	0.000	97.872	2.128	86.6290
60	79.7649	2.5189	17.716	79.7649	0.000	92.565	7.435	81.6926
61	26.9565	10.3627	62.176	27.4611	0.000	32.773	67.227	78.6364
62	25.6098	0.9756	73.415	25.6098	0.000	78.632	21.368	86.2676
63	68.1720	17.2043	14.624	68.1720	0.000	59.589	40.411	60.5263
64	16.4444	59.7458	19.915	20.3390	0.000	12.598	87.402	42.4658
65	13.0045	39.4813	44.380	16.1383	0.000	0.000	100.000	42.7835
66	20.8929	64.4643	14.643	20.8929	0.000	0.000	100.000	64.5051
67	29.1339	16.2791	53.488	30.2326	0.000	0.000	100.000	43.0556
68	7.8759	10.7728	79.625	9.6019	0.000	100.000	0.000	51.0582
69	0.0000	39.5105	60.490	0.0000	0.000	100.000	0.000	44.0972
70	15.5367	34.5404	48.747	16.7131	2.121	3.030	94.848	52.5773
71	20.0000	17.5000	62.500	20.0000	0.000	0.000	100.000	61.4634
72	6.5116	5.8296	84.305	9.8655	0.000	100.000	0.000	47.0313
73	11.7647	7.0423	77.465	15.4930	0.000	92.500	7.500	46.1248
74	10.7280	5.8608	79.487	14.6520	0.000	100.000	0.000	53.7653
75	0.0000	0.0000	100.000	0.0000	0.000	100.000	0.000	99.3307
76	8.6957	0.0000	86.697	13.3028	0.000	100.000	0.000	47.2509
77	5.7416	15.2838	70.742	13.9738	0.000	100.000	0.000	63.5093
78	18.7500	9.7778	65.333	24.8889	0.000	100.000	0.000	63.7520
79	14.5646	2.3881	82.537	15.0746	92.701	0.000	7.299	37.2807
80	5.2036	0.0000	92.905	7.0953	.	.	.	76.4384
81	4.3716	0.0000	95.628	4.3716	0.000	83.333	16.667	69.4444
82	3.4026	2.0638	93.809	4.1276	94.805	0.000	5.195	66.9323
83	27.9070	4.9834	67.110	27.9070	0.000	97.619	2.381	72.1893
84	85.0000	3.6885	11.066	85.2459	100.000	0.000	0.000	31.7495
85	38.6364	6.8182	54.545	38.6364	95.732	0.000	4.268	49.5951
86	0.0000	1.0152	98.985	-0.0000	0.000	81.818	18.182	94.7791
87	93.7500	0.0000	6.250	93.7500	0.000	91.371	8.629	98.1453
88	15.4780	0.0000	84.522	15.4780	100.000	0.000	0.000	80.2326
89	53.9683	0.0000	46.032	53.9683	0.000	100.000	0.000	64.6316
90	17.1642	2.7778	74.306	22.9167	0.000	27.972	72.028	72.8546
91	26.6892	15.3333	57.000	27.6667	10.000	20.000	70.000	48.4848
92	1.7857	8.9431	80.488	10.5691	75.269	24.731	0.000	43.8792

OBS	QMS5	QP5	QP5	QM6	QMS6	QP6
57	33.3333	17.1908	17.1908	49.4759	33.3333	17.1908
58	28.4946	4.8387	4.8387	66.6667	28.4946	4.8387
59	9.9812	3.3898	3.3898	86.6290	9.9812	3.3898
60	9.1537	9.1537	9.1537	81.6926	9.1537	9.1537
61	10.0000	11.3636	11.3636	31.3975	3.9927	64.6098
62	4.5775	9.1549	9.1549	42.1687	2.2375	55.5938
63	13.1579	26.3158	26.3158	57.5000	12.5000	30.0000
64	30.5936	26.9406	26.9406	32.1799	23.1834	44.6367
65	40.7216	16.4948	16.4948	24.7024	23.5119	51.7857
66	27.6451	7.8498	7.8498	51.0811	21.8919	27.0270
67	41.6667	15.2778	15.2778	25.6198	24.7934	49.5868
68	25.6614	23.2804	23.2804	31.0289	15.5949	53.3762
69	43.0556	12.8472	12.8472	32.3155	31.5522	36.1323
70	26.8041	20.6186	20.6186	42.6778	21.7573	35.5649
71	25.3659	13.1707	13.1707	41.4474	17.1053	41.4474
72	45.0000	7.9688	7.9688	37.1147	35.5117	27.3736
73	40.2647	13.6106	13.6106	34.6099	30.2128	35.1773
74	35.9019	10.3327	10.3327	41.2634	27.5538	31.1828
75	0.0000	0.6693	0.6693	81.5385	0.0000	18.4615
76	36.2543	16.4948	16.4948	38.3008	29.3872	32.3120
77	16.7702	19.7205	19.7205	56.4138	14.8966	28.6897
78	22.5755	13.6725	13.6725	56.3994	19.9719	23.6287
79	45.6140	17.1053	17.1053	12.5000	15.2941	72.2059
80	13.6986	9.8630	9.8630	47.2881	8.4746	44.2373
81	15.2778	15.2778	15.2778	49.8339	10.9635	39.2027
82	18.7251	14.3426	14.3426	26.3323	7.3668	66.3009
83	24.0631	3.7475	3.7475	53.5871	17.8624	28.5505
84	25.9179	42.3326	42.3326	31.7495	25.9179	42.3326
85	29.3522	21.0526	21.0526	45.8801	27.1536	26.9663
86	5.2209	0.0000	0.0000	54.3153	2.9919	42.6928
87	1.2365	0.6182	0.6182	96.9466	1.2214	1.8321
88	17.0543	2.7132	2.7132	80.2326	17.0543	2.7132
89	24.4211	10.9474	10.9474	53.0225	20.0345	26.9430
90	16.2872	10.8581	10.8581	56.0647	12.5337	31.4016
91	36.8687	14.6465	14.6465	37.1373	28.2398	34.6228
92	34.4992	21.6216	21.6216	36.8000	28.9333	34.2667

APPENDIX 4

DISCUSSION OF PROBLEMS INVOLVED IN USING LINEAR WAVE THEORY

A: STRUCTURAL DEFORMATION

In the Capel Curig anticline, the orientation of rhyolite clasts (Wilkinson, 1987; pers. com., 1986) indicates a mean local strain of 1.27: 1.00: 0.78 within sandstones at this locality. The subvertical fractures cross-cutting the swaley-cross stratification within section B4 (Fig. 4.42), for example, in fact represent spaced cleavage planes, with 20% shortening along the x-axis of deformation. Where ripple crestlines parallel the strike of cleavage, strain is preferentially taken up within ripple troughs (Fig. 4.40) to give a deformation structure similar to mullion or rodding (see Wilson, 1982, p.87). The ripples on the main bedding plane (λ 65 cm, H = 9cm) were destrained by Wilkinson (op cit) using the above information. The strain in the plane of the section (max = 1.085, min = 0.82) means that one must increase the wavelength of ripples by 12.3% and decrease their amplitude by 3% to obtain a destrained profile. The true ripple profile is thus "flatter" than it appears in the field (73cm, H = 8.73) with a vertical form index of 8.36. Unfortunately, this section is the only ripple "locality" where data is structural data from sandstones was available to deform ripple profiles; in other cases, the unstrained ripple parameters probably differ by as much as 20% from the original values. The direction of error (*ie.* understimate, overestimate) is indicated for unstrained ripples by superscripts in Fig. 5.64.

B: ARE THEY ORBITAL RIPPLES???

To use linear wave theory to predict wave regime, it is necessary to derive an approximate orbital diameter (d_o) from ripple parameters. Field observations and laboratory experiments indicate that at wavelength/grain size (λ/D) ratios of less than 400, ripple spacing will be related to orbital diameter by the approximate relationship $\lambda = 0.65\ d_o$ (orbital ripples). The grain size of many wave ripples is difficult to ascertain, as the

sediments often contains detritus varying from 1 mm medium sand grains to small 3-4 mm granules with rarer 1-2 cm rhyolitic pebbles. For the ripples in the Capel Curig anticline, sediment calibres give _/D ratios which vary from 740 to 243, suggesting that ripples might be suborbital types. If this is true, the ripple wavlength will underestimate the orbital motion of the water waves (Allen, 1985).

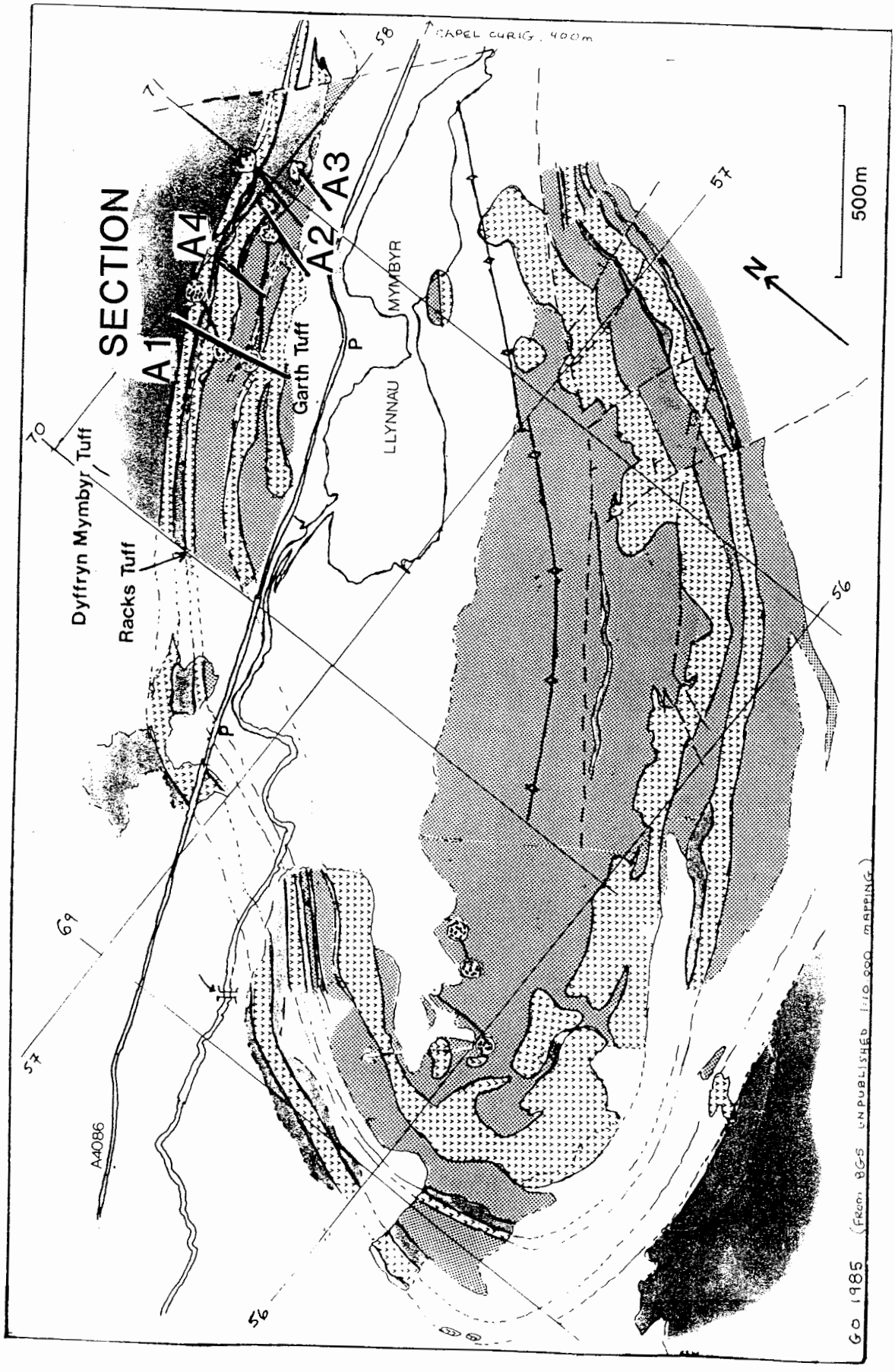
As a result of the above complications, the absolute values derived from application of linear wave theory must be interpreted with extreme caution. As more ripples record waning storm events, it is probably safe to assume that ripples record threshold conditions, and the water wave period (T) is related to the limiting velocity (U_t) achieved by the water particles (bottom orbital velocity) and orbital diameter (d_o) by the expression:

$$T = \pi d_o / U_t$$

where the near-bed orbital diameter (d_o) can be obtained from wave-ripple spacing () by the empirical equation: d_o = /0.65.

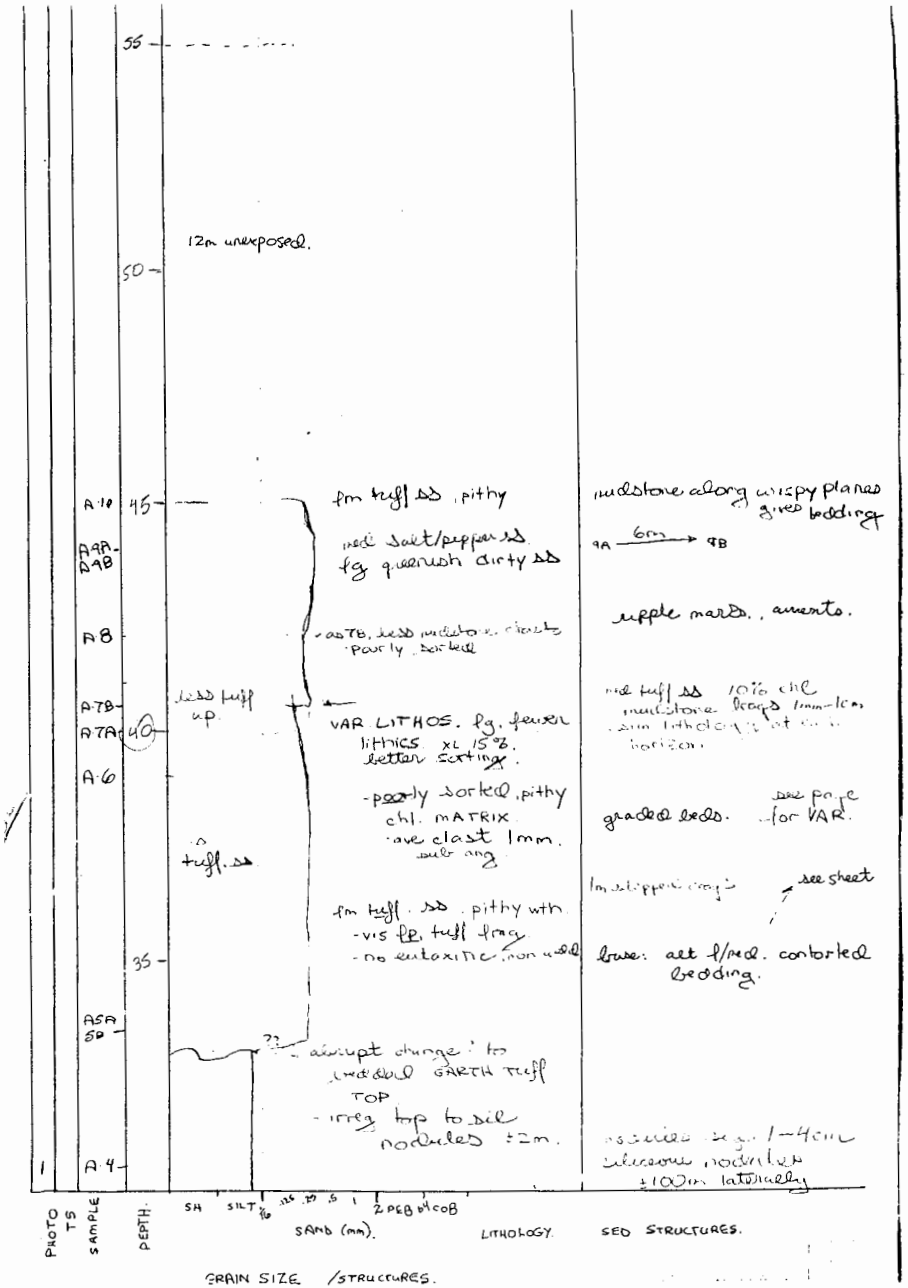
AREA A

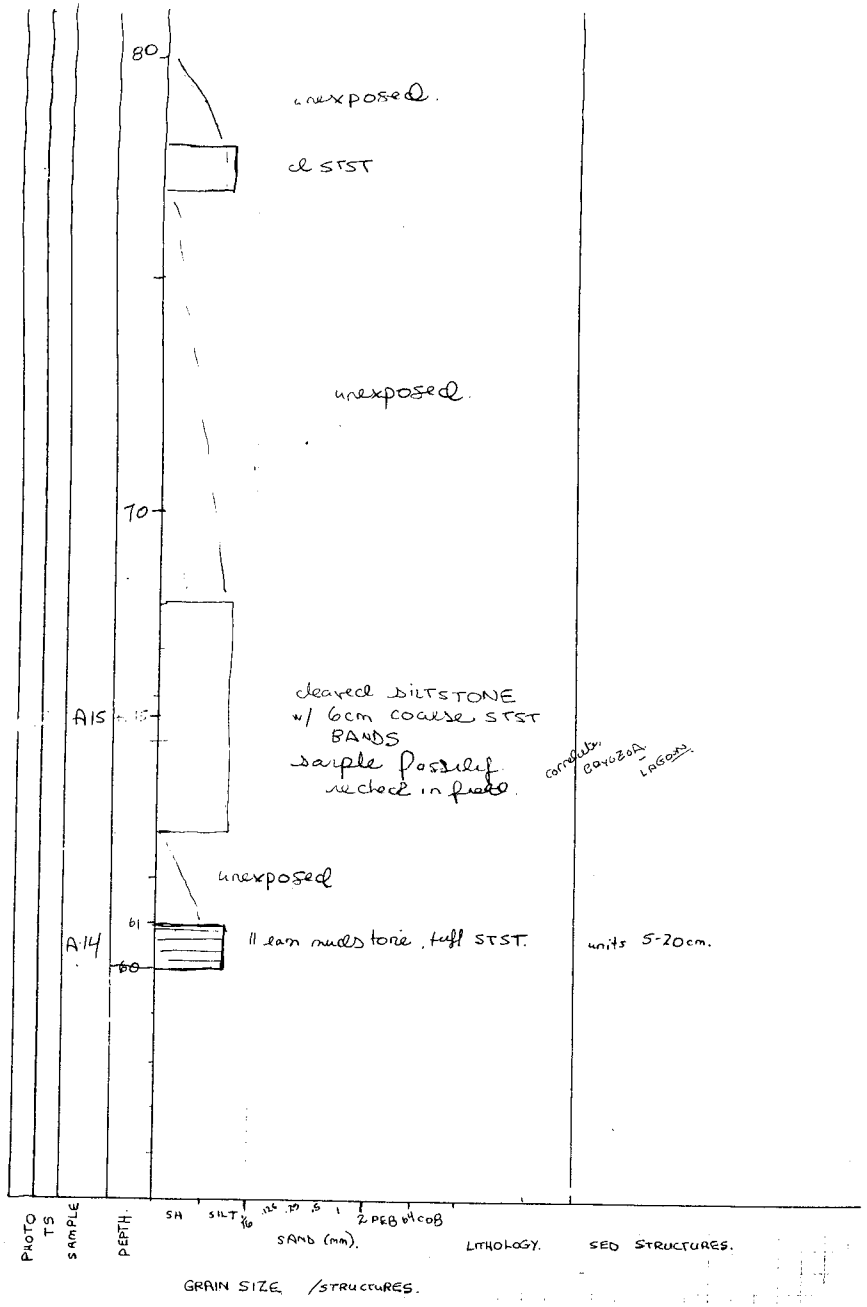
LOCATION MAP.

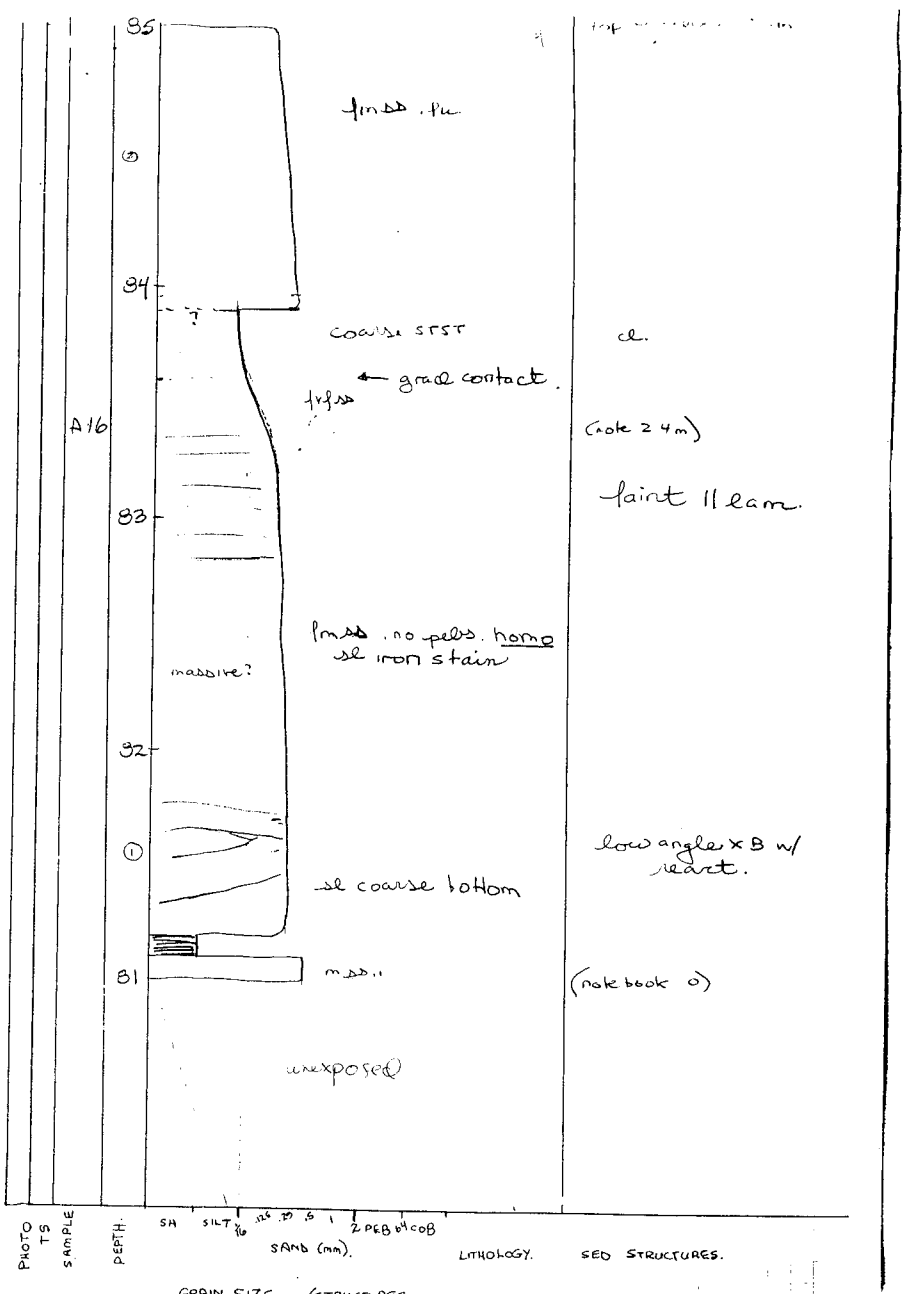


SECTION A1

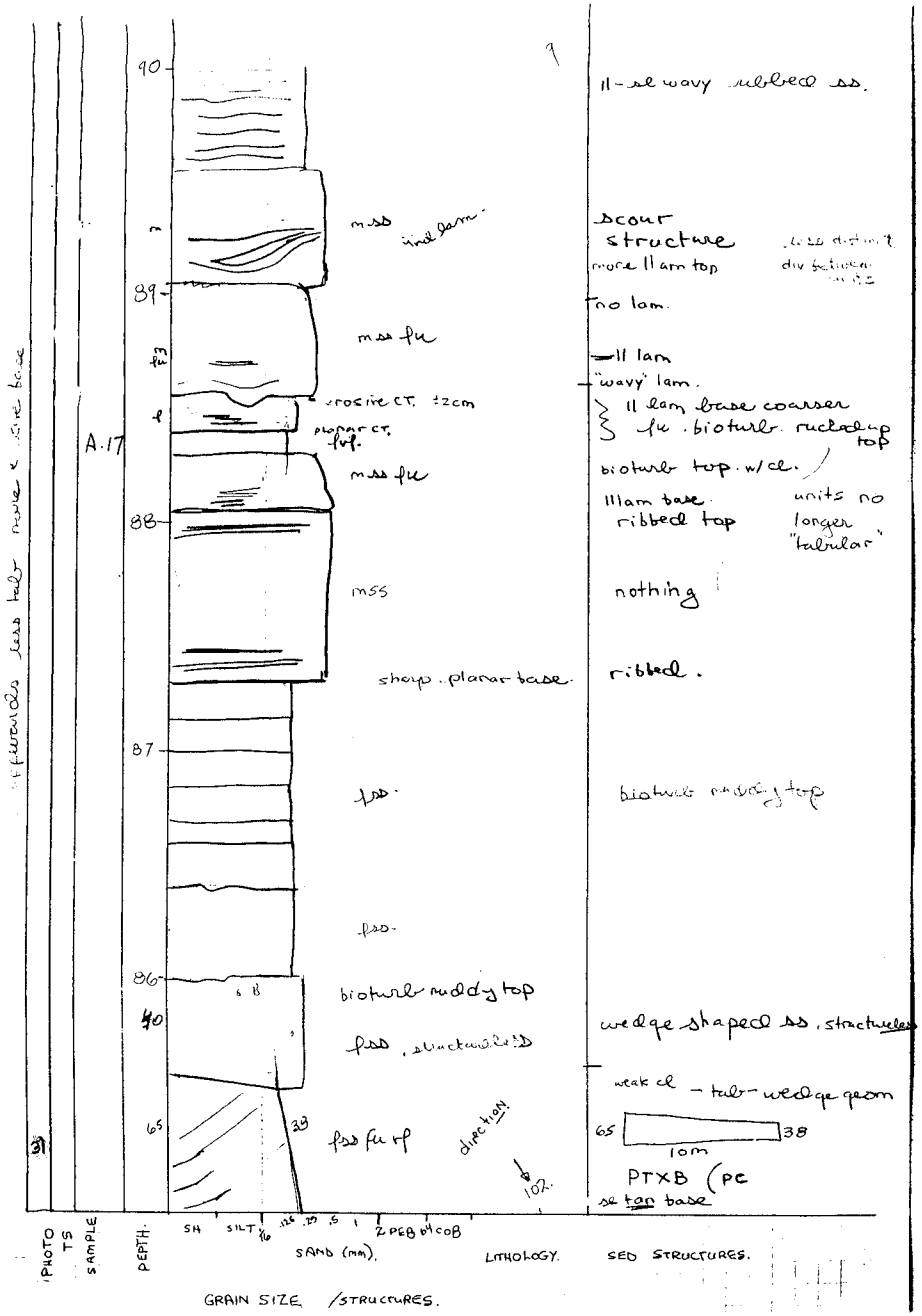
SECTION A1 LOCATION: Locate lowest crags of Garth tuff directly to NW of lay-by along A4086. Section proceeds perpendicular to regional dip. See photograph in Figure 5.

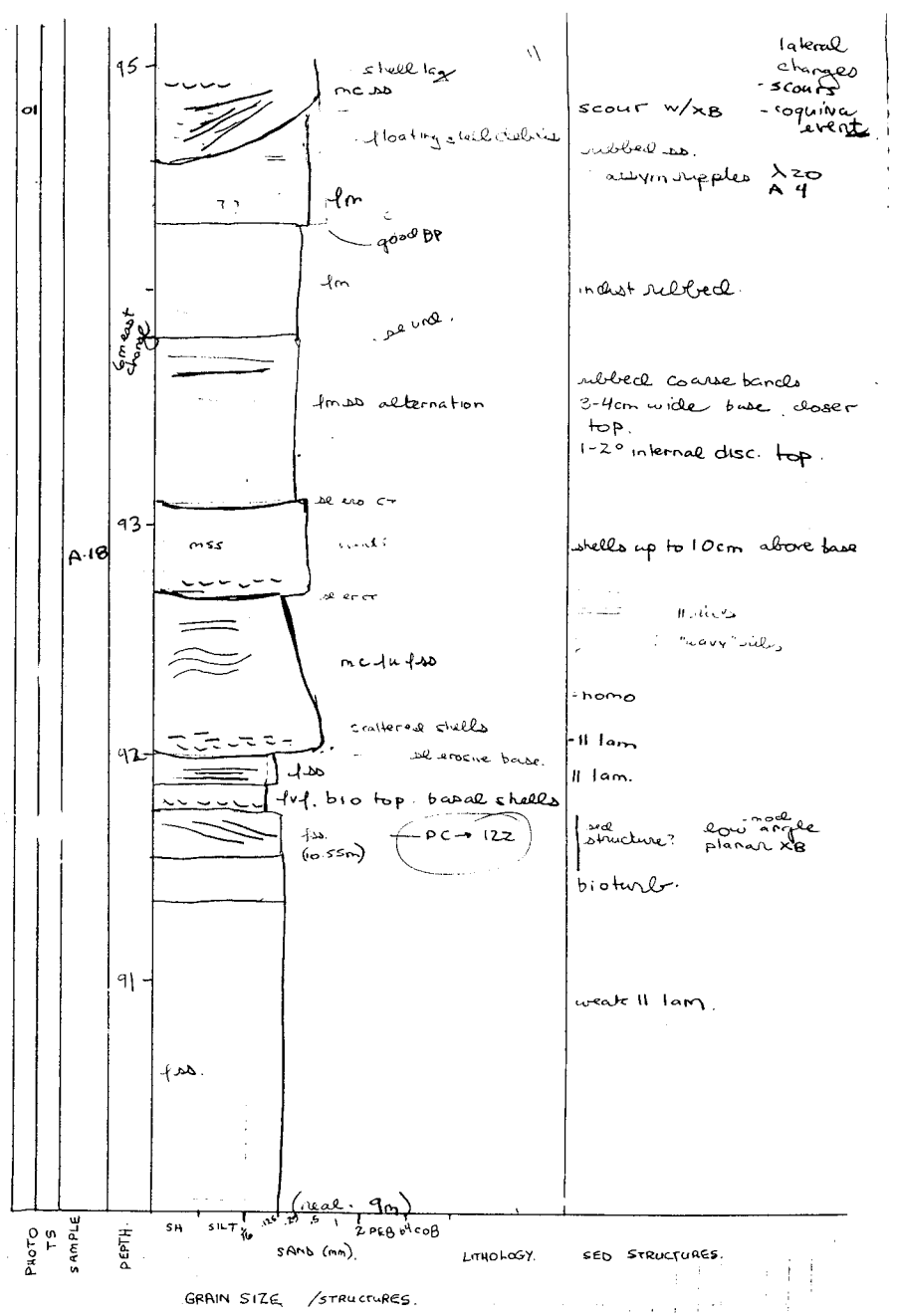


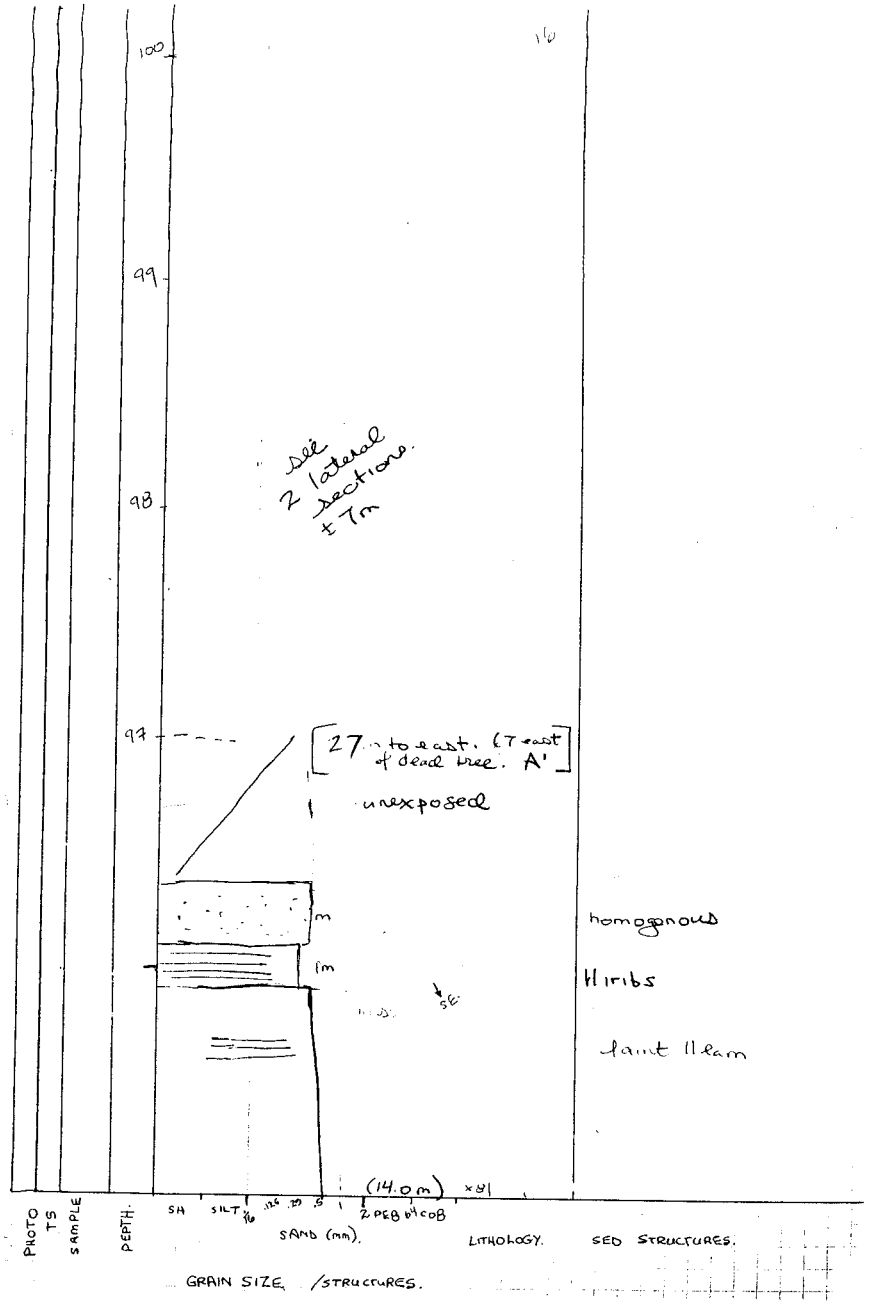

80
unexposed.
cl STST
unexposed.
70
A15
cleared SILTSTONE
w/ 6cm coarse STST
BANDS
sample fossils
re-check in field.
unexposed
A14
61
60
11 lam mudstone, tuff STST.
units 5-20cm.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

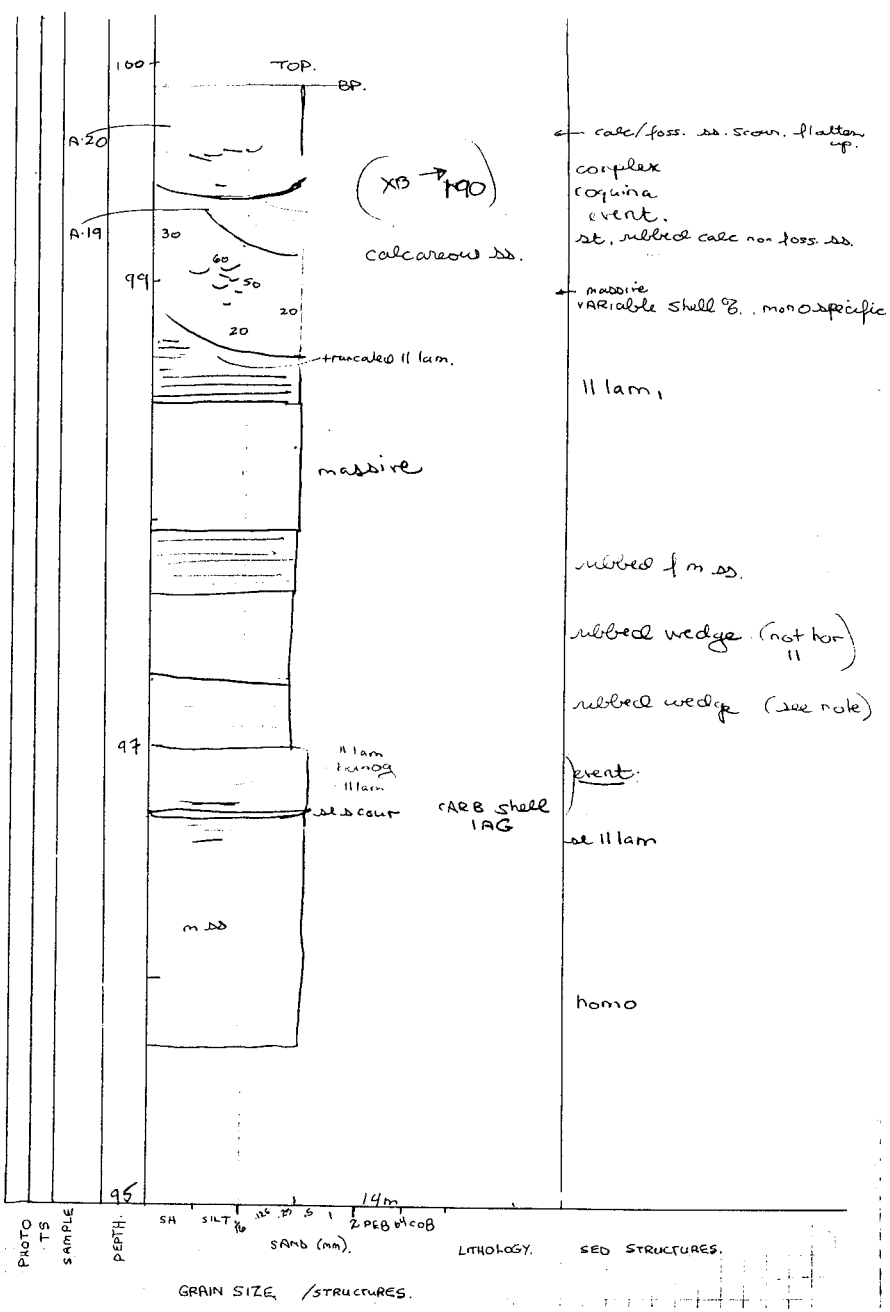

95
fmSS . pl.
94
coarse STST
cl.
grad contact.
tr fgSS
A16
(note 2 4m)
faint 11 lam.
93
fmSS . no pebs. home
sl iron stain
massive?
92
low angle x B w/
rearet.
sl coarse bottom
91
mSS.
(note book 0)
unexposed
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

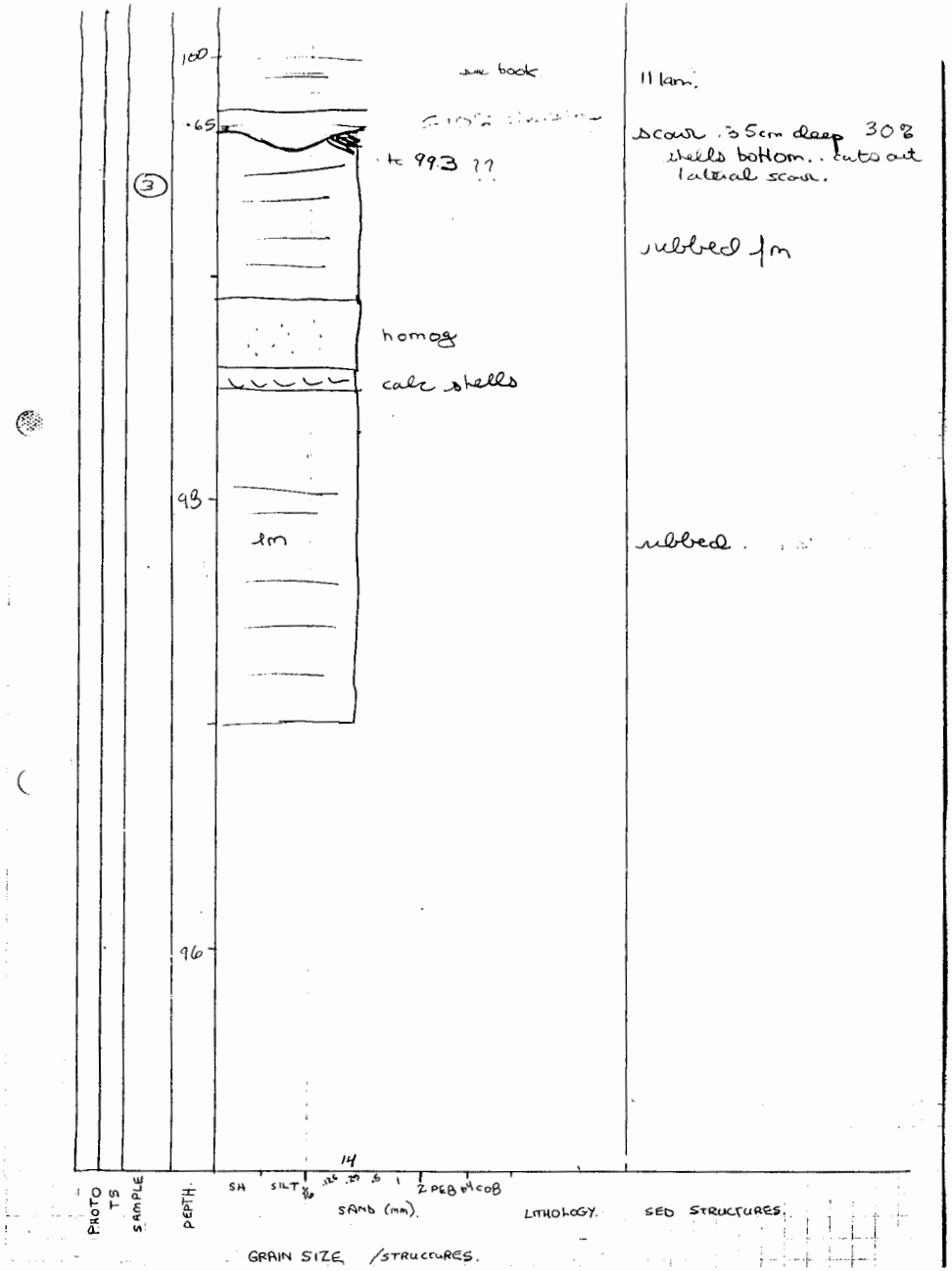
D

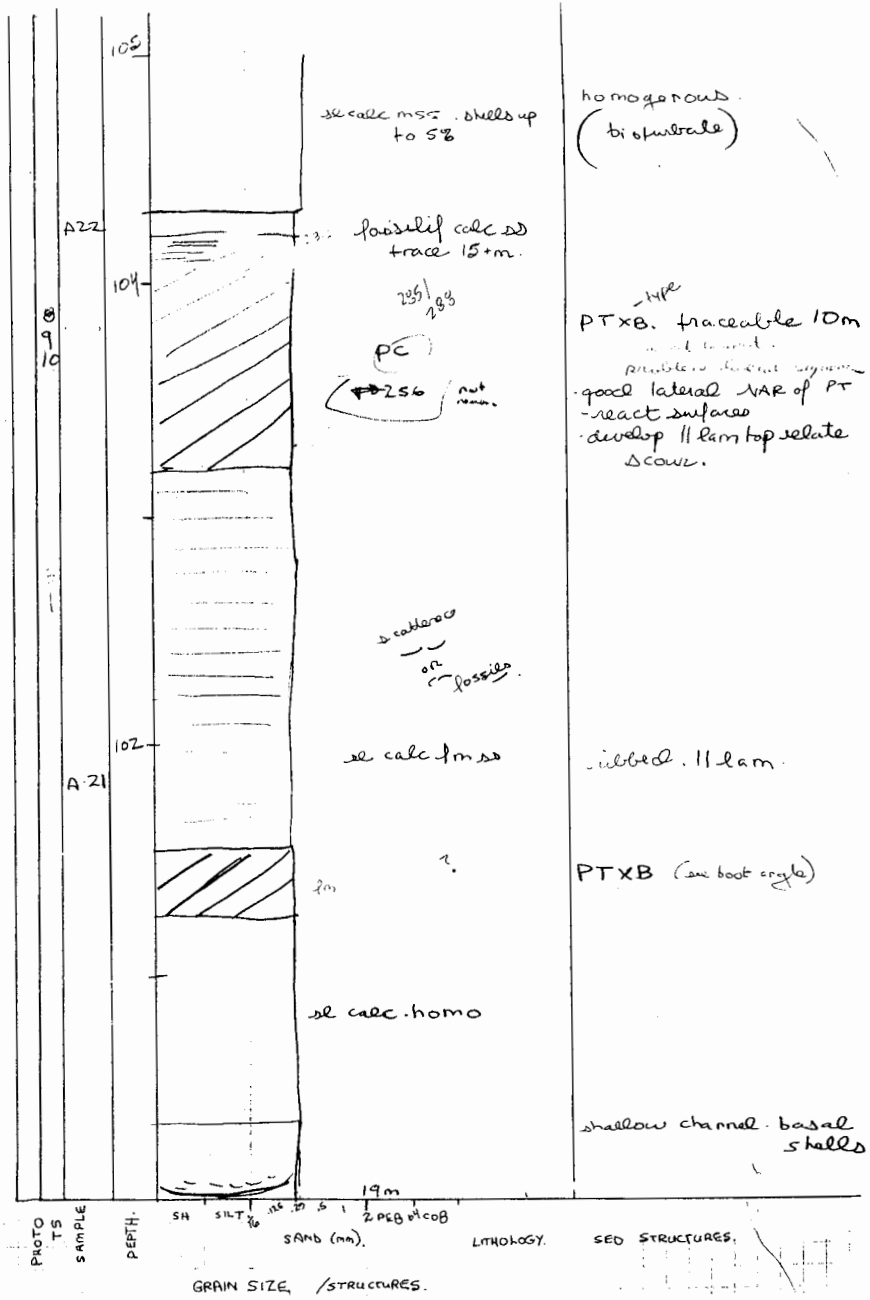

A-17
90
89
88
87
86
40
65
31
39
38
mss
mss fu
mss
fss.
fss.
fss fu tf
bioturb muddy top
sharp, planar base.
ribbed.
nothing
bioturb muddy top
wedge shaped ss, structureless
weak cl – tub – wedge geom
65
38
10m
PTXB (pc
se tan base
dip to 10°
11-sl wavy rubbled ss.
scour structure
more ll arm top
no lam.
ll lam
"wavy" lam.
ll lam base coarser fu. bioturb. mudd up top
bioturb top. w/cl.
ll lam base. ribbed top
units no longer "tabular"
crosive CT. ±2cm
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

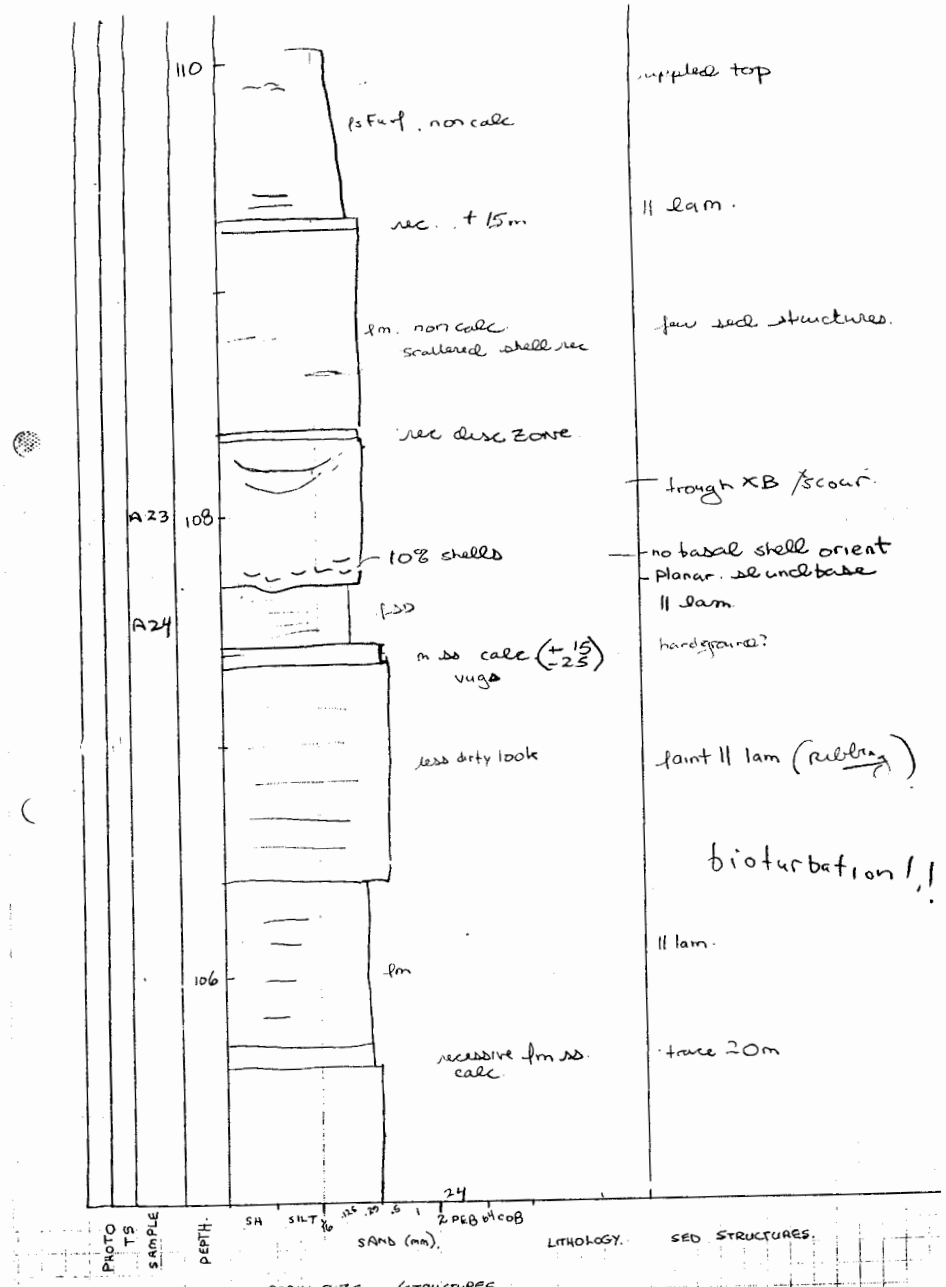

A-18
95
93
92
91
mc ss
floating shell debris
flm
good DP
flm
sl und.
fm ss alternation
sl ero ct
mss
sl erosive base.
mc-lu fss
scattered shells
fss
lvf. bio top. basal shells
fss. (to 55m)
PC → 122
sed structure?
low angle planar XB
bioturb.
weak ll lam.
fss.
(real. 9m)
scour w/xB
rubbled ss.
ripples λ 20 A 4
indist rubbled.
rubbled coarse bands 3-4cm wide base, closer top. 1-2° internal disc. top.
shells up to 10cm above base
ll lam
"wavy" silts
homo
ll lam
ll lam.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

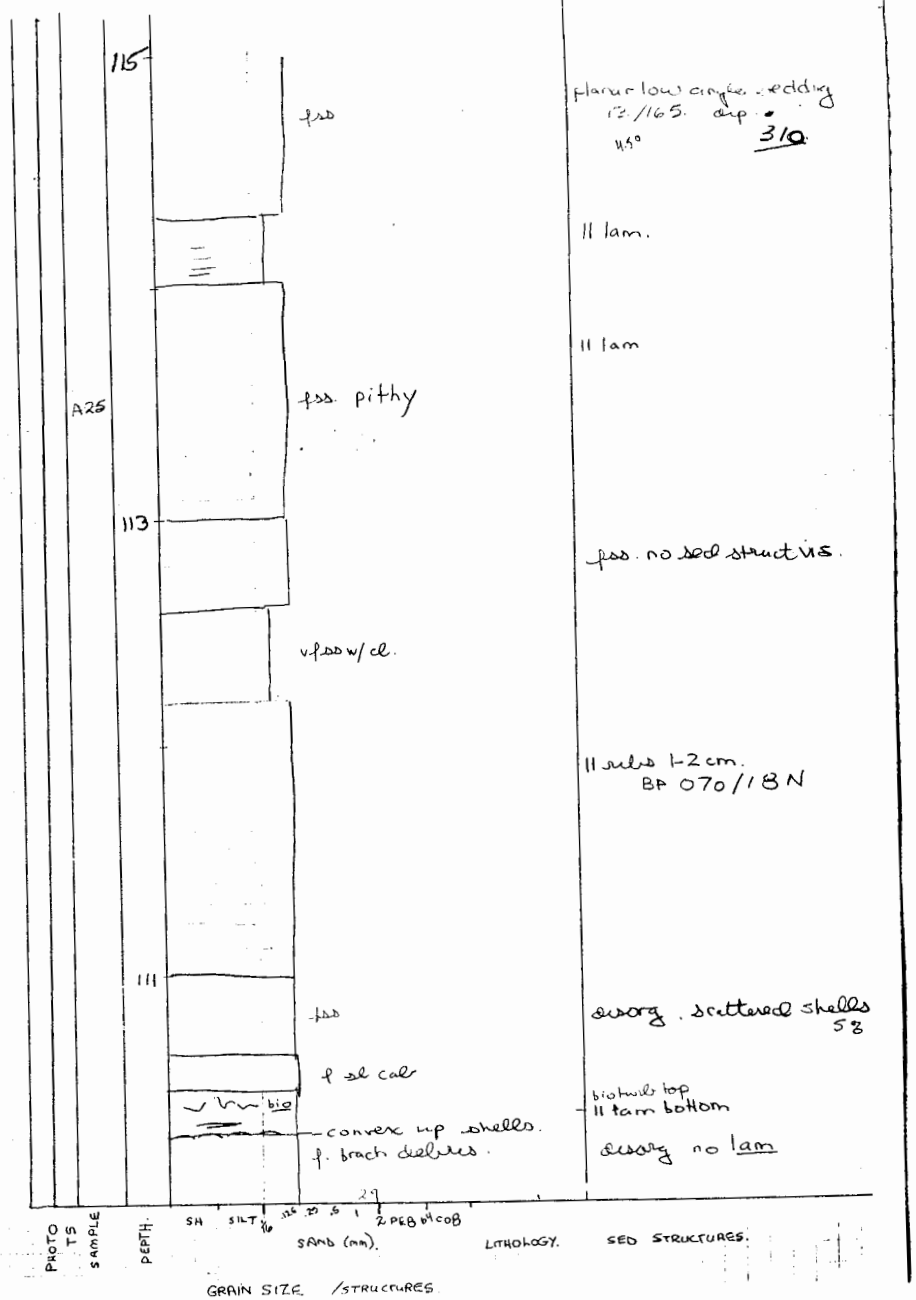

100
99
98
97
see 2 lateral sections ± 7m
27 : to east. 67 east of dead tree. A'
unexposed
m
fm
homogenous
11 ribs
faint 11 lam
(14.0m)
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

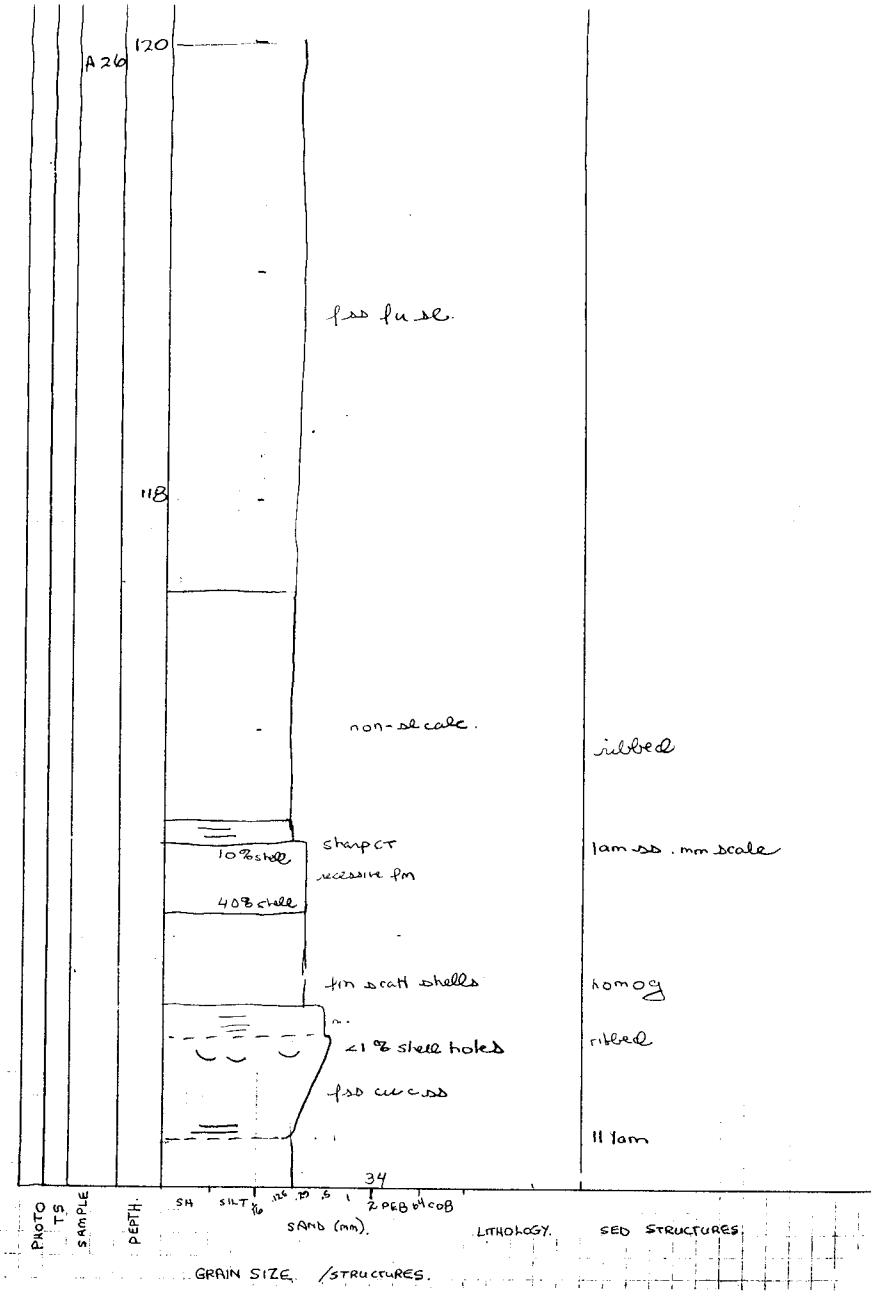

TOP.
BP.
100
99
97
95
A·20
A·19
XB → 190
calcareous ss.
30
60
50
20
20
truncated 11 lam.
massive
11 lam.
11 lam
transg
11 lam
sl scour
CARB shell lag
m ss
14m
calc/foss. ss. scour. flattop.
complex
corbina
event.
st, rubbed calc non foss. ss.
massive
VARiable shell %. monospecific
11 lam,
rubbed f m ss.
rubbed wedge (not hor 11)
rubbed wedge (see note)
event.
st 11 lam
homo
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

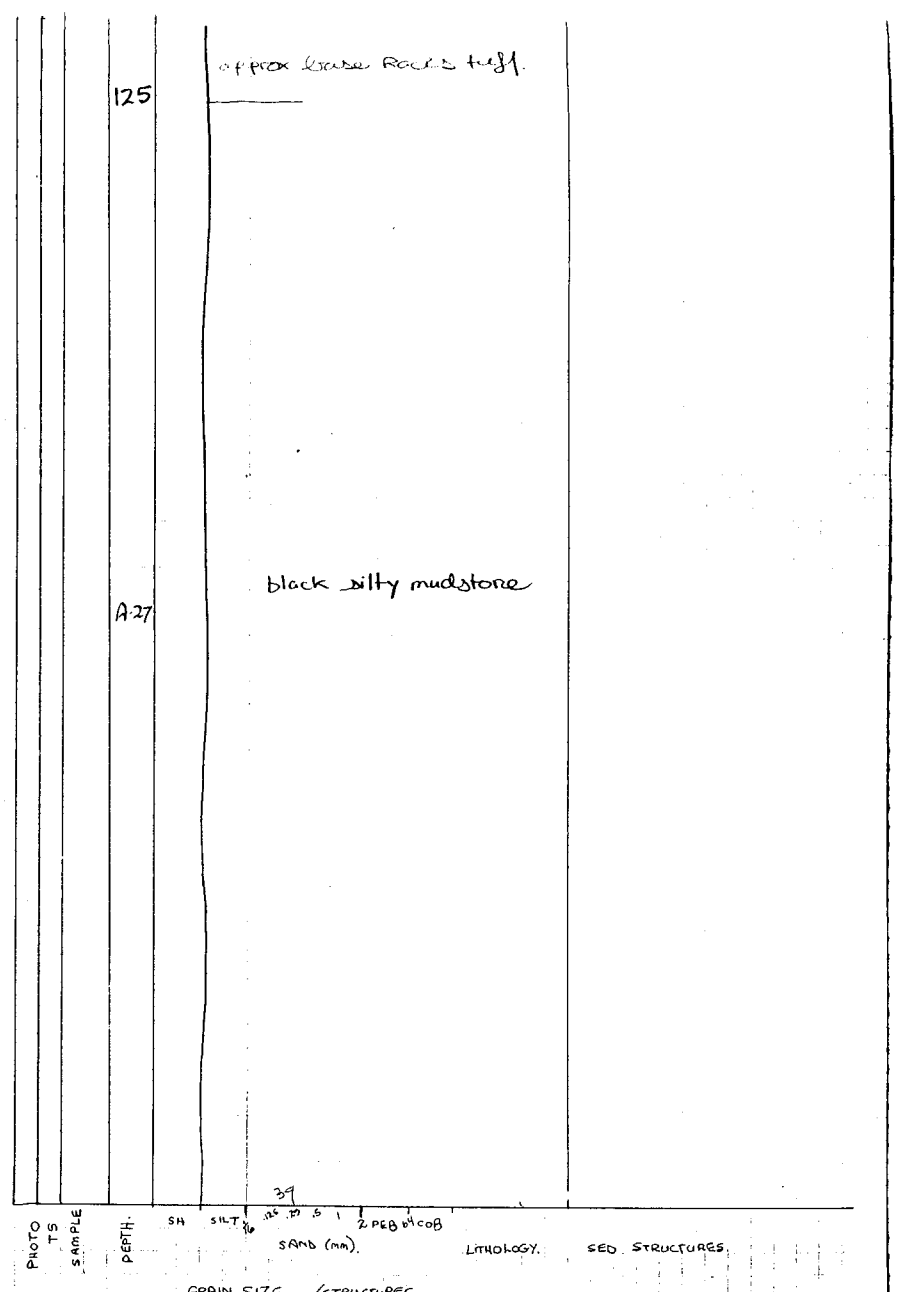

100
·65
(3)
to 99.3 ??
11 lam.
scour. 35cm deep 30%
shells bottom.. cuts out
lateral scour.
rubbed fm
homog
calc shells
98
fm
rubbed.
96
14
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

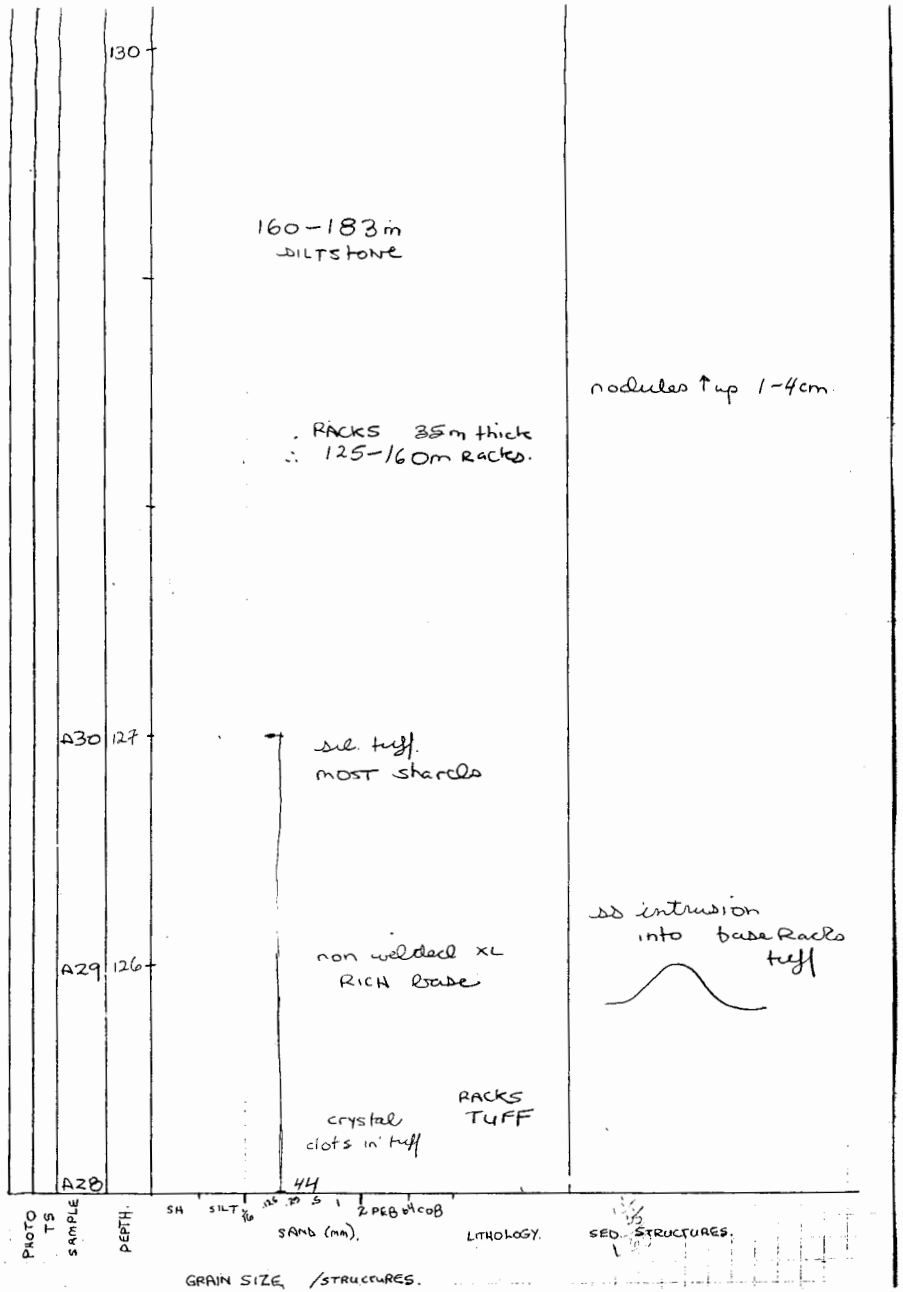

105
sl calc mst. shells up to 5%
homogeneous (bioturbated)
A22
fossilif calc ss trace 15+m.
104
PC
256
cut
PTXB. traceable 10m
good lateral VAR of PT
react surfaces
develop 11 lam top relate scour.
scattered
or
fossils.
102
A21
sl calc fm ss
rubbed. 11 lam.
PTXB (see boot angle)
sl calc. homo
shallow channel. basal shells
19m
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

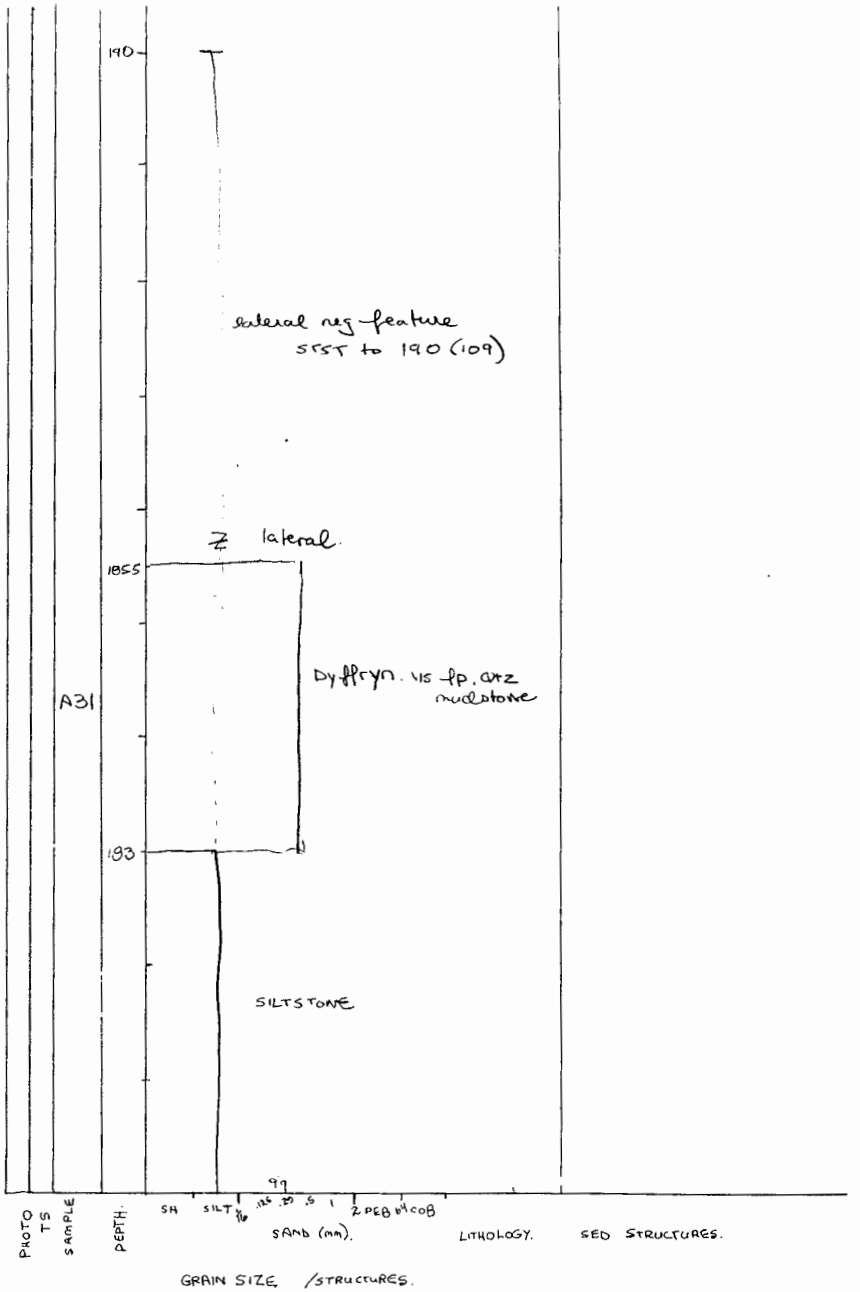

110
fs Fm f. non calc
rec. + 15m
ripples top
|| lam.
fm. non calc
scattered shell rec
few sed structures.
rec disc zone
trough XB / scour
A23
108
10% shells
no basal shell orient
Planar. sl undl base
|| lam.
fss
A24
m ss calc (+15 -25)
vugs
hard grained?
less dirty look
faint || lam (Ribbon)
bioturbation!!
|| lam.
fm
106
recessive fm ss calc
trace 20m
24
PROTO TS
SAMPLE
DEPTH
SH
SILT
.125
.25
.5
1
2
PEB
GR
COB
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

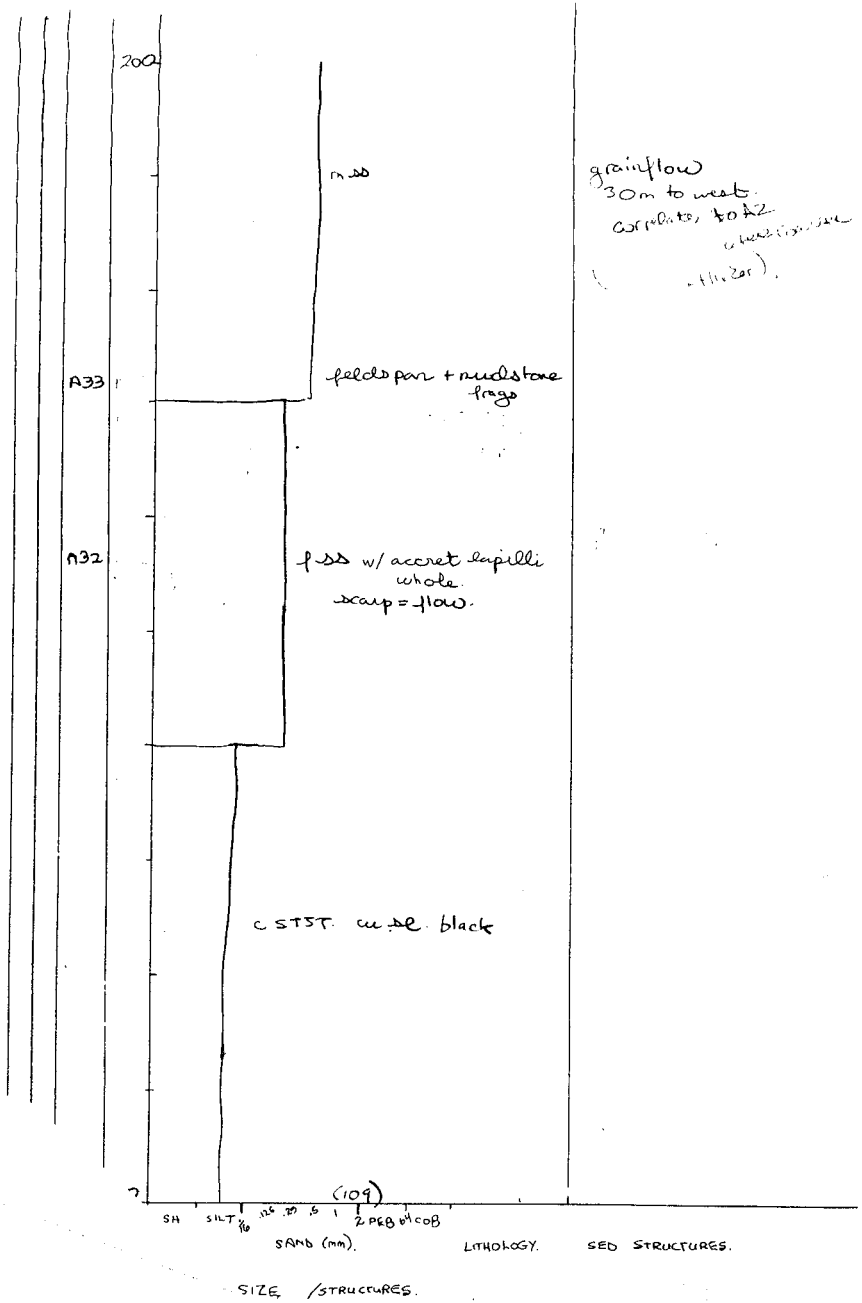

115
fss
planar low angle. bedding
12/165. dip 31°
|| lam.
|| lam
A25
fss. pithy
113
fss. no sed structus.
vfss w/ cl.
|| ribs 1-2 cm.
BA 070/18N
111
fss
disorg. scattered shells
5%
f sl calc
bioturb top
|| lam bottom
convex up shells.
f. brach debris.
disorg no lam
29
PROTO TS
SAMPLE
DEPTH
SH
SILT
.125
.25
.5
1
2
PEB
GR
COB
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

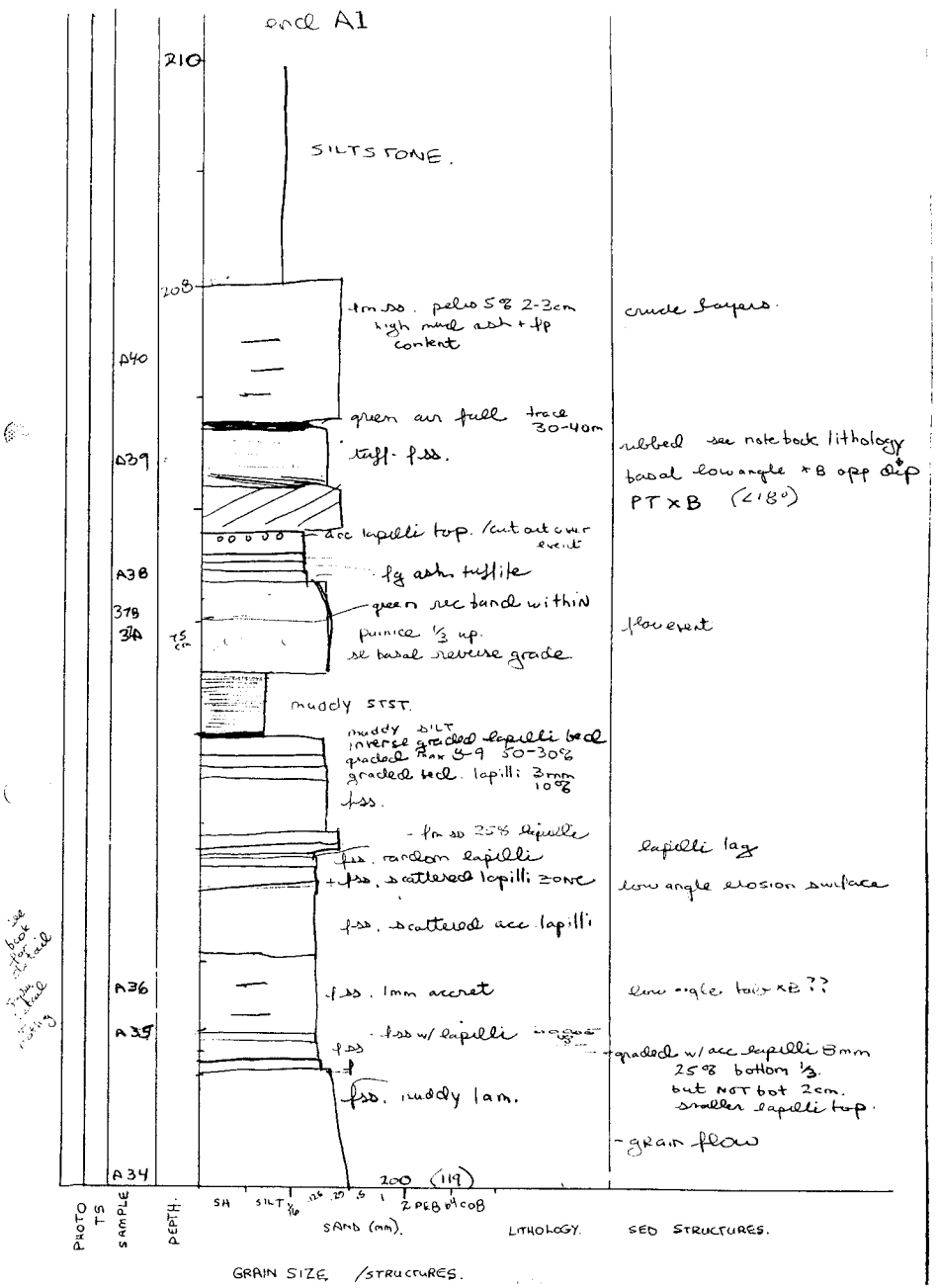

A 26
120
118
fss fu sc.
non-sc calc.
ribbed
sharp ct
10% shell
lam ss . mm scale
accessive fm
40% shell
thin scatt shells
homog
<1% shell holes
ribbed
fss cc ss
11 lam
34
PHOTO
T S
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES
GRAIN SIZE /STRUCTURES.


approx base Rocks tuff.
125
A 27
black silty mudstone
39
PHOTO
T S
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES
GRAIN SIZE /STRUCTURES.


130
160–183 m
SILTSTONE
nodules ↑ up 1–4cm
. RACKS 35m thick
∴ 125–160m racked.
A30 127
sil. tuff.
most shards
A29 126
non welded XL
RICH base
dd intrusion
into base Racks
tuff
RACKS
TUFF
crystal
clots in tuff
A28
44
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED. STRUCTURES.
GRAIN SIZE /STRUCTURES.


190
lateral neg-feature
SFST to 190 (109)
≠ lateral.
185.5
A31
Dyffryn. vls fp. qtz
mudstone
183
SILTSTONE
99
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

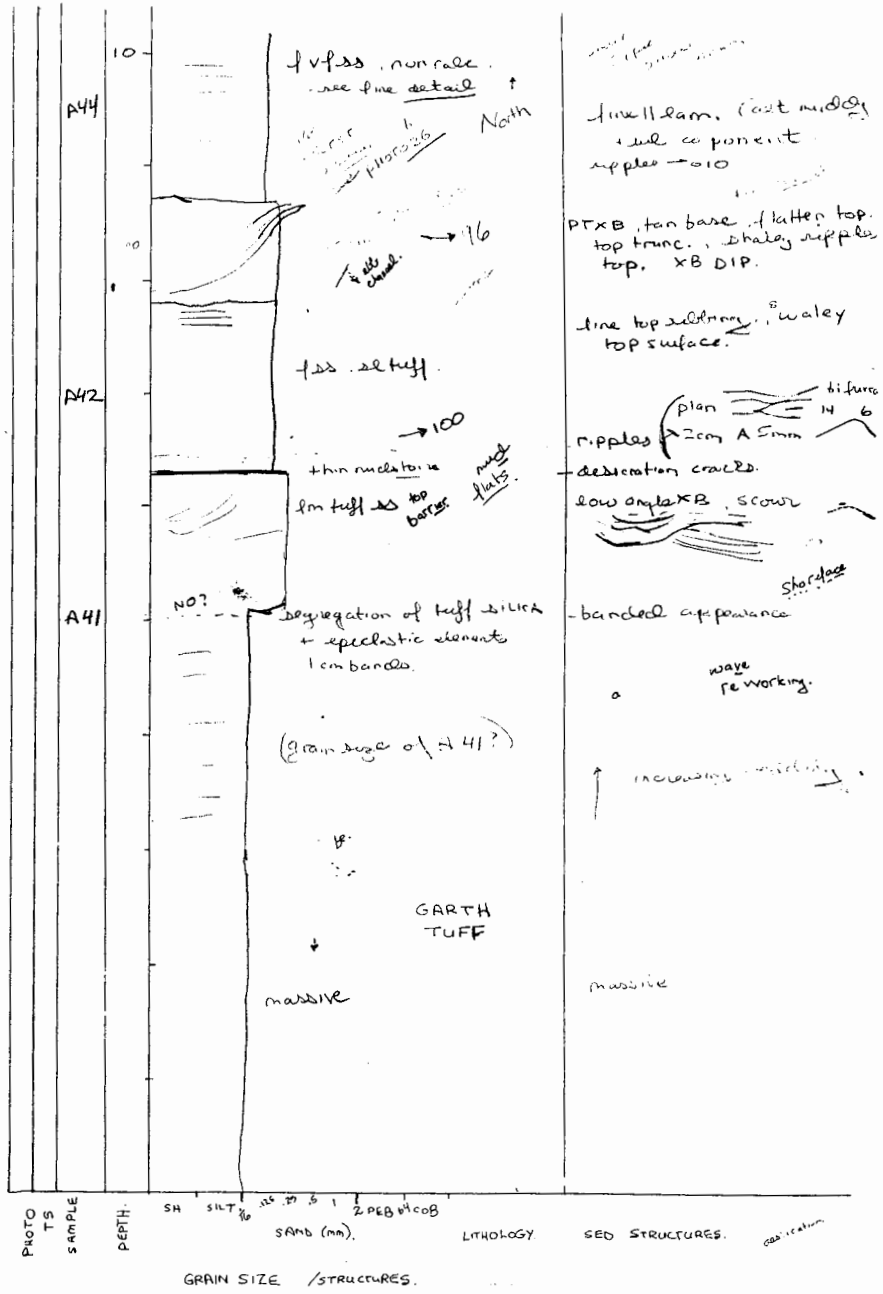

202
A33
A32
fm ss
felds par + mudstone frags
f ss w/ accret lapilli whole.
scarp = flow.
c STST. v.f.e. black
grainflow
30m to west.
correlates to A2
(109)
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
SIZE /STRUCTURES.


encl A1
210
208
A40
A39
A38
37B
37A
A36
A35
A34
SILTSTONE.
fm ss. pebs 5% 2-3cm high mud ash + fp content
green arr full trace 30-40m
tuff. f ss.
acc lapilli top. / cut out over event
fg ash tuffite
green rectangle within
pumice 1/3 up.
sl basal reverse grade
muddy STST.
muddy SILT
inverse graded lapilli bed
graded fam 5-9 50-30%
graded bed. lapilli: 3mm 10%
f ss.
- fm ss 25% lapilli
f ss. random lapilli
+ f ss. scattered lapilli zone
f ss. scattered acc lapilli
f ss. 1mm accret
f ss w/ lapilli
f ss
f ss. muddy lam.
crude layers.
rubbed see notebook lithology
basal low angle xB opp dip
PT x B (<18°)
flow event
lapilli lag
low angle erosion surface
low angle, tabl xB ??
graded w/ acc lapilli 8mm 25% bottom 1/3.
but NOT bot 2cm.
smaller lapilli top.
- grain flow
200 (119)
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

A1

SECTION A2

SECTION A2 LOCATION: Locate white-weathering cliff of Garth tuff frequently used by climbers. Section starts at first discernible bedding in tuff and proceeds to NE towards abandoned sandstone quarry. See photograph in Figure 5. .



A45

30

fss

ll lam.

fvfss homo
fss

detail A: PHOTO 26

27 fss ll lam.
24 STST.
19 STST. shale wisps, top.
sh lam fss
" thin grey STST.
4 ev. sandst. vxl top ±2m
2.5 fss, cleanup green bottom, top ripples
0 cm

markov.

DETAIL B:

3.5 fm ll lam green ss
3.0 grey STST. clk
nodstone
med ss.
white ss, burrowed top.
1.7 green fss
fss white
1.1 ll lam fss, green up
.5 bio fss

PHOTO | TS | SAMPLE | DEPTH | SH | SILT | .125 | .25 | .5 | 1 | 2 PEB | COB

SAND (mm).

LITHOLOGY. SED STRUCTURES.

GRAIN SIZE /STRUCTURES.

see note book

30

w/ 1-4cm fss pebs
coarse qtz/fp xl
? fine base
support

A52 .02 fu
.72 planar base. w/ FP

A51 .4 m
.3 .8 erosive CT
.90 1.65 only 1-2% clasts
fag shale clasts, 80% 1-2cm
irreg ±10cm CT
.2

very dom. 86.
mcoarse ss.
very well sorted

.4 undulating CT
?
A50 med. vis qtz-fp. lost
pithy wtn
.4 size. 1m
596 PHOTO 31.
.7 fss
.15
A49 fss
595
A46 47 48 48B muddy STST

lagoon ??
- fauna?
- algae?

rubbed

soft def features dog

fine sm.

tab low angle sandwave

bio rubbed ss fine

disc wavy ribs, bioturb
- scattered silt filled burrows
- loaded wrinkle ss/mudstone

fine lam 1-2cm

fossils
- bryozoa rhync brach. lingula
- fossils iron stained
- rare OCTA cubes

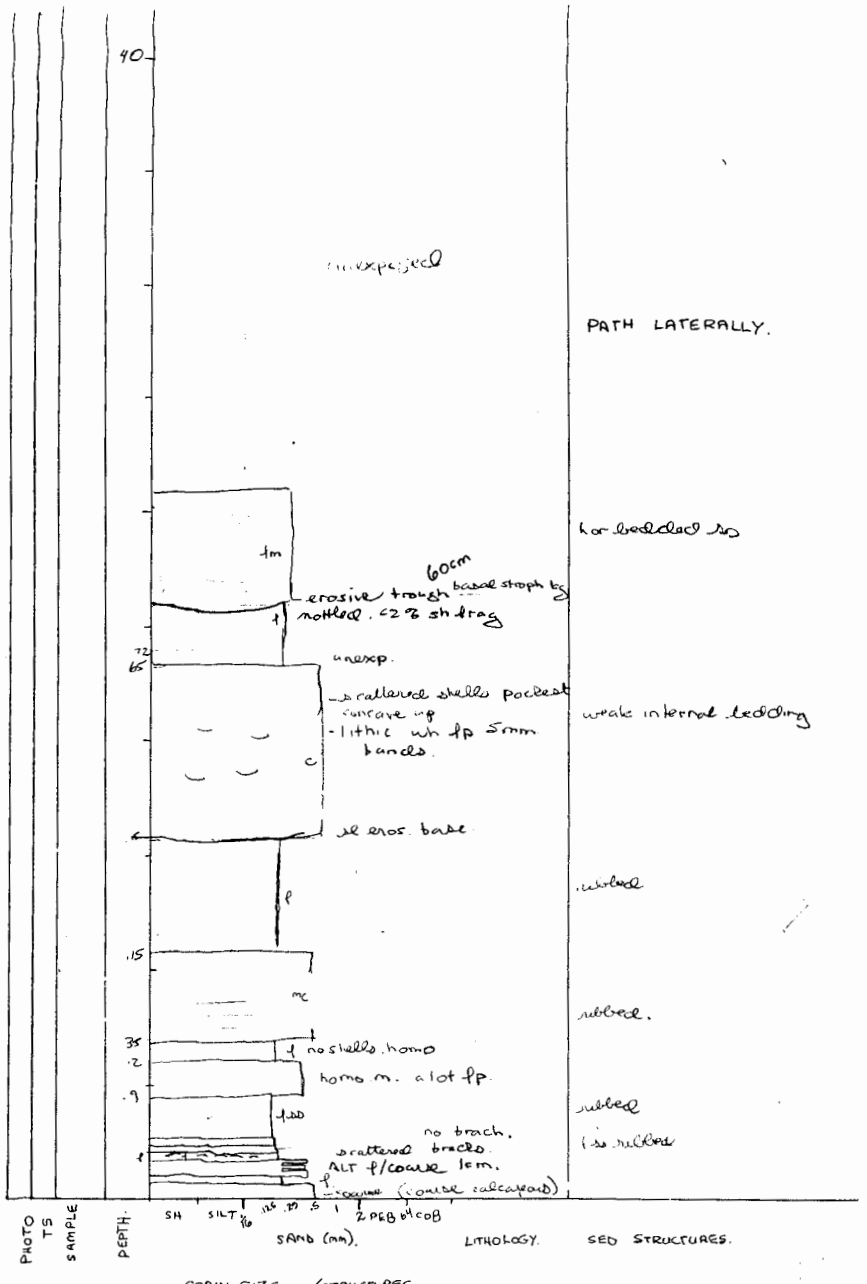
PHOTO | TS | SAMPLE | DEPTH | SH | SILT | .125 | .25 | .5 | 1 | 2 PEB | COB

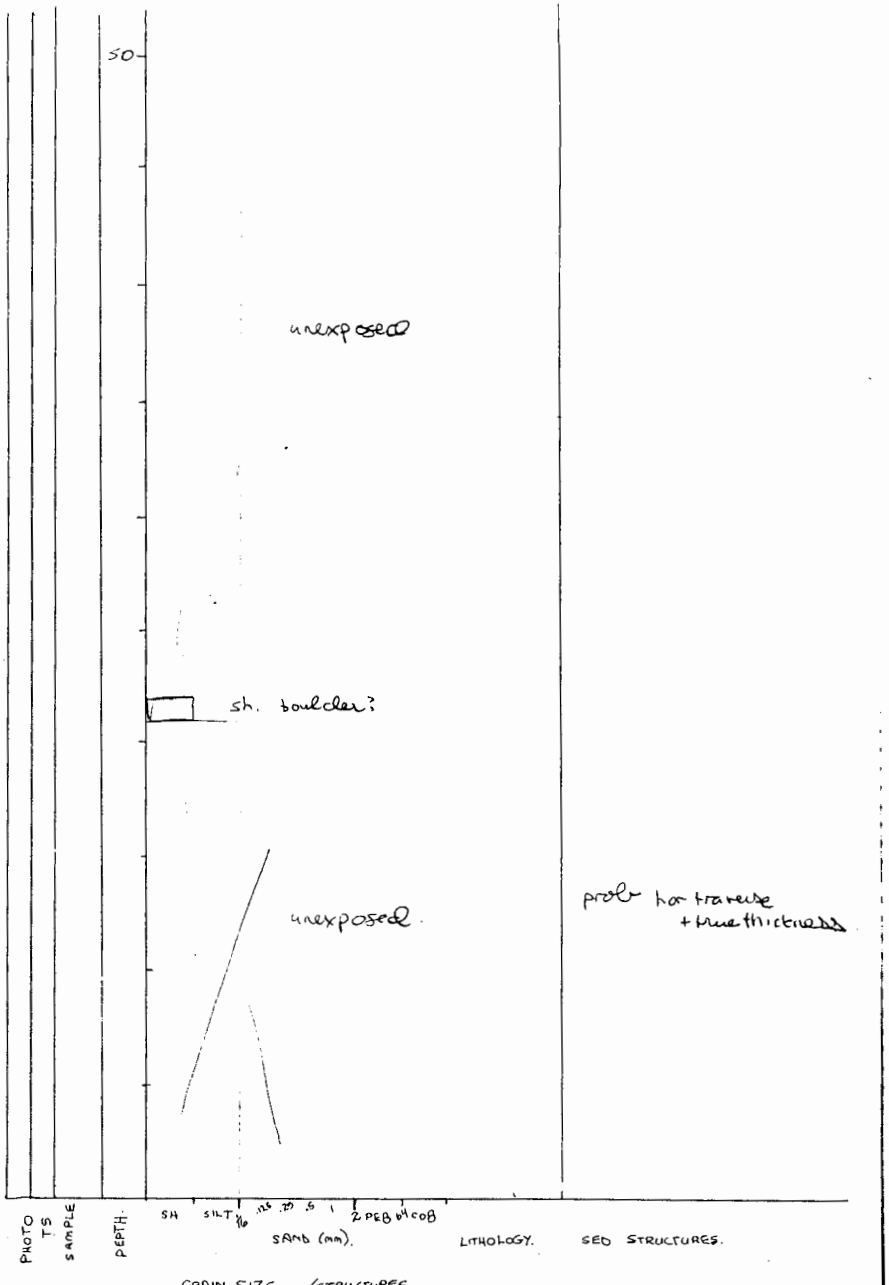
SAND (mm).

LITHOLOGY. SED STRUCTURES.

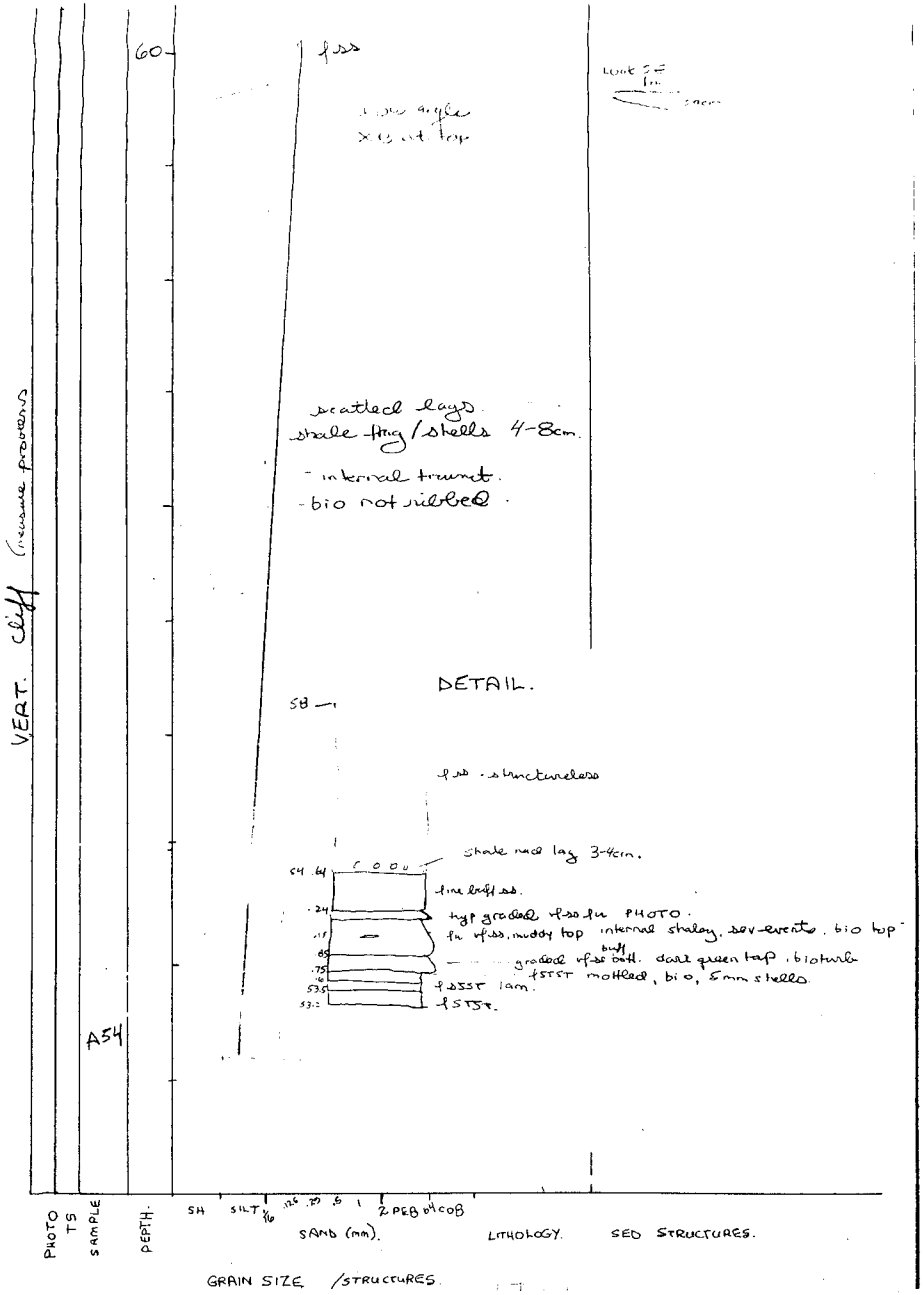
GRAIN SIZE /STRUCTURES.

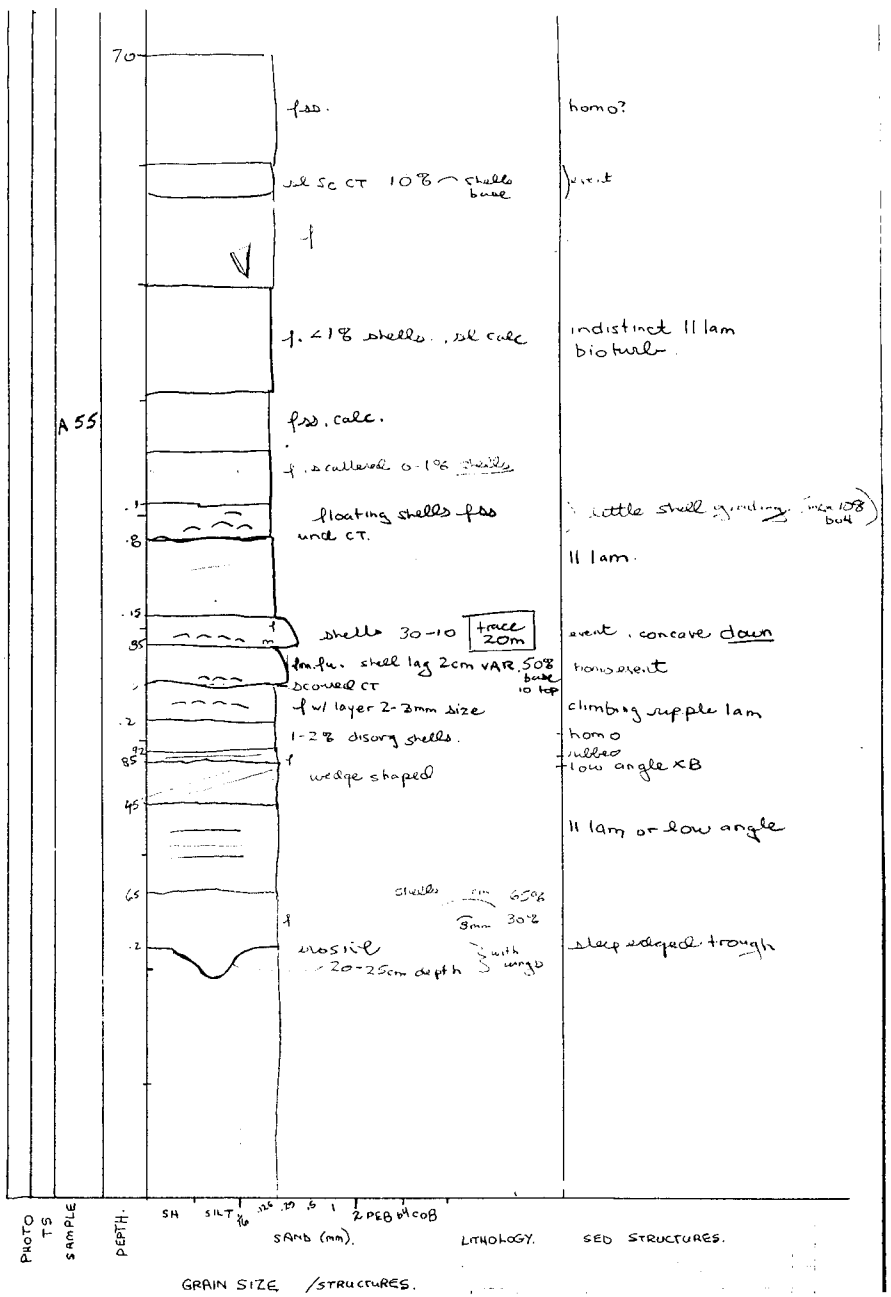
A2

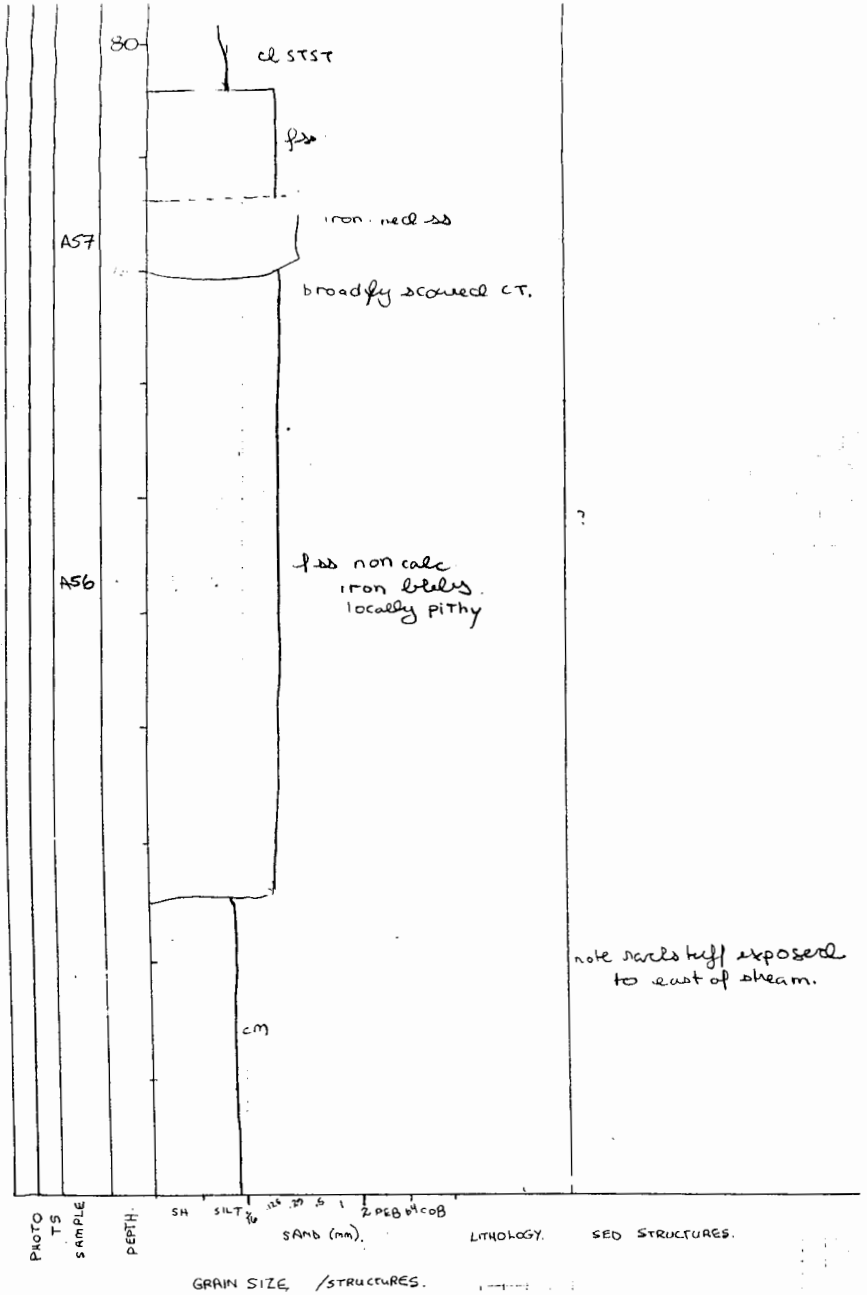

40
unexposed
PATH LATERALLY.
tm
hor bedded ss
60cm
erosive trough base steeply
mottled. <2% sh drag
72
65
unexp.
rafted shells pockets
concave up
lithic wh fp 5mm
bands.
weak internal bedding
sl eros base
mc
.15
35
.2
.9
1.00
no shells. homo
homo m. a lot fp
no bioch.
scattered brachs.
ALT f/coarse lam.
coarse (coarse calcarenite)
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

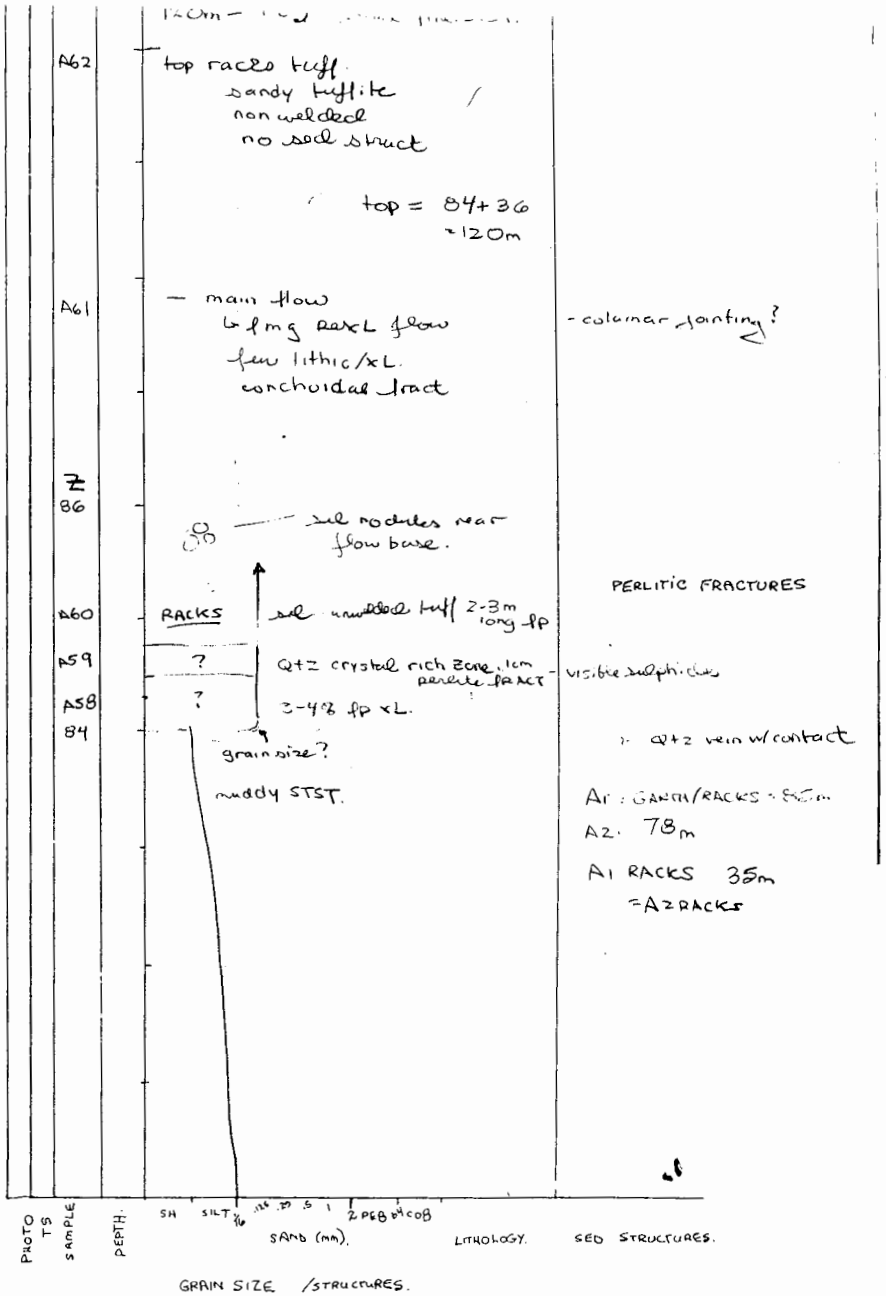

50
unexposed
sh. boulder?
unexposed.
prob hor traverse
+ true thickness
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

A2

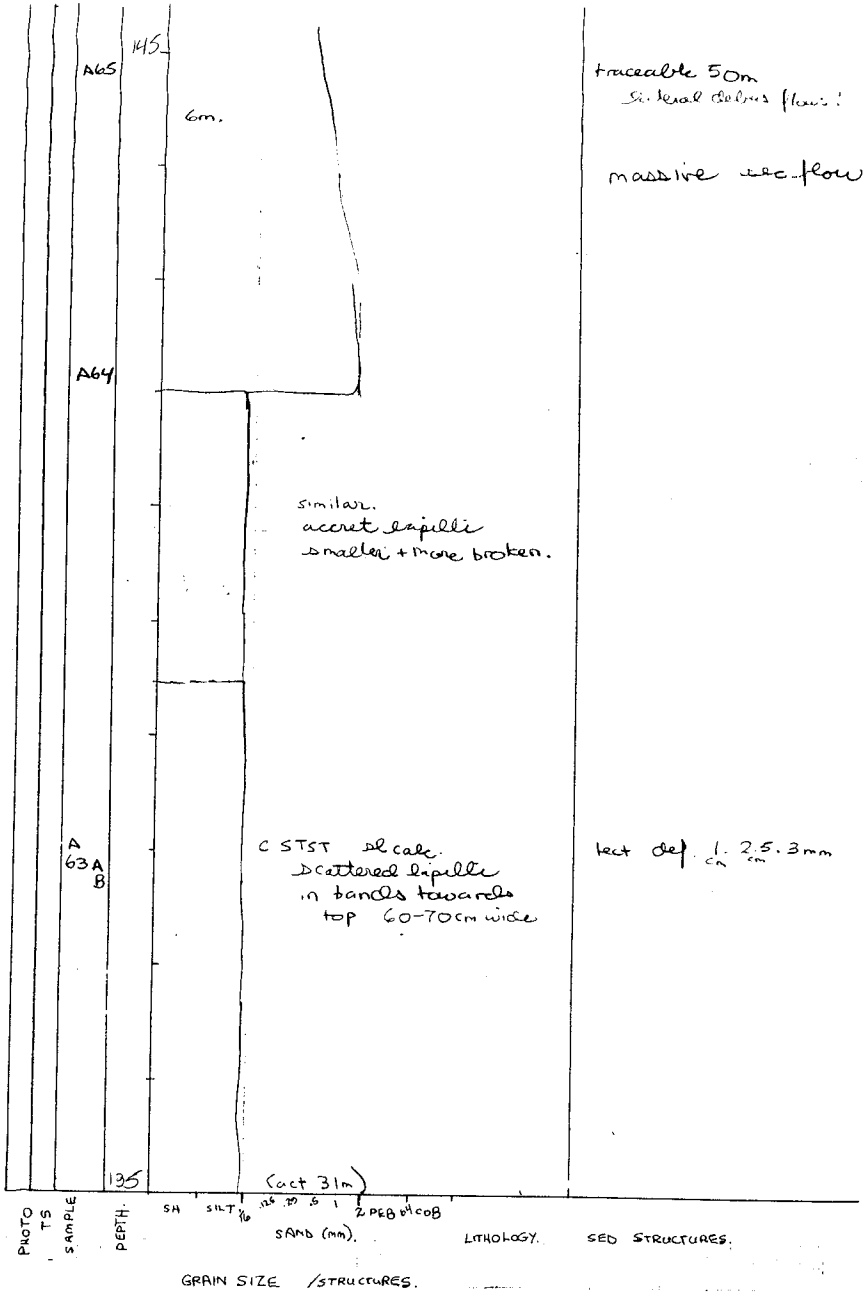

VERT. cliff (measure protons)
60
fss
low angle xbs at top
scattered lags shale frag/shells 4-8cm.
- internal truncat.
- bio not rubbled.
DETAIL.
58
fss - structureless
shale rnd lag 3-4cm.
fine buff ss.
tgt gradatl fss fn PHOTO.
fn fss, muddy top internal shaley, sev-events, bio top
buff
gradatl fss bott. dark green top, bioturb
fSSST lam.
fSSST mottled, bio, 5mm shells.
fSTST.
A54
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

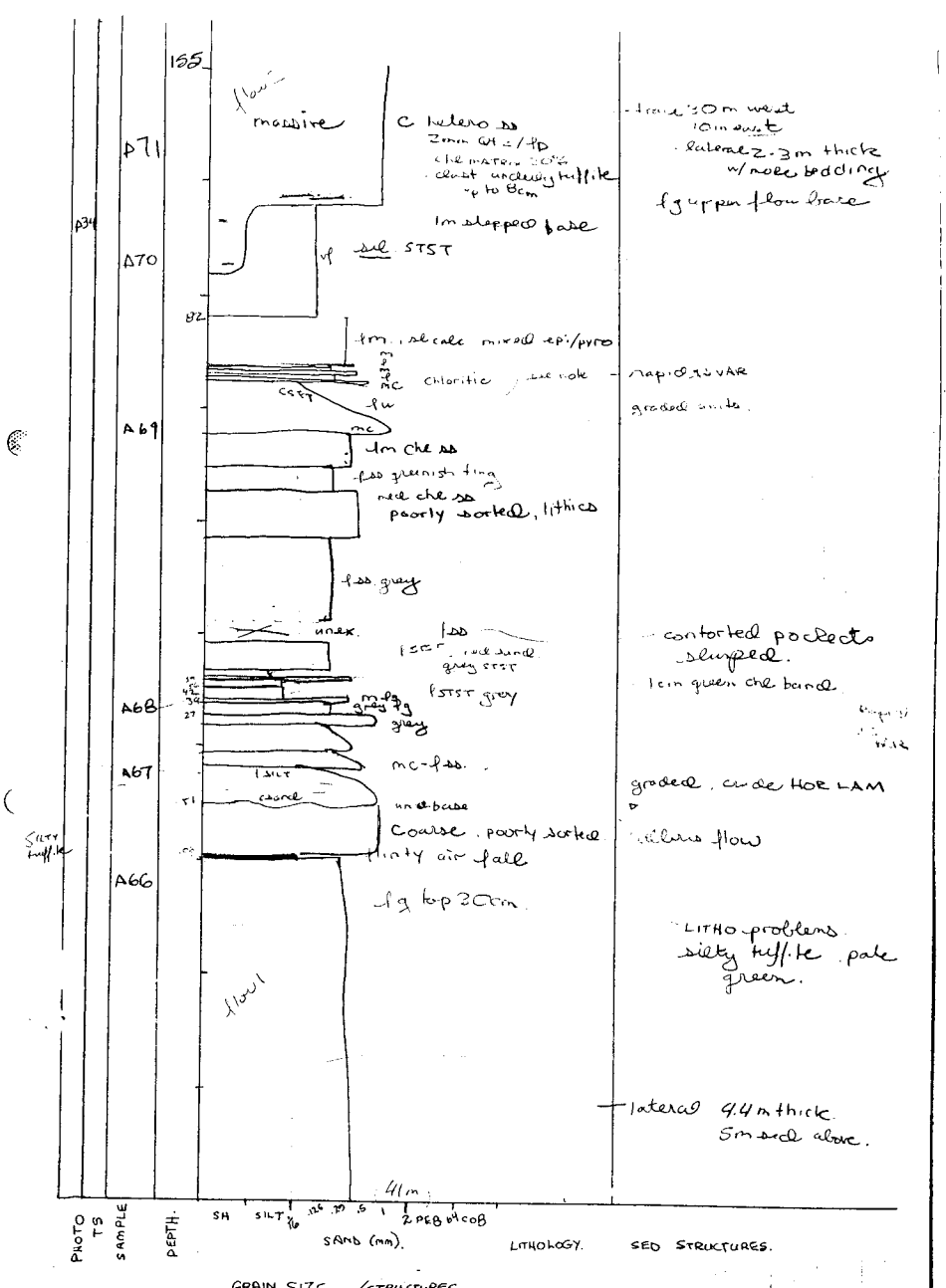

70
fss.
homo?
vsl sc CT 10% shells base
vsl sc CT
indistinct ll lam bioturb
f. <1% shells, sl calc
fss, calc.
A55
f, scattered 0-1% shells
floating shells fss und CT.
little shell grading (incr 10% base)
ll lam.
shells 30-10 trace 20m
event, concave down
fm-fu, shell lag 2cm VAR. 50% base 10 top
scoured CT
transgress.
f w/ layer 2-3mm size
climbing ripple lam
1-2% disorg shells.
homo
rubbled
low angle XB
wedge shaped
ll lam or low angle
shells 1cm 65%
3mm 30%
erosnl with wings
~20-25cm depth
steep edged trough
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


80
cl STST
fss
A57
iron. ped ss
broadly scoured CT.
A56
fss non calc
iron blebs.
locally pithy
cm
note racks tuff exposed
to east of stream.
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

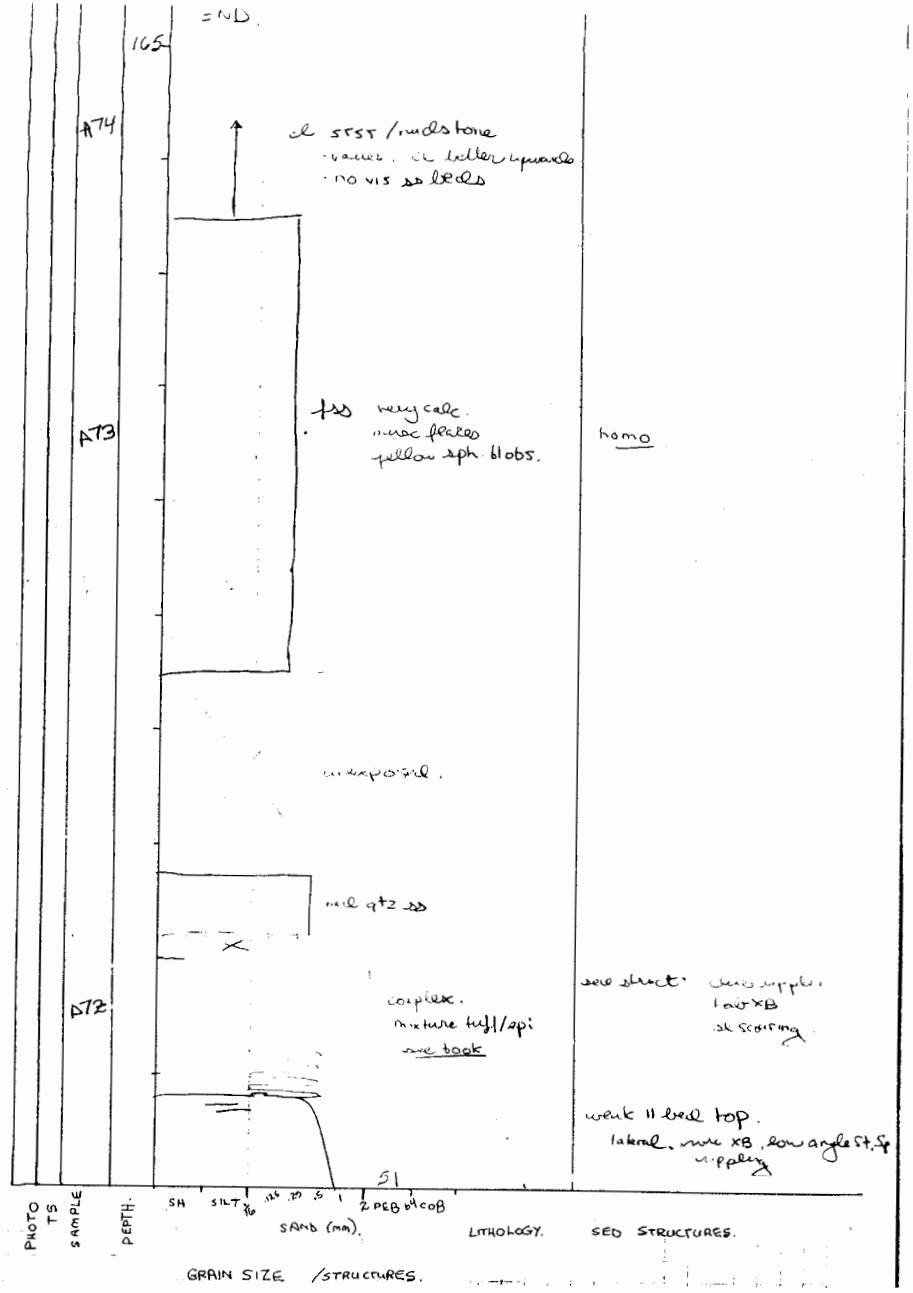

A62
top racks tuff.
sandy tuffite
non welded
no sed struct
top = 84+36
=120m
A61
— main flow
b&mg rare xL flow
few lithic/xL.
carchoidal fract
- columnar jointing?
86
ss nodules near
flow base.
PERLITIC FRACTURES
A60
RACKS
ss mudded tuff 2-3m
long fp
A59
?
Qtz crystal rich zone, 1cm
pervasive FRACT
- visible sulphides
A58
?
3-4% fp xL.
84
grain size?
muddy STST.
+ Qtz vein w/ contact
A1: GANTH/RACKS = 85m
A2. 78m
A1 RACKS 35m
=A2 RACKS
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

A2


145
A65
6m.
traceable 50m
Sideral blobs flows!
massive vtc. flow
A64
similar.
accret lapilli
smaller + more broken.
A
63A
B
C STST sl calc.
Scattered lapilli
in bands towards
top 60-70cm wide
text def. 1. 2.5. 3mm
135
(act 31m)
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


155
massive
C lutero ss
2mm GH = 1/p
chl MATRIX 30%
clast underlay tuffite
"p to 8cm
1m stepped base
A71
A70
vf sil STST
A69
1m chl ss
f-ss greenish tint
med chl ss
poorly sorted, lithics
f-ss grey
A68
f-ss
f STST grey
mc-f ss.
A67
SILT
coarse
Coarse, poorly sorted
tuffy air fall
A66
f g top 30cm.
flow
41m
- trace 30m west
10cm east
- lateral 2-3m thick
w/ more bedding
f g upper flow base
- contorted pockets
slumped.
1cm green chl bands
graded, crude HOR LAM
ripples flow
LITHO problems
silty tuffite pale
green.
- lateral 4.4m thick
5m sed above.
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

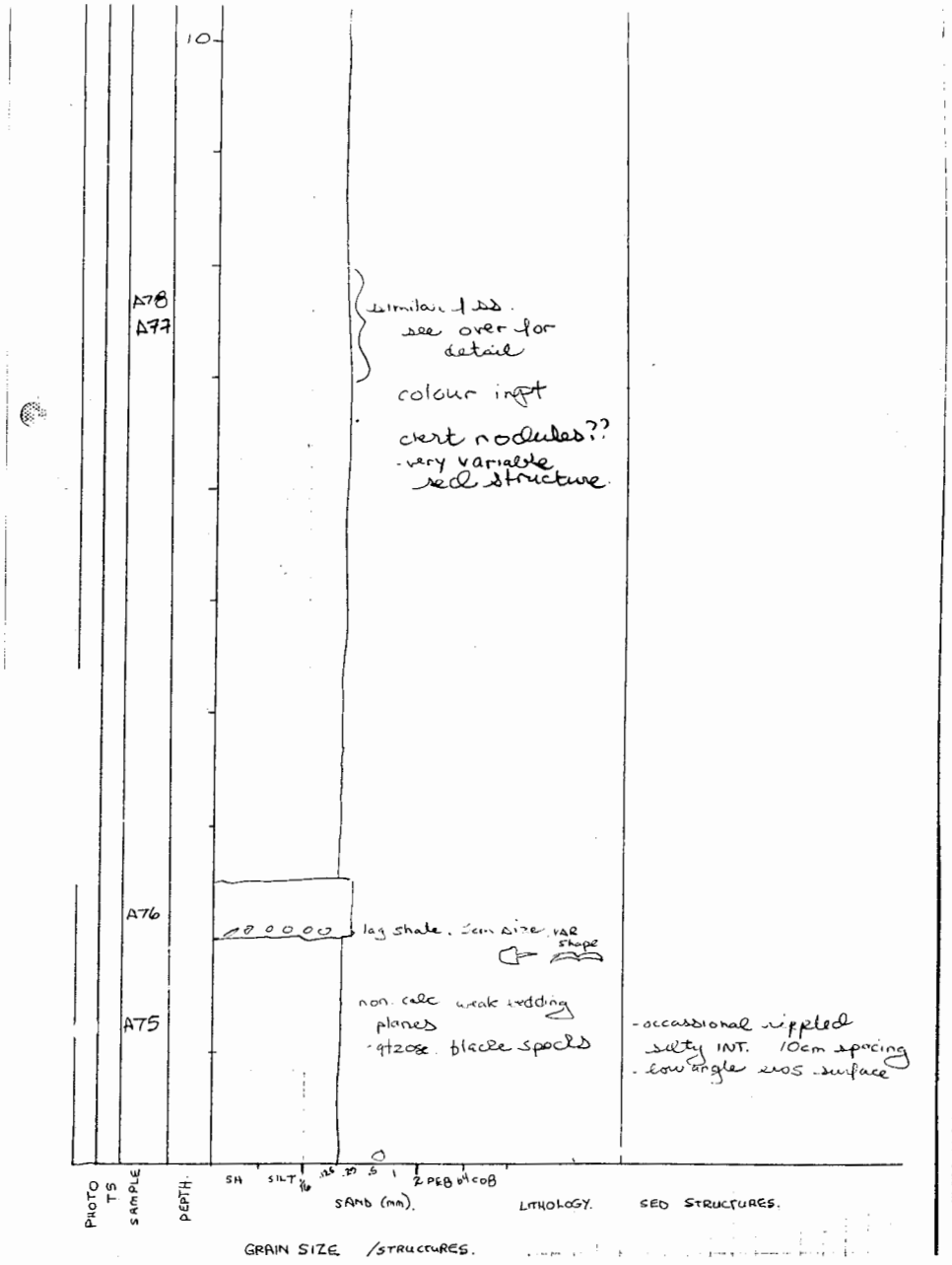
A2

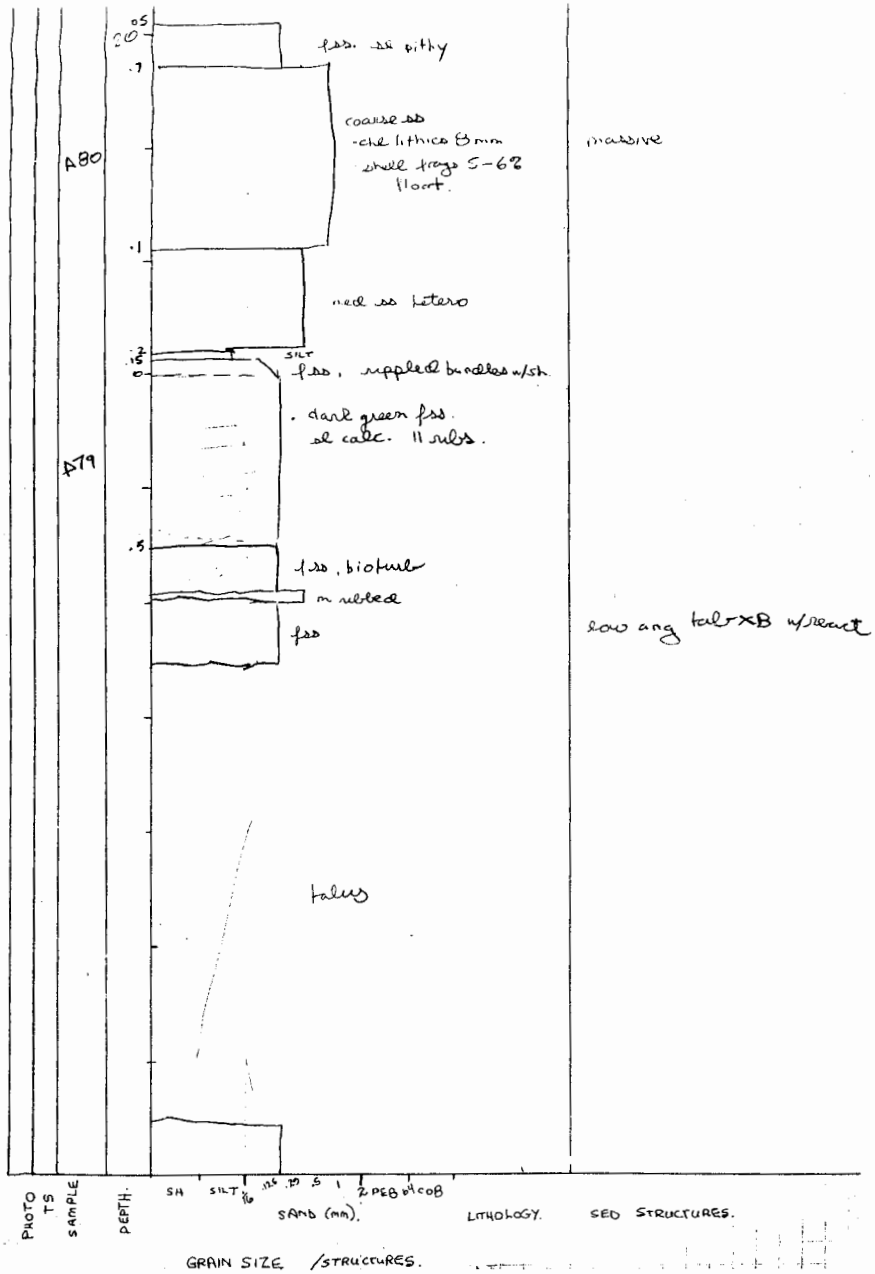

END.
165
A74
A73
A72
ss
homo
SH
SILT
SAND (mm).
PHOTO
T.S
SAMPLE
DEPTH.
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

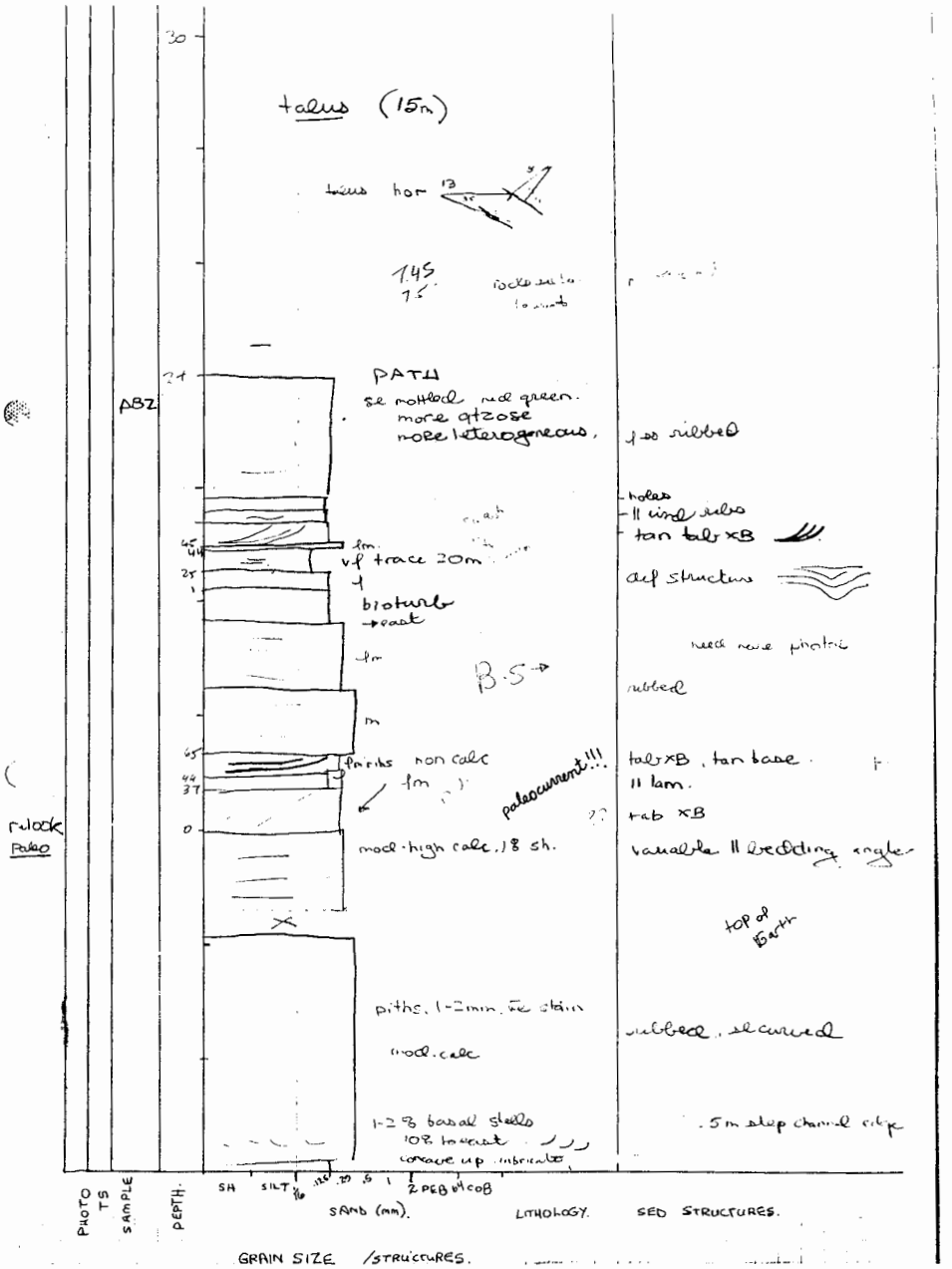
A2

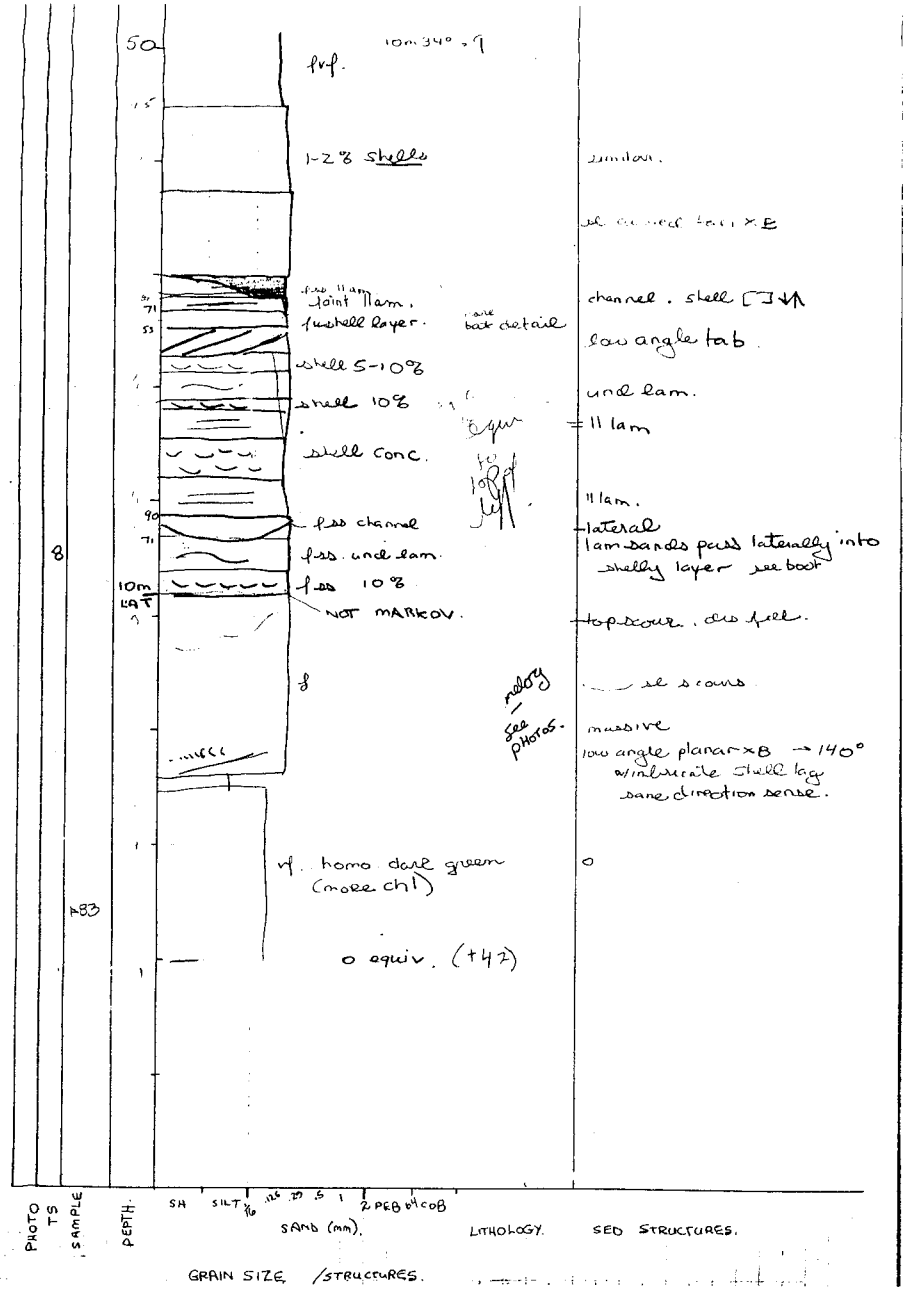
SECTION A3

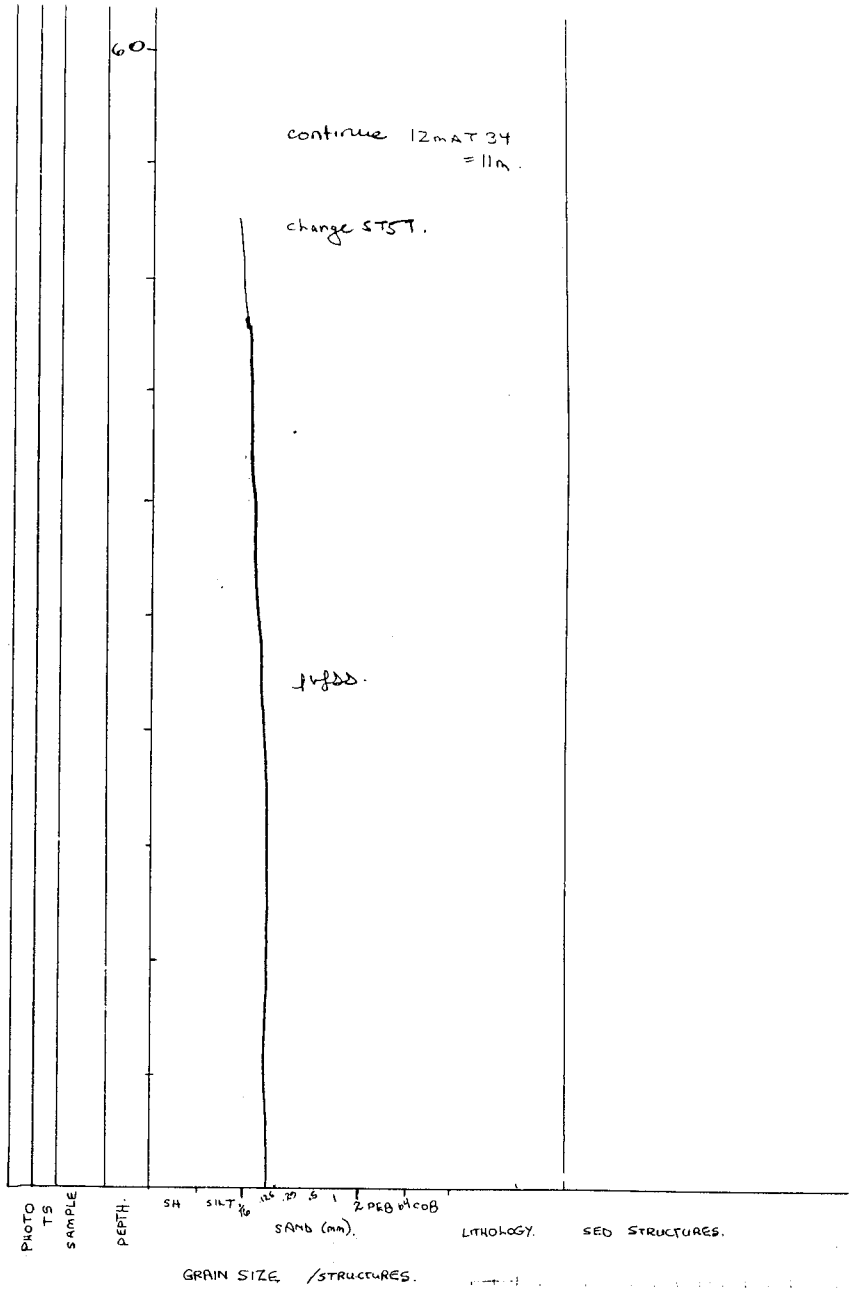
SECTION A3 LOCATION: Locate small stream to east of white-weathering crags of Garth tuff frequently used by climbers. Sections starts in lowest crags of reworked Garth tuff 100 m to east of stream. See photograph in Figure 5. .




fss. ss silty
coarse ss
-chl lithics 8 mm
shell frags 5-6%
float.
massive
med ss litero
SILT
fss, rippled bndries w/sh.
. dark green fss.
sl calc. ll ribs.
fss, bioturb
m ribbed
fss
low ang tab xB w/recut
talus
A80
A79
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


talus (15m)
talus hor
145
75
rocks into talus
PATH
A82
se mottled red green.
more qtzose
more heterogeneous.
fss ribbed
holes
ll ind ribs
tan tab xB
def structures
med-vcse pinstr
fm
vf trace 20m
bioturb
root
B.S
m
rubbed
fm
parlks non calc
paleocurrent!!!
tab xB, tan base.
ll lam.
tab xB
variable ll bedding angle
rubble
Paleo
mod-high calc, 18 sh.
top of bluff
piths, 1-2mm, fe stain
mod. calc
rubbed, sl curved
1-2 B basal shells
10B toward
concave up imbricate
.5m step channel ribs
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


50
prf.
10m 34° = 9
1-2% shells
similar.
faint llam.
fine llam.
fine shell layer.
see back detail
channel . shell
low angle tab.
shell 5-10%
und lam.
shell 10%
= 11 lam
shell conc.
11lam.
fss channel
lateral
lam sands pass laterally into shelly layer see back
fss. und lam.
fss 10%
NOT MARKOV.
top scour . dis lag.
sc scours
massive
low angle planar xB → 140°
w/ imbricate shell lag
same direction sense.
vf. homo dark green (more chl)
0
0 equiv. (+47)
A83
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

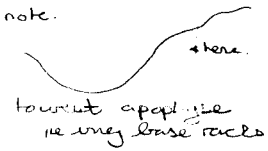

60
continue 12m AT 34
= 11m.
change ST5T.
fvfss.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

A3

base RACKS

f STST/mud .cl.
red-dark grey 7m

note.



tourist appl. ...
re ...ney base rocks.

PHOTO
TS
SAMPLE
DEPTH.
SH SILT ⅛ .125 .25 .5 1 2 PEB 64 COB
SAND (mm).
LITHOLOGY.
SED STRUCTURES.

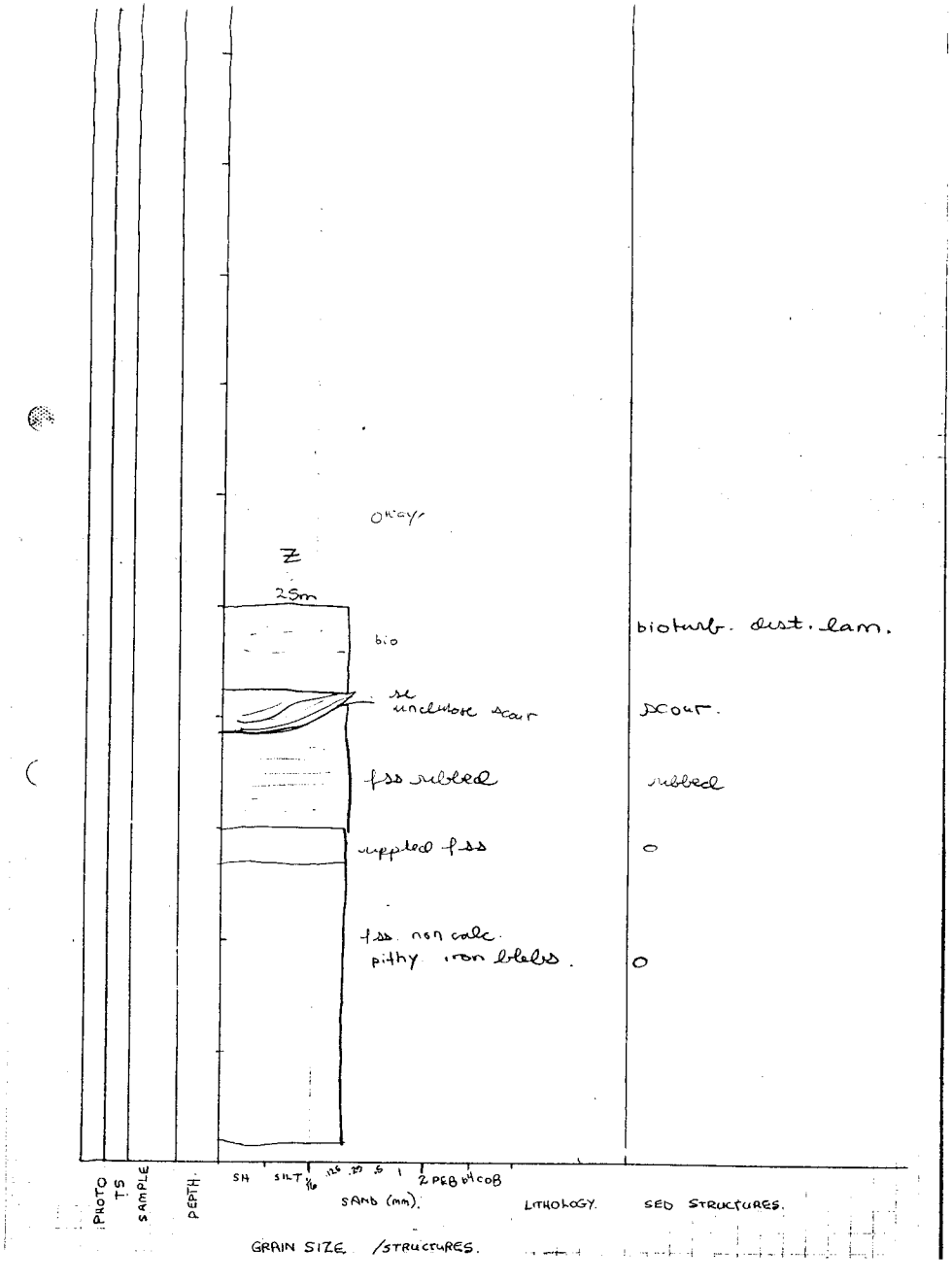
GRAIN SIZE /STRUCTURES.

A81
20
channel
scattered floating shells
cut by large channel
7m laterally NW/SE
orient
1.5m deep
11 lam. -chl lithics
-shells ~ VAR
non calc. rusty
edges of channel
FU. more VAR.
scour fill
fSD
rubbed ss
fss rubbed
faint lam
detail book
f.m. ss.
bio...
not rubbed . massive
f
(11 lam, scours, slumping)
shell layer . shaver disp
see book
m/c. bands
3
7
4
ripple, bioturb
see notebook for scale. 3 scours
1st lam full scour 1
2nd scour bigger.
thickness VAR 12-5/130
thickness varies 23→19/1.3m
faint 11 lam
ripples base
rippled top
rubbed
see notebook.
low angle scour
micro growth fault
3 dips
lateral thickness VAR.

PHOTO
TS
SAMPLE
DEPTH.
SH SILT ⅛ .125 .25 .5 1 2 PEB 64 COB
SAND (mm).
LITHOLOGY.
SED STRUCTURES.

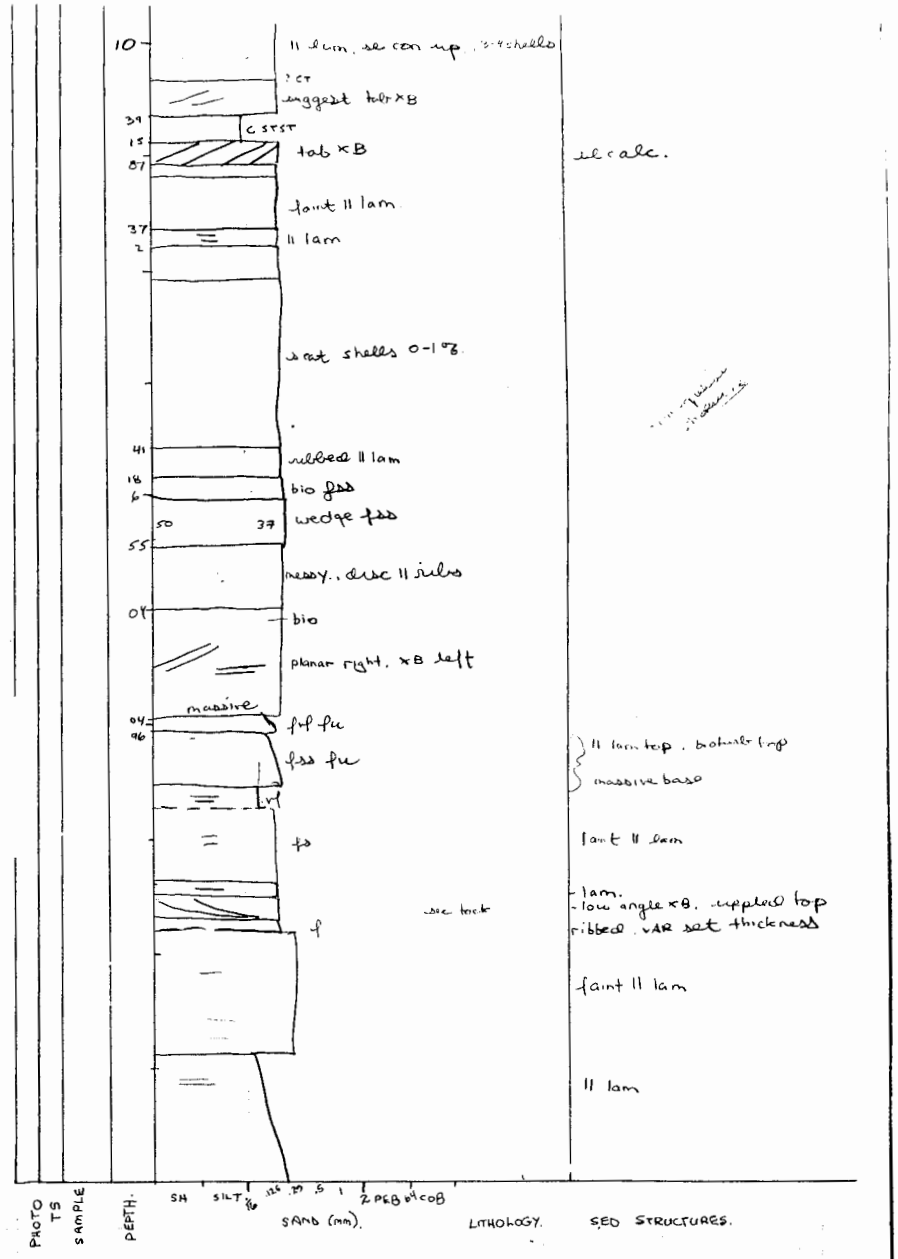
GRAIN SIZE /STRUCTURES.

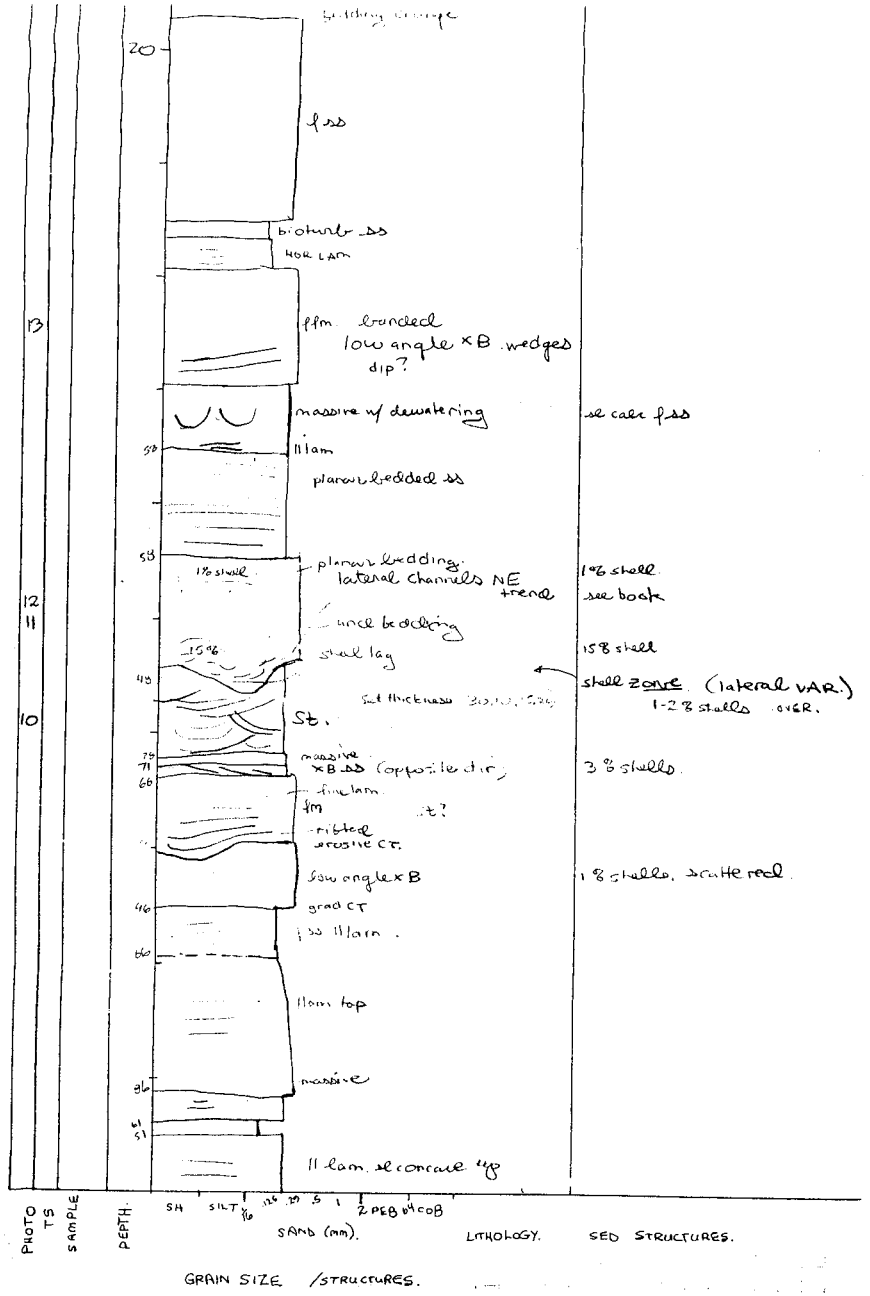
A3

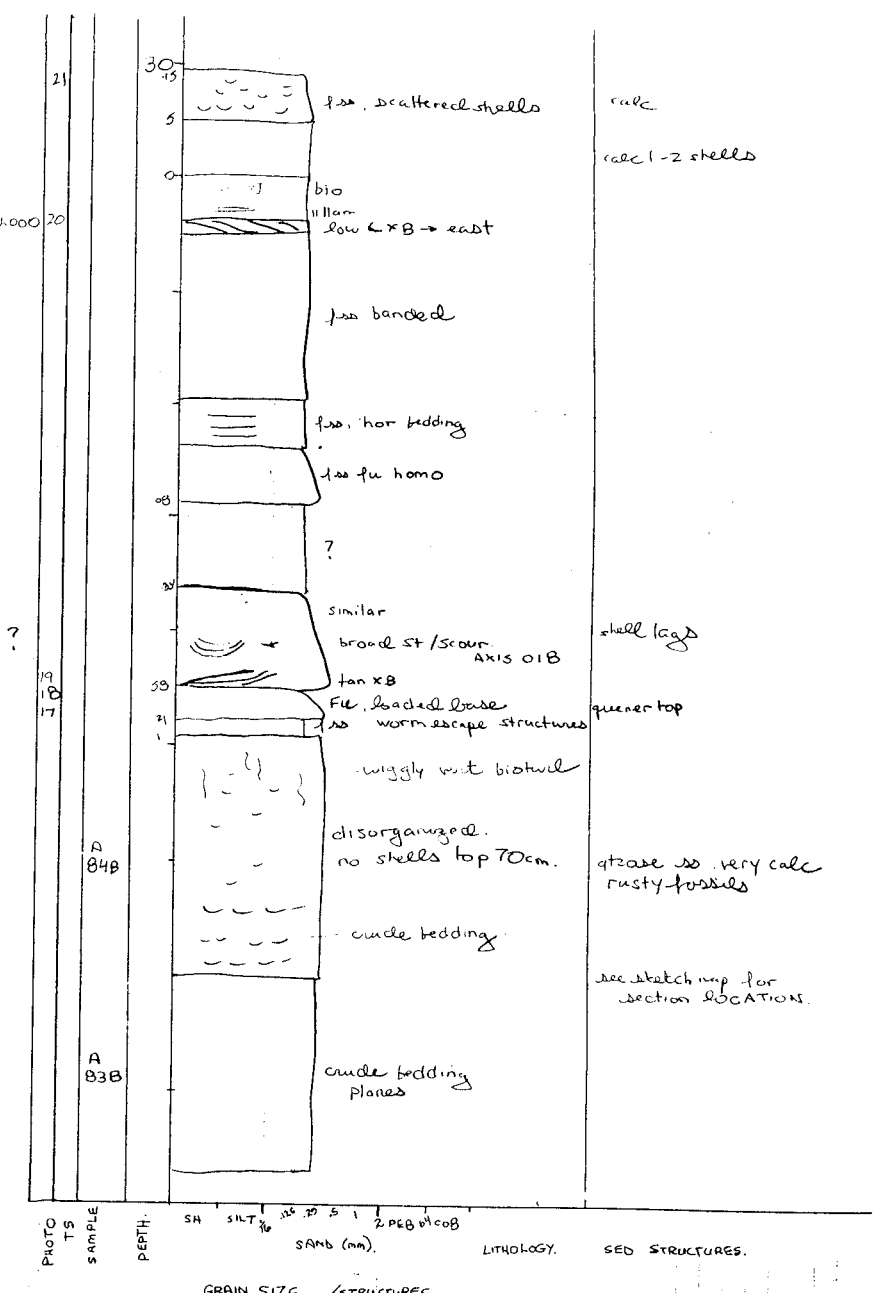

Okay
Z
25m
bio
sc
uncl shore scour
fss rubbled
rippled fss
fss. non calc.
pithy iron blebs.
bioturb. dist. lam.
scour.
rubbled
0
0
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

SECTION A4

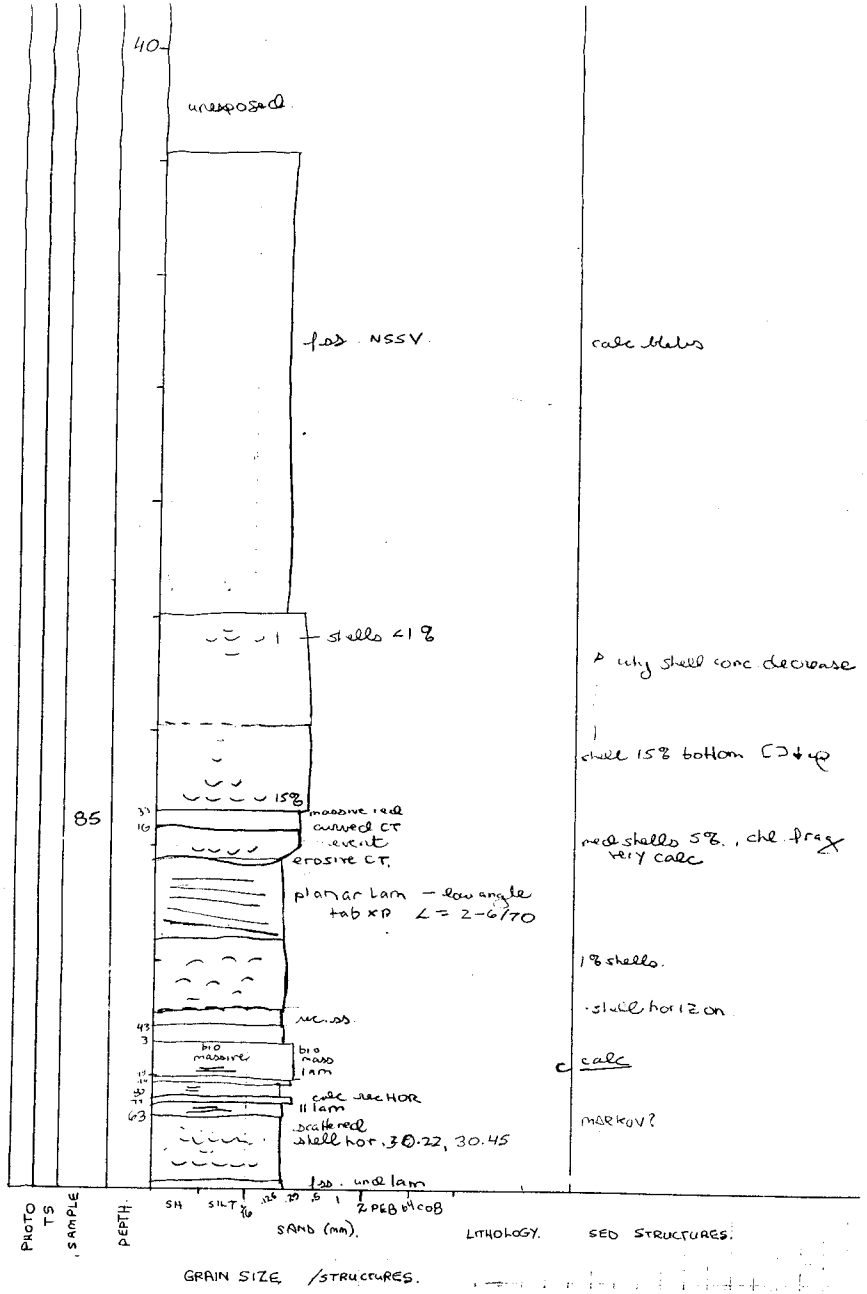
SECTION A4 LOCATION: Section starts in lowest exposures of sandstone midway between Section A1 and A3. See photograph in Figure 5. .

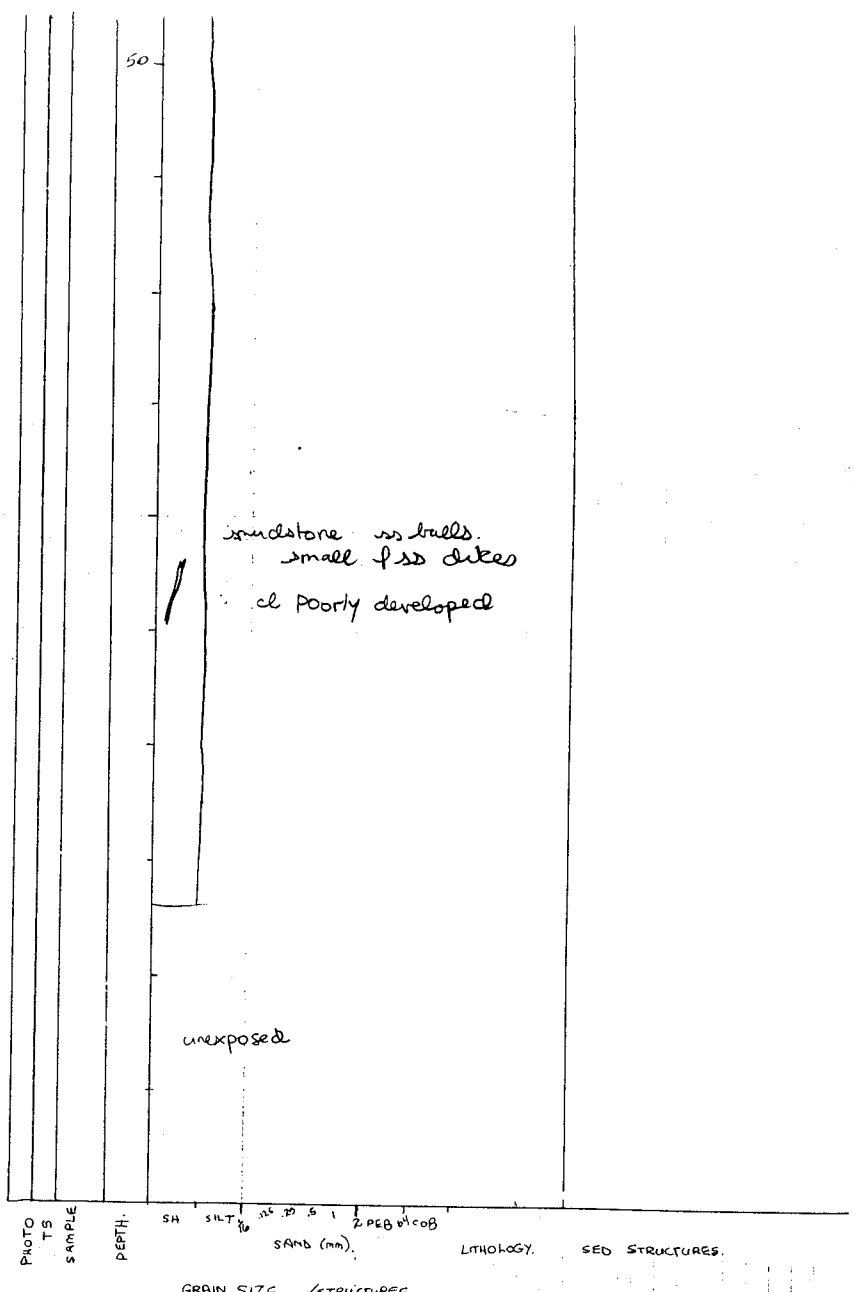



20
fss
bioturb ss
HOR LAM
13
ffm bracded
low angle xB wedges
dip?
massive w/ dewatering
se calc fss
58
11 lam
planar bedded ss
58
planar bedding
lateral channels NE trend
1% shell
see back
12
11
wvy bedding
shell lag
15%
15% shell
49
shell zone (lateral VAR.)
1-2% shells OVER.
St.
10
79
71
66
massive
xB ss (opposite dir)
3% shells
fine lam
fm
ribbed
erosive CT.
low angle xB
1% shells, scattered
46
grad CT
fss 11 lam.
60
11 lam top
massive
51
11 lam. sl concave up
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


21
1000
20
30
15
5
0
fss, scattered shells
calc
calc 1-2 shells
bio
11 lam
low ∠ xB → east
fss banded
fss, hor bedding
fss fu homo
08
?
?
similar
broad sf/scour
AXIS 018
shell lags
19
18
17
58
tan xB
Fu, loaded base
fss worm escape structures
queer top
wiggly w/ bioturb
disorganized.
no shells top 70cm.
A
84B
grease ss, very calc
rusty fossils
crude bedding
see sketch map for
section LOCATIONS.
A
83B
crude bedding
planes
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

A4

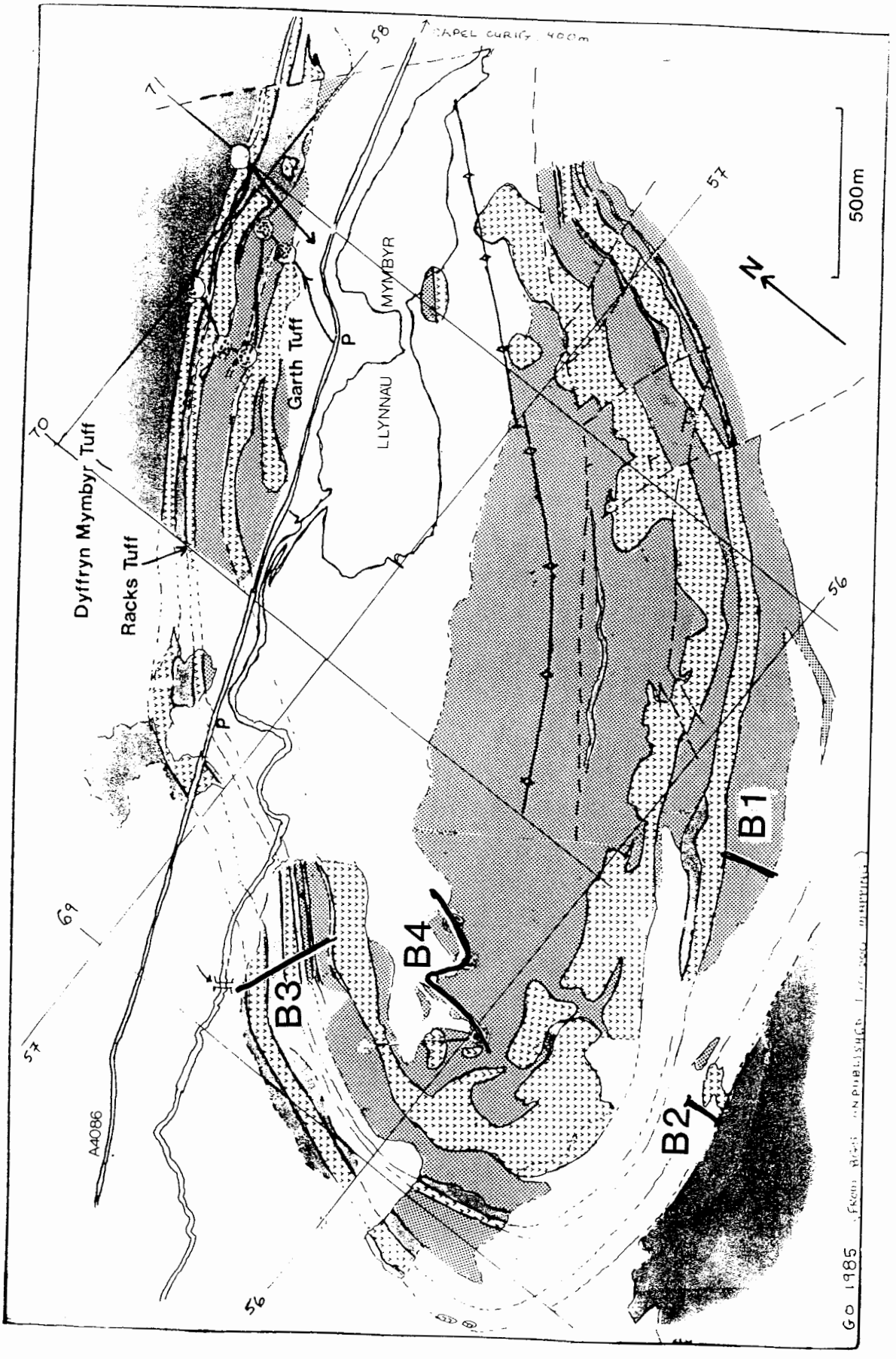

40
unexposed
fos. NSSV
calc blebs
stells <1%
ripply shell conc decrease
shell 15% bottom CJ+up
15%
85
massive reel
curved CT
erosive CT.
reel shells 5%, chl frag
very calc
planar lam – low angle
tab xp ∠ = 2-6/70
1% shells.
shell horizon
wc. ss.
bio massive
bio mass lam
calc rec HOR
11 lam
broke reel
shell hor. 30.22, 30.45
63
lss. und lam
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


50
sandstone ss balls.
small fss dikes
cl poorly developed
unexposed
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

A4

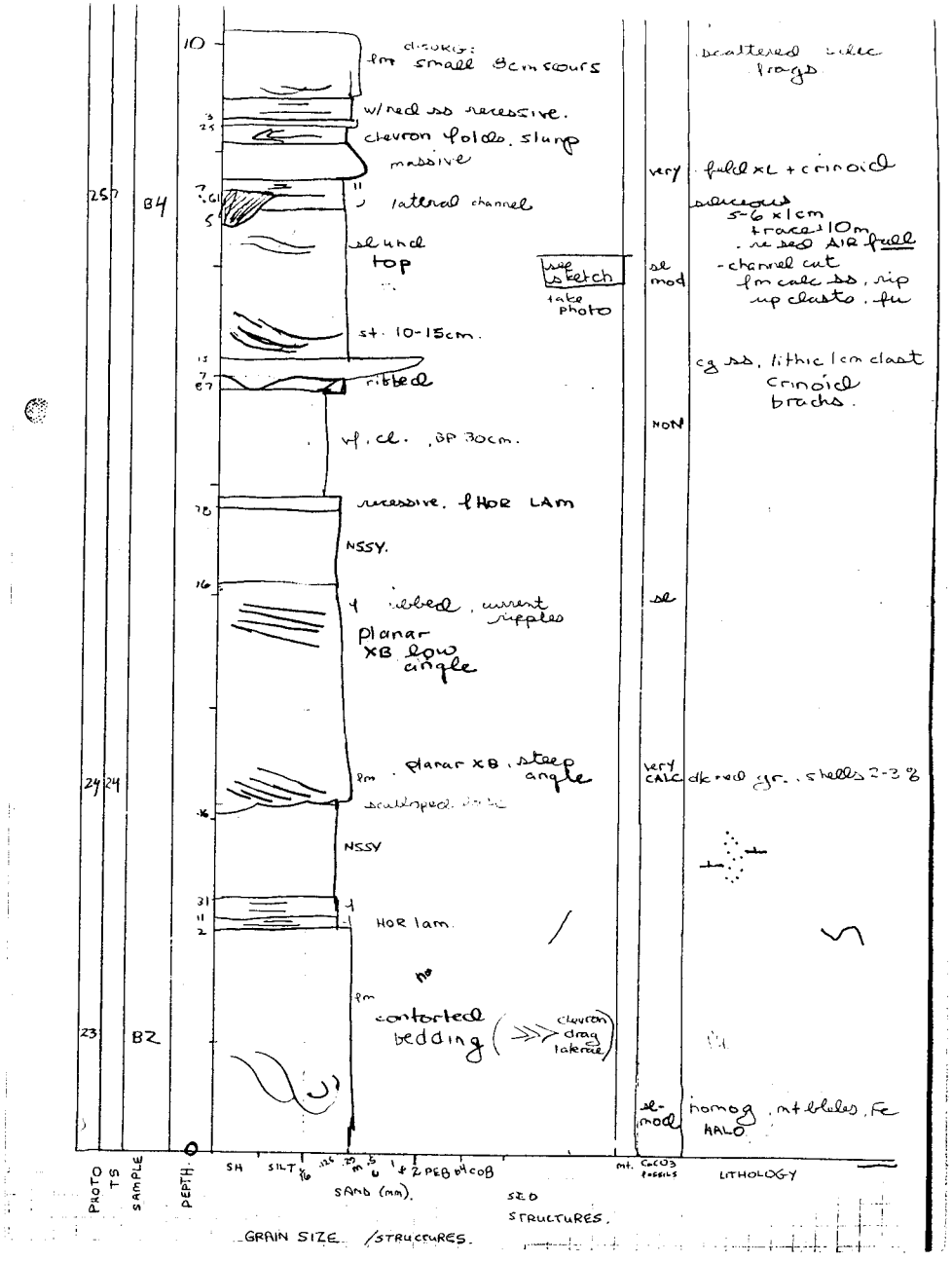
AREA B

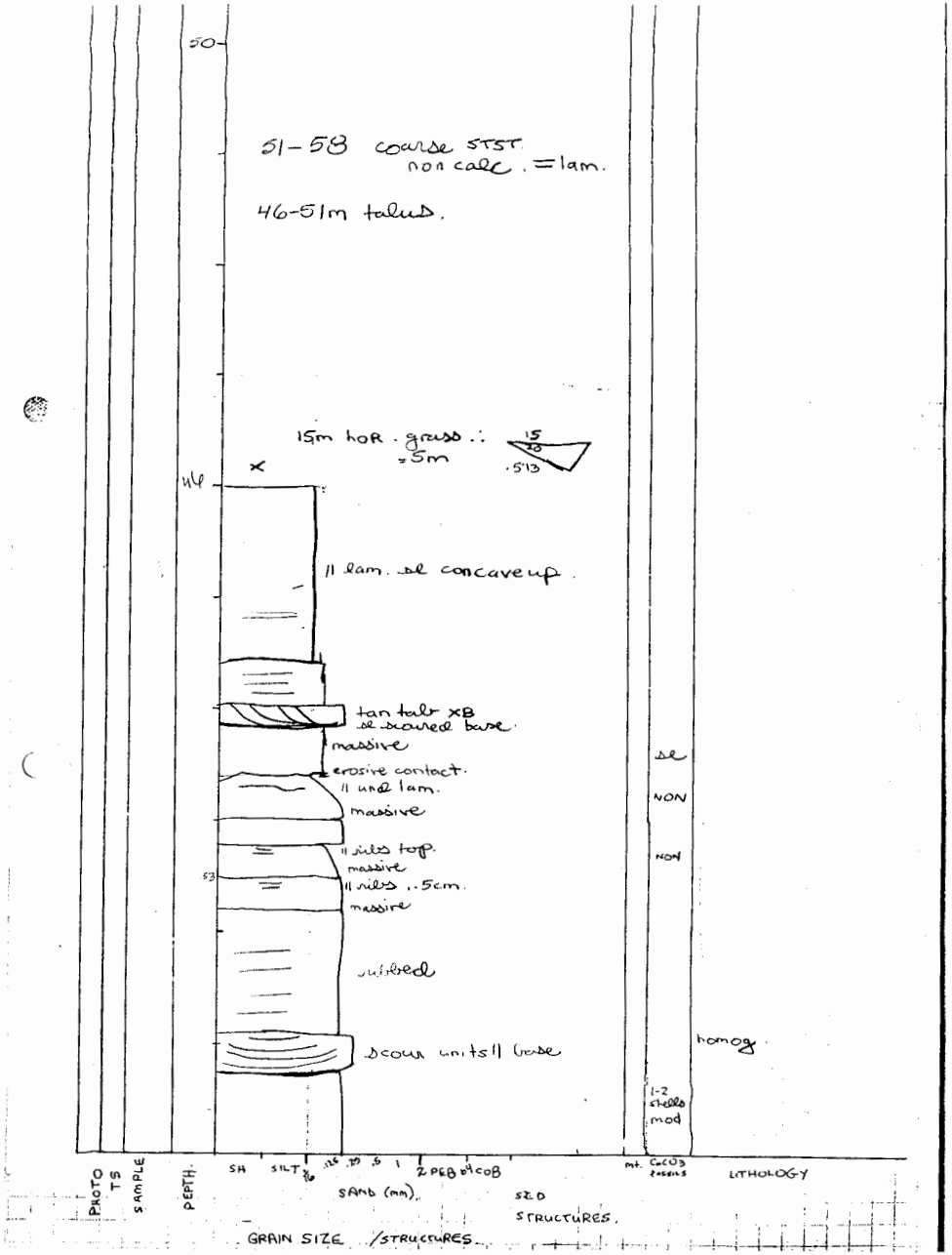
LOCATION MAP.



SECTION B1

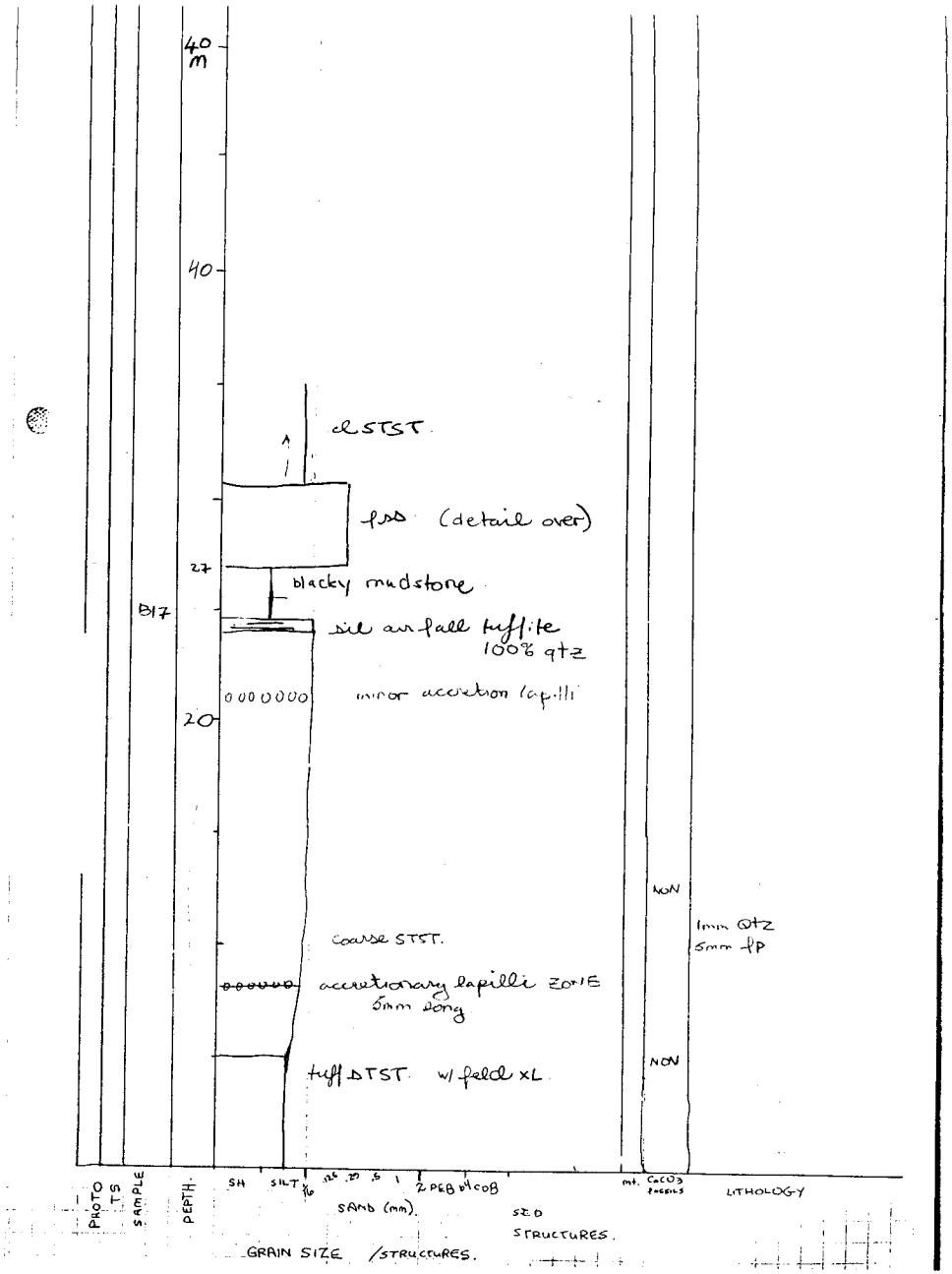
SECTION B1 LOCATION: Locate top of Racks tuff at SW end of Capel Curig anticline. Section proceeds perpendicular to regional dip until sedimentary structures no longer discernible.

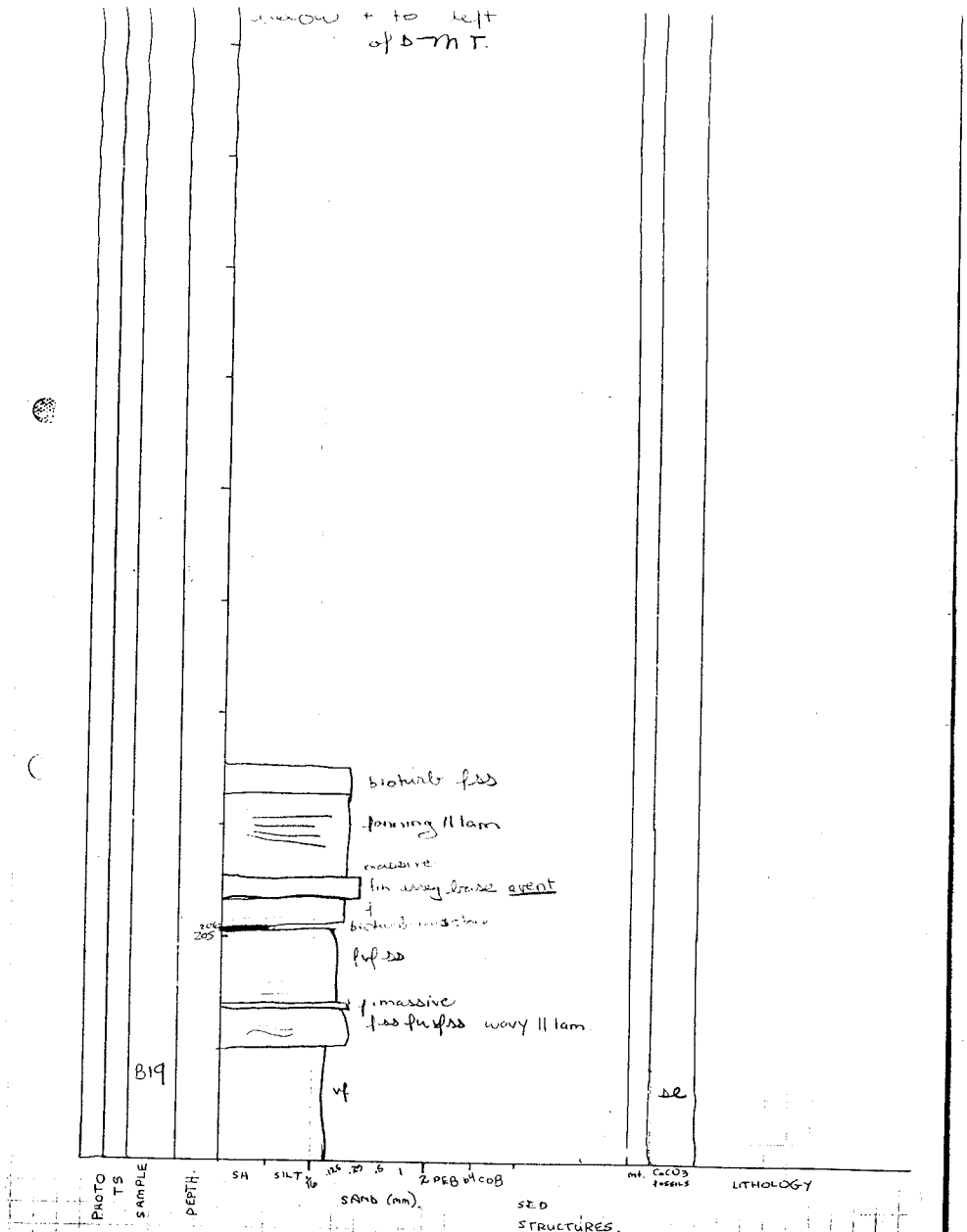



50
51-58 course STST.
non calc. = lam.
46-51m talus.
15m hor. grass ∴
= 5m
15
10
5 13
x
46
|| lam. sl concave up.
tan tuff XB
sl scoured base.
massive
erosive contact.
|| und lam.
massive
|| silts top.
massive
53
|| silts .5cm.
massive
subbed
Scour units || base
homog.
sl
NON
NON
1-2 shells mod
PROTO TS
SAMPLE
DEPTH
SH
SILT
.125
.25
.5
1
2 PEB
cOB
mt.
CaCO3 fossils
LITHOLOGY
SAND (mm)
SED STRUCTURES
GRAIN SIZE /STRUCTURES

SECTION B2

SECTION B2 LOCATION: Locate stream immediately to east of Cwm-Isaf plantation. Section commences 5 m below first outcrop of 4th volcanic member of Capel Curig Volcanic Fm. containing accretionary lapilli; section proceeds to SE along stream.

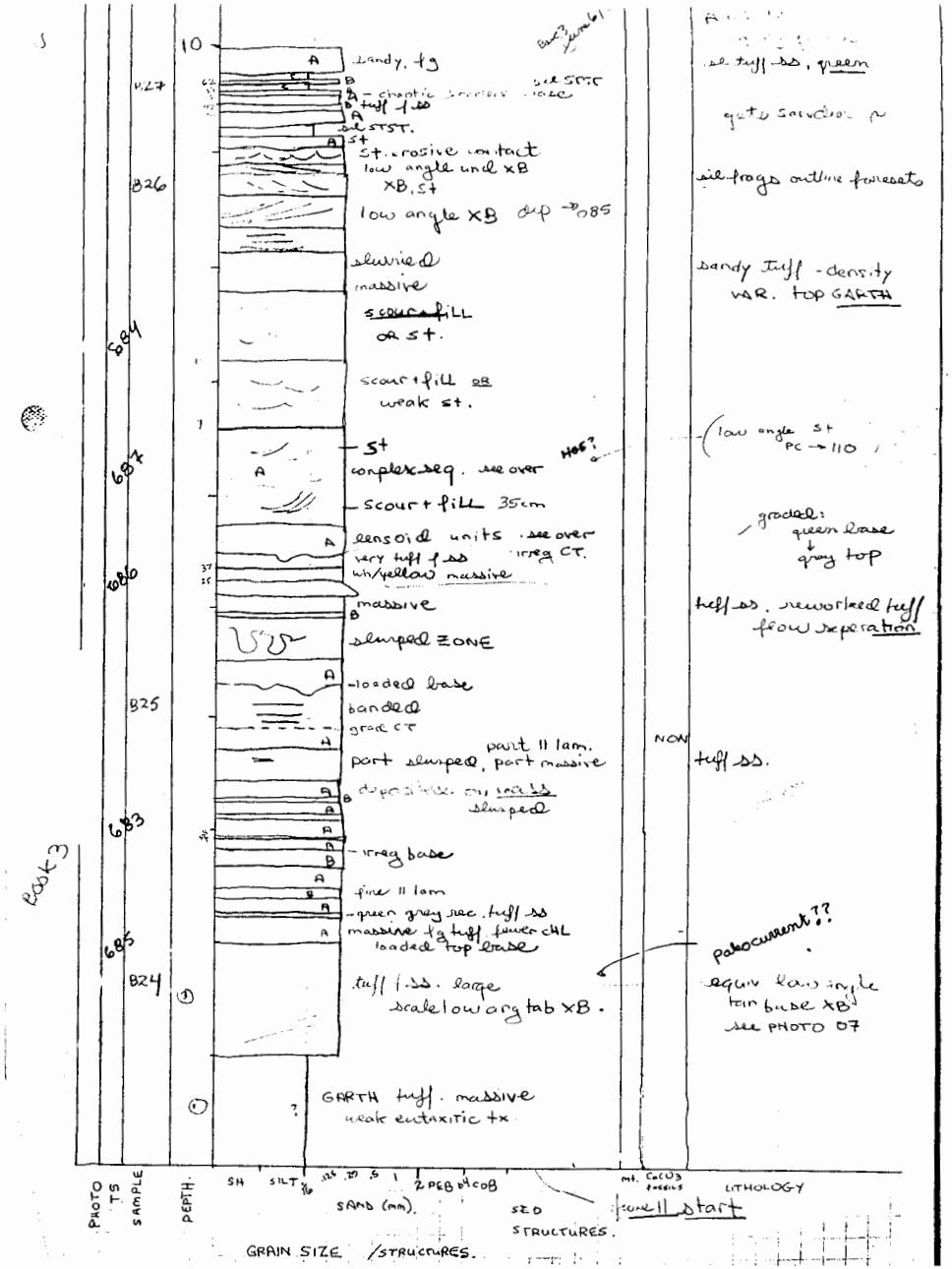


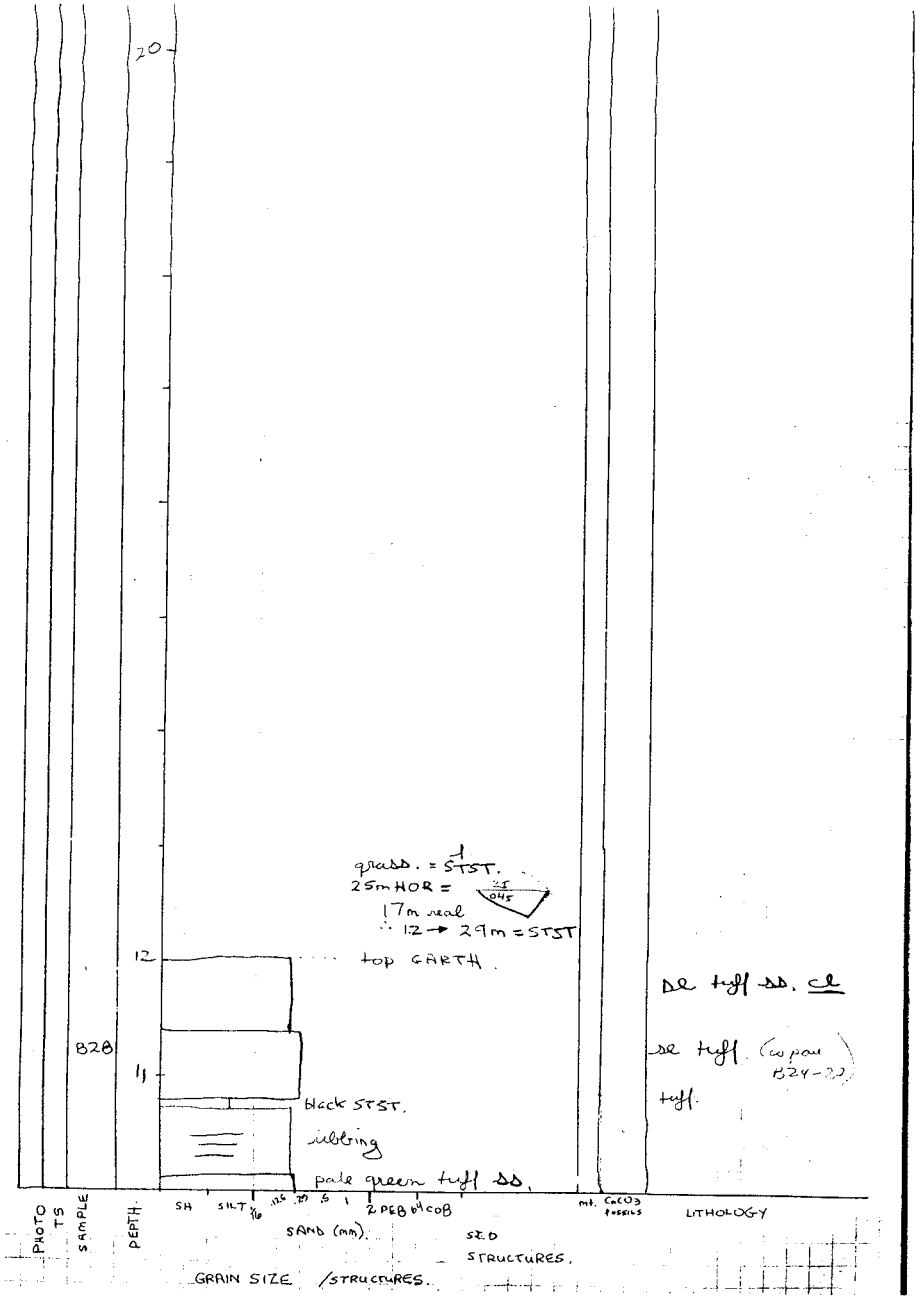

arrow + to left of B-m T.
bioturb fss
planar ll lam
massive
fin wavy bdse event
bioturb mudstone
206
205
fvfss
massive
fss fvfss wavy ll lam
B19
vf
se
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
%
.125
.25
.5
1
2
PEB
BH
COB
mt. CaCO3 fossils
LITHOLOGY
SAND (mm).
SED STRUCTURES.
GRAIN SIZE. /STRUCTURES.

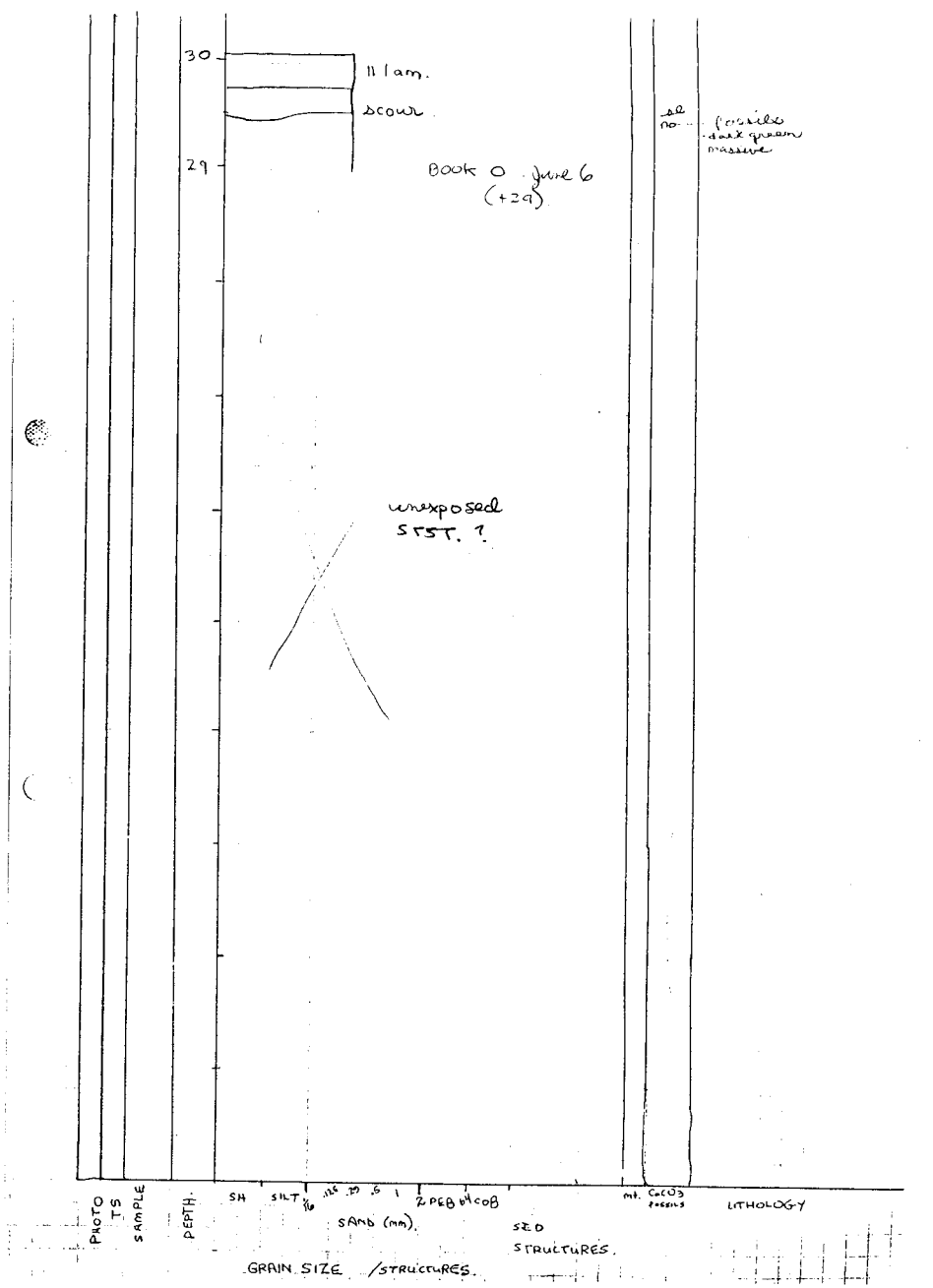
B2

SECTION B3

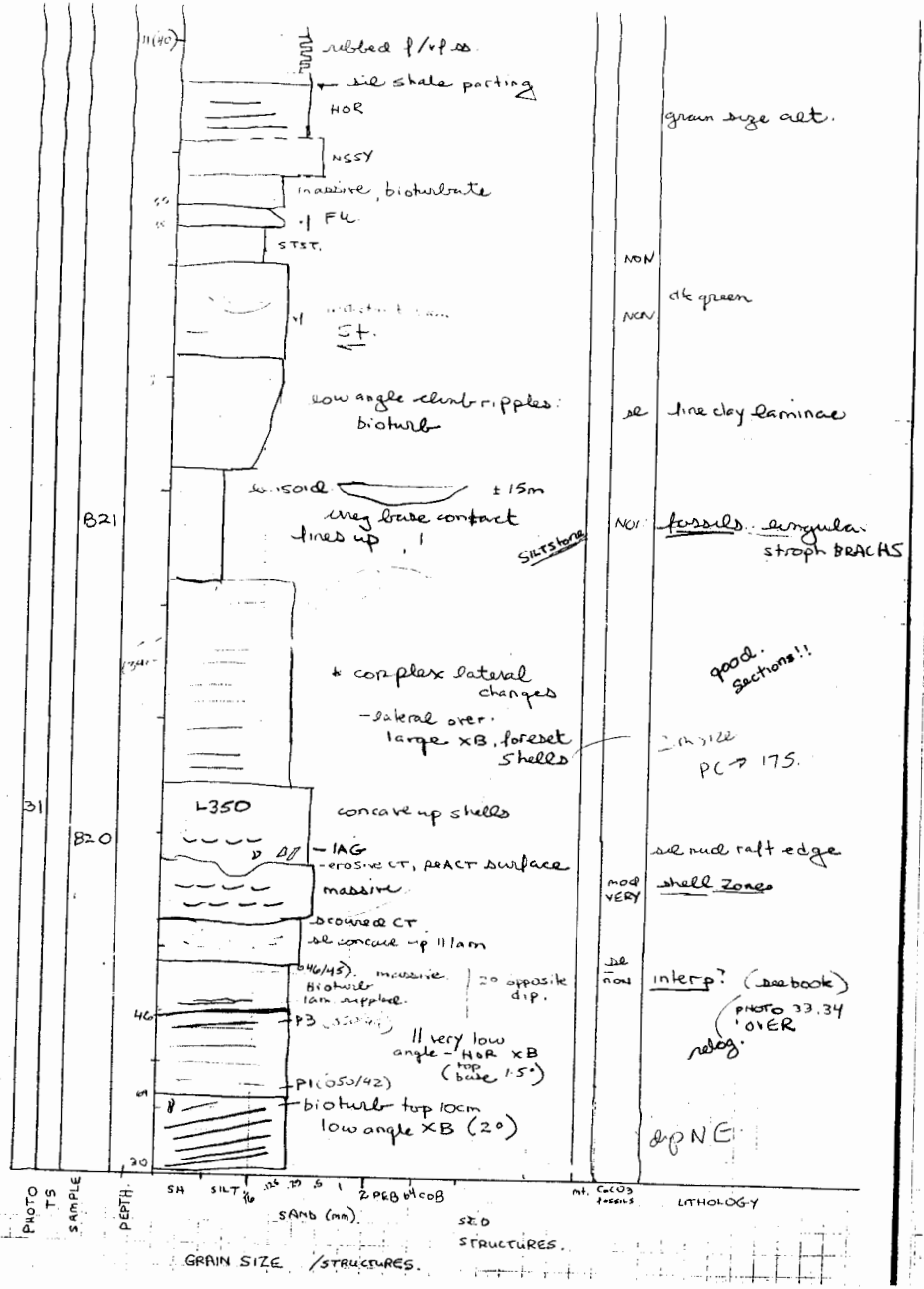
SECTION B3 LOCATION: Locate top of Garth tuff along ridge immediately to south of Nantygwryd and east of farm track to Cwm-Clorad Isaf. Section proceeds to NW along SW side of crags.

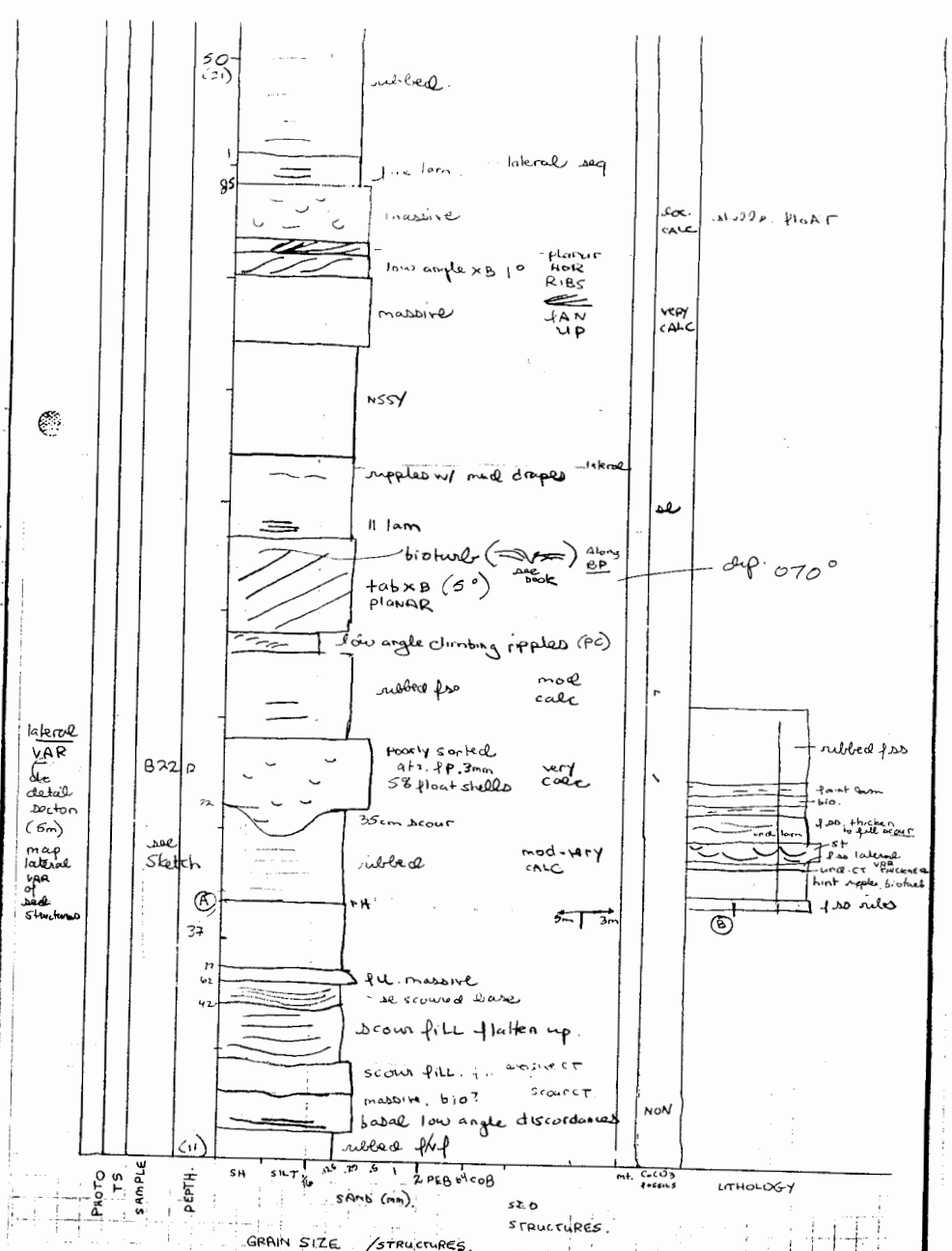


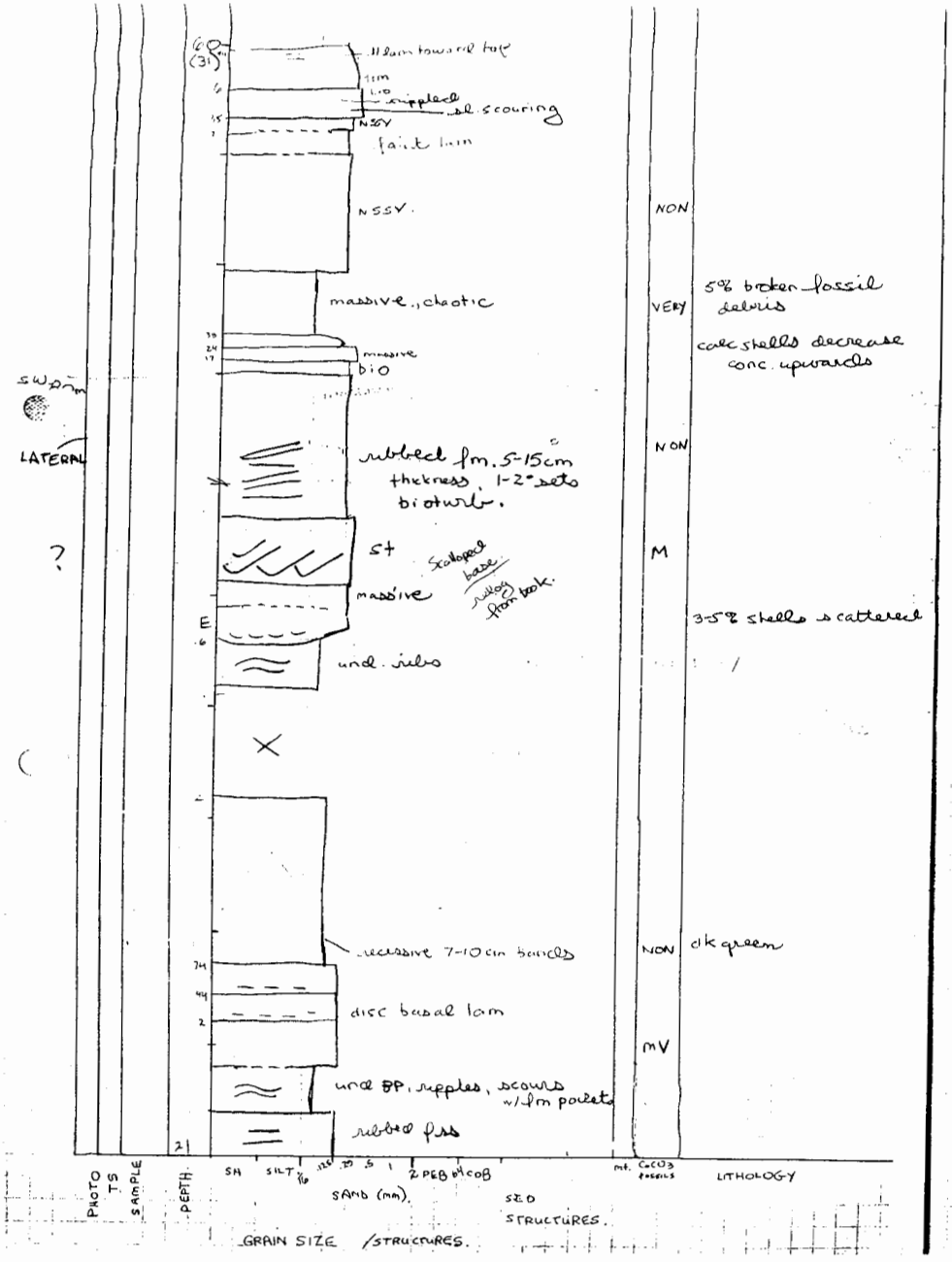

20
12
11
B28
grass. = STST.
25m HOR =
17m real
∴ 12 → 29m = STST
top EARTH.
black STST.
ribbing
pale green tuff ss.
dk tuff ss. cl
sl tuff (copaw B24-32)
tuff.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
mt.
CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

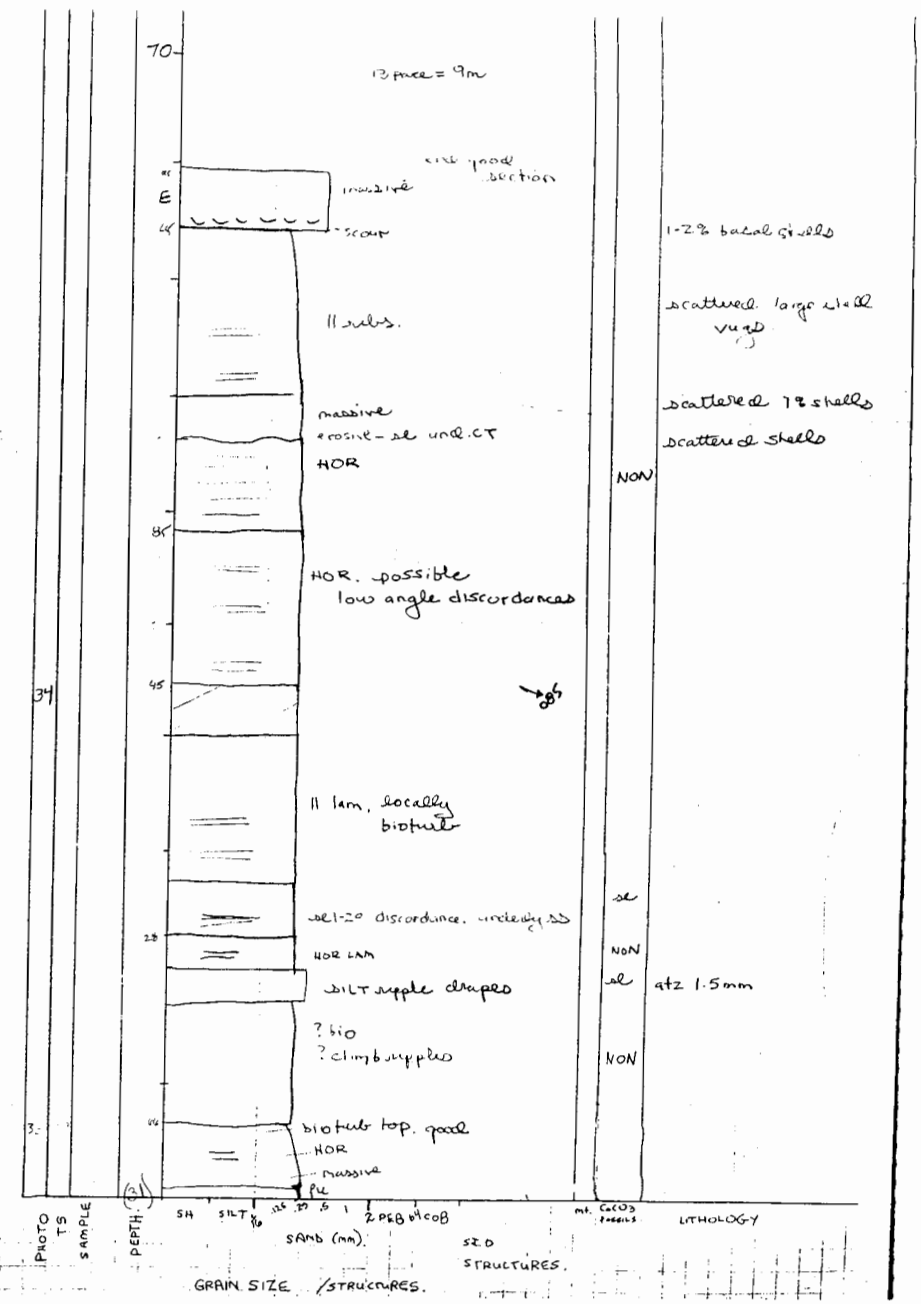

30
29
11 1 am.
scour
Book O June 6
(+29)
unexposed
STST. ?
sl fossils dark green massive
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
mt.
CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

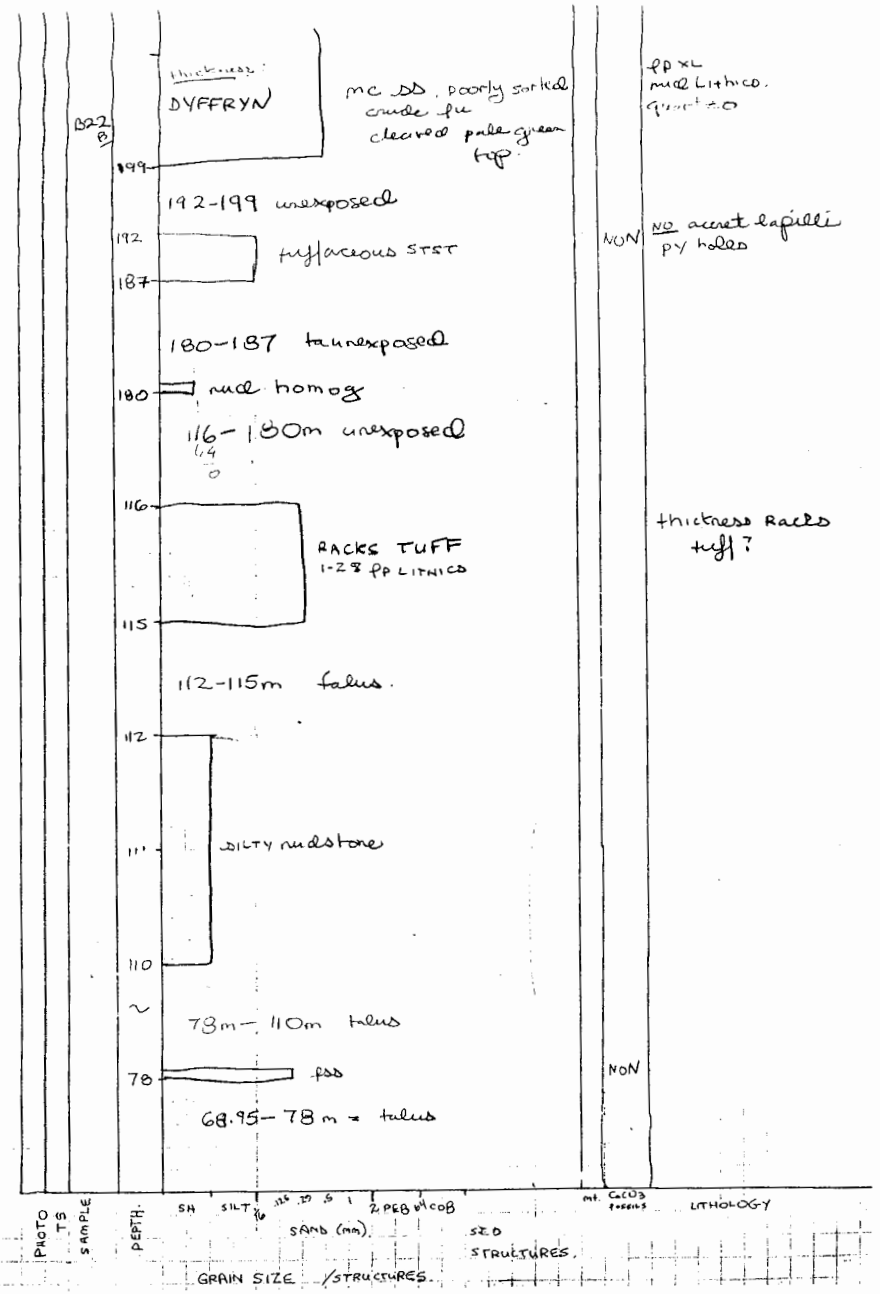
B3

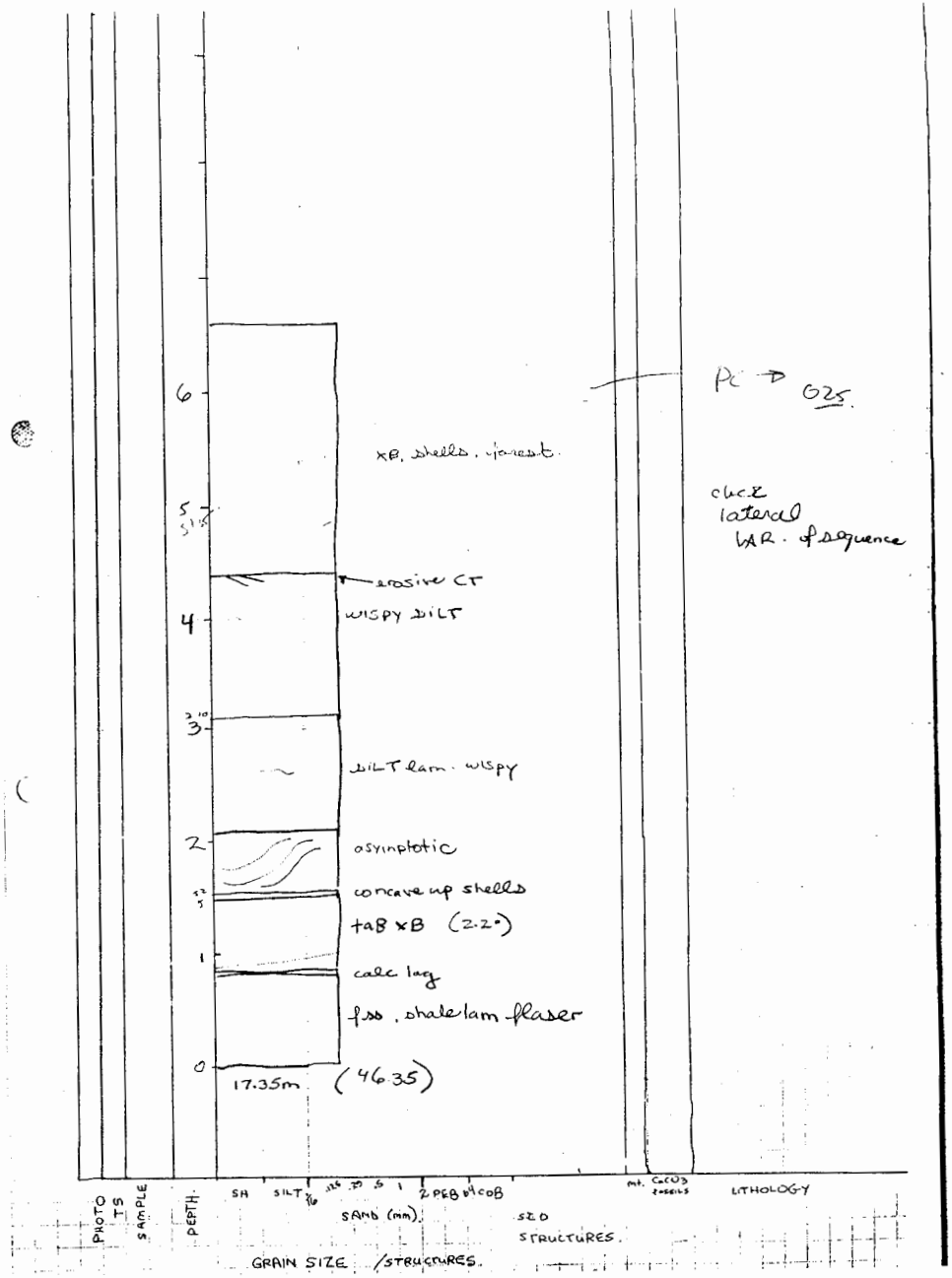

rubbled f/vf ss
sil shale parting
HOR
NSSY
massive, bioturbated
FU
STST.
ripple lam
St.
low angle climb ripples: bioturb
lenticle ± 15m
very loose contact fines up
SILTSTONE
B21
* complex lateral changes
-lateral over. large xB, foreset shells
L350
concave up shells
B20
-IAG
-erosive CT, REACT surface
massive
-scoured CT
sl concave up 11 lam
046/45). massive. Bioturb lam rippled.
20 opposite dip.
P3
11 very low angle - HOR xB (top base 15°)
P1 (050/42)
bioturb top 10cm
low angle XB (20)
grain size alt.
dk green
fine clay laminae
fossils: angular strophs BRACHS
good sections!!
shells
PC → 175.
sl mud raft edge
shell zones
interp? (see book)
PHOTO 33.34 OVER
relog.
dpNE
PHOTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
GRAIN SIZE /STRUCTURES.
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY


rubbled.
fine lam
lateral seq
massive
low angle xB 10°
planar HOR RIBS
FAN UP
massive
NSSY
rippled w/ mud drapes
lateral
11 lam
bioturb
Along BP
see book
tab xB (5°) PLANAR
dip 070°
low angle climbing ripples (PC)
rubbled fss
mod calc
lateral VAR
poorly sorted
very calc
B22
35cm scour
rubbled
mod-very CALC
Sketch
massive
scoured base
scour fill flatten up
scour fill
massive, bio?
basal low angle discordance
rubbled f/vf
NON
PHOTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
GRAIN SIZE /STRUCTURES.
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY


(31)
11 lam toward top
9cm
Lin
crippled
sl. scouring
NSSV
faint lam
NSSV.
massive, chaotic
massive
bio
LATERAL
rubbed fm. 5-15cm thickness, 1-2° sets bioturb.
?
St
scalloped base
massive
rubs from below
E
und. rubs
recessive 7-10 cm bedding
disc basal lam
und SP, ripples, scours w/fm pockets
rubbed fss
NON
VERY
NON
M
NON
MV
5% broken fossil debris
calc shells decrease conc. upwards
3-5% shells scattered
dk green
SW
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
CoBB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

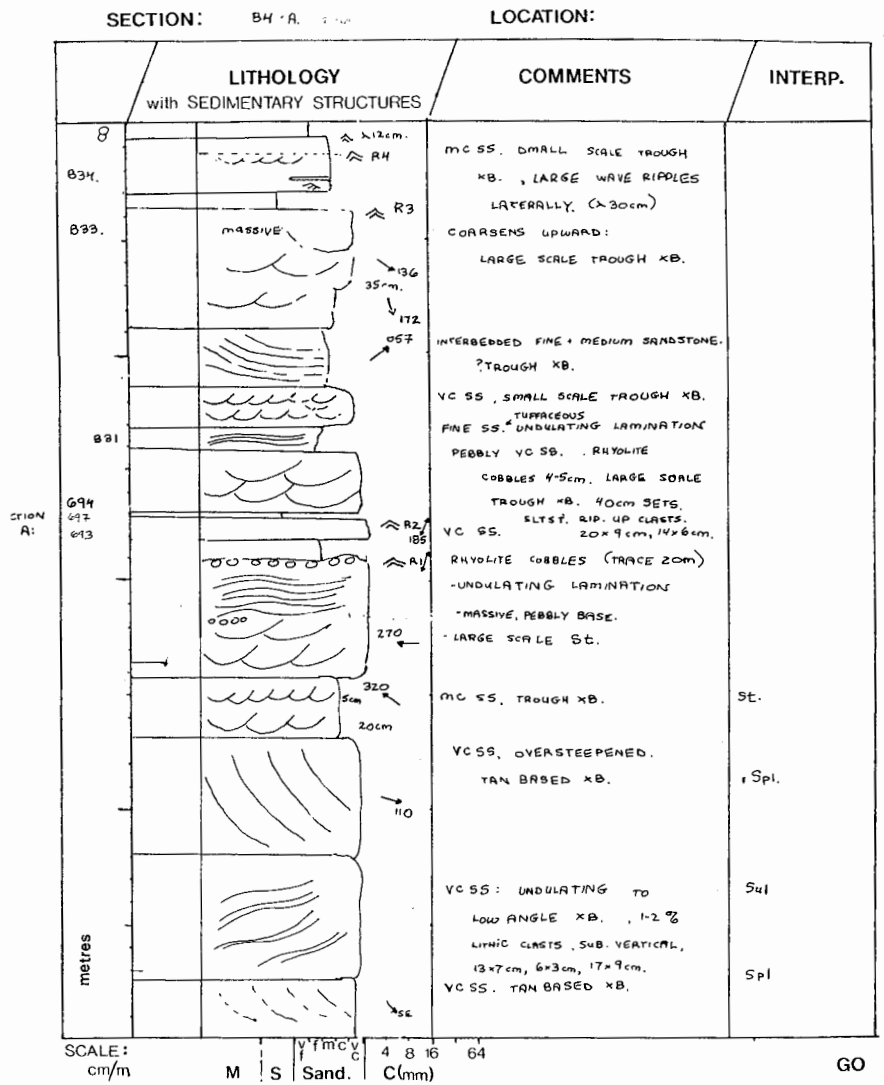

70
13 pieces = 9m
E
scour
11 subs.
massive
erosive - sl und. CT
HOR
HOR. possible low angle discordances
45
34
11 lam, locally bioturb
sl 1-2° discordance, unclear if SS
28
HOR LAM
SILT ripple draped
? bio
? climb ripples
bioturb top, good
HOR
massive
PL
(31)
1-2% basal gravels
scattered large shell vugs
scattered 1% shells
scattered shells
NON
sl
NON
sl
qtz 1.5mm
NON
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
CoBB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


Thickness?
DYFFRYN
mc ss. poorly sorted
crude lam
cleaved pale green
tuff.
pp xl
mud Lithics.
Quartz ±0
B22
199
192-199 unexposed
192
tuffaceous SLST
187
NON
NO accret lapilli
py holes
180-187 tan unexposed
180
mud homog
116-180m unexposed
116
RACKS TUFF
1-2% pp LITHICS
thickness RACKS
tuff?
115
112-115m talus.
112
SILTY mudstone
111
110
78m-110m talus
78
fss
NON
68.95-78m = talus
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

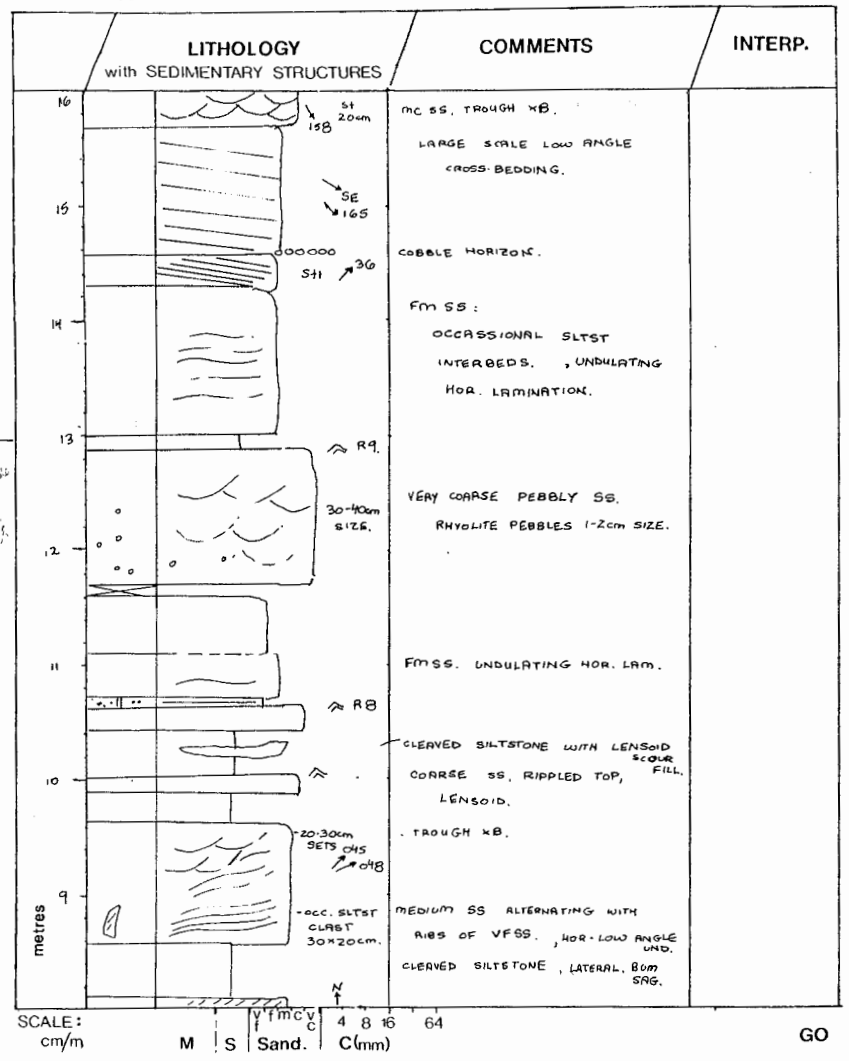

Pc → 025.
6
xB, shells, ripples.
check lateral VAR. of sequence
5
4
erosive CT
WISPY SILT
3
SILT lam. WISPY
2
asymptotic
concave up shells
taB xB (2.2°)
1
calc lag
fss, shale lam flaser
0
17.35m (46.35)
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

SECTION B4

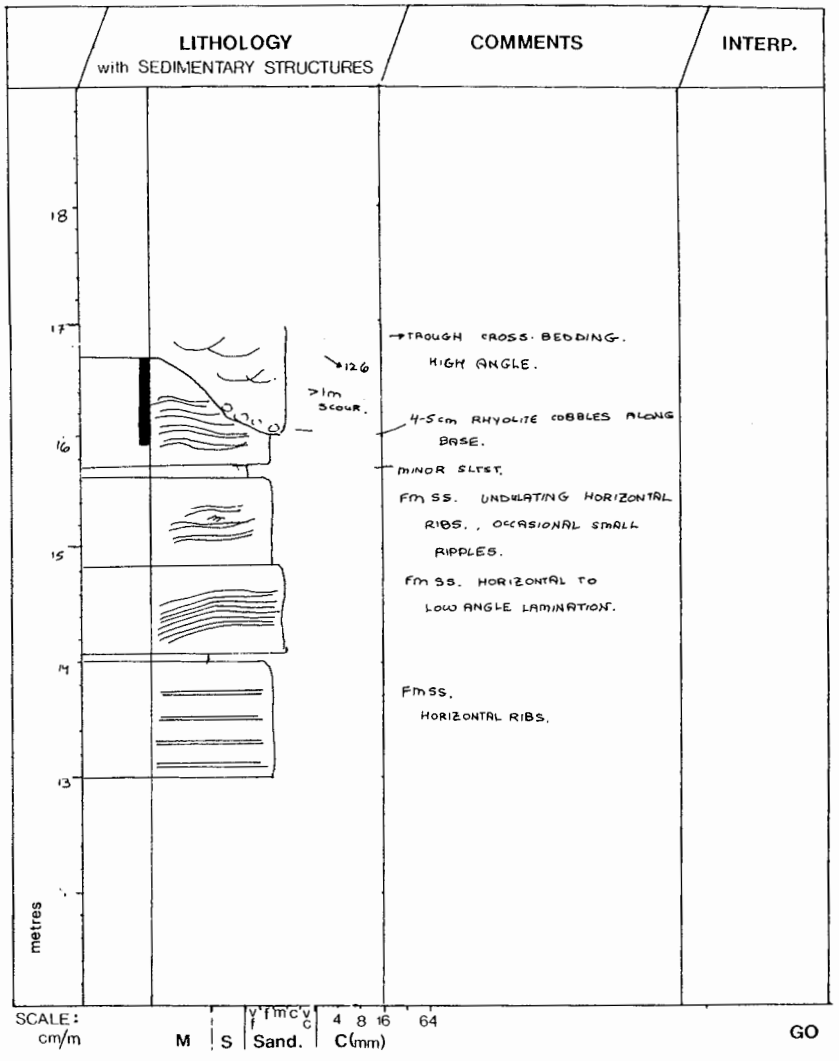
SECTION B4 LOCATION: Locate prominant bedding plane with wave ripples 50 m to south of small tributary stream of Nantygwryd and/or wire fence. Section starts in blocky crags 20 stratigraphic metres beneath (to east) rippled bedding plane. and proceeds to SW, crossing tributary at 30 m until lowest load ball of Garth tuff. Entire section not included in Appendix.



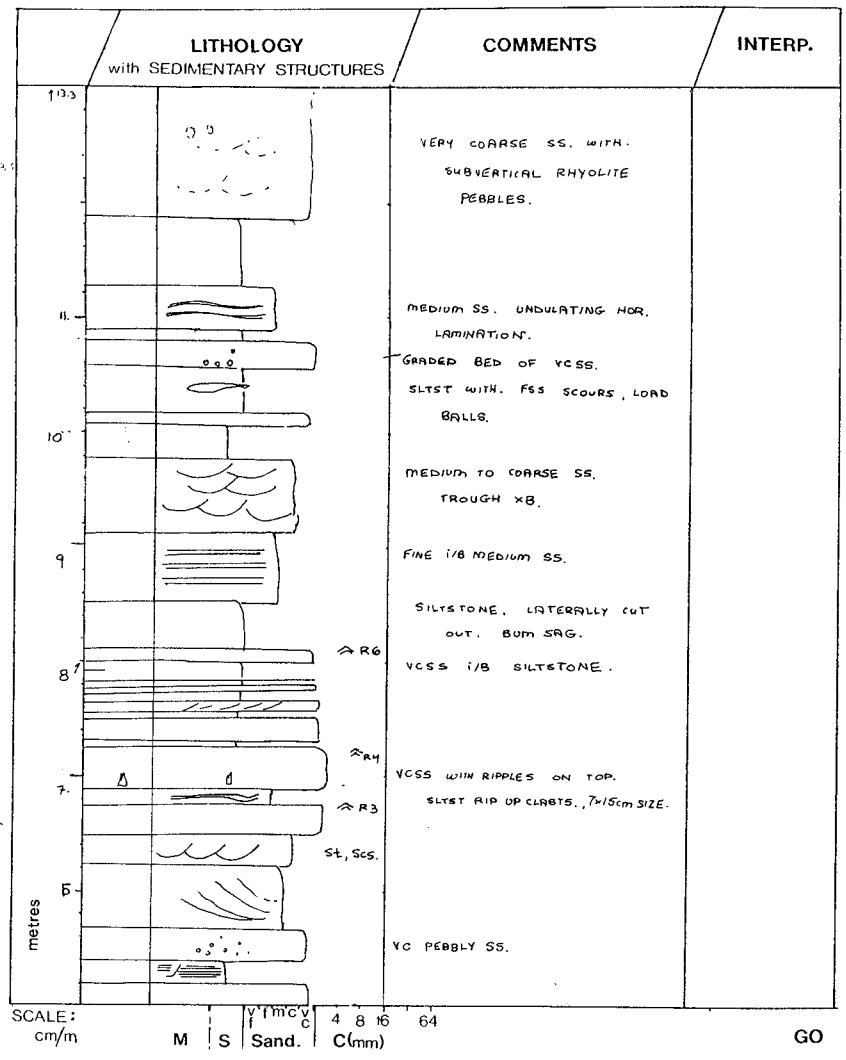
SECTION: B4-C STRAIGHT. LOCATION:



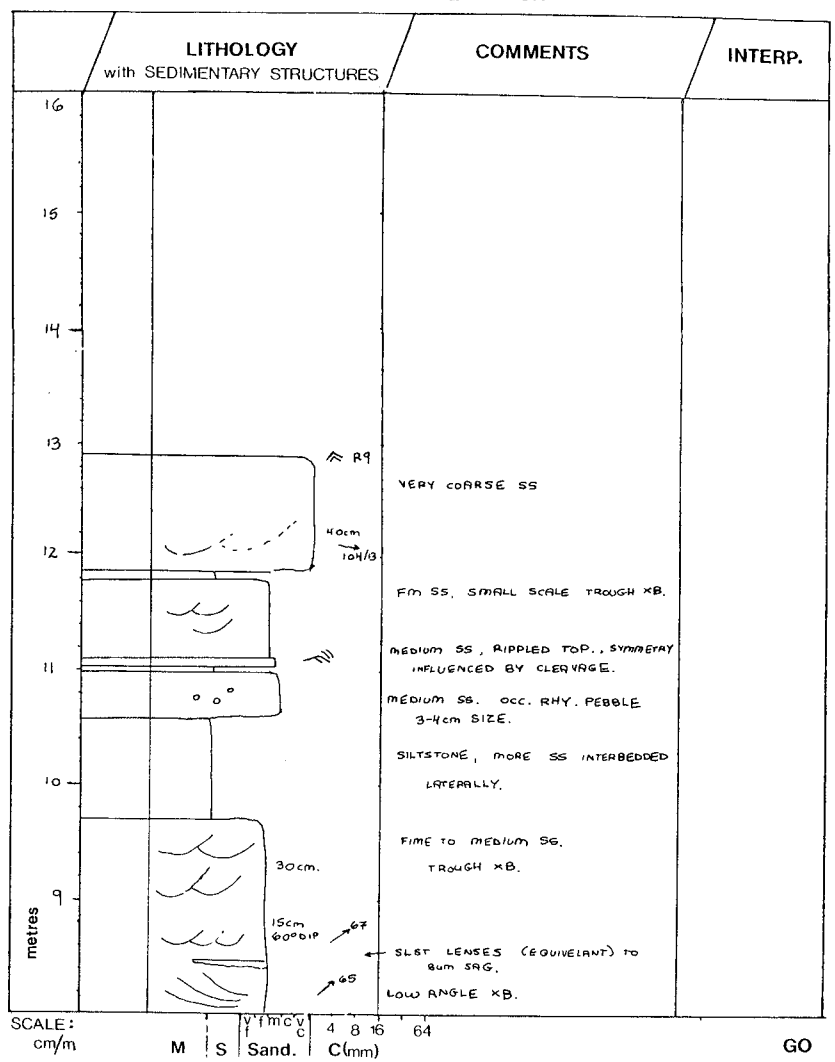
SECTION: B4-D. LOCATION: CWM CLORAD ISAF.



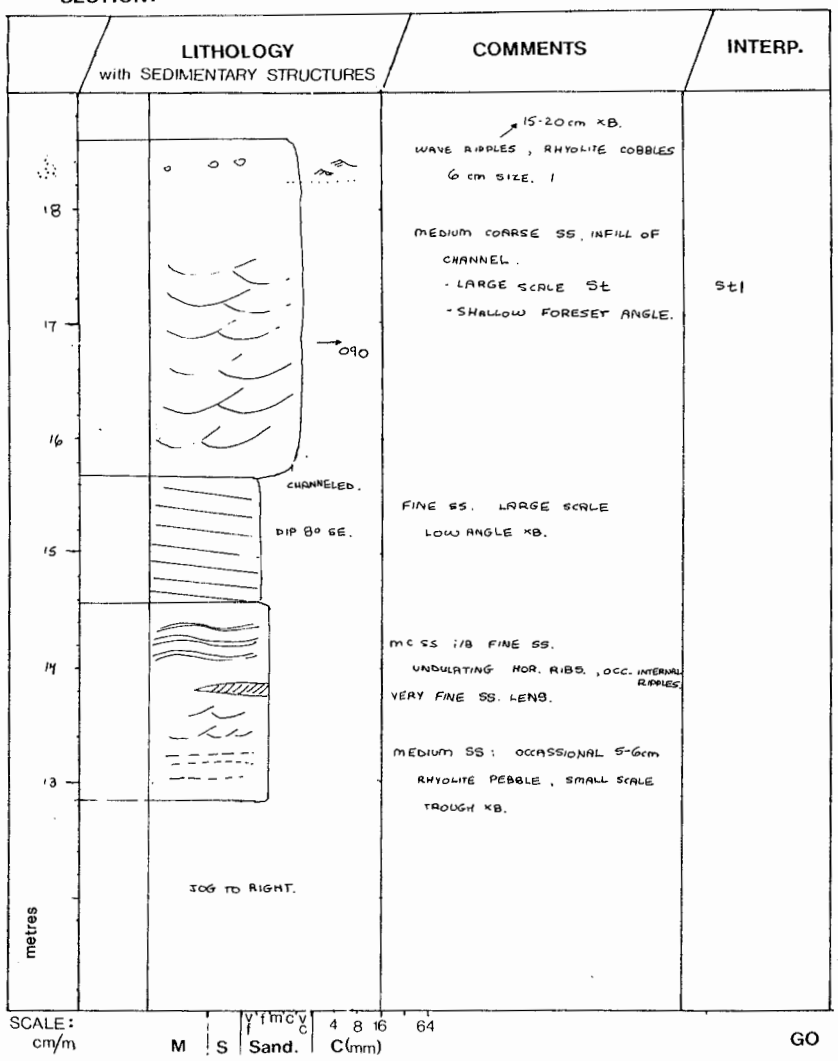
SECTION: BH · E · Left. LOCATION:



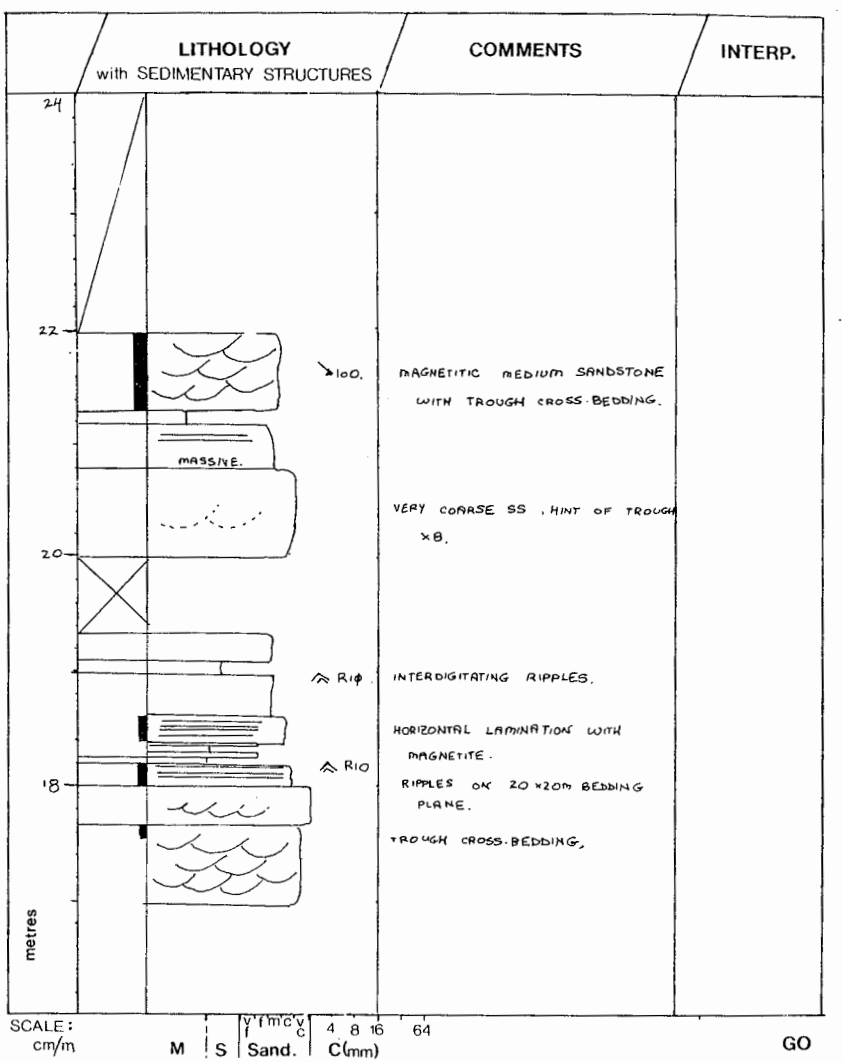
SECTION: BH. - A LOCATION:



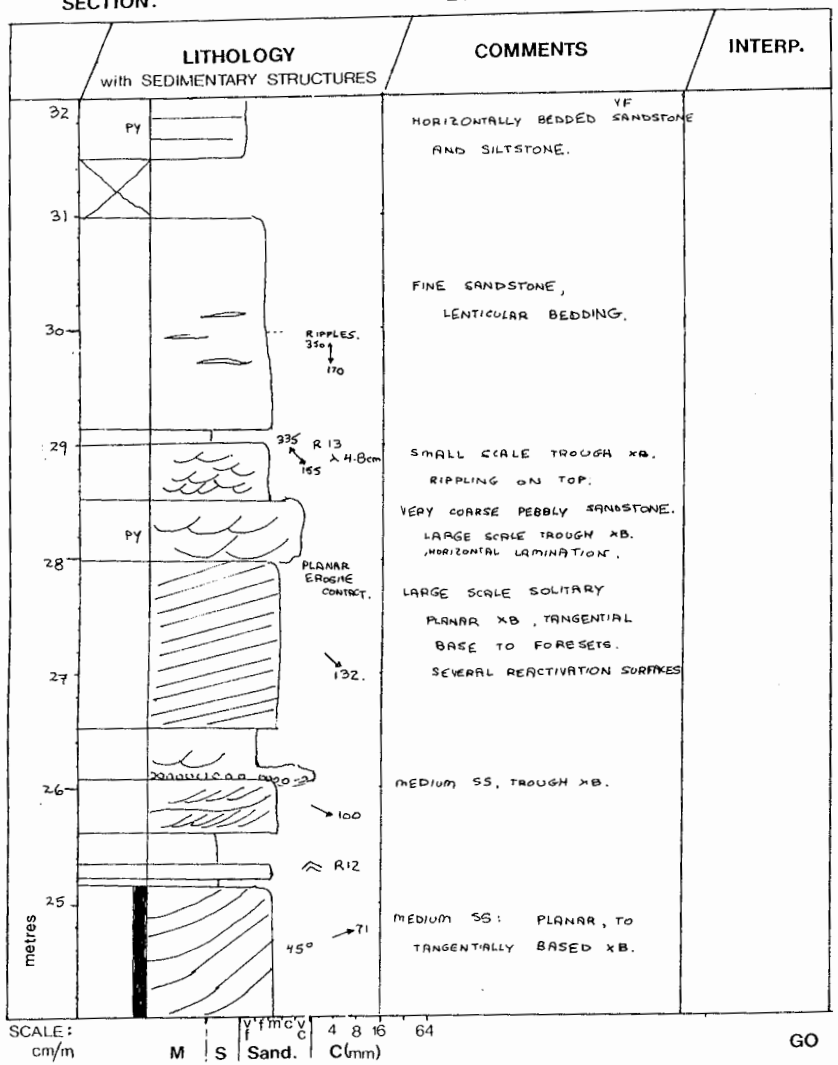
SECTION: 84. mini B. LOCATION:



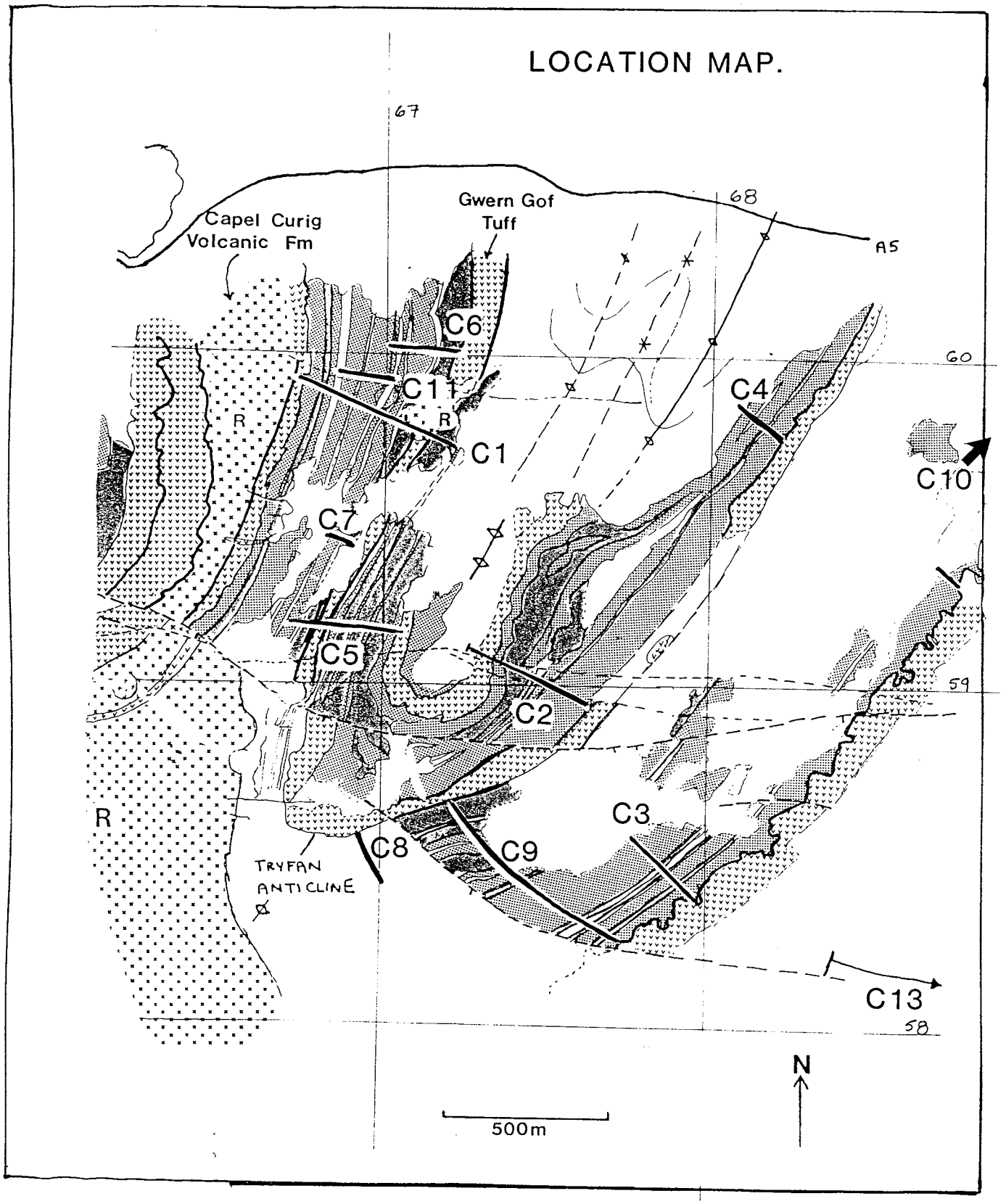
SECTION: 84. F LOCATION:



SECTION: B4 - F LOCATION: CWM CLORAD ISAF.

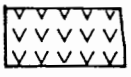


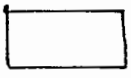
AREA C


LOCATION MAP.
67
68
60
59
58
A5
Capel Curig
Volcanic Fm
Gwern Gof
Tuff
C6
C11
C1
C4
C10
C7
C5
C2
C3
C8
C9
C13
R
TRYFAN
ANTICLINE
N
500m

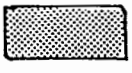
Map Legend

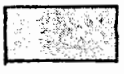
ASH FLOW TUFF


LLYN DINAS BRECCIA.

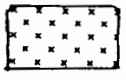

"AIRFALL" DUST TUFFITE

BASALT, HYALOCLASTITE


SANDSTONE


SILTSTONE, SHALE (CLEAVED)

INTRUSIVES



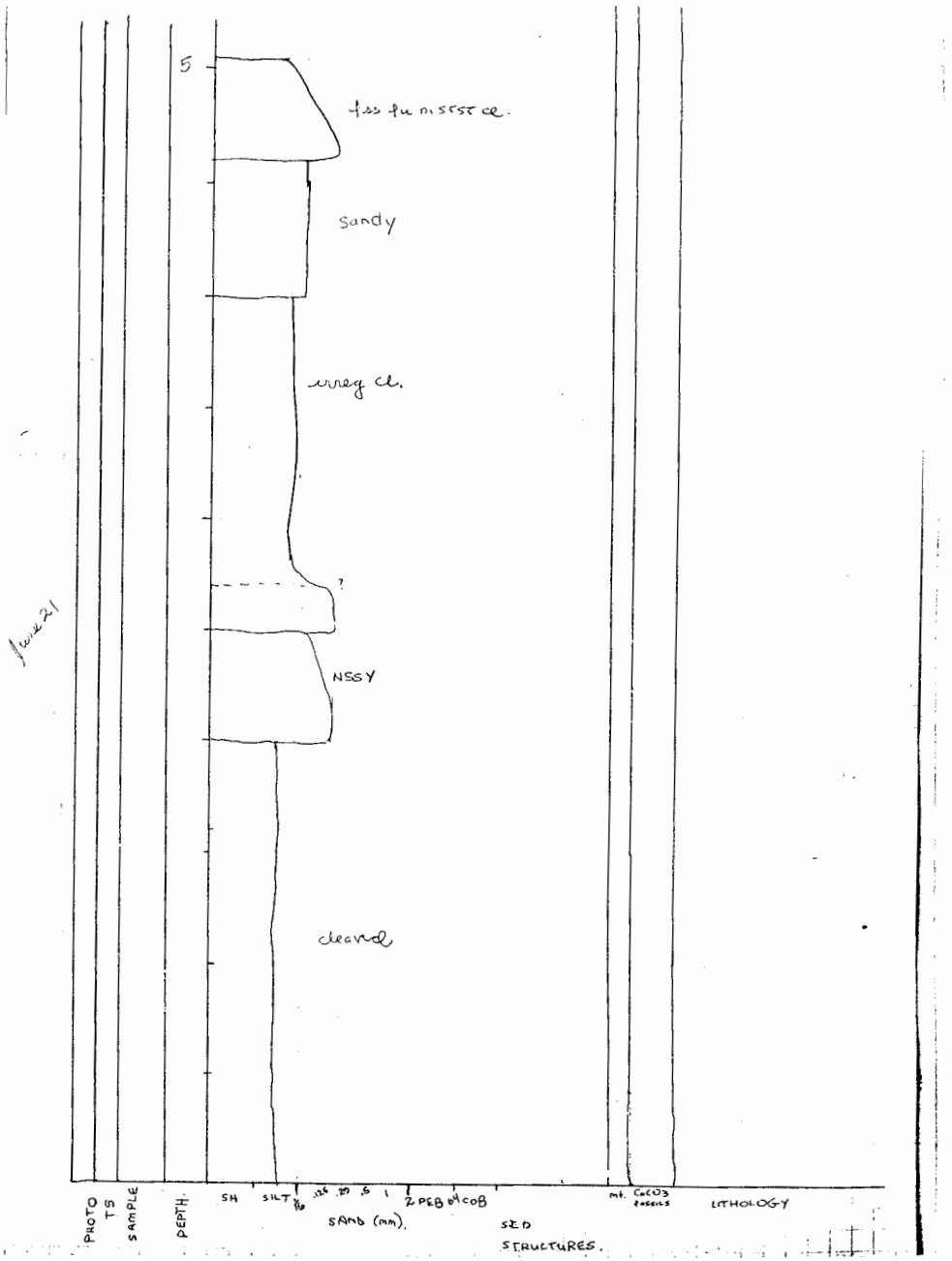
R RHYOLITE

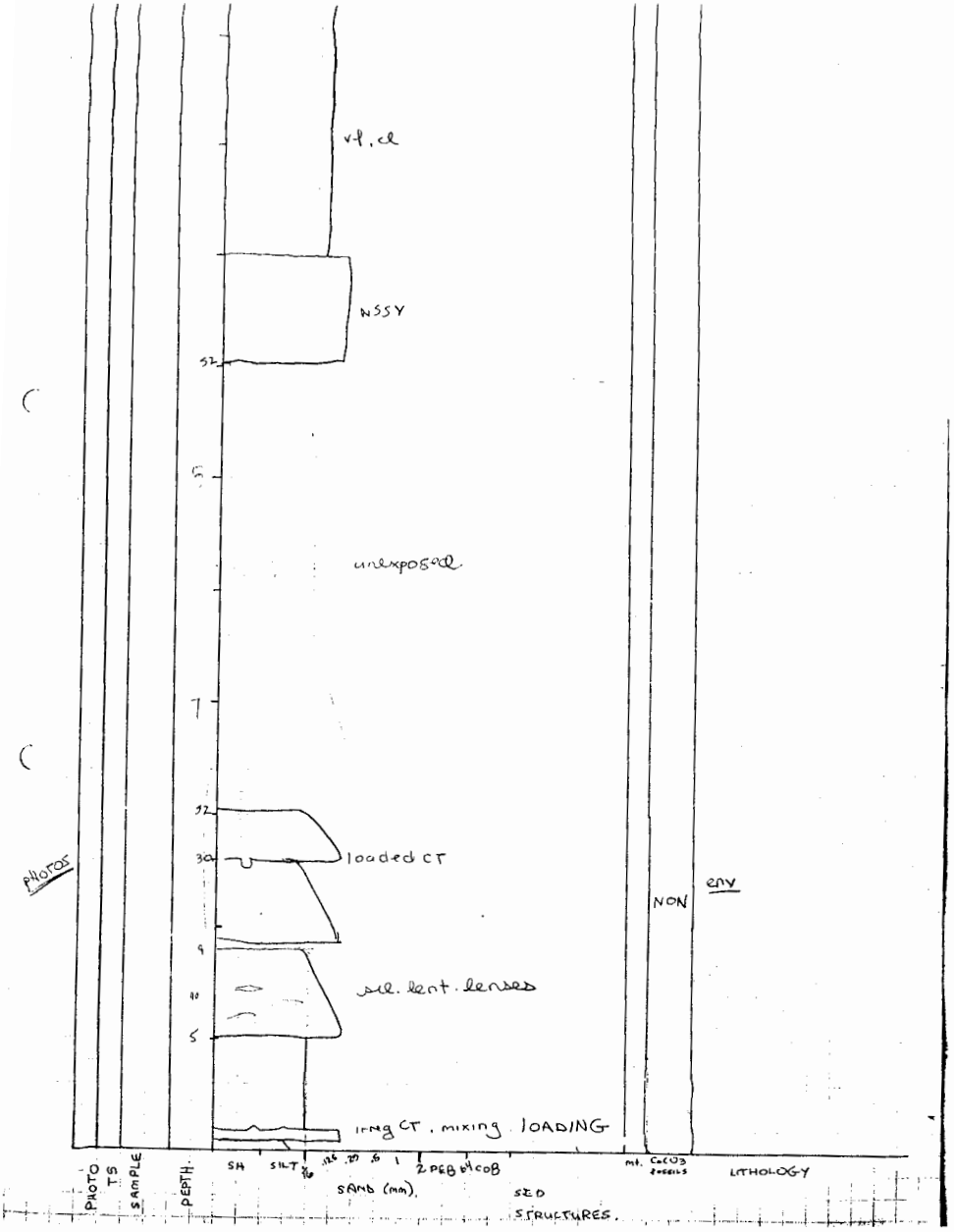
G GRANOPHYRE

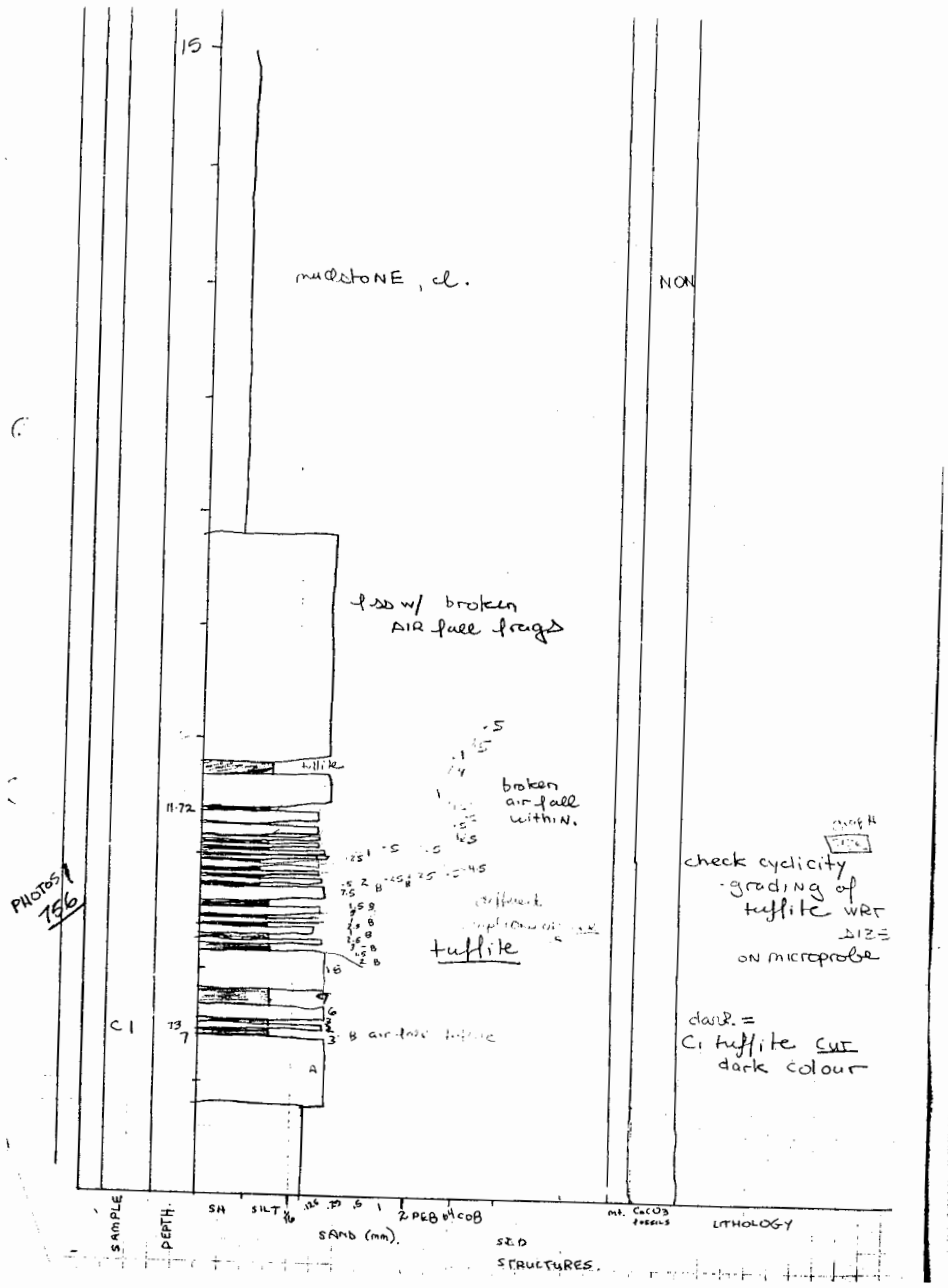
D DOLERITE.

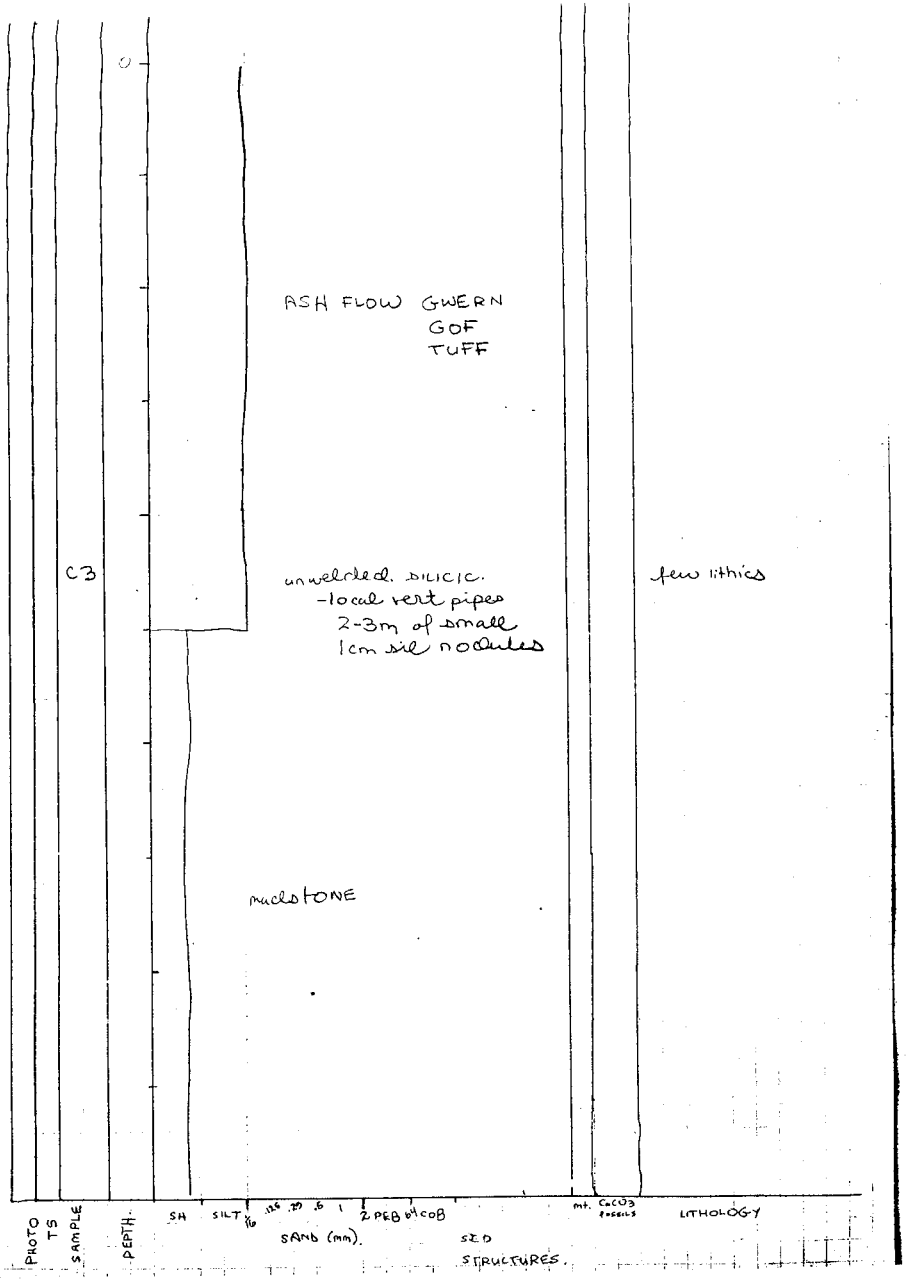
SECTION C1

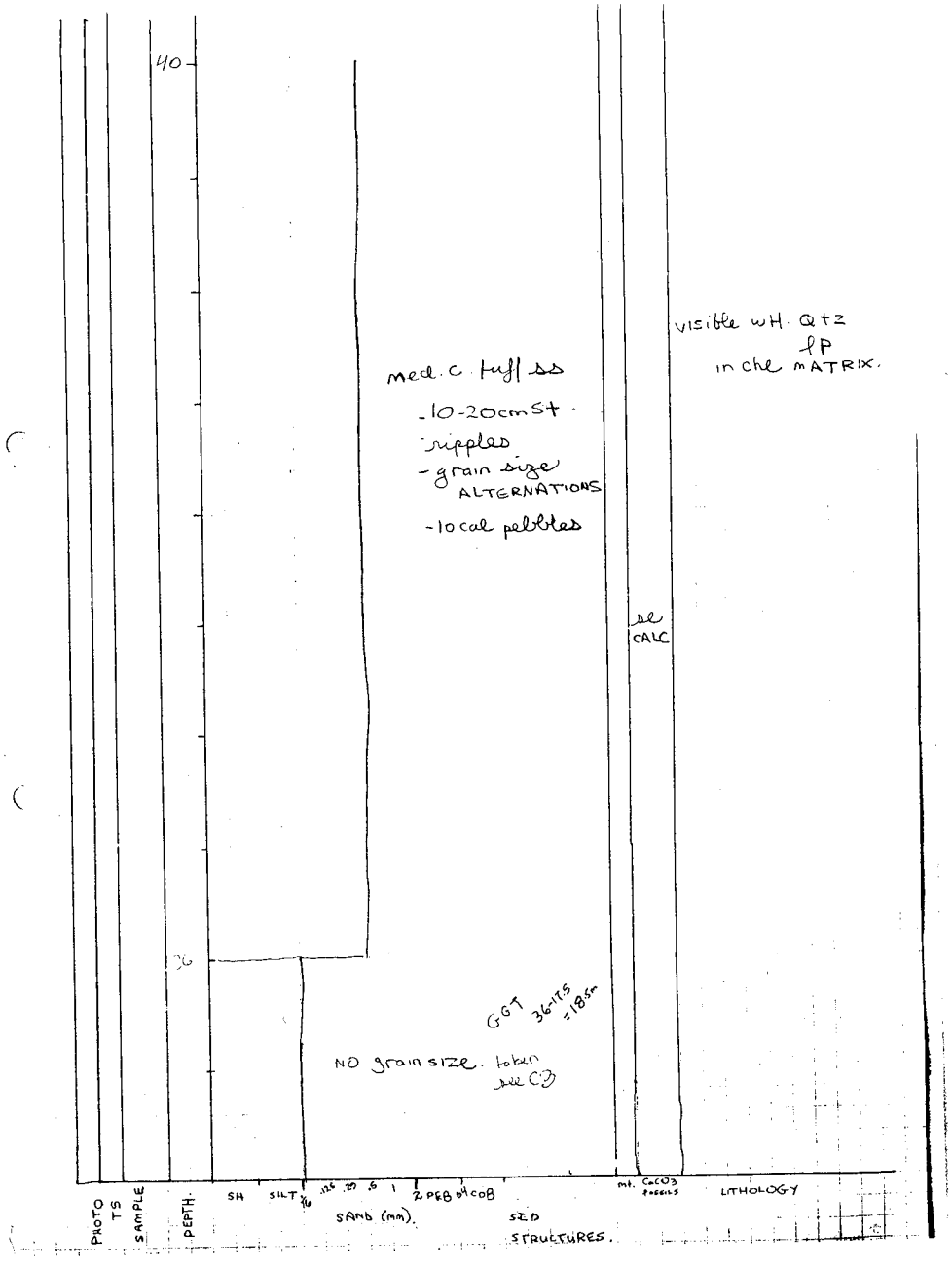
SECTION C1 LOCATION: Locate east-west trending wire-fence immediately to south of Tryfan Fach near Gwern Gof Uchaf. Section starts at Nant Gwern-y-Gof stream 200 m to SSW of wire fence and proceeds to WNW until Garth tuff.

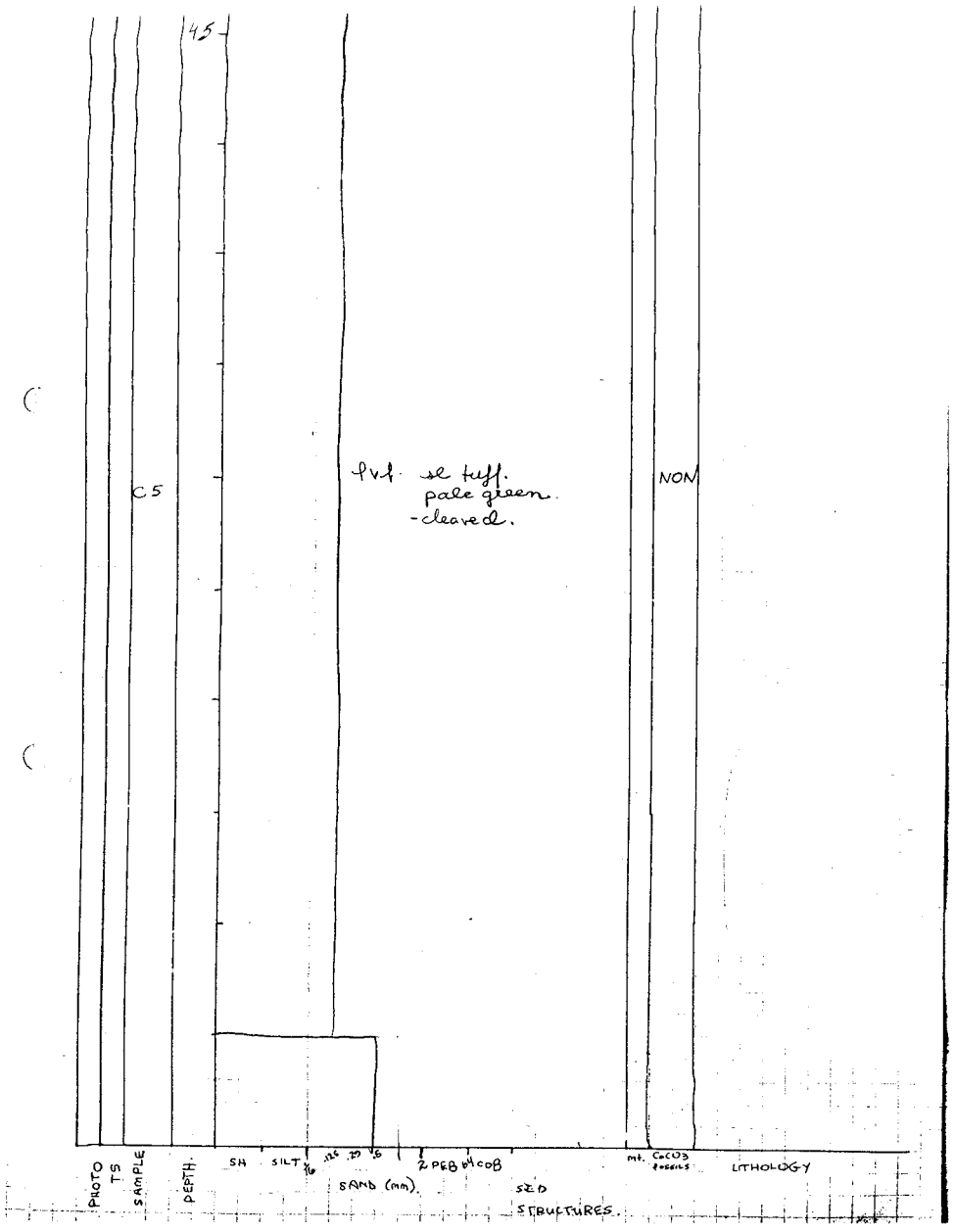


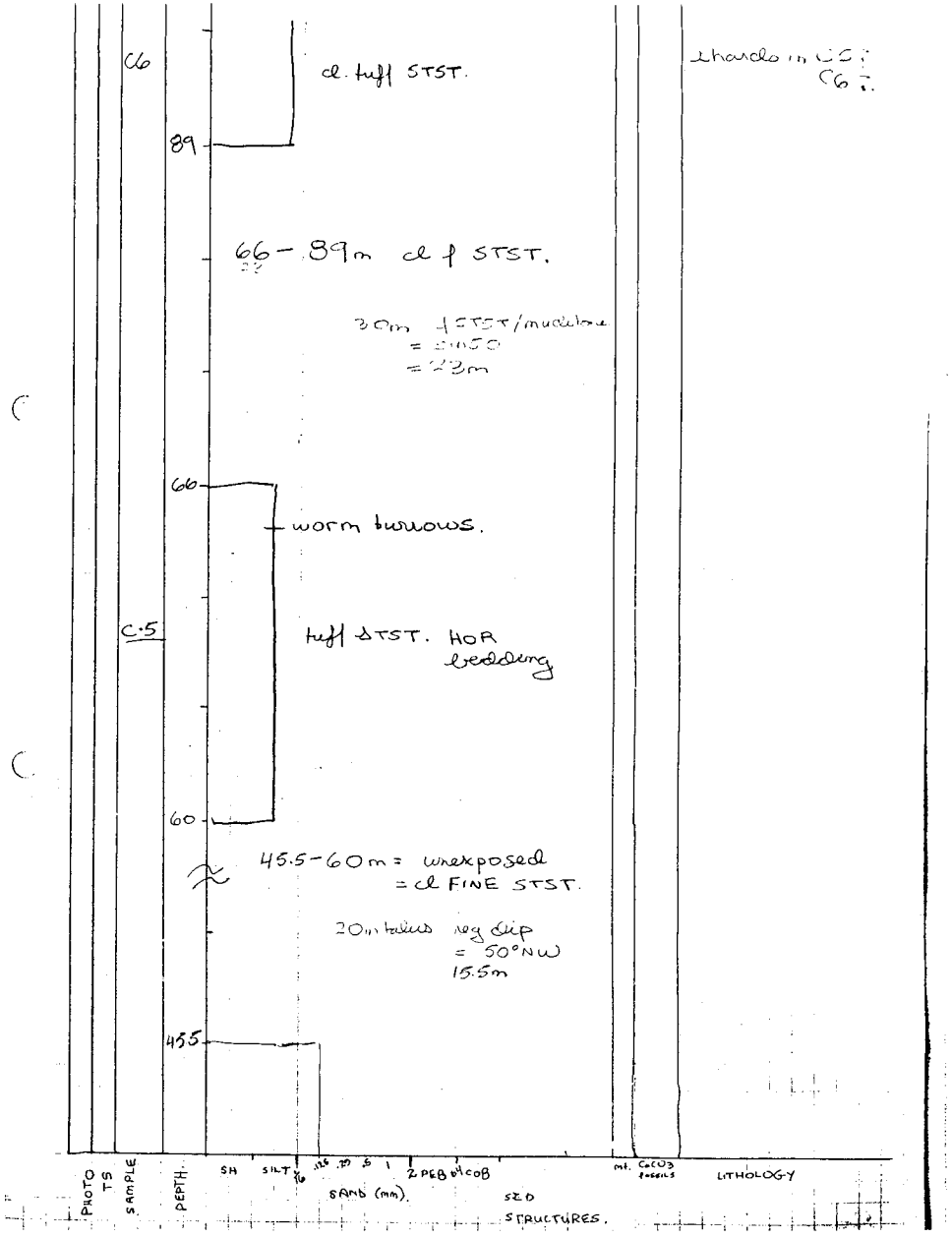

v.f. cl
NSSY
52
5
unexposed
7
32
30
loaded CT
9
10
5
sil. lent. lenses
NON
env
PHOTOS
ring CT, mixing LOADING
PHOTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.

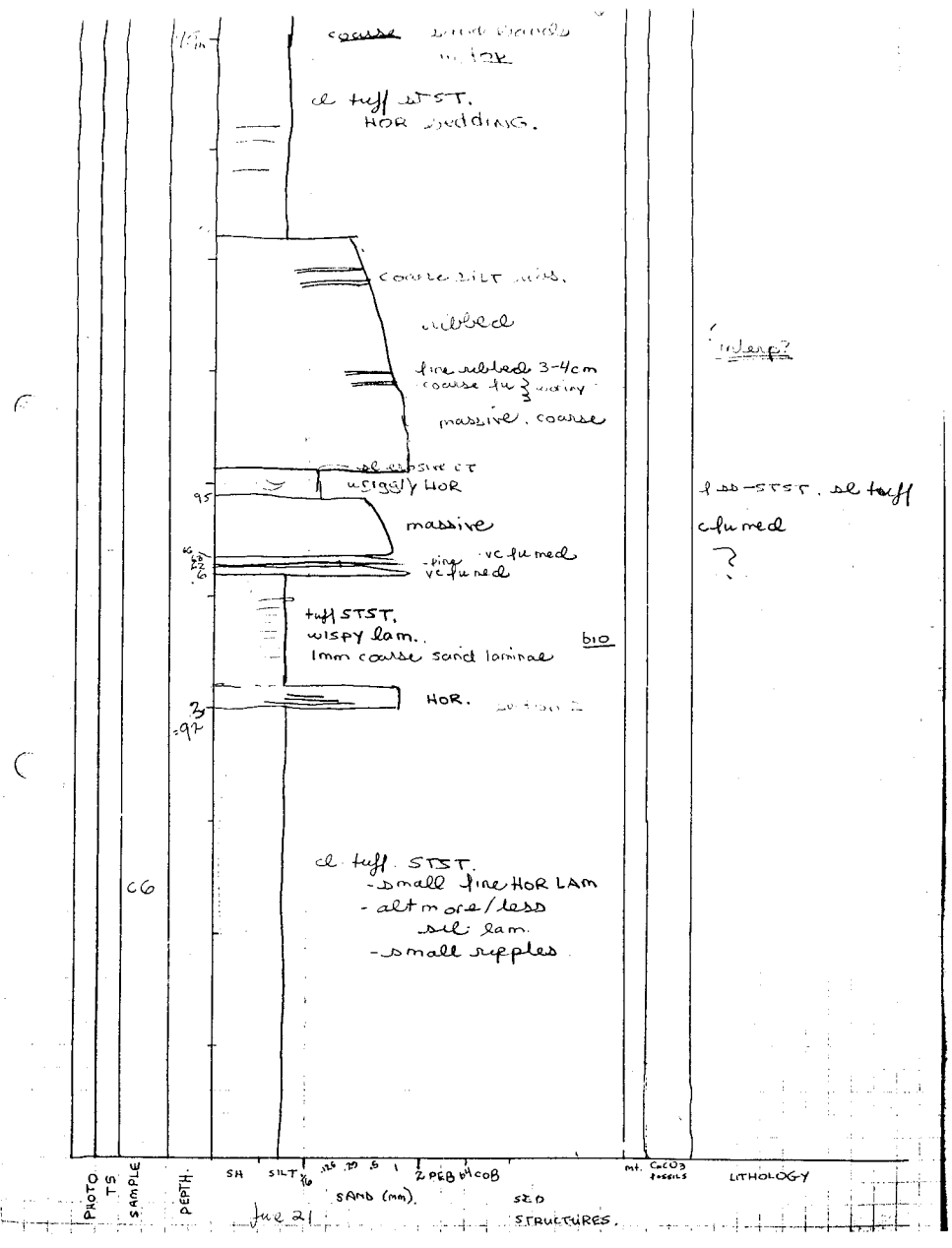

15
mudstone, cl.
NON
f-ss w/ broken AIR fall frags
tuffite
11.72
broken air-fall within N.
tuffite
check cyclicity
grading of tuffite WRT
SIZE
ON microprobe
dark. =
C1 tuffite
dark colour
PHOTOS 156
C1
7.3
B air-fall tuffite
A
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.

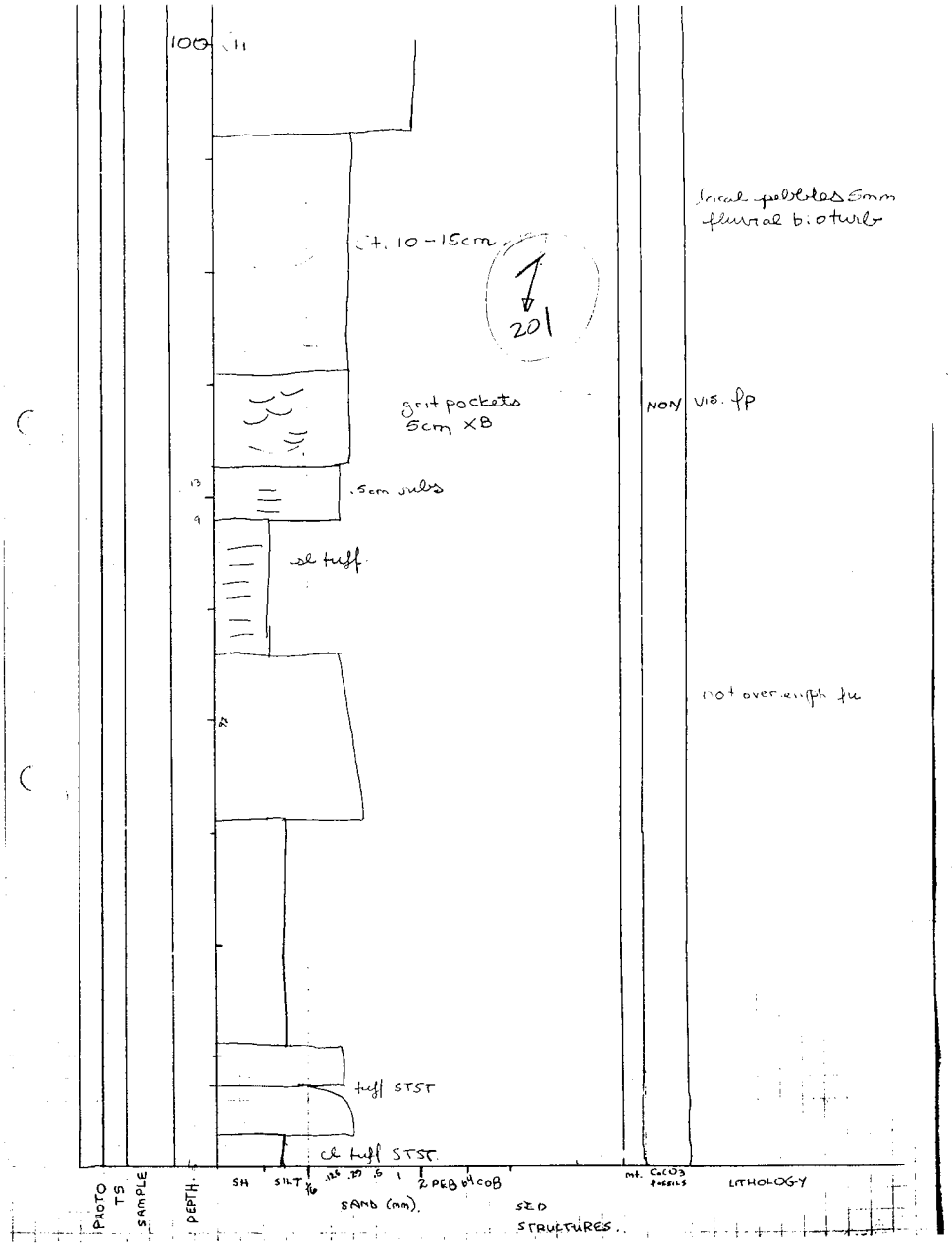

0
ASH FLOW GWERN
GOF
TUFF
C3
unwelded. SILICIC.
-local vert pipes
2-3m of small
1cm sil nodules
few lithics
mudstone
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

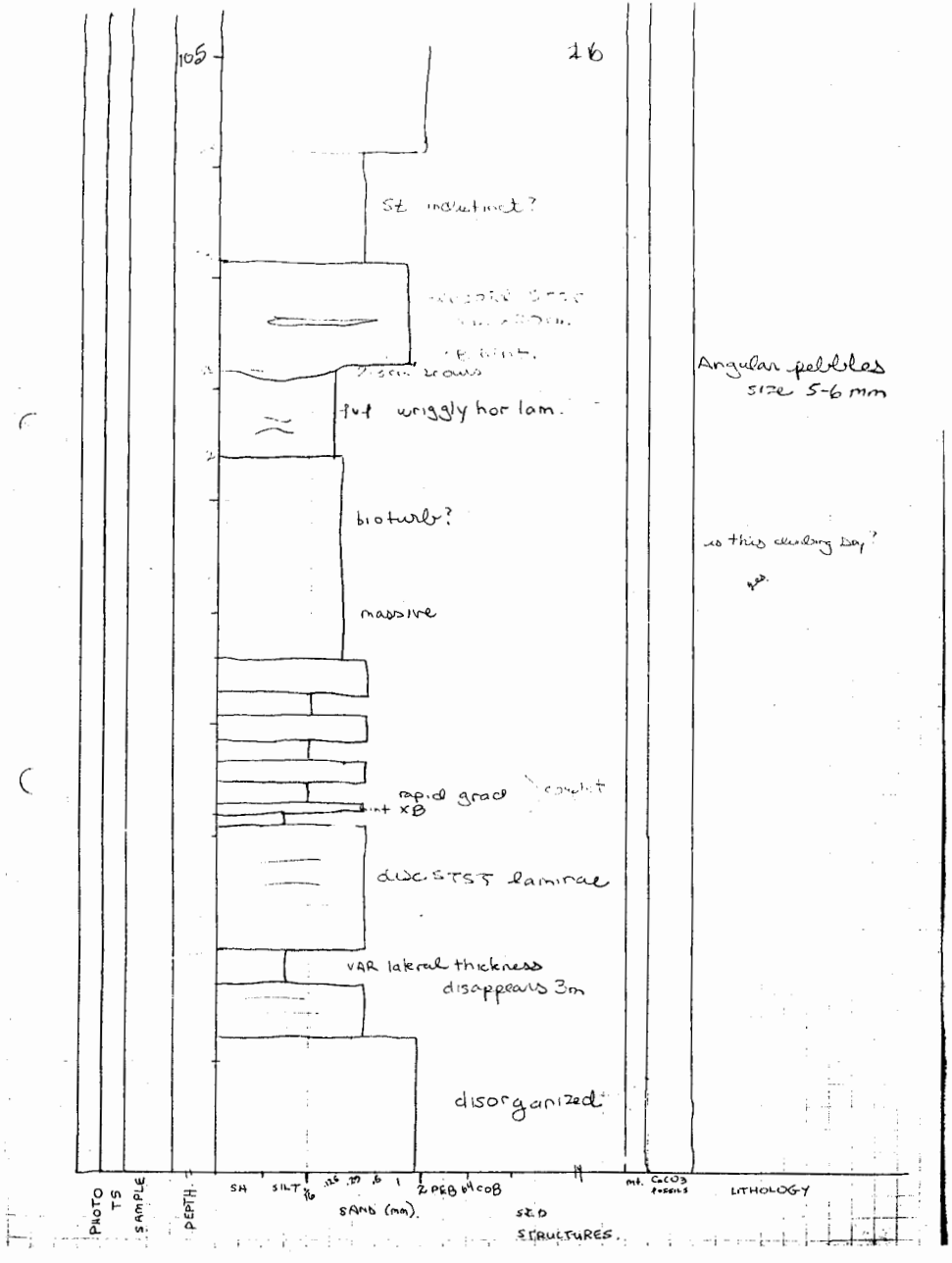

40
36
med.c tuff ss
-10-20cm St.
ripples
-grain size
ALTERNATIONS
-local pebbles
visible wH. Qtz
fP
in the MATRIX.
sl
CALC
GGT 36-17.5 = 18.5m
NO grain size. taken
see C3
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

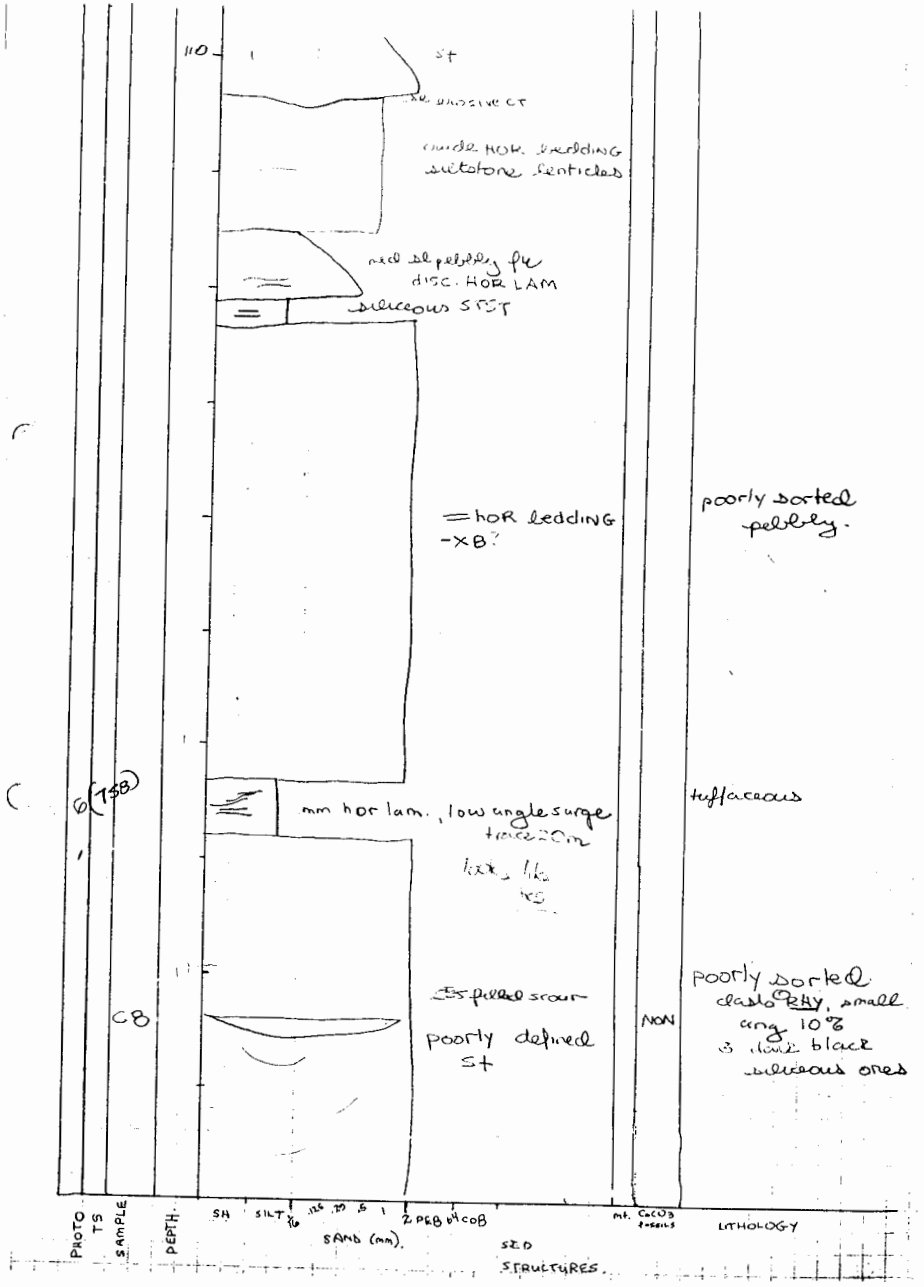

45
C5
fvf. sl tuff.
pale green.
-cleaved.
NON
PHOTO
T S
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY


C6
cl. tuff STST.
89
66 - 89m cl f STST.
30m + STST/mudstone
= 2m50
= 22m
66
worm burrows.
C5
tuff STST. HOR
bedding
60
45.5 - 60m = unexposed
= cl FINE STST.
20m talus veg clip
= 50°NW
15.5m
45.5
PHOTO
T S
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY


coarse
cl tuff wTST.
HOR beddings.
coarse SILT with.
ribbed
fine ribbed 3-4cm
coarse fu
massive, coarse
massive CT
wispy HOR
massive
ving vc fu med
vc fu med
tuff STST.
wispy lam.
1mm coarse sand laminae
bio
HOR.
cl tuff STST.
- small fine HOR LAM
- alt more/less
sil lam.
- small ripples
C6
fu-STST. sl tuff
c fu med
?
PHOTO
T S
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY


100
11
13
9
22
lt. 10-15cm
201
grit pockets
5cm x8
.5cm subs
sl tuff
tuff STST
cl tuff STST
local pebbles 5mm
fluvial bioturb
NON VIS. fp
not overemph fu
PHOTO
T S
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY


105
16
St indistinct?
fvf wriggly hor lam.
bioturb?
massive
rapid grad
int XB
disc. STST laminae
VAR lateral thickness
disappears 3m
disorganized
Angular pebbles
size 5-6 mm
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY


110
St
HOR LAM, bedding
siltstone lenticles
disc. HOR LAM
siliceous SLST
=HOR bedding
-XB?
mm hor lam., low angle surge
poorly defined
St
C8
tuffaceous
poorly sorted
pebbly.
poorly sorted
clasts only, small
ang. 10%
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

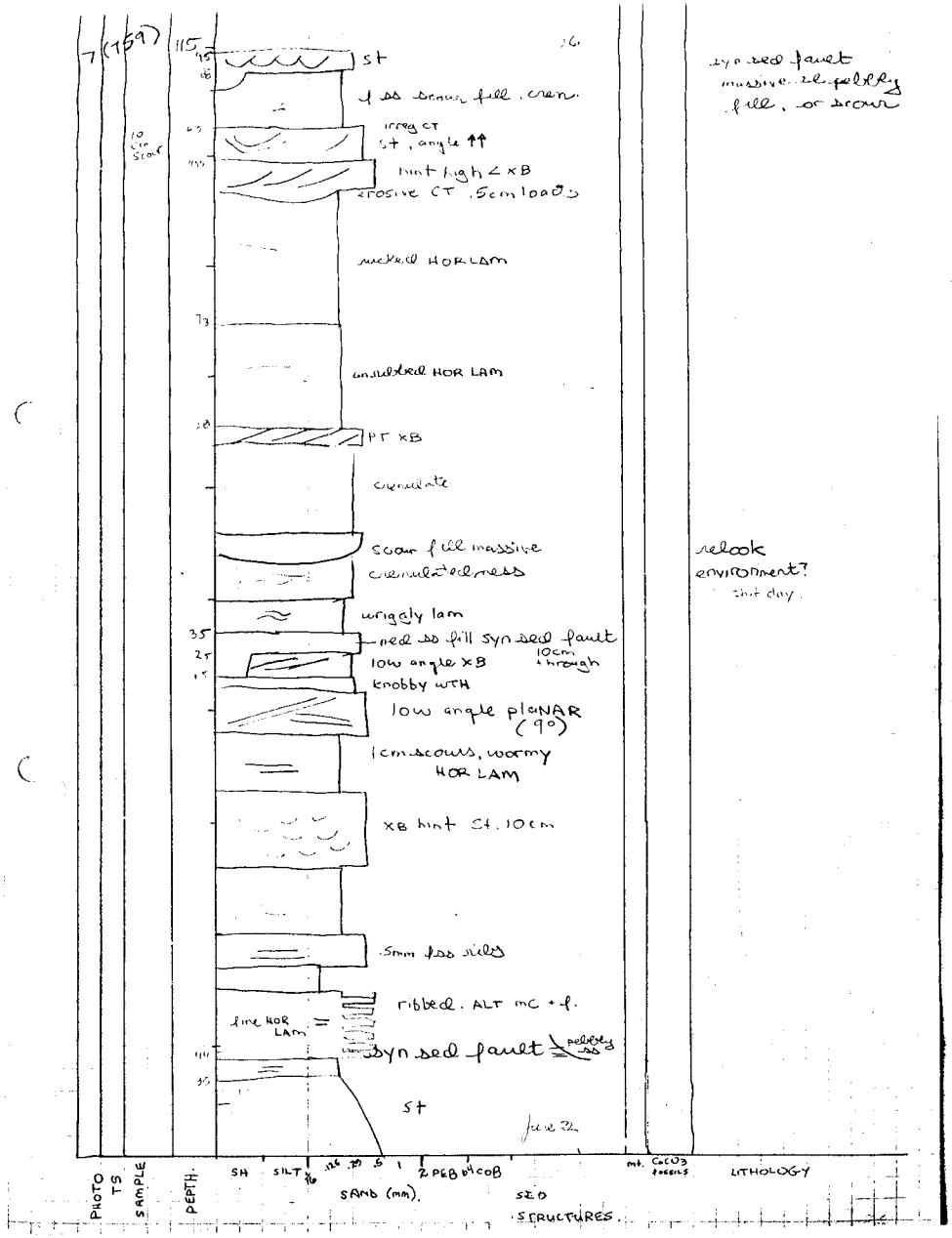


PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
SED STRUCTURES
mt. CaCO3 fossils
LITHOLOGY
St
f ss brown fill, cren.
irreg CT
St, angle ↑↑
hint high ∠ xB
erosive CT, 5cm load
marked HOR LAM
unmarked HOR LAM
PT xB
crenulate
scour fill massive
crenulated ness
wriggly lam
med ss fill syn sed fault
10cm through
low angle xB
knobby WTH
low angle planAR (90)
1cm scours, wormy HOR LAM
xB hint St. 10cm
.5mm fss rills
ribbed. ALT mC + f.
fine HOR LAM
syn sed fault
pebbly ss
St
syn sed fault
massive, sl pebbly fill, or scour
relook environment?
thin dry.

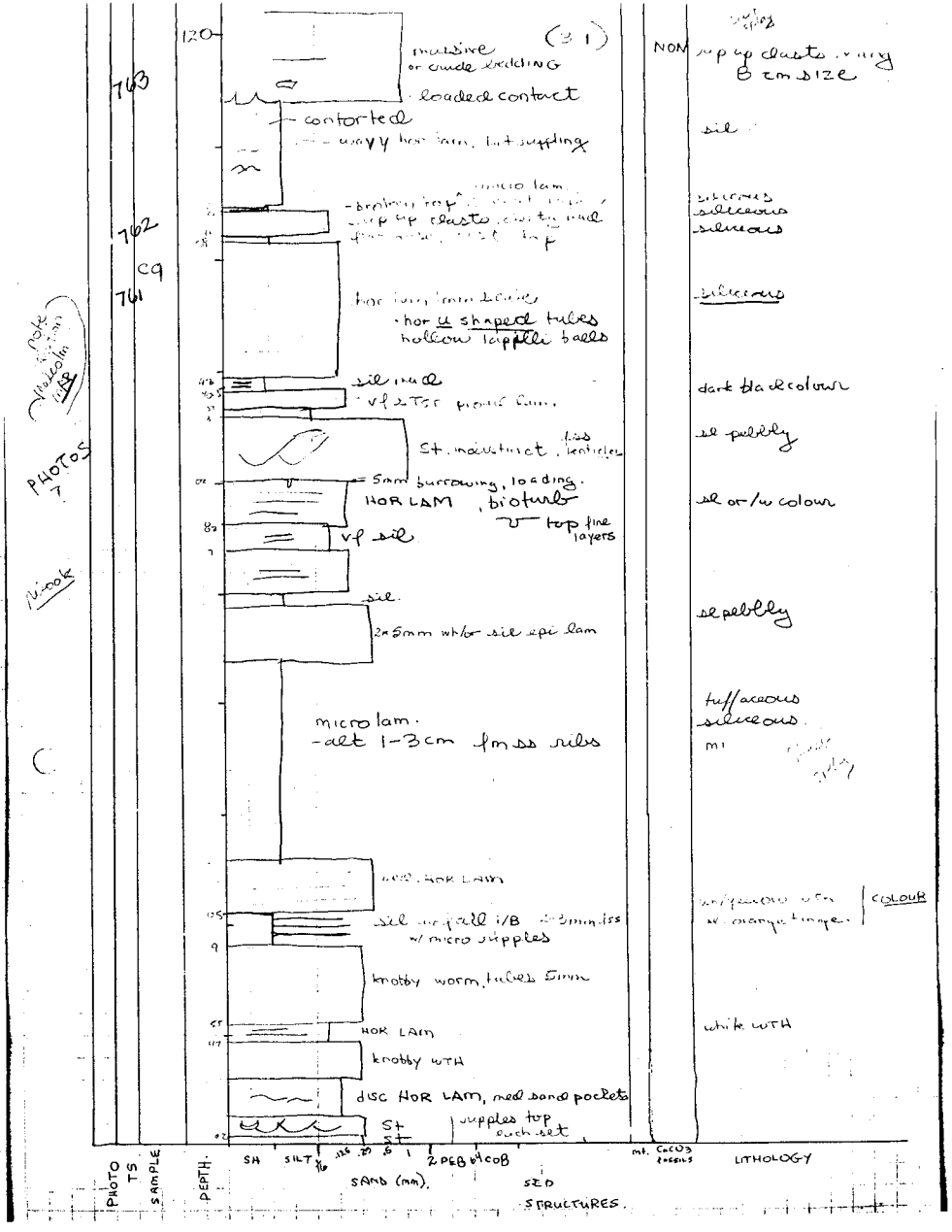
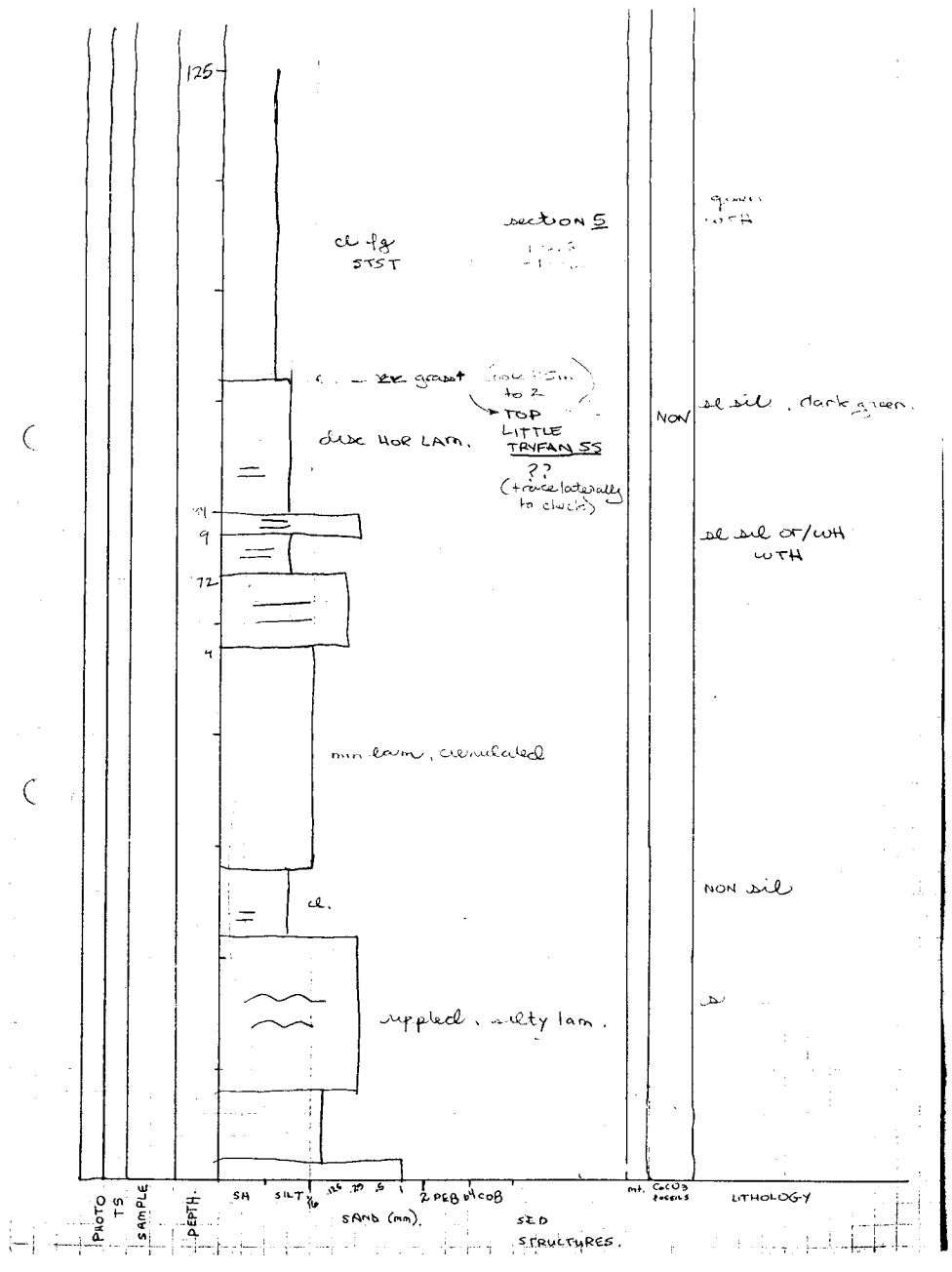
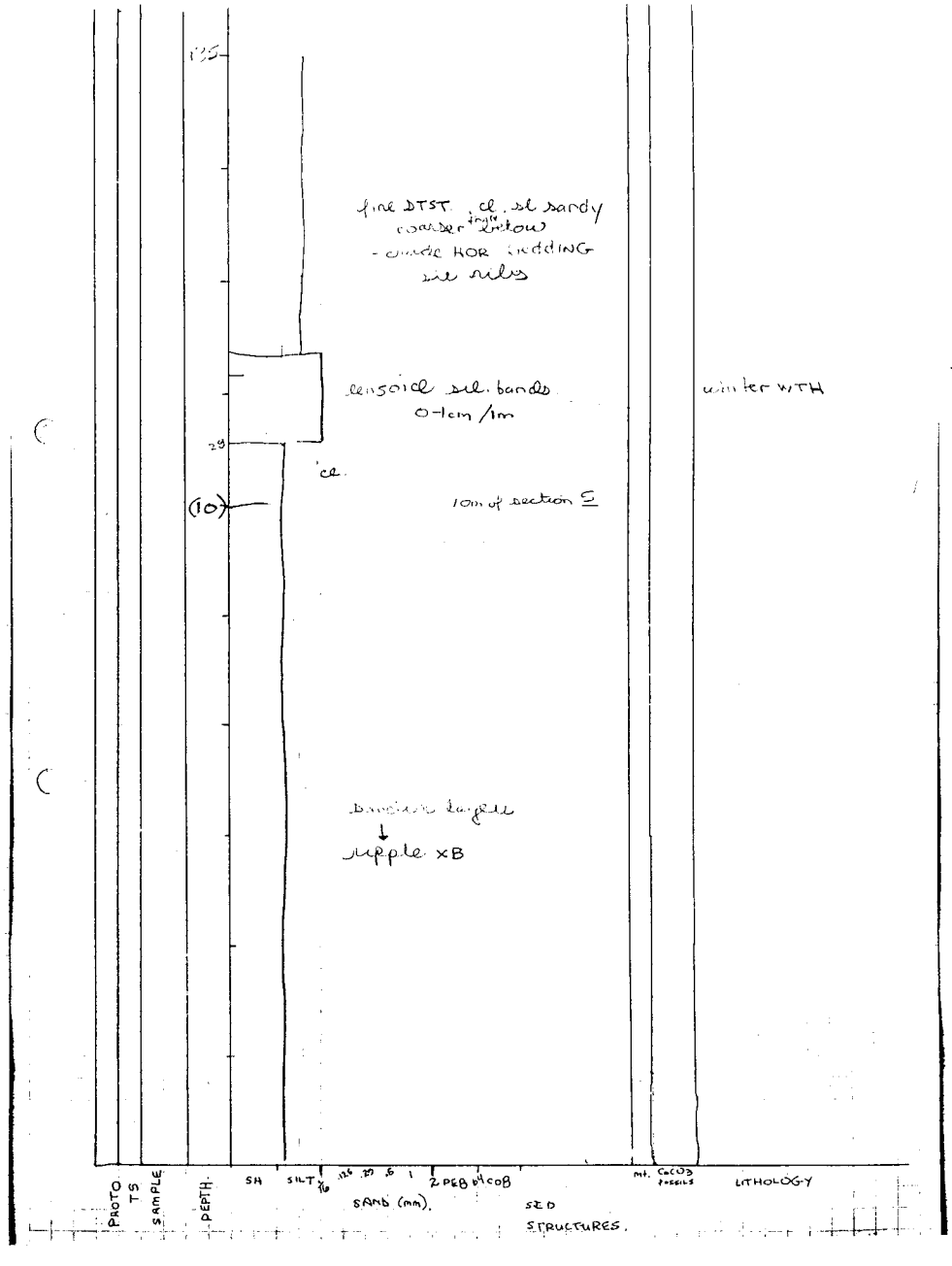
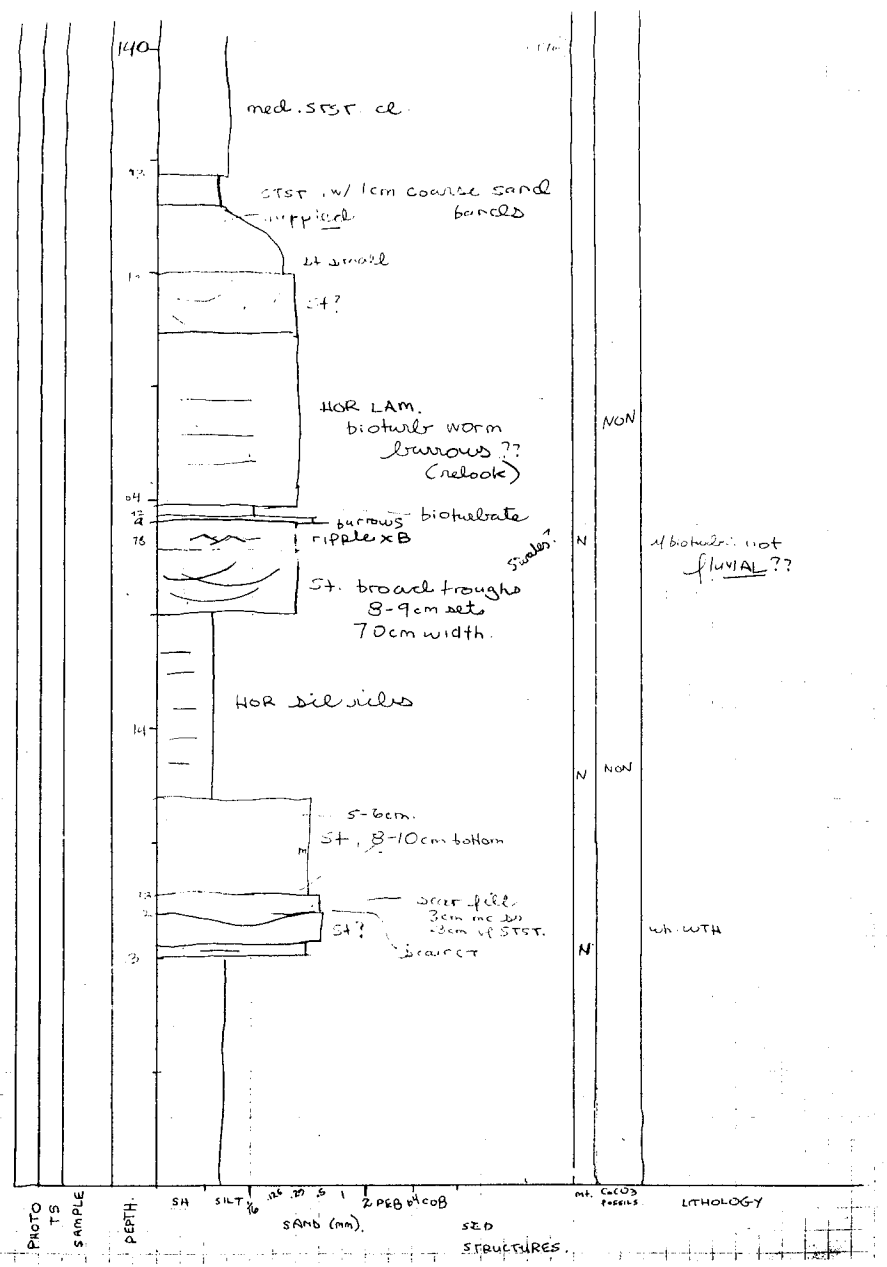


PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
SED STRUCTURES
mt. CaCO3 fossils
LITHOLOGY
massive or crude bedding
loaded contact
contorted
wavy hor lam, lnt suppling
micro lam
-bndnes top
-up up clasts
hor lam, 1mm-2cm
-hor U shaped tubes
hollow lapilli balls
sil mud
St. indistinct
5mm burrowing, loading.
HOR LAM, bioturb
top fine layers
vf sil
sil.
2x 5mm wh/br sil spl lam
micro lam.
-alt 1-3cm fm ss ribs
med. HOR LAM
sil w/ fall i/B
w/ micro ripples
knobby worm tubes 5mm
HOR LAM
knobby WTH
disc HOR LAM, med sand pockets
St
ripples top
NOM
up up clasts
B cm size
sil
siliceous
dark blk colour
sl pebbly
sl or/w colour
sl pebbly
tuffaceous
siliceous
COLOUR
thick WTH


125
section 5
cl fg STST
NON
sl sil, dark green.
disc HOR LAM.
TOP LITTLE TRYFAN SS
??
(+rare laterally to clwdy)
9
72
4
sl sil OF/WH WTH
min lam, crenulated
cl.
NON sil
rippled, silty lam.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.


125
fine STST. cl. sl sandy
coarser
- crude HOR bedding
see silts
lensoid sil. bands
0-1cm/1m
winter WTH
29
(10)
cl.
10m of section 5
ripple xB
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.


140
med. STST. cl.
STST. w/ 1cm coarse sand bands
rippled
sl small
ST?
HOR LAM.
bioturb worm burrows ??
(relook)
burrows
bioturbate
ripple xB
St. broad troughs
8-9cm sets
70cm width.
HOR sil wisps
5-6cm.
St, 8-10cm bottom
sharp fill
3cm mc ss
18cm of STST.
St?
Sharp CT
NON
N
NON
N
wh. WTH
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY

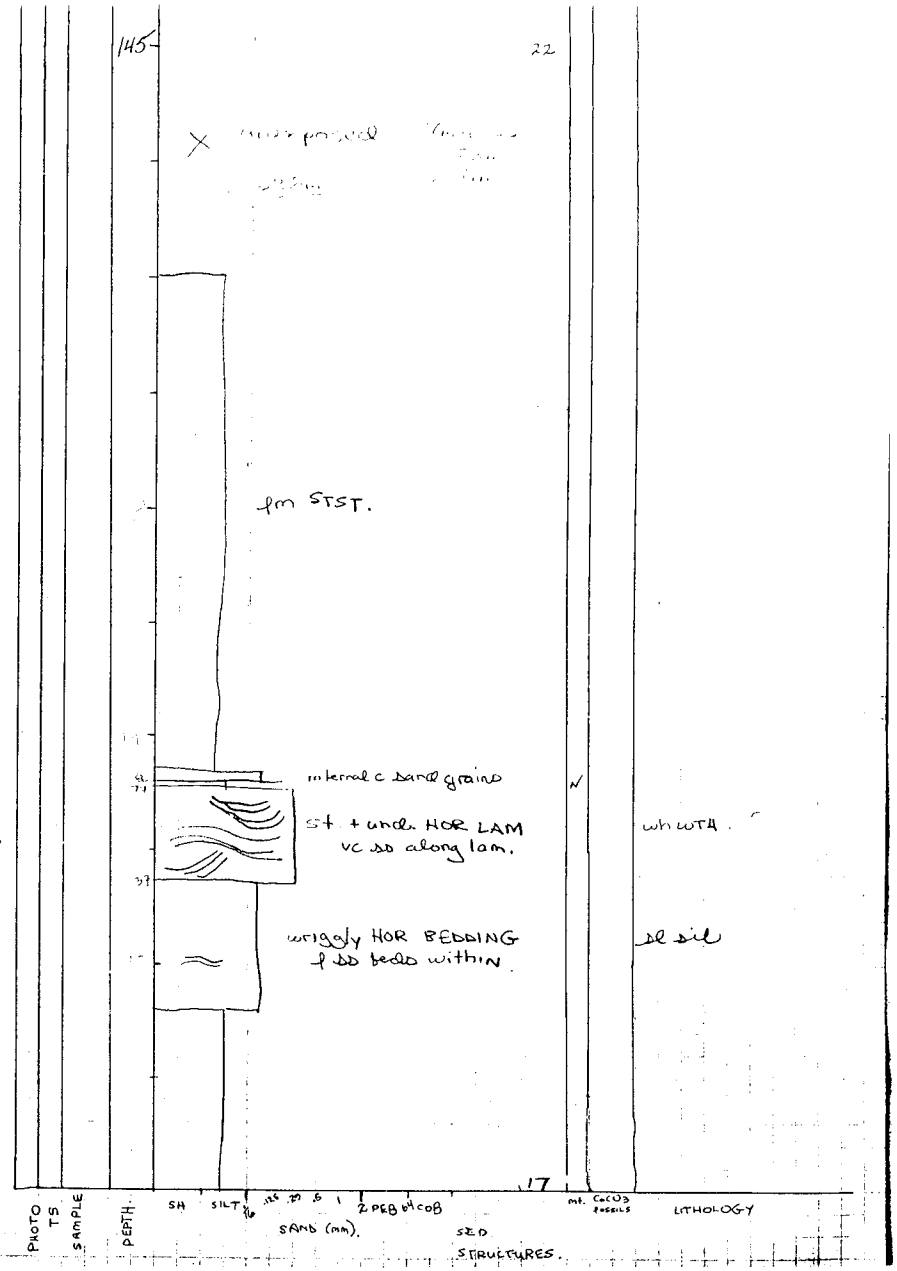
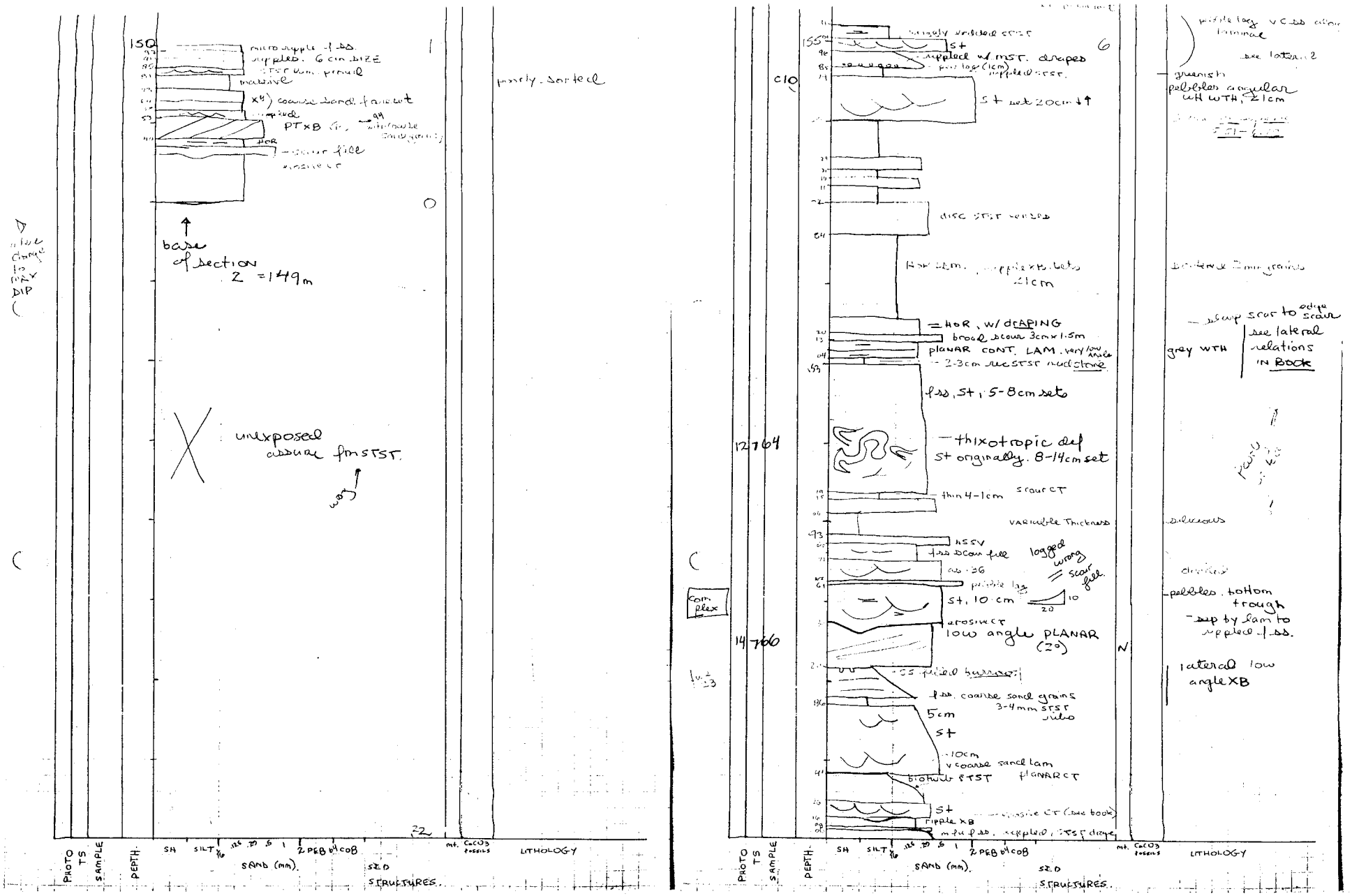
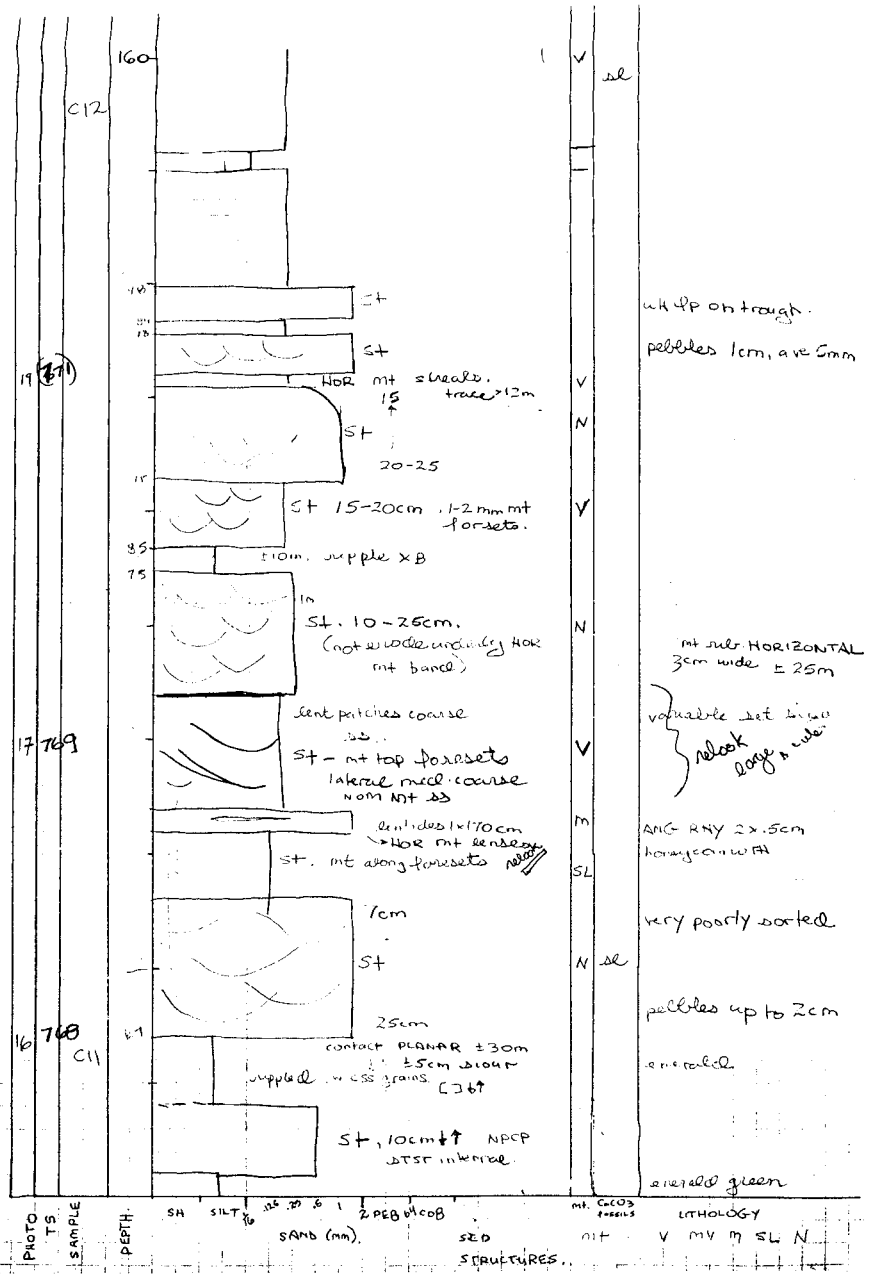
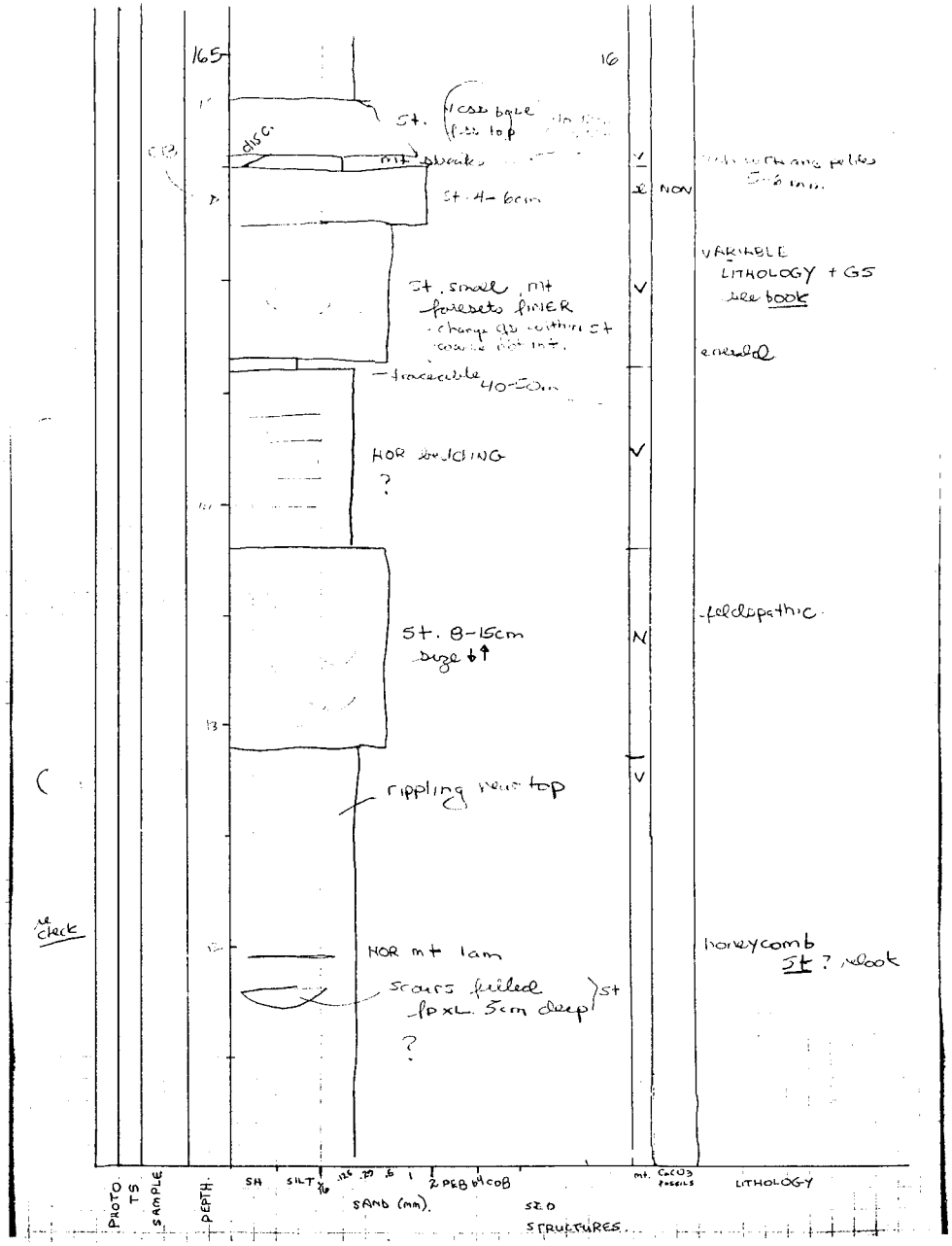

145
22
fm STST.
internal c sand grains
St + undu. HOR LAM
vc ss along lam.
wrigaly HOR BEDDING
f ss beds within
wh WTH.
sl sil
N
17
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY

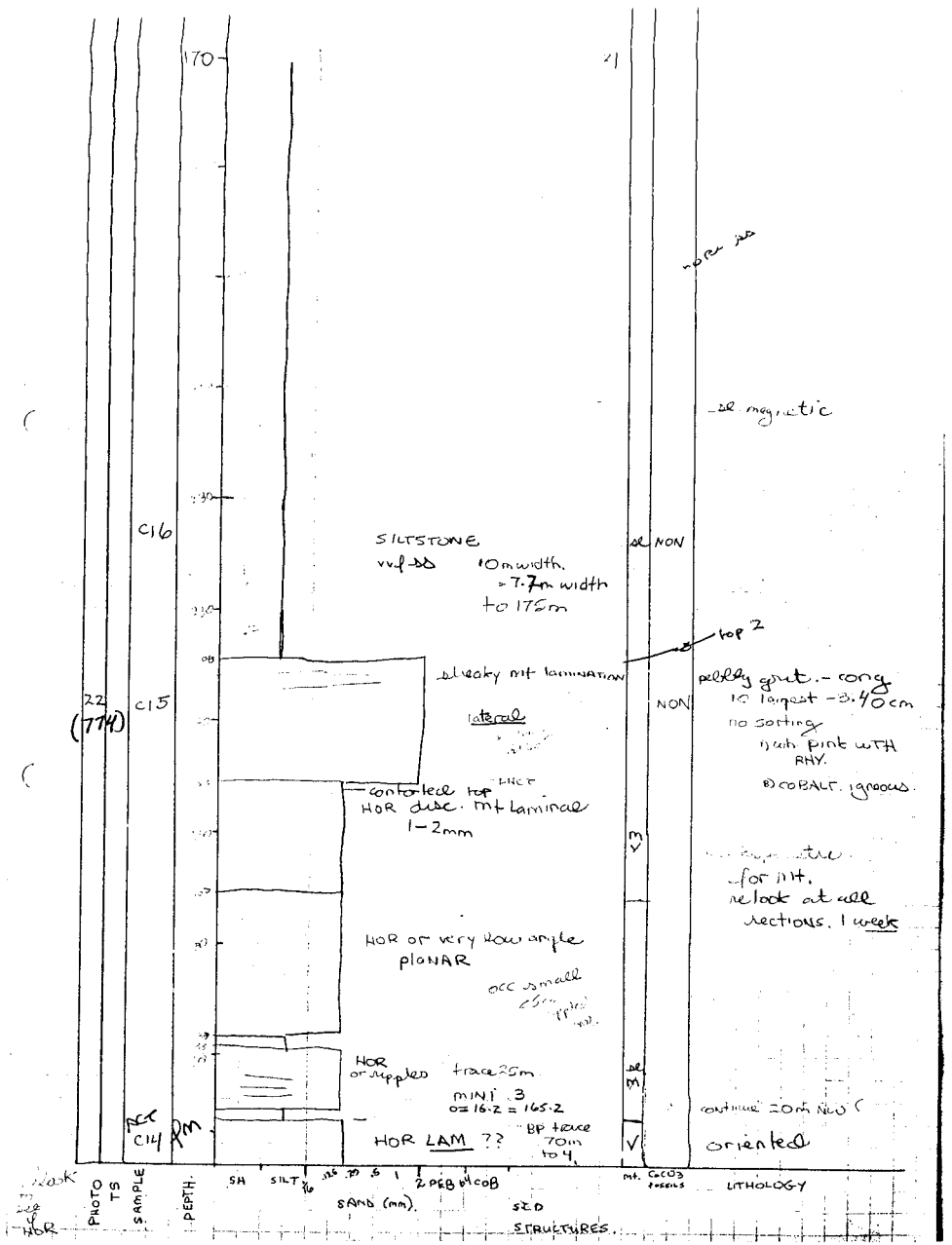
figure 23

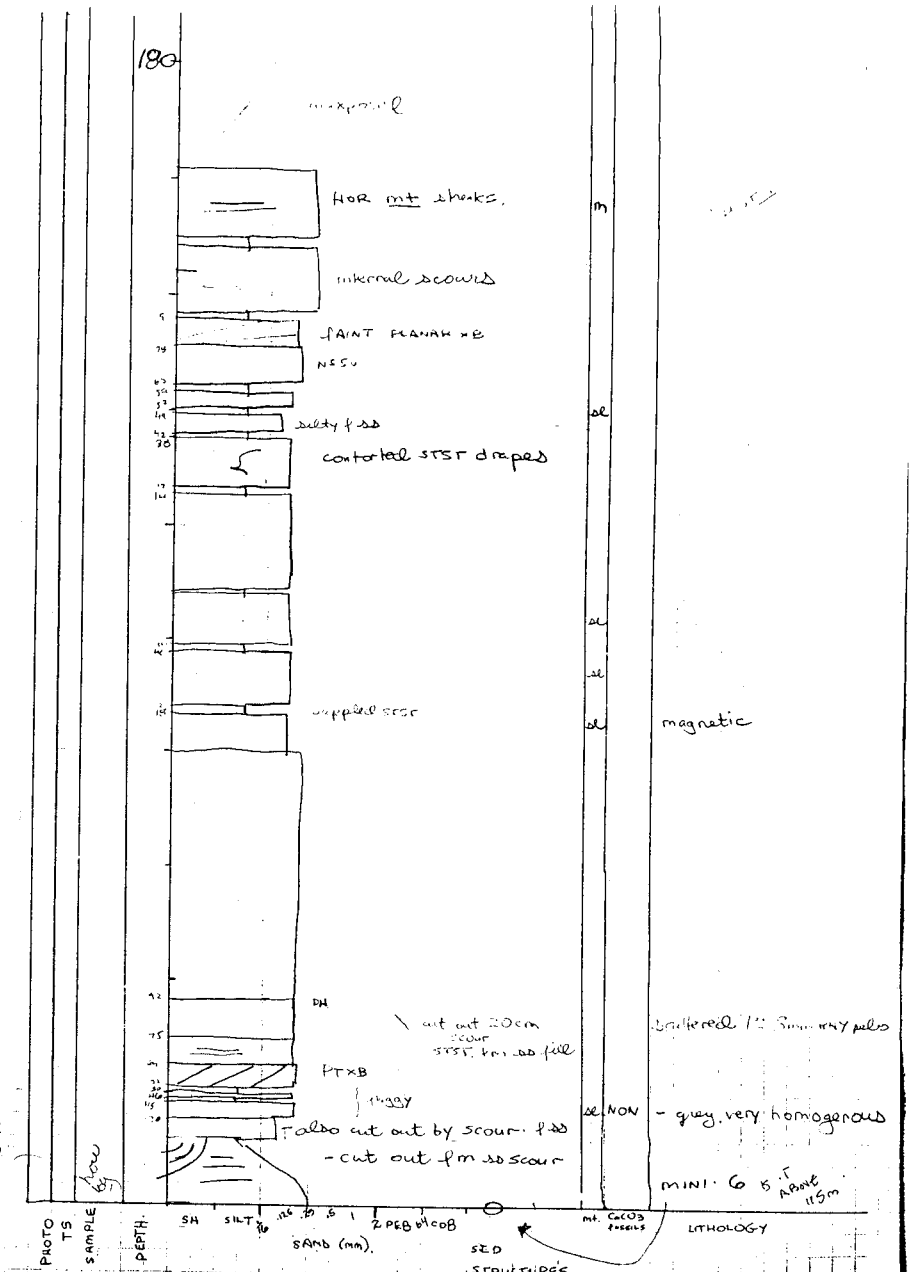

150
micro ripple cl ss.
rippled. 6 cm SIZE
STST dom. proud
massive
coarse sand. faint cut
PT x B
HOR
base of section
Z = 149m
unexposed
closure fm STST
poorly - sorted
155
St
rippled w/ mST. draped
St not 20cm
C10
disc STST veined
HOR w/ DRAPING
broad scour 3cm x 1.5m
PLANAR CONT. LAM. very low angle
2-3cm mic STST mud stone
fss, St, 5-8cm sets
thixotropic def
St originally 8-14cm set
12 7/64
thin 4-1cm
VARIABLE Thickness
HSSV
fss scour free
logged wrong
scour fill
St, 10 cm
10
20
erosive
low angle PLANAR (2°)
14 7/66
Complex
fss. coarse sand grains
3-4mm STST
5cm
St
10cm
v coarse sand lam
PLANAR CT
bioturb STST
St
ripple XB
m fu fss. rippled, STST drape
pebbly lag v c ss
laminae
see lateral
greenish
pebbles angular
wth WTH, 2 1cm
gray WTH
see lateral relations IN BOOK
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

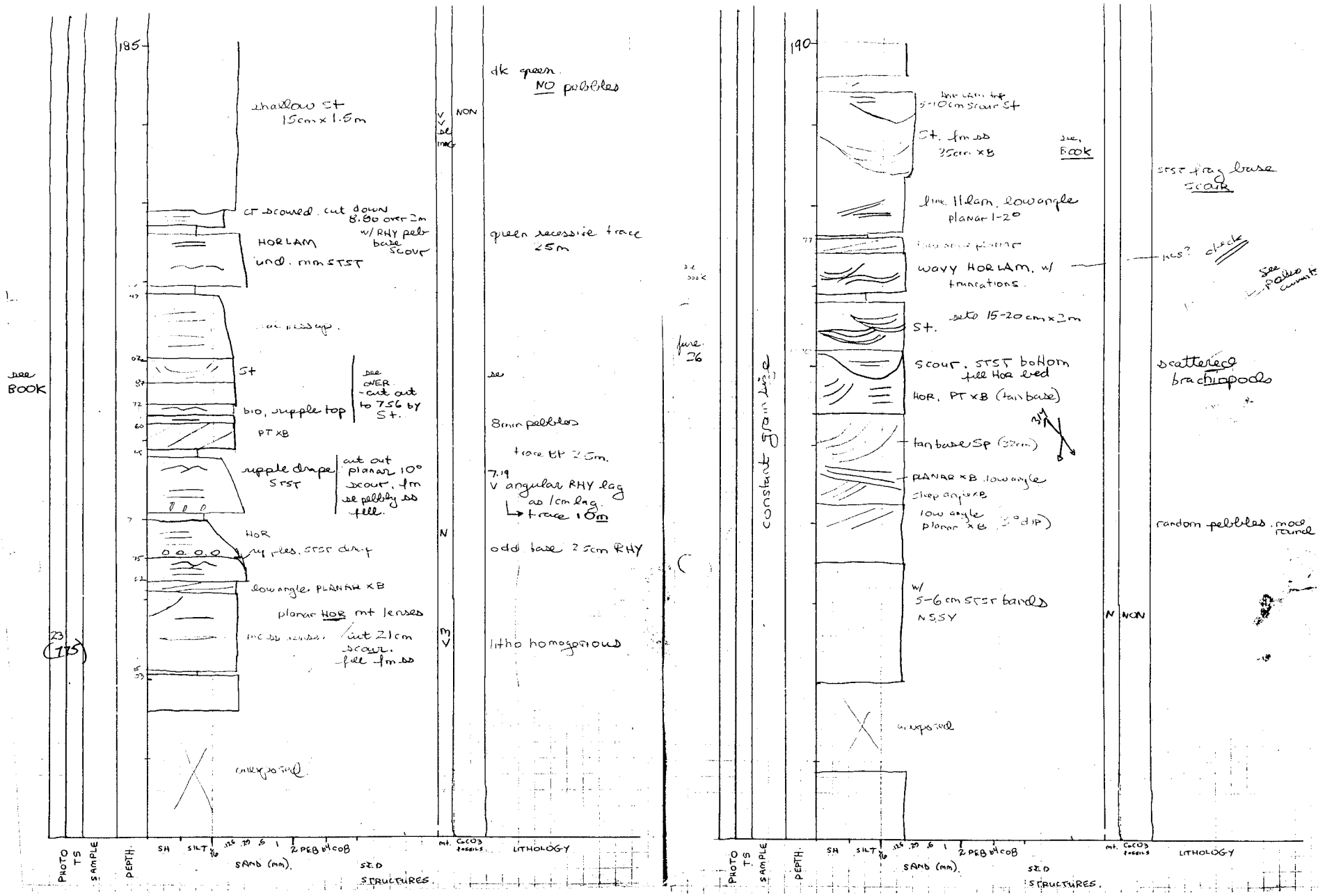

160
C12
St
St
HOR mt streaks. trace >1m
15
St
20-25
St 15-20cm, 1-2mm mt foresets.
±10m. ripple XB
St. 10-25cm.
(not to scale vertically HOR mt band)
lent patches coarse ss..
St - mt top foresets
lateral incl. coarse
NOM MT ss
17 769
divides 1x170cm
→HOR mt lenses
St. mt along foresets
1cm
St
25cm
16 768
C11
contact PLANAR ±30m
±5cm SLIGHT
rippled, v coss grains
St, 10cm+↑ NPCP
ATST interval
ripples
mt sub HORIZONTAL
3cm wide ± 25m
valuable set here
relook
large x sec
ANG RNY 2x.5cm
honeycomb WTH
very poorly sorted
pebbles up to 2cm
emerald
emerald green
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt
CaCO3 fossils
LITHOLOGY


165
16
St. fcss base fss top
dip
mt streaks
St. 4-6cm
St. small, mt foresets FINER
- change dip within St
coarse plot int.
- traceable 40-50m
HOR BEDDING
?
St. 8-15cm
size ↓↑
rippling reac top
check
HOR mt 1cm
scours filled
fpxL. 5cm deep
St
?
NON
VARIABLE
LITHOLOGY + GS
see book
emerald
-feldspathic
honeycomb
St ? relook
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt
CaCO3 fossils
LITHOLOGY

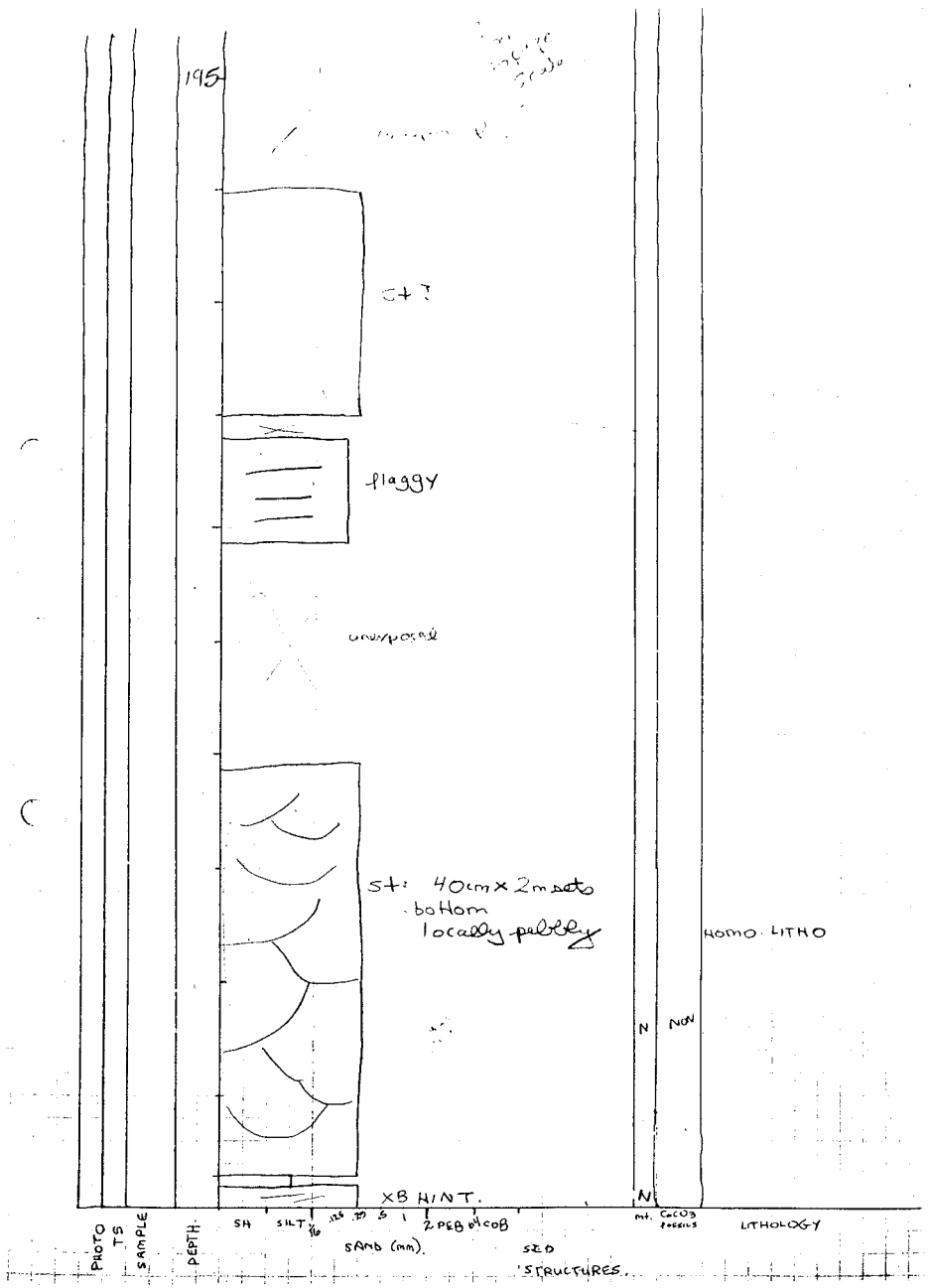
C1

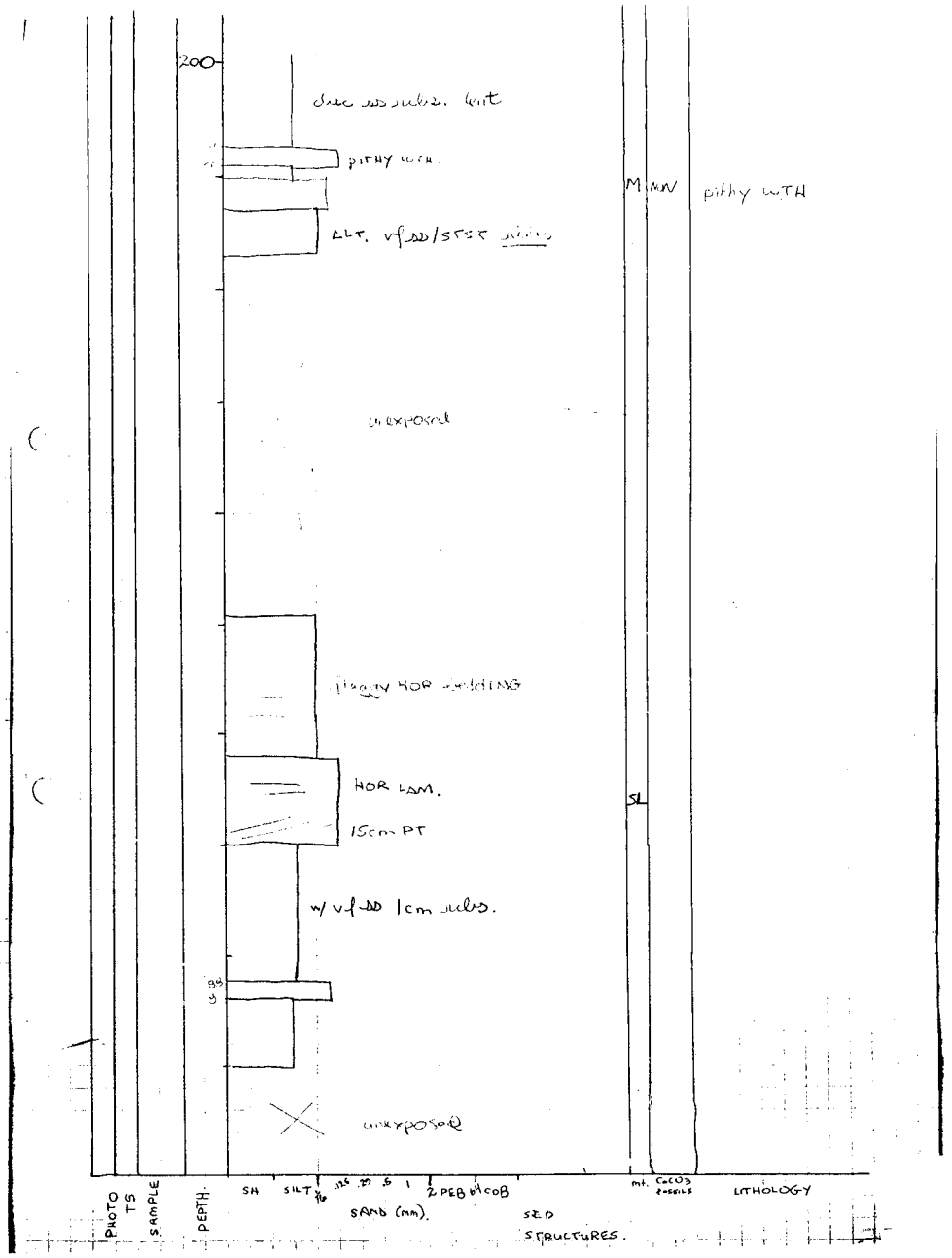

170
C16
C15
C14
SILTSTONE
vvf-ss
10m width.
=7.7m width
to 175m
sl bleaky mt lamination
lateral
contorted top
HOR disc. mt laminae
1-2mm
HOR or very low angle
planar
HOR
or rippled
trace 25m
MINI .3
0=16.2 = 165.2
HOR LAM ??
BP trace
70m
to 4
sl magnetic
NON
top 2
pebbly grit. - corg
lg largest ~3.40cm
no sorting
with PINK WITH
RHY.
B) COBALT. 1groove.
for mt.
relook at all
sections. 1 week
continue 20m NEW
oriented
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
mt. CaCO3 fossils
LITHOLOGY
STRUCTURES.

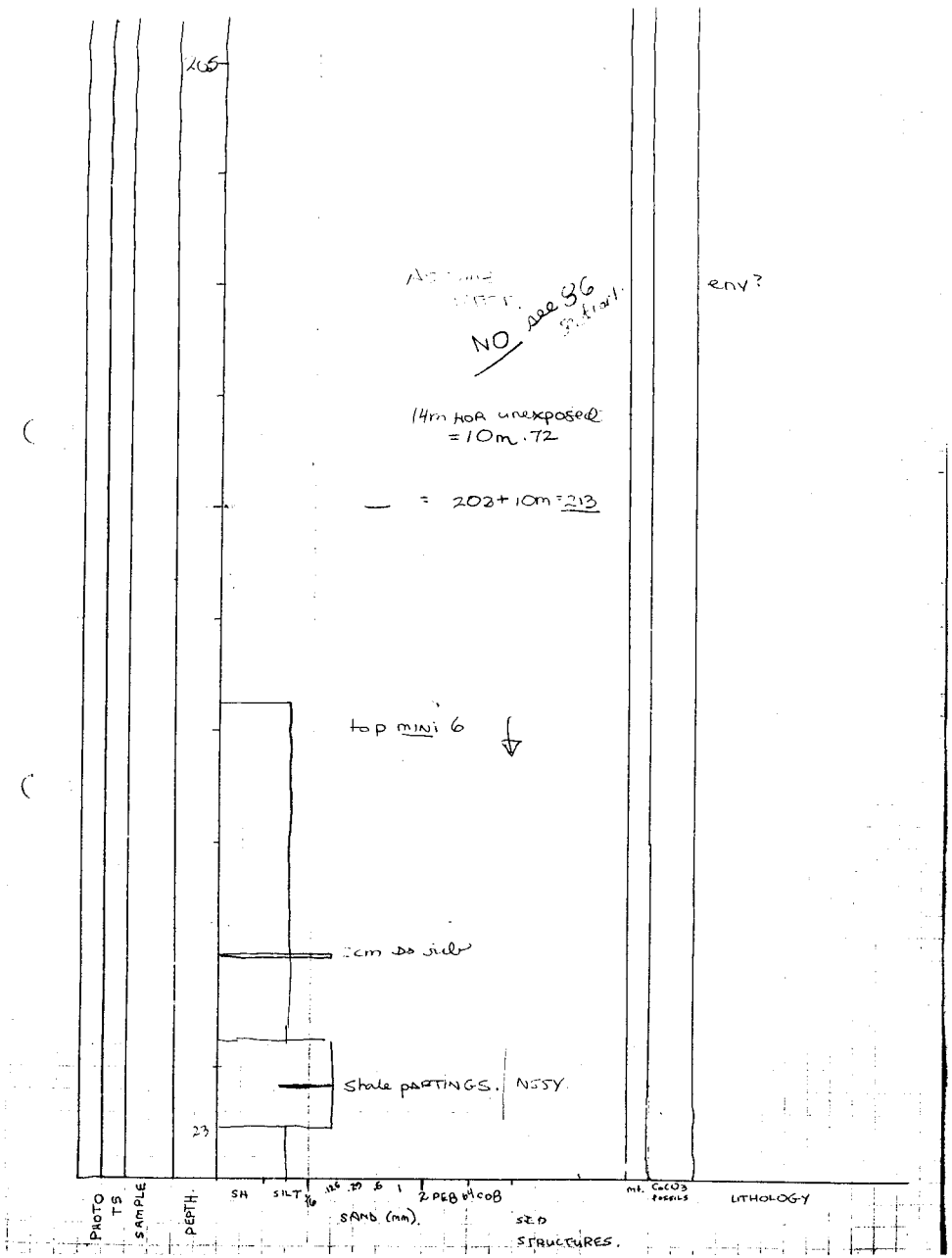

180
HOR mt thinks.
internal scours
FAINT PLANAR xB
NSSu
silty f ss
contorted STST drapes
rippled SSST
PH
cut out 20cm
scour
STST. fine ss fill
PTxB
muddy
also cut out by scour. f ss
- cut out fm ss scour
June 23
sl magnetic
Scattered 1" Sm. RHY pebs
- grey. very homogenous
MINI. 6 S.T. Above 11.5m
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
mt. CaCO3 fossils
LITHOLOGY
STRUCTURES.

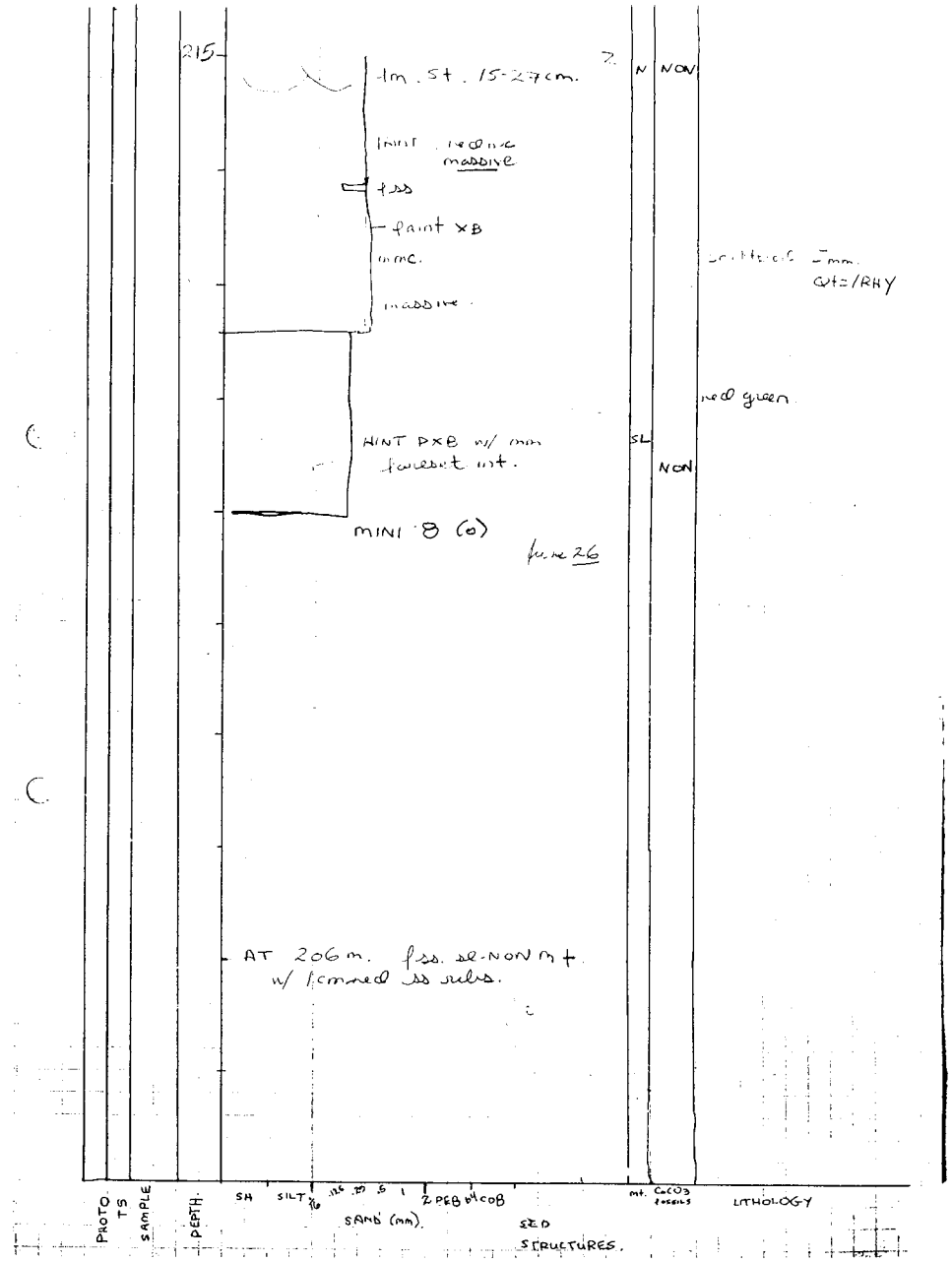

185
shallow St
15cm x 1.5m
dk green
NO pebbles
NON
cr scoured. cut down 8.90 over 2m w/ RHY peb base scour
HORLAM und. mm STST
green recessive trace <5m
St
bio, ripple top
PT XB
see OVER - cut out to 7.56 by St.
8mm pebbles
trace UP 2.5m.
ripple drape STST
cut out planar 10° scour, fm ss pebbly ss fill.
7.19
V angular RHY lag as 1cm lag.
trace 10m
HOR
mg pebs. STST drop
N
odd base 2.5cm RHY
low angle PLANAR XB
planar HOR mt lenses
cut 21cm scour. fill fm ss
M V
litho homogenous
unexposed
PHOTO
T S
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
SED STRUCTURES
mt. CaCO3 fossils
LITHOLOGY
see BOOK
23 (775)
fine 26
190
thin calc. ltr 5-10cm scour St
St. fm ss 25cm x B
see Book
lime. Hlam, low angle planar 1-20°
wavy HORLAM. w/ truncations.
St. sets 15-20cm x 2m
scour. STST bottom full HOR bed
HOR. PT x B (fair base)
fair base Sp (32cm)
PLANAR XB. low angle
steep angle XB
low angle planar XB (3° dip)
w/ 5-6cm STST bands N55Y
unexposed
constant grain size
STST frag base
SCOUR
MCS? check
see pebble current
scattered brachiopods
random pebbles. mod rounded
N NON

C1

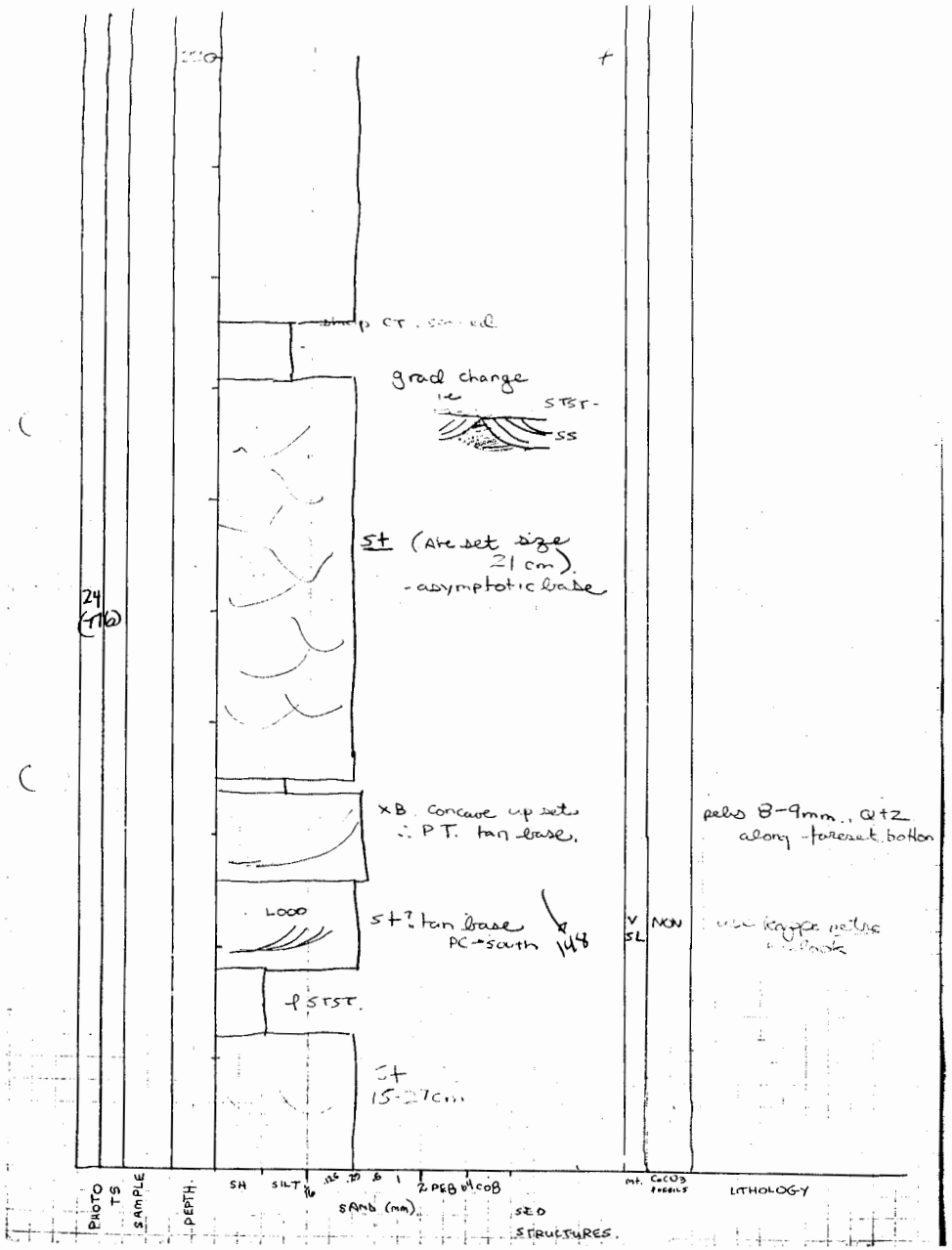

195
ct?
flaggy
unexposed
st: 40cm x 2m sets
bottom
locally pebbly
XB HINT.
homo. LITHO
N
NON
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.

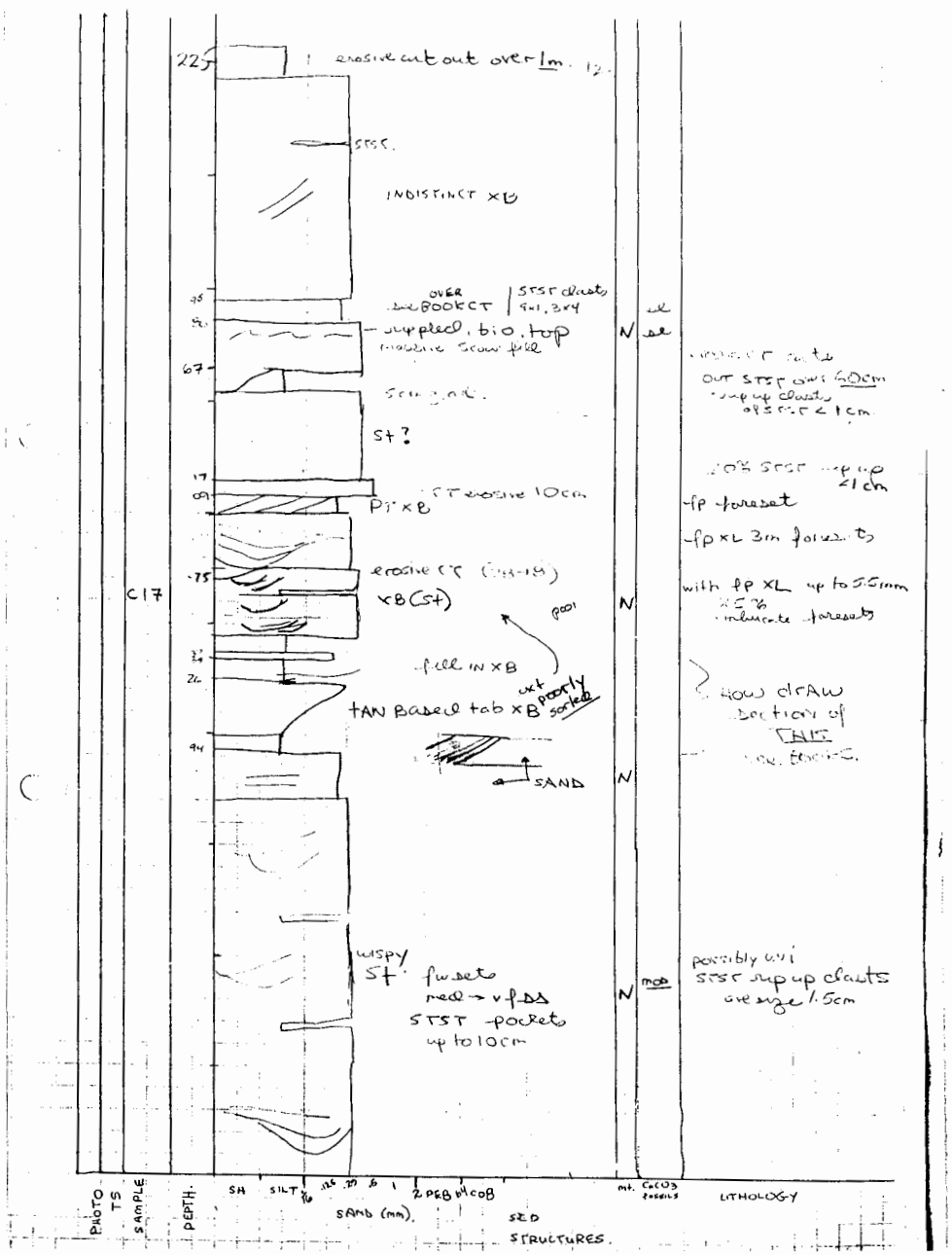

200
disc ss subs. knit
pithy w/ fl.
ALT. vf ss/sltst subs.
unexposed
flaggy HOR bedding
HOR LAM.
15cm PT
w/ vf ss 1cm subs.
unexposed
M MVN pithy w/ fl
SL
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.

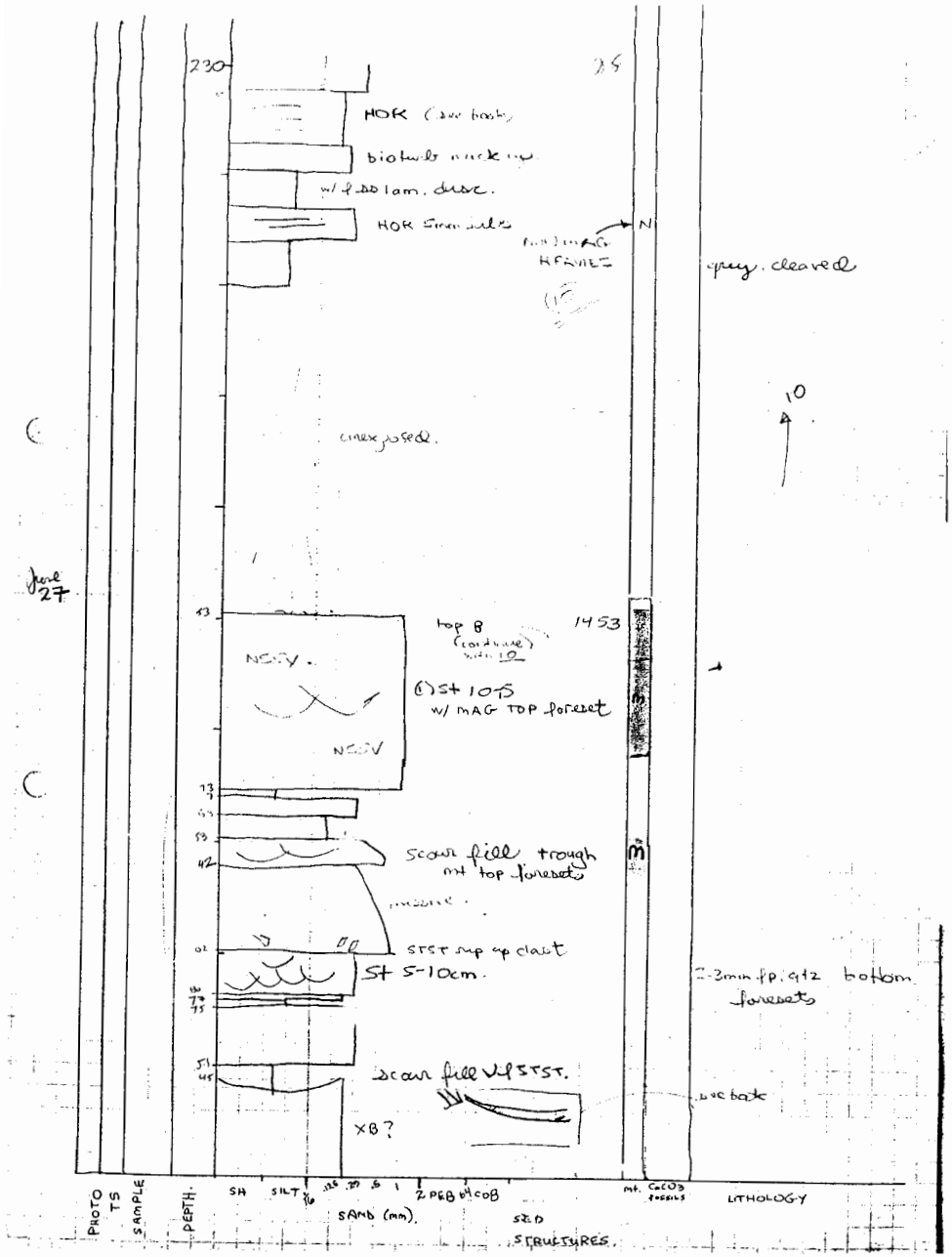

205
NO see 36 original
env?
14m HOA unexposed
=10m .72
= 202+10m=213
top MINI 6
1cm ss rich
Shale partings.
NSSY
23
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

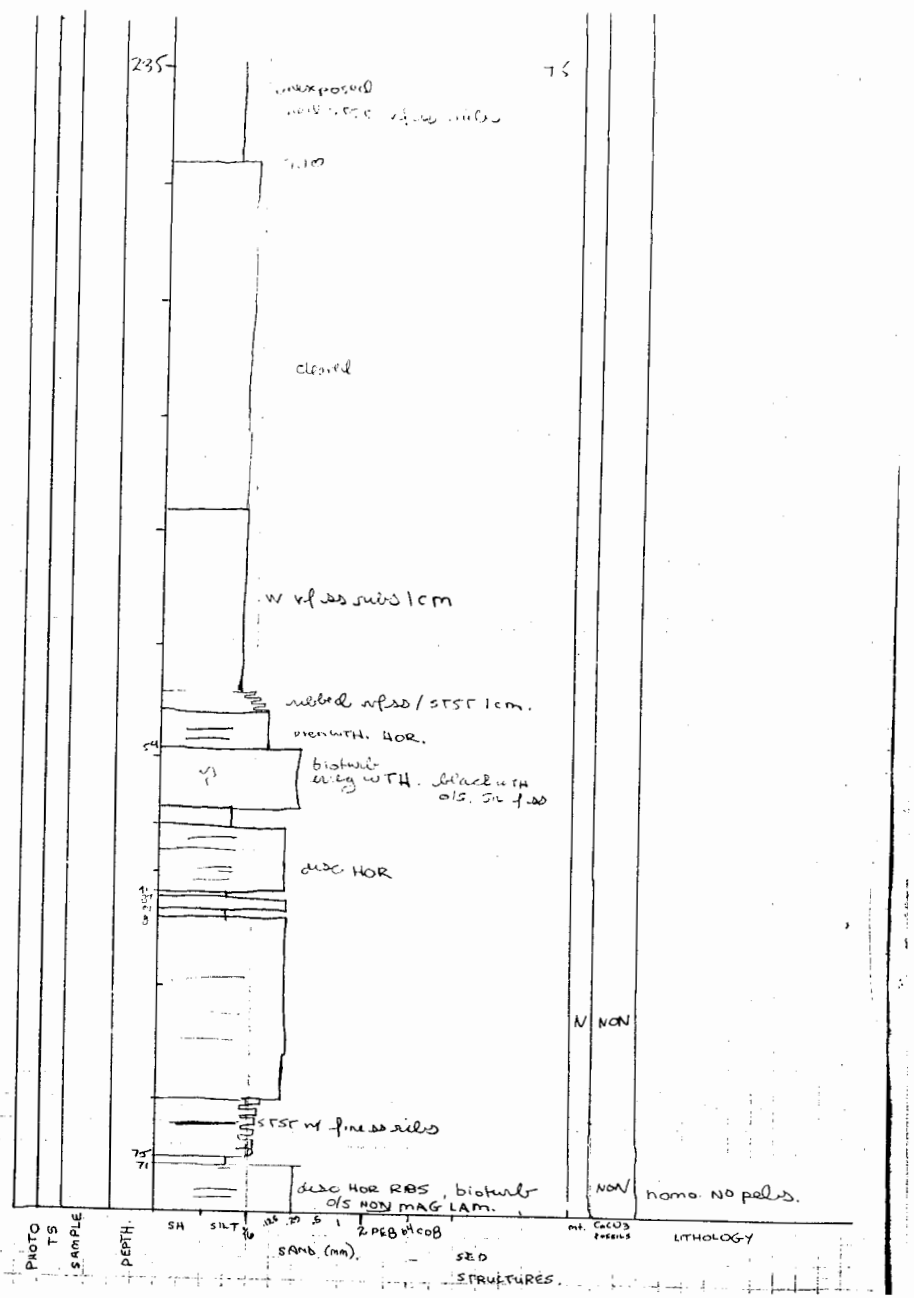

215
1m. St. 15-27cm.
massive
fss
faint XB
massive
HINT PXB w/ min
lowest int.
MINI 8 (6)
see 26
N
NON
SL
NON
med green
Qt=/RHY
AT 206m. fss. sl-NON mt
w/ 1cm med ss subs.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

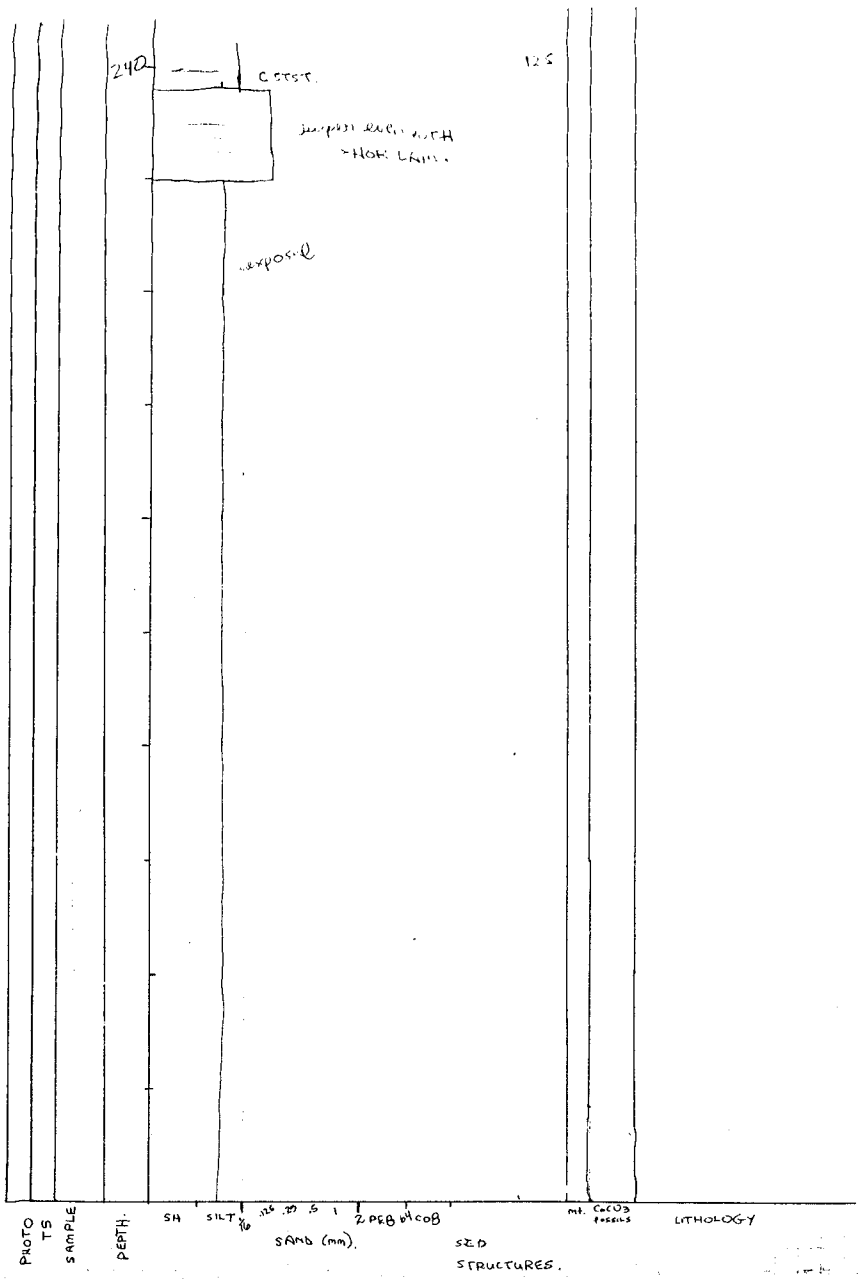
C1

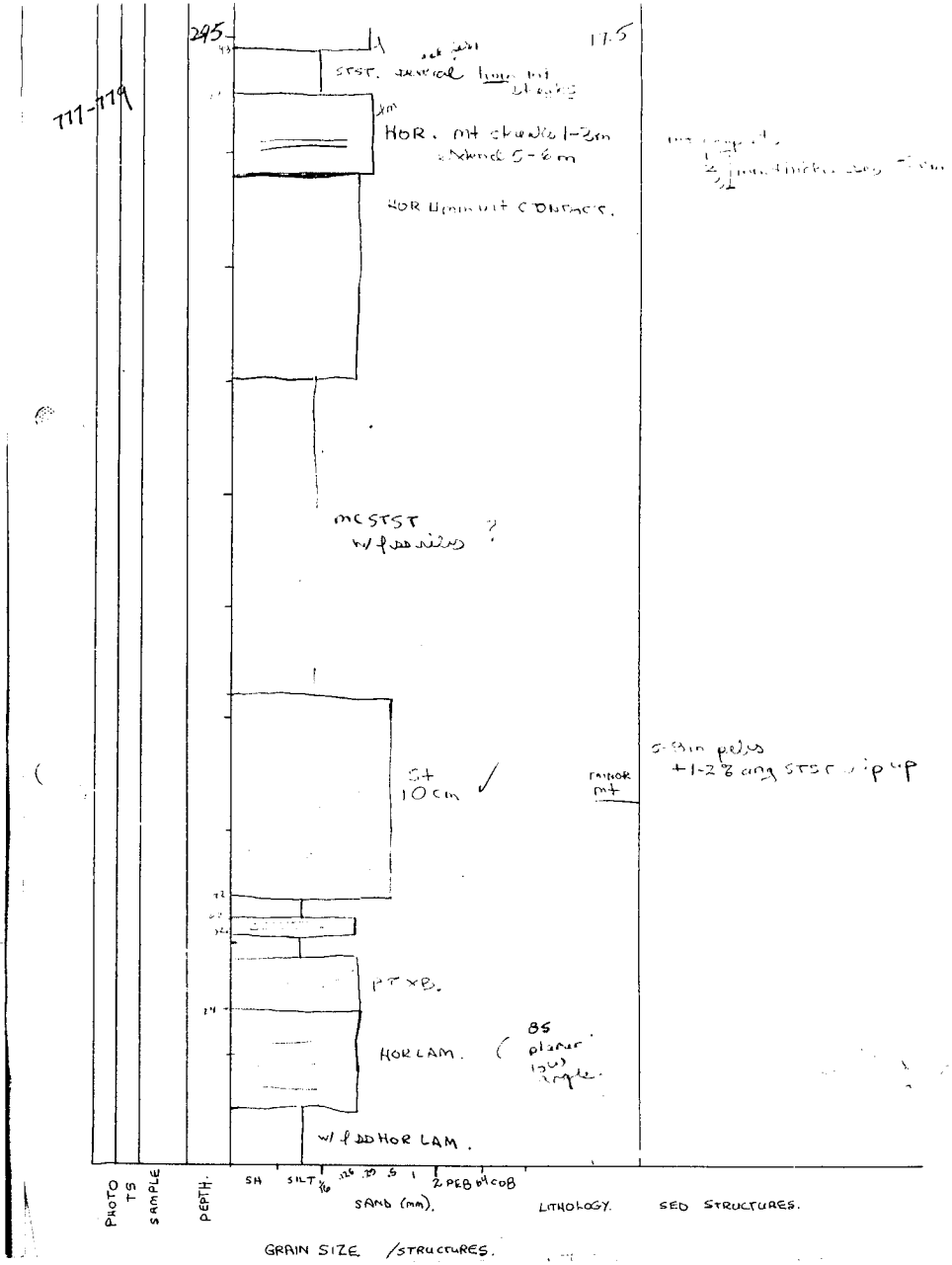

grad change
STST-
SS
St (Ave set size 21 cm).
-asymptotic base
XB. concave up sets
∴ P.T. tan base.
St? tan base
PC→ south 148
pSTST.
St
15-27cm
24 (716)
rels 8-9mm., Qtz
along foreset bottom
PHOTO TS
SAMPLE
DEPTH.
SAND (mm).
STRUCTURES.
LITHOLOGY

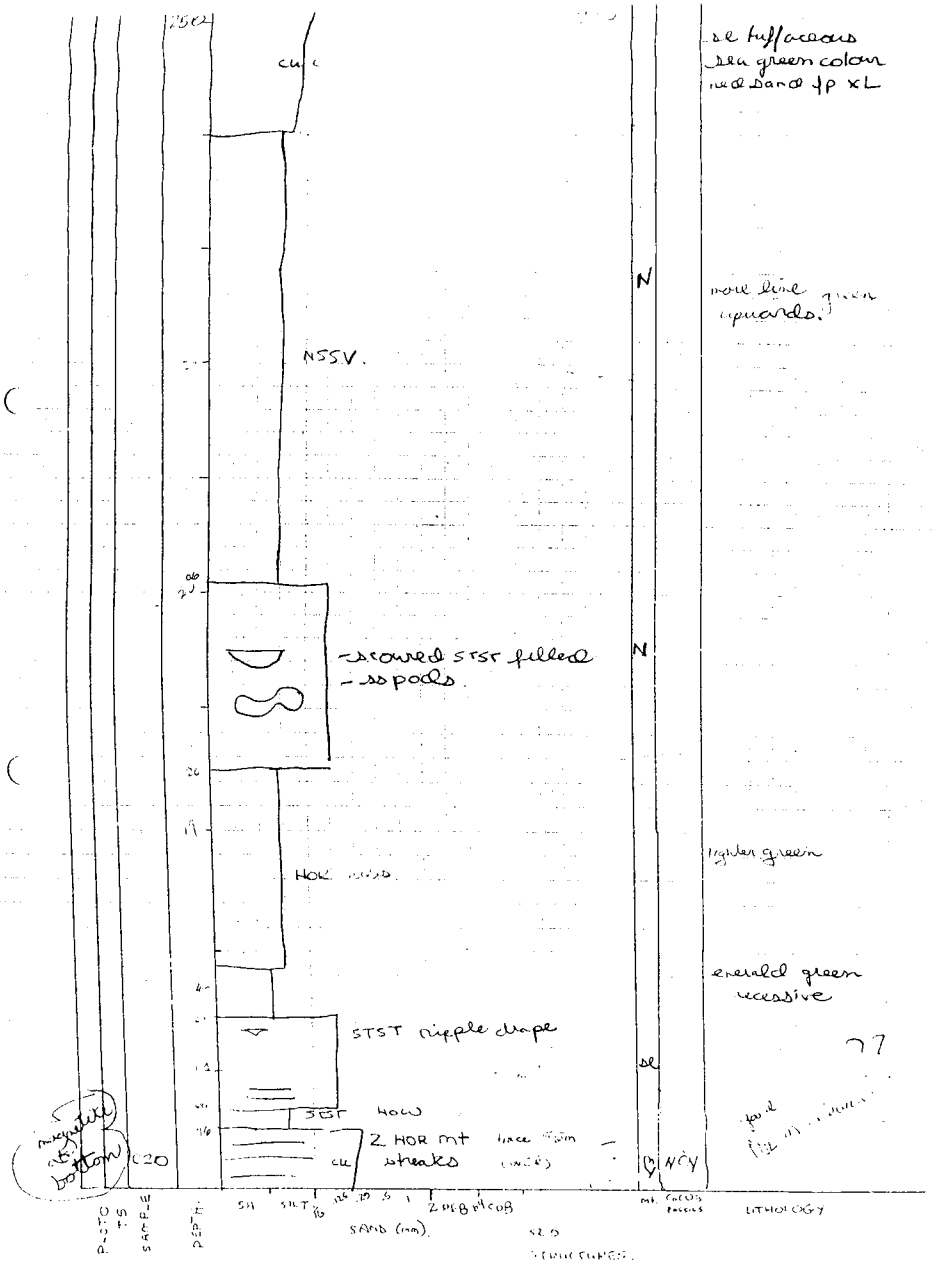

erosive cut out over 1m.
STST.
INDISTINCT XB
OVER BOOKCT
STST clasts 4×1, 3×4
suppleck, bio, top
massive scour fill
Scr. grad.
St?
Pi × B
erosive 10cm
erosive CT (0.8-1M)
XB (St)
pool
fill in XB
tAN Based tab XB
ext poorly sorted
SAND
C17
wispy St.
fw set
red → v f ss
STST pockets
up to 10cm
OUT STST cl's 60cm
sup up clasts
ofs CT < 1cm
STST sup up
<1cm
-fp foreset
-fp XL 3m foresets
with fp XL up to 5.5mm
~5%
indicate foresets
How draw
section of
CHTS
poss. fractures
possibly cvi
STST sup up clasts
ave size 1.5cm
PHOTO TS
SAMPLE
DEPTH.
SAND (mm).
STRUCTURES.
LITHOLOGY

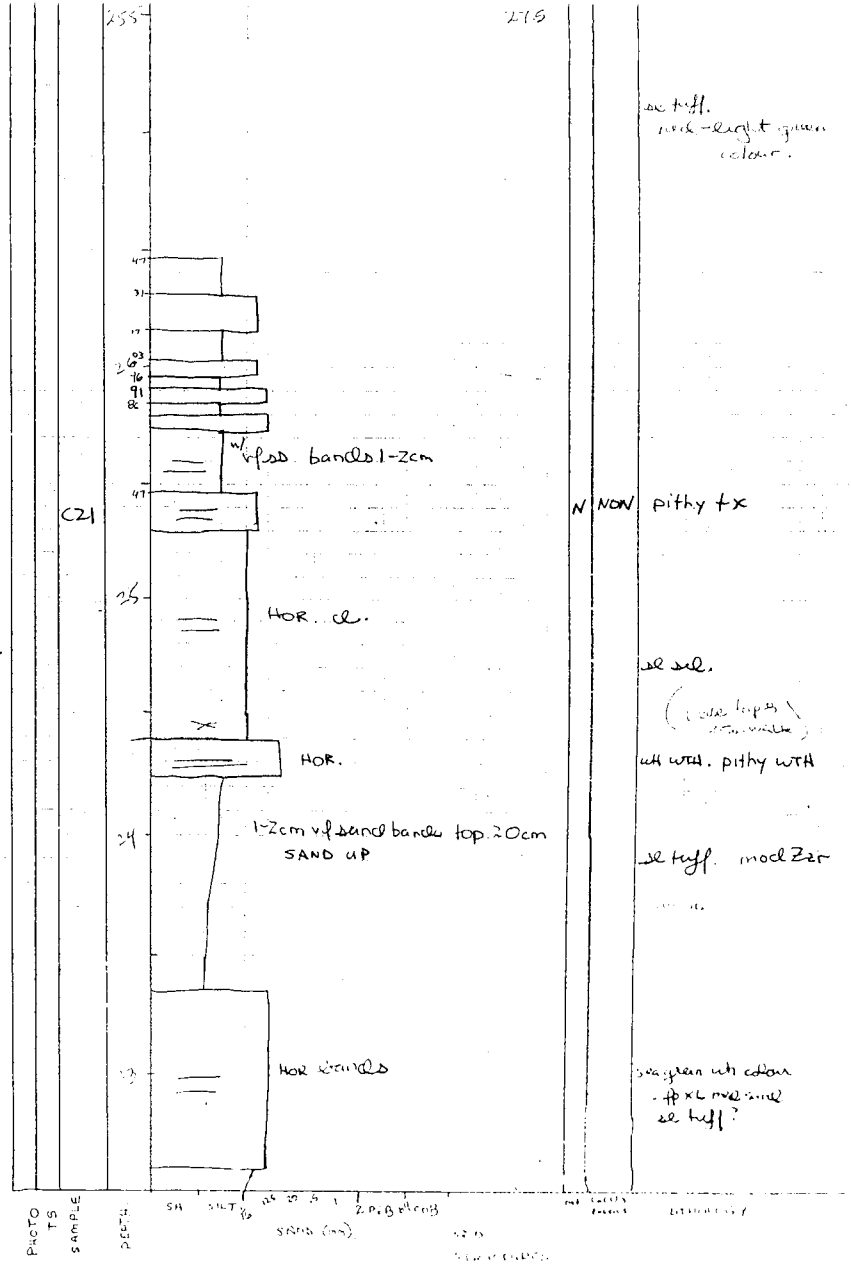

230
HOR (saw track)
bioturb mixed up
w/ fine lam. disc.
HOR small ripples
MAG FRAMES
N
grey. cleared
unexposed.
10
top B
(coal mine)
1453
NCSV.
(c) St 10-15
w/ MAG TOP foreset
NCSV
scour fill trough
at top foreset
St 5-10cm.
scour fill VF STST.
XB?
3mm fp. qtz bottom
foreset
base
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

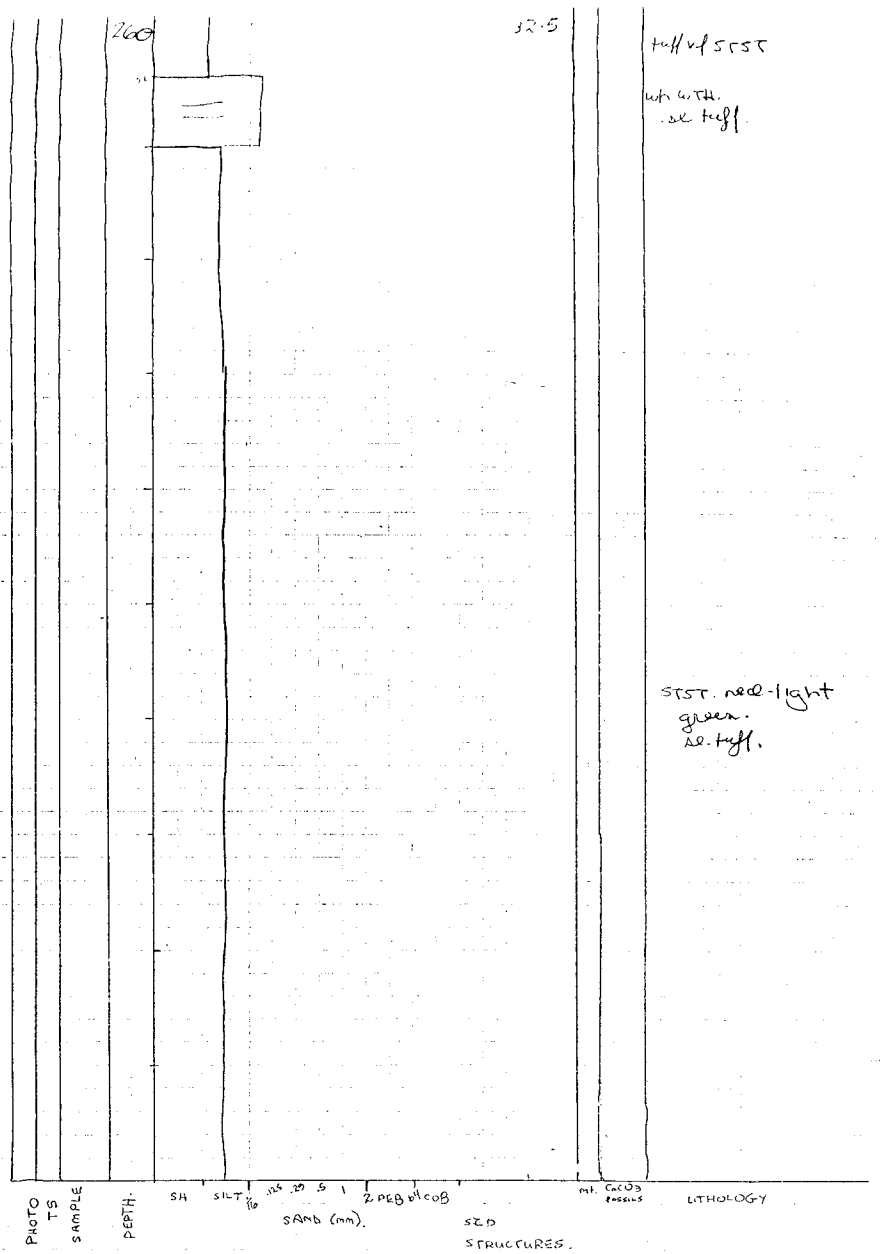

235
unexposed
cleared
W VF ss ripples 1cm
rubbled VFSS / STST 1cm.
disc. HOR.
bioturb
w/ very WTH. black sh
o/s. Sh fine ss
disc. HOR
STST w fine ss ribs
N
NON
NON
disc HOR RBS, bioturb
o/s NON MAG LAM.
homo. NO pebs.
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

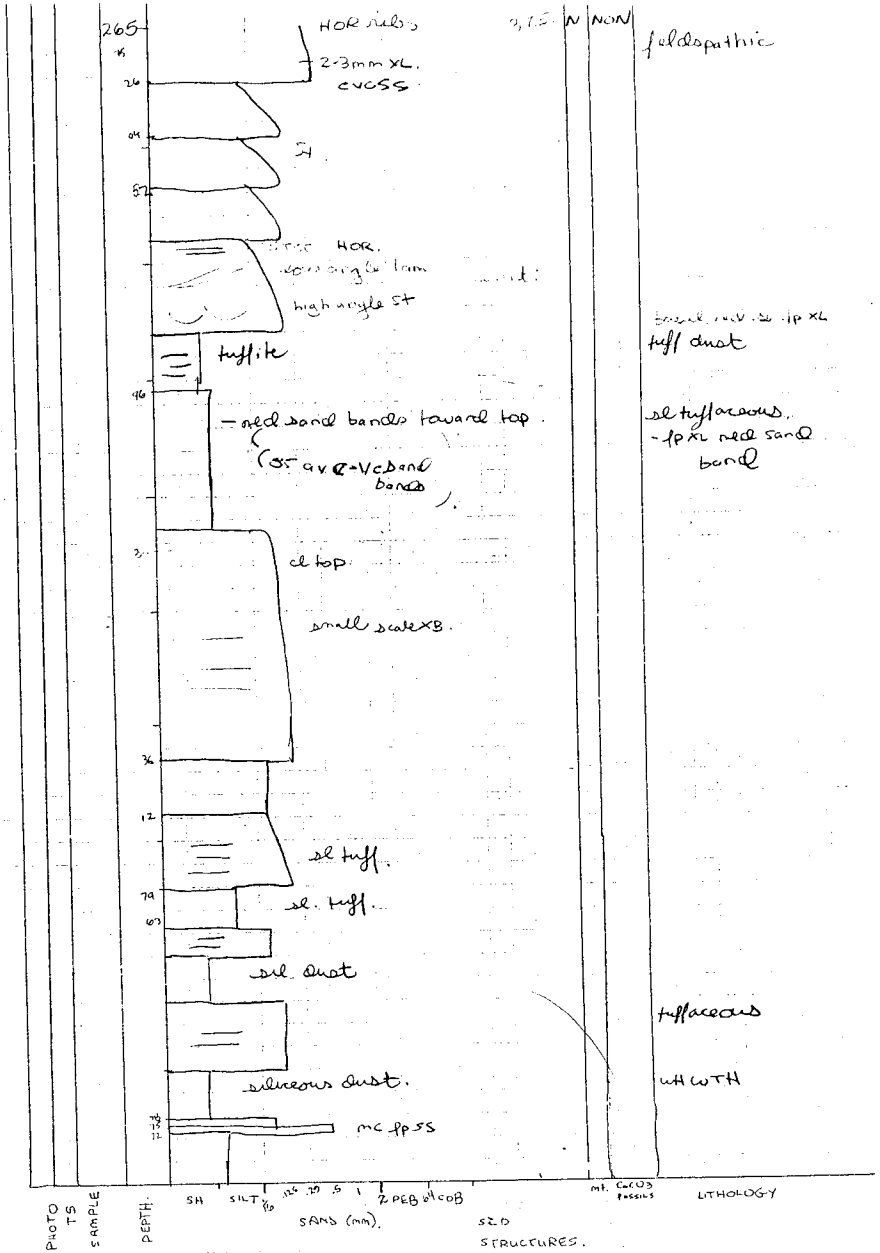

240
CSTST.
12.5
HOR LAM.
exposed
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

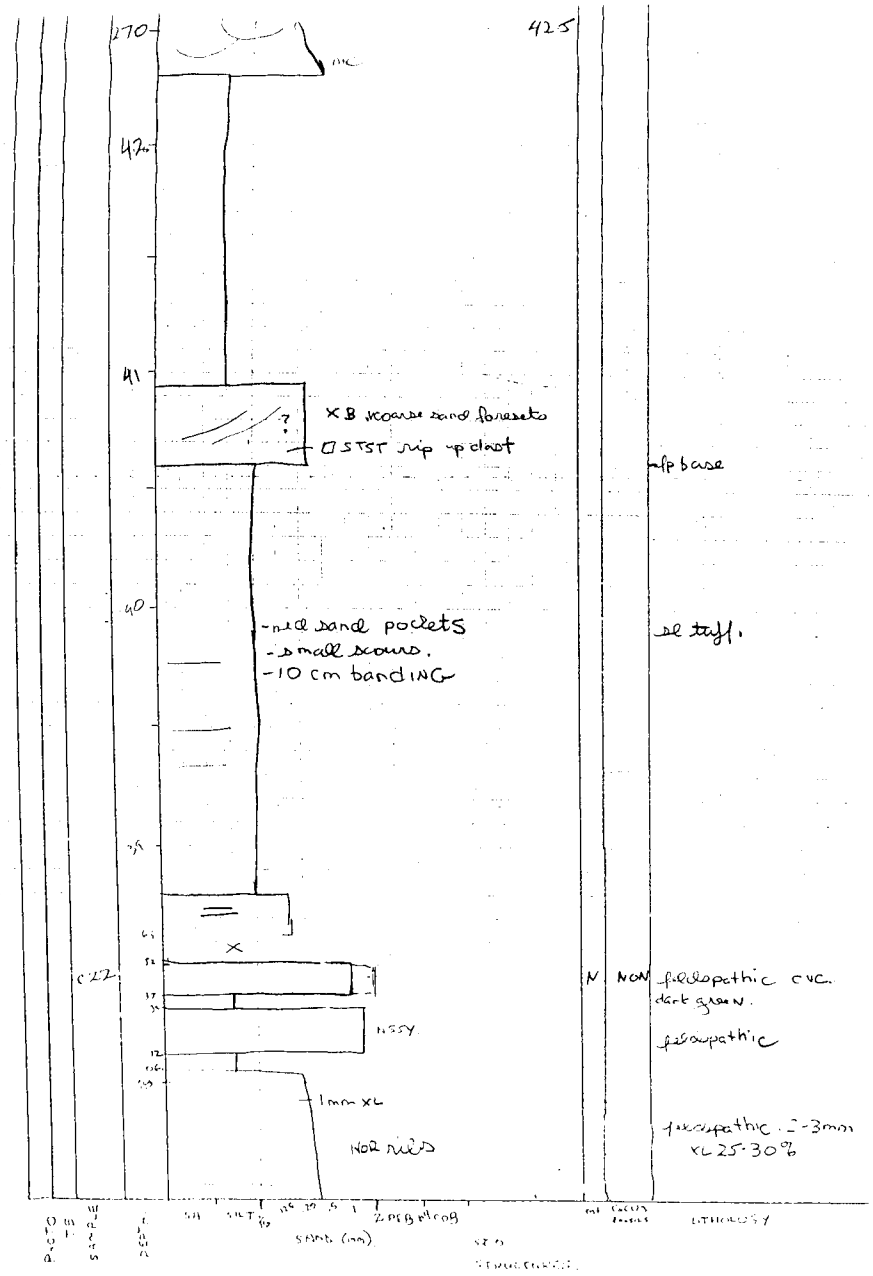

295
777-779
11.5
CSTST.
HOR. mt
HOR LAM CONTACTS.
MCSTST
St
10cm
PTXB.
HOR LAM.
w/ DD HOR LAM.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

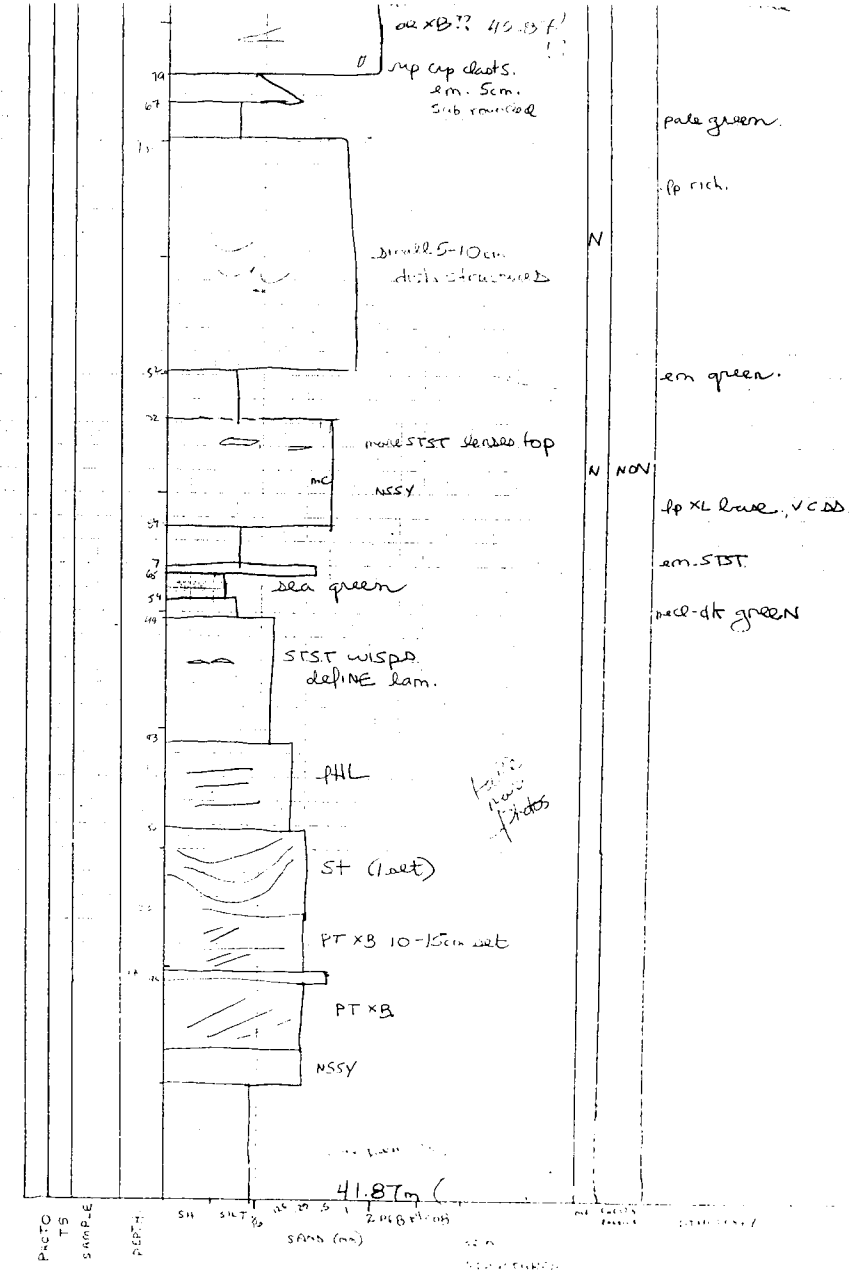

cu c
N55V.
-scoured sTST filled
-ss pools.
HOR ripples.
STST ripple drape
3ST HOCW
2 HOR mt streaks
cu
C20
N
N
N
sl
SH SILT VF F M C VC 2 PEBBLES COBB
SAND (mm)
LITHOLOGY
GRAIN SIZE /STRUCTURES

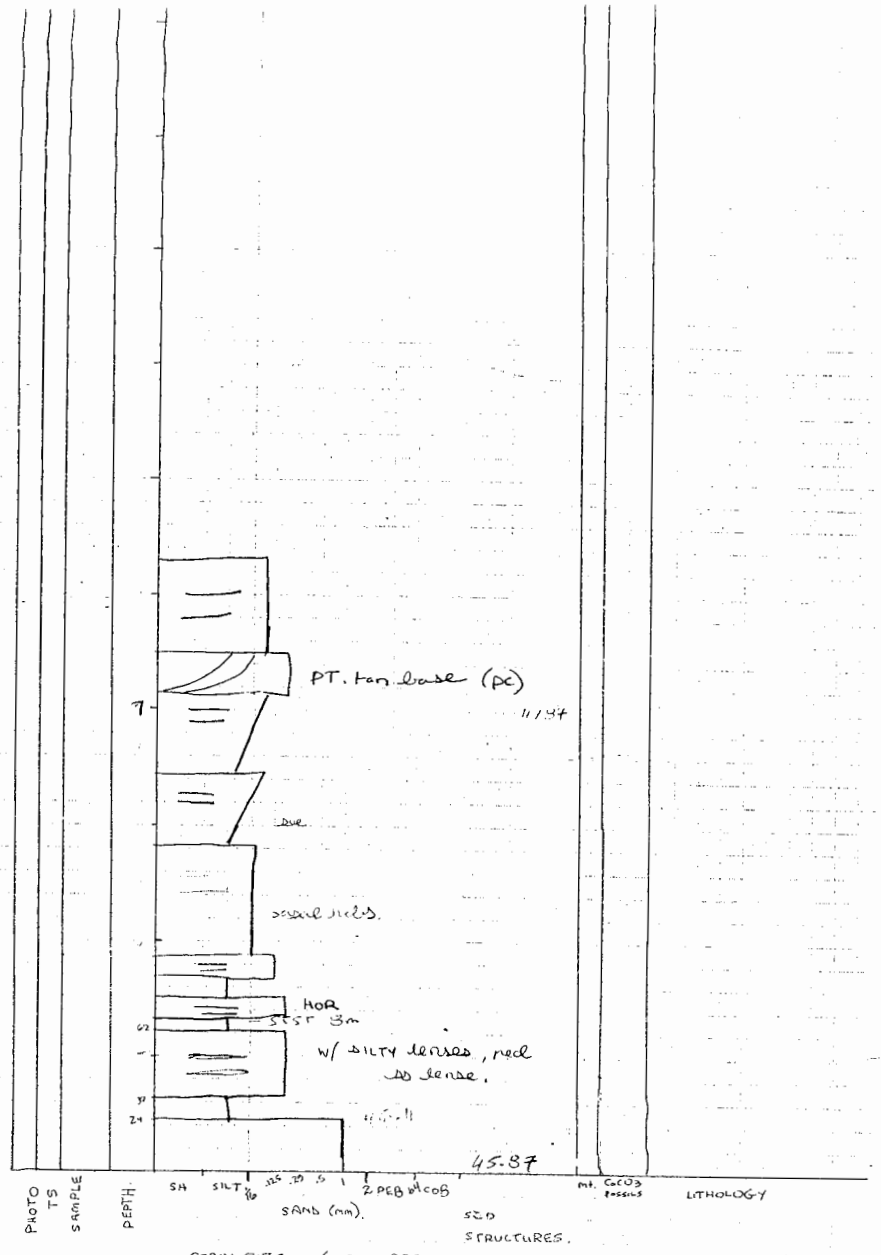

HOR. cl.
HOR.
1-2cm v.f sand bands top 20cm
SAND UP
HOR ripples
C21
N NON
SH SILT VF F M C VC 2 PEBBLES COBB
SAND (mm)
LITHOLOGY
GRAIN SIZE /STRUCTURES

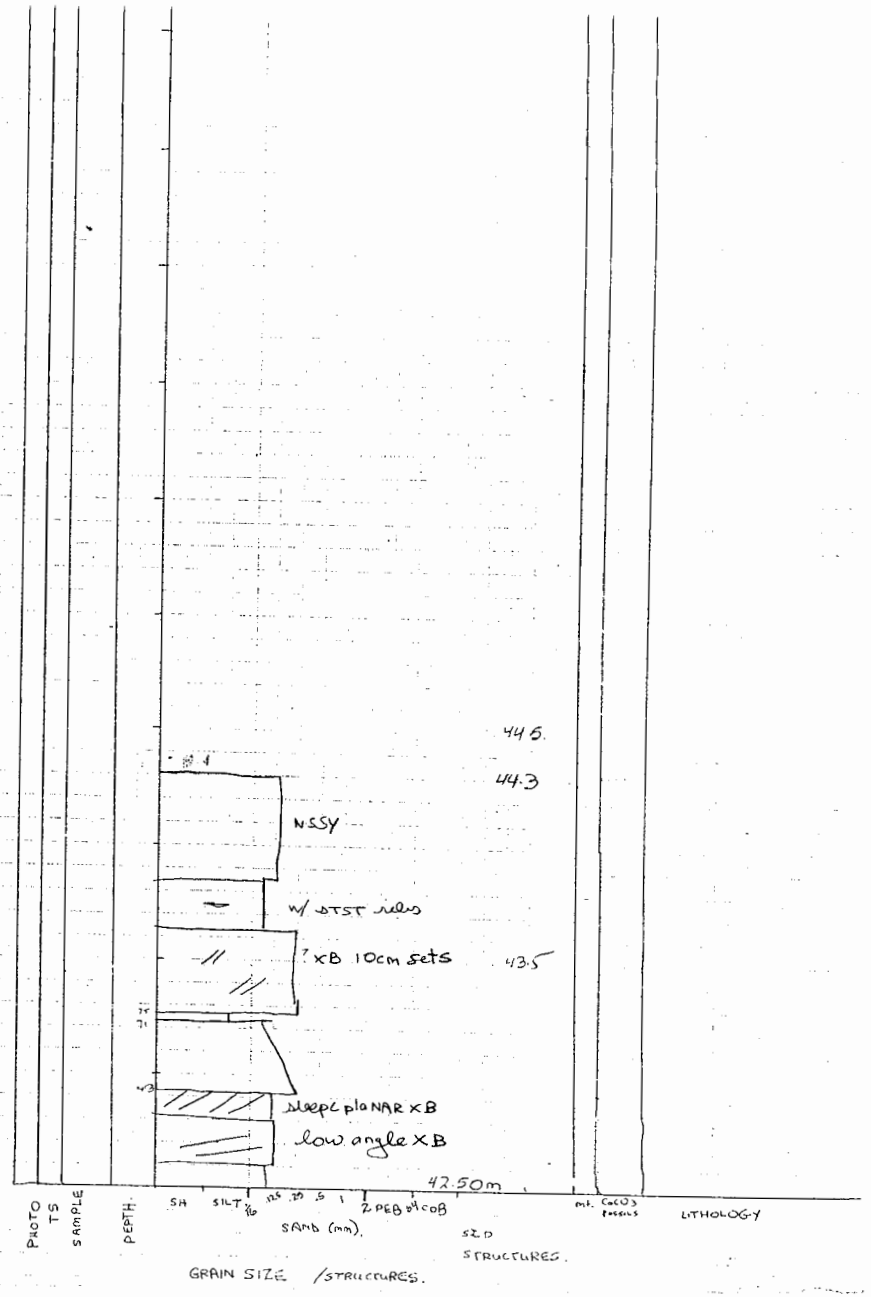

260
32.5
tuff v f SSST
with WTH.
sl tuff.
SSST. red-light green.
sl. tuff.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEBBLES
COBB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

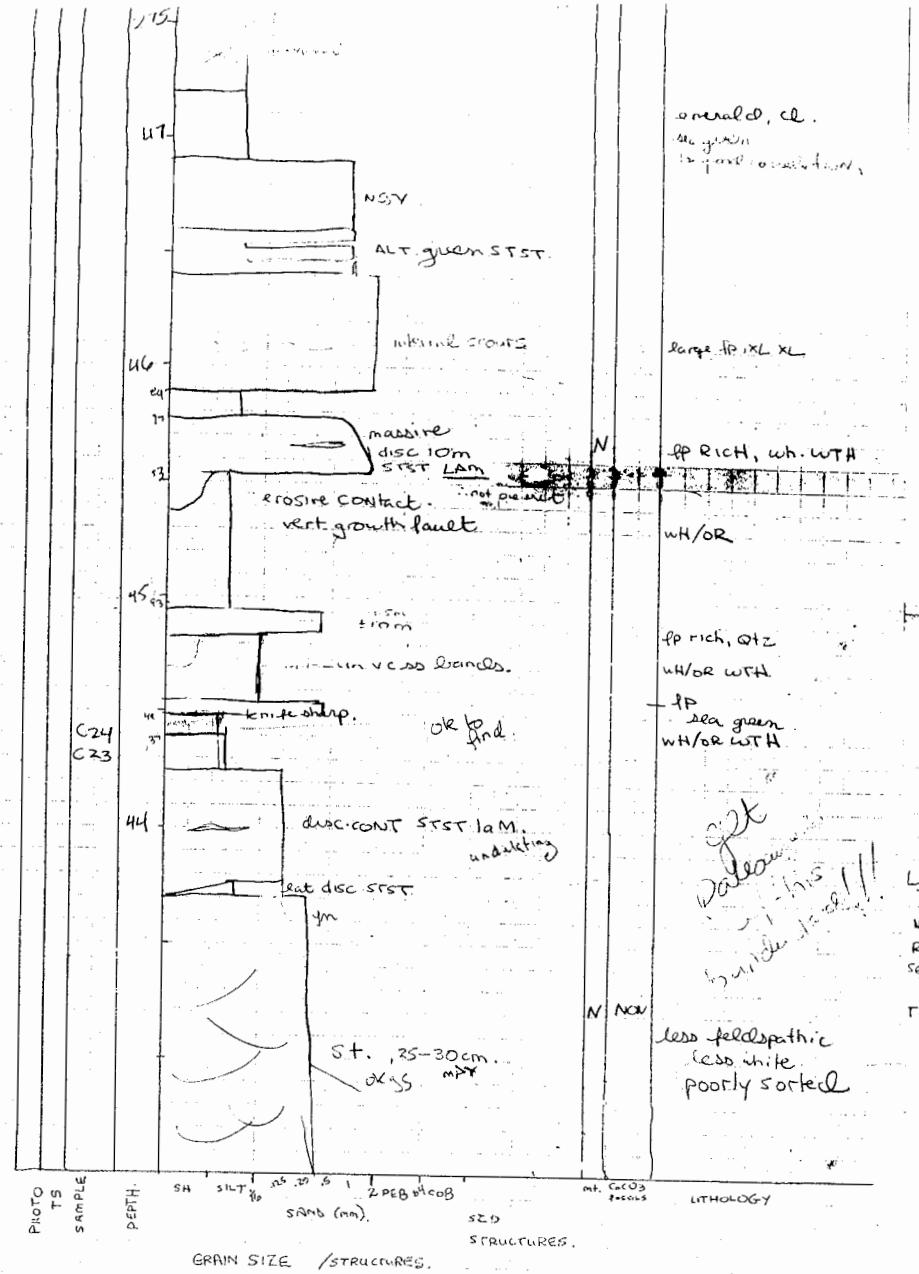

265
HOR ribs
2-3mm XL.
CVCSS
SH
SSST HOR.
high angle lam
high angle SH
tuffite
red sand bands toward top
(ST a v f-VCS and bands).
cl top
small scale XB.
sl tuff.
sl. tuff.
sl. dust
siliceous dust.
mc lpSS
3.75
N
NON
feldspathic
tuff dust
sl tuffaceous.
-lp XL red sand band
tuffaceous
WH WTH
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEBBLES
COBB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

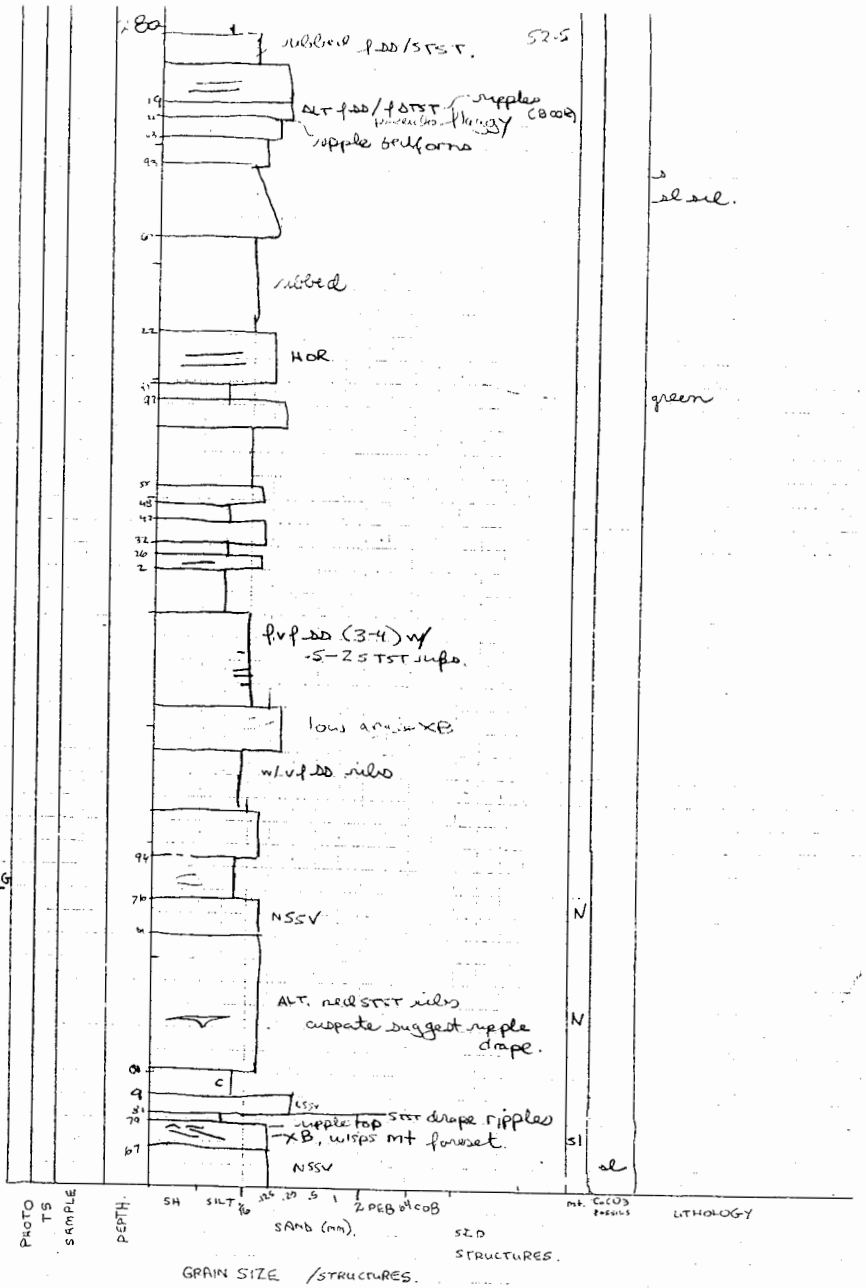

425
mc
XB coarse sand foresets
STST rip up clast
-mtd sand pockets
-small scours.
-10 cm banding
fp base
sl tufl.
fp rich.
pale green.
em green.
fp XL lvae., v c ss.
em. STST
med-dk green
N
NON
fibropathic cvc.
dark green.
fibropathic
NSSY
1mm XL
NOR nids
fibropathic 2-3mm
XL 25-30%
SAMP. (mm)
LITHOLOGY

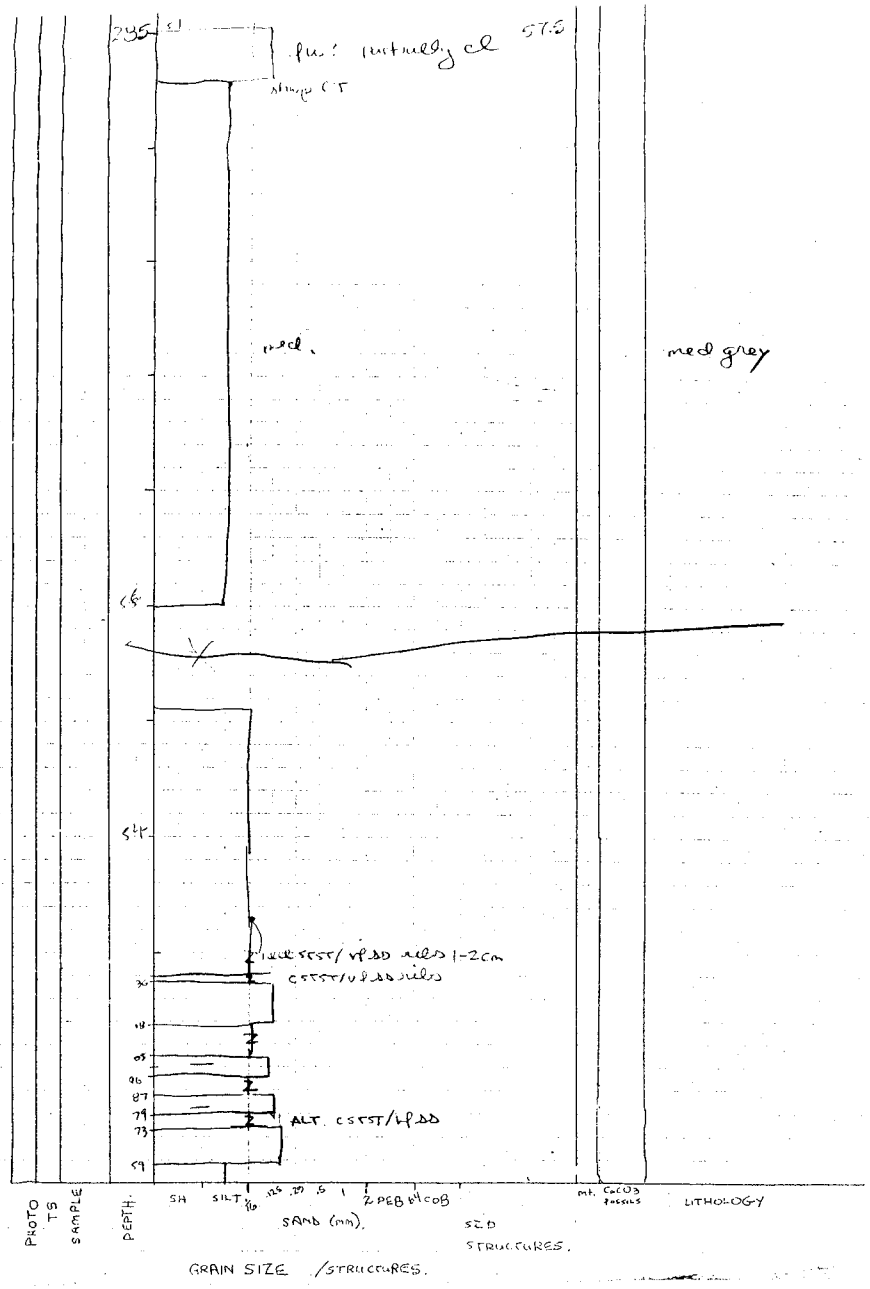

or XB?? 42.8 ft
rip up clasts.
em. 5cm.
sub rounded
Small 5-10cm
dish structures
mod STST lenses top
NSSY
sea green
STST wisps
define lam.
PHL
St (1 set)
PT XB 10-15cm set
PT XB
NSSY
41.87m
SAMP. (mm)

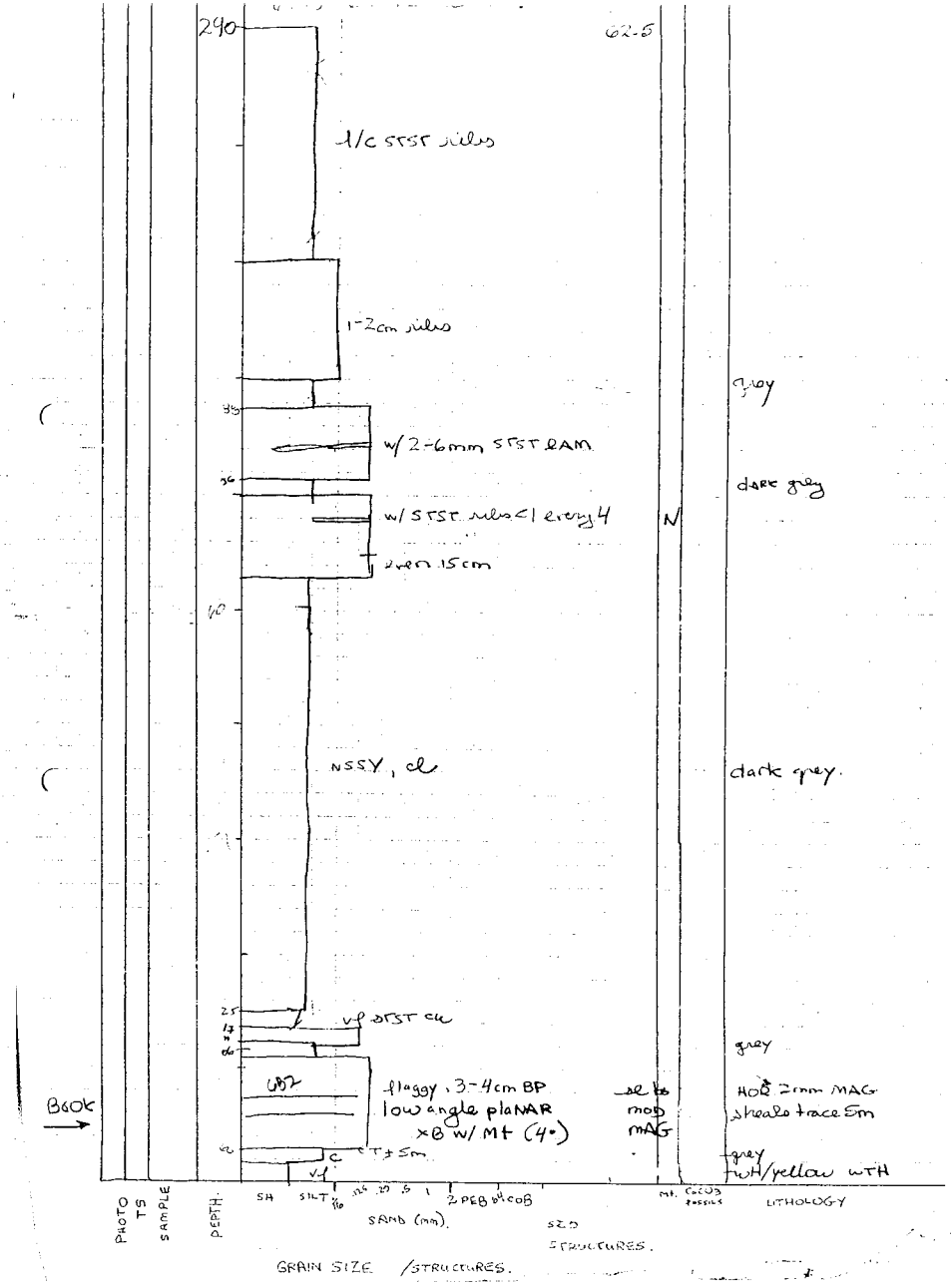

PT. fan base (pc)
11/97
HOR
STST 3m
w/ SILTY lenses, red
45.87
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

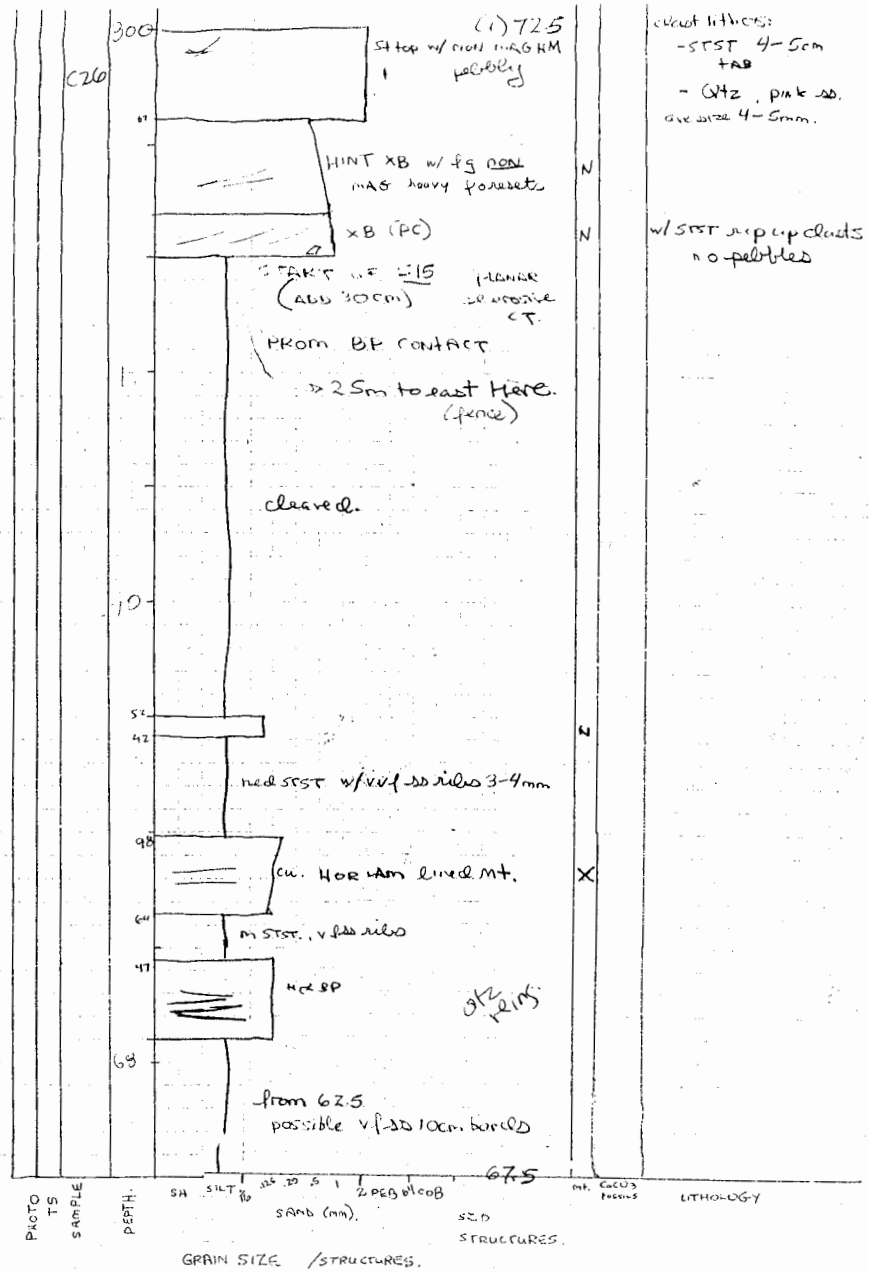

44.5
44.3
NSSY
w/ STST lens
7 xB 10cm sets
43.5
steepl planar xB
low angle xB
42.50m
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

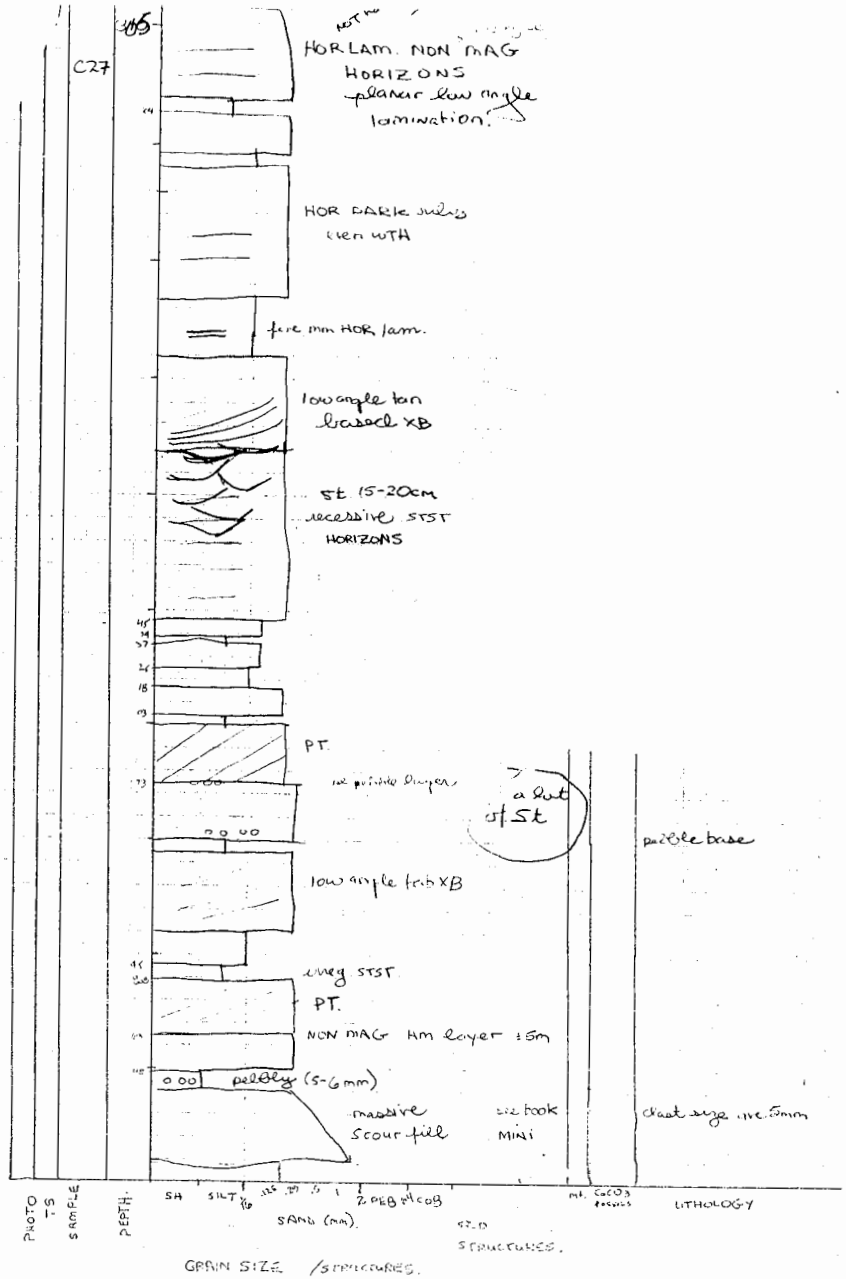

NSSV
ALT. green STST.
massive disc 10m STST LAM
erosive contact. vert. growth fault.
±10m
knife sharp.
C24
C23
44
disc. cont STST lam. undulating
flat disc STST
St. ,25-30cm.
LITHOLOGY
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
GRAIN SIZE /STRUCTURES.

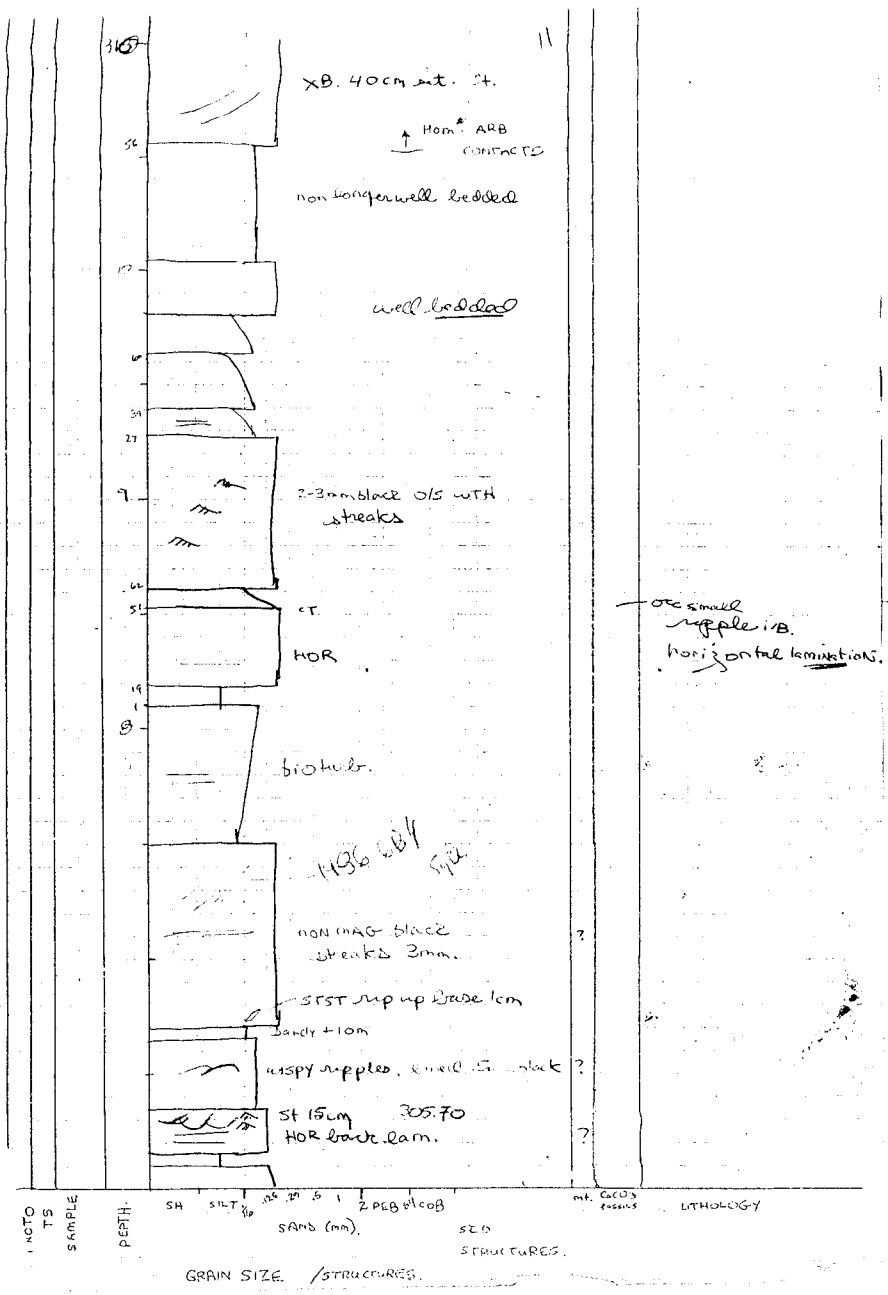

NSSV
ALT fSS/fSTST
ripples
ripple bedforms
ribbed
HOR
fvf SS (3-4) w/ -5-25 TST lnfs.
low angle XB
w/ vf SS ribs
NSSV
ALT. ned STST ribs
cuspate suggest ripple drape.
ripple top STST drape ripples
XB, wisps mt foreset.
NSSV
LITHOLOGY
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
GRAIN SIZE /STRUCTURES.

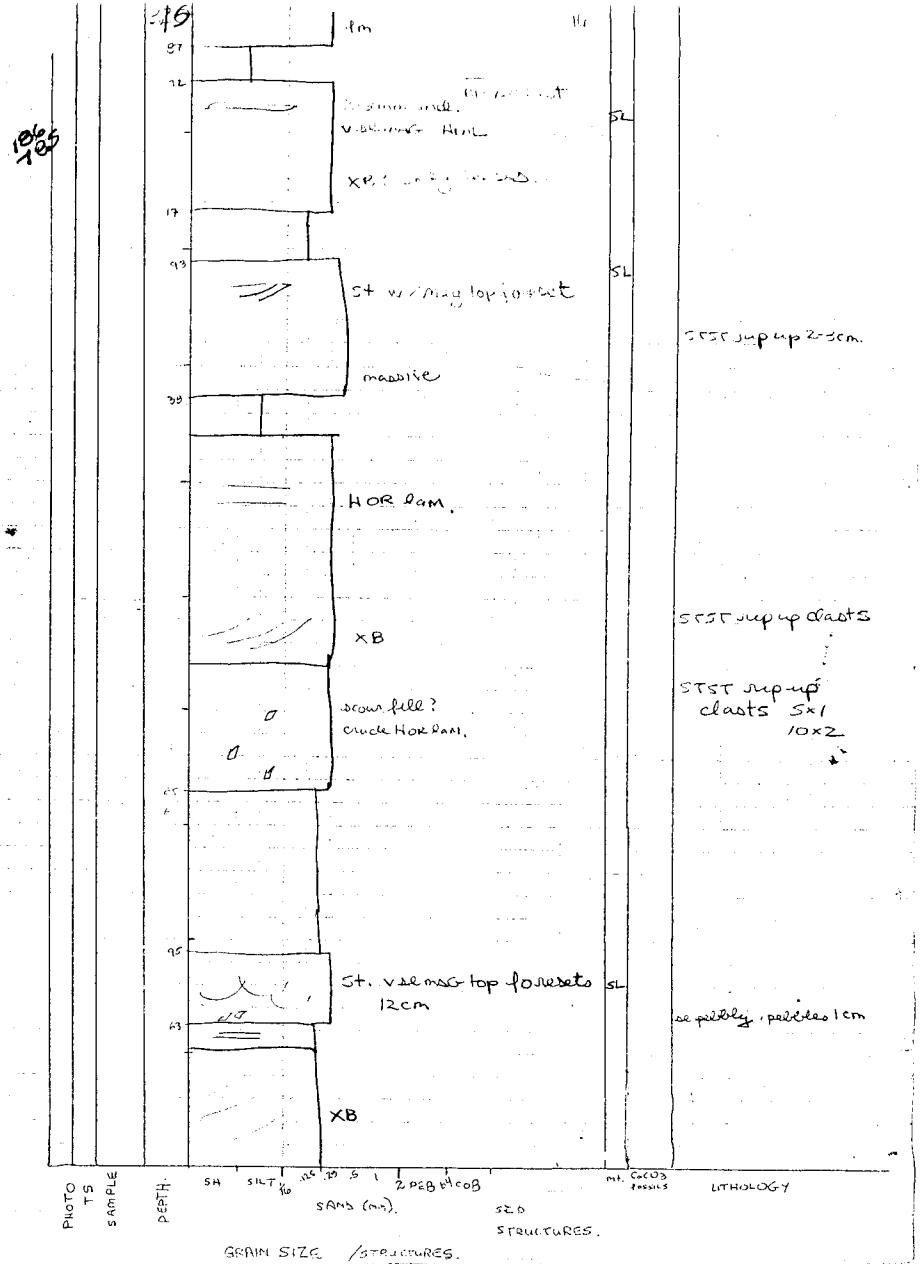

235
57.5
flu? intmdly cl
sharp CT
med.
med grey
64
54
vf sstst/vfSD wlbs 1-2cm
cSTST/vfSD wlbs
ALT. cSTST/LFSD
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2
PEB
CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

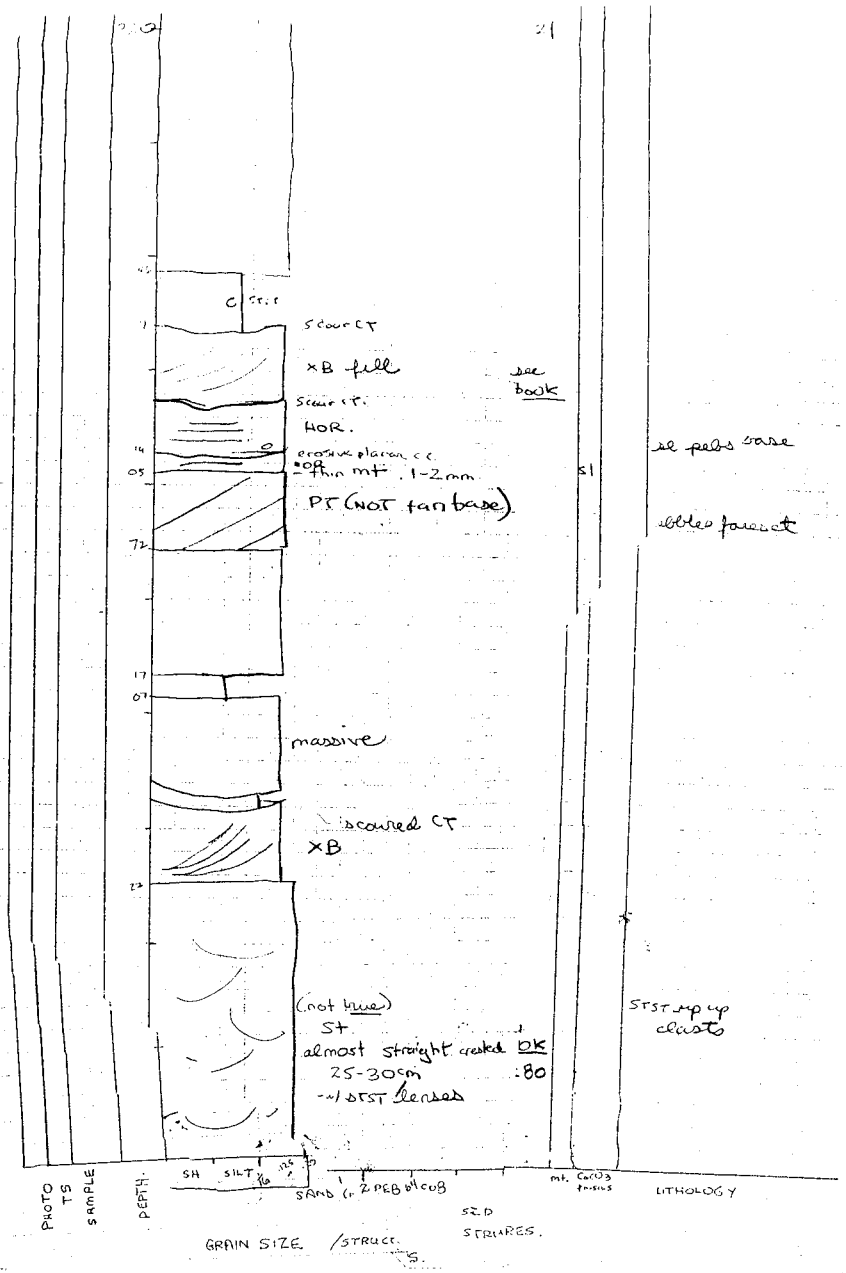

240
62.5
1/c sstst wlbs
1-2cm wlbs
grey
w/ 2-6mm sstst lam
dark grey
w/ sstst wlbs <1 every 4
N
even 15cm
NSSY, cl
dark grey.
vf sstst cl
grey
BIOT 2mm MAG
shrubs trace Fm
mod MAG
grey tuff/yellow wTH
BIOK
flaggy, 3-4cm BP
low angle planar
xB w/ Mt (4°)
CT ± 5m
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2
PEB
CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

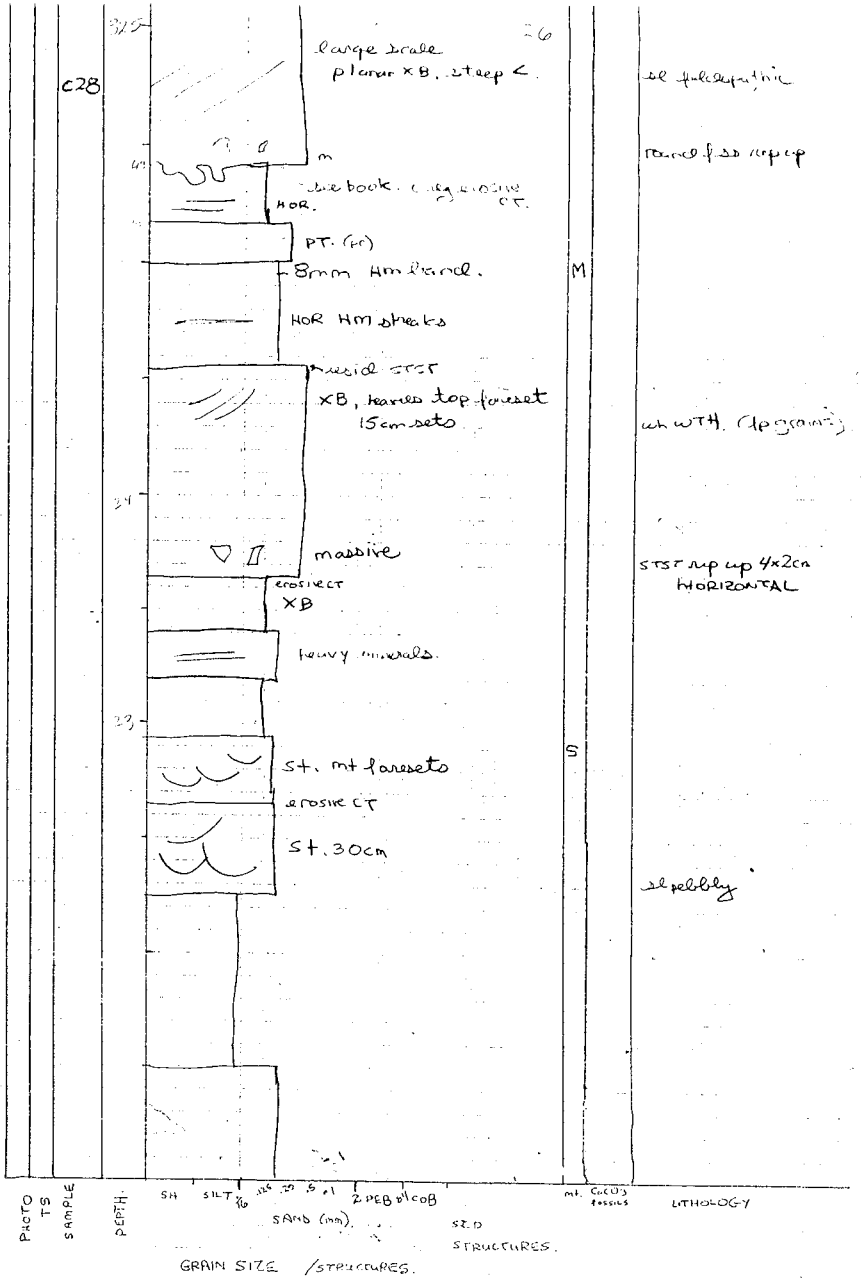

C25 Heating terrace ~SST.
C26
(1) 725
St top w/ mon mAG HM pebbly
HINT XB w/ fg non mAG heavy forsets
xB (PC)
START of ~15 (ABS 30cm)
planar to recessive CT.
from BF contact
≈ 2.5m to east Here. (fence)
cleaved.
med SSST w/ v-f SS ribs 3-4mm
cu. HOR LAM lined Mt.
m SSST., v f SS ribs
HOR BP
from 67.5 possible v f-SS 10cm. bored
67.5
Chert lithics: -SSST 4-5cm TAB
- Qtz, pink ss. Gve size 4-5mm.
w/ SSST ripup clasts no pebbles
PROTO T-S SAMPLE DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

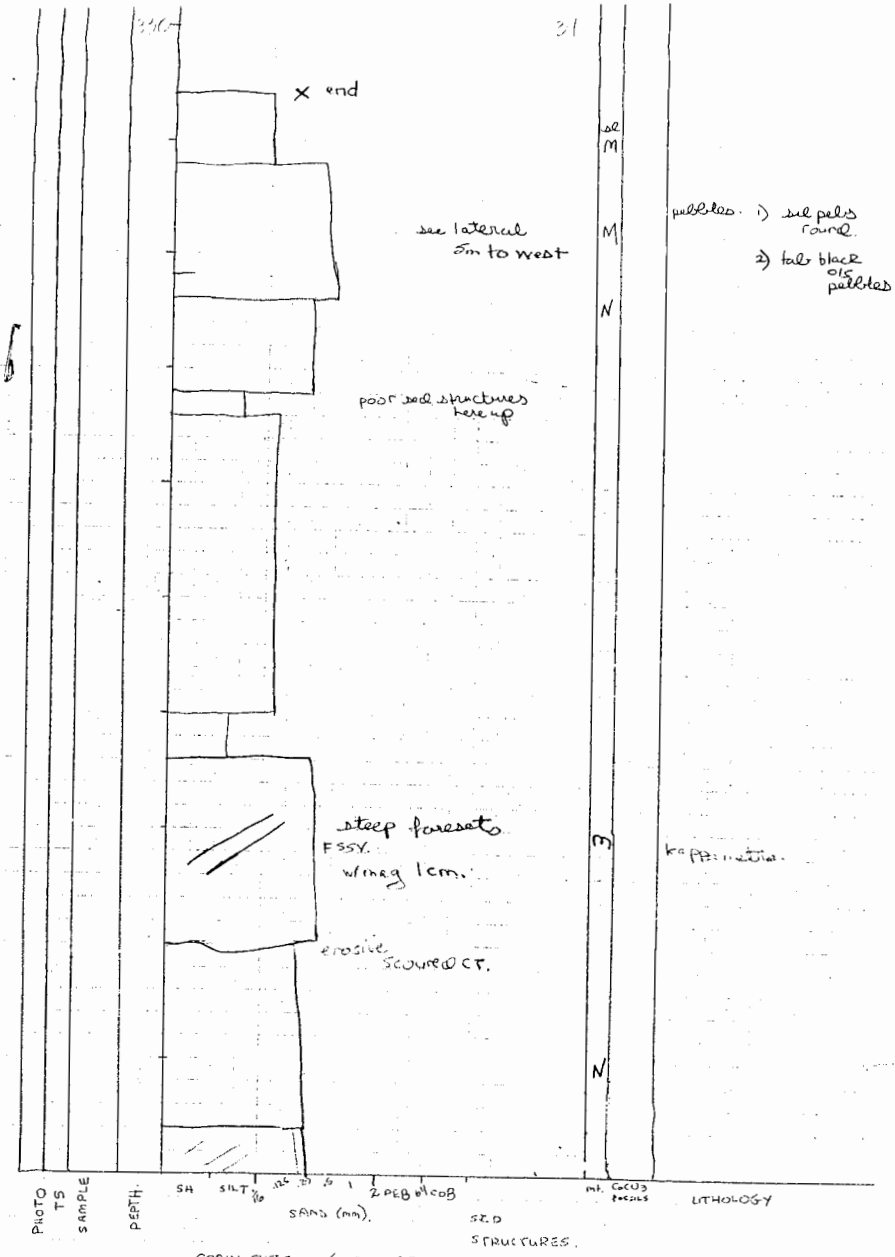

C27
HOR LAM. NON mAG HORIZONS planar low angle lamination.
HOR PARTIC LAMS then WTH
fine mm HOR lam.
low angle tan braced XB
St 15-20cm recessive SSST HORIZONS
PT.
a lot of St
pebble base
low angle trib XB
wvy SSST
PT.
NON mAG Hm layer ~5m
pebbly (5-6mm)
massive scour fill
v.c hook MINI
clast size ave. 5mm
PROTO T-S SAMPLE DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

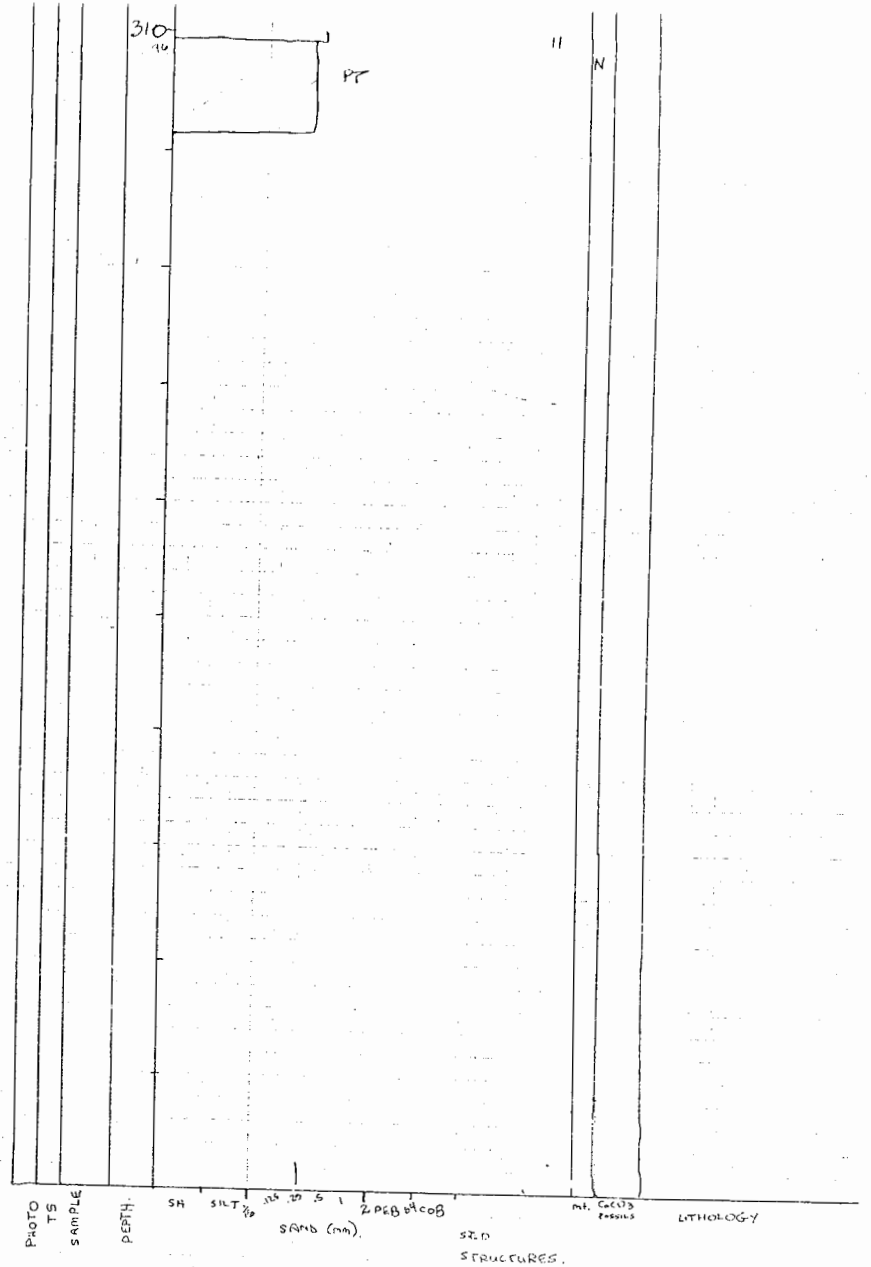

XB. 40cm set. sf.
Hom. ARB contacts
non tonper well bedded
well bedded
2-3mm black O/S with streaks
cf.
HOR
bioturb.
non mag black streaks 3mm.
STST up up base 1cm
sandy +10m
wispy rippled, cuneif. S. black ?
St 15cm
HOR base lam.
occ small ripple i/B.
horizontal lamination.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

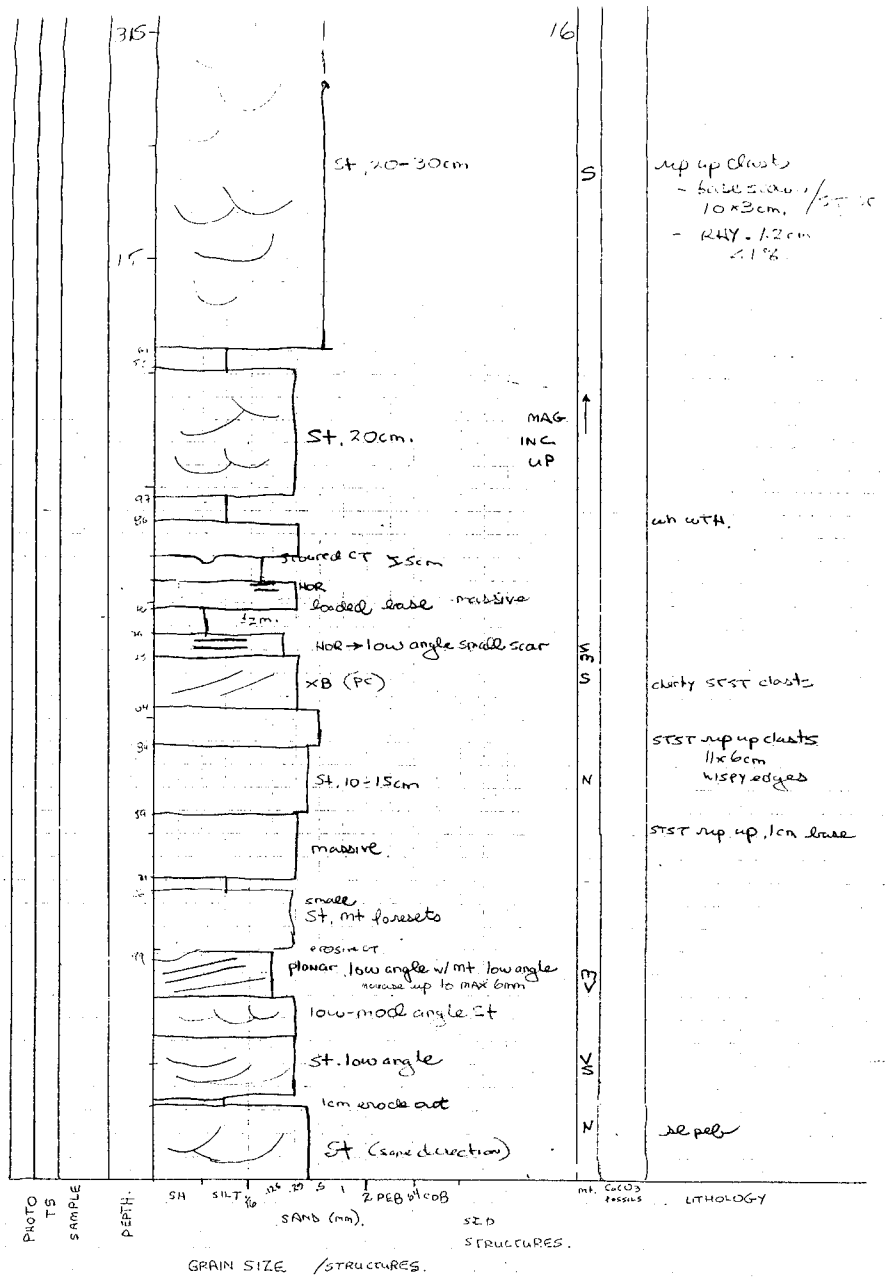

1m
XB
St w/ mag top foreset
massive
HOR lam.
XB
scour fill?
cf. HOR LAM.
St. v sl mag top foresets
12cm
XB
STST sup up 2-3cm.
STST sup up clasts
STST sup up clasts 5x1
10x2
sl pebbly, pebbles 1cm
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

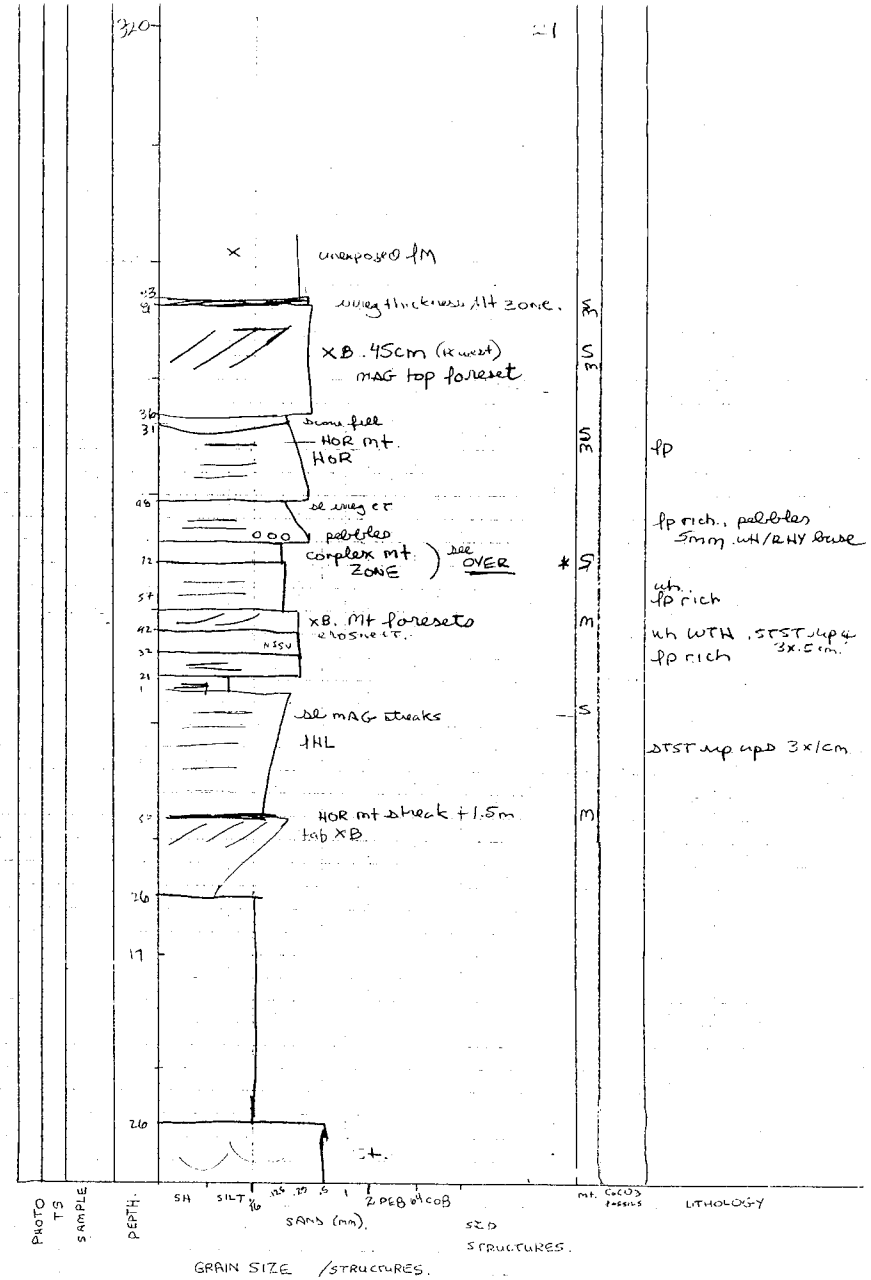

21
scour CT
xB fill
see book
scour CT
HOR.
erosive planar CT
thin mt. 1-2mm
PT (NOT tan base)
massive
scoured CT
xB
(not true)
St
almost straight crested OK
25-30cm :80
w/ STST lenses
sl pebs sand
ebbed foreset
STST mp up clasts
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
mt.
CaCO3 fossils
LITHOLOGY
SED STRUCTURES
GRAIN SIZE /STRUCTURES

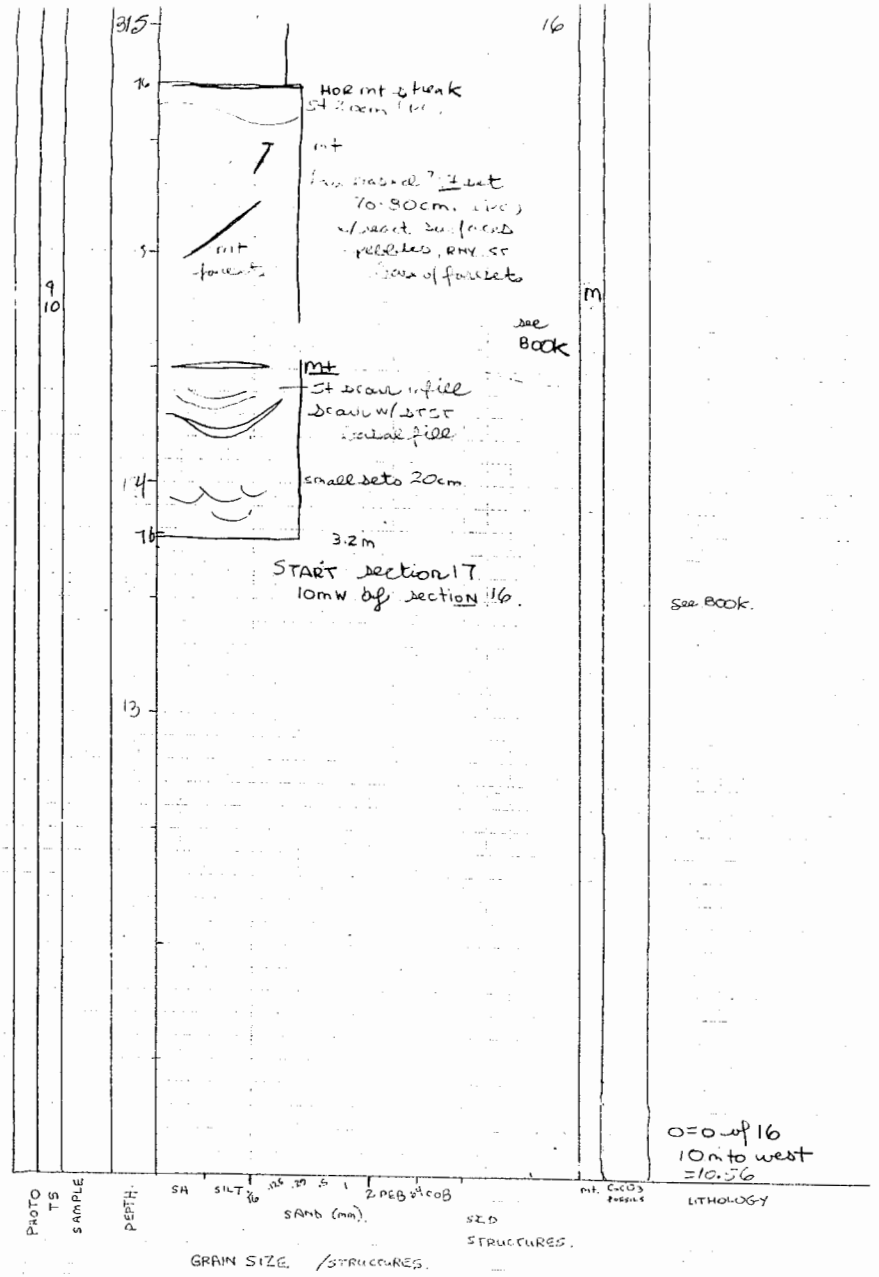

C28
26
large scale planar xB, steep <
sl hellepathic
m
rounded fs ripup
see book. (big erosive CT.
HOR.
PT. (ff)
8mm Hm lamel.
M
HOR Hm streaks
scour CT
xB, leaved top foreset 15cm sets
wh WTH. (ripgrain)
massive
STST mp up 4x2cm HORIZONTAL
erosive CT
xB
heavy minerals
St. mt foresets
erosive CT
St. 30cm
sl pebbly
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
mt.
CaCO3 fossils
LITHOLOGY
SED STRUCTURES
GRAIN SIZE /STRUCTURES

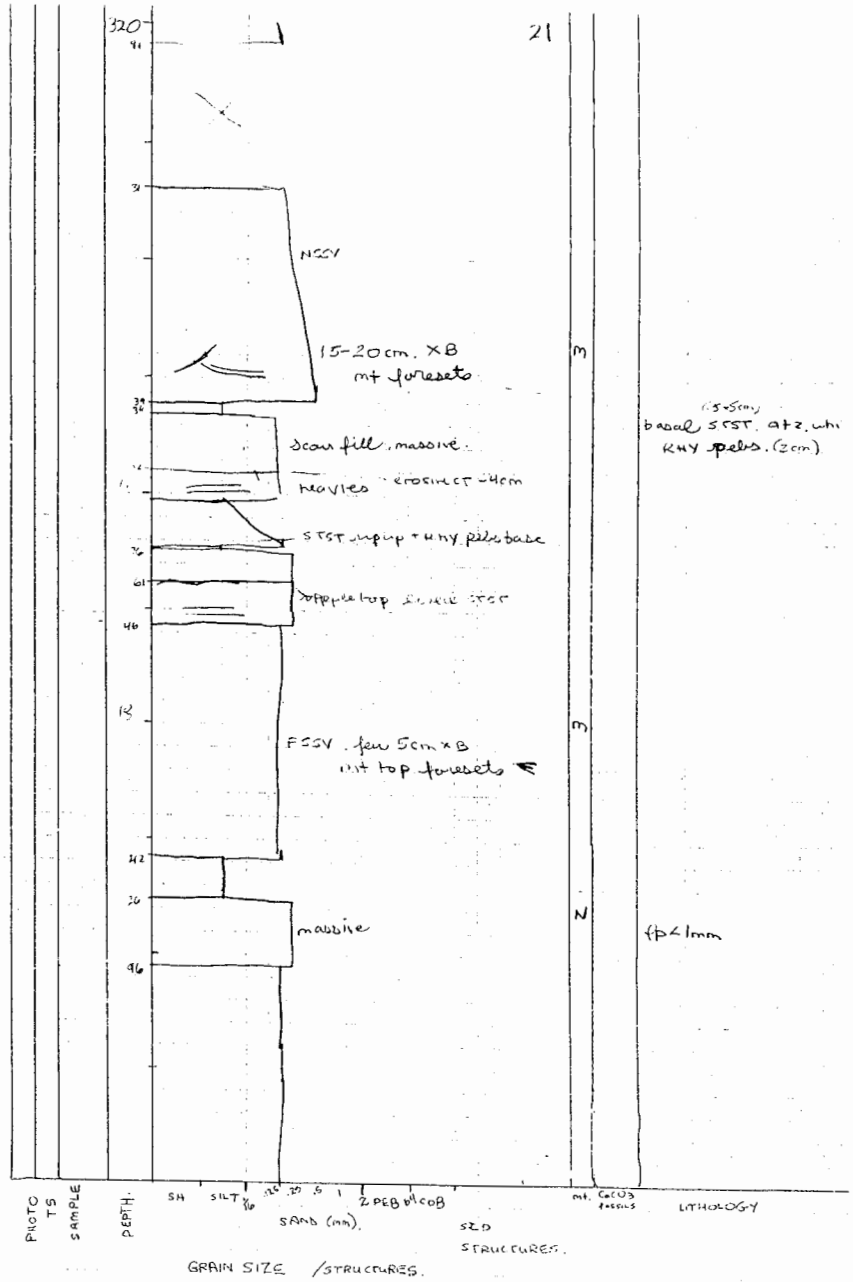

330
31
× end
see lateral 5m to west
poor sed structures here up
steep foreset FSSY. w/mag 1cm.
erosive SCOURED CT.
pebbles: 1) sil pebs round. 2) tab black ols pebbles
kappa-matrix
M
M
N
S
N
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

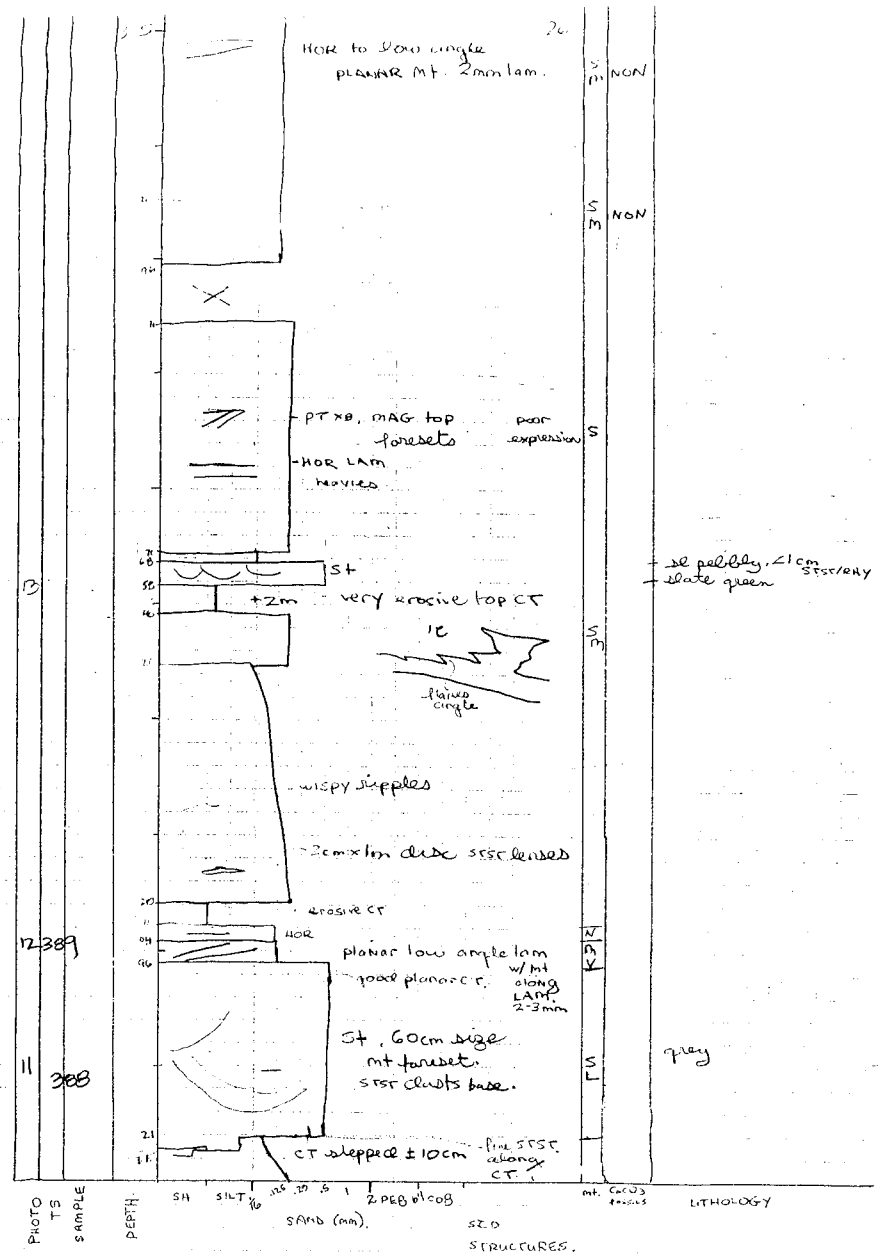

310
PT
11
N
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

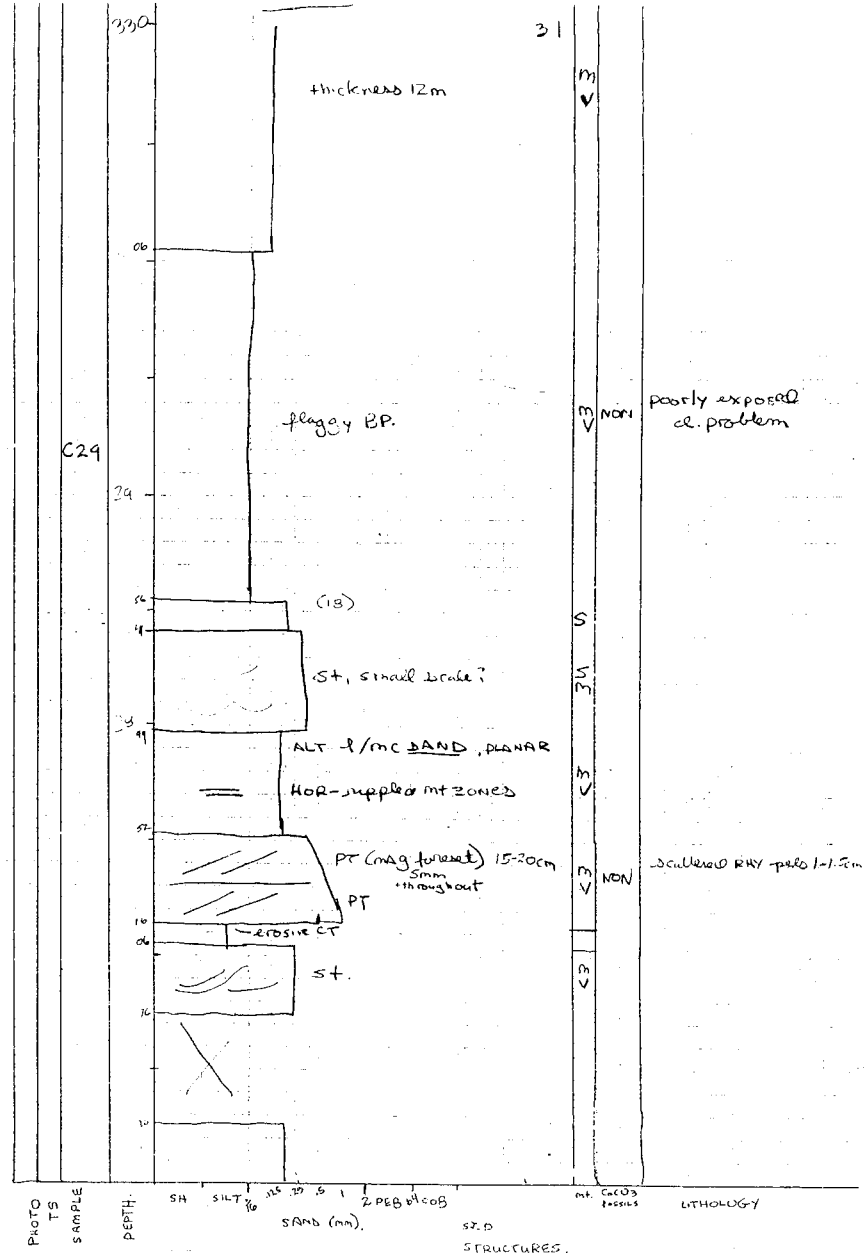

315
16
17
St, 20-30cm
St, 20cm.
MAG INC UP
coloured CT 15cm
HOR
loaded base
massive
1cm.
HOR → low angle small scar
xB (PC)
St, 10-15cm
massive
small St, mt foresets
ripple CT
planar low angle w/ mt low angle increase up to MAX 6mm
low-mod angle St
St. low angle
1cm erode out
St (same direction)
rip up clasts
- [illegible] 1/3 of
10×3cm.
- RHY - 1.2cm
<1%
wh wTH.
clusty SFST clasts
SFST rip up clasts
11×6cm
wispy edges
SFST rip up, 1cm base
sl peb
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

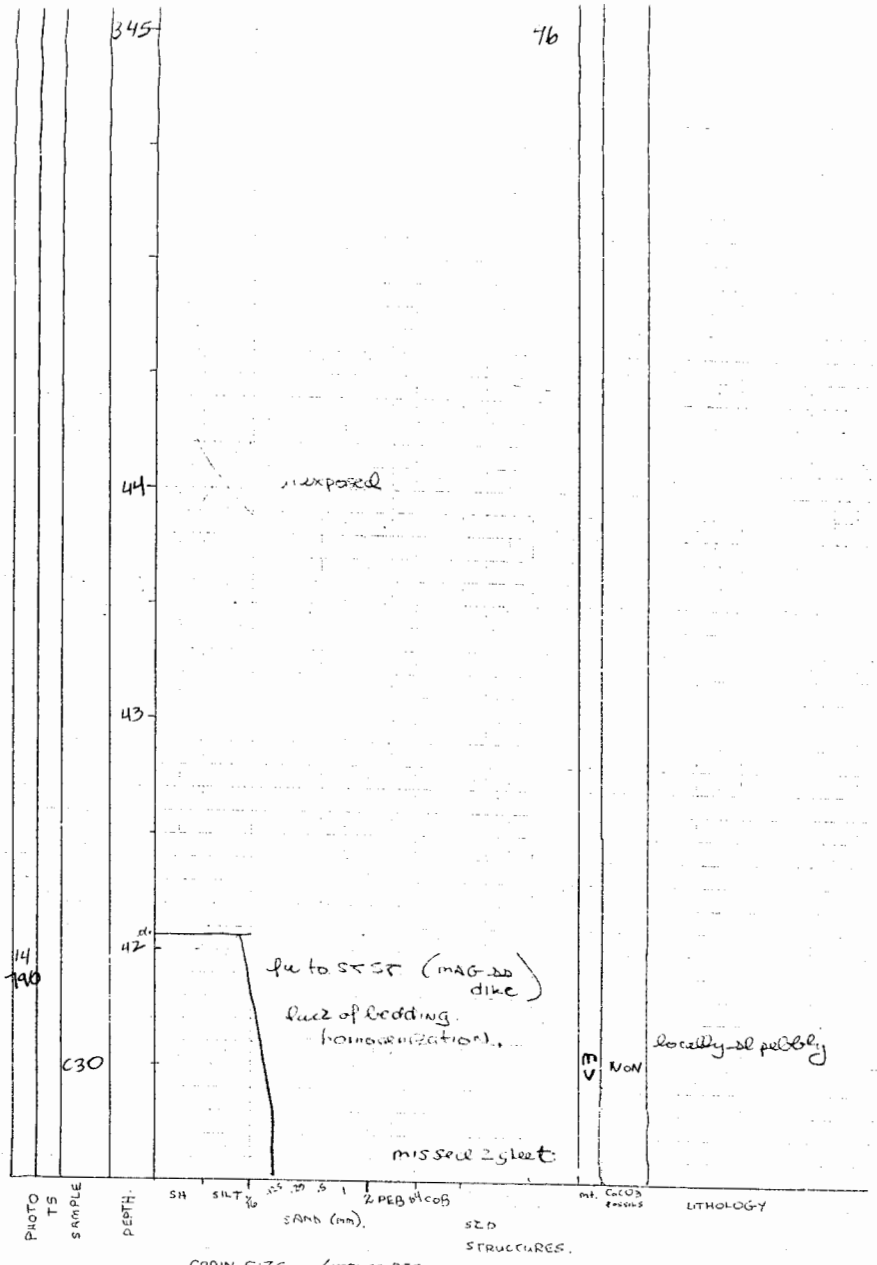

320
21
unexposed fM
wedge thickness /Mt zone.
xB. 45cm (K west)
MAG top foreset
base flat
HOR mt.
HOR
sl wedge CT
pebbled
complex mt. zone
see OVER
xB. Mt foresets
E/SE CT.
NISV
sl MAG streaks
THL
HOR mt streak +1.5m
tab xB.
St.
fp
fp rich., pebbles 5mm wh/RHY base
wh. fp rich
wh WTH. SFST rip up 3x.5cm.
fp rich
SFST rip ups 3x1cm
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


16
315
HOR int & trunk
54 2 cm (1m)
int
mt
foresets
70-90cm. thick
w/ erosional
pebbled, RHY. ST
base of foresets
see
Book
mt
St scour infill
scour w/ SFST
basal fill
small sets to 20cm
3.2m
START section 17
10m W of section 16.
See Book.
0=0 of 16
10m to west
=10.56
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES
GRAIN SIZE /STRUCTURES

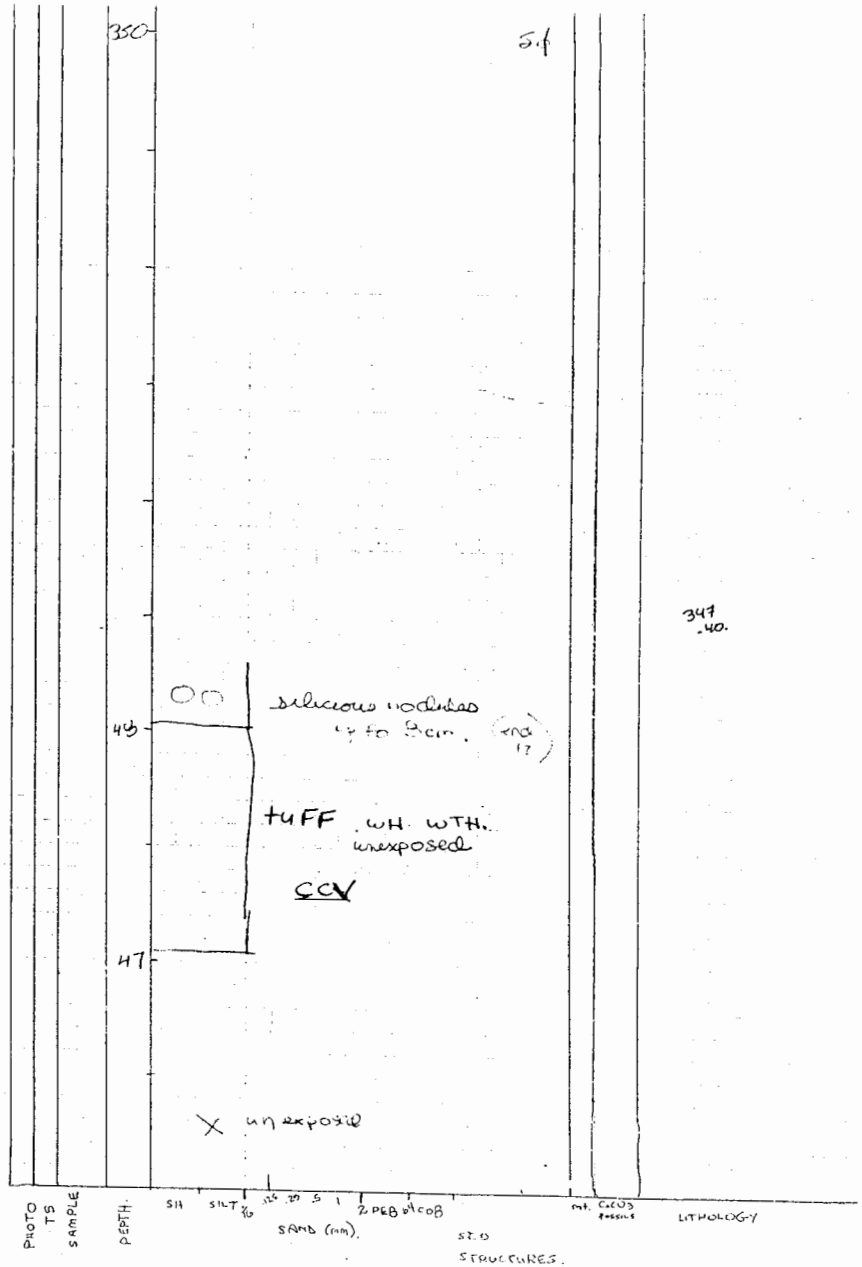

21
320
NSSV
15-20cm. XB
mt foresets
scour fill, massive
(15-35cm)
basal SFST. qtz. wh
RHY pebs. (2cm)
wavies erosional 4cm
SFST w/ up + RHY pebs base
FSSV. few 5cm XB
int top foresets
massive
fp<1mm
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES
GRAIN SIZE /STRUCTURES


26
HOR to low angle PLANAR Mt. 2mm lam.
NON
NON
PT xB, MAG top foresets
poor expression
HOR LAM
wavies
St
+2m
very erosive top CT
pebbly, <1cm SFSS/RHY
slate green
wispy ripples
2cm x 1cm disc SFSS lenses
erosive CT
HOR
planar low angle lam w/ mt along LAM 2-3mm
good planar CT
St, 60cm size mt foreset.
SFST clasts base.
gray
CT stepped ±10cm
fine SFST along CT
12389
11
388
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.


31
thickness 12m
C29
flaggy BP.
poorly exposed cl. problem
(18)
St, small trough?
ALT f/mc SAND, PLANAR
HOR-rippled mt zones
PT (mag foreset) 15-20cm
5mm throughout
PT
erosive CT
St.
scattered RHY peb 1-1.5cm
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.



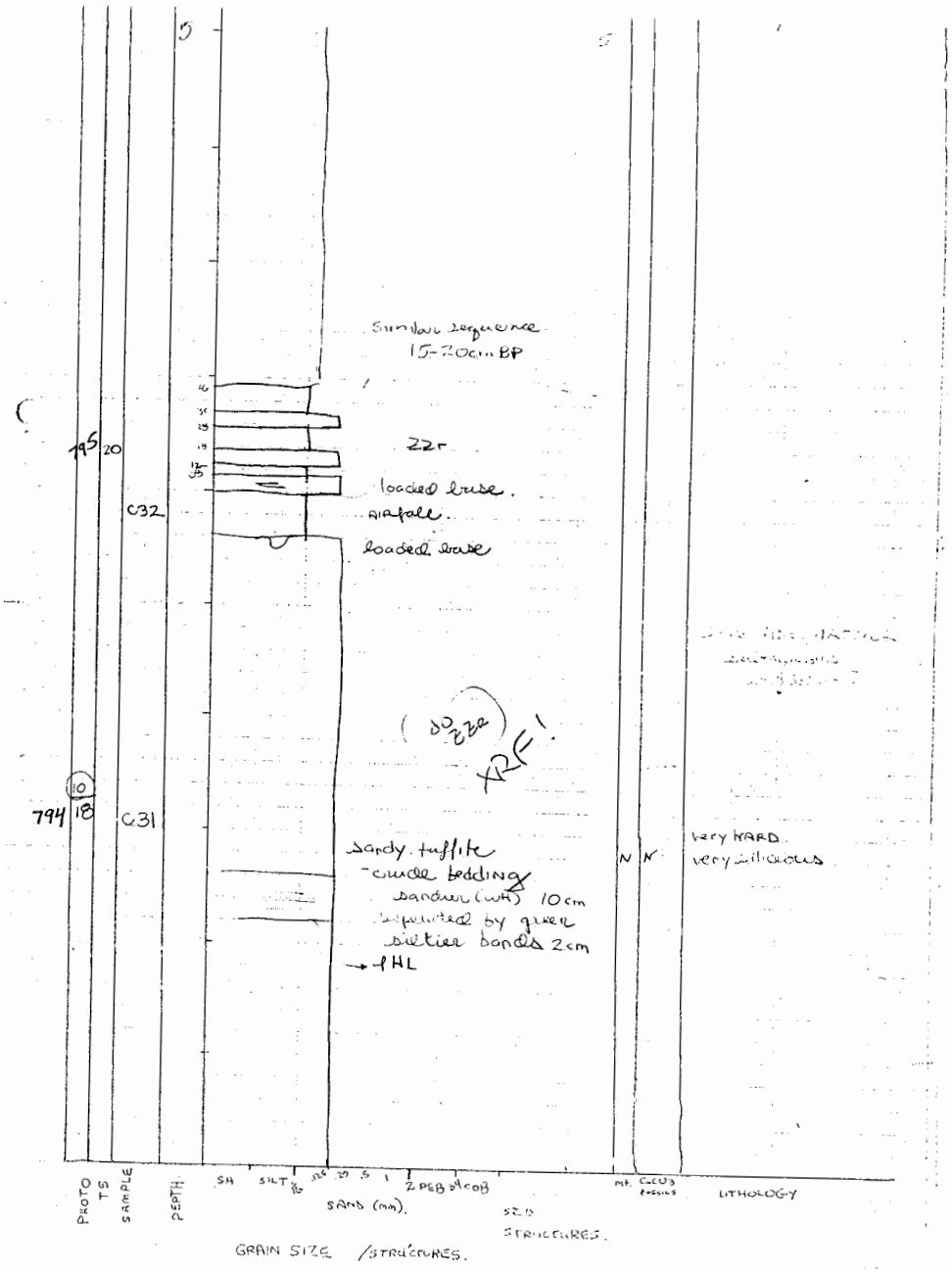
GRAIN SIZE /STRUCTURES.

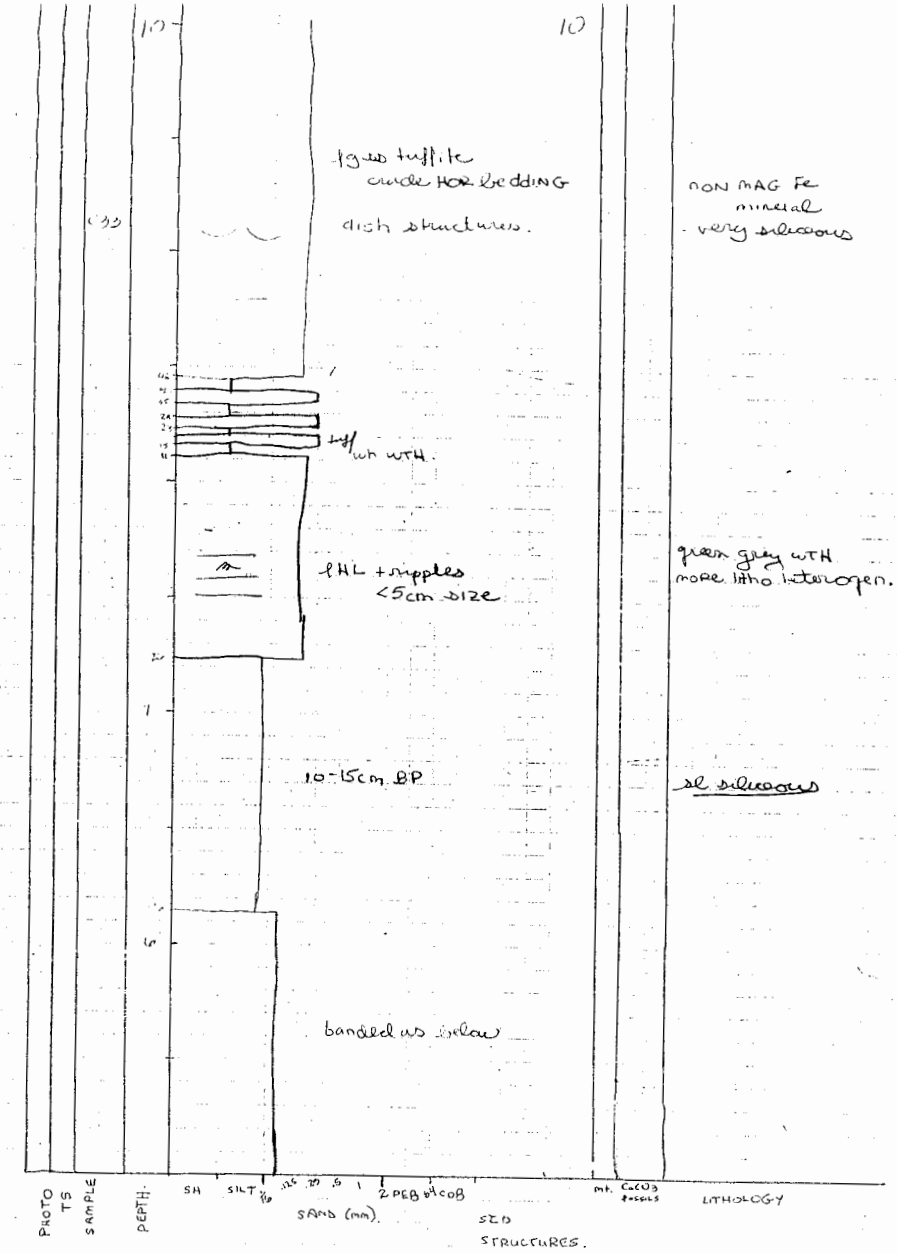


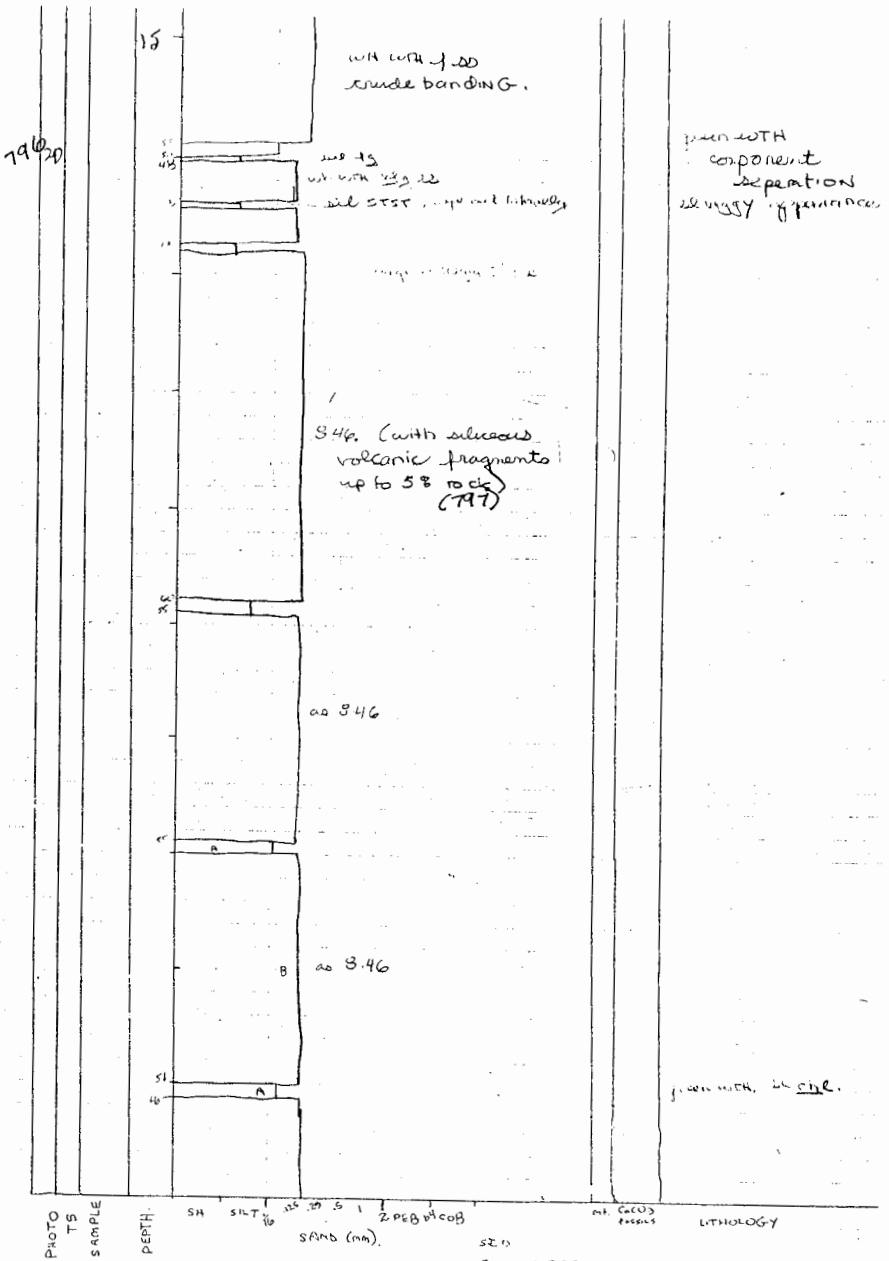
GRAIN SIZE /STRUCTURES.

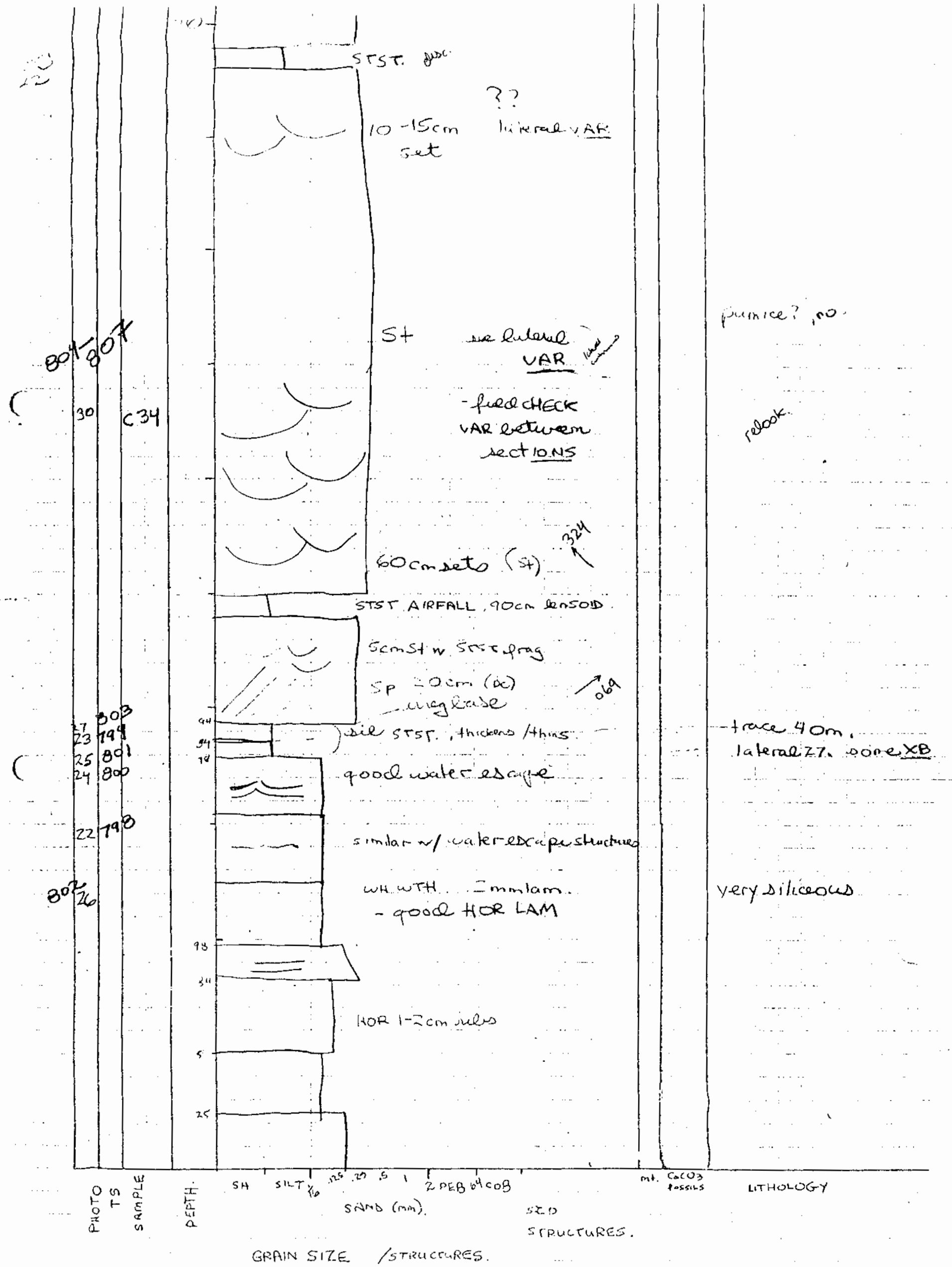
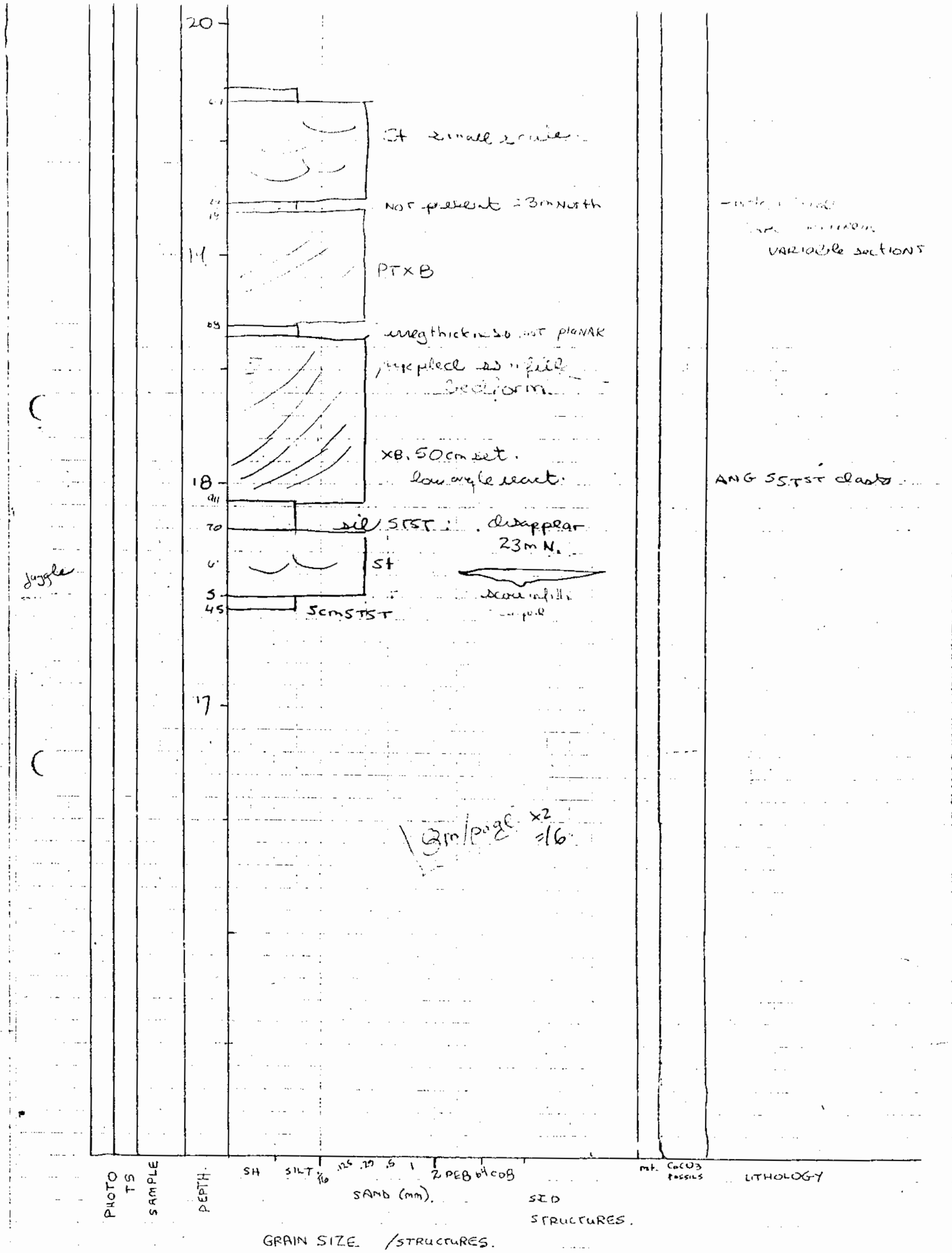
SECTION C2

SECTION C2 LOCATION: Locate stratigraphically lowest exposures of sandstone in SE corner of Tryfan Anticline. Section proceeds to ESE over Dduegwm ridge until Gwern Gof Tuff.

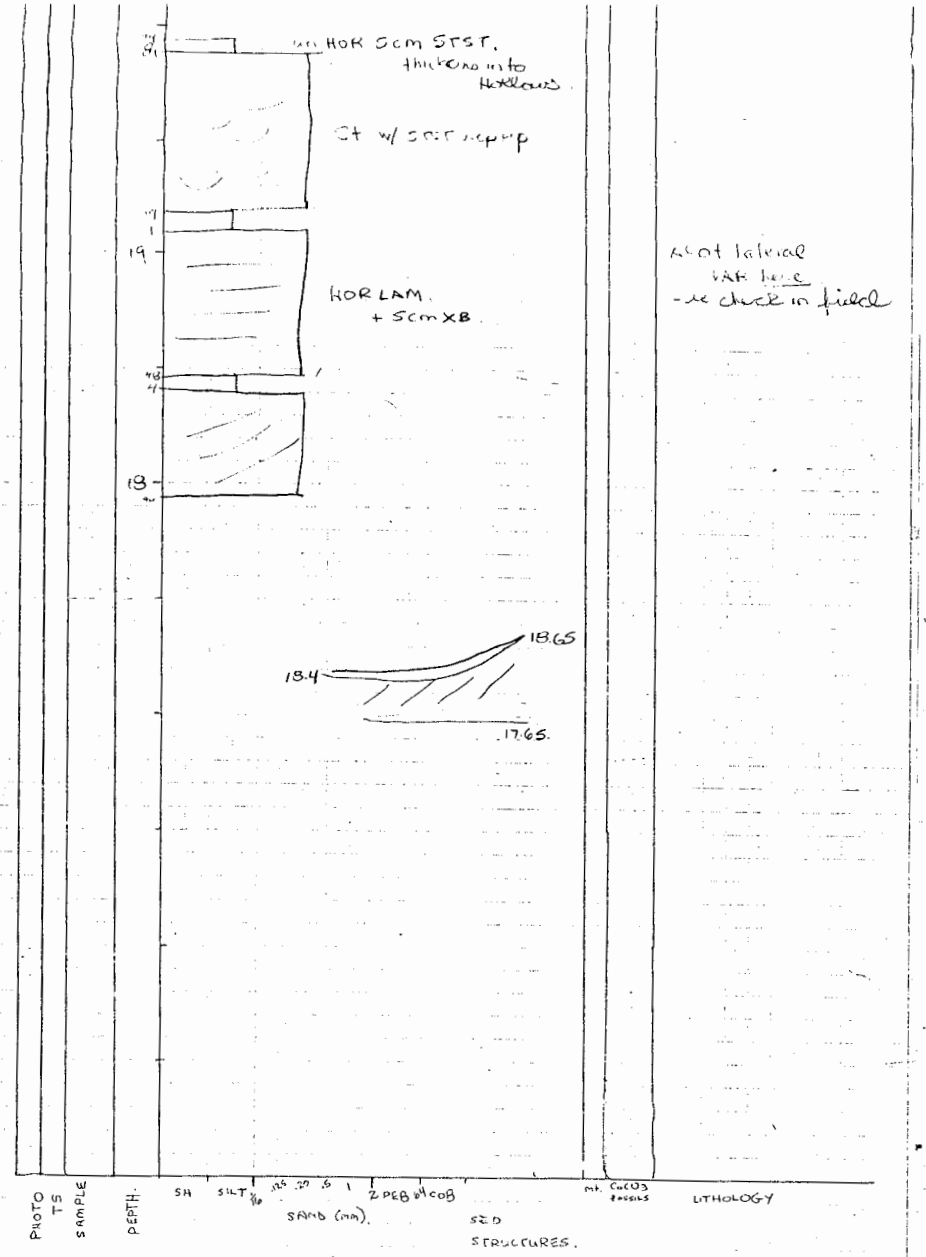



10
10
green tuffite
crude HOR bedding
dish structures.
NON MAG Fe
mineral
very siliceous
wh with
LHL + ripples
<5cm size
green grey with
more litho interogen.
10-15cm BP
sl siliceous
banded as below
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3
fossils
LITHOLOGY
STRUCTURES.
GRAIN SIZE /STRUCTURES.

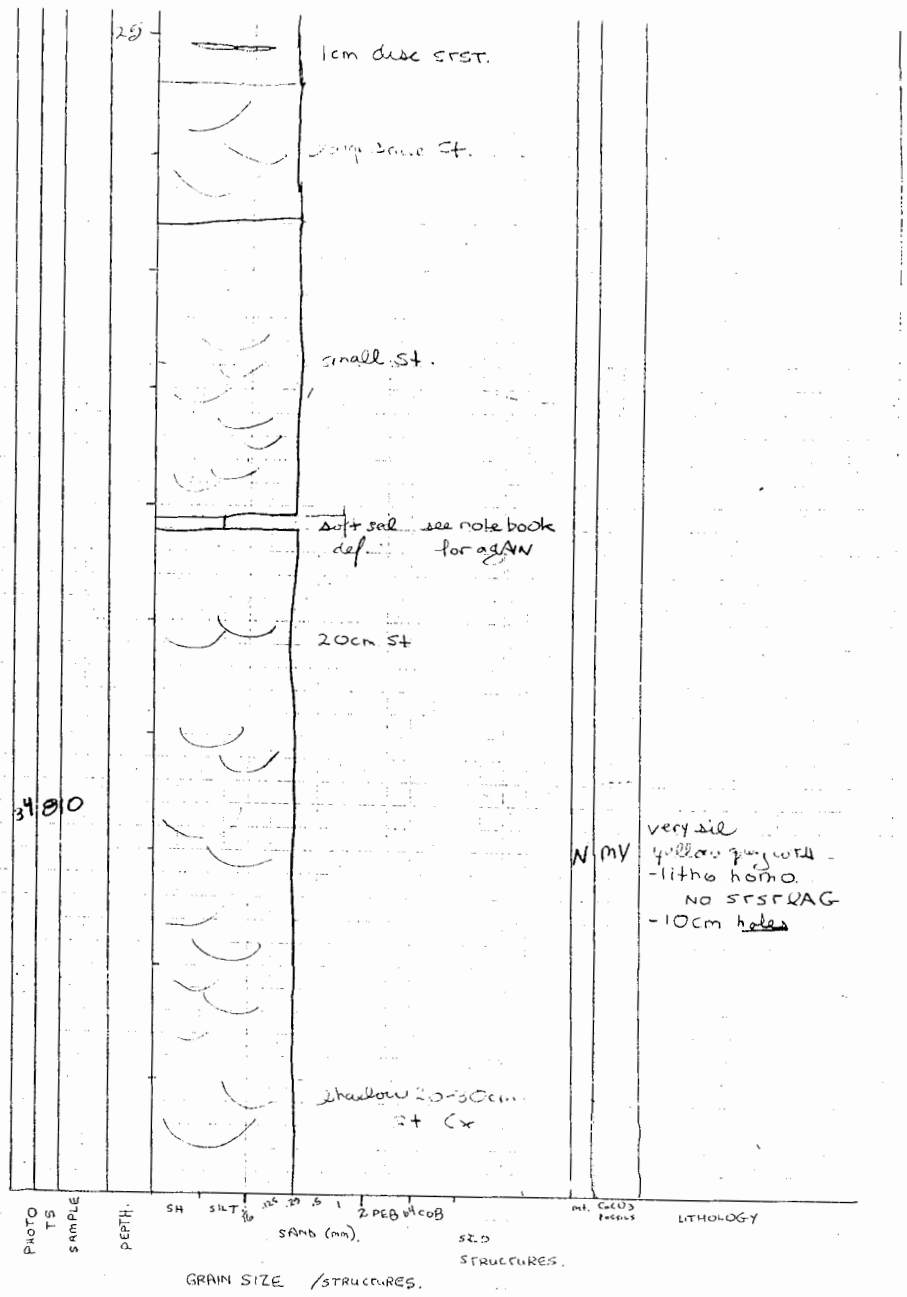

15
wh with fine
crude banding.
green with
component
separation
wh with
as S46.
(with siliceous
volcanic fragments
up to 5% rock
(797)
as S46
as S46
green with
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3
fossils
LITHOLOGY
STRUCTURES.
GRAIN SIZE /STRUCTURES.


STST.
??
10-15cm set
lateral VAR
St
see lateral VAR
-field CHECK VAR between sections
relook
pumice? no.
60cm sets (St)
324
STST AIRFALL 90cm lensoid
5cm St w. STST frag
Sp 20cm (xc)
069
sil STST. thickens/thins
-trace 40m. lateral 27. some XB
good water escape
similar w/ water escape structures
wh. with 2mm lam.
- good HOR LAM
very siliceous
HOR 1-2cm
801-807
C34
30
803
799
801
800
798
802
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
2 PEB
cob
SED STRUCTURES
GRAIN SIZE /STRUCTURES
CaCO3 fossils
LITHOLOGY

20
St small scale
NOT present 3m North
variable sections
19
PTXB
irreg thickness not planar
XB. 50cm set.
low angle react.
18
ANG SSTST clasts
sil STST. disappear 23m N.
St
scour infill
5cm STST
juggle
17
2m/page x2 =16
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
2 PEB
cob
SED STRUCTURES
GRAIN SIZE /STRUCTURES
CaCO3 fossils
LITHOLOGY

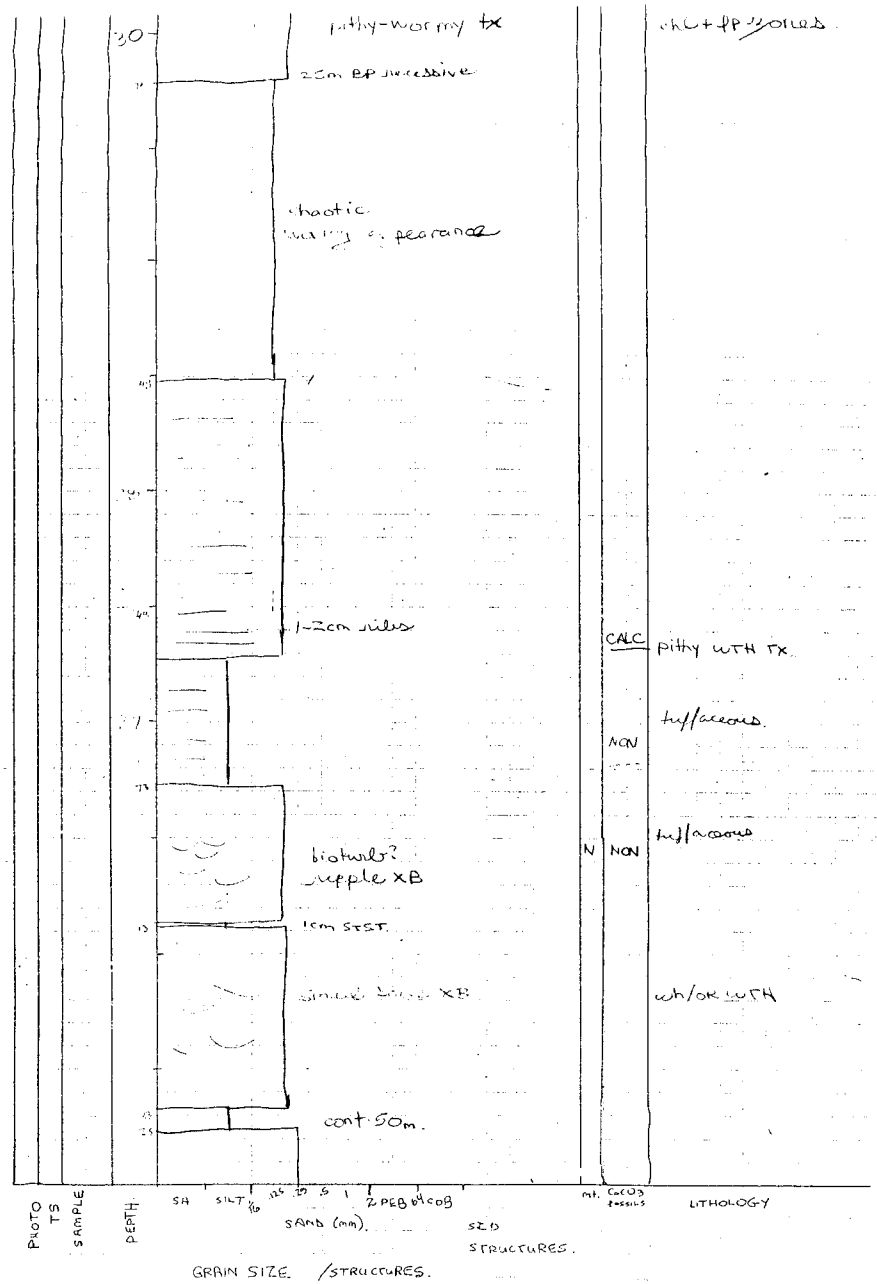
C2

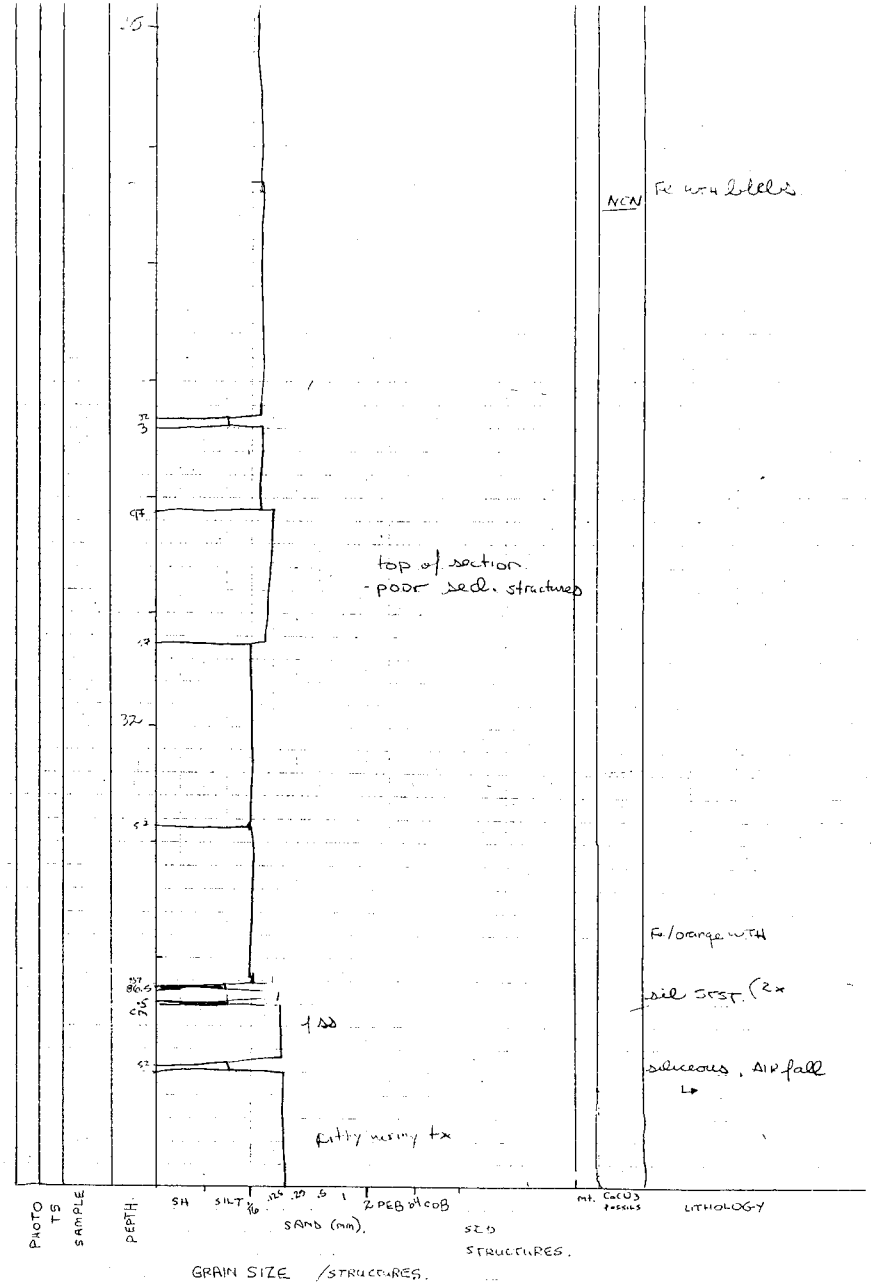


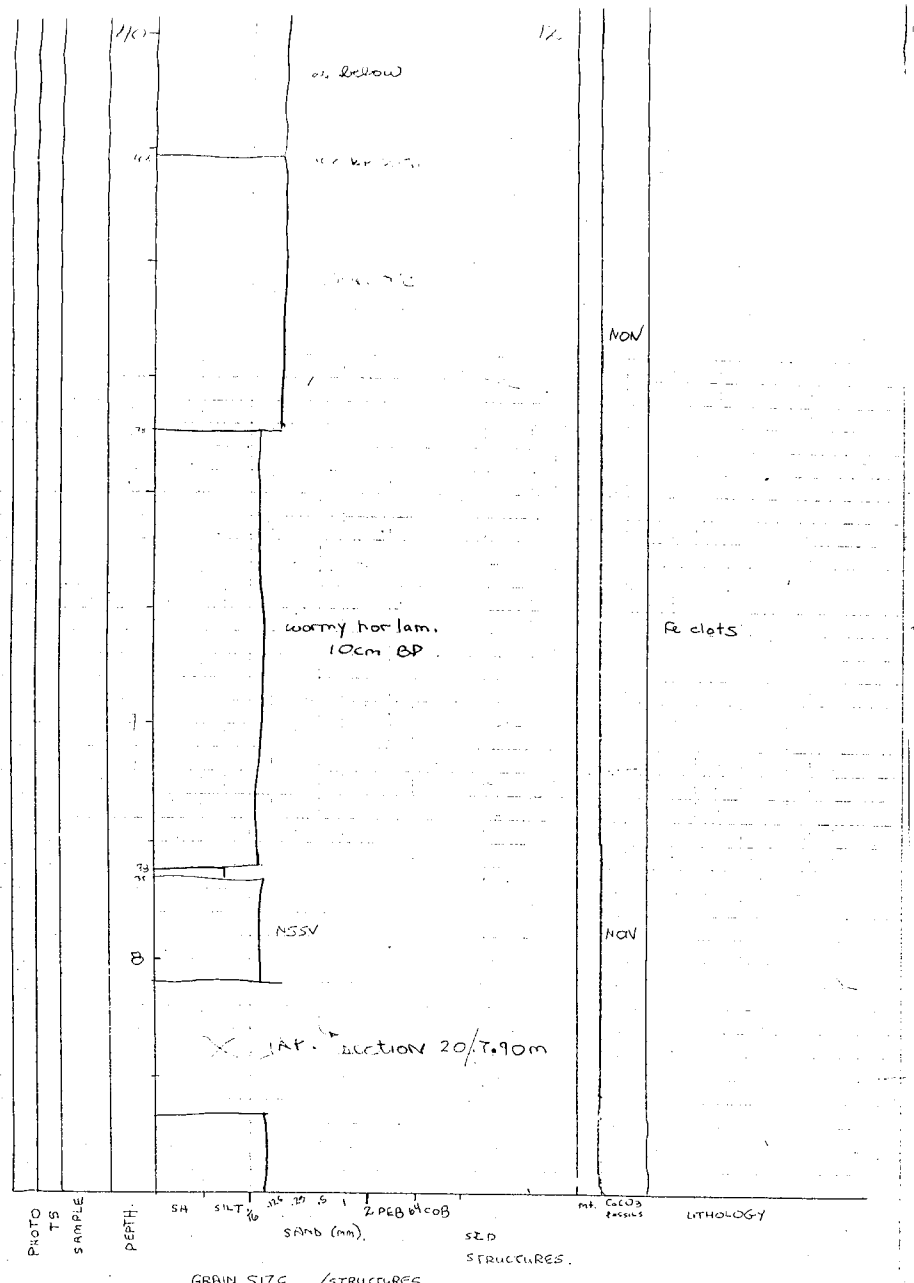
Need material VAR here - re check in field



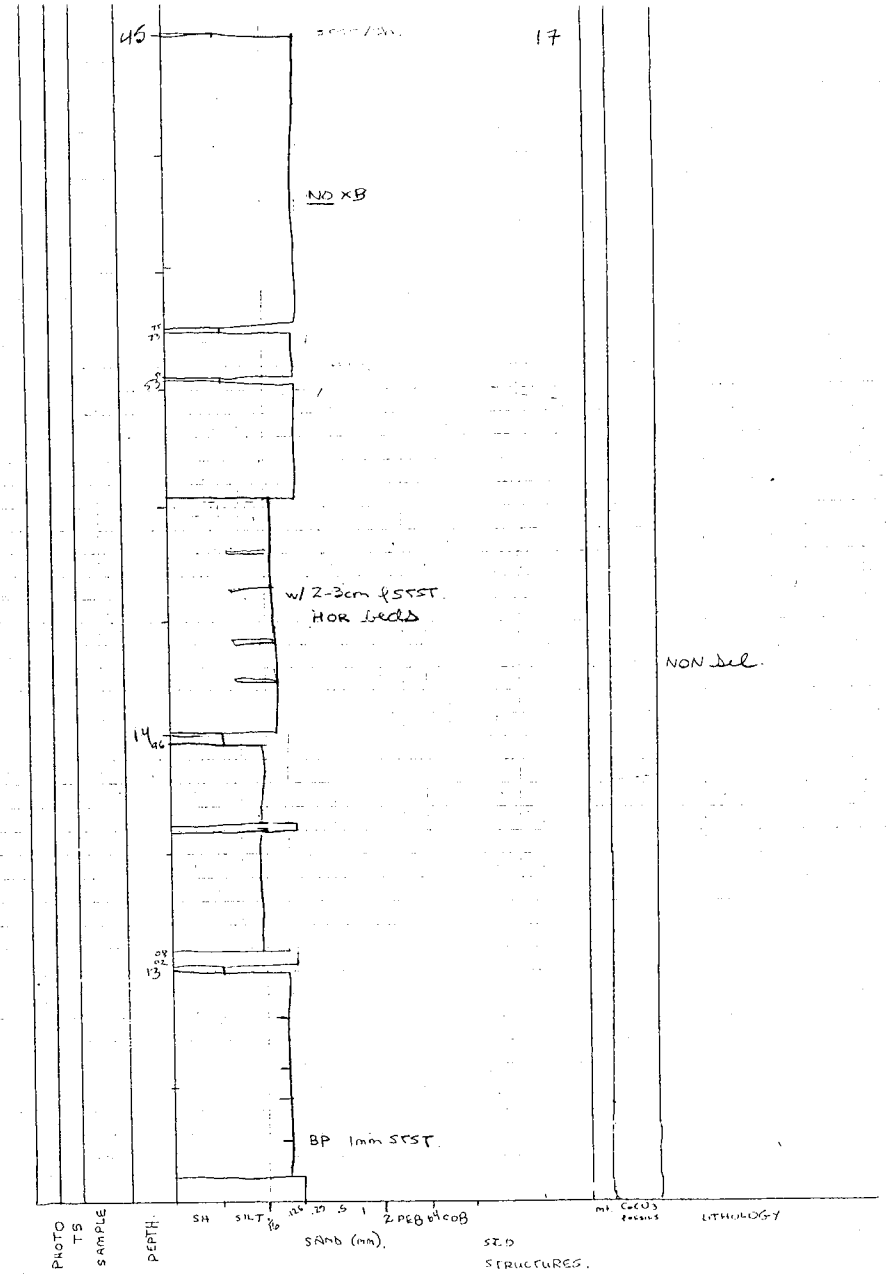
C2


pithy-wormy tx
2cm BP successive
chaotic
1-2cm silts
biotwb?
ripple XB
1cm SFST.
cont. 50m.
CALC
pithy WTH tx.
tuffaceous.
NON
tuffaceous
N NON
wh/OR WTH
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
FOSSILS
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.


NON
Fe WTH blebs
top of section
- poor sed. structures
Fe/orange WTH
SFST. (2x
siliceous, DIP fall
pithy wormy tx
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
FOSSILS
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

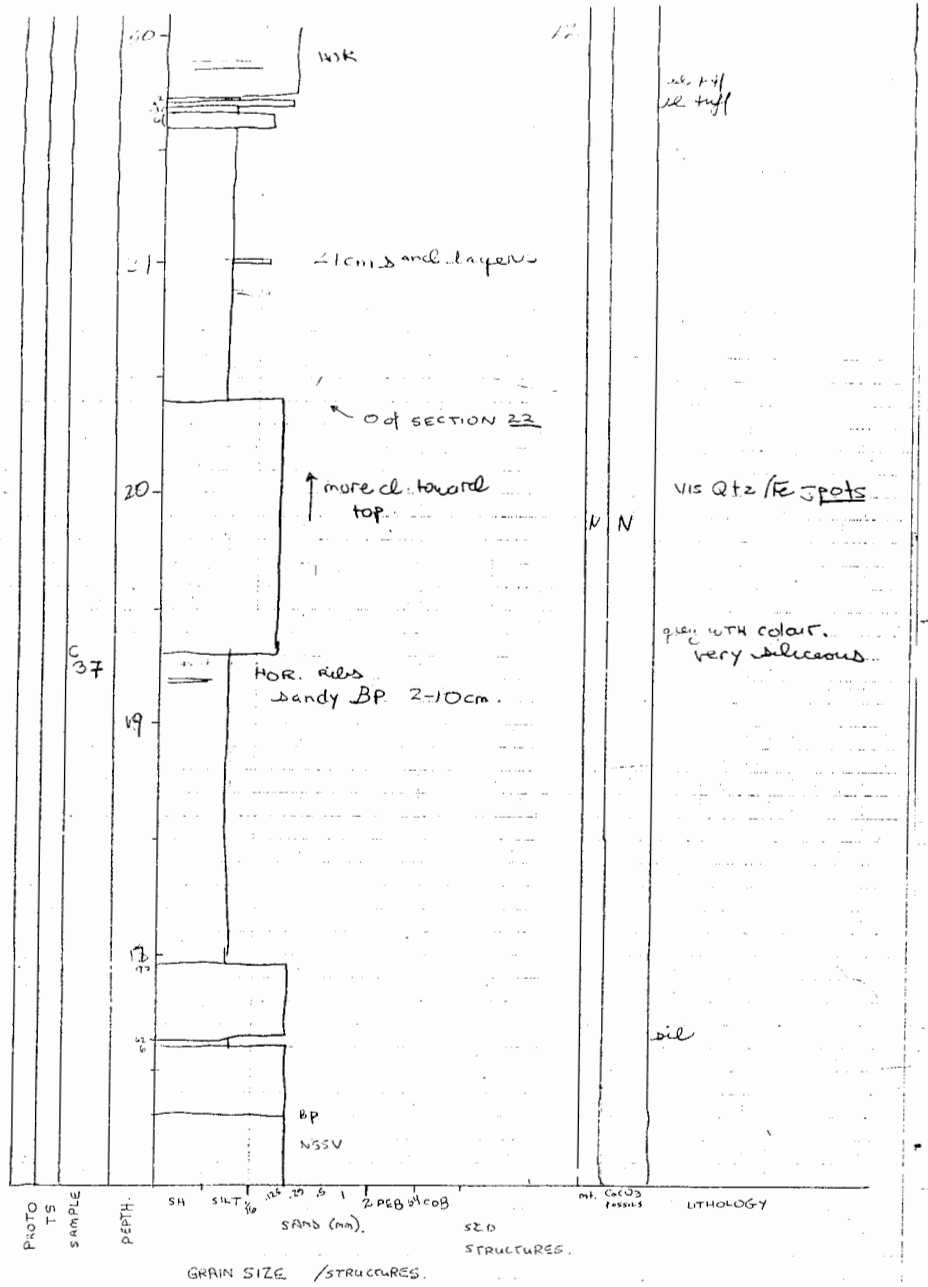


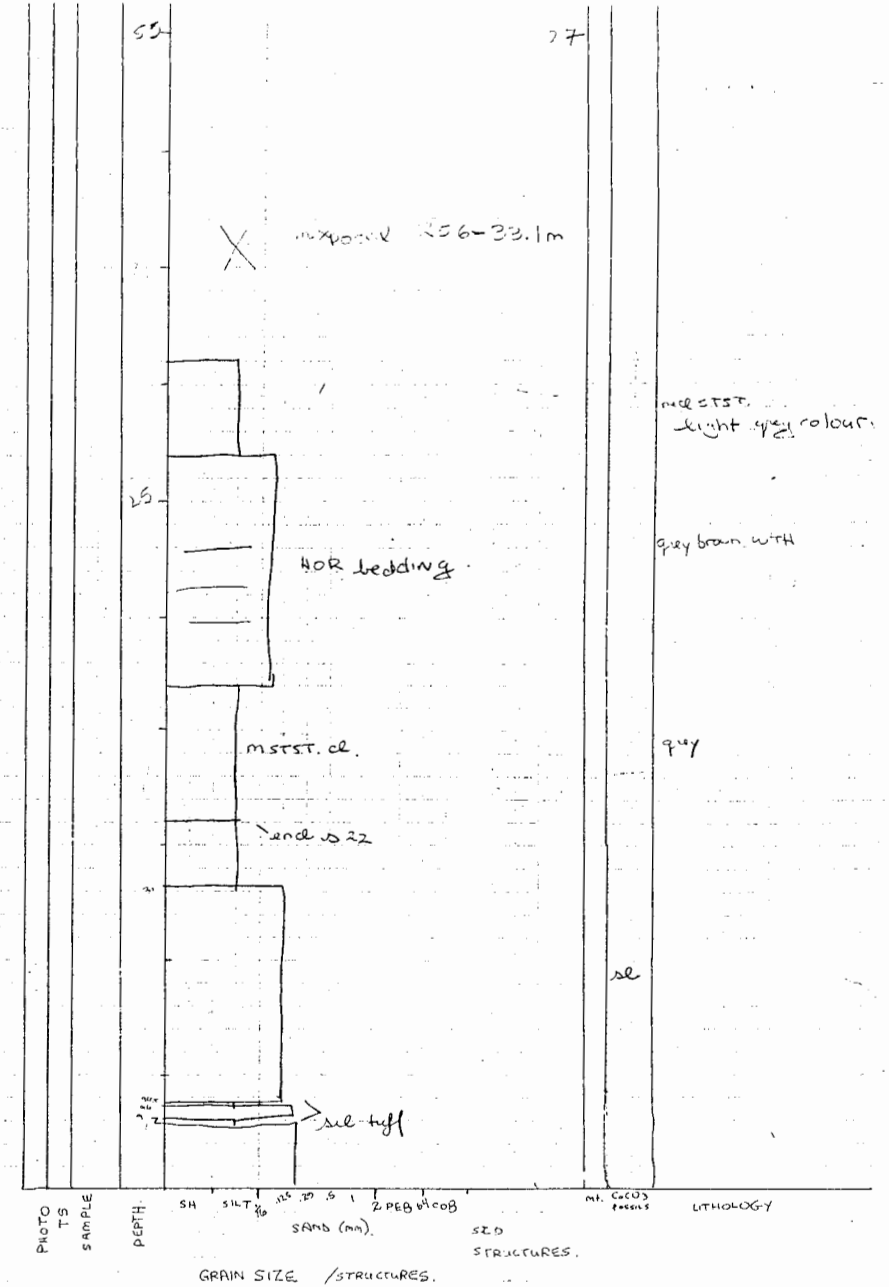
GRAIN SIZE /STRUCTURES.

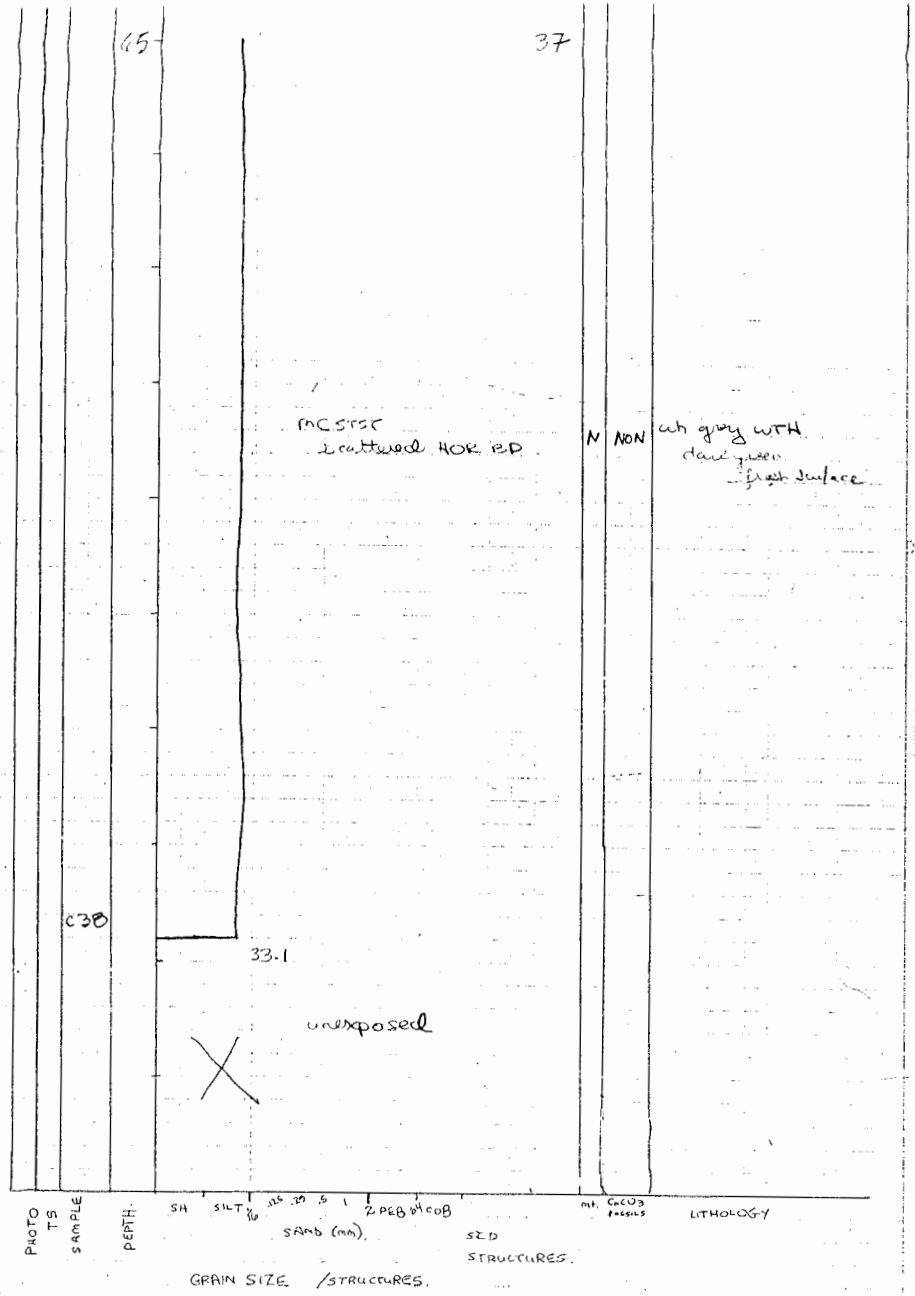


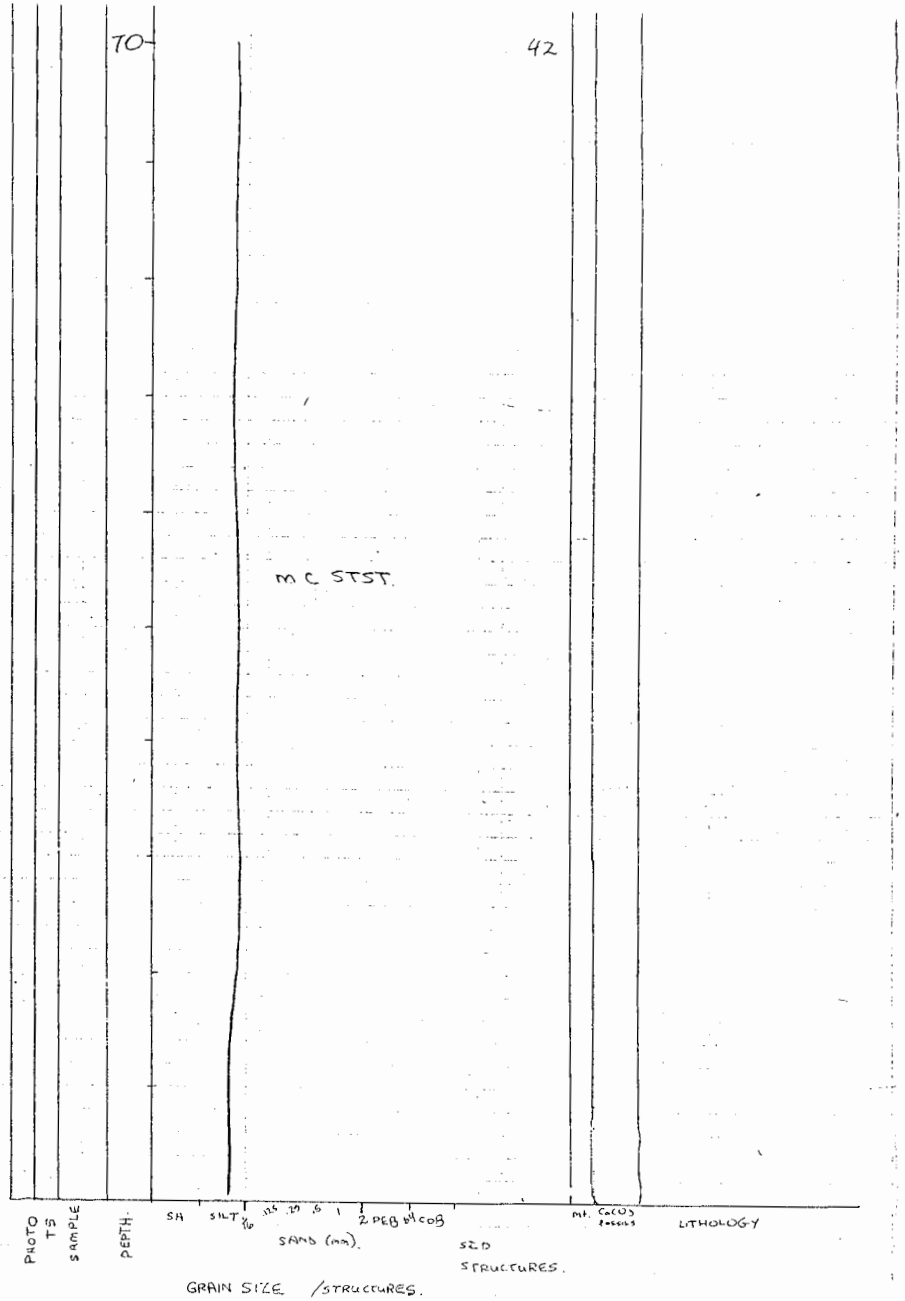
GRAIN SIZE /STRUCTURES.

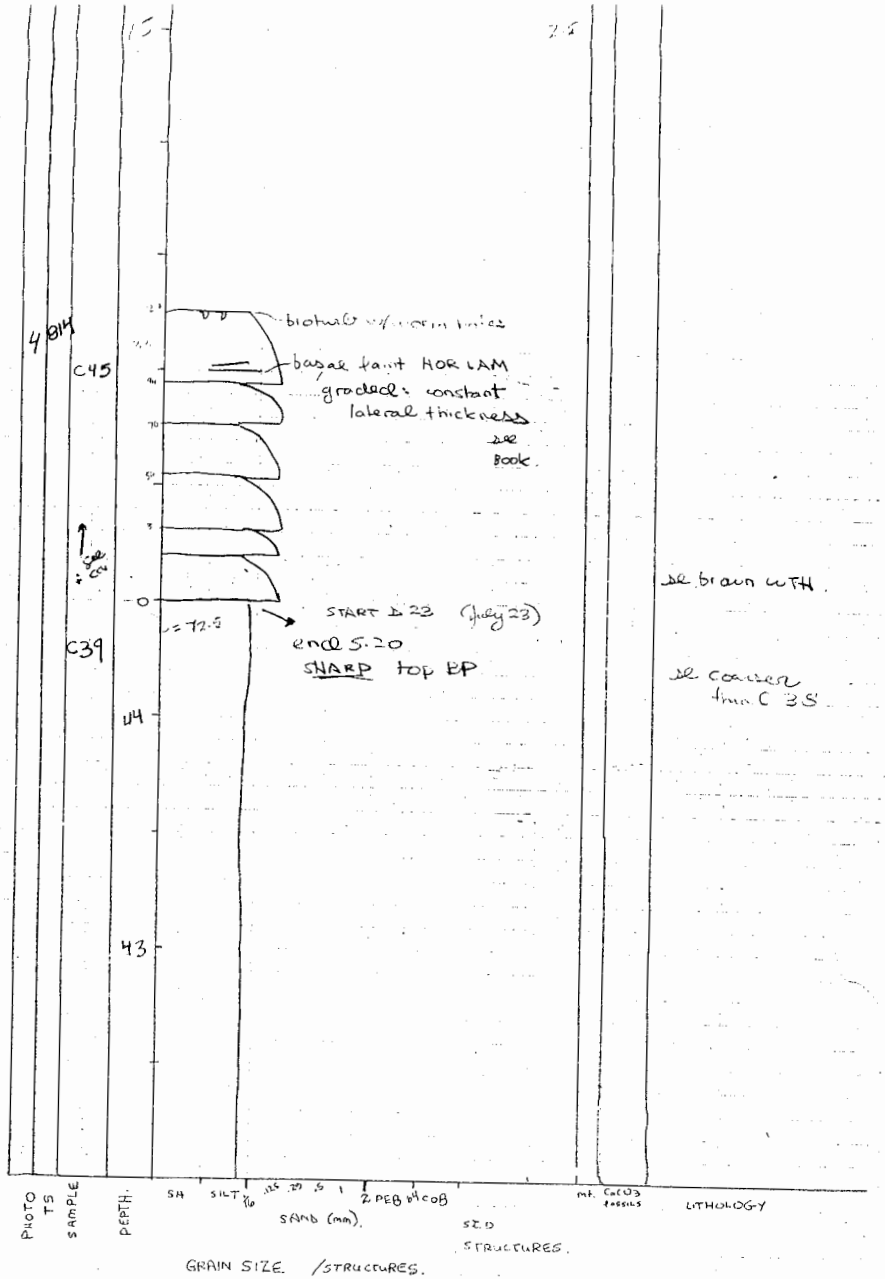
C2

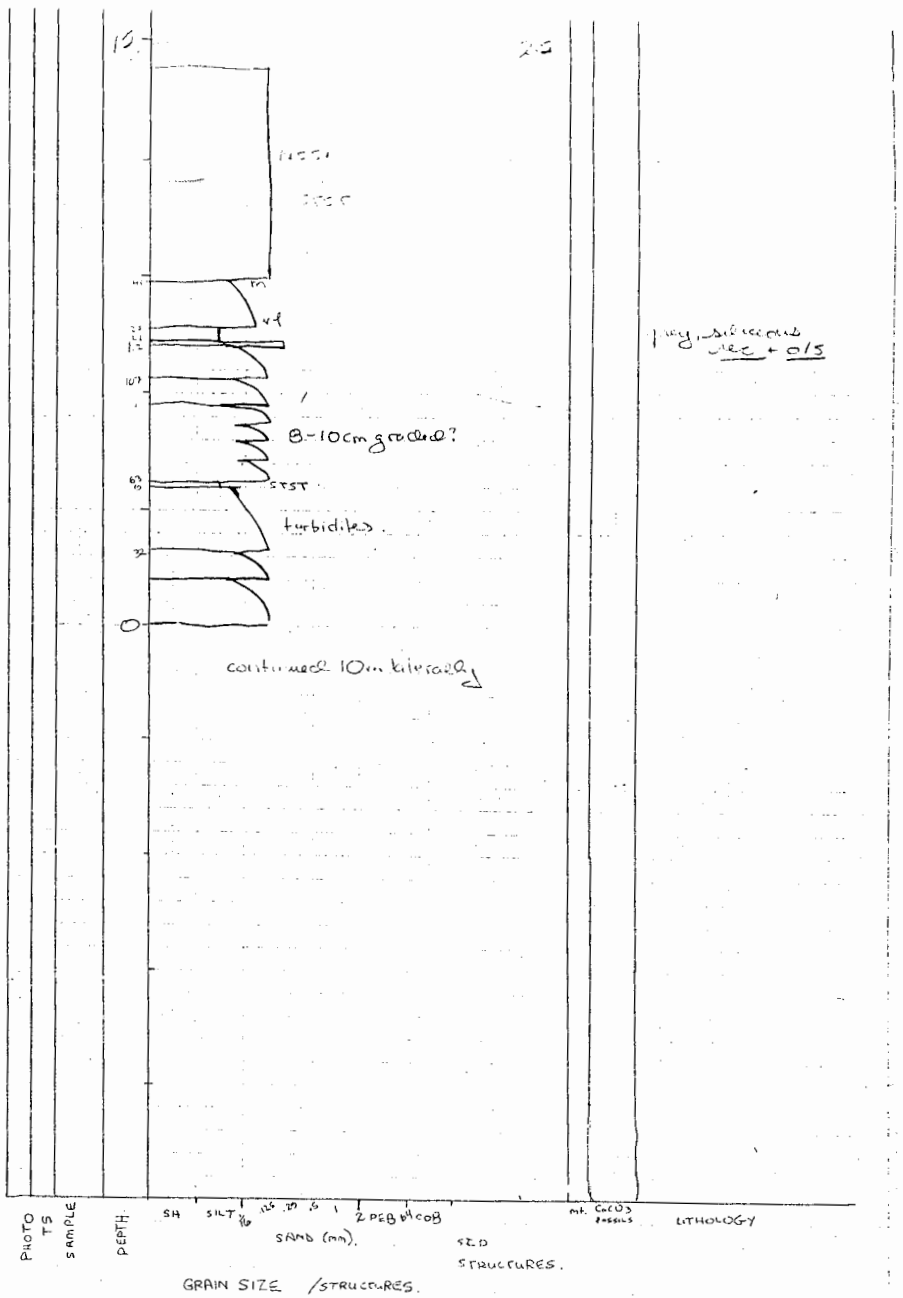

HOR
4cm sand layer
0 of SECTION 23
more cl. toward top.
HOR. Ribs
sandy BP 2-10cm.
BP
NSSV
VIS Qtz/FE spots
grey with colour.
very siliceous
sil
PHOTO
TS
SAMPLE
PEPTH
SH
SILT
SAND (mm).
PEB
COB
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

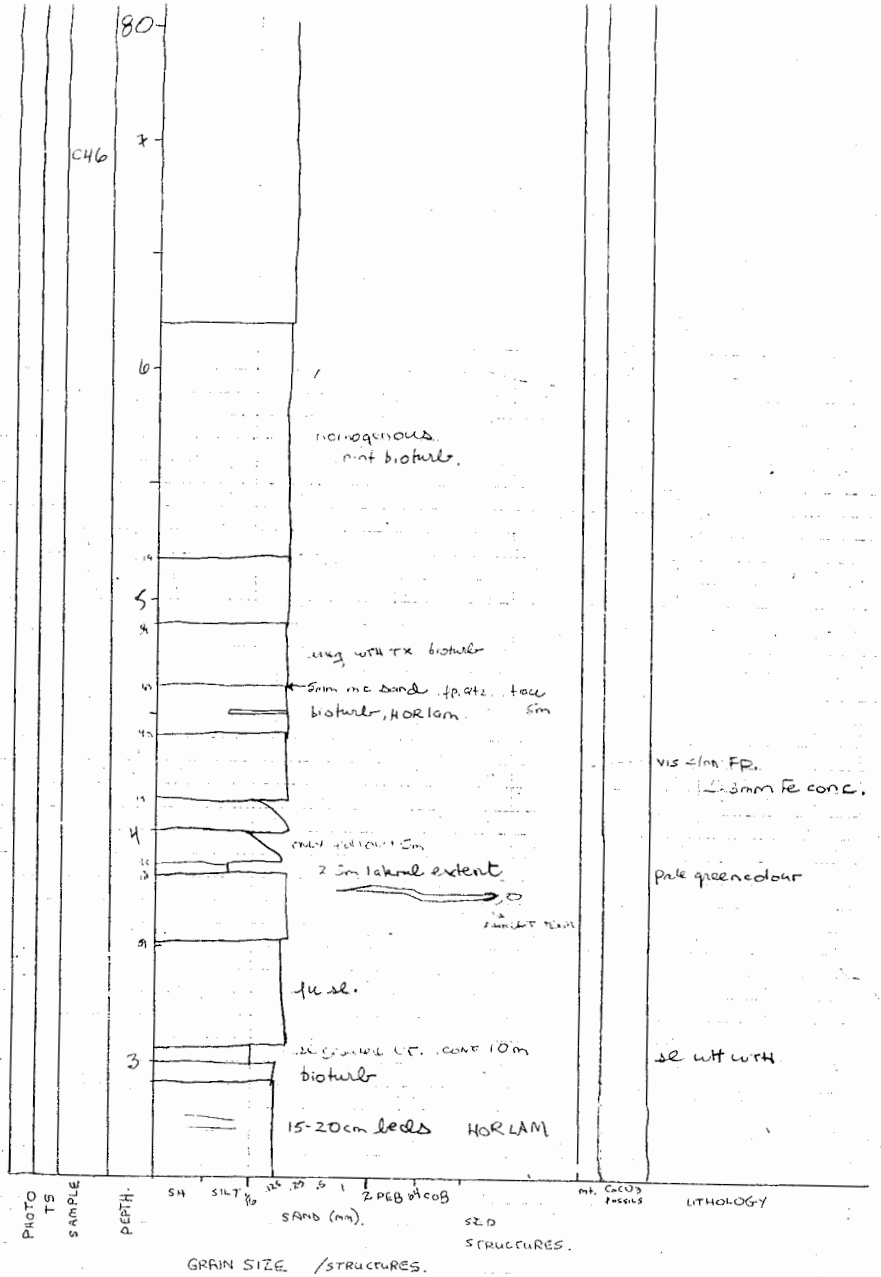

exposure 25-33.1m
HOR bedding
mSTST. cl.
sand
sil-tuff
mod STST.
light grey colour
grey brown with
grey
sl
PHOTO
TS
SAMPLE
PEPTH
SH
SILT
SAND (mm).
PEB
COB
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

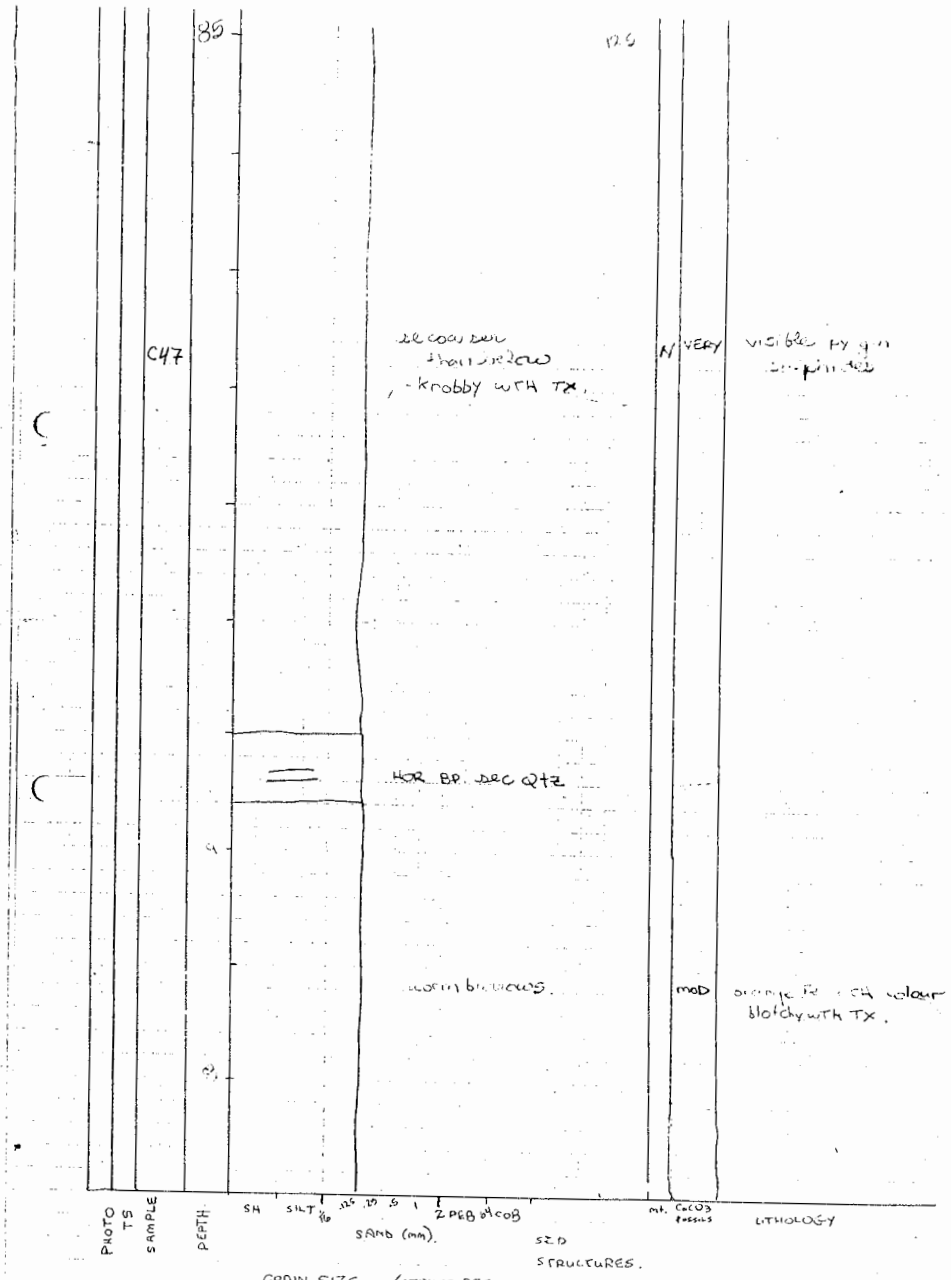

65
37
mC STST
scattered HOR BD.
N NON
wh gray WITH
dark green
fresh surface
c38
33.1
unexposed
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.


70
42
mC STST.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

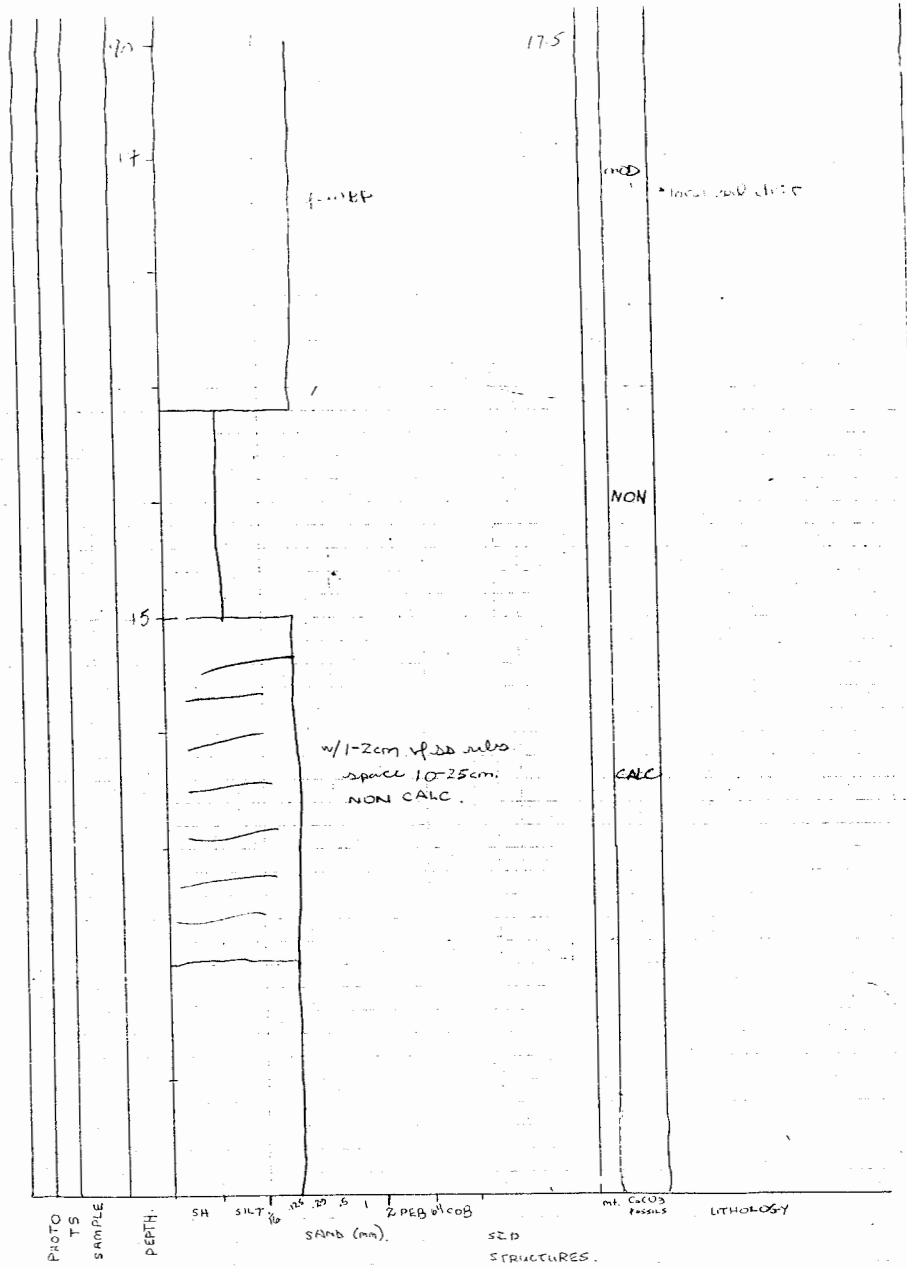

15
biotwb w/ worm tubes
basal faint HOR LAM
gradacl: constant lateral thickness
see Book.
C45
C39
0
START Δ 23 (July 23)
end 5.20
SHARP top BP
44
43
dk brown w/TH.
dk coarser from C 35
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


10
8-10cm graded?
TRST
turbidites.
0
continued 10m laterally
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

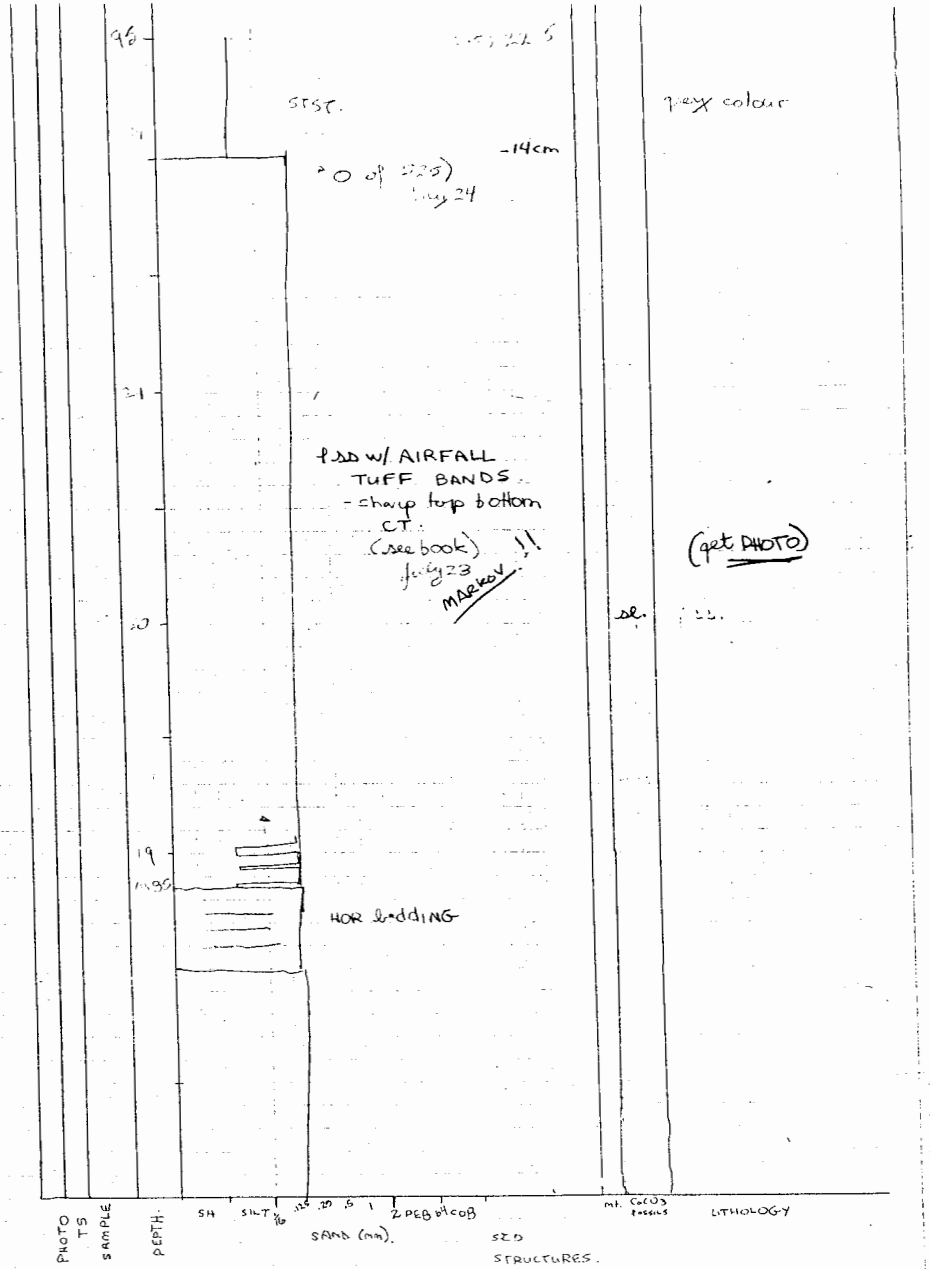

C46
80
7
6
5
4
3
homogeneous
mnf bioturb.
vfsl.
15-20cm beds HORLAM
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.


C47
85
knobby with TX.
HOR BP. src Qtz
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

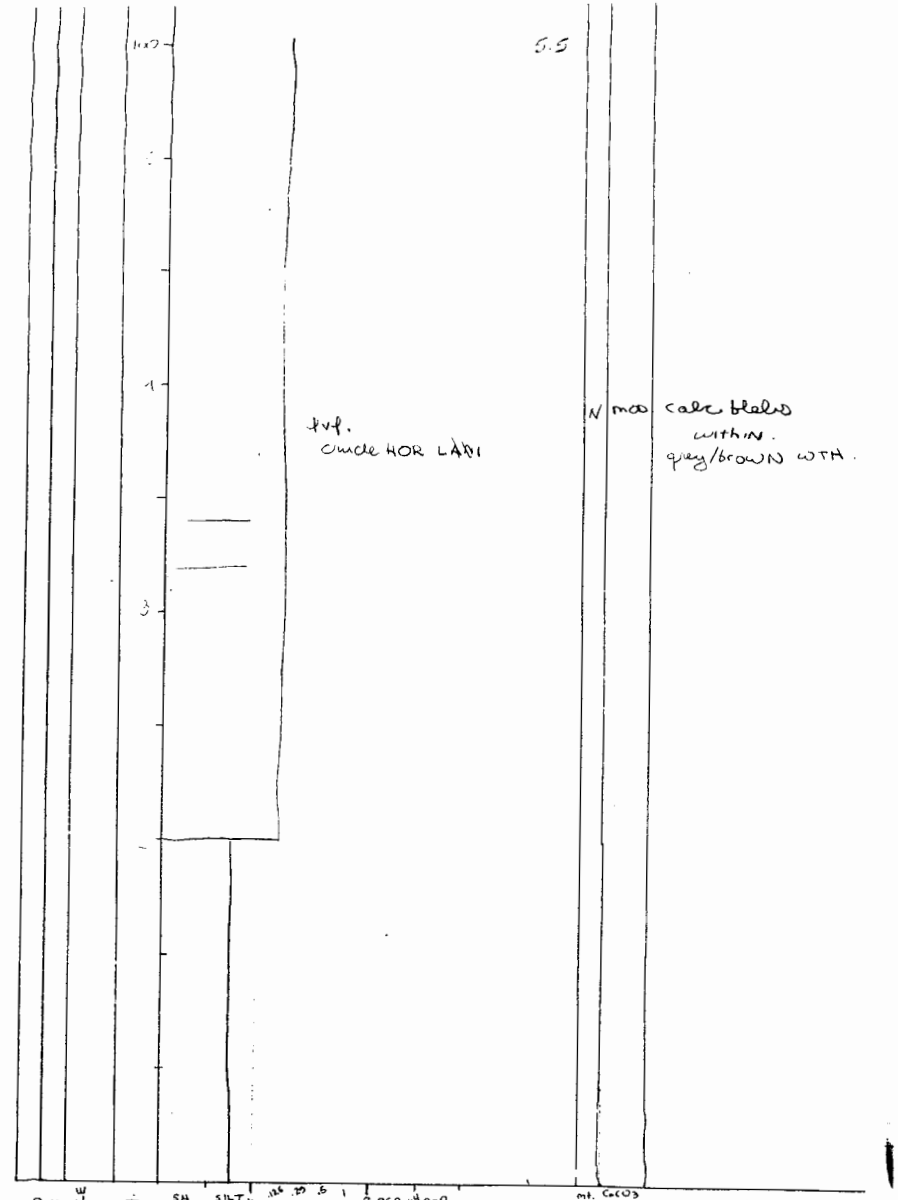
C2

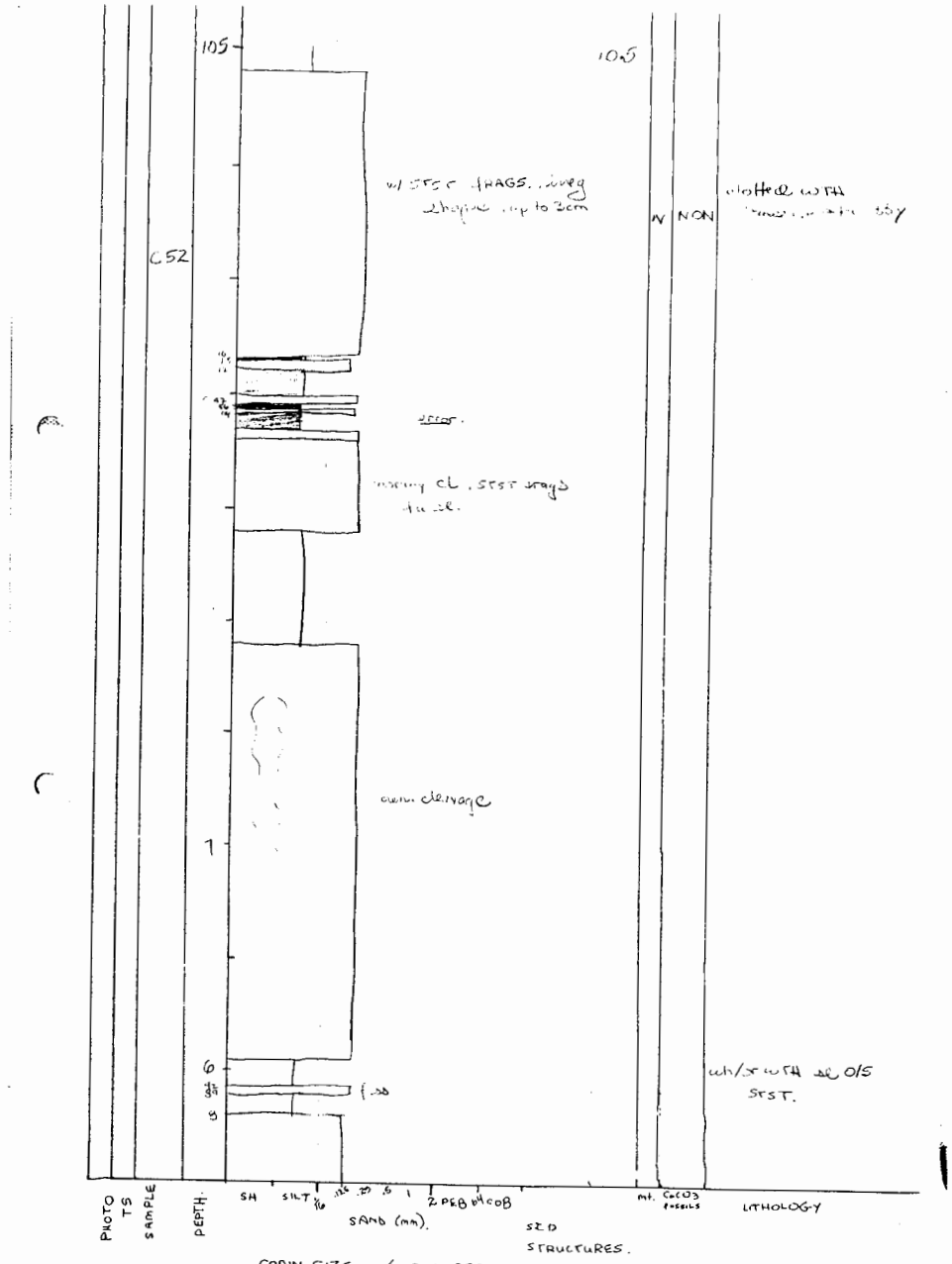


GRAIN SIZE /STRUCTURES.

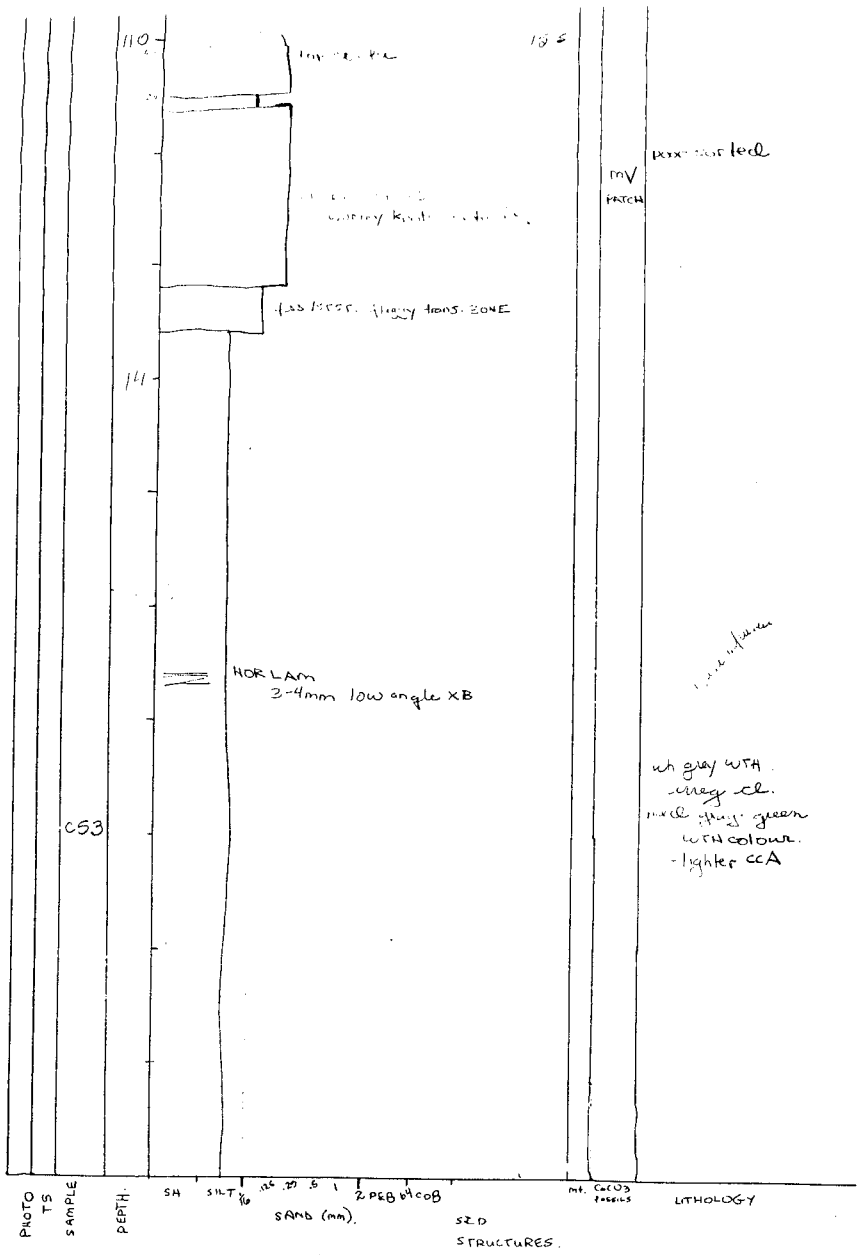


GRAIN SIZE /STRUCTURES.

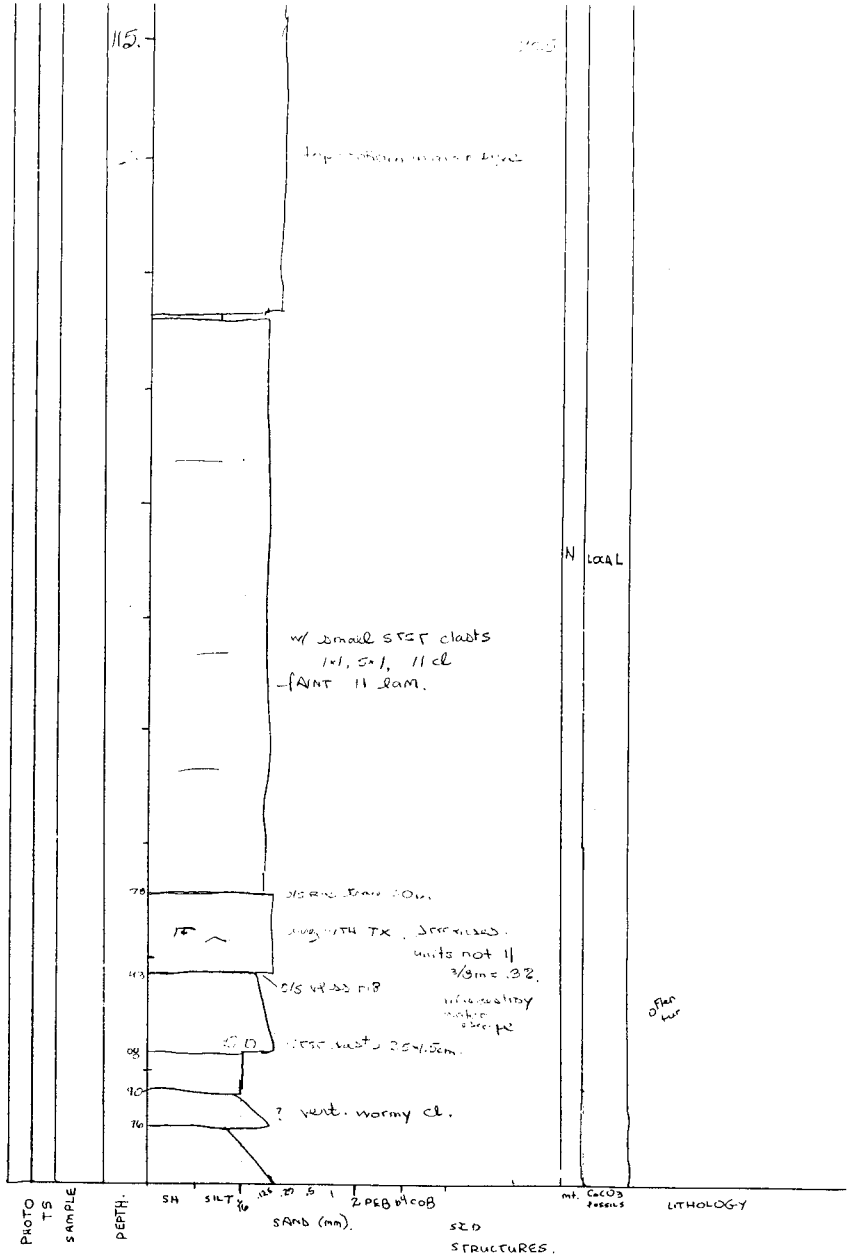

5.5
N
mod calc bladed within. grey/brown WTH.
f.v.f. cmcle HOR LAMI
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


10.5
C52
w/ SFST FRAGS. wavy shapes up to 3cm
N
NON
mottled with
SFST.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

C2

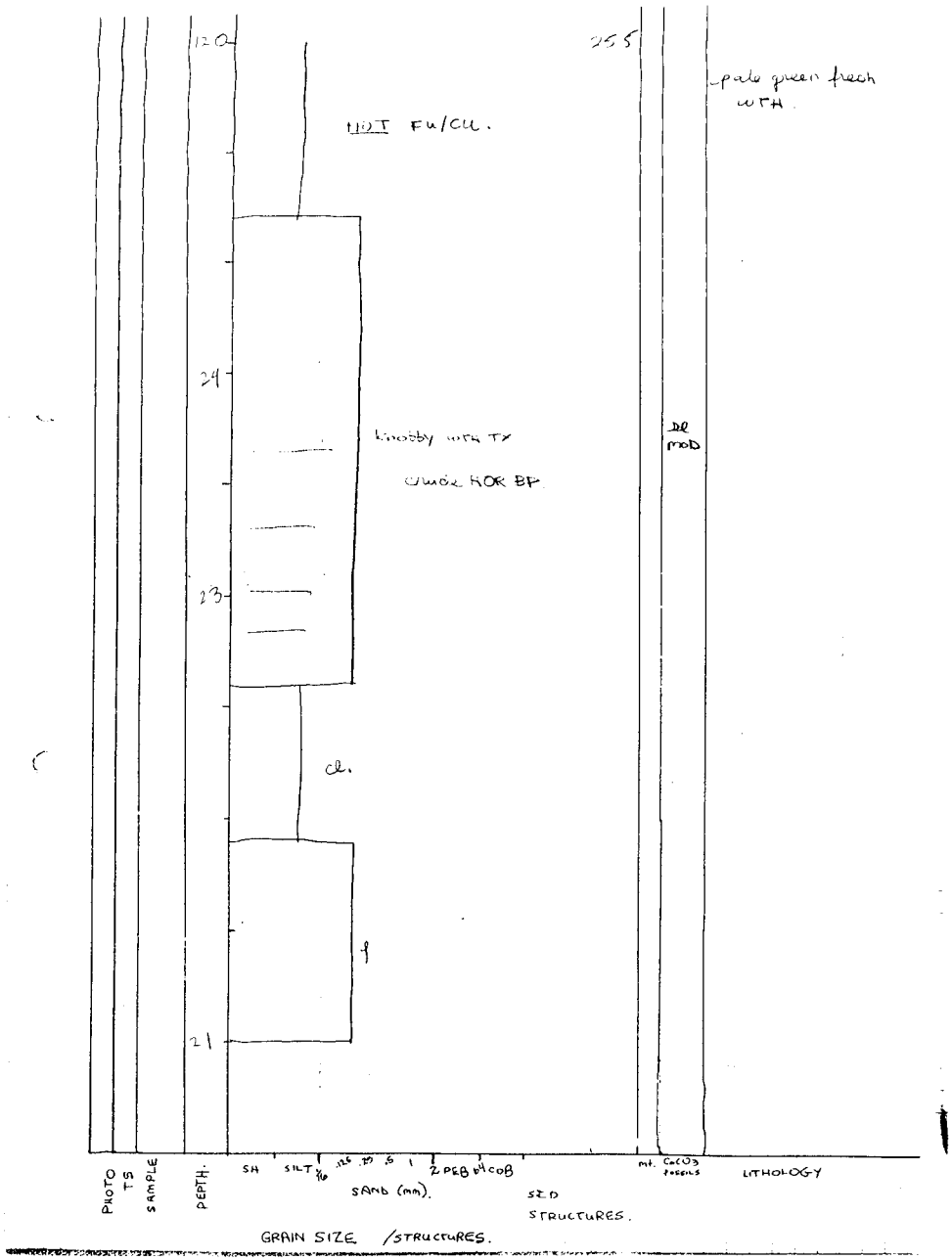


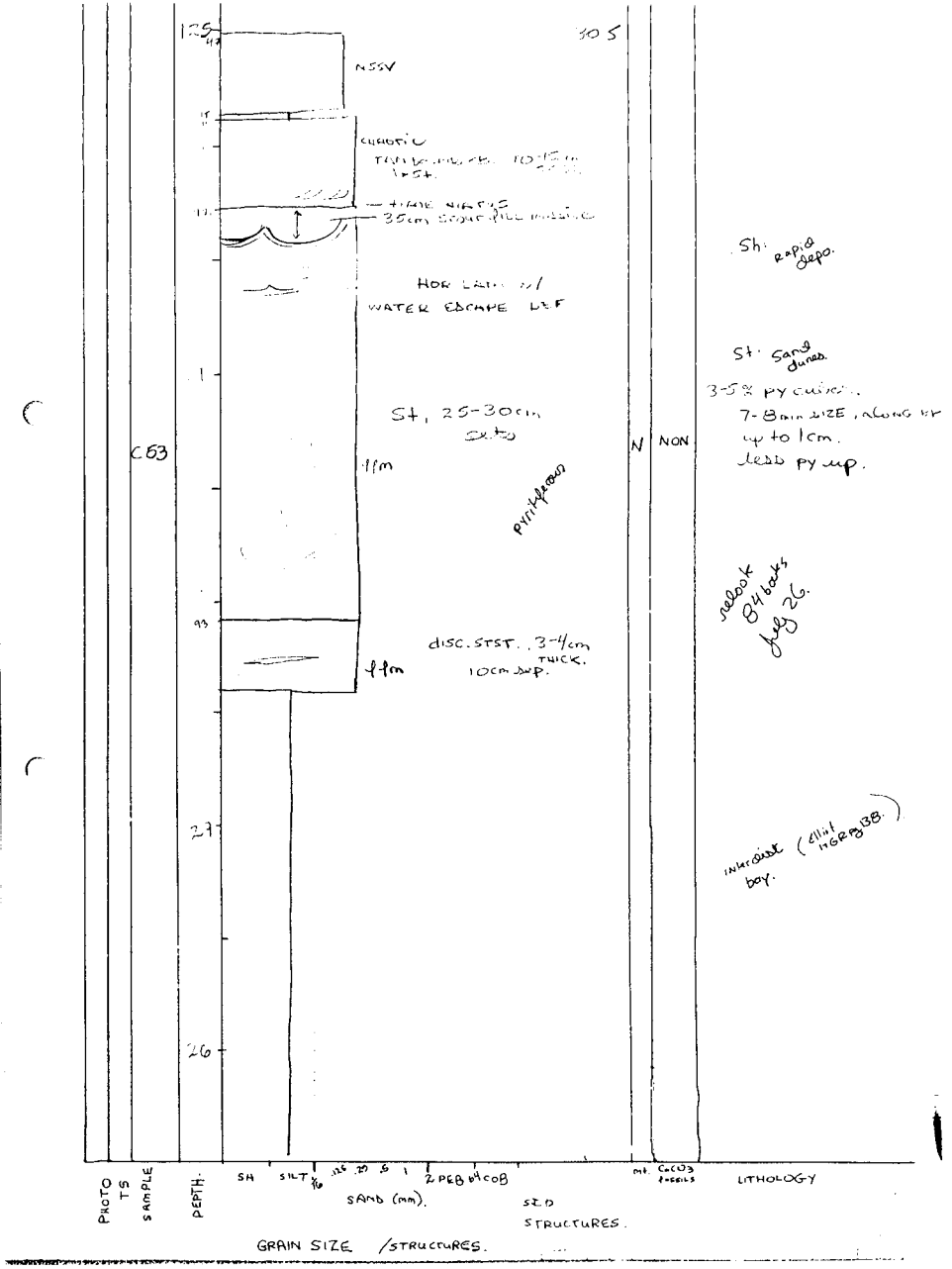
GRAIN SIZE /STRUCTURES.

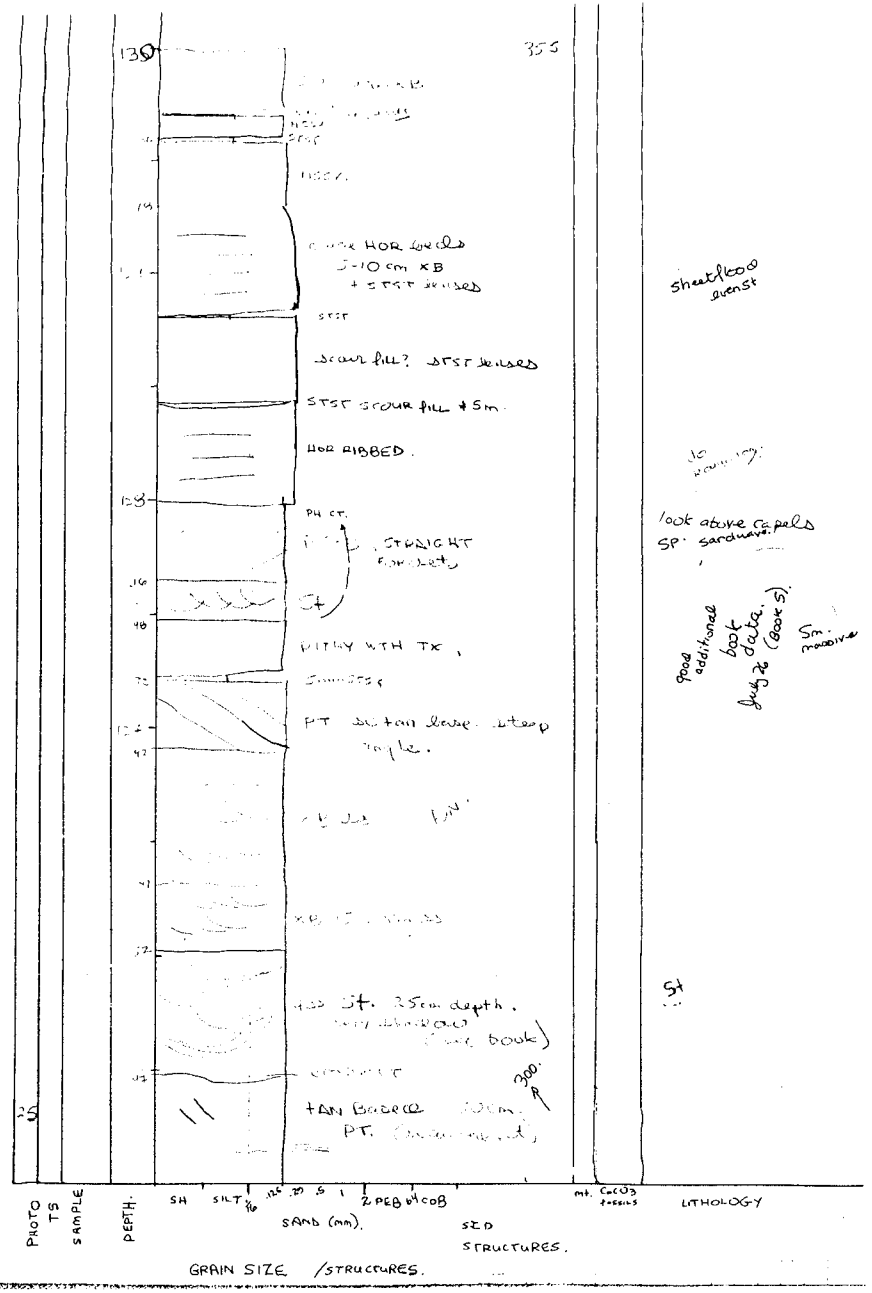


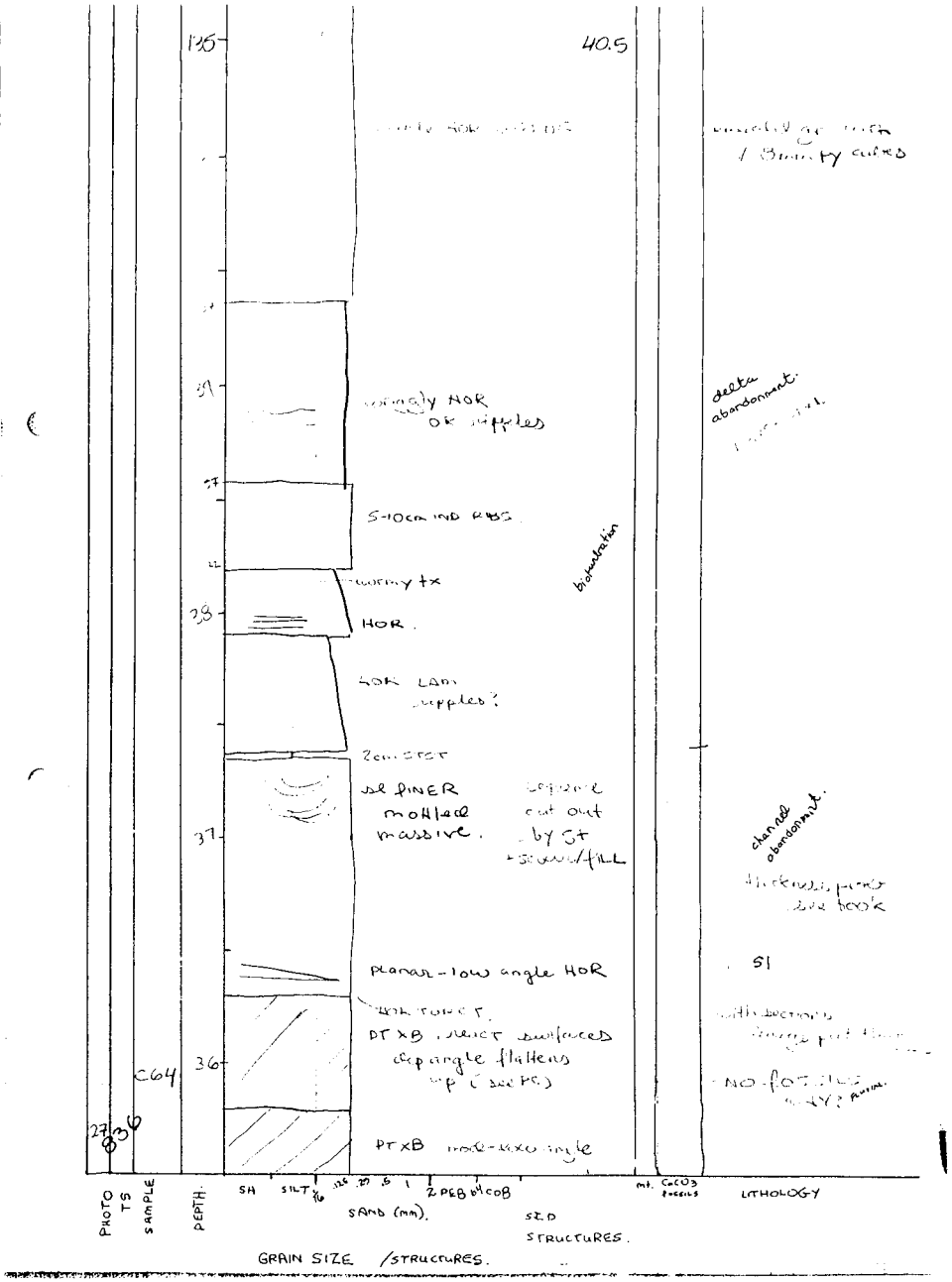
GRAIN SIZE /STRUCTURES.

C2

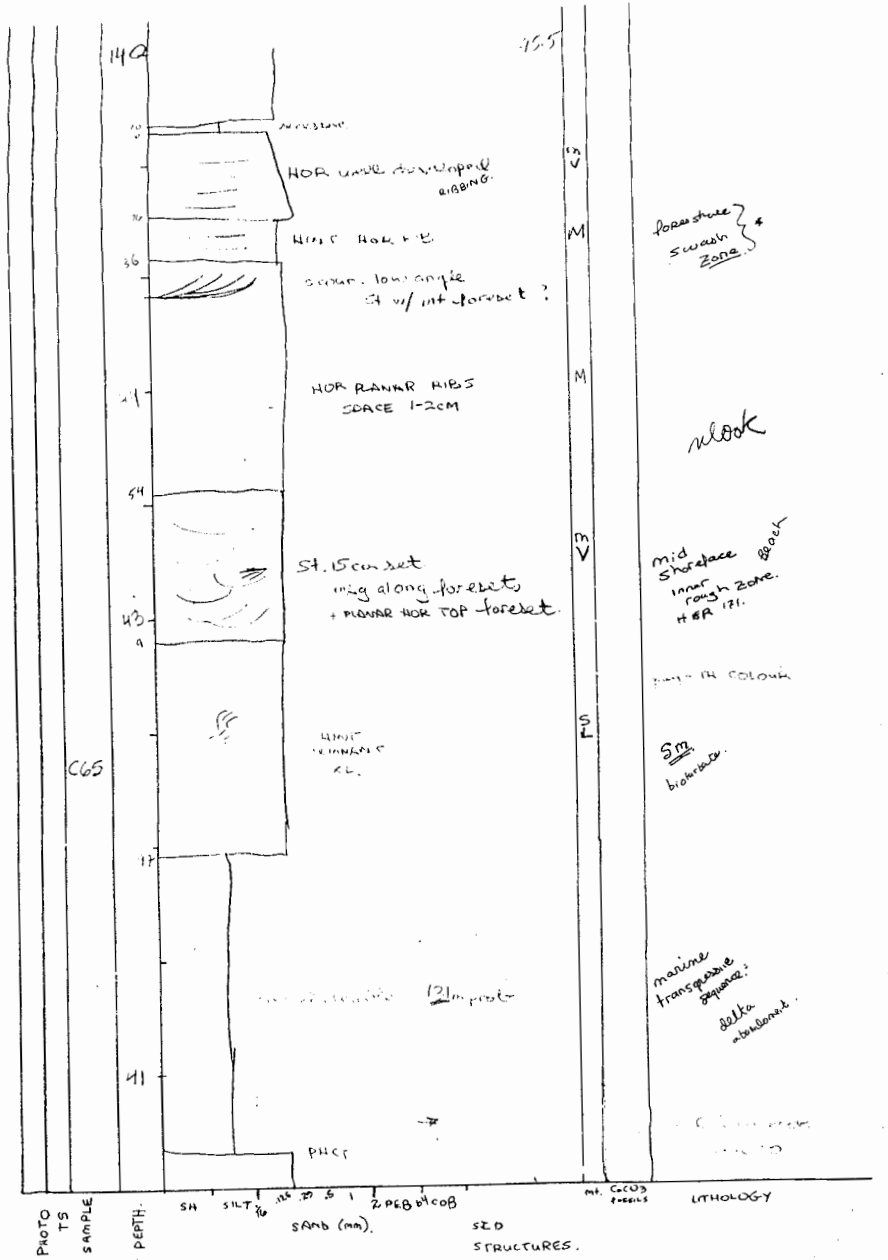

120
255
NOT Fu/Cu.
pale green fresh with
24
knobby with TX
23
21
cl.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
LITHOLOGY
STRUCTURES.
GRAIN SIZE /STRUCTURES.

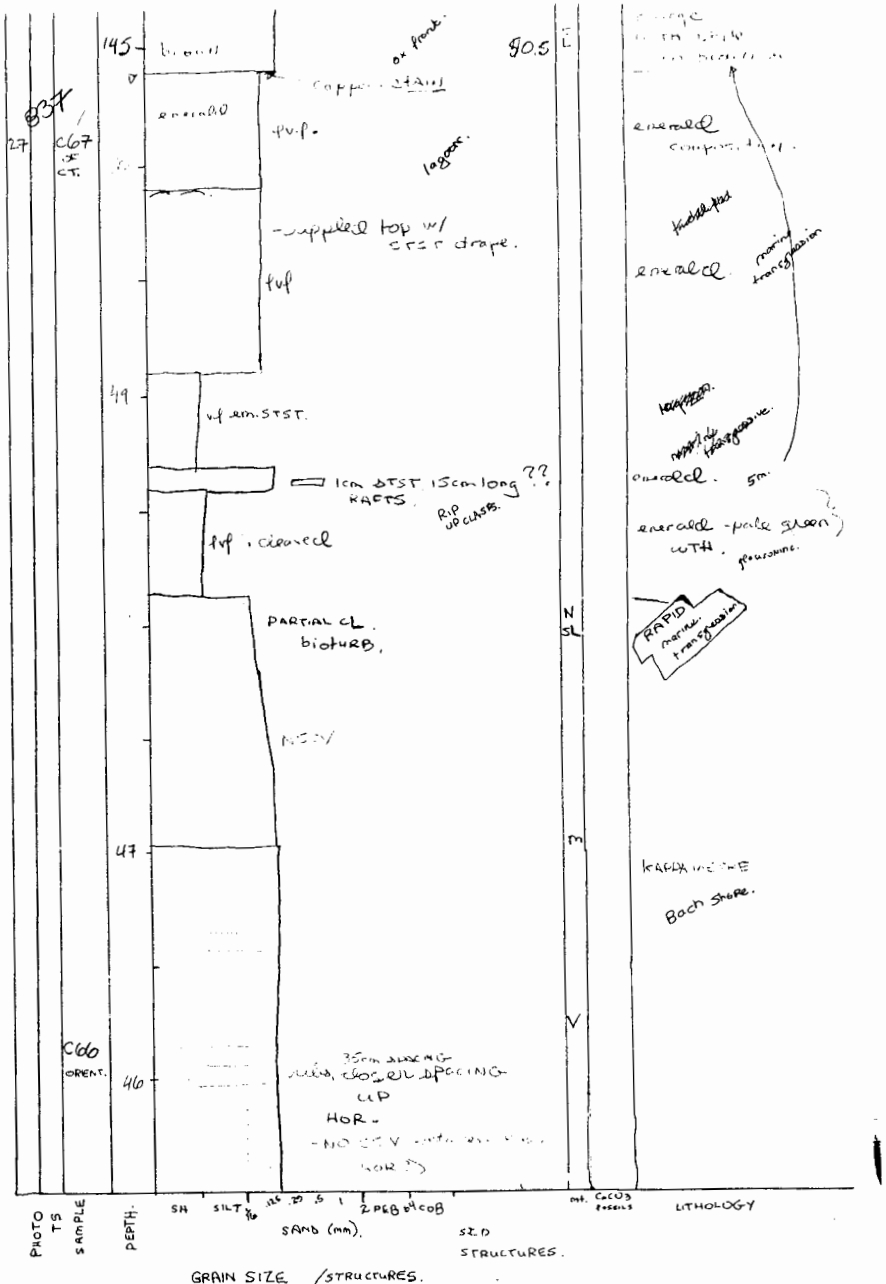

125
105
NSSV
CHAOTIC
TIME WRAPS
35cm
HOR LAM. w/
WATER ESCAPE LEF
St, 25-30cm
11m
PYRITE/Fe stain
C63
N NON
St. Sand dunes.
3-5% py cubes.
7-8 mm SIZE, ALONG BP
up to 1cm.
less py up.
notebook
84 books
July 26.
27
26
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
LITHOLOGY
STRUCTURES.
GRAIN SIZE /STRUCTURES.

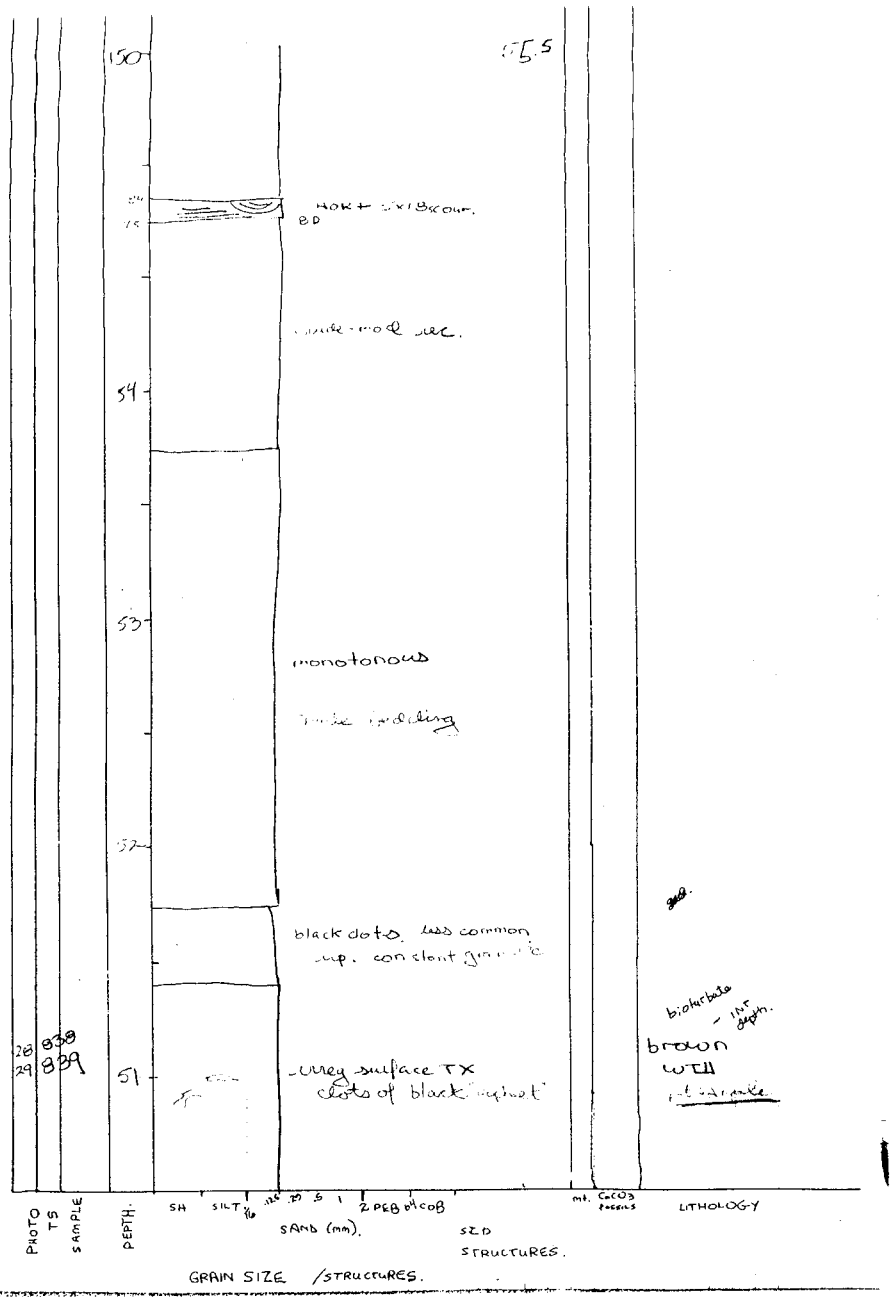

135
355
HOR RIBBED.
STST scour fill + Sm.
PH ct.
STRAIGHT
PLANAR-LOW
St
PLANAR-LOW ANGLE
PT
St. 25cm depth.
TAN BRAIDED
PT.
sheathflood
overst
look above ripples
SP: sandwave
good additional
bank data.
(book 5).
Sm.
massive
St
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

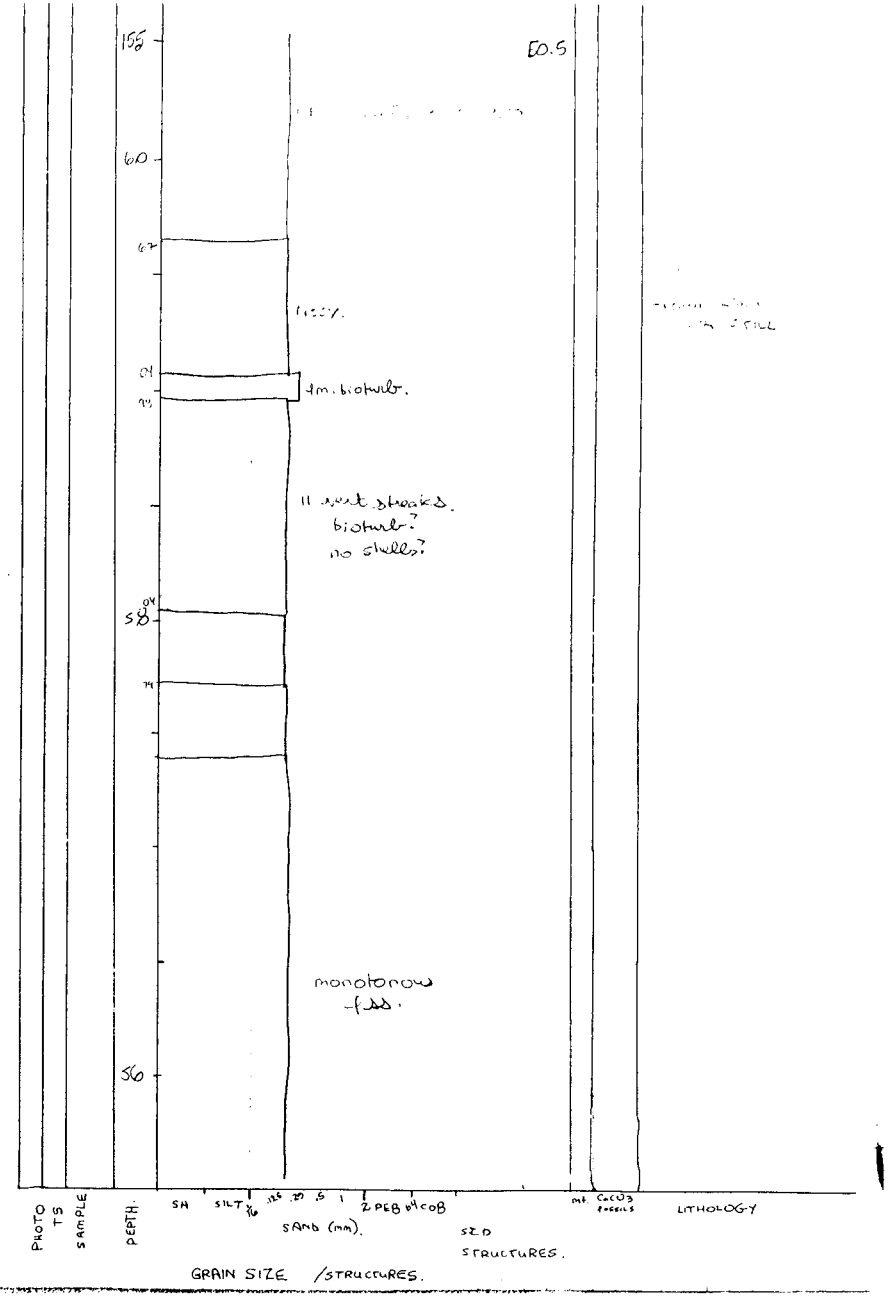

135
40.5
HOR
OR ripples
5-10cm IND RBS
bioturbation
HOR.
HOR LAM
ripples?
2cm STST
v. fiNER
mottled
massive.
sequence
cut out
by St
+ scour fill
delta
abandonment
channel
abandonment
PLANAR-LOW ANGLE HOR
PT XB, indist surfaces
dip single flattens
up (sweeps)
PT XB mod-lxo single
51
NO-FOT
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

C2

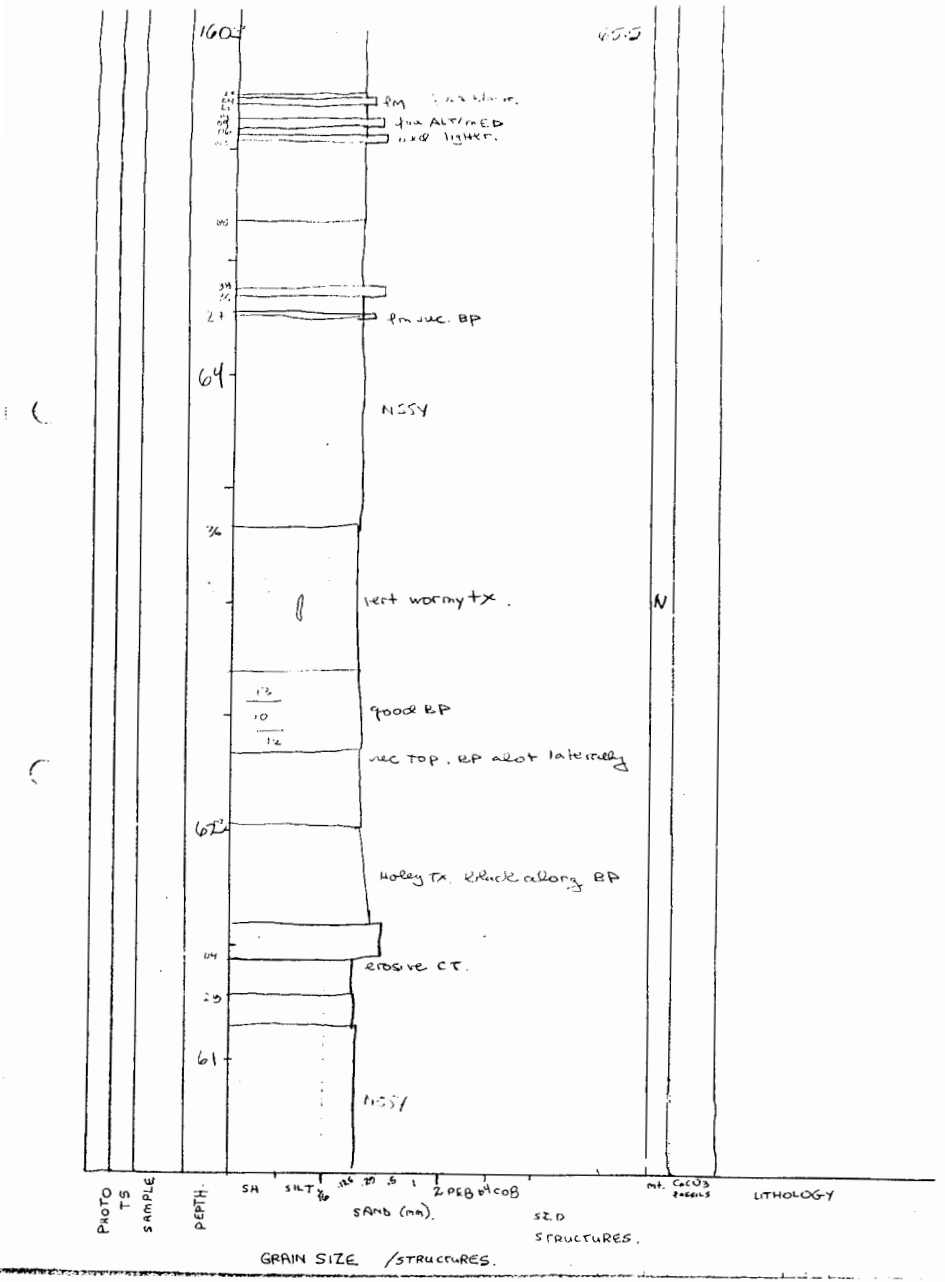

140
HOR LAMS developed RIBBING.
HOR PLANAR RIBS SPACE 1-2cm
St. 15cm set
+ PLANAR HOR TOP foreset.
C65
121m proto
PHCF
forestore swash zone
mid shoreface
inner rough zone.
HCR 171.
SM
bioturbated.
marine transgressive sequence.
delta abandonment.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.


145
90.5
ox front
RWORKED
fvf.
lagoon.
-supplied top w/ STST drape.
fvf
vf sm. STST.
1cm STST 15cm long ??
RIP UP CLASTS.
fvf. cleaned
PARTIAL CL.
bioturb.
C67
C66
35cm SEQUENCE
HOR.
-NO STV
emerald
emerald - pale green
WITH.
RAPID marine transgression
RAPID marine transgression
Beach Shore.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

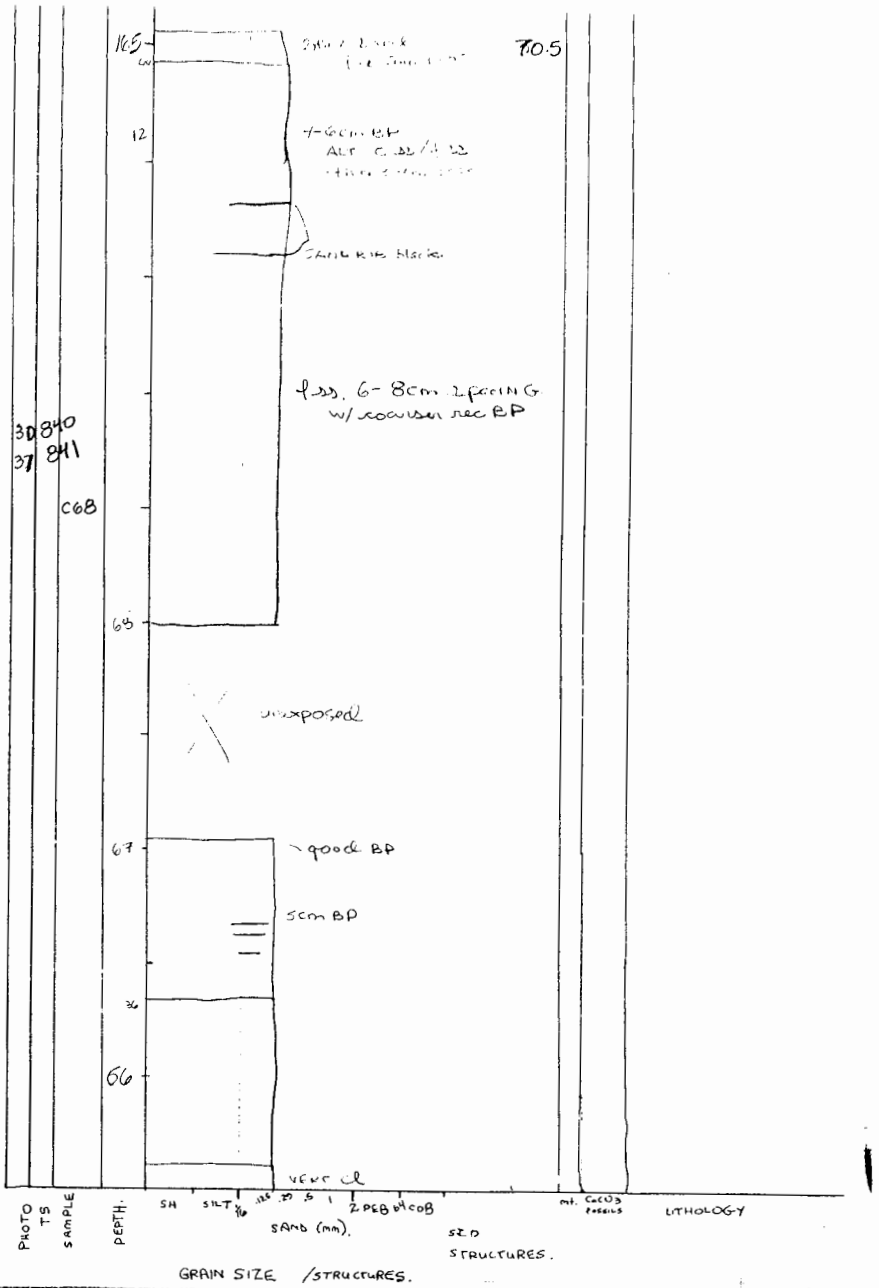

155
150
54
53
52
51
monotonous
black dots
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.


155
60
56
monotonous
-fss.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

C2

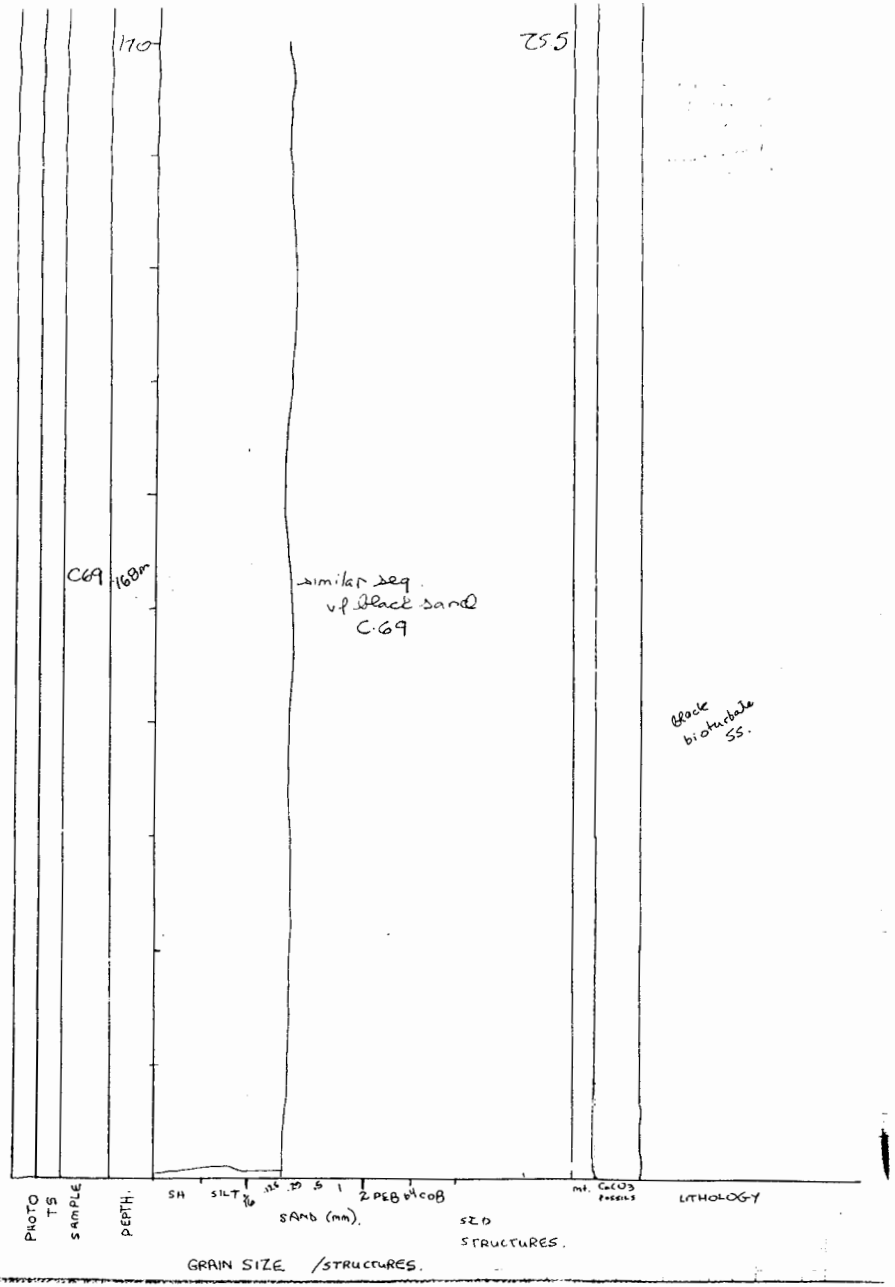


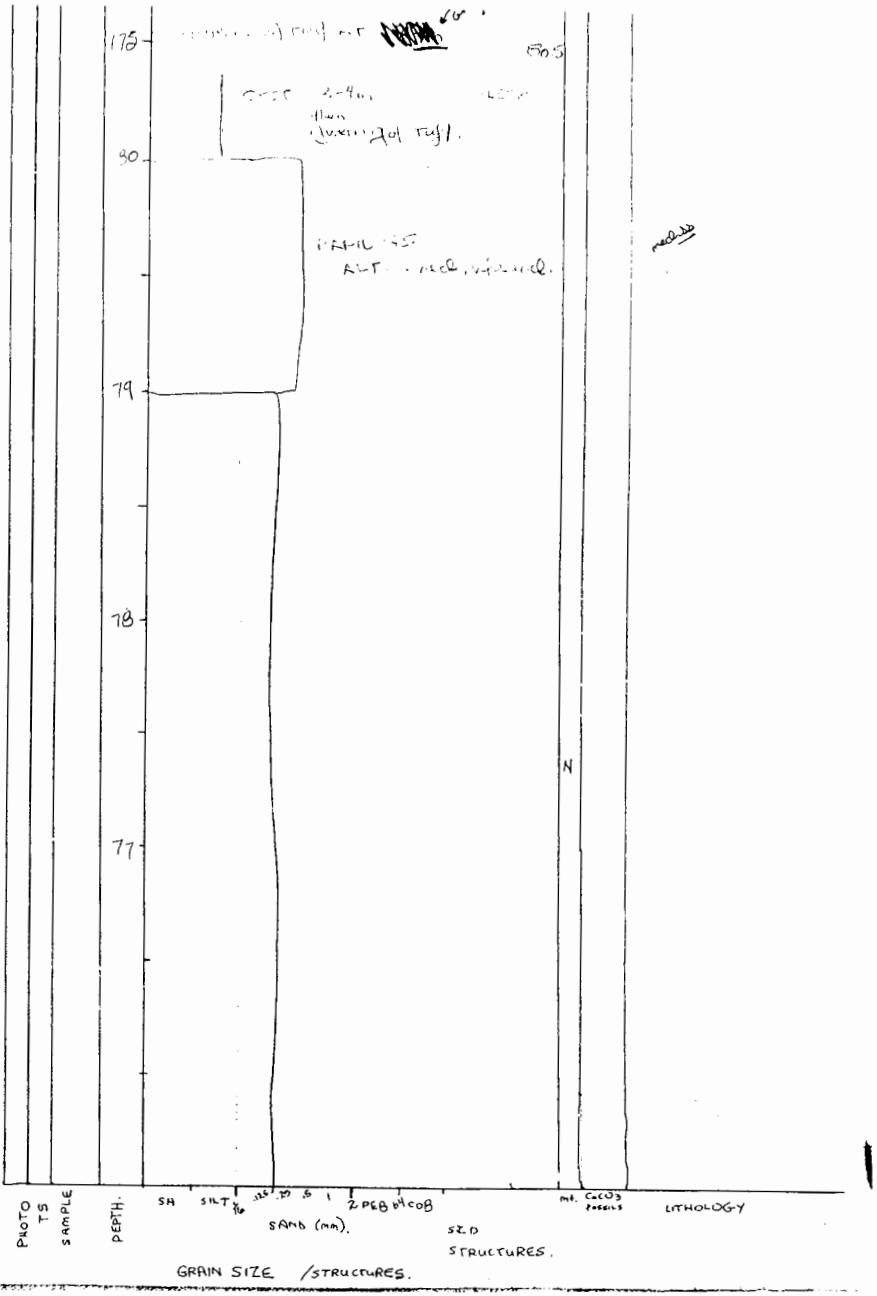
GRAIN SIZE /STRUCTURES.



GRAIN SIZE /STRUCTURES.

C2

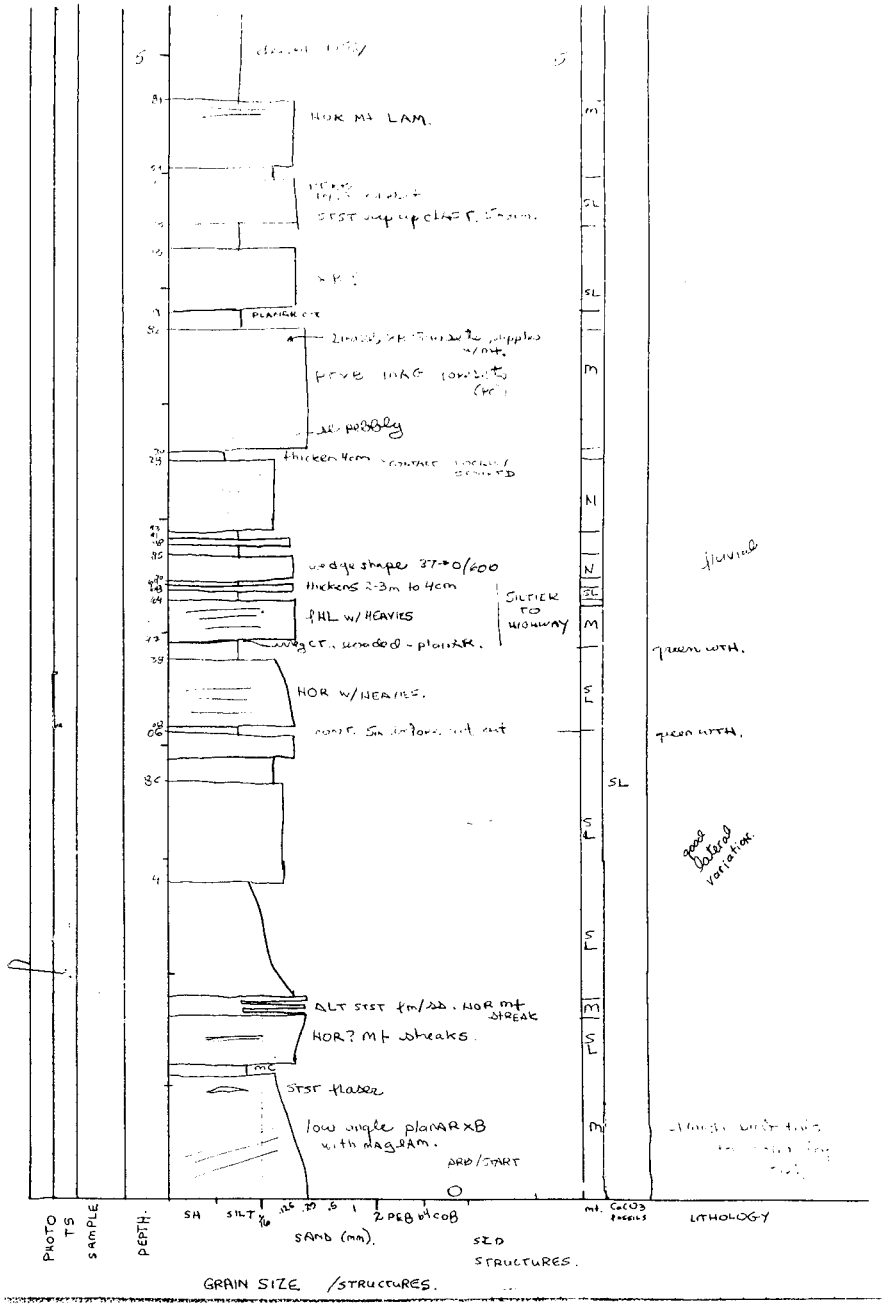

170
255
C69
168m
similar seq.
vf black sand
C.69
black
bioturbated
ss.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
.125
.25
.5
1
2
PEB
CoB
SED
STRUCTURES.
mt.
CaCO3
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

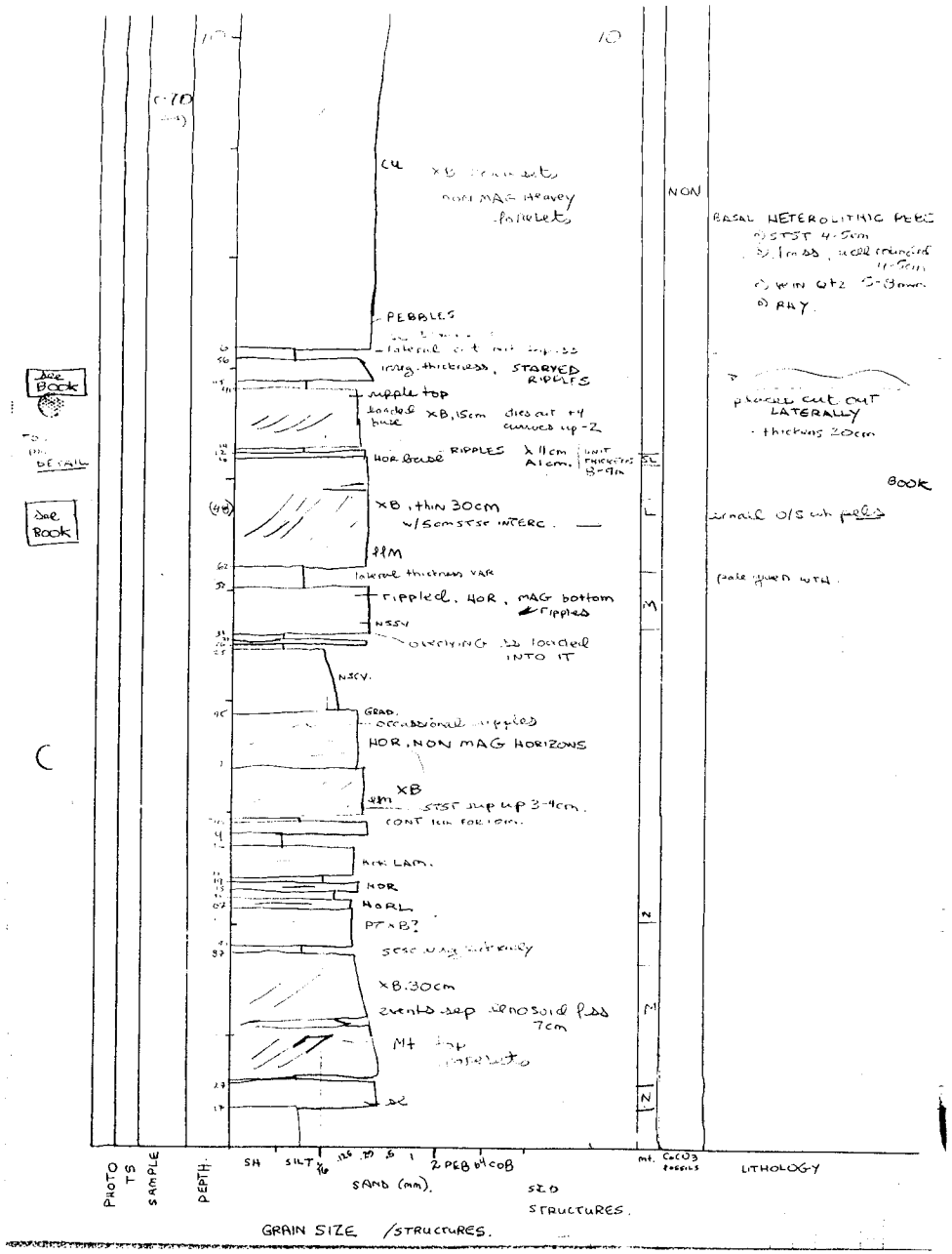

175
80
79
78
77
N
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
.125
.25
.5
1
2
PEB
CoB
SED
STRUCTURES.
mt.
CaCO3
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

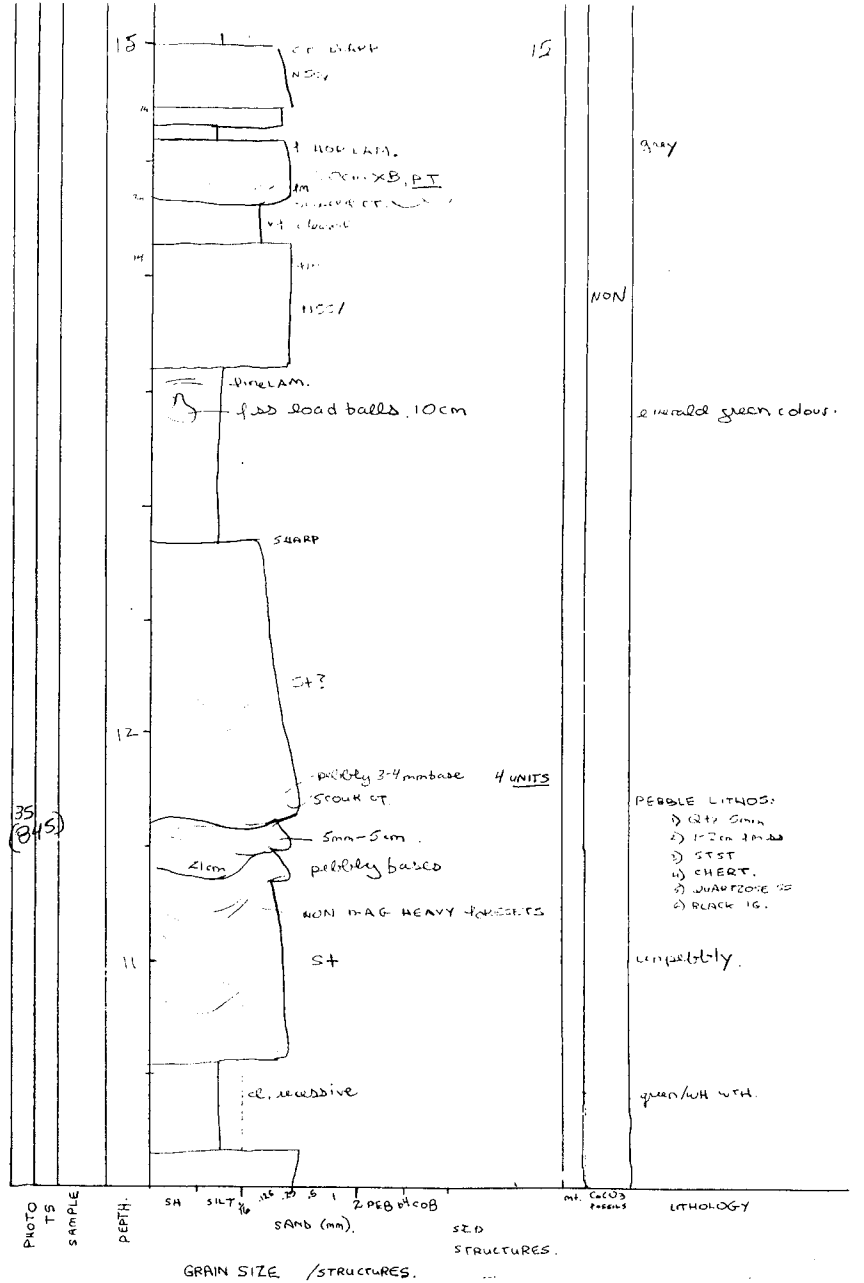
C2

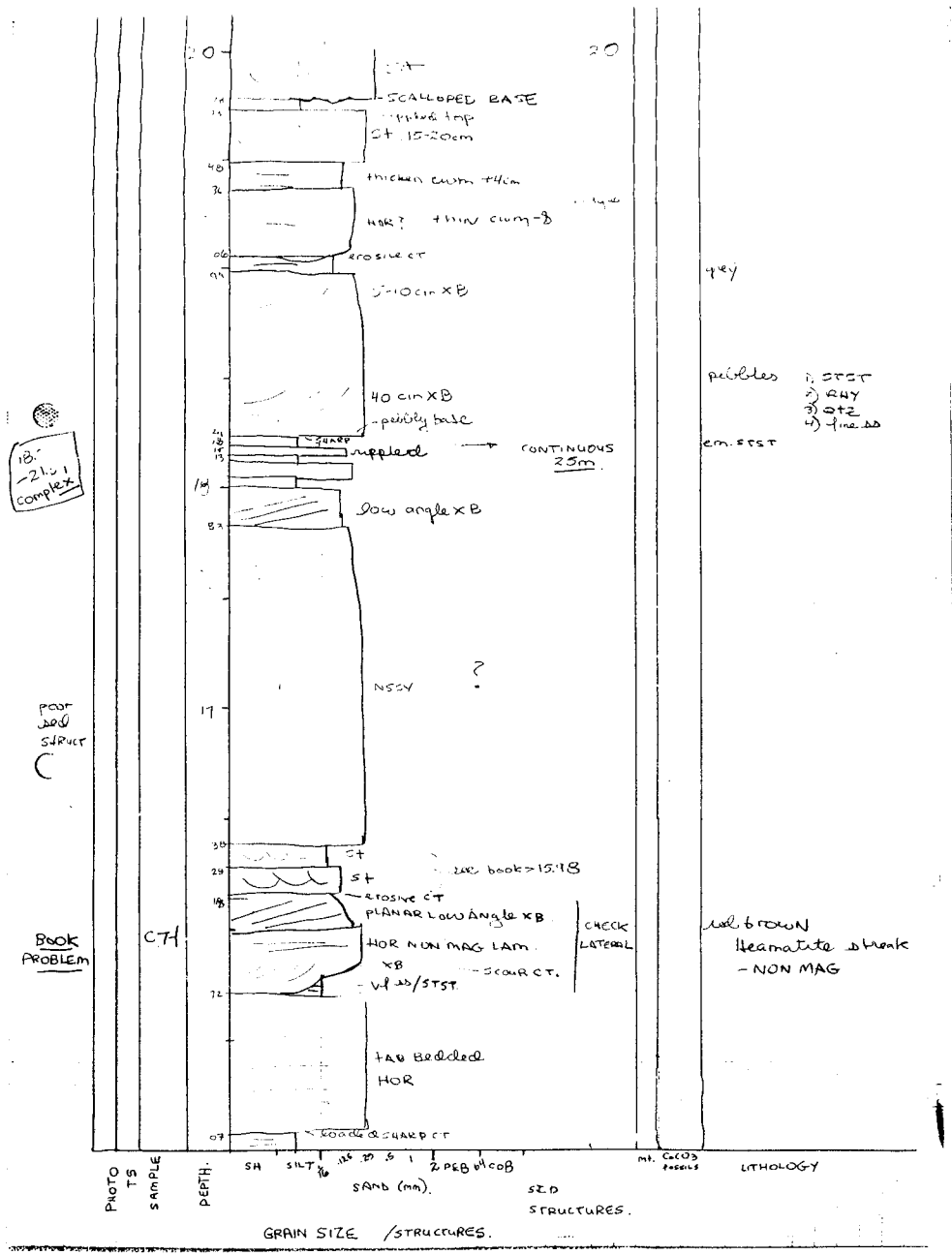
SECTION C3

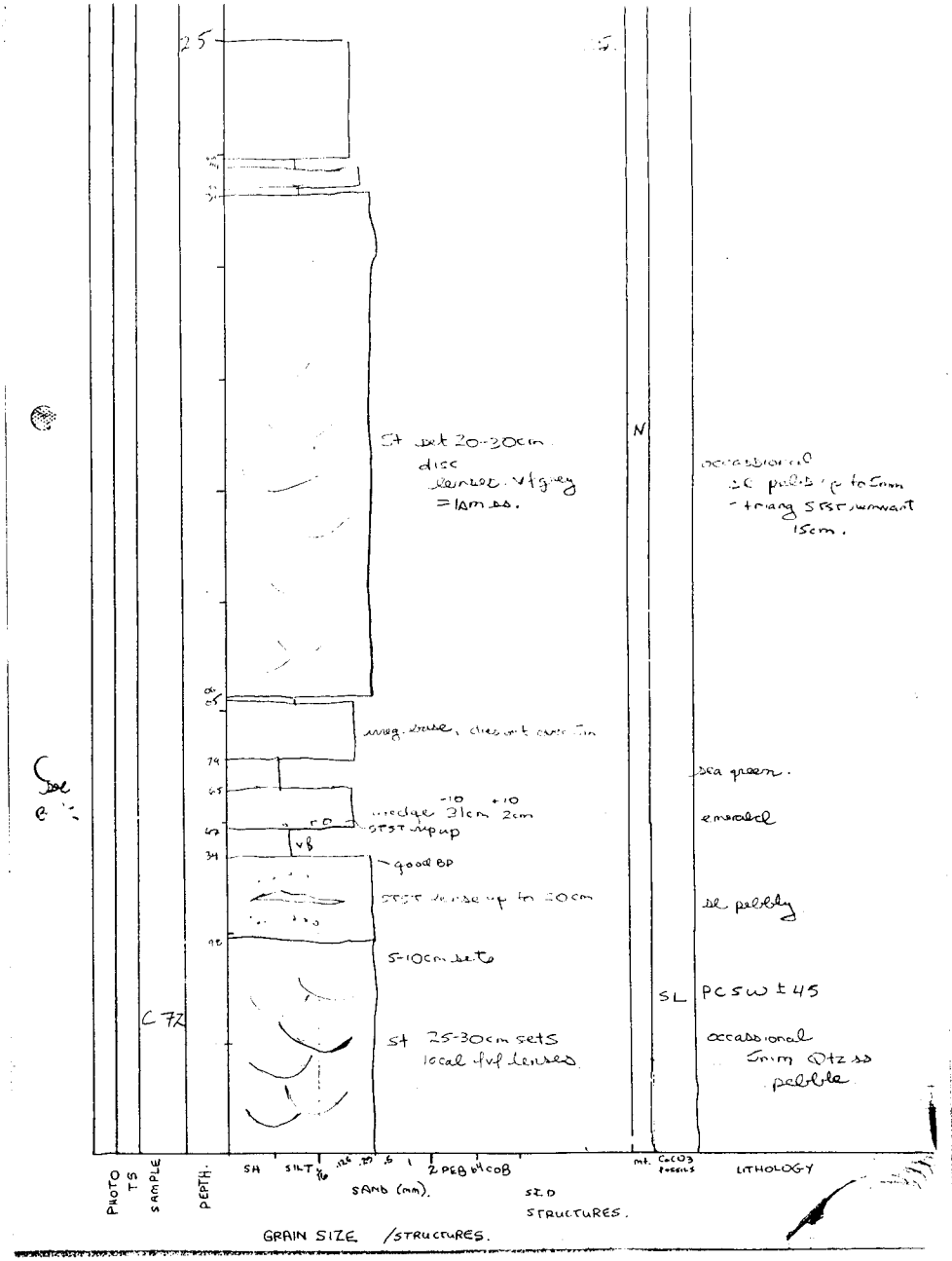
SECTION C3 LOCATION: Locate blocky outcrops of sandstone at SE corner of Cwm Nant-yr-Ogof. Section continues stratigraphically until Garth tuff is reached.

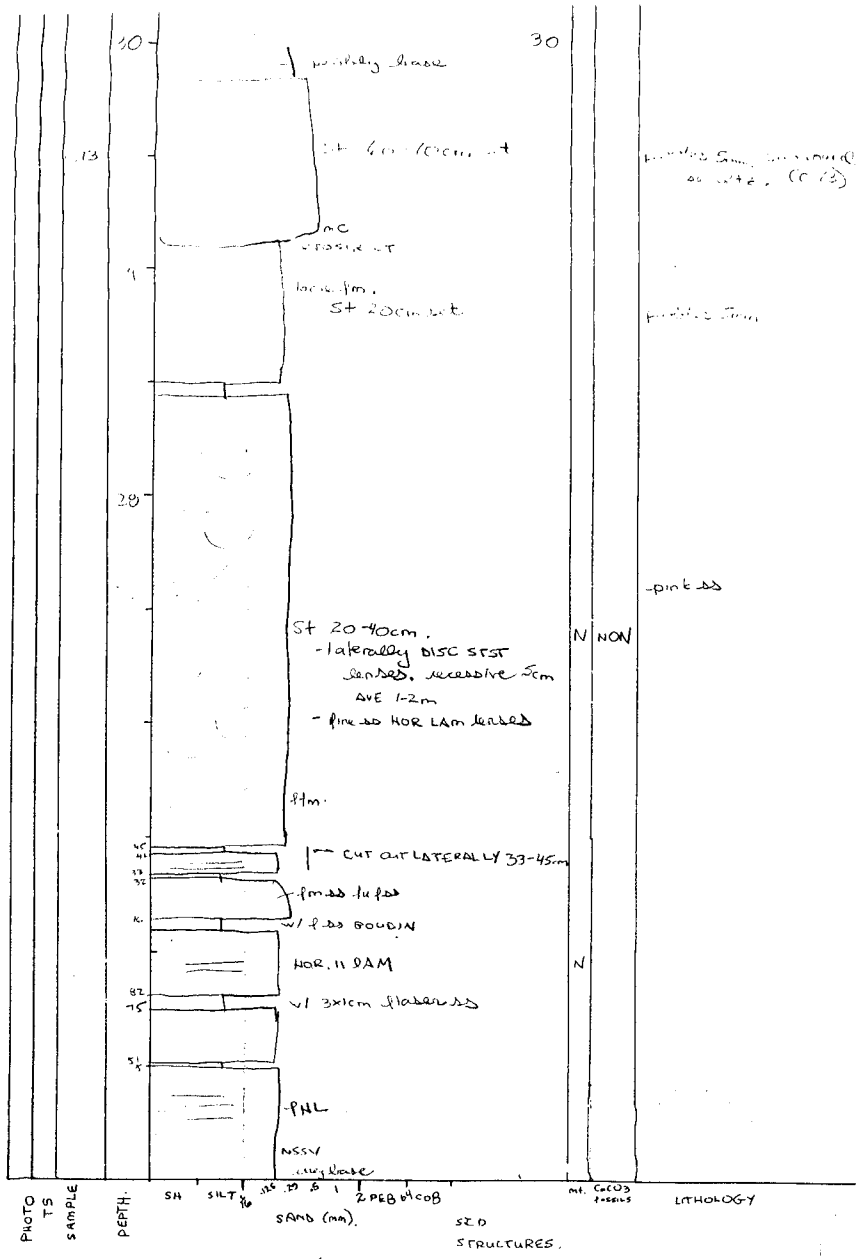


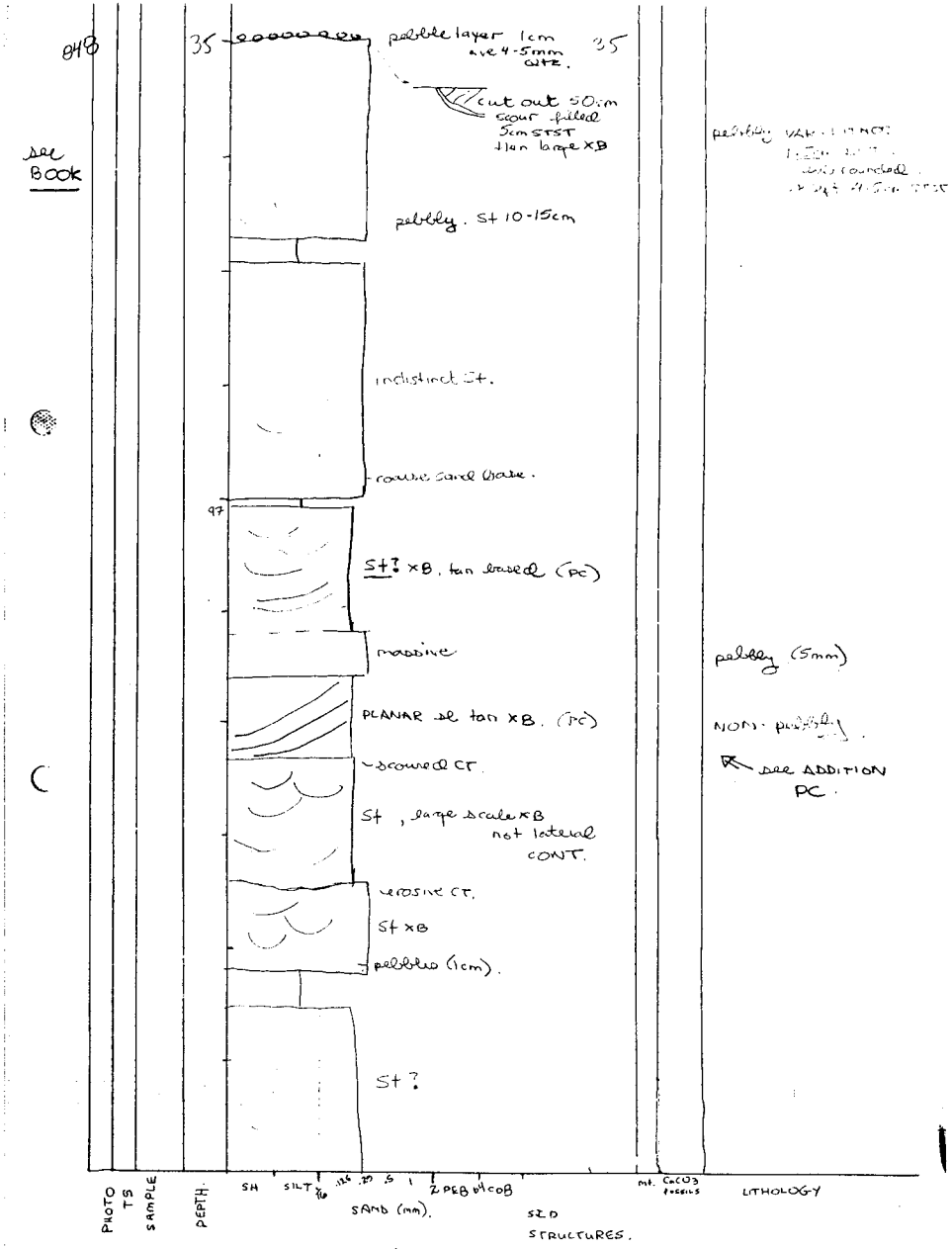

10
NON
BASAL HETEROLITHIC BED
PEBBLES
HOR BEDS
RIPPLES
XB, thin 30cm
HOR, NON MAG HORIZONS
NON LAM.
HOR
HORL
PT XB?
XB. 30cm
Mt
sc
Book
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

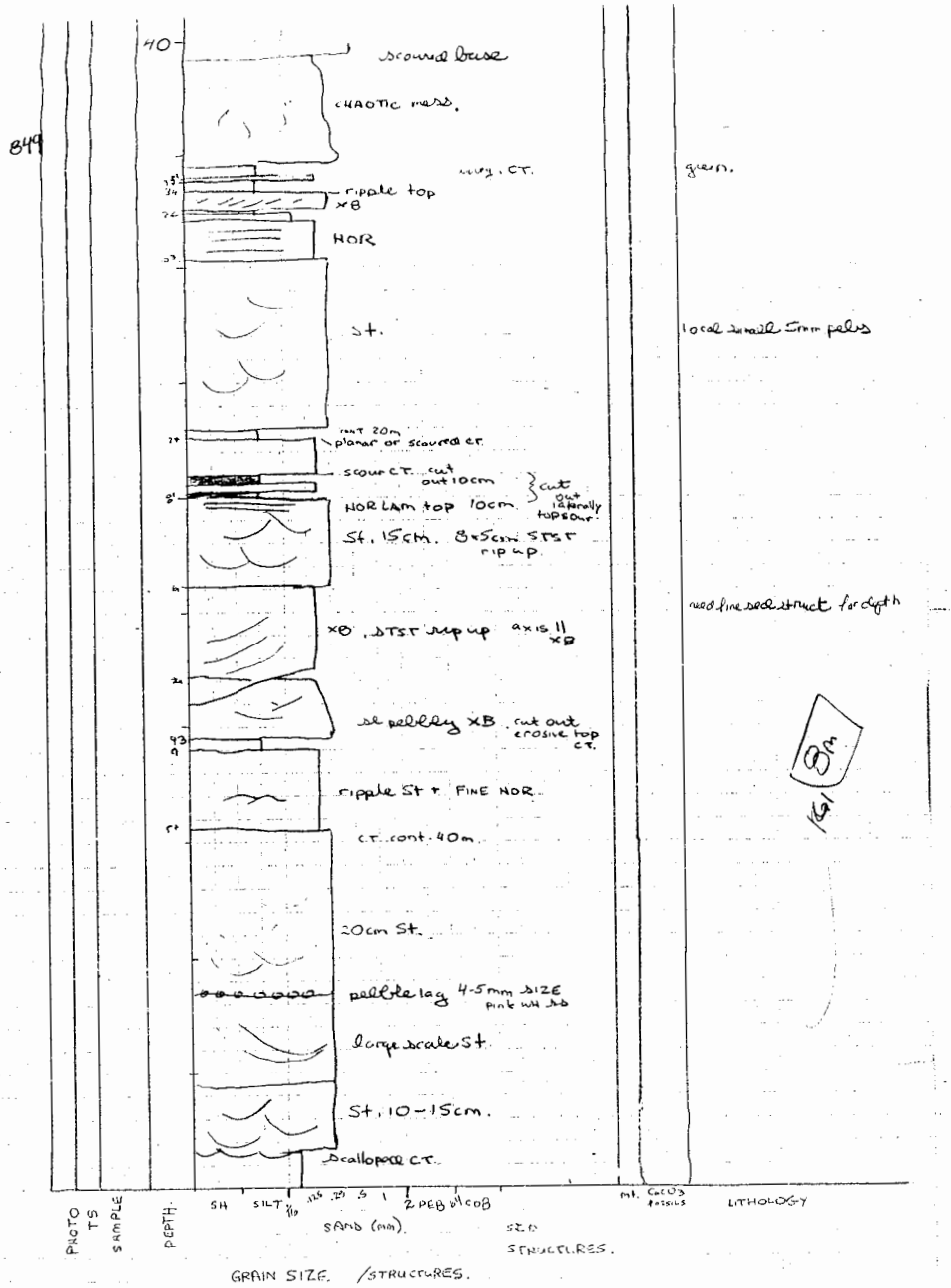

15
12
11
NON
SHARP
St?
St
pebbly 3-4mm base
4 UNITS
5mm-5cm
21cm
pebbly based
NON MAG HEAVY FORESETS
cl. recessive
PEBBLE LITHOS:
1) Qtz 5mm
2) 1-2cm
3) STST
4) CHERT.
5) QUARTZITE
6) BLACK LG.
completely.
green/wh with.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

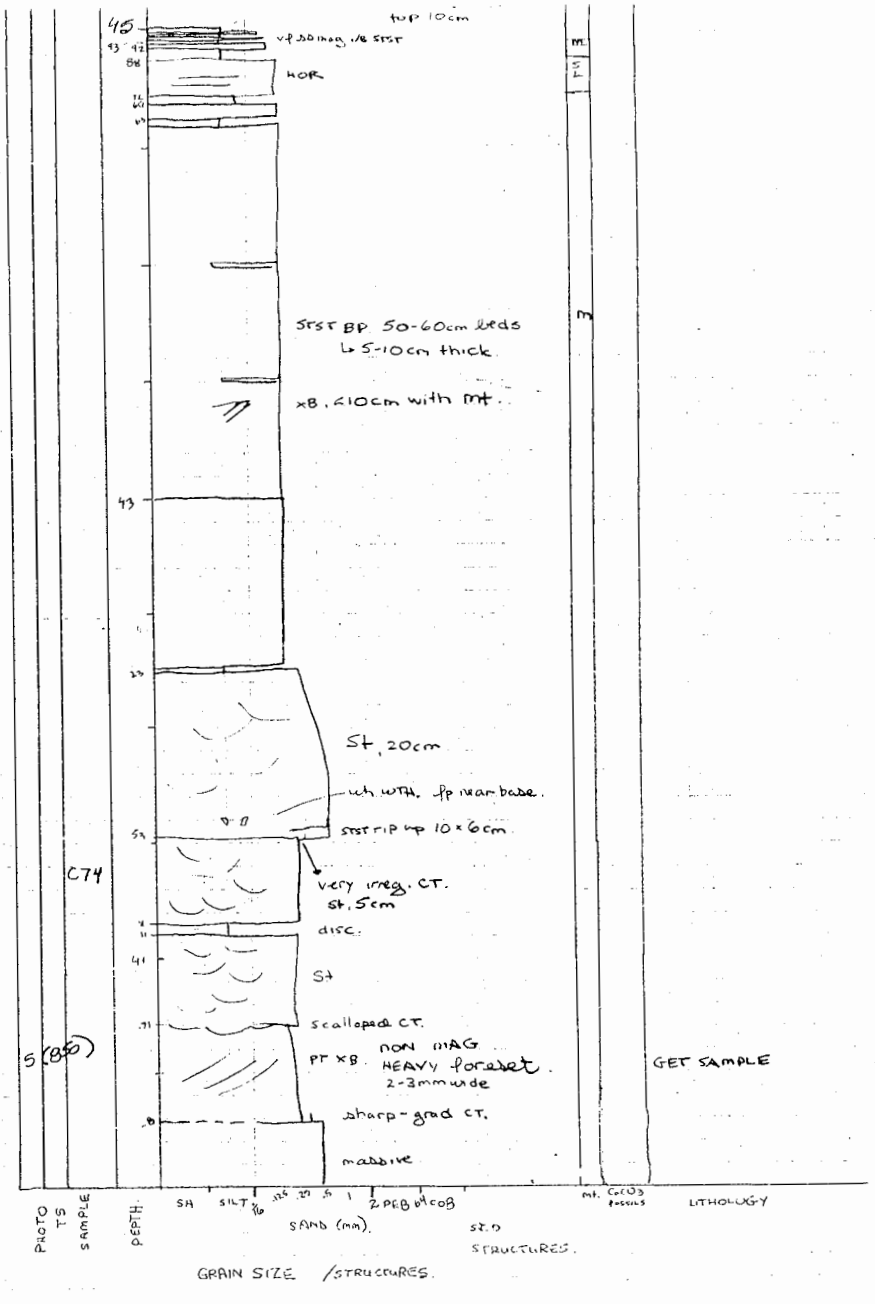

20
20
ST
SCALLOPED BASE
rippled top
St 15-20cm
thicken cluny +4cm
HOR? thin cluny-8
erosive CT
grey
5-10cm XB
pebbles 1) STST 2) RHY 3) Qtz 4) fine ss
40 cm XB
pebbly base
SHARP
rippled
CONTINUOUS 25m.
em. STST
low angle XB
NSCV
?
poor soft struct
St
see book > 15.18
EROSIVE CT
PLANAR LOW ANGLE XB
CHECK LATERAL
Book PROBLEM
C71
HOR NON MAG LAM.
XB
SCOUR CT.
Vf ss/STST
mod brown
Hematite streak
- NON MAG
HAB Bedded
HOR
LOADED & SHARP CT
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

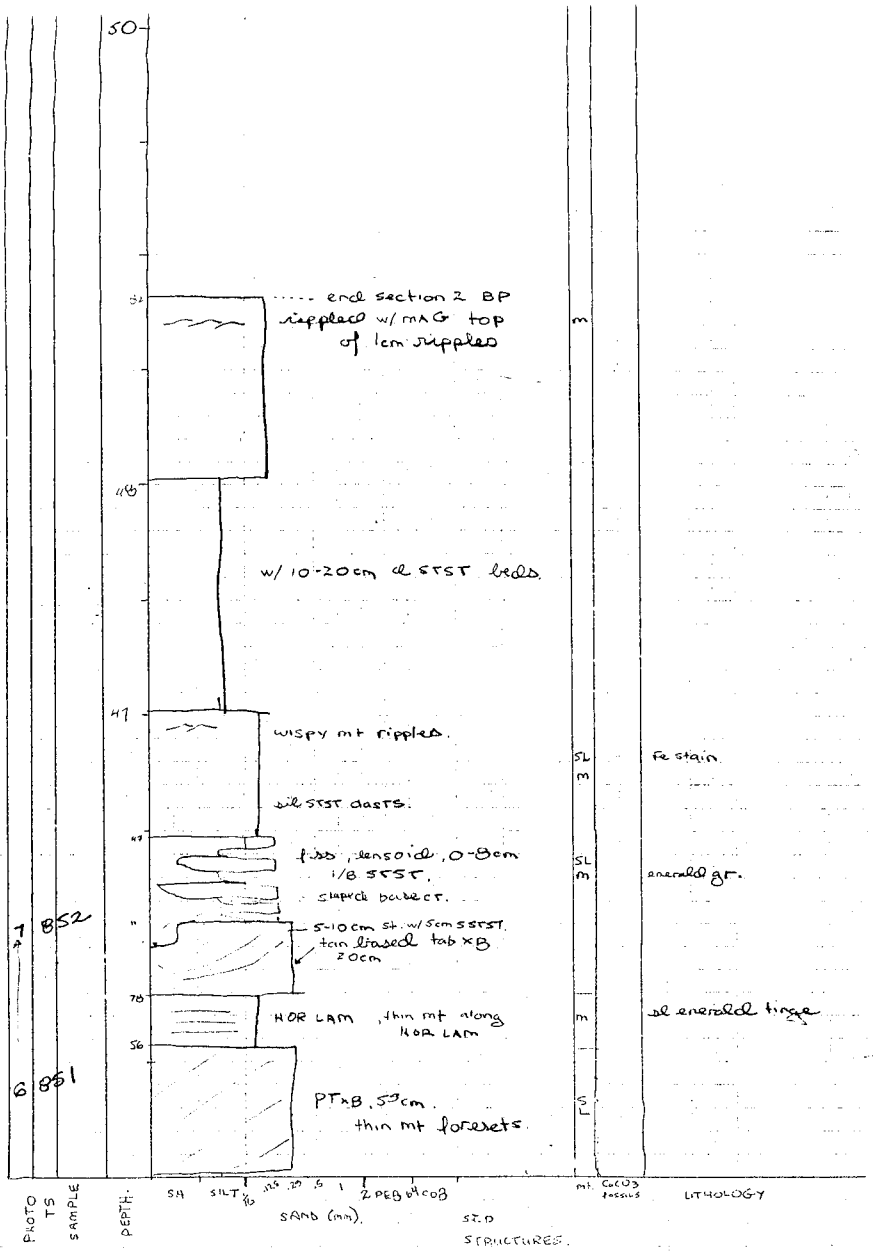

25
25
St set 20-30cm
disc
lenses vfg grey
= 1cm ss.
N
occasional
SC pebbles up to 5mm
- triang SRST, unwant
15cm.
wisp. bases, discont over 5m
sea green.
wedge -10 +10
3cm 2cm
STST in up
emerald
VB
good BP
STST in rise up in 20cm
sl pebbly
5-10cm sets
C72
St 25-30cm sets
local fvf lenses
SL
PCSW ± 45
occasional
5mm Qtz ss
pebble
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

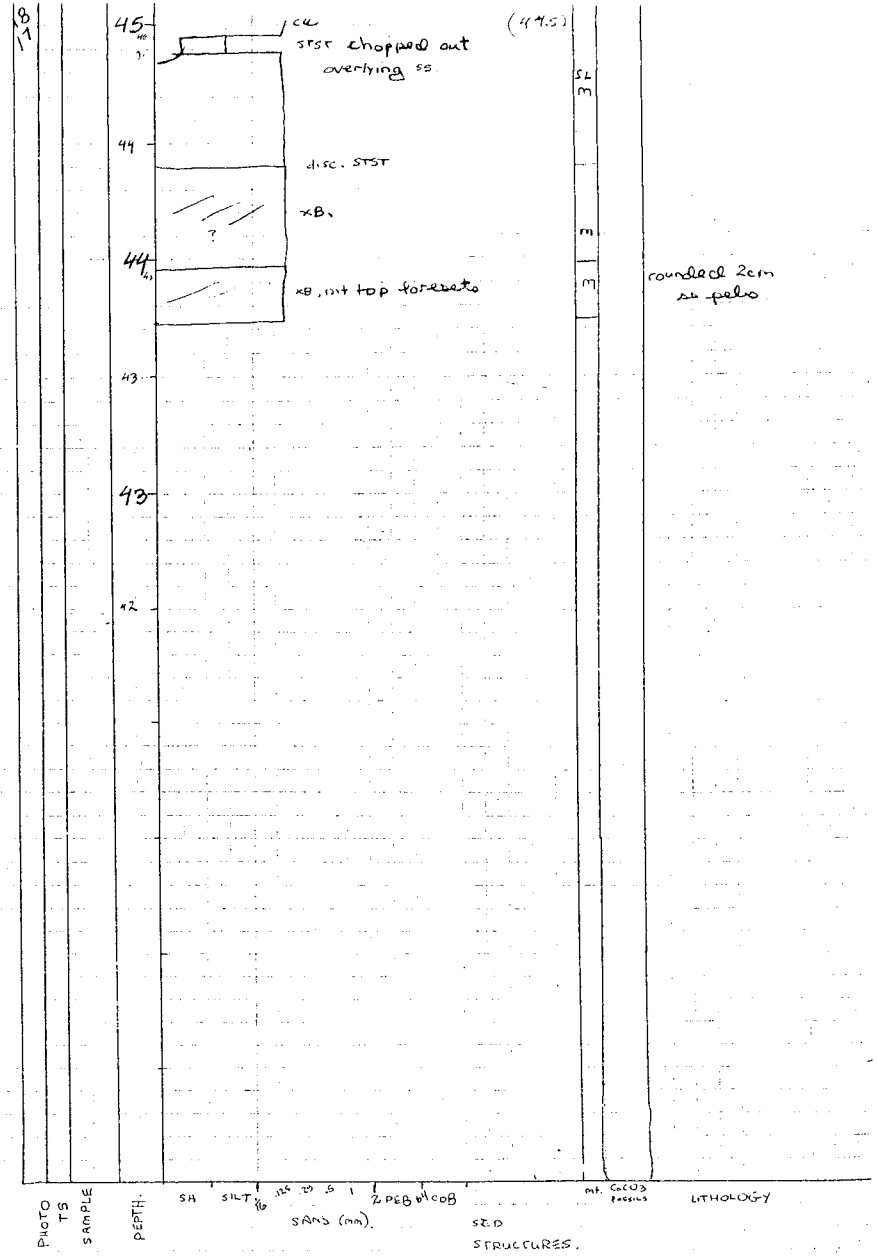

10
30
13
1
20
possibly climbing
nc
erosive ct
lam fm.
St 20cm set.
St 20-40cm.
-laterally DISC STST
lenses. recessive 5cm
AVE 1-2m
- fine ss HOR LAM lenses
fm.
CUT OUT LATERALLY 33-45cm
fm ss lu fos
w/ f ss BOUDIN
HOR. II LAM
w/ 3x1cm flaser ss
PHL
NSSV
ripple lam
pink ss
N NON
N
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

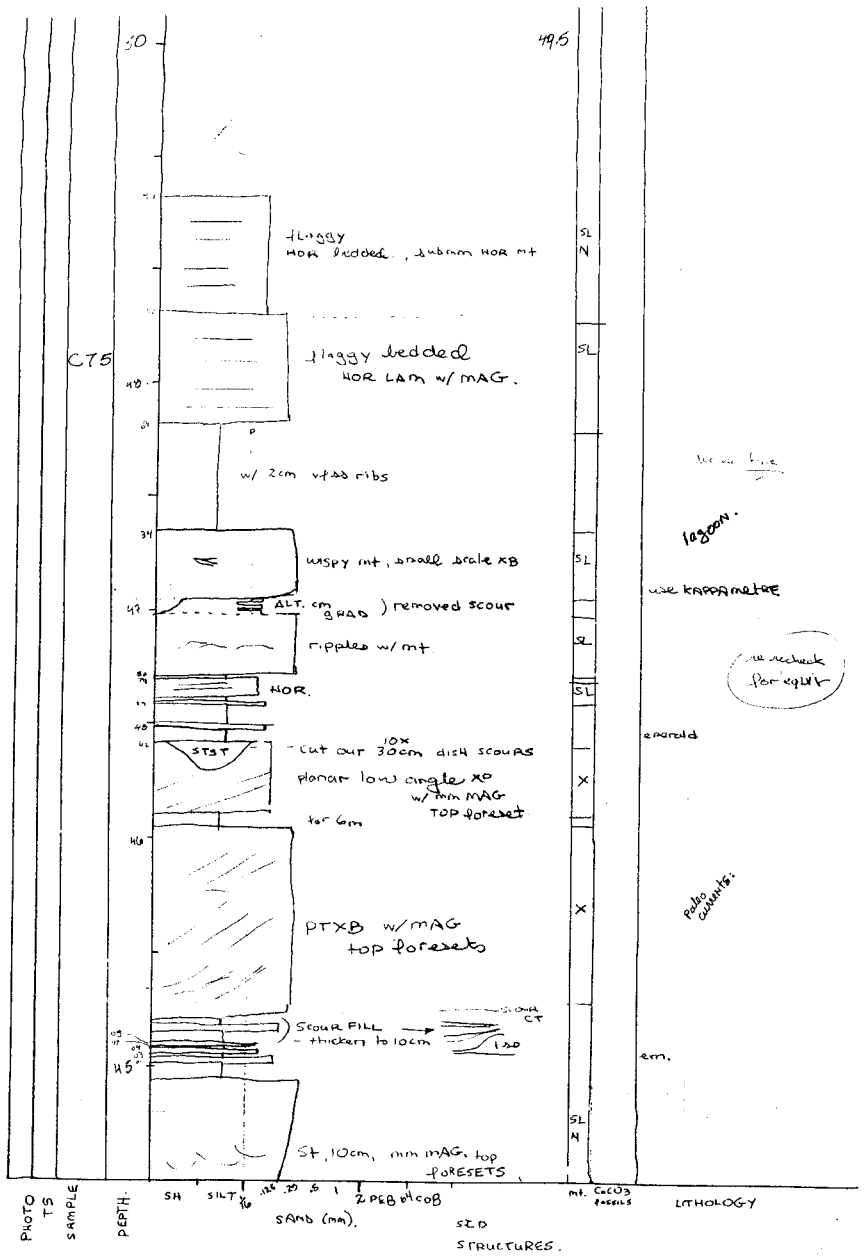

048
see
Book
35
35
pebble layer 1cm
ave 4-5mm
QTZ.
cut out 50cm
scour filled
5cm STST
+lam large XB
pebbly. St 10-15cm
indistinct St.
rouse sand base.
97
St? XB. tan brwd (PC)
massive
PLANAR sl tan XB. (PC)
scoured ct.
St, large scale XB
not lateral
CONT.
erosive ct.
St XB
pebbled (1cm).
St?
pebbly (5mm)
see ADDITION
PC.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

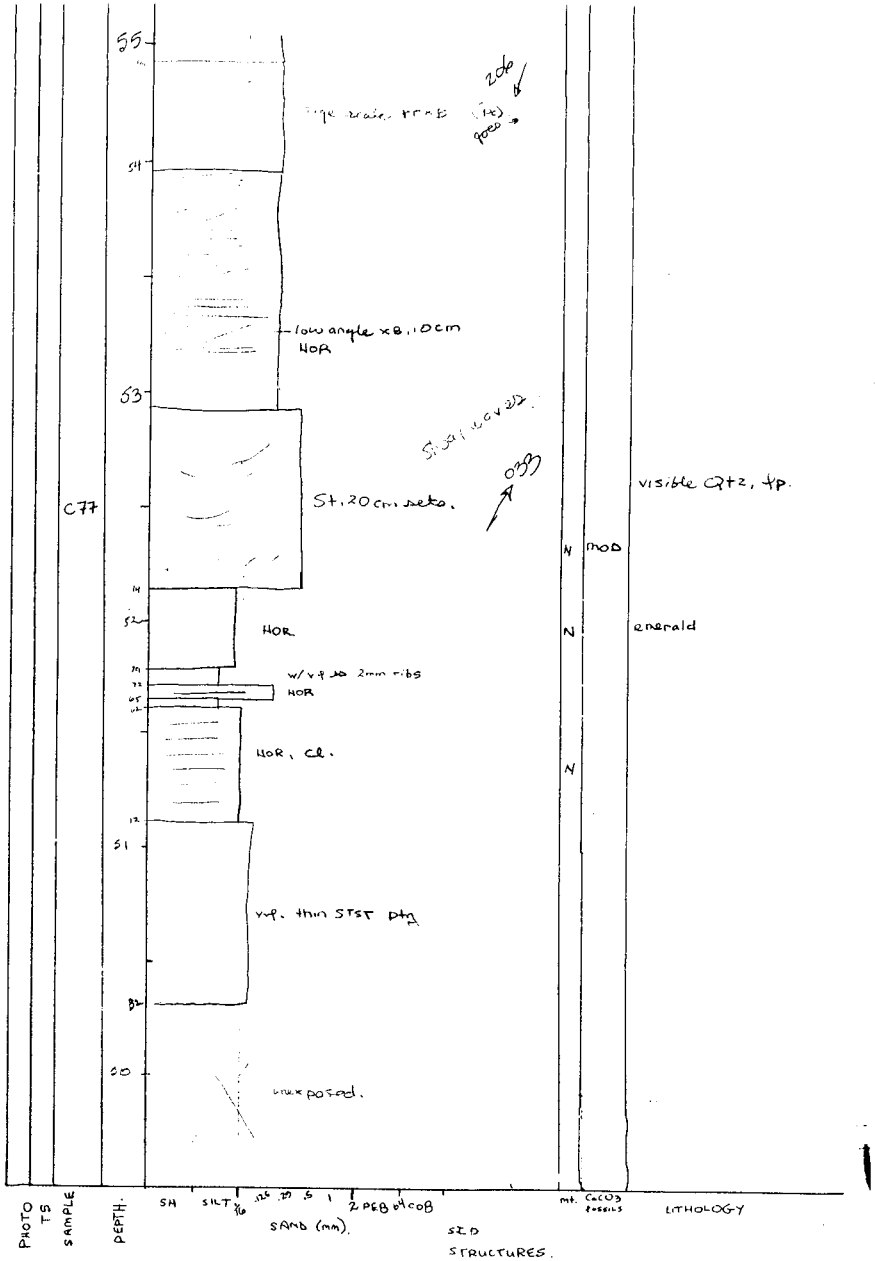

849
40
scoured base
CHAOTIC mass.
wavy CT.
ripple top
xB
HOR
St.
local small 5mm pebs
cont 20m planar or scoured CT.
scour CT. cut out 10cm
cut out vertically top scour
HOR LAM top 10cm
St. 15cm. 8×5cm SISTR rip up.
xB, SISTR imp up axis ⊥ xB
pebbly xB. cut out erosive top CT.
ripple St + FINE HOR.
CT. cont. 40m.
20cm St.
pebble lag 4-5mm SIZE pink WH Jsb
large scale St.
St, 10-15cm.
Scalloped CT.
need fine scale struct for depth
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
Mt.
CaCO3
FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

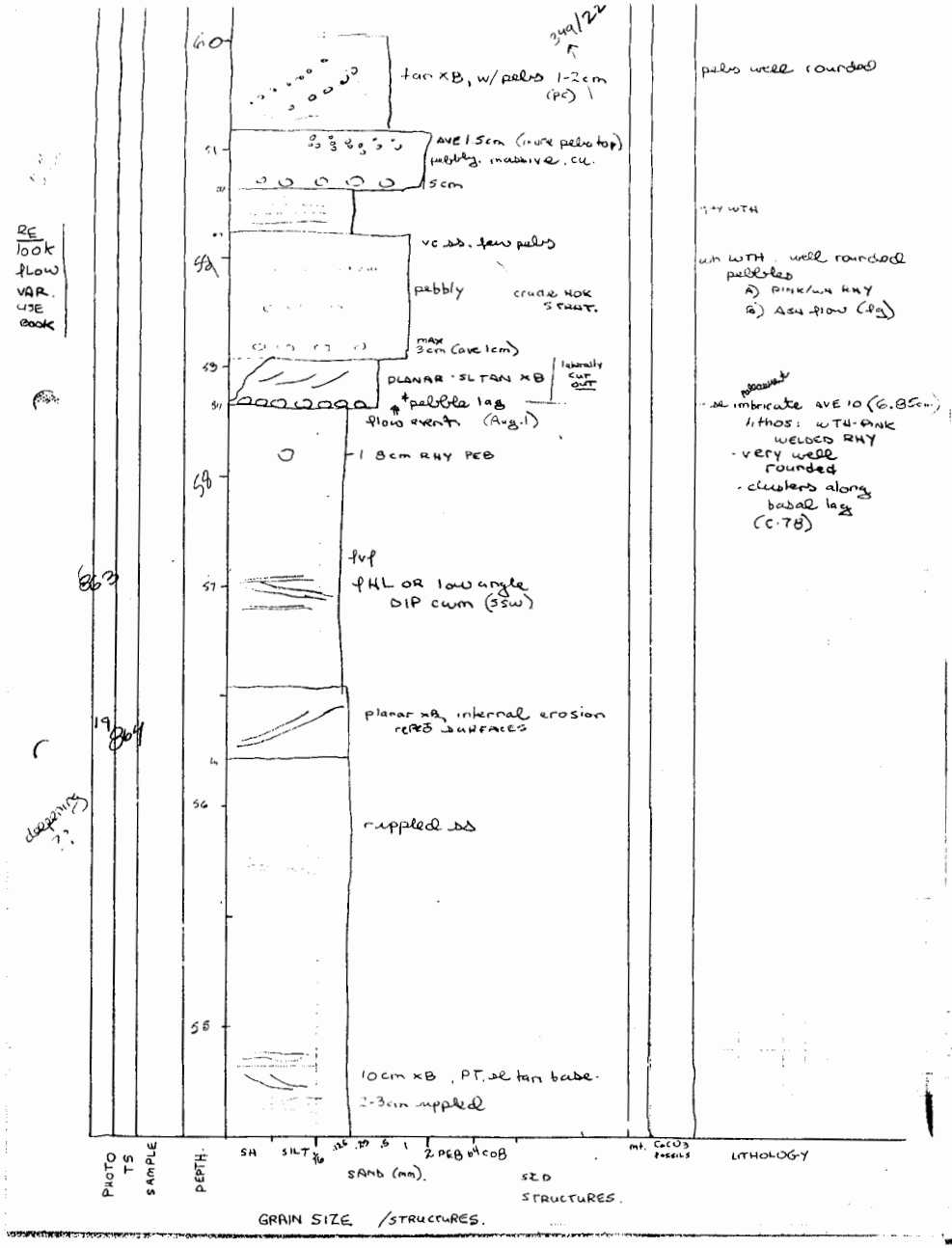

top 10cm
45
VF SS inag. /B SISTR
HOR
SISTR BP 50-60cm beds & 5-10cm thick
xB, ≤10cm with mt.
St, 20cm
uch with. fp near base.
SISTR rip up 10×6cm
C74
very irreg. CT. St. 5cm
disc.
St
scalloped CT.
5 (850)
PT xB. NON MAG HEAVY foreset. 2-3mm wide
sharp-grad CT.
massive
GET SAMPLE
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
Mt.
CaCO3
FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

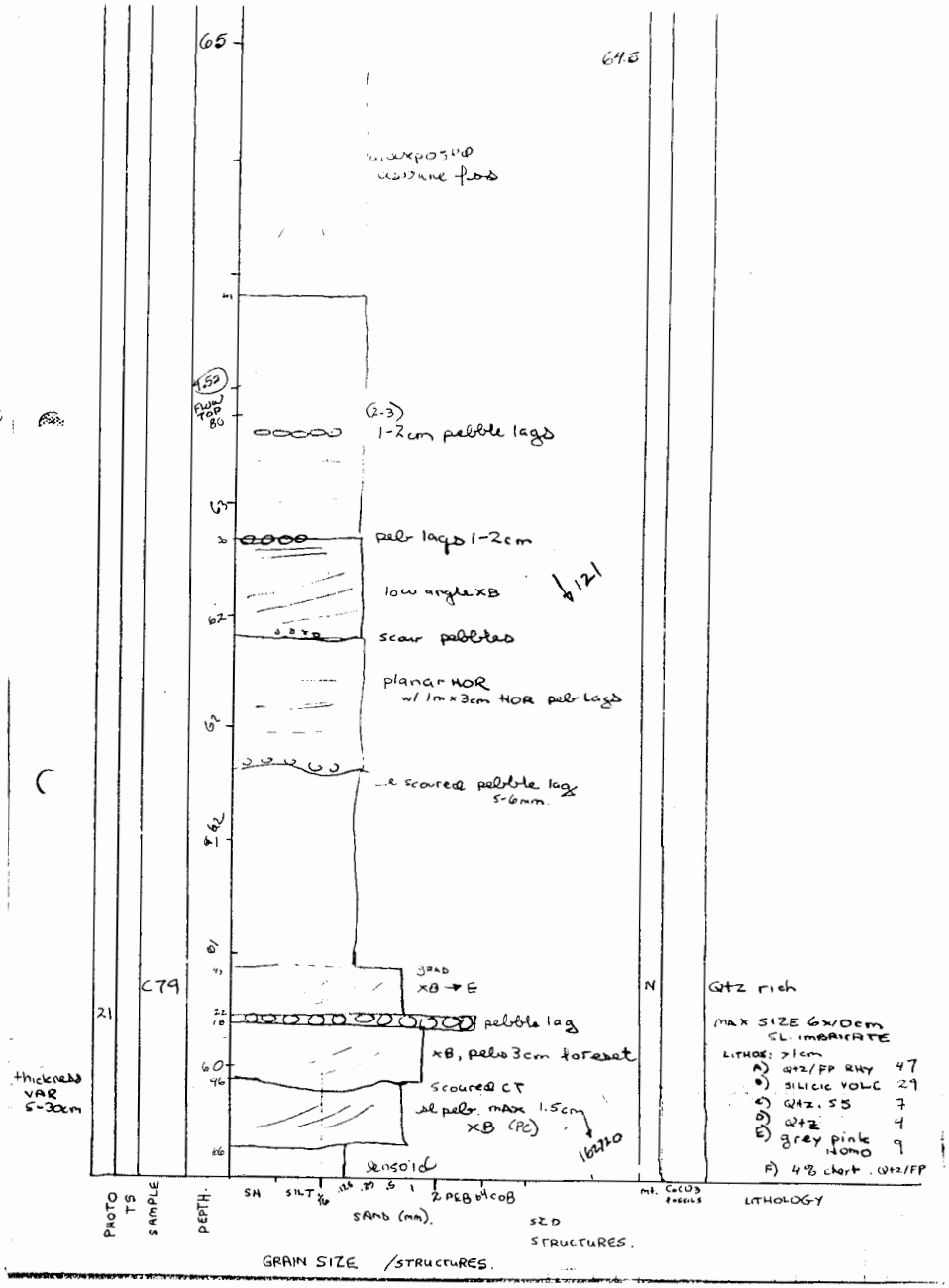

50
49
48
47
46
45
44
43
42
..... end section 2 BP
rippled w/ mAG top
of 1cm rippled
w/ 10-20cm ol STST beds.
wispy mt rippled.
sil STST dasts.
fiss, lensoid, 0-8cm
i/B STST.
slumped bedset.
5-10cm st. w/5cm SSTST.
tan biased tab xB
20cm
HOR LAM, thin mt along
HOR LAM
PT xB, 59cm.
thin mt foresets
Fe stain
emerald gr.
sl emerald tinge
B52
B51
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
STRUCTURES
mt
CaCO3
fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

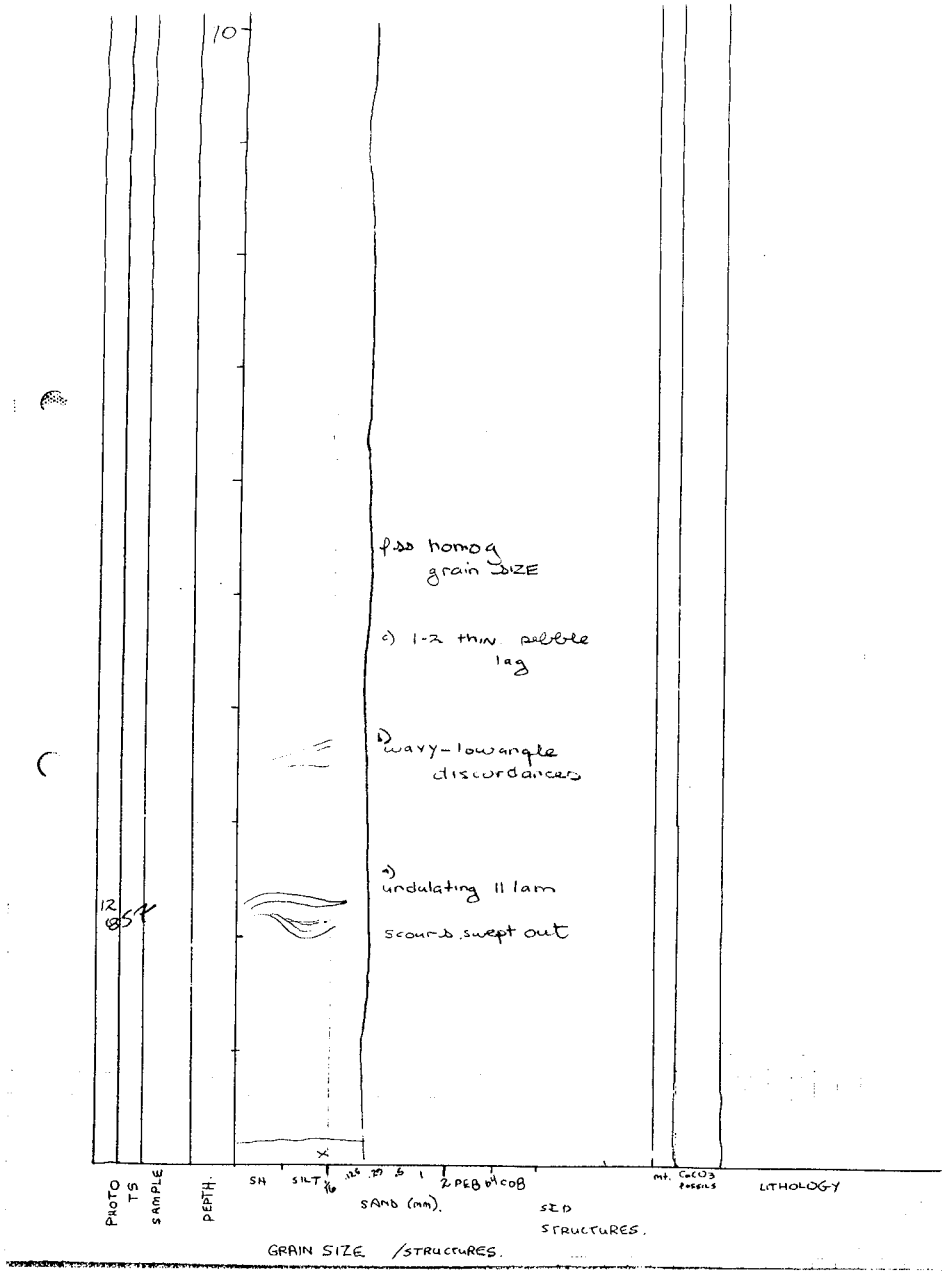

B63
B62
45
44
43
42
(44.5)
cu
STST chopped out
overlying ss
disc. STST
xB.
xB, mt top foresets
rounded 2cm
ss pebs
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
STRUCTURES
mt
CaCO3
fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.


C75
50
49.5
flaggy HOR bedded, 1mm HOR mt
flaggy bedded HOR LAM w/ MAG.
w/ 2cm v.f.ss ribs
wispy mt, small scale XB
ALT. cm grad) removed scour
ripples w/ mt
HOR.
STST
- cut our 10x 30cm dish scours
planar low angle XB w/ 1mm MAG TOP foreset
for 6m
PTXB w/MAG top foresets
SCOUR FILL - thickens to 10cm
St, 10cm, mm MAG. top foresets,
lagoon.
use KAPPA metre
emerald
em.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

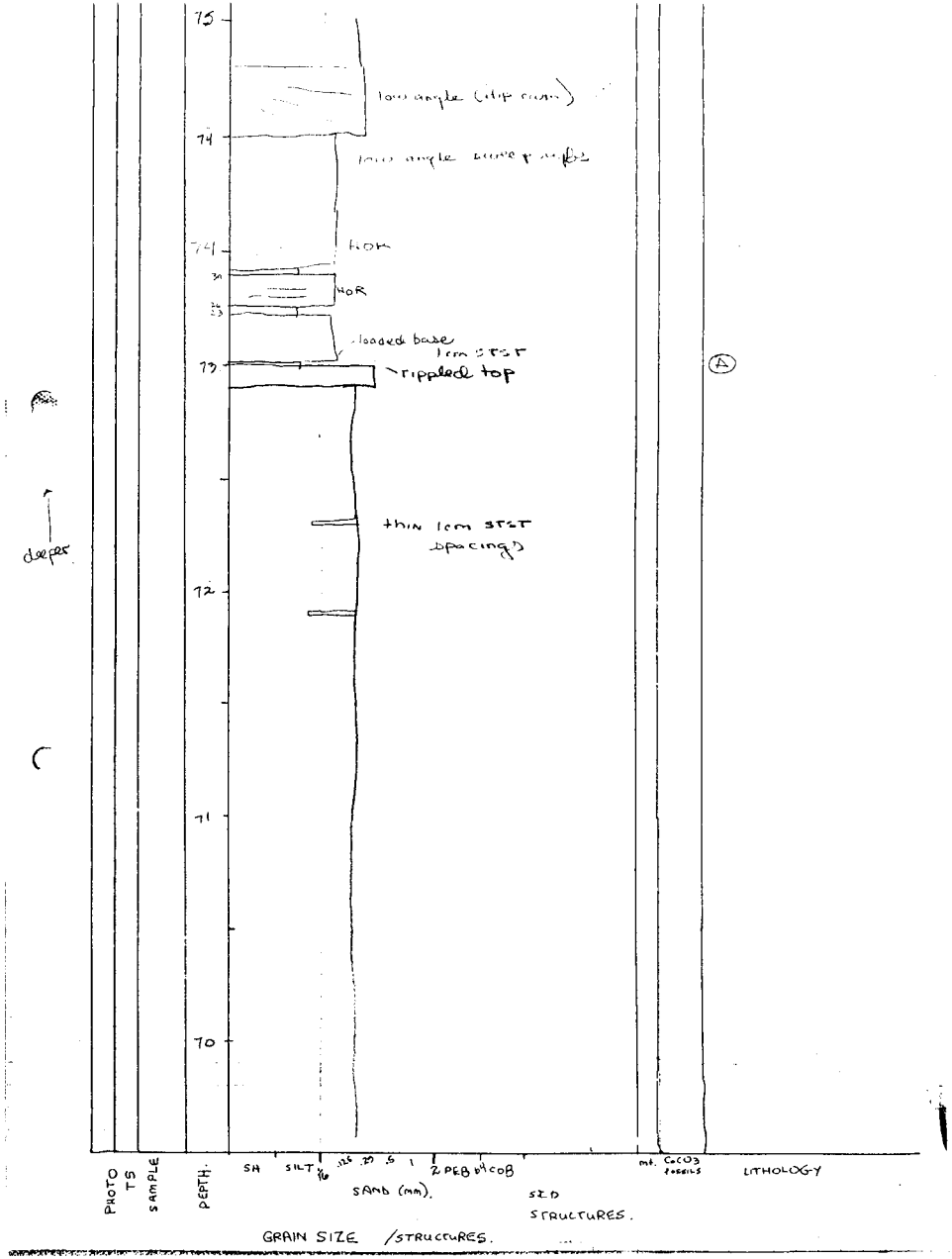

C77
55
54
53
52
51
50
low angle XB, 10cm HOR
St, 20cm, sets.
HOR
w/ v.f. to 2mm ribs
HOR, Cl.
v.f. thin STST ptg
visible Qtz, fp.
mod
emerald
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.


RE look flow VAR. USE book
tan XB, w/ pebs 1-2cm (PC)
AVE 15cm (irreg pebs top) pebbly, massive, cu.
5cm
vc ss, few pebs
pebbly
crude HOR STRAT.
max 3cm (ave 1cm)
PLANAR SL TAN XB
pebble lag
flow event (Aug.1)
1-8cm RHY PEB
fvf
LHL OR low angle DIP cum (SSW)
planar XB, internal erosion reped surfaces
rippled ss
10cm XB, PT, sl tan base.
2-3cm rippled
pebs well rounded
with WTH
with WTH, well rounded pebbles
A) PINK/WH RHY
B) ASH flow (Pg)
sl imbricate AVE 10 (6.85cm)
lithos: WTH-PNK WELDED RHY
- very well rounded
- clusters along basal lag (C-78)
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
SED STRUCTURES
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

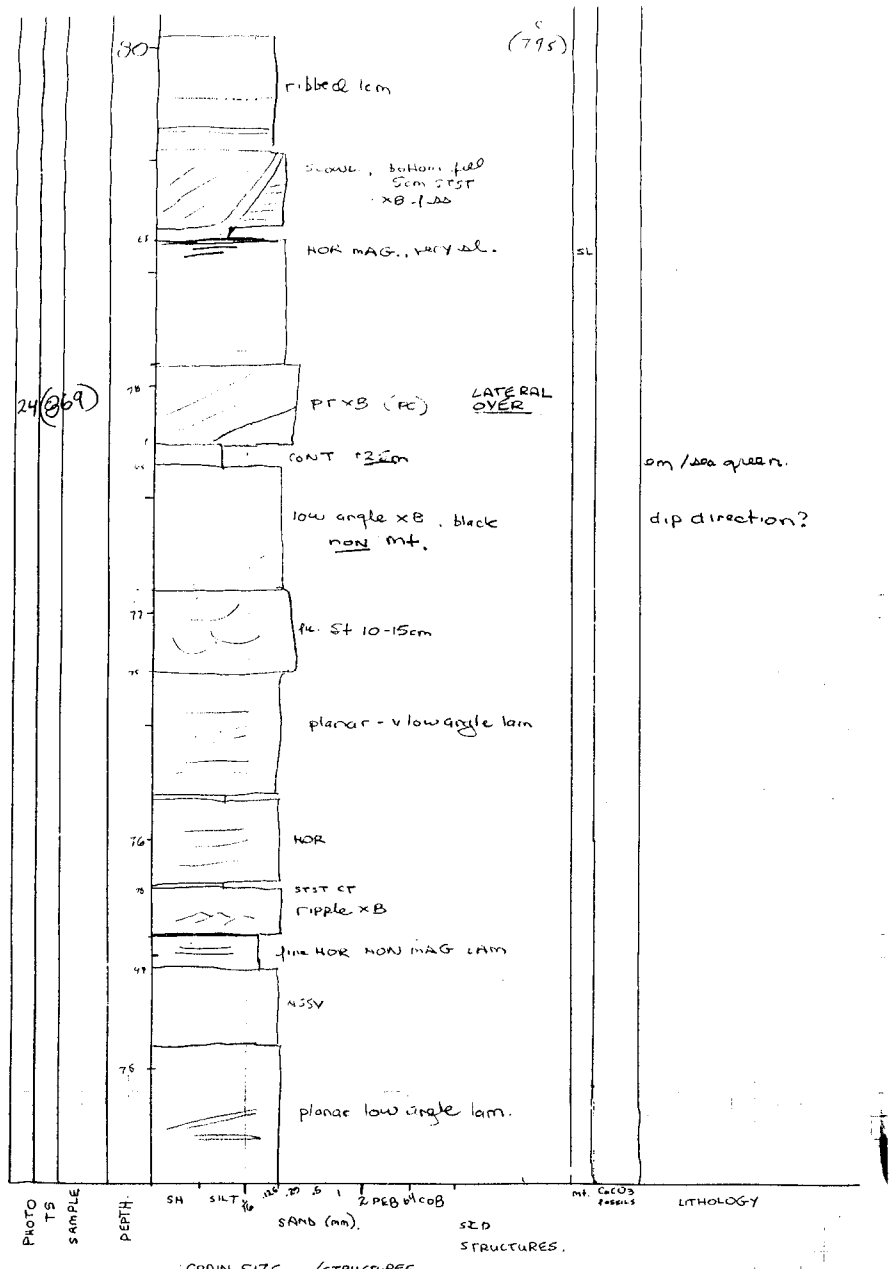

well exposed
wavy flow
(2-3) 1-2cm pebble lags
peb lags 1-2cm
low angle XB
scour pebbled
planar HOR w/ 1m x 3cm HOR peb lags
scoured pebble lag 5-6mm.
GRAD XB → F
pebble lag
XB, pebs 3cm foreset
scoured CT
sl peb. max 1.5cm
XB (PC)
sensoid
C79
thickness VAR 5-30cm
N
Qtz rich
max SIZE 6x10cm
SL. IMBRICATE
LITHOS: >1cm
A) Qtz/FP RHY 47
B) SILICIC VOLC 29
C) Qtz. SS 7
D) Qtz 4
E) grey pink homo 9
F) 4% chert, Qtz/FP
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
PEB
COB
SED STRUCTURES
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

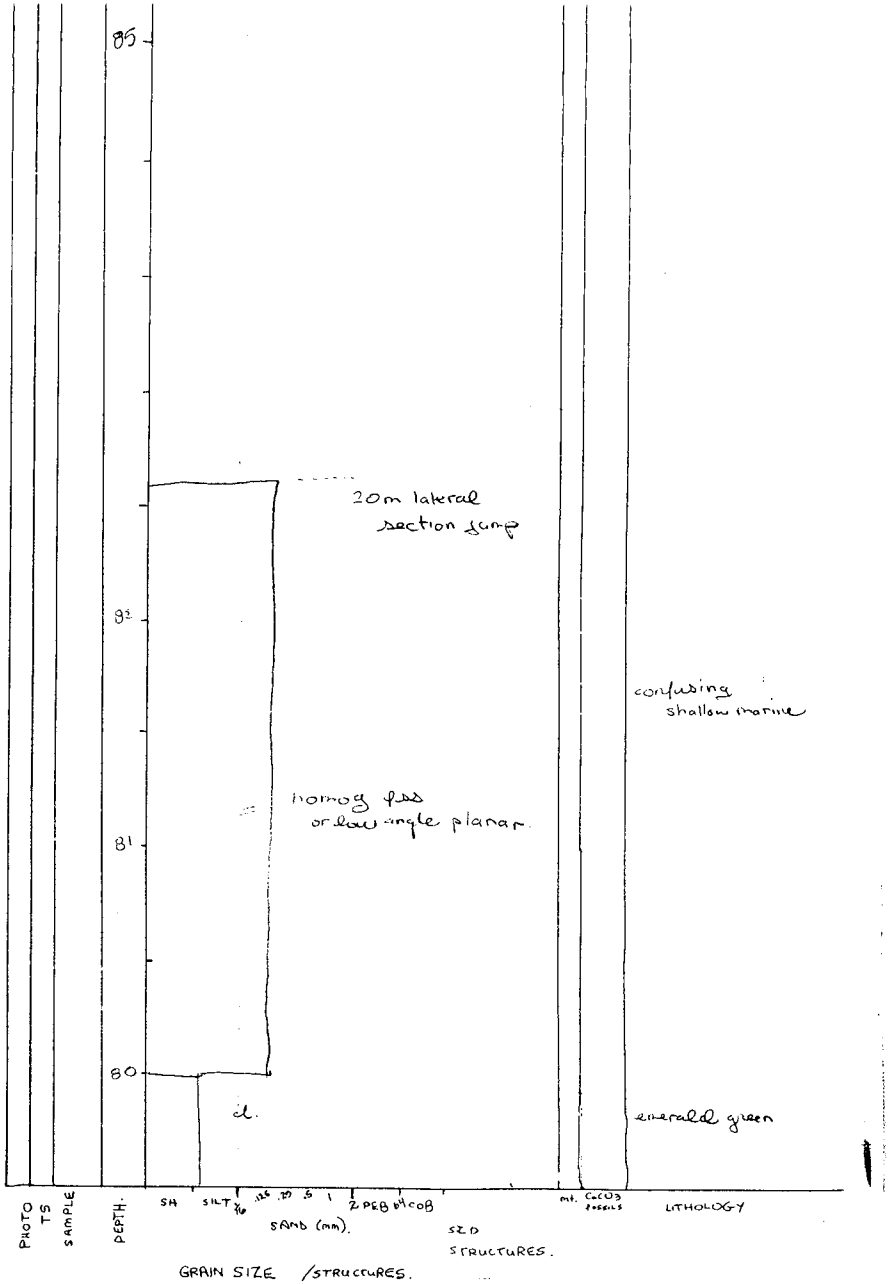


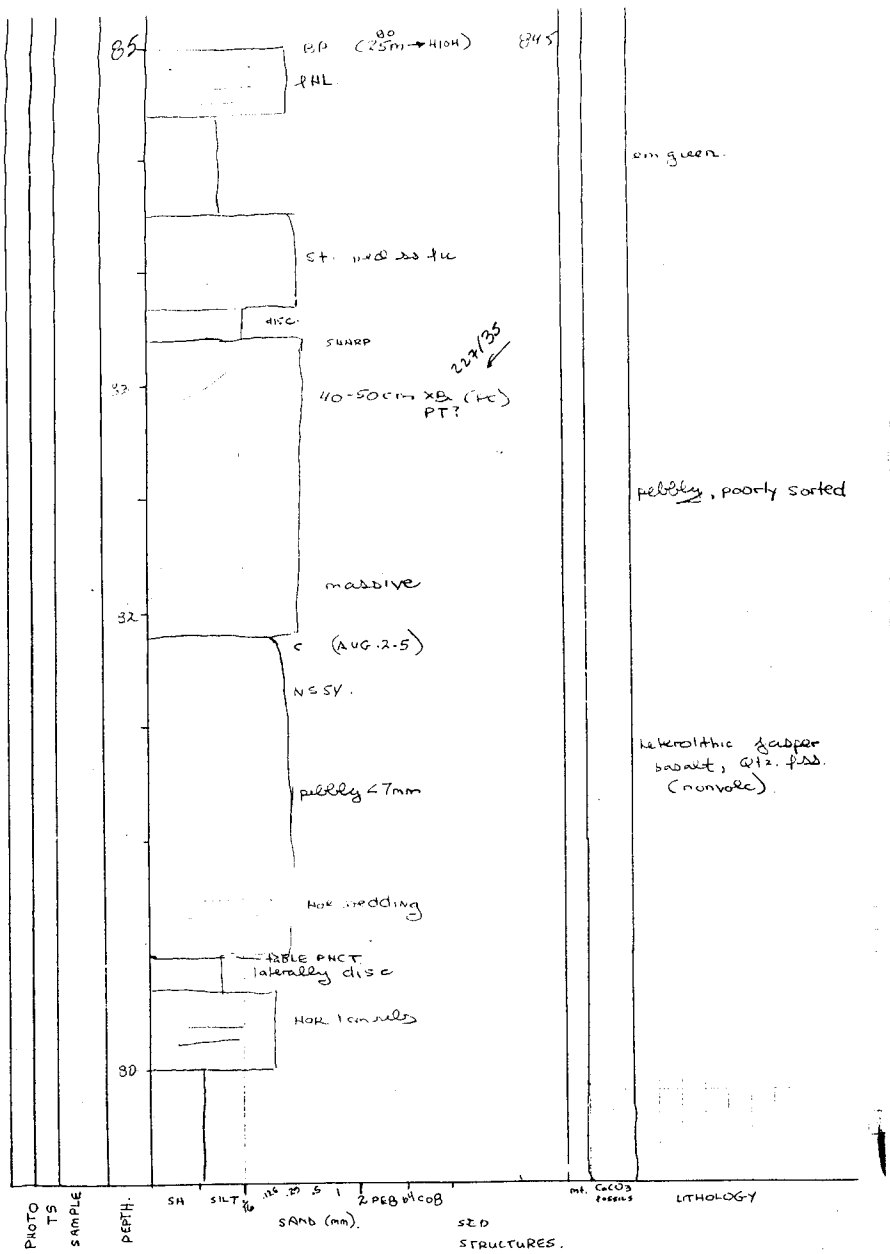
GRAIN SIZE /STRUCTURES.

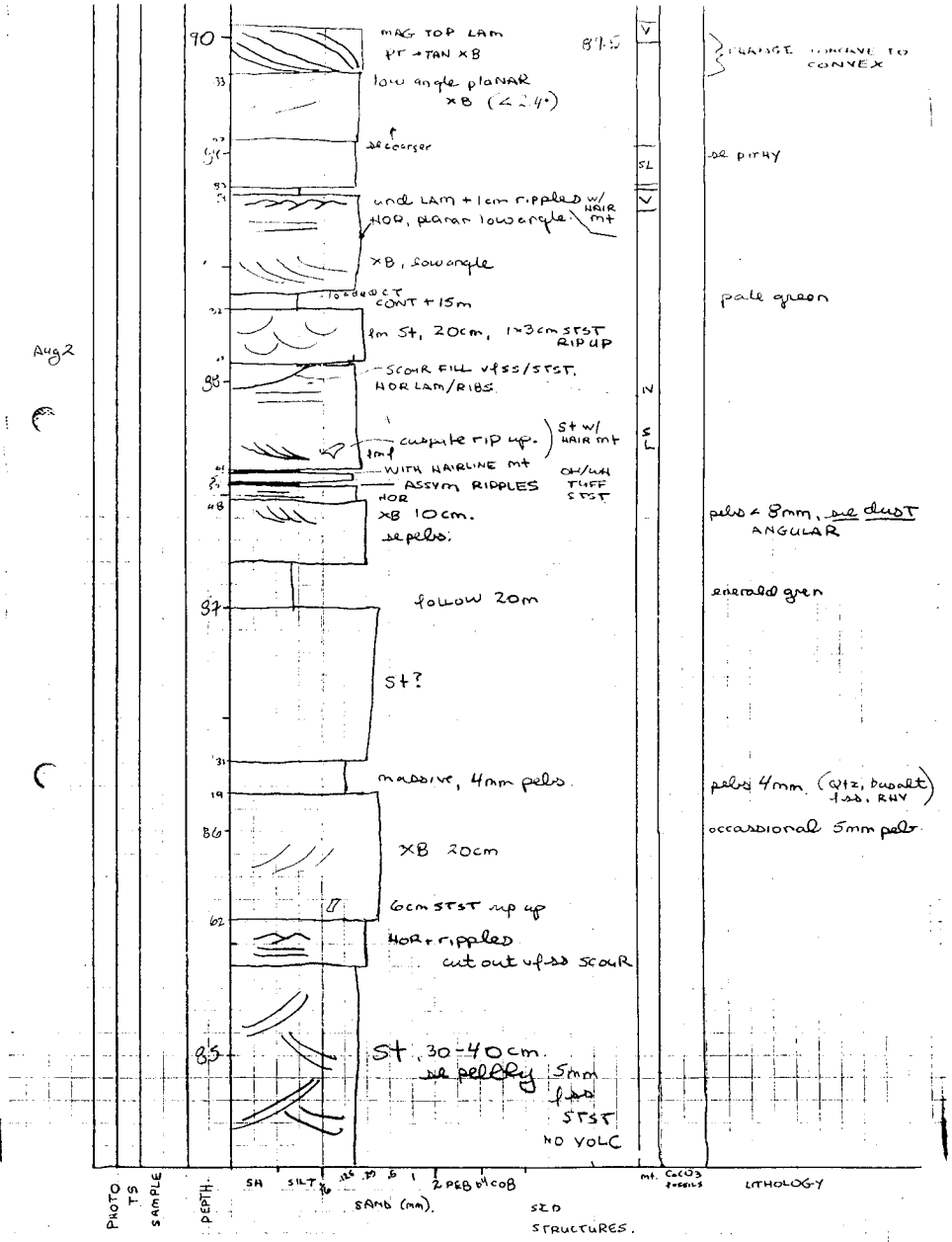


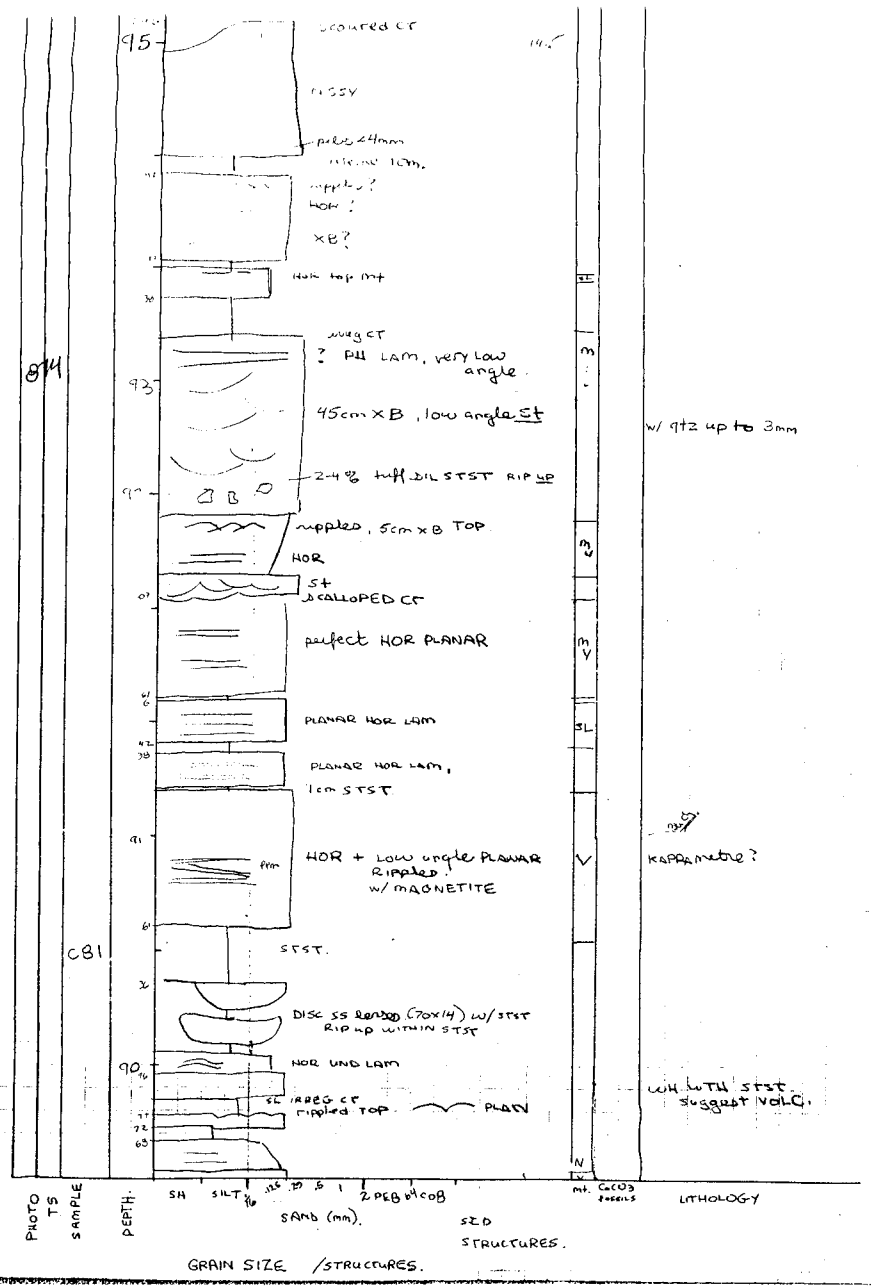
GRAIN SIZE /STRUCTURES.

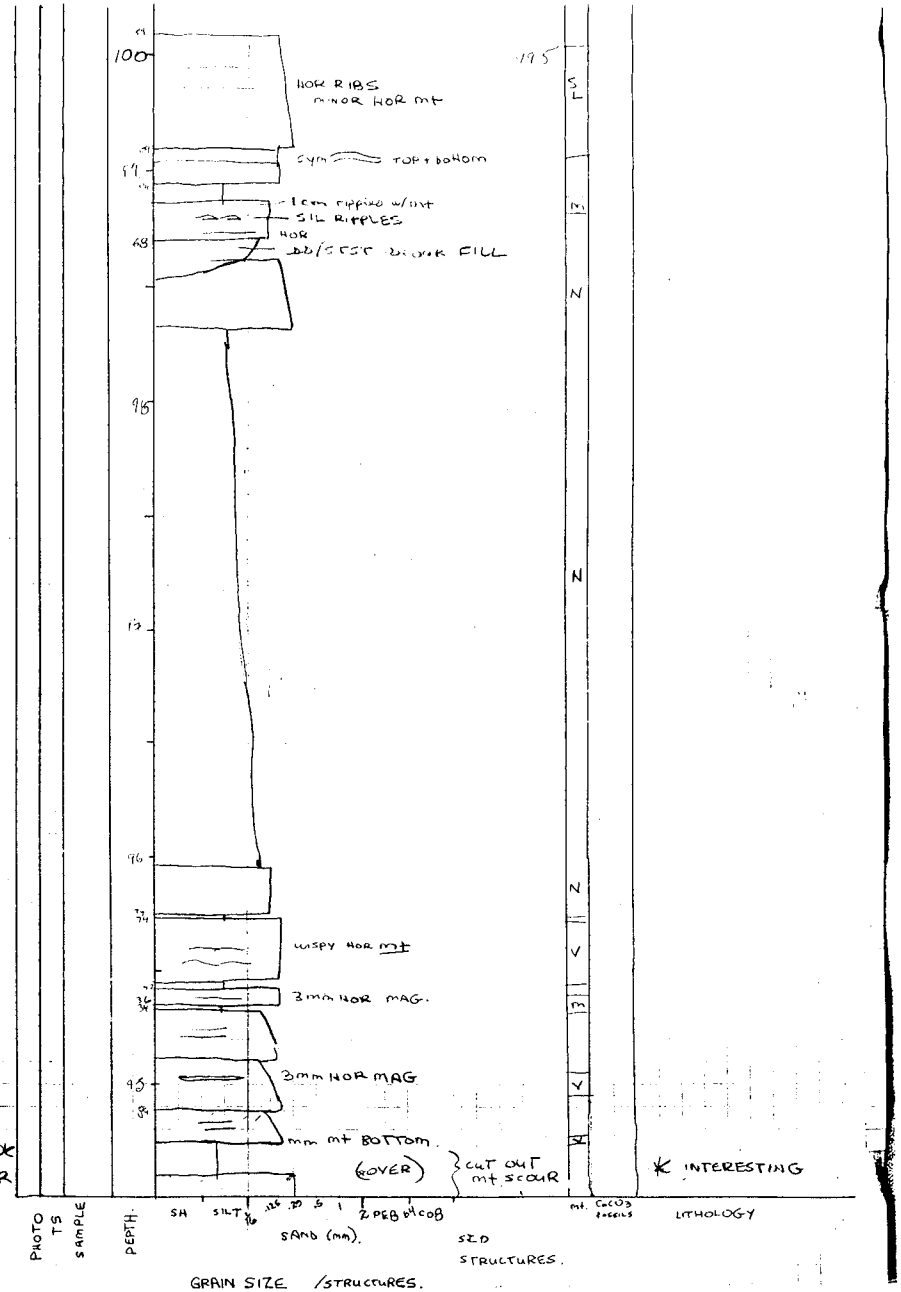

(795)
rippled lcm
Scour, bottom fill 5cm STST XB-1 ss
HOR MAG., very sl.
PT XB (FC)
LATERAL OVER
CONT 25cm
low angle XB, black non mt.
PL. St 10-15cm
planar - v low angle lam
HOR
STST CT
ripple XB
fine HOR NON MAG LAM
MASSV
planar low angle lam.
om/sea green.
dip direction?
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCCURES.

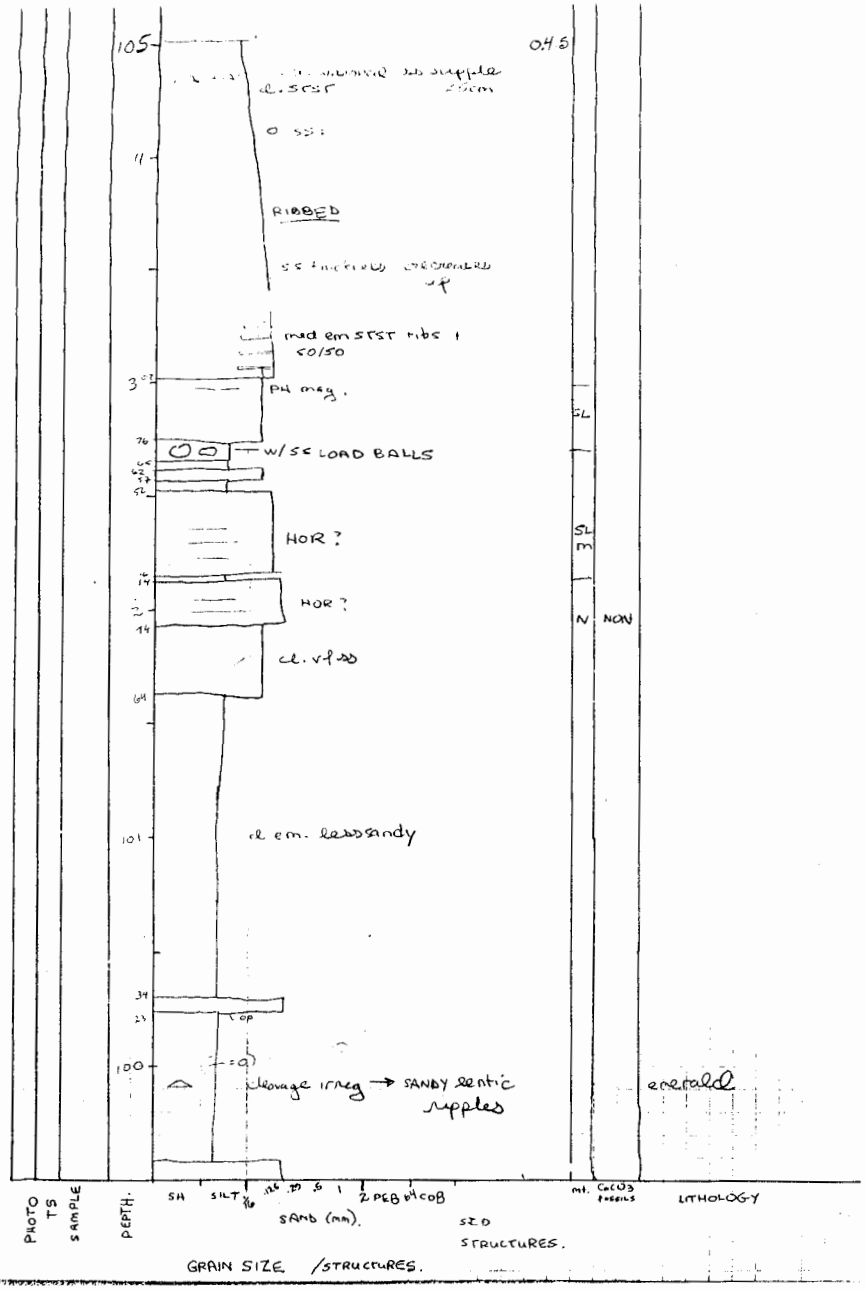

20m lateral section jump
homog ss or low-angle planar
confusing shallow marine
emerald green
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCCURES.

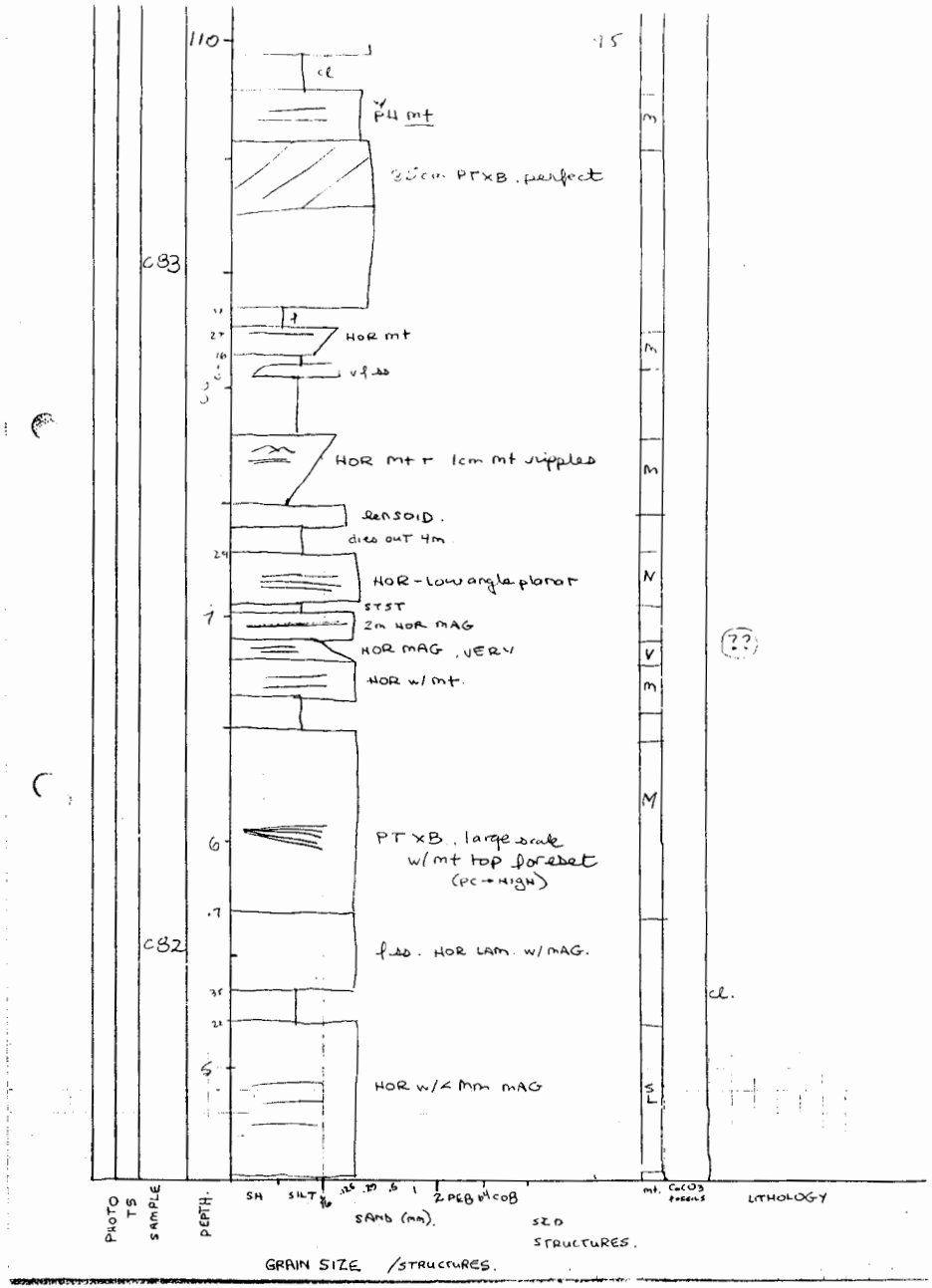

85
BP (80 →25m →HIGH)
RHL
84.5
dm green.
St. med ss fic
sharp
sharp
220/35
40-50cm XB (HC) PT?
33
pebbly, poorly sorted
massive
32
c (AUG.2-5)
NSSY.
pebbly <7mm
HOR bedding
TABLE PNCT laterally disc
HOR 1cm ripples
30
heterolithic gabbro basalt, Qtz. fss. (nonvolc)
PHOTO
TS
SAMPLE
DEPTH
SA
SILT
SAND (mm).
PEB
COB
mt.
CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

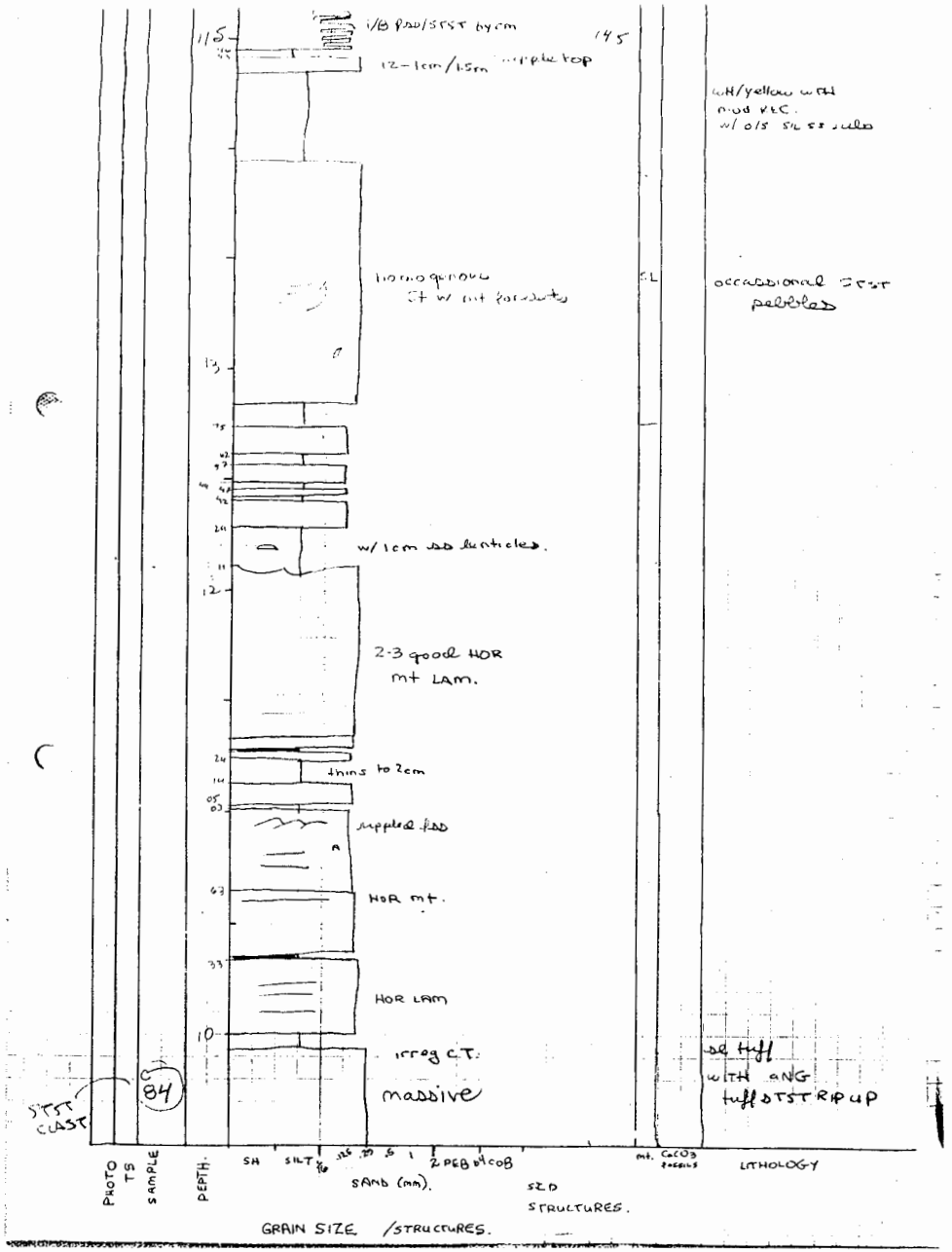

Aug2
90
MAG TOP LAM
PT → TAN XB
84.5
low angle planar XB (∠ ~4°)
↑ coarser
33
gr
93
91
und LAM + 1cm ripples w/ HAIR mt
HOR, planar low angle
XB, low angle
CONT + 15m
92
1m St, 20cm, 1x3cm STST RIP UP
SCOUR FILL vfSS/STST. HOR LAM/RIBS
88
cuspate rip up.
1mf
St w/ HAIR mt
WITH HAIRLINE mt
OH/ULL TUFF STST
ASSVM RIPPLES
HOR
87
XB 10cm.
↑ pebs.
follow 20m
St?
31
massive, 4mm pebs.
19
86
XB 20cm
6cm STST rip up
62
HOR + rippled
cut out vfss scour
85
St, 30-40cm.
↑ pebbly 5mm
fss
STST
NO VOLC
CHANGE CONCAVE TO CONVEX
↑ pithy
pale green
pebs < 8mm, ↑ dust
ANGULAR
emerald grn
pebs 4mm. (Qtz, basalt fss, RHY)
occasional 5mm peb
PHOTO
TS
SAMPLE
DEPTH
SA
SILT
SAND (mm).
PEB
COB
mt.
CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

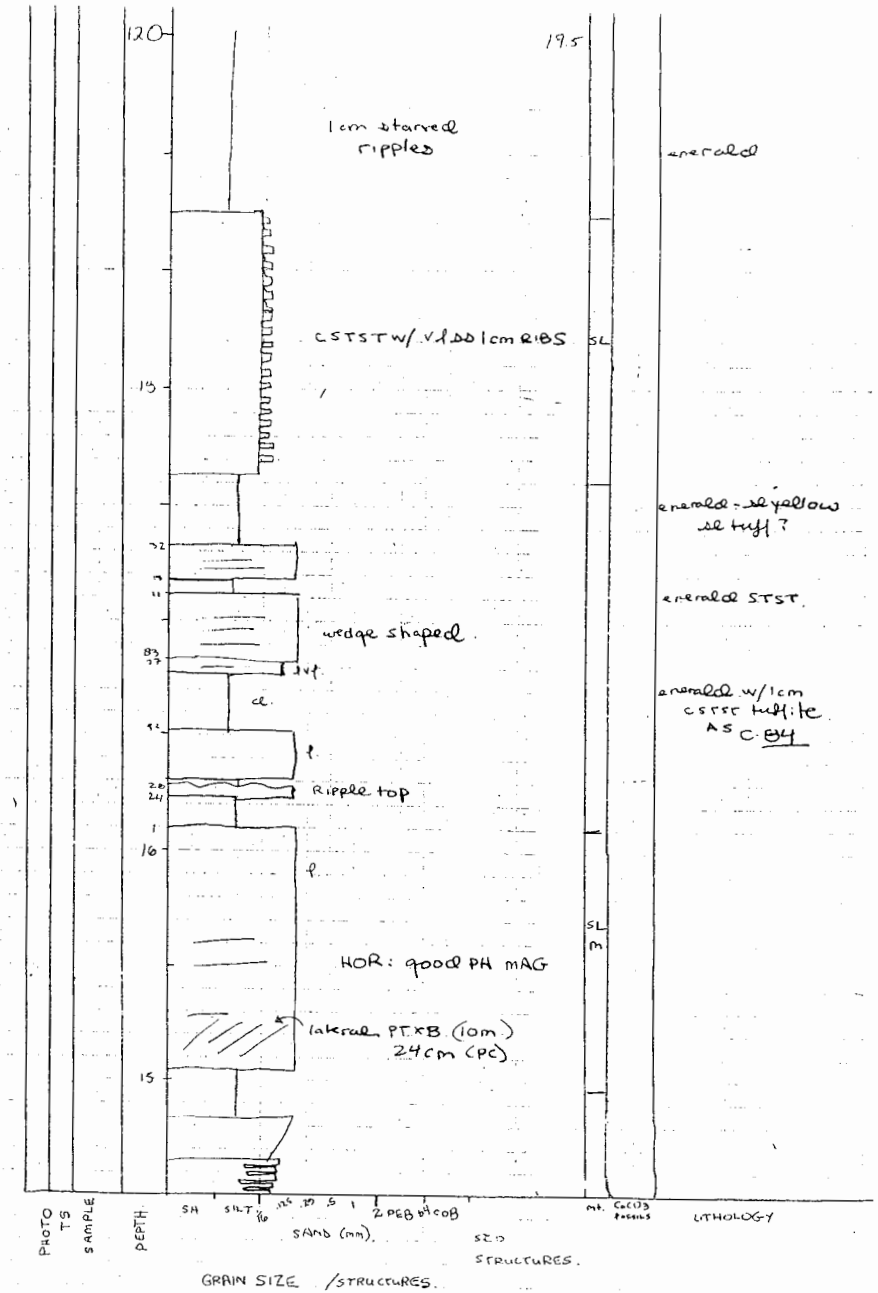

95
93
91
90
scoured CF
wispy
pebs ≤4mm
rippled?
HOR?
XB?
HOR top mt
wvy CF
? PLL LAM, very low angle
45cm XB, low angle St
2-4% tuff. DIL STST RIP UP
rippled, 5cm XB TOP
HOR
St
SCALLOPED CF
perfect HOR PLANAR
PLANAR HOR LAM
PLANAR HOR LAM, 1cm STST
HOR + LOW ANGLE PLANAR RIPPLED! W/ MAGNETITE
STST.
DISC SS lenses (7cm x 1cm) w/ STST RIP UP WITHIN STST
HOR UND LAM
IRREG CF rippled TOP
PLANY
w/ grz up to 3mm
KAPPA meter?
wsh WITH STST. suggest VOLC.
C81
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

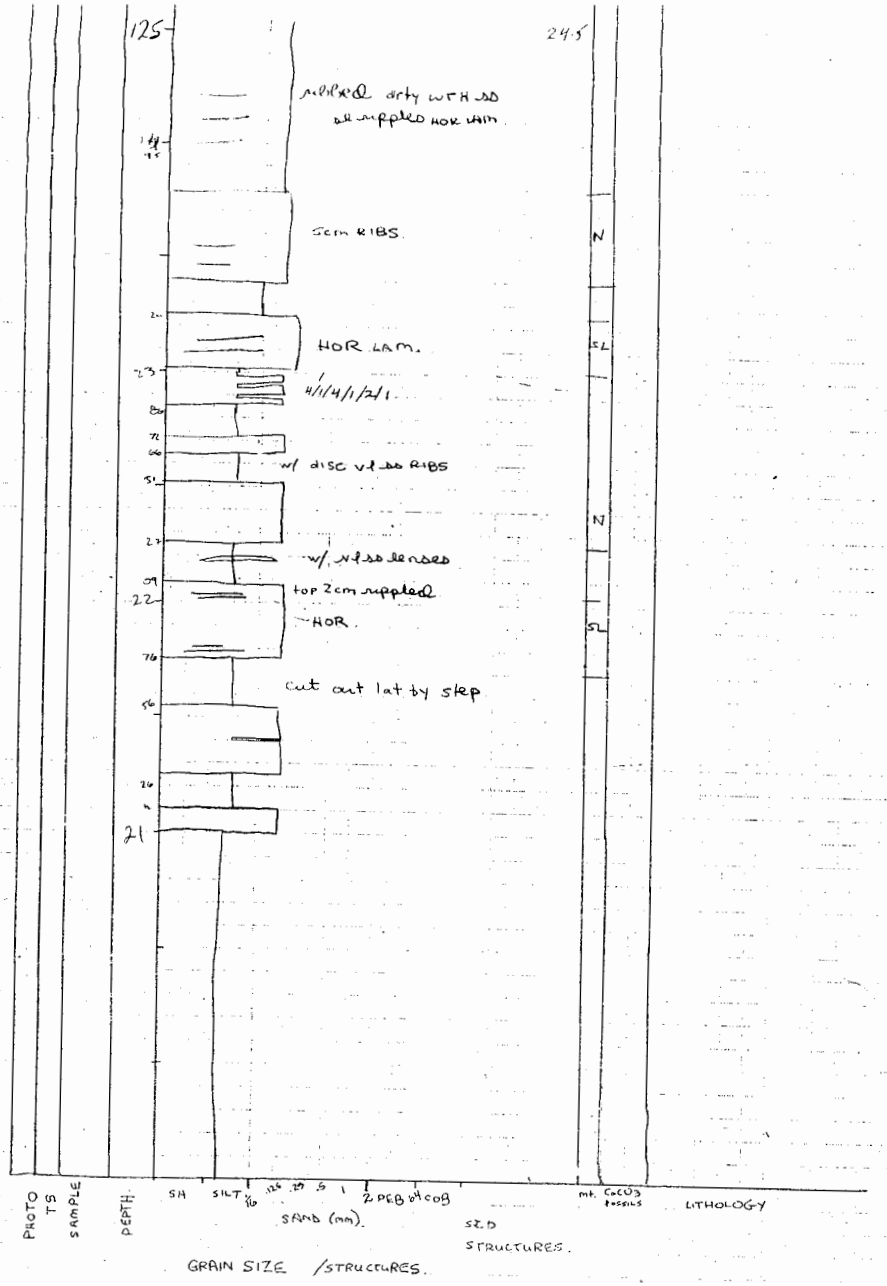

100
99
98
96
HOR RIBS
MINOR HOR mt
cym TOP + BOHOM
1cm rippled w/ mt SIL RIPPLES
HOR
DD/STST blank FILL
wispy HOR mt
3mm HOR MAG.
3mm HOR MAG
mm mt BOTTOM.
RELOCK AT SCOUR
(COVER)
cut out mt. scour
* INTERESTING
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

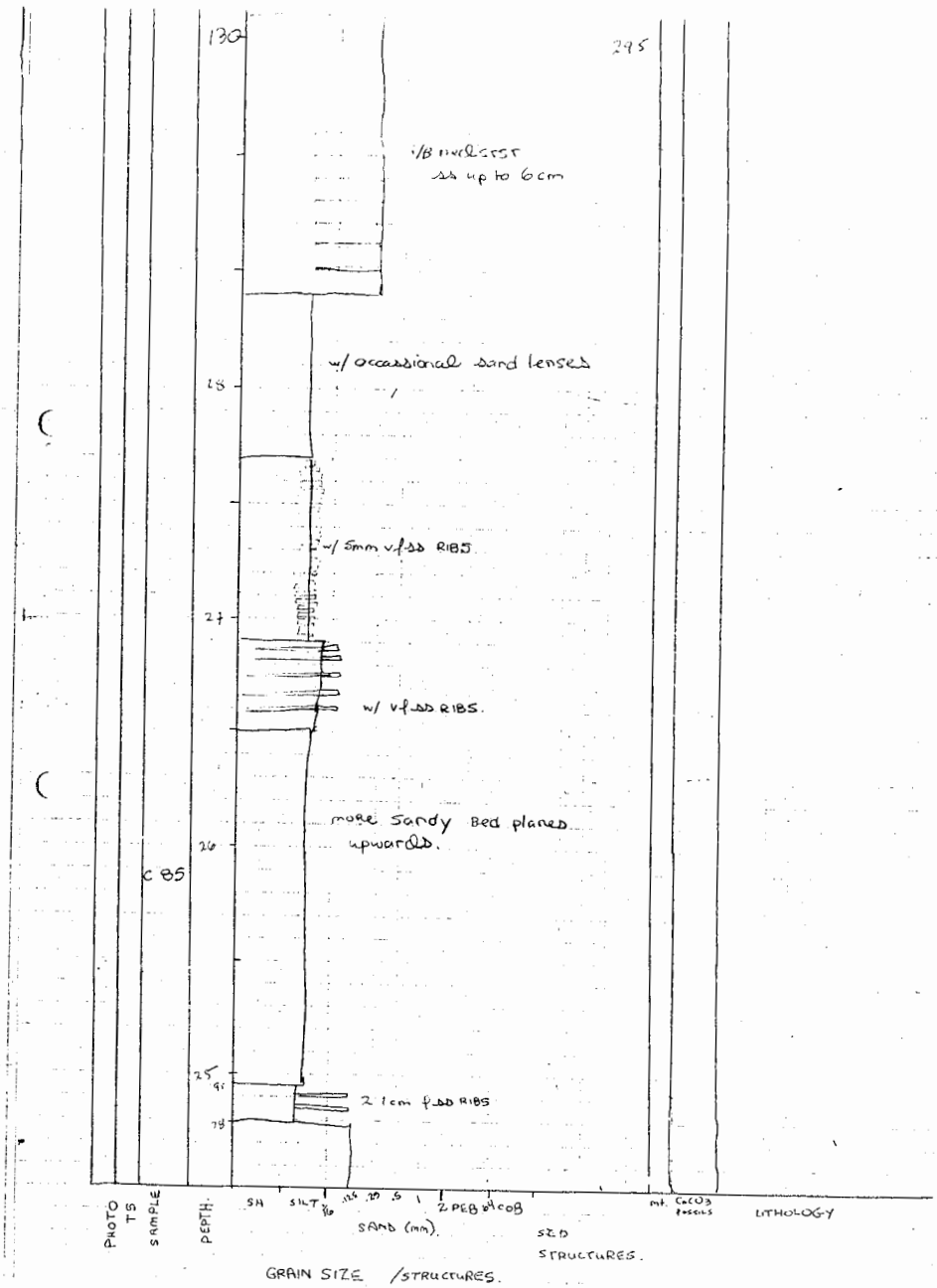

105
11
3
76
64
101
100
0.45
RIBBED
mod em SFST ribs 1
50/50
PH mag.
w/ SC LOAD BALLS
HOR ?
HOR ?
cl. vf ss
cl em. lenssandy
cleavage irreg → SANDY lentic ripples
emerald
SH
SILT
SAND (mm).
PEB
CoB
mt.
fossils
LITHOLOGY
PHOTO
TS
SAMPLE
DEPTH.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


110
C83
C82
.75
cl
PH mt
20cm PTxB. perfect
HOR mt
vf ss
HOR mt r 1cm mt ripples
lenSOID.
dies out 4m
HOR - Low angle planar
SFST
2m HOR MAG
HOR MAG, VERY
HOR w/ mt.
PTxB. large scale
w/ mt top foreset
(PC → HIGH)
f ss. HOR LAM. w/ MAG.
HOR w/ < mm MAG
??
cl.
SH
SILT
SAND (mm).
PEB
CoB
mt.
fossils
LITHOLOGY
PHOTO
TS
SAMPLE
DEPTH.
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

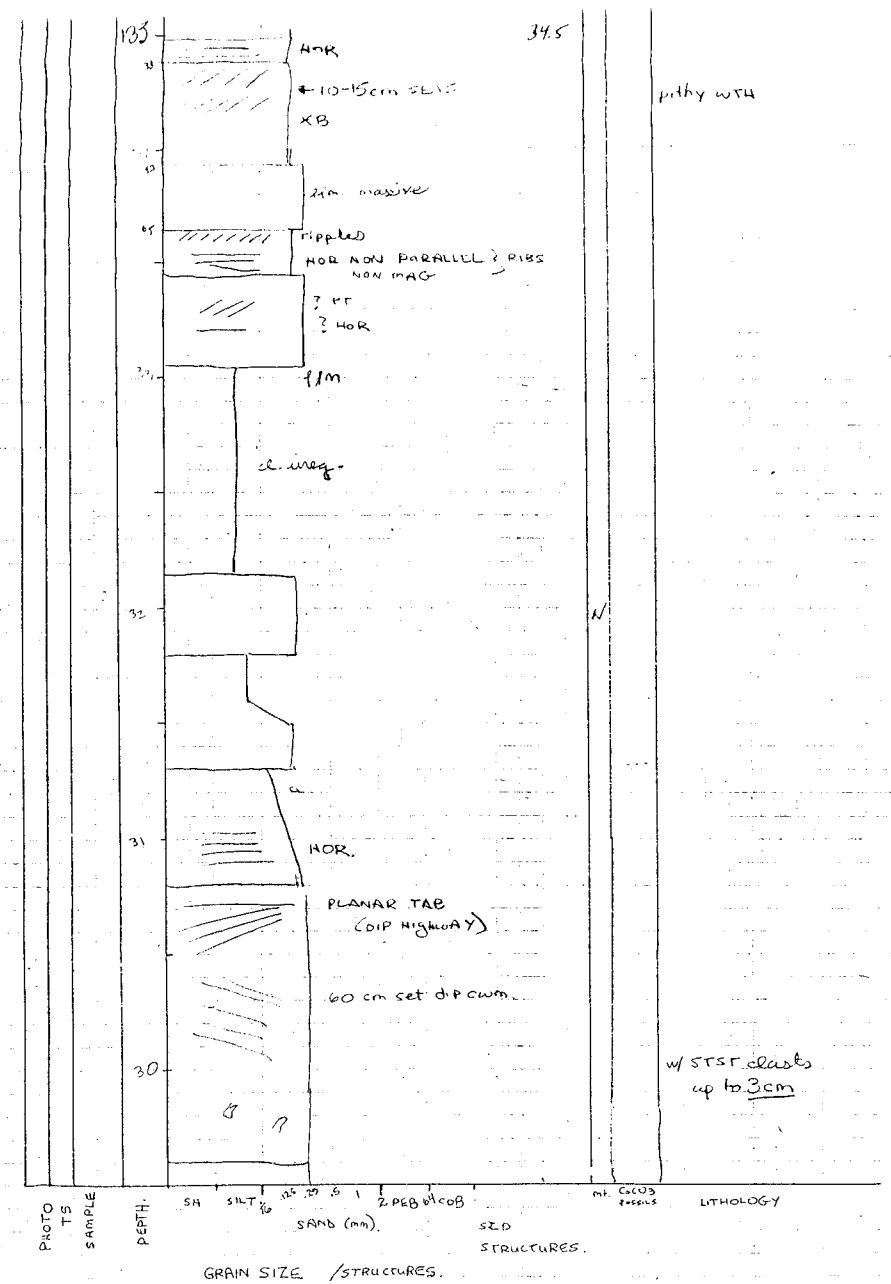

i/B Rad/STST by cm
12-1cm/1.5cm ripple top
w/1cm sd lenticles.
2-3 good HOR mt LAM.
thins to 2cm
rippled bed
HOR mt.
HOR LAM
irreg C.T.
massive
STST CAST
84
wH/yellow with mud vfc. w/ 0/5 SL ss pebbles
occassional STST pebbles
sd tuff WITH sNG tuff & TST RIP up
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

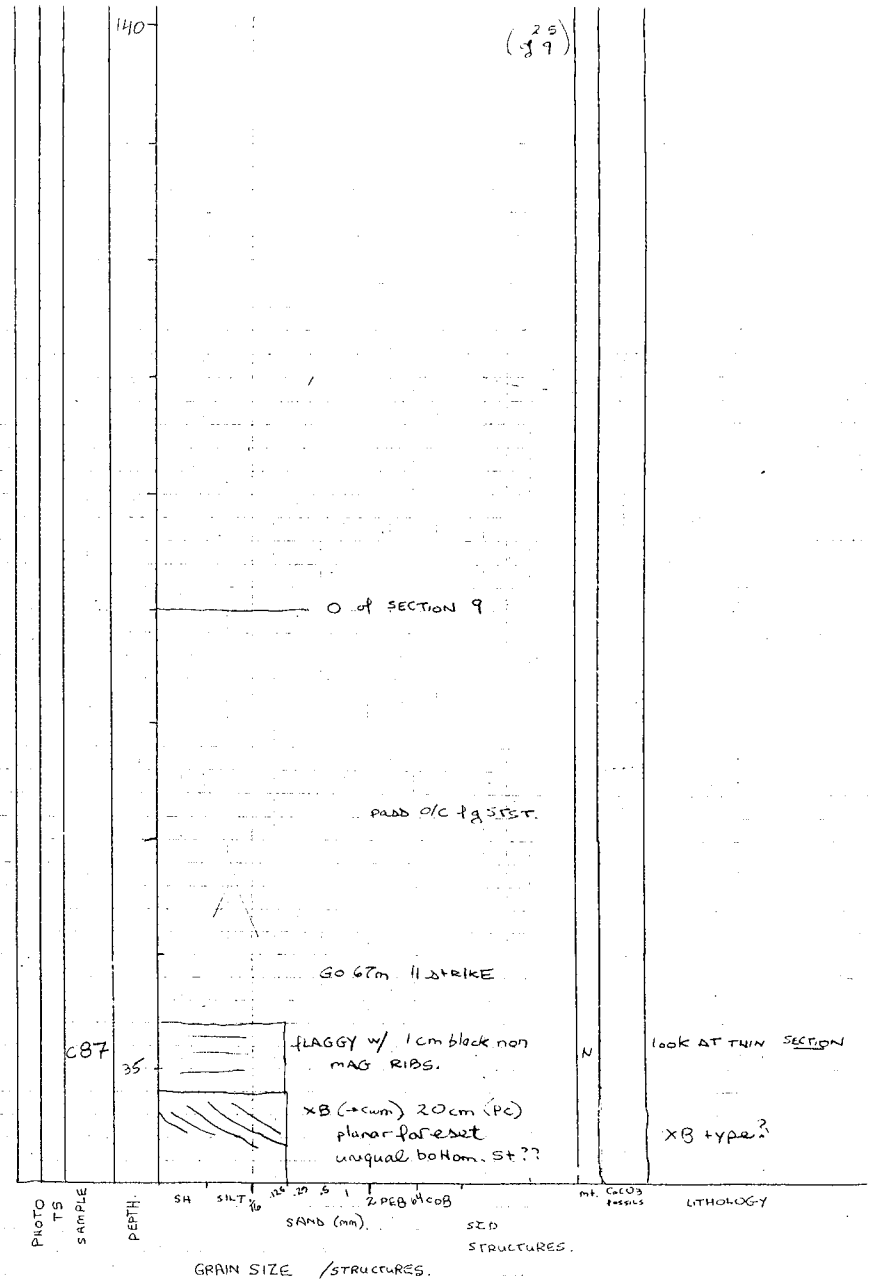

1cm starved ripples
CSTST w/ vf ss 1cm RIBS
wedge shaped
Ripple top
HOR: good PH MAG
lateral PT xB (10m) 24cm (pc)
emerald
emerald - sl yellow sd tuff ?
emerald STST
emerald w/1cm CSTST tuffite AS C-84
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
LITHOLOGY
GRAIN SIZE /STRUCTURES.


125
24.5
rippled dirty w/ f ss
all rippled HOR lam.
5cm RIBS.
HOR LAM.
4/1/4/1/2/1.
w/ disc v.f ss RIBS
w/ v.f ss lenses
top 2cm rippled
HOR.
Cut out lat by step
21
N
SL
N
SL
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


130
29.5
i/B inverse ST
ss up to 6cm
w/ occassional sand lenses
28
w/ 5mm v.f ss RIBS
27
w/ v.f ss RIBS.
more sandy Bed planes upwards.
26
C 85
25
2.1cm f ss RIBS
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

C3


135
34.5
HOR
← 10-15cm SET?
XB
2m massive
rippled
HOR NON PARALLEL ? RIBS
NON MAG
? FF
? HOR
1m
cl. irreg.
32
31
HOR.
PLANAR TAB
(DIP HIGHWAY)
60 cm set dip cwm
30
pithy WTH
w/ STST clasts
up to 3cm
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.


140
(25 g 9)
0 of SECTION 9
pass o/c fg SST.
Go 67m // STRIKE
C87
35
FLAGGY w/ 1cm black non
MAG RIBS.
XB (→cwm) 20cm (PC)
planar foreset
unqual bo Hom. St??
look AT THIN SECTION
XB type?
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

C3

SKIP 1 PAGE

145

75

C88

fine STST /mudstone

red grey with dark-steel grey on fresh
- cl sl imperfect.

crenulated

PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

GRAIN SIZE /STRUCTURES.

155

175

16

15

14

13

cleaved. NSSV

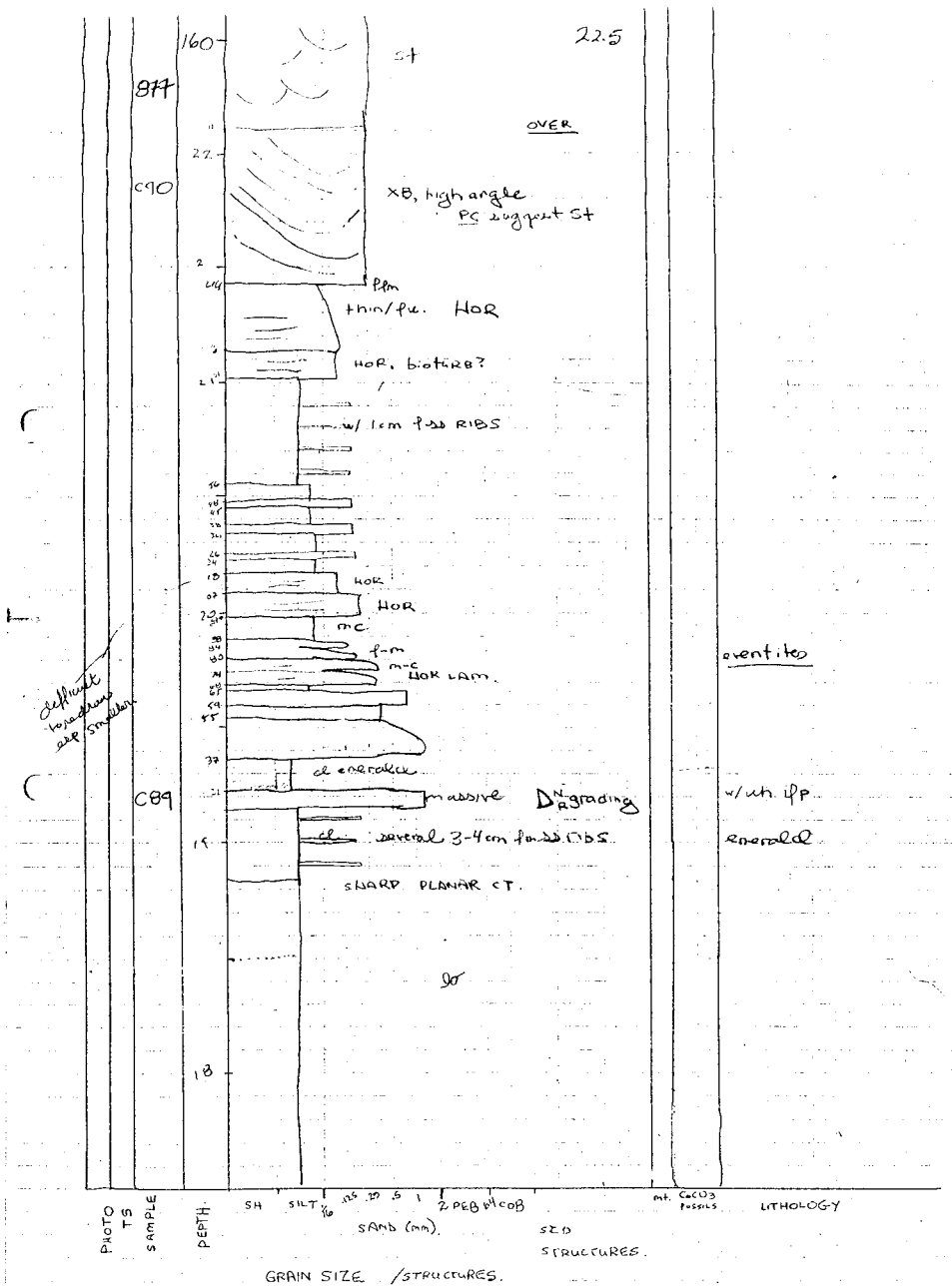
cl.

N

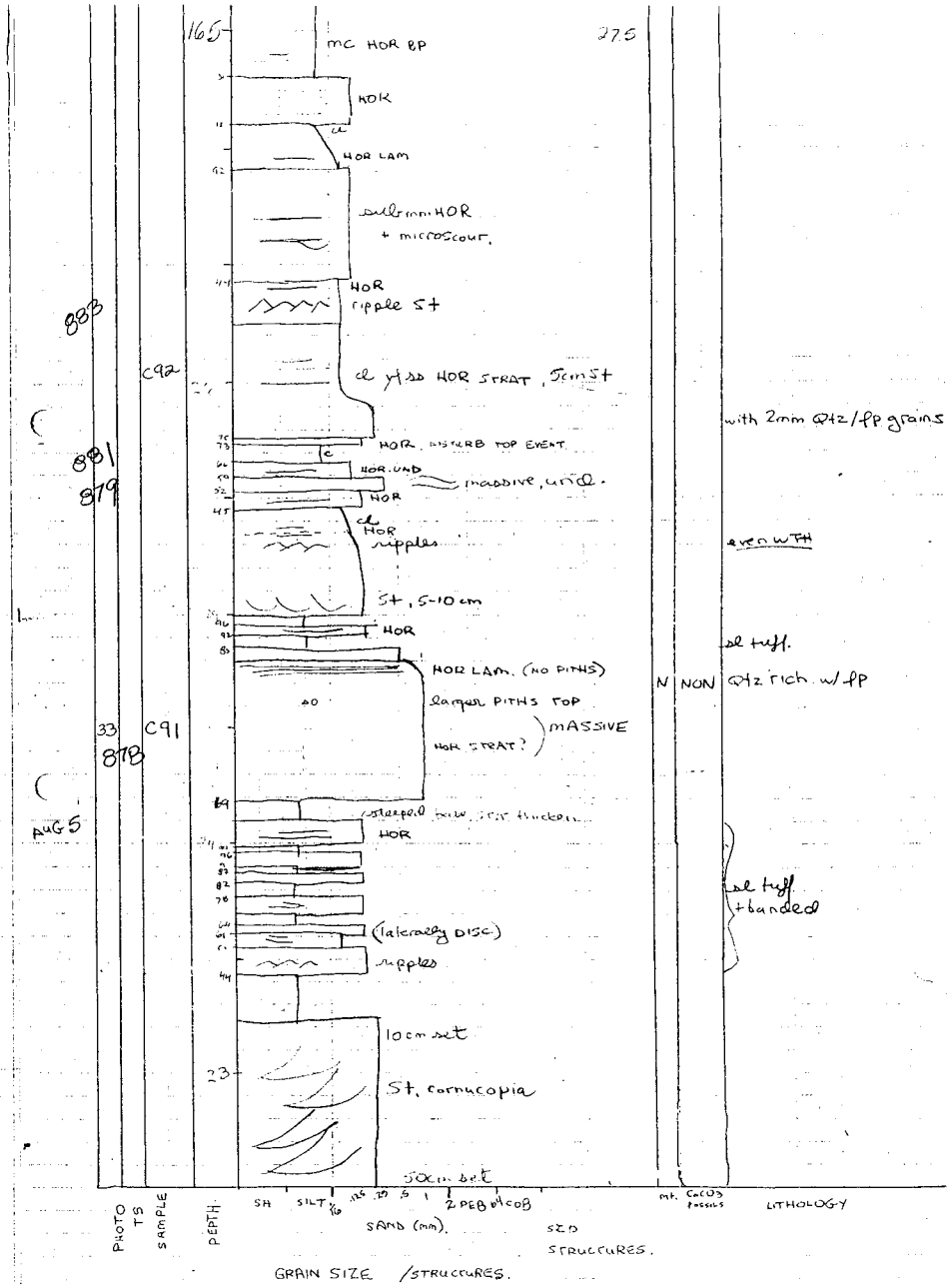
(missed 1 page)

PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

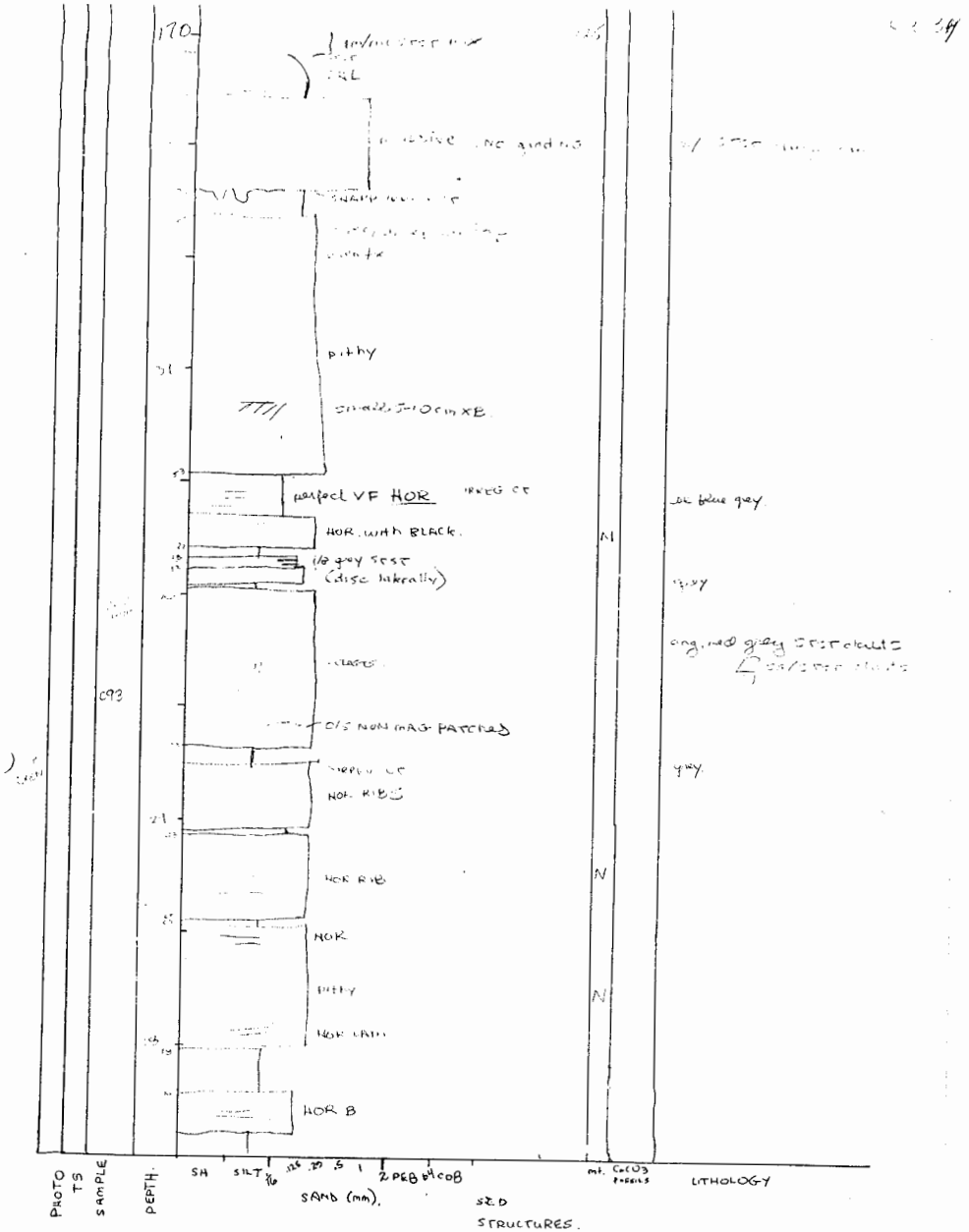
GRAIN SIZE /STRUCTURES.

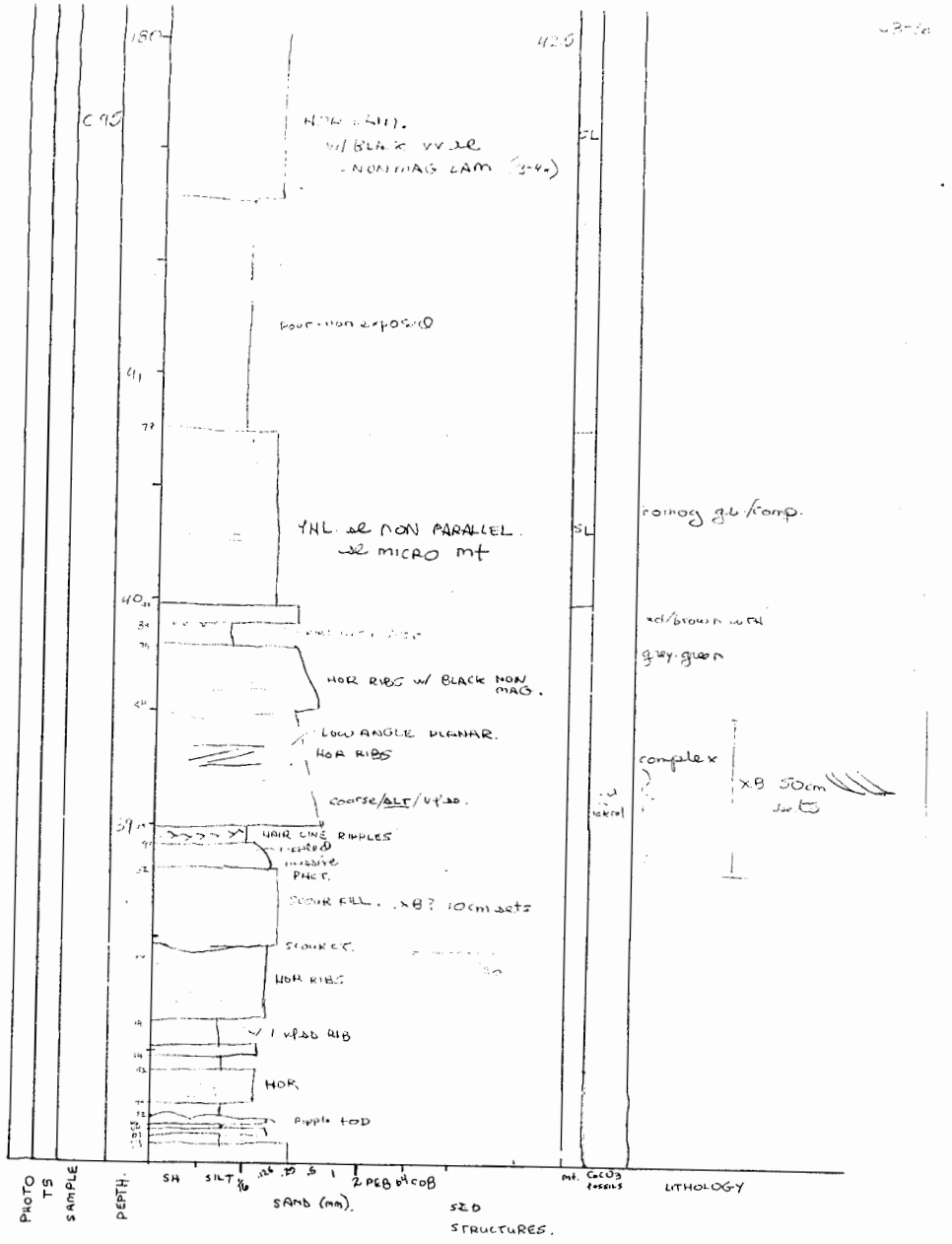


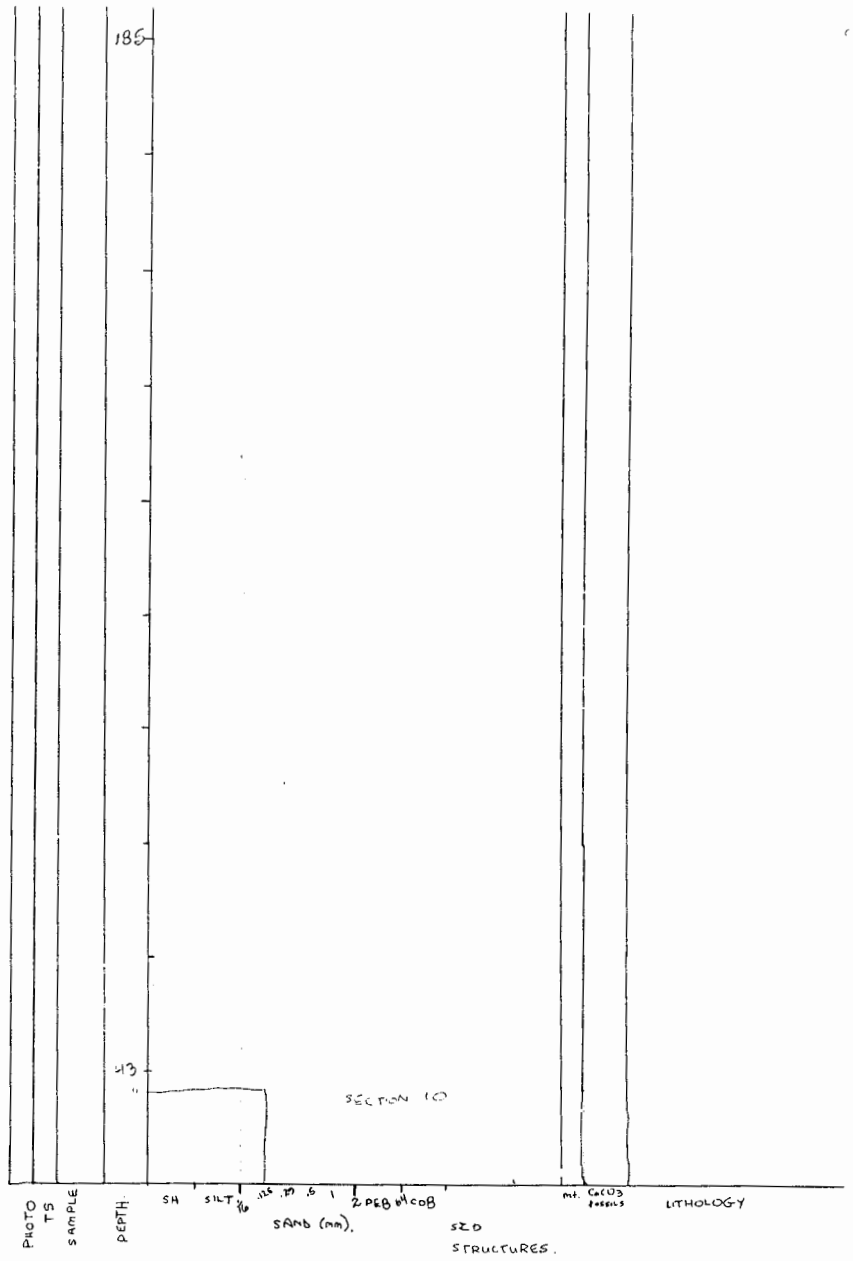
GRAIN SIZE /STRUCTURES.

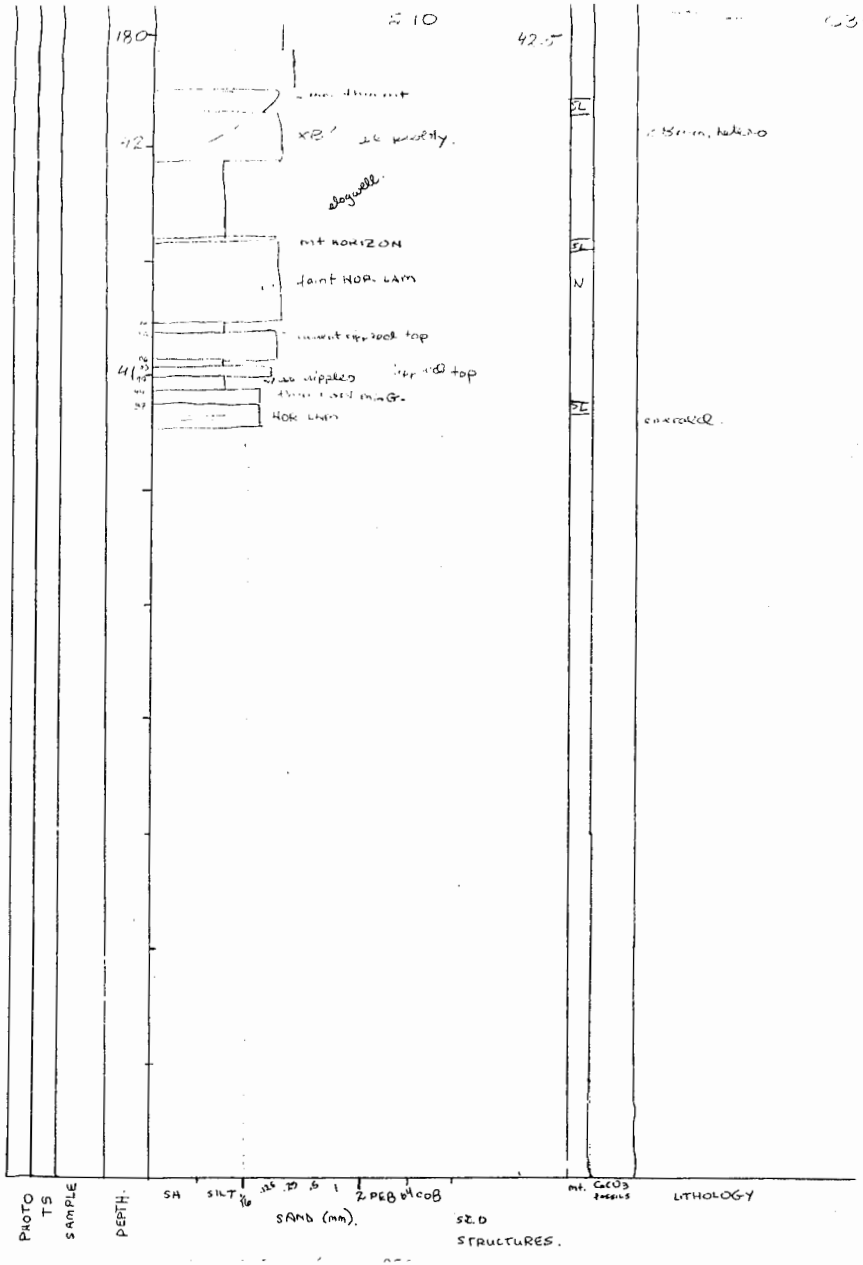


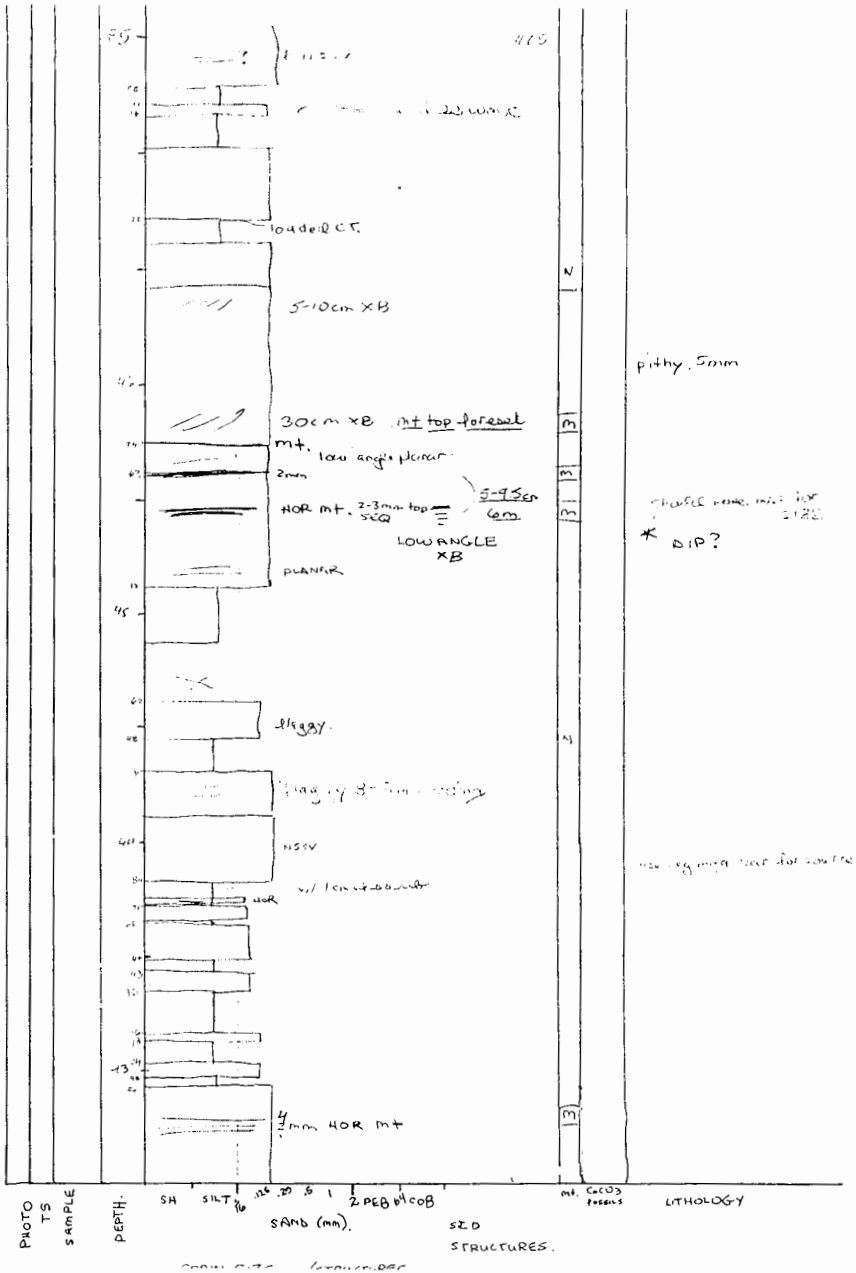
GRAIN SIZE /STRUCTURES.


170
175
pithy
small 5–10 cm XB
perfect VF HOR
HOR. with BLACK
HOR RIBS
HOR
HOR B
dk blue grey
grey
grey
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2
PEB
coB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.

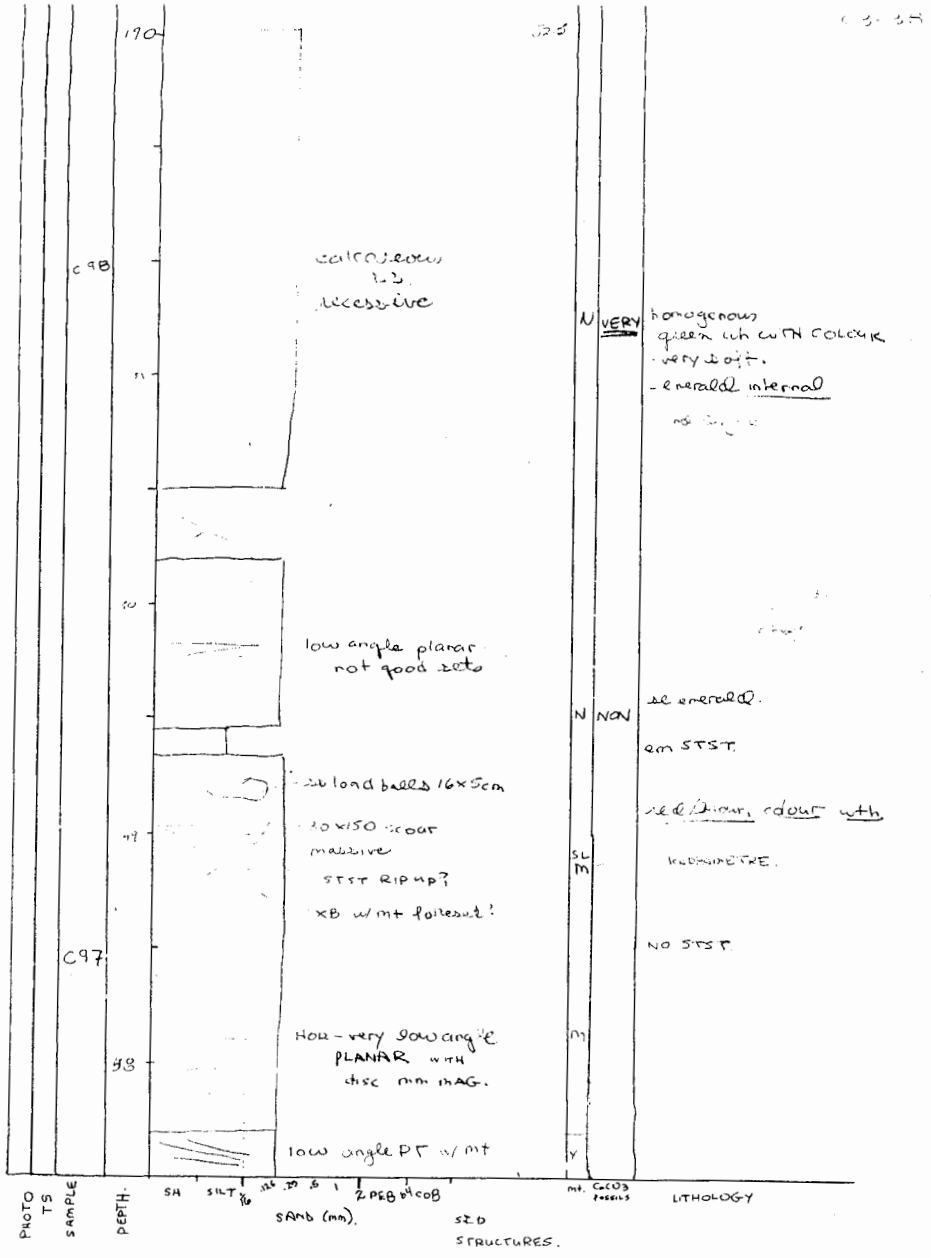

180
C95
HOR SAND.
w/ BLACK VV xl
- NON MAG LAM (3-4cm)
425
FL
pour-out exposed
41
77
YNL xl NON PARALLEL.
xl MICRO mt
SL
ripply gb/comp.
40
red/brown w/ FM
gray-green
HOR RIBS w/ BLACK NON MAG.
LOW ANGLE PLANAR.
HOR RIBS
complex
x8 50cm
Jar 5
coarse/SLT/U-pap.
39
HAIR LINE RIPPLES
w/ scoured
massive
PNCF.
SCOUR FILL. x8? 10cm sets
SCOUR CF.
HOR RIBS
V / wash RIB
HOR
Ripple FOD
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
%
.125
.25
.5
1
2
PEB
mt
COB
SAND (mm).
SZD
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

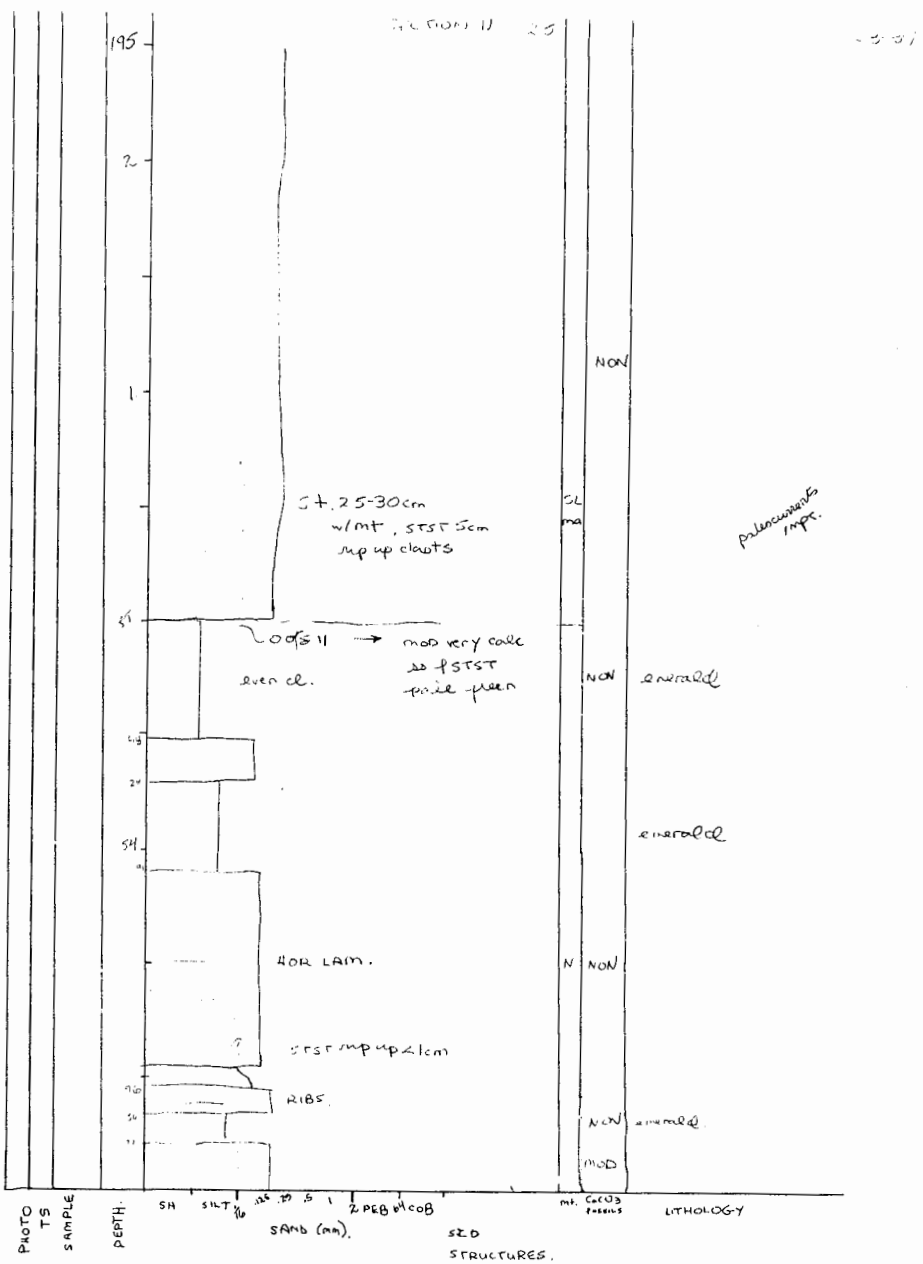

185
43
SECTION 10
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
%
.125
.25
.5
1
2
PEB
mt
COB
SAND (mm).
SZD
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

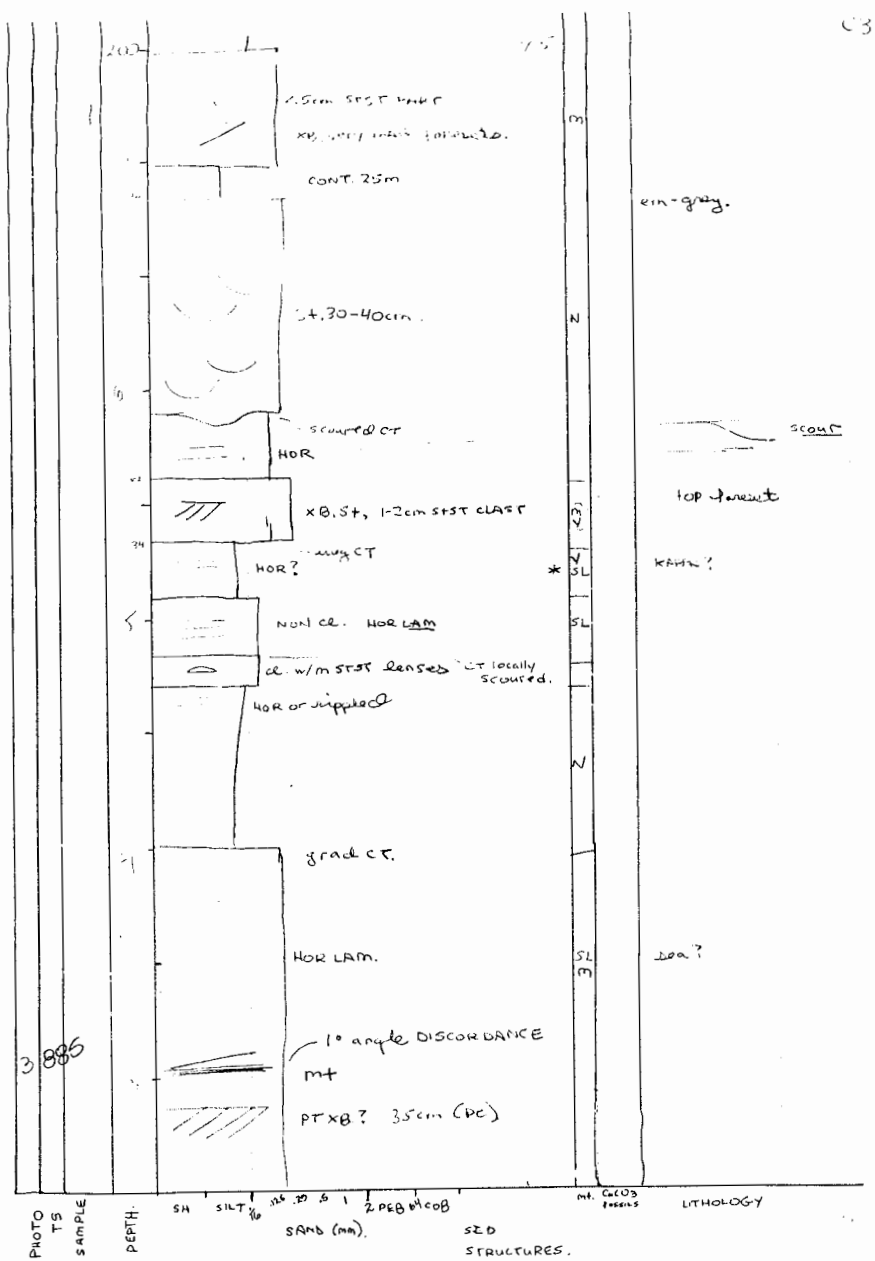

C3-36B
42.5
180
mt. HORIZON
faint HOR. LAM
xB
sloping
HOR LAM
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY

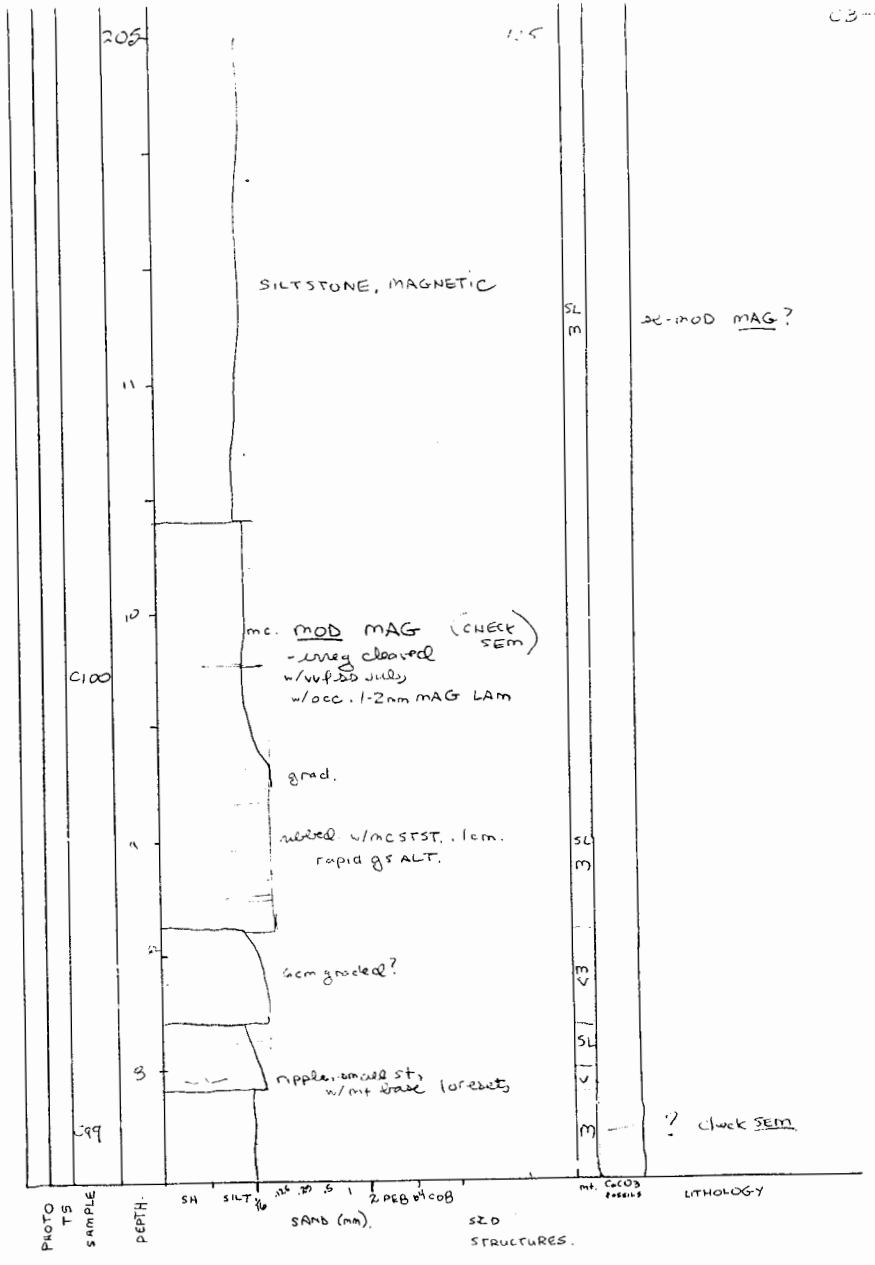

42.5
loaded CT.
5-10cm xB
30cm xB
mt top foreset
mt.
low angle planar
2mm
HOR mt.
LOW ANGLE
xB
PLANAR
sloppy
NSSV
HOR
4mm HOR mt
pithy. 5mm
* DIP?
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY

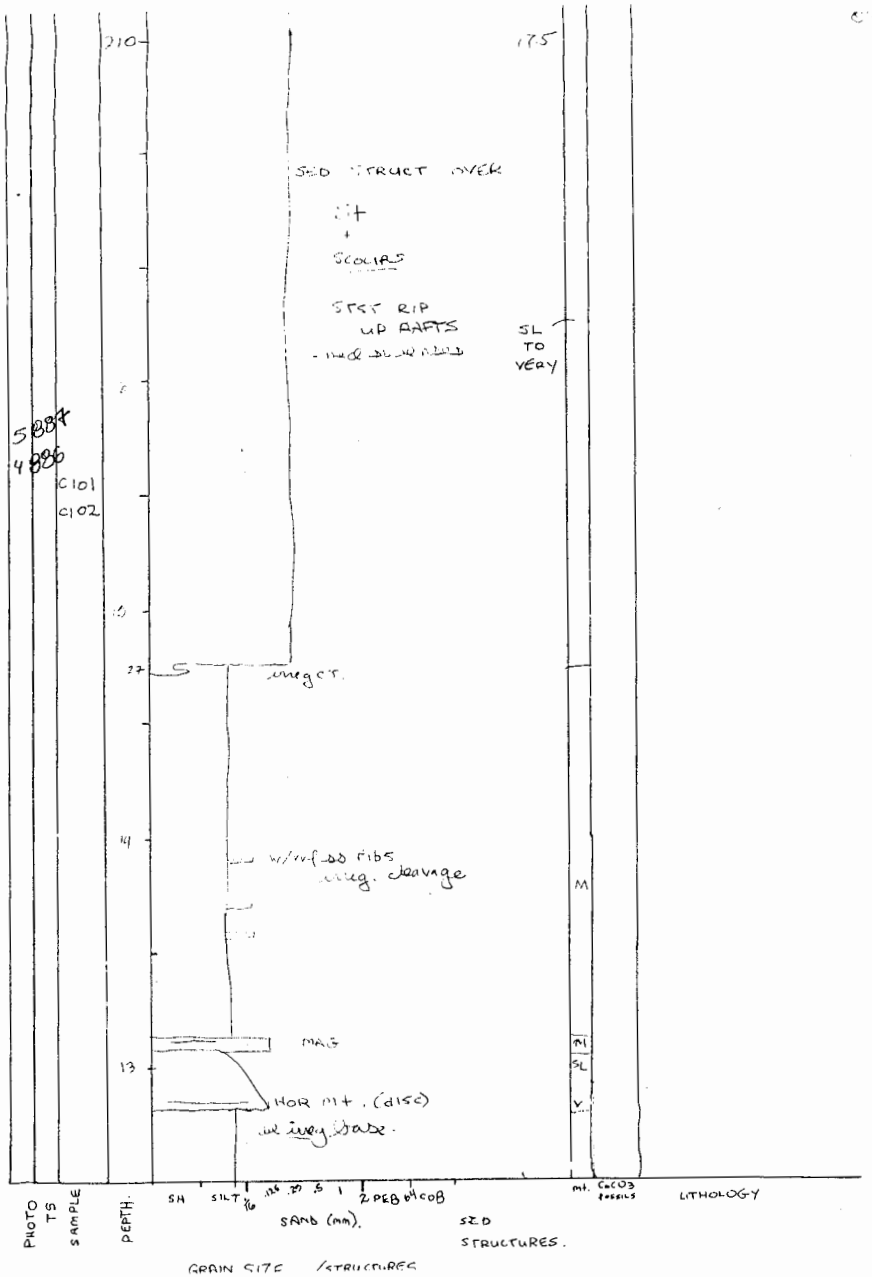
C3


190
C98
C97
98
cal conglom
to 2.
successive
low angle planar
not good sets
2x load balls 16x5cm
20x150 coarse
massive
STST RIP up?
XB w/ mt foliosets
HOR - very low angle
PLANAR WITH
disc mm MAG.
low angle PT w/ mt
N VERY homogenous
green ish with COLOUR
very soft.
- emerald internal
N NON
se emerald.
em STST.
NO STST
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.

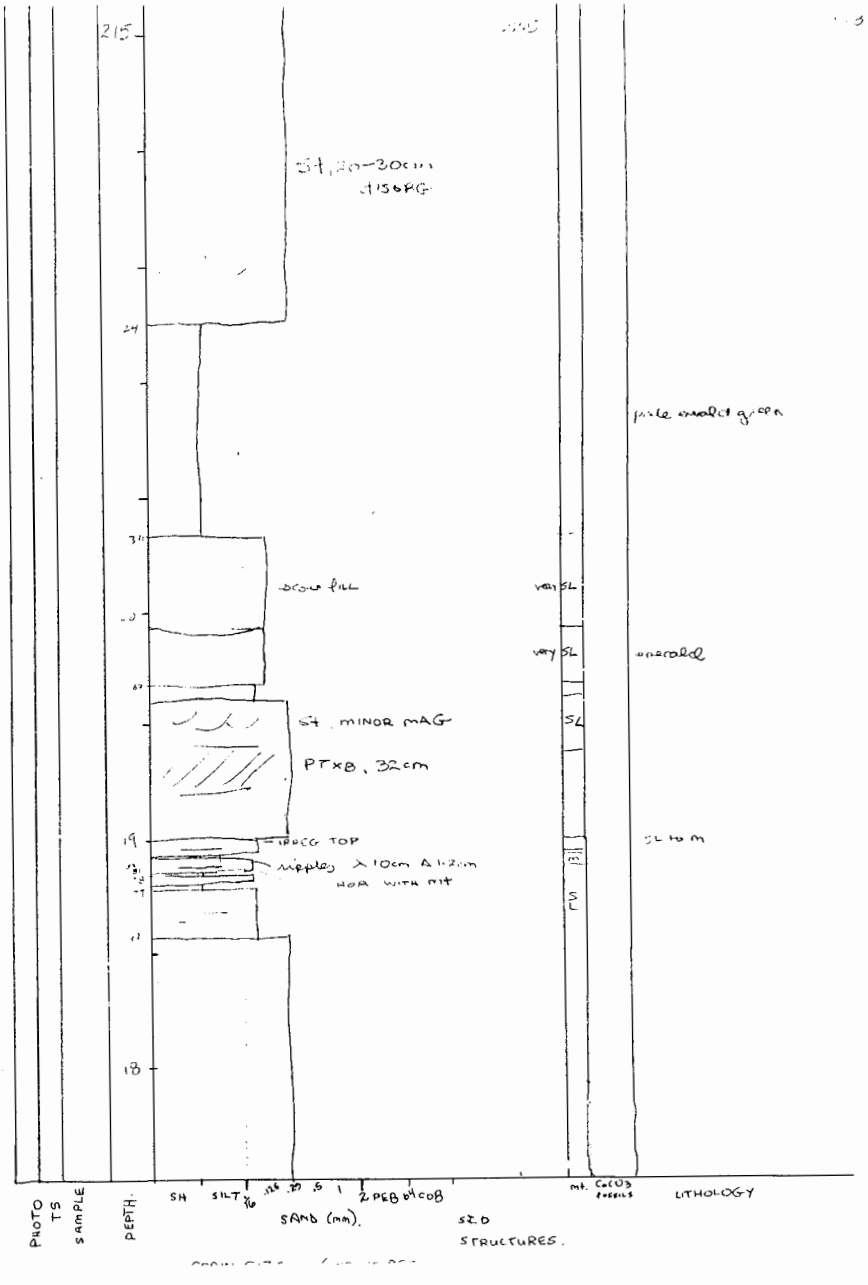

195
2
1
SECTION 11
C5
St. 25-30cm
w/mt, STST 5cm
rip up clasts
bds 11
even cl.
mod very calc
ss fSTST
pale green
HOR LAM.
STST rip up 1cm
RIBS.
NON
NON
emerald
emerald
N NON
NON
emerald
MOD
paleocurrents
impr.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.


C3-40
200
1.5cm STST PART
XB, WAVY LAMS TRUNCATED.
CONT. 25m
ein-grey.
St, 30-40cm.
SCOURED CT
HOR
scour
XB. St, 1-2cm STST CLAST
top foreset
HOR?
KAHN?
NON CR. HOR LAM
cr. w/m STST lenses CT locally scoured.
HOR or rippled
grad CT.
HOR LAM.
sea?
1° angle DISCORDANCE
mt
PT XB? 35cm (pc)
3885
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SZD
STRUCTURES.
mt.
CaCO3
fossils
LITHOLOGY

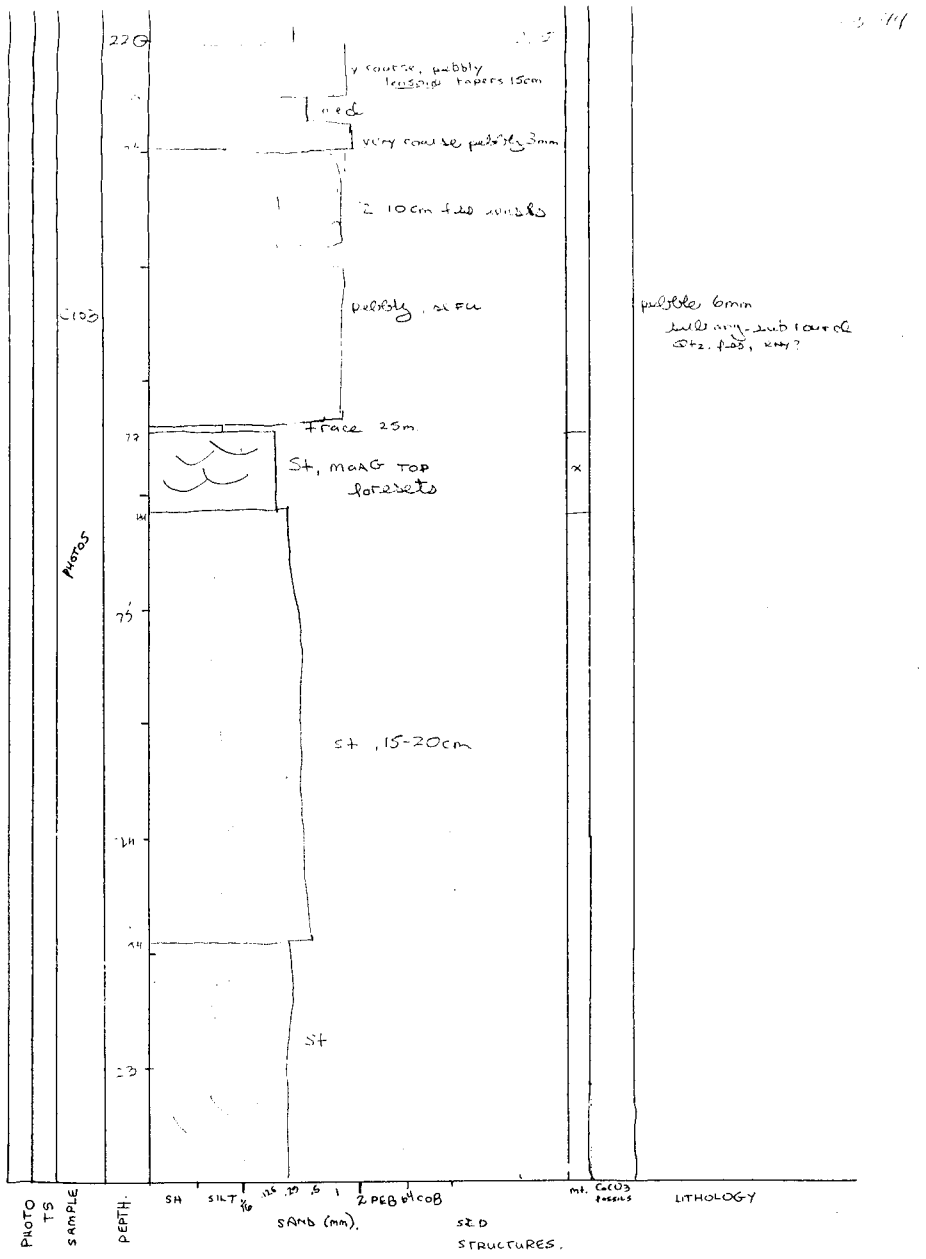

C3-41
205
SILTSTONE, MAGNETIC
re-MOD MAG?
mc. MOD MAG (CHECK SEM)
-wavy cleaved
w/vvfsd wisps
w/occ. 1-2mm MAG LAM
C100
grad.
rubbed w/mcSTST. 1cm.
rapid gs ALT.
6cm graded?
ripples, small sets
w/mt base foresets
C99
? check SEM
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SZD
STRUCTURES.
mt.
CaCO3
fossils
LITHOLOGY



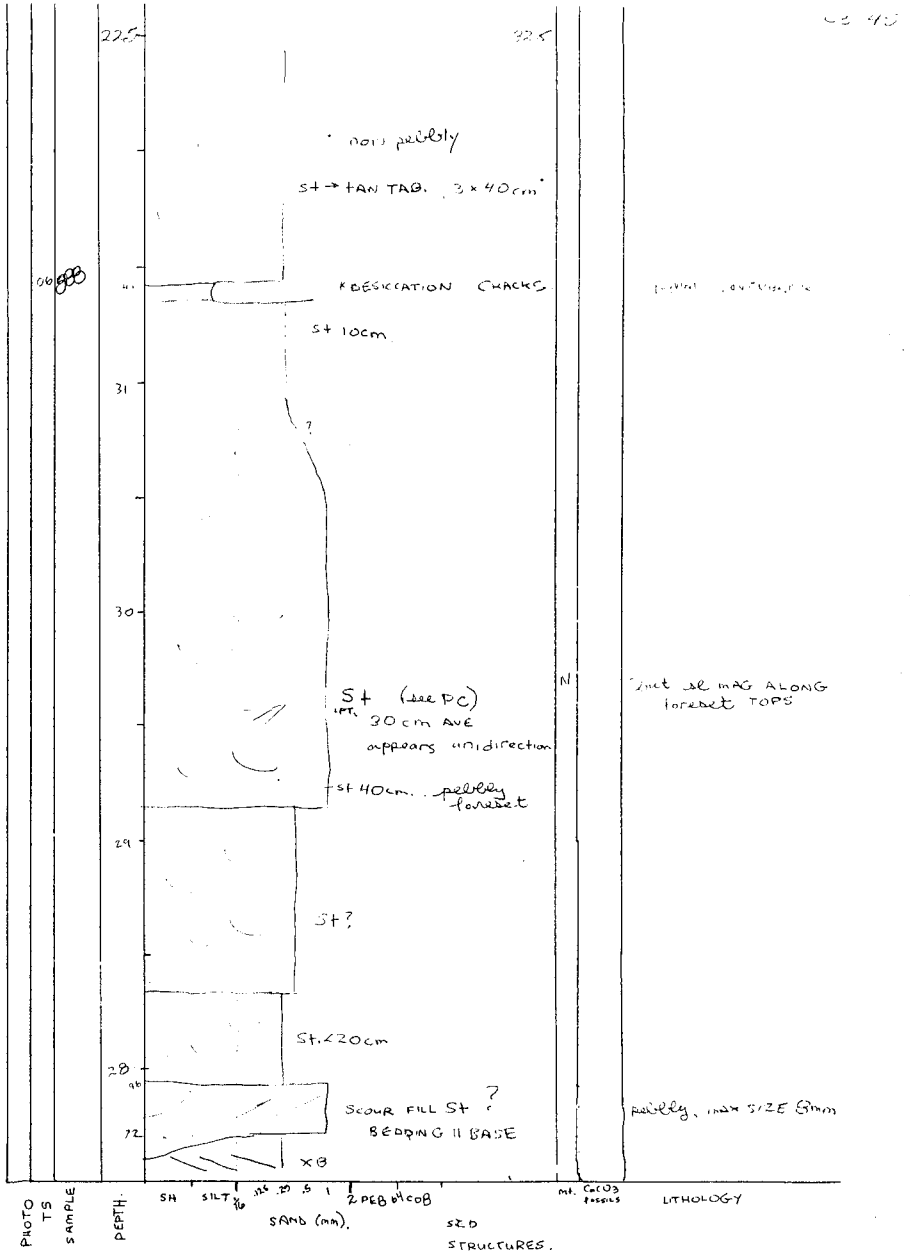
GRAIN SIZE /STRUCTURES



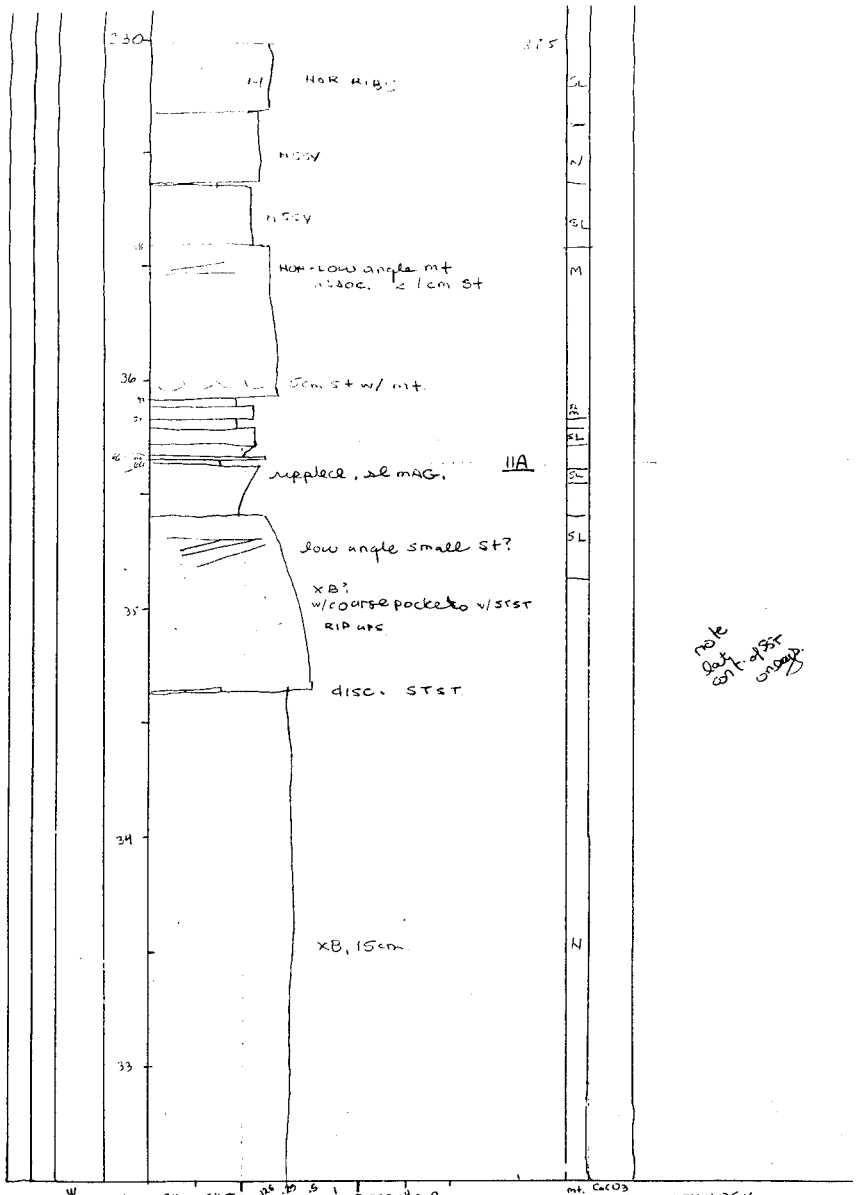
C3

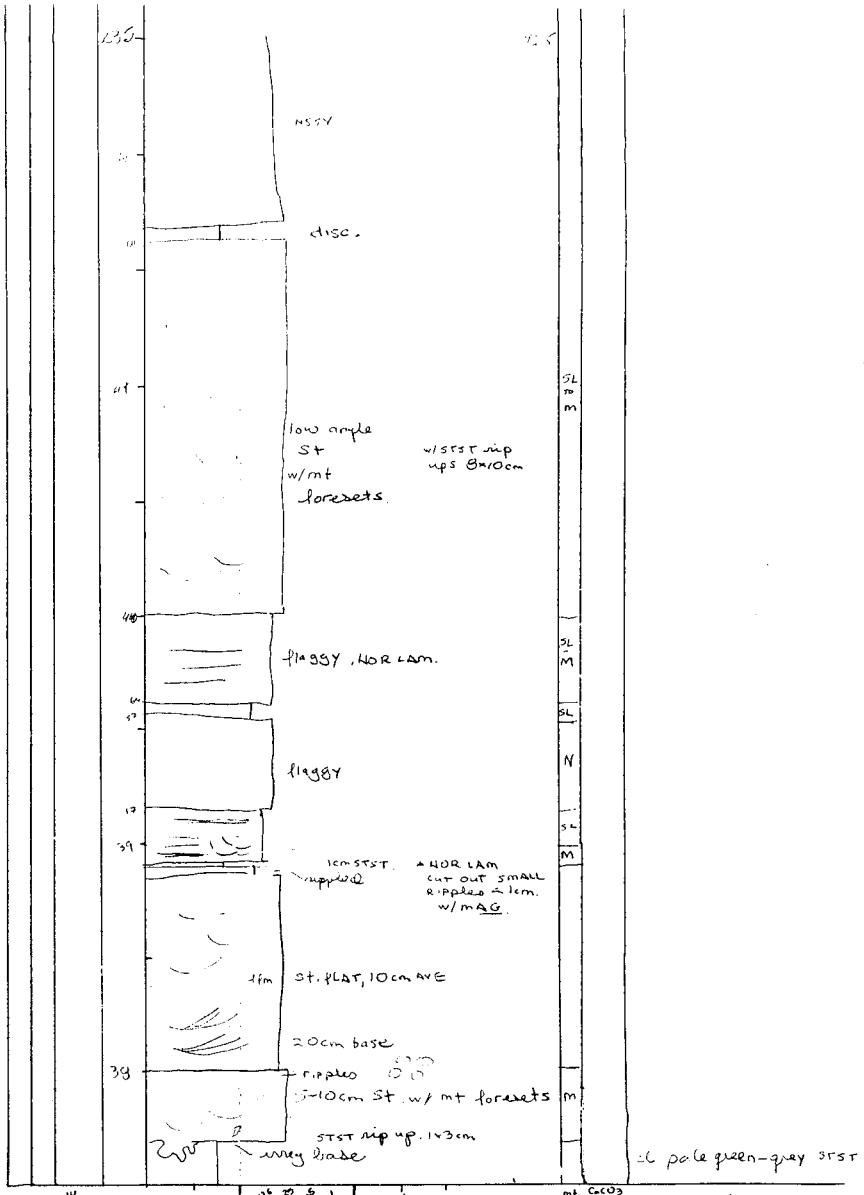

v coarse, pebbly
tapers 15cm
v coarse pebbly 3mm
≥ 10cm fine sands
pebbly, sl FU
pebble 6mm
Face 25m
St, MAG TOP
foresets
St, 15-20cm
St
PHOTOS
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED
STRUCTURES.

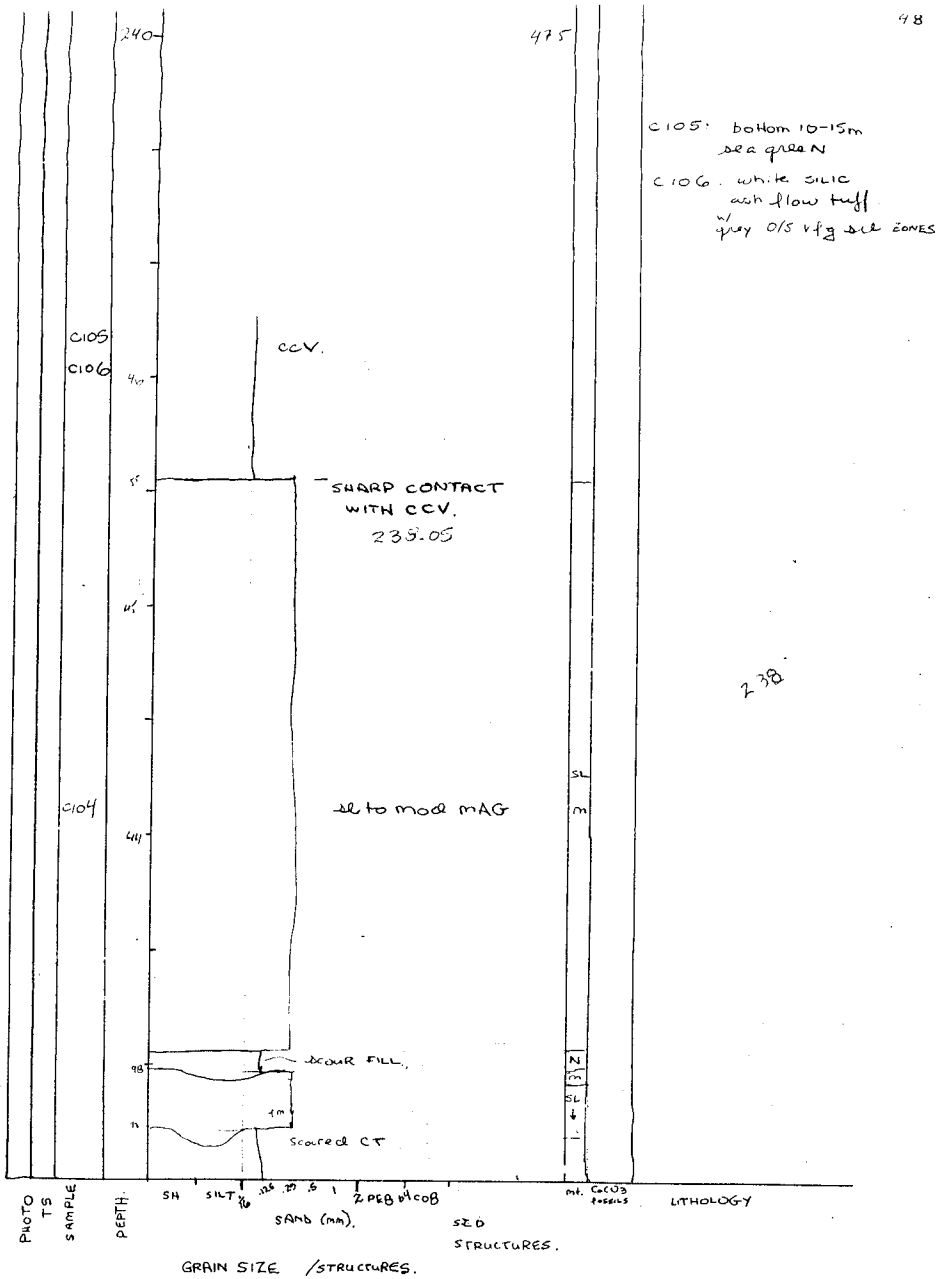
relook


pebbly
St → TAN TAB. 3 x 40cm
DESICCATION CRACKS
St 10cm
St (see PC)
30cm AVE
appears unidirection
St 40cm. pebbly
foreset
St?
St. <20cm
SCOUR FILL St ?
BEDDING ⊥ BASE
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED
STRUCTURES.

C3


HOR RIB
NSSY
NSSY
HOR-LOW angle mt
1cm St
5cm St w/ mt.
rippled, sl MAG.
IIA
low angle small St?
XB?
w/coarse pockets w/ STST
RIP UPS
disc. STST
XB, 15cm
JOG HIGHWAY 20M
note flaky cont. of SST
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

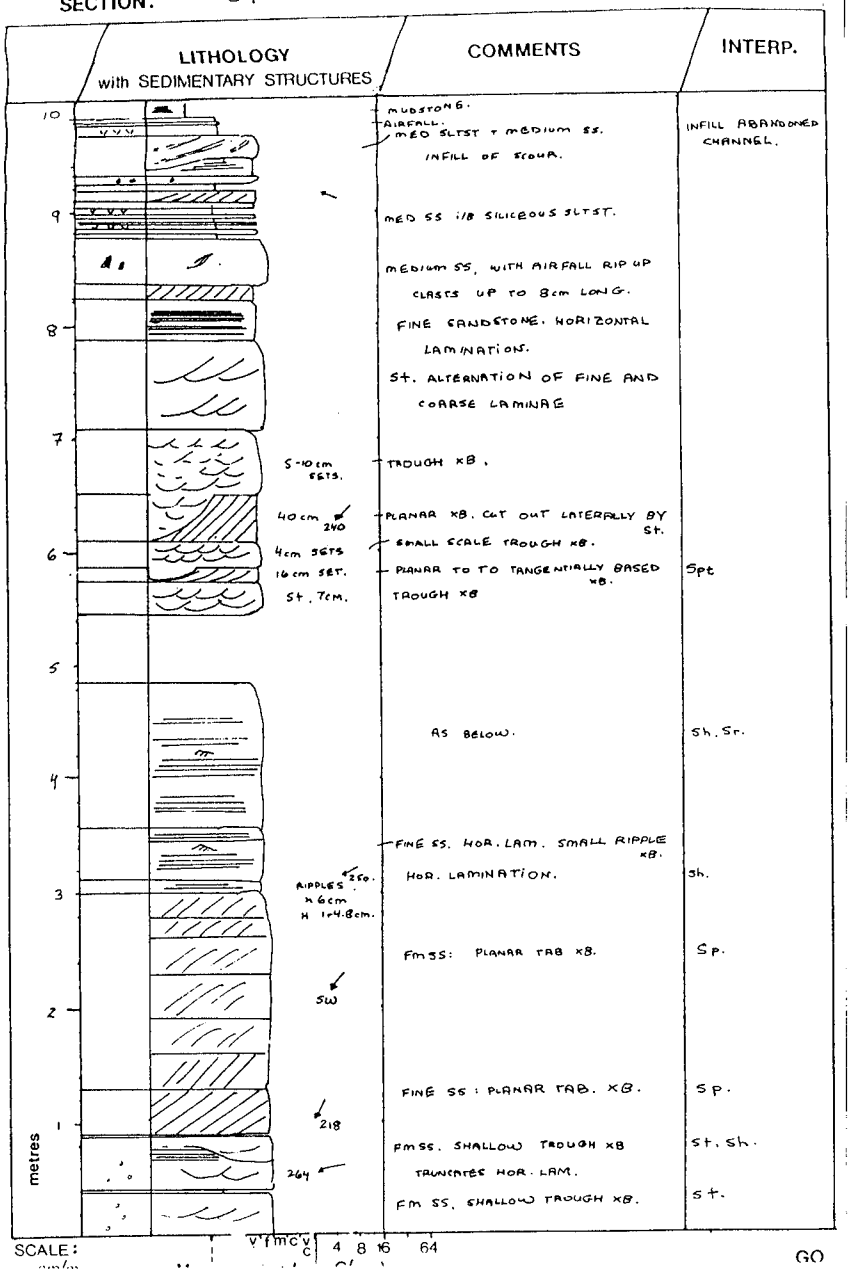

NSSY
disc.
low angle St w/mt foresets
w/STST rip ups 8x10cm
flaggy, HOR LAM.
flaggy
1cm STST rippled
HOR LAM cut out SMALL RIPPLES 1cm. w/MAG.
1fm
St. PLAT, 10cm AVE
20cm base
rippled
5-10cm St w/ mt foresets
STST rip up. 1x3cm
wavy base
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.


240
475
C105: bottom 10-15m sea green
C106: white silic ash flow tuff w/ gray 0/5 v f g sd zones
C105
C106
C104
CCV.
SHARP CONTACT WITH CCV.
239.05
sl to mod MAG
238
SCOUR FILL.
Scoured CT
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

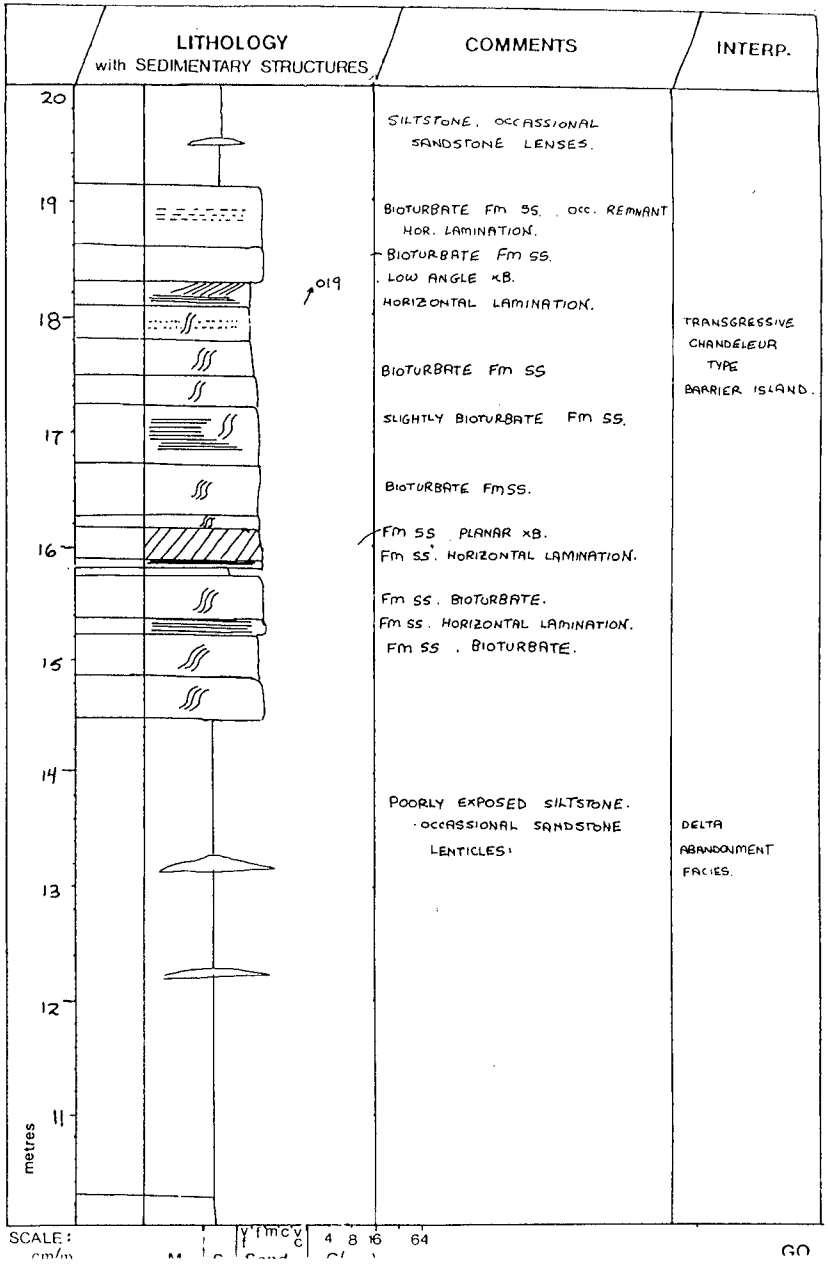
SECTION C4

SECTION C4 LOCATION: Locate stratigraphically lowest outcrops of sandstone 100 m to south of east-west trending wire fence and 450 m south of Gwern Gof Isaf. Section continues from here until base of Gwern Gof Tuff.

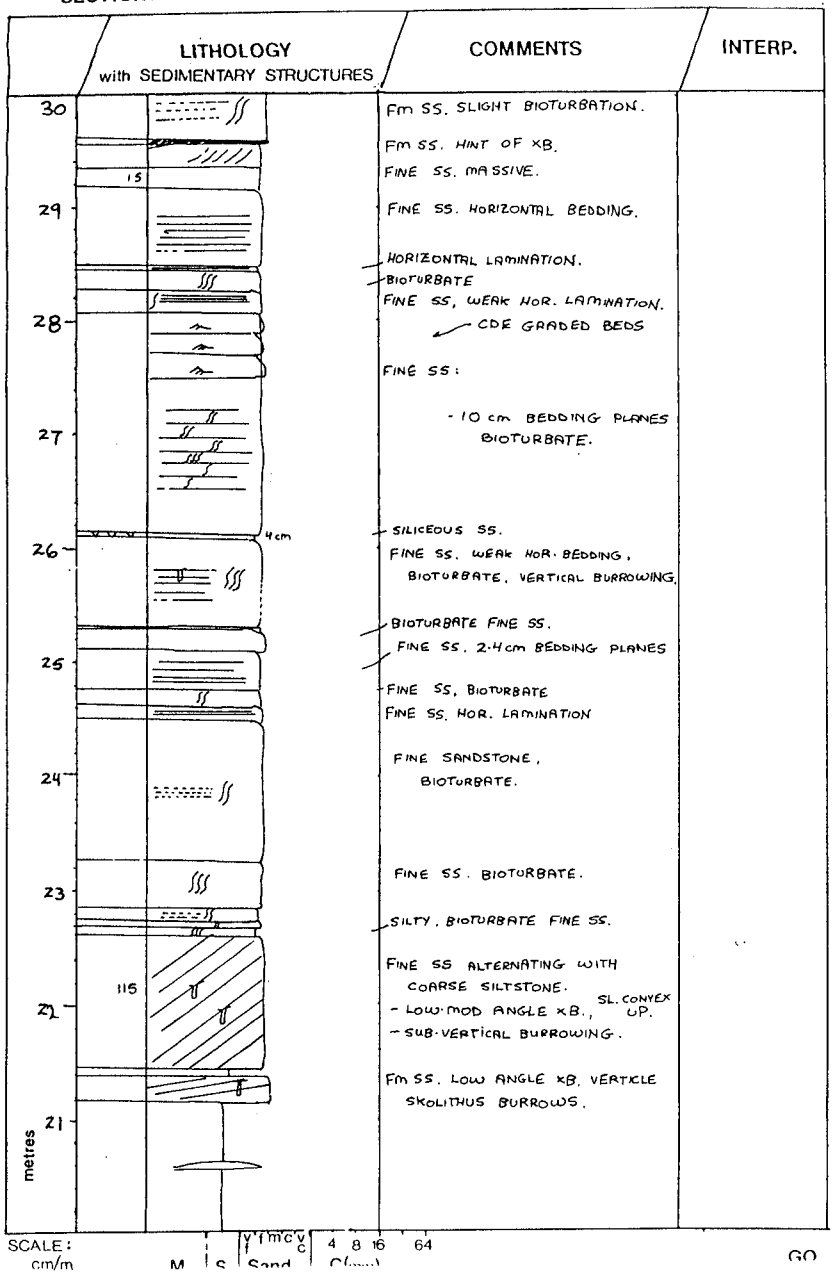
SECTION: C 4 LOCATION:



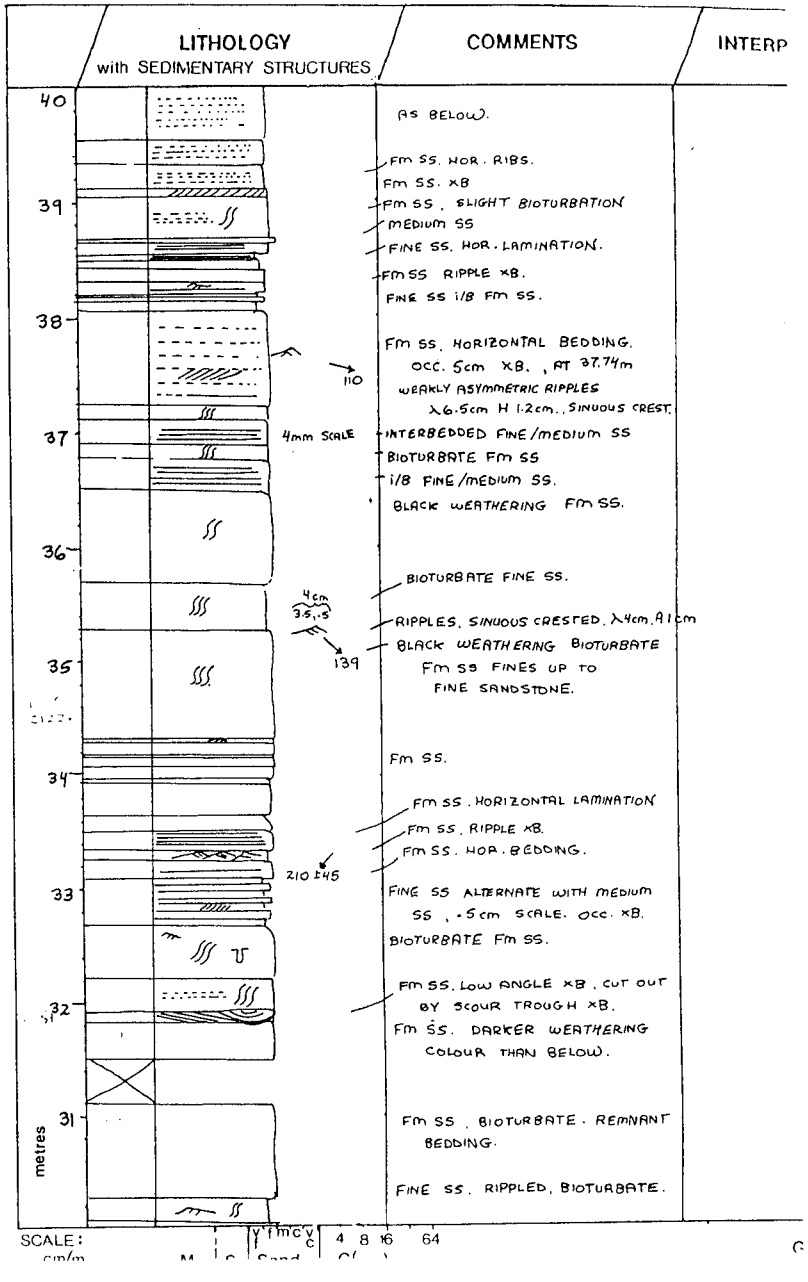
SECTION: C 4 LOCATION: TRYFAN ANTICLINE



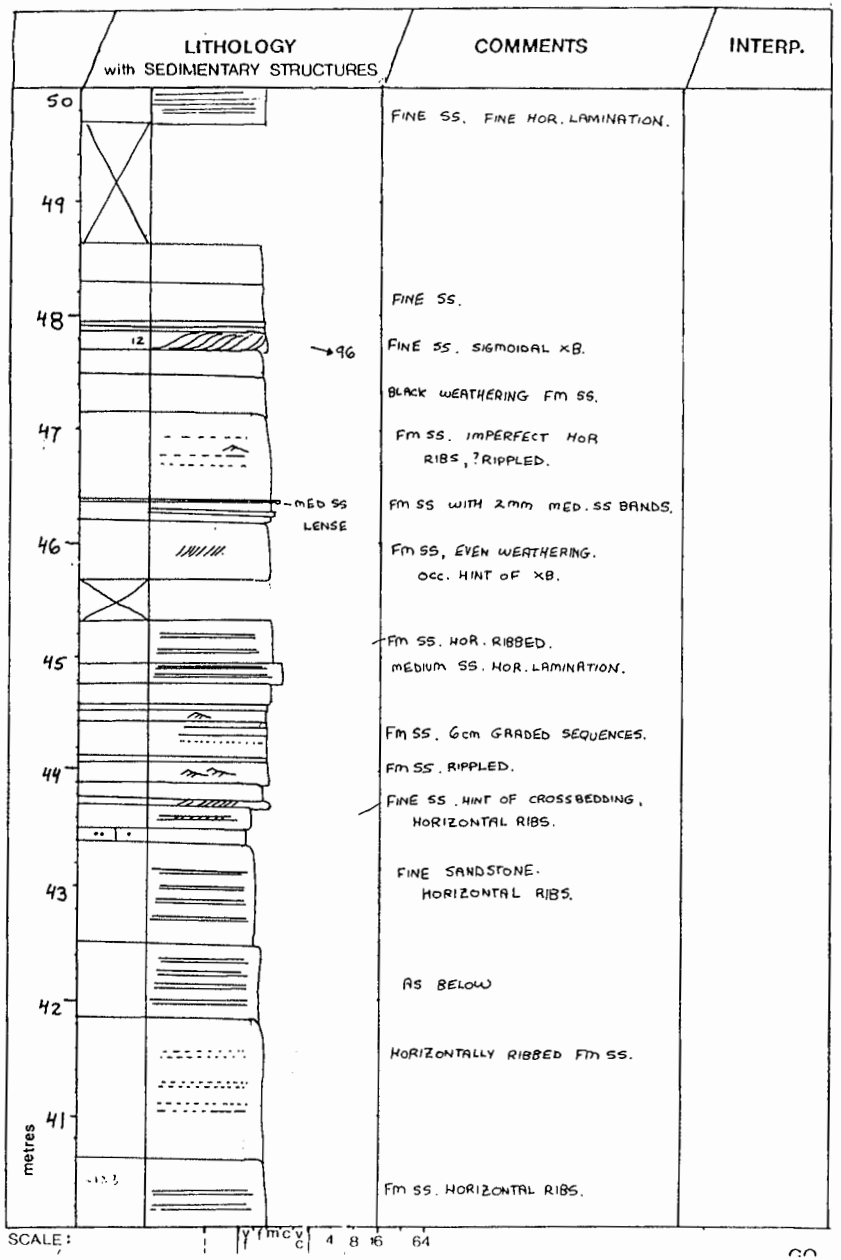
SECTION: C4 LOCATION: TRYFAN ANTICLINE.



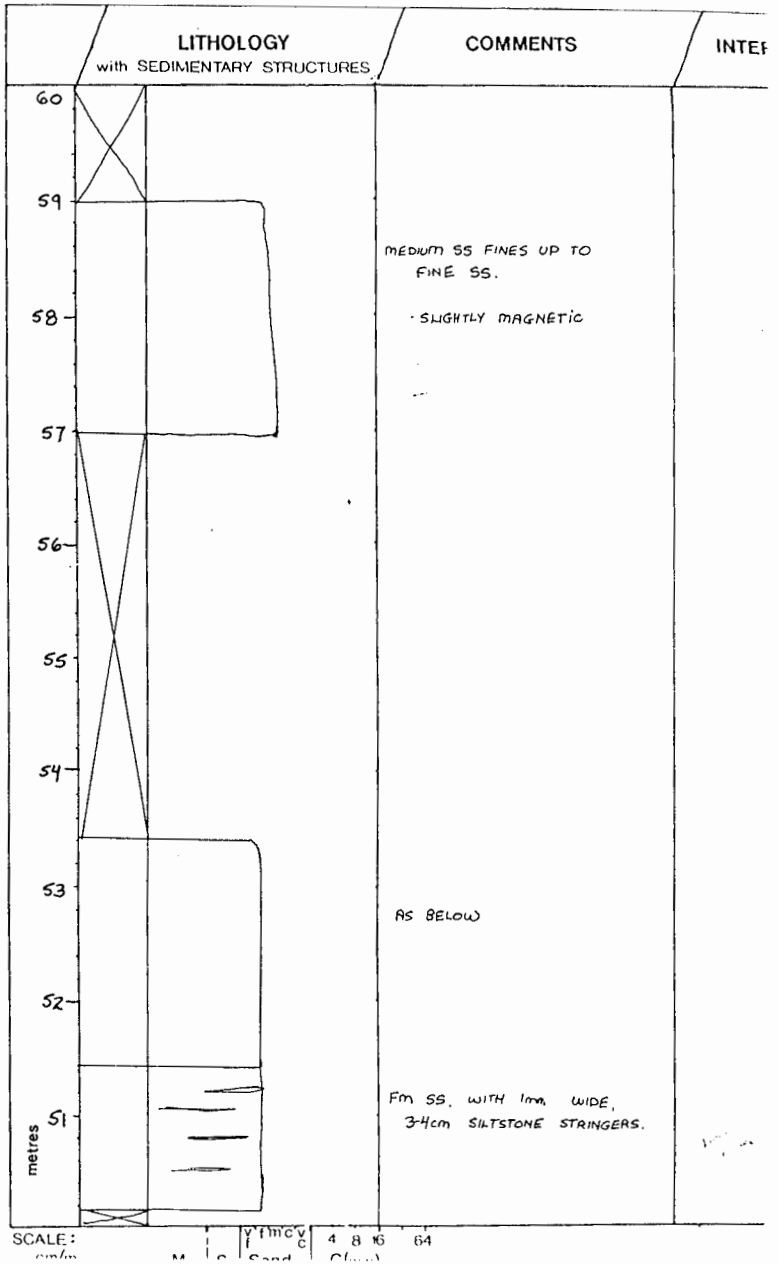
SECTION: C.4. LOCATION: TRYFAN ANTICLINE



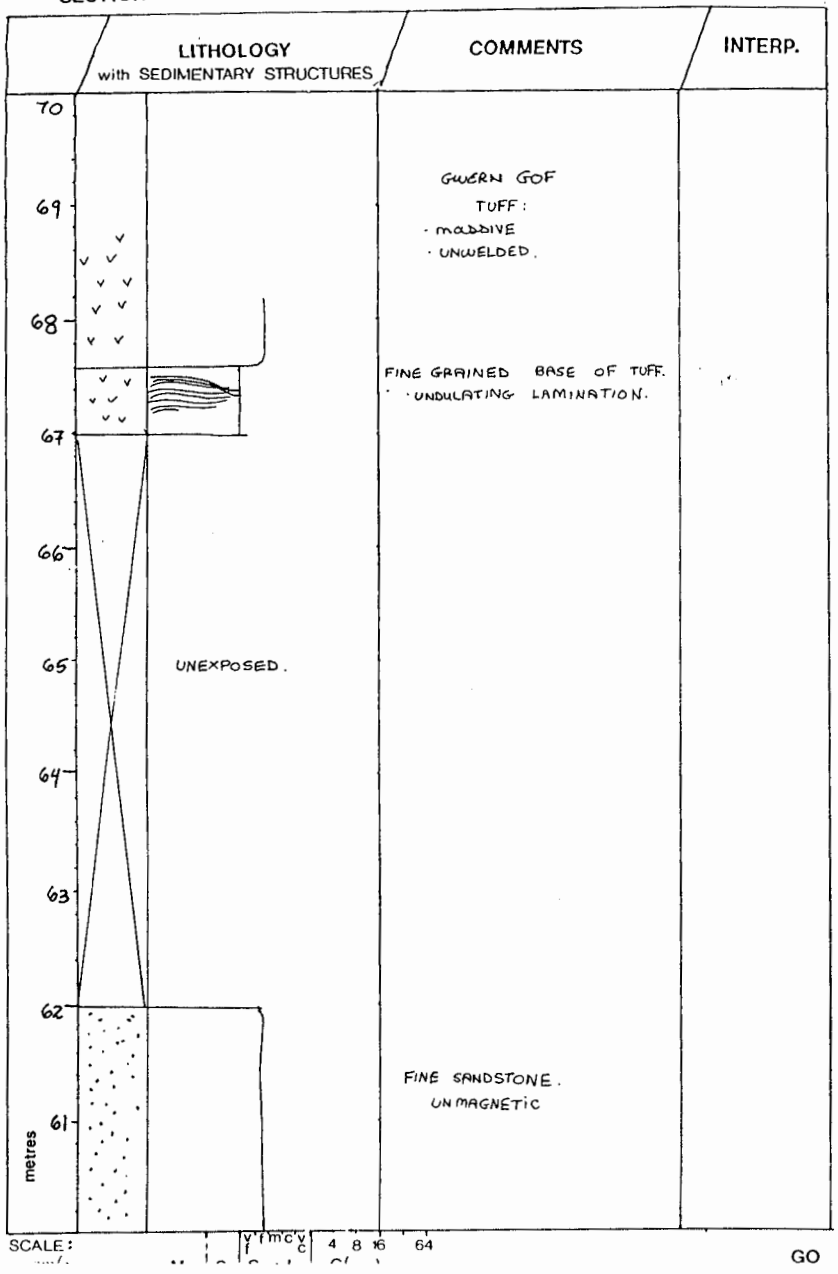
SECTION: C· LOCATION: TRYFAN ANTICLINE



SECTION: C4 LOCATION: TRYFAN ANTICLINE

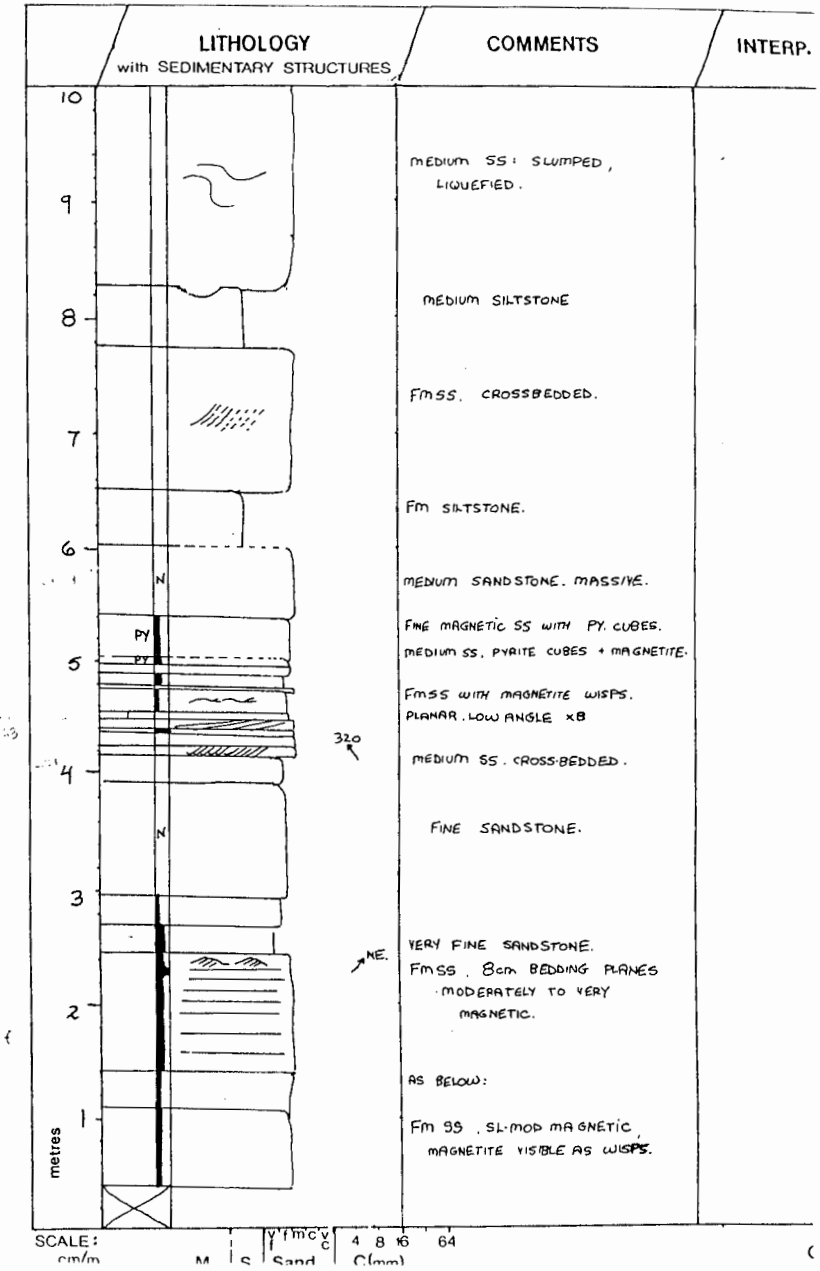


SECTION: C4 LOCATION: TRYFAN ANTICLINE

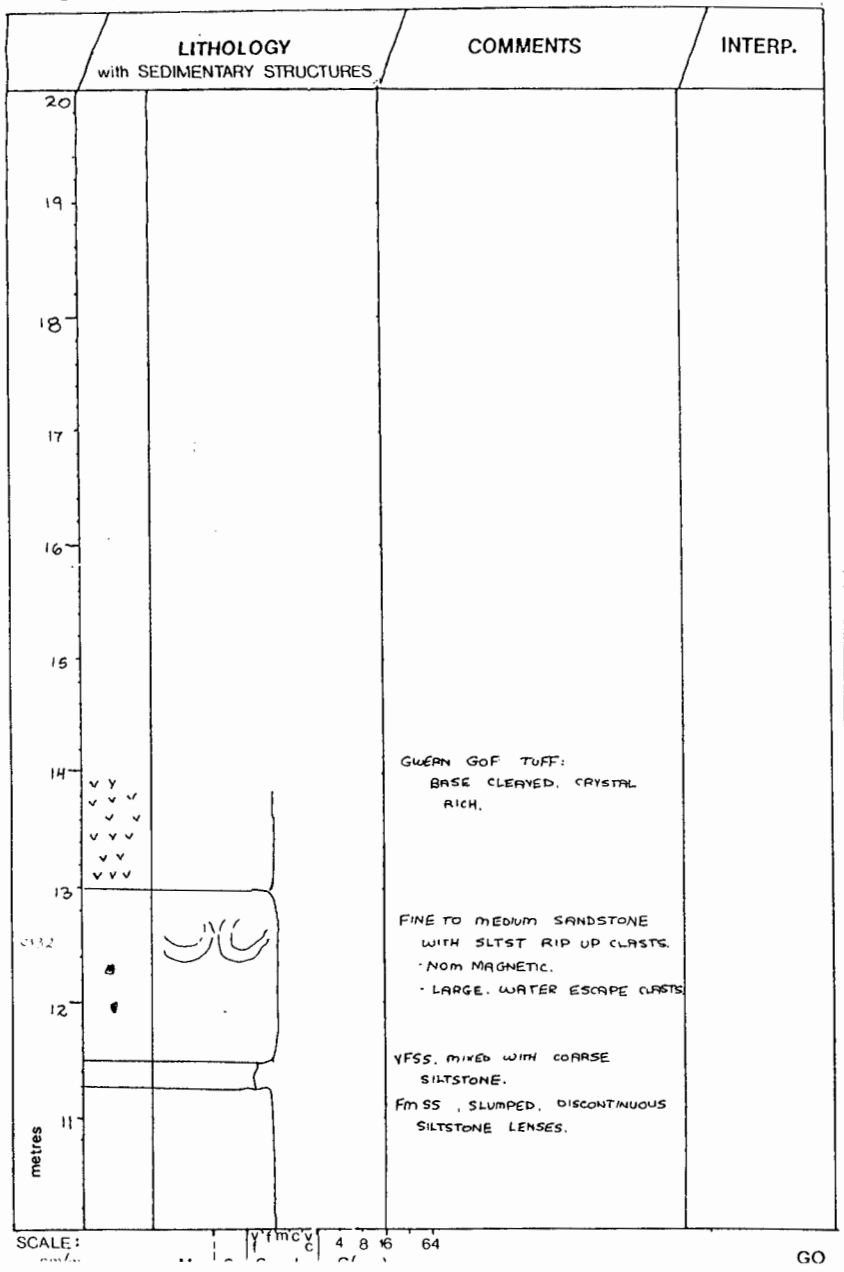


GO

SECTION: C4B LOCATION: TRYFAN ANTICLINE

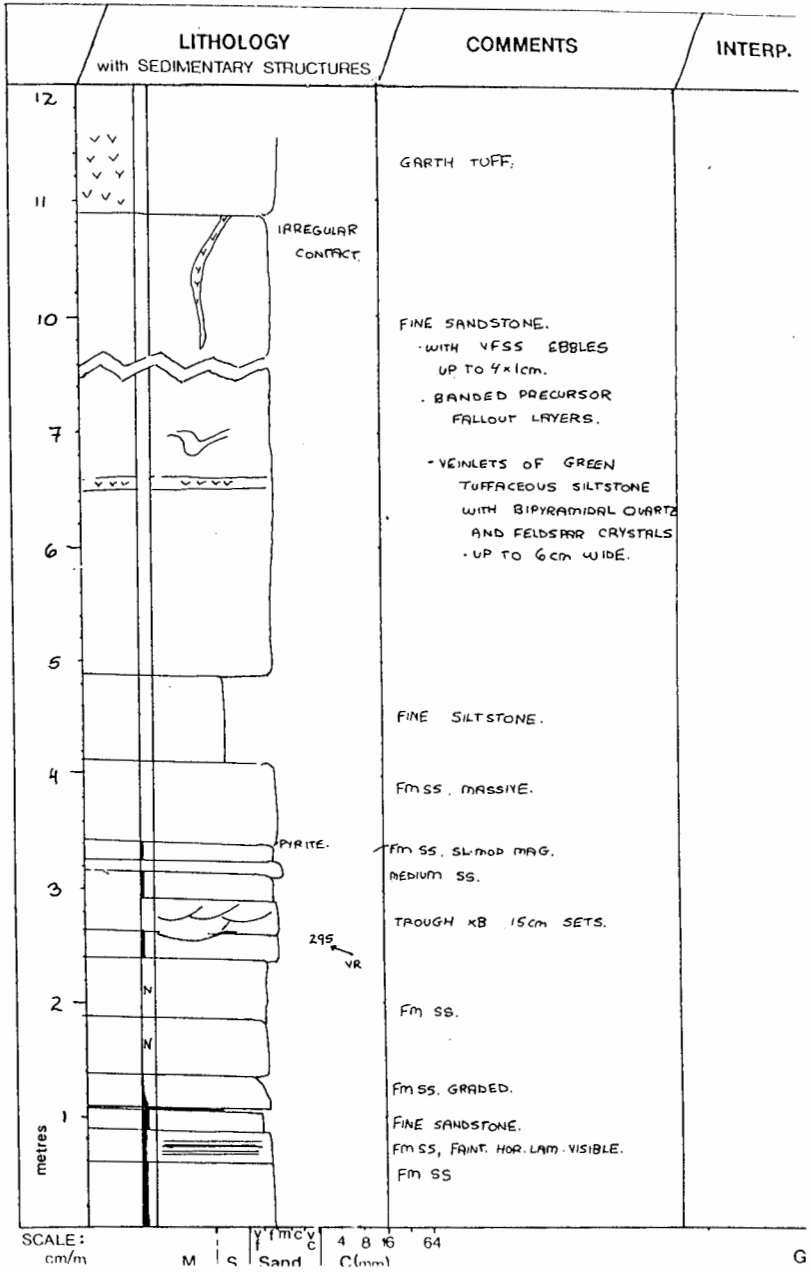


SECTION: C4B LOCATION: TRYFAN EAST



GO

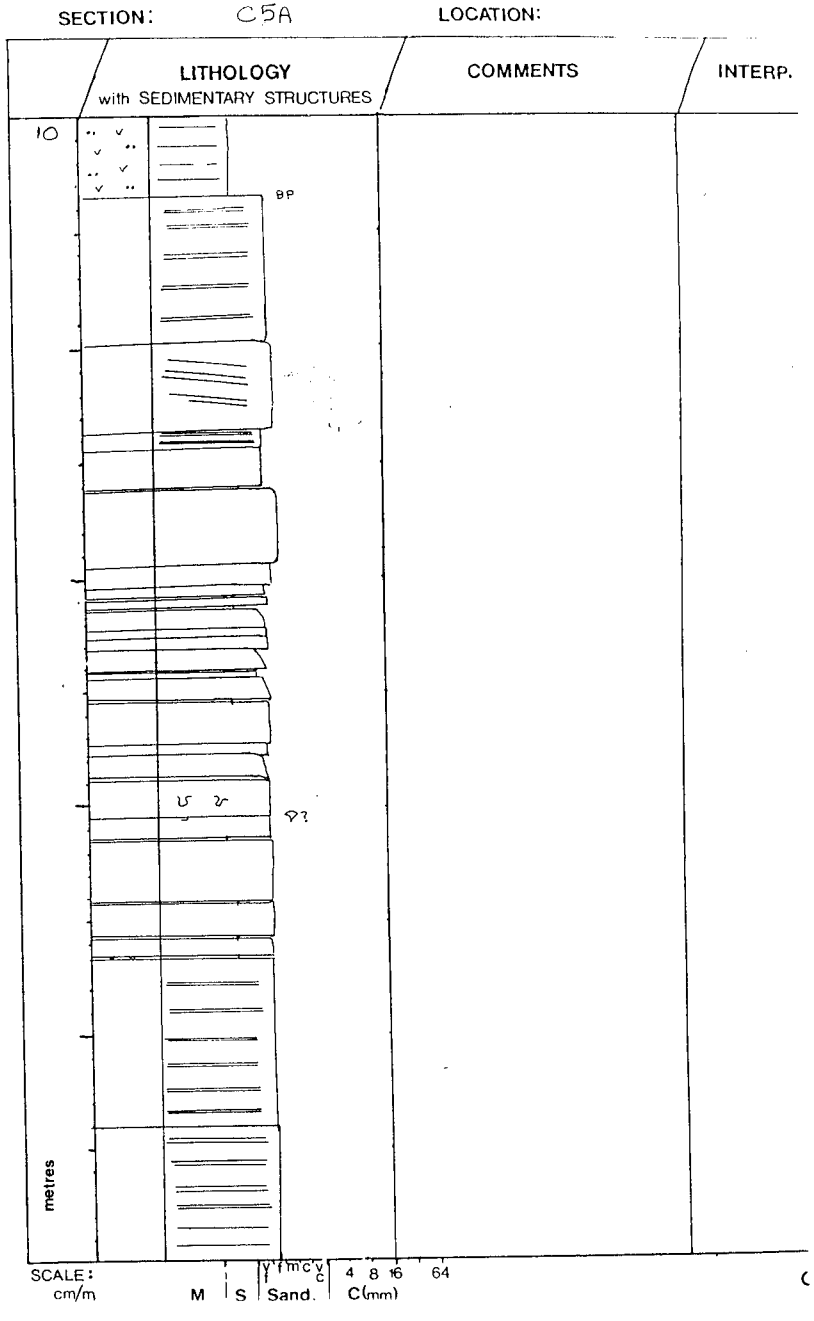
SECTION: C4C LOCATION: TRYFAN ANTICLINE



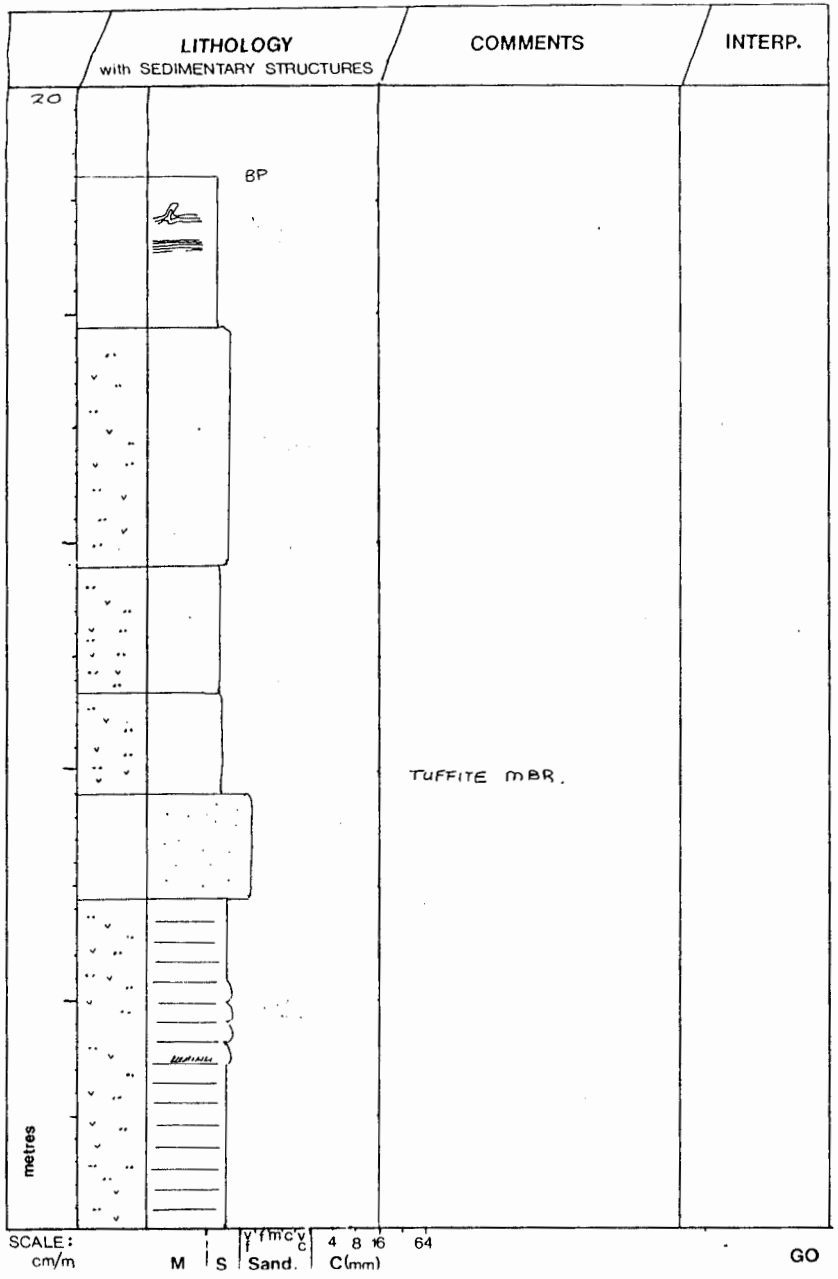
G

SECTION C5a

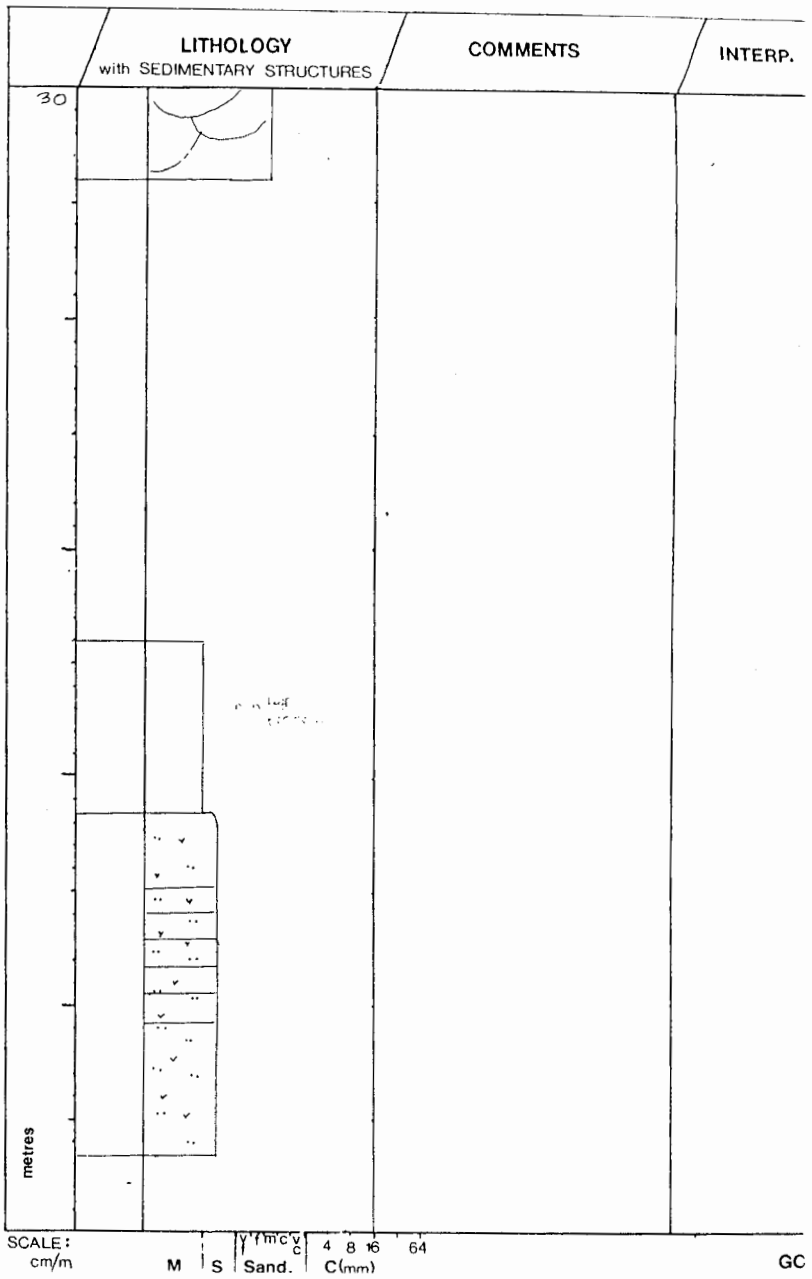
SECTION C5 LOCATION: Locate lowest stratigraphic outcrops at southern end of Tryfan anticline. Section proceeds to west until Gwern Gof Tuff. Section C5b starts at top of Gwern Gof Tuff and continues up slope until talus scree.



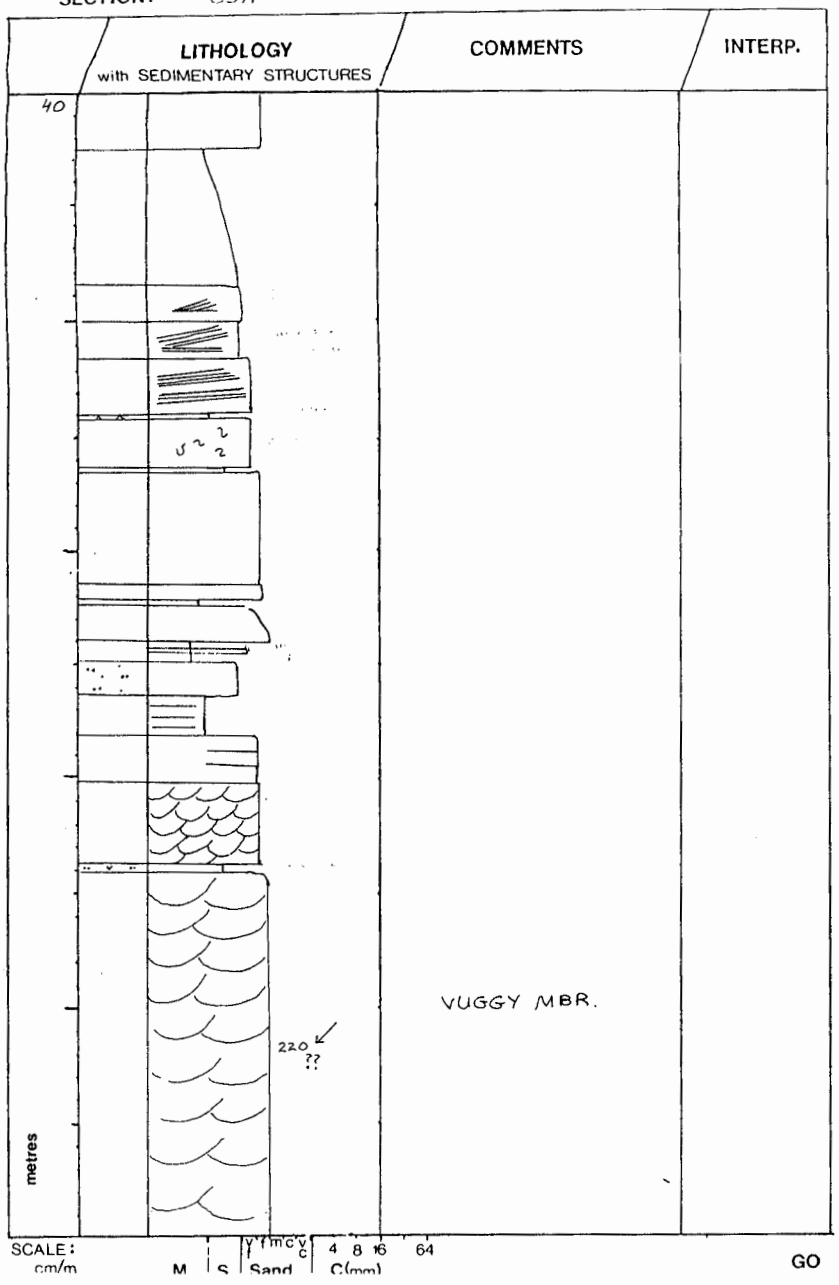
SECTION: C5A LOCATION:



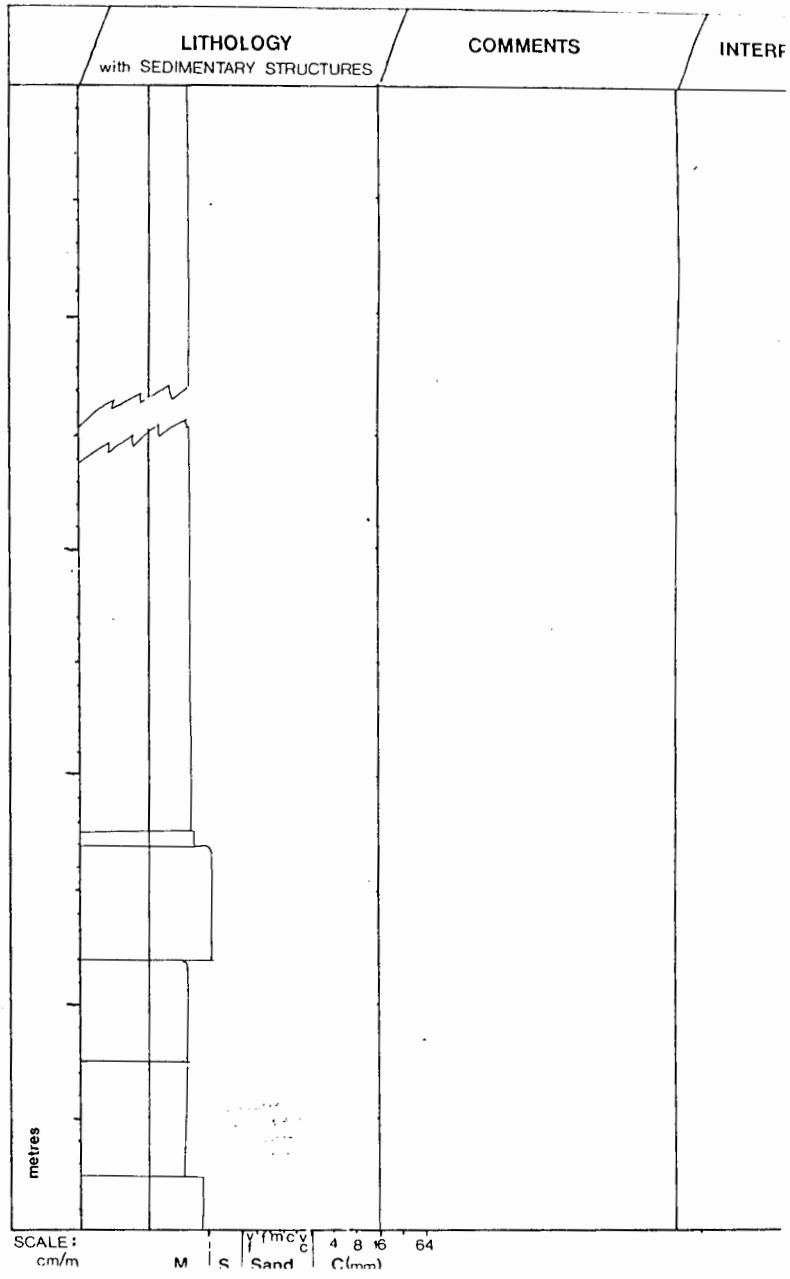
SECTION: C5A LOCATION:



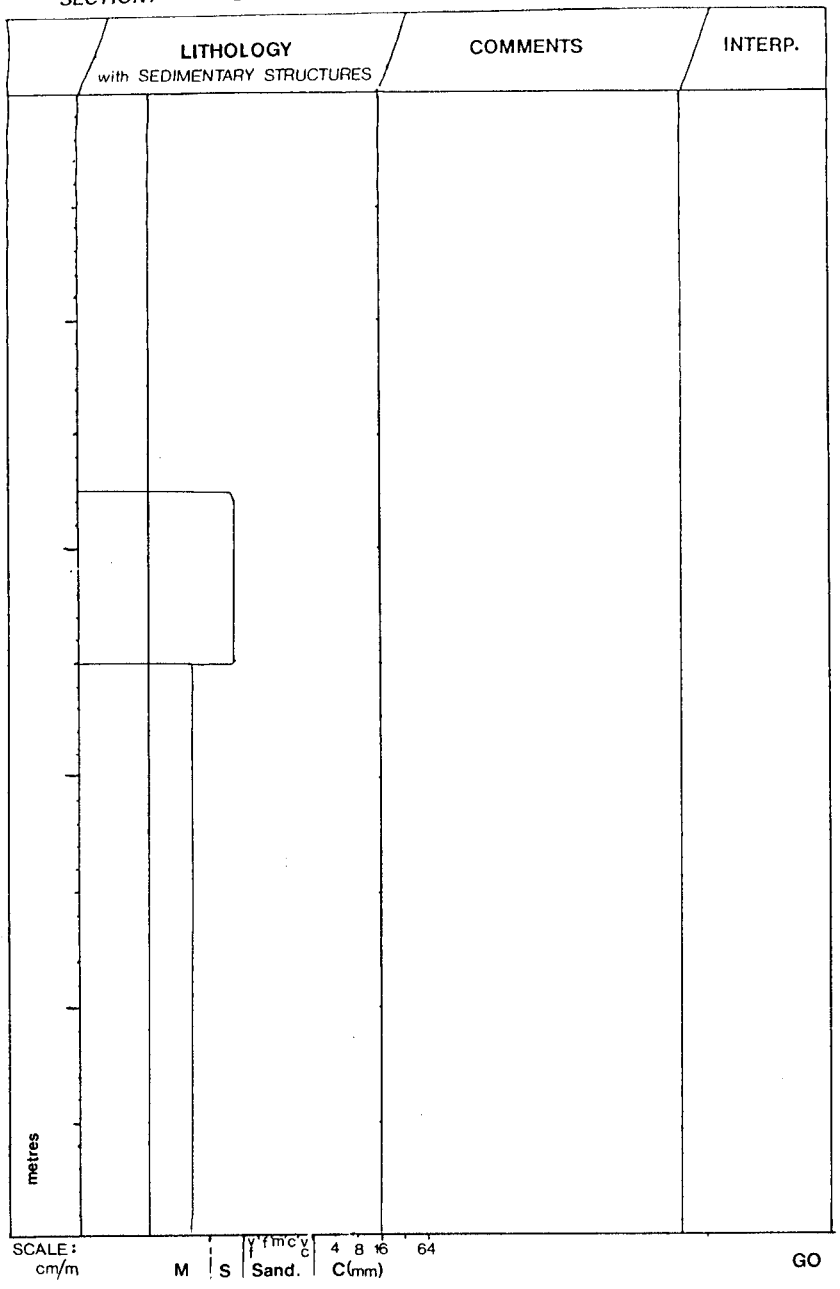
SECTION: C5A LOCATION:



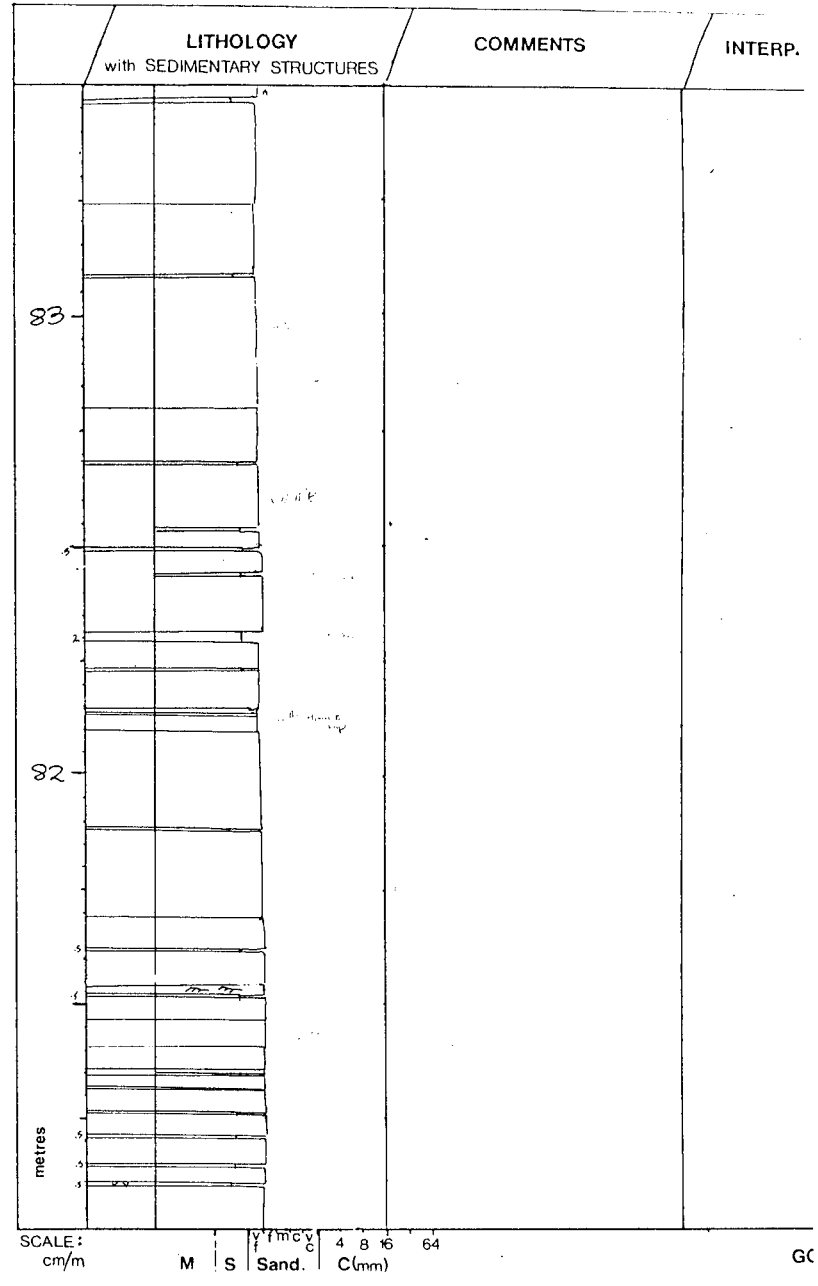
SECTION: C5A. LOCATION:



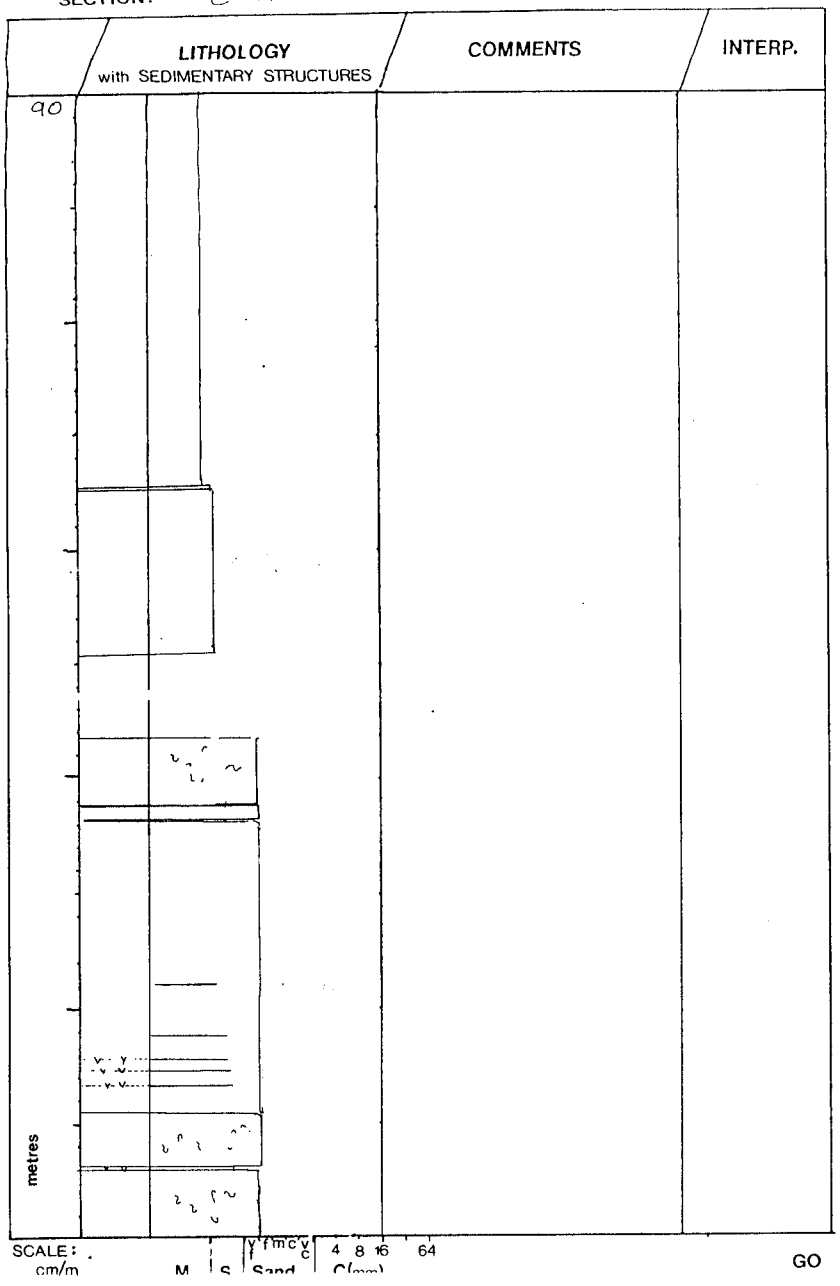
SECTION: CSA LOCATION:



SECTION: CSA DETAIL LOCATION:



SECTION: C5A LOCATION:



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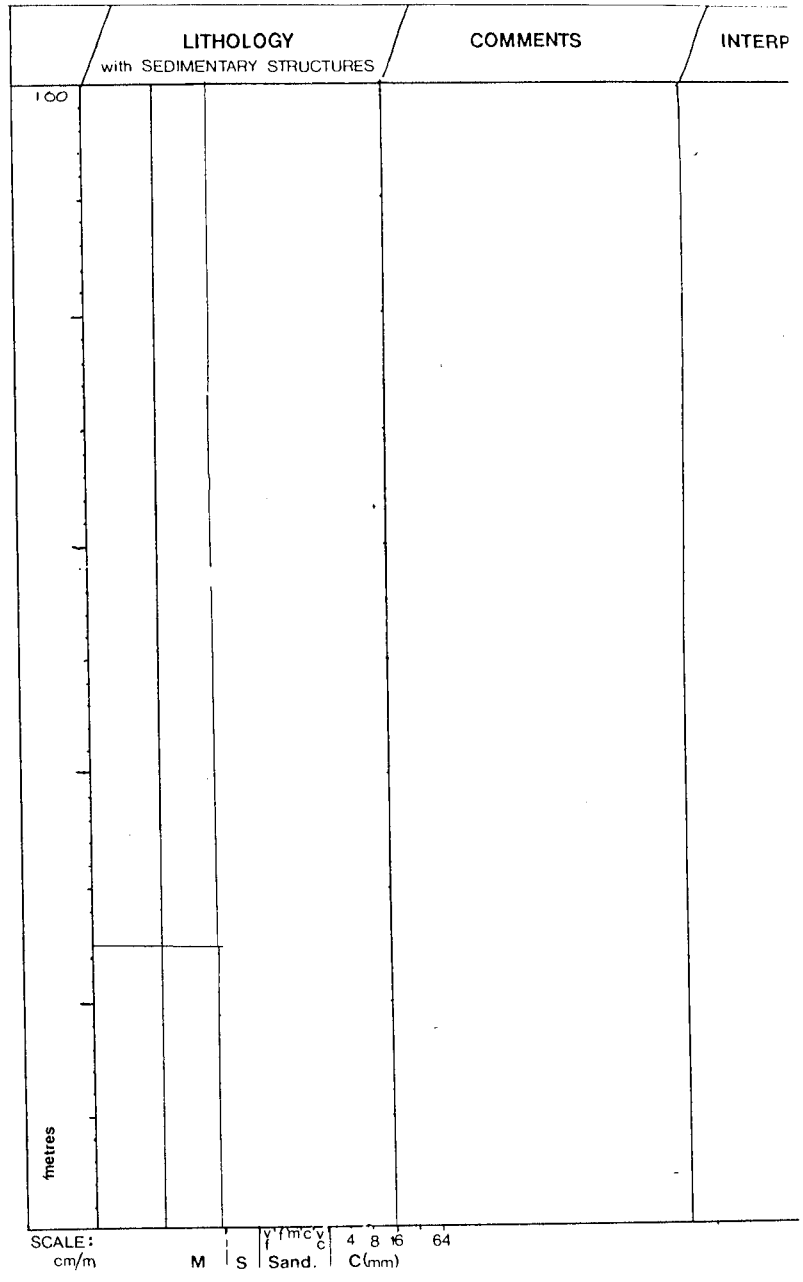
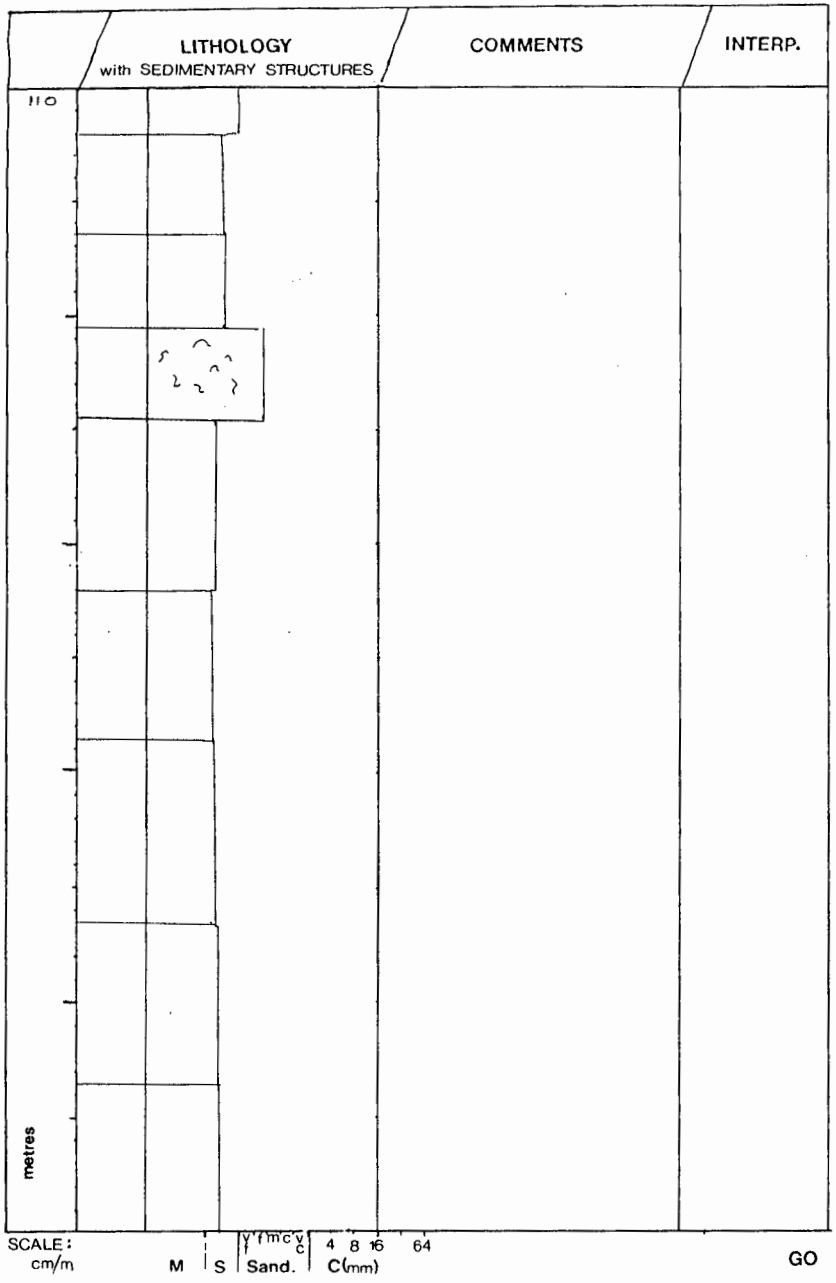
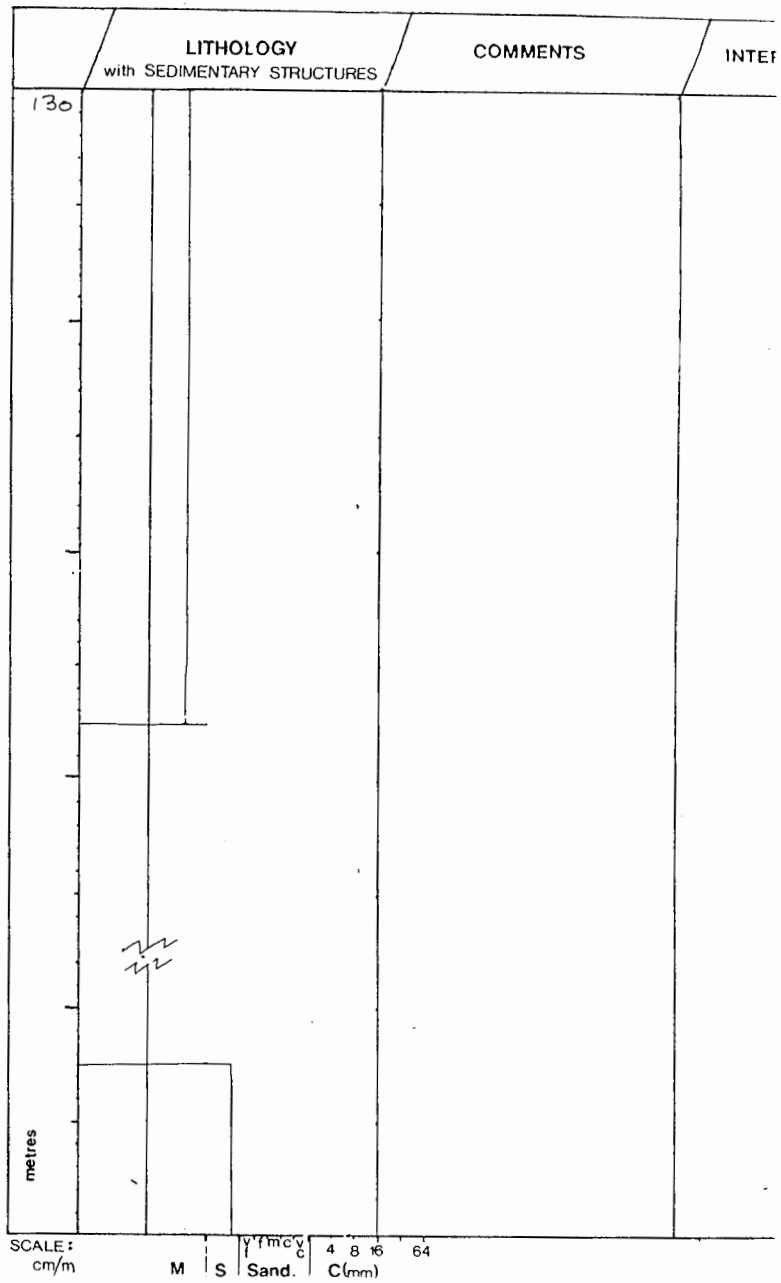


SECTION: C 5A. LOCATION:



SECTION: C 5A. LOCATION:



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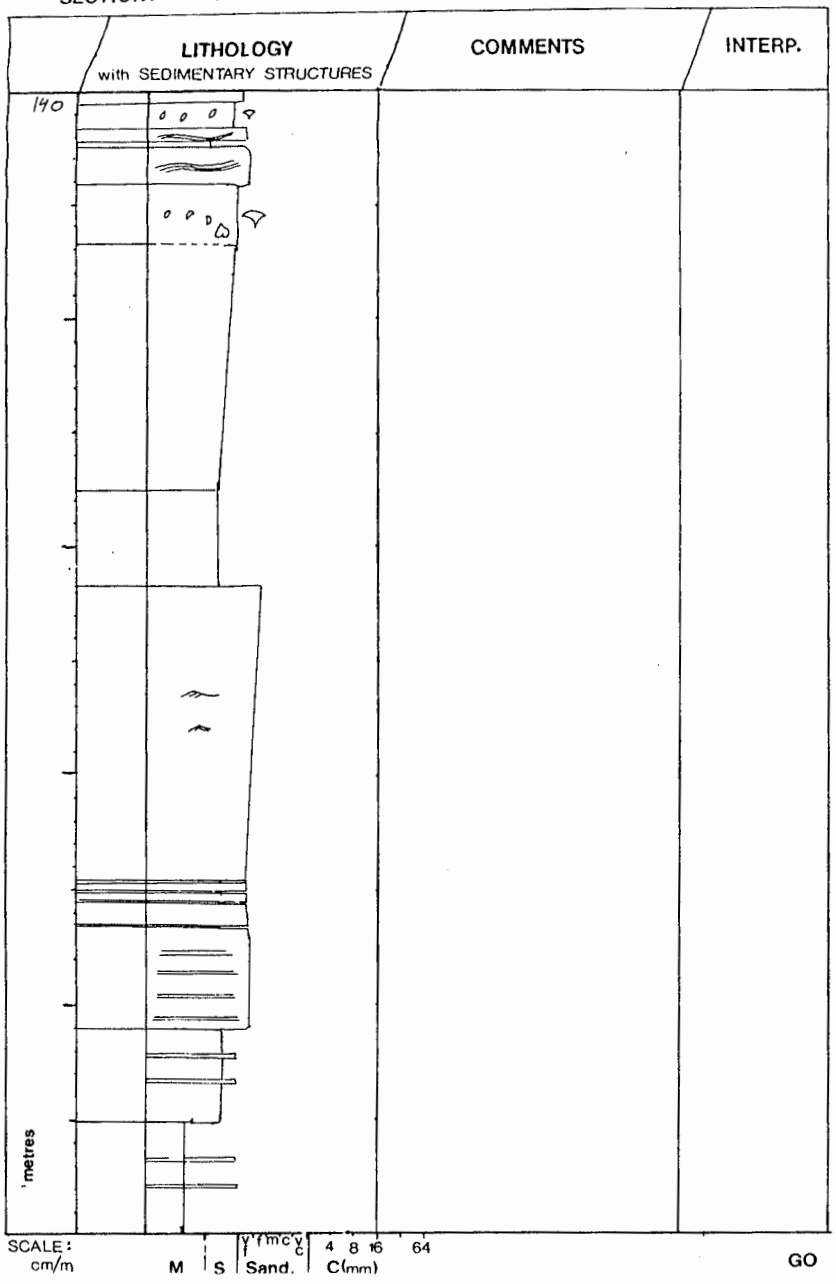

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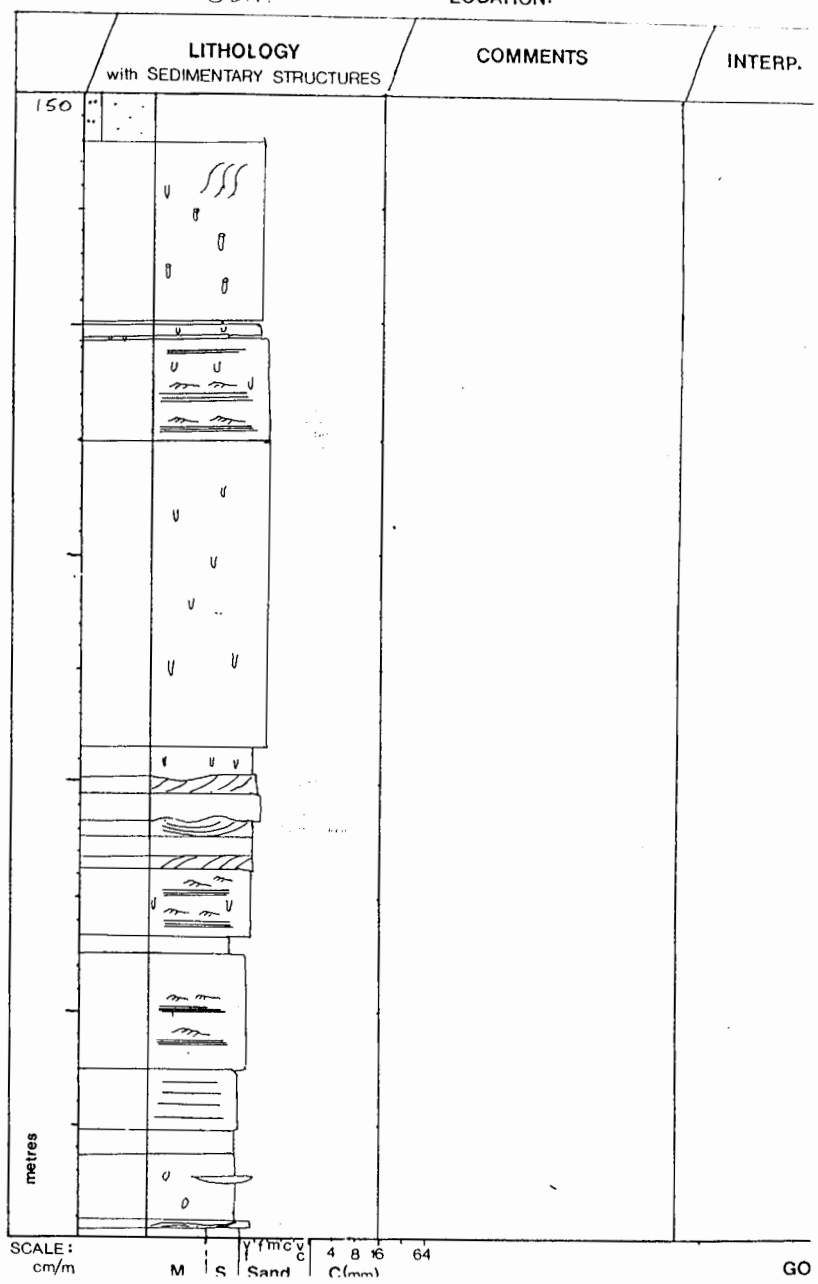
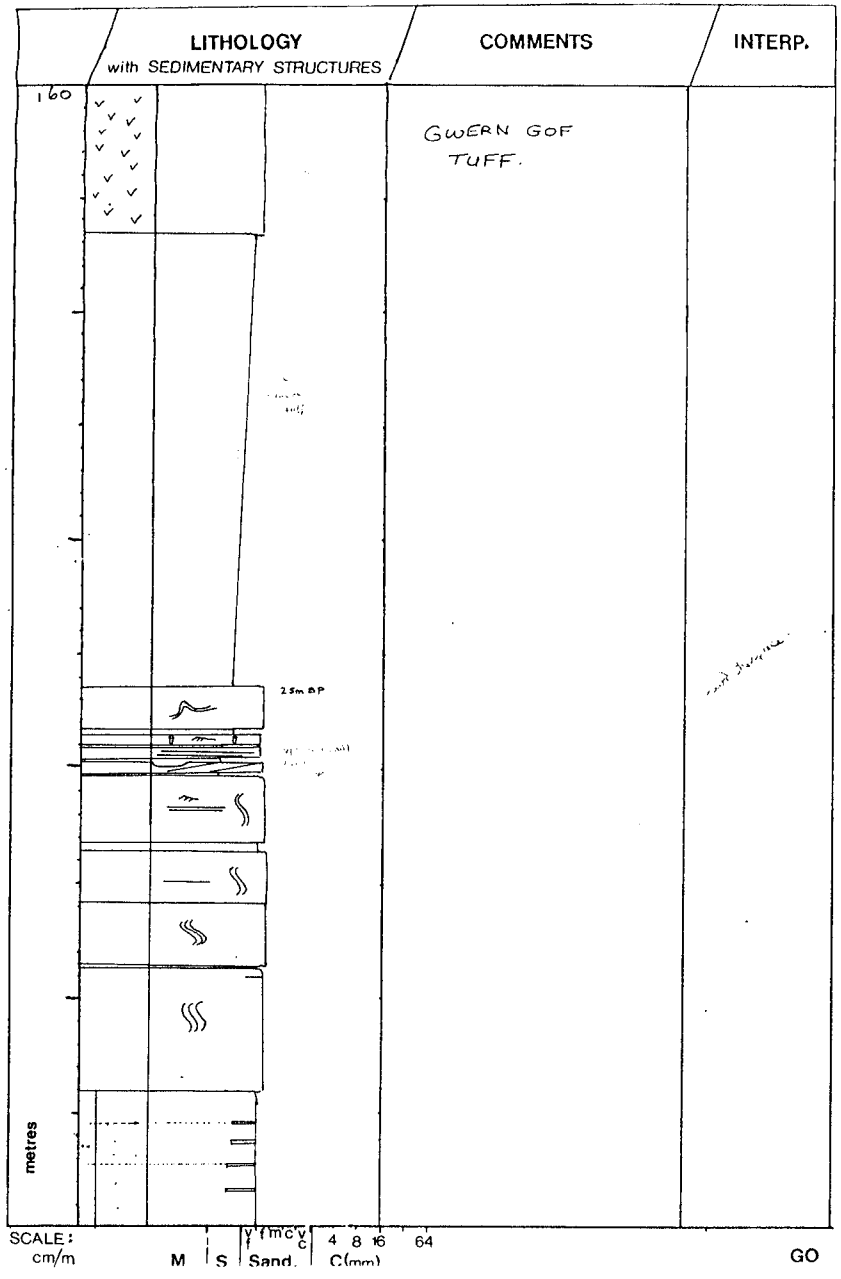
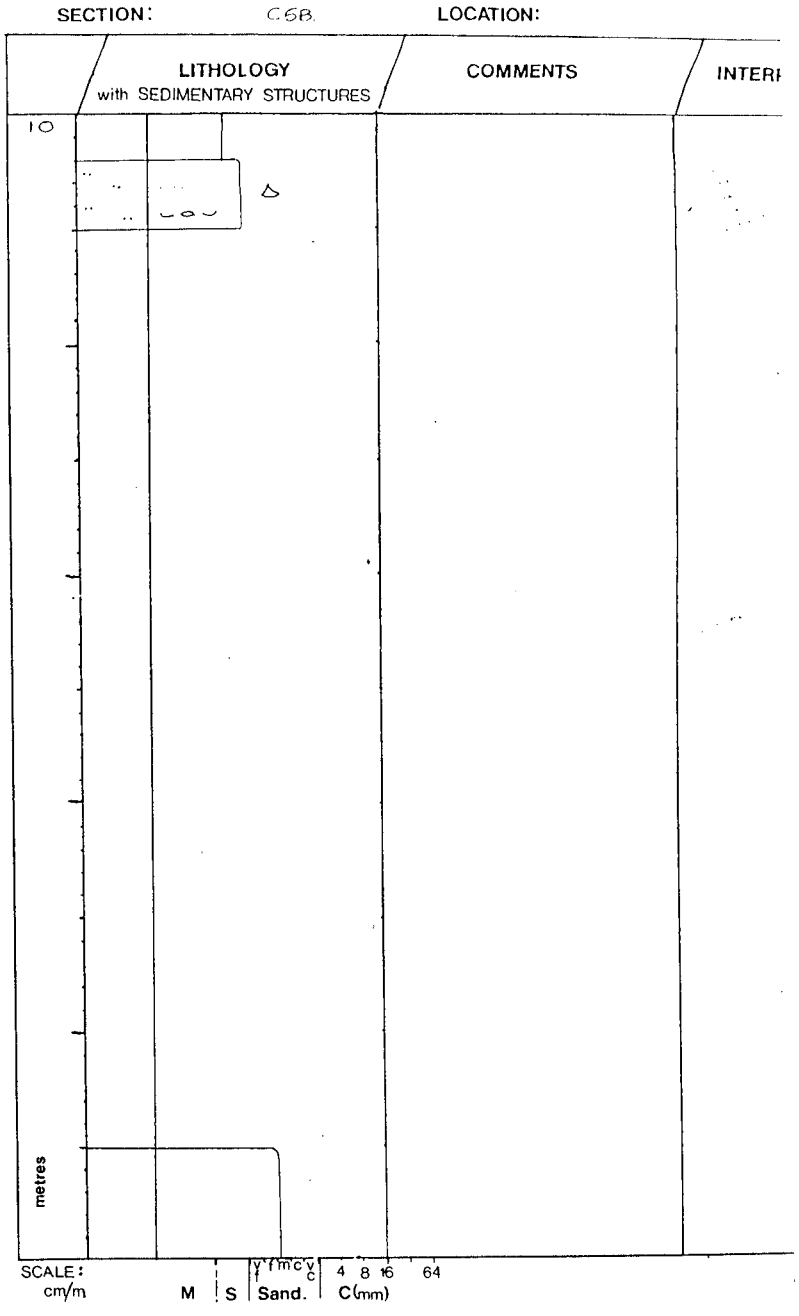


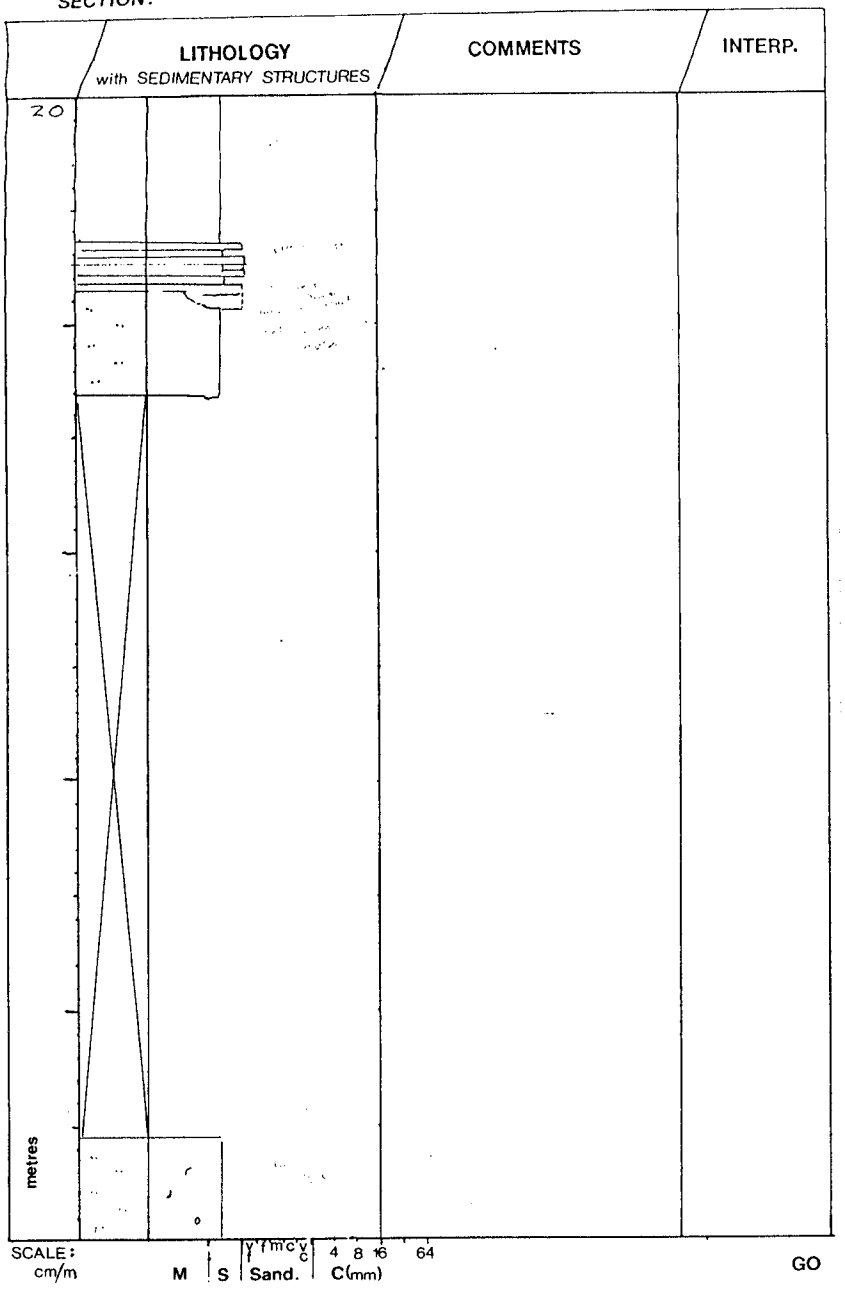
SECTION: C 5A LOCATION:



SECTION C5b


SECTION: C5B LOCATION:
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTERI
10
metres
SCALE:
cm/m
M
S
Sand.
v f m c v c
4 8 16 64
C(mm)

SECTION: C5B LOCATION:



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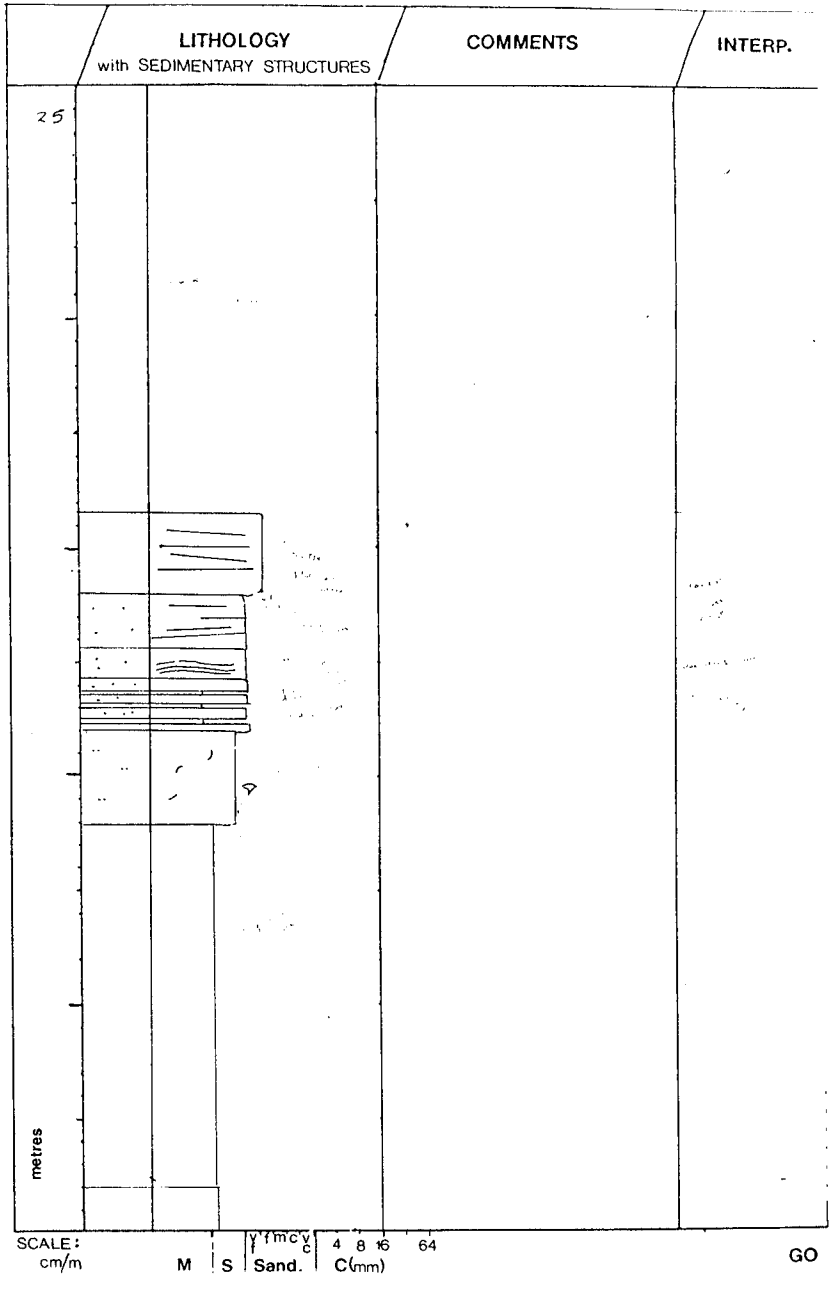

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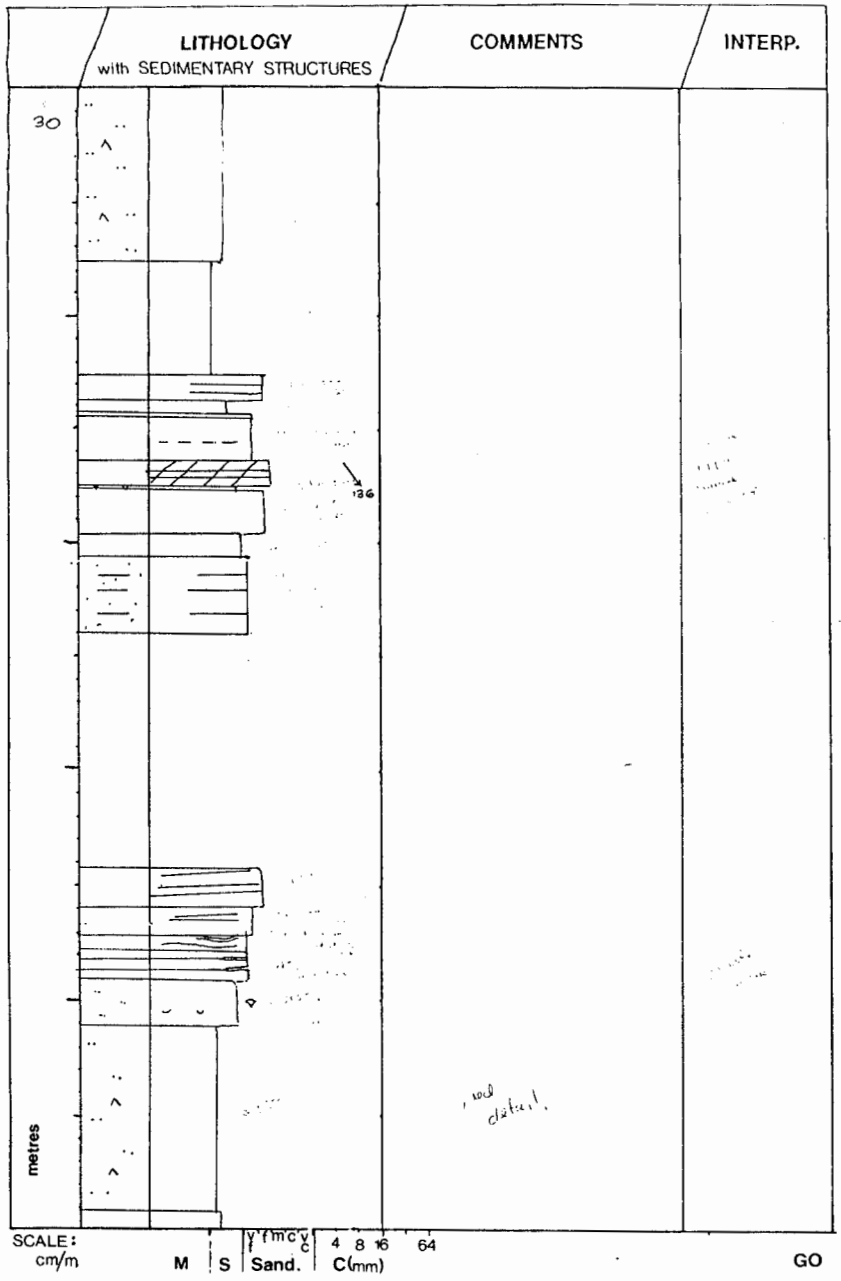
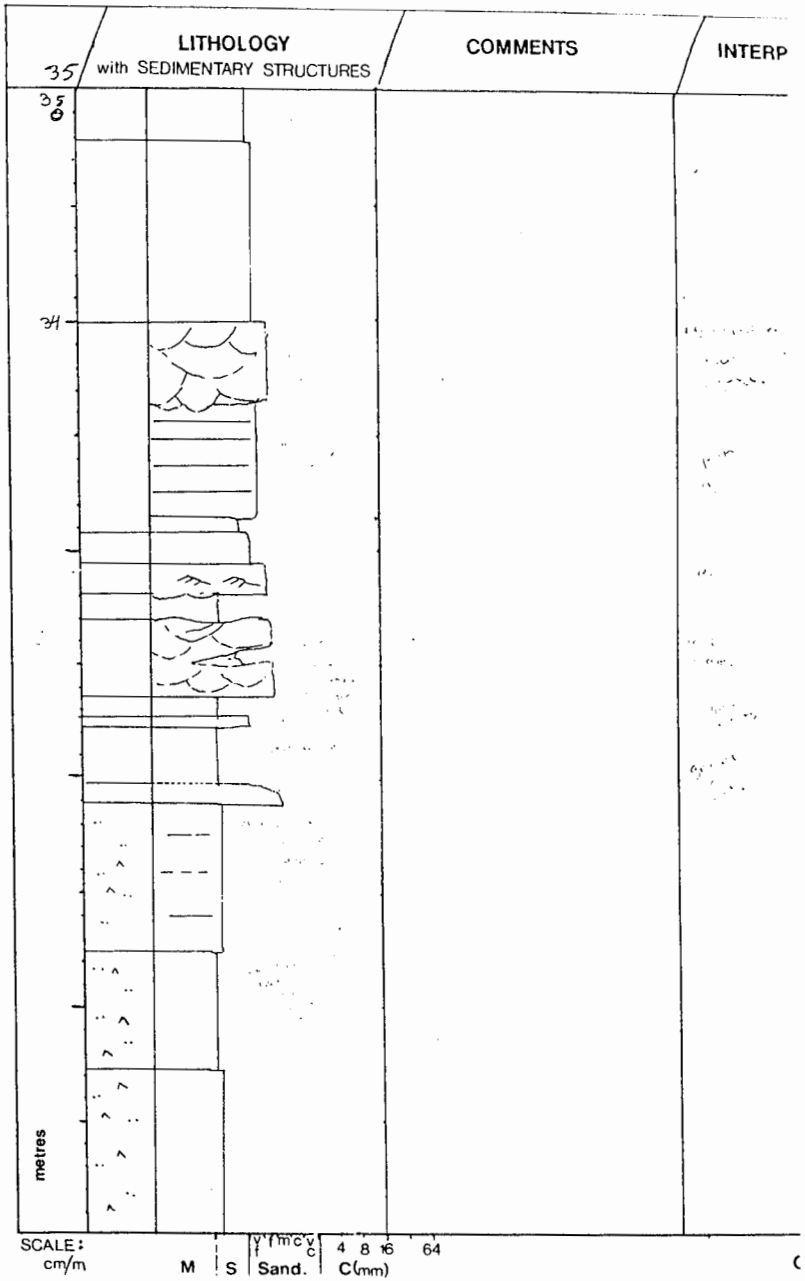
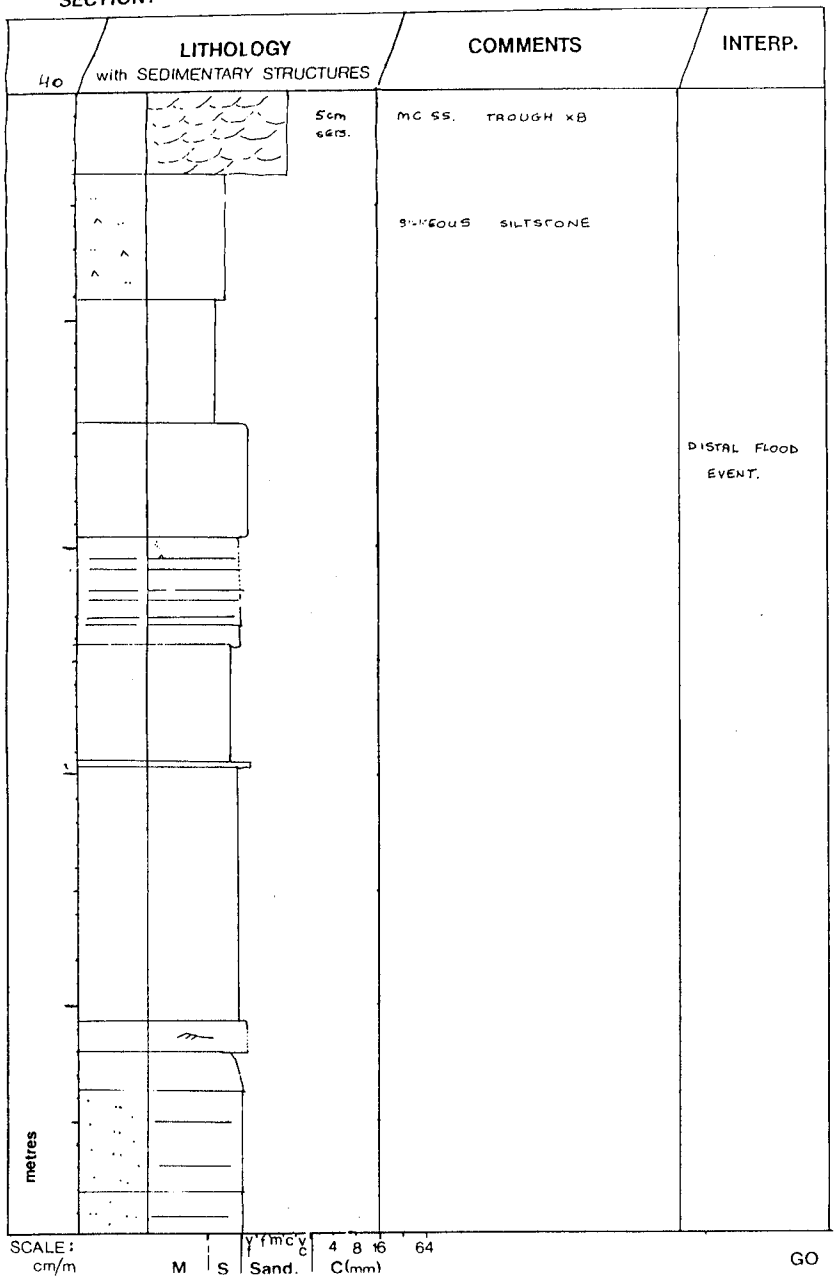


SECTION: C5B LOCATION:



SECTION: C 5B LOCATION:



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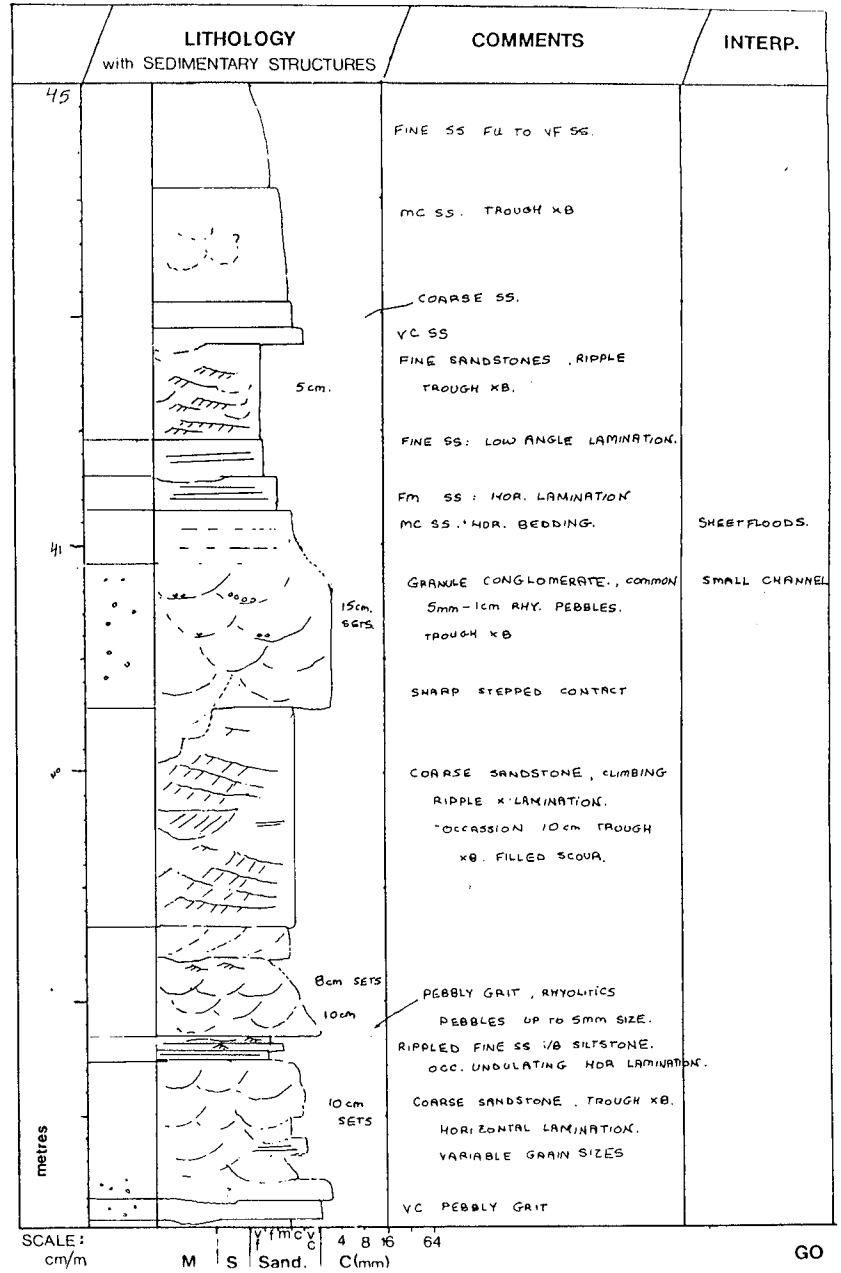
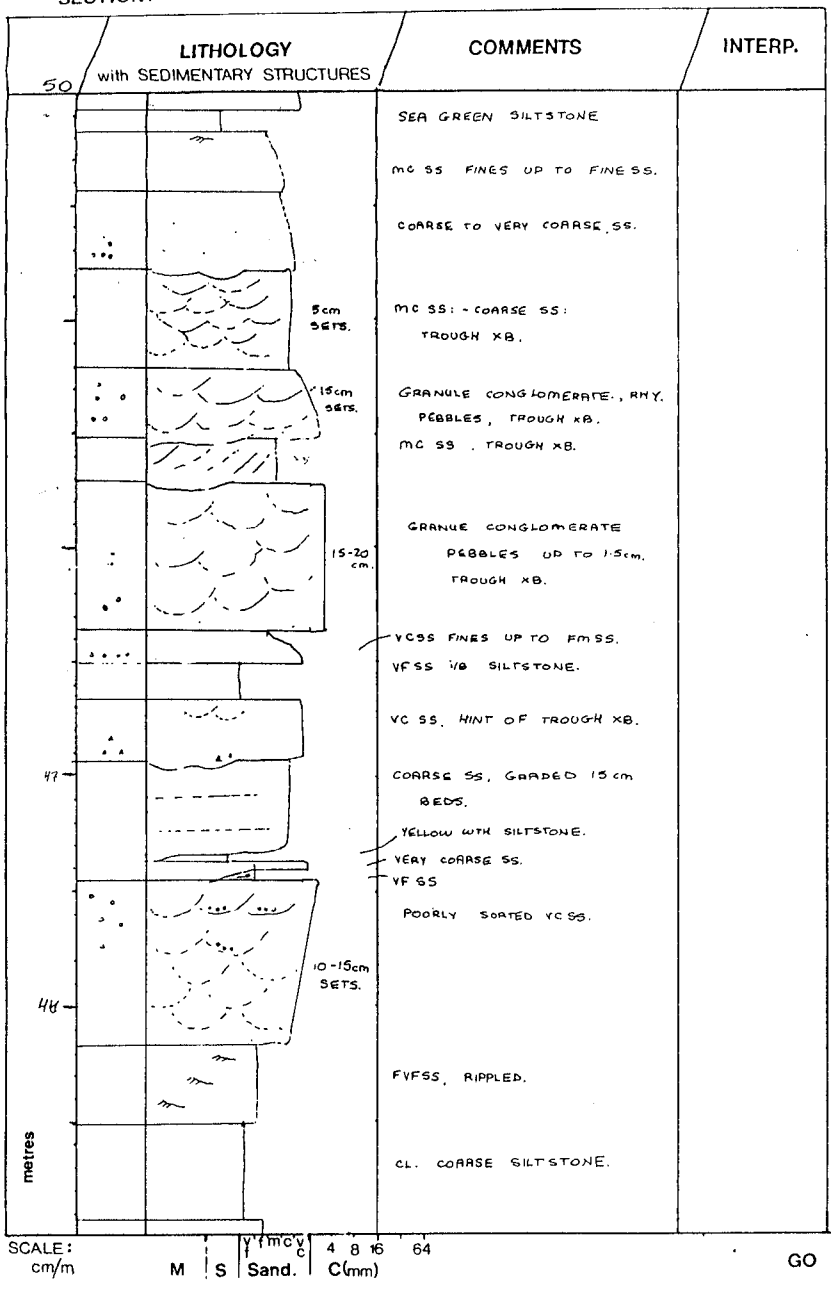


SECTION: LOCATION:



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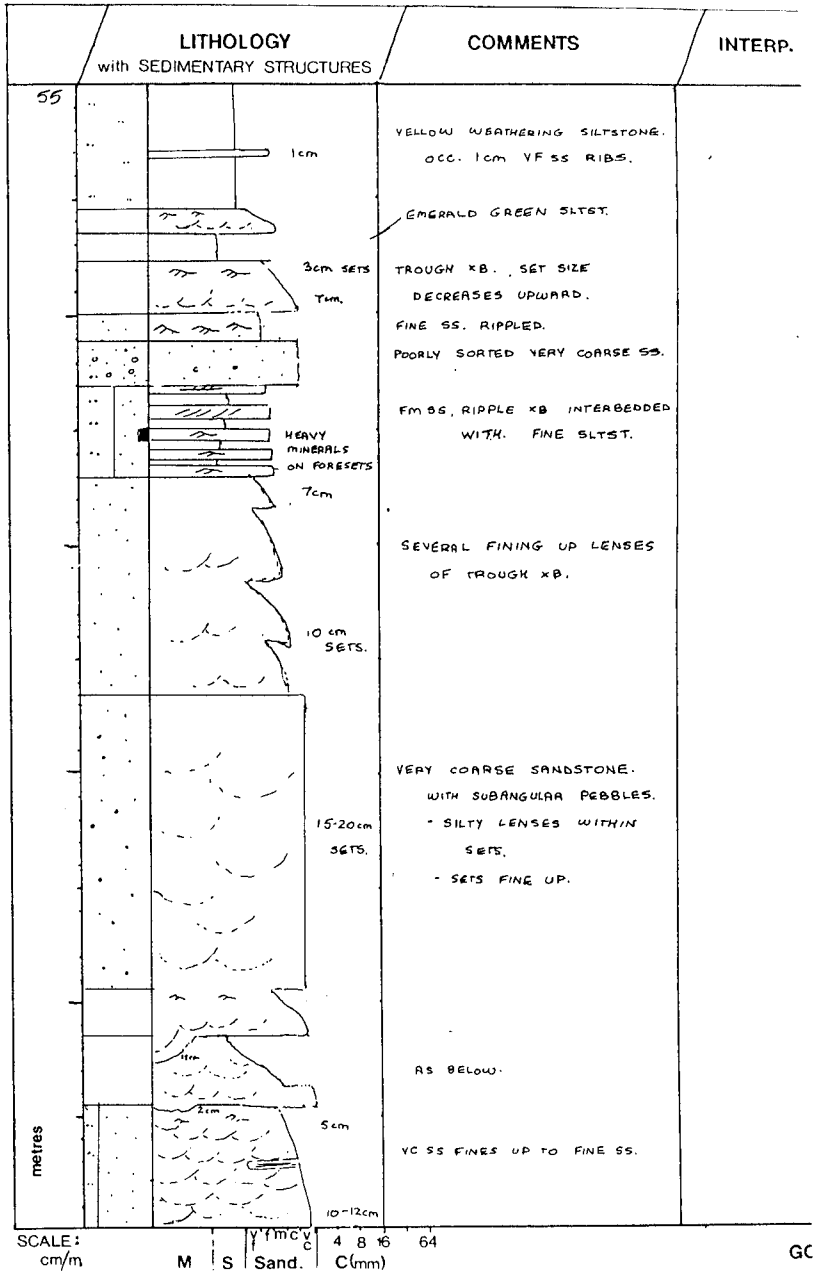
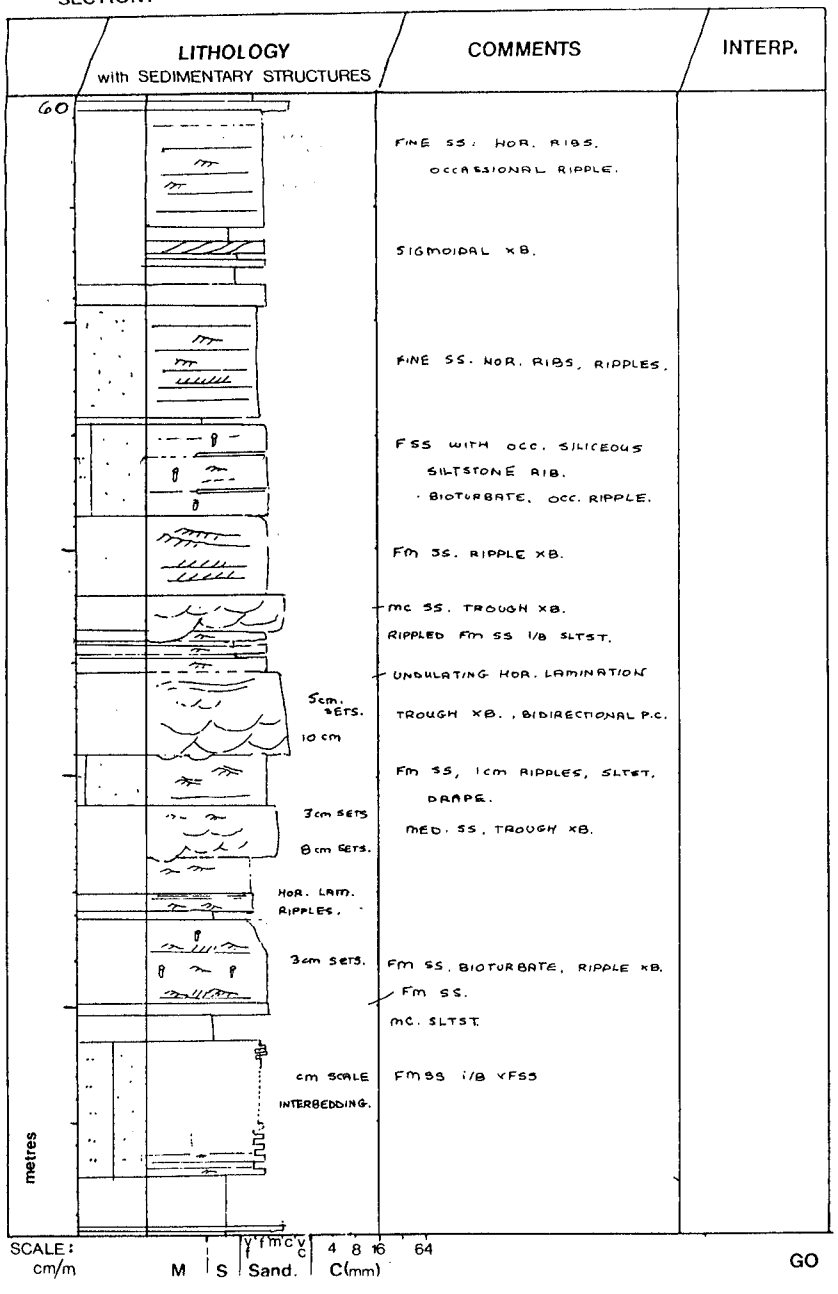
SECTION: LOCATION:



GC

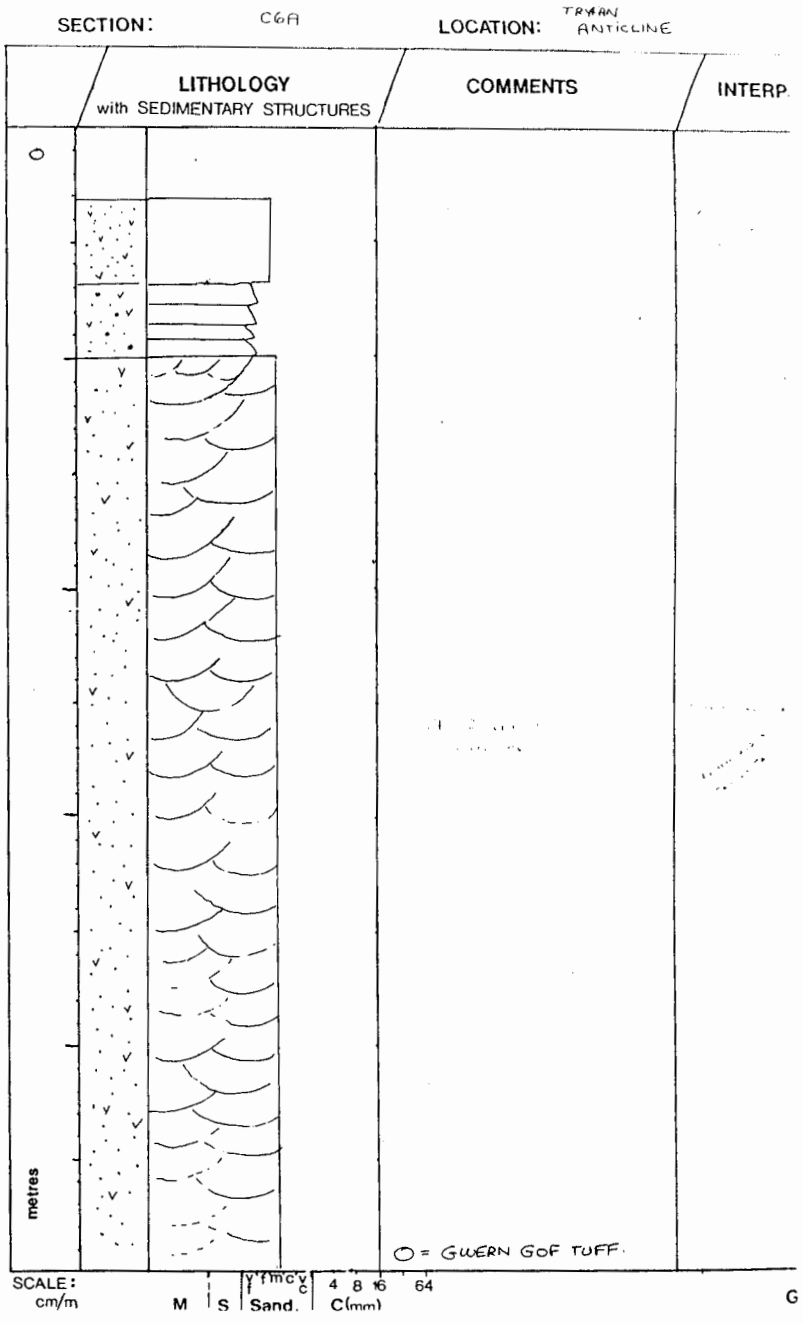
SECTION:

LOCATION:

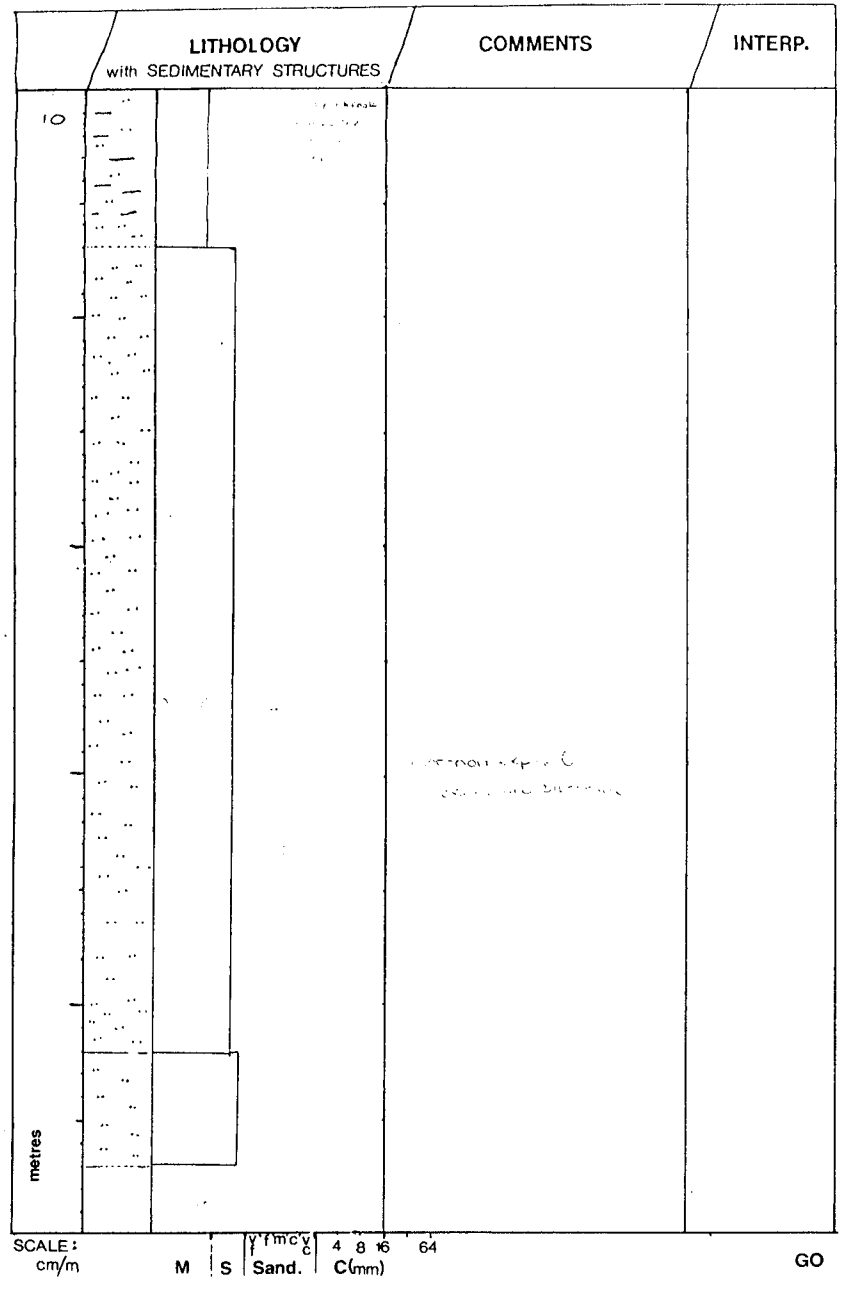


SECTION C6

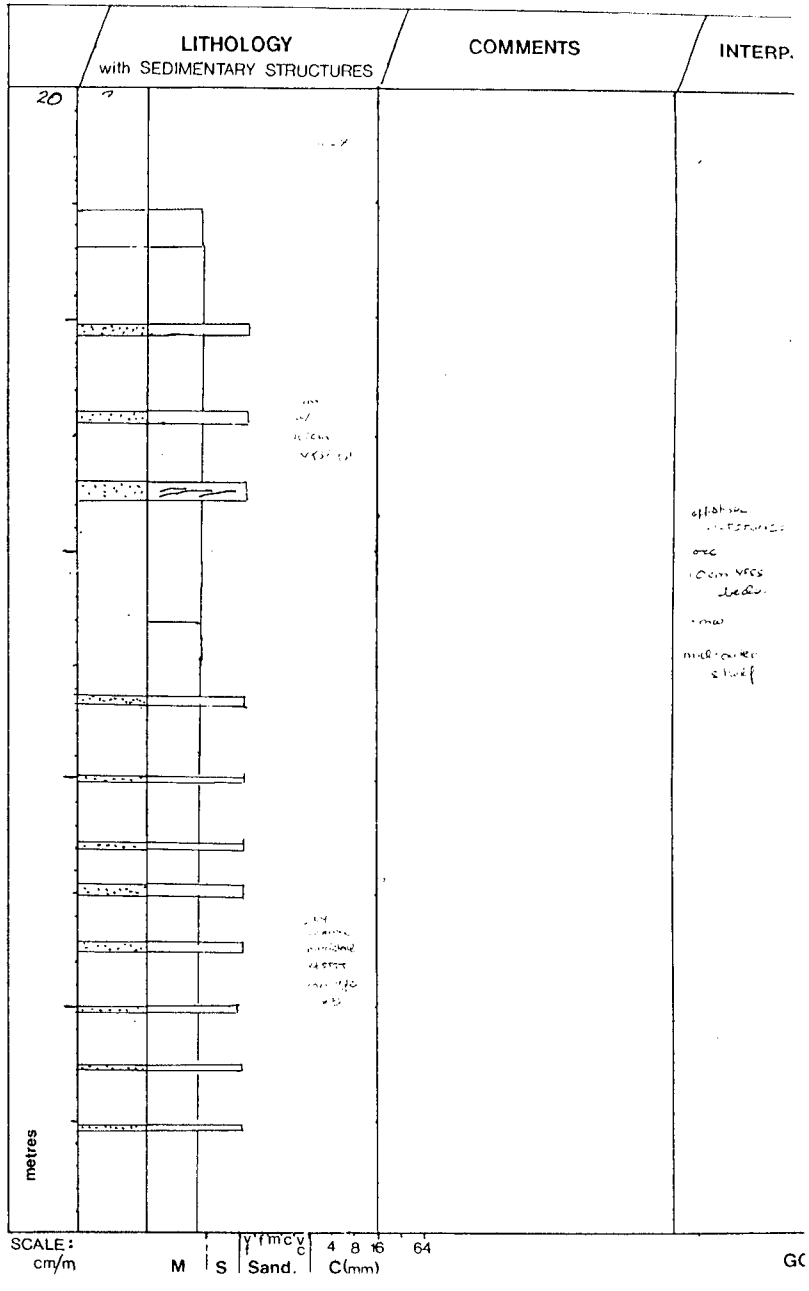
SECTION C6 LOCATION: Locate Tryfan Fach climbing slab. Traverse along topographic contour 150 m to east to top of Gwern Gof Tuff. Sections A/B proceed from top of Gwern Gof tuff along break in slope until top of Tryfan Fach climbing slabs. Section D starts at top of climbing slabs.



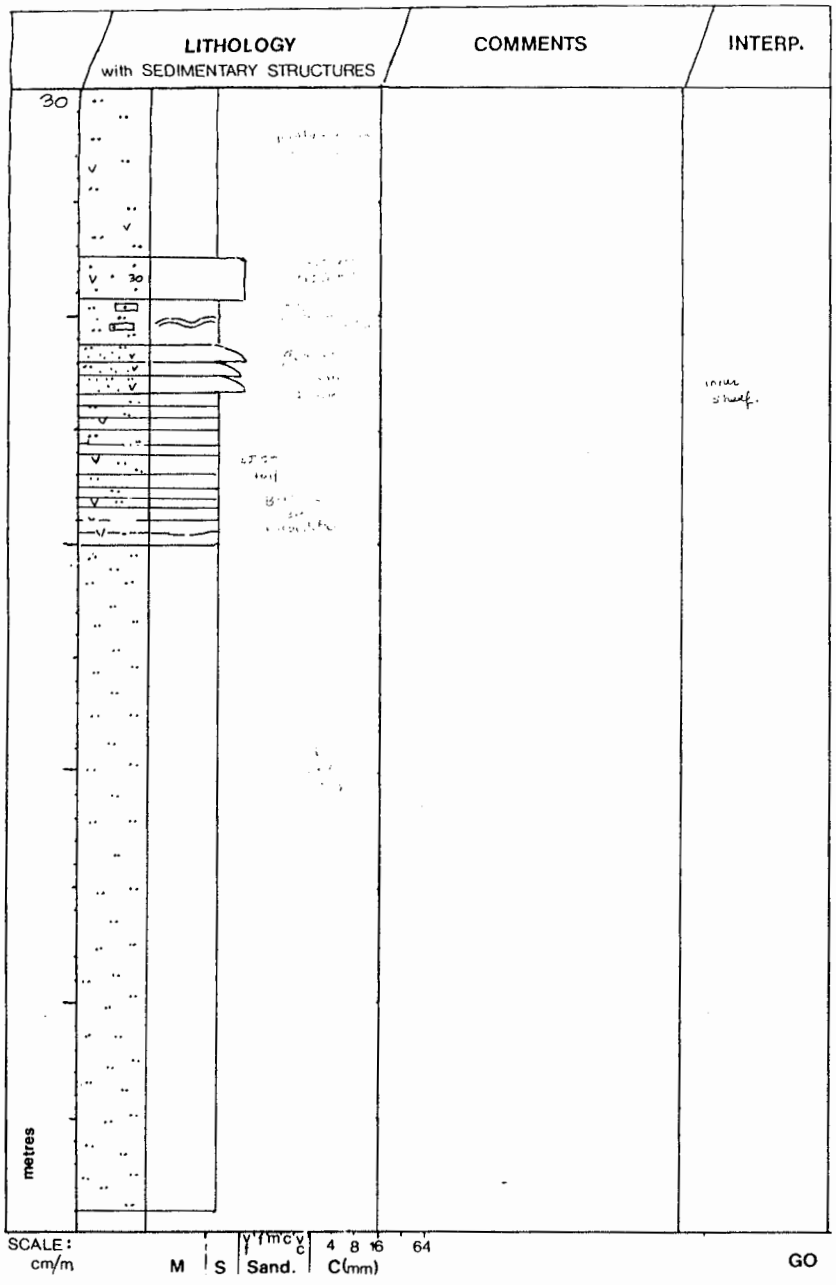
SECTION: C6A LOCATION:



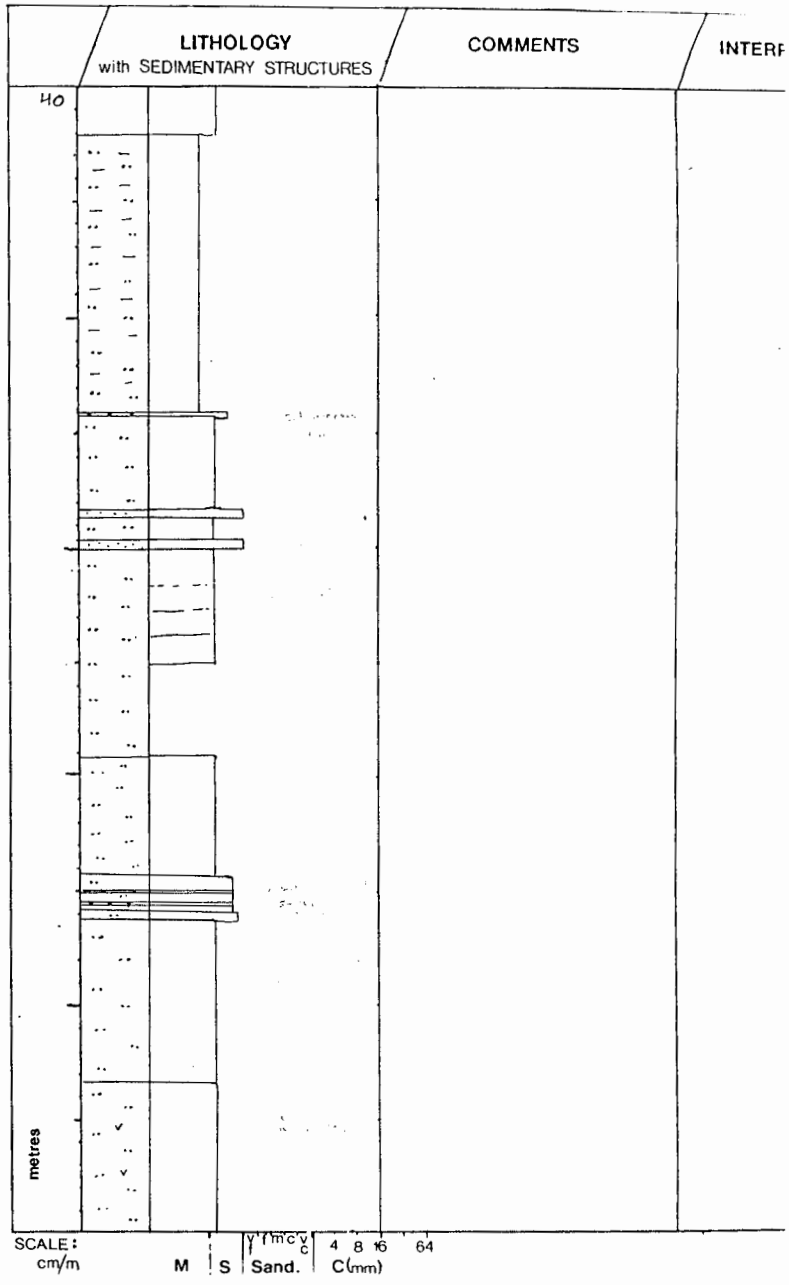
SECTION: C6A LOCATION:



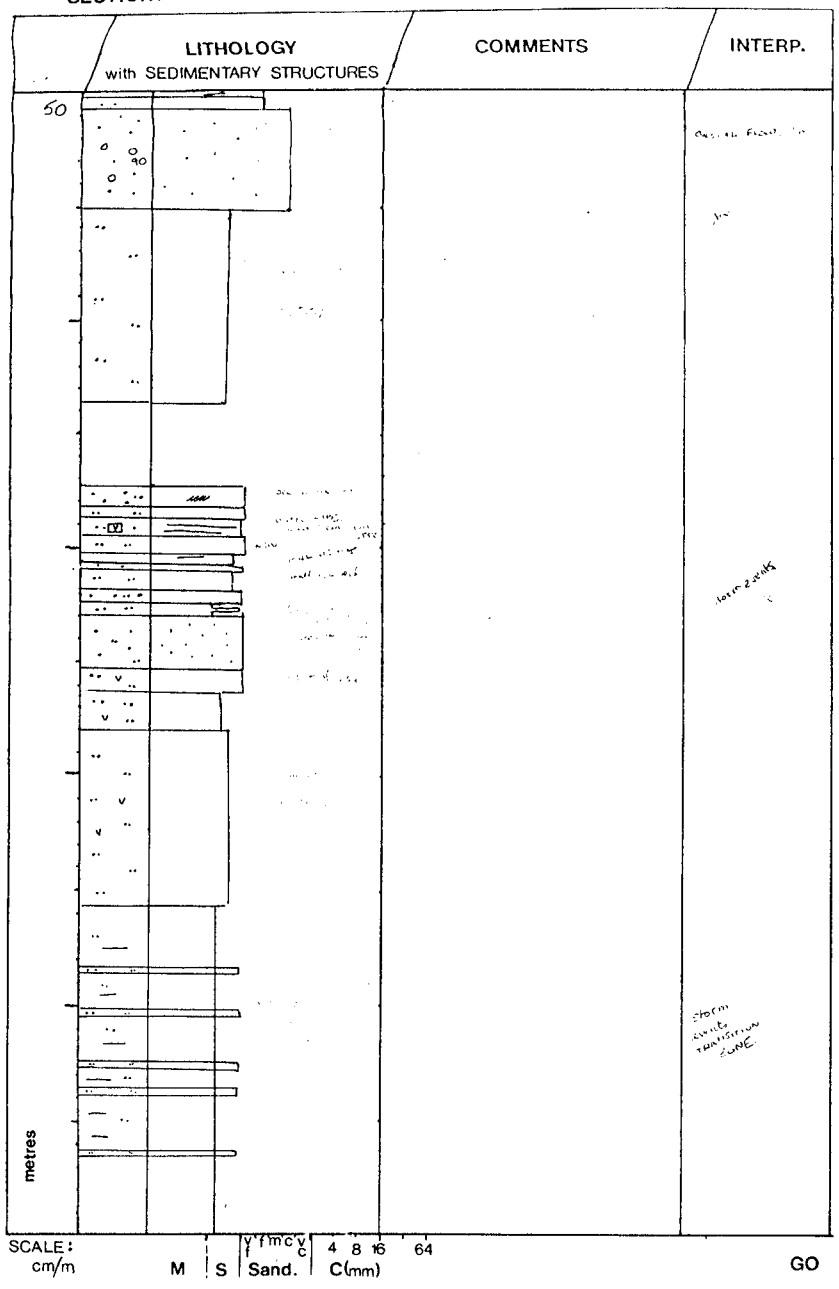
SECTION: C6A LOCATION:



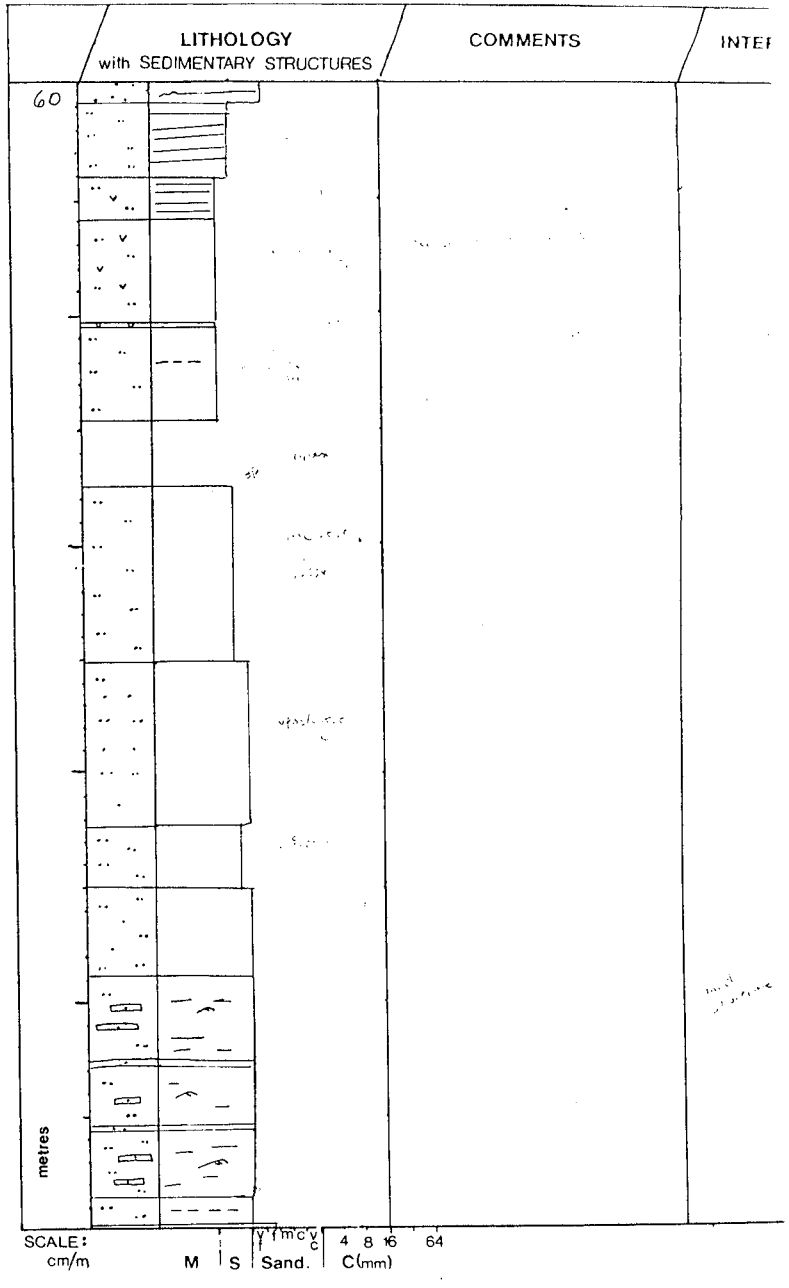
SECTION: C6A LOCATION:



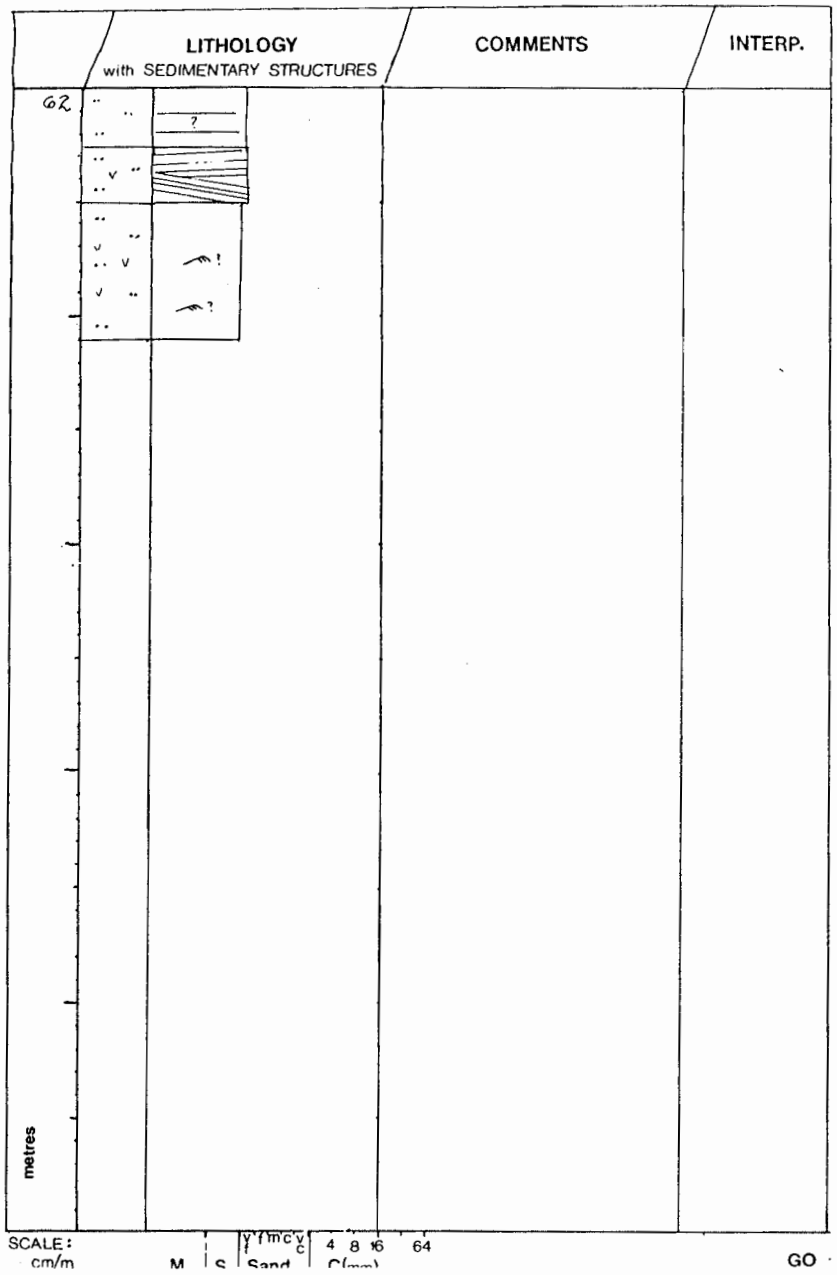
SECTION: C6A LOCATION:



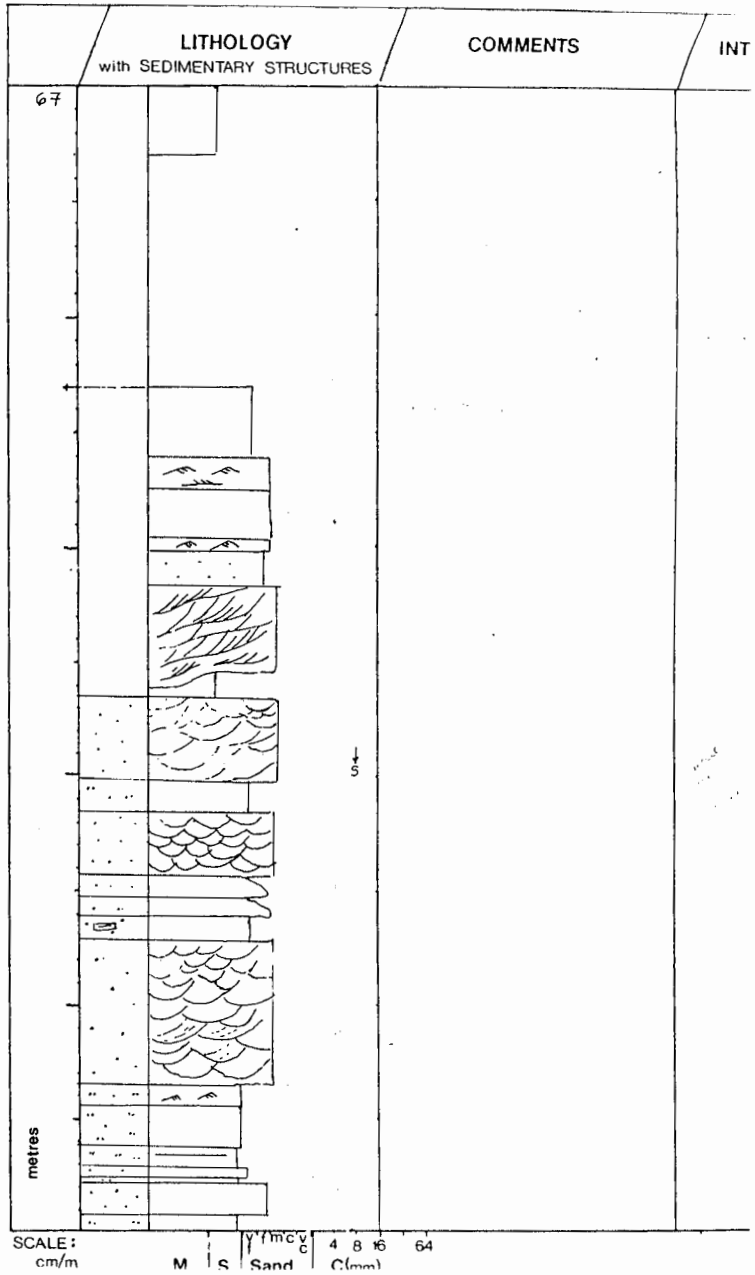
SECTION: C6A LOCATION:



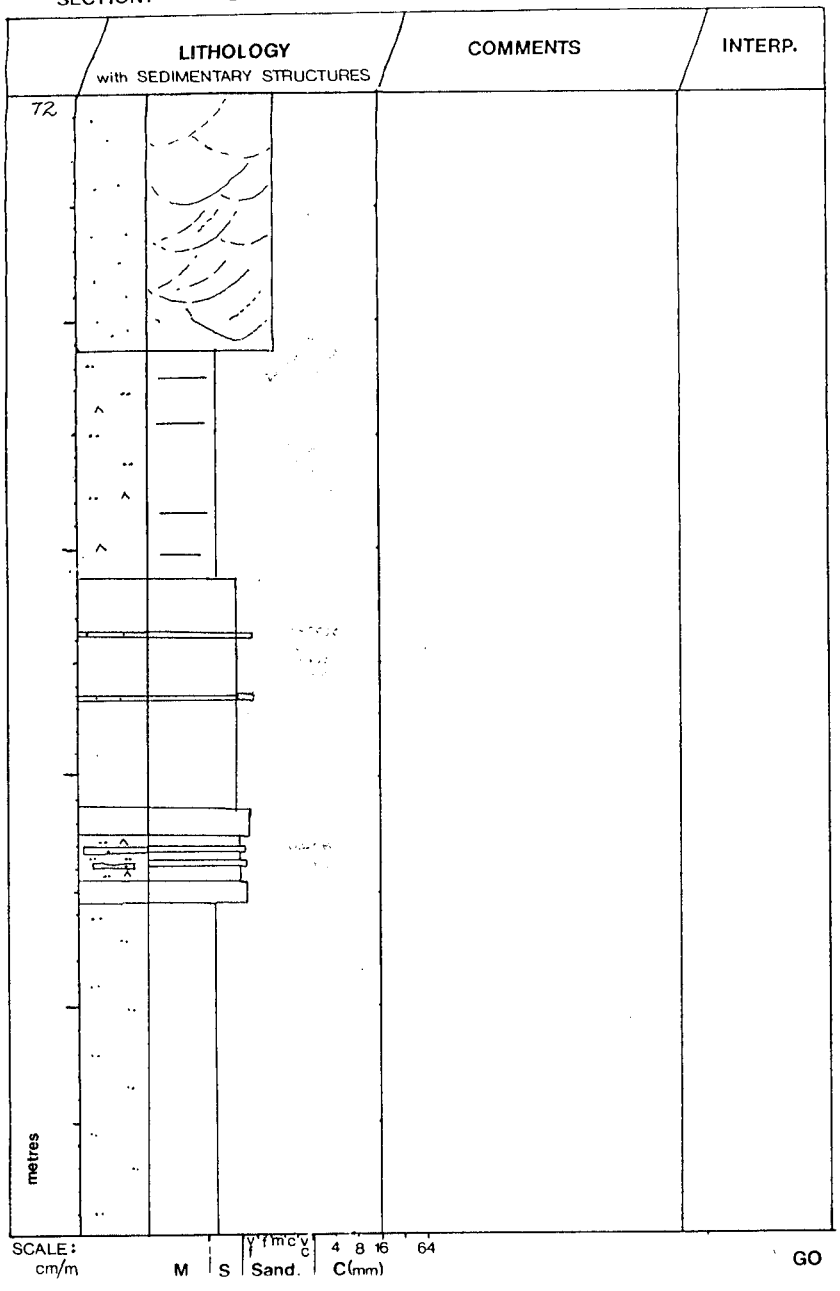
SECTION: C6B LOCATION:



SECTION: C6B LOCATION:



SECTION: C 6B LOCATION:



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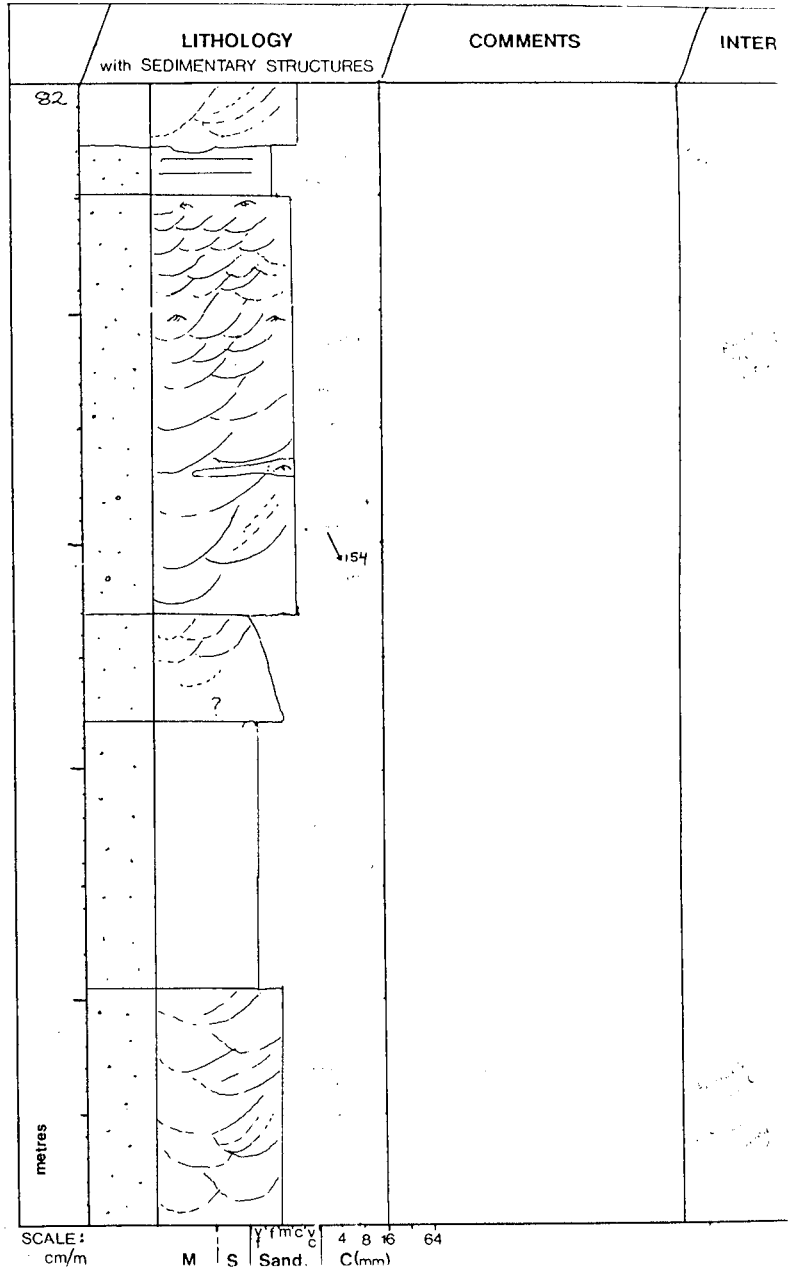

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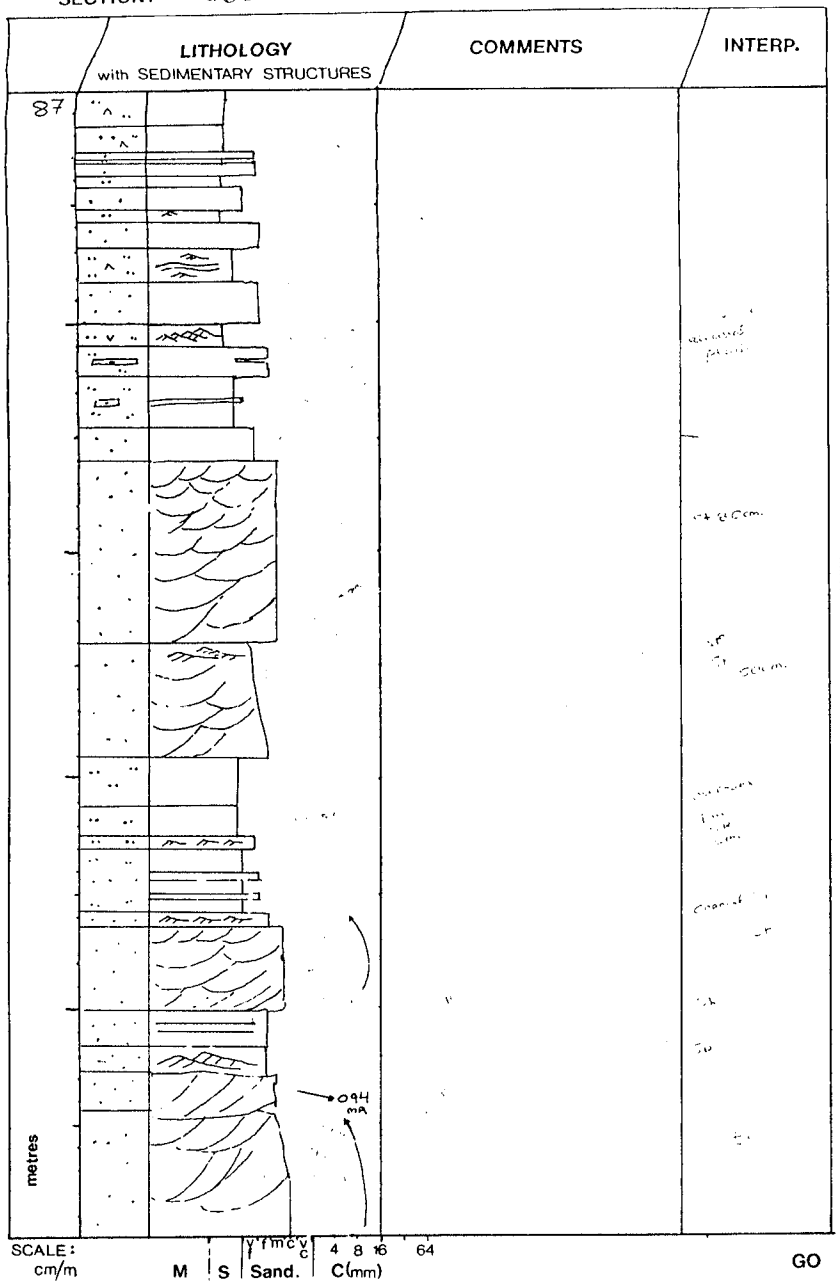

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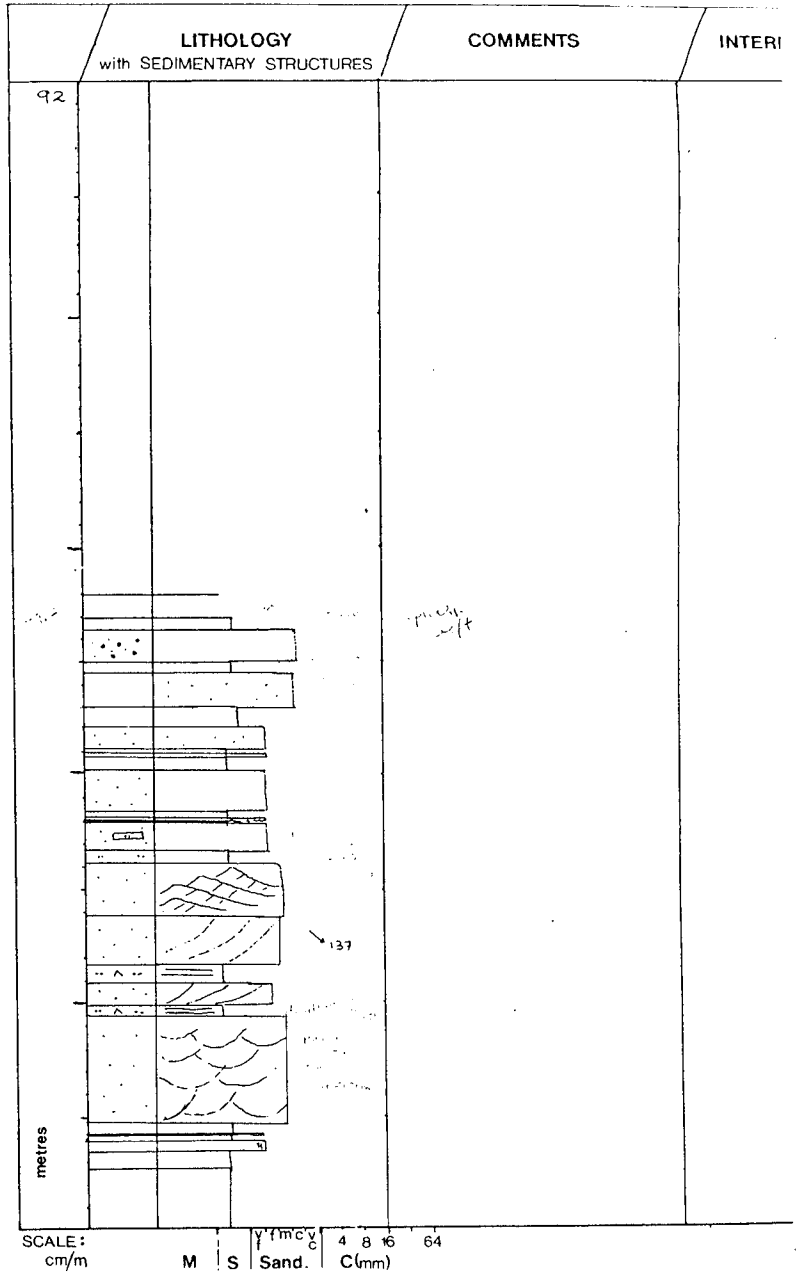

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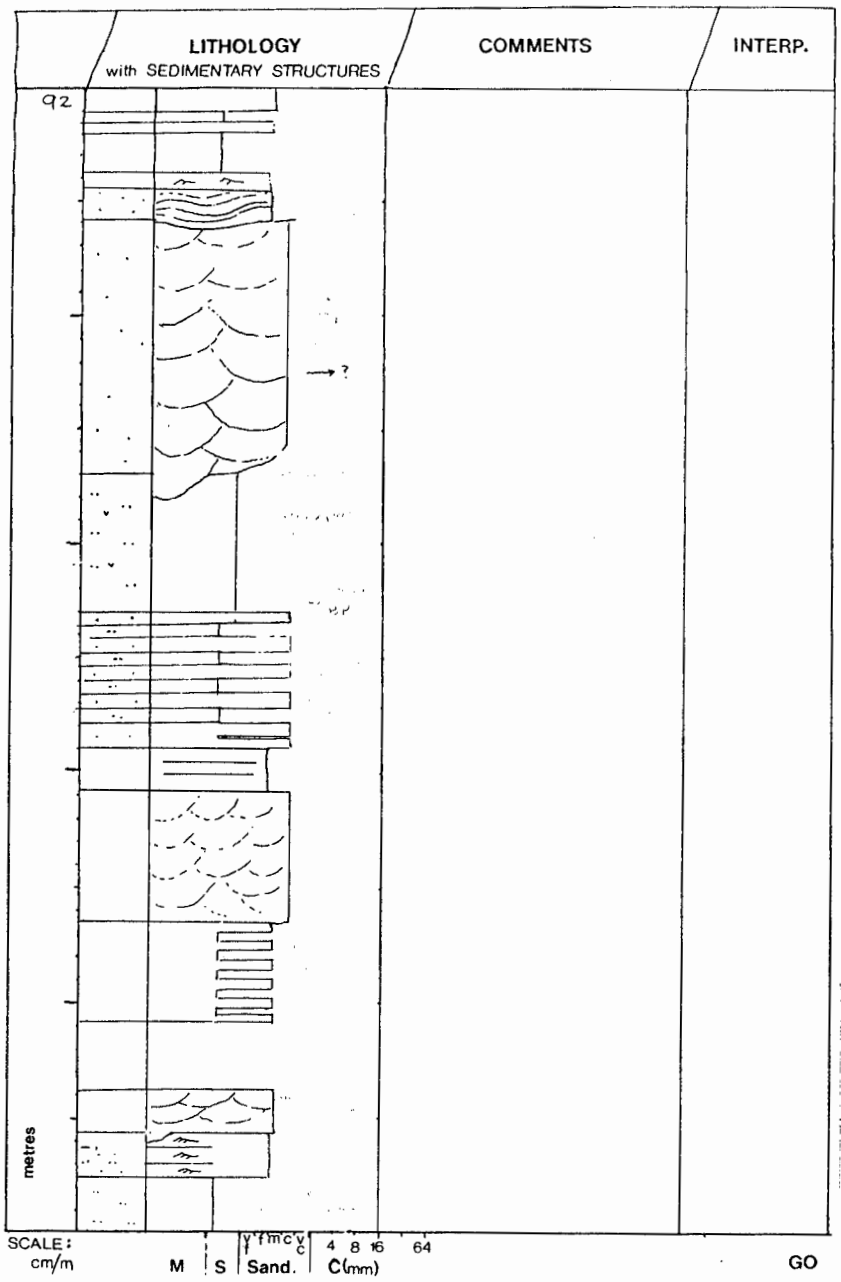

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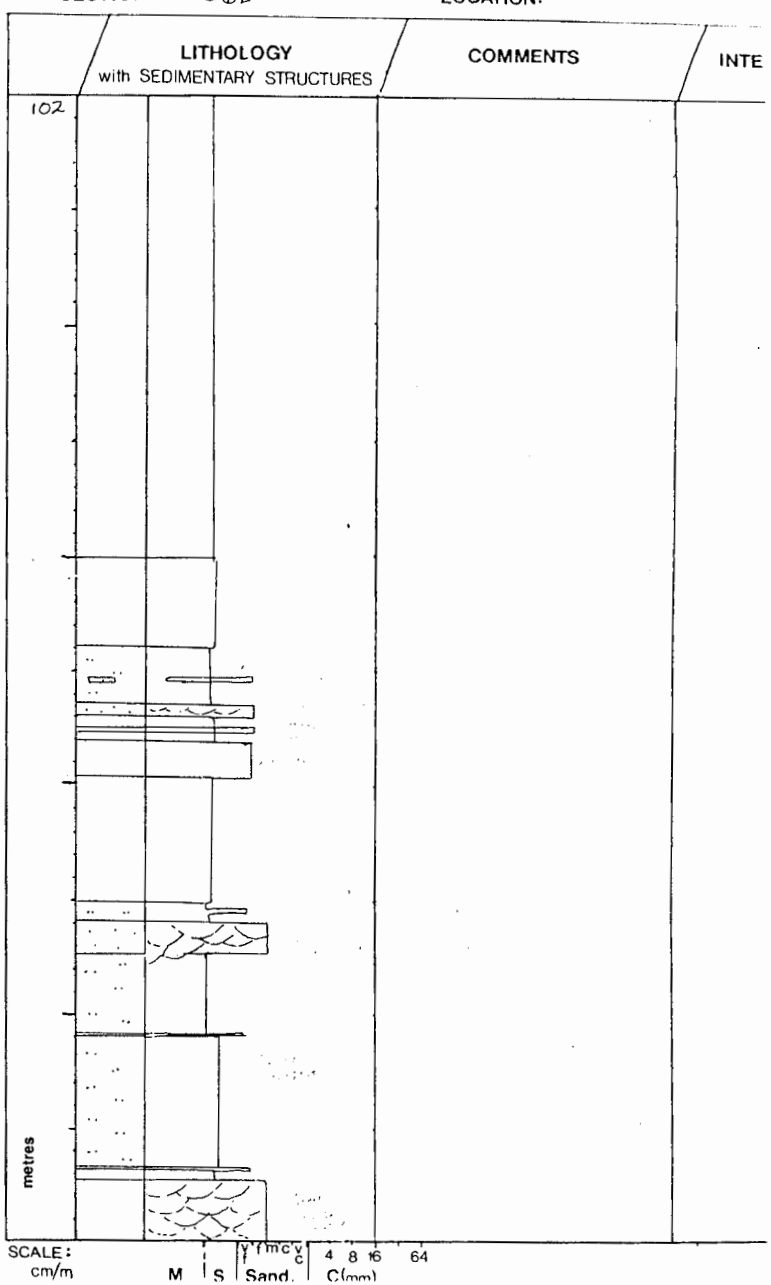

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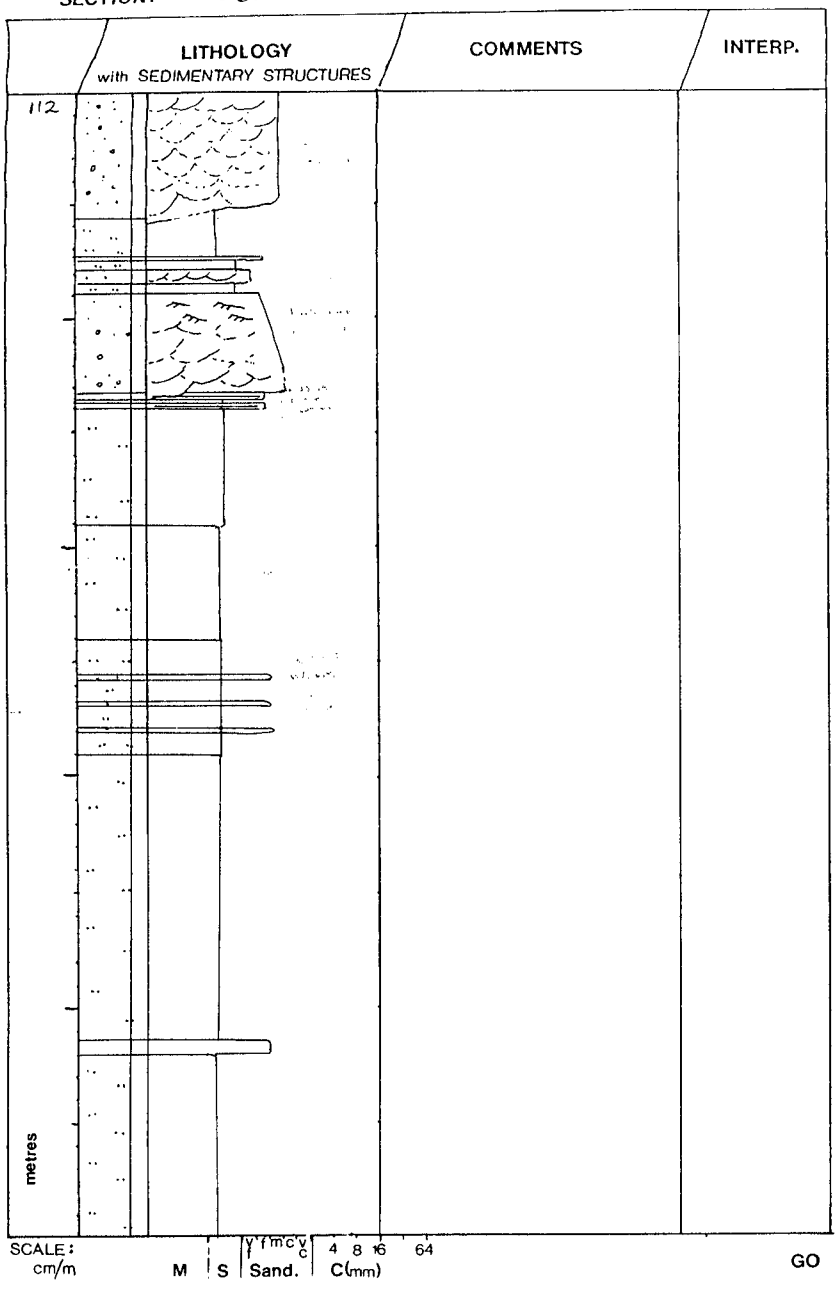

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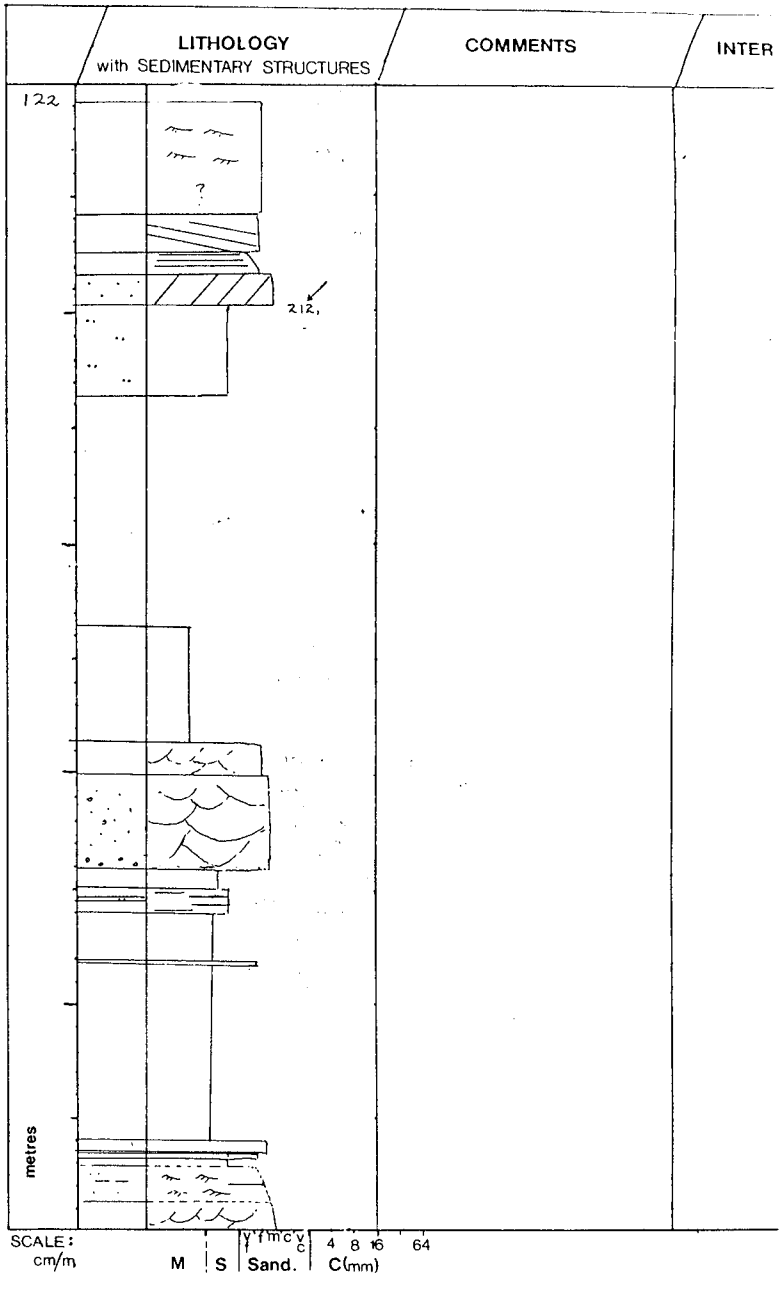

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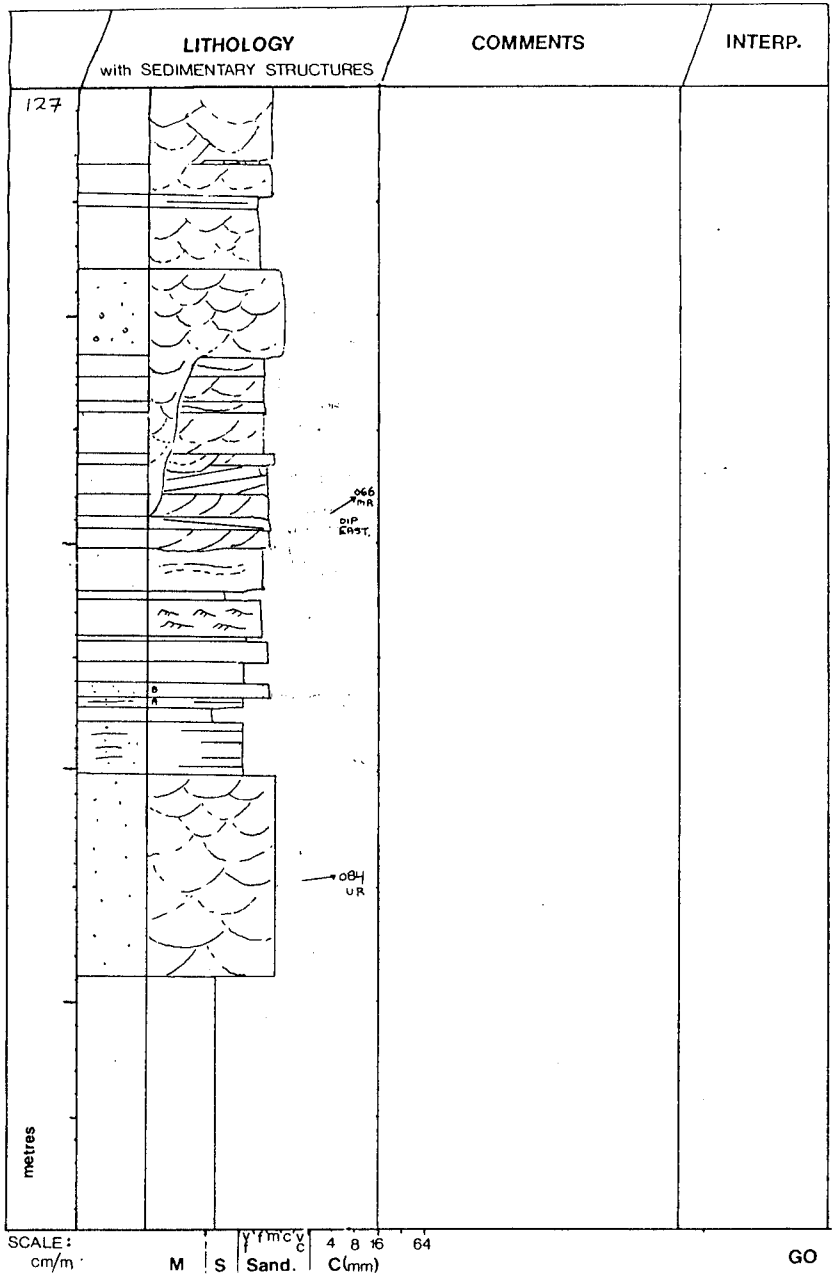

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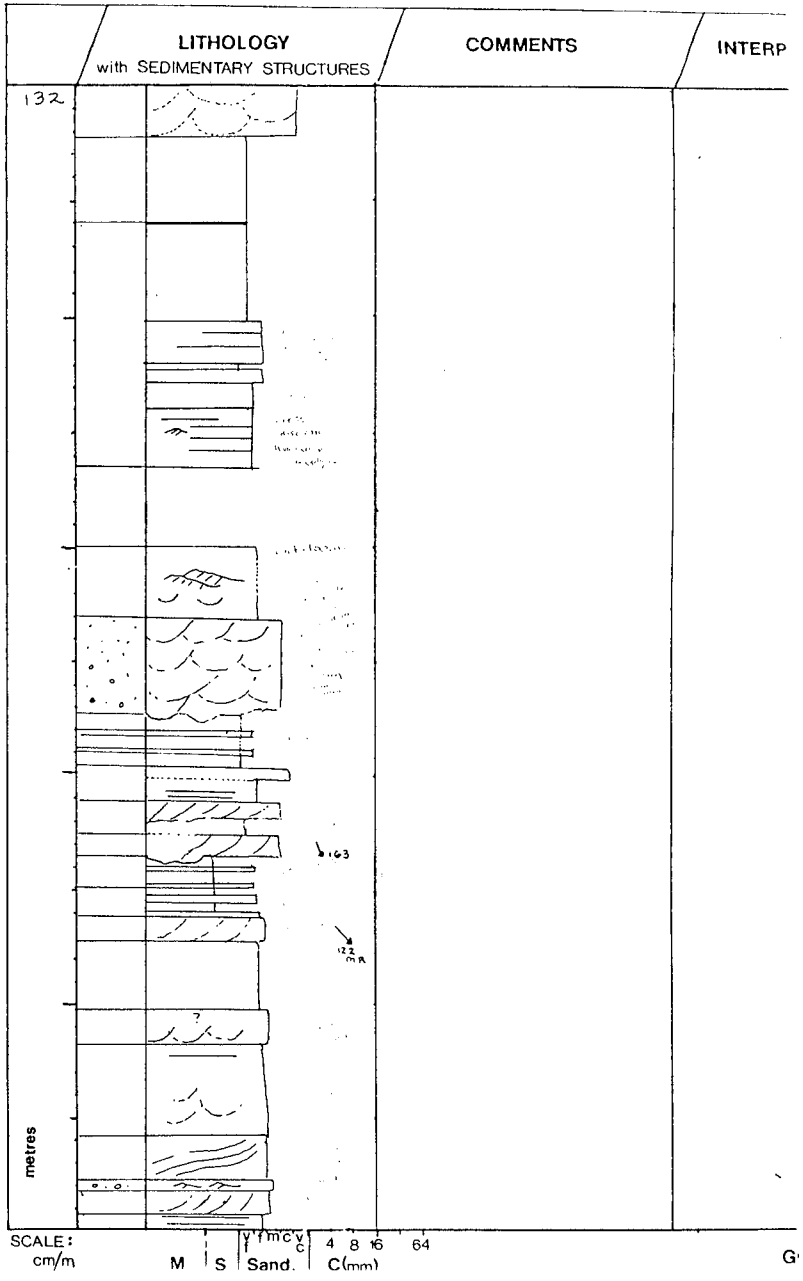
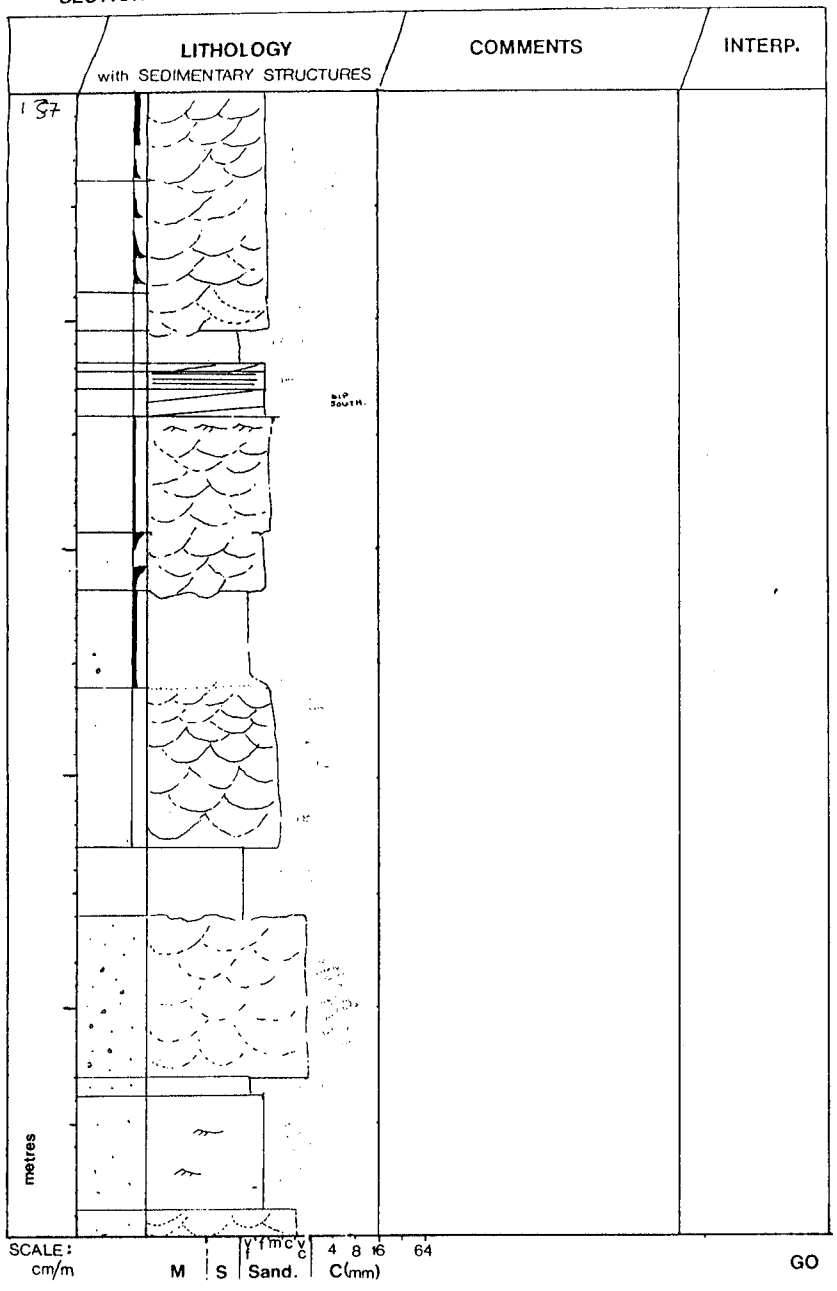


SECTION: C GD LOCATION:



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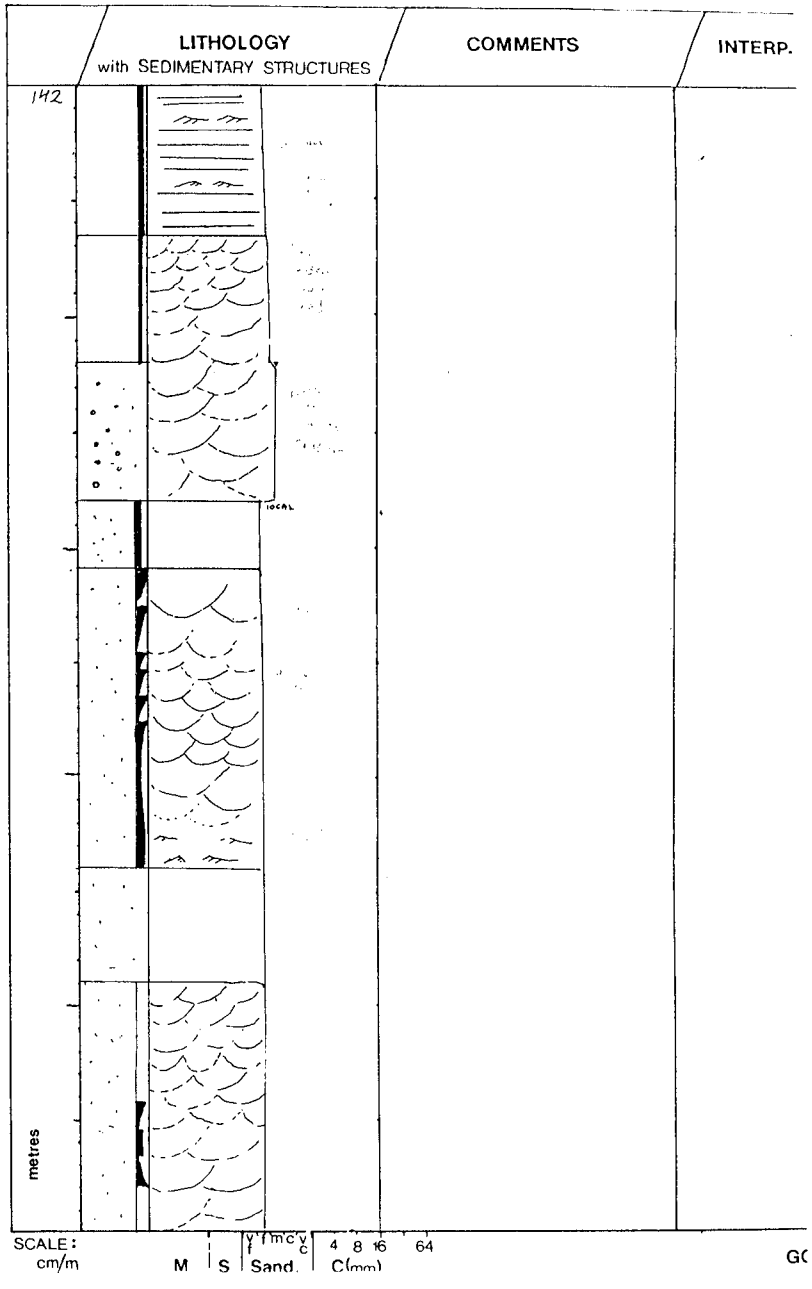

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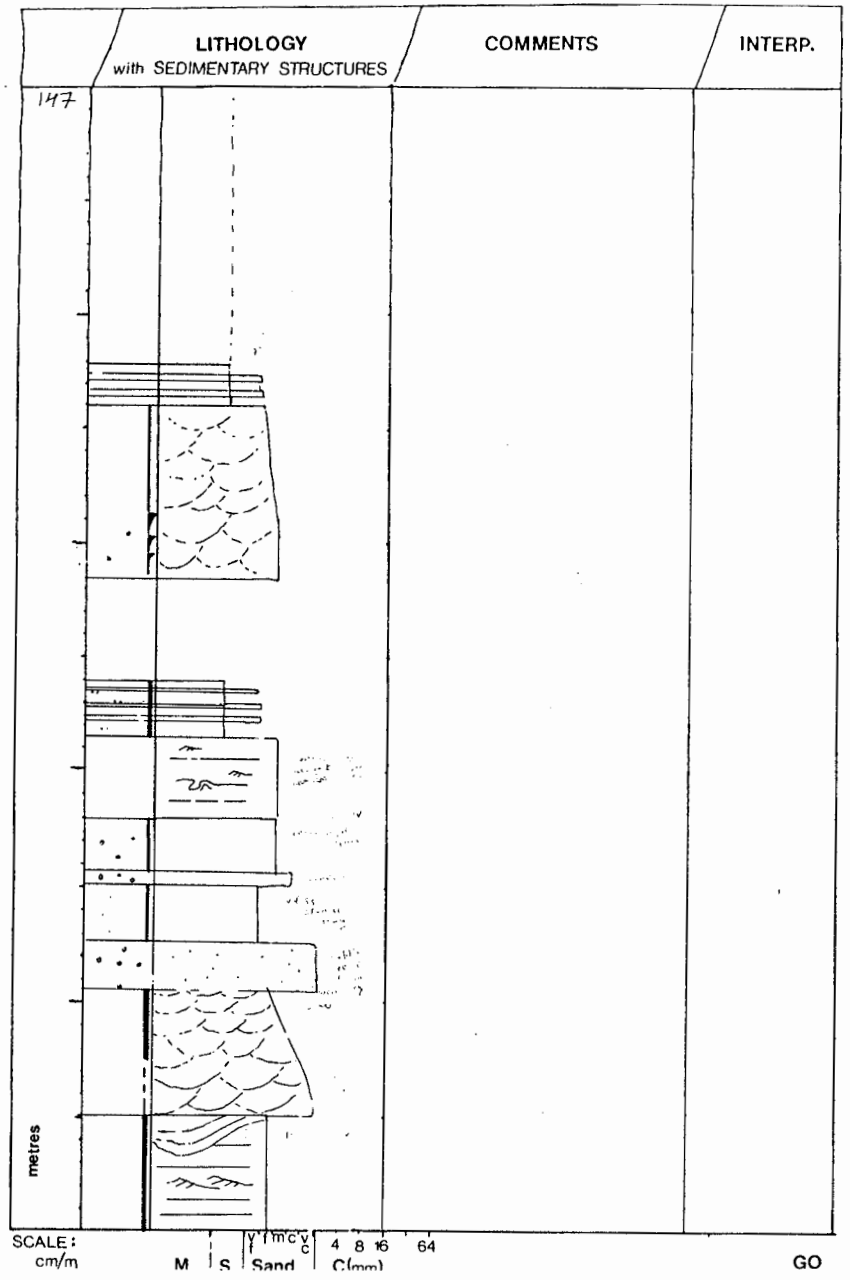
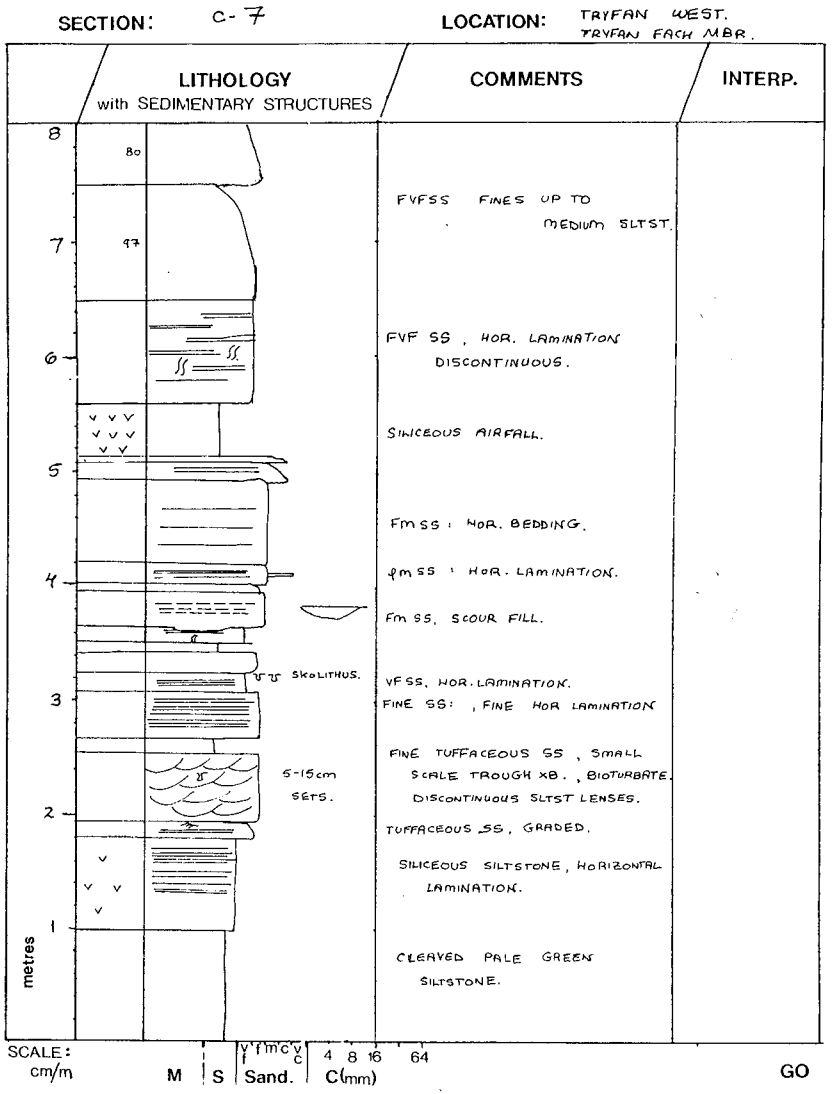
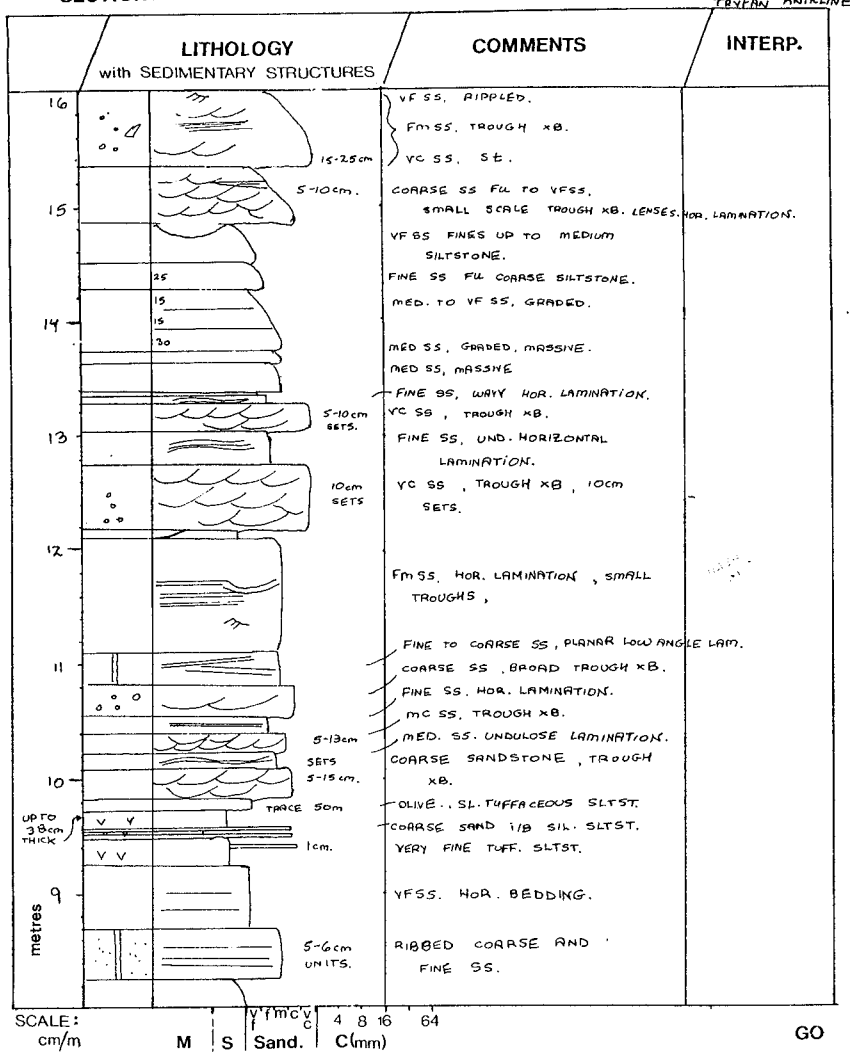


SECTION C7

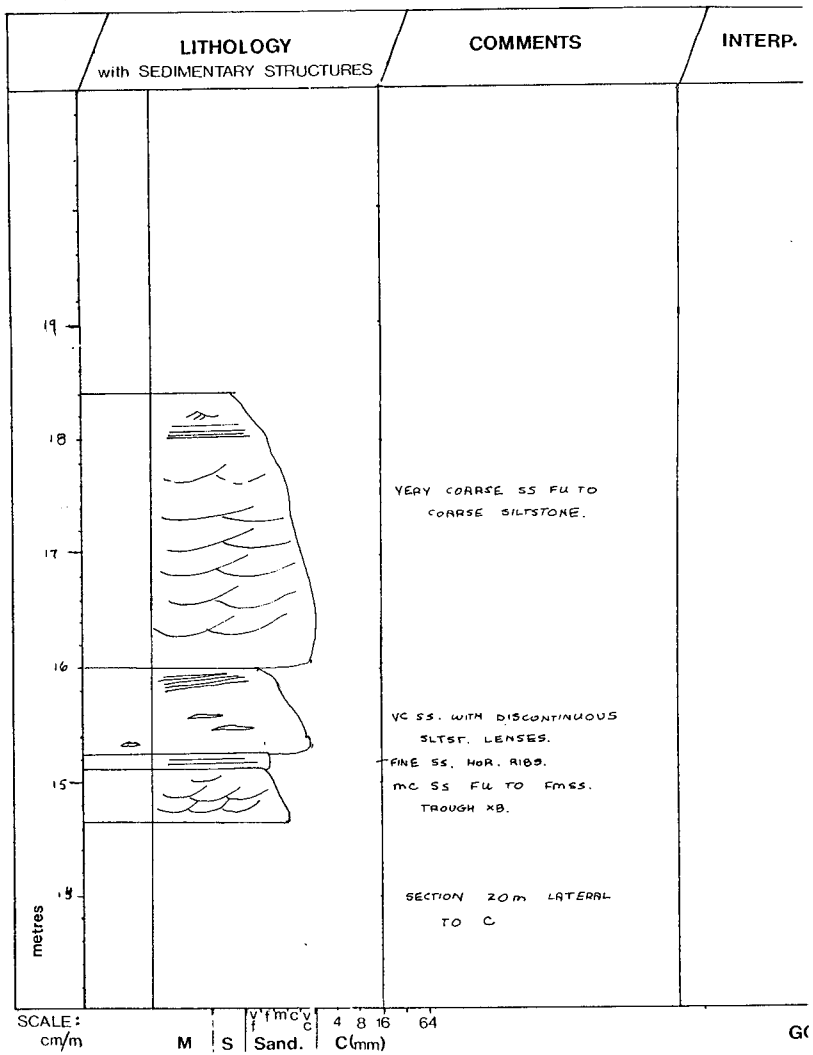
SECTION C7 LOCATION: Section commences 30 m to east of footpath from Gwern Gof Uchaf to Bwlch Tryfan, halfway along its length.



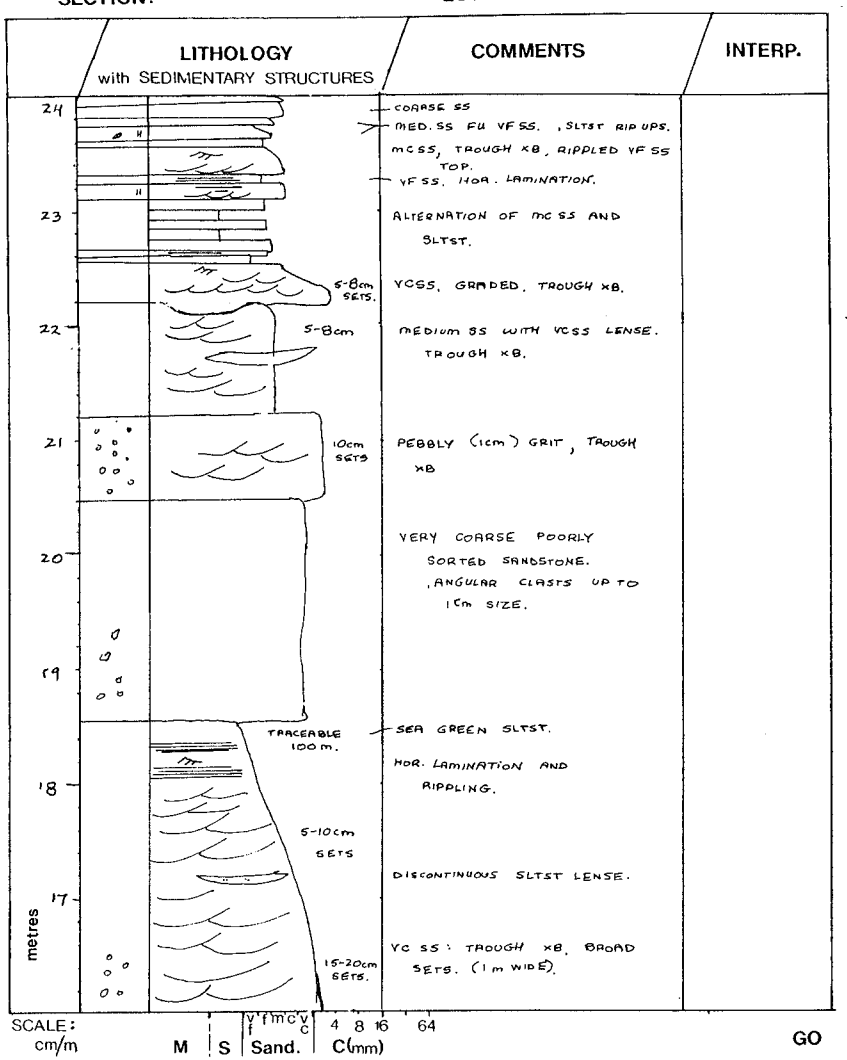
SECTION: C 7 LOCATION: TRYFAN FACH MBR. TRYFAN ANTICLINE



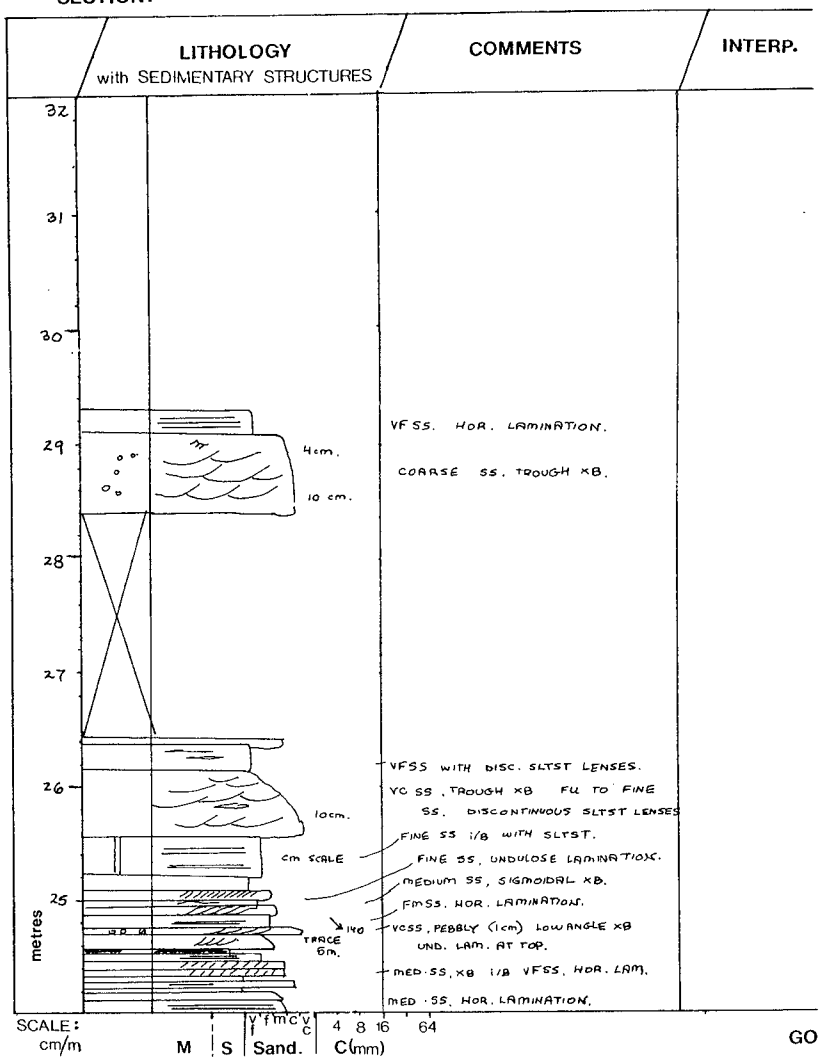
SECTION: mini: C 7 LOCATION:



SECTION: C 7 LOCATION:

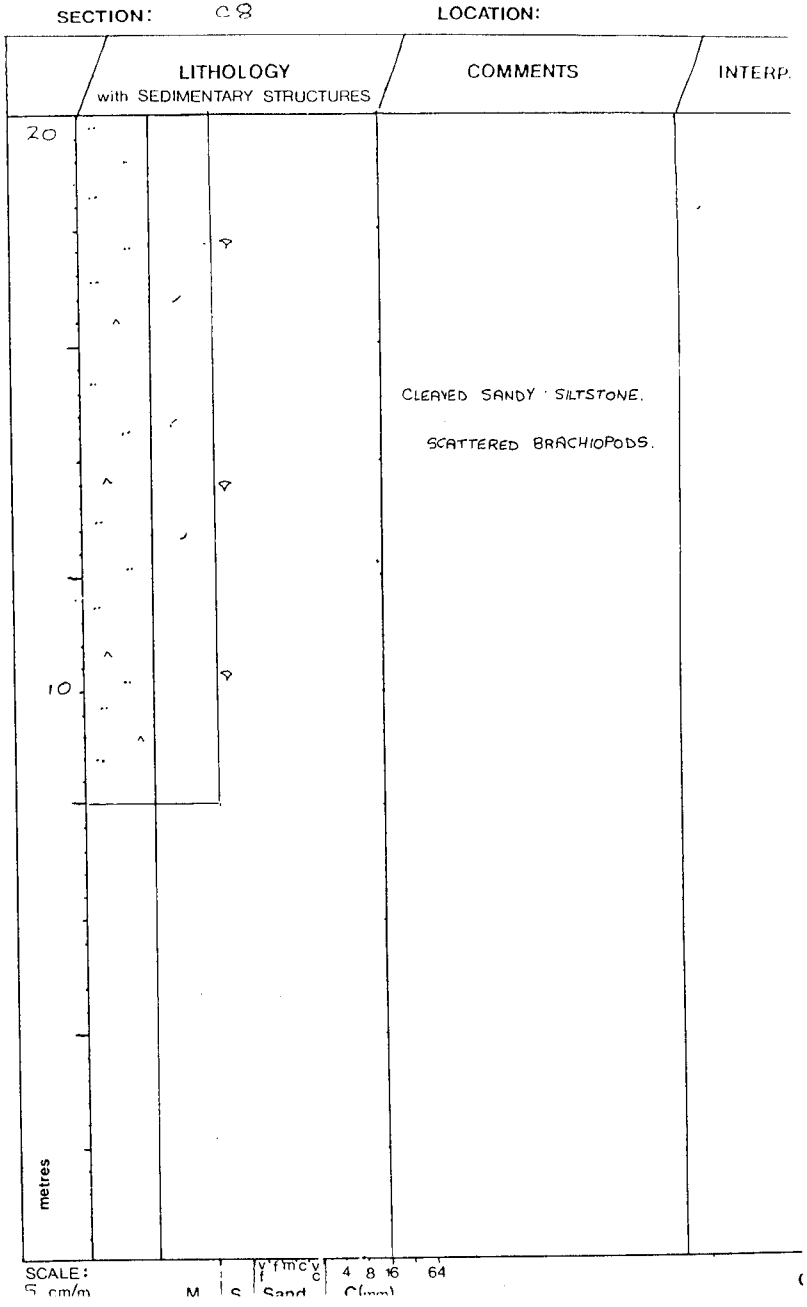


SECTION: C 7 LOCATION:

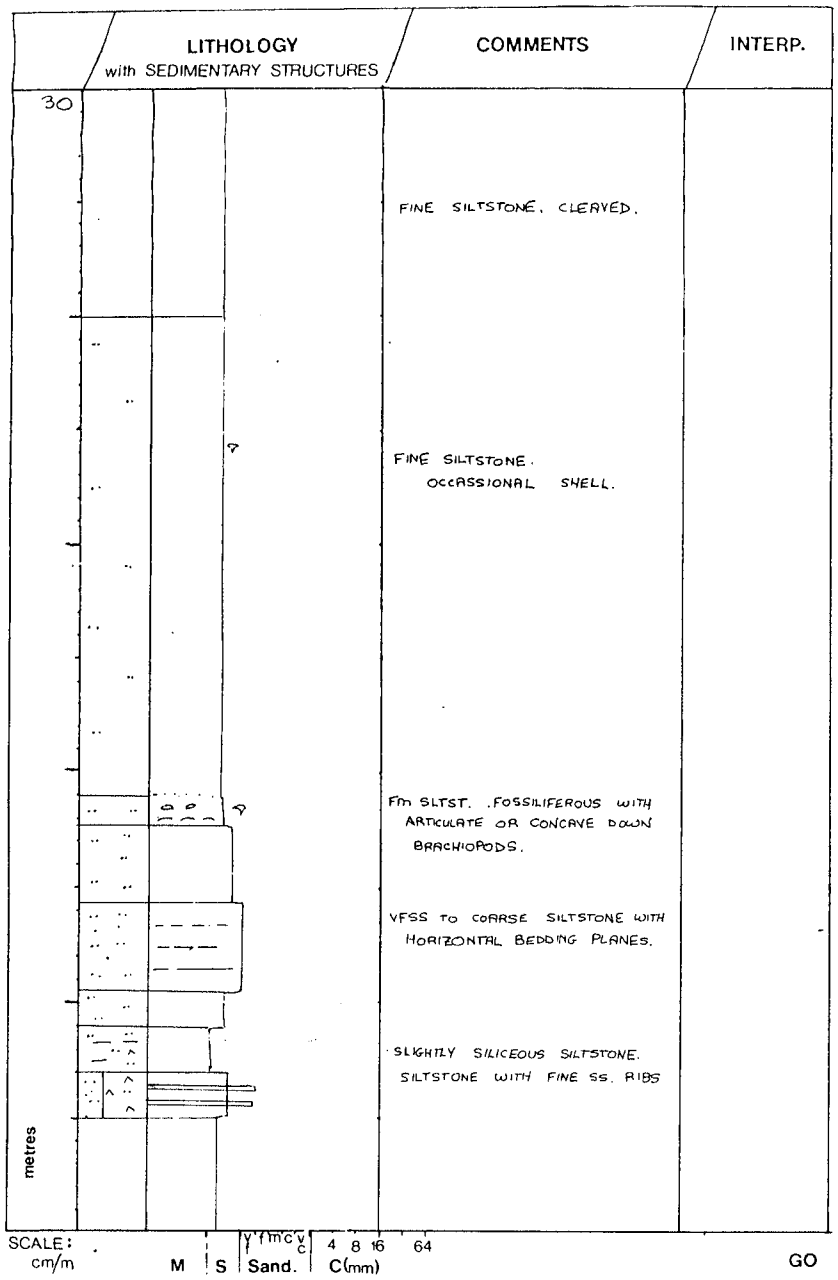


SECTION C8

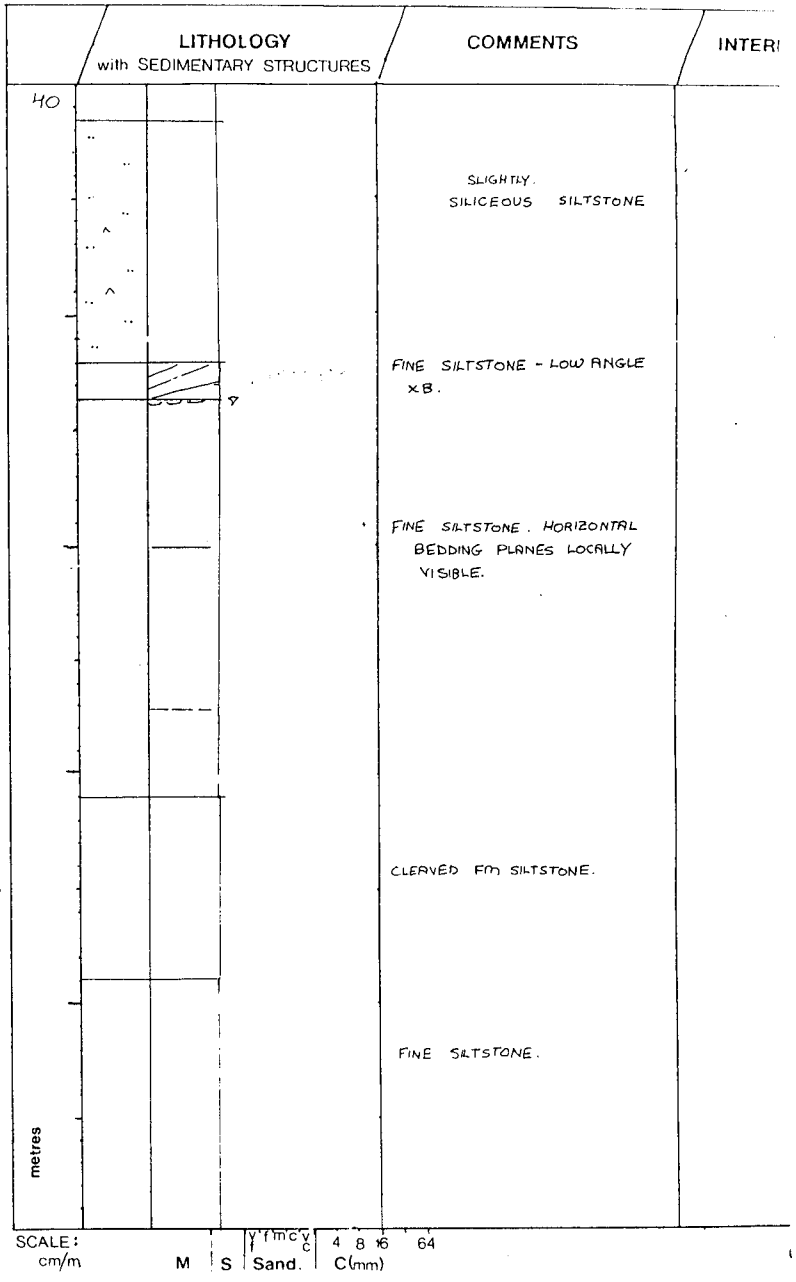
SECTION C8 LOCATION: Locate top of Gwern Gof Tuff at southern plunge of Tryfan anticline. Section proceeds from here up steep slope to SW.



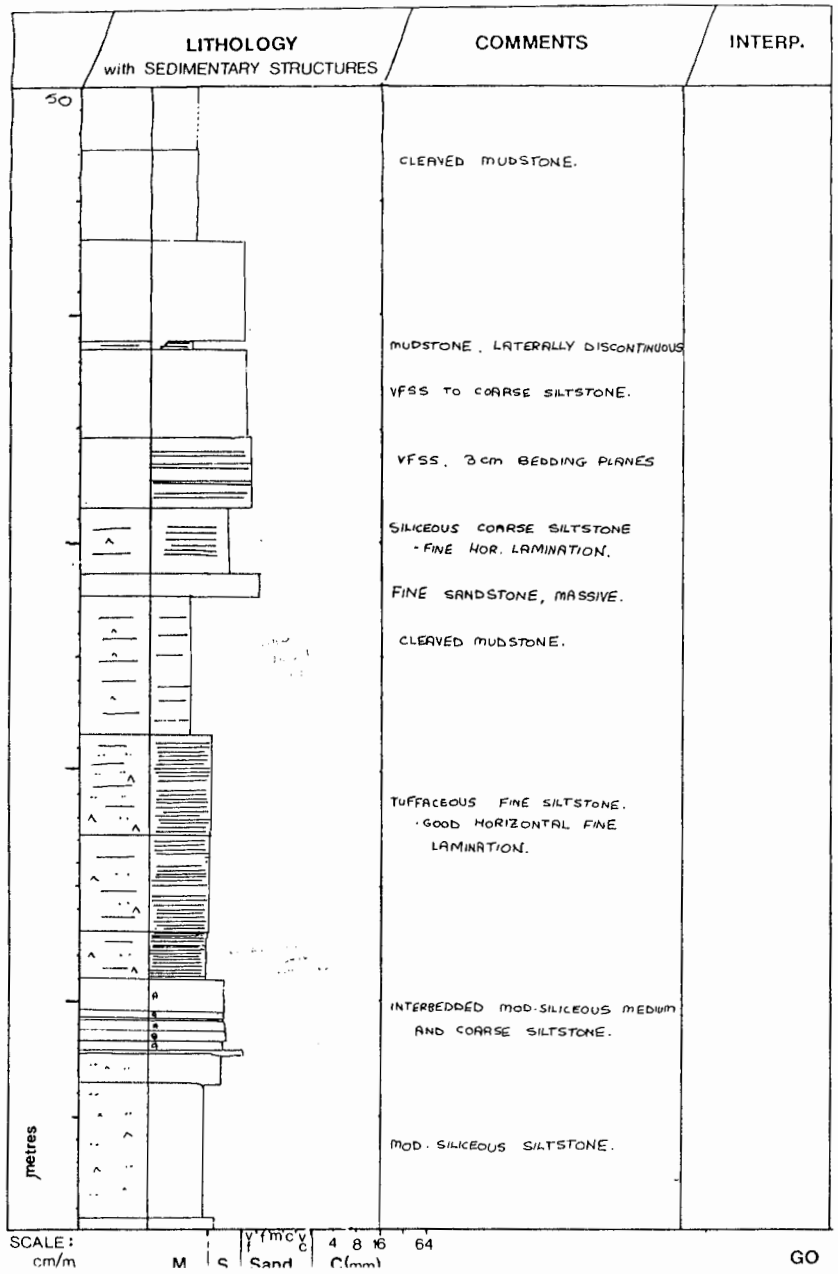
SECTION: C8 LOCATION:



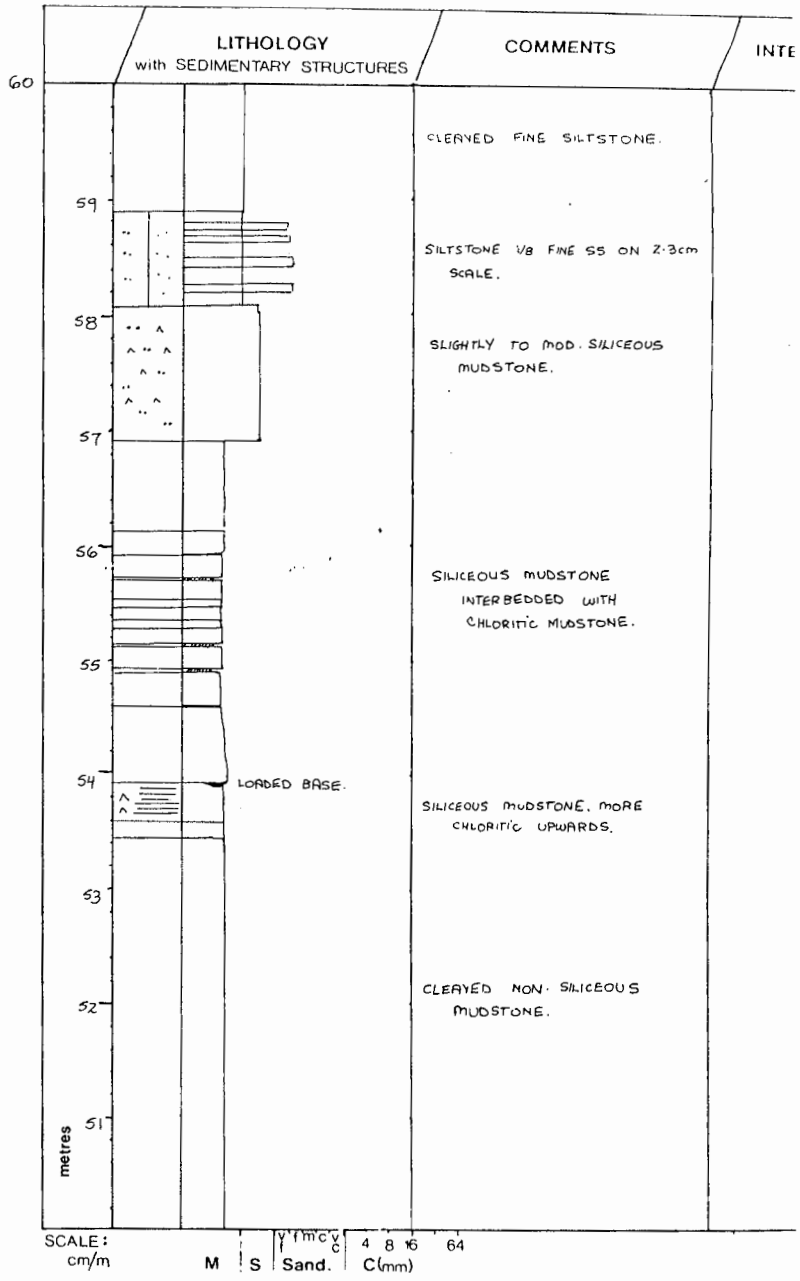
SECTION: C8 LOCATION:



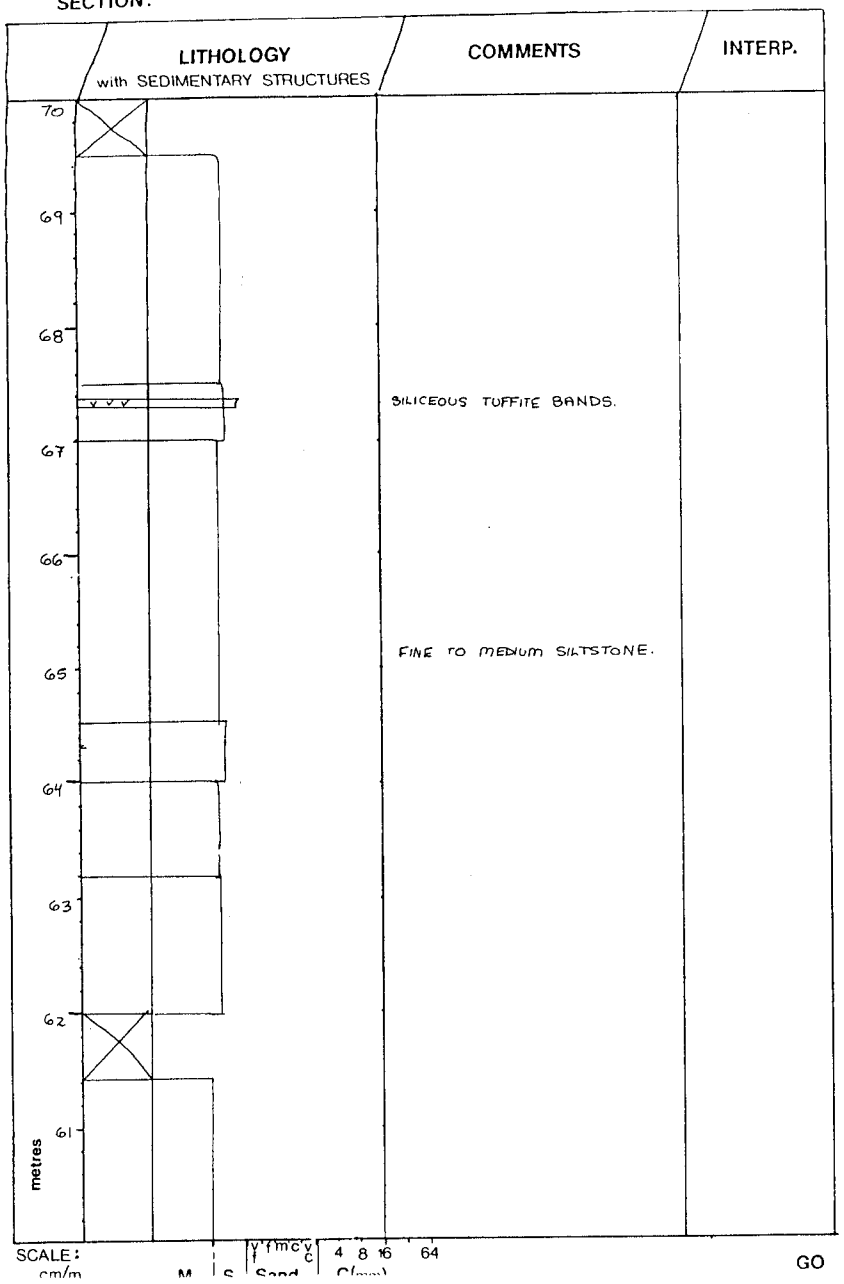
SECTION: C 8 LOCATION: TRYFAN EAST



SECTION: C 8 LOCATION: TRYFAN ANTICLINE EA



SECTION: C8 LOCATION: TRYFAN ANTICLINE EAST



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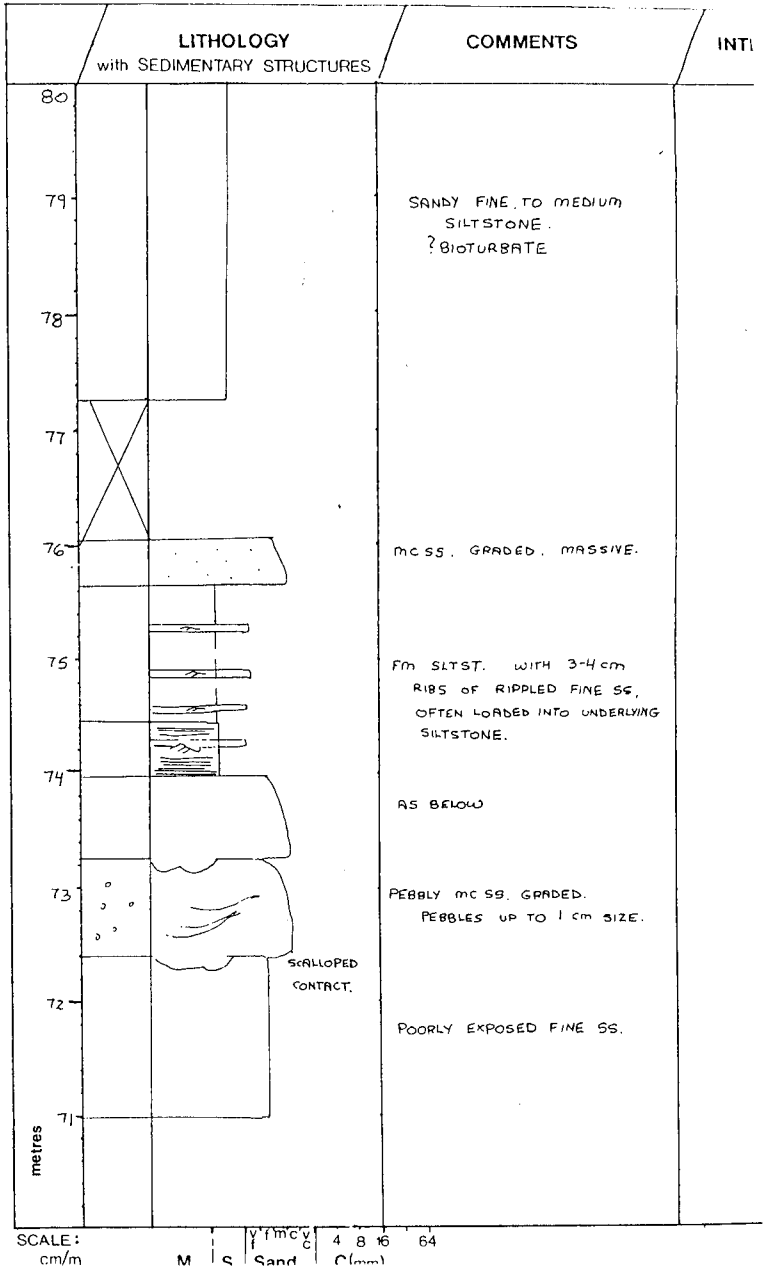
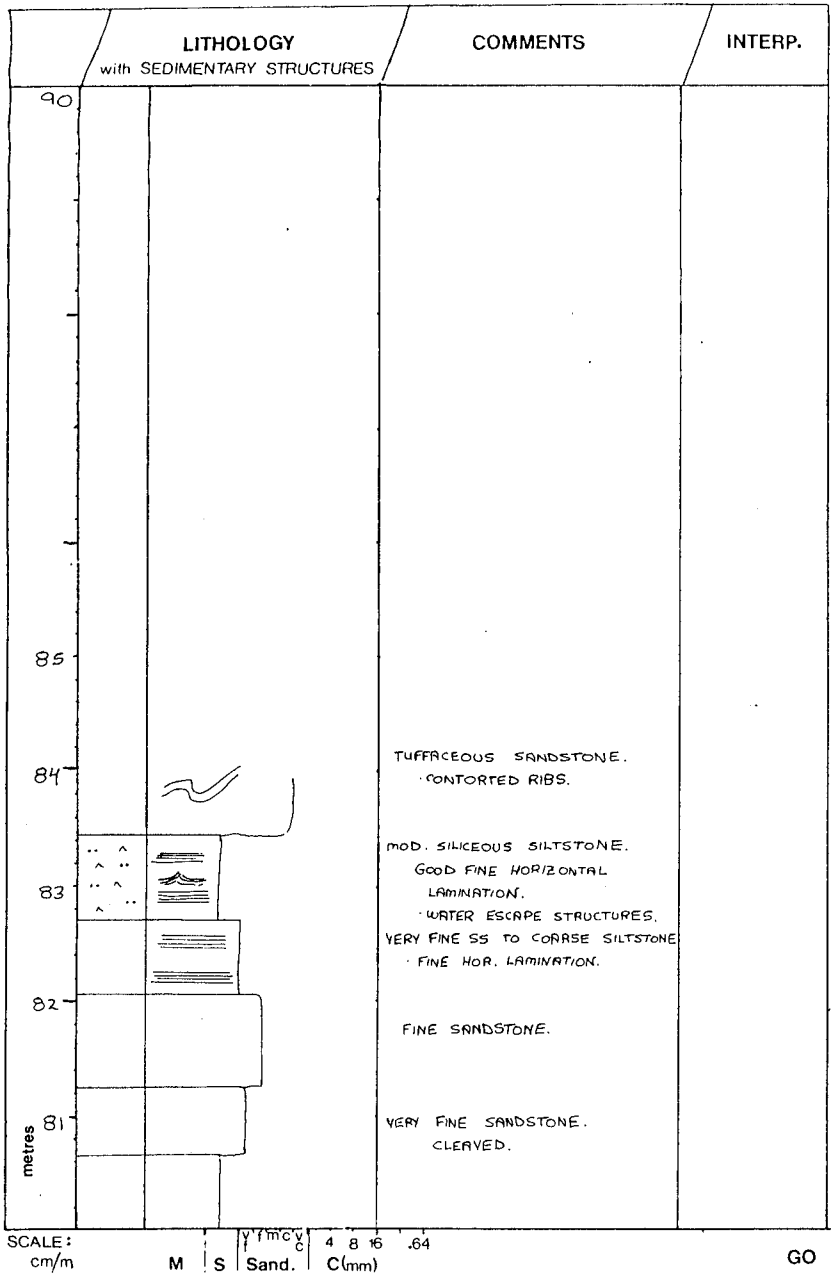
SECTION: C8 LOCATION: TRYFAN ANTICLINE E



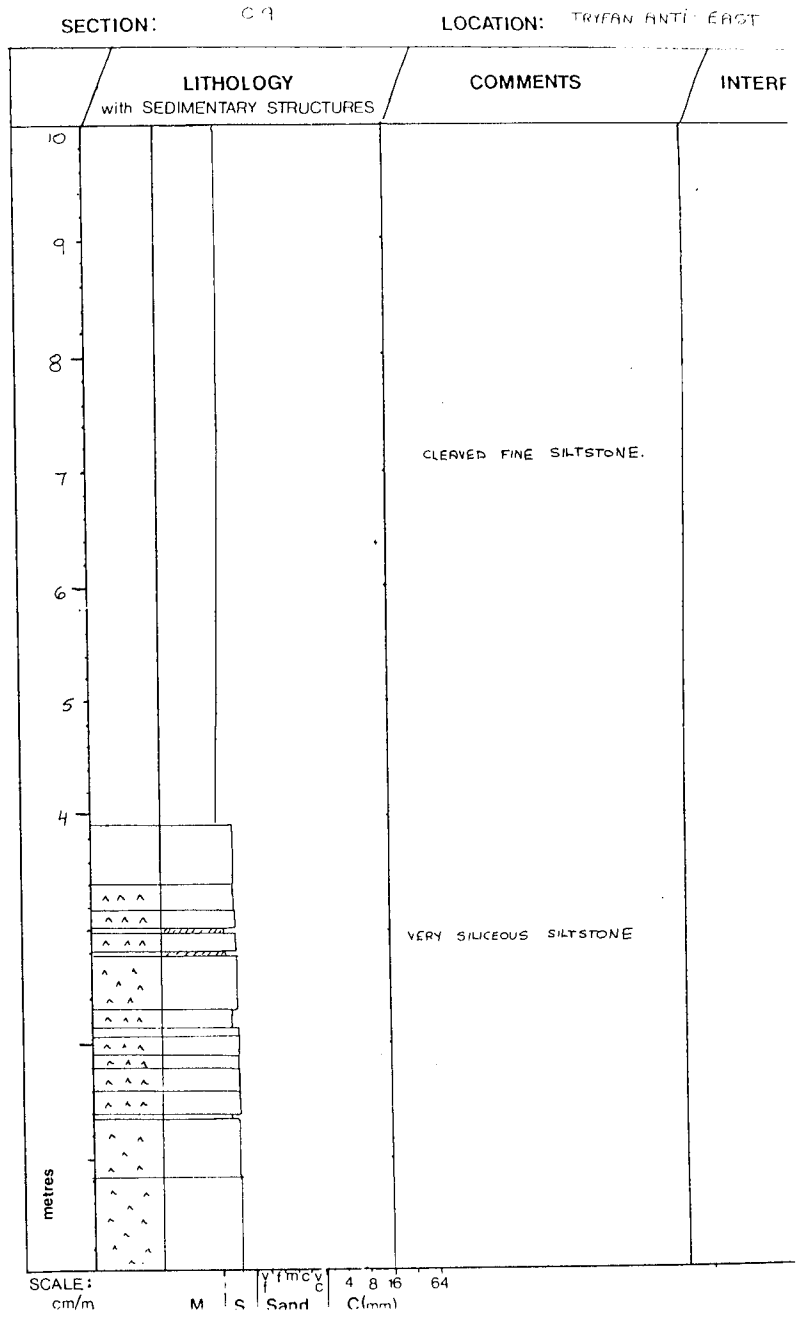
SECTION:

LOCATION:

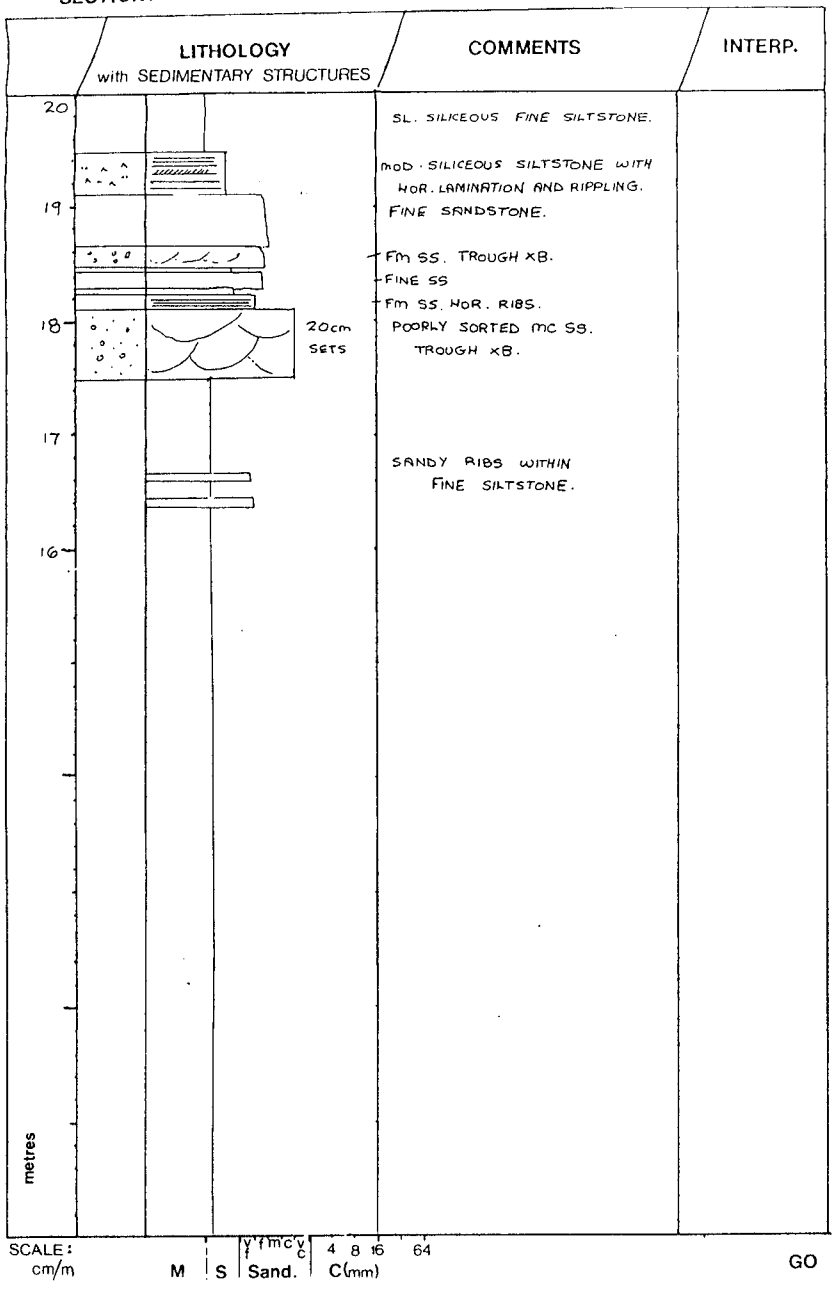


SECTION C9

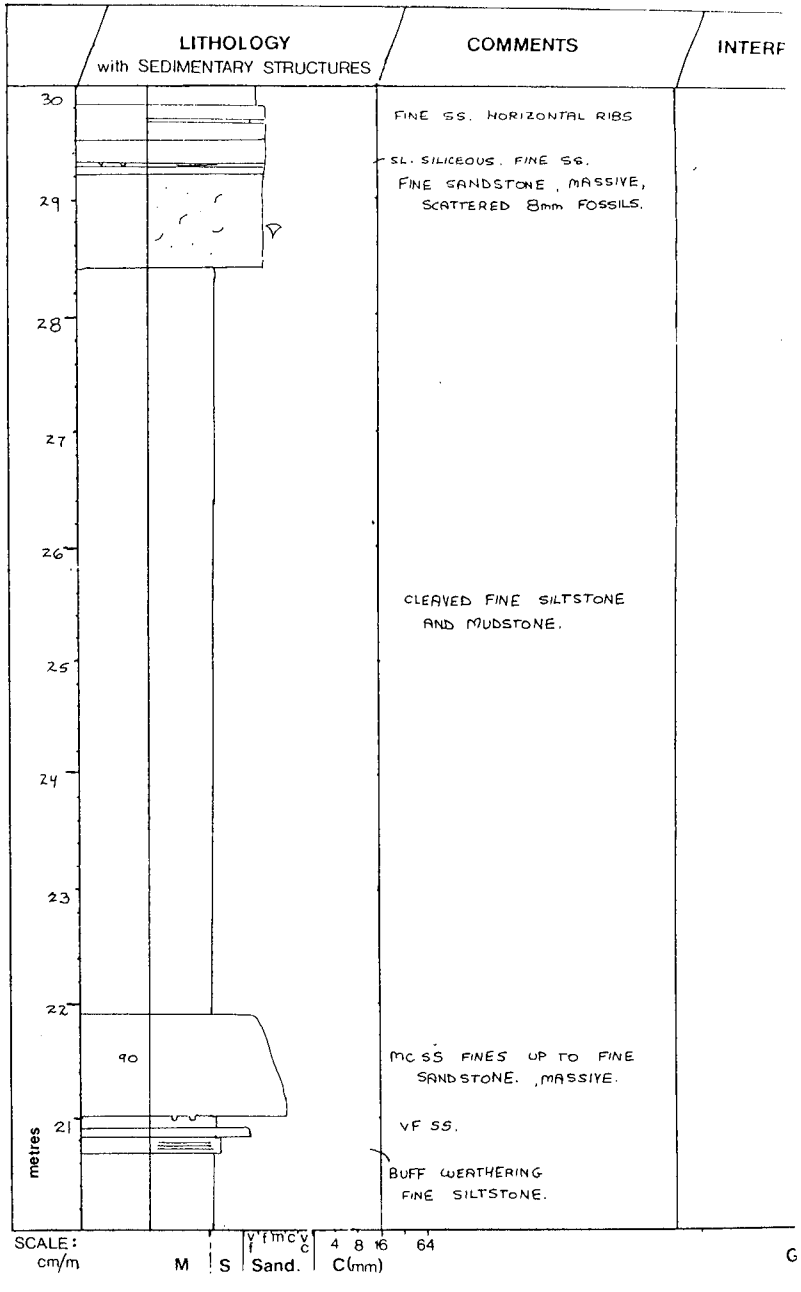
SECTION C9 LOCATION: Locate top of Gwern Gof Tuff where Braich y Ddeugwm ridge flattens out 200 m to NE of Llyn-y-Caseg-fraith. Section proceeds from here to ESE along break in slope at head of Cwm Nant-yr-Ogof to base of Garth Tuff.



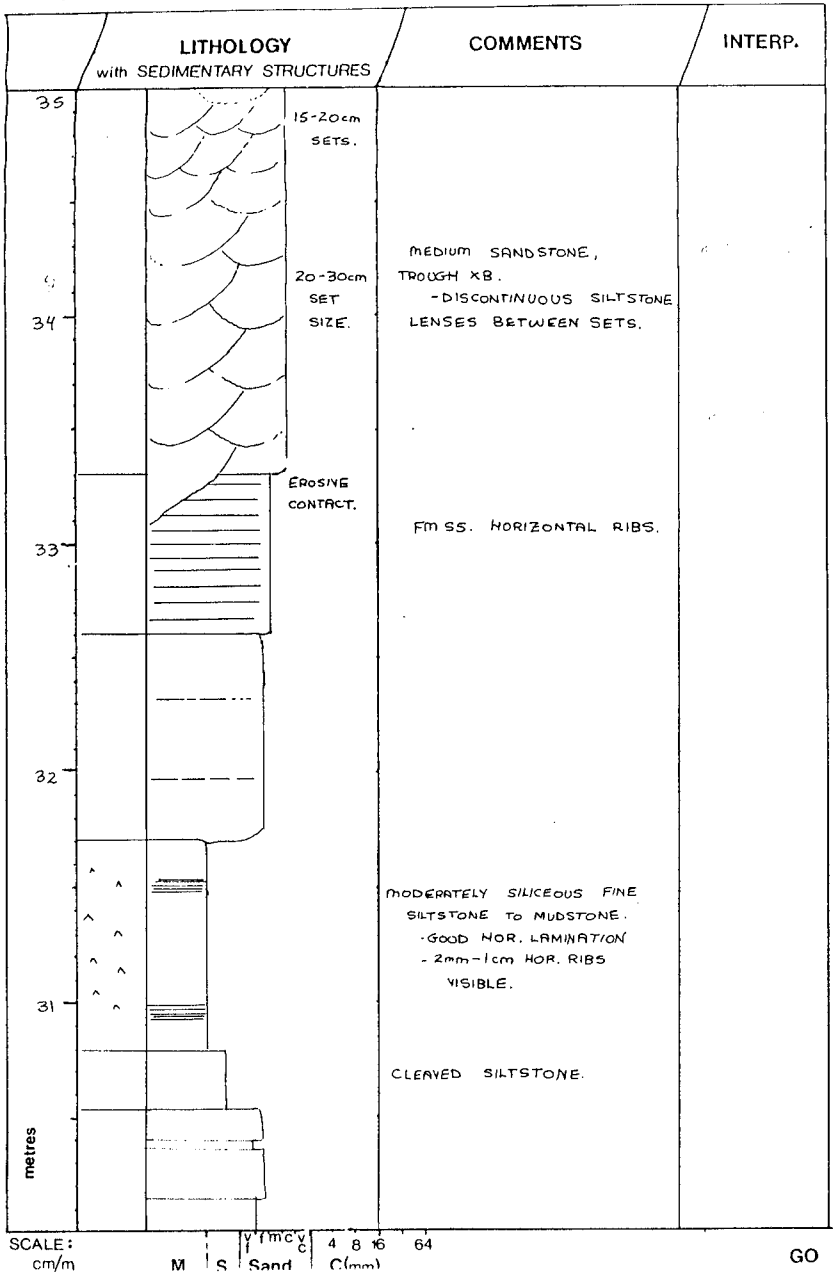
SECTION: C9 LOCATION: TRYFAN EAST.



SECTION: C9 LOCATION: TRYFAN EAST.



SECTION: C9 LOCATION: TRYFAN EAST



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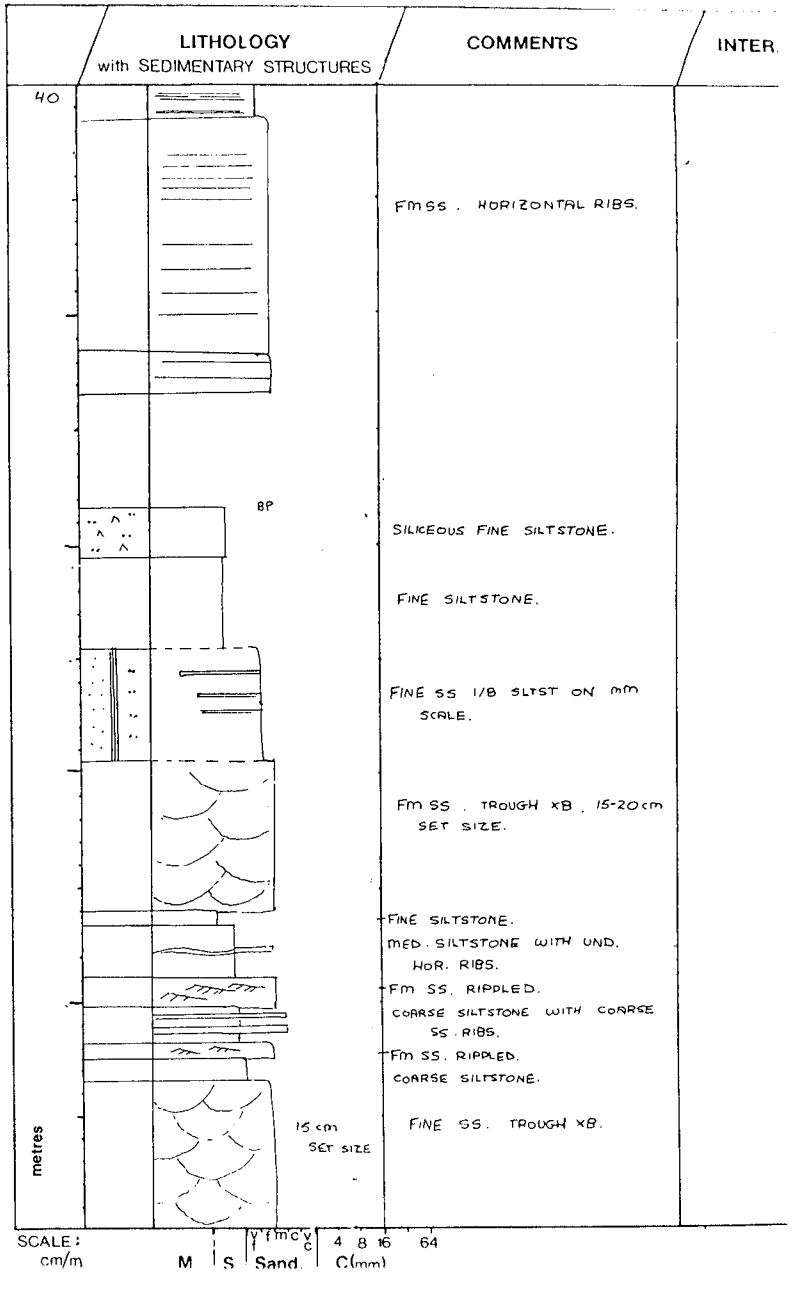
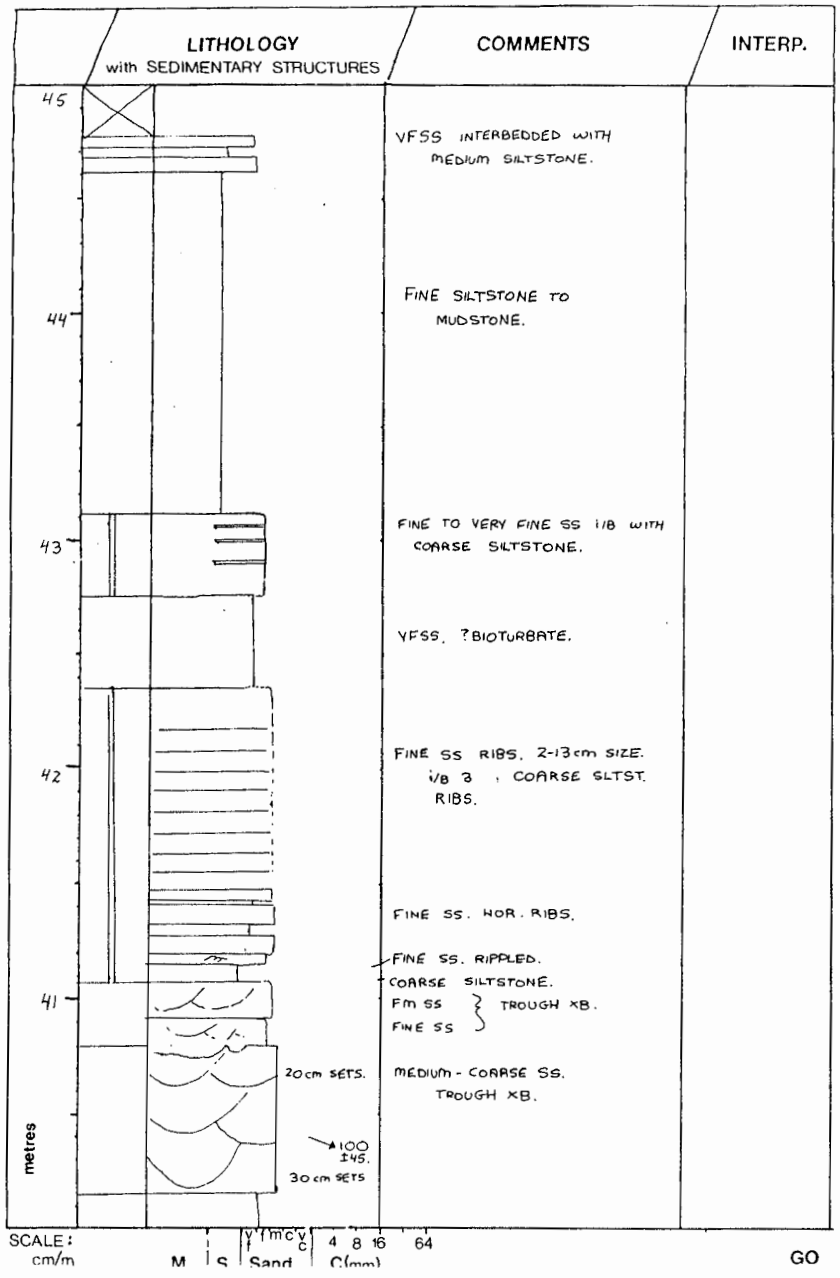
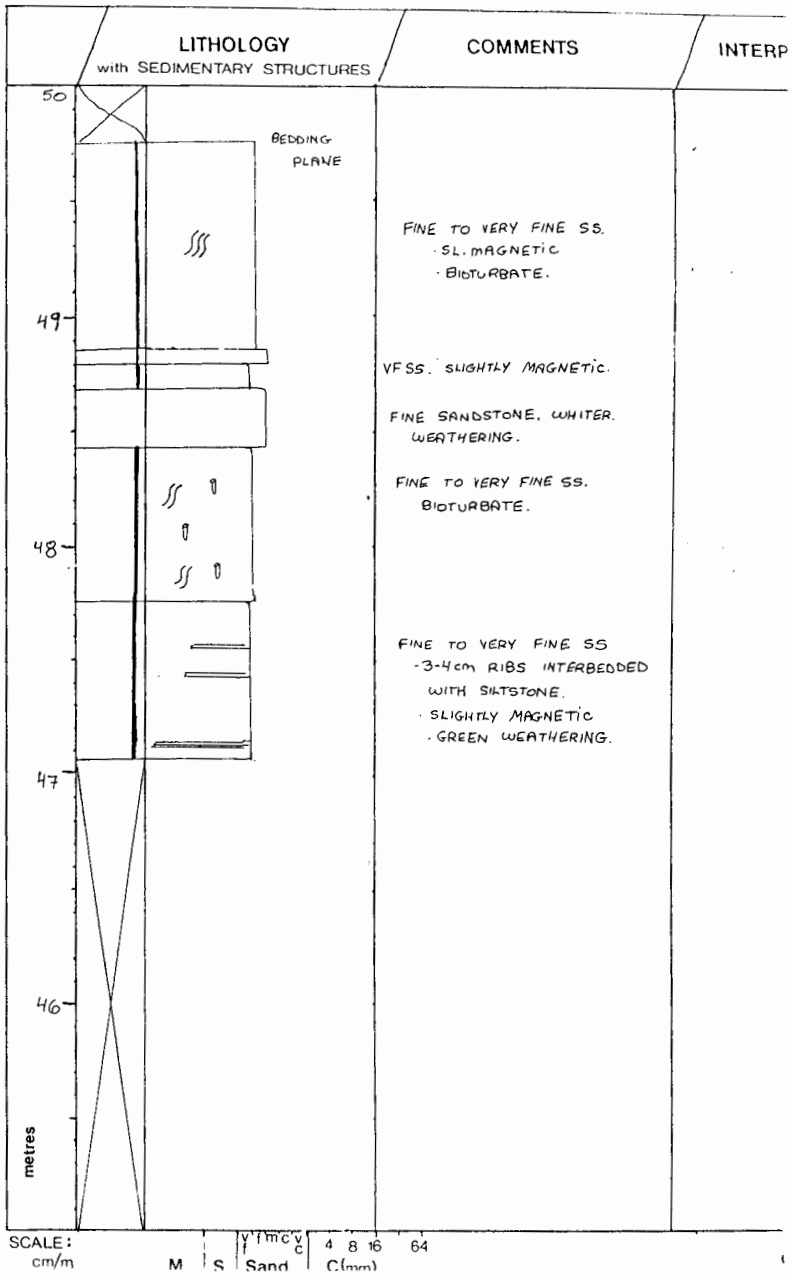
SECTION: C9 LOCATION: TRYFAN EAST.



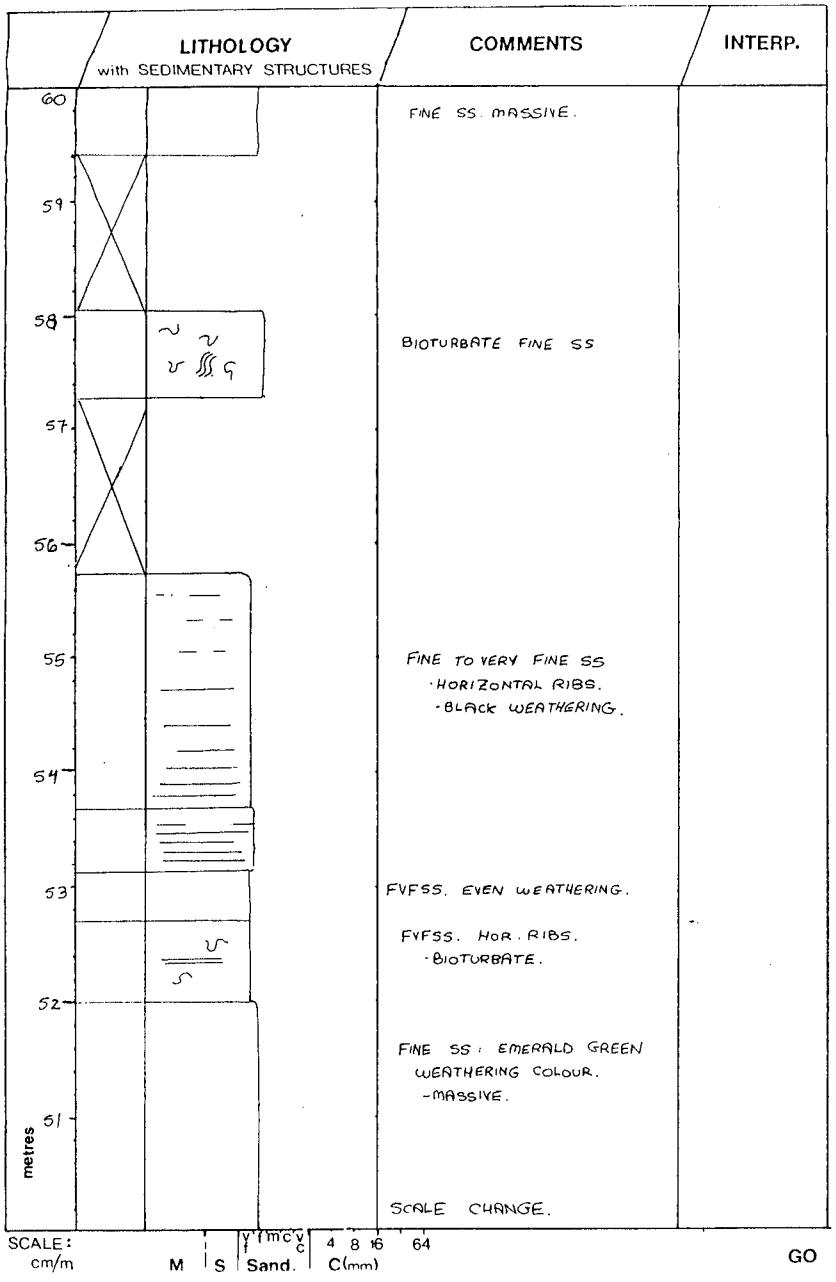
SECTION: C9 LOCATION: TRYFAN EAST.



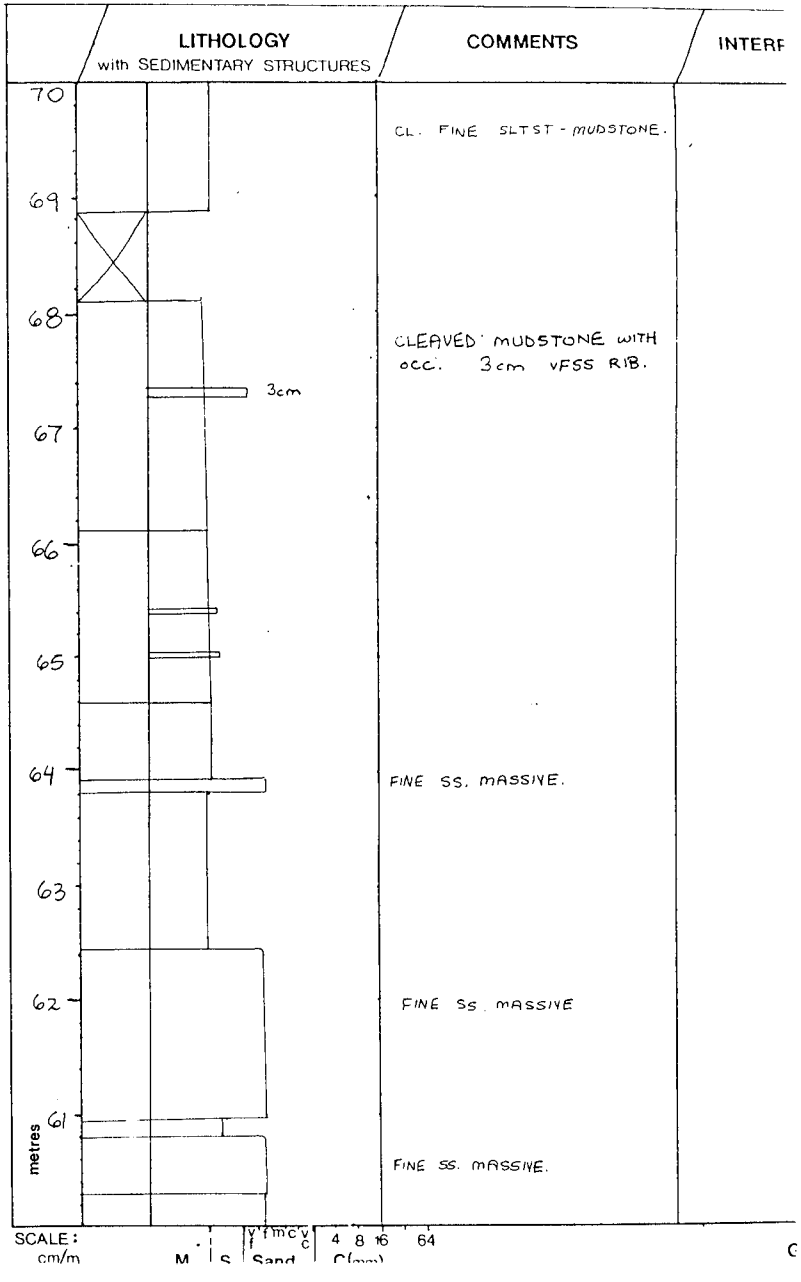
SECTION: C9 LOCATION: TRYFAN EAST



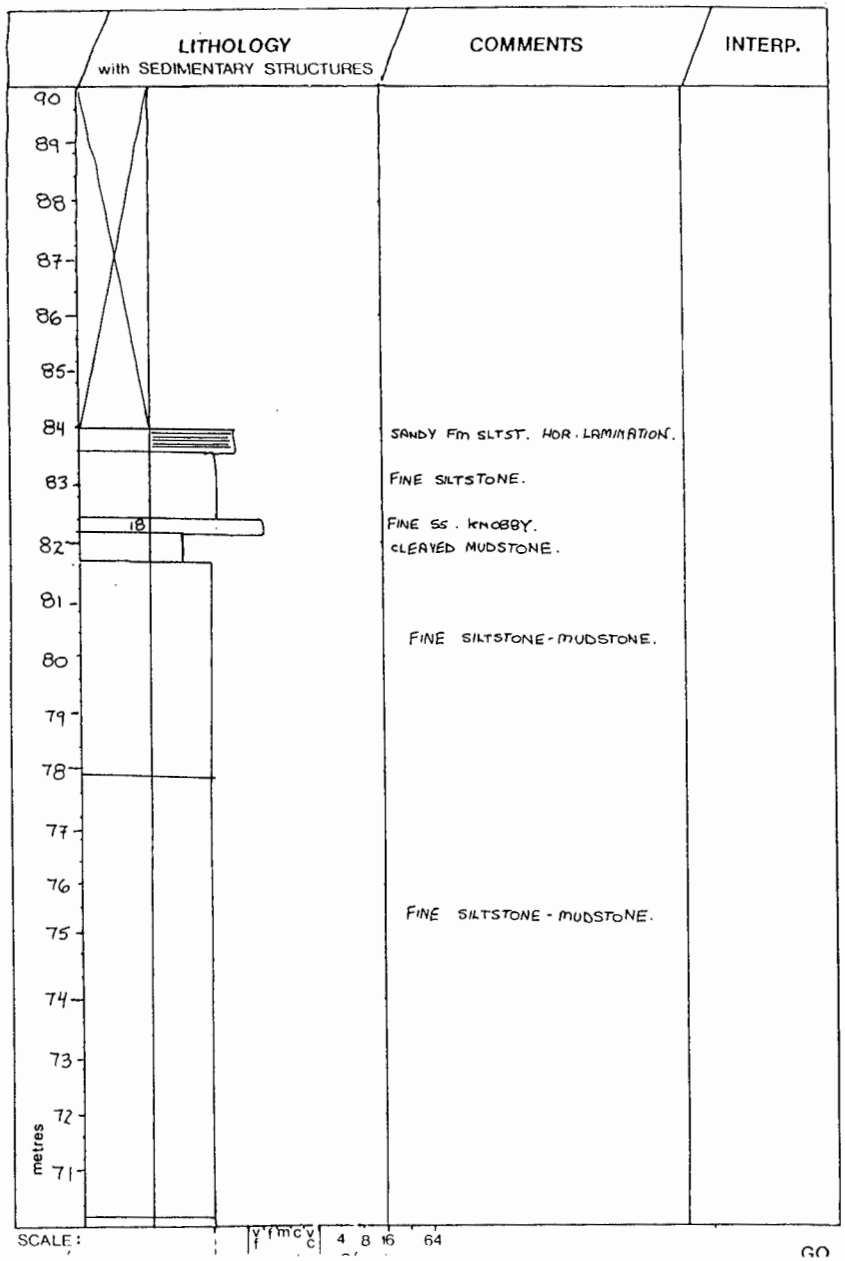
SECTION: C9 LOCATION: TRYFAN EAST.



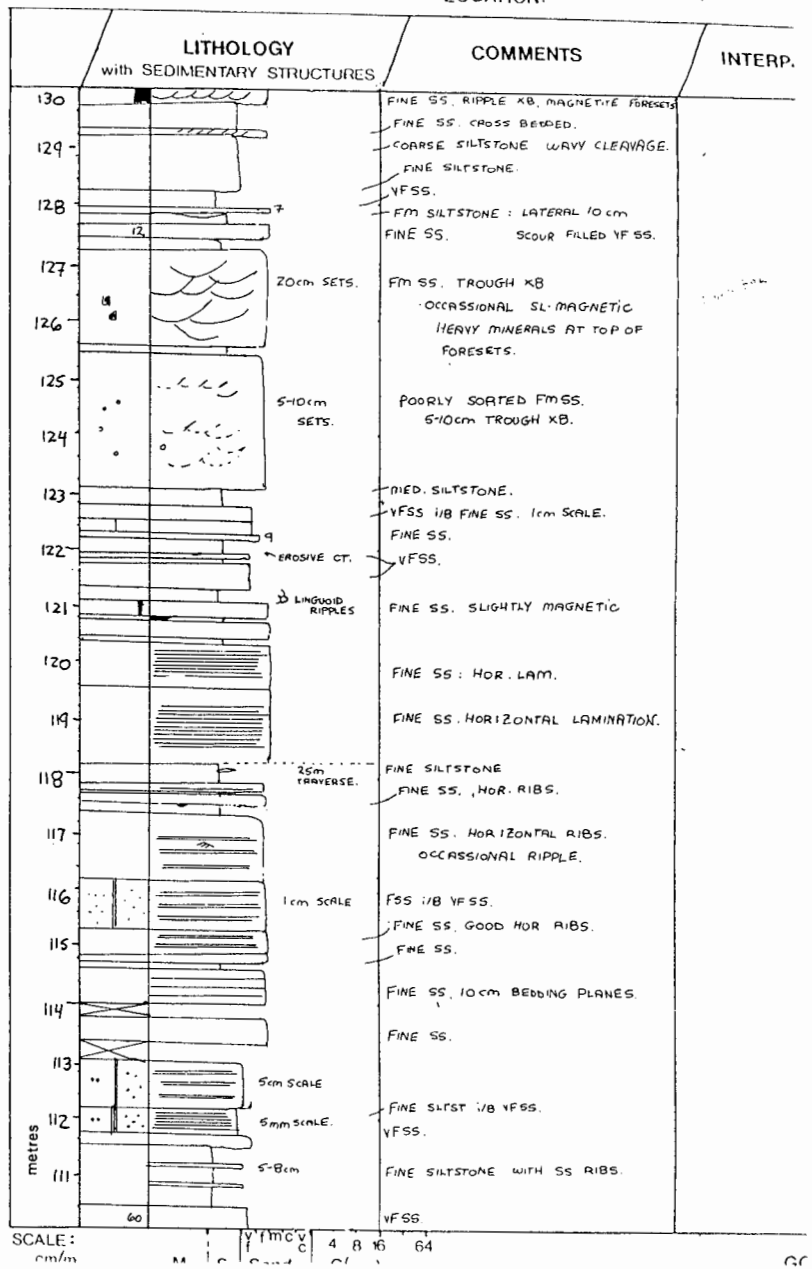
SECTION: C-9. LOCATION: TRYFAN EAST



SECTION: C·6 LOCATION: TRYFAN EAST.



SECTION: C·9 LOCATION: TRYFAN EAST.



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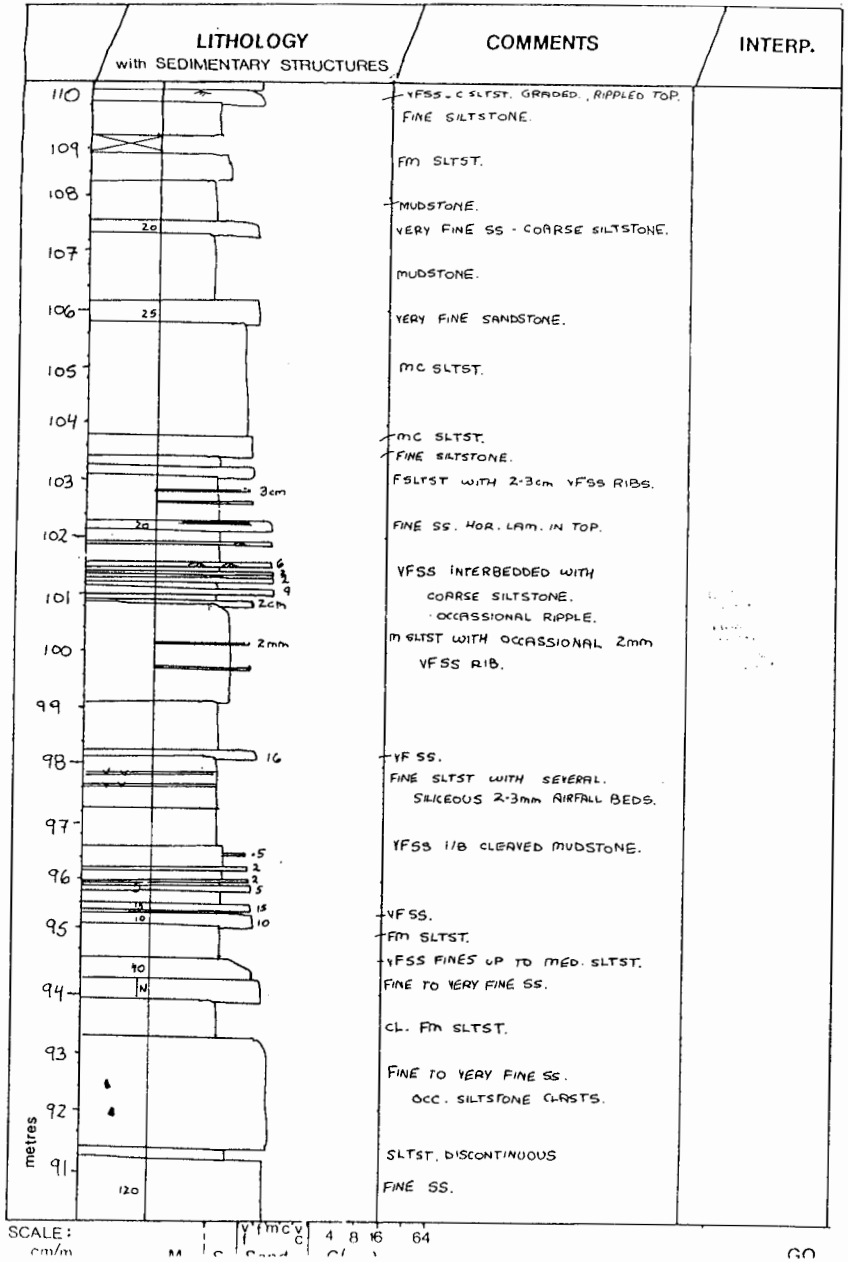

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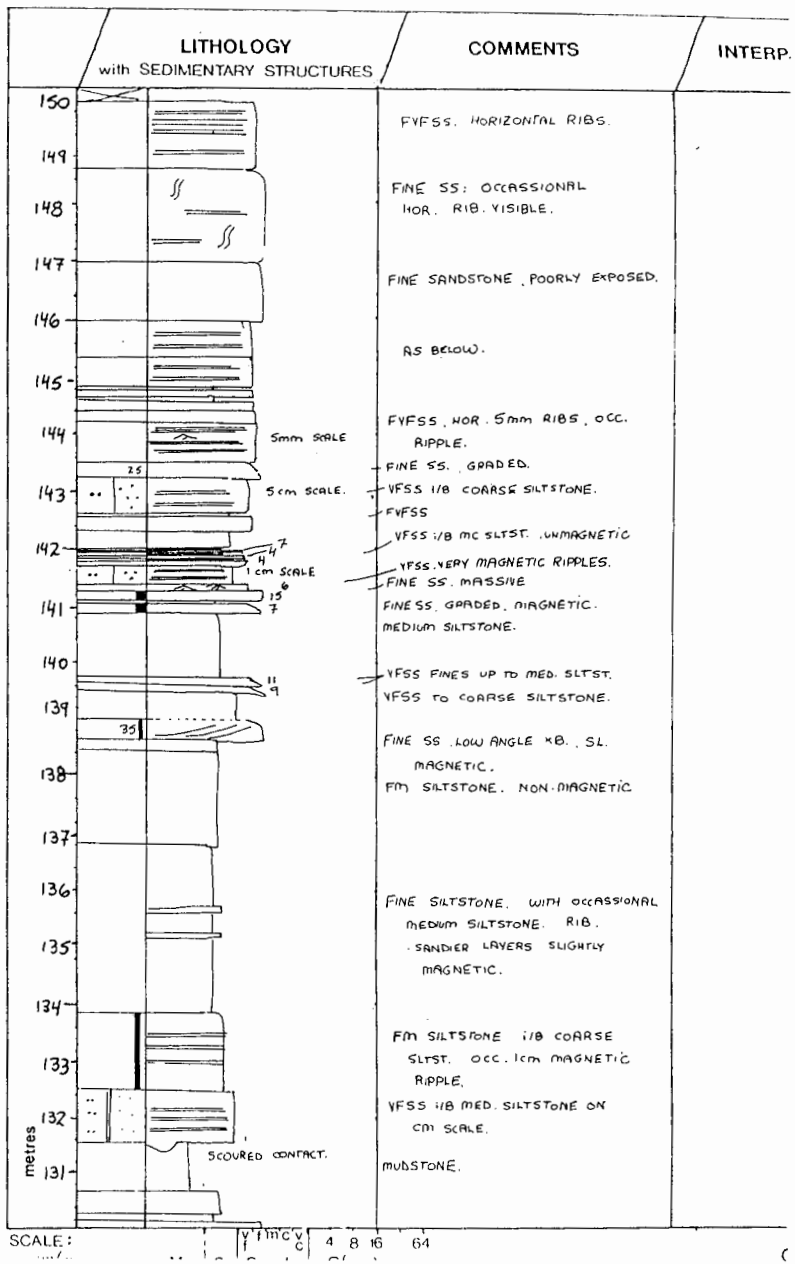

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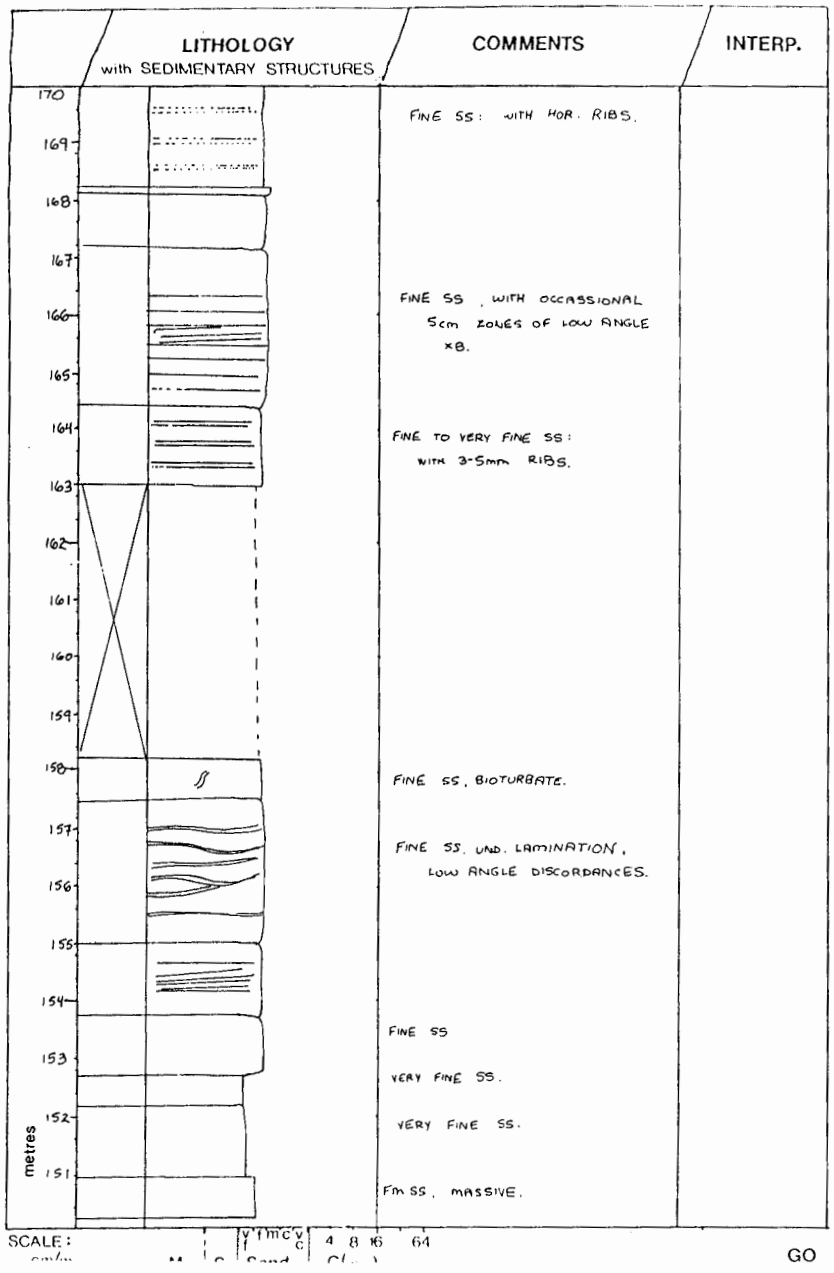
SECTION: C-9 LOCATION:



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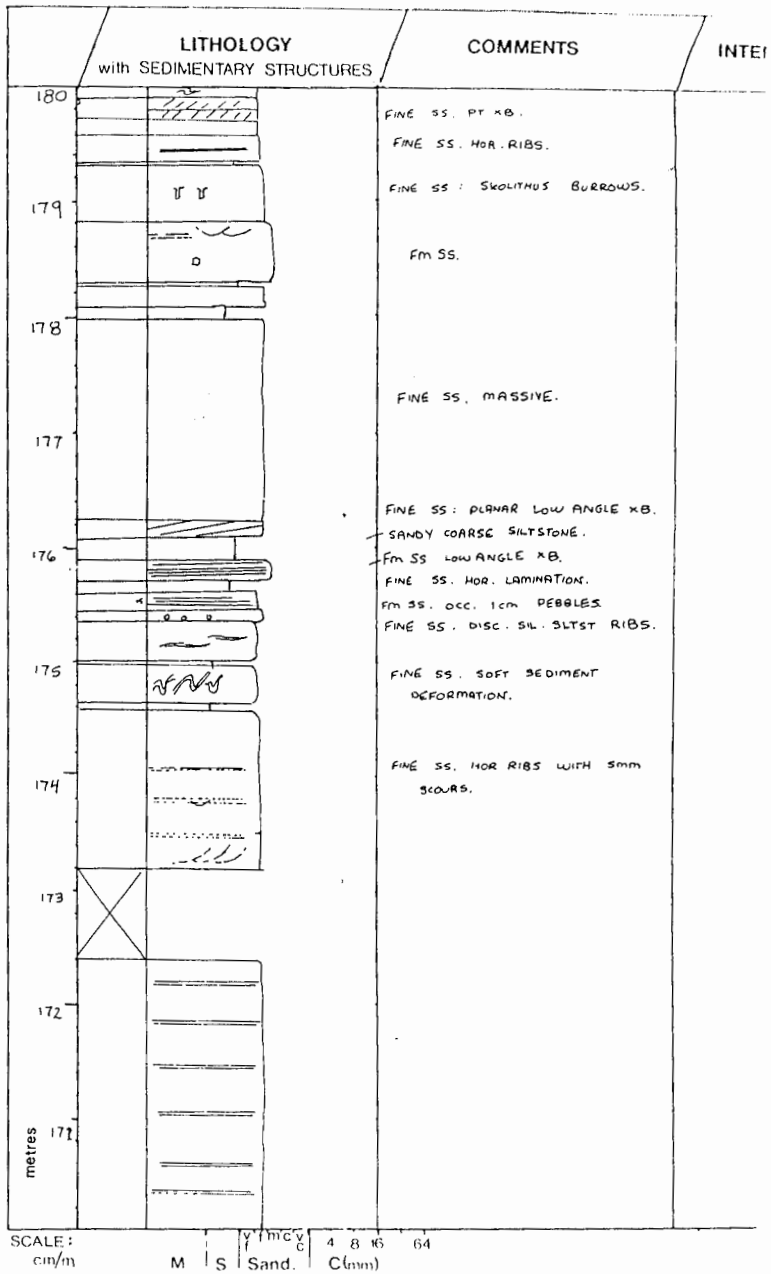
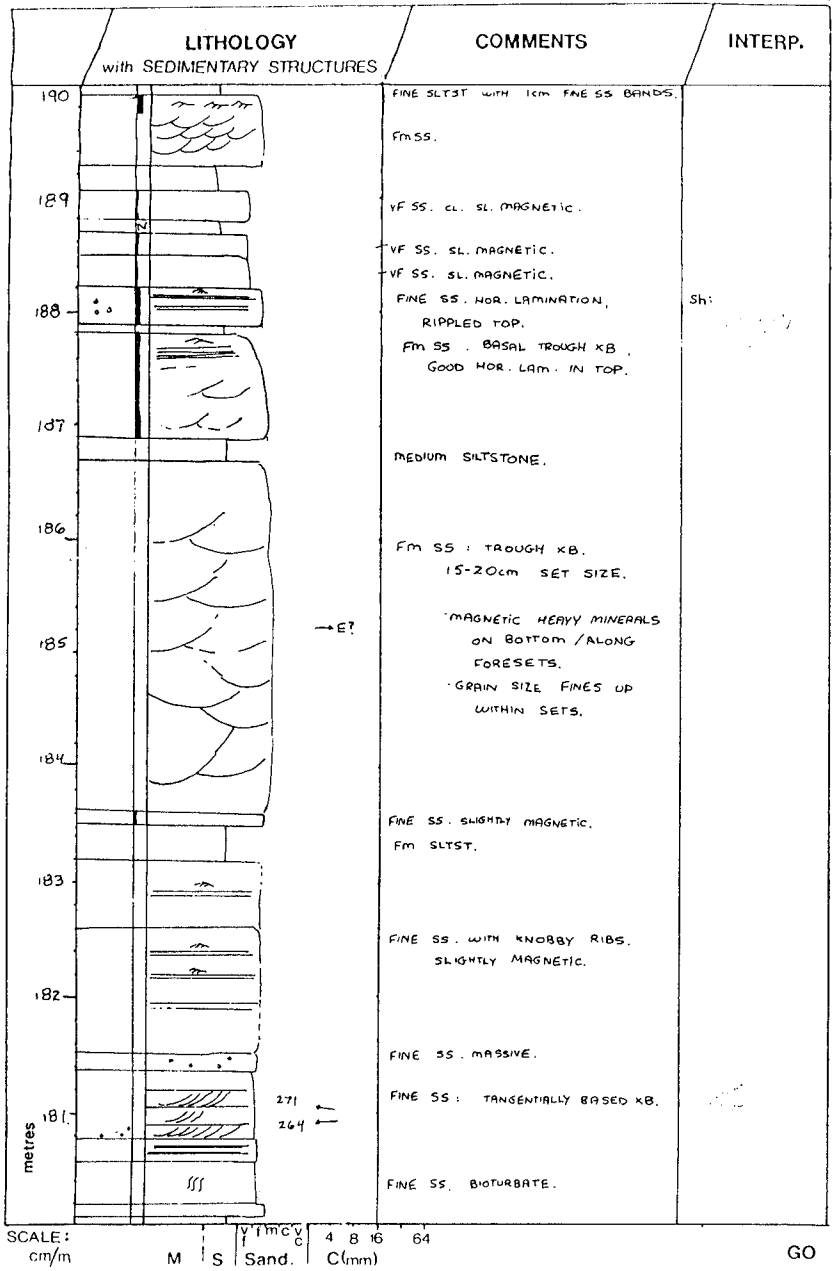


SECTION: C-9. LOCATION:



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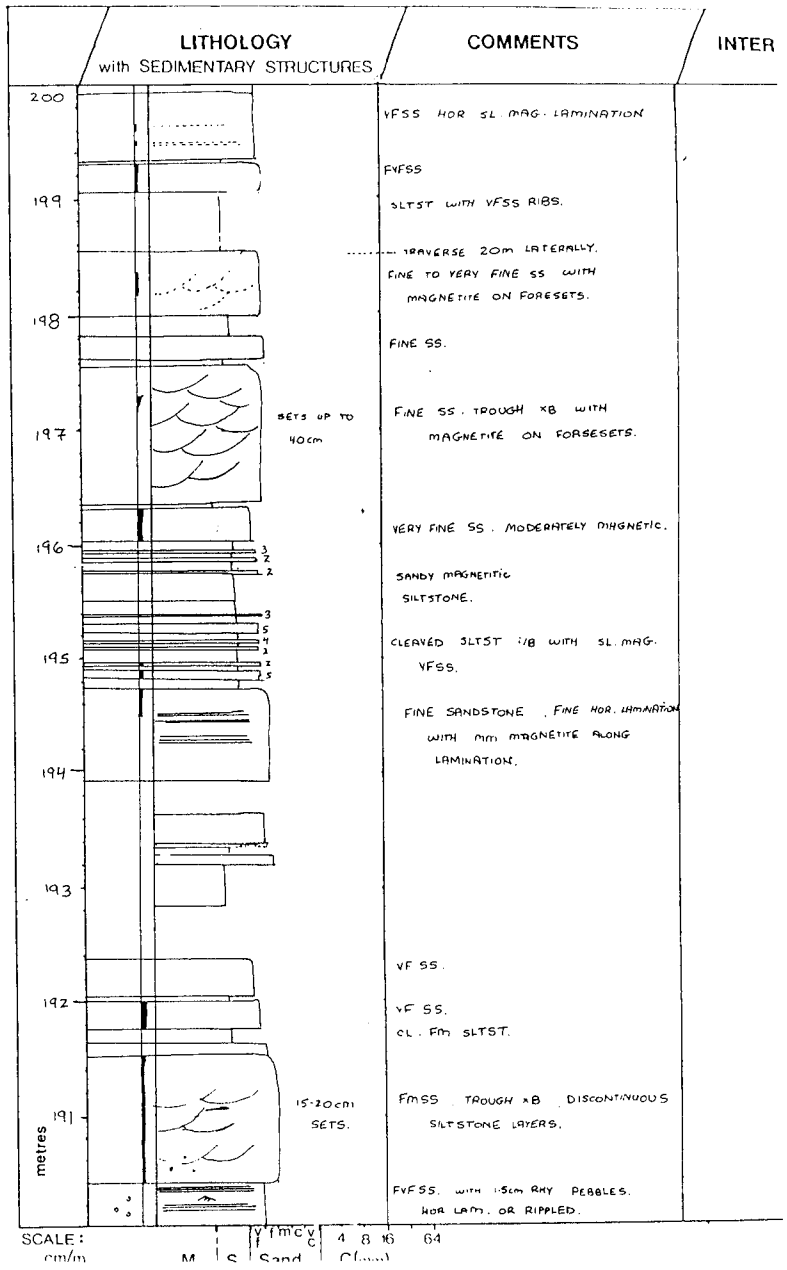

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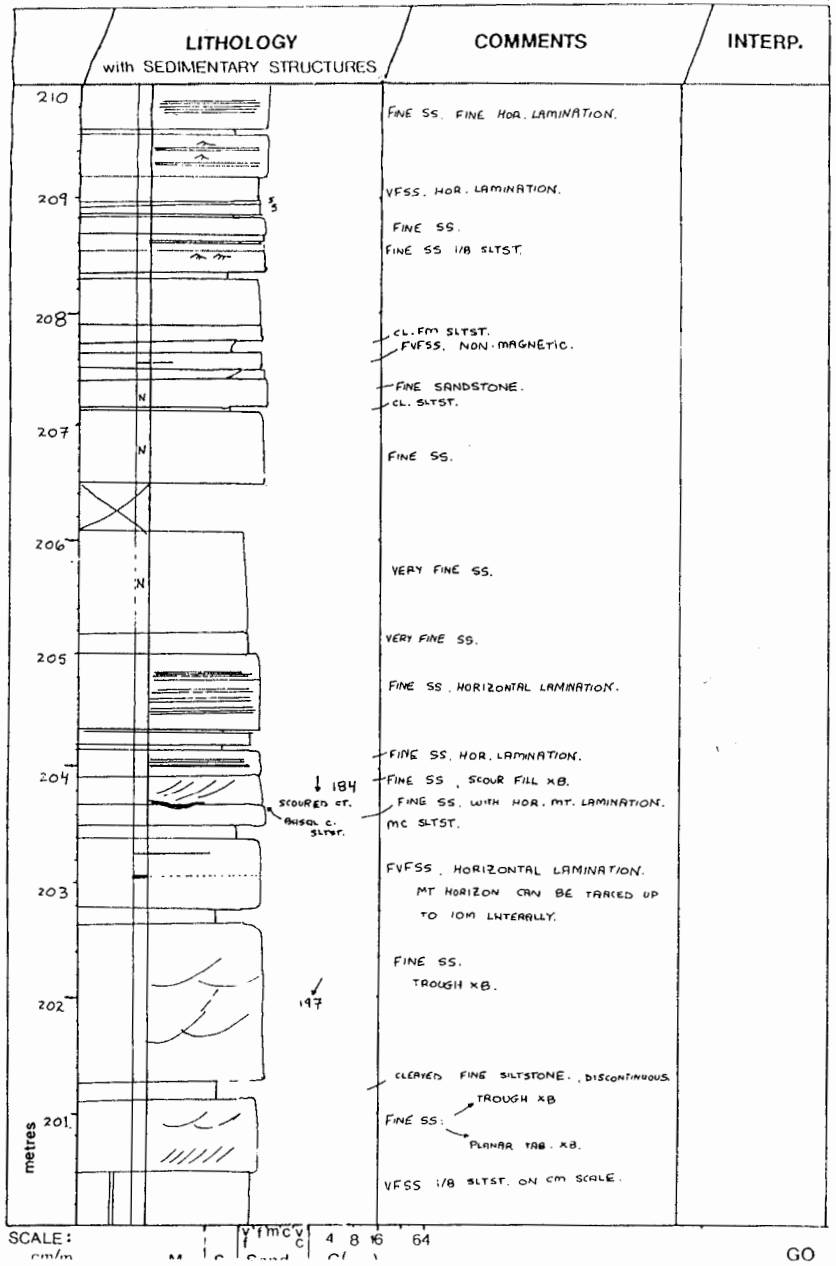

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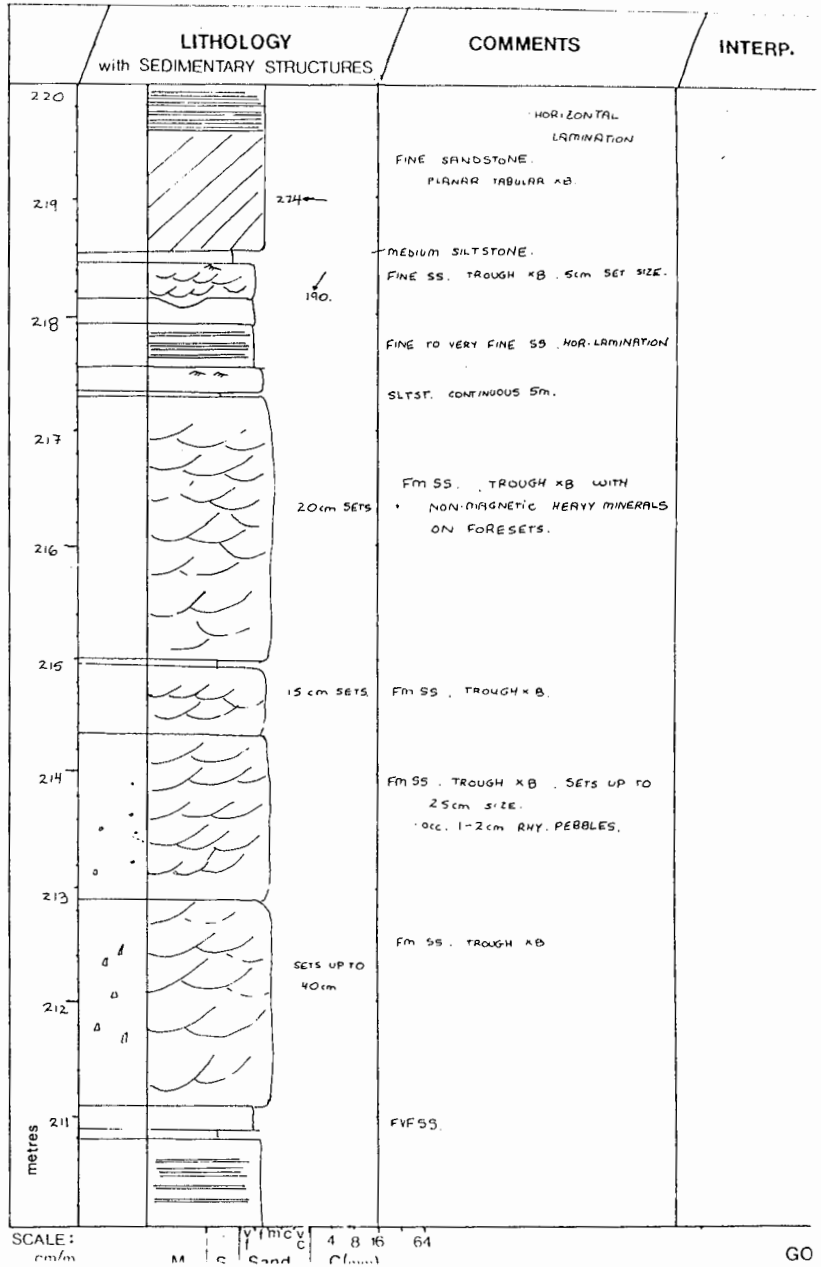

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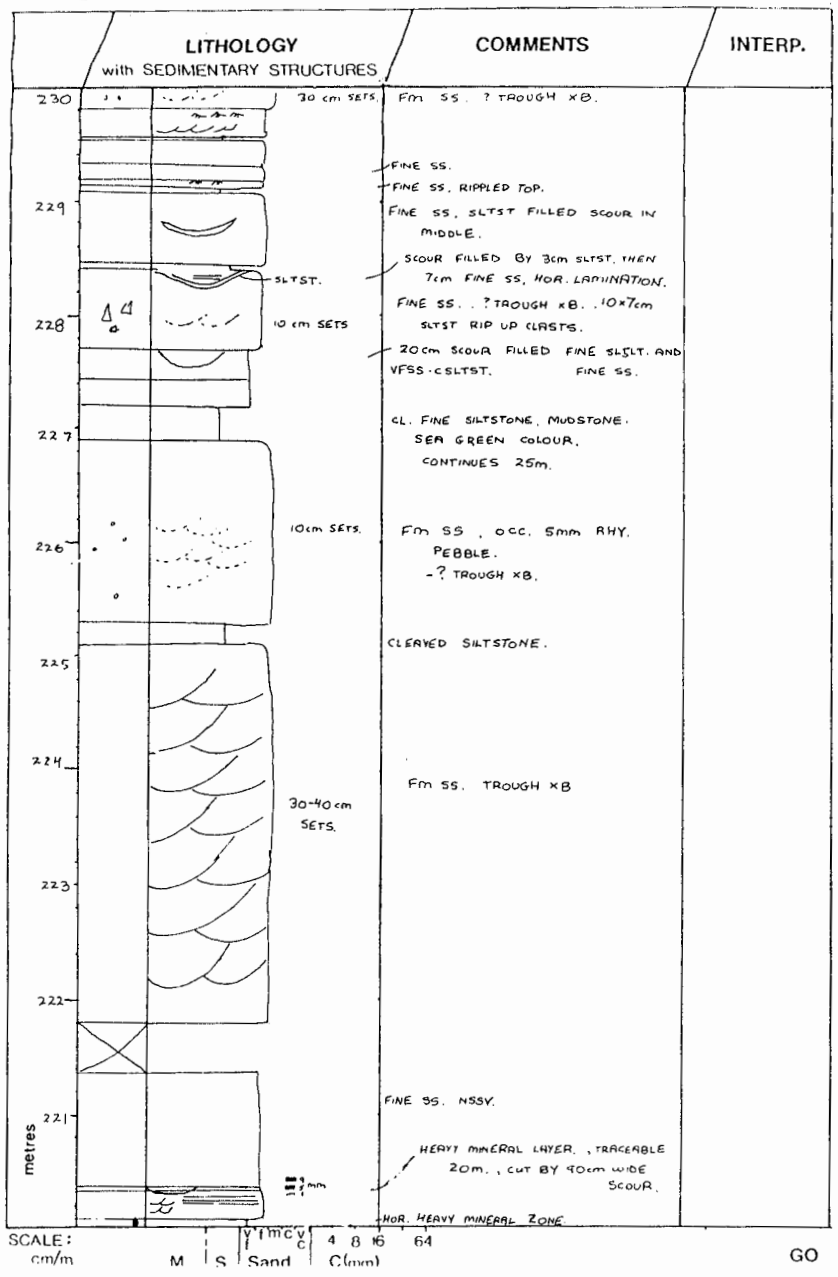

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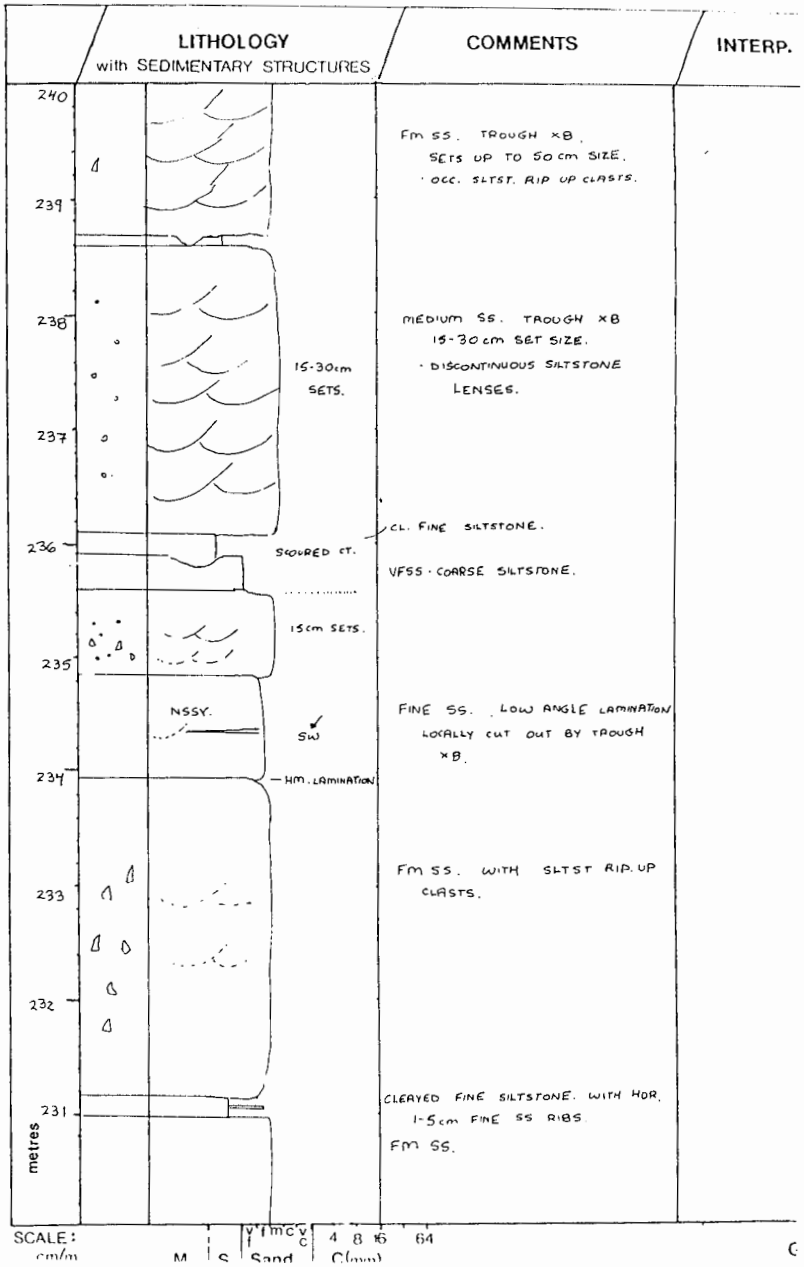

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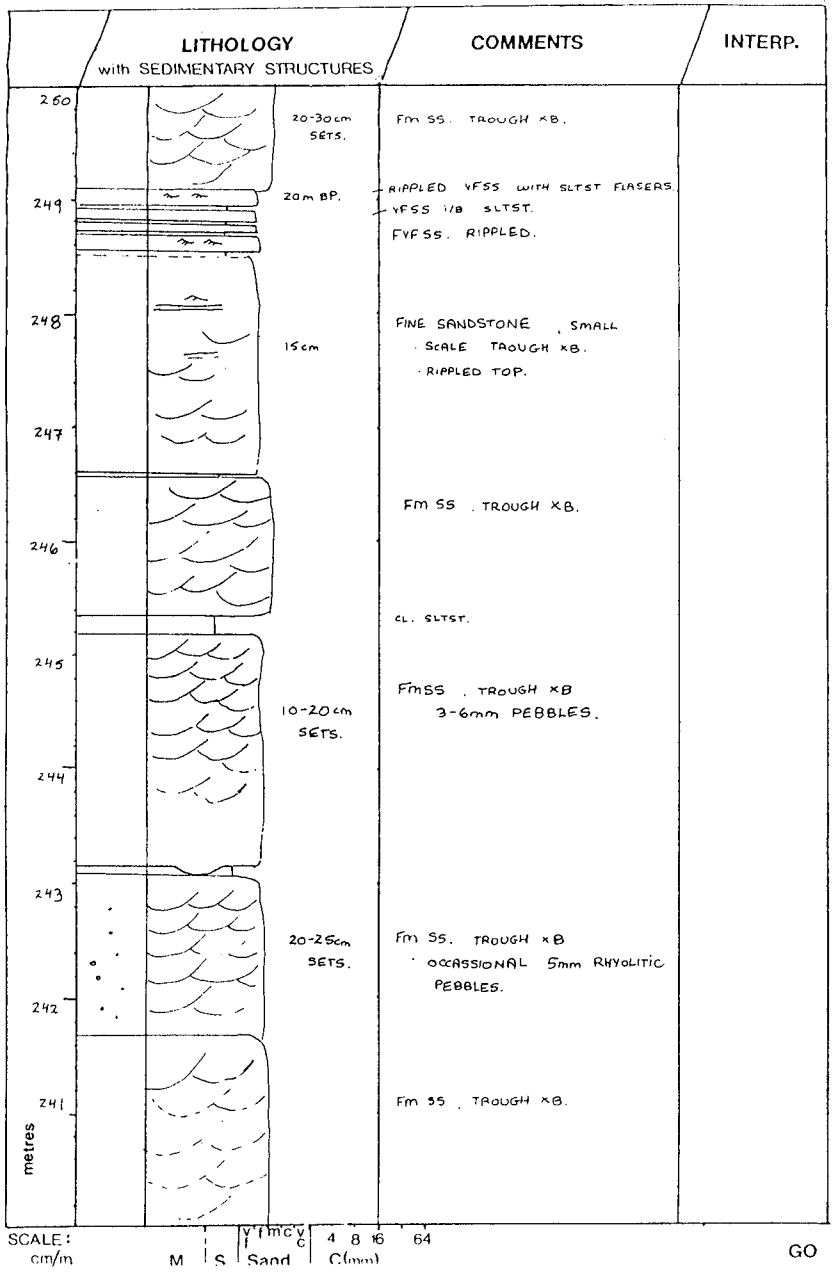

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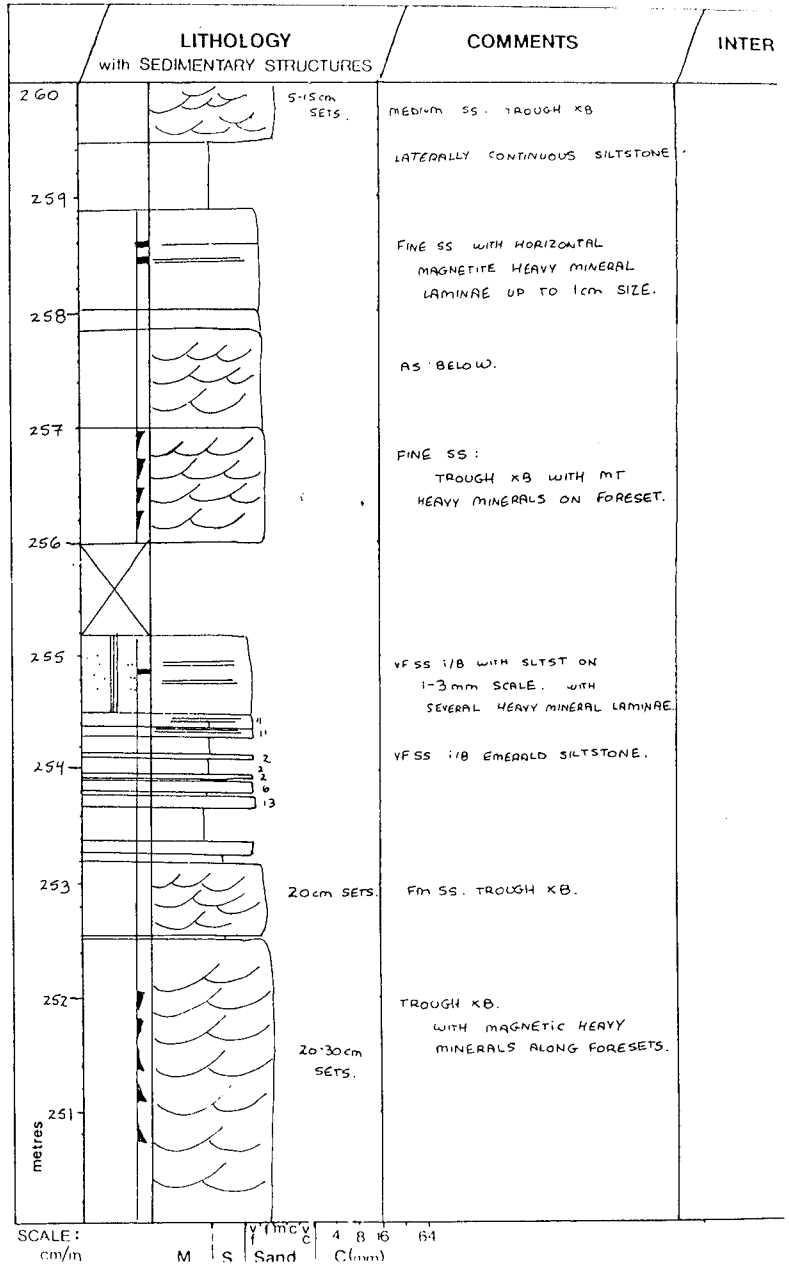

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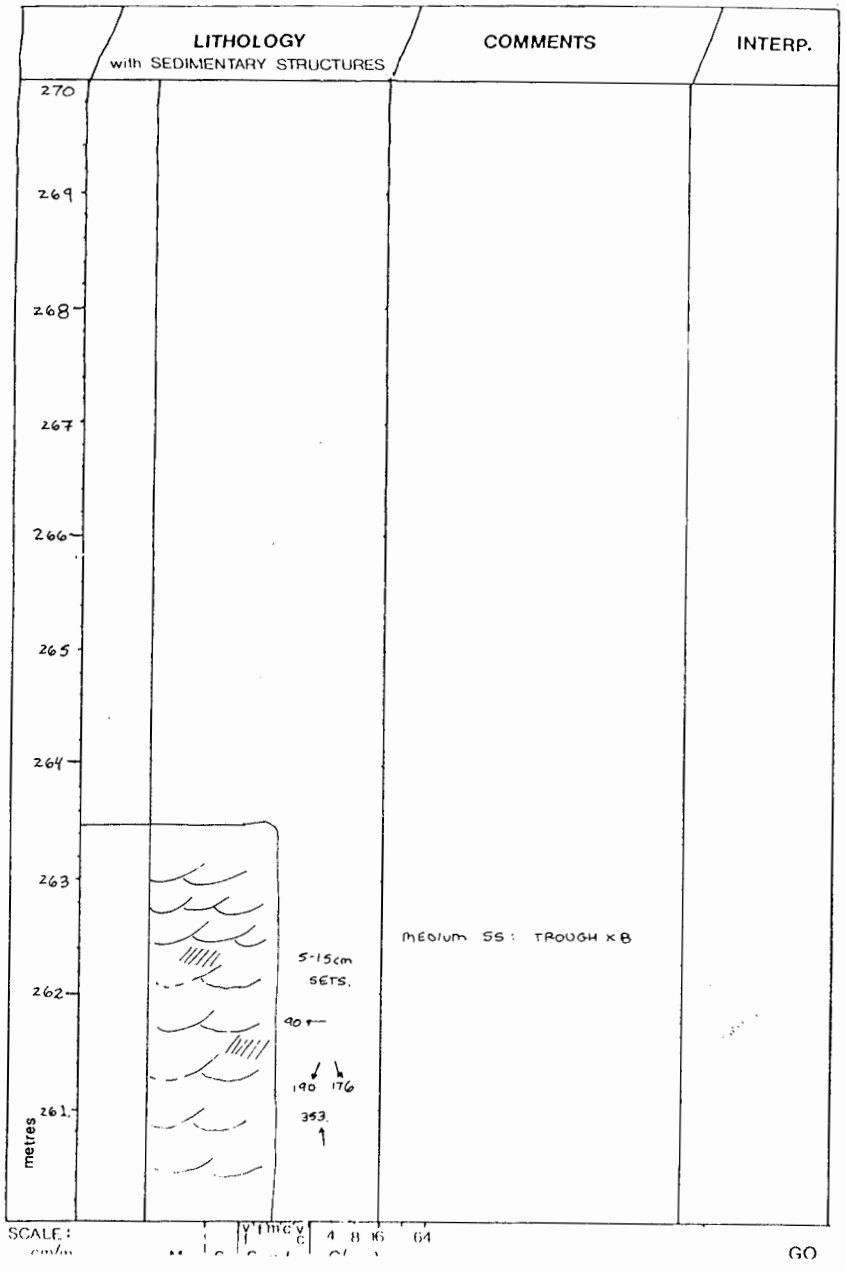

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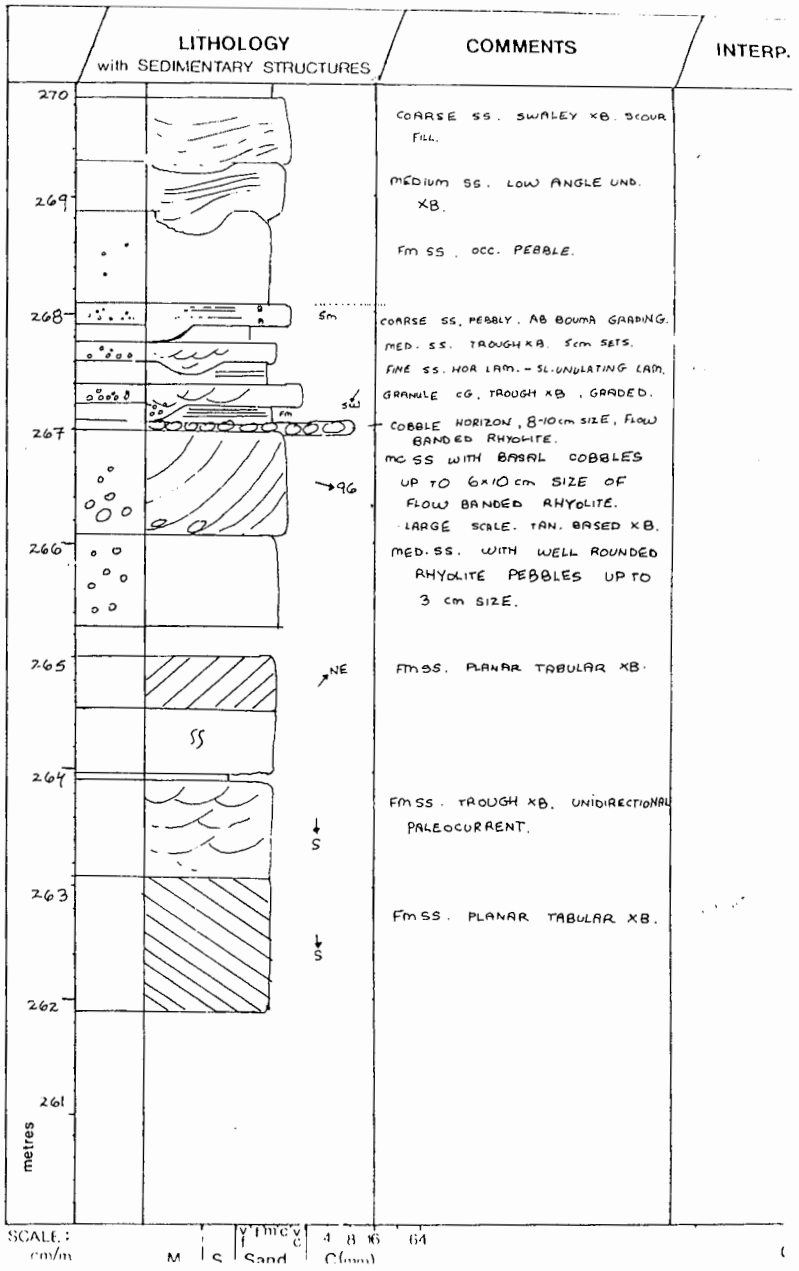
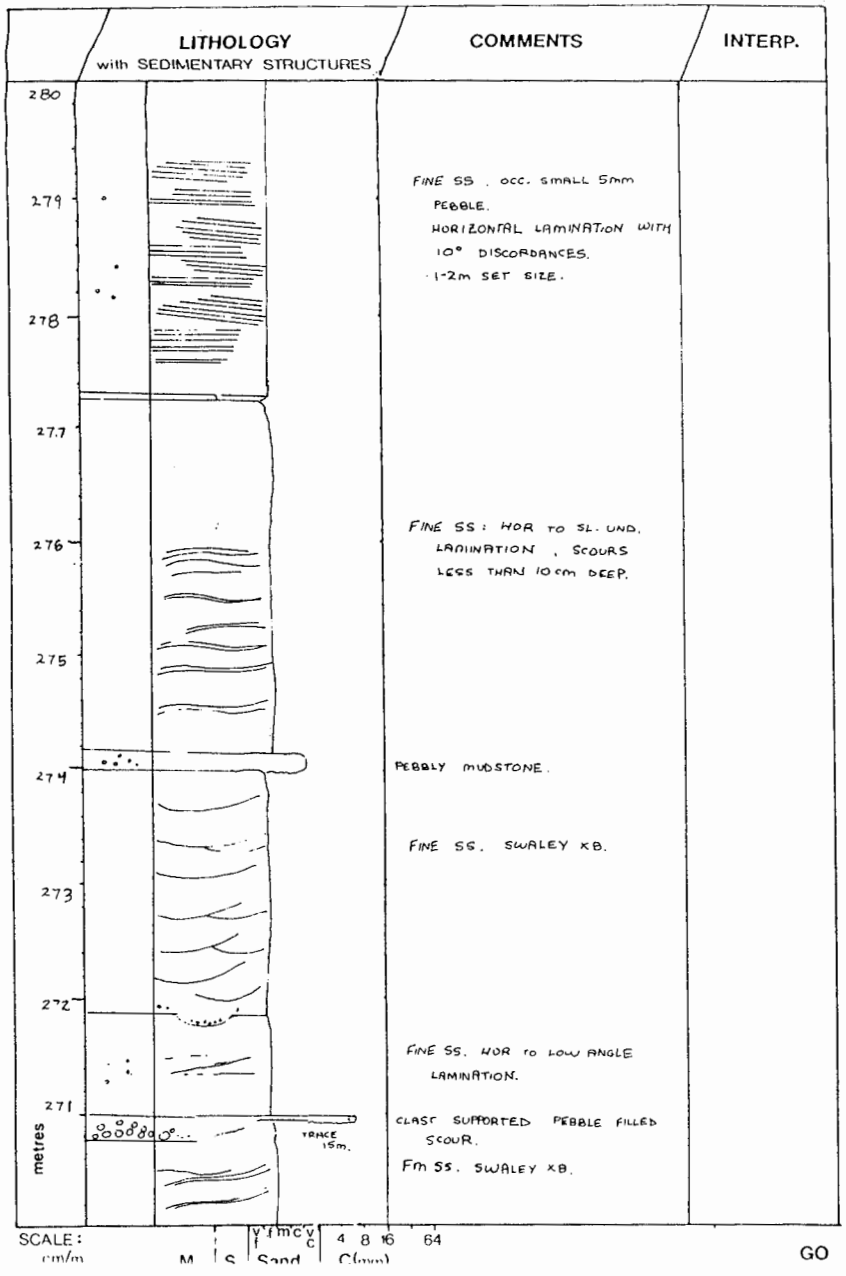
SECTION: LOCATION:



SECTION: C9 LOCATION:



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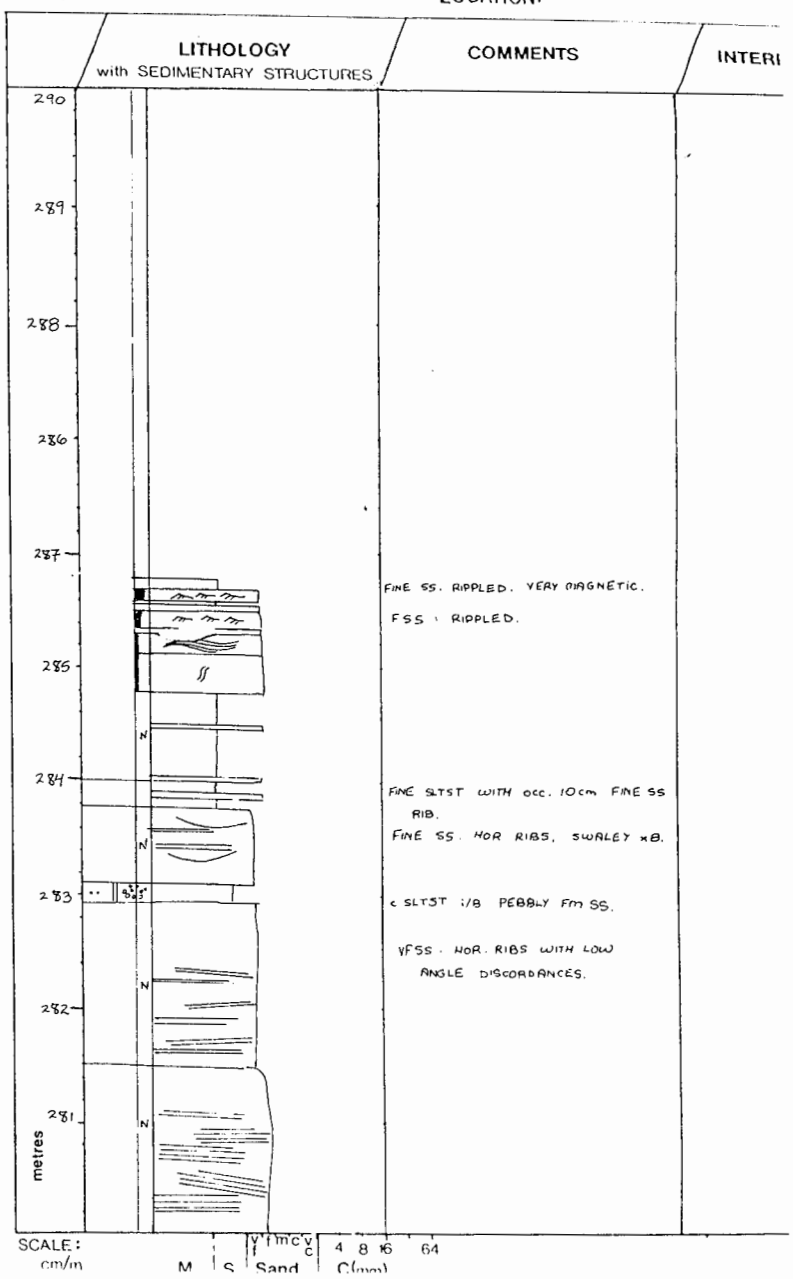

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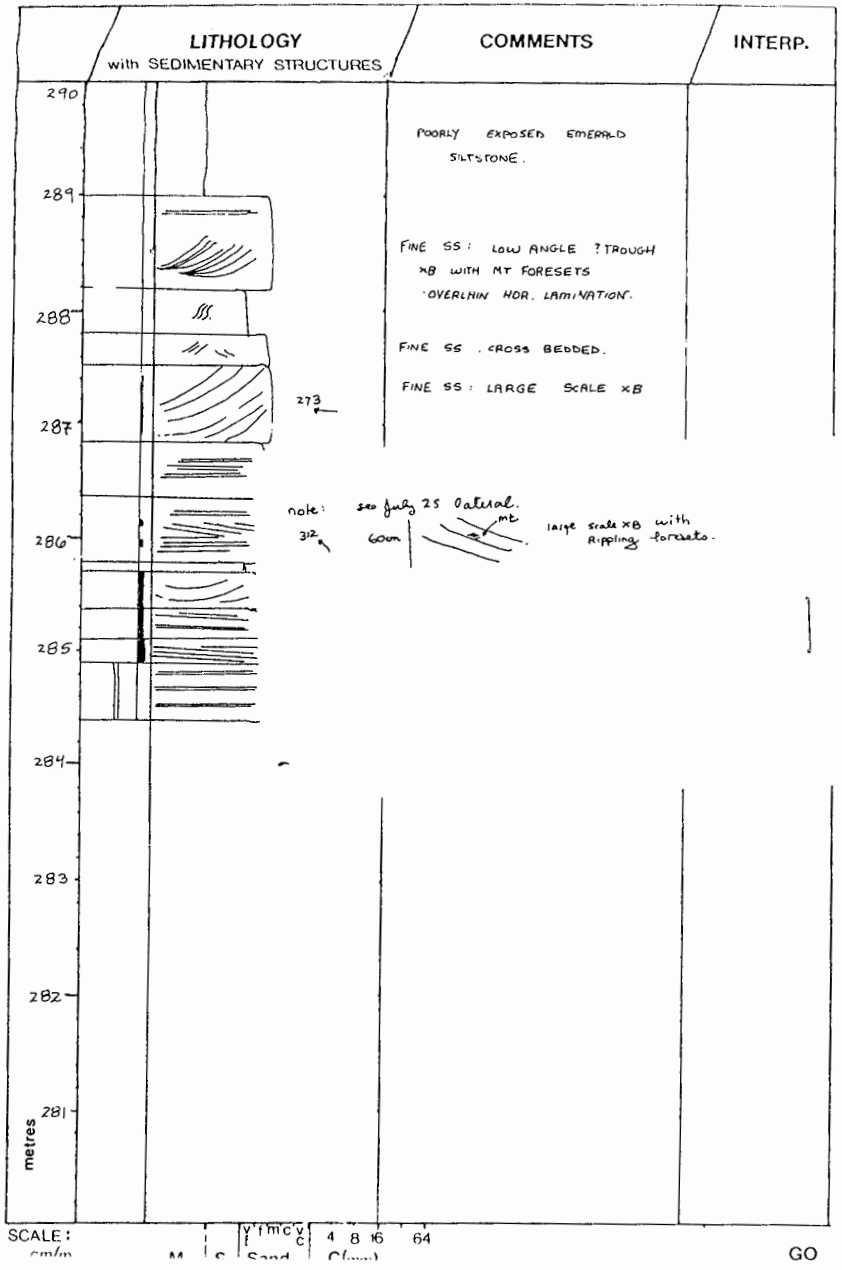

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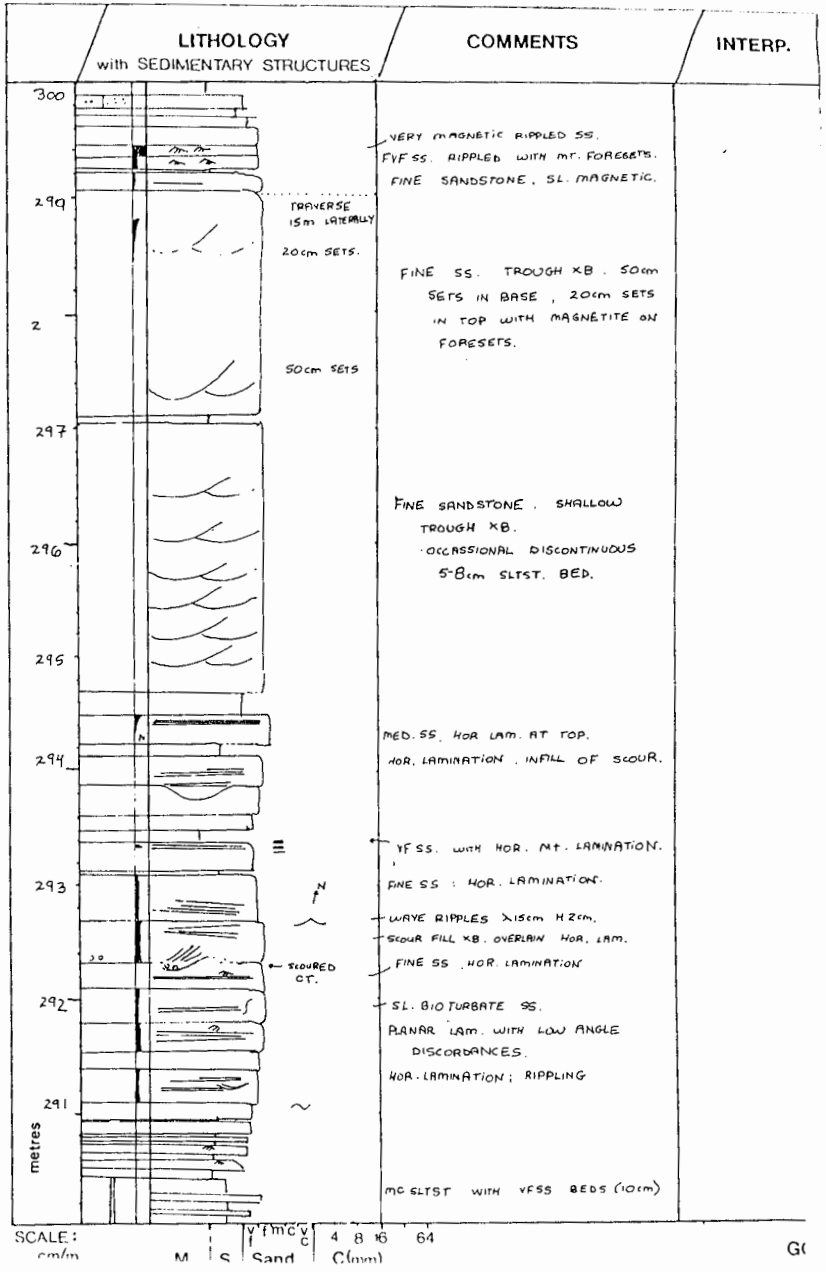

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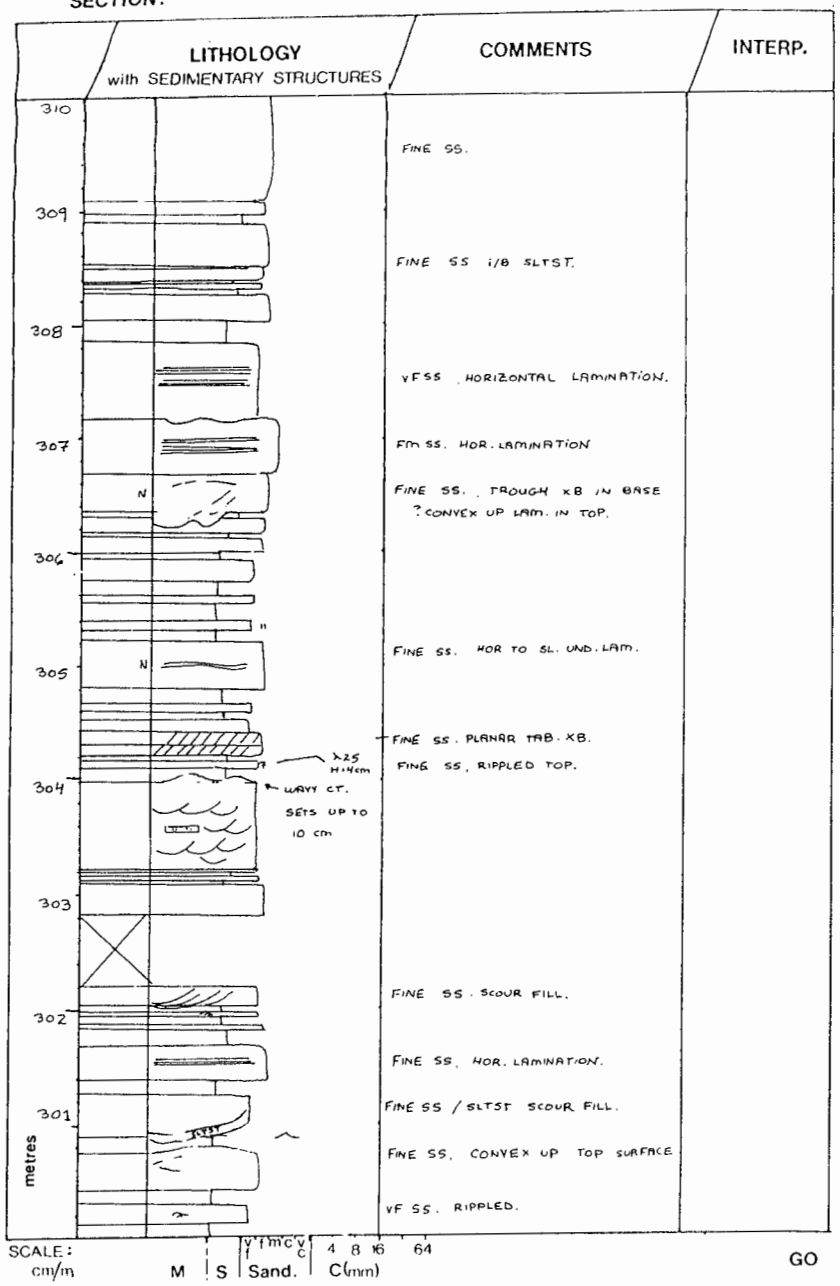

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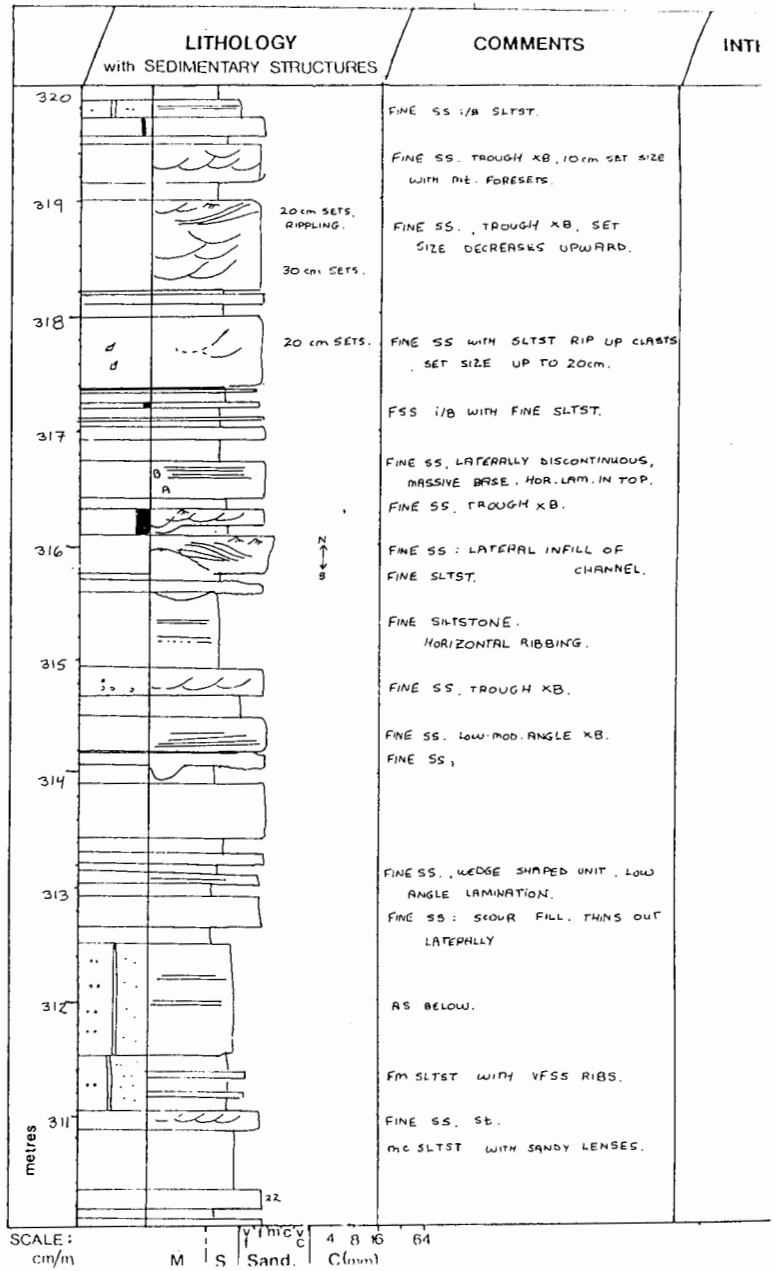

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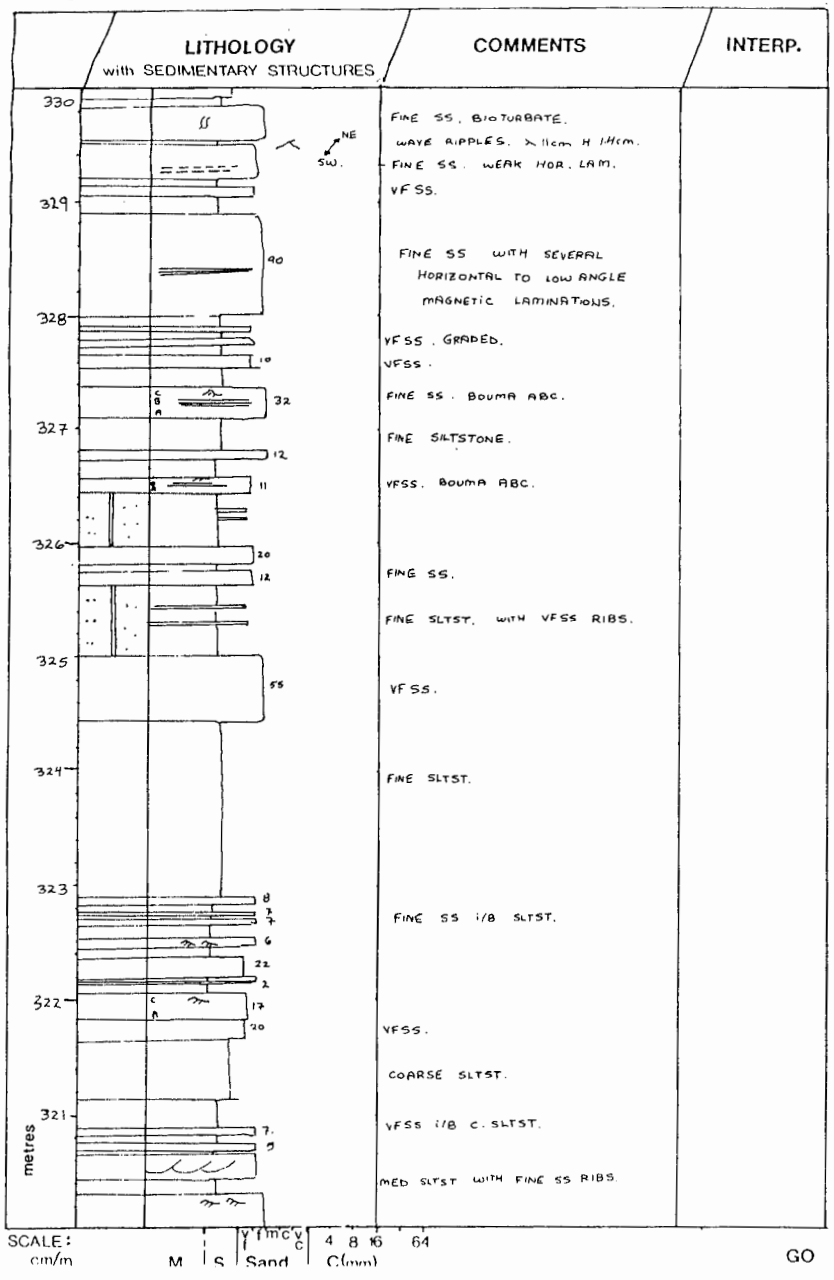

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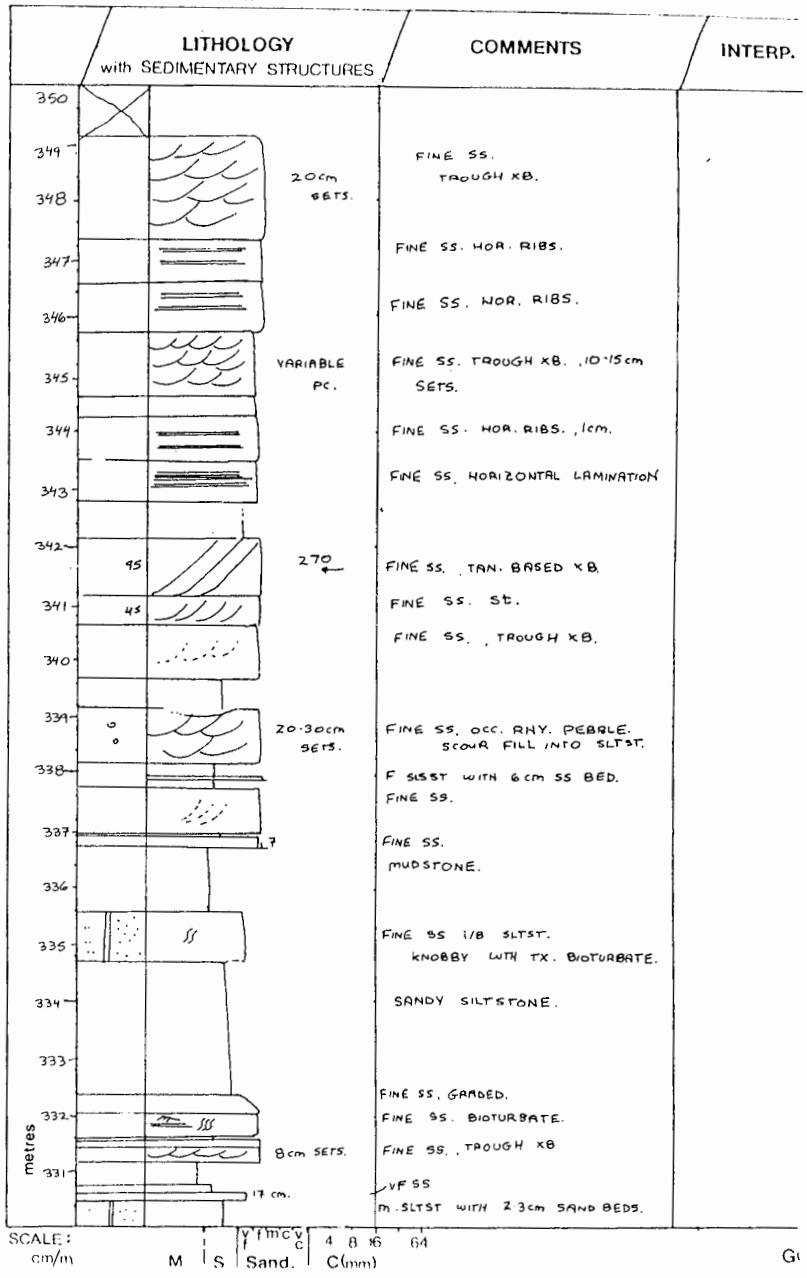
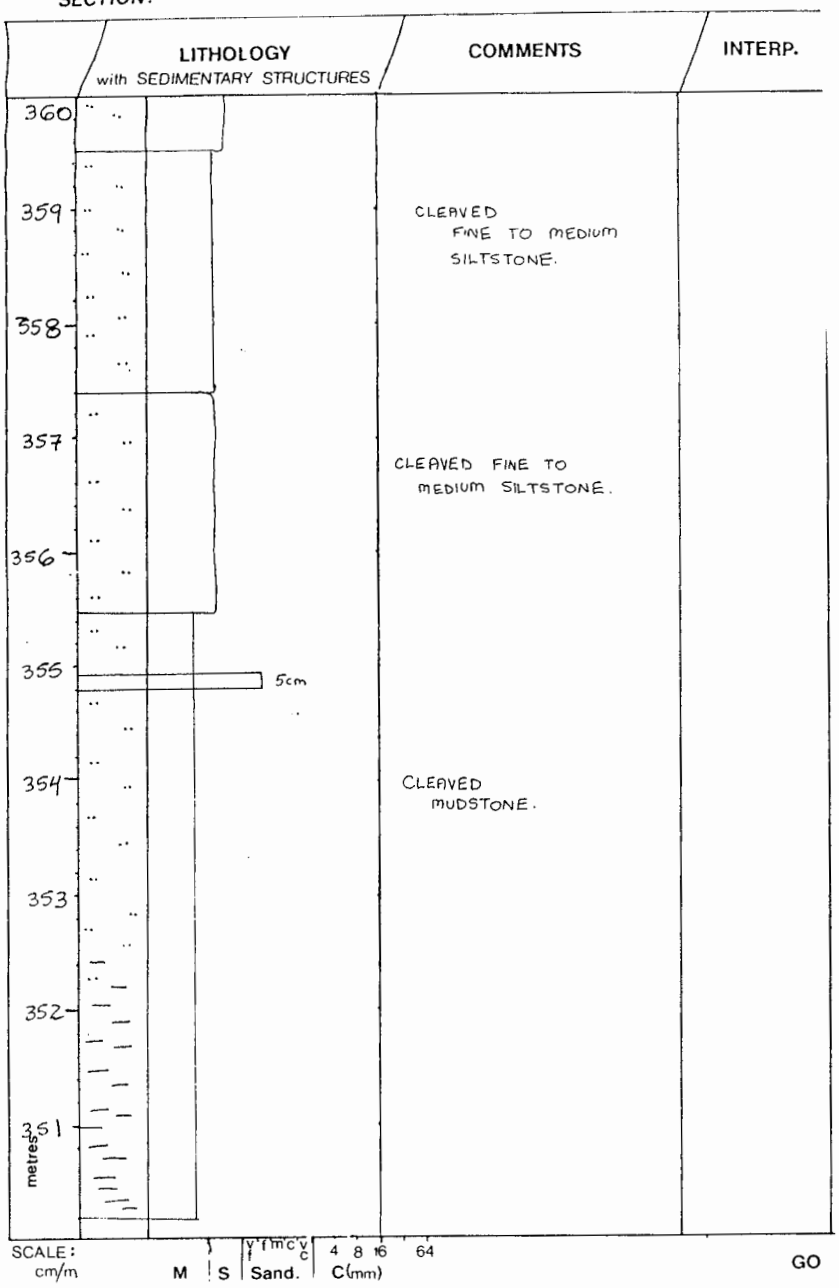


SECTION: C-4 LOCATION: TRYFAN EAST



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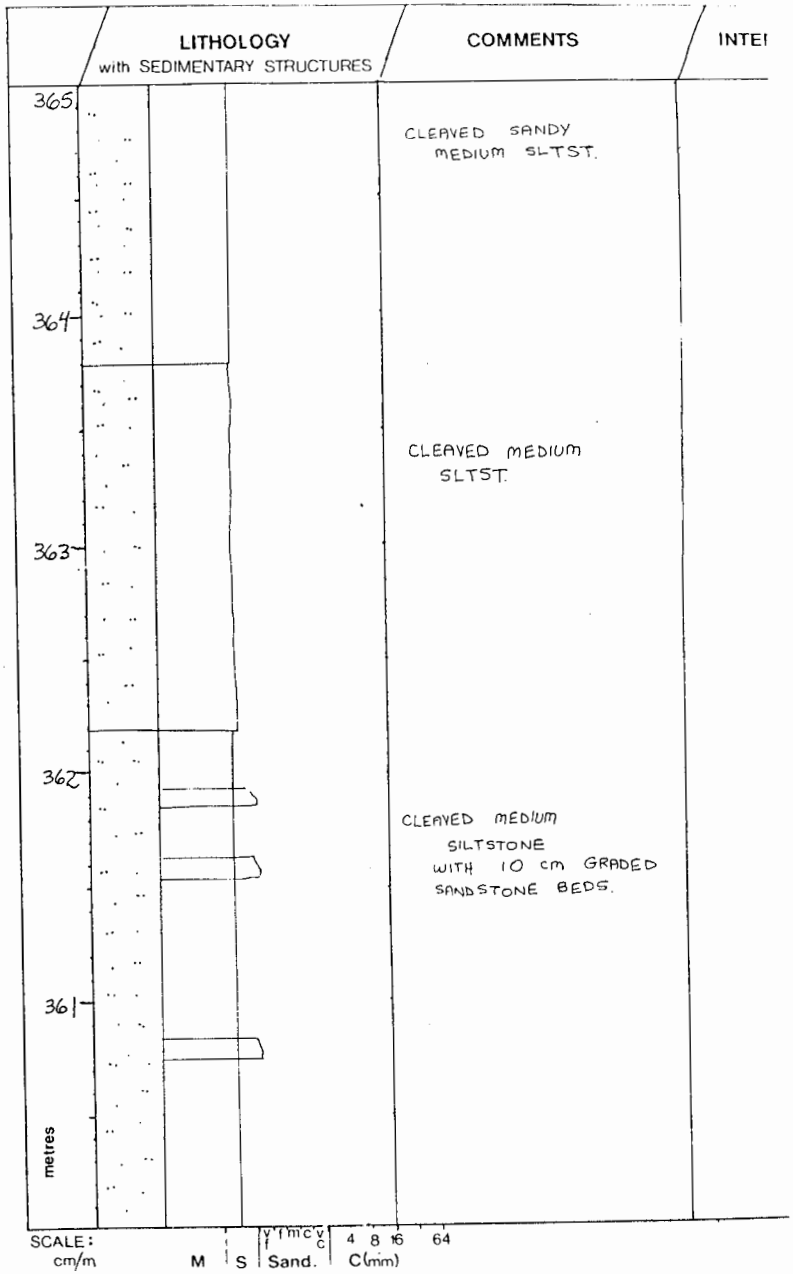
SECTION: C-9 LOCATION: TRYFAN EAST.



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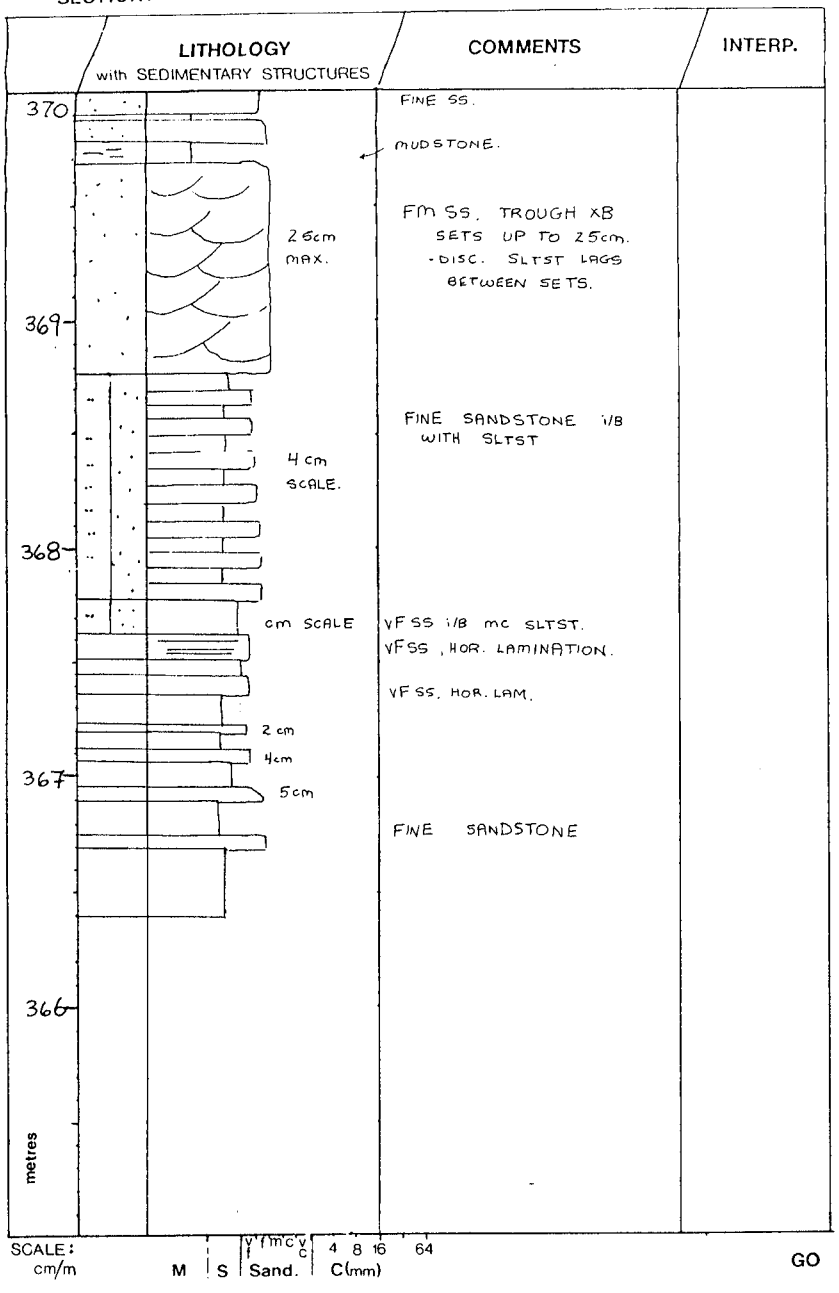
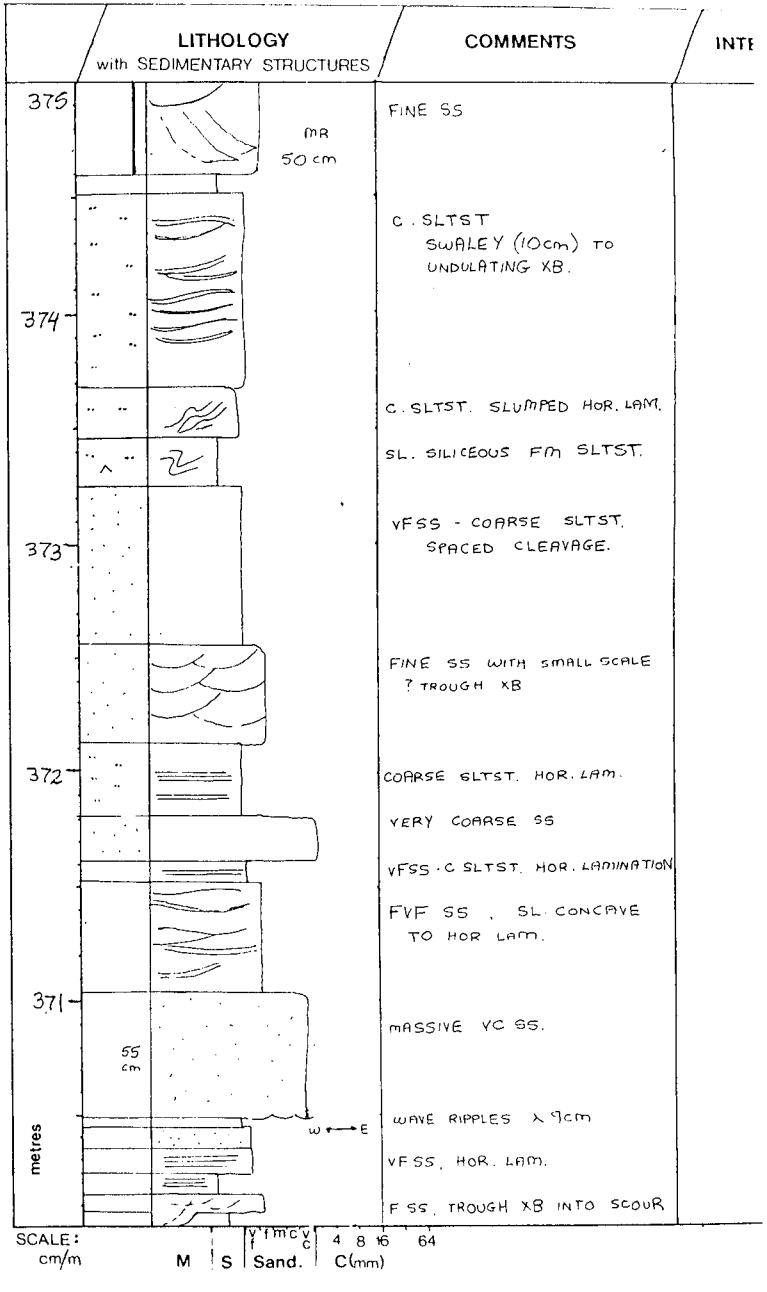
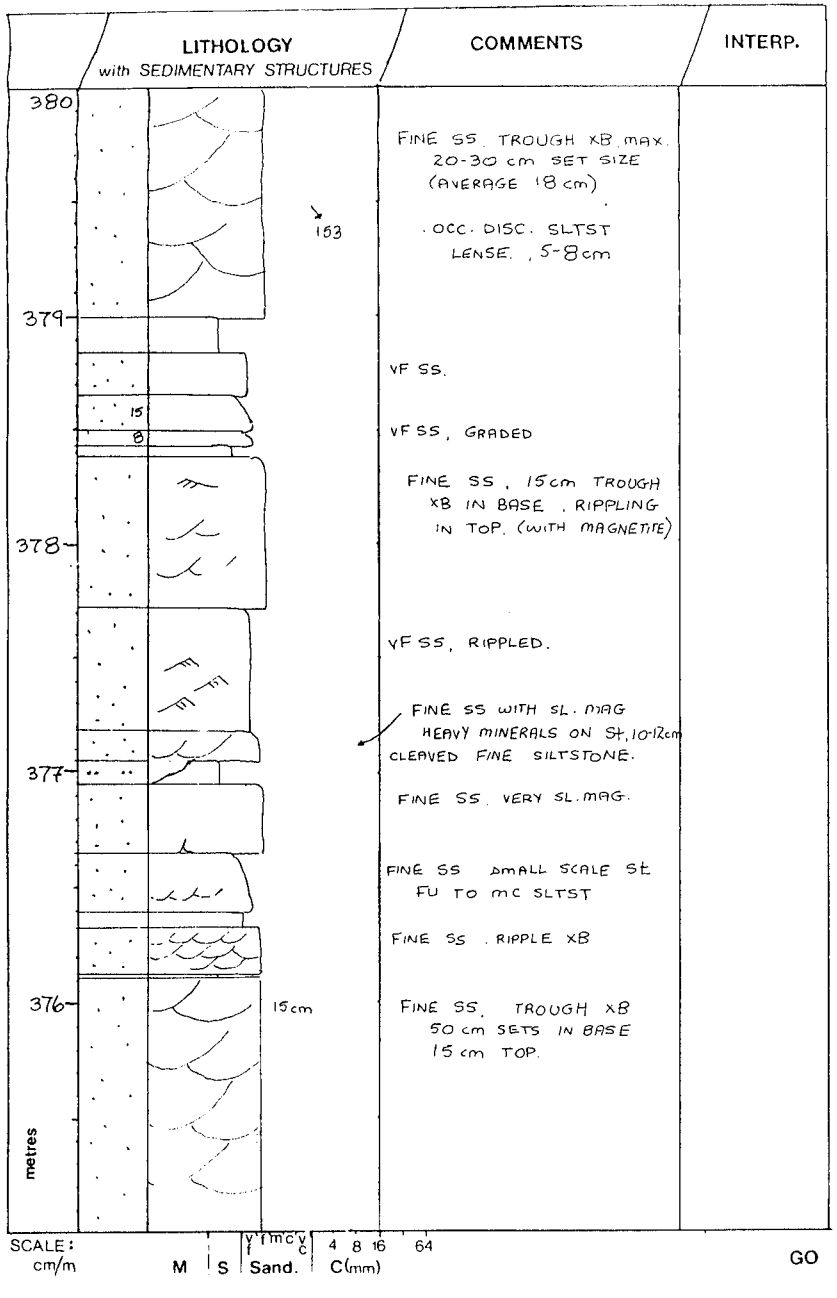


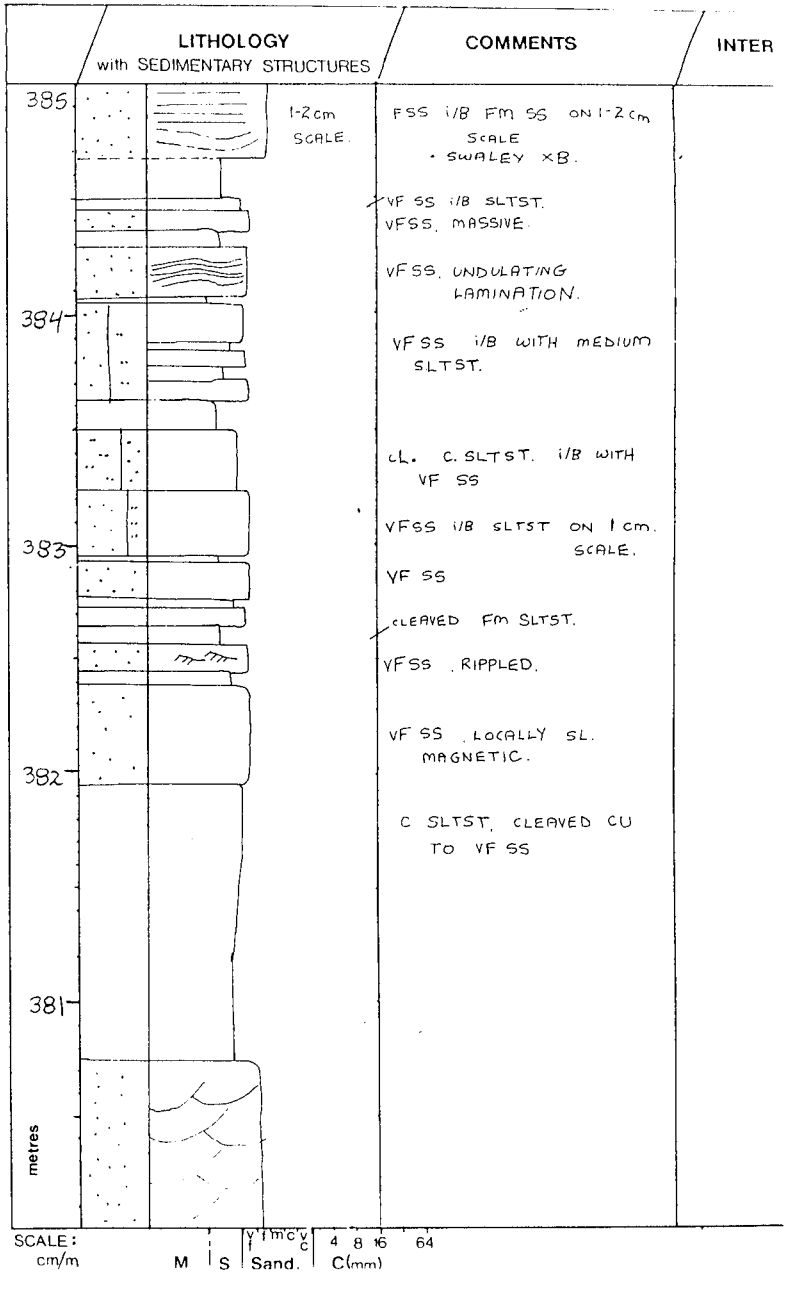
SECTION: C-4 LOCATION: TRYFAN EAST



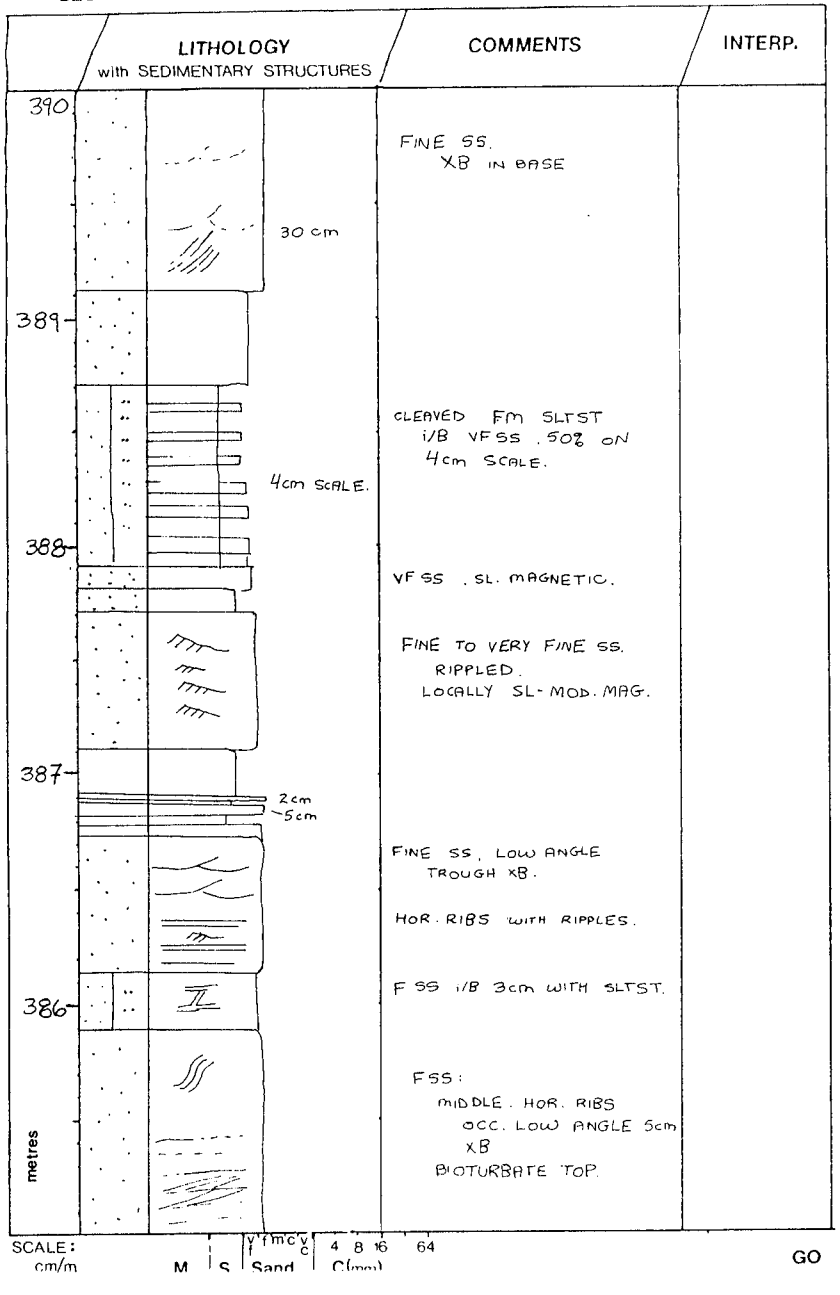
SECTION: C 4 LOCATION: TRYFAN EAST



SECTION: C 4 LOCATION: TRYFAN EAST.



SECTION: C 9 LOCATION: TRYFAN EAST



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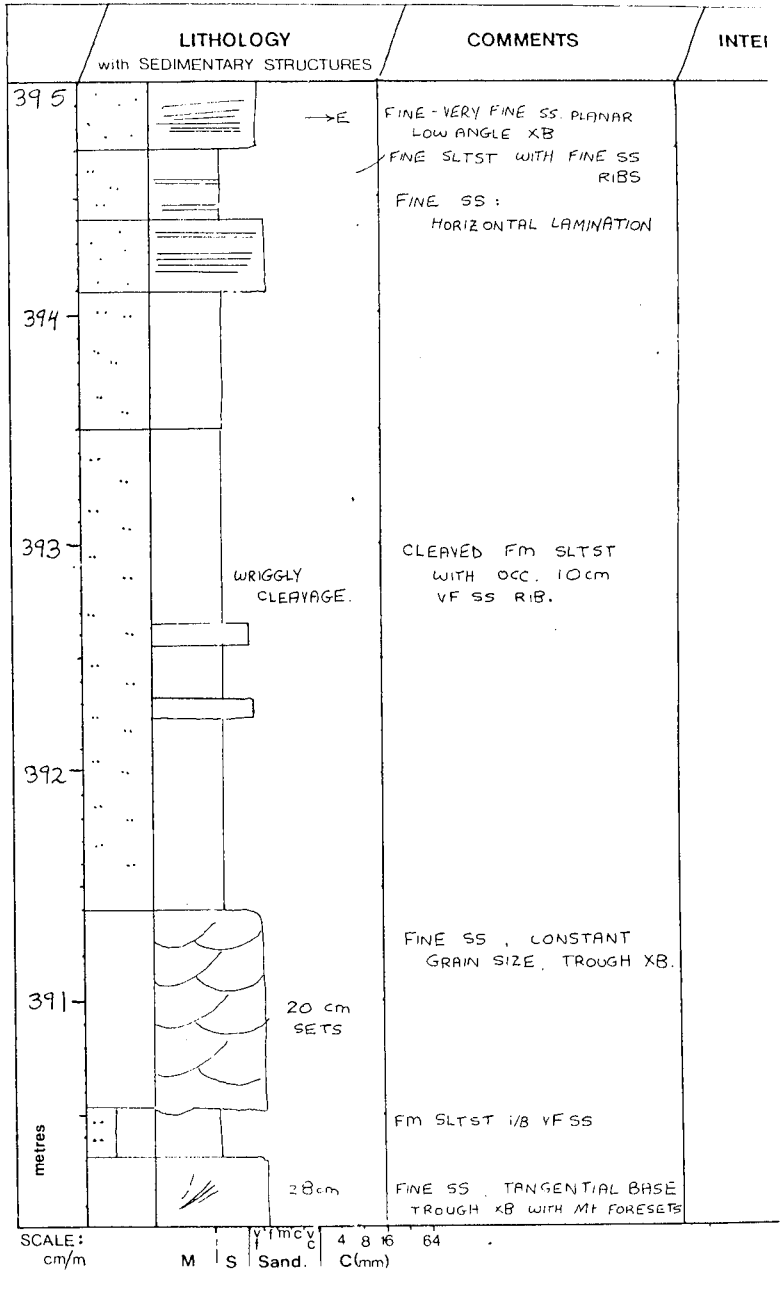
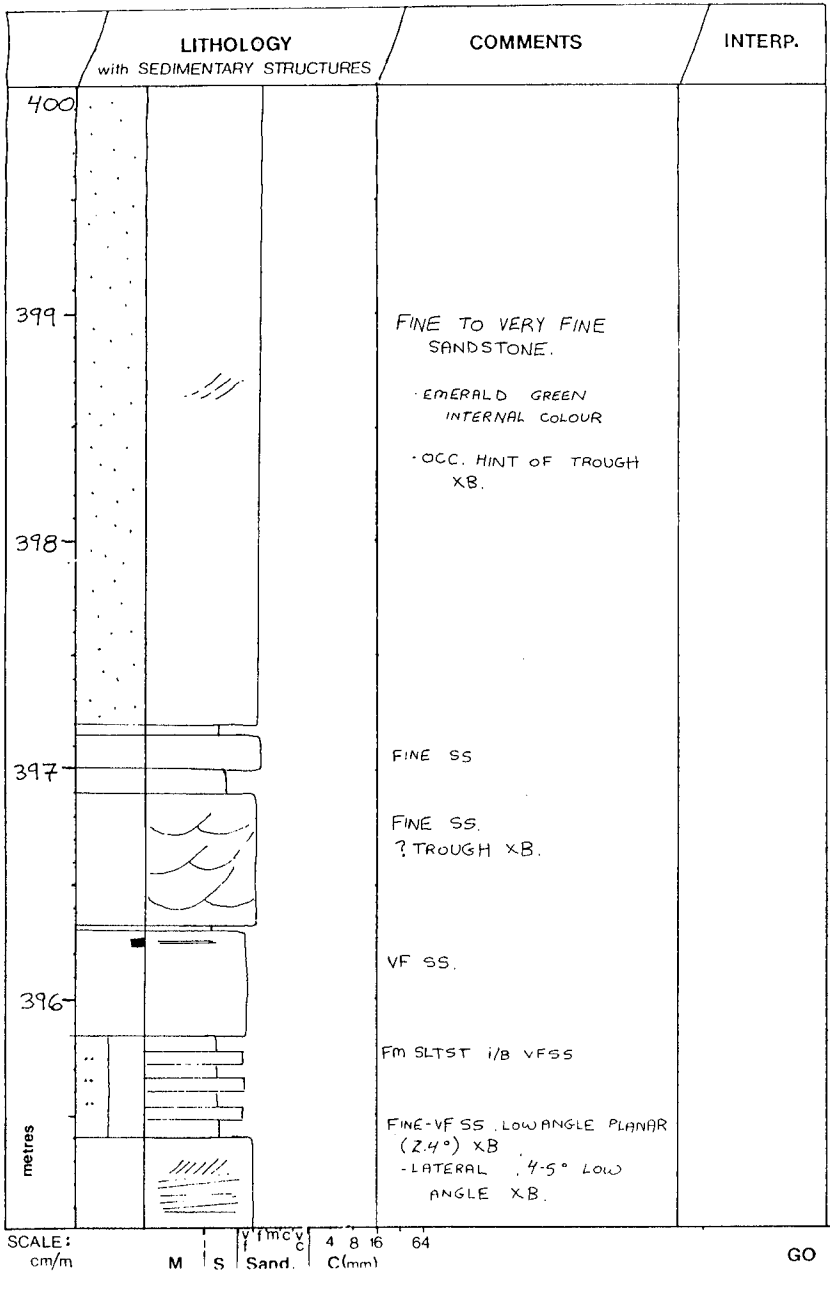
SECTION: C-9 LOCATION: TRYFAN EAST



SECTION: C 9 LOCATION: TRYFAN EAST



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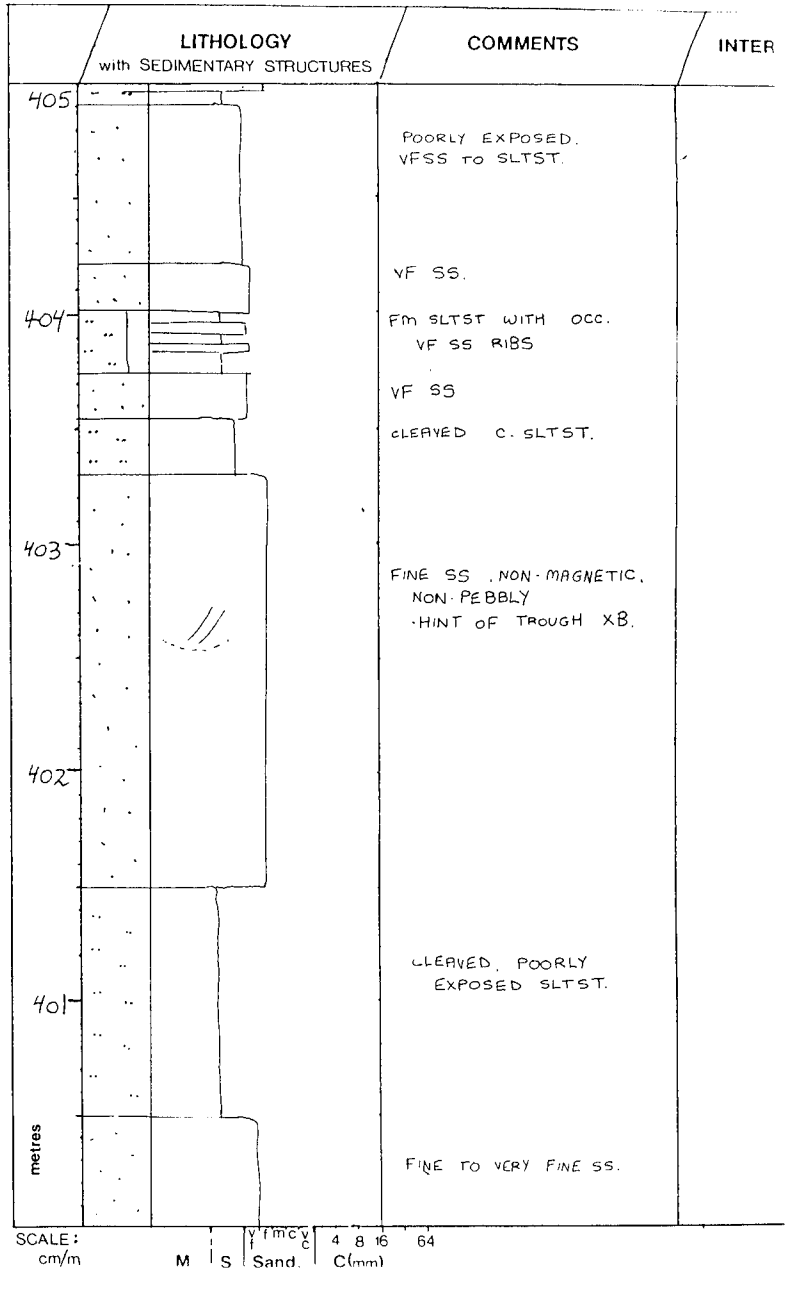
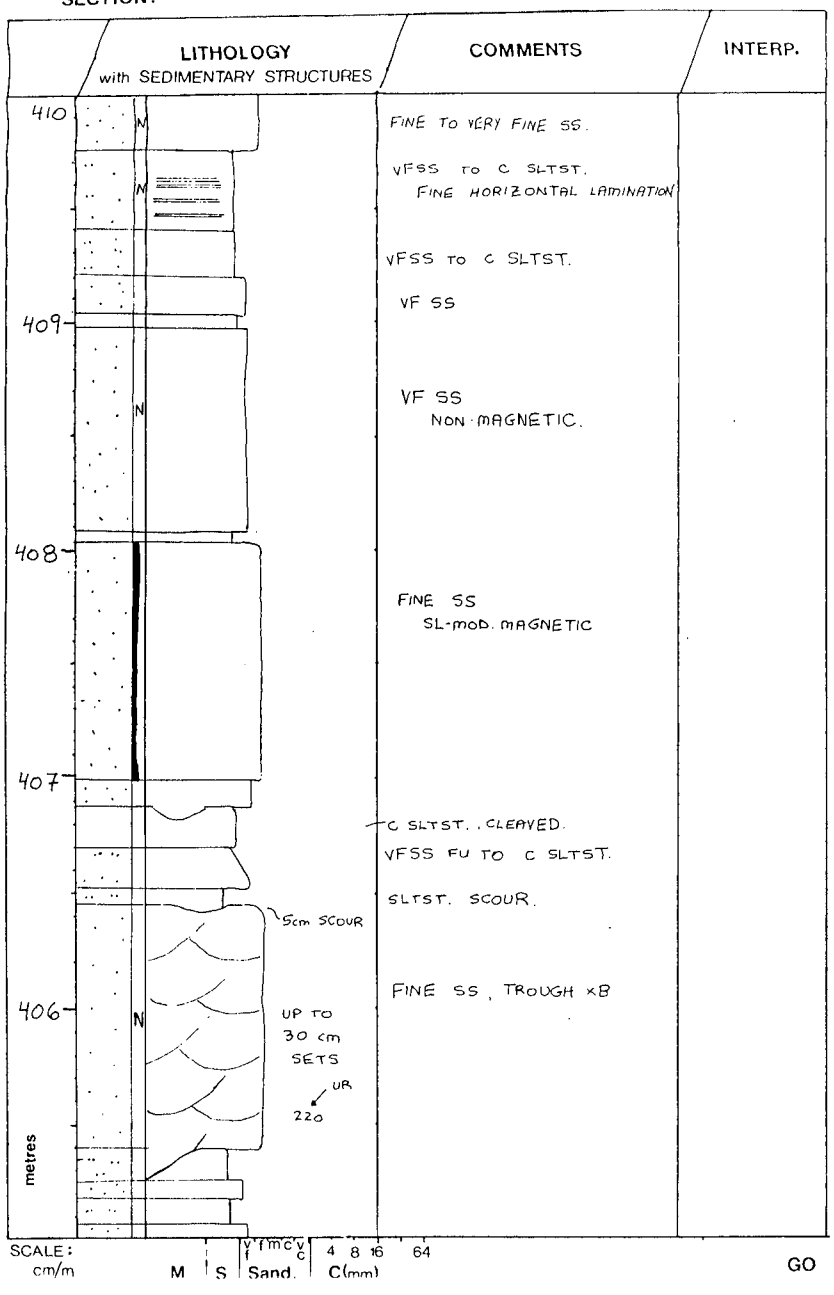
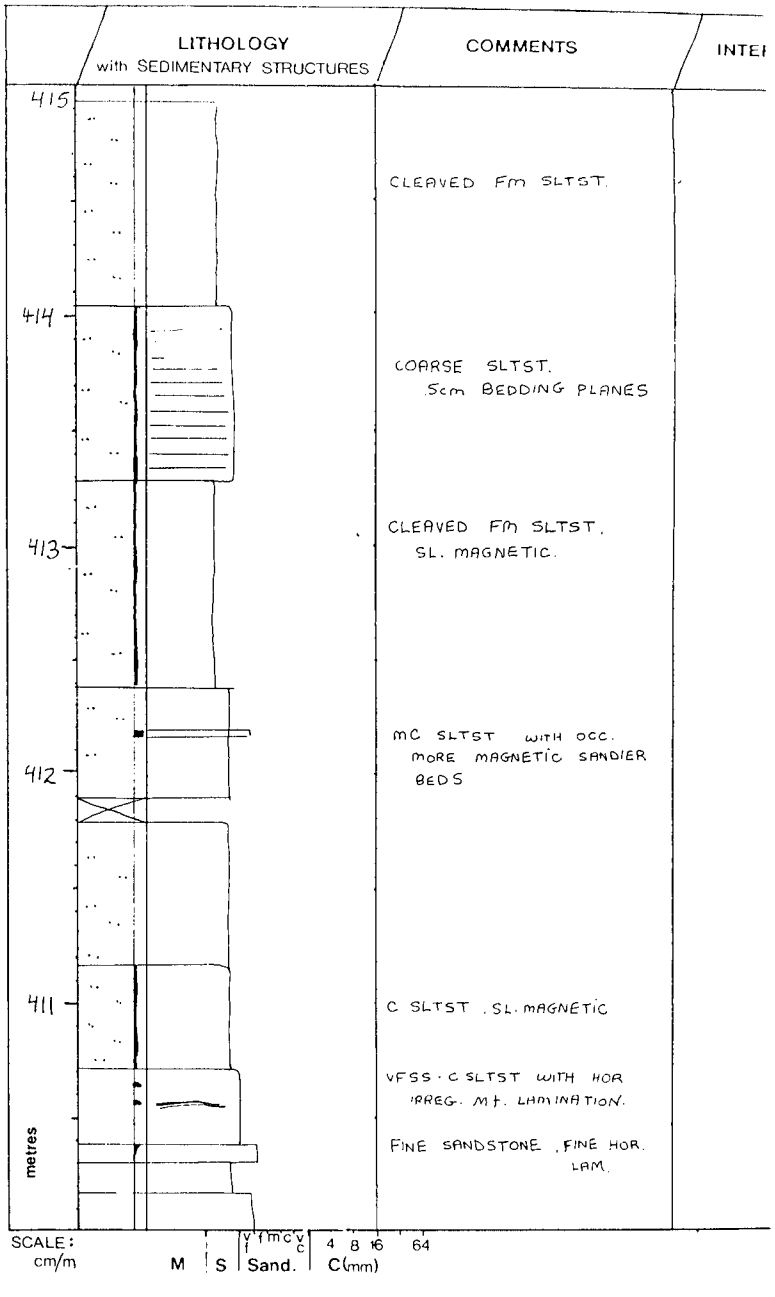
SECTION: C 9 LOCATION: TRYFAN EAST



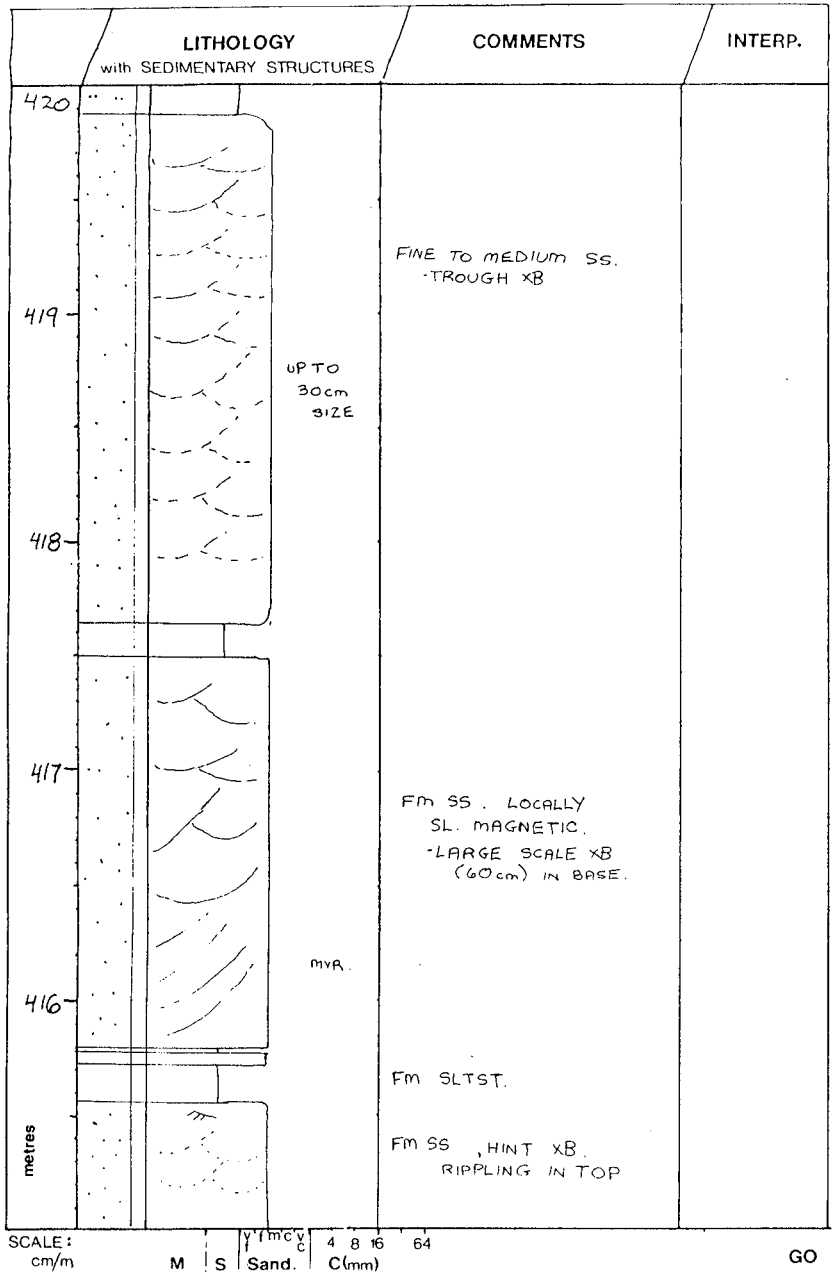
SECTION: C9 LOCATION: TRYFAN EAST.



SECTION: C1 LOCATION: TRYFAN EAST



SECTION: C4 LOCATION: TRYFAN EAST.



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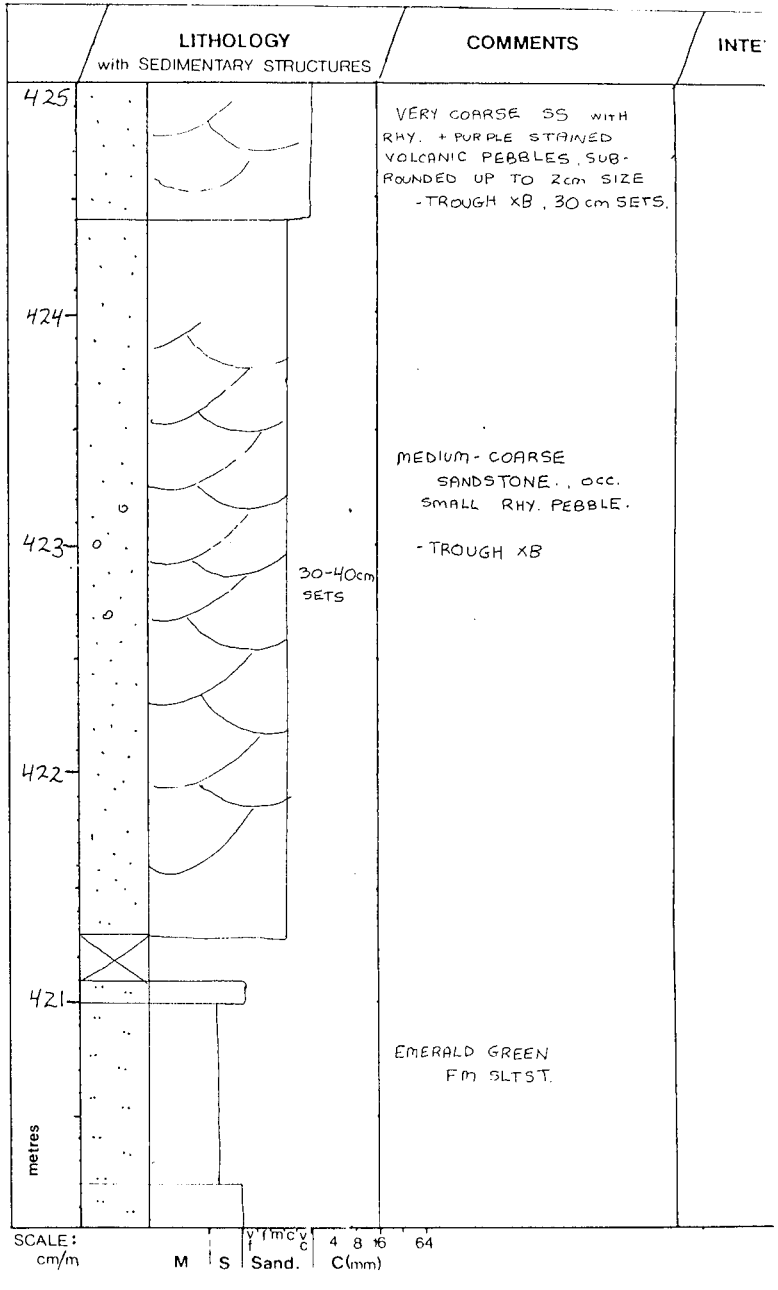
SECTION: C4 LOCATION: TRYFAN EAST



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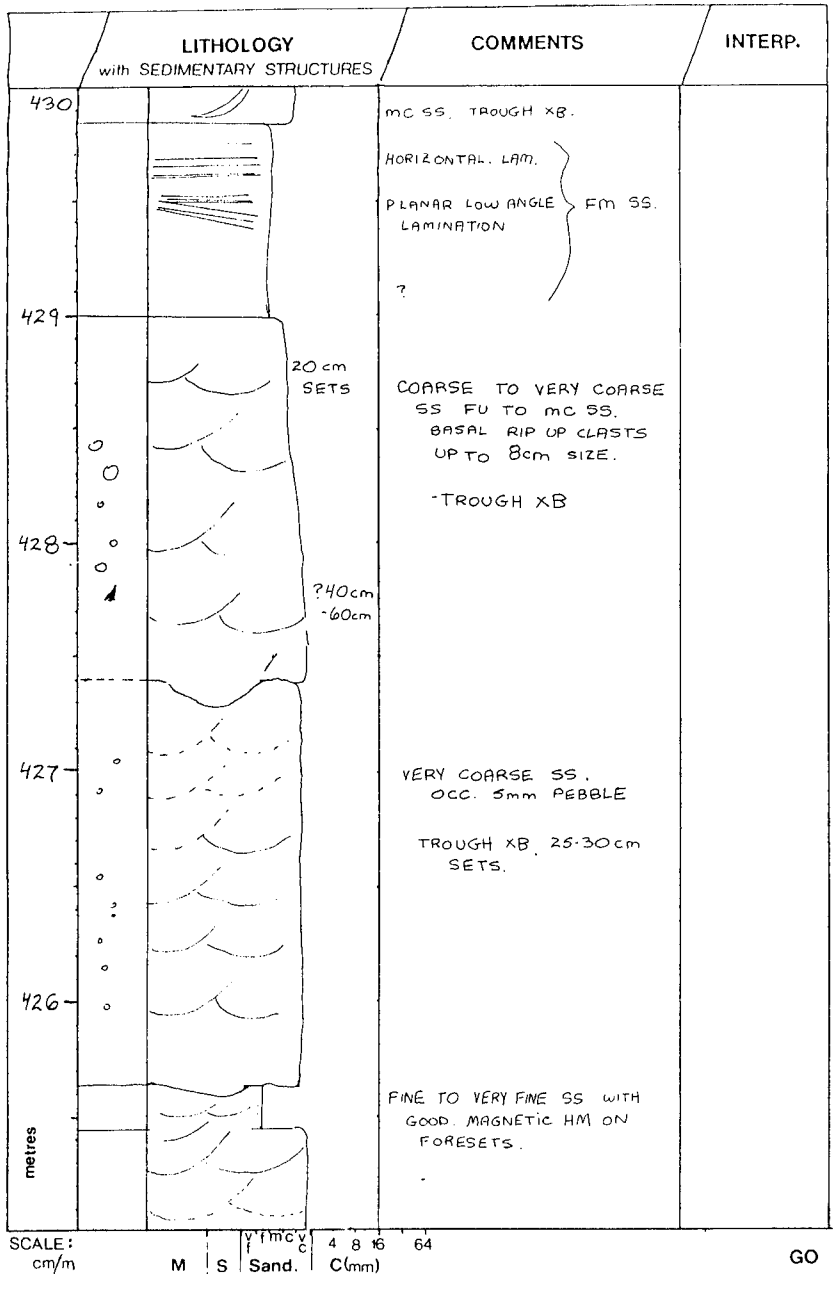
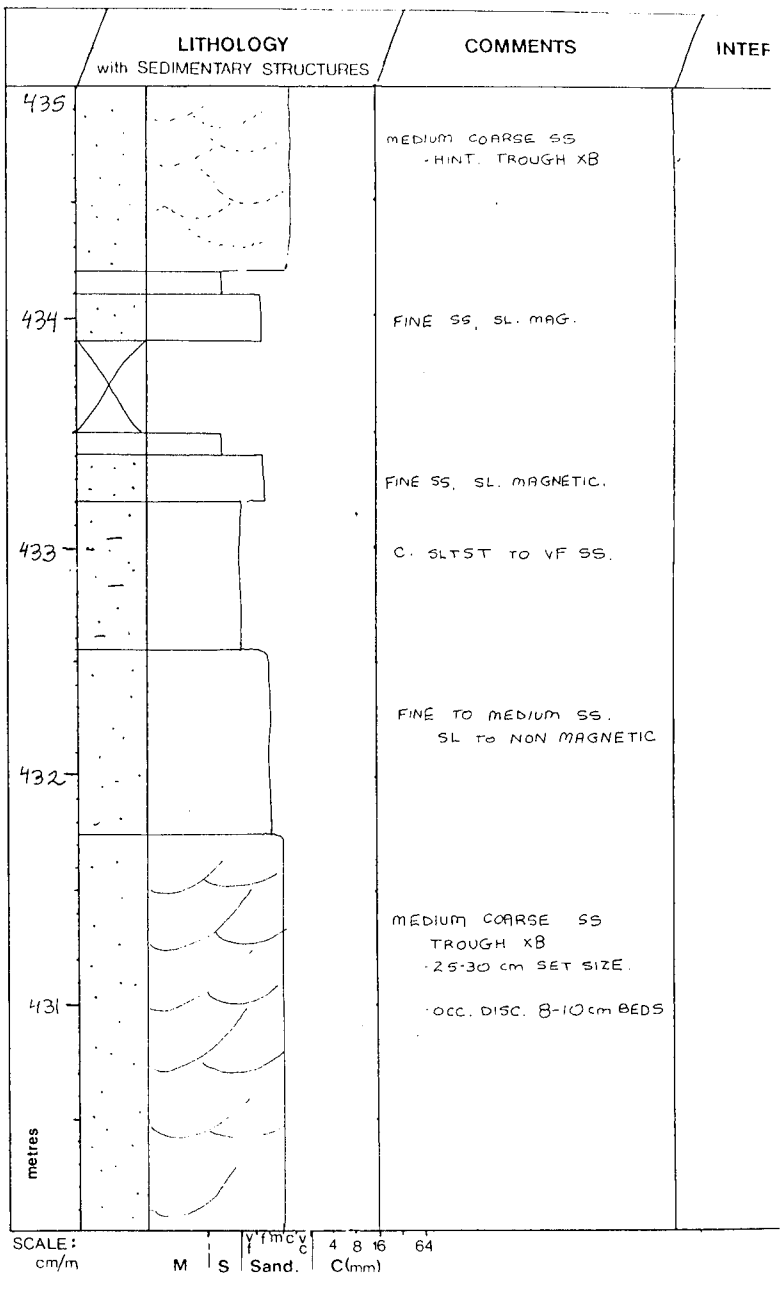
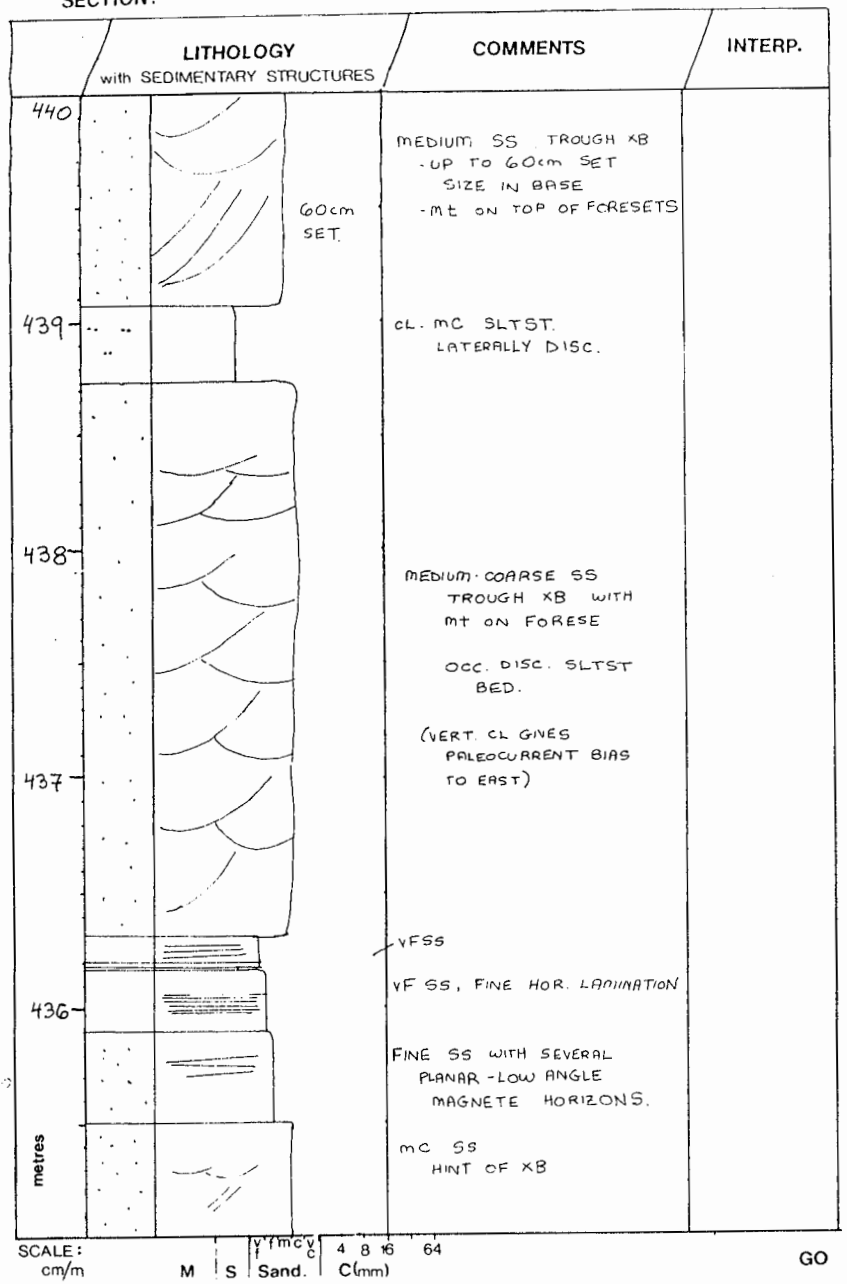


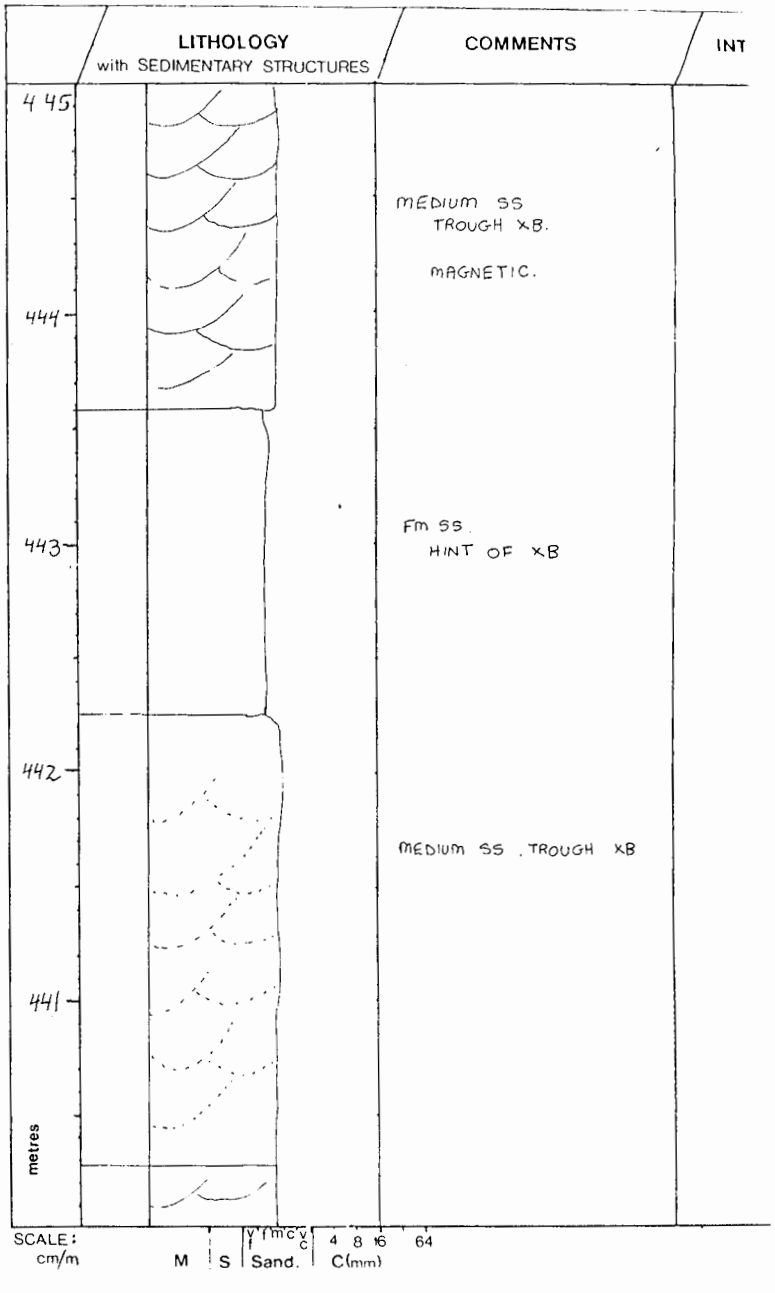
SECTION: C 4 LOCATION: TRYFAN EAST



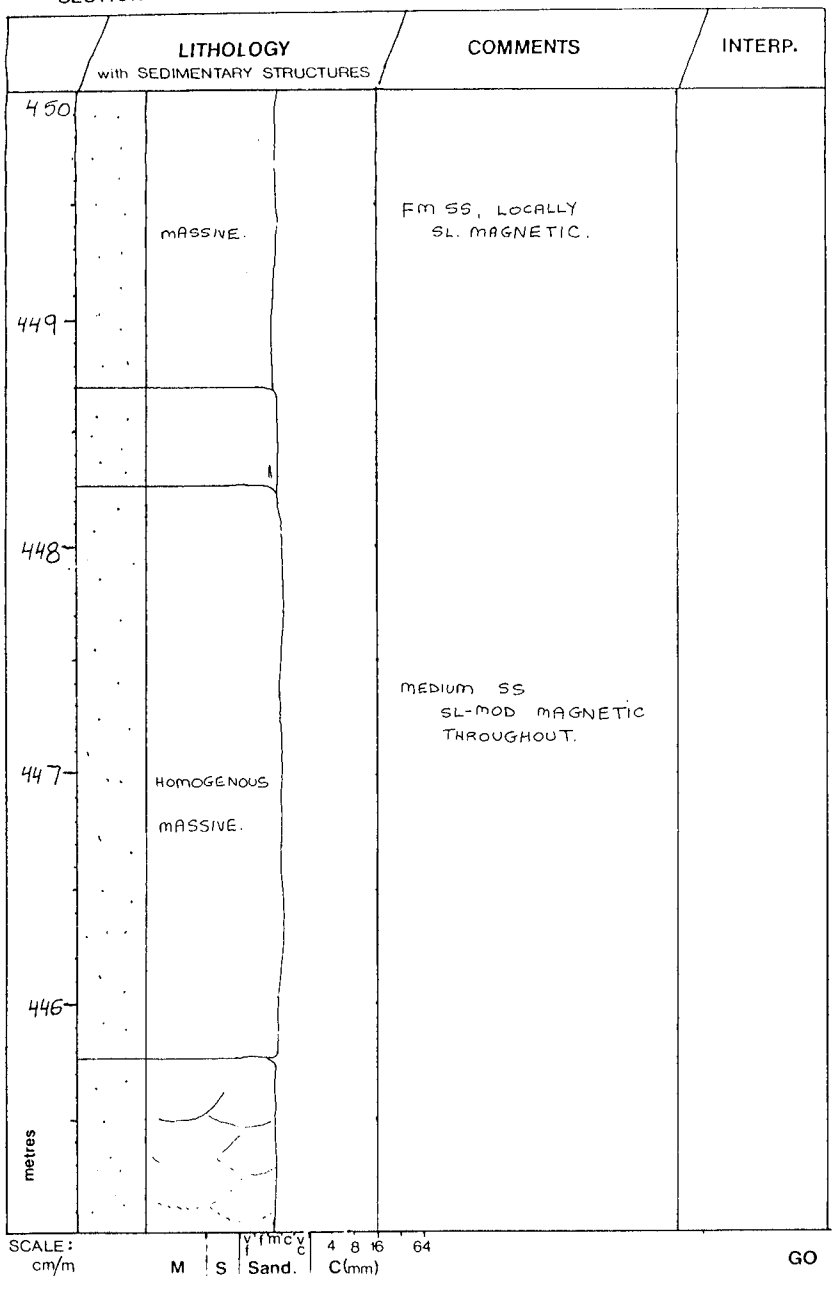
SECTION: C9 LOCATION: TRYFAN EAST



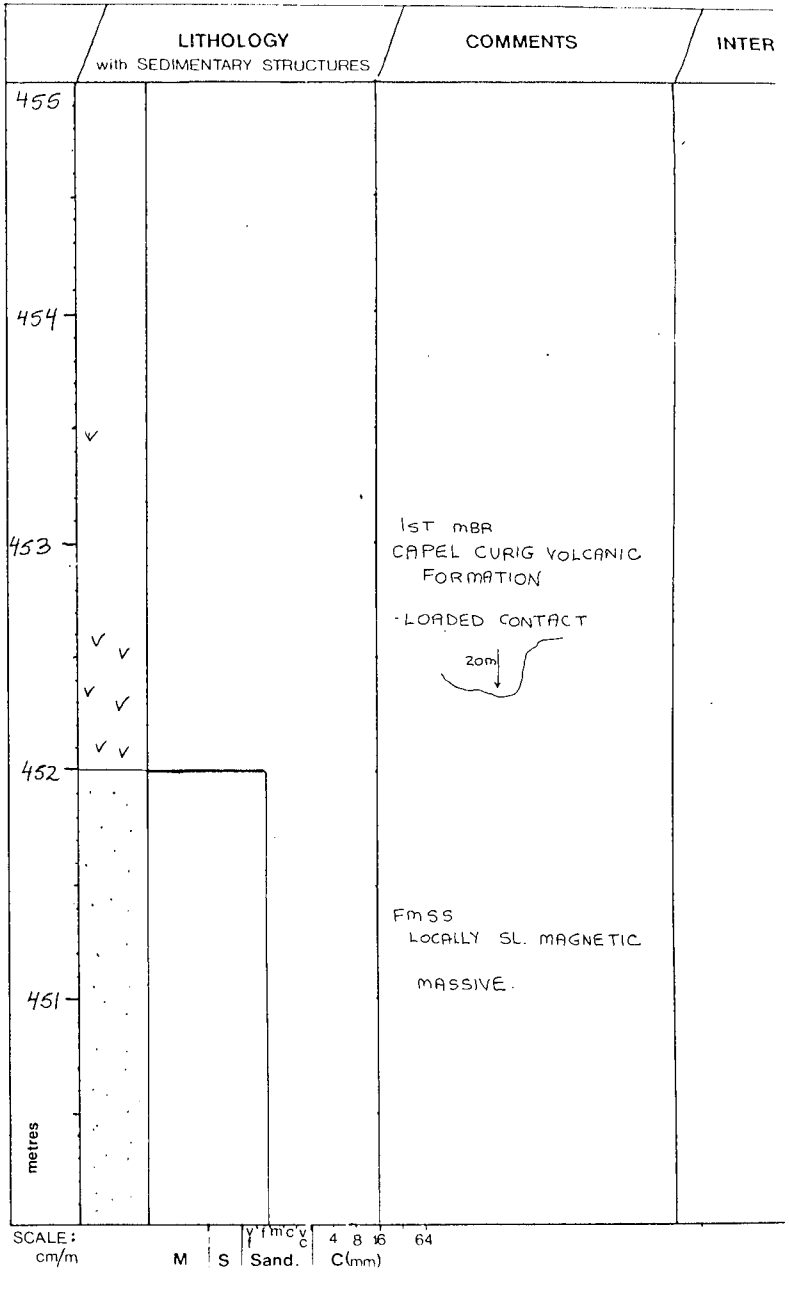
SECTION: C9 LOCATION: TRYFAN EAST



SECTION: C-4 LOCATION: TRYFAN EAST

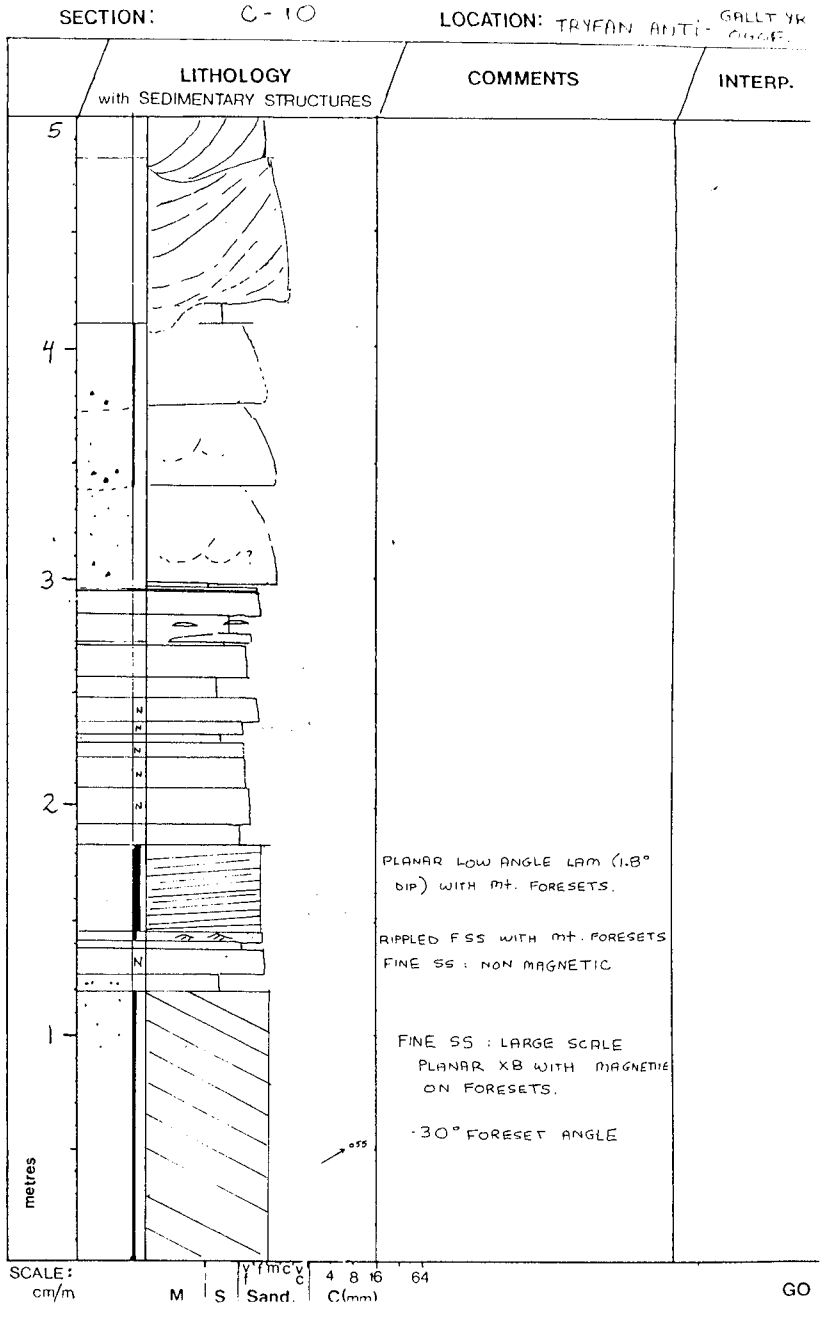


SECTION: C9 LOCATION:

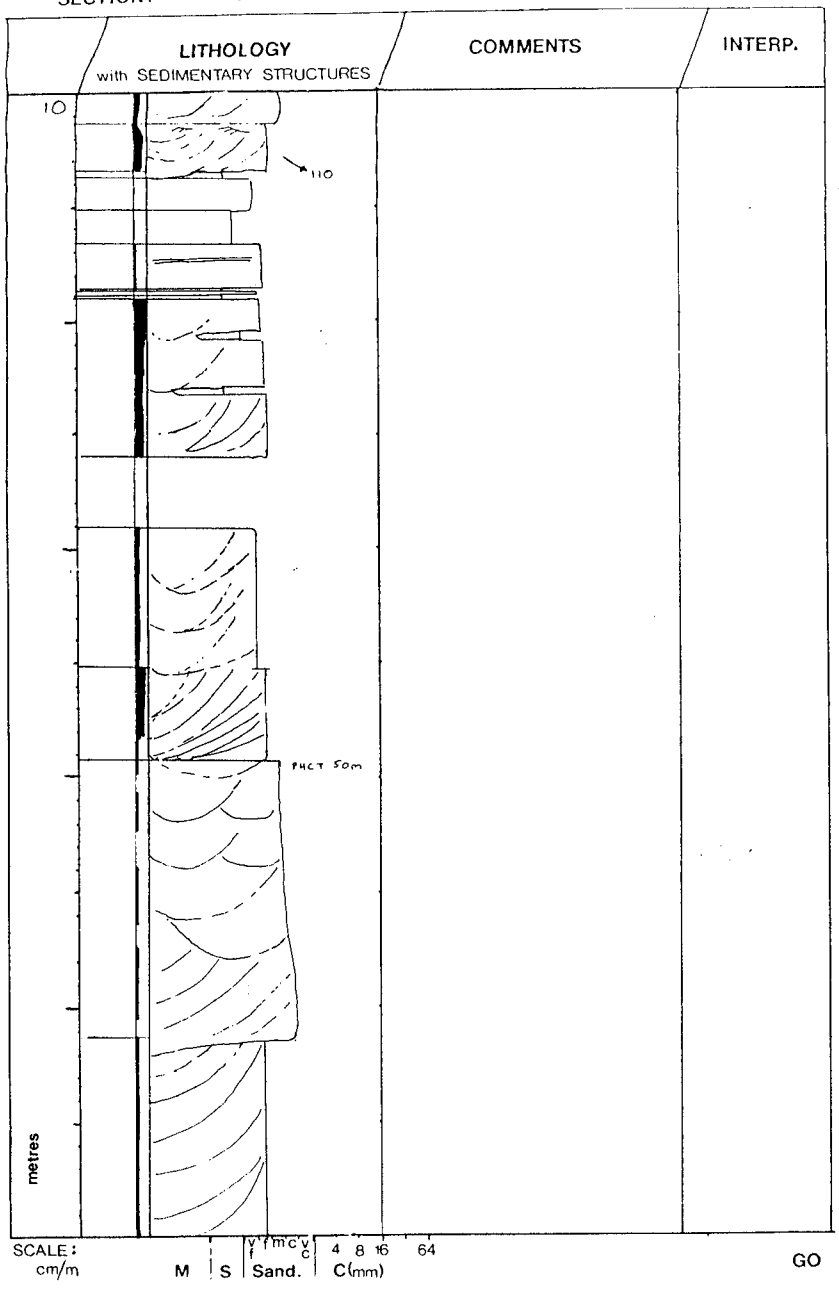


SECTION C10

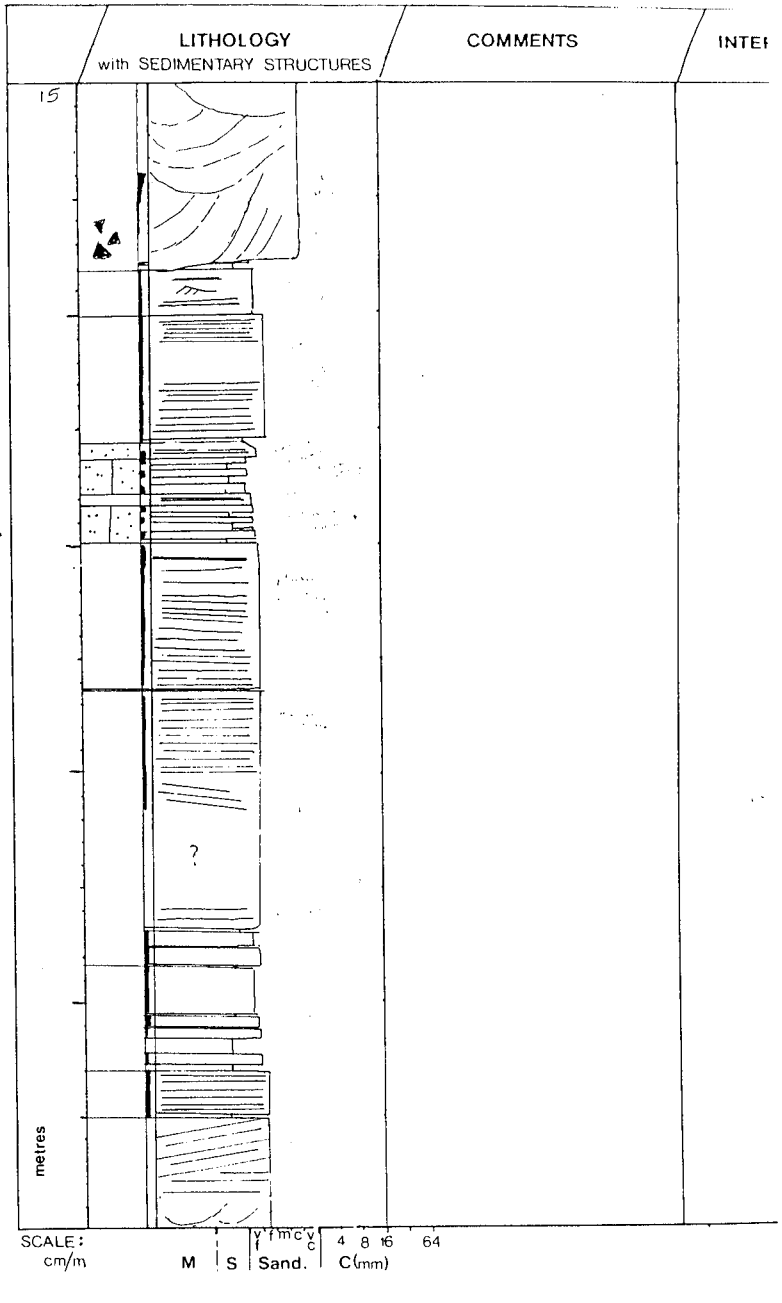
SECTION C10 LOCATION: Locate lowest well-exposed outcrops of sandstone beneath Garth Tuff at most northerly end of Gallt yr ogof. Section continues stratigraphically until base of Garth Tuff.



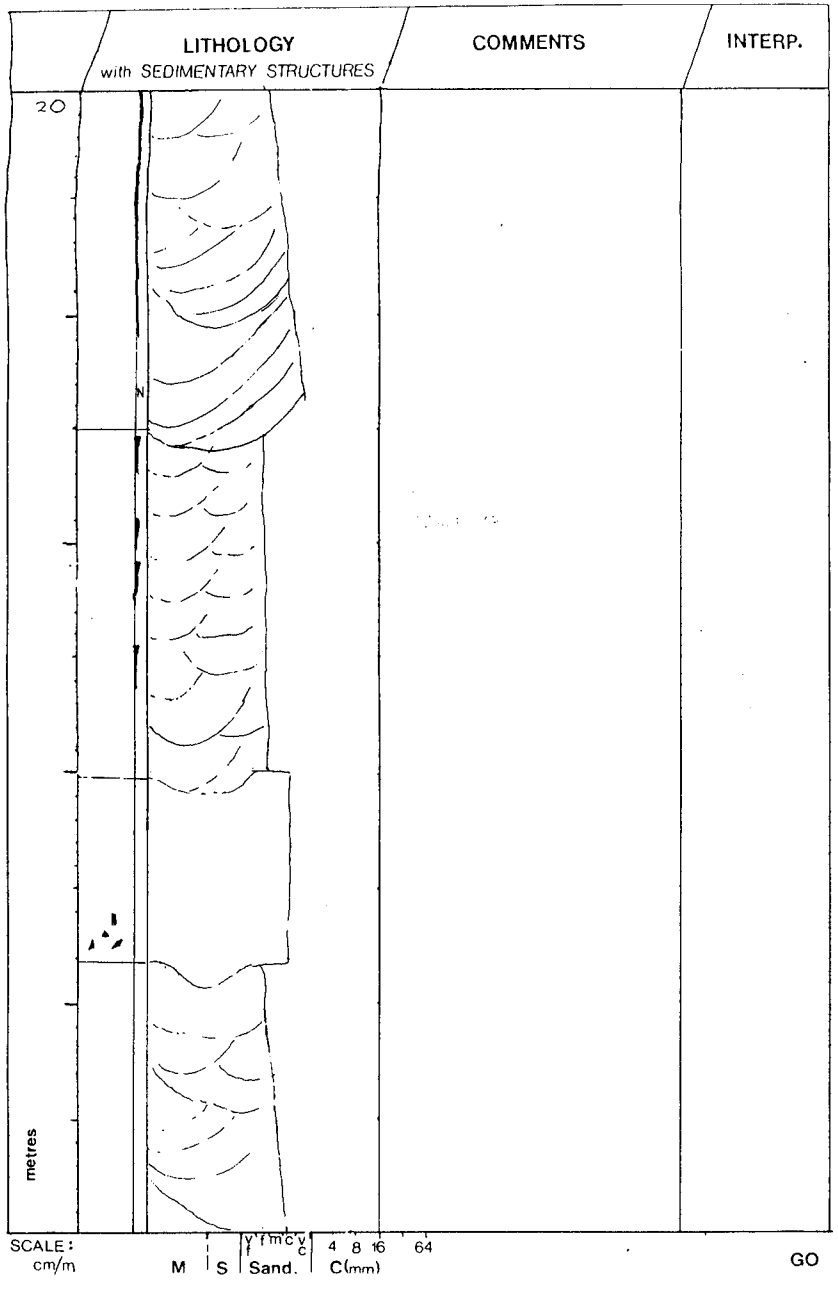
SECTION: C10 LOCATION:



SECTION: C10 LOCATION: TRYFAN ANTICLINE



SECTION: C10 LOCATION:



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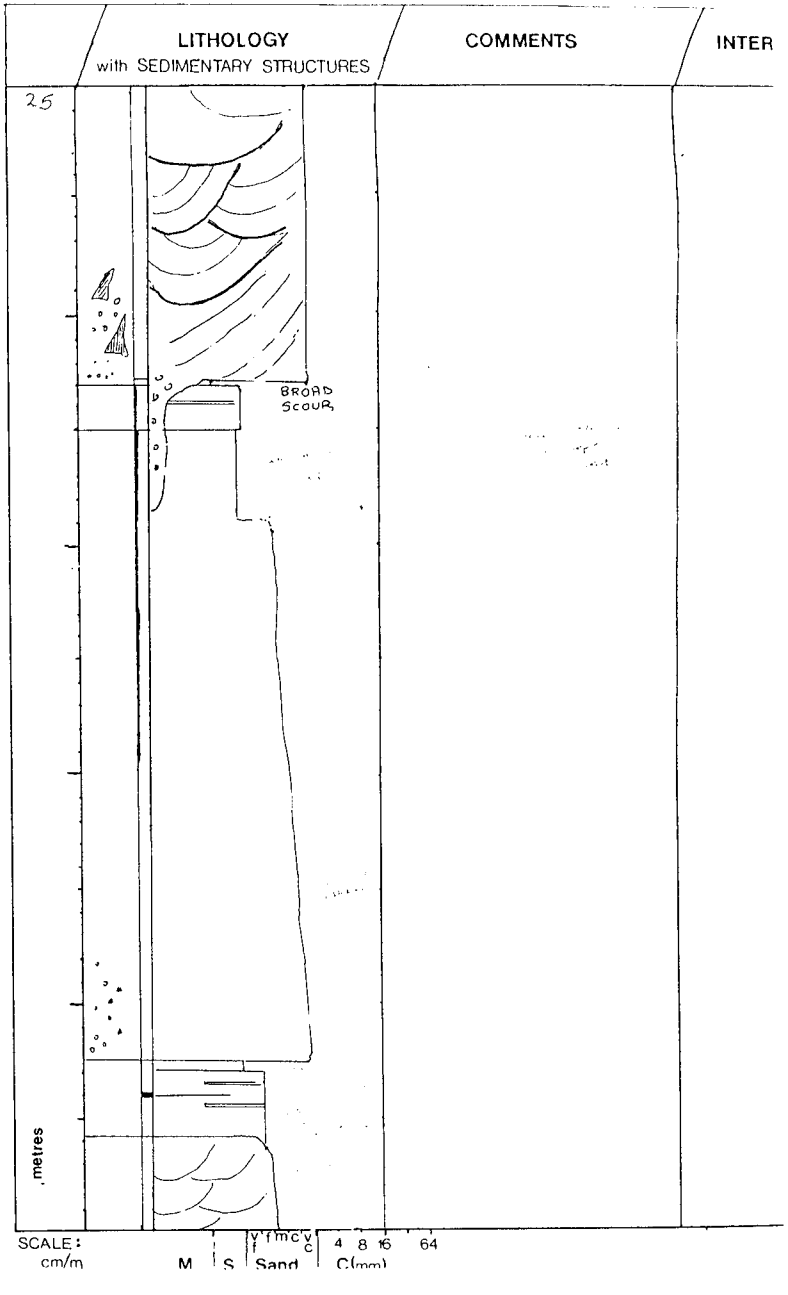

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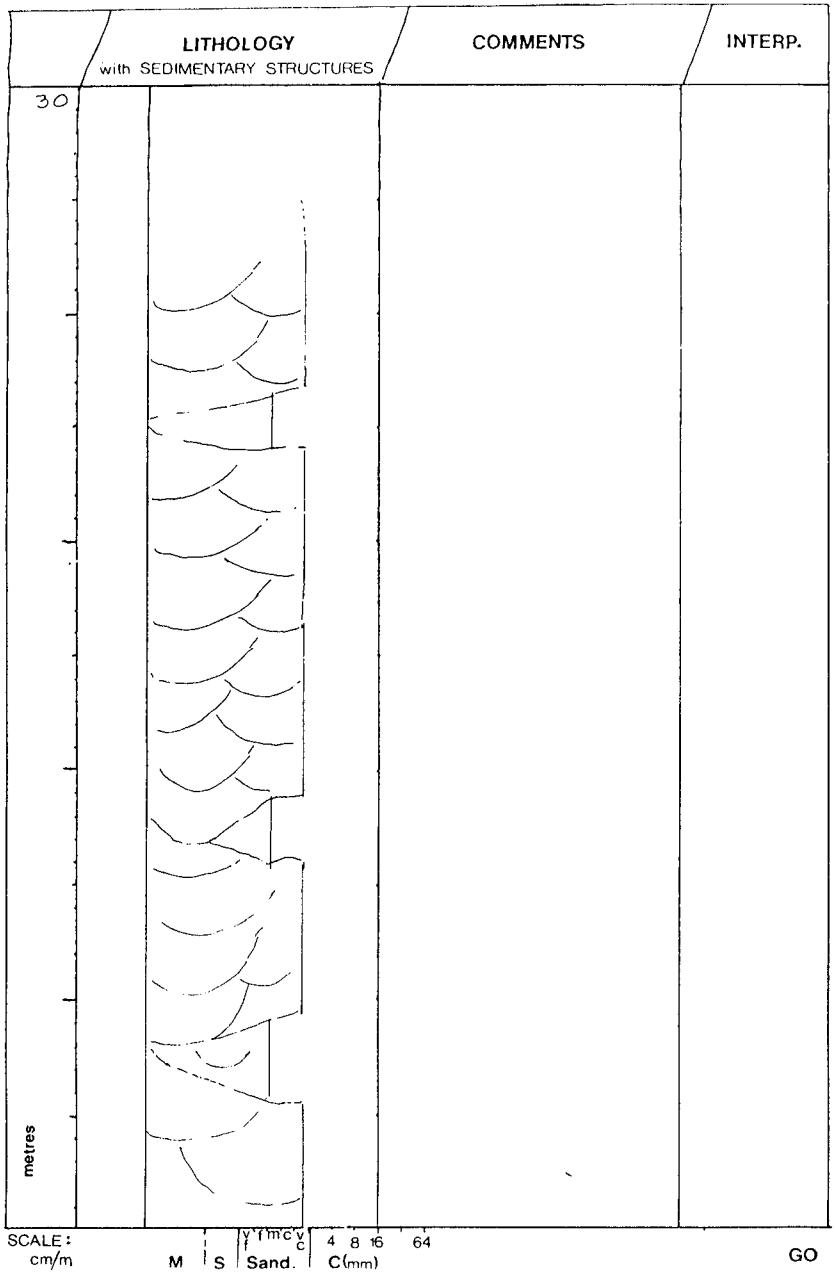
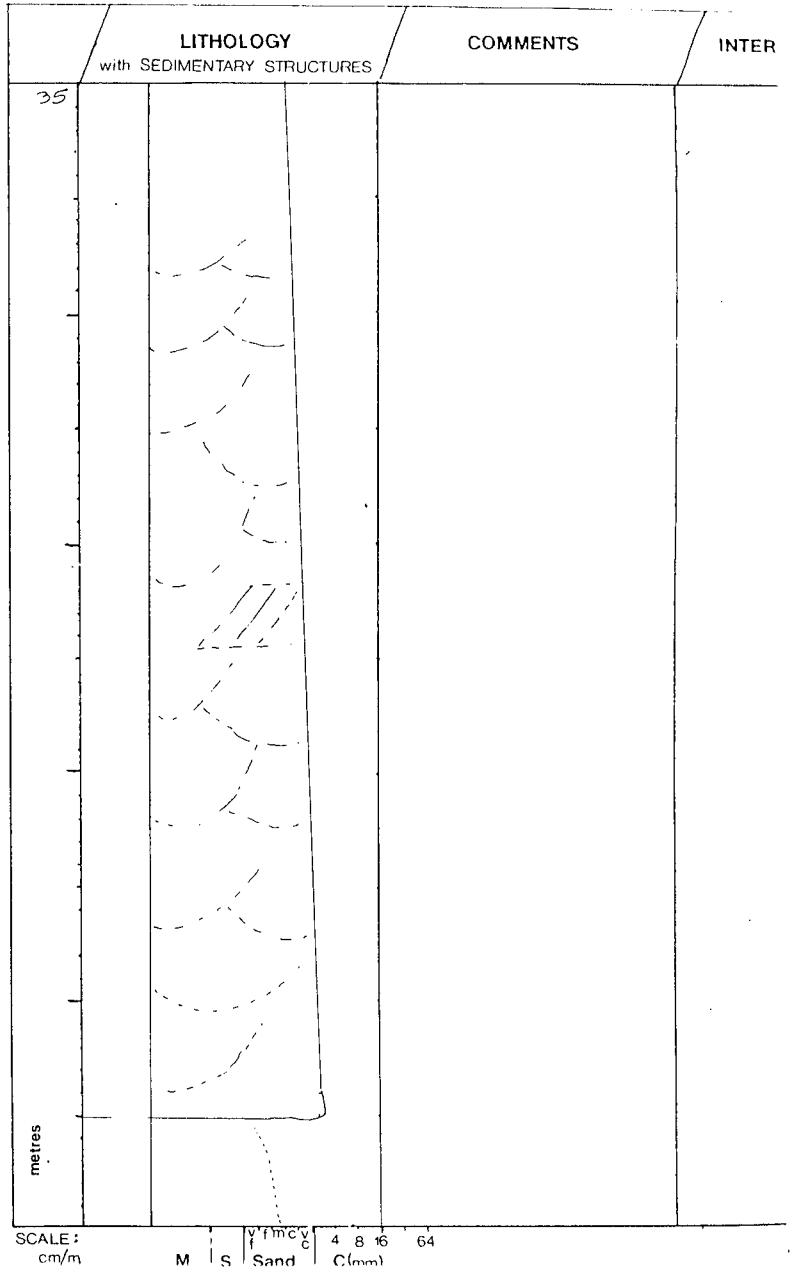


SECTION: LOCATION:



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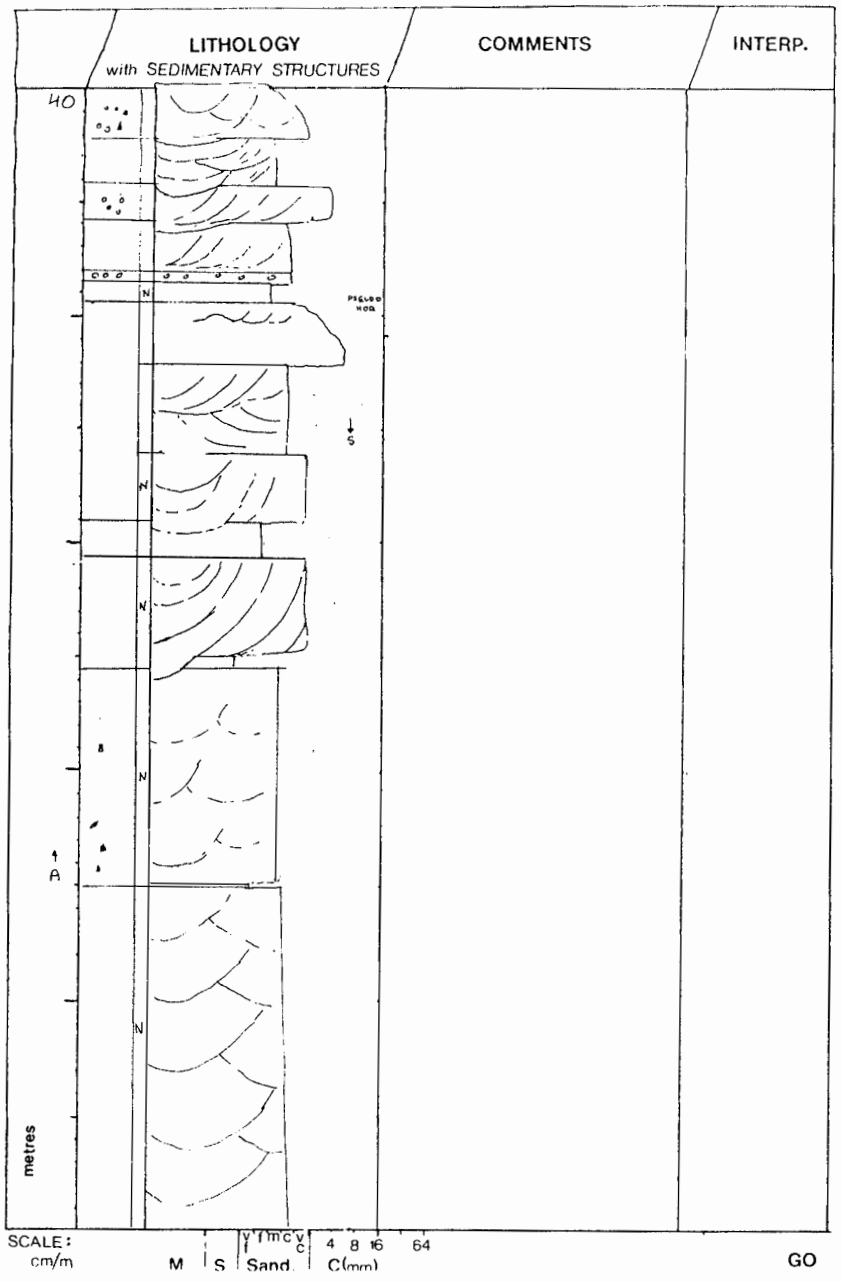

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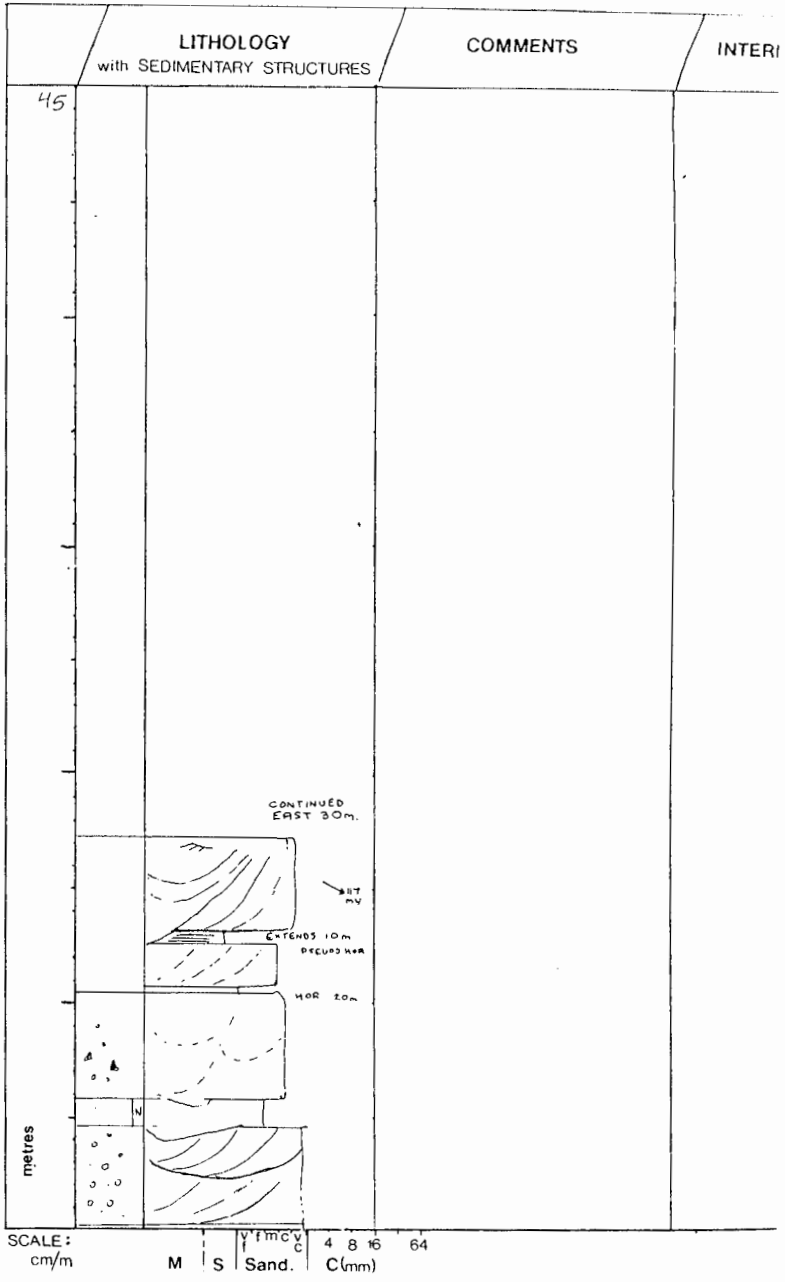
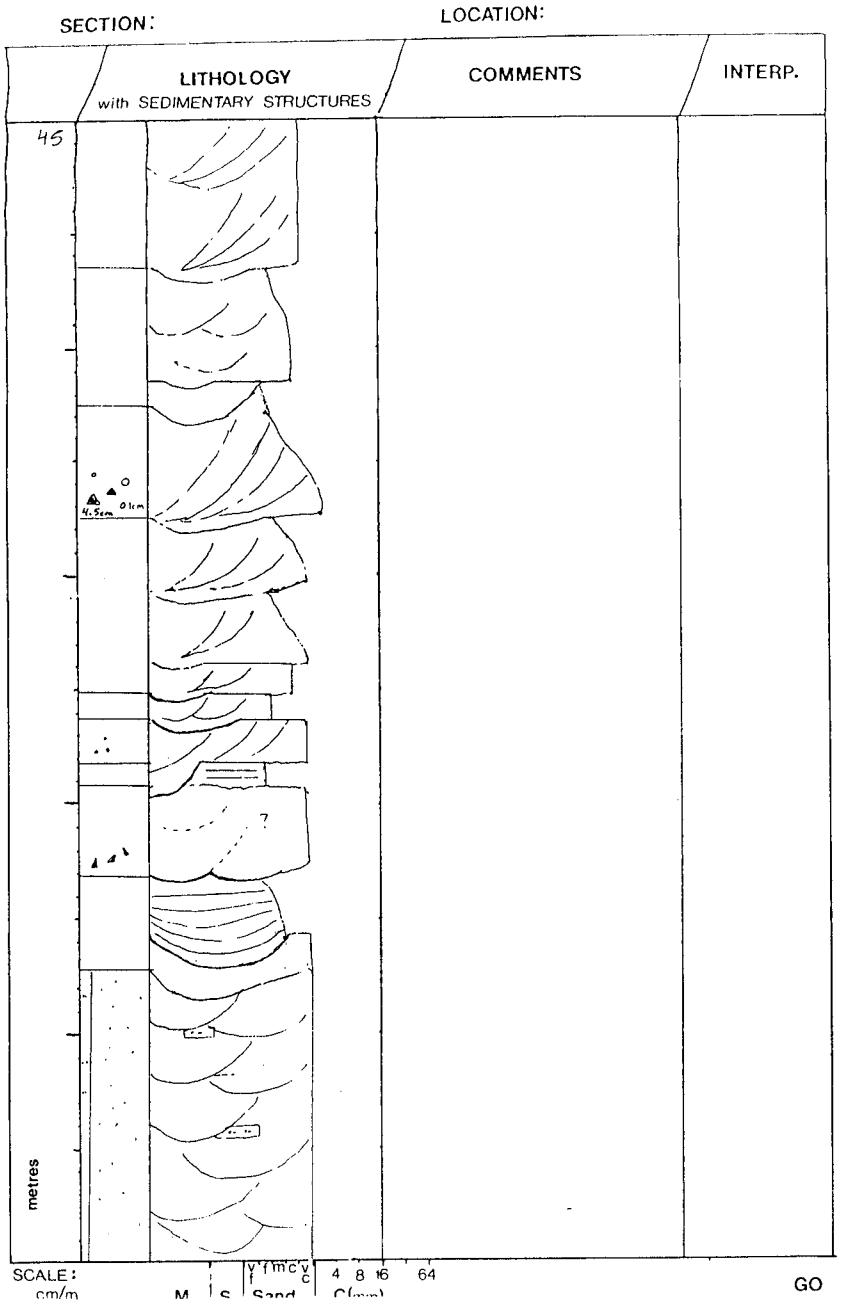
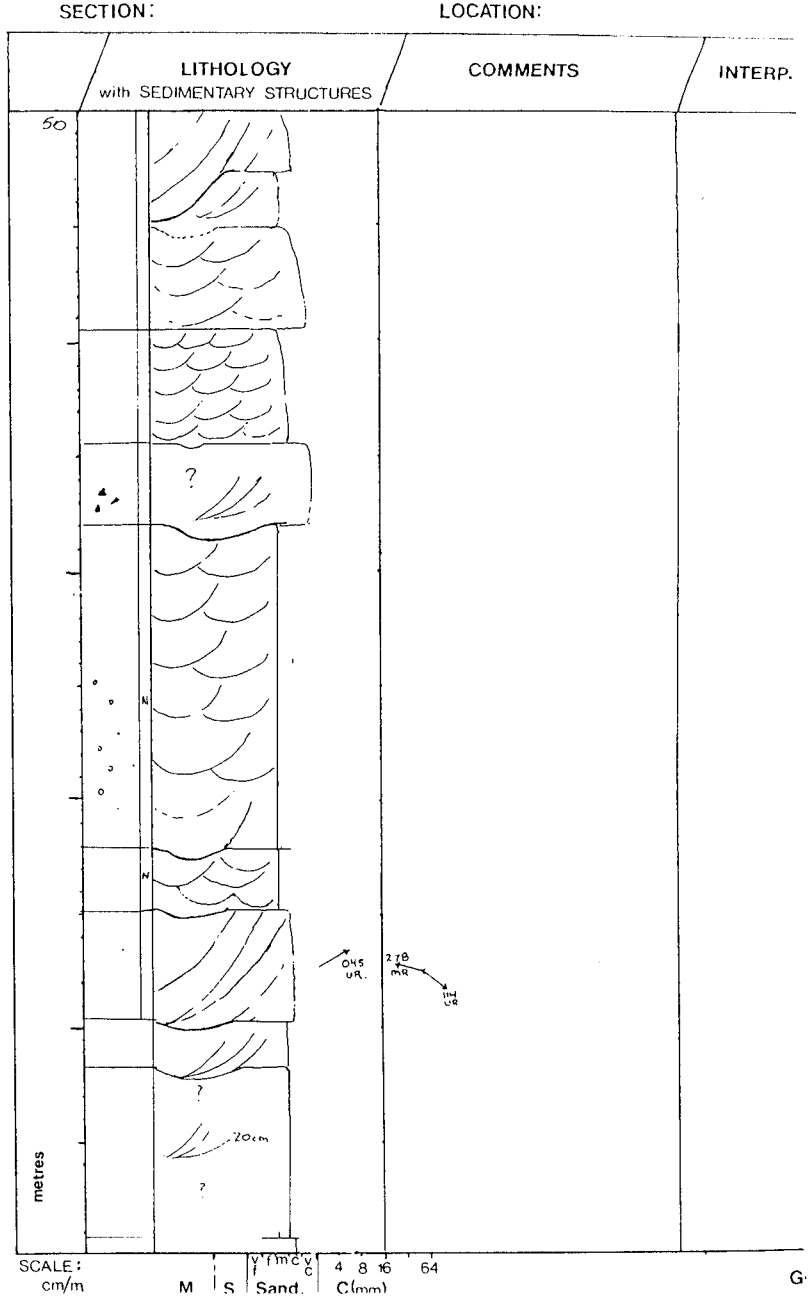
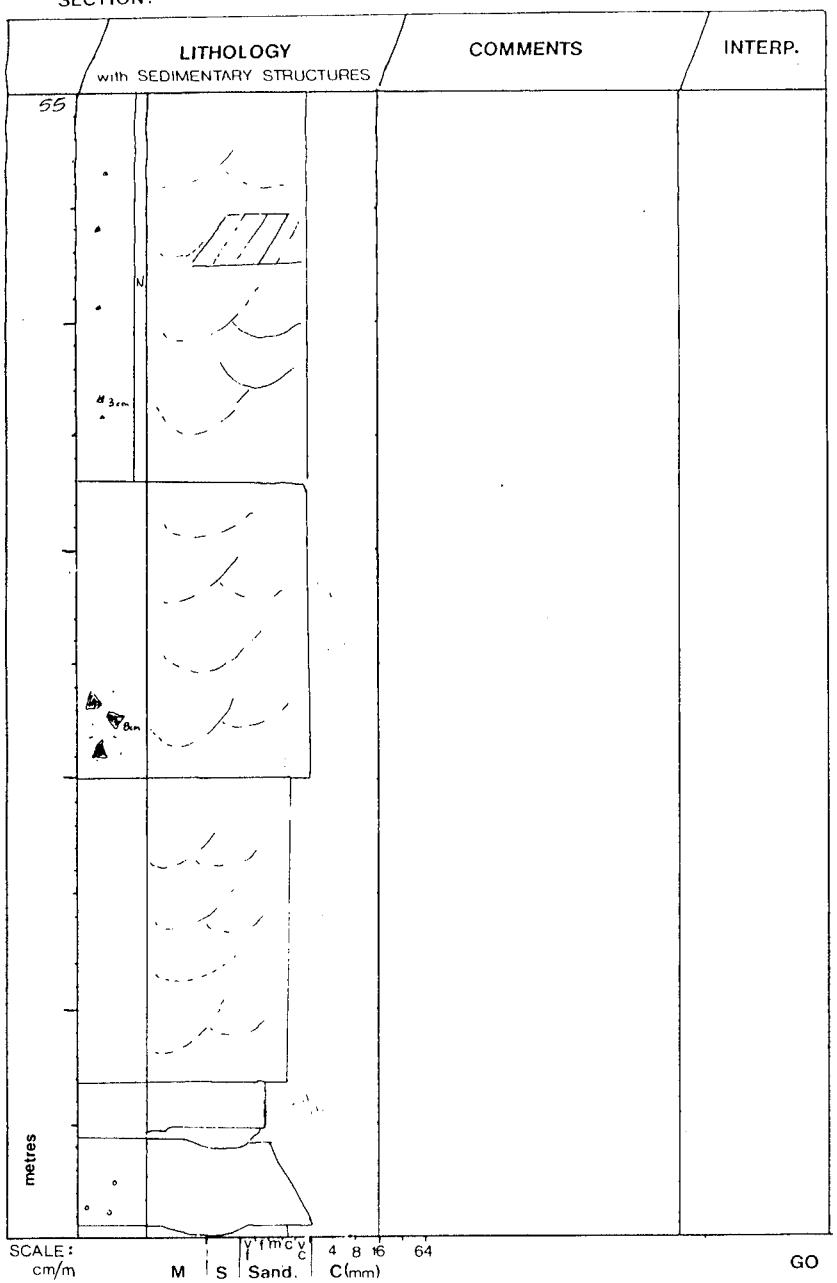
SECTION: LOCATION:




SECTION:
LOCATION:
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTERP.
45
4.5cm
0.1cm
?
metres
SCALE:
cm/m
M
S
v f m c v c
Sand
4 8 16 64
C(mm)
GO


SECTION:
LOCATION:
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTERP.
50
?
N
N
045
UR.
278
30
?
20cm
?
metres
SCALE:
cm/m
M
S
v f m c v c
Sand
4 8 16 64
C(mm)
G

SECTION: LOCATION:



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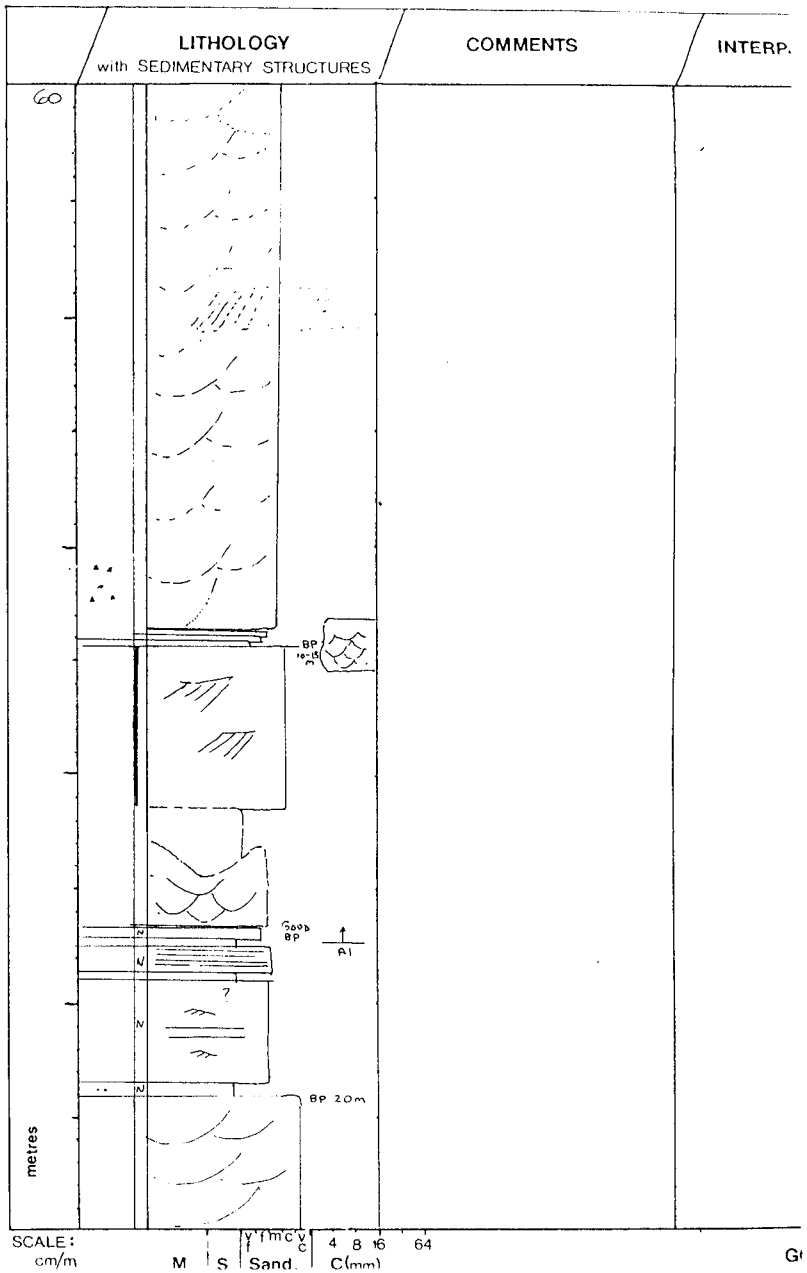
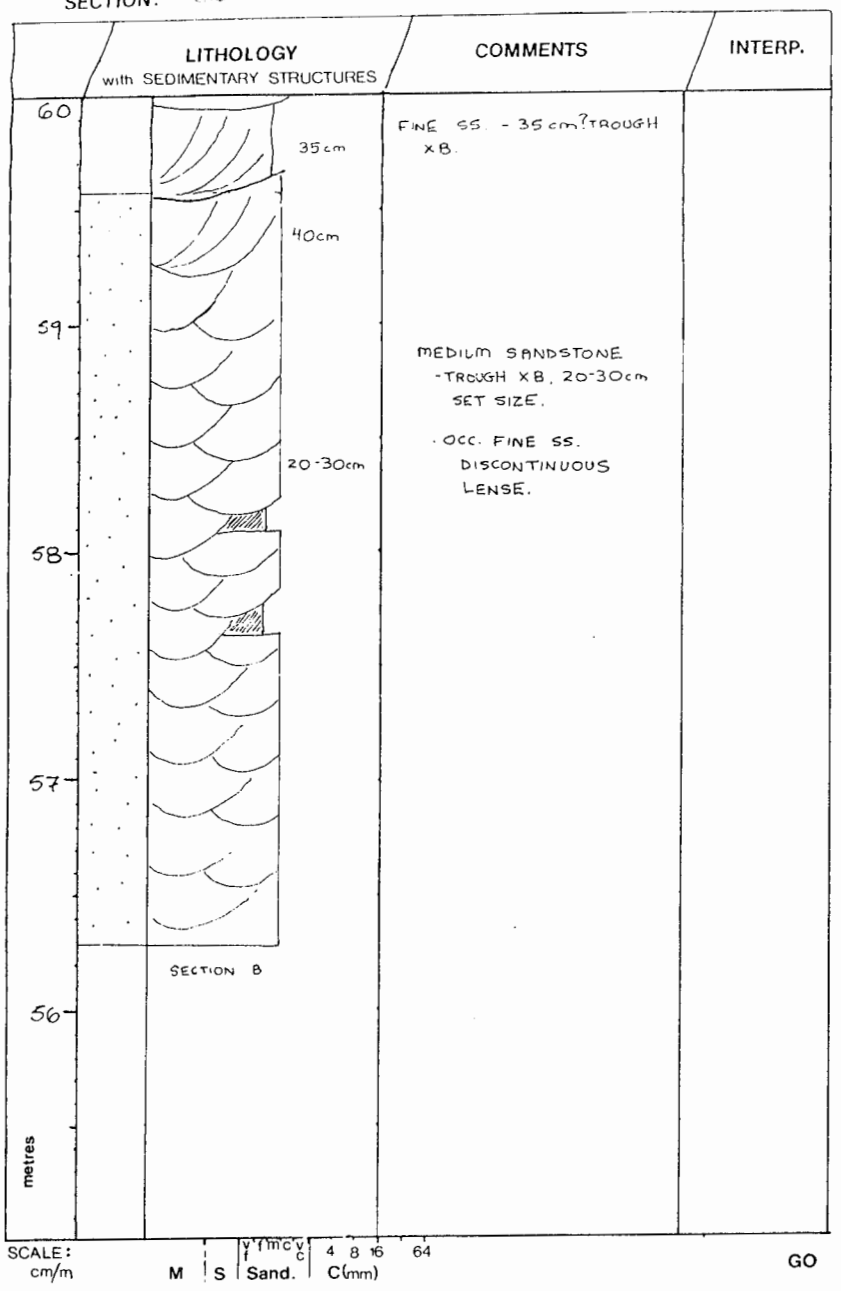
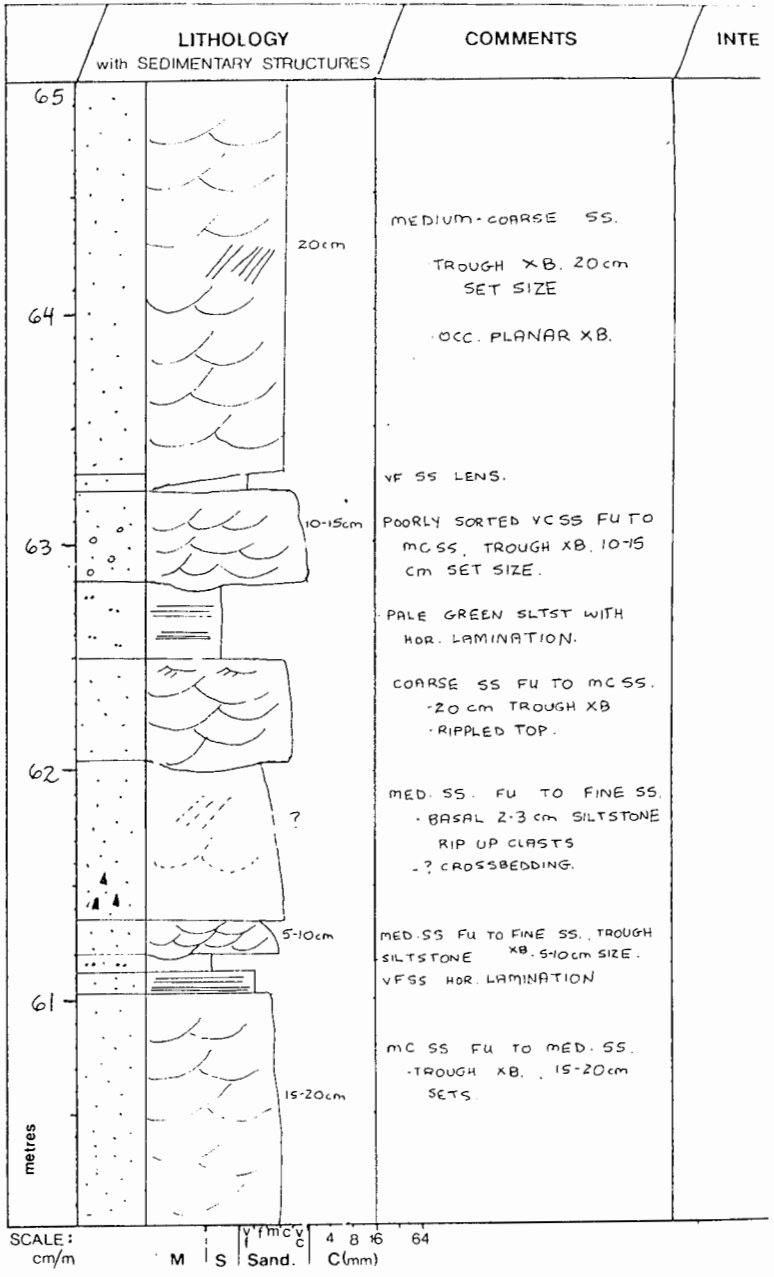


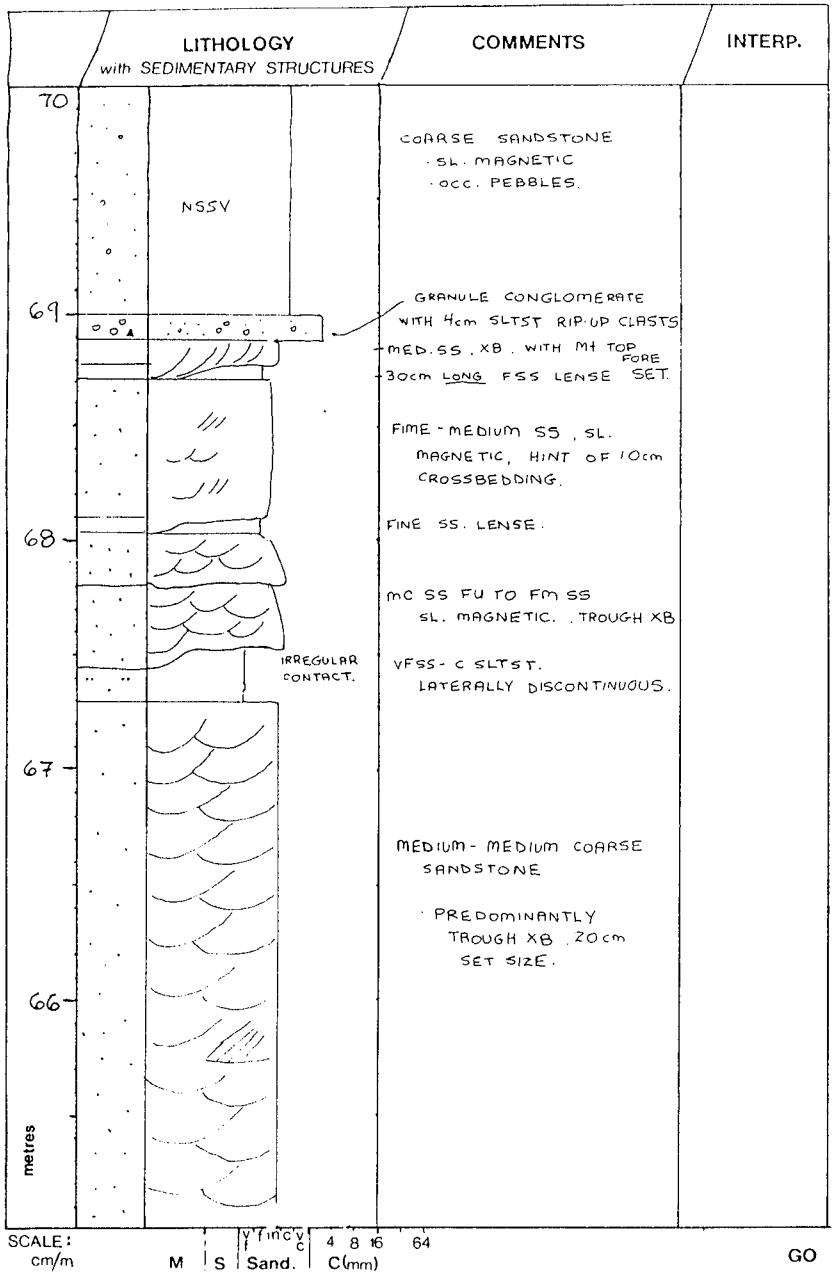
SECTION: C10 B LOCATION:



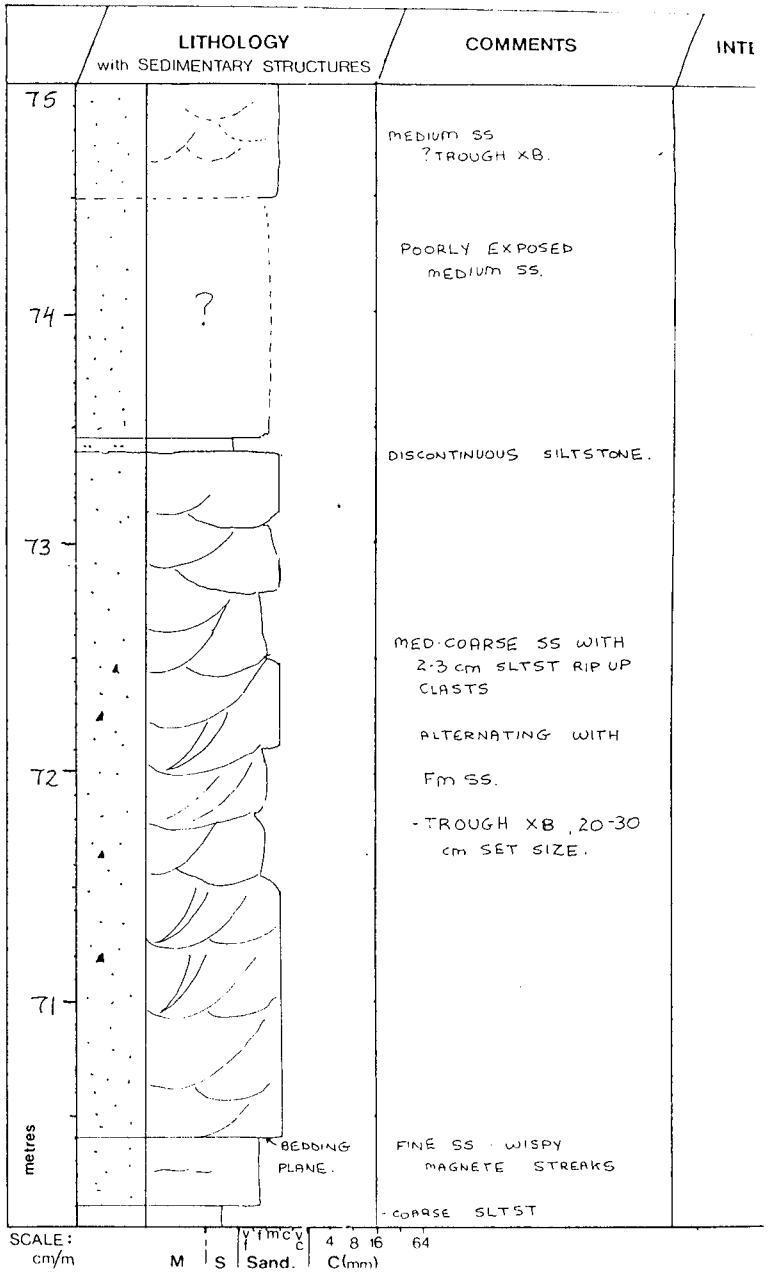
SECTION: C- 10 B LOCATION: TRYFFIN EAST



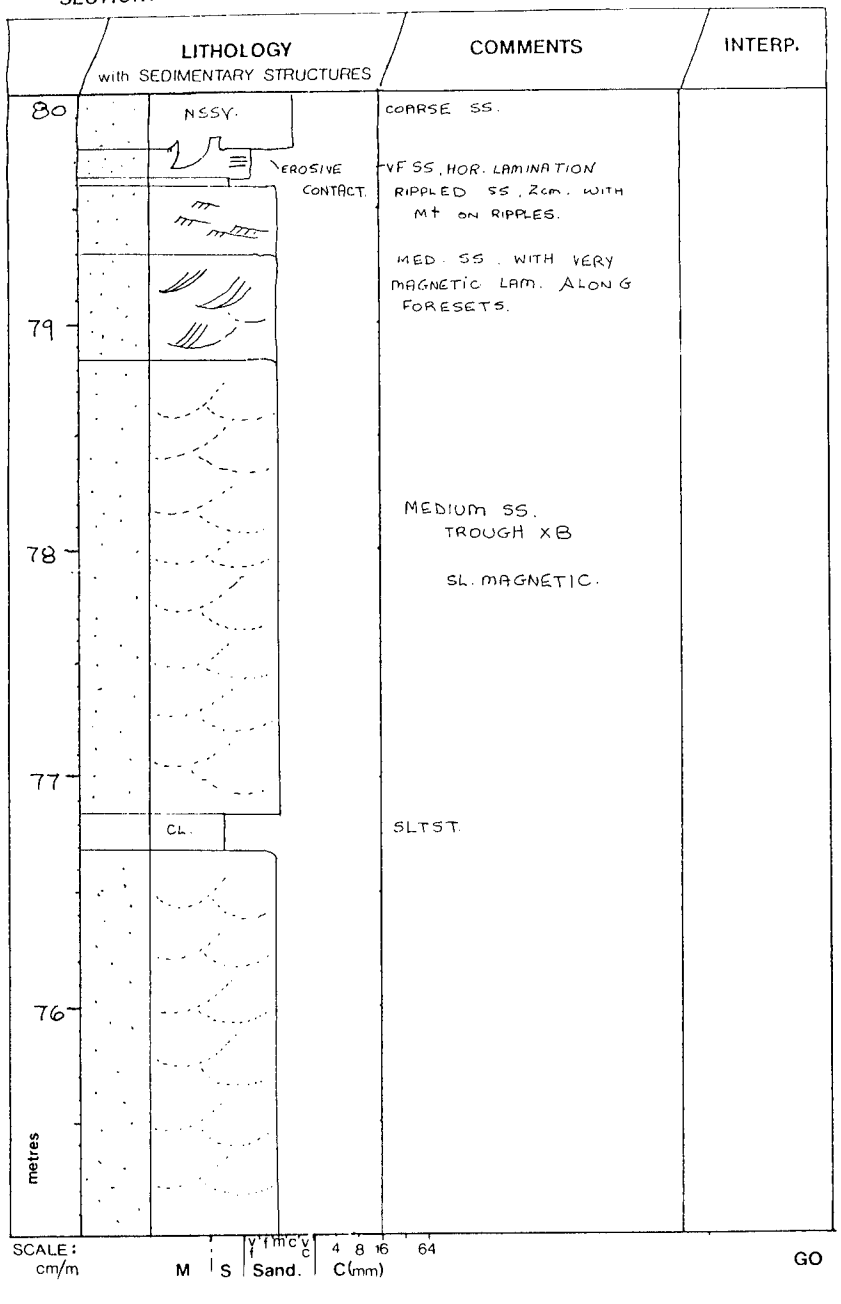
SECTION: C-10B LOCATION: TRYFAN EAST.



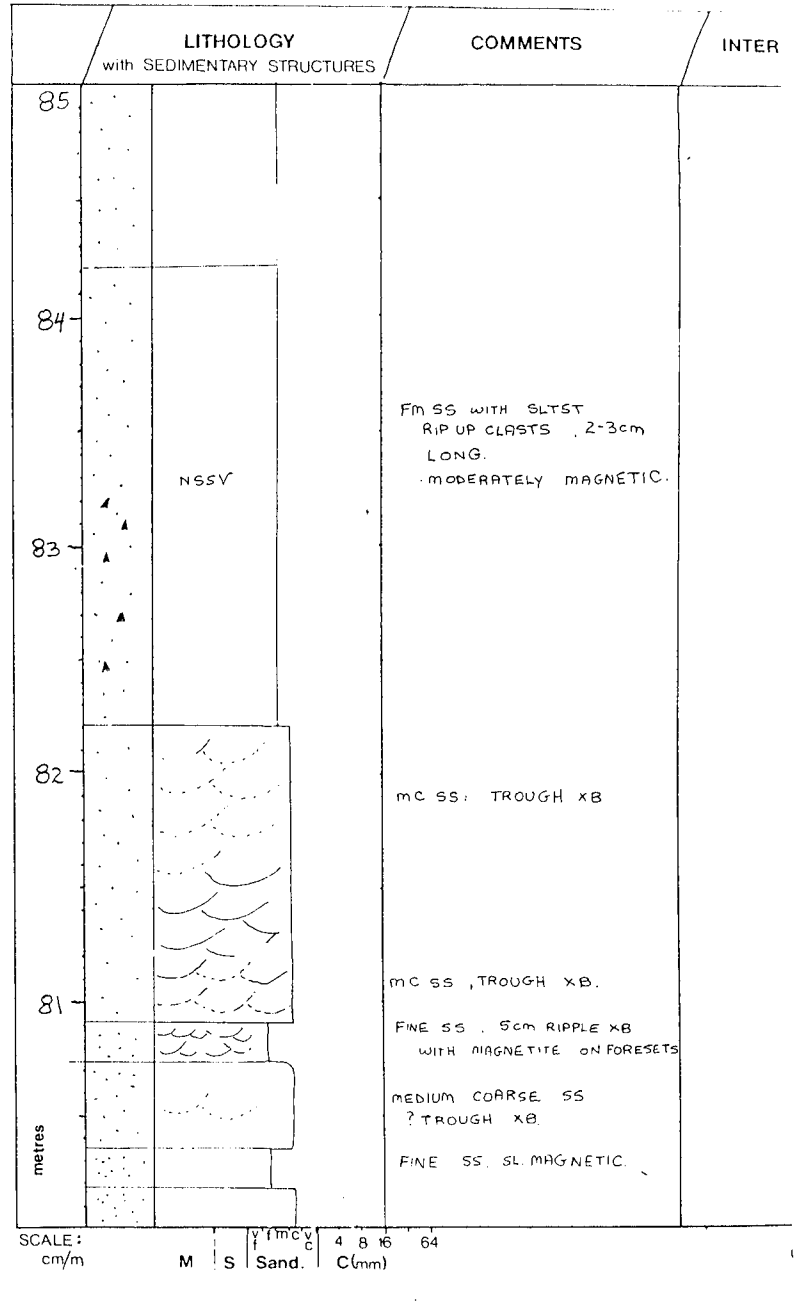
SECTION: C-10B LOCATION: TRYFAN EAST



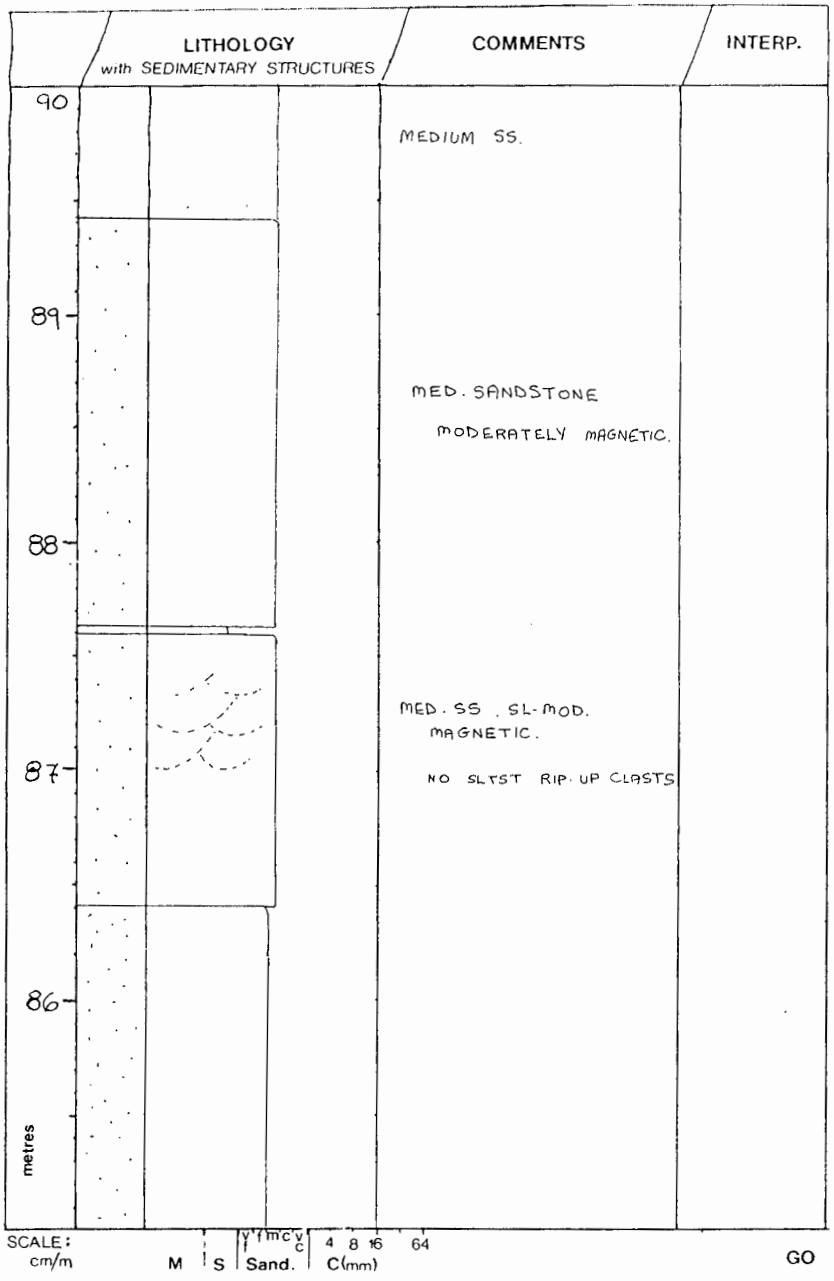
SECTION: C10 B LOCATION: TRYFAN EAST



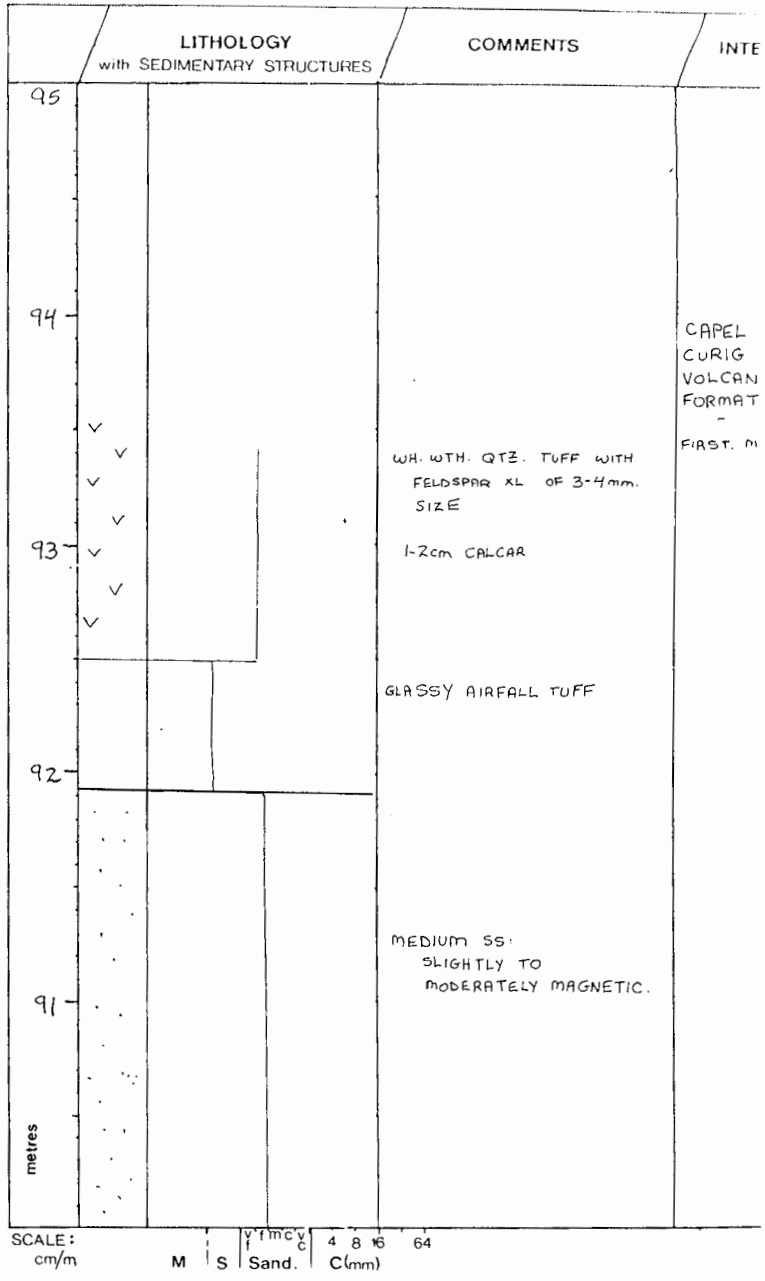
SECTION: C10B LOCATION: TRYFAN EAST.



SECTION: C-10B LOCATION: TRYFAN EAST

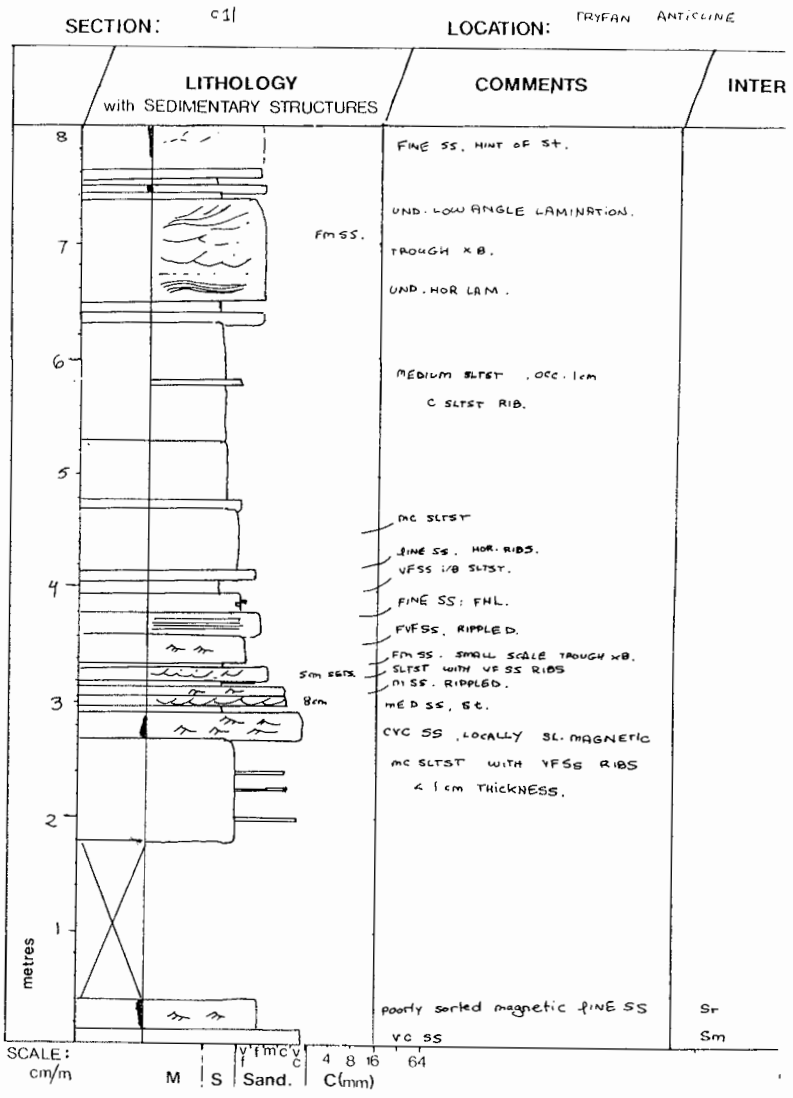


SECTION: C 10B LOCATION:

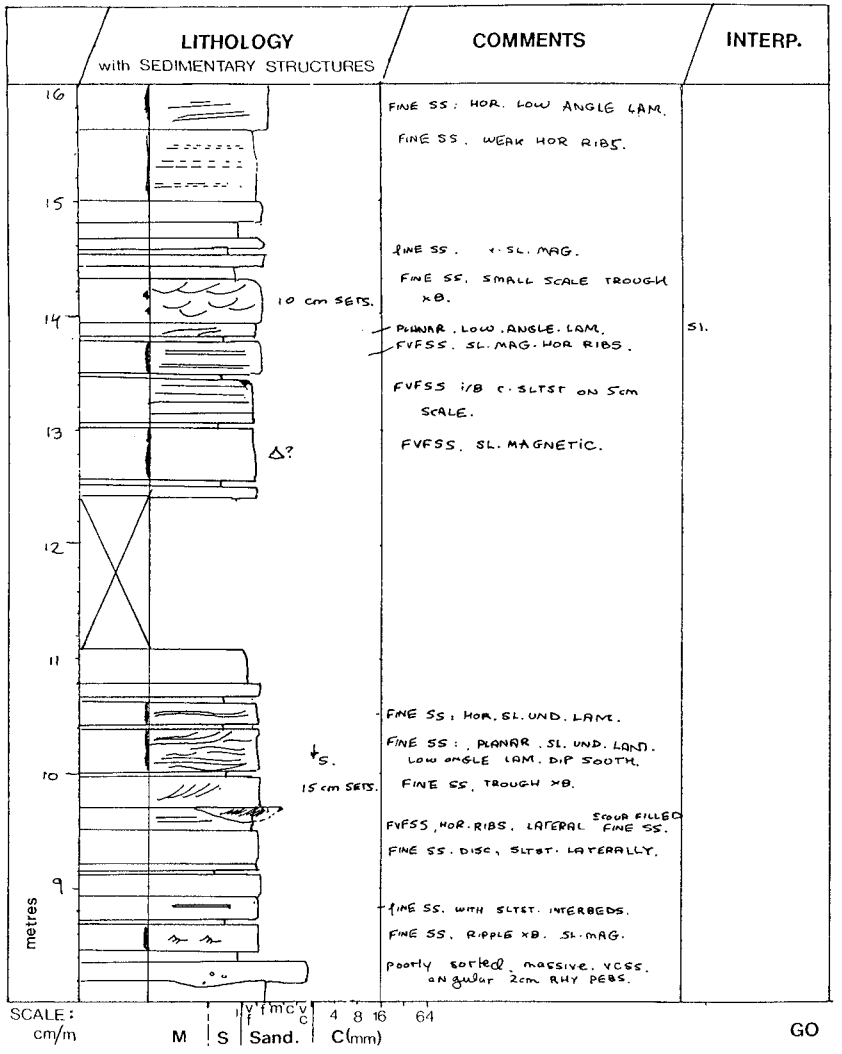


SECTION C11

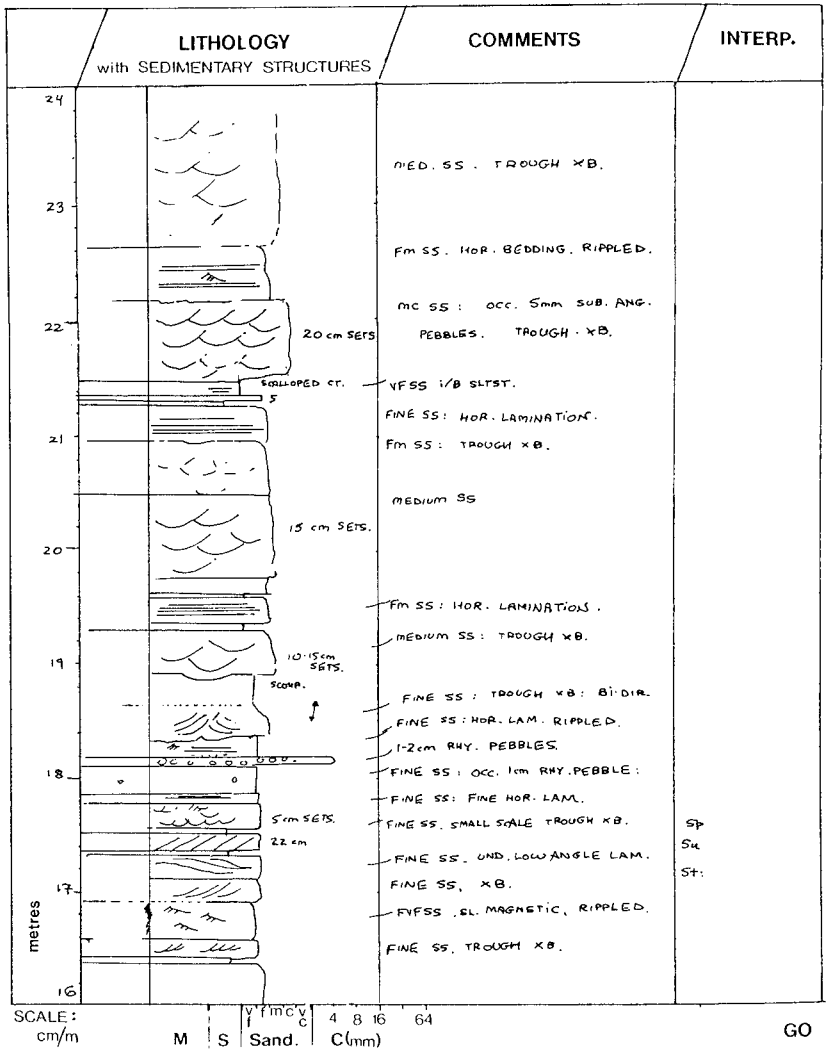
SECTION C11 LOCATION: Follow Tryfan Fach climbing slab topographically up slope until wire fence is reached. Section proceeds from here towards Tryfan for 56 stratigraphic metres.



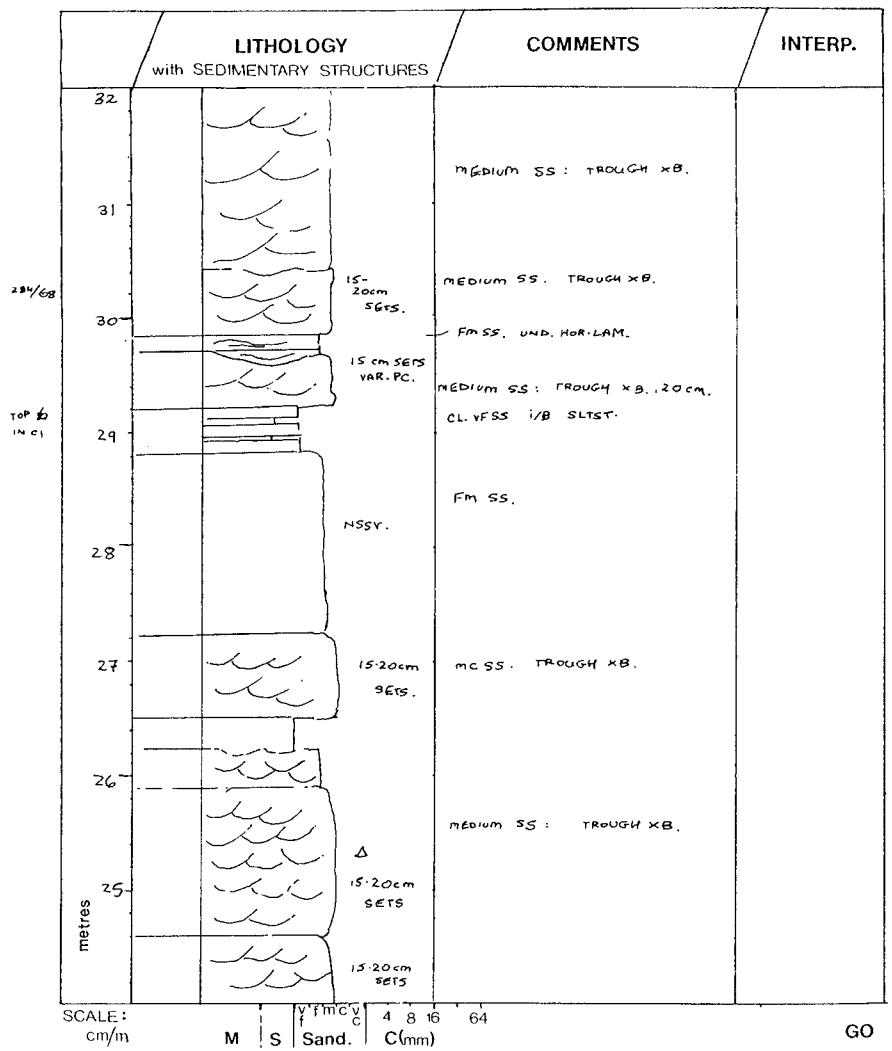
SECTION: C11 LOCATION: TRYFAN ANTICLINE



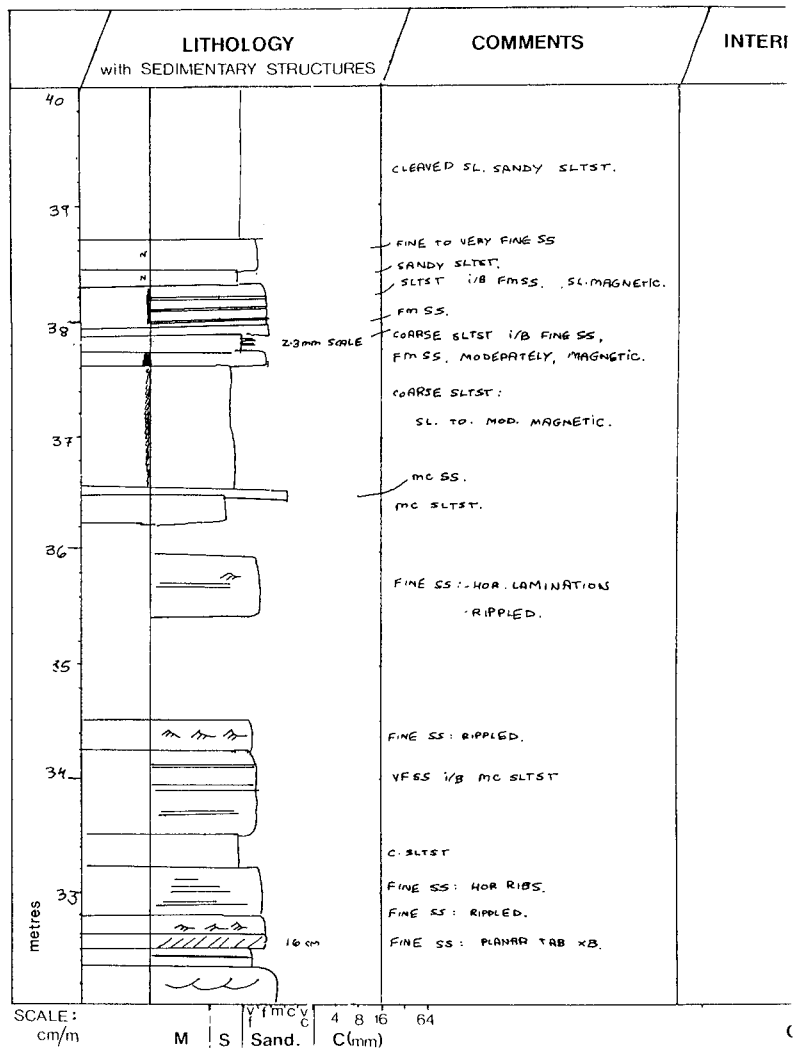
SECTION: C31 LOCATION: TRYFAN ANTICLINE.



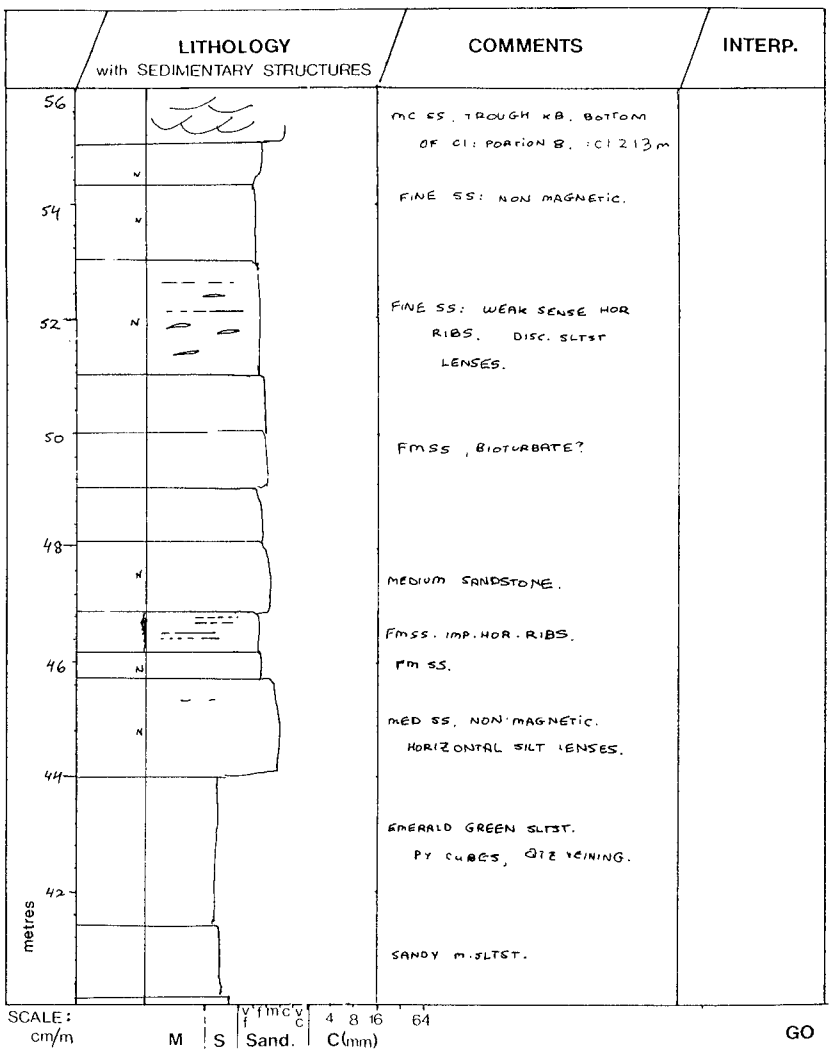
SECTION: C11. LOCATION: TRYFAN ANTICLINE: FENCE.



SECTION: C11 LOCATION: TRYFAN ANTICLINE

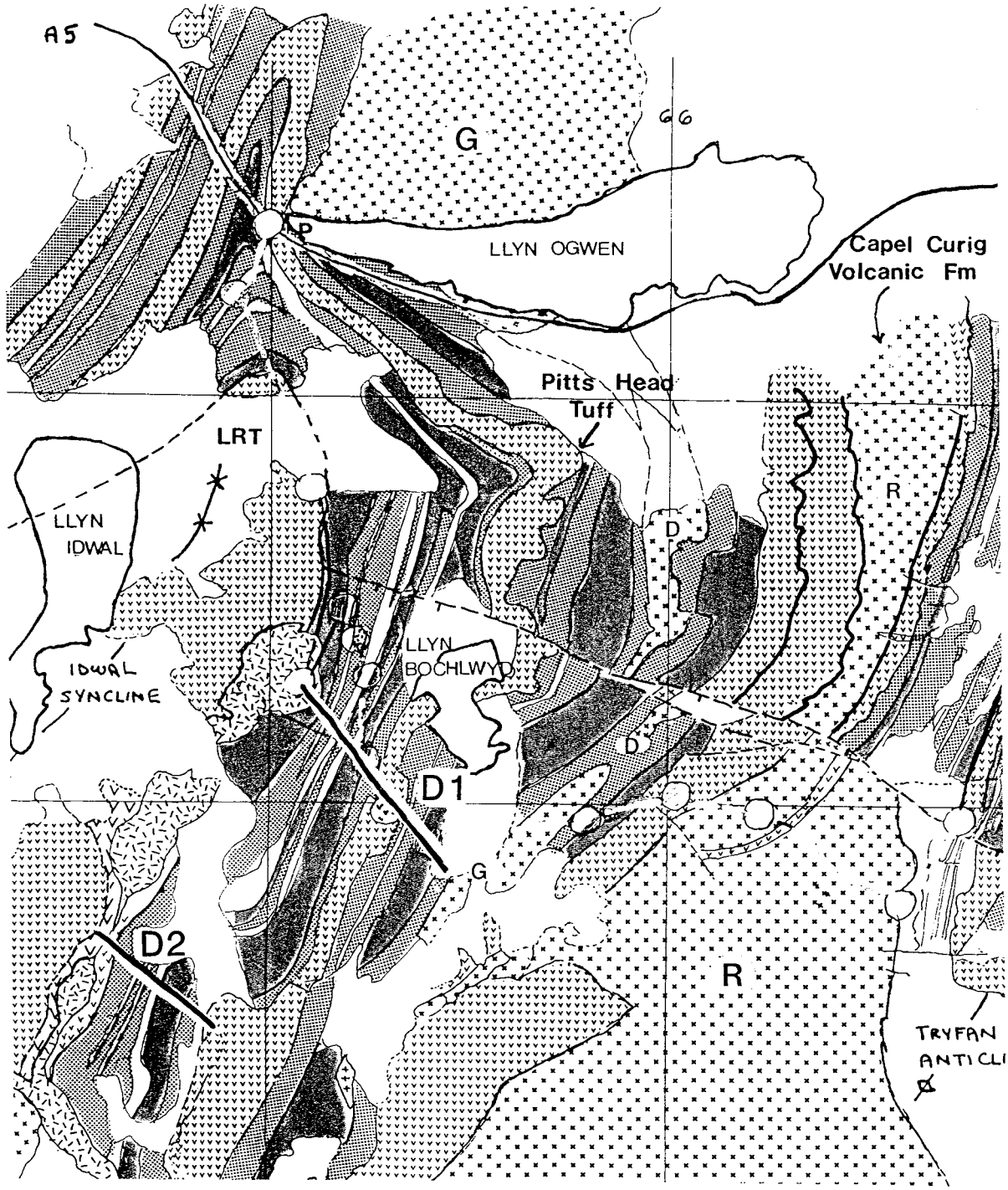


SECTION: C11. LOCATION: TRYFAN ANTICLINE



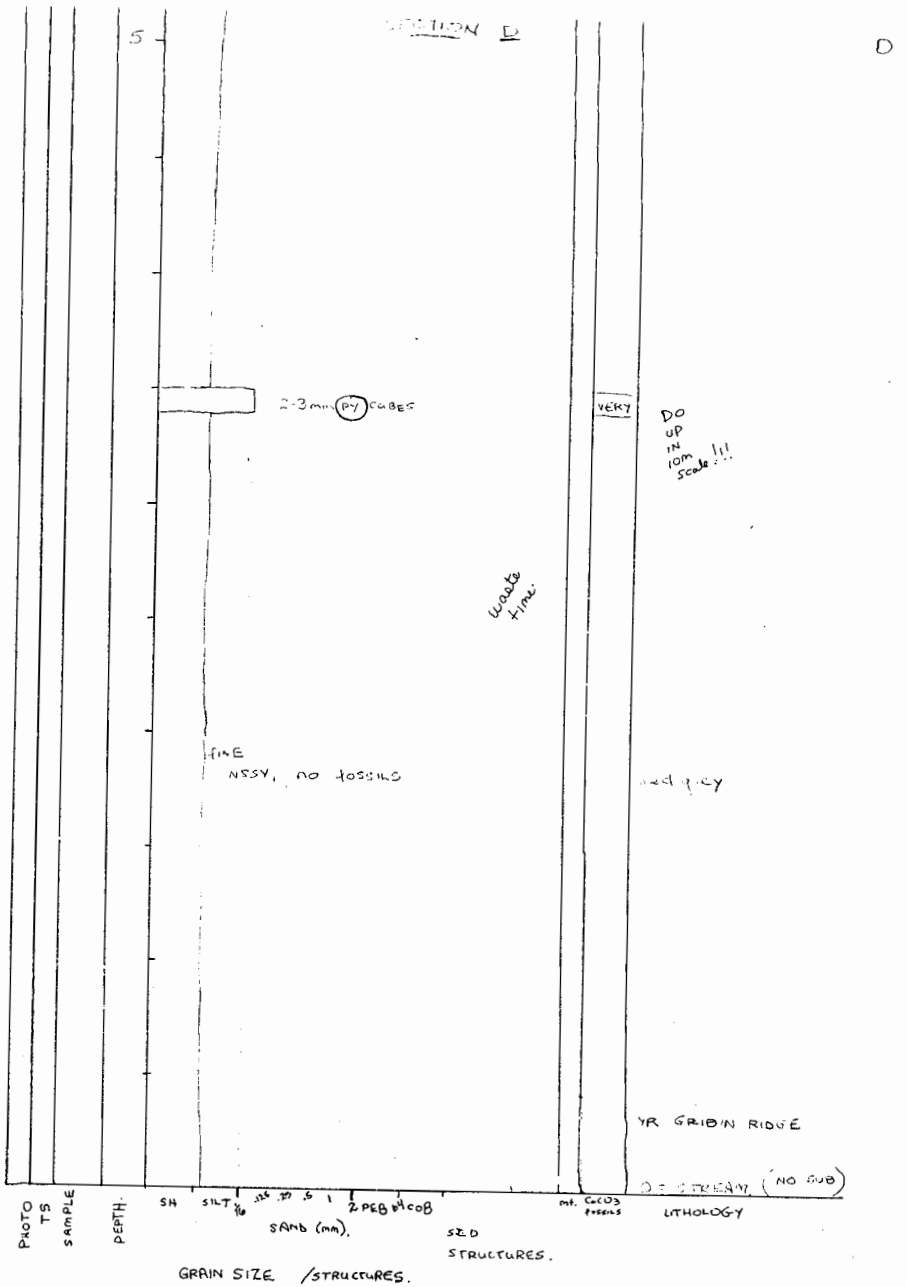
AREA D

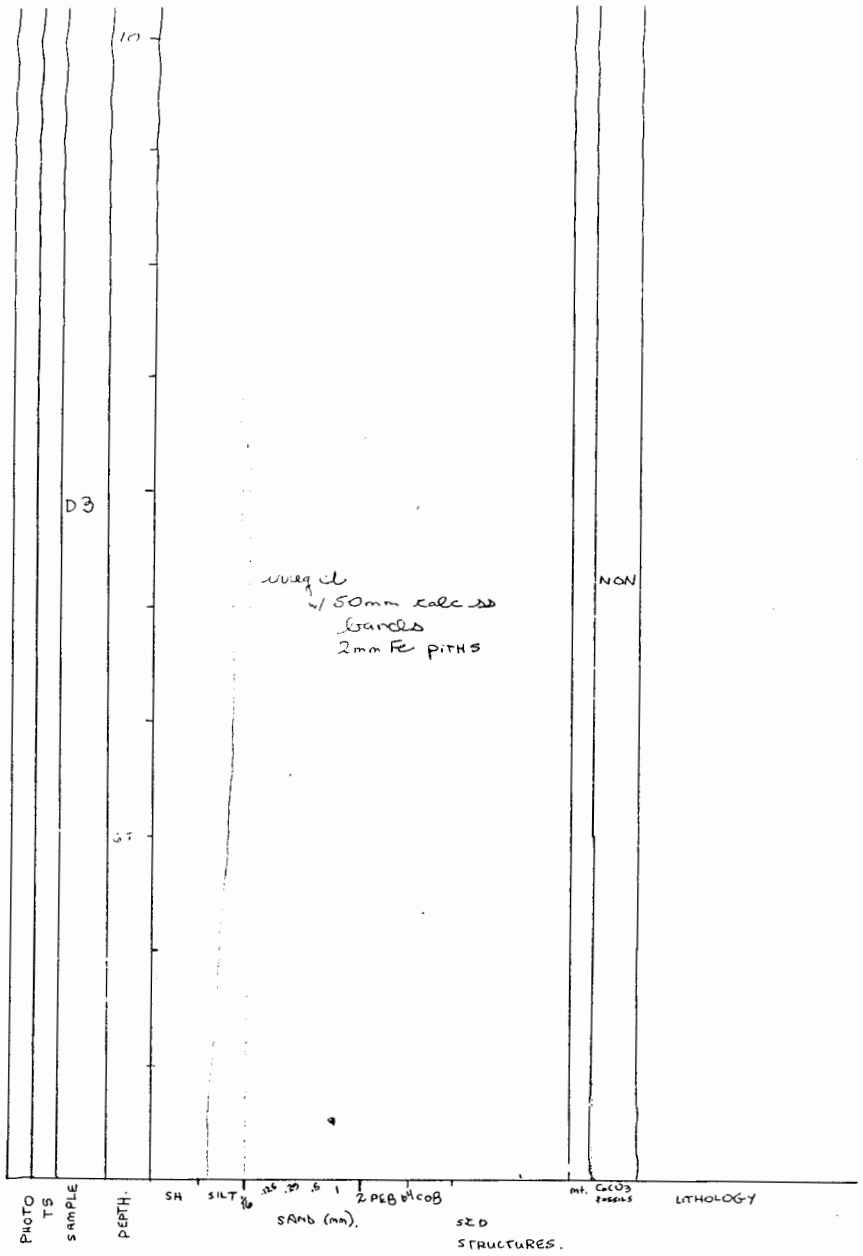
LOCATION MAP.



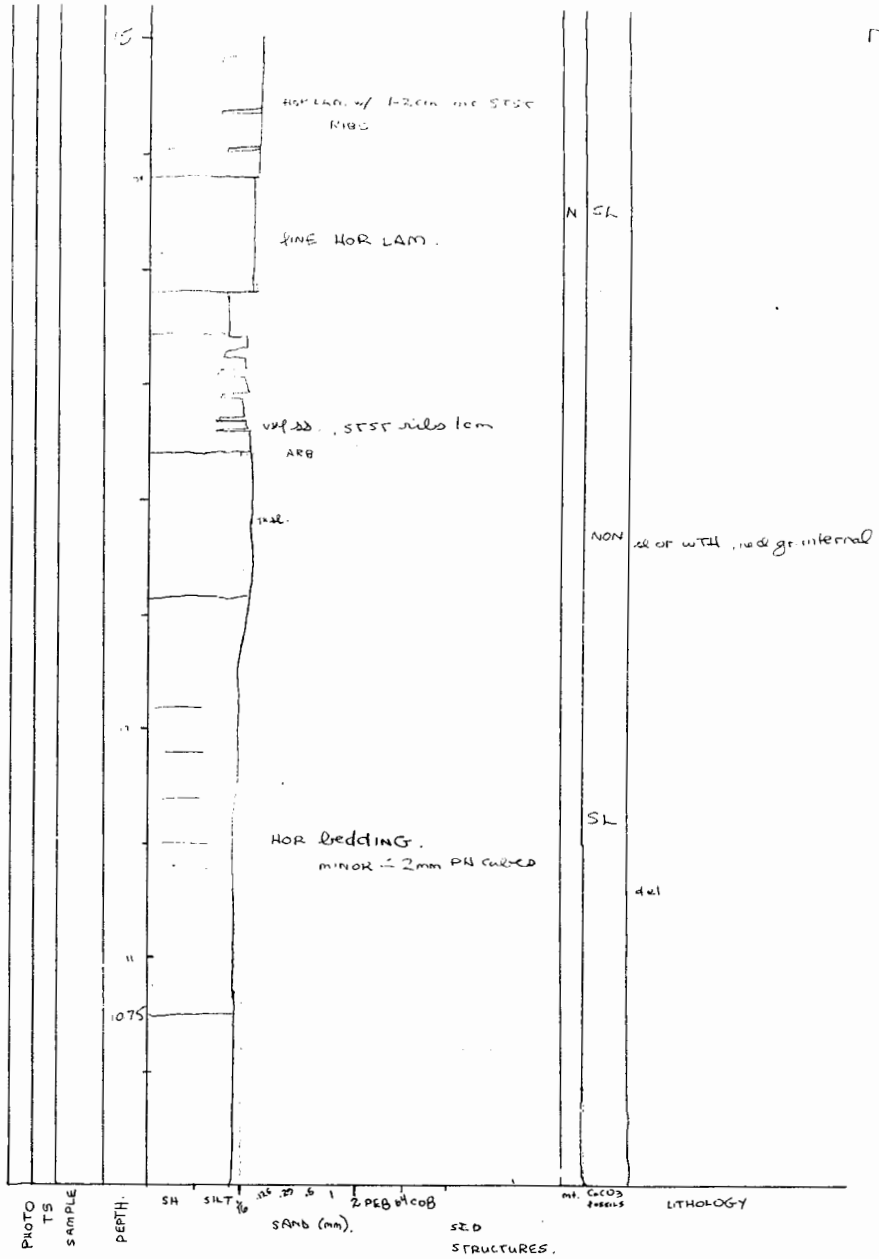
SECTION D1

SECTION D1 LOCATION: Locate stream to east of ridge which is directly to south of Llyn Bochlwyd. Section starts in cleaved slates at stream ca. 320 metres to SW of Llyn Bochlwyd. See photograph in Figure 7. for region of section. Section proceeds across Pitts Head Tuff at oblique angle with respect to regional strike to base of Lower Rhyolitic tuff along Gribin ridge.

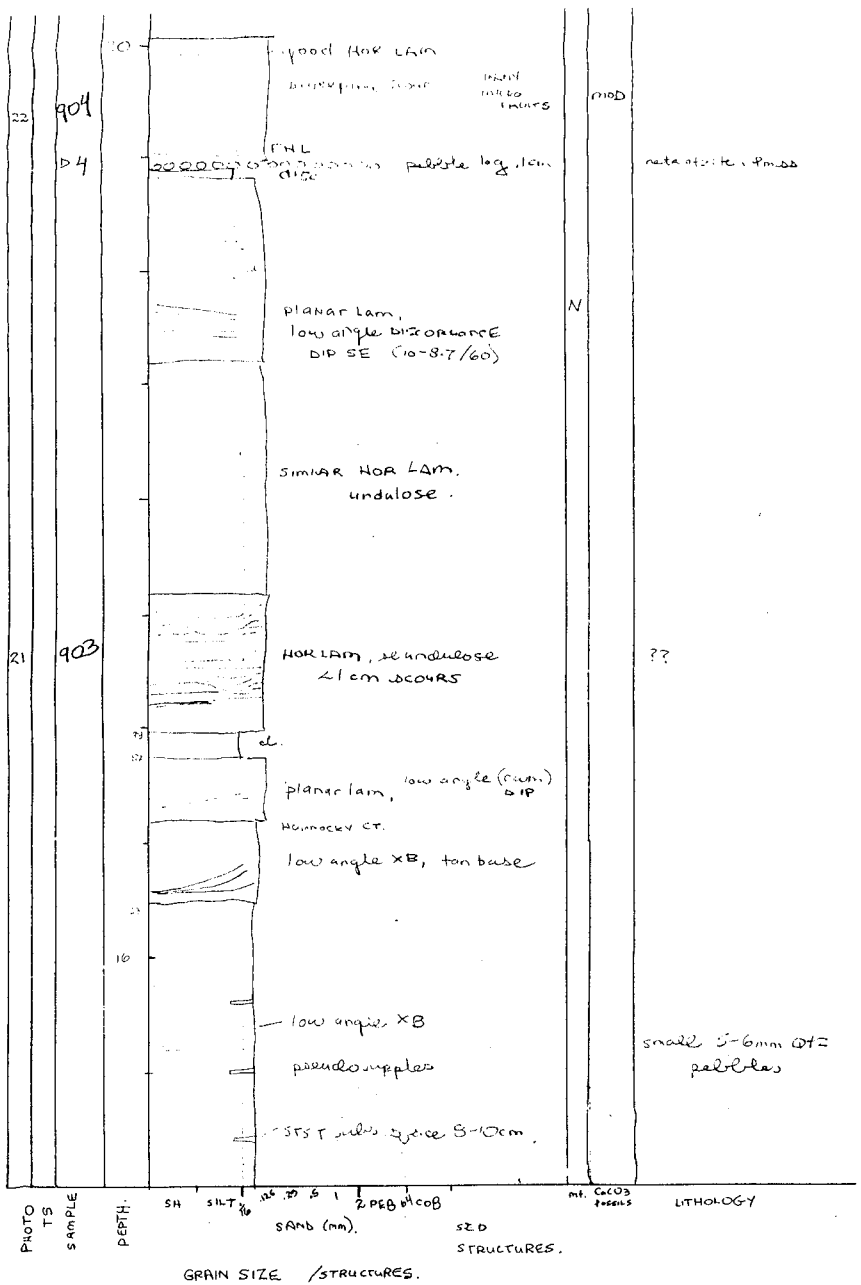




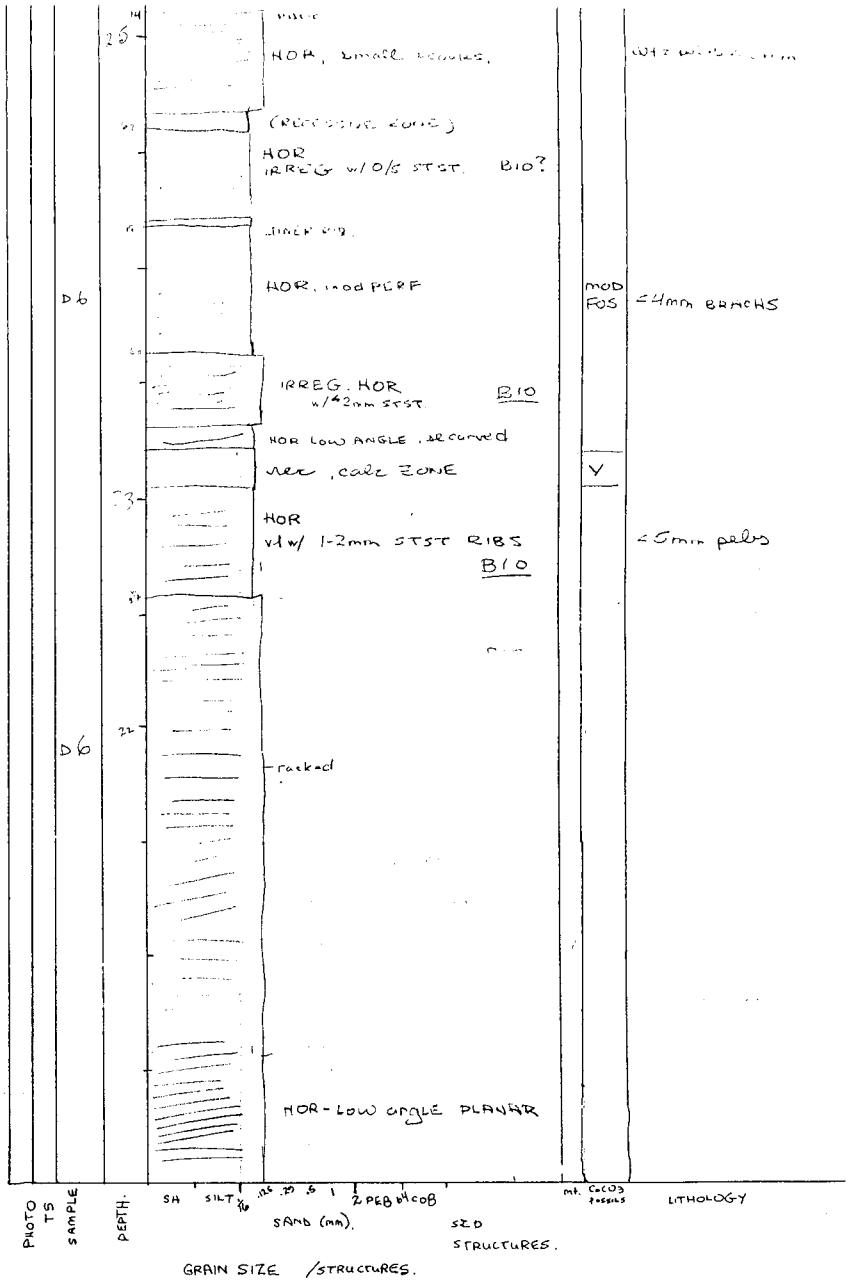
GRAIN SIZE /STRUCTURES.



GRAIN SIZE /STRUCTURES.

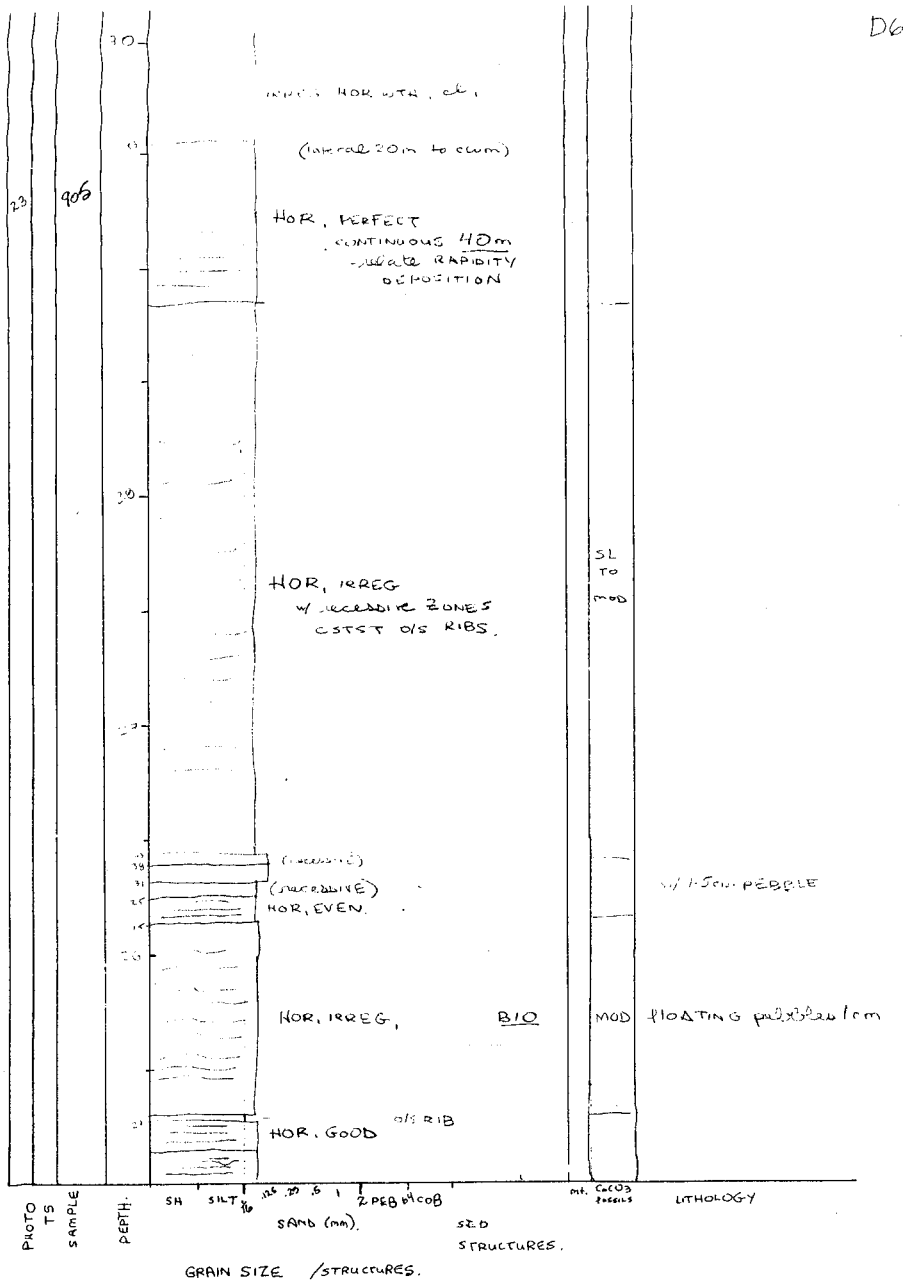


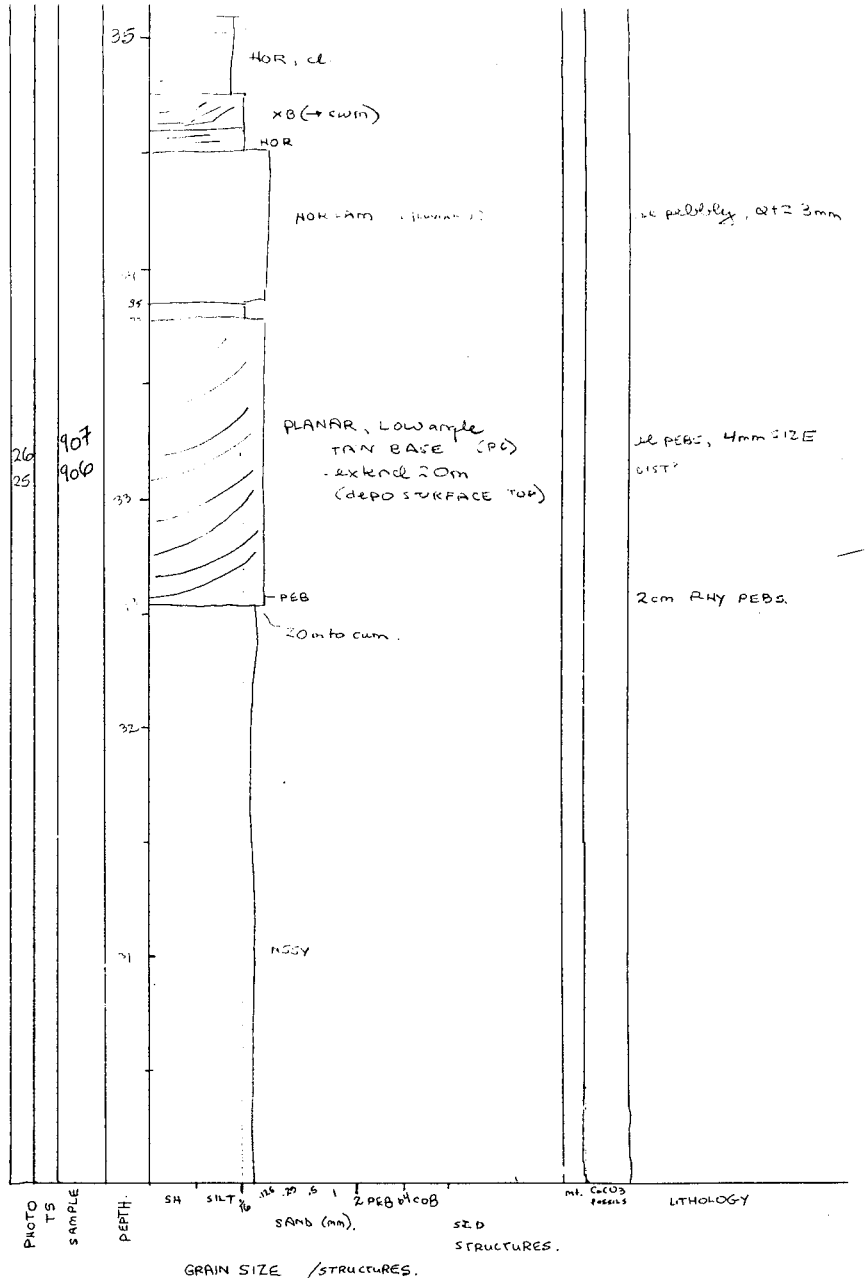
GRAIN SIZE /STRUCTURES.

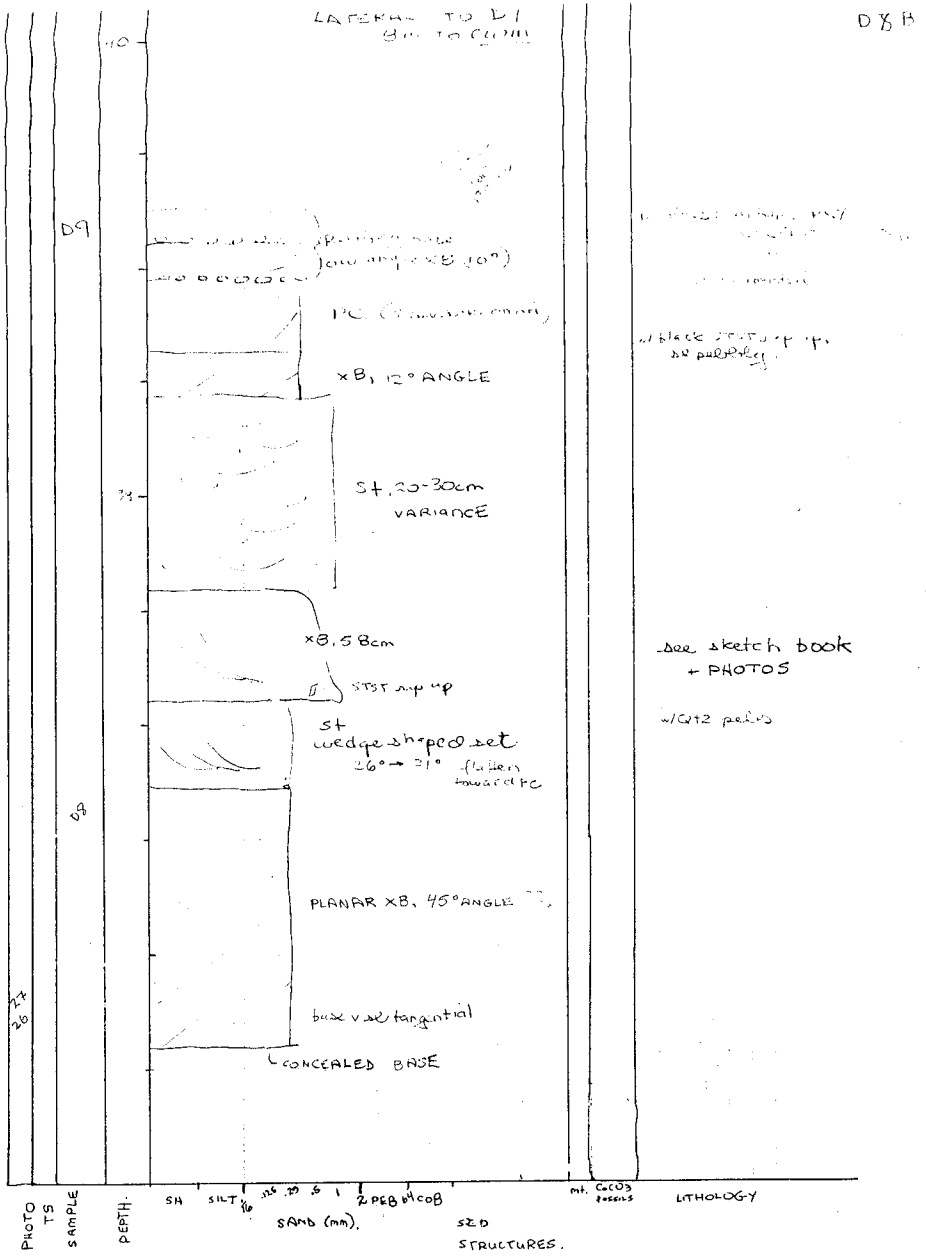


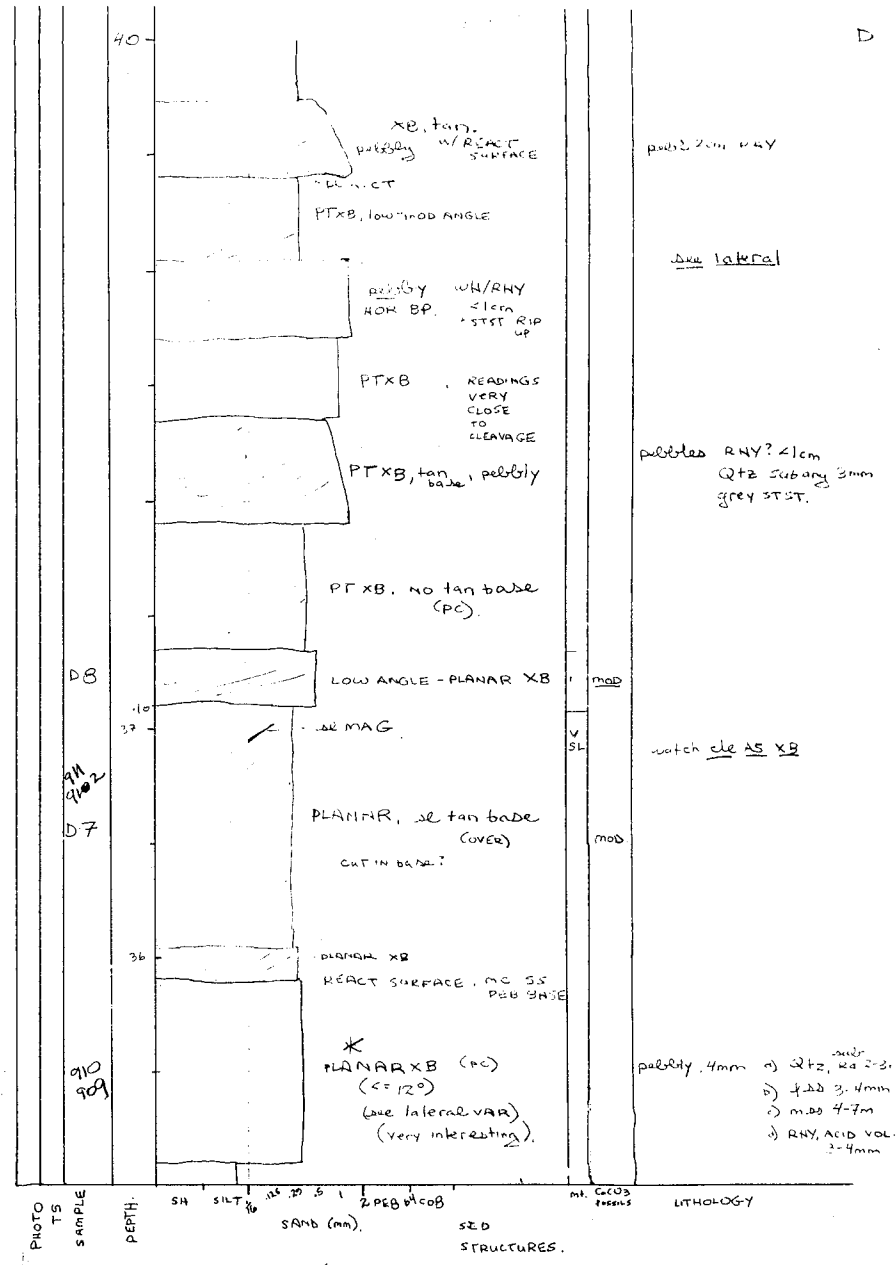
GRAIN SIZE /STRUCTURES.

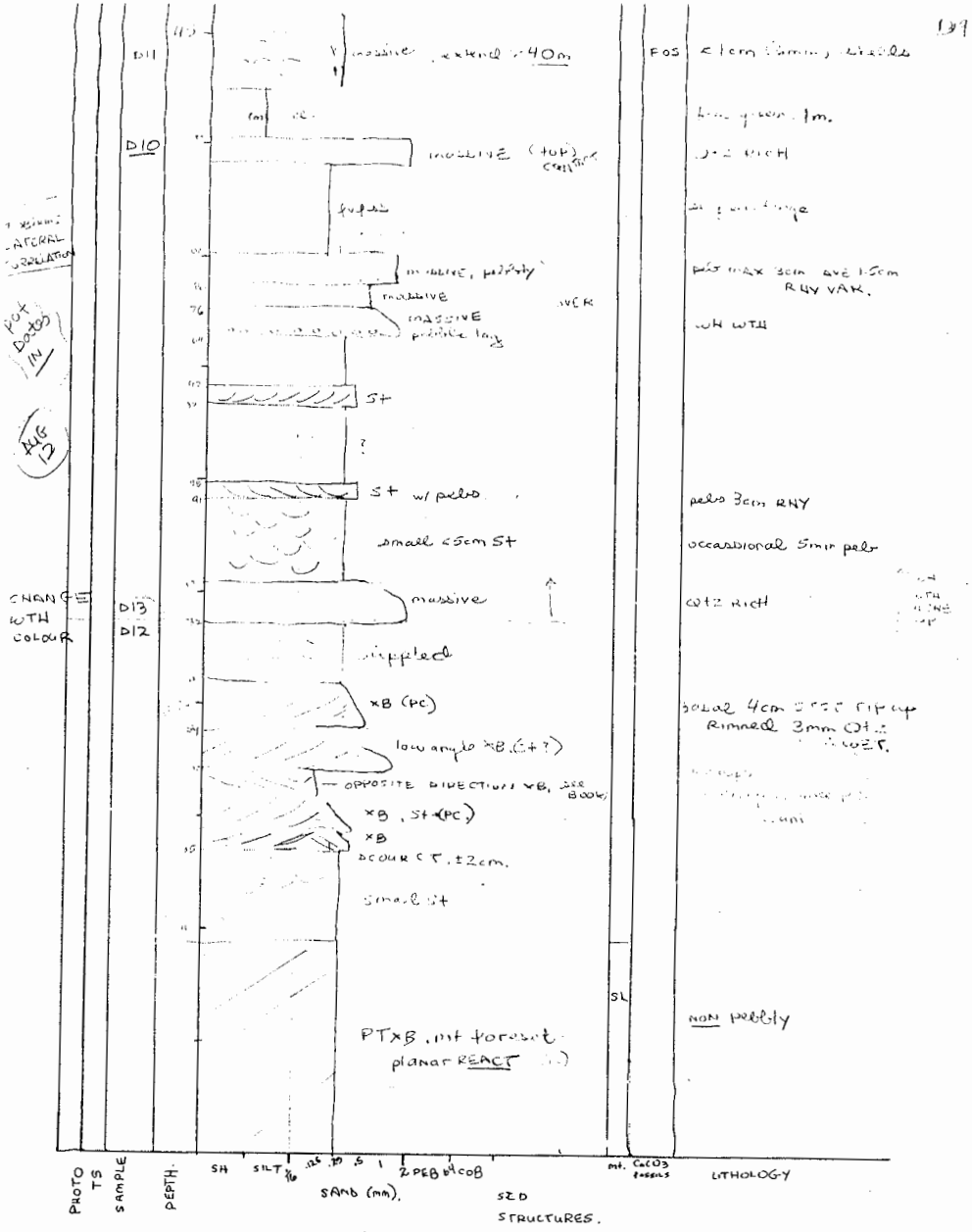
D6

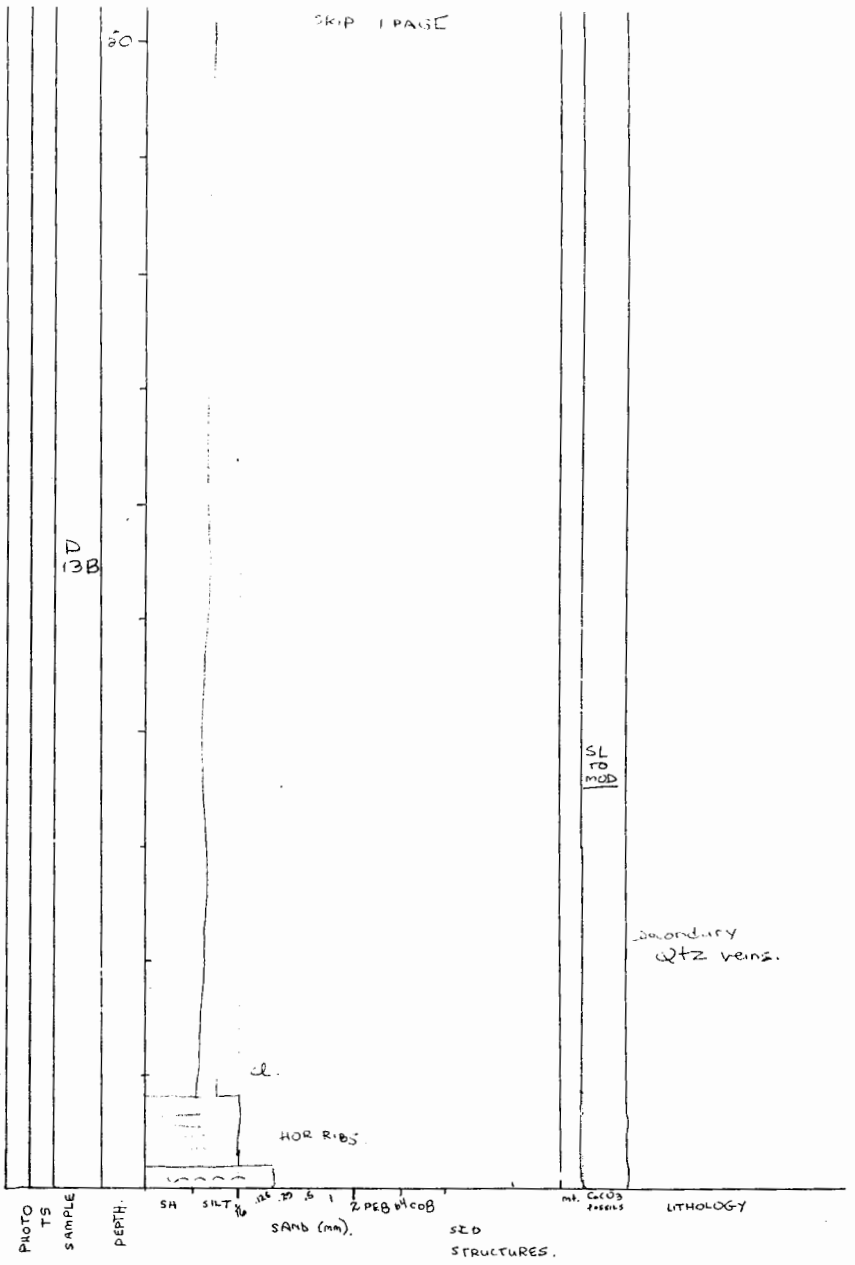

HOR, PERFECT
CONTINUOUS 40m
-rate RAPIDITY DEPOSITION
HOR, IRREG
w/ RECESSIVE ZONES
CSTST O/S RIBS.
(RECESSIVE)
HOR, EVEN.
HOR, IRREG, BIO
HOR, GOOD O/S RIB
SL TO MOD
w/ 1.5cm PEBBLE
MOD FLOATING pebbles 1cm
PROTO TS SAMPLE
DEPTH
SH SILT SAND (mm). PEB GRAN COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

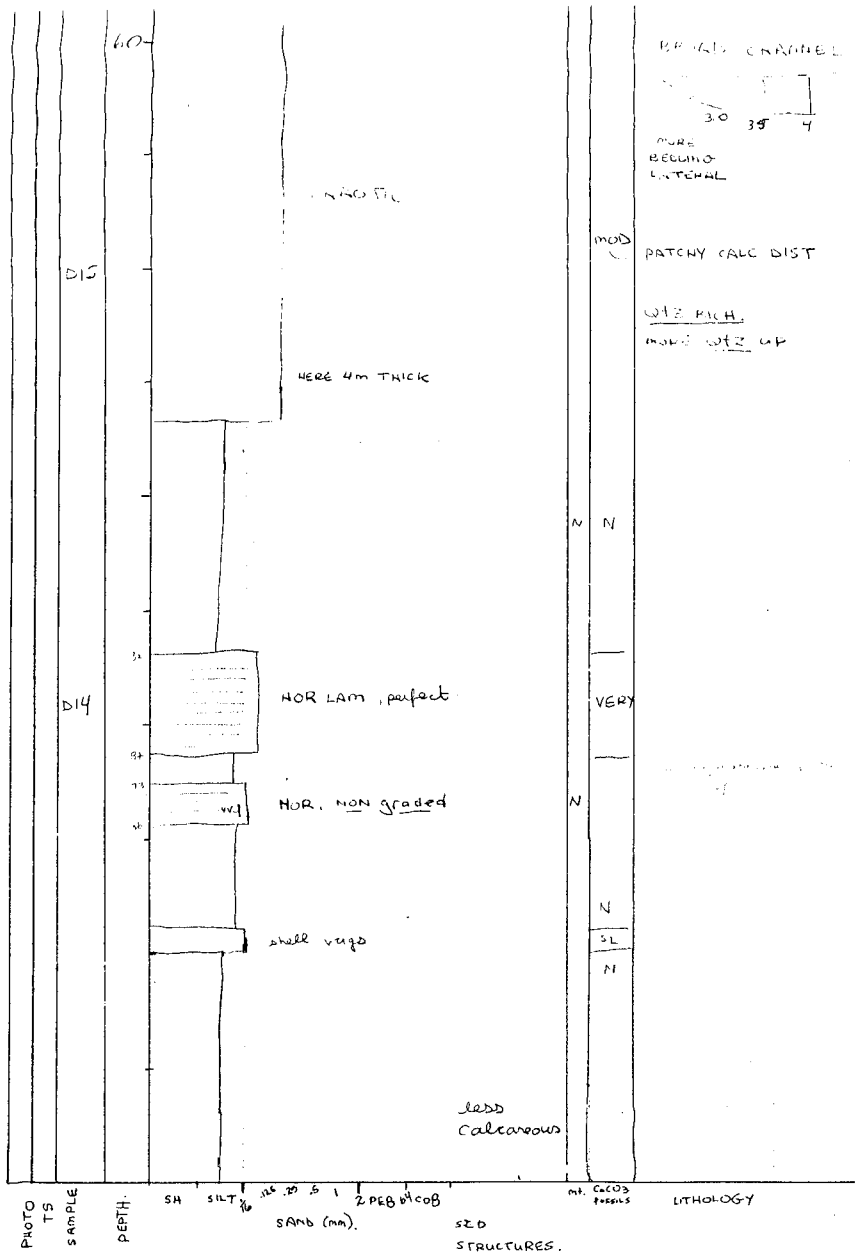

HOR, cl
xB (→ cwm)
HOR
PLANAR, LOW angle
TAN BASE (PC)
-extend 20m
(depo SURFACE TOP)
PEB
20m to cwm.
MSSY
pebbly, QTZ 3mm
PEBS, 4mm SIZE
2cm ANY PEBS.
PROTO TS SAMPLE
DEPTH
SH SILT SAND (mm). PEB GRAN COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

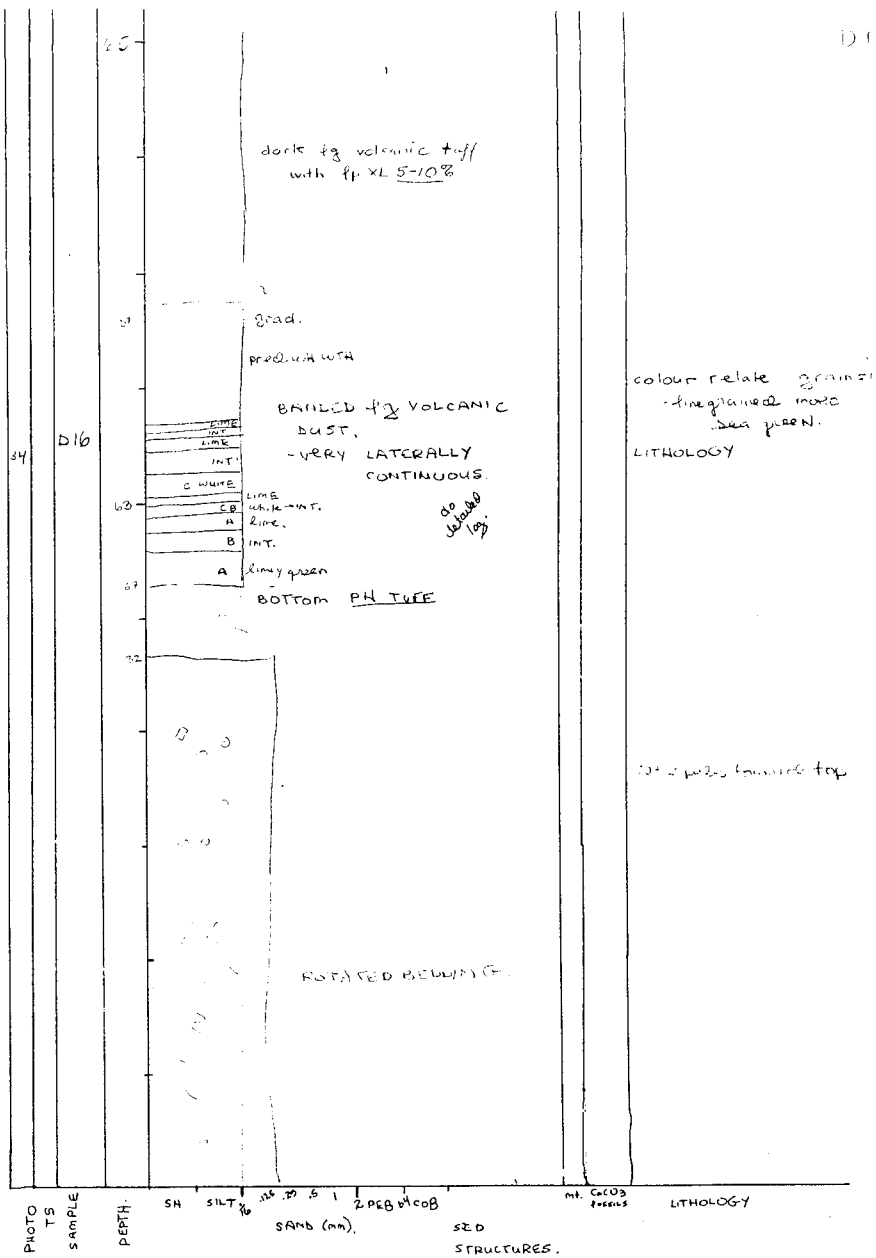

D8
D9
PC
xB, 12° ANGLE
St, 20-30cm
VARIANCE
xB, 58cm
St
wedge shaped set
26° → 31°
PLANAR xB, 45° ANGLE
base v. sl tangential
CONCEALED BASE
see sketch book
+ PHOTOS
w/QTZ pebs
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

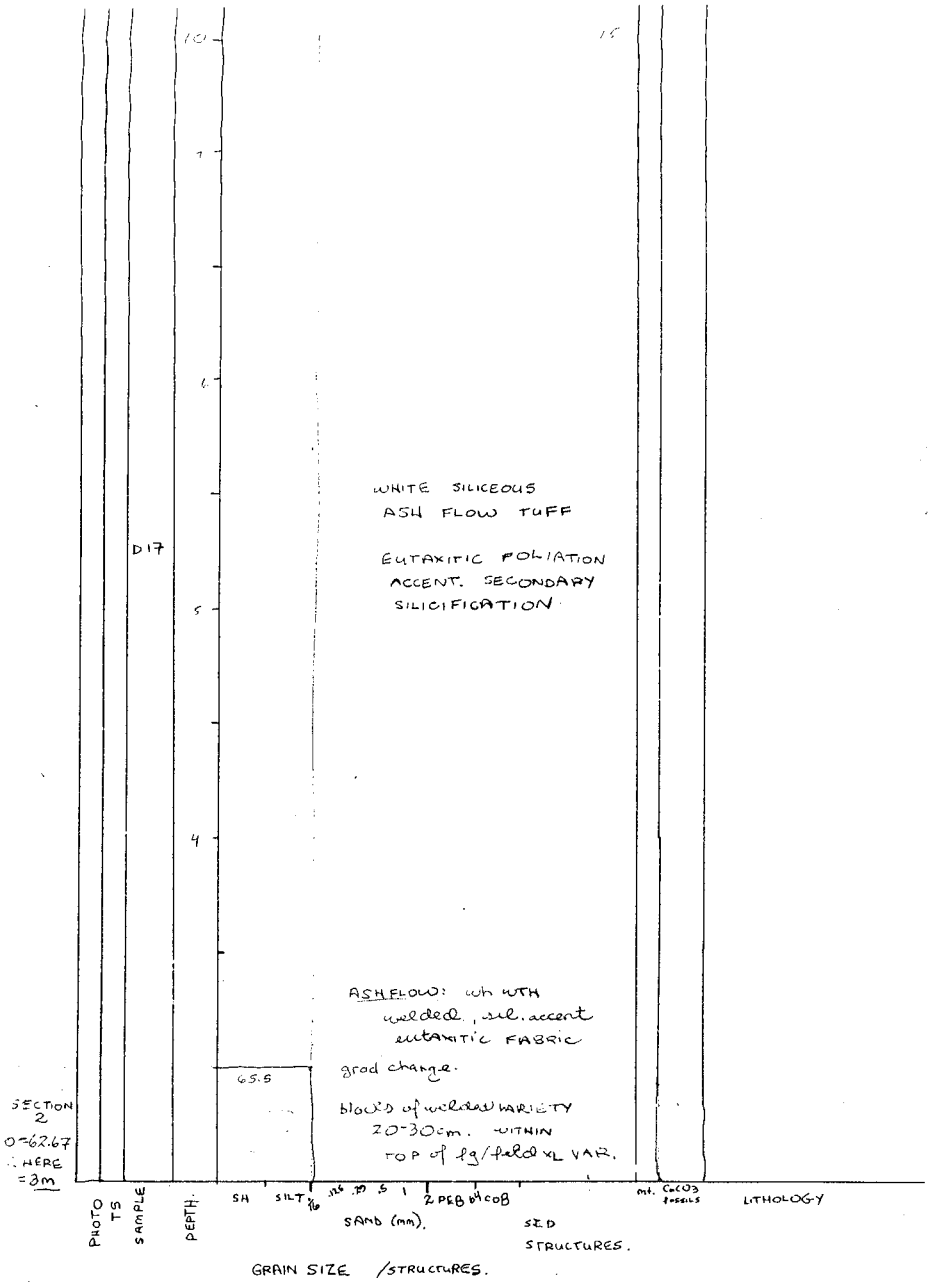

xB, tan.
REACT SURFACE
PTxB, low→mod ANGLE
PTxB
READINGS VERY CLOSE TO CLEAVAGE
PTxB, tan base, pebbly
PT xB. no tan base (PC).
LOW ANGLE - PLANAR XB
sl MAG.
PLANAR, sl tan base (covex)
CUT IN BASE?
PLANAR xB
REACT SURFACE. NC SS PEB BASE
*
PLANAR xB (PC)
(<= 120°)
(see lateral VAR)
(very interesting).
D8
D7
pebbles RNY? <1cm
Qtz subang 3mm
grey STST.
watch clc AS xB
mod
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

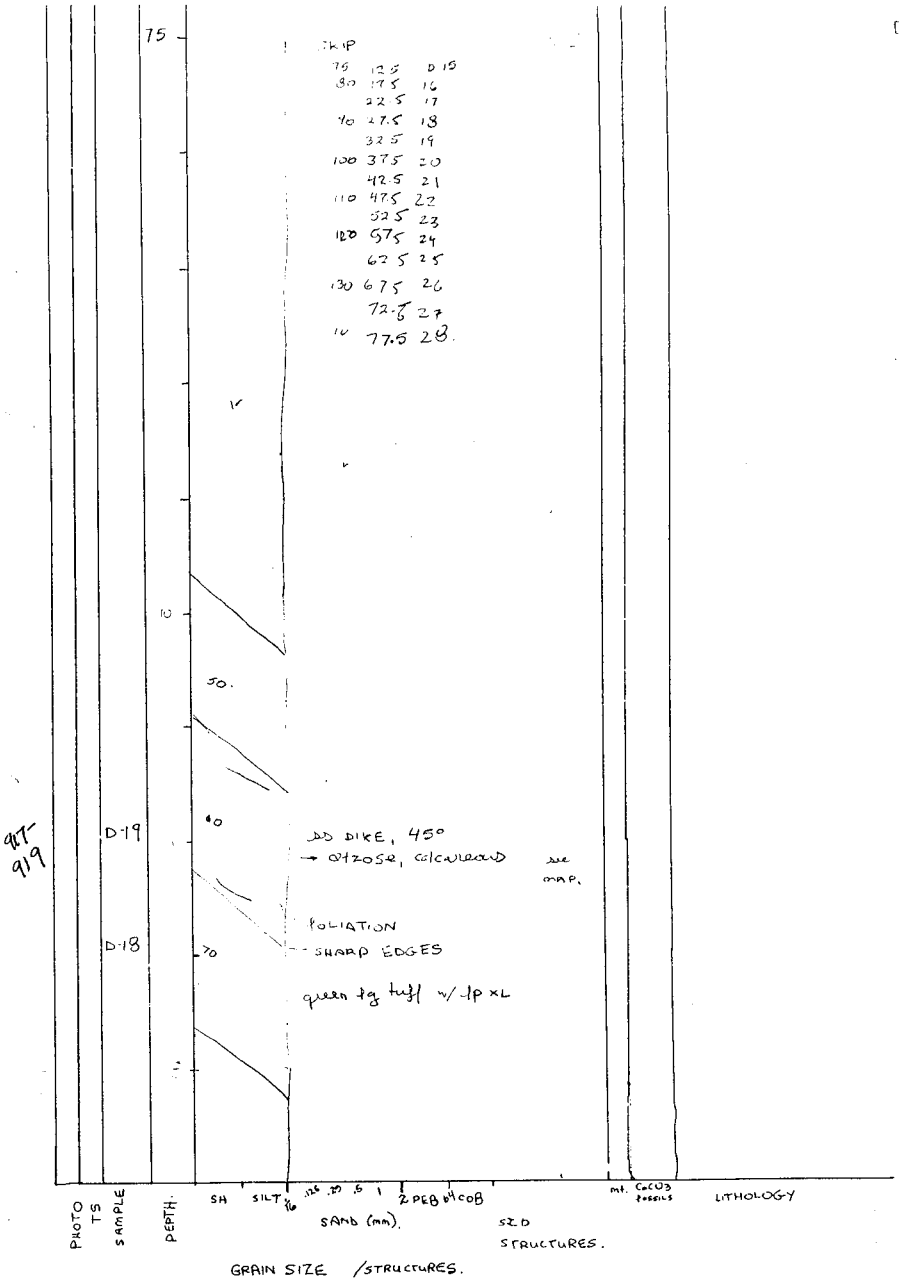

D11
D10
D13
D12
massive, extend >40m
massive (top)
massive, patchy
massive
massive pebble lay
St
St w/ pebs
small <5cm St
massive
rippled
xB (pc)
low angle xB (C+?)
OPPOSITE DIRECTION xB, SEE BOOK
xB, St (pc)
xB
scour c.t. ±2cm.
small St
PTxB, init forest planar REACT
SL
FOS
<1cm (5mm) clasts
base gravel 1m.
Qtz rich
pebs max 3cm ave 1.5cm RHY VAR.
non wth
pebs 3cm RHY
occasional 5mm pebs
Qtz rich
scour 4cm
Rimmed 3mm Qtz
non pebbly
PROTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

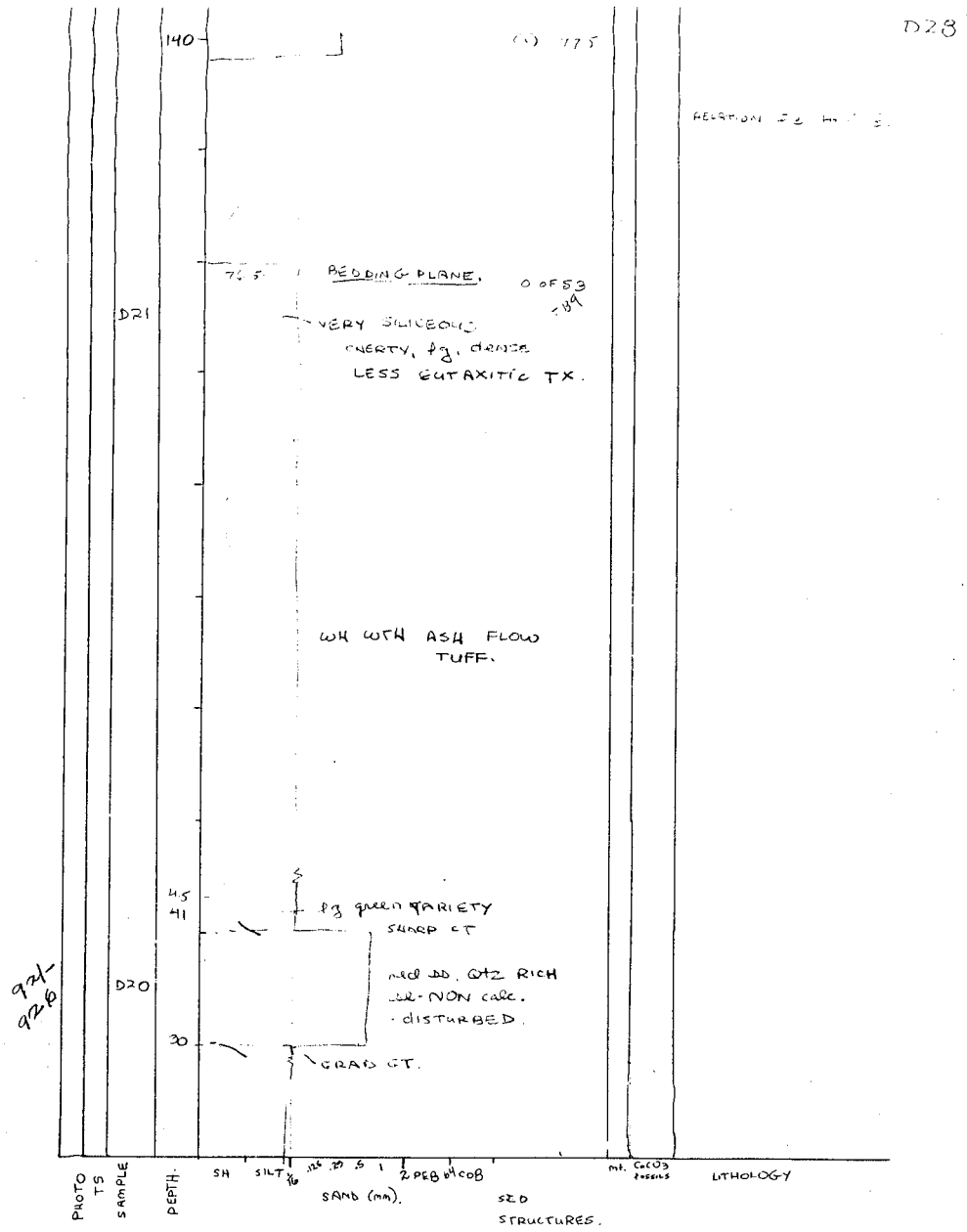

SKIP 1 PAGE
D10
D13B
HOR RIBS
SL TO MOD
secondary Qtz veins.
PROTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

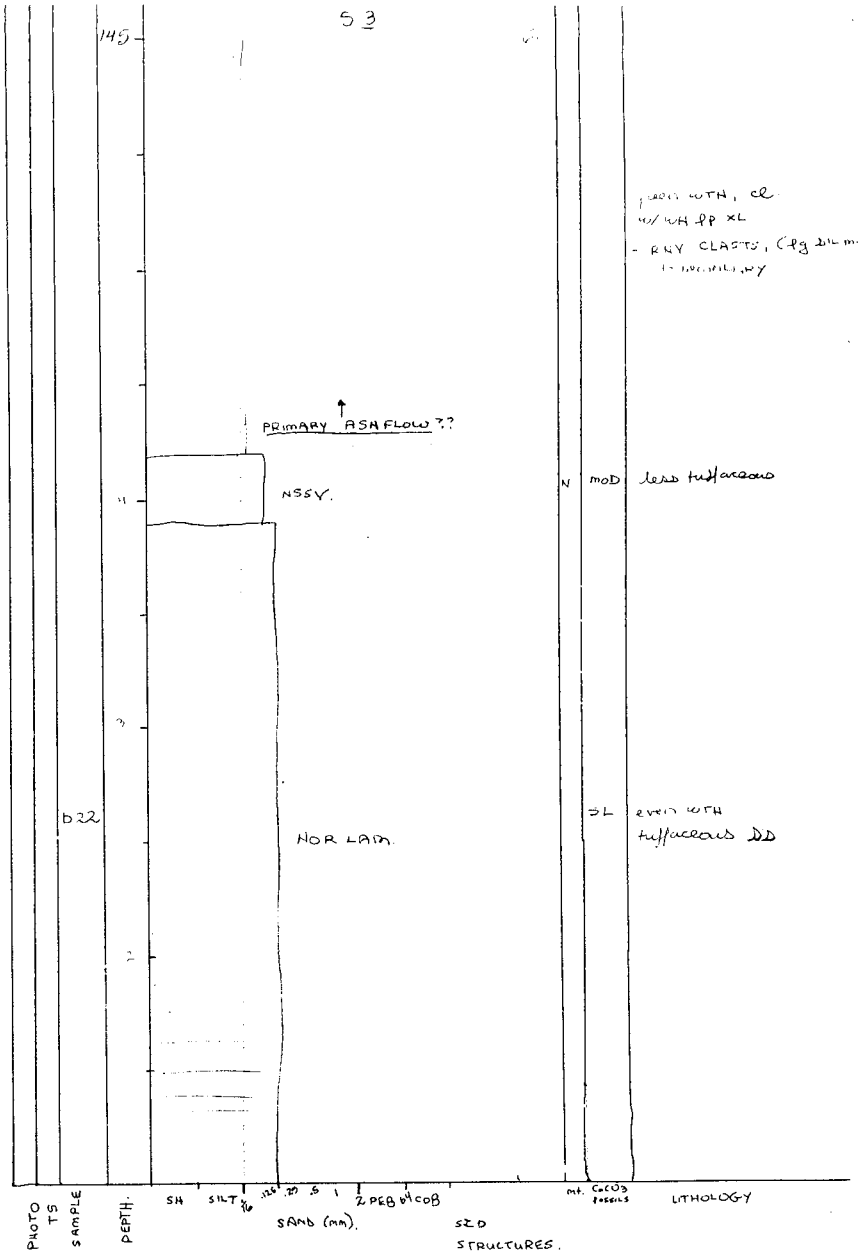

D12
D15
D14
6.0
CHANNEL
30
35
4
MORE BEDDING LATERAL
MOD
PATCHY CALC DIST
WTZ RICH.
MORE WTZ UP
HERE 4m THICK
NOR LAM, perfect
NOR. NON graded
shell vugs
less calcareous
N
VERY
SL
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

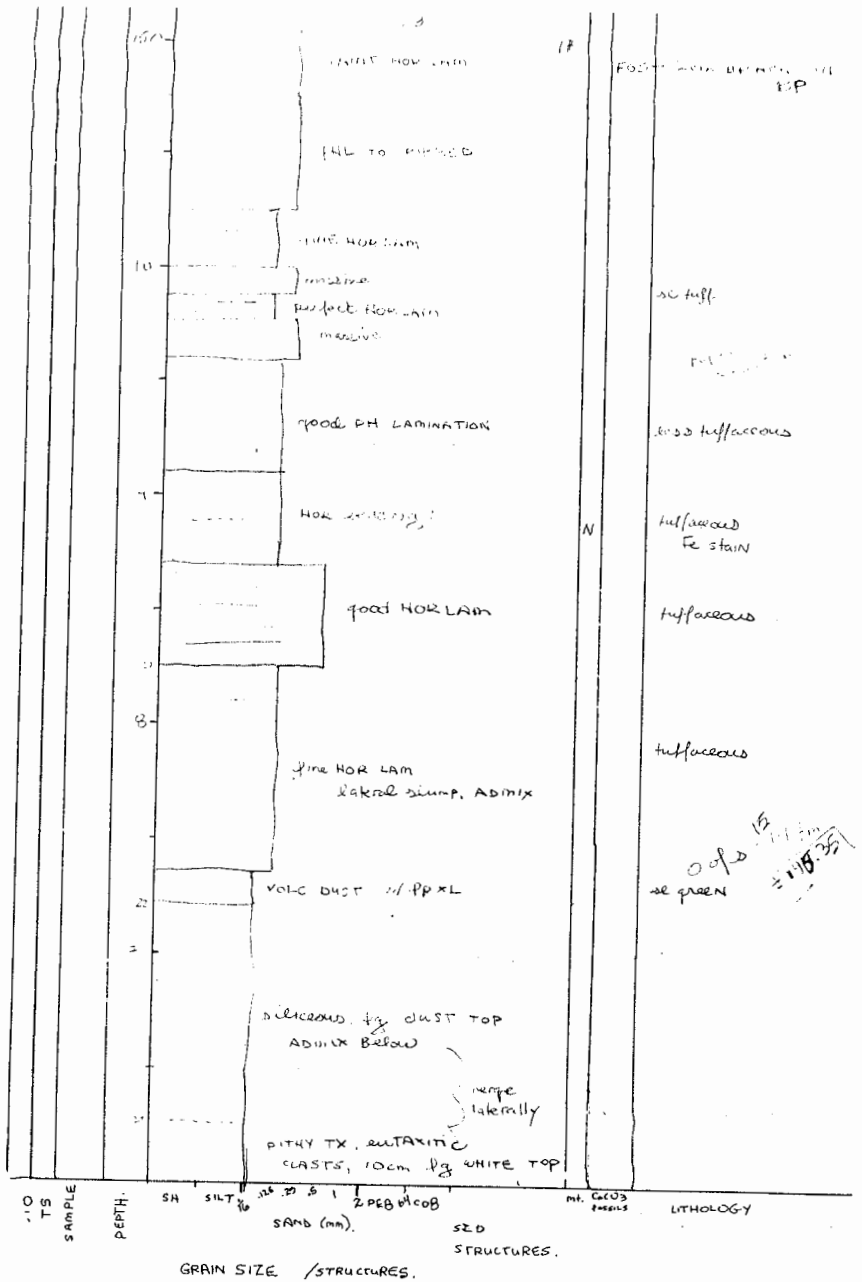

D11
6.5
dark fg volcanic tuff with fp XL 5-10%
grad.
prod with WTH
BANDED ½ VOLCANIC DUST.
- VERY LATERALLY CONTINUOUS.
do detailed log.
LIME
INT
LIME
INT
C WHITE
LIME
CB
LIME
INT.
A
LIME.
B
INT.
A
limy green
BOTTOM PH TUFF
6.8
6.7
6.2
D16
9/16
ROTATED BEDDING
colour relate grain size
- fine grained more clay poor N.
LITHOLOGY
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

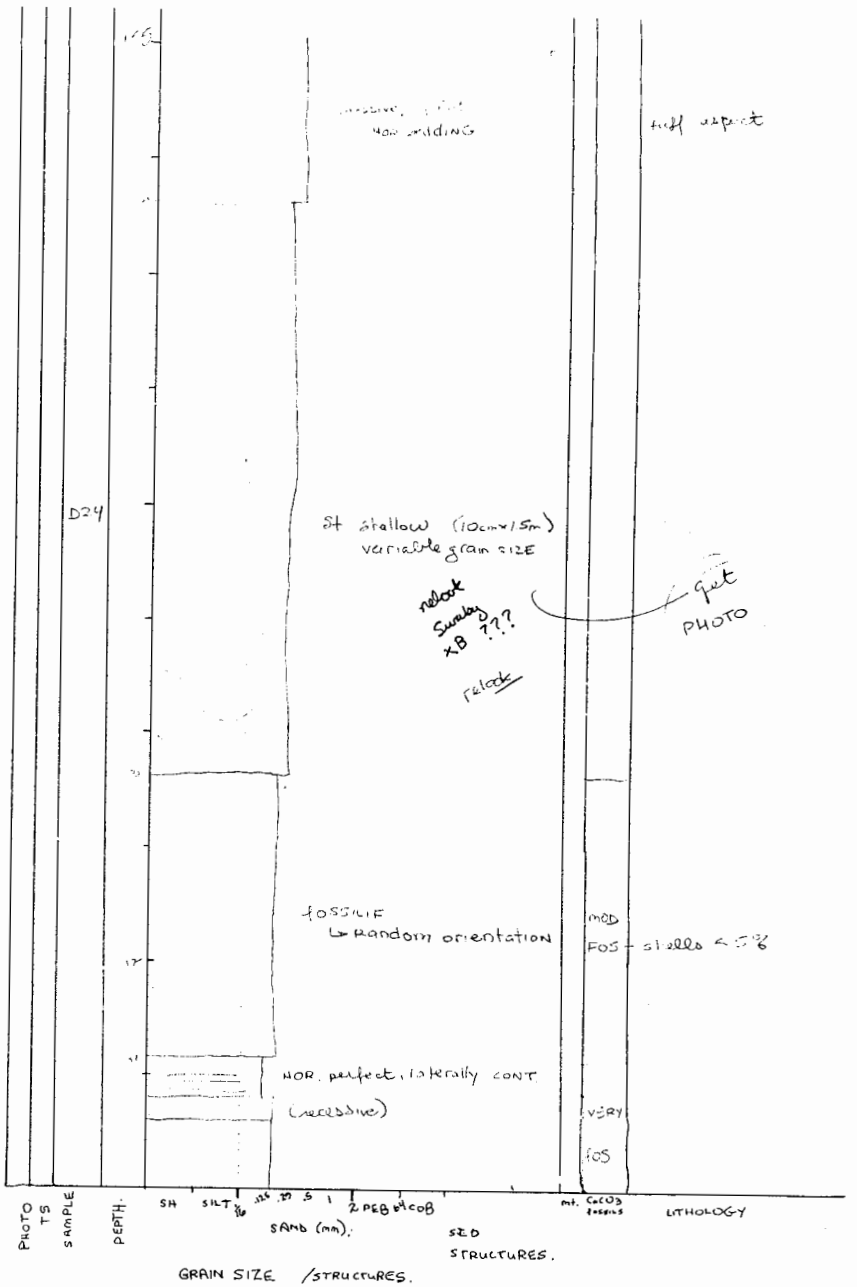

WHITE SILICEOUS
ASH FLOW TUFF
EUTAXITIC FOLIATION
ACCENT. SECONDARY
SILICIFICATION
D17
ASHFLOW: wh WITH
welded, sil. accent
eutaxitic FABRIC
grad change.
65.5
blocks of welded VARIETY
20-30cm. WITHIN
TOP of fg/fold xL VAR.
SECTION 2
0-62.67
HERE
=3m
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.


SKIP
75
80
100
110
120
130
140
D 15
16
17
18
19
20
21
22
23
24
25
26
27
28.
D-19
D-18
50.
60
70
DD DIKE, 45°
→ QTZOSR, calculeard
see MAP.
FOLIATION
SHARP EDGES
green fg tuff w/ 1p xL
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.


D28
140
D21
BEDDING PLANE.
0 OF 53
VERY SILICEOUS
CHERTY, fg, ORNGE
LESS EUTAXITIC TX.
WH WTH ASH FLOW
TUFF.
45
41
D20
fg green VARIETY
SHARP CT
med DD. QTZ RICH
cer-NON calc.
· disturbed.
30
GRAD CT.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
mt.
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.


53
145
PRIMARY ASH FLOW ??
NSSV.
D22
NOR LAM.
N
moD
less tuffaceous
SL
even wth
tuffaceous DD
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
mt.
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES


D30
FAIL TO PUNCH
fine HOR LAM
massive
perfect HOR LAM
massive
good FH LAMINATION
HOR LAM
good HOR LAM
fine HOR LAM
laterally slump, admix
VOLC DUST w/ PP XL
siliceous, fg DUST TOP
ADMIX Below
wedge laterally
PITHY TX, EUTAXITIC
CLASTS, 10cm fg WHITE TOP
sc tuff
tuffaceous
tuffaceous
Fe stain
tuffaceous
tuffaceous
sc green
mt. CaCO3 fossils
LITHOLOGY
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


D24
massive, poor
NOR LAMINATION
tuff aspect
St shallow (10cm x 1m)
variable grain SIZE
relook
Sunday
XB ???
relook
get
PHOTO
fossils
Random orientation
MOD
FOS - shells < 5%
NOR. perfect, laterally cont
(recessive)
VERY
FOS
mt. CaCO3 fossils
LITHOLOGY
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

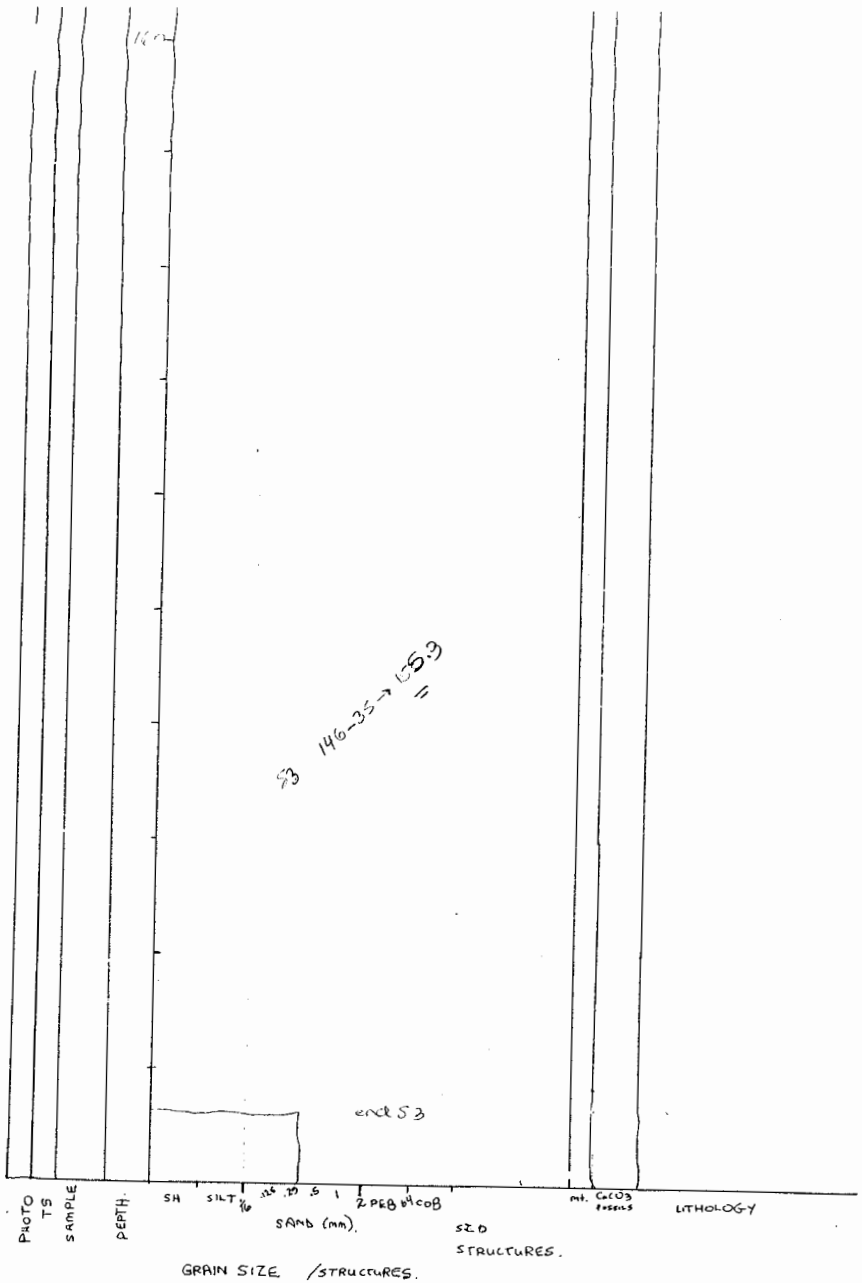
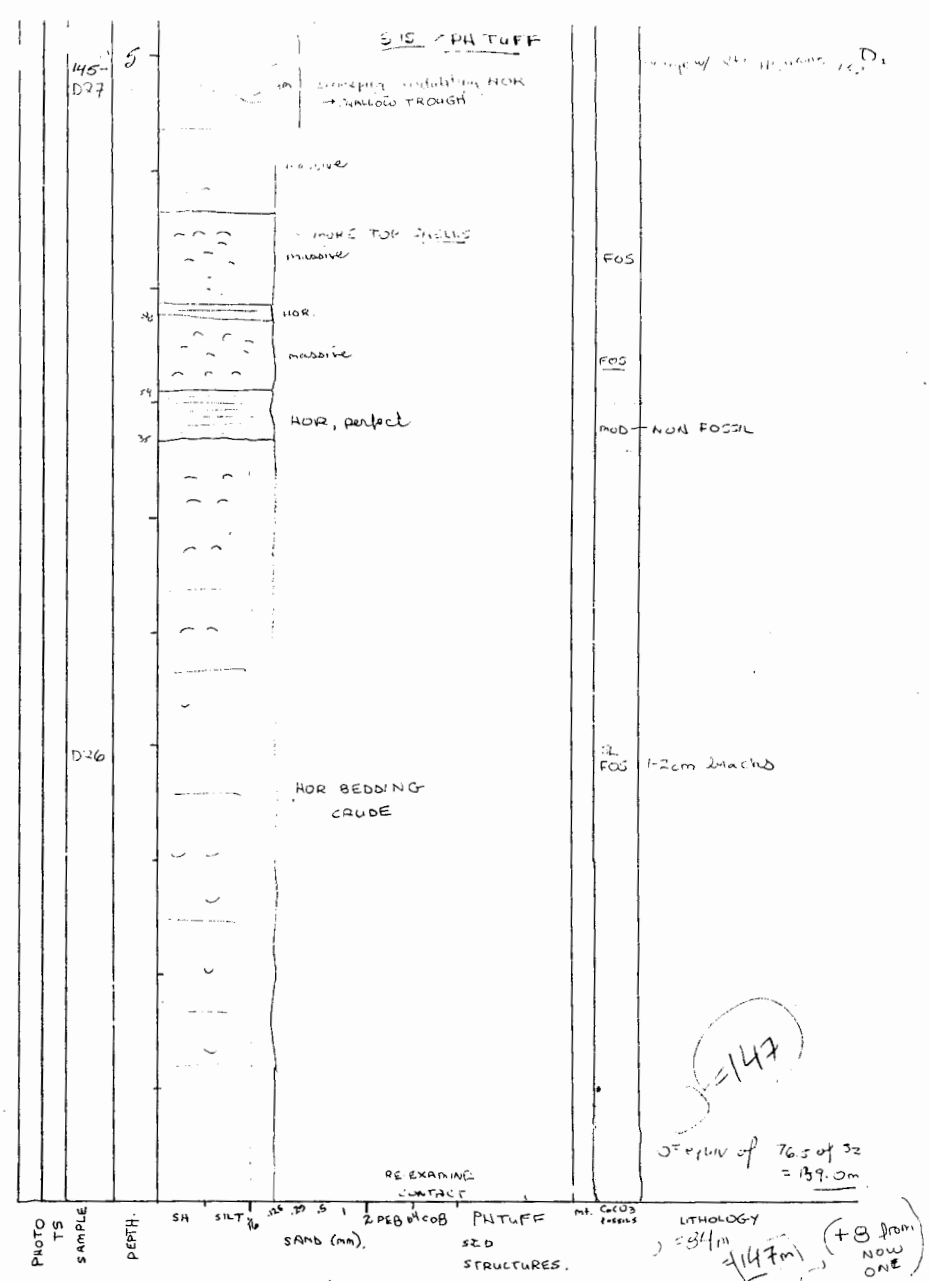
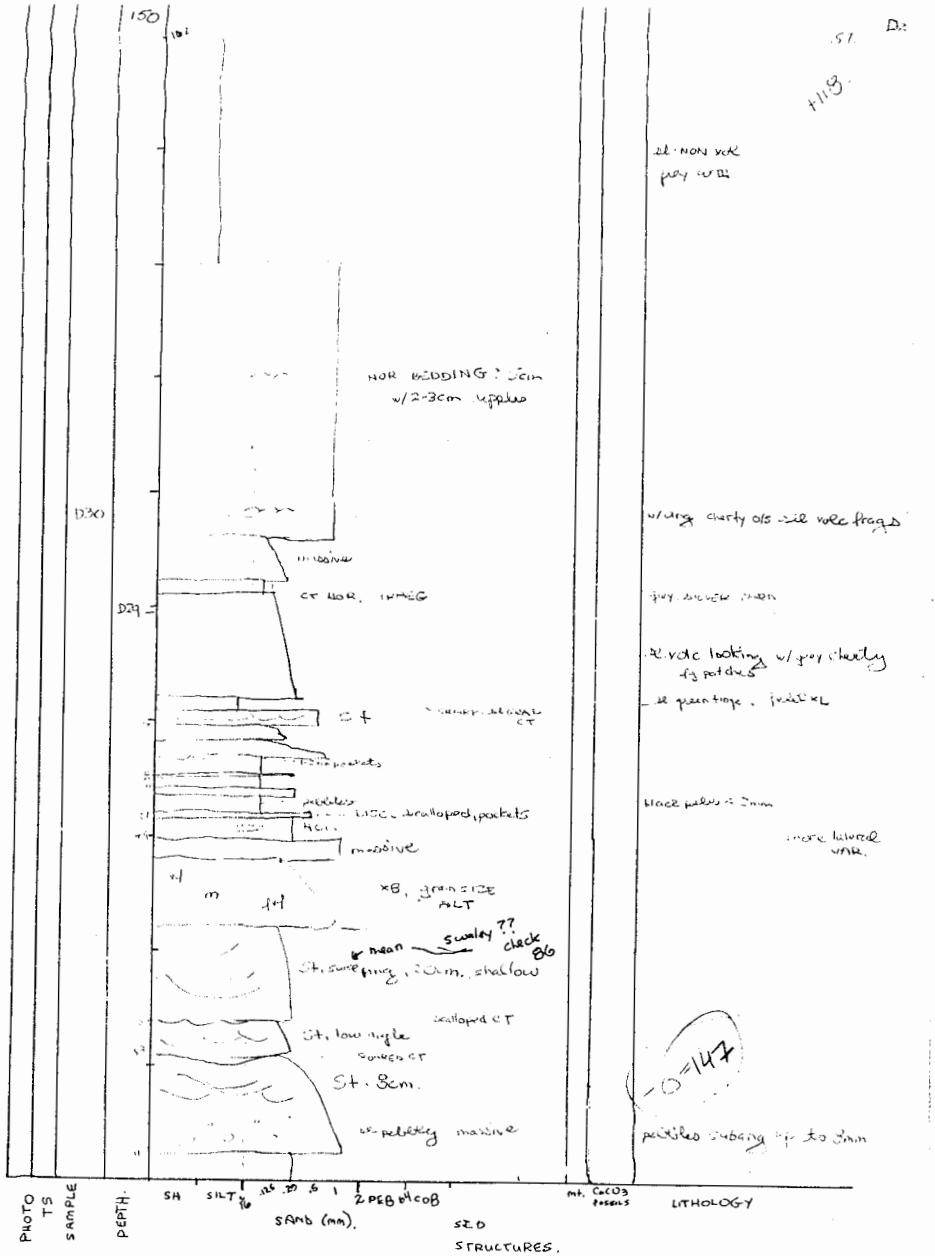
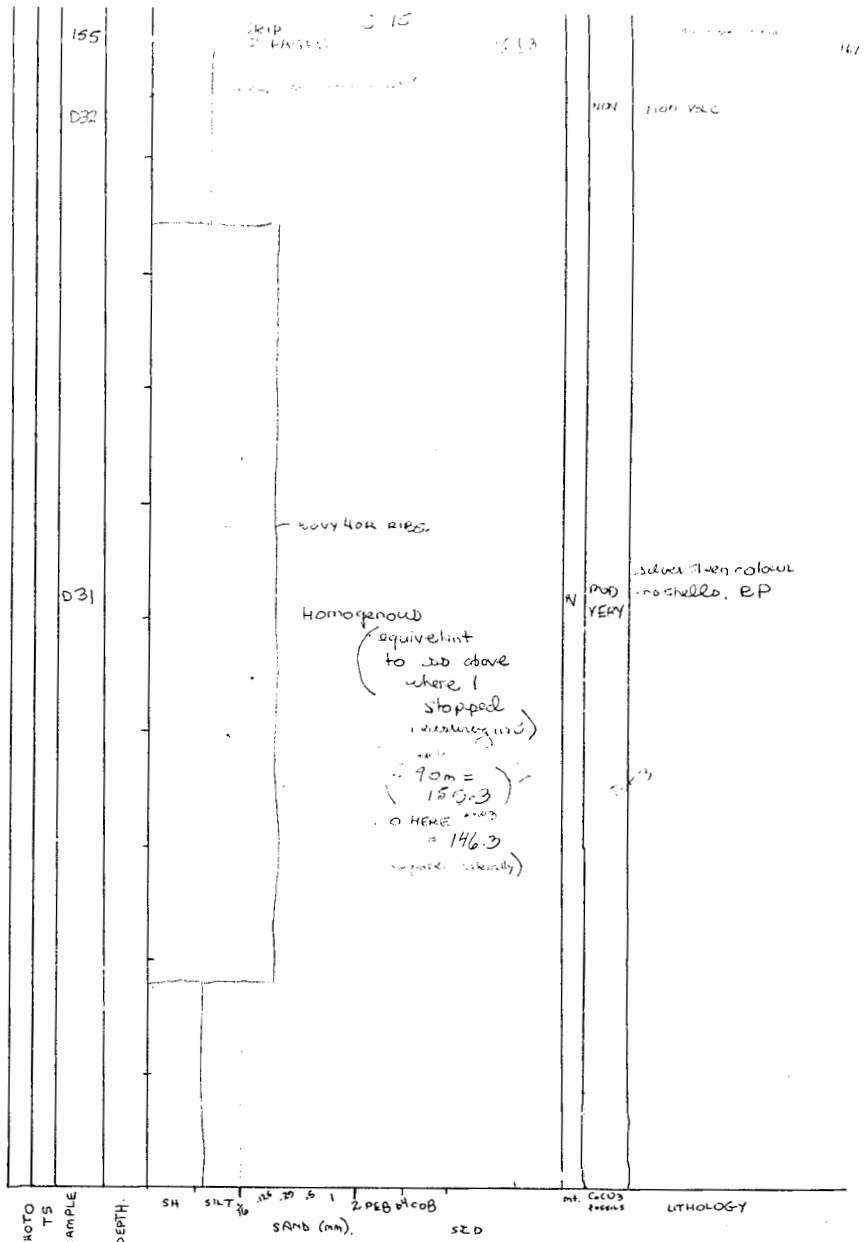
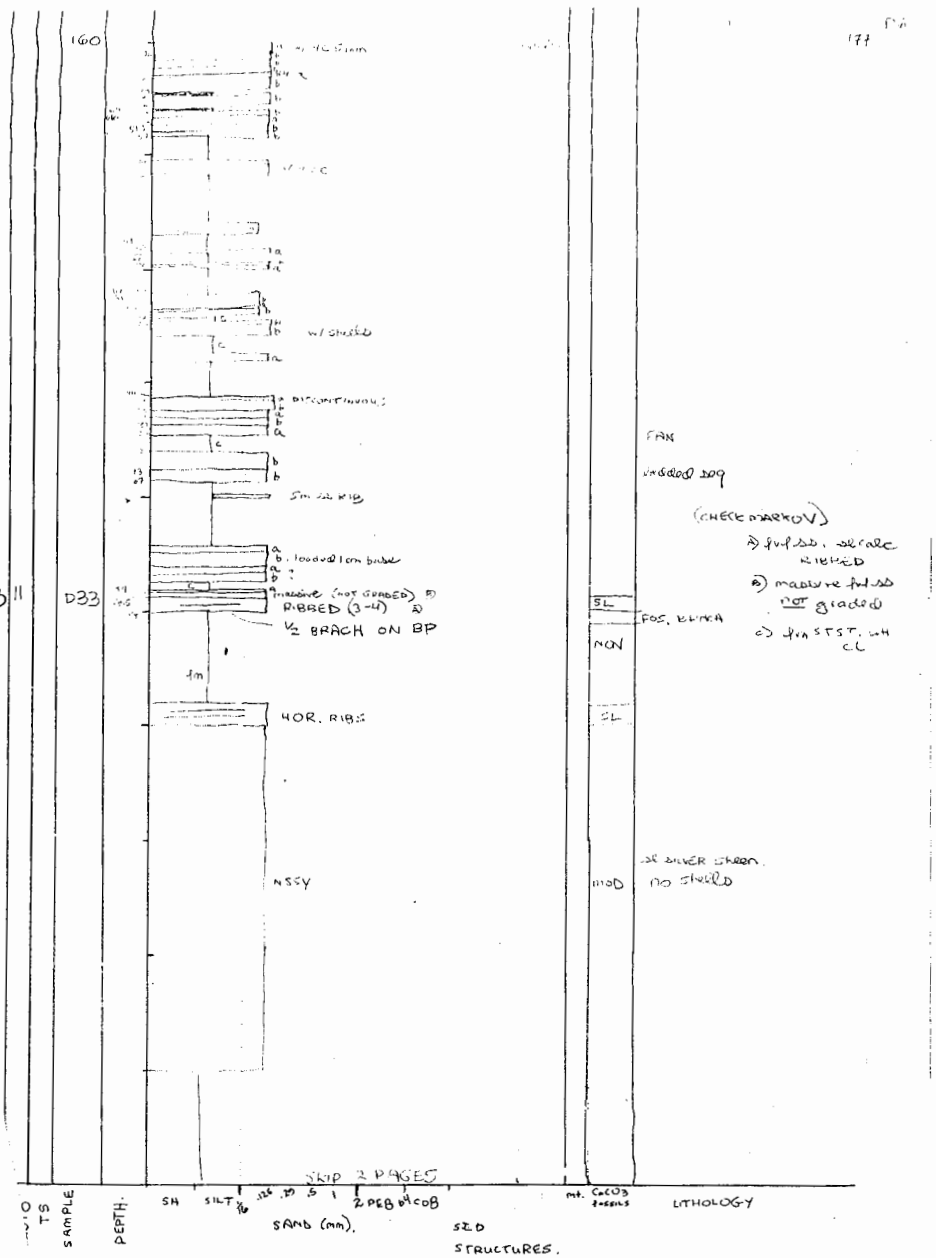


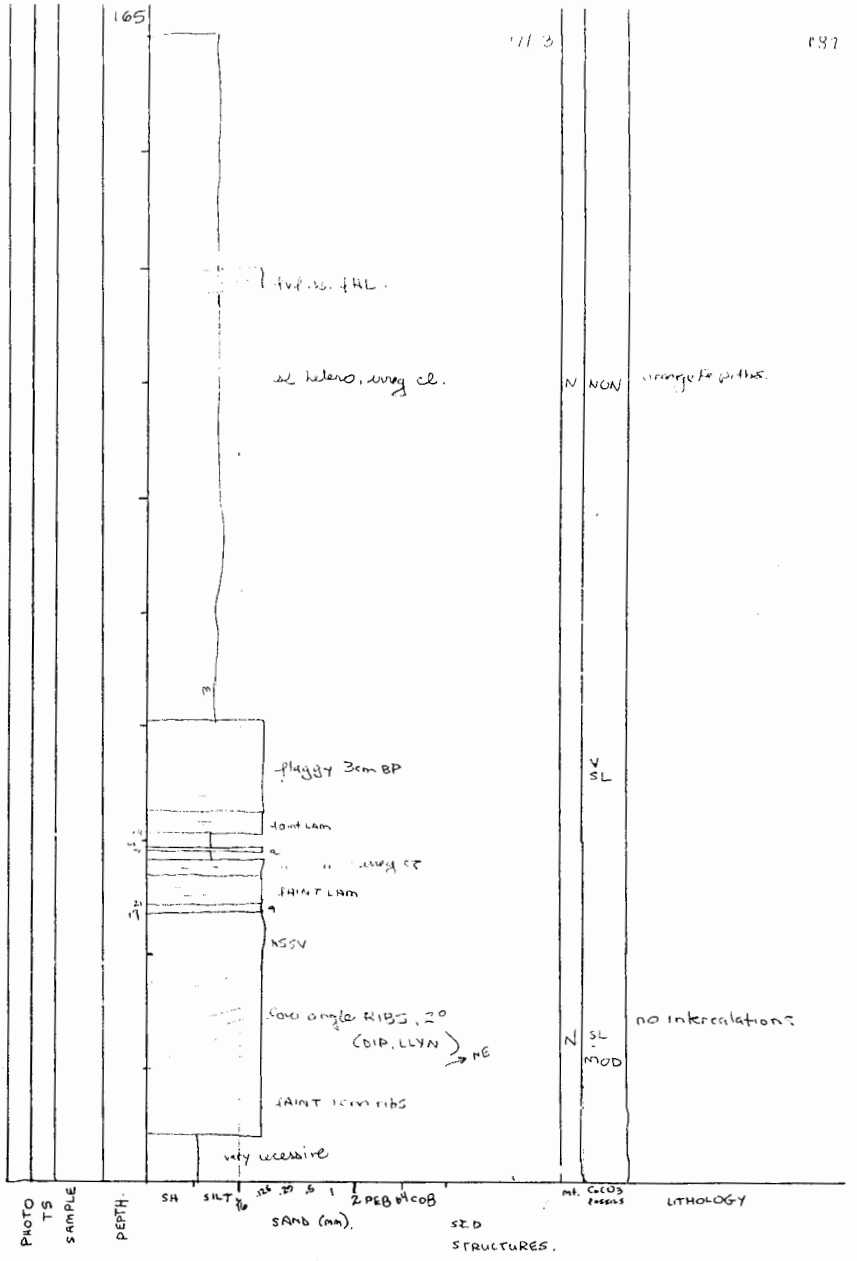
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
SZD
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.
S3 146-35 → 153
end S3

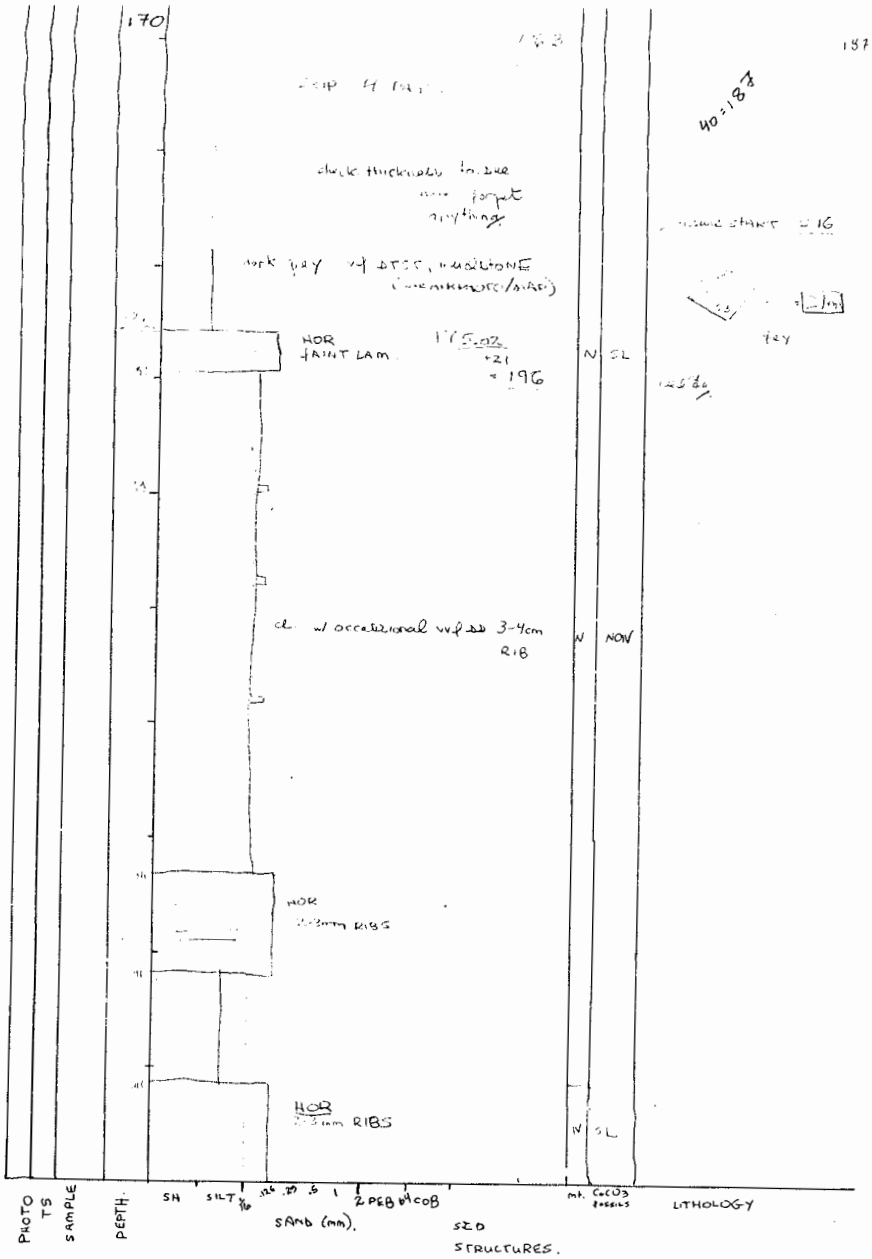

S15 ~PH TUFF
145-
D27
5
HOR
massive
HOR, perfect
HOR BEDDING
CRUDE
D26
FOS
NON FOSSIL
1-2cm lmacha
RE EXAMINE
CONTACT
PH TUFF
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
SZD
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.
=147
=147m
(+8 from NOW ONE)

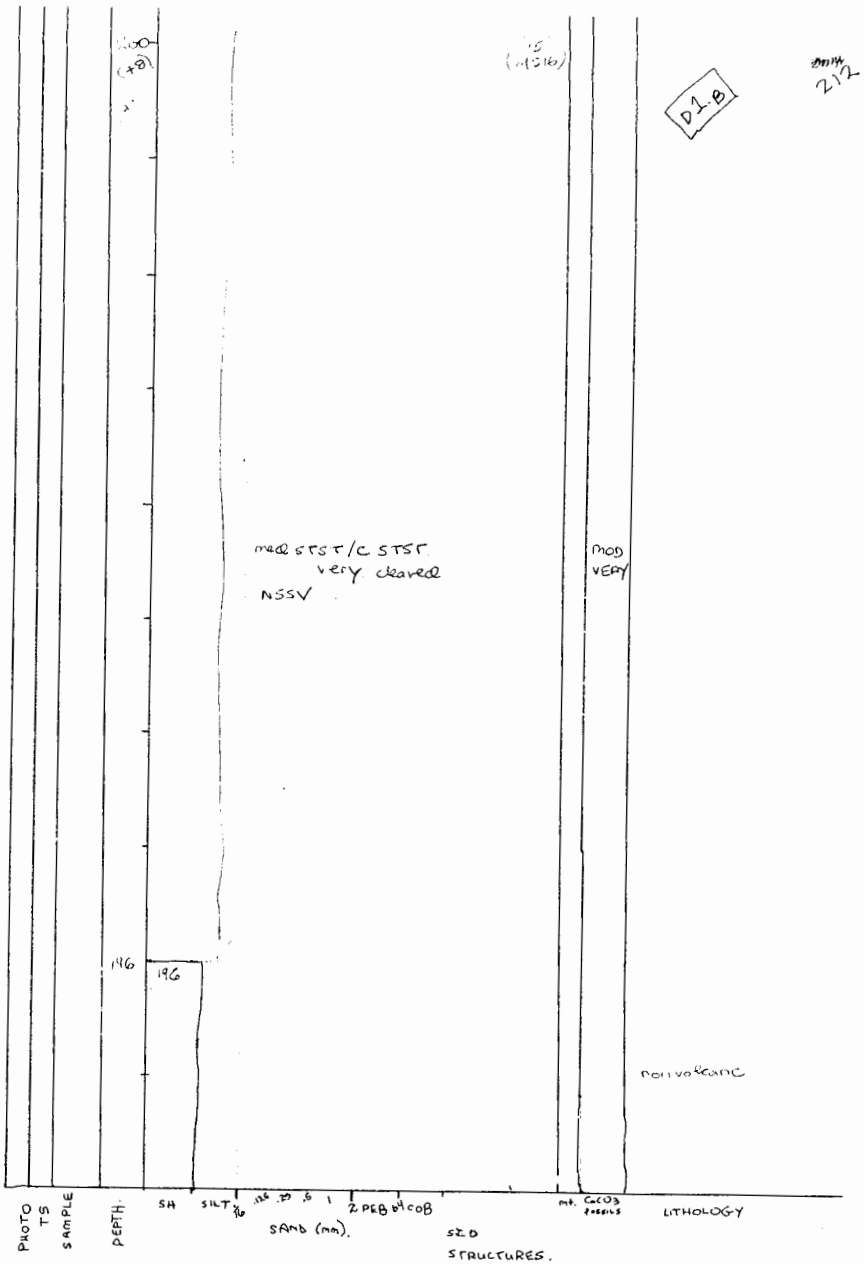

150
D30
D29
NOR BEDDING ? 3cm w/2-3cm ripples
massive
cr HOR. INTERC
ripple laminated CT
pebbles
HCSC - scalloped packets
massive
xB, grain SIZE ALT
wavy ??
check
St. sweeping, 30cm. shallow
scalloped CT
St. low angle curves CT
St. 8cm.
pebbly massive
D=147
NON BEDDING
w/very cherty o/s
fairly uniform
w/ cherty
pebbles = 2mm
more layered
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
mt. CaCO3 nodules
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


155
D32
D31
skip
3 PASSES
HOR RIBS.
Homogenous
(equivelint
to 30 above
where I
stopped
measuring)
= 90m =
150.3
HENCE
= 146.3
NON
HIGH VSC
MOD
VERY
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
mt. CaCO3 nodules
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

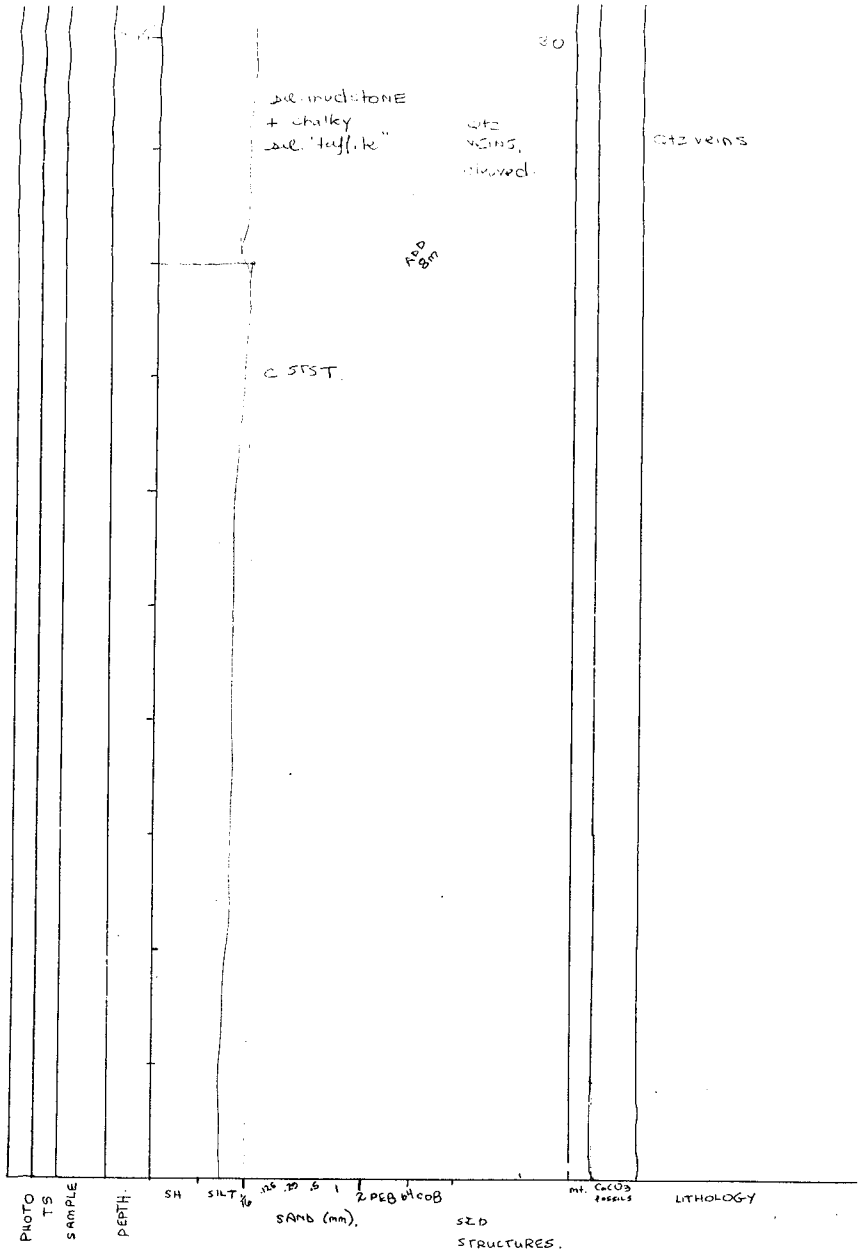

160
177
D33
w/ shells
DISCONTINUOUS
FAN
(CHECK MARKOV)
RIBBED (3-4)
½ BRACH ON BP
HOR. RIBS
NSSV
SL
FOS. ELTRA
NON
SL
MOD
no SILVER SHEEN.
SKIP 2 PAGES
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

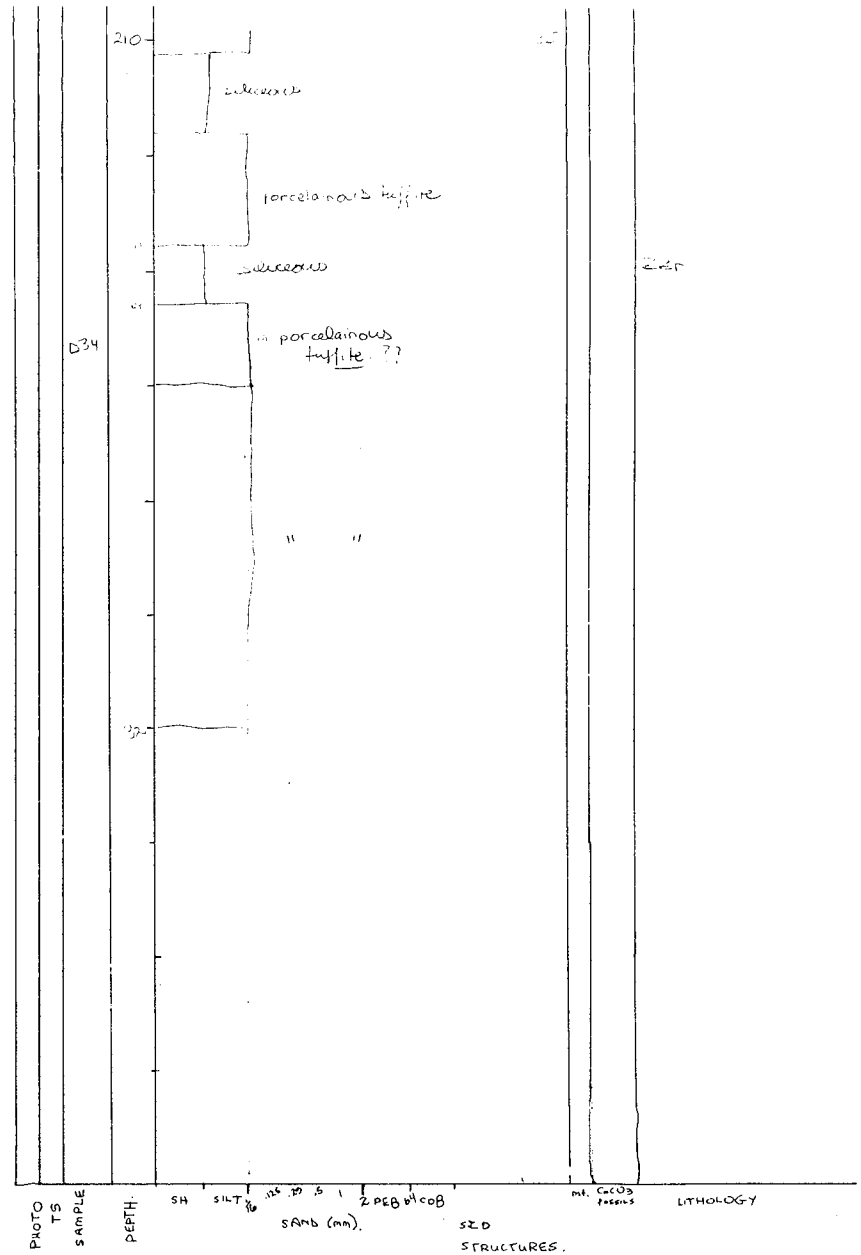

165
PBT
fluggy 3cm BP
FAINT LAM
NSSV
FAINT 1cm ribs
very recessive
NON
SL
MOD
no interrelations
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
2 PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.


170
HOR FAINT LAM
N SL
cl. w/ occasional vvf ss 3-4cm RIB
N NOV
HOR RIBS
HOB RIBS
N SL
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

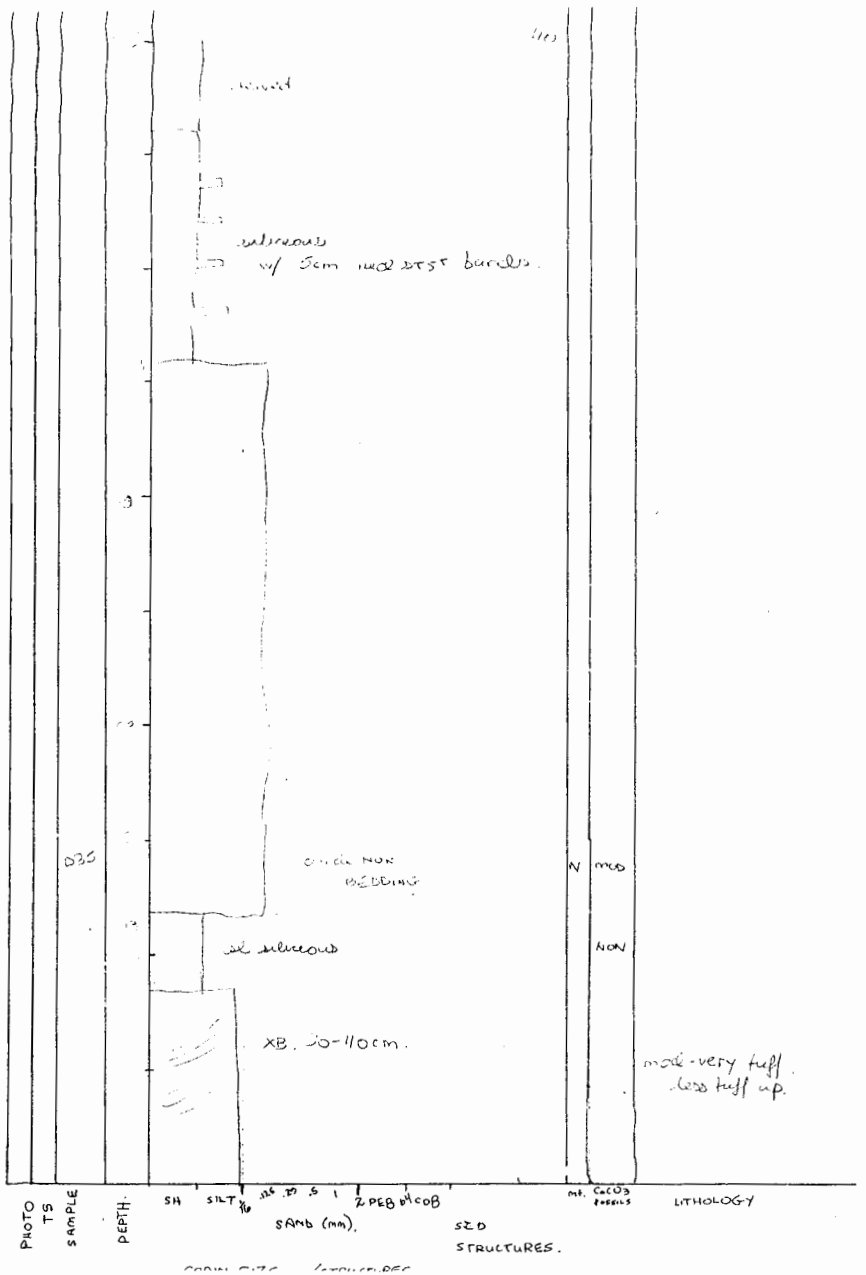

196
196
mod SFST/C SFST
very cleaved
NSSV
MOD
VERY
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

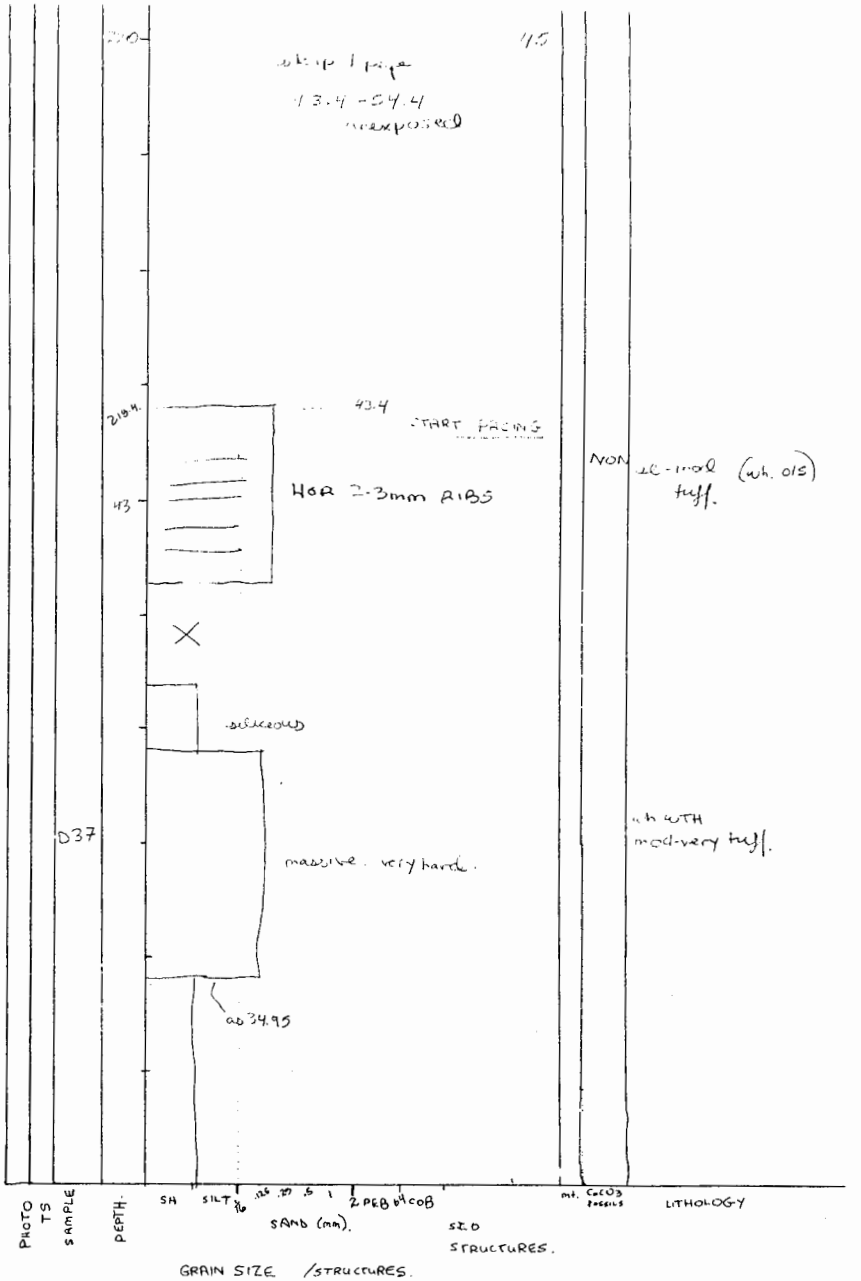
D1-8


dk. mudstone
+ chalky
dk. "tuffite"
wh
veins,
silicified
FOD
8m
C 5TST
30
Qtz veins
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
1/16
.125
.25
.5
1
2
PEB
CGL
COB
SAND (mm).
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

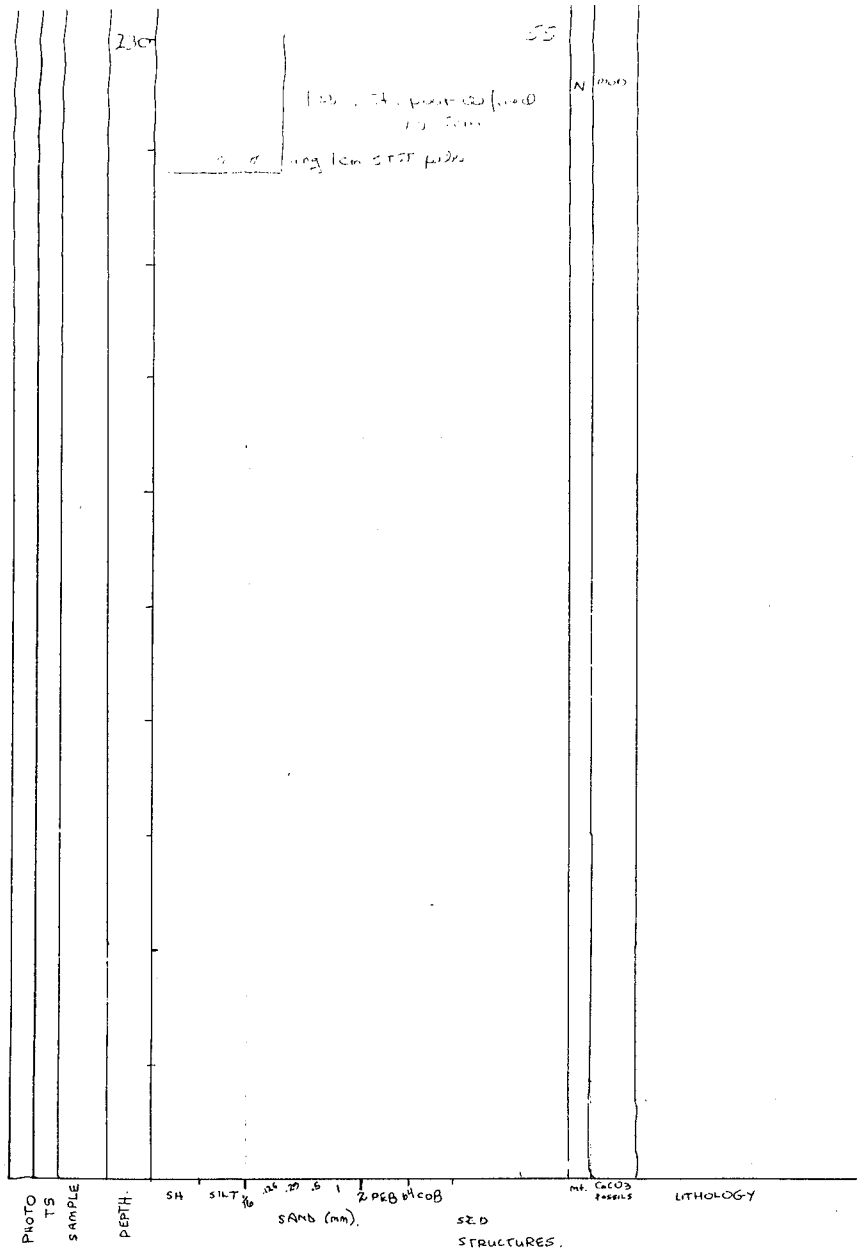

210
D34
siliceous
porcellanous tuffite
siliceous
porcellanous
tuffite ??
" "
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
1/16
.125
.25
.5
1
2
PEB
COB
SAND (mm).
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.

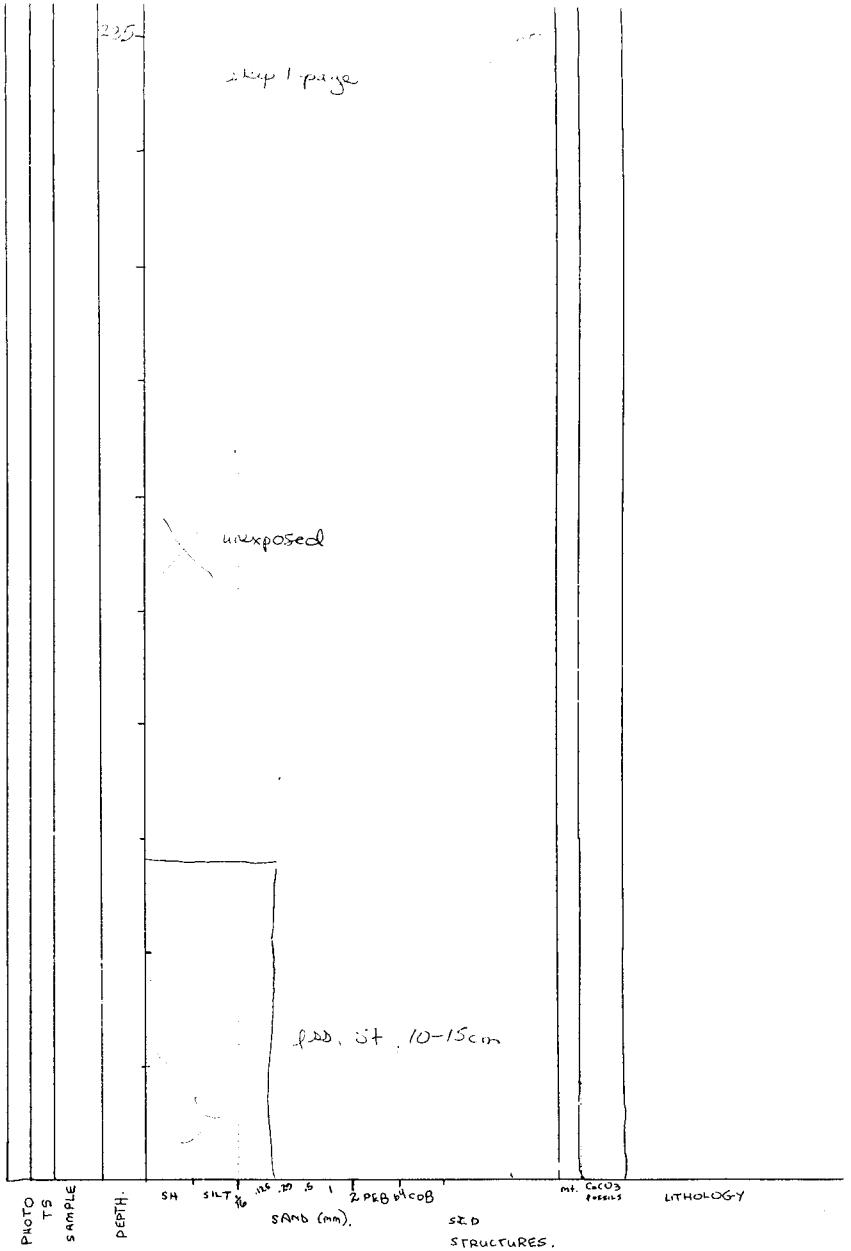
D

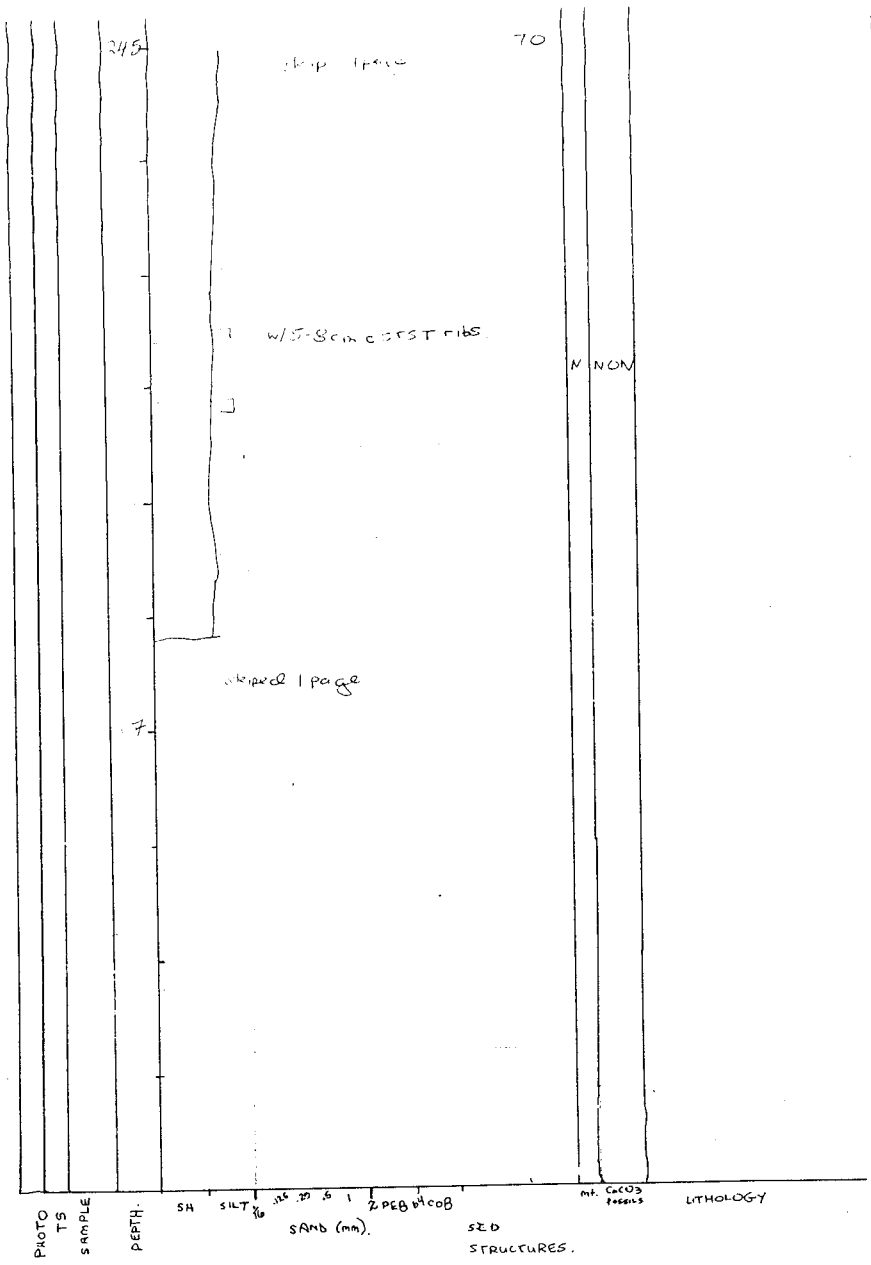


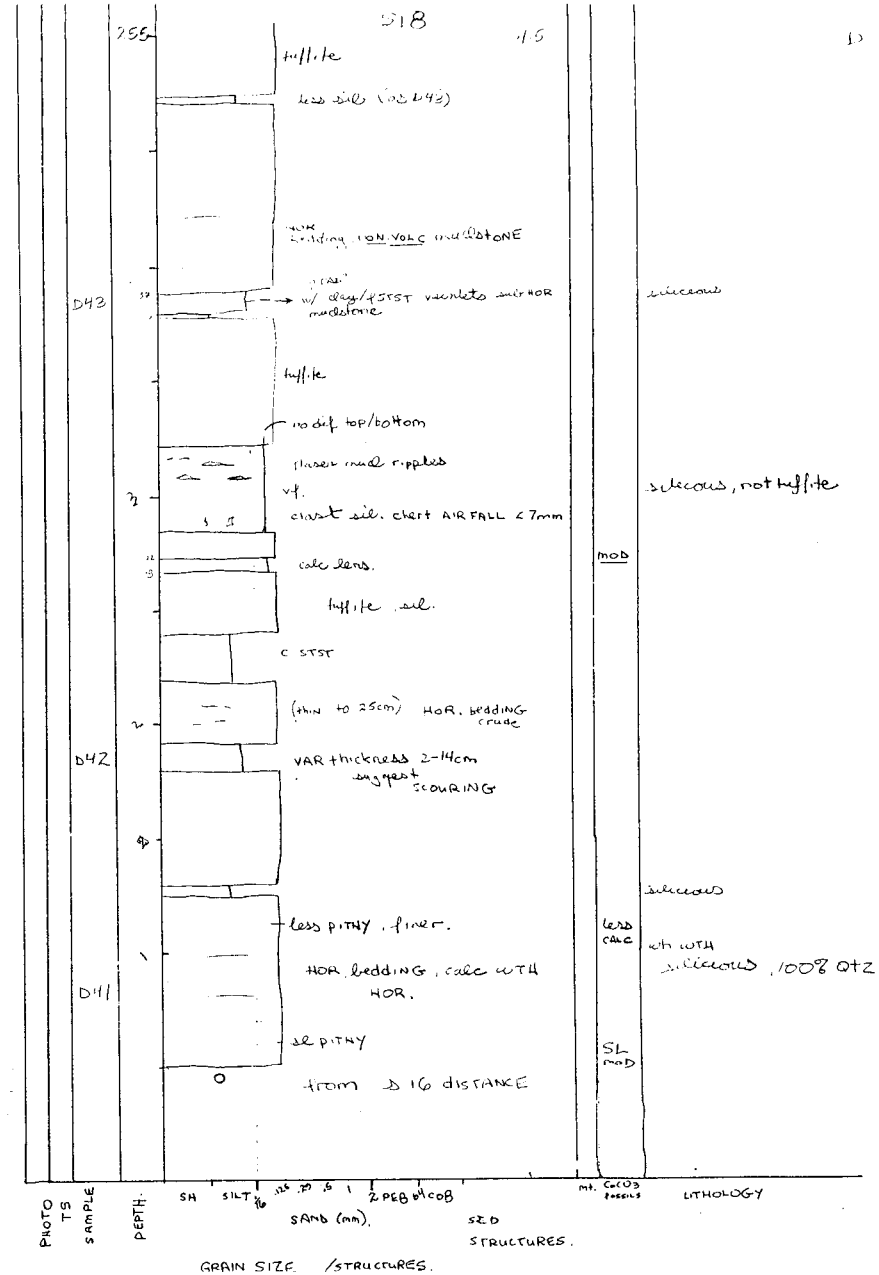


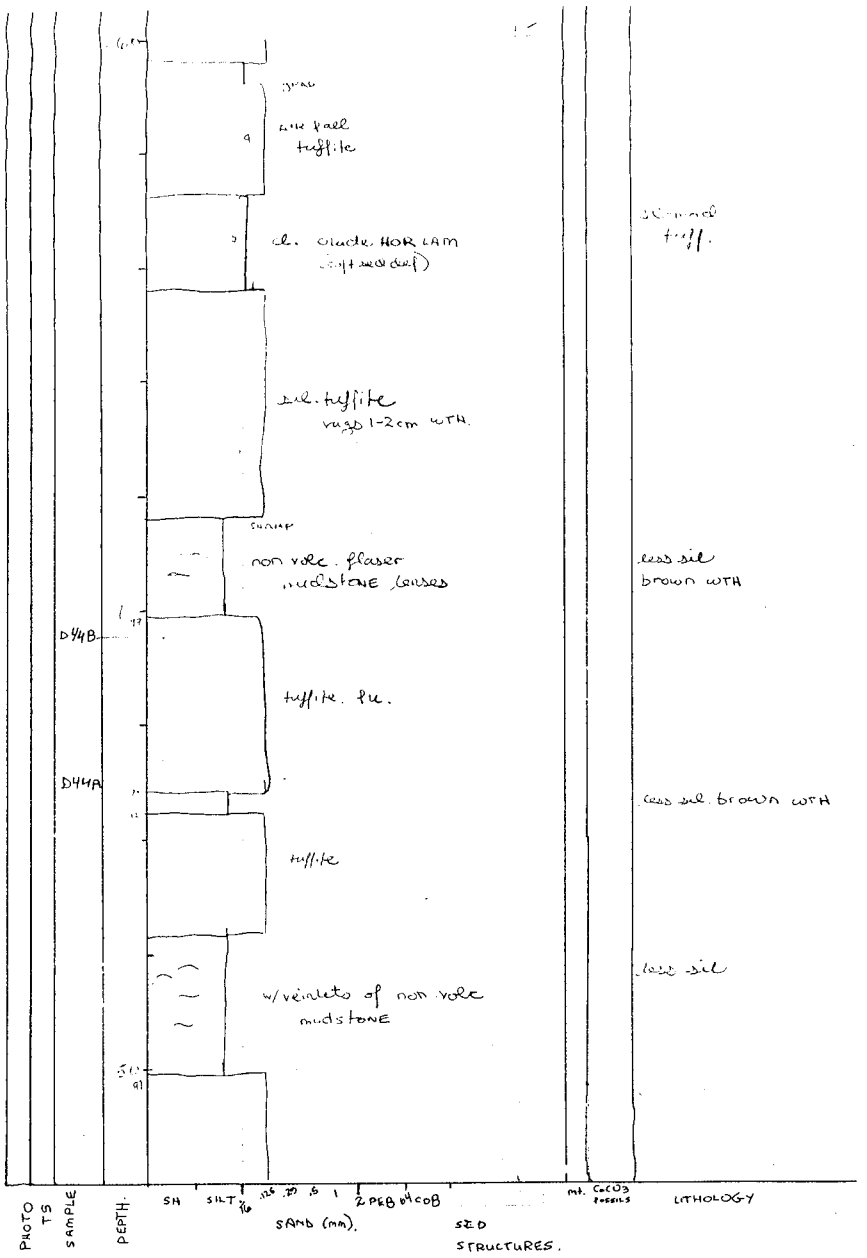
GRAIN SIZE /STRUCTURES.

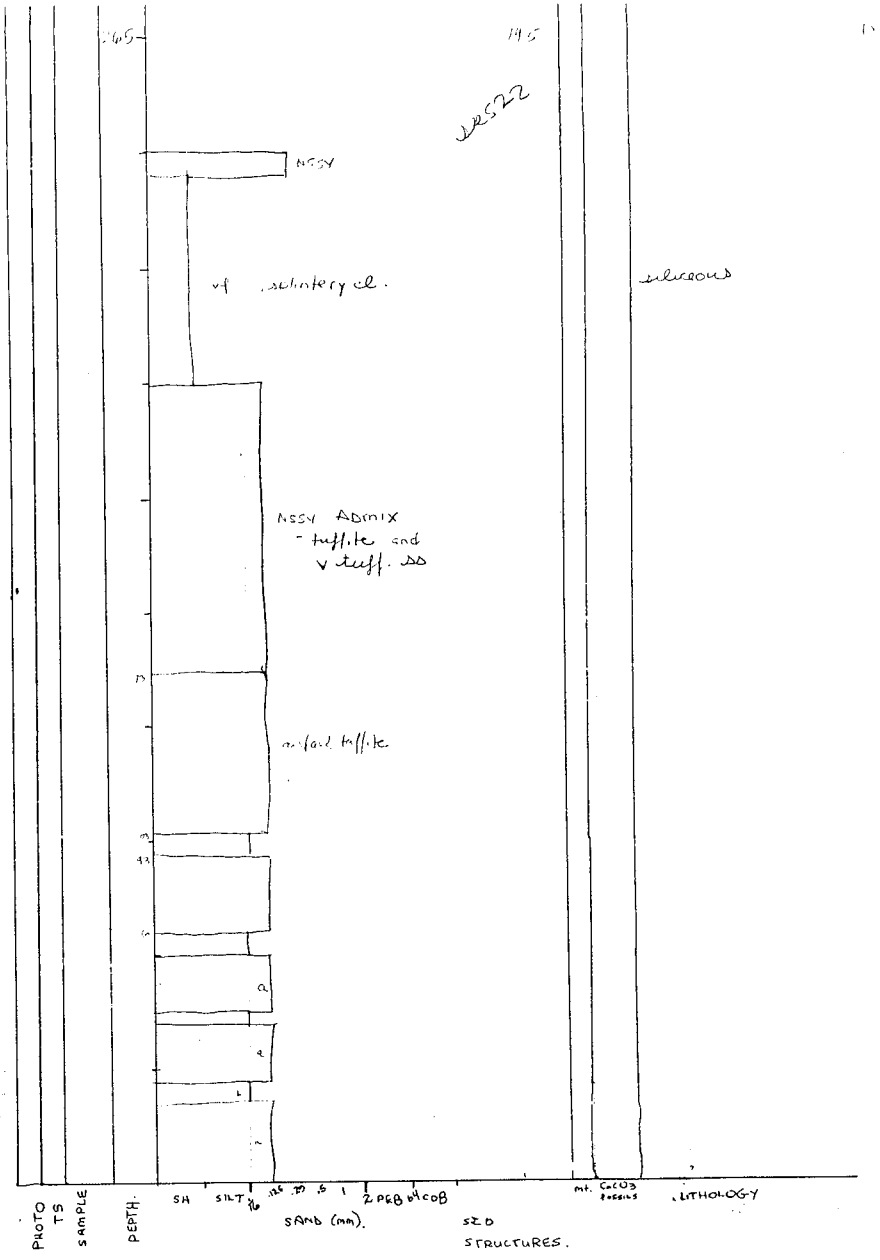

230
N
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEBB
COB
mt.
CaCO3
FOSSILS
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

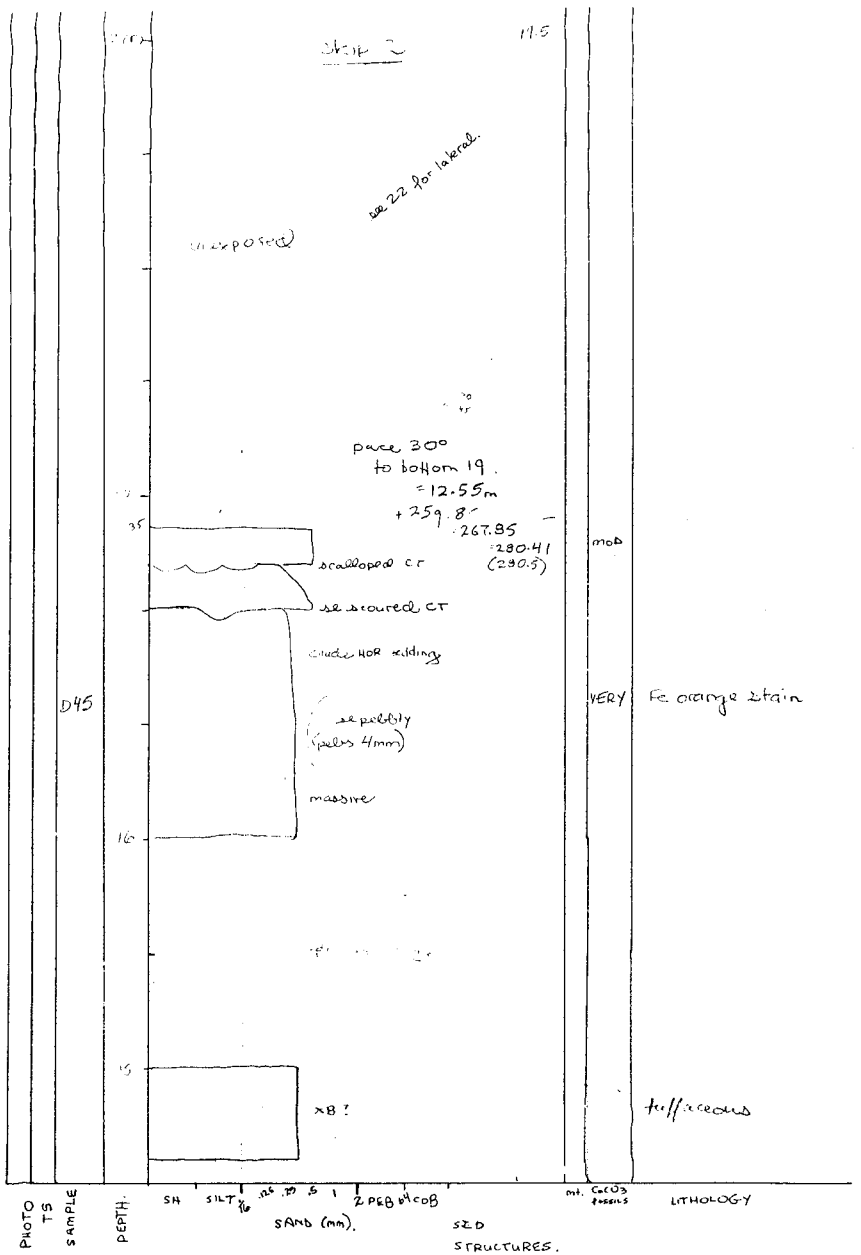

235
skip 1 page
unexposed
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEBB
COB
mt.
CaCO3
FOSSILS
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE /STRUCTURES.

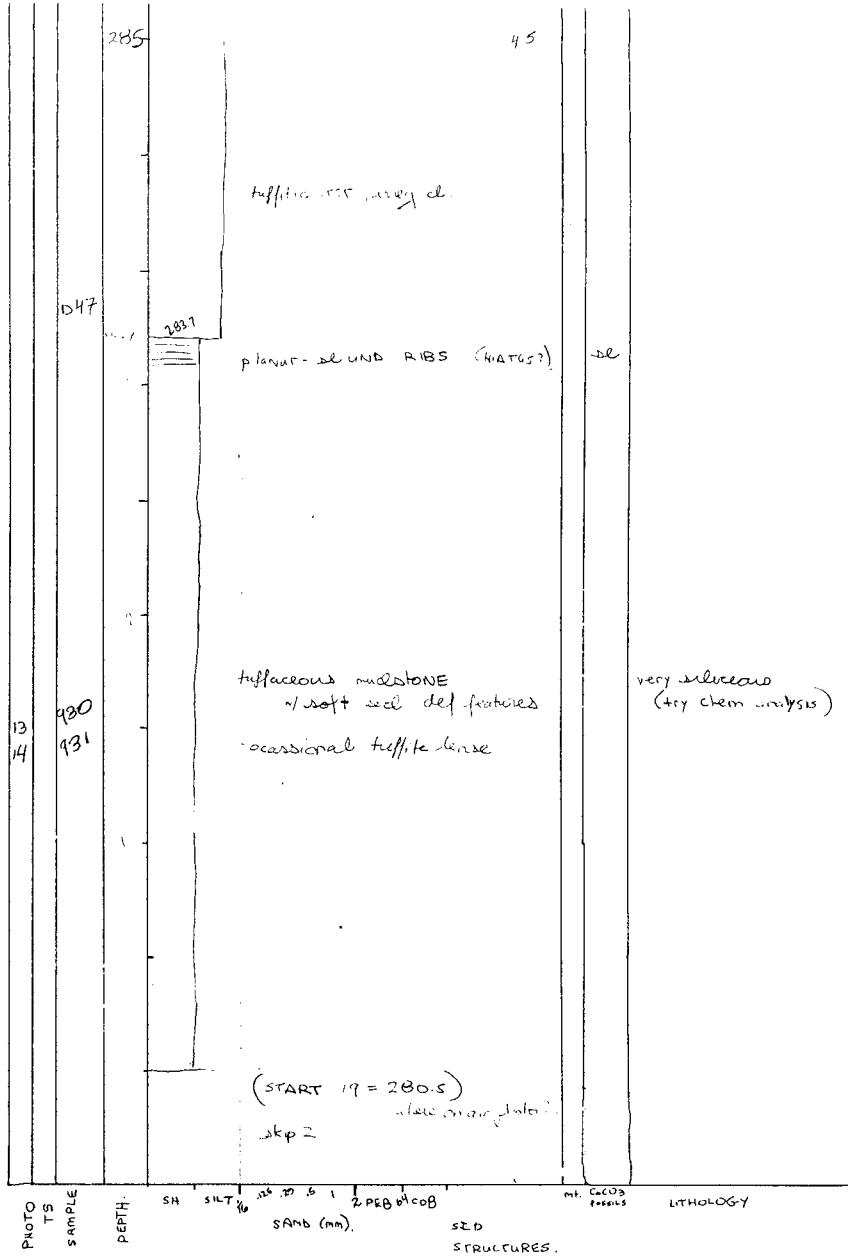

245
70
skip 1 page
w/ 5-8cm c STST ribs
N NON
skipped 1 page
7
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY

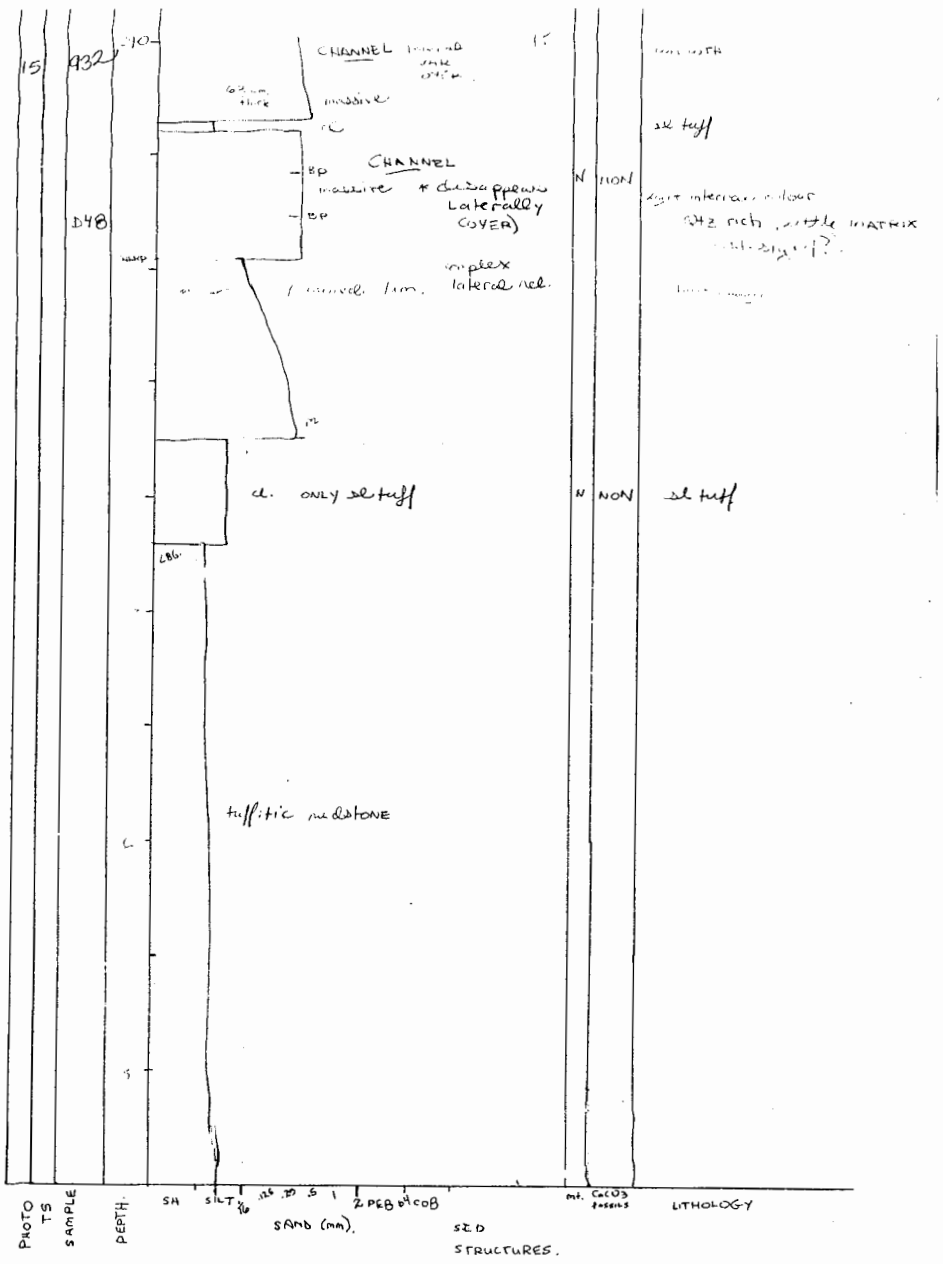

255
318
45
tuffite
less silt (vs D43)
w/ clay/f STST varvelets suit HOR mudstone
D43
tuffite
no dir top/bottom
planar mud ripplets
v.f.
clast sil. chert AIR FALL < 7mm
calc lens.
tuffite, sil.
c STST
(thin to 25cm) HOR. bedding crude
VAR thickness 2-14cm
suggest SCOURING
D42
less PITNY, finer.
HOR. bedding, calc with HOR.
D41
sl PITNY
from D 16 distance
siliceous
siliceous, not tuffite
mod
less CALC
with WITH siliceous, 100% Qtz
SL mod
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

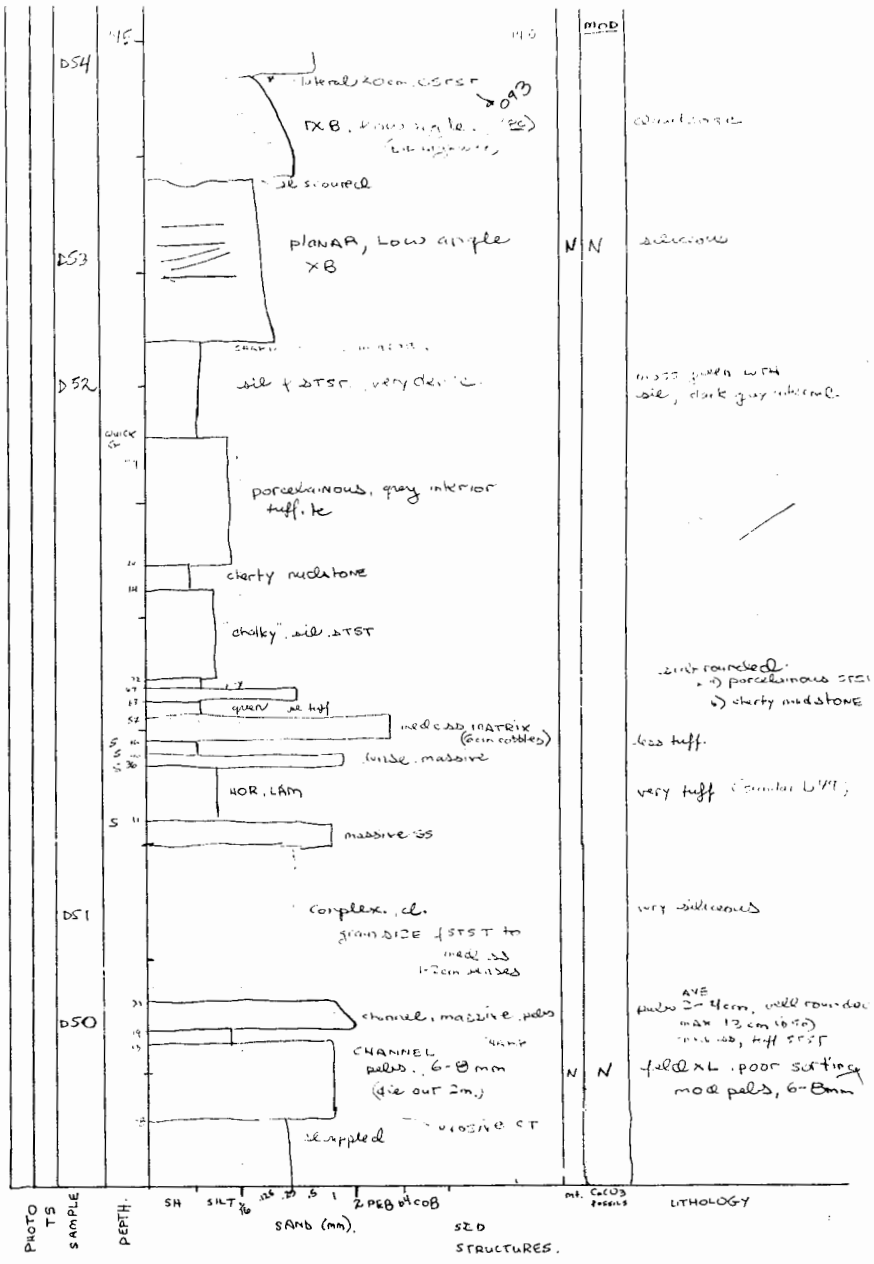

grav
ash fall tuffite
ch. claste. HOR LAM (soft sed def)
sil. tuffite rugs 1-2cm WTH.
non vole. flaser mudstone lenses
D44B
tuffite. fu.
D44A
tuffite
w/ veinlets of non vole mudstone
less sil brown WTH
less sil
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

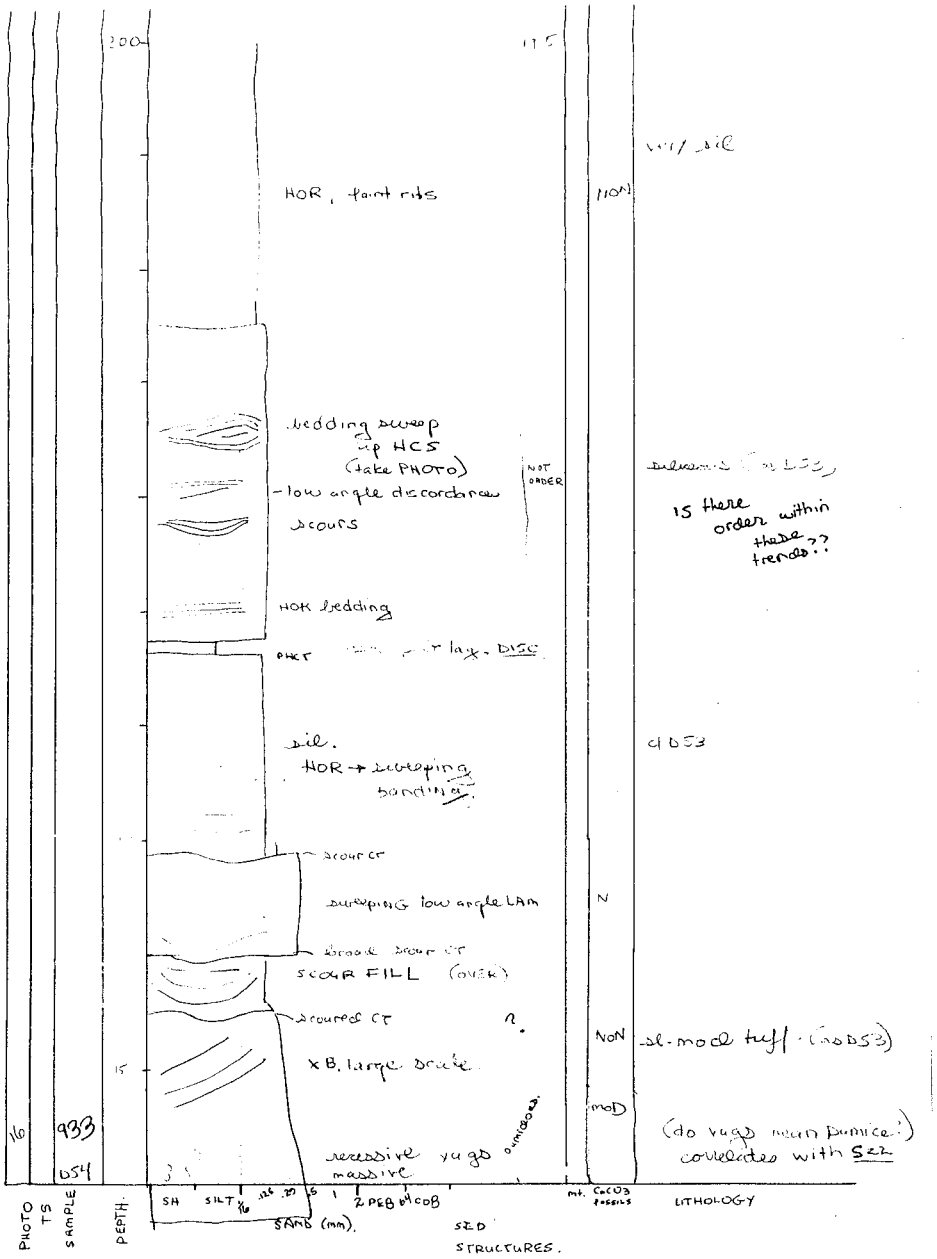

NSSV
vf schistery cl.
NSSV ADMIX - tuffite and v tuff. ss
a/fol tuffite
siliceous
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

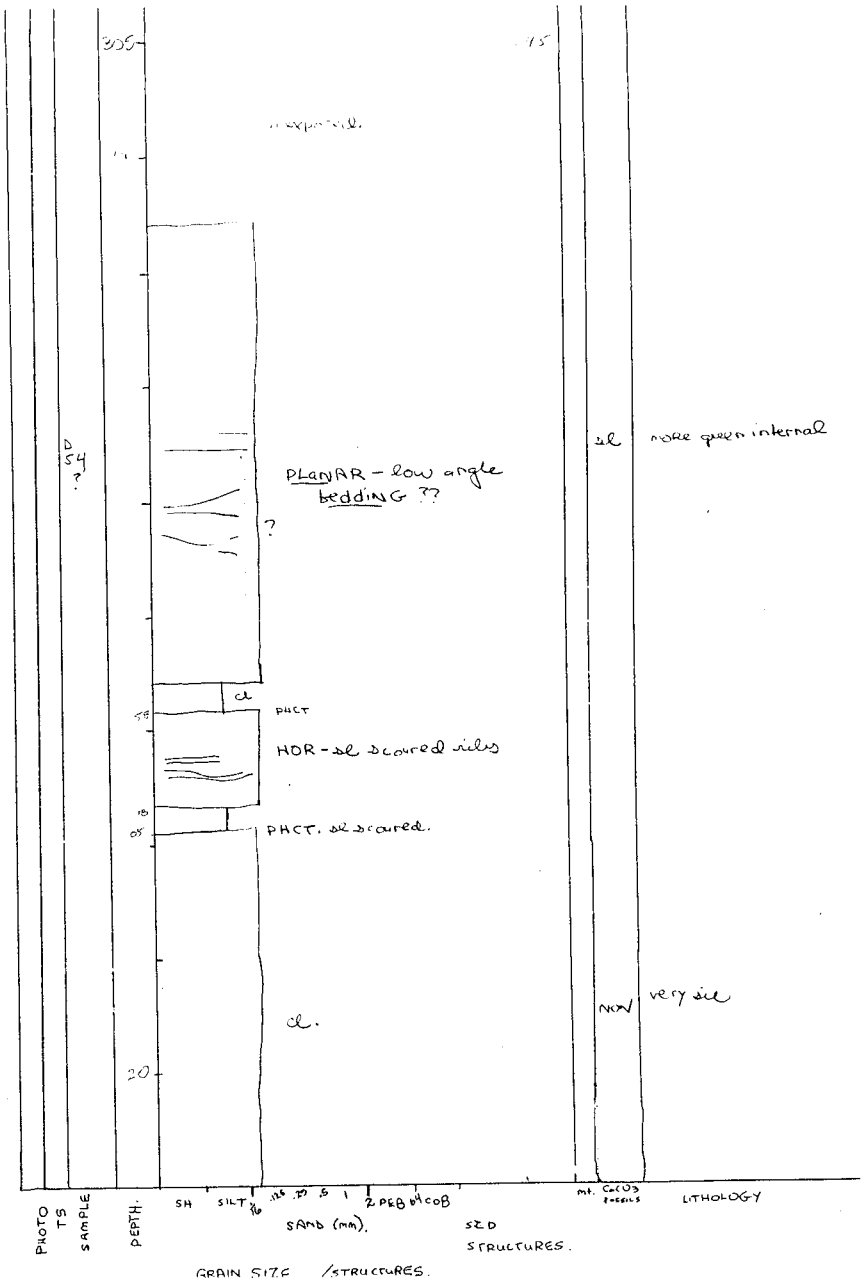

17.5
see 22 for lateral
unexposed
pace 30°
to bottom 19.
=12.55m
+259.8
267.85
280.41
(290.5)
D45
scalloped CT
se scoured CT
cmdse HOR ridding
se pebbly
(pebs 4mm)
massive
mod
VERY
Fe orange stain
tuffaceous
XB?
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
FOSSILS
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE
STRUCTURES

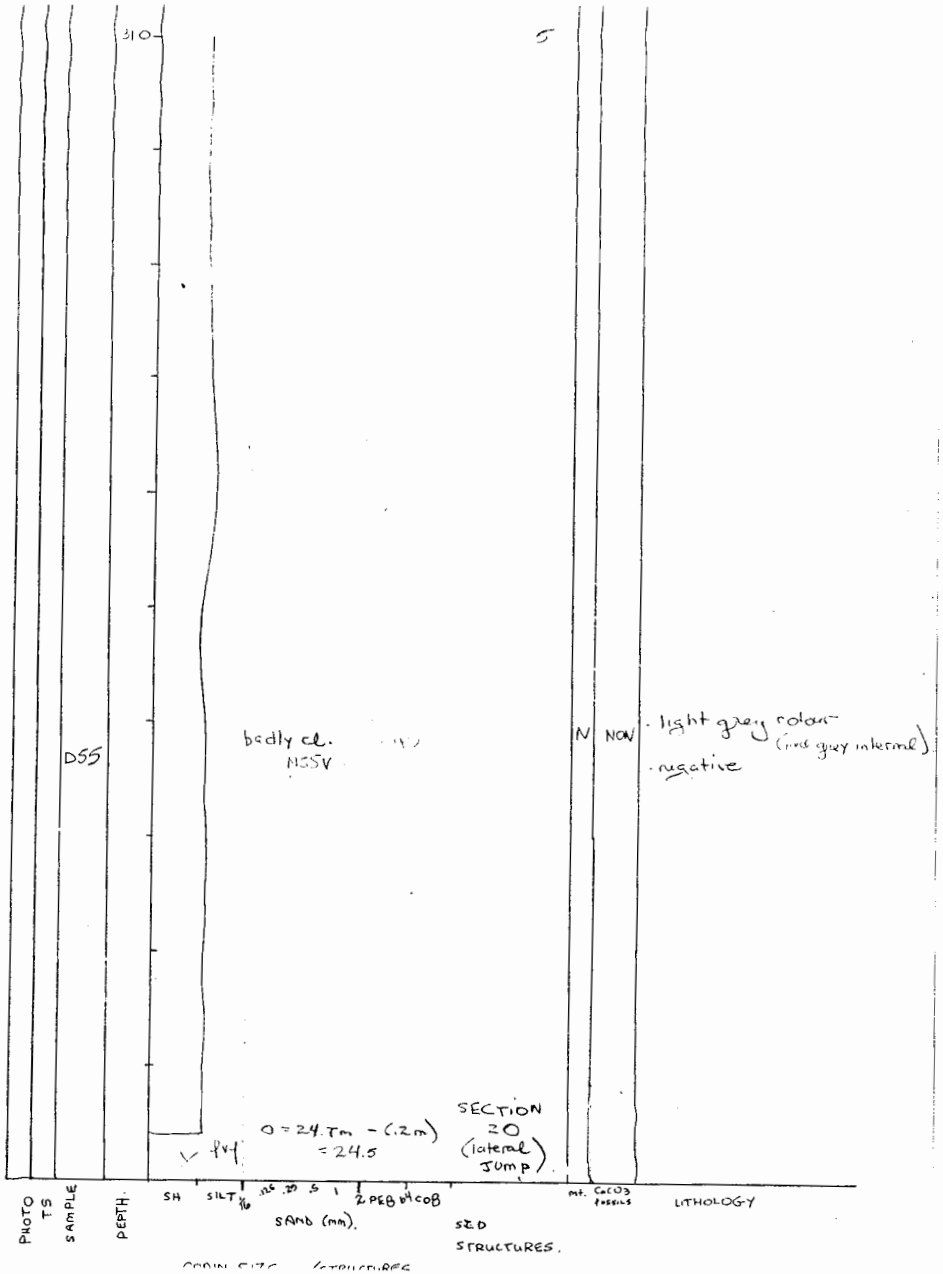

285
45
tuffitic
D47
283.7
planar-se UND RIBS (HIATUS?)
se
tuffaceous mudstone
w/ soft sed def features
occasional tuffite lense
very siliceous
(try chem analysis)
13
14
930
931
(START 19 = 280.5)
where on our plots?
skp 2
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
FOSSILS
LITHOLOGY
SED
STRUCTURES.

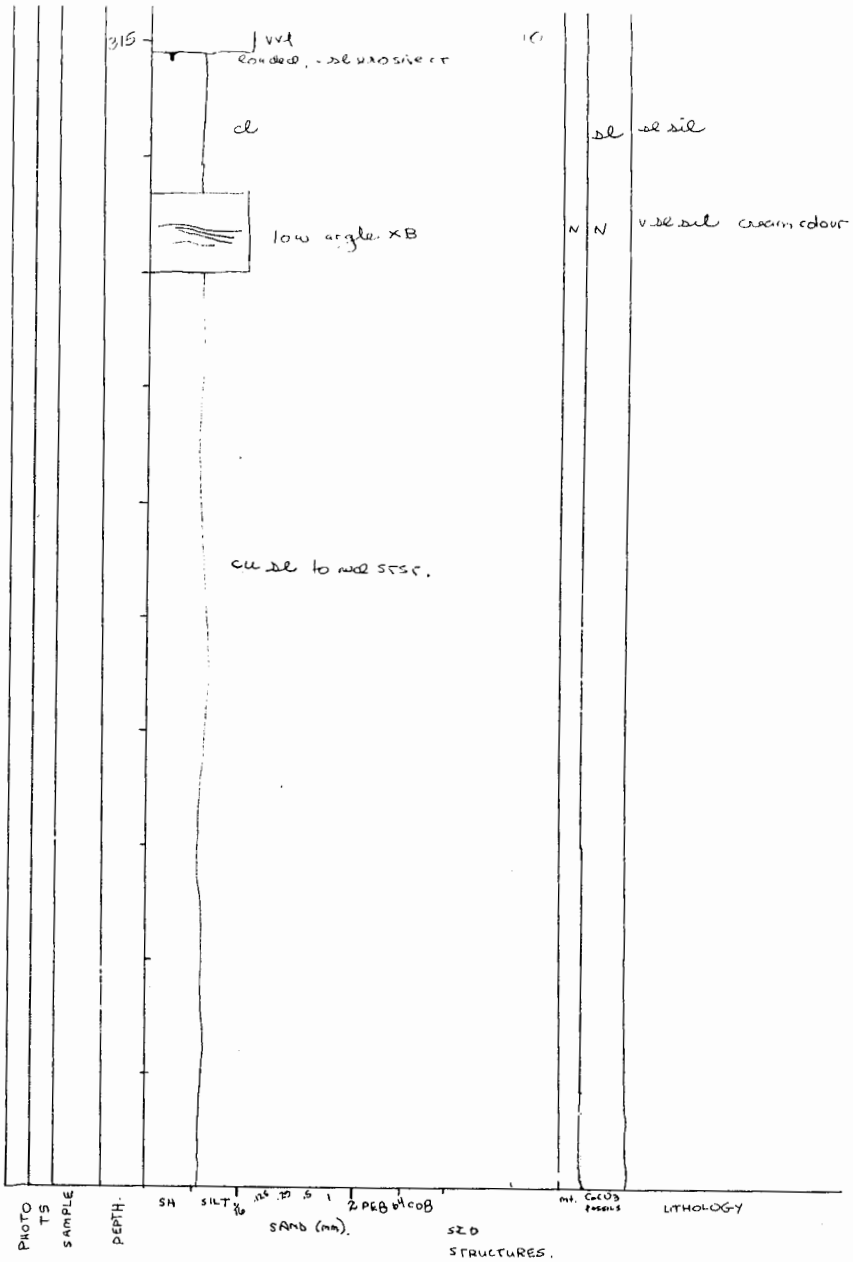

CHANNEL
massive
CHANNEL
massive
lateral rel.
vf sl tuff
tuffitic mudstone
sl tuff
NON
PROTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

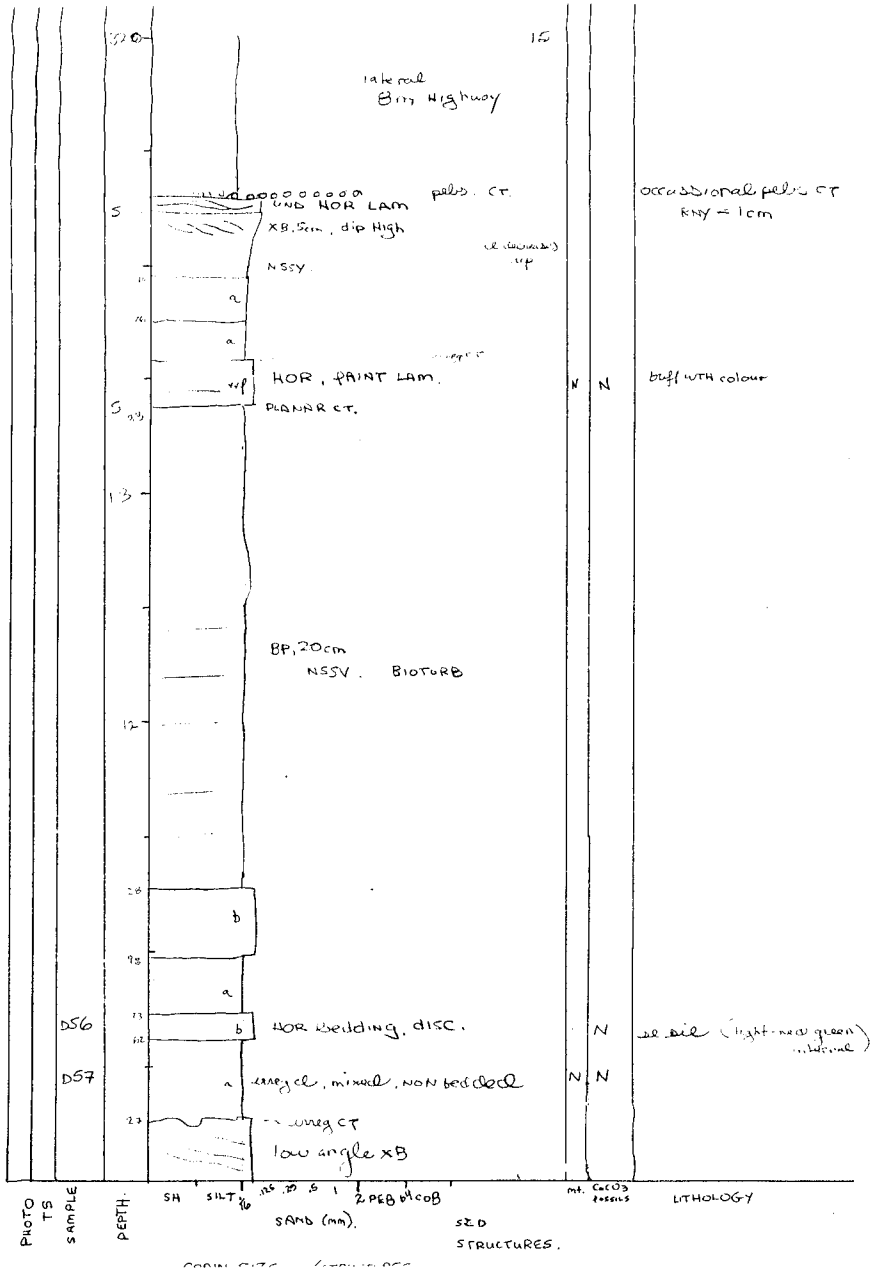

DS4
DS3
DS2
DS1
DS0
laterally 20cm, CSTST
TXB, planar, low angle
planar, low angle
XB
massive
massive
massive
channel, massive pebs
CHANNEL
pebs, 6-8mm
slumped
MOD
NON
PROTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

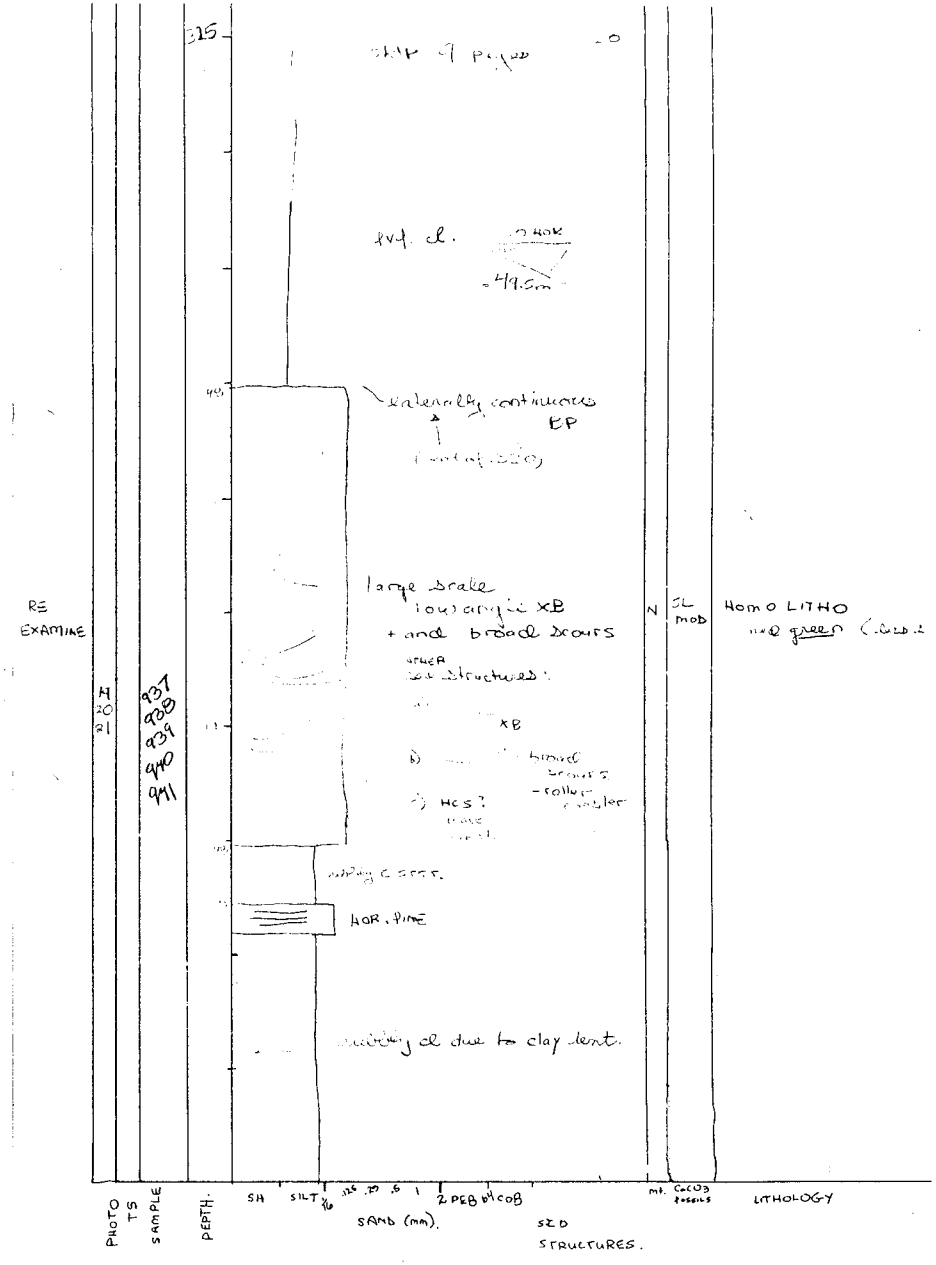

HOR, faint ribs
bedding sweep up HCS (take PHOTO)
- low angle discordance
scours
NOT ORDER
HOR bedding
PHCT
lam - DISC
dl.
HOR → sweeping bedding
scour ct
sweeping low angle LAM
broad scour ct
SCOUR FILL (OVER)
scoured ct
?
XB, large scale
recessive rugs massive
DUNEBOOK?
Vfl / dl
MON
dl DS3
N
NON
dl-mod tuff (no DS3)
MOD
(do rugs mean pumice?) correlates with Sez
16
933
DS4
200
15
PHOTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES


DS4 ?
PLANAR - low angle bedding ??
?
d
PHCT
HOR - sl scoured ribs
PHCT. sl scoured.
dl.
20
sl more green internal
NON very sil
PHOTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.


310
5
D55
badly cl.
NSSV
N NON
light grey colour
(med grey internal)
negative
V pf
0 = 24.Tm - (.2m)
= 24.5
SECTION
20
(lateral
Jump)
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED
STRUCTURES.

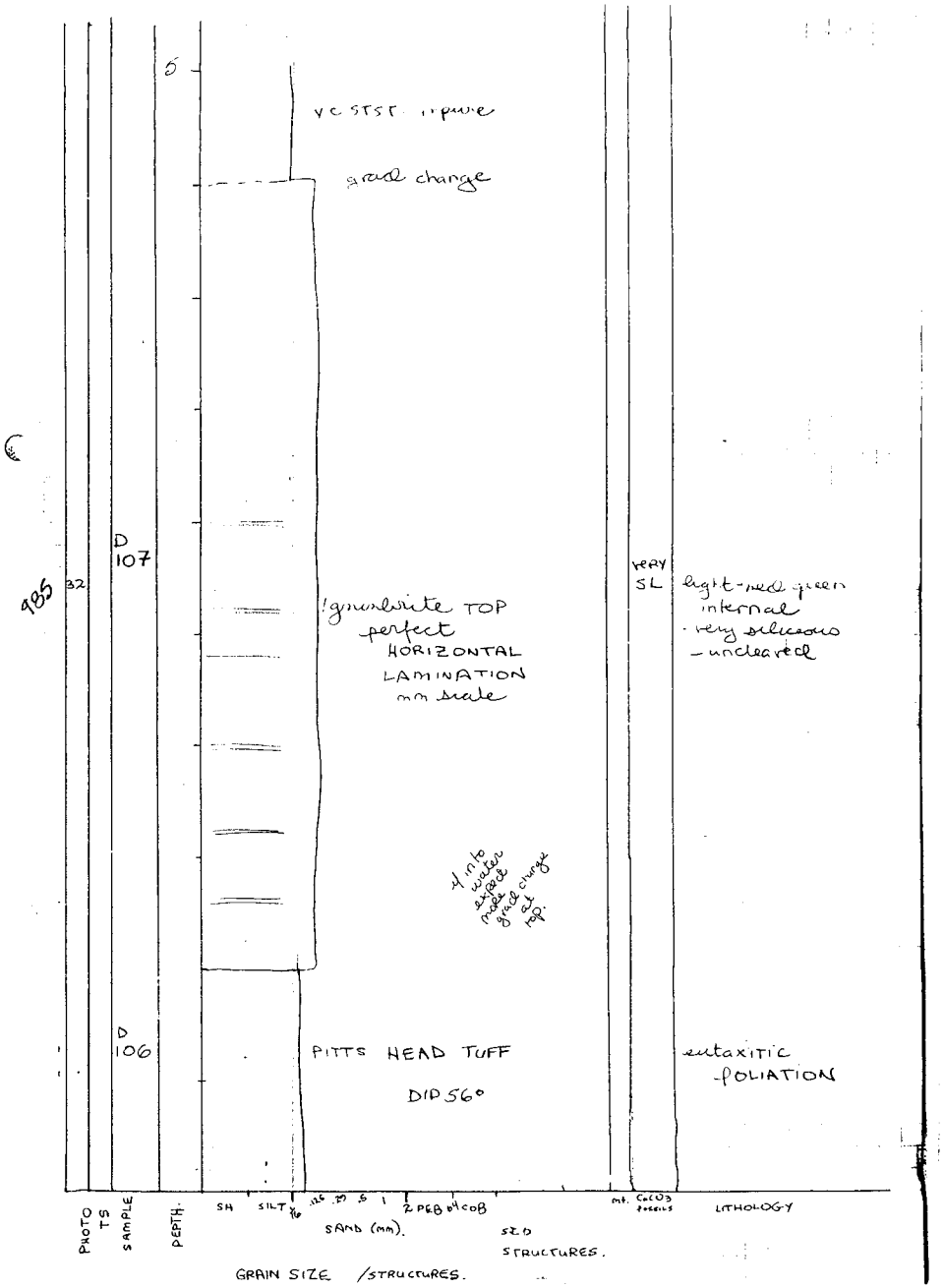

315
VVf
rounded, - sl MASSIVE ff
cl
low angle XB
cl
sl sil
N N
v sl sil cream colour
cl sl to non SSS.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED
STRUCTURES.

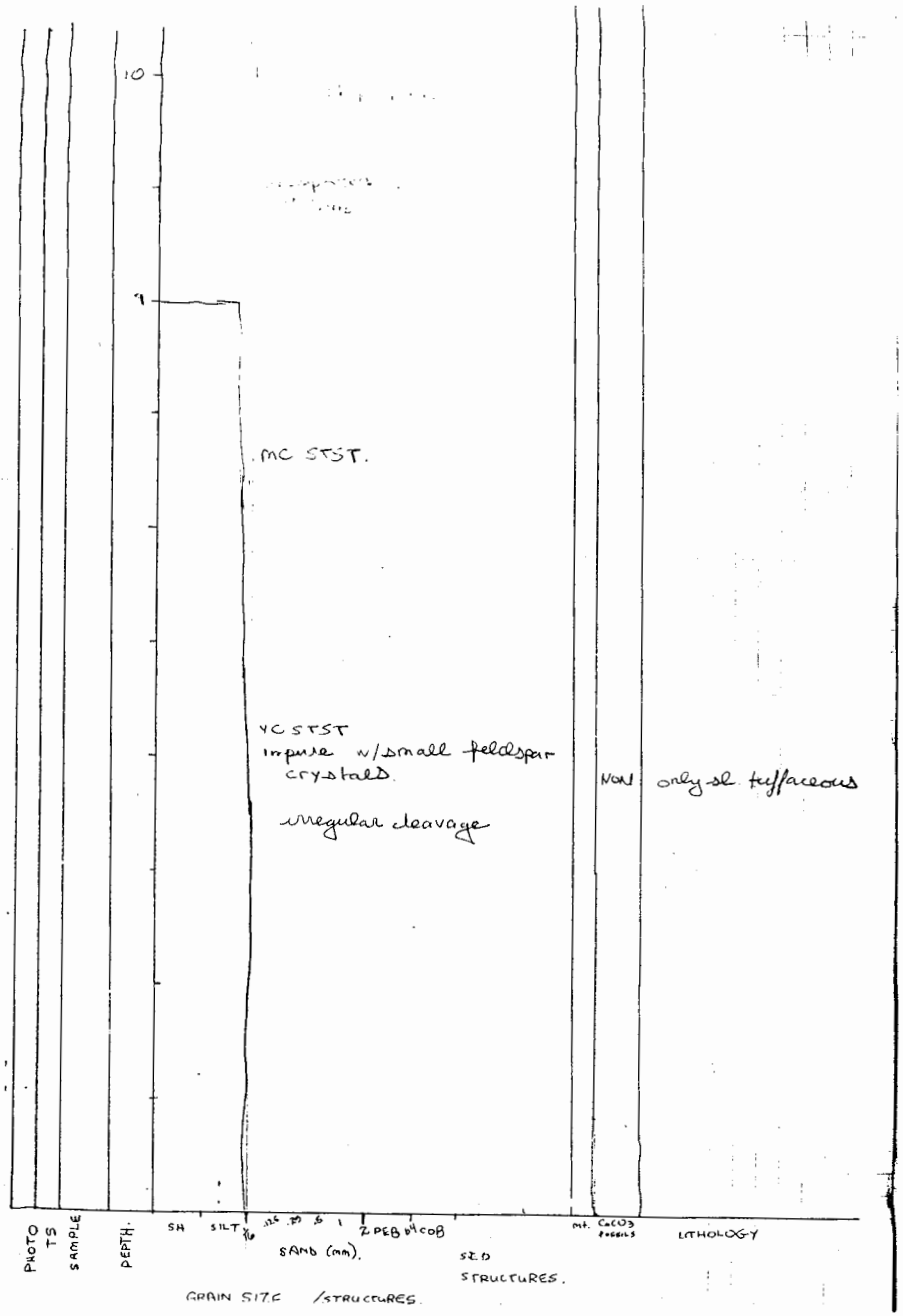

lateral
Britt Highway
occ. pebs. CT
ENG HOR LAM
XB. 5cm, dip High
NSSV
HOR, PAINT LAM.
PLANAR CT.
occasional pebs CT
RNY = 1cm
buff with colour
BP, 20cm
NSSV. BIOTURB
D56
HOR bedding, disc.
D57
wavy CT
low angle XB
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
mt.
CaCO3
fossils
LITHOLOGY

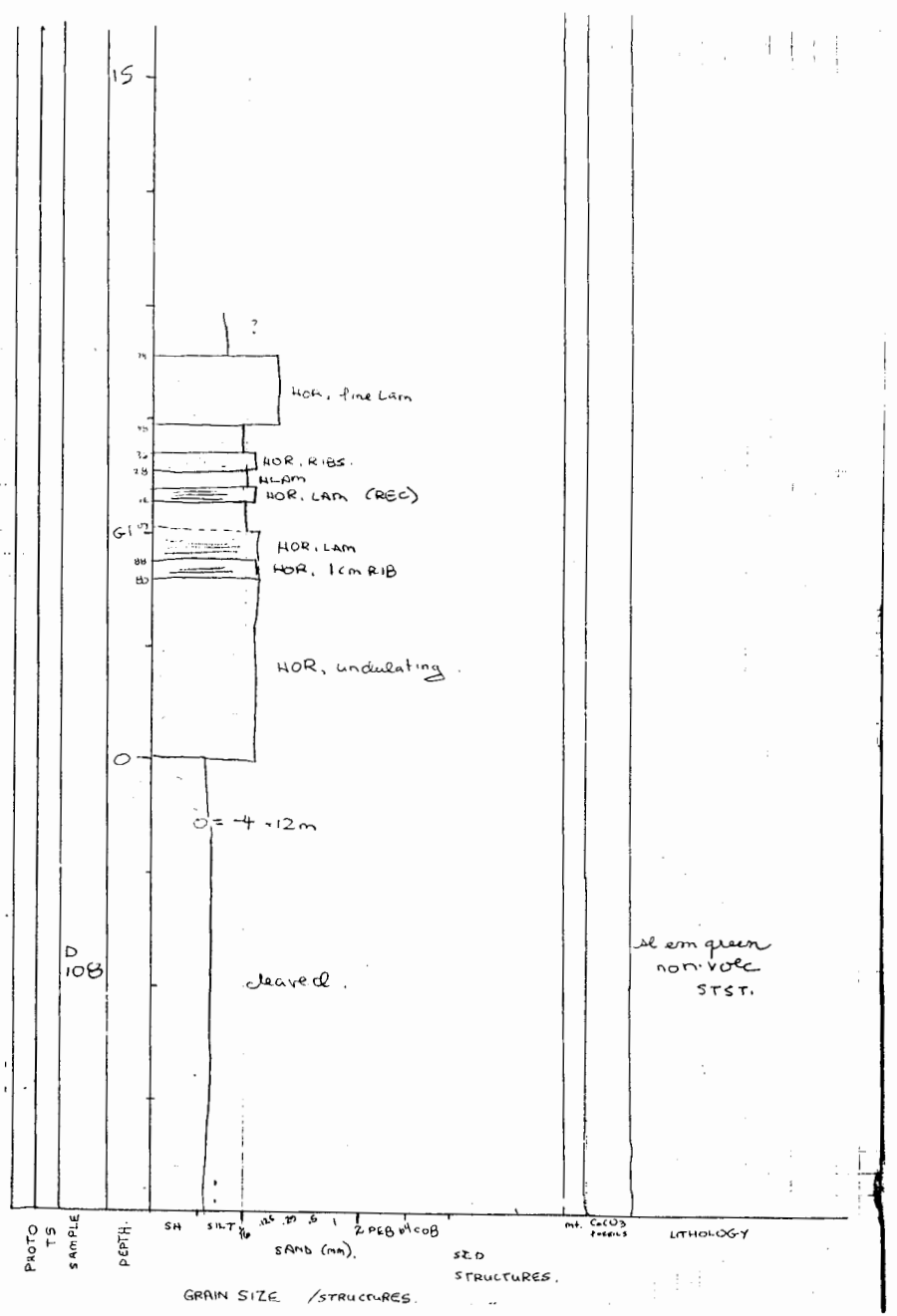

RE
EXAMINE
937
938
939
940
941
Laterally continuous
EP
large scale
low angle XB
+ and broad scours
HOR, PLANE
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
mt.
CaCO3
fossils
LITHOLOGY

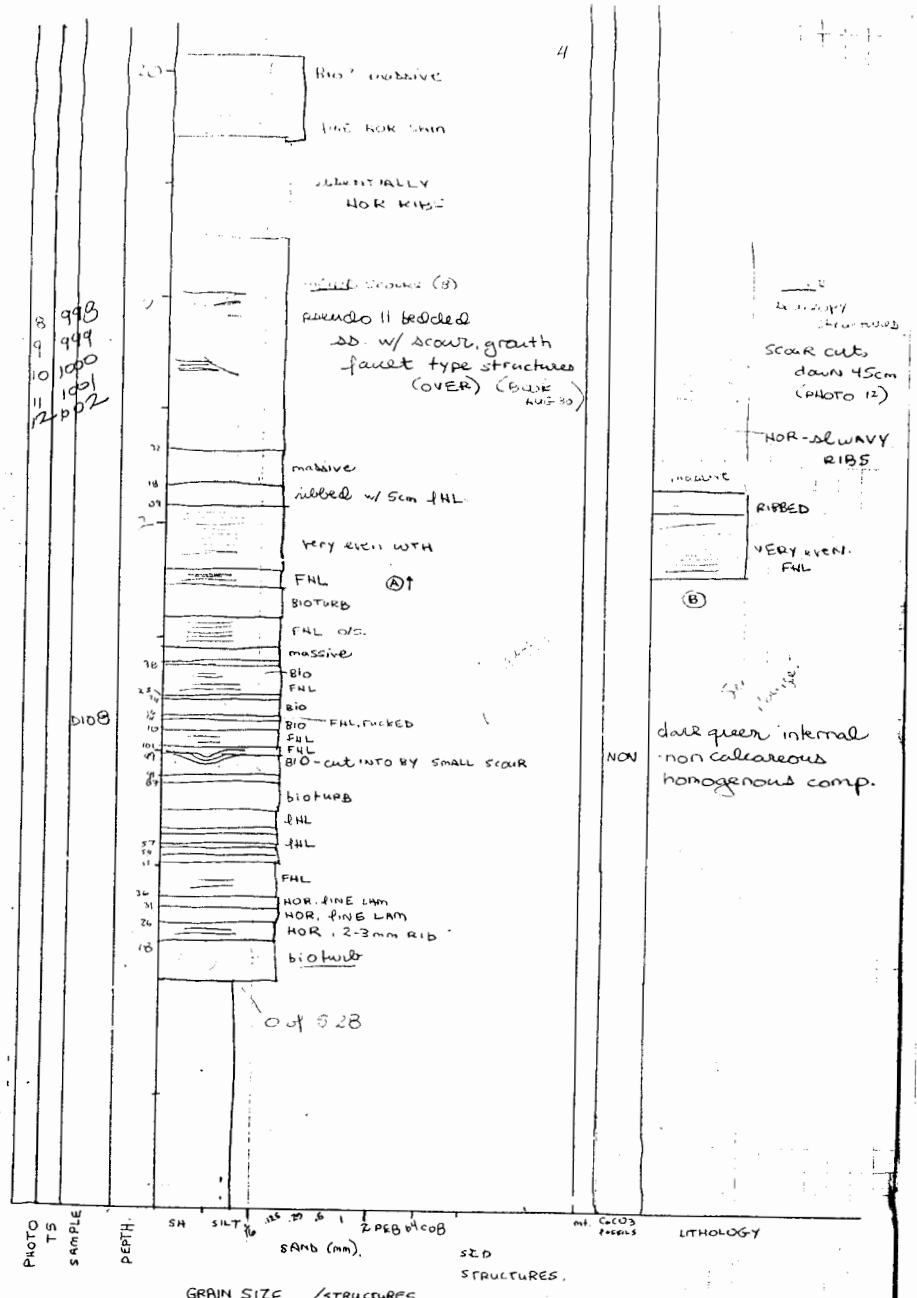
SECTION D2

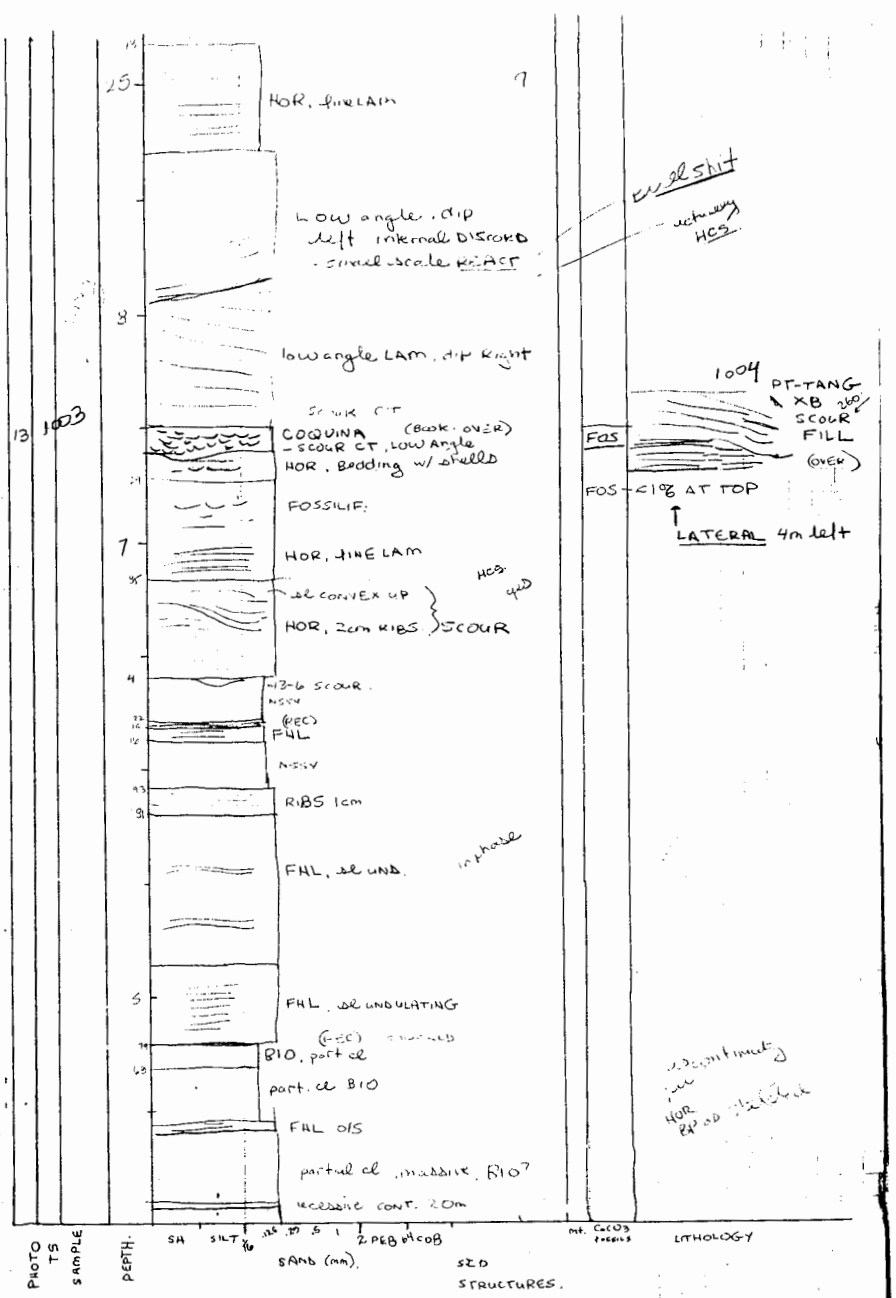
SECTION D2 LOCATION: Locate most easterly stream draining Cwm Cneifion. Section starts at top of Pitts Head Tuff and proceeds to WNW along crags to base of Lower Rhyolitic Tuff.

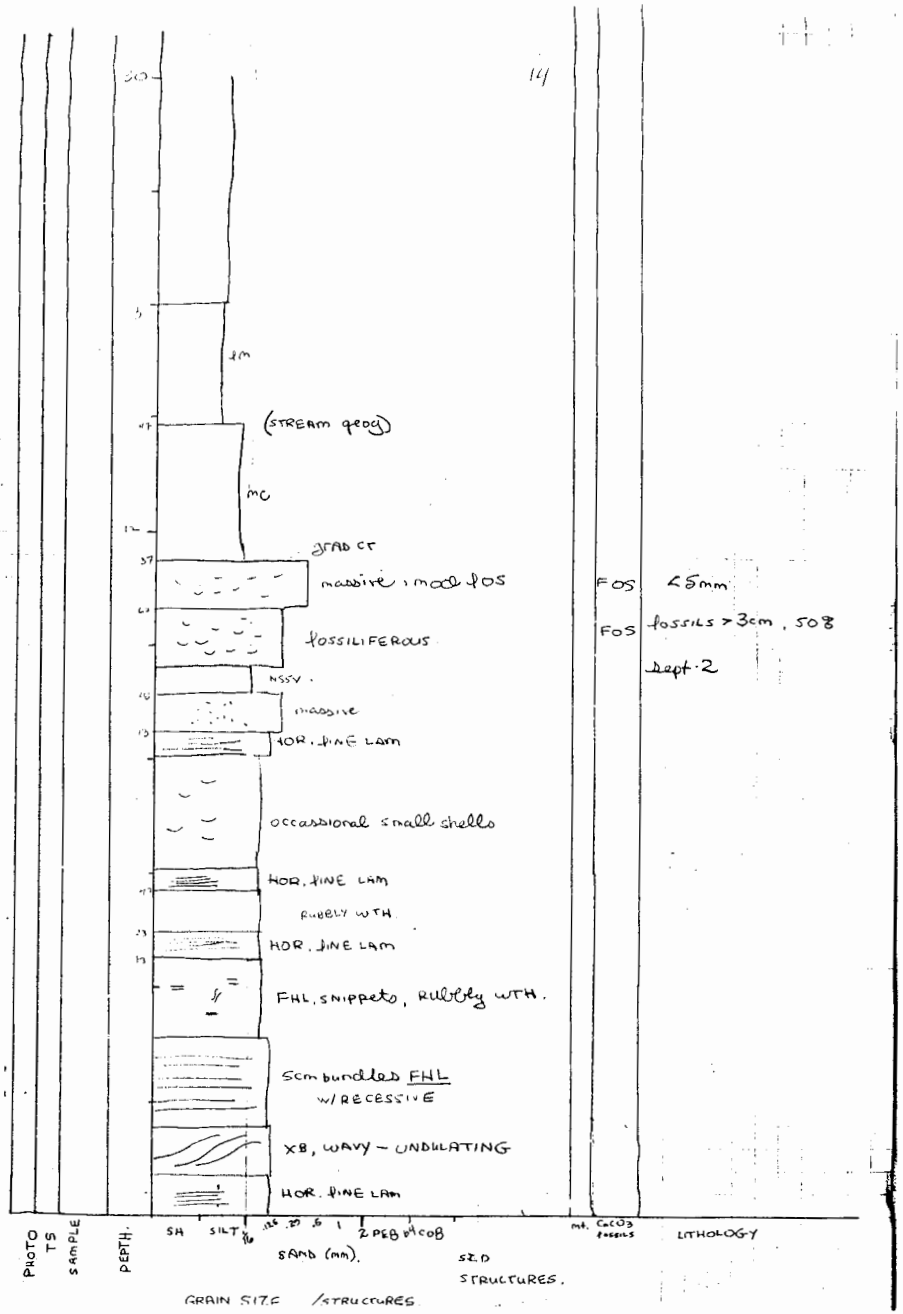


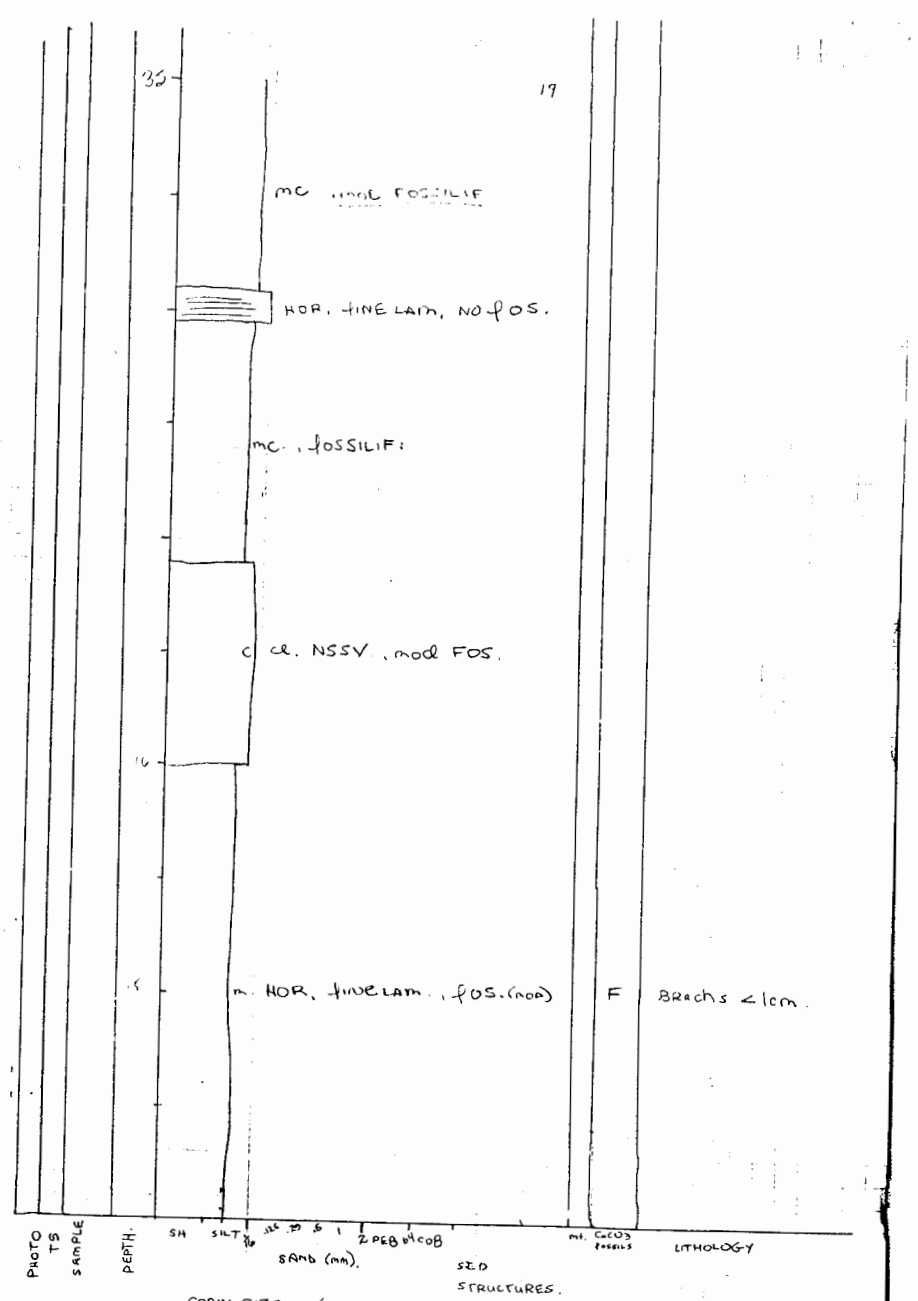

10
1
MC STST.
VC STST
impure w/small feldspar crystals.
irregular cleavage
NON only sl tuffaceous
PHOTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
GRAIN SIZE /STRUCTURES.
STRUCTURES.
mf. CaCO3 fossils
LITHOLOGY

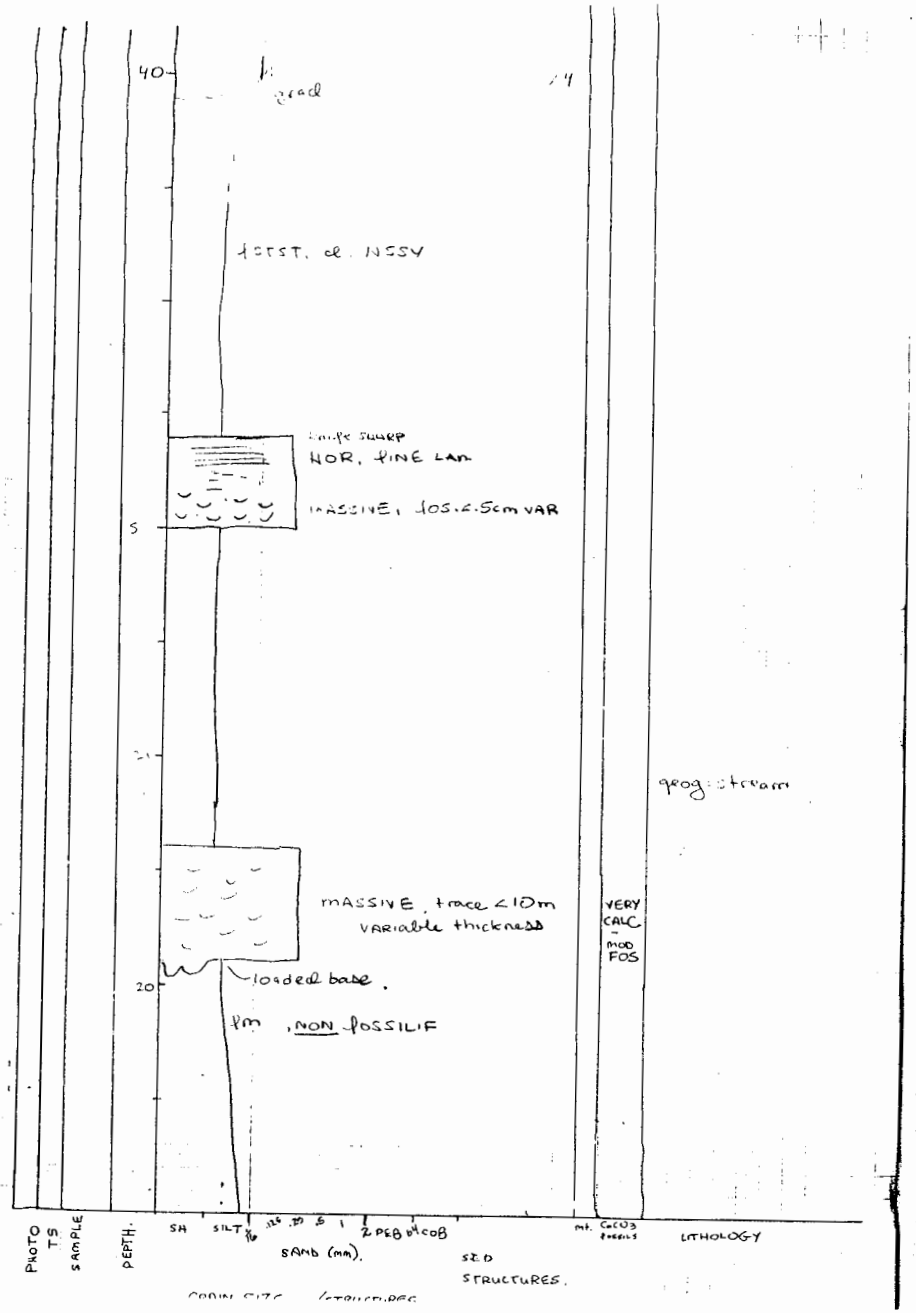

15
?
HOR, fine Lam
HOR, RIBS.
HOR. LAM (REC)
HOR. LAM
HOR. 1cm RIB
HOR, undulating.
0
0 = 4.12m
D
108
cleaved.
sl em green non-volc STST.
PHOTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
GRAIN SIZE /STRUCTURES.
STRUCTURES.
mf. CaCO3 fossils
LITHOLOGY

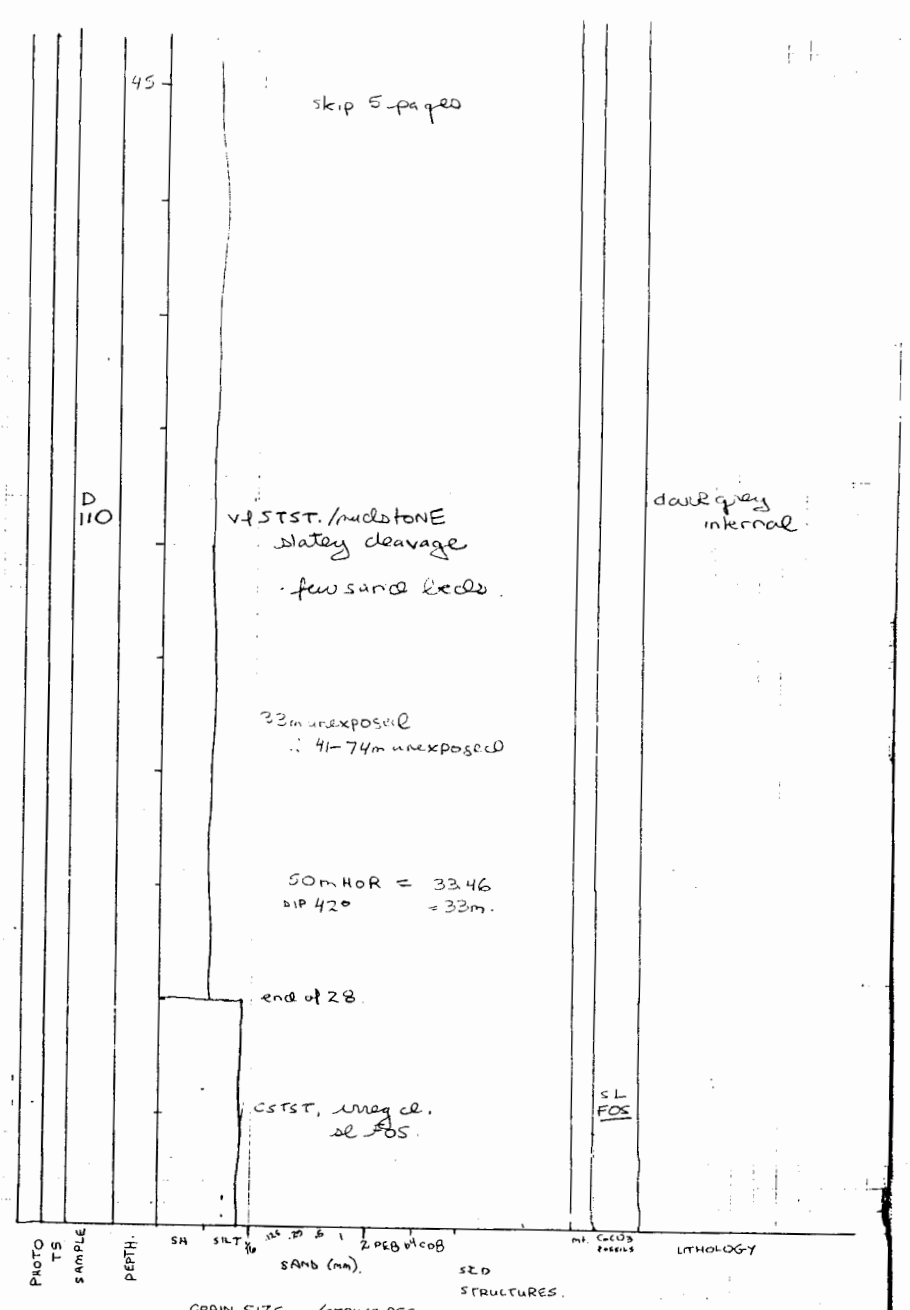

4
998
999
1000
1001
1002
1003
1004
Bio' massive
fine HOR lam
HOR RIBS
pseudo II bedded
SS. w/ scour, growth
fault type structures
(OVER) (BLUE
massive
ribbed w/ 5cm FHL
very even WTH
FHL
BIOTURB
FHL o/s.
massive
BIO
FHL
BIO
FHL, FUCKED
FHL
FHL
BIO - cut INTO BY SMALL SCOUR
bioturb
FHL
FHL
FHL
HOR. FINE LAM
HOR. FINE LAM
HOR. 2-3mm RIB
bioturb
0 of 528
SCOUR cuts
down 45cm
(PHOTO 12)
HOR-sl WAVY
RIBS
RIBBED
VERY EVEN.
FHL
dark green internal
non calcareous
homogenous comp.
NON
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
CoB
SED
STRUCTURES.
mt. CaCO3
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

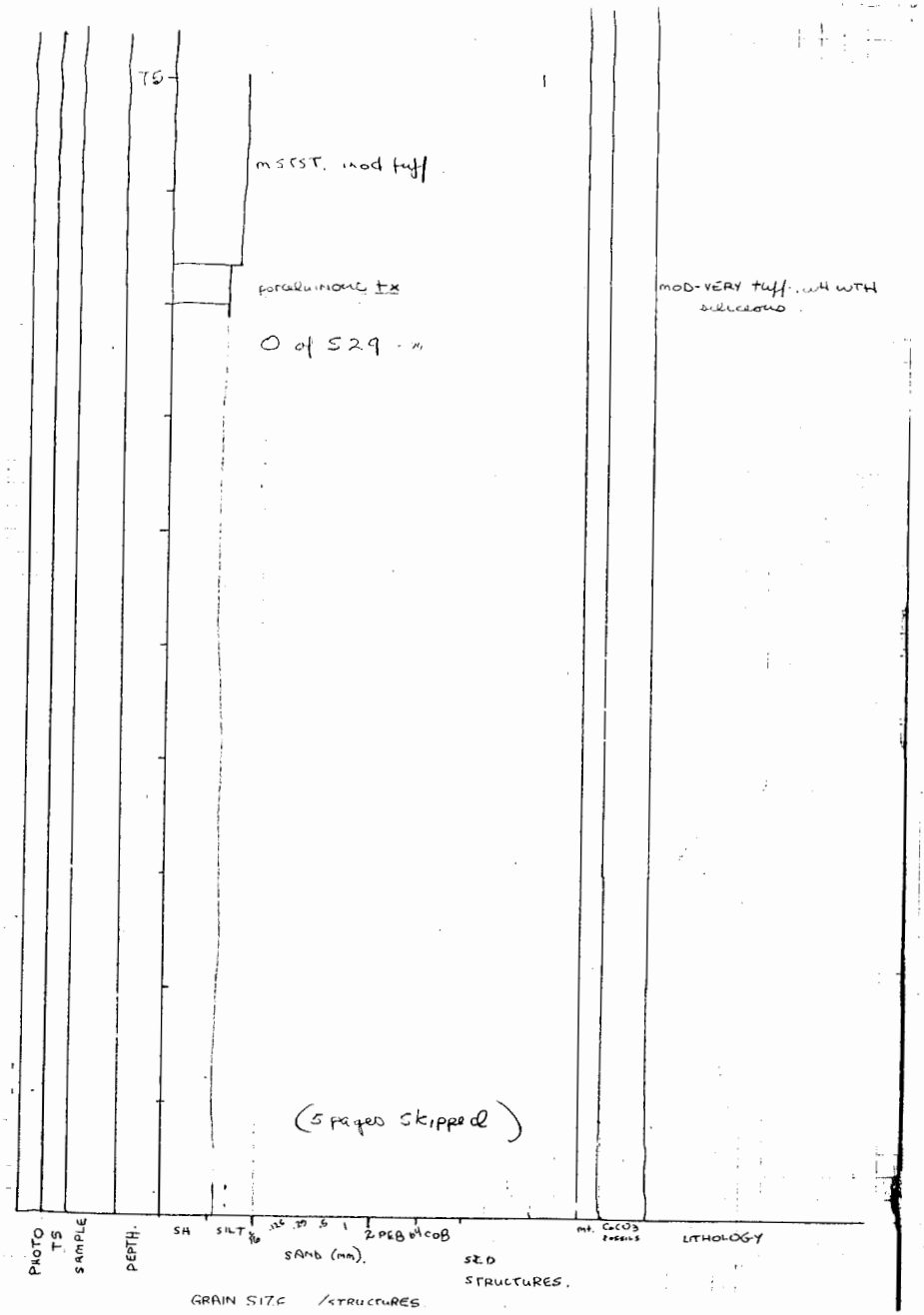

7
HOR, fine LAM
low angle, dip
left internal DISTORD
- small scale REACT
low angle LAM, dip Right
SCOUR CT
COQUINA (BASE OVER)
- SCOUR CT, LOW Angle
HOR. Bedding w/ shells
FOSSILIF.
HOR, FINE LAM
sl CONVEX UP
HOR, 2cm RIBS
SCOUR
~3-6 SCOUR.
NSSV
(REC)
FHL
NSSV
RIBS 1cm
FHL, sl UND.
FHL, sl UNDULATING
(REC)
BIO, part cl
part. cl BIO
FHL o/s
partial cl. massive, BIO?
recessive cont. 20m
sl silt
HCS
FOS
PT-TANG
XB
SCOUR
FILL
(OVER)
FOS - <1% AT TOP
LATERAL 4m left
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
CoB
SED
STRUCTURES.
mt. CaCO3
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

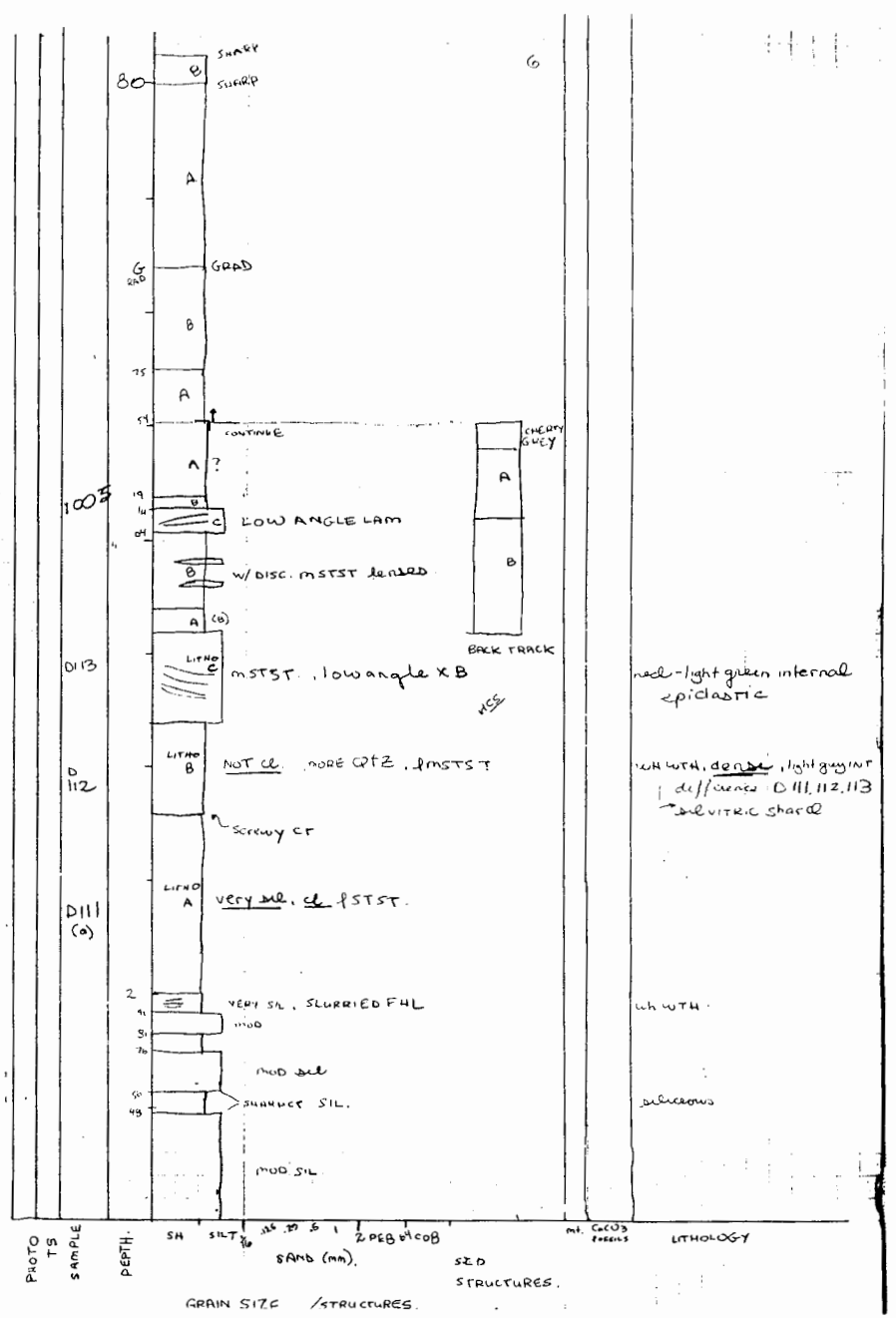

14
30
5
1m
(STREAM geog)
mc
GRAD CT
massive ; mod fos
fossiliferous
NSSV .
massive
HOR. fine lam
occassional small shells
HOR. fine lam
RUBBLY WTH
HOR. fine lam
FHL, snippets, RUBBLY WTH.
5cm bundled FHL
W/RECESSIVE
XB, WAVY – UNDULATING
HOR. fine lam
FOS <5mm
FOS fossils >3cm, 50%
dept·2
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES

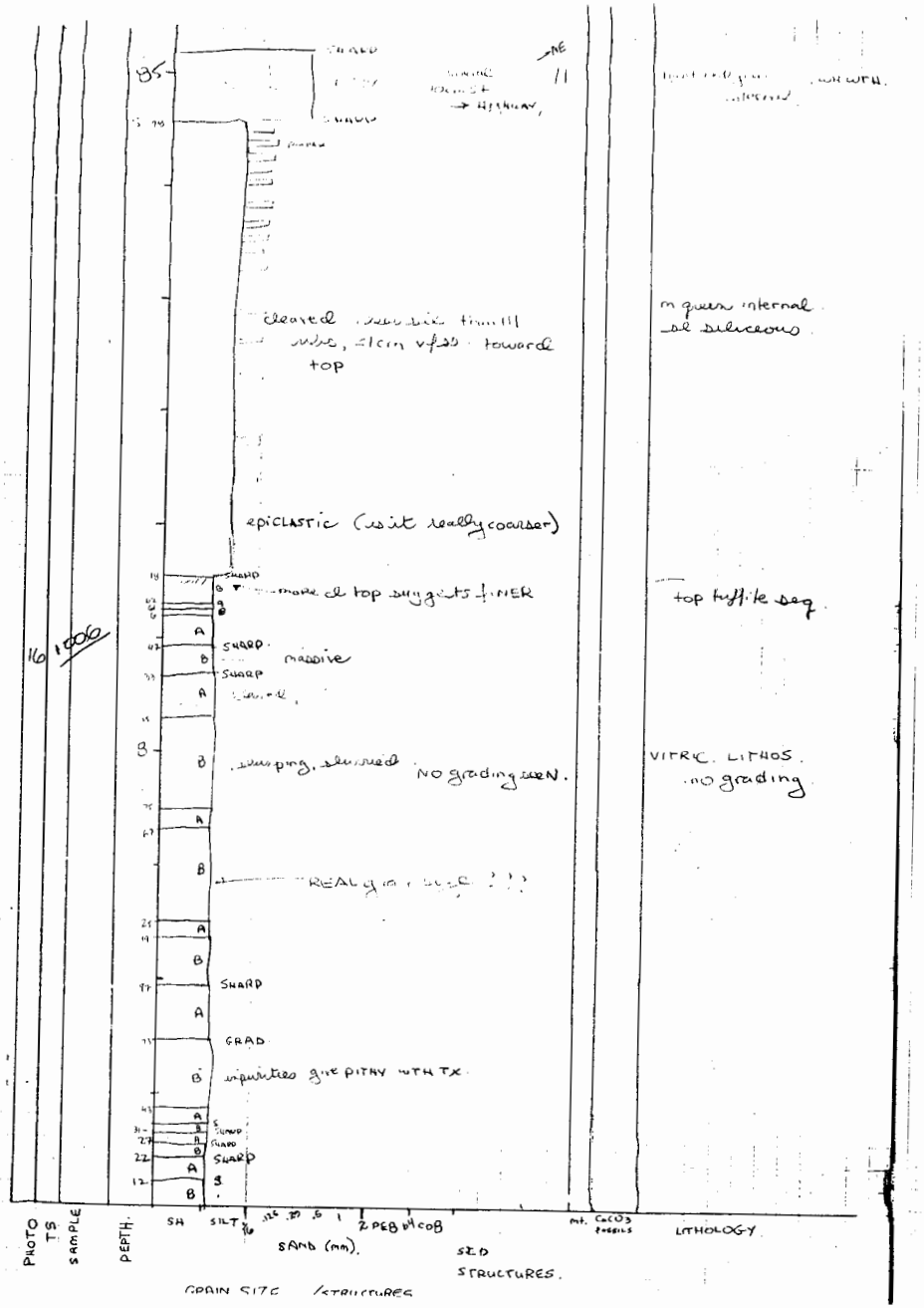

17
35
mc . FOSSILIF
HOR. fine lam, NO fos.
mc . fossilif:
cl. NSSV . mod FOS.
m. HOR. fine lam . fos. (noA)
16
5
F Brechs <1cm.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

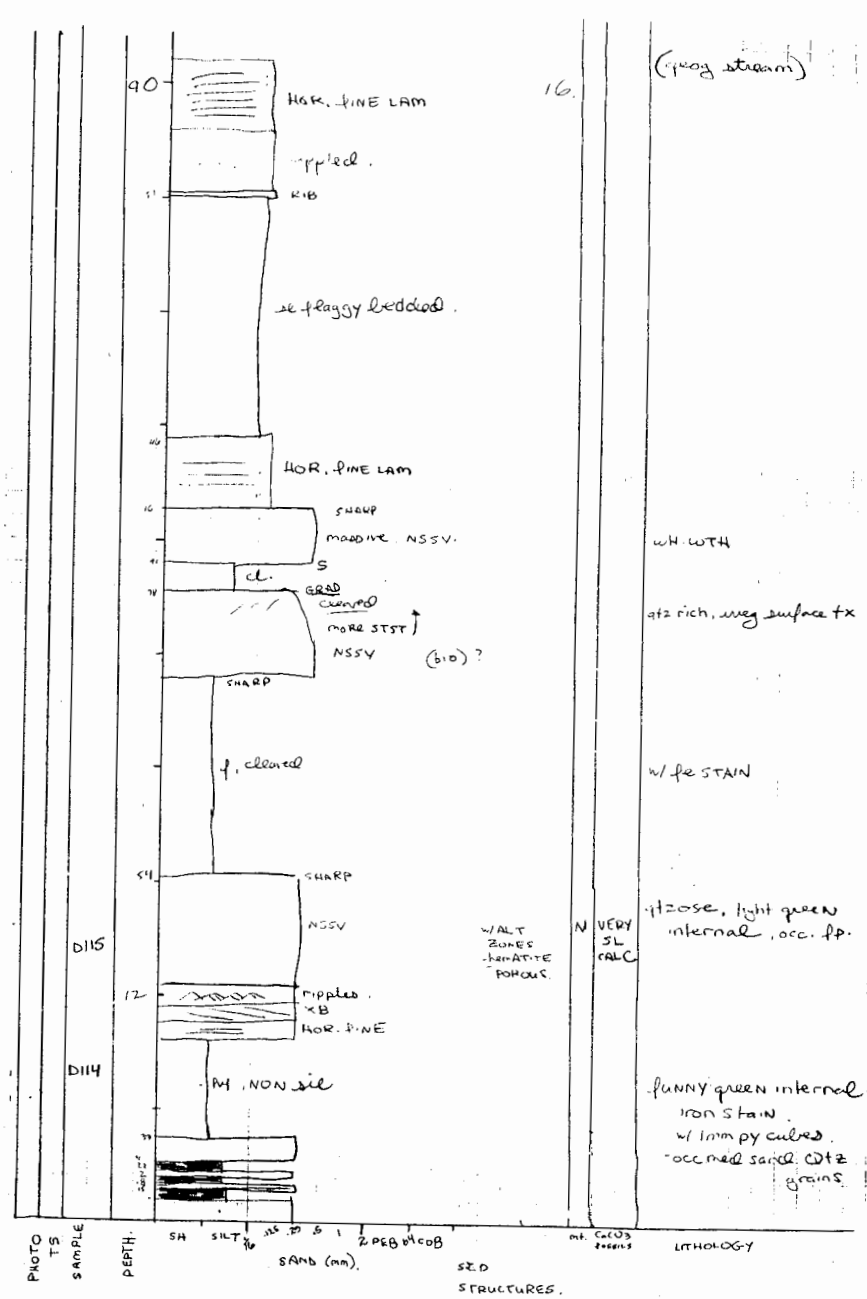

40
5
20
gradual
1STST. cl. NSSV
knife sharp
HOR. FINE LAM
MASSIVE, fos. c. 5cm VAR
prog. stream
MASSIVE, trace < 10m
VARIABLE thickness
VERY CALC - MOD FOS
loaded base.
fm. NON FOSSILIF
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES


45
skip 5 pages
D 110
v f STST. / mudstone
flaky cleavage
few sand beds.
dark grey internal
33m unexposed
∴ 41-74m unexposed
50m HOR = 33.46
DIP 42°
= 33m.
end of 28.
CSTST, irreg cl.
sl FOS
SL FOS
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES

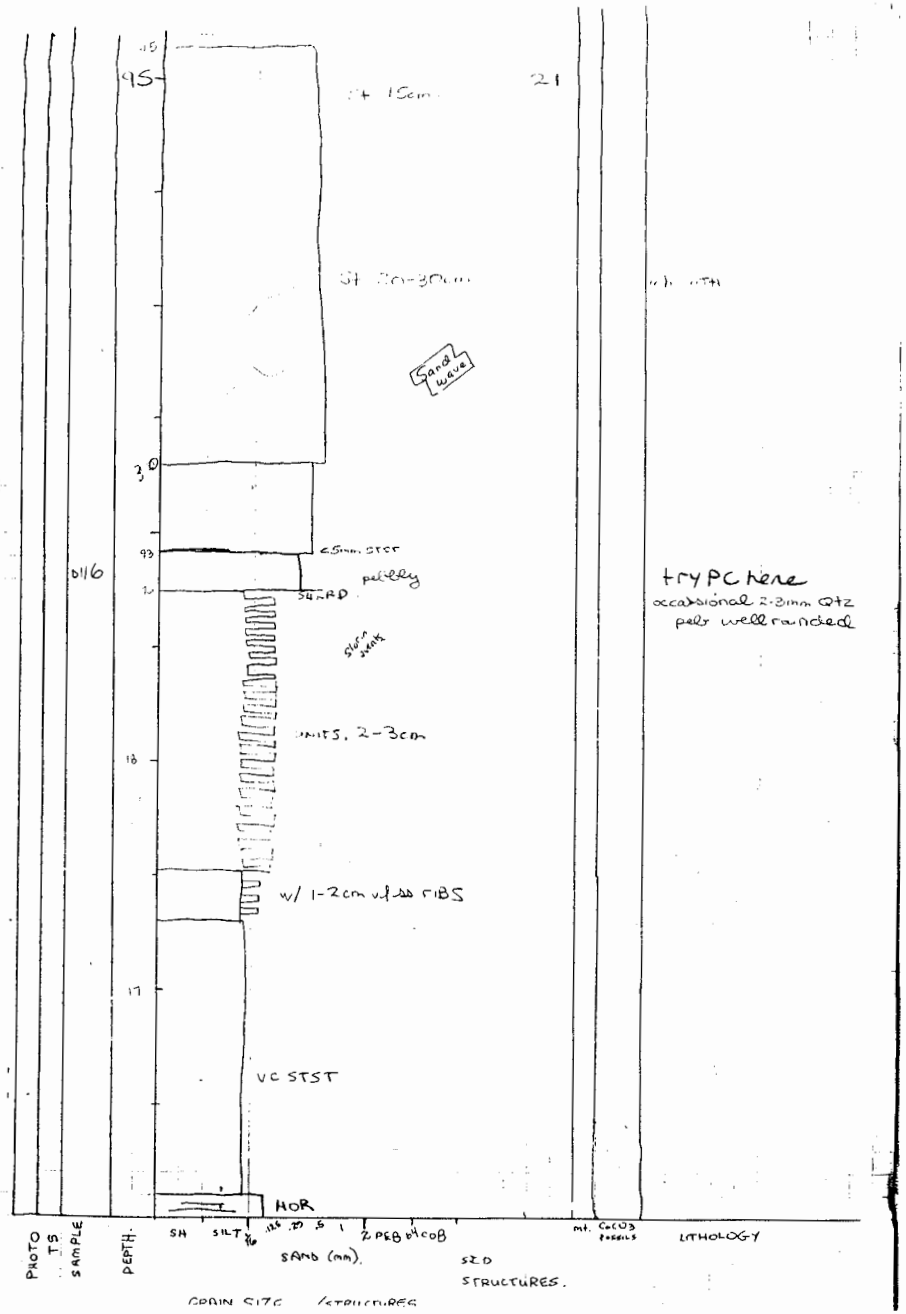

75
mSTST. mod tuff
foraminifera tx
0 of 529 - m
mod-very tuff. with silicrous
(5 pages skipped)
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES

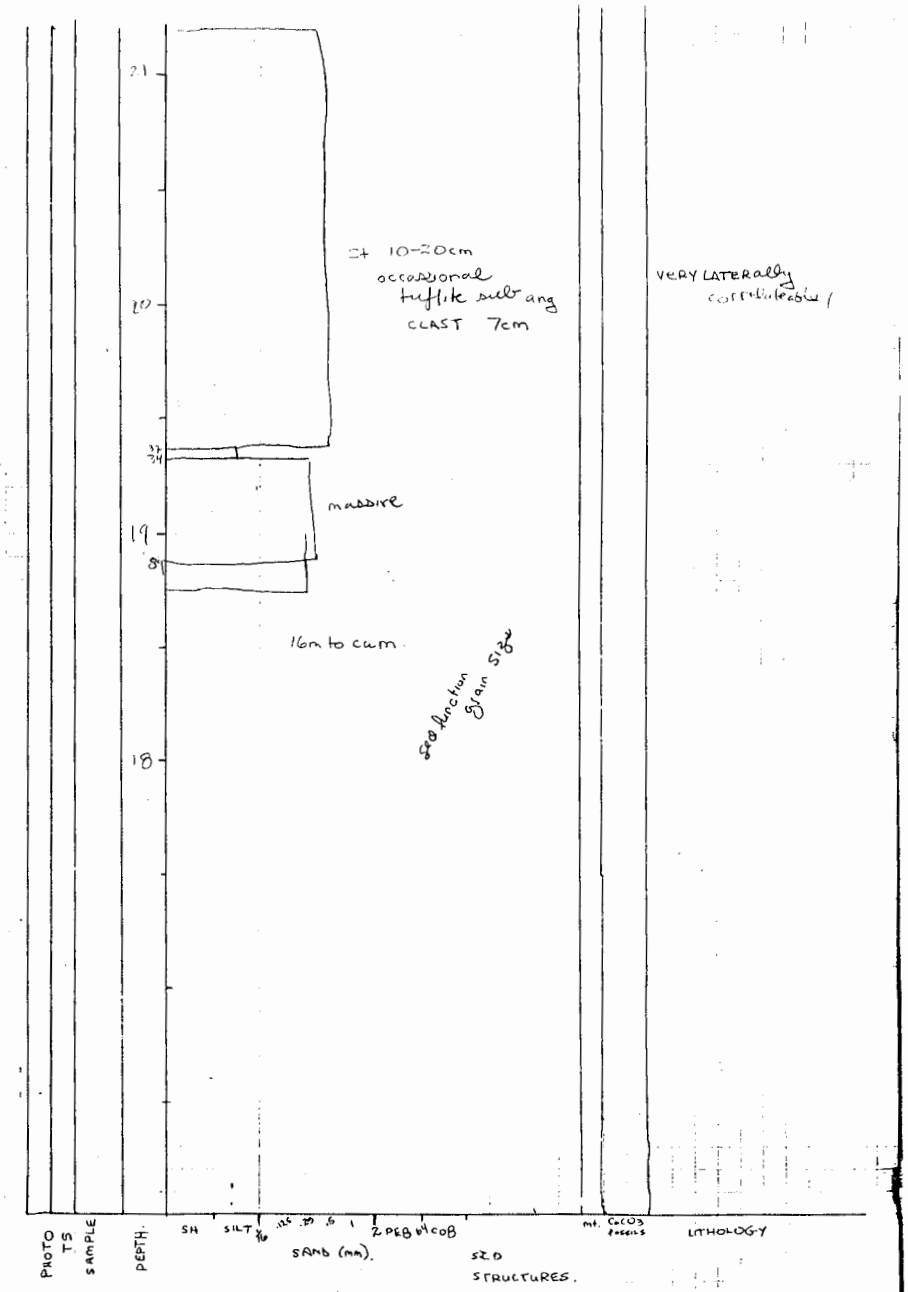

6
SHARP
SLIGHT
80
B
A
GRAD
G
GRAD
B
75
A
CONTINUE
A ?
CHERRY GREY
A
B
BACK TRACK
100
B
C
LOW ANGLE LAM
B
w/ DISC. mSTST lenses
A (B)
LITHO B
mSTST. low angle X B
D113
LITHO B
NOT cl. more QTZ. fmSTST
D112
Screwy CF
LITHO A
very sl. cl fSTST.
D111 (a)
VERY SL. SLURRIED FHL
mod
mod sil
SHARPER SIL.
mod SIL
mod-light green internal epiclastic
with with, dense, light gray INT
diffuses D 111, 112, 113
sil VITRIC shards
with with
siliceous
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES

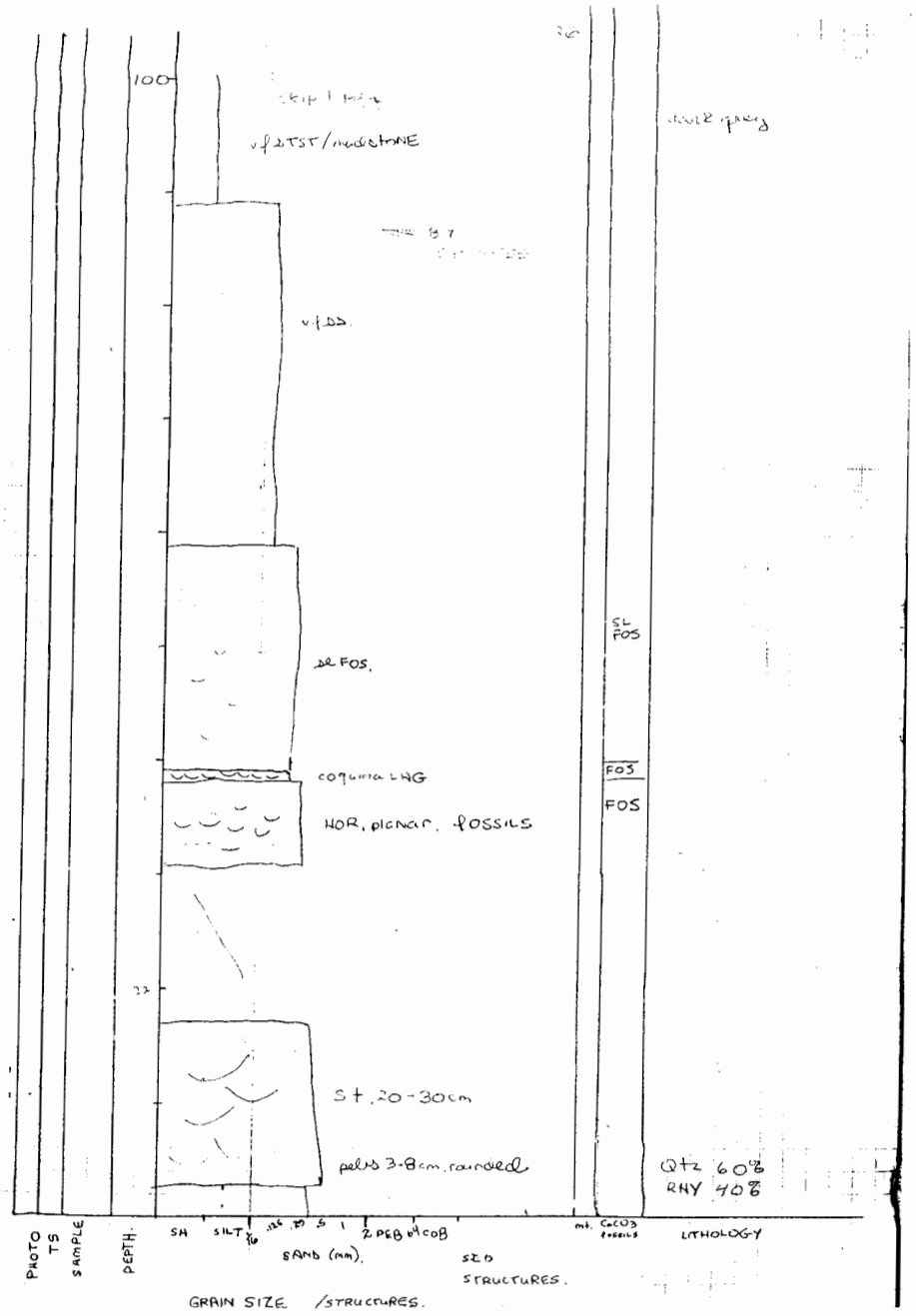

SHARP
95
SHARP
cleared
m green internal
ol siliceous
epiclastic (v.f.t. really coarser)
top tuffite seq.
SHARP
SHARP
massive
VITRIC. LITHOS.
no grading
REAL grn
SHARP
GRAD
impurities give PITHY WITH TX
SHARP
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED
STRUCTURES.
mt.
LITHOLOGY
GRAIN SIZE /STRUCTURES

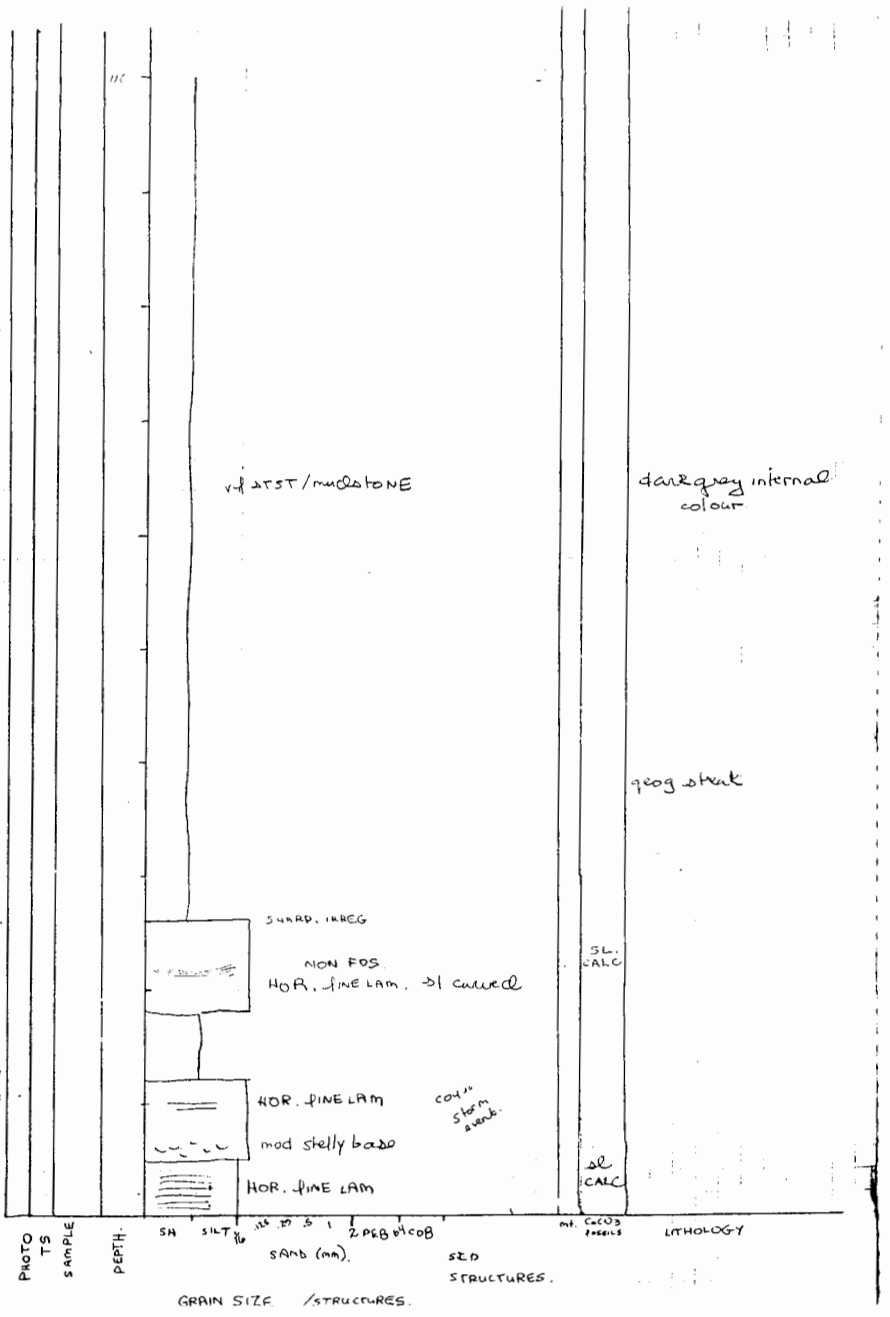

90
HOR. FINE LAM
ripp'ed.
RIB
sl flaggy bedded
HOR. FINE LAM
SHARP
massive NSSV.
cl.
GRAD
NSSV
SHARP
f, cleared
w/ fe STAIN
SHARP
NSSV
D115
rippled
xB
HOR. FINE
D114
M, NON sil
funny green internal
iron stain
w/ 1mm py cubes
occ med sand. Qtz
grains
WALT
ZONES
HEMATITE
POROUS
N
VERY
SL
CALC
(grey stream)
wh WITH
qtz rich, veg surface tx
ptzose, light green
internal, occ. fp.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED
STRUCTURES.
mt.
LITHOLOGY
GRAIN SIZE /STRUCTURES.

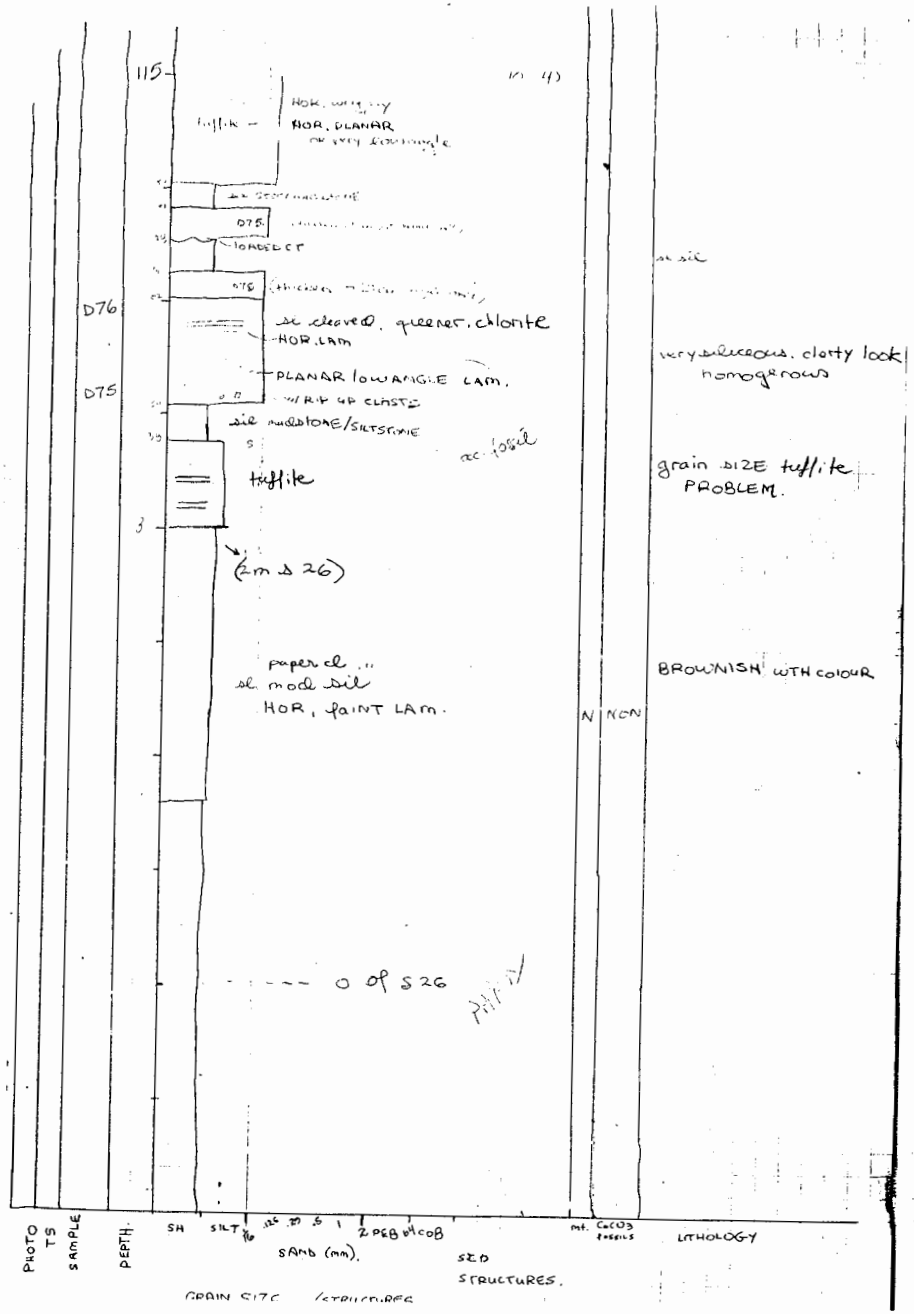
D2

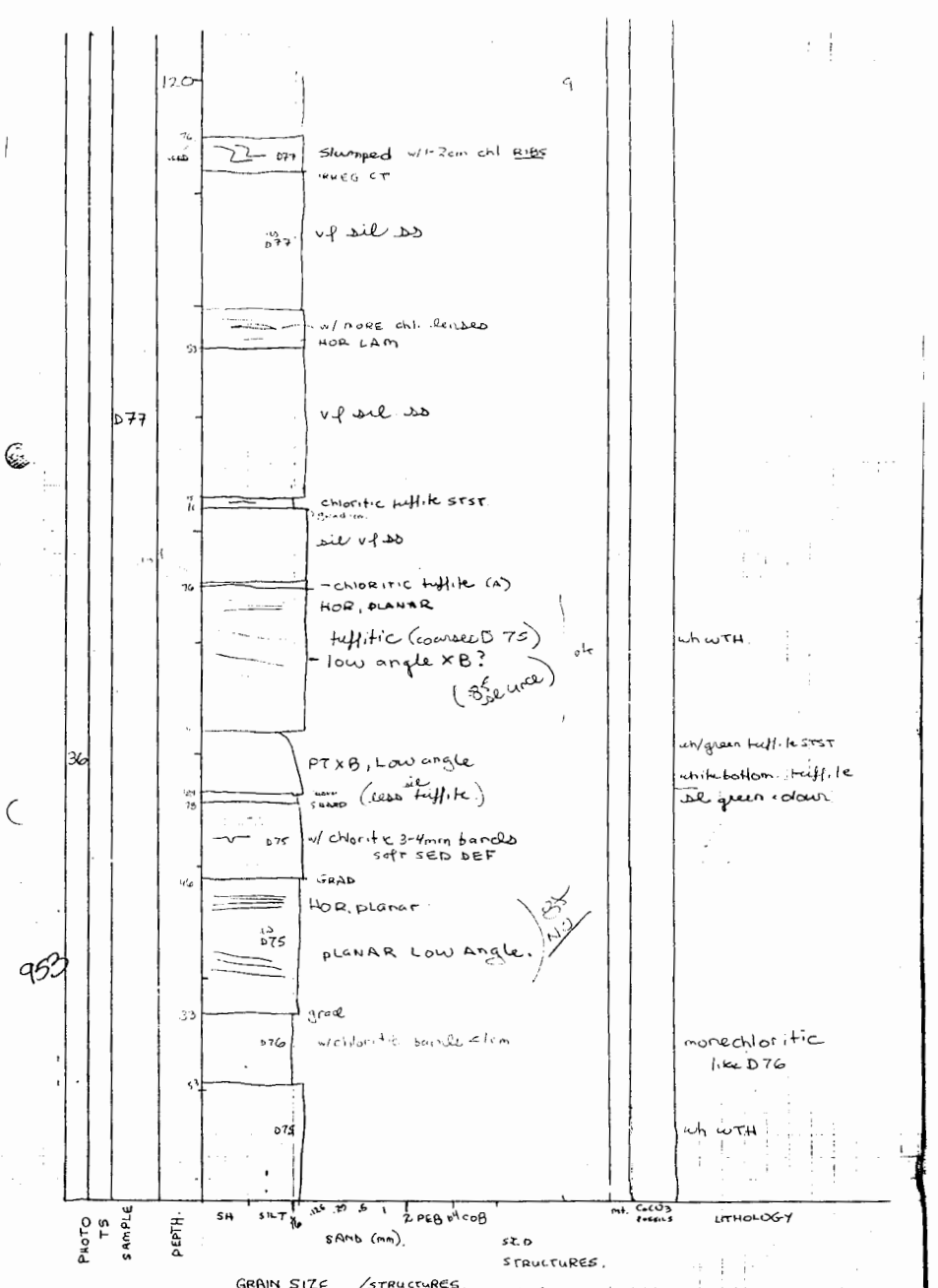

95
21
+ 15cm
21
Sand wave
30
93
<5mm STST
pebbly
2
SHARP
0116
18
UNITS, 2-3cm
w/ 1-2cm v.f SS RIBS
17
VC STST
HOR
try PC here
occasional 2-3mm Qtz
pebs well rounded
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES

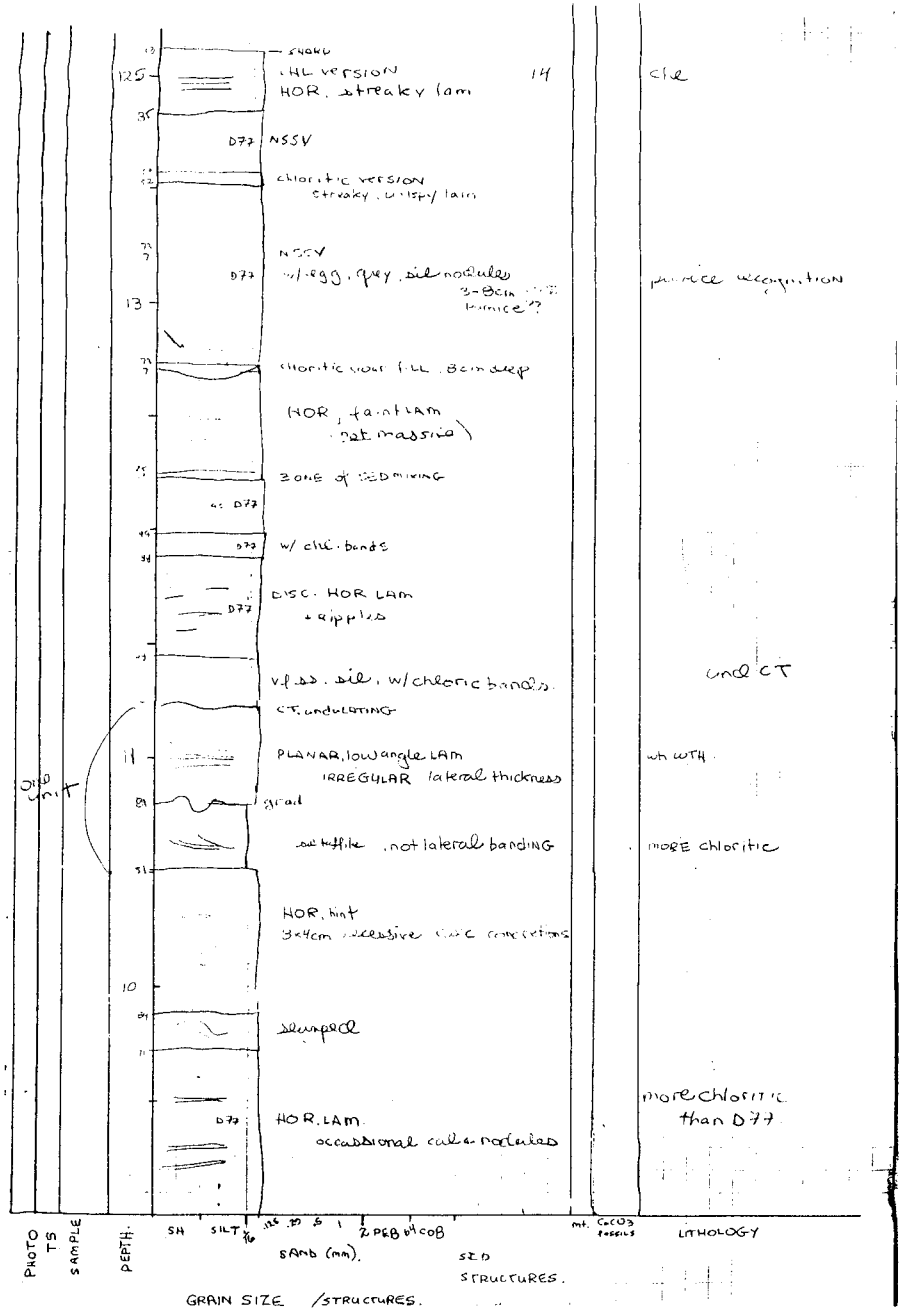

21
20
+ 10-20cm
occasional
tuffik sub ang
CLAST 7cm
VERY LATERALLY
correlatable!
37
34
massive
19
8
16m to cwm.
Stratification
Grain Size
18
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
LITHOLOGY
GRAIN SIZE /STRUCTURES

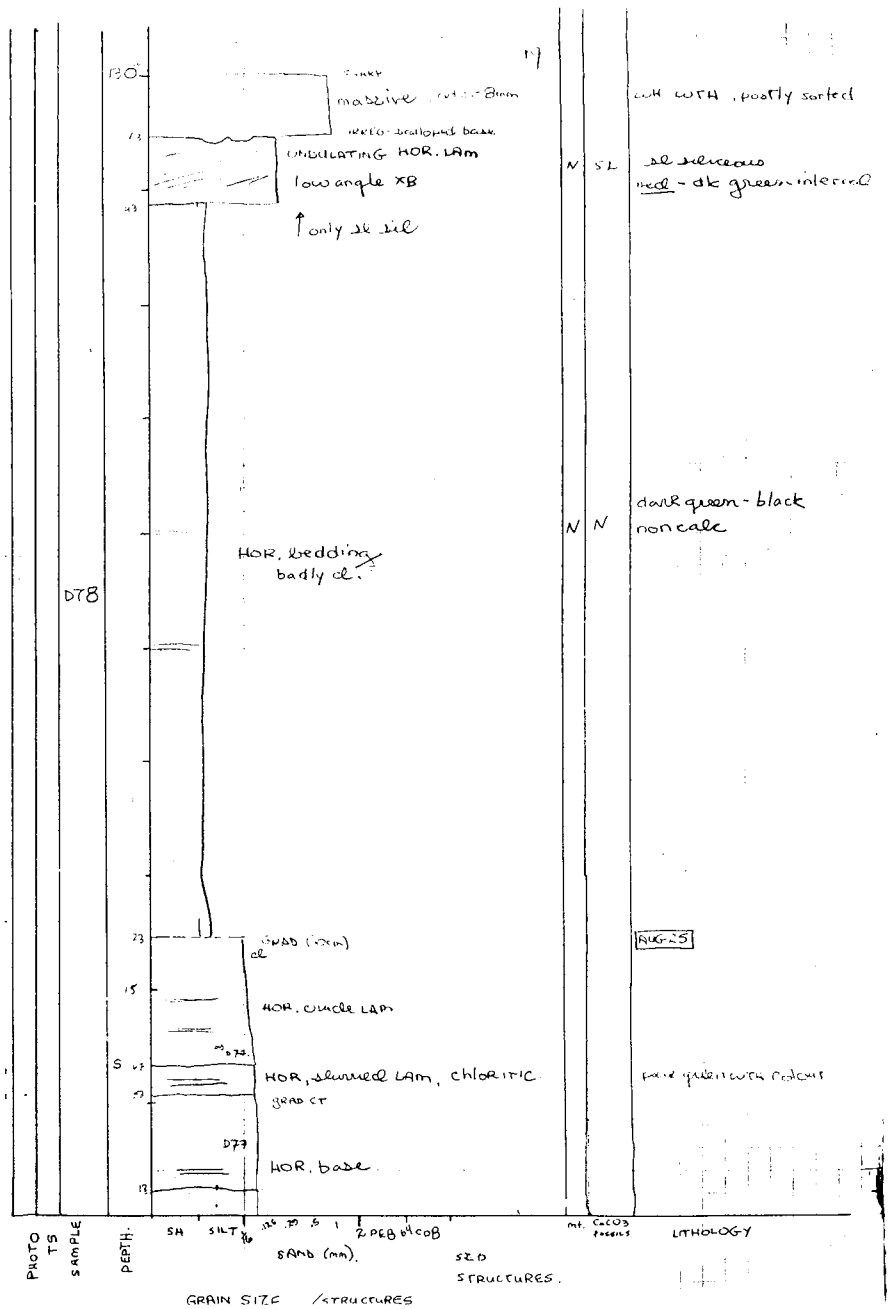

100
vf ΔTST/mudstone
vf FOS.
sl FOS.
coquina LAG
HOR. planar. FOSSILS
St. 20-30cm
pebs 3-8cm. rounded
Qtz 60%
RHY 40%
SL FOS
FOS
FOS
dark grey
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.


vf ΔTST/mudstone
dark grey internal colour
geog streak
SHARP. IRREG
NON FOS.
HOR. fine lam. sl curved
HOR. fine lam
mod shelly base
HOR. fine lam
coq/" storm event.
SL. CALC
sl CALC
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

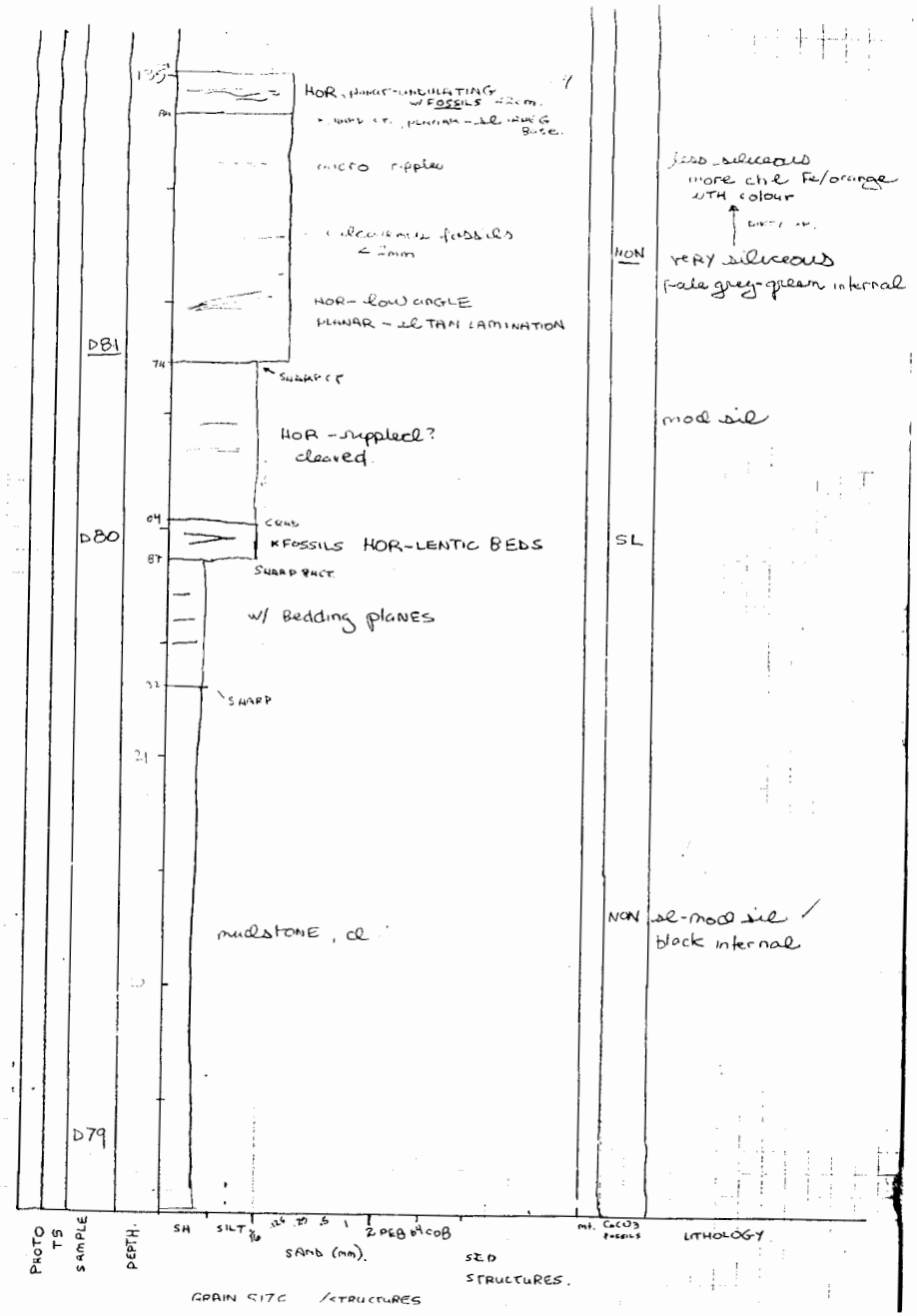

115
HOR. wavy
tuffitic
HOR. PLANAR
D75
LENTICULAR
D76
vf cleaved, greener, chlorite
HOR LAM
PLANAR low ANGLE LAM.
w/ RIP UP CLASTS
D75
sil mudstone/siltstone
tuffite
(2m S 26)
paper cl
sl. mod sil
HOR, faint LAM.
0 of S26
very siliceous, clotty look
homogenous
grain SIZE tuffite
PROBLEM.
BROWNISH WITH COLOUR
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES

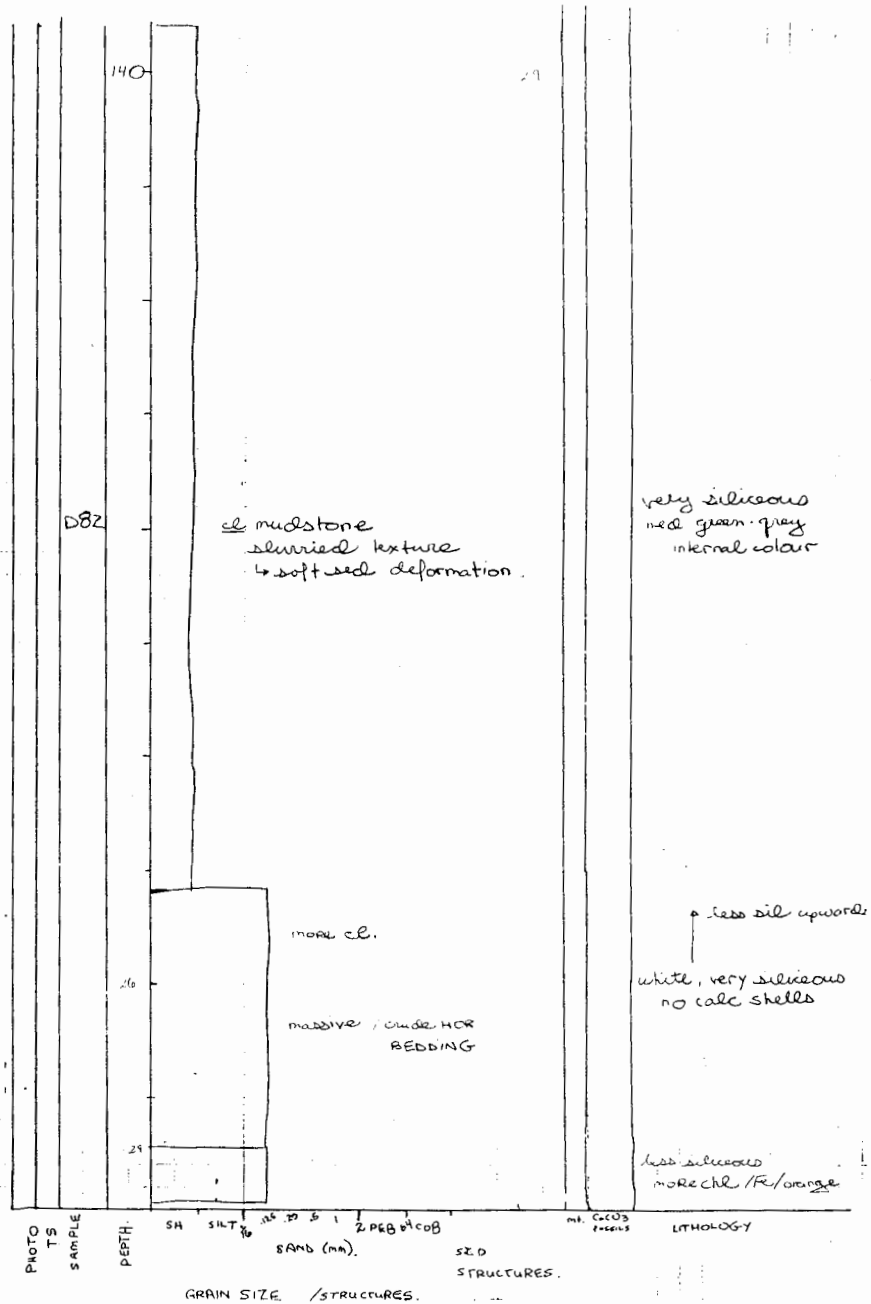

120
D77
slumped w/1-2cm chl RIBS
IRREG CT
vf sil ss
w/ MORE chl. lenses
HOR LAM
vf sil ss
chloritic tuffite SLST
sil vf ss
CHLORITIC tuffite (A)
HOR, PLANAR
tuffitic (coarser D 75)
- low angle XB?
(Sequence)
PT XB, LOW angle
(less sil tuffite)
D75
w/ chlorite 3-4mm bands
soft SED DEF
GRAD
HOR. planar
PLANAR LOW Angle.
953
grad
w/chloritic bands <1cm
D76
D75
ch WTH
ch/green tuffitic SLST
chlor bottom. tuffite
sl green colour
monochloritic
like D76
ch WTH
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

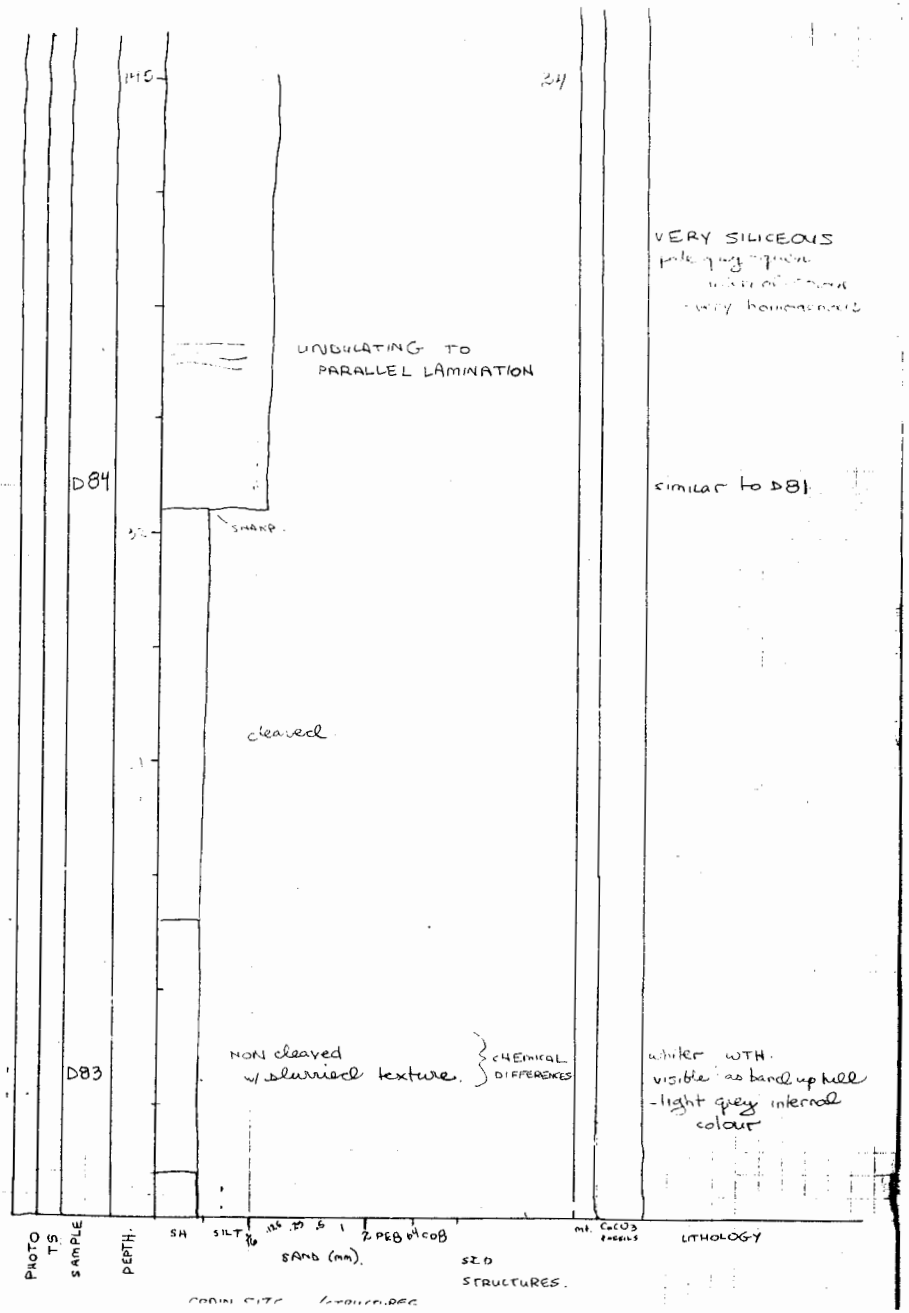

SAND
chl VERSION
HOR. streaky lam
D77 NSSV
chloritic VERSION
streaky, wispy laim
NSSV
w/ egg. grey. sil nodules
3-8cm
pumice??
chloritic vcar fill. 8cm deep
HOR, faint LAM
not massive)
ZONE of BED MIXING
w/ chl. bands
DISC. HOR LAM
+ ripples
vf ss. sil, w/ chloric bands
CT. undulating
PLANAR, low angle LAM
IRREGULAR lateral thickness
graded
sandlike, not lateral banding
HOR, faint
3-4cm successive CaCO3 concretions
slumped
HOR. LAM.
occasional calc. nodules
chl
pumice accretion
und CT
wh WTH.
more chloritic
more chloritic than D77
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
%
.125 .25 .5 1 2 PEB
COB
SAND (mm).
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

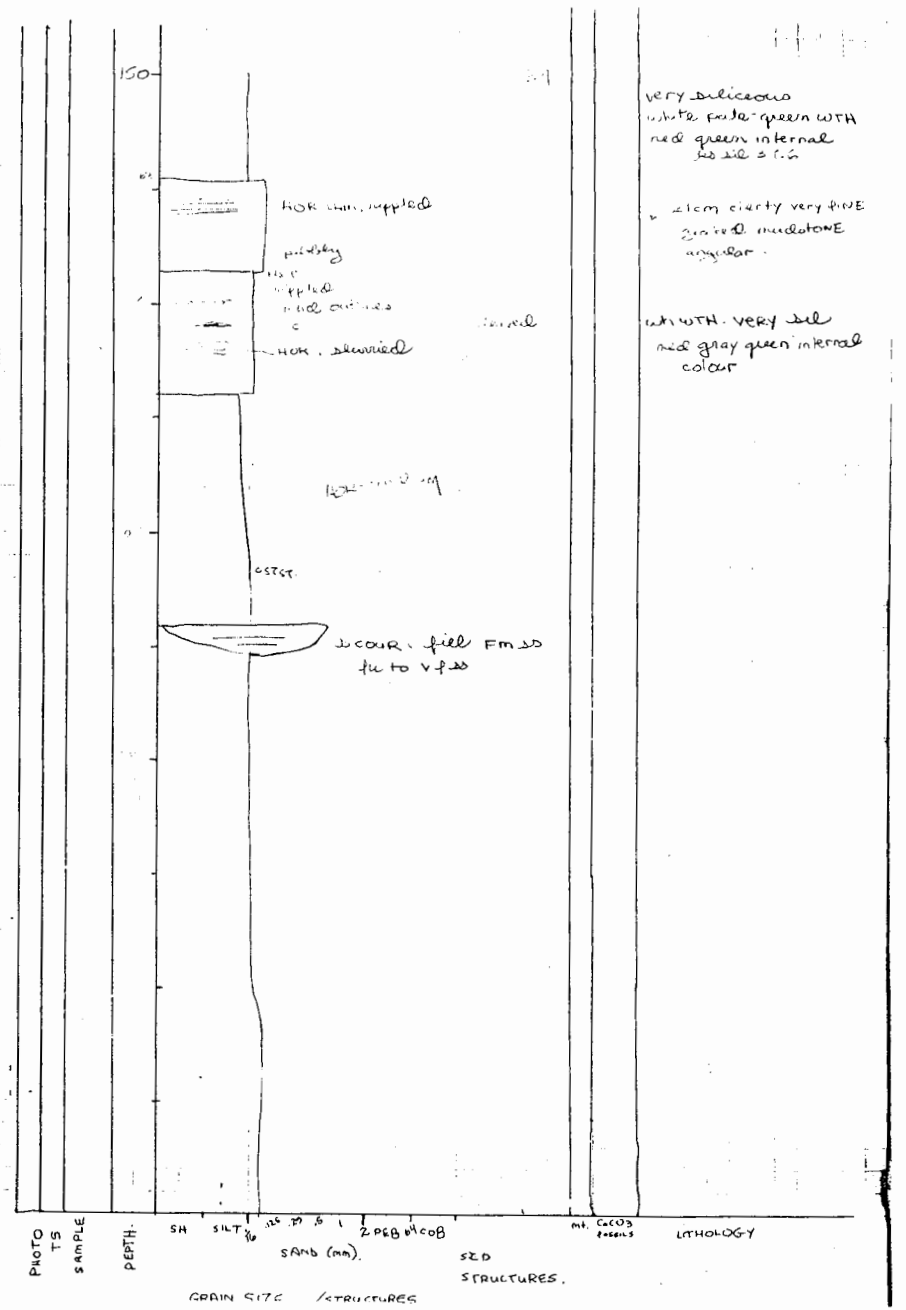

massive
undulating HOR. LAM
low angle XB
only sl sil
HOR. bedding
badly cl.
D78
SAND (<2cm)
HOR. cmcle LAM
HOR, slumped LAM, chloritic
grad CT
HOR. base
wh WTH. poorly sorted
sl siliceous
med - dk green, interval
dark green - black
non calc
AUGAS
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
%
.125 .25 .5 1 2 PEB
COB
SAND (mm).
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES

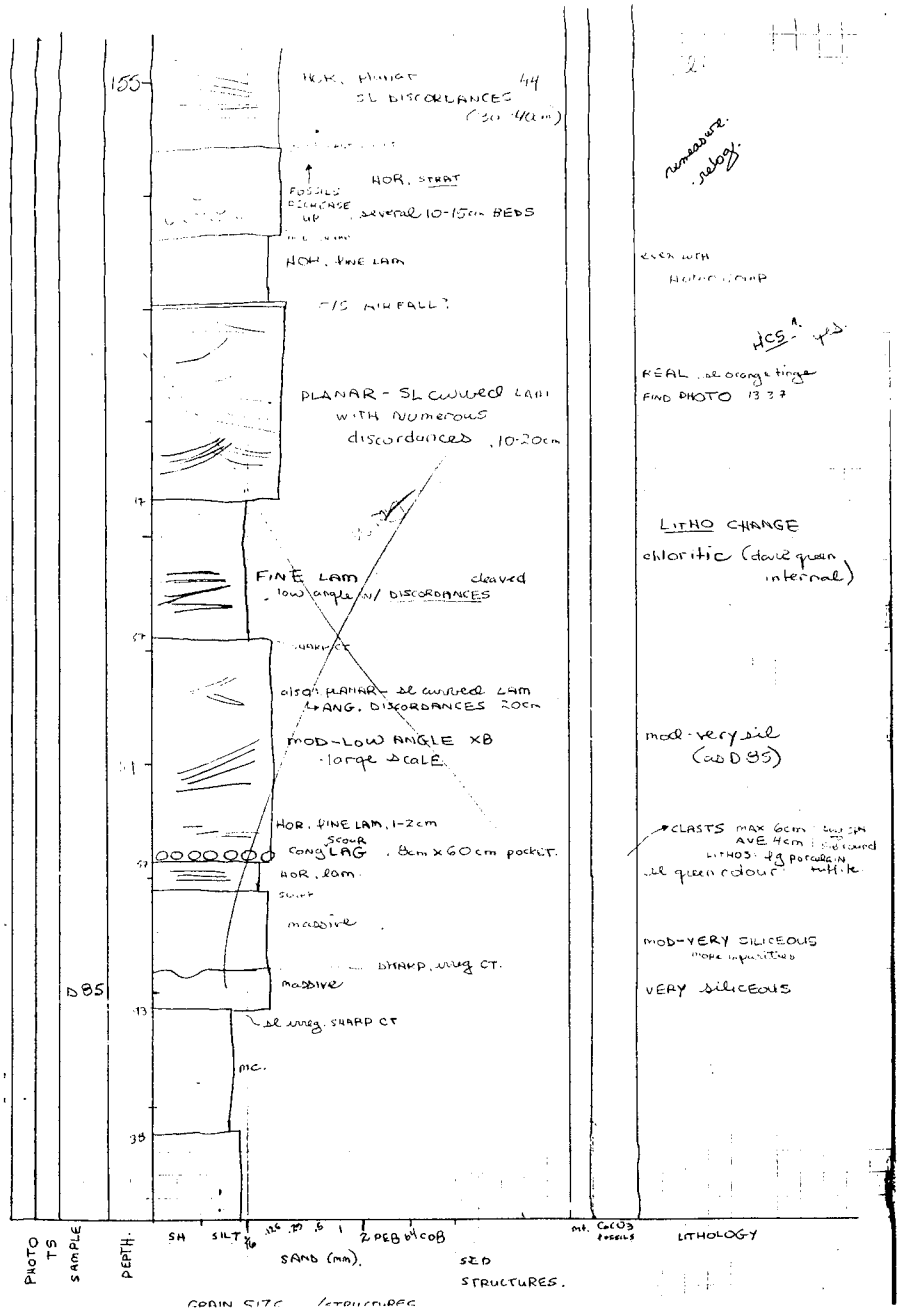
D2


HOR, WAVY-UNDULATING w FOSSILS
micro ripples
HOR- LOW ANGLE PLANAR - cl TAN LAMINATION
D81
SHARP CT
HOR - rippled? cleared
D80
CONG
KFOSSILS HOR-LENTIC BEDS
SHARP PACT
w/ Bedding planes
SHARP
mudstone, cl
D79
less siliceous more chk Fe/orange with colour
very siliceous pale grey-green internal
NON
mod sil
SL
NON sl-mod sil / black internal
PROTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES


D82
cl mudstone slurried texture
soft sed deformation.
very siliceous med green-grey internal colour
more cl.
massive / crude HOR BEDDING
less sil upwards
white, very siliceous no calc shells
less siliceous more chk/Fe/orange
PROTO TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.


115
24
VERY SILICEOUS
UNDULATING TO
PARALLEL LAMINATION
D84
SHARP
similar to D81
cleaved
NON cleaved
w/ slurried texture.
CHEMICAL
DIFFERENCES
D83
whiter WTH.
visible as band up hill
-light grey internal
colour
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE
/STRUCTURES


150
24
very siliceous
white pale green WTH
med green internal
HOR thin, rippled
HOR. slurried
COUR. fill FmSS
fu to VfSS
PROTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE
/STRUCTURES



measure. relog.

cover with

HCS? yes.

REAL. at orange tinge

FIND PHOTO 1337

LITHO CHANGE

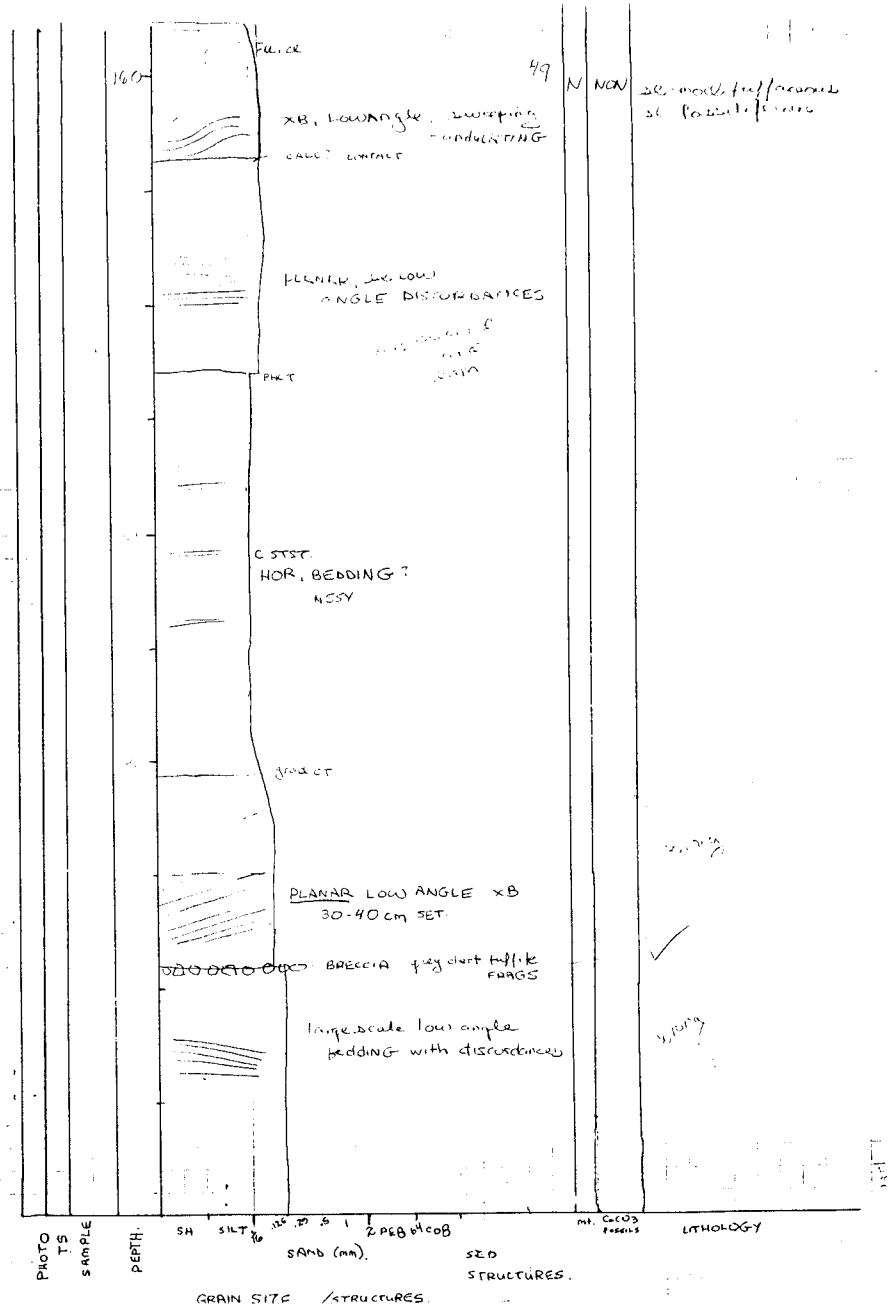
chloritic (dark green internal)

mod-very sil (as DBS)

CLASTS MAX 6cm
AVE 4cm
LITHOS: fg porcellan
sil green colour
mudstone

MOD-VERY SILICEOUS
more impurities

VERY SILICEOUS



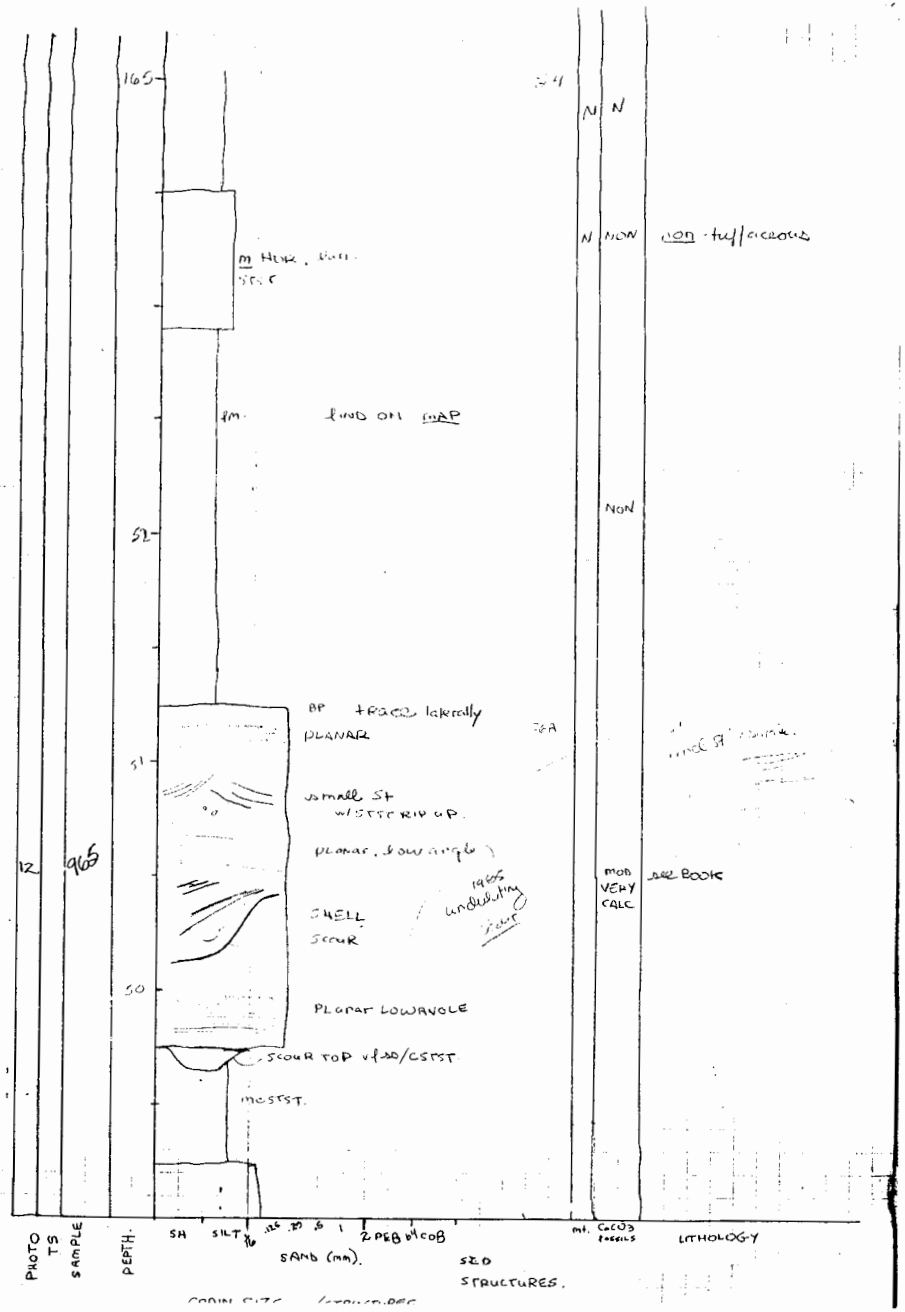


PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE
165
52
51
50
m HUM. Burr. STRUCTURE
fm.
FIND ON MAP
BP
PLANAR
small SC w/ STTC RIP UP.
PLANAR, low angle
SHELL SCOUR
PLANAR LOWANGLE
SCOUR TOP v f SD/CSTST
mcSTST.
NON
MOD VERY CALC
BOOK
N
NON
non-tuff/arenous

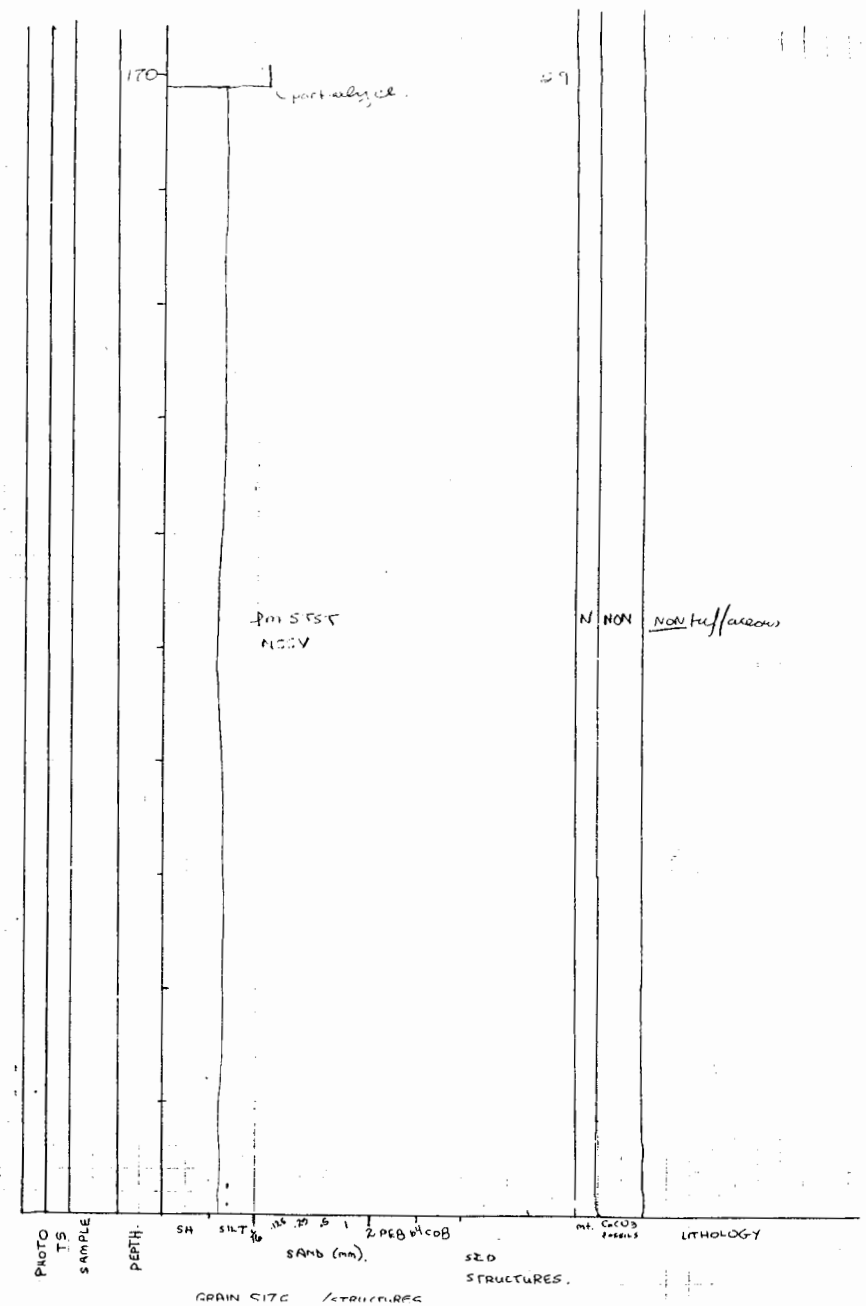
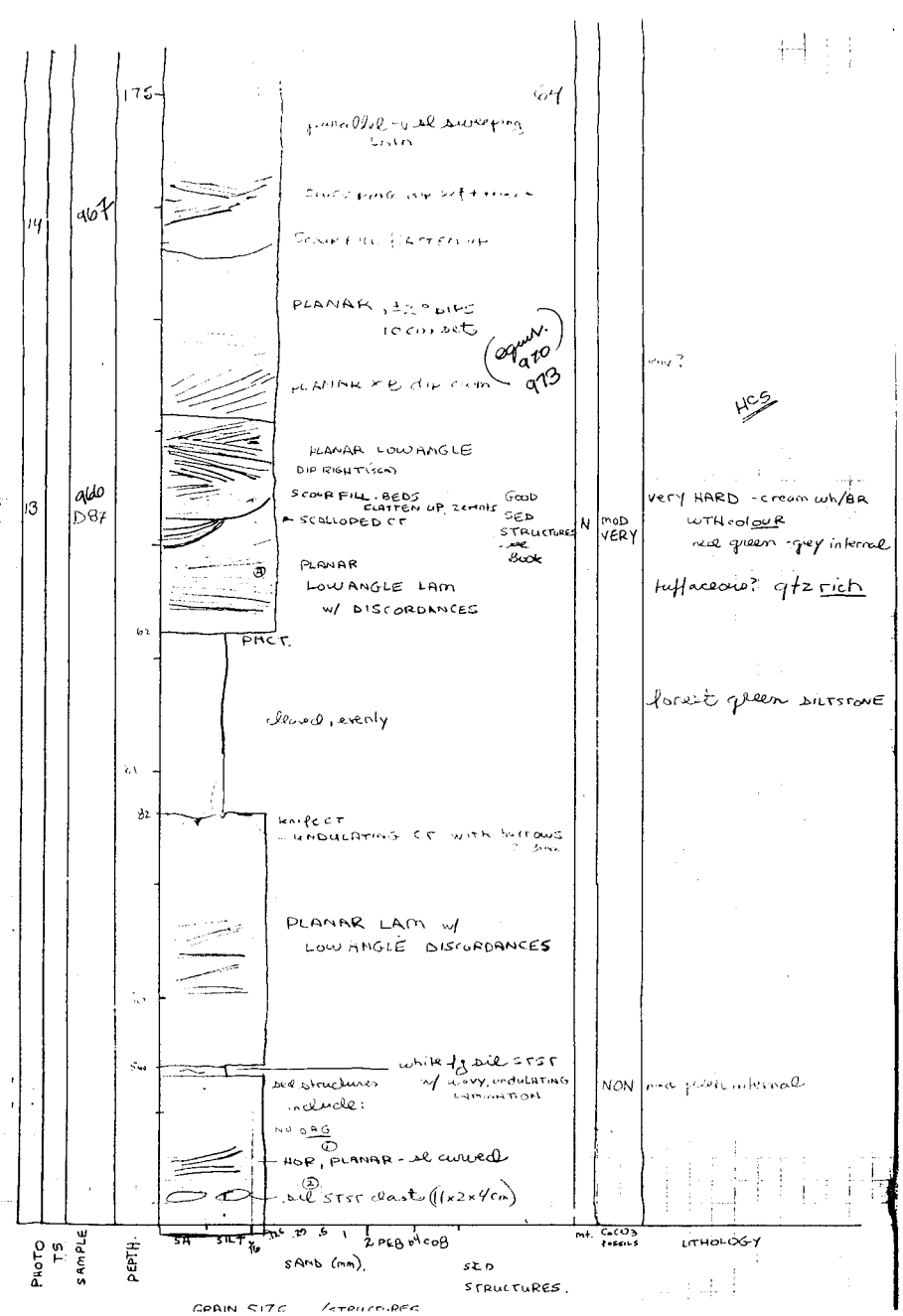
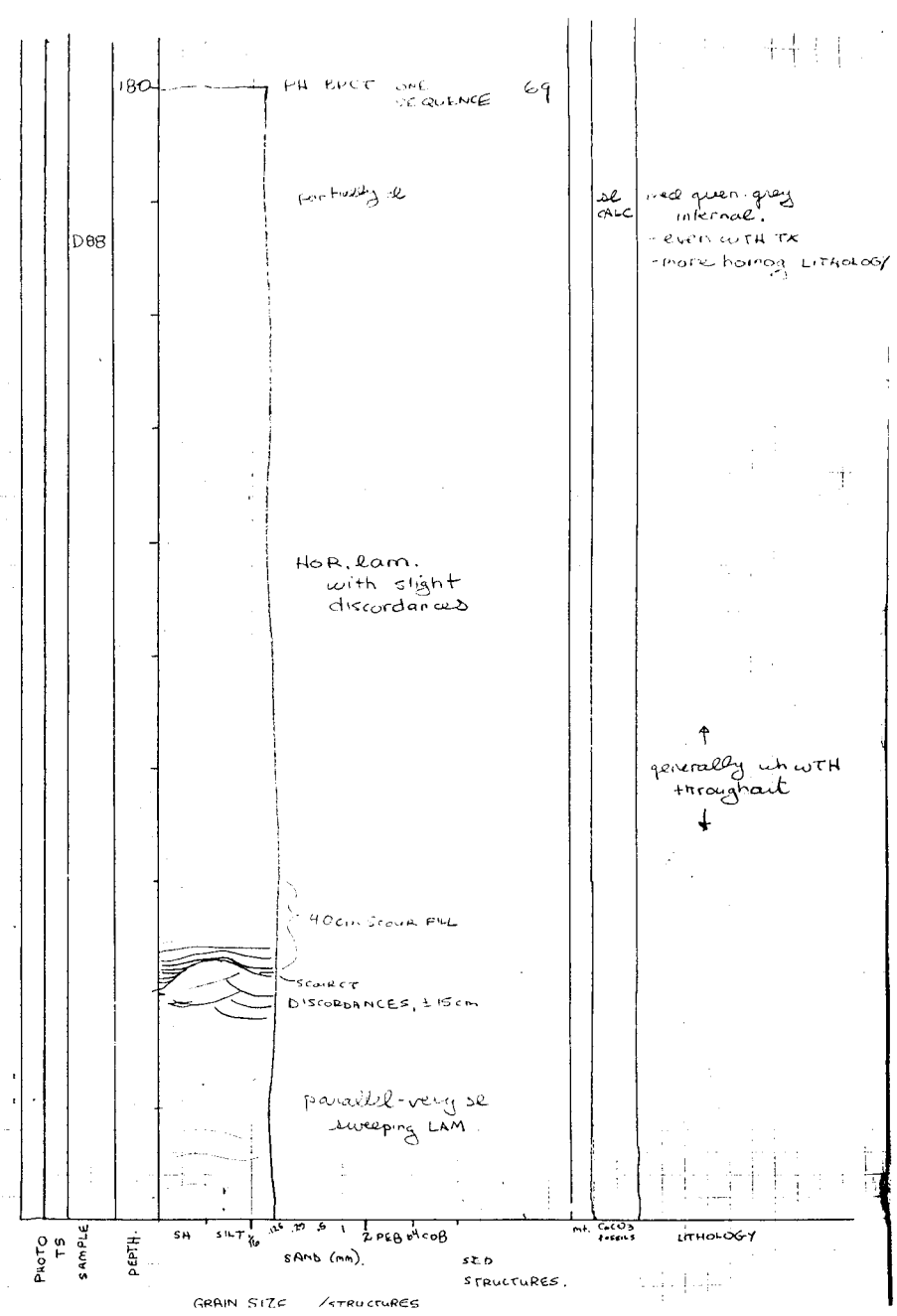
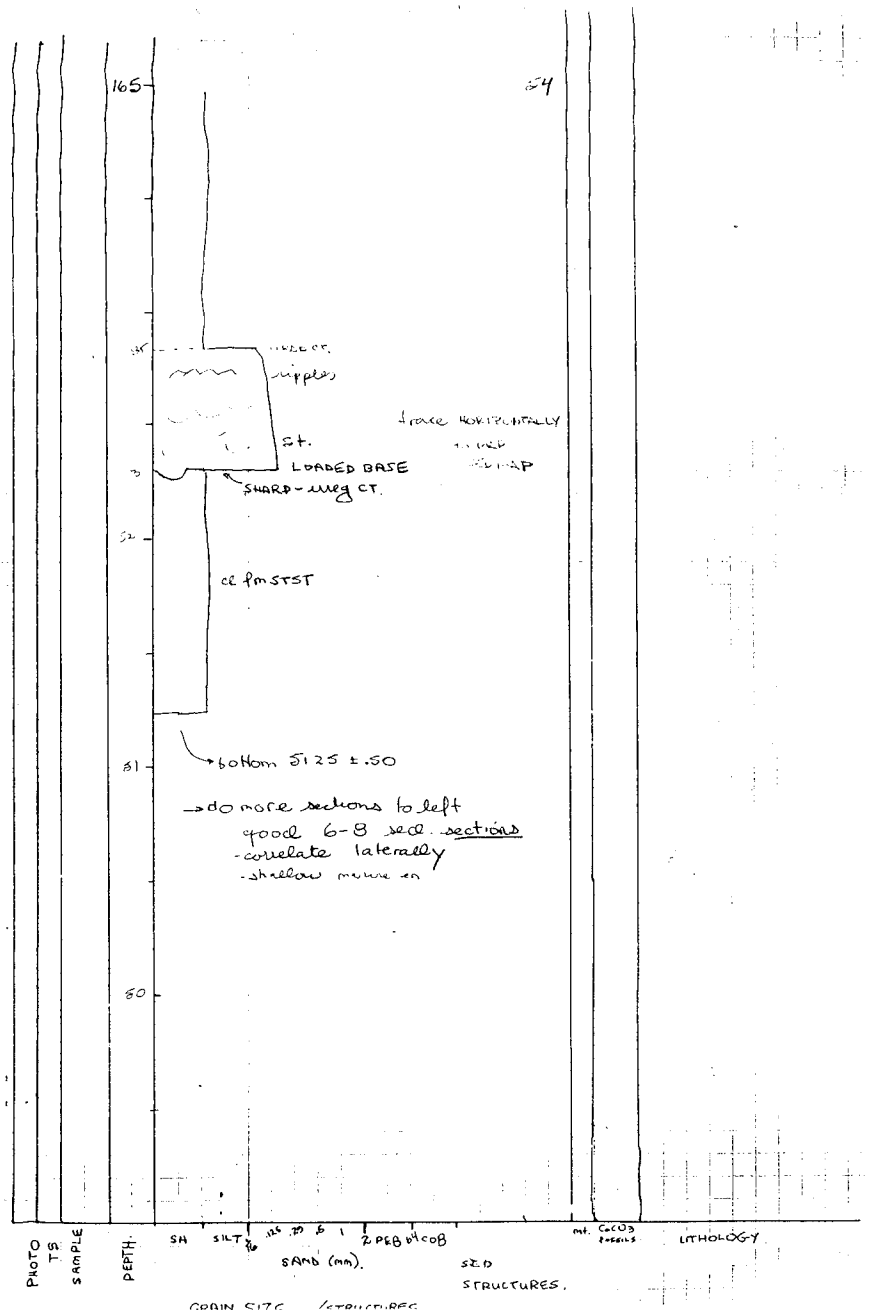
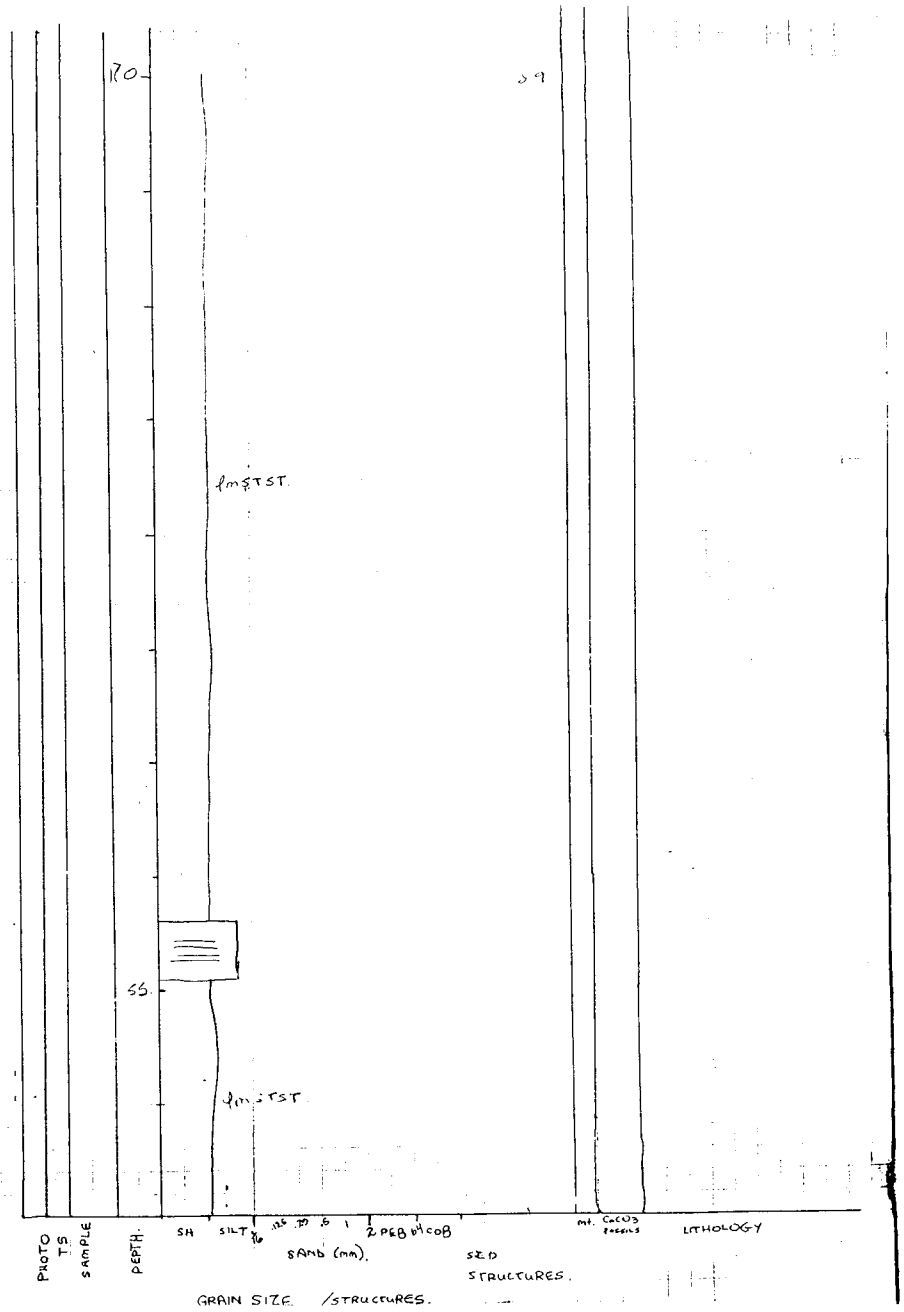


PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE
170
(partially cut.
fm SSST
N
NON
NON tuff/arenous

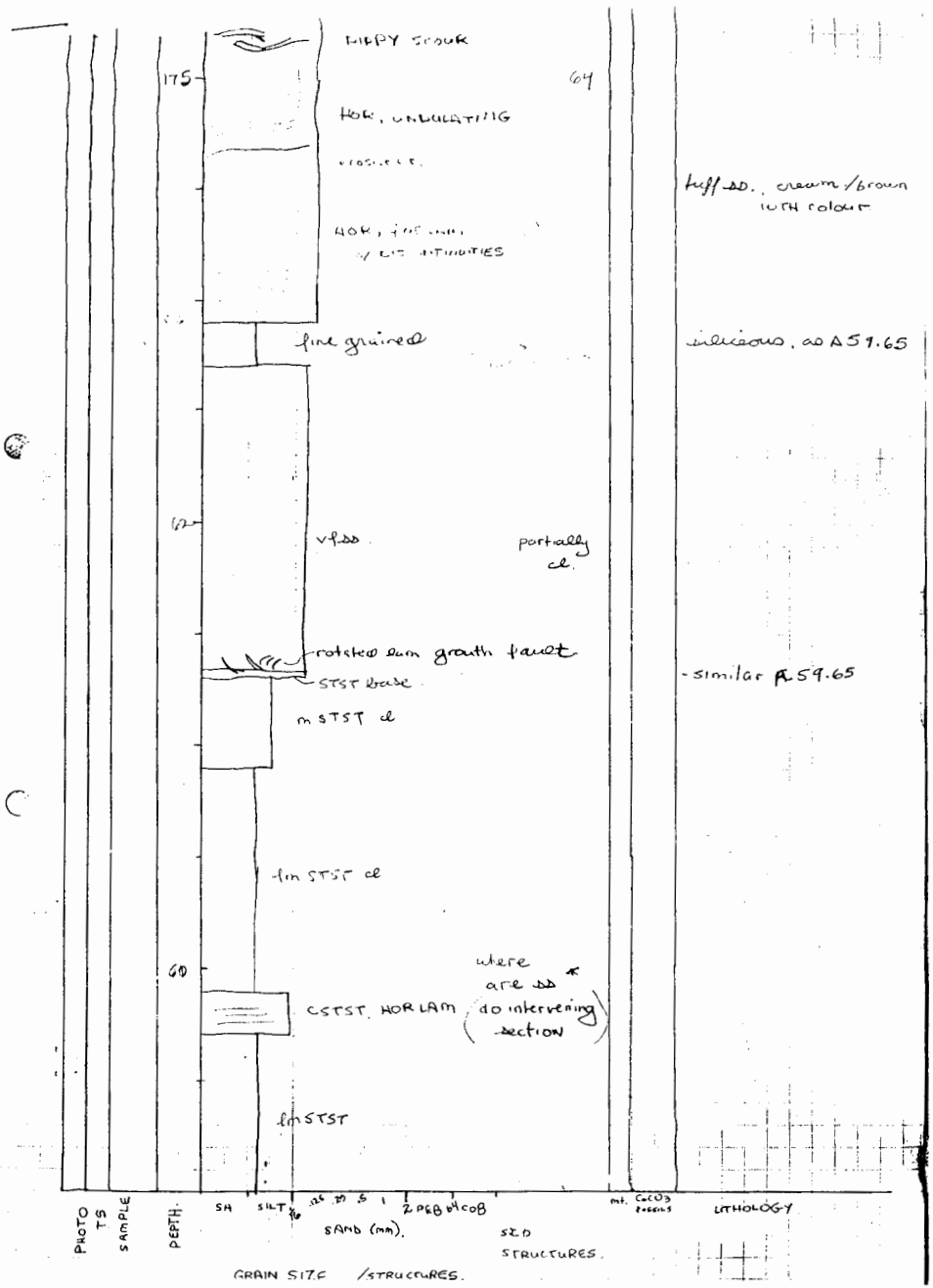

175
64
parallel-v sl sweeping LAM
PLANAR, ± 20° DIPS
10 cm set
(equiv. a to 973)
HCS
PLANAR LOW ANGLE
DIP RIGHT (SSW)
SCOUR FILL. BEDS CLATTEN UP. ZEMAIS
SCALLOPED CT
Good SED STRUCTURES - see Book
N
MOD VERY
very HARD - cream wh/BR WITH colour
med green-grey internal
PLANAR LOW ANGLE LAM w/ DISCORDANCES
tuffaceous? qtz rich
PACT.
forest green SILTSTONE
slwd, evenly
knife CT - UNDULATING CT with burrows
PLANAR LAM w/ LOW ANGLE DISCORDANCES
whit-lt gy sil SLTST w/ wavy, undulating LAMINATION
NON
med green internal
SED structures include:
NU BAG
HOR, PLANAR - sl curved
sil SLTST clasts (11x2x4cm)
14
13
q&T
q&D
D87
SH
SILT
SAND (mm).
PEBBLE
COBBLE
mt.
CaCO3 FOSSILS
LITHOLOGY
PHOTO
TS
SAMPLE
DEPTH.
SED STRUCTURES.
GRAIN SIZE
STRUCTURES


180
PH FACT ONE SEQUENCE
69
fortuitously sl
D88
sl CALC
med green-grey internal.
- even with TX
- more homog LITHOLOGY
HOR. lam. with slight discordances
generally wh WITH throughout
40cm SCOUR FILL
SCALLOPED DISCORDANCES, ± 15cm
parallel-very sl sweeping LAM
SH
SILT
SAND (mm).
PEBBLE
COBBLE
mt.
CaCO3 FOSSILS
LITHOLOGY
PHOTO
TS
SAMPLE
DEPTH.
SED STRUCTURES.
GRAIN SIZE
STRUCTURES


165
54
ripples
trace HORIZONTALLY
LOADED BASE
SHARP - irreg CT.
cc fmSTST
bottom 5125 ± .50
→ do more sections to left
good 6-8 sect. sections
- correlate laterally
- shallow marine en
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES


170
59
fmSTST
55
fmSTST
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

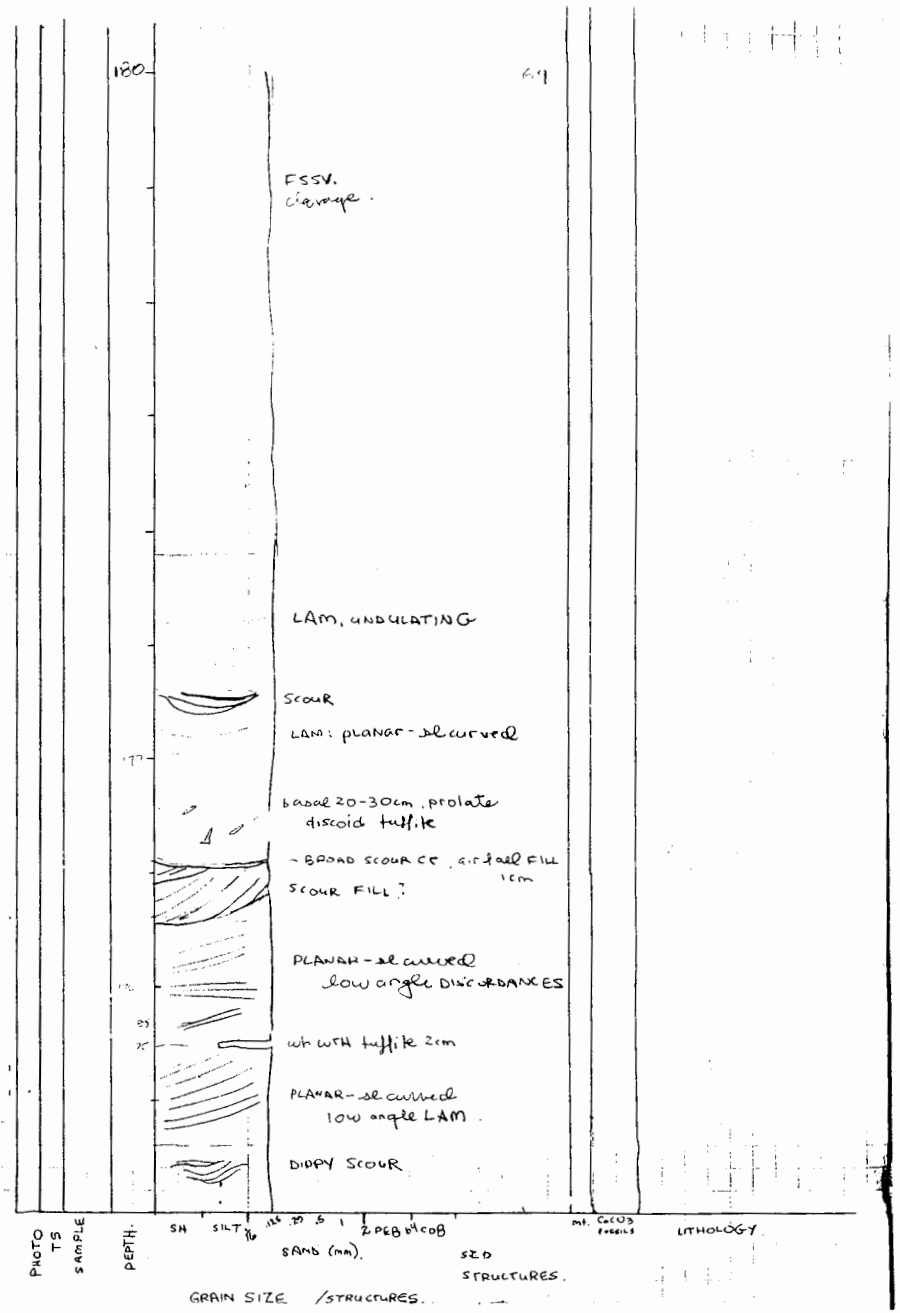
D2

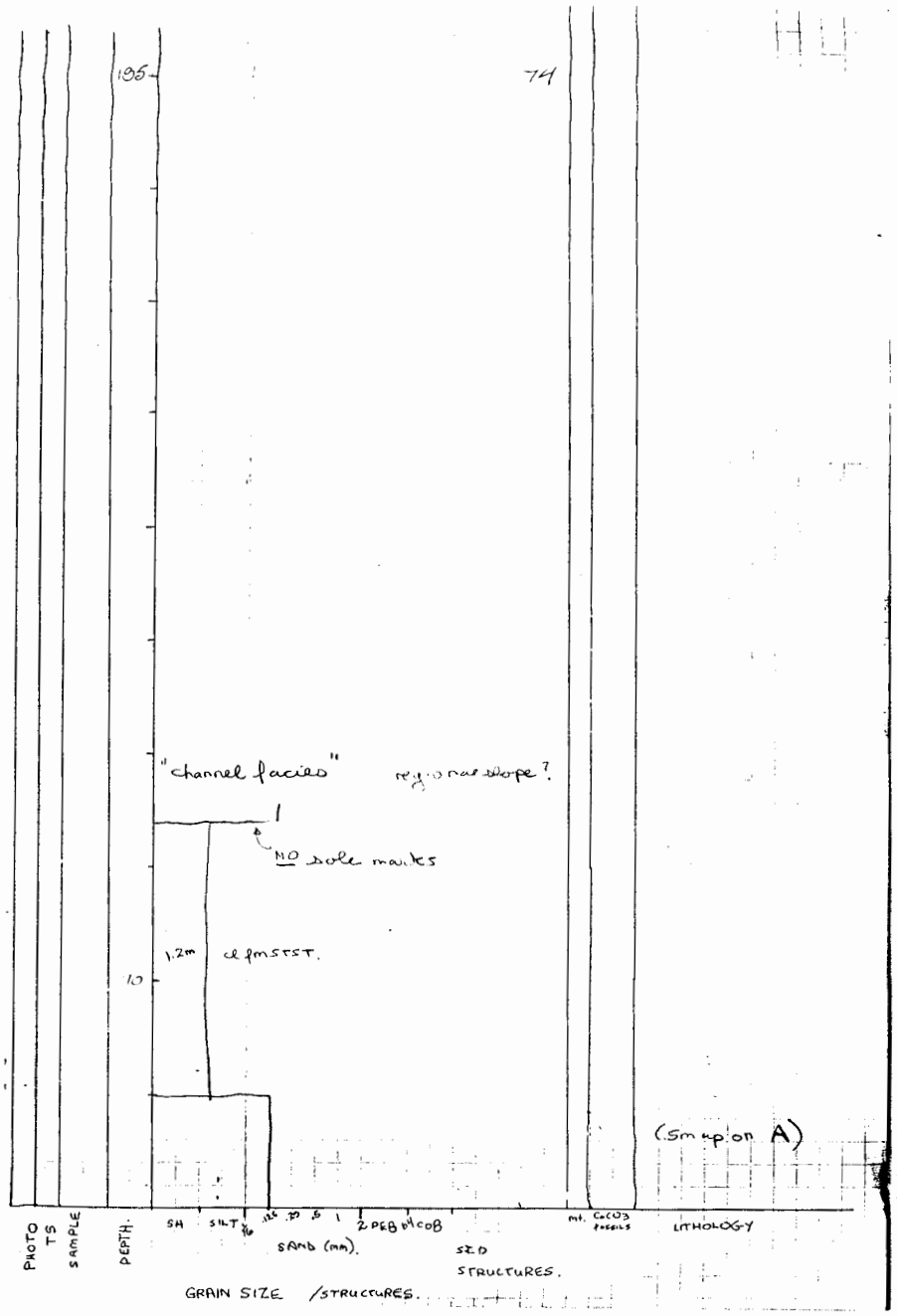


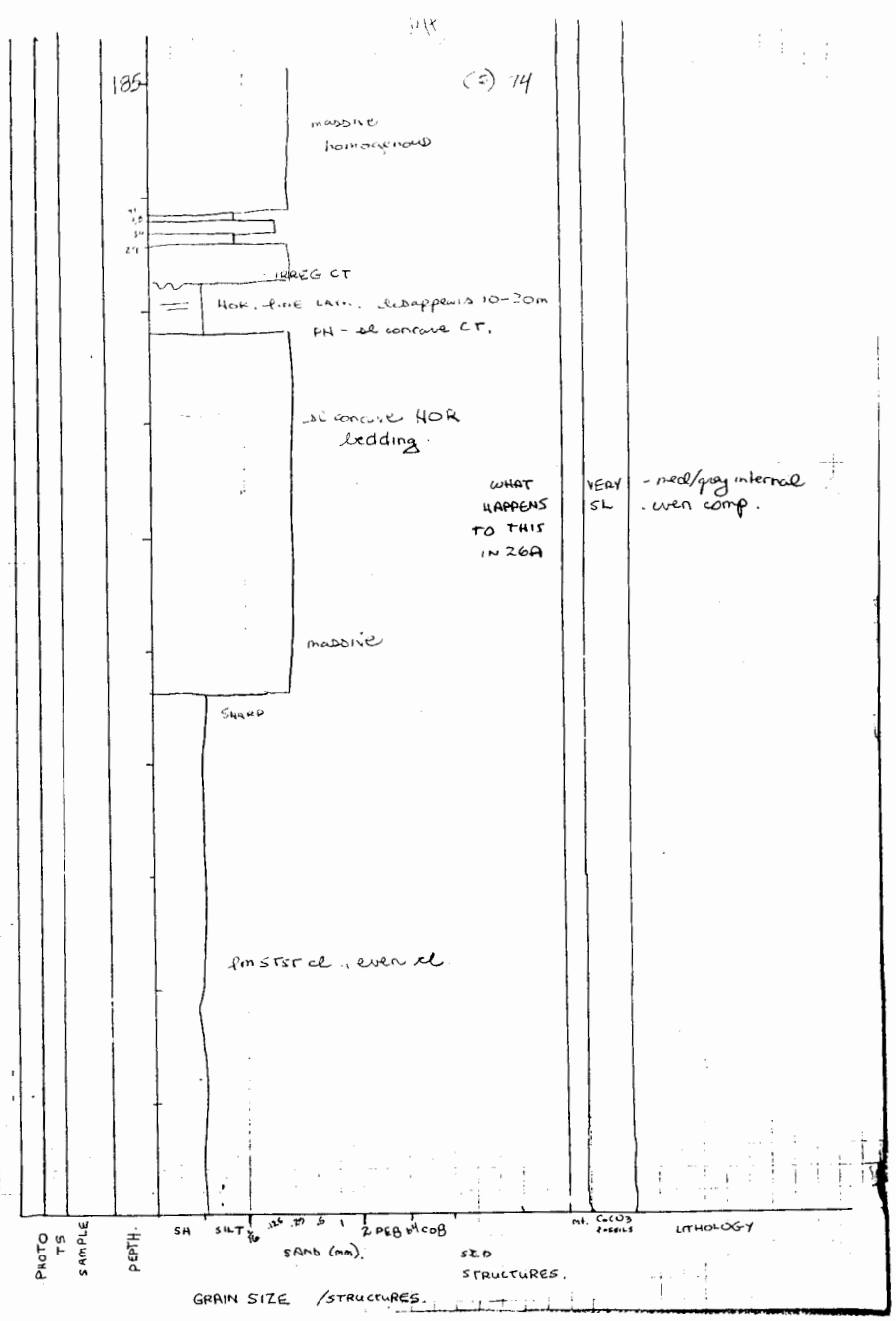
tuff ss., cream/brown with colour

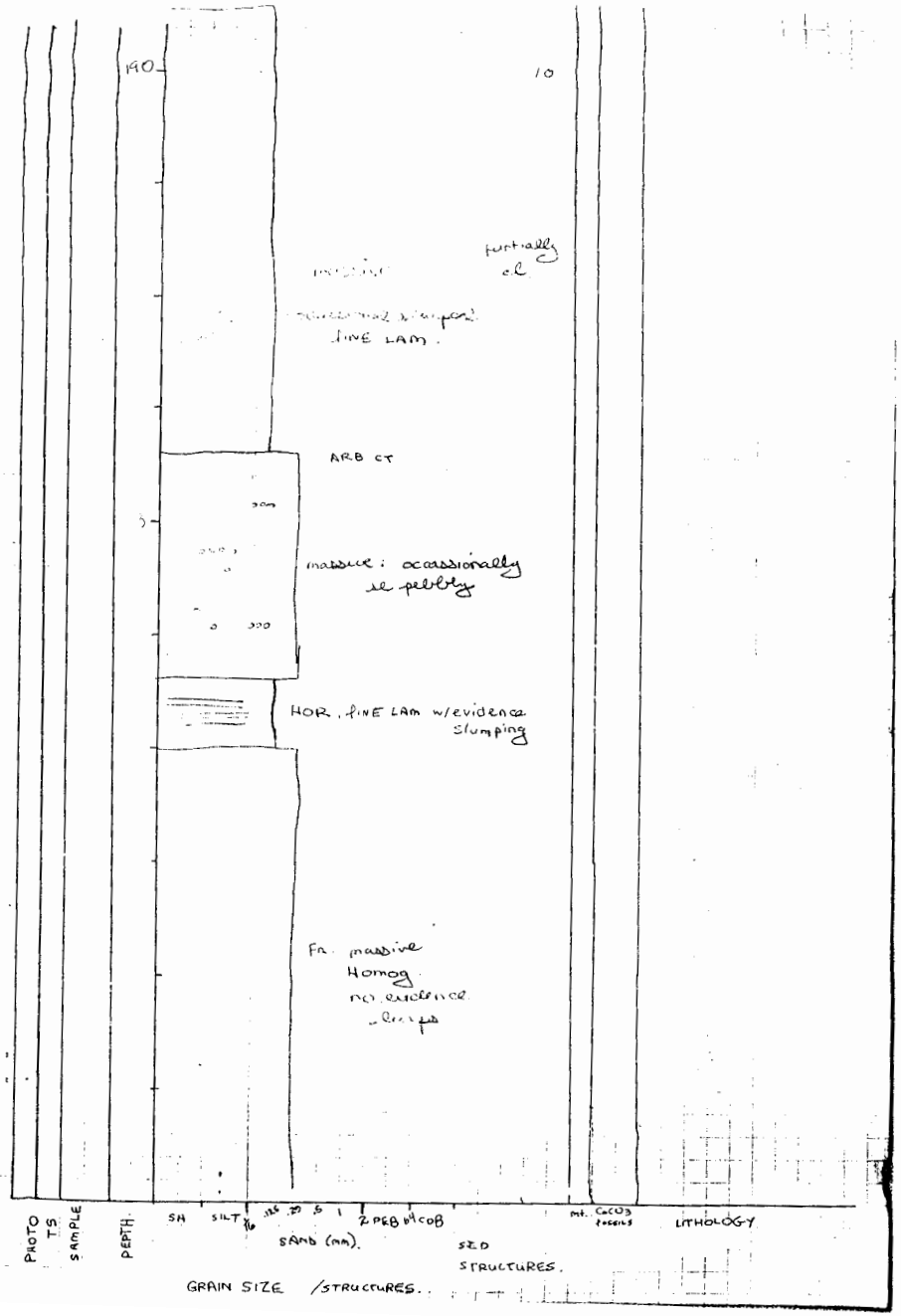
siliceous, as A59.65

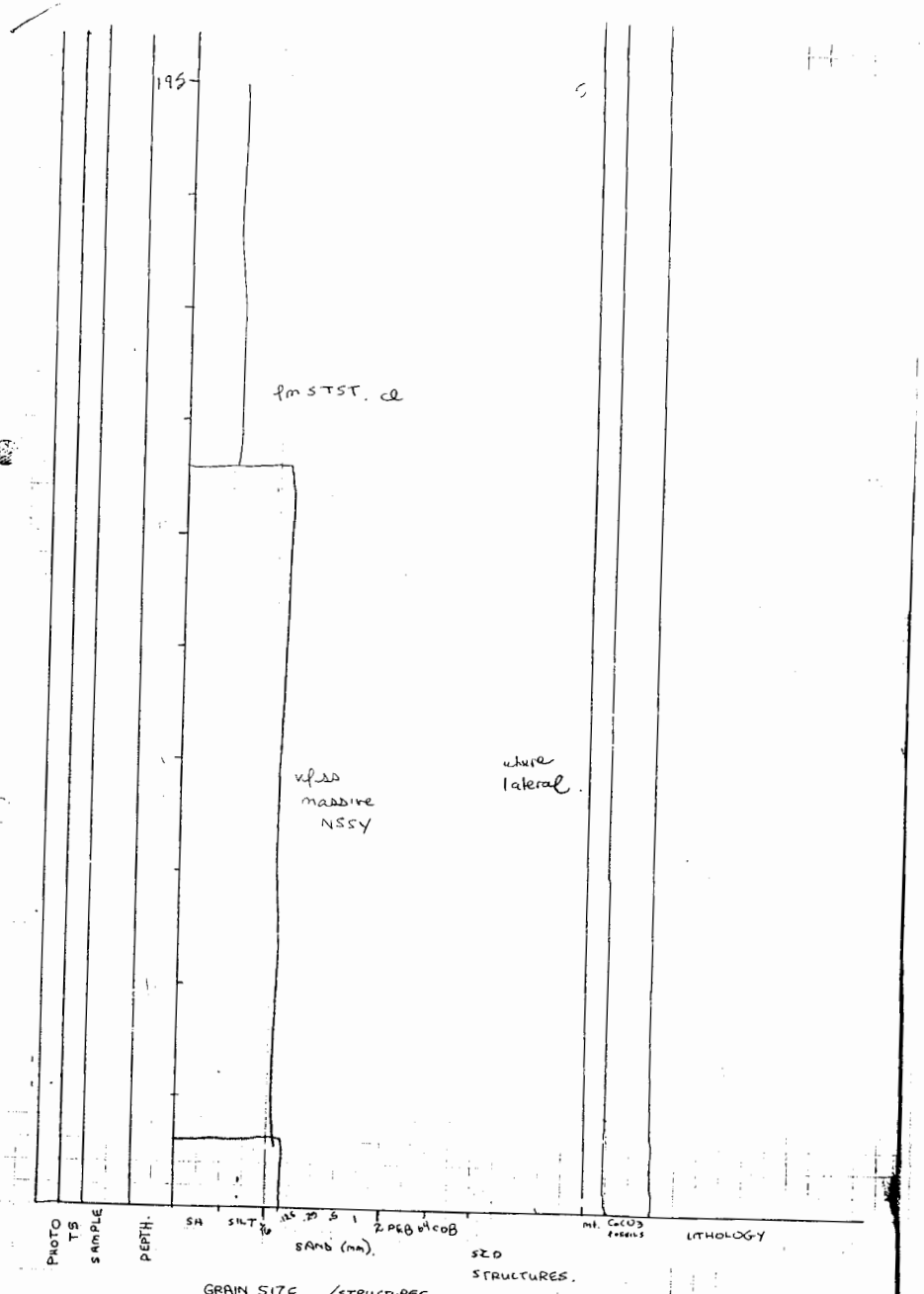
- similar A59.65

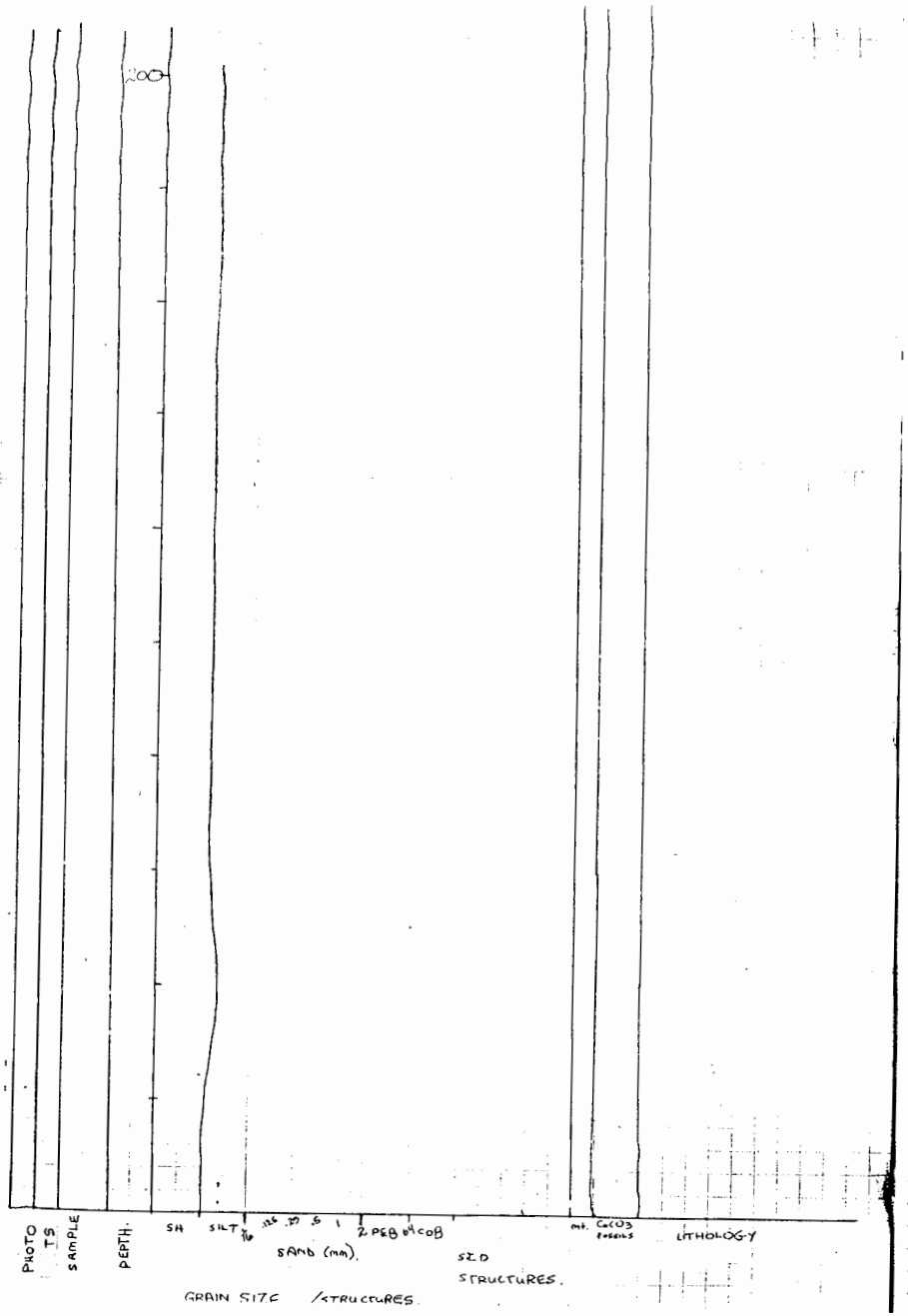


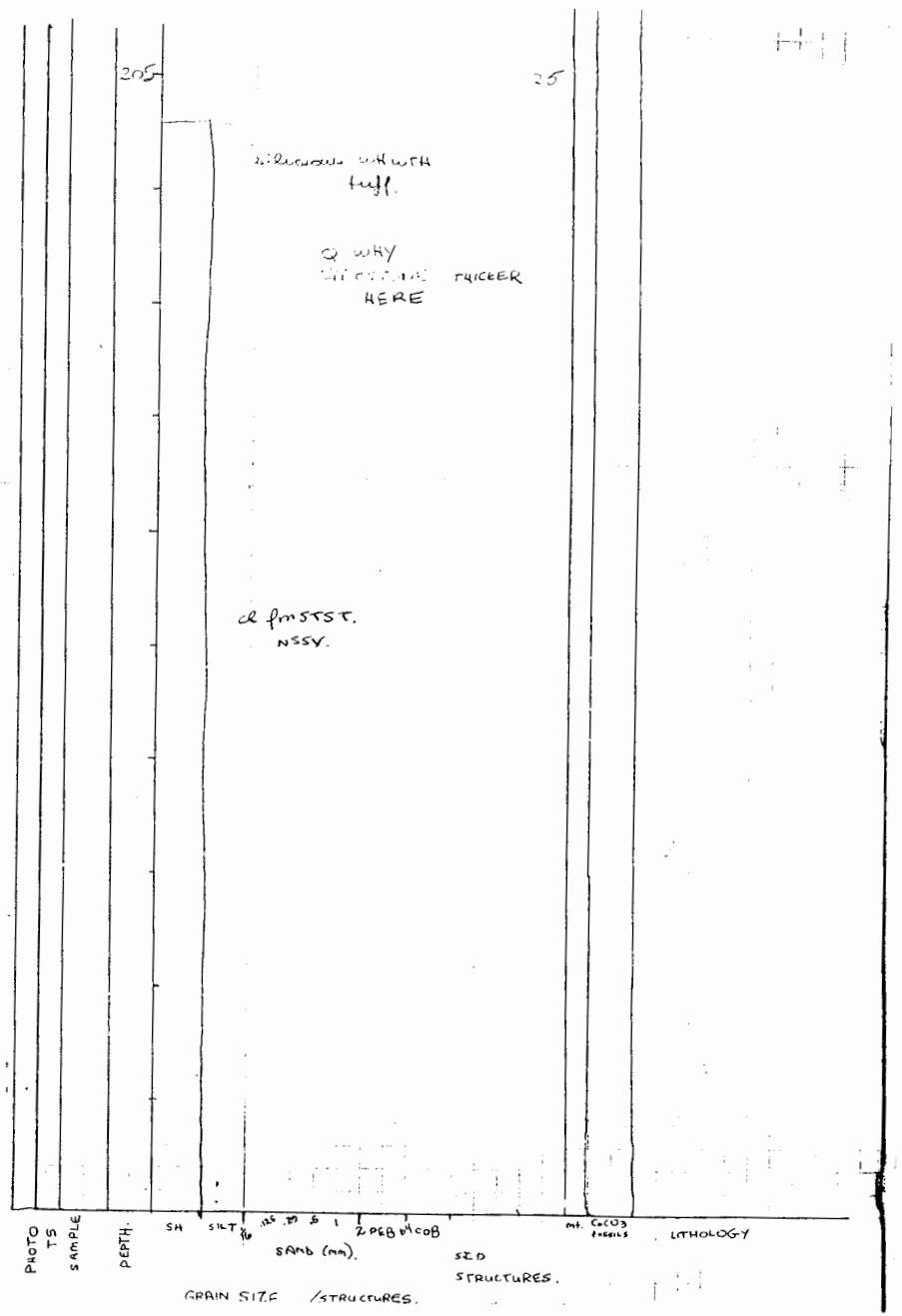

185
74
"channel facies"
regional slope?
NO sole marks
1.2m
cl fm sst.
10
(Sample A)
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
MCOB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

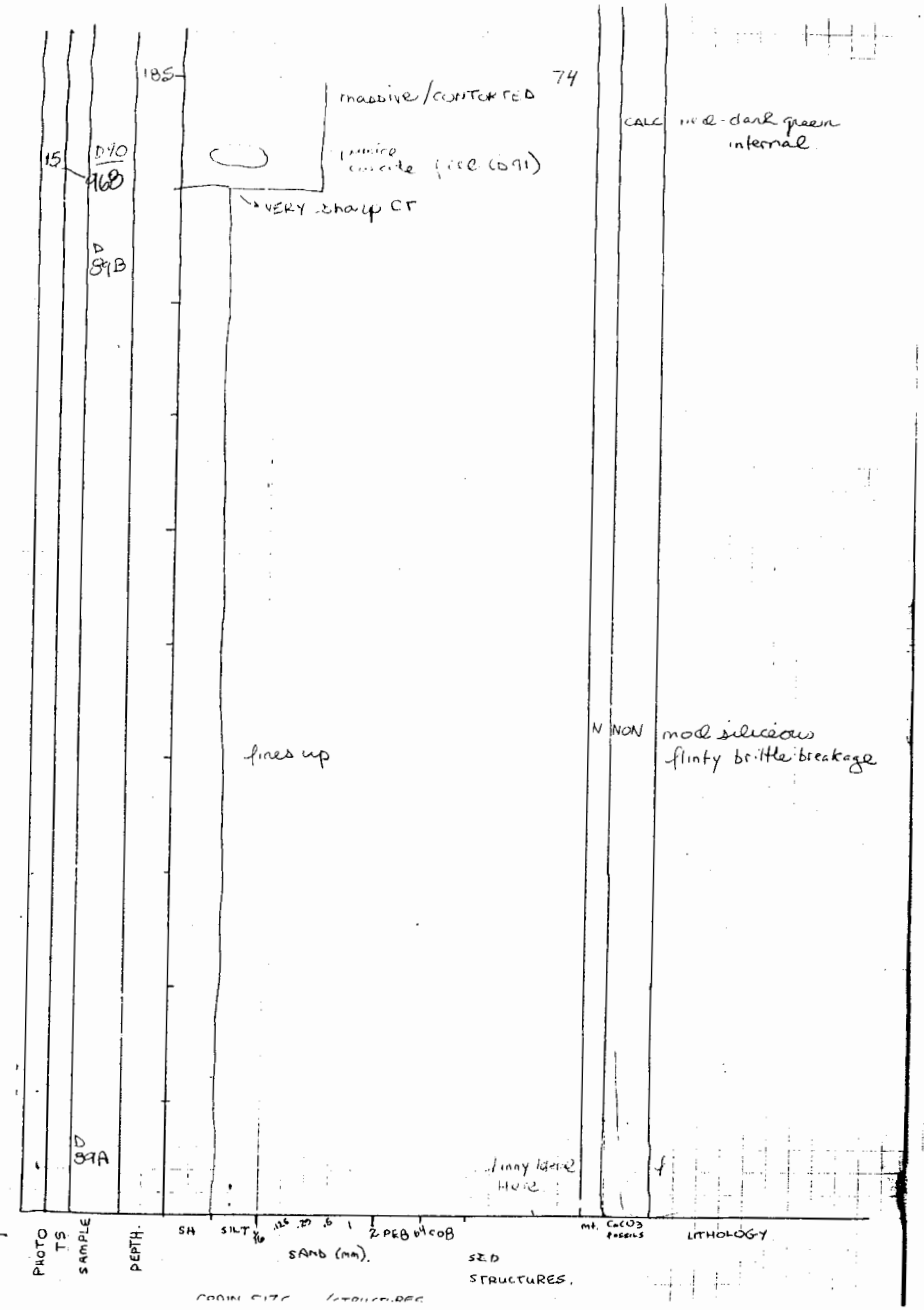

185
(=) 74
massive
homogeneous
IRREG CT
HOR. fine LAM. disappears 10-20m
PH - sl concave CT.
sl concave HOR bedding.
WHAT HAPPENS TO THIS IN 26A
VERY SL
- red/gray interval
. even comp.
massive
SHARP
fm sst cl. even sl
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
MCOB
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

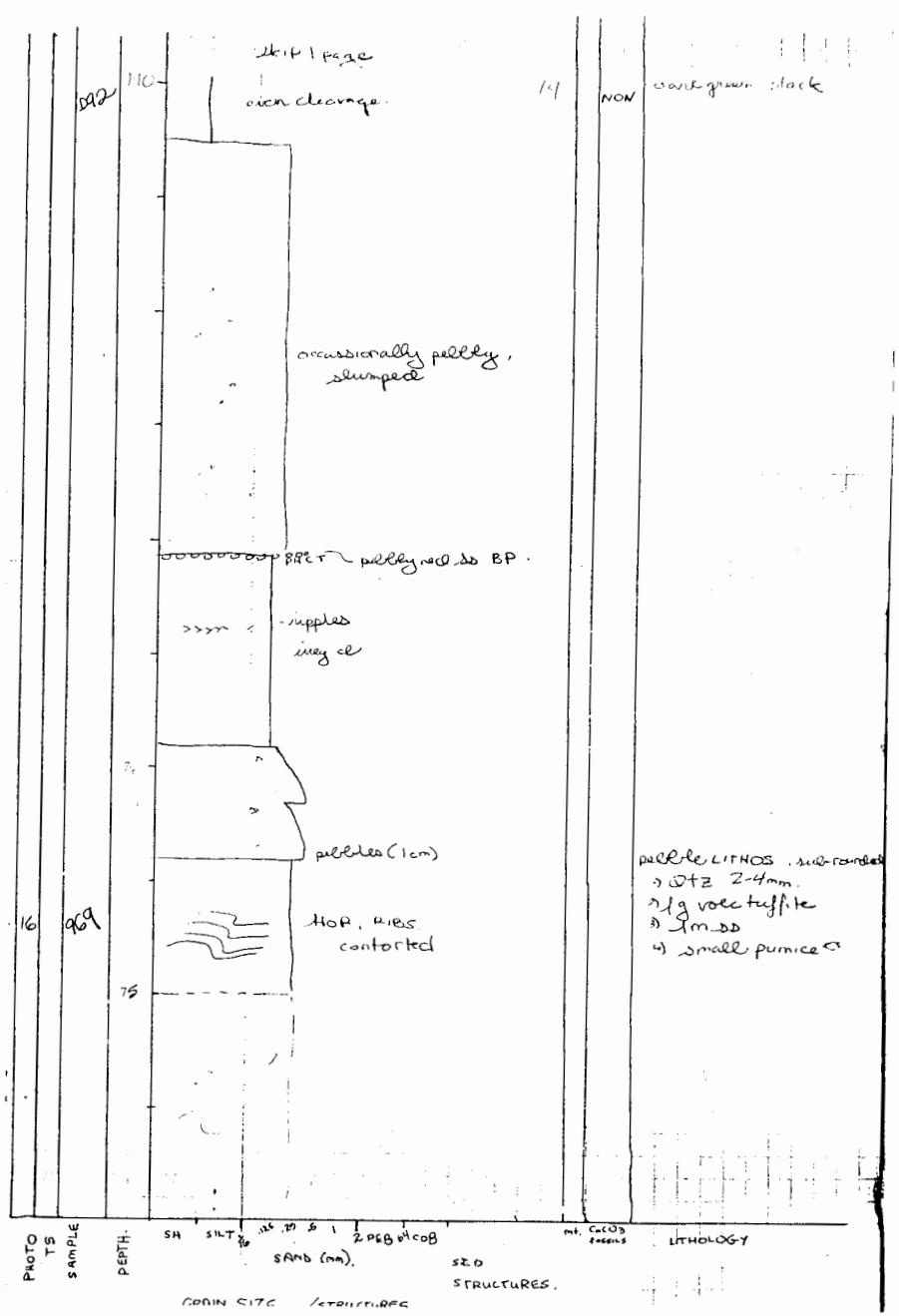

190
10
massive
partially cl
ARB CT
massive: occasionally sl pebbly
HOR. FINE LAM w/evidence slumping
Fr. massive
Homog.
PHOTO
T.S.
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

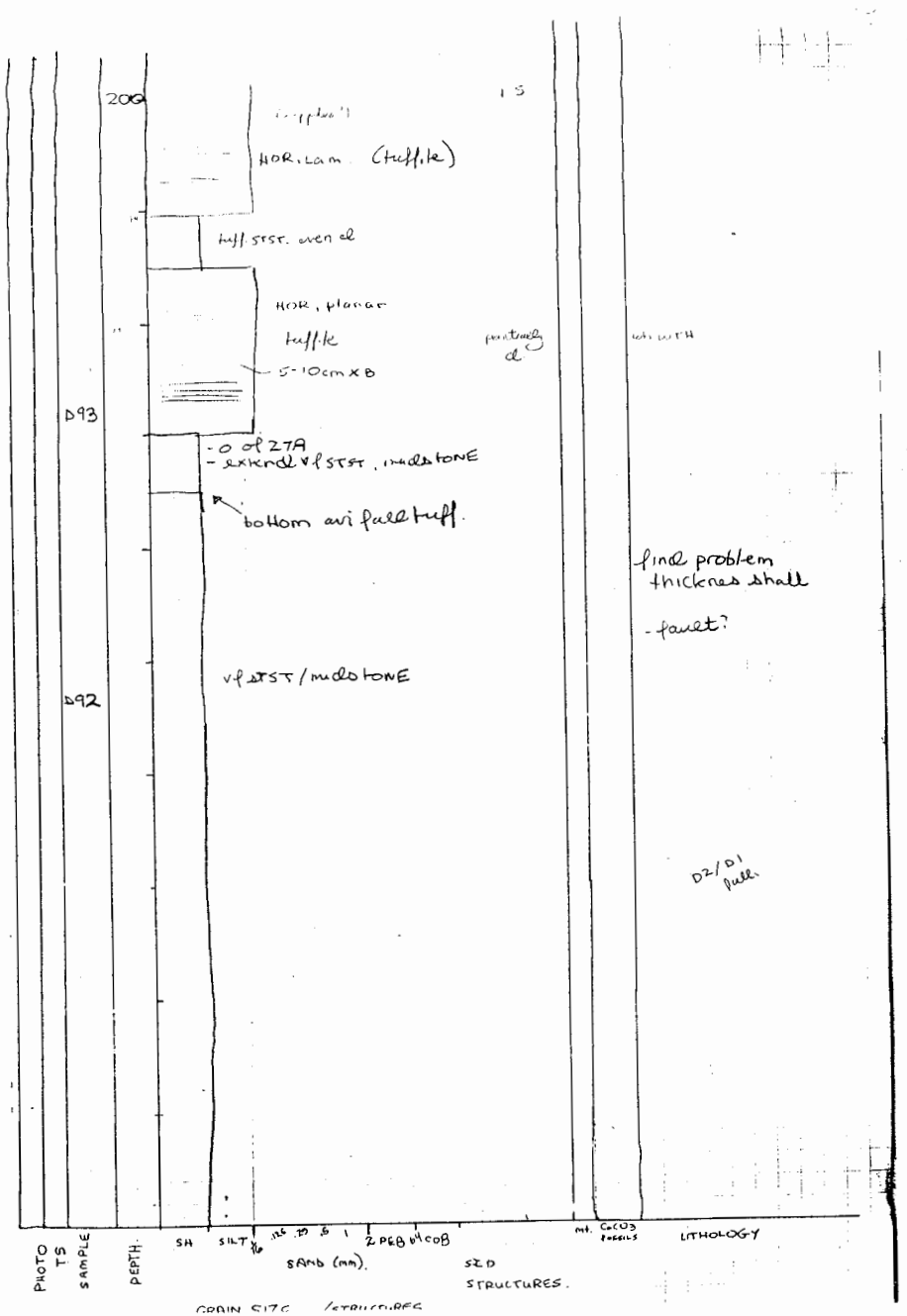

195
fm STST. cl
vfss massive NSSY
wavy lateral
PHOTO
T.S.
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
GRAIN SIZE /STRUCTURES.

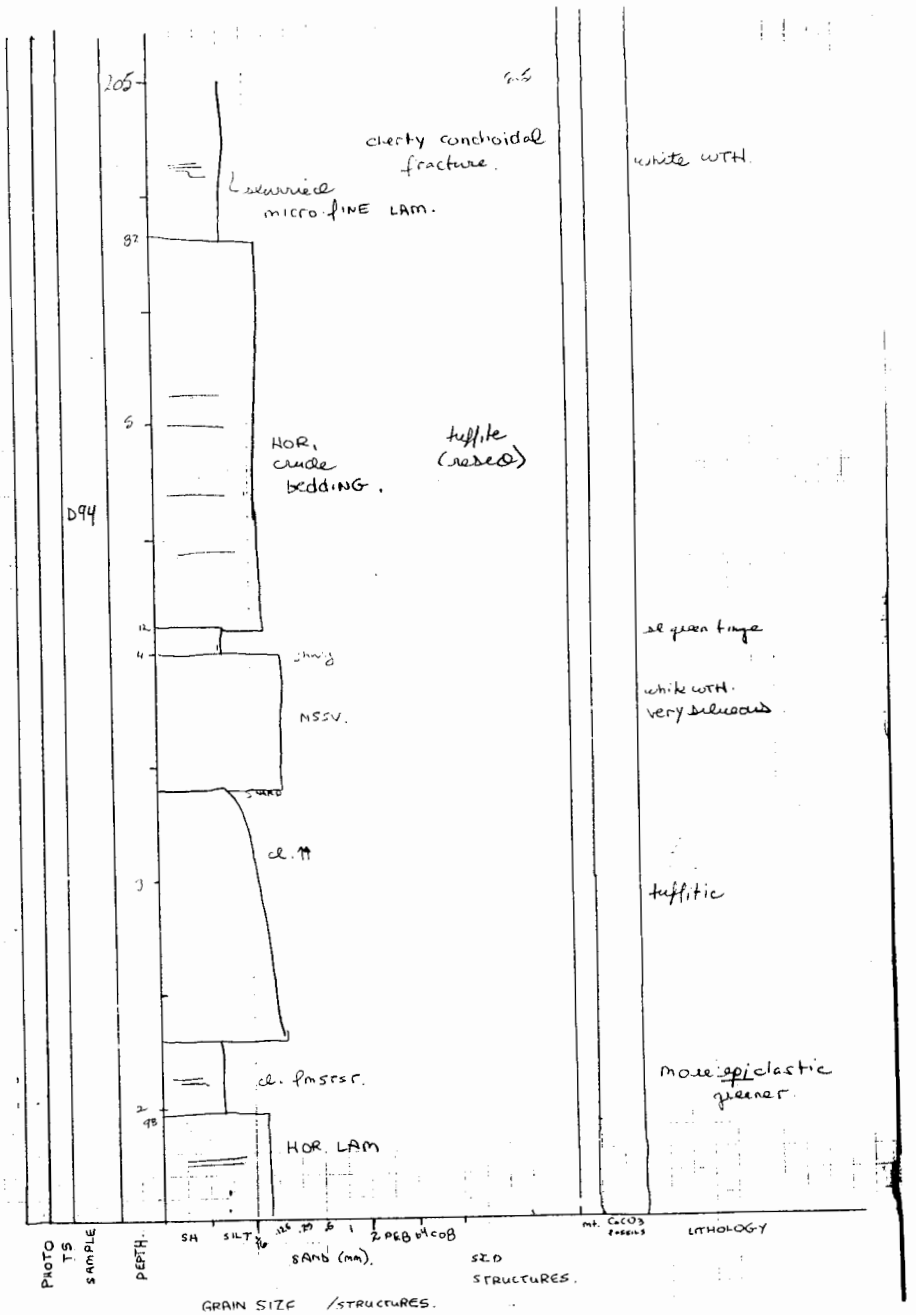

200
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
SED
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

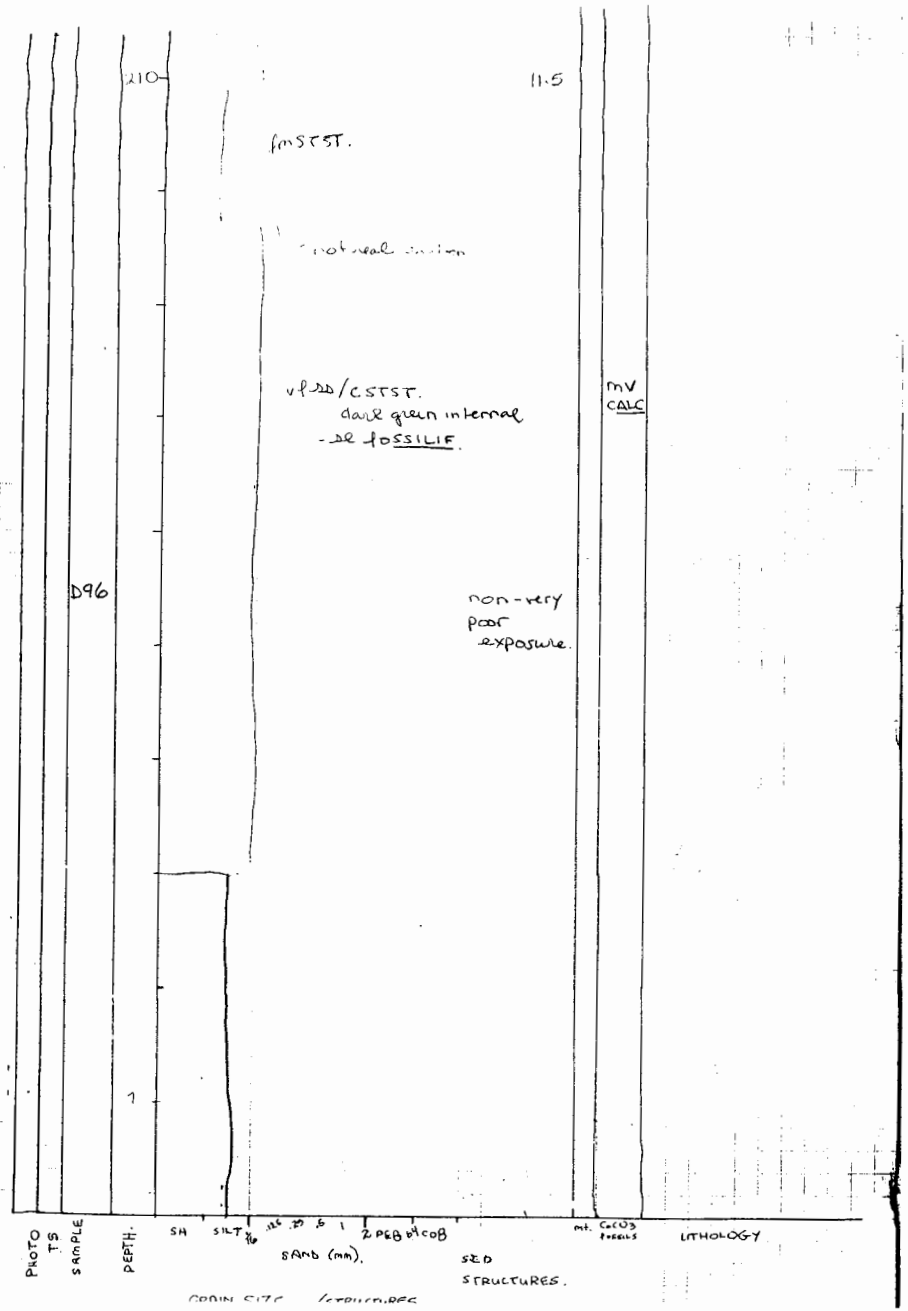

205
25
THICKER
HERE
PROTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
SED
STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY
GRAIN SIZE /STRUCTURES.

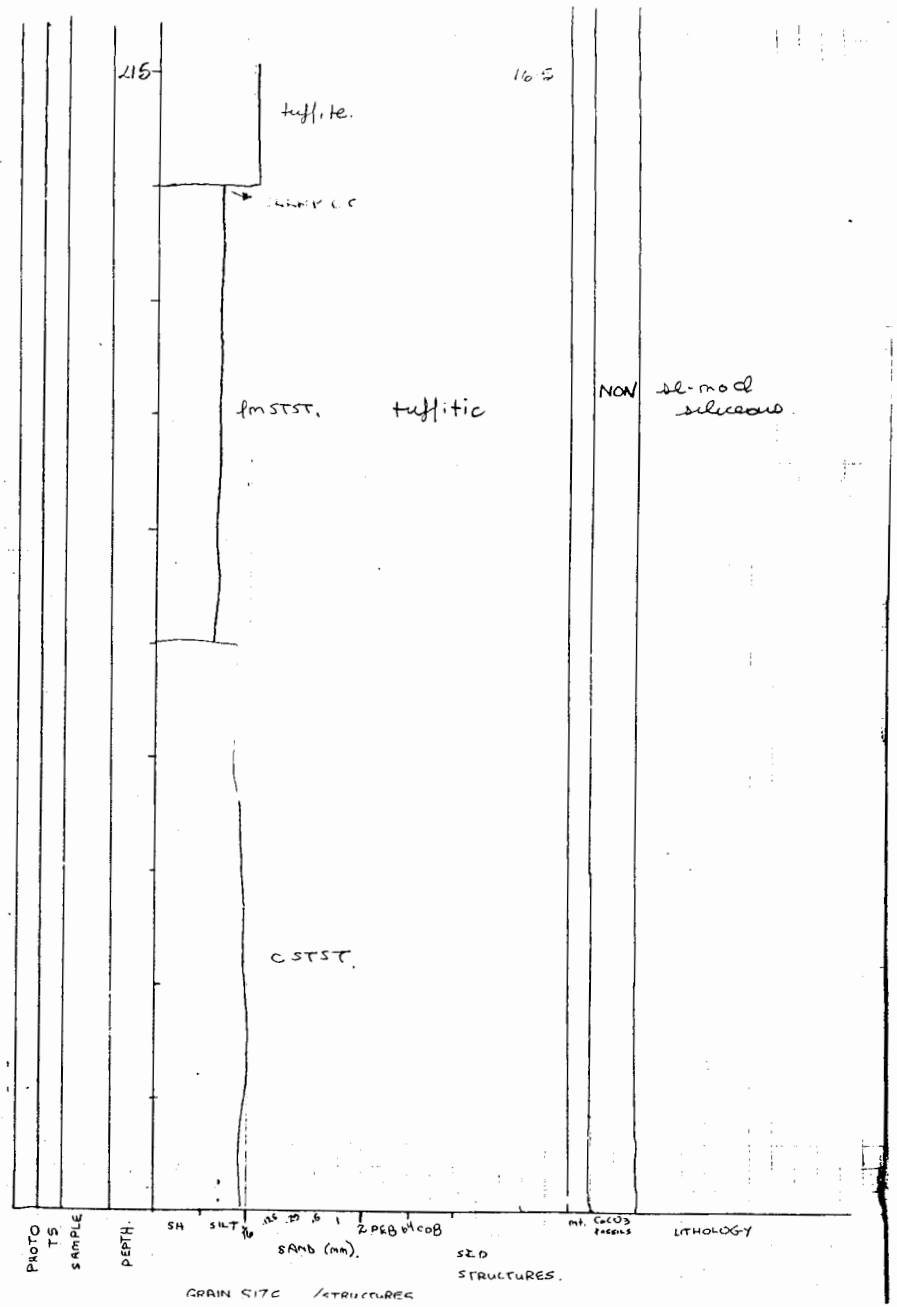

185
74
massive/contorted
pumice
very sharp cr
15
D40
968
D
89B
CALC
med-dark green
internal
N NON
mod siliceous
flinty brittle breakage
fines up
D
89A
thinly laminated
mud
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE
/STRUCTURES

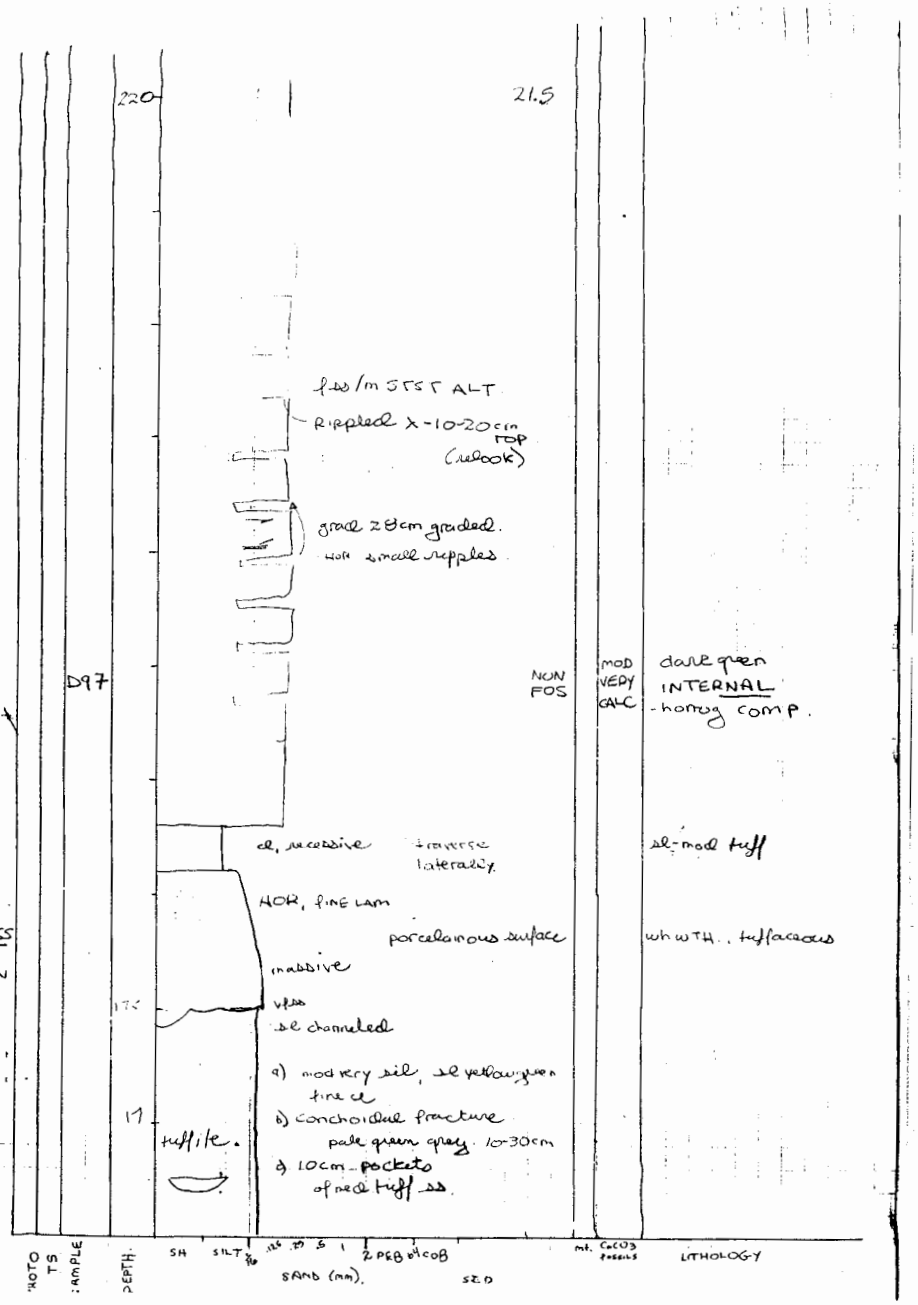

skip 1 page
110
992
14
NON
dark green stack
vein cleavage
occassionally pebbly,
slumped
sharp pebbly mud bp
ripples
inverted
pebbles (1cm)
16
969
HCP, ribs
contorted
75
pebble LITHOS, well-rounded
1) Qtz 2-4mm.
2) 1g volc tuffite
3) 1m ss
4) small pumice
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.
GRAIN SIZE
/STRUCTURES

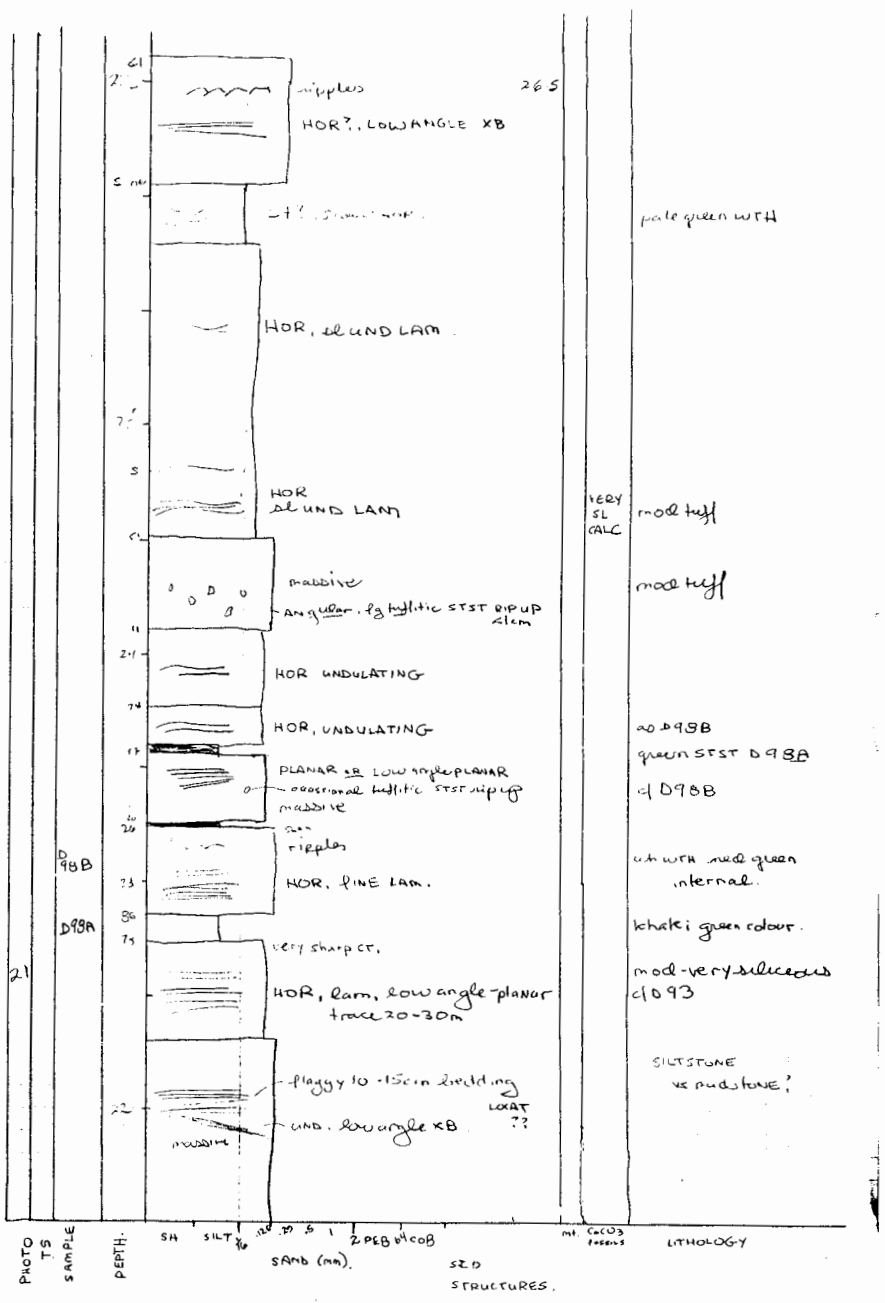

206
HOR. LAM (tuffite)
tuff. SLST. even cl
HOR. planar
tuffite
5-10cm XB
D93
- 0 of 27A
- extend vf SLST, mudstone
bottom avi fault tuff.
D92
vf SLST / mudstone
find problem
thickness shall
- fault?
D2/D1
fault
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED
STRUCTURES.
mt.
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES

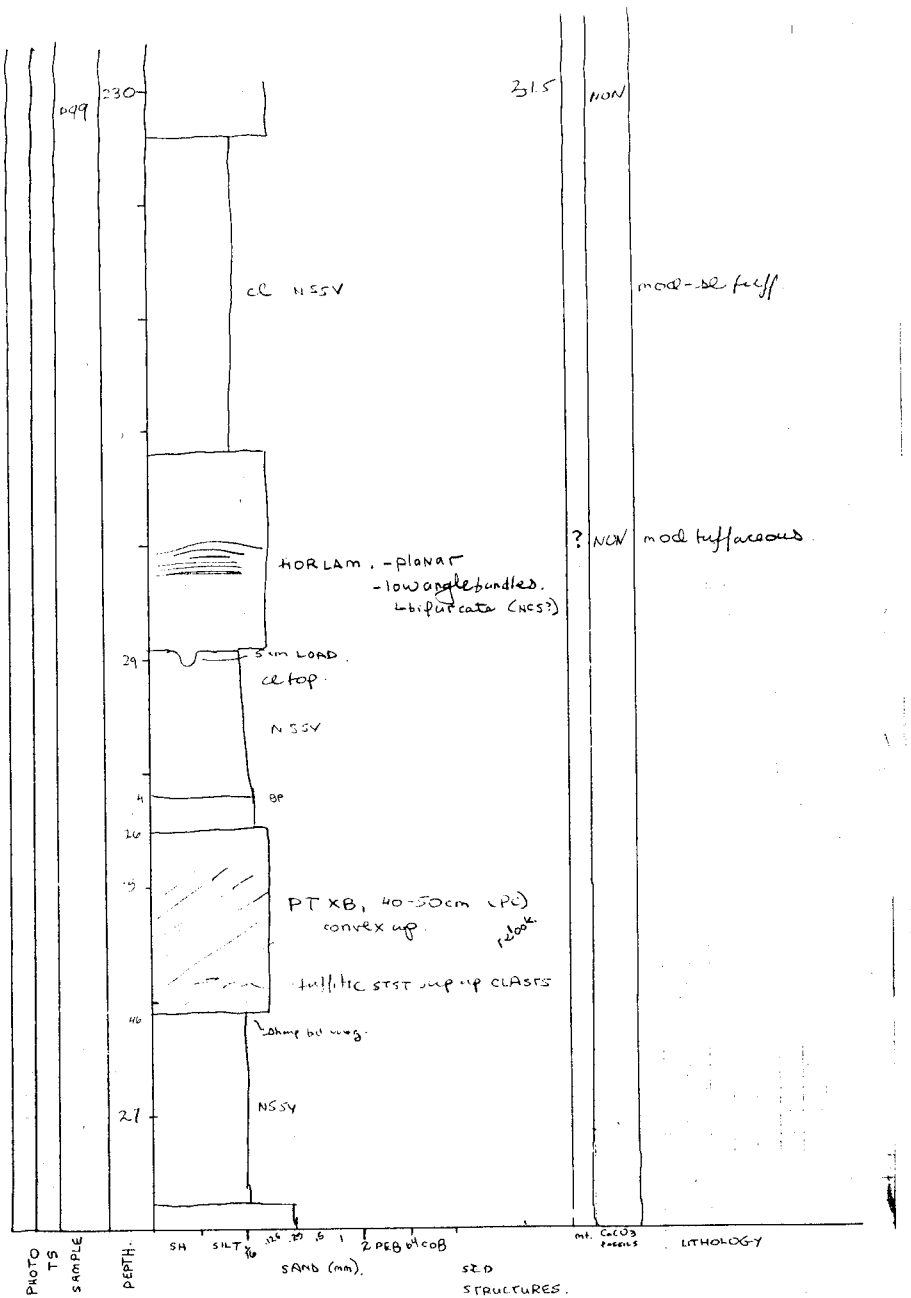

205
cherty conchoidal
fracture.
LAMINATED
MICRO-FINE LAM.
D94
HOR.
CRUDE
BEDDING.
tuffite
(reseD)
MSSV.
cl.
cl. fmSTST.
HOR. LAM
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED
STRUCTURES.
mt.
FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES.

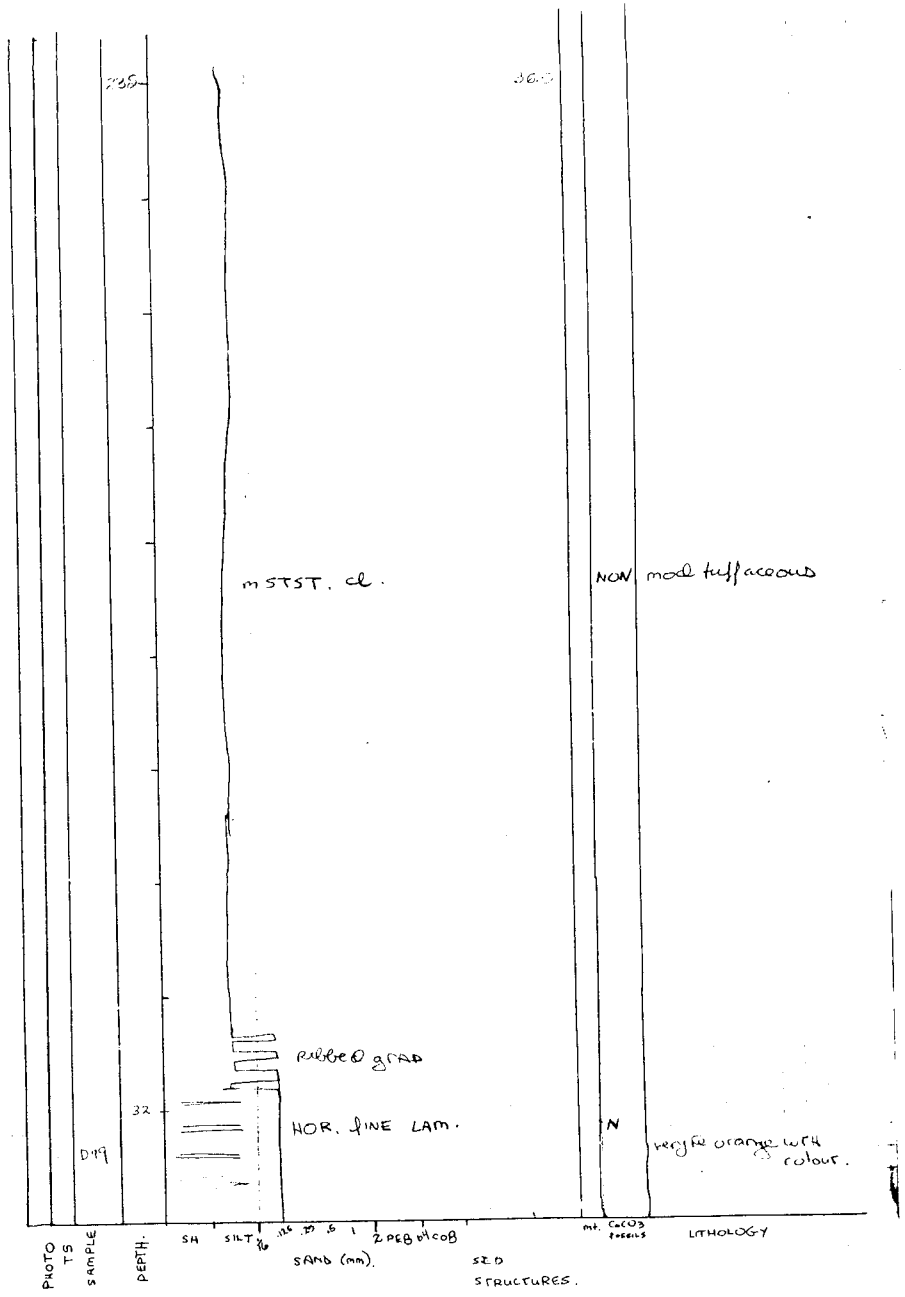

210
11.5
fmSTST.
vfss/cSTST.
dark green interval
-sl fossilif.
mV CALC
D96
non-very poor exposure.
1
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES

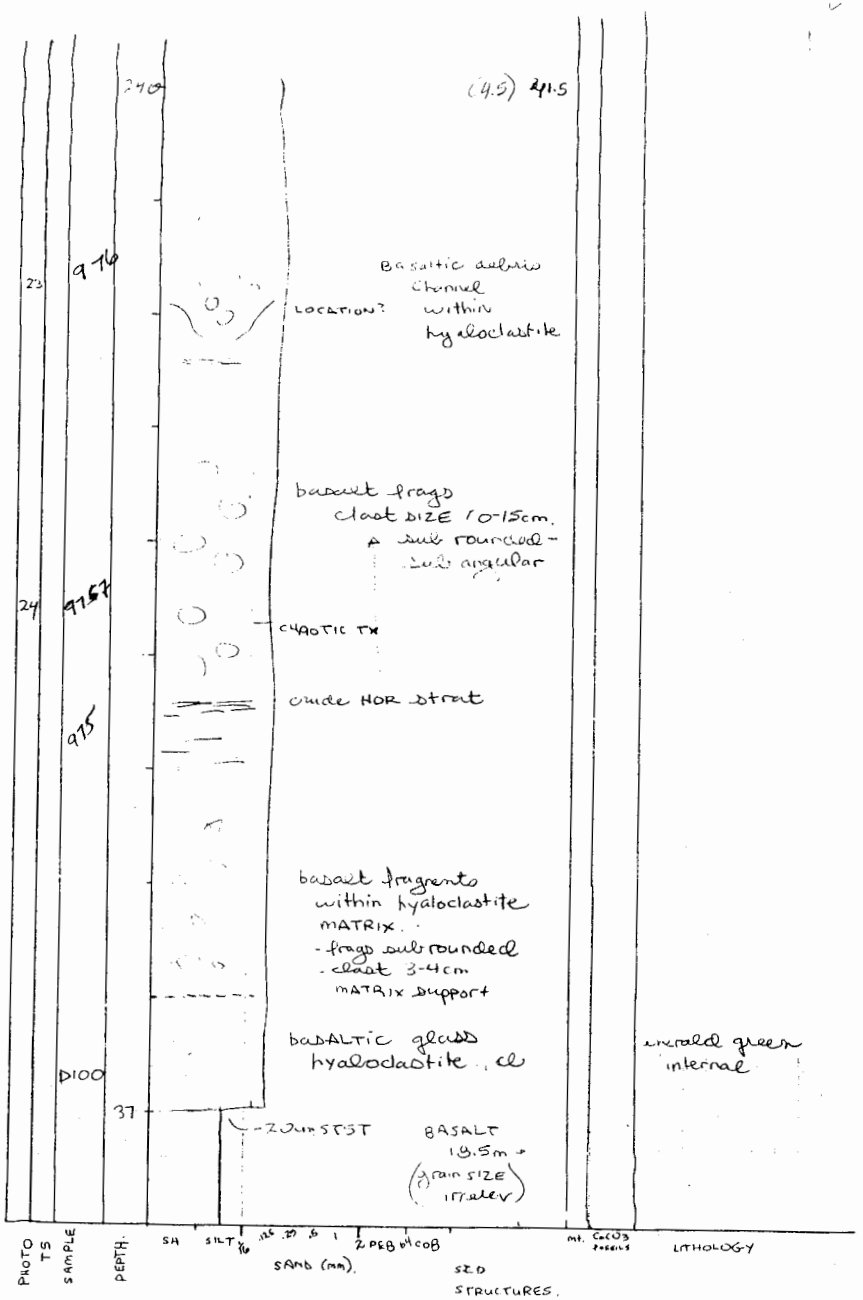

215
16.5
tuffite.
fmSTST.
tuffitic
cSTST.
NON
sl-mod siliceous
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
SED STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY
GRAIN SIZE /STRUCTURES

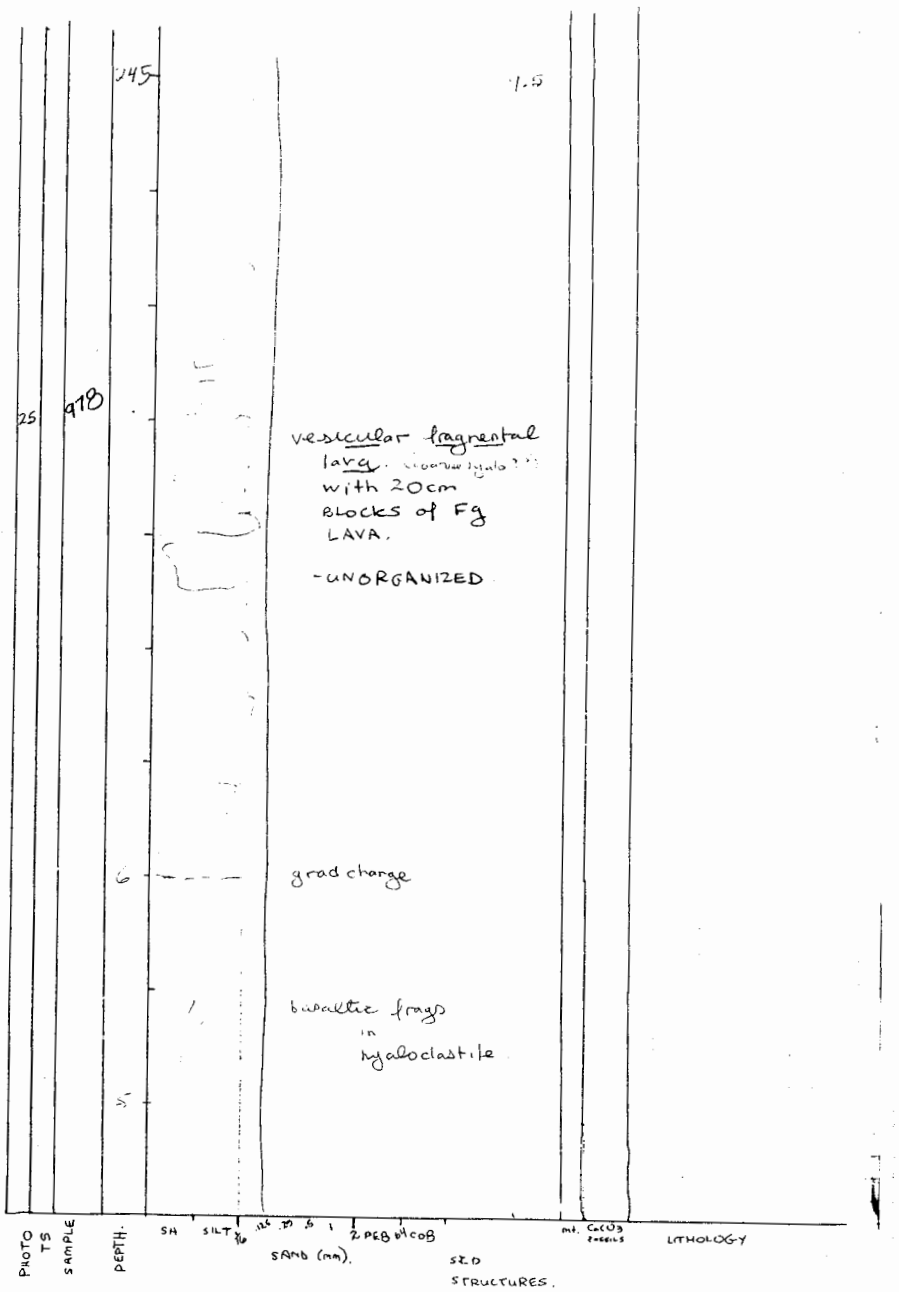

220
21.5
D97
f-ss/m STST ALT
Rippled x-10-20cm
TOP
(reverse)
grad 28cm graded.
HOR small ripples
NON FOS
MOD VERY CALC
dark green
INTERNAL
- honey comp.
cl, recessive
transverse laterally
sl-mod tuff
HOR, fine lam
porcellanous surface
wh WTH. tuffaceous
massive
vf-ss
sl channeled
a) mod very sil, sl yellow-green tinge
b) conchoidal fracture
pale green grey. 10-30cm
c) 10cm pockets of red tuff ss.
tuffite.
17
PROCESS
??
common
A/B
hybrids
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
%
SAND (mm).
SED STRUCTURES
mt. CaCO3 fossils
LITHOLOGY

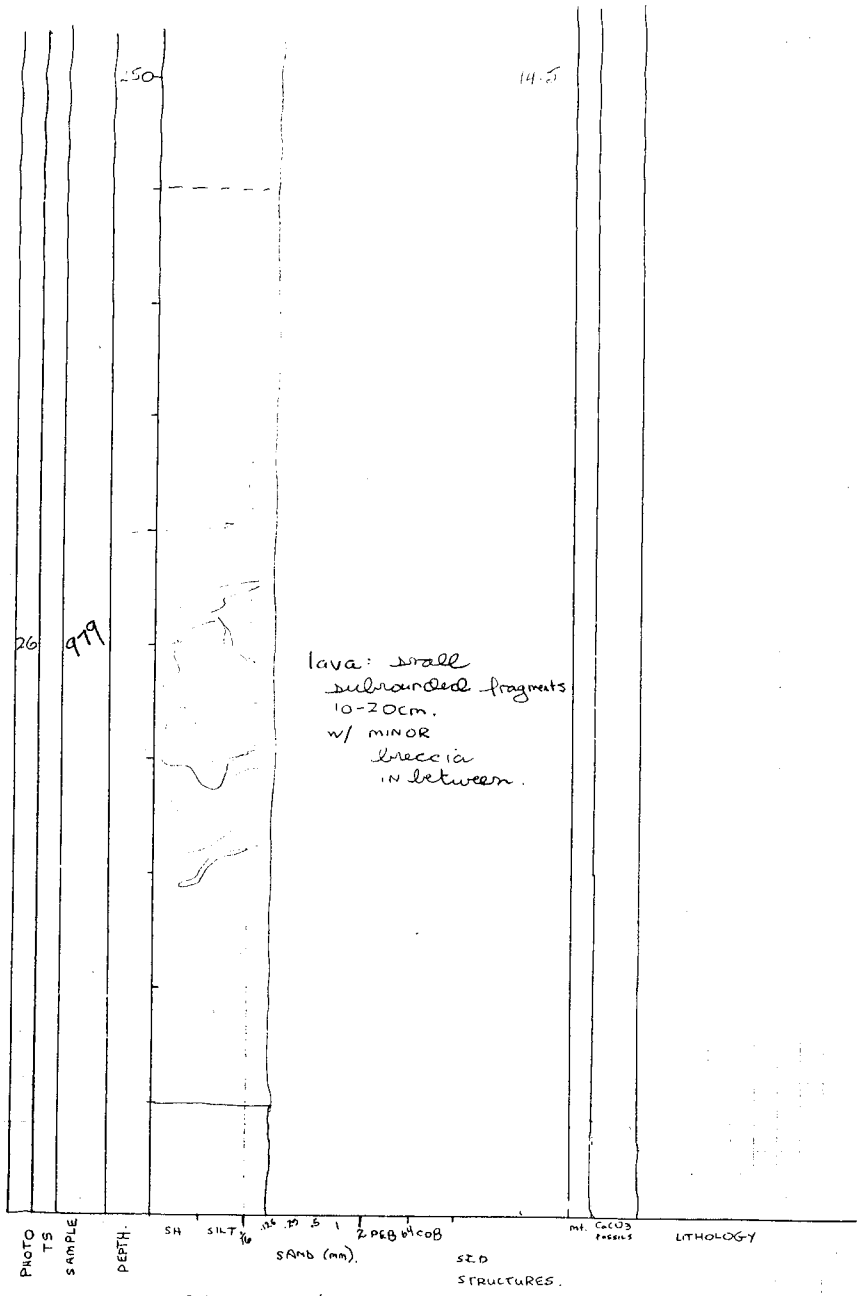

265
ripples
HOR?, LOW ANGLE XB
HOR, sl UND LAM
HOR
sl UND LAM
massive
- Angular, fg tuffitic STST rip up clasts
HOR UNDULATING
HOR, UNDULATING
PLANAR or LOW angle PLANAR
- occasional tuffitic STST rip up
massive
ripples
HOR, fine lam.
very sharp CT,
HOR, lam, low angle-planar
trace 20-30m
- flaggy to ~15cm bedding
- UND. low angle XB
massive
LOCAT ??
D98B
D98A
21
pale green WTH
VERY SL CALC
mod tuff
mod tuff
as D98B
green STST D98A
cf D98B
wh WTH mod green internal.
khaki green colour.
mod-very siliceous
cf D93
SILTSTONE
vf mudstone?
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
%
SAND (mm).
SED STRUCTURES.
mt. CaCO3 fossils
LITHOLOGY


D99
230
cl NSSV
HOR LAM. - planar
- low angle bundles.
- bifurcate (NCS?)
sm LOAD.
cl top.
NSSV
BP
PT XB, 40-50cm (PC)
convex up
tuffitic STST imp up CLASTS
NSSV
21
31.5
NON
mod-str tuff
?
NON
mod tuffaceous
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3
FOSSILS
LITHOLOGY

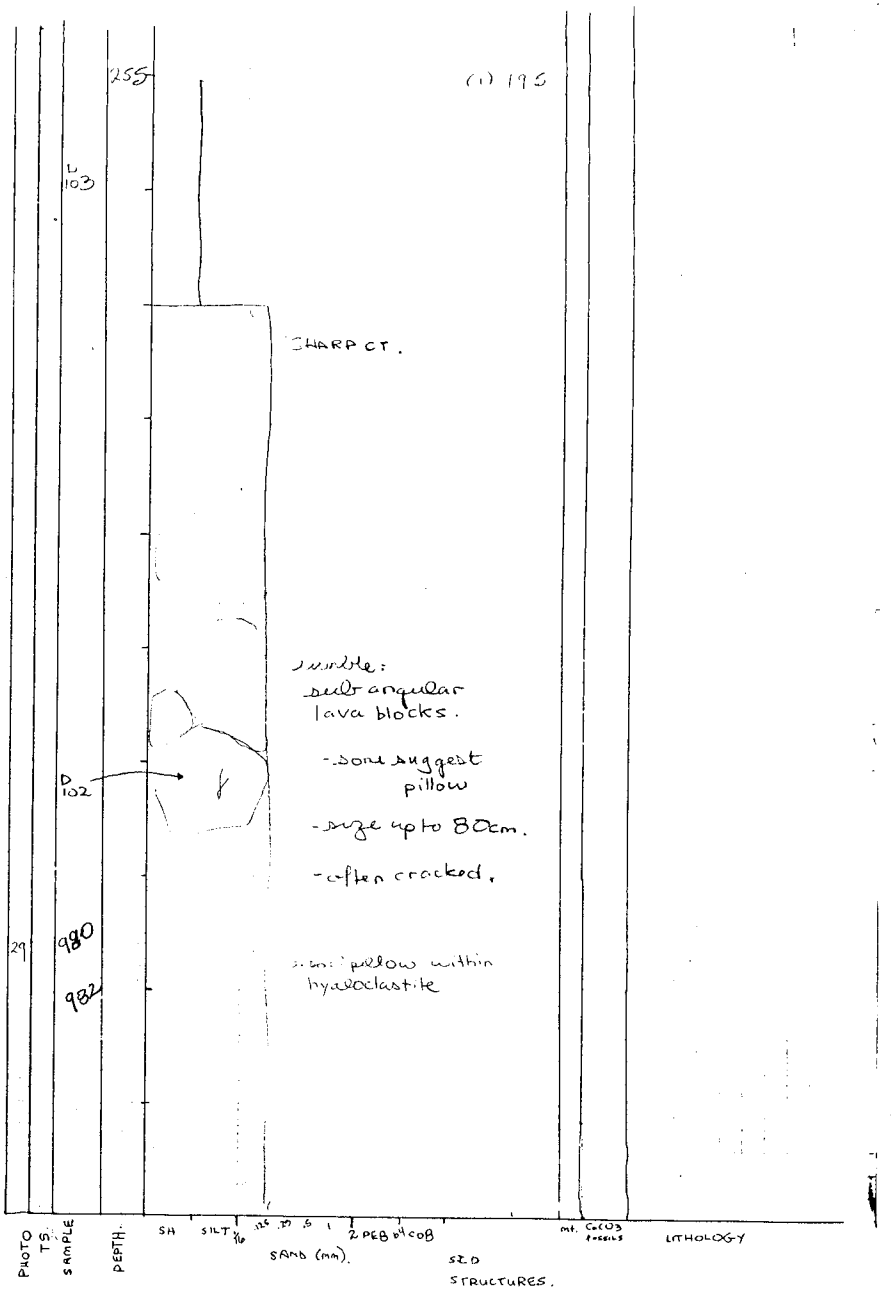

D99
32
m STST. cl.
RIBBED GRAD
HOR. FINE LAM.
NON
mod tuffaceous
N
freq fe orange with colour.
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
SED STRUCTURES.
mt.
CaCO3
FOSSILS
LITHOLOGY


240
(4.5) 241.5
23
9764
BASALTIC debris
channel
within
hyaloclastite
LOCATION?
basalt frags
clast SIZE 10-15cm.
A sub rounded -
sub angular
24
9757
CHAOTIC TX
crude HOR strat
975
basalt fragments
within hyaloclastite
MATRIX.
- frags sub rounded
- clast 3-4cm
MATRIX support
basALTIC glass
hyaloclastite
emerald green
internal
D100
37
~20cm SILT
BASALT
19.5m +
(grain SIZE
irrelev)
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.

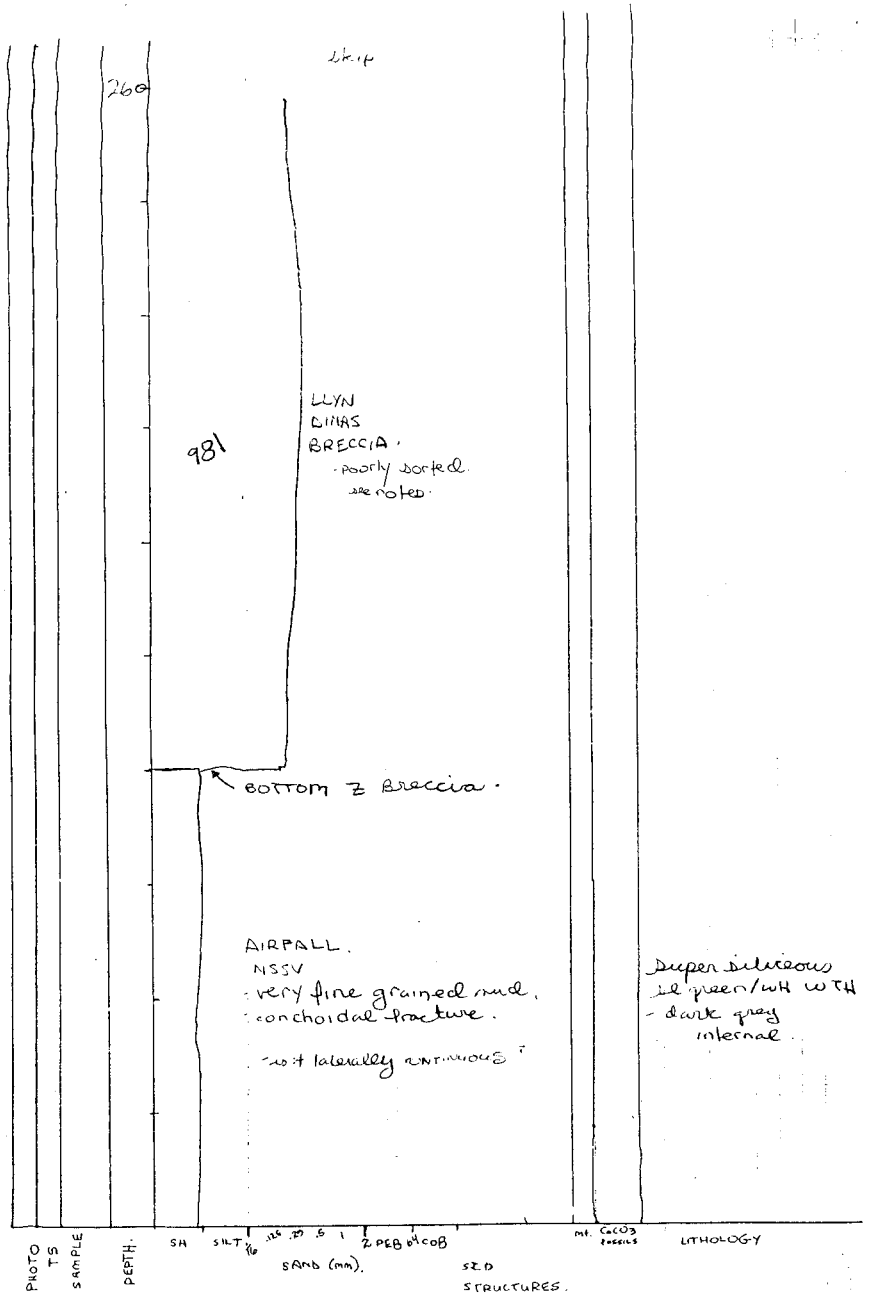

245
1.5
25
9778
vesicular fragmental
lava.
with 20cm
BLOCKS of Fg
LAVA.
- UNORGANIZED
grad charge
basaltic frags
in
hyaloclastite
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.



GRAIN SIZE /STRUCTURES.



D2



LLYN DINAS BRECCIA NOTES: - Porosity of ~~ss~~

BOTTOM a) heterolithic breccia: 5m from base
subrounded clast, clast. supported.
MATRIX: mod siliceous D104
w/ feldspar XL
CLASTS: (D105)
1) Basalt w/ pitty surface tx. most common *
2) tuff mc stst.
3) sil mudstone
?? 4) lg. light-red green, 2-3mm qtz vesicle fills.

UP: 1) more MATRIX supported
- more sil tuffite clasts.
- raft shaped 90×40cm sil mudstone blocks
2) basalt pillows 35×25cm.

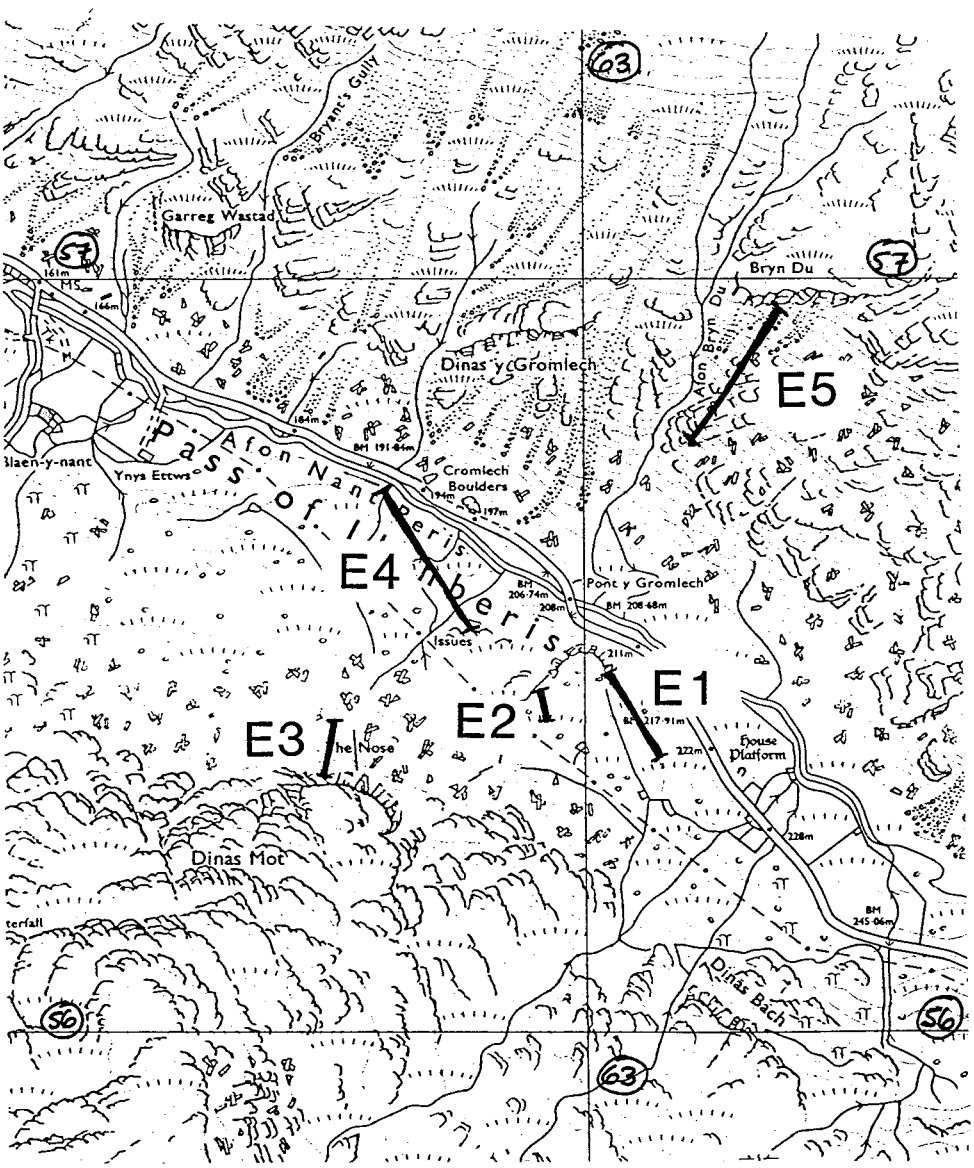
PHOTO30 d) MATRIX supported breccia, RHYolite tuffite clasts
crude HOR STRAT.

- breccia thicker between "basalt piles"

PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm)
STRUCTURES
LITHOLOGY
LOWER
RHYOLITE TUFF.
LLVN
DINAS
BRECCIA
SHARP CONTACT

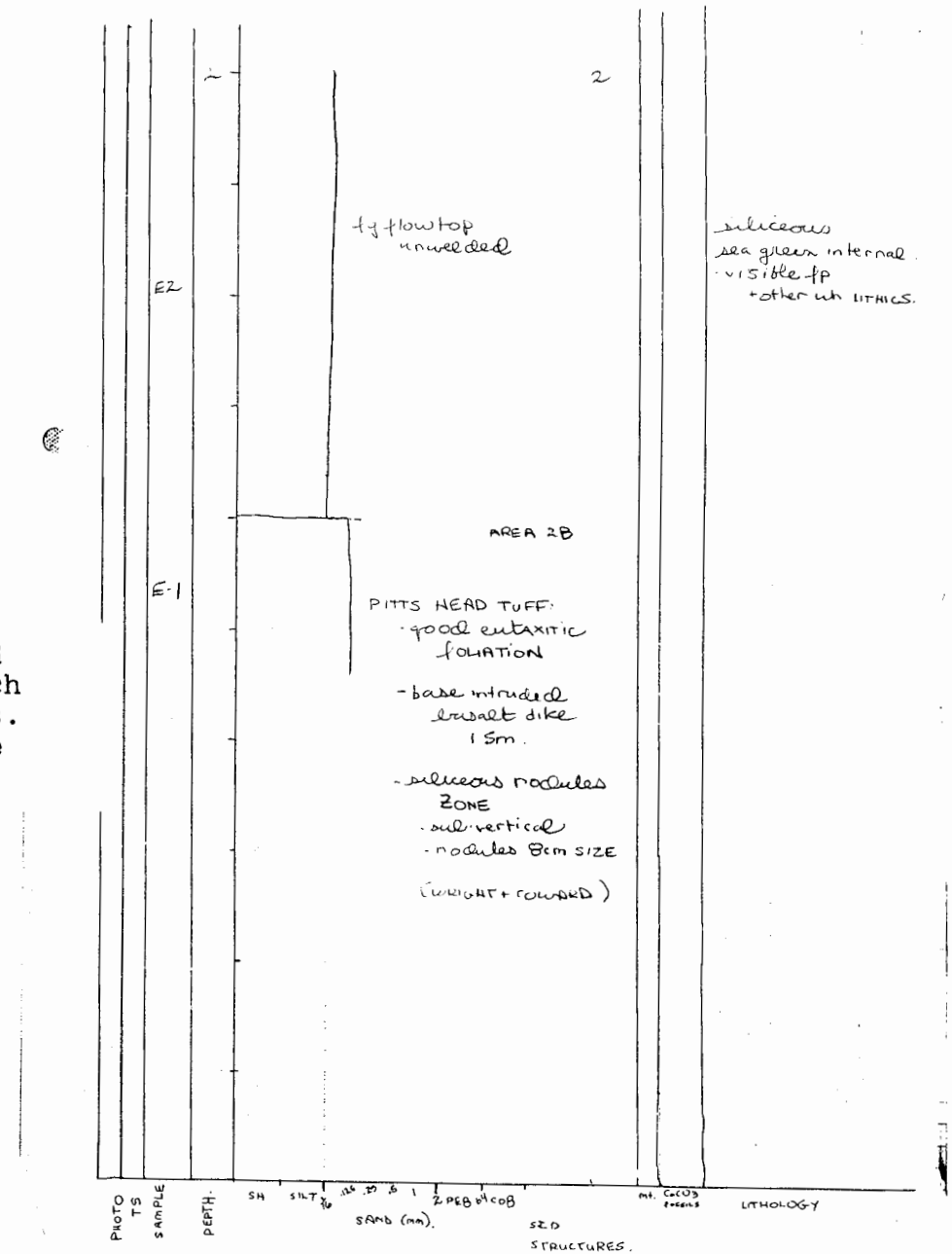
AREA E

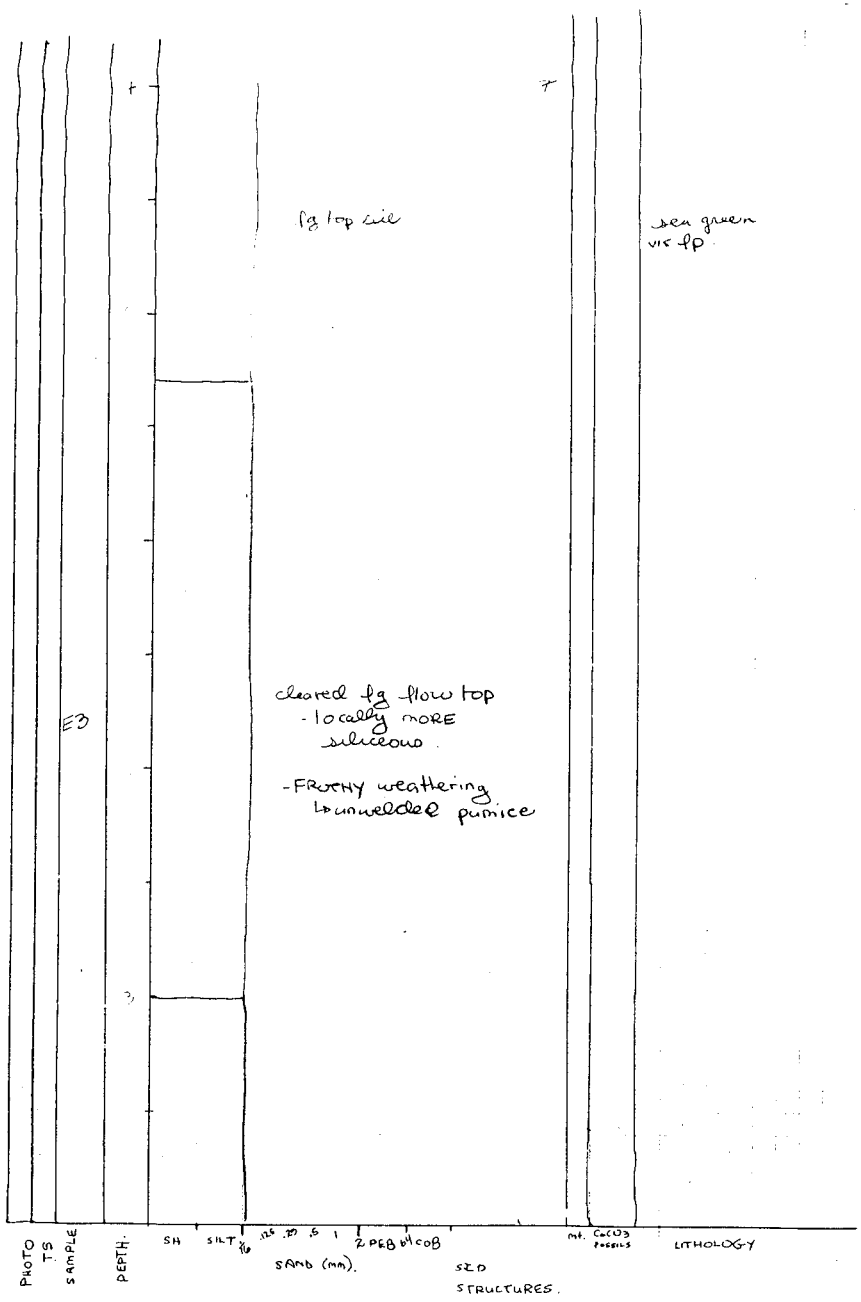
LOCATION MAP.

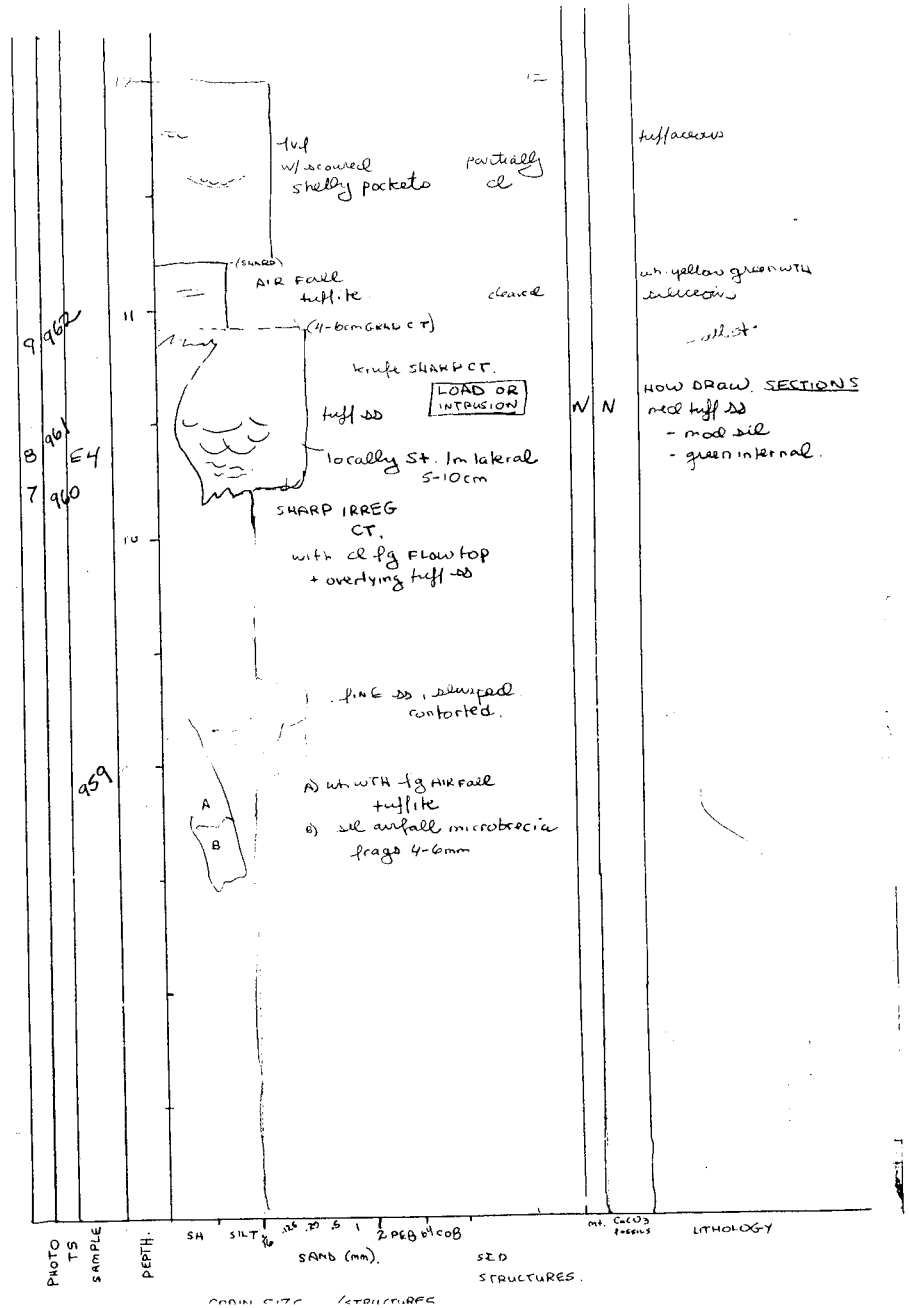


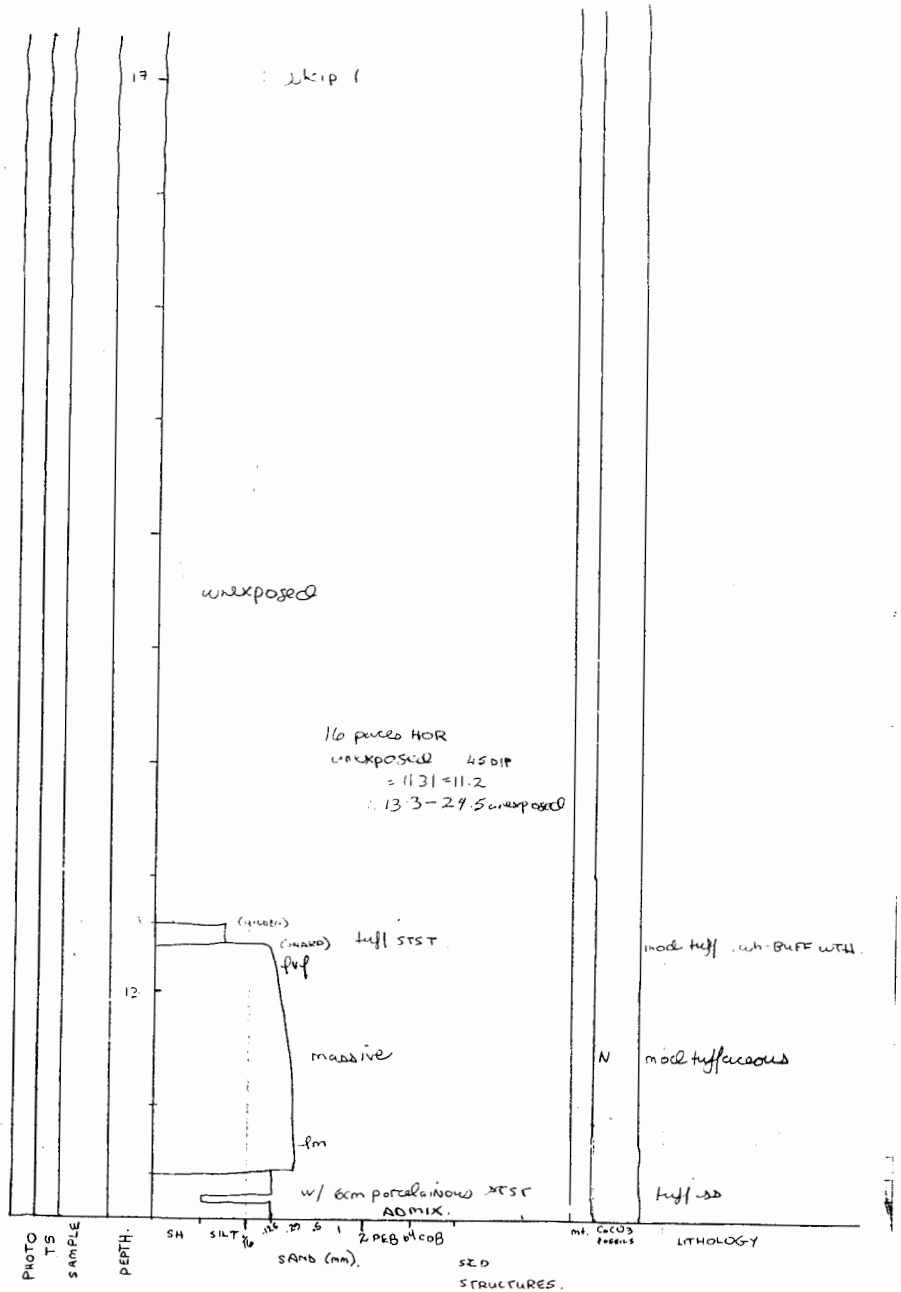
SECTIONE1

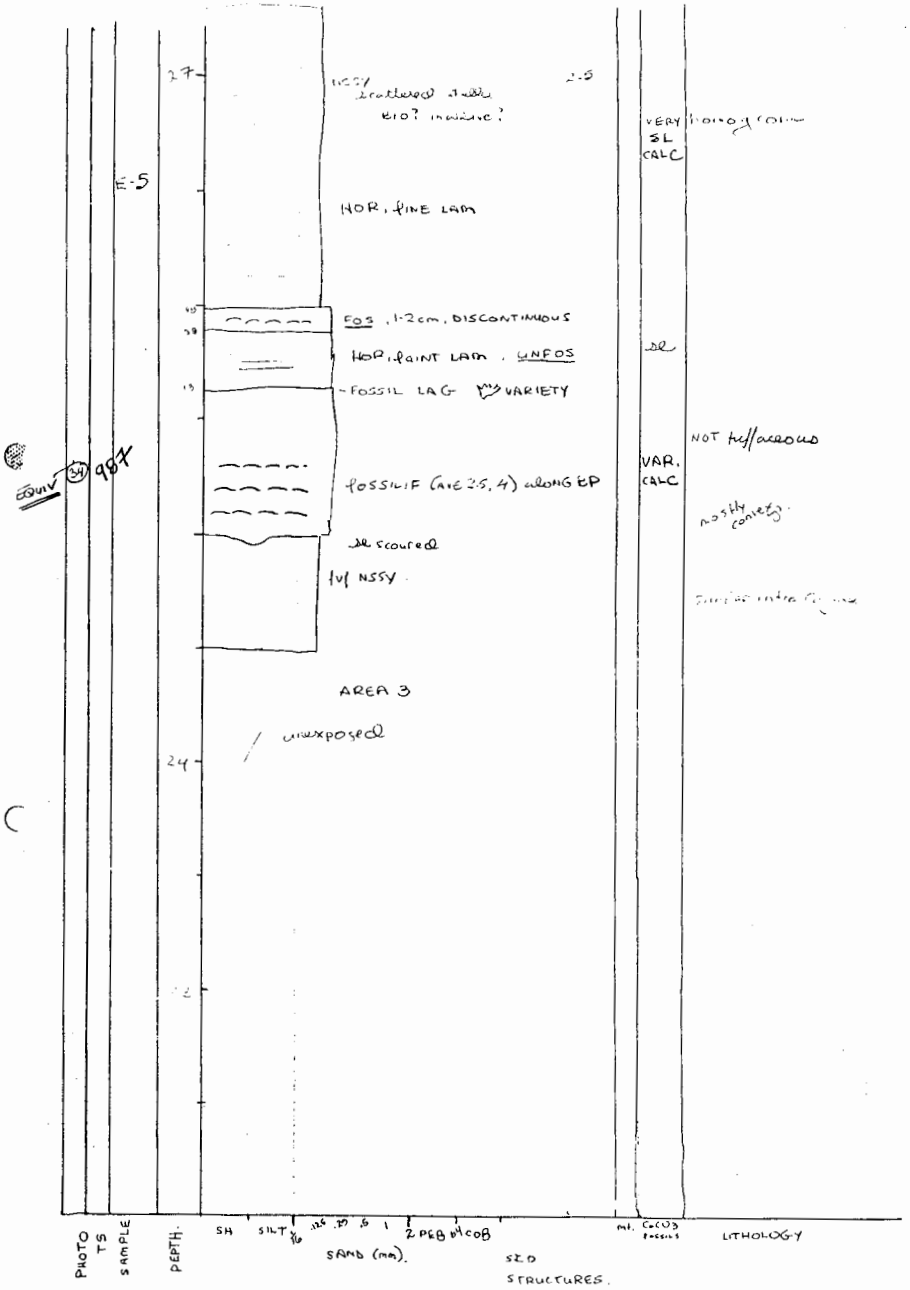
SECTION E1 LOCATION: Locate top of Pitts Head Tuff 50 metres to east of Pont-y-Gromlech on south side of A4086 in Llanberis Pass. Section proceeds from here along SW side of road until first outcrop of basalt.

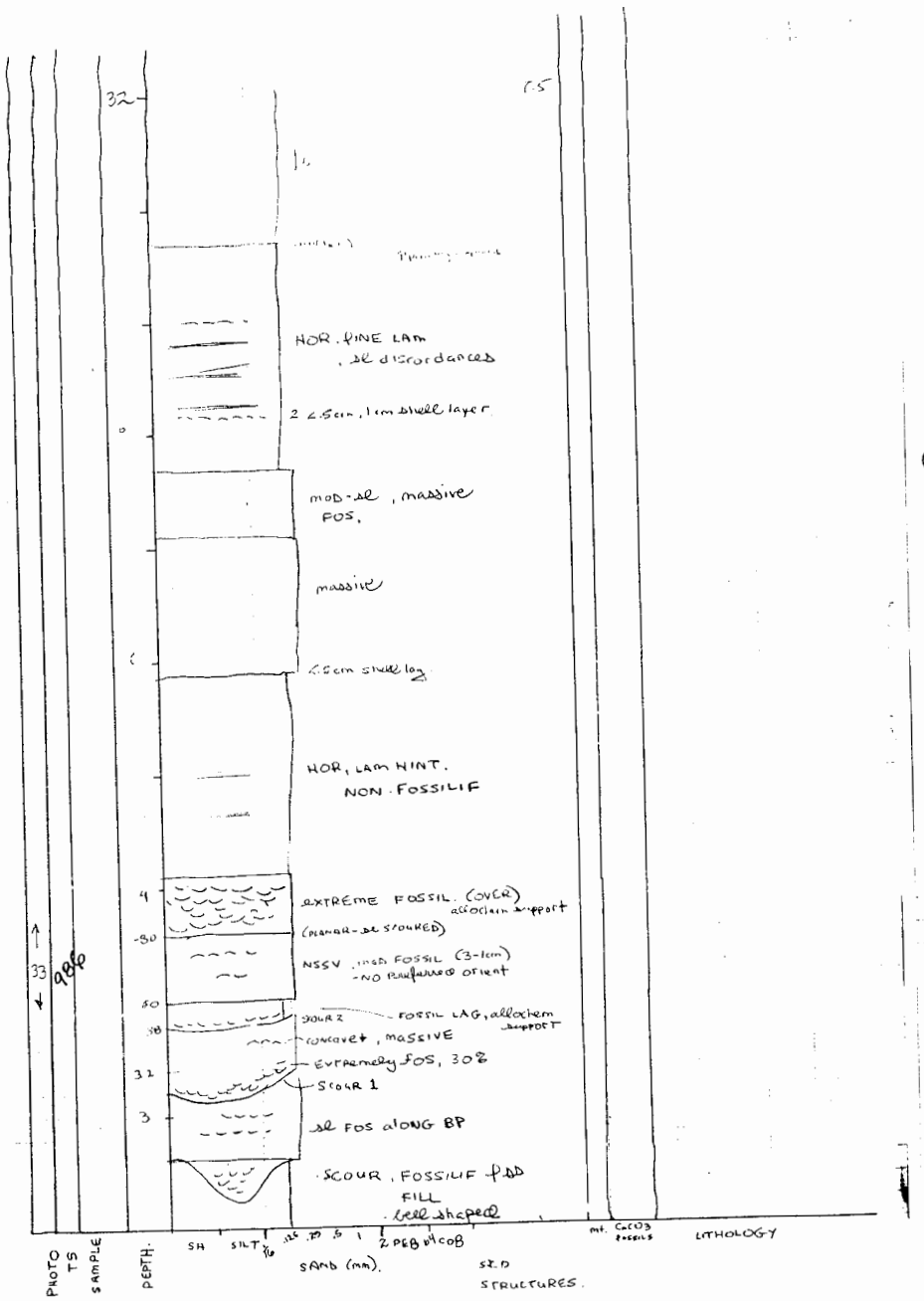


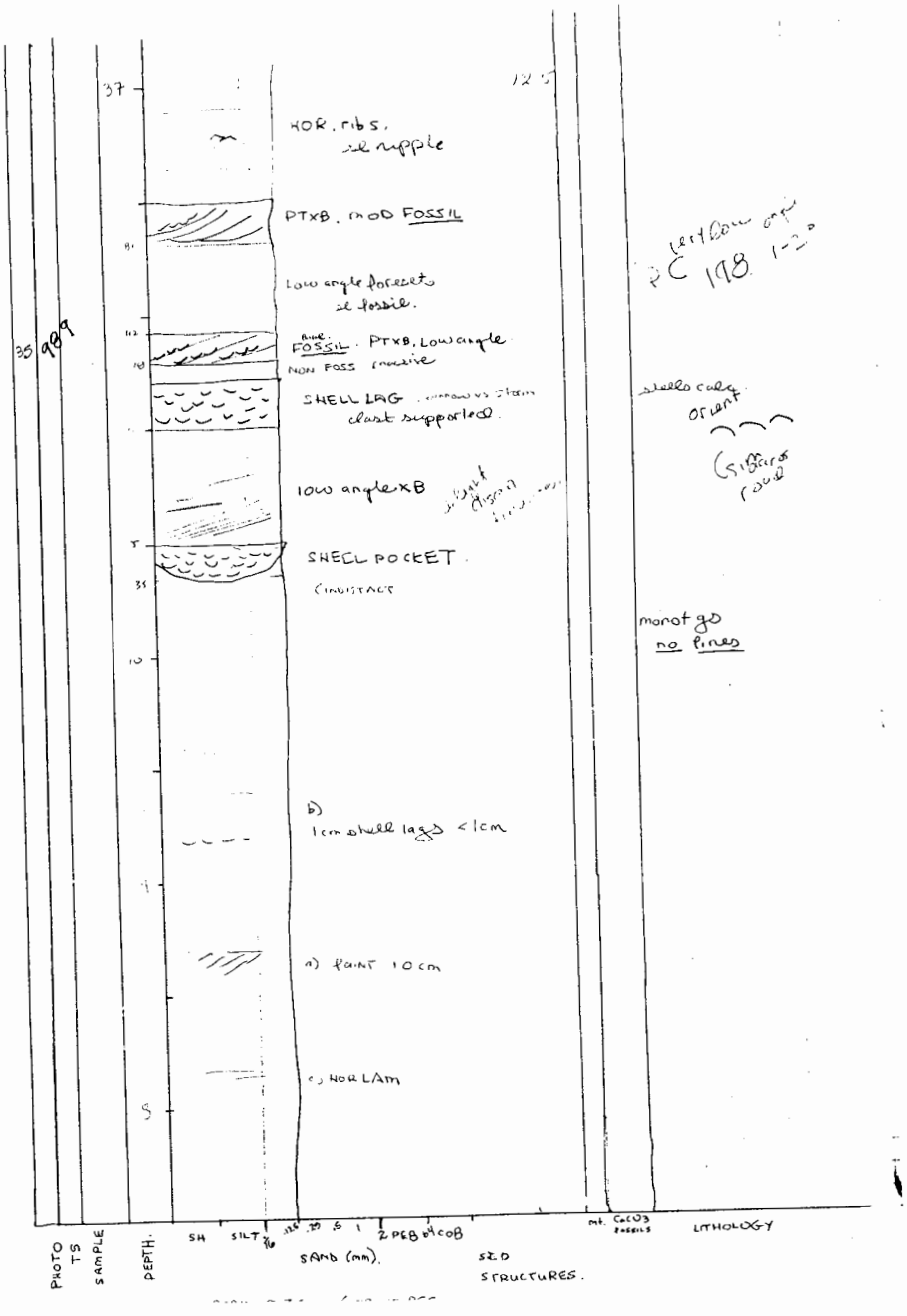

fg top sil
sea green vit fp
cleared fg flow top
- locally more siliceous
- FROTHY weathering
unwelded pumice
E3
PHOTO
T.S
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED STRUCTURES.
mt.
LITHOLOGY

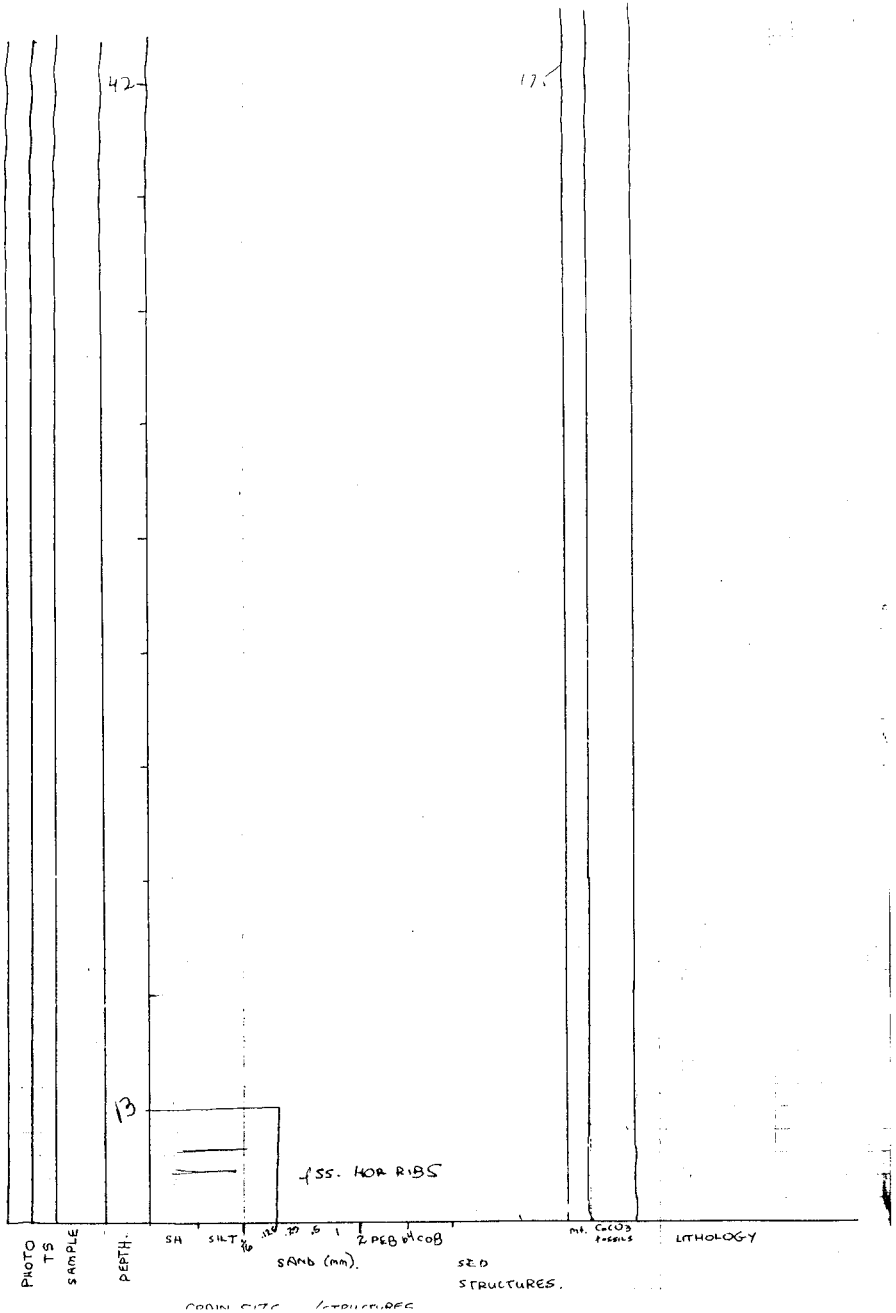

tuff
w/ scoured shelly pockets
partially cl
(SHARP) AIR Fall tuffite
clearer
(4-6cm GRAD CT)
knife SHARP CT.
LOAD OR INTRUSION
tuff ss
locally St. lm lateral 5-10cm
SHARP IRREG CT. with cl fg FLOW top + overlying tuff ss
fine ss, slumped contorted.
A) wh WTH fg AIR Fall tuffite
B) sil airfall microbrecia frags 4-6mm
A
B
9 962
8 961
E4
7 960
959
11
10
N N
tuffaceous
wh. yellow green WTH siliceous
HOW DRAW. SECTIONS
red tuff ss
- mod sil
- green internal.
PHOTO
T.S
SAMPLE
DEPTH
SH
SILT
SAND (mm).
SED STRUCTURES.
mt.
LITHOLOGY

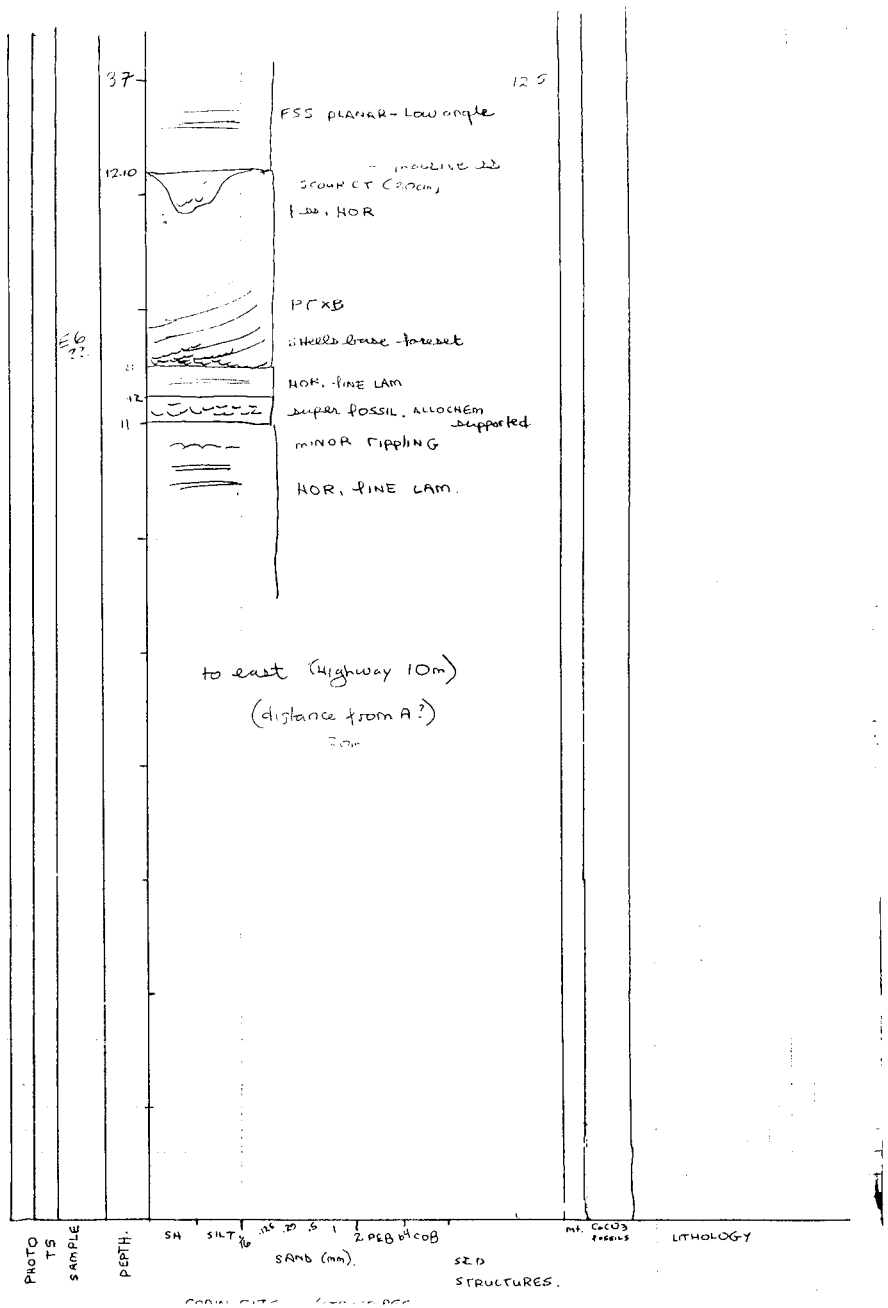

17
12
skip 1
unexposed
1/6 paced HOR
unexposed 45 DIP
= 11.31 = 11.2
13.3 − 29.5 unexposed
(laminated)
(sharp)
tuff SLST
fvf
massive
fm
w/ 6cm portal sinous SLST
ADMIX.
mod tuff, wh-BUFF WTH
N
mod tuffaceous
tuff-ss
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.

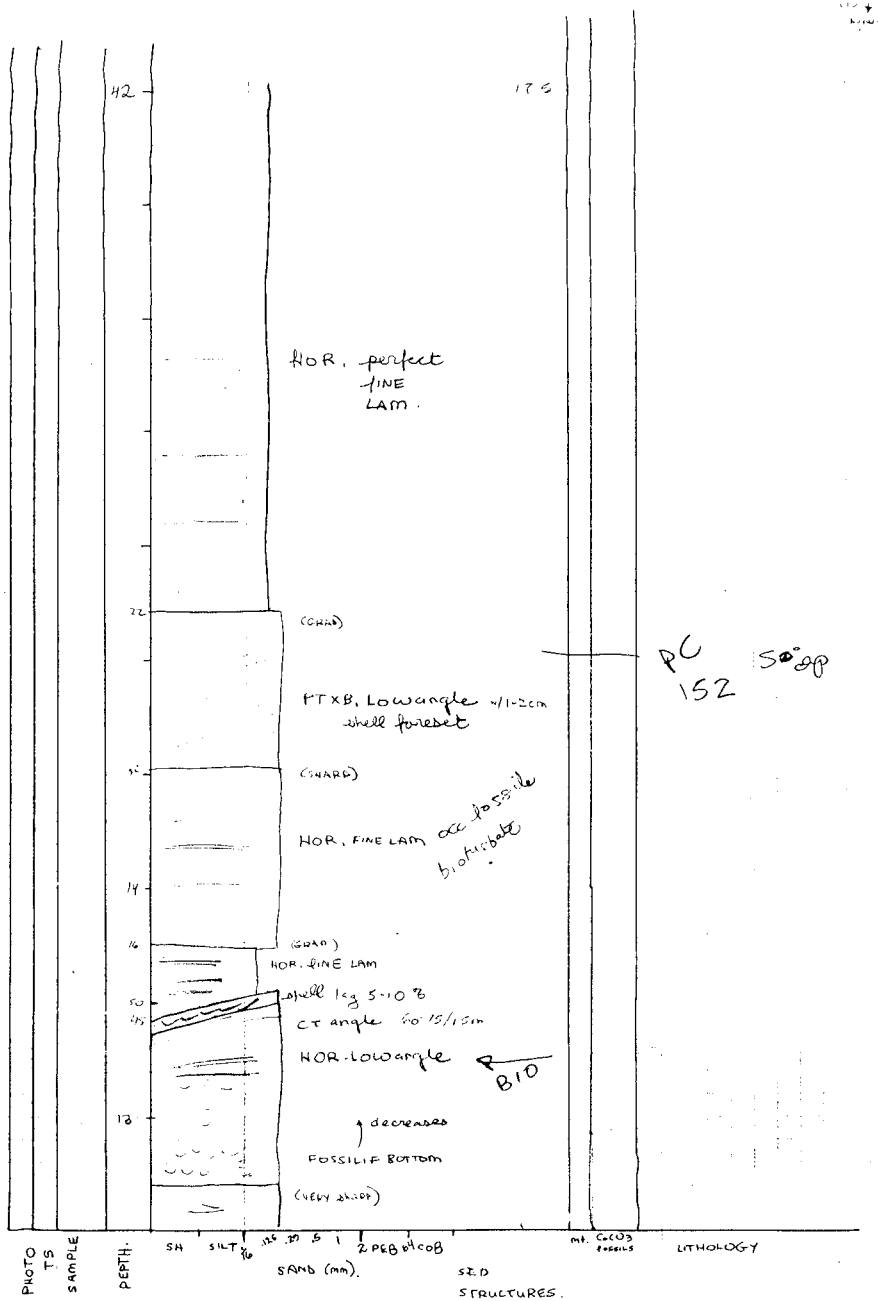

27
24
12
E-5
EQUIV
987
HOR, FINE LAM
FOS, 1-2cm, DISCONTINUOUS
HOR, FAINT LAM, UNFOS
FOSSIL LAG
VARIETY
FOSSILIF (AVE 2.5, 4) ALONG EP
sl scoured
tvf NSSY
AREA 3
unexposed
VERY SL CALC
sl
VAR. CALC
NOT tuffaceous
MOSTLY CONSIST
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.

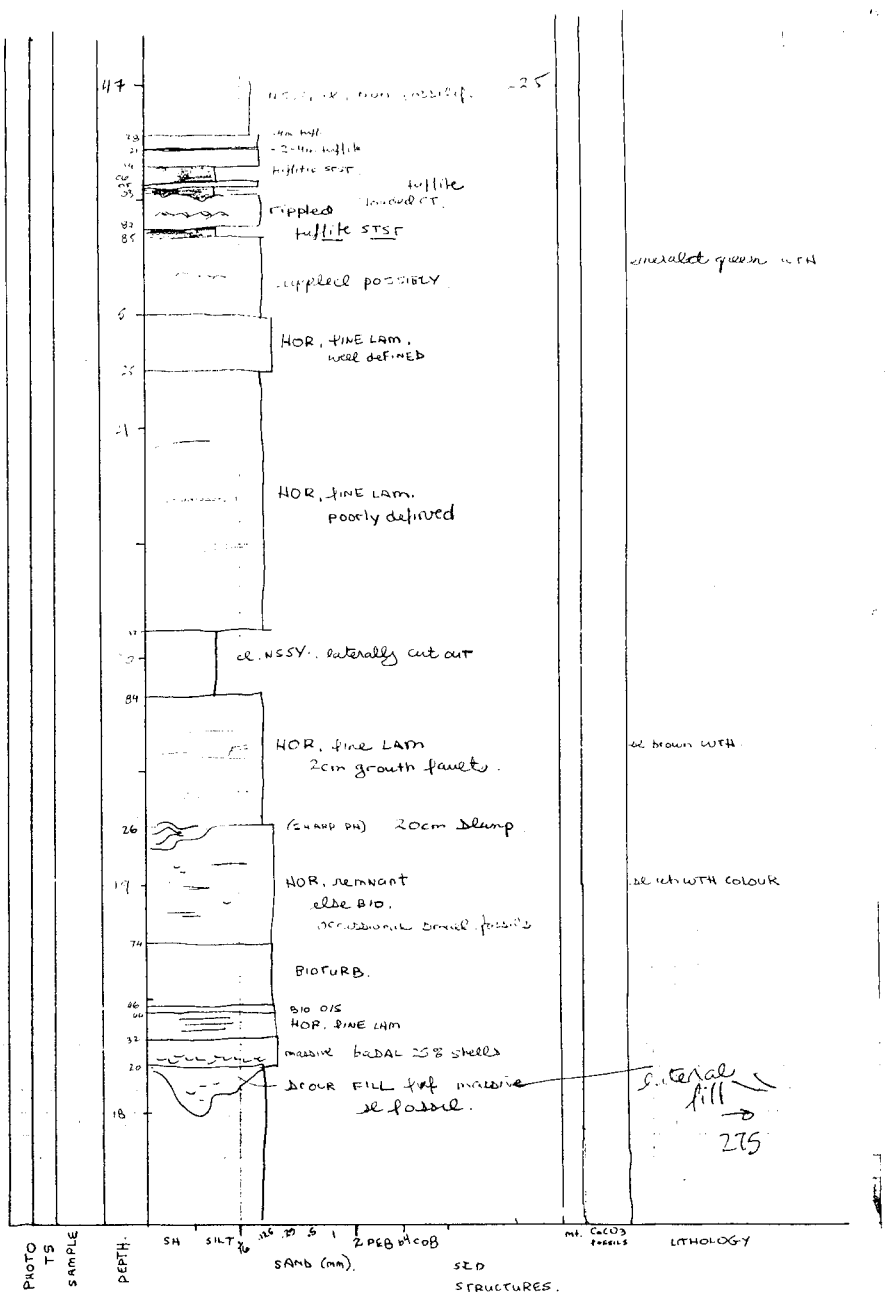

32
HOR. FINE LAM
sl disrd dances
2 ∠.5cm, 1cm shell layer
mod-sl, massive
FOS.
massive
∠.5cm shell lag
HOR, LAM HINT.
NON-FOSSILIF
4
-80
NSSV
50
38
32
3
SCOUR 2
CONCAVE, MASSIVE
EXTREMELY FOS, 30%
SCOUR 1
sl FOS ALONG BP
SCOUR, FOSSILIF POOR
FILL
well shaped
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY

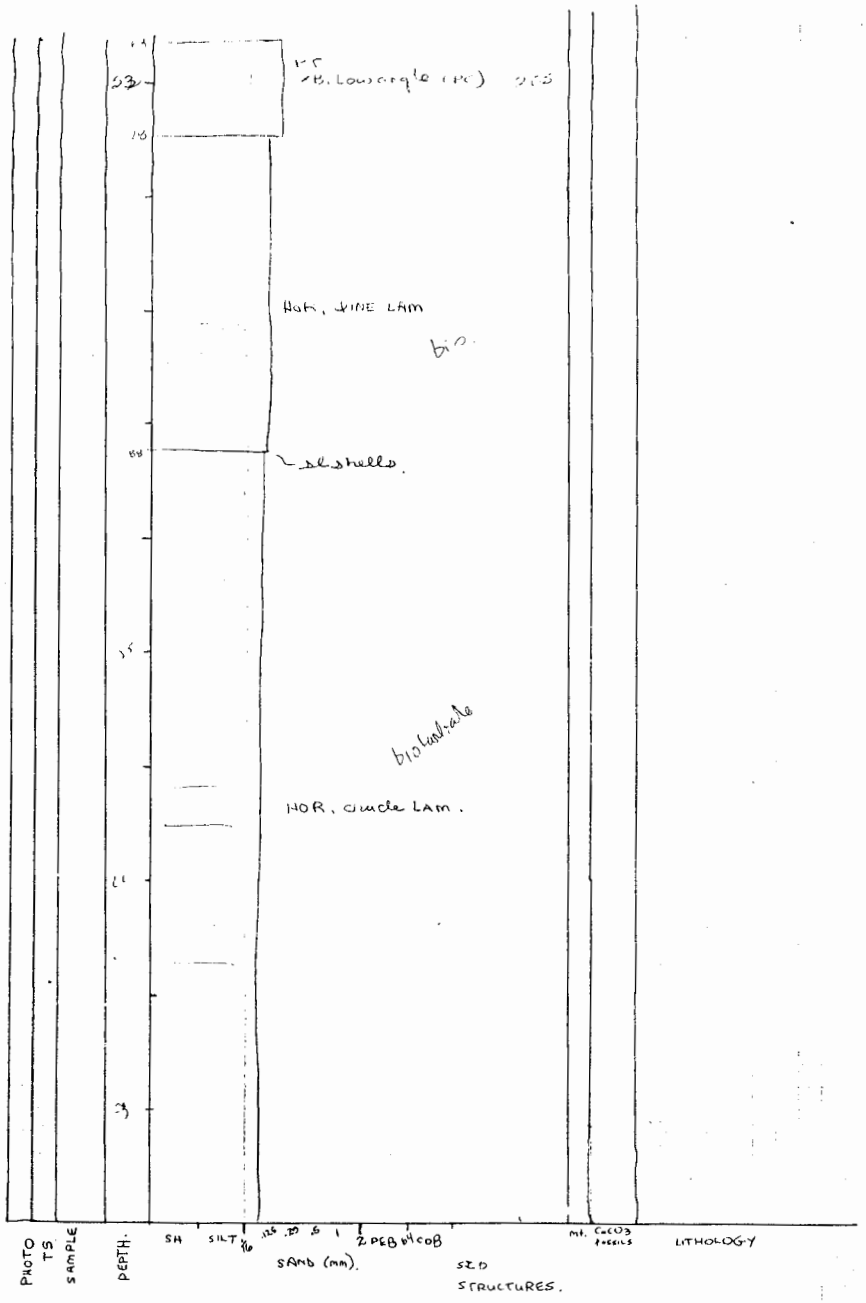

37
35
HOR. ribs.
sl ripple
PTXB. mod FOSSIL
Low angle foresets
sl fossil.
FOSSIL. PTXB. Low angle
NON FOSS massive
SHELL LAG
clast supported.
low angle XB
SHELL POCKET
DISCONTINUOUS
b)
1cm shell lags <1cm
a) faint 10cm
c) HOR LAM
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
STRUCTURES.
mt. CaCO3 FOSSILS
LITHOLOGY

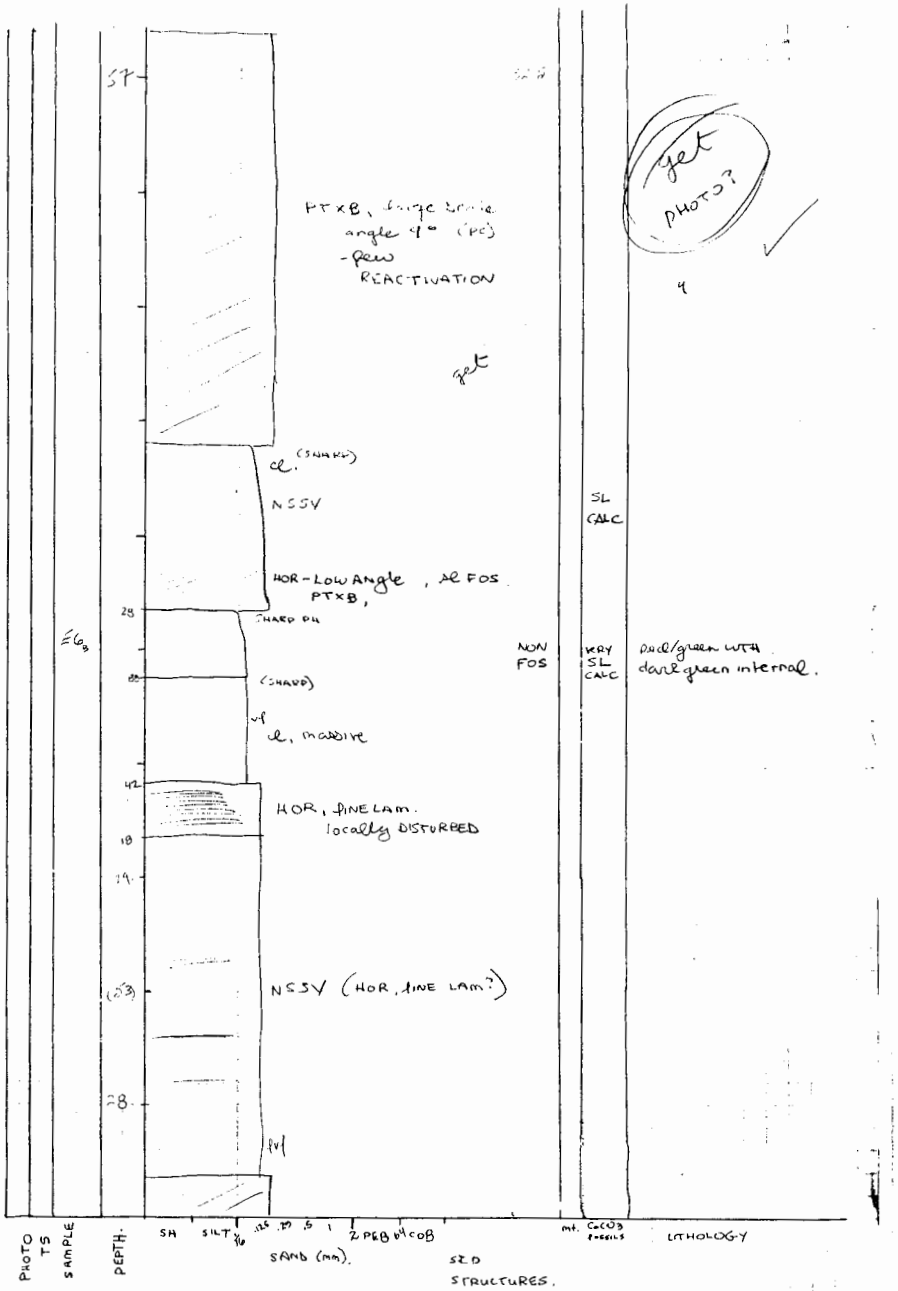

42
17
13
fSS. HOR RIBS
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.

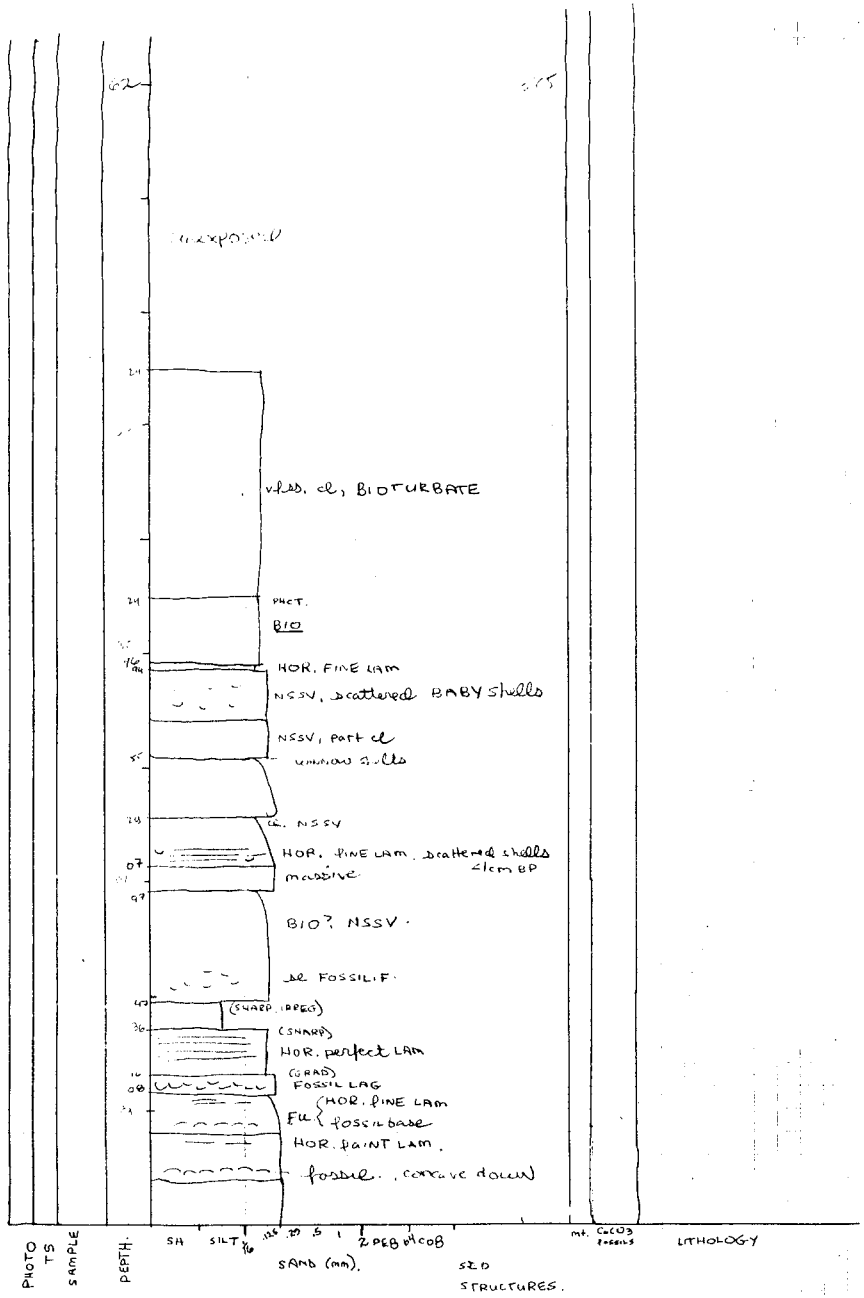

37
12.10
12
11
12.5
FSS PLANAR - LOW ANGLE
SCOUR CT (20cm)
HOR
PCXB
HOR. FINE LAM
super FOSSIL. ALLOCHEM supported
MINOR RIPPLING
HOR. FINE LAM.
to east (Highway 10m)
(distance from A?)
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.

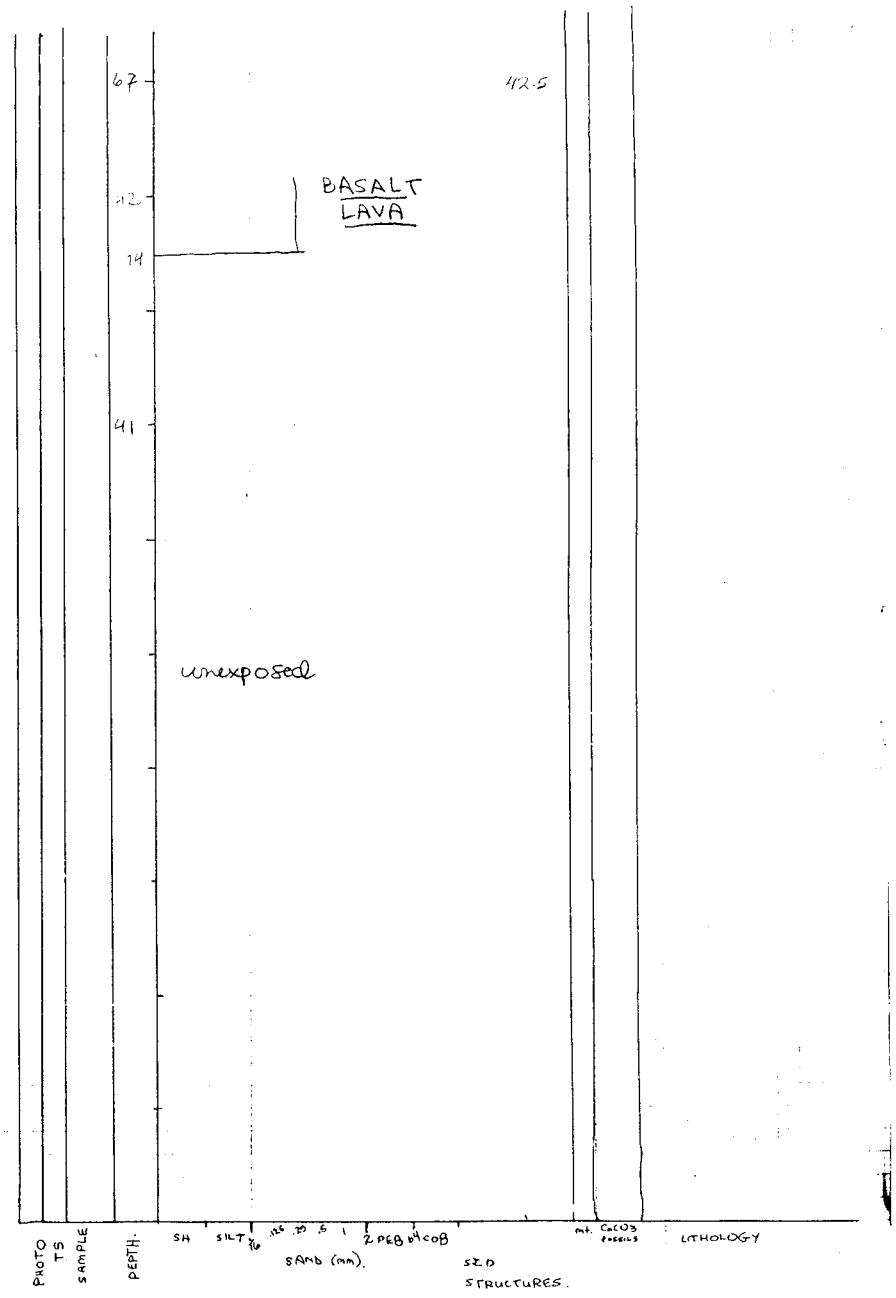

42
HOR. perfect fine LAM.
22
(CRAD)
PC 152
50°SP
FTXB, Low angle w/1-2cm shell foreset
(SHARP)
HOR. FINE LAM occ fossils bioturbated
14
(GRAD)
16
HOR. FINE LAM
shell lag 5-10 %
50
45
CT angle 60/15/15cm
HOR-Low angle
BIO
decreases
18
FOSSILIF BOTTOM
(VERY SHARP)
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY


47
HOR, FINE LAM, MOD. BIOTURB.
25
thin tuff
~2-4cm tuffite
tuffitic SLST
tuffite
tuffite
Rippled tuffite SLST
rippled possibly
HOR, FINE LAM. well defined
HOR, fine LAM. poorly defined
cl. NSSY. laterally cut out
HOR, fine LAM 2cm growth faults.
(SHARP PH) 20cm slump
HOR, remnant else BIO.
occasional small fossils
BIOTURB.
BIO OIS
HOR. FINE LAM
massive bedal ISS shells
SCOUR FILL but massive & fossil.
lateral fill
275
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
STRUCTURES.
mt.
CaCO3 FOSSILS
LITHOLOGY


PTxB, Low angle (PC)
HOR, FINE LAM
bioturbated
HOR, CURVE LAM.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.

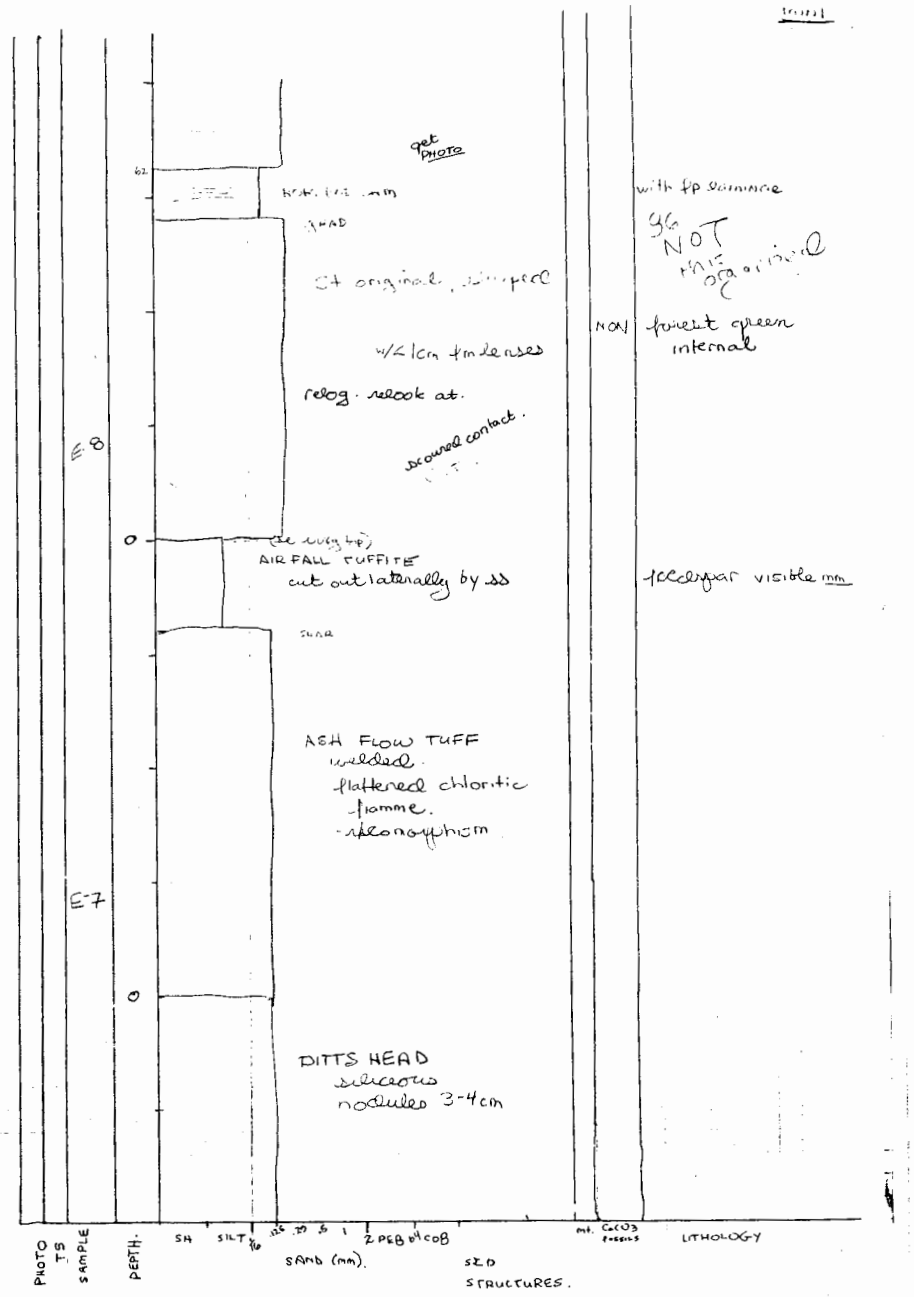

PTxB, large trough angle 4° (PC)
-new REACTIVATION
get PHOTO?
get
cl. (SHARP)
NSSV
HOR-LOW ANGLE, Al FOS PTxB,
SHARP PH
(SHARP)
cl, massive
HOR, FINE LAM. locally DISTURBED
NSSV (HOR, FINE LAM?)
NON FOS
SL CALC
VERY SL CALC
dark/green with dark green interval.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.


62
3.75
unexposed
24
vfss. cl, BIOTURBATE
24
PHOT.
BIO
16/46
HOR. FINE LAM
NSSV, scattered BABY shells
NSSV, patt cl
unmow silts
55
24
cl. NSSV
07
HOR. fine LAM, scattered shells ≤1cm BP
massive
97
BIO? NSSV.
cl FOSSILIF.
45
(SHARP, IRREG)
36
(SHARP)
HOR. perfect LAM
16
(GRAD)
08
FOSSIL LAG
24
HOR. FINE LAM
FL
fossil base
HOR. faint LAM.
fossil. . concave down
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
.125
.25
.5
1
2
PEB
64
COB
mt. CaCO3 fossils
LITHOLOGY
SAND (mm).
SED
STRUCTURES.


67
42.5
42
BASALT
LAVA
14
41
unexposed
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
.125
.25
.5
1
2
PEB
64
COB
mt. CaCO3 fossils
LITHOLOGY
SAND (mm).
SED
STRUCTURES.

SECTION E2

SECTION E2 LOCATION: Section starts at top of Pitts Head Tuff to 20 m to west of dry stone wall and/or main outcrop (rounded hill) of Pitts Head Tuff.



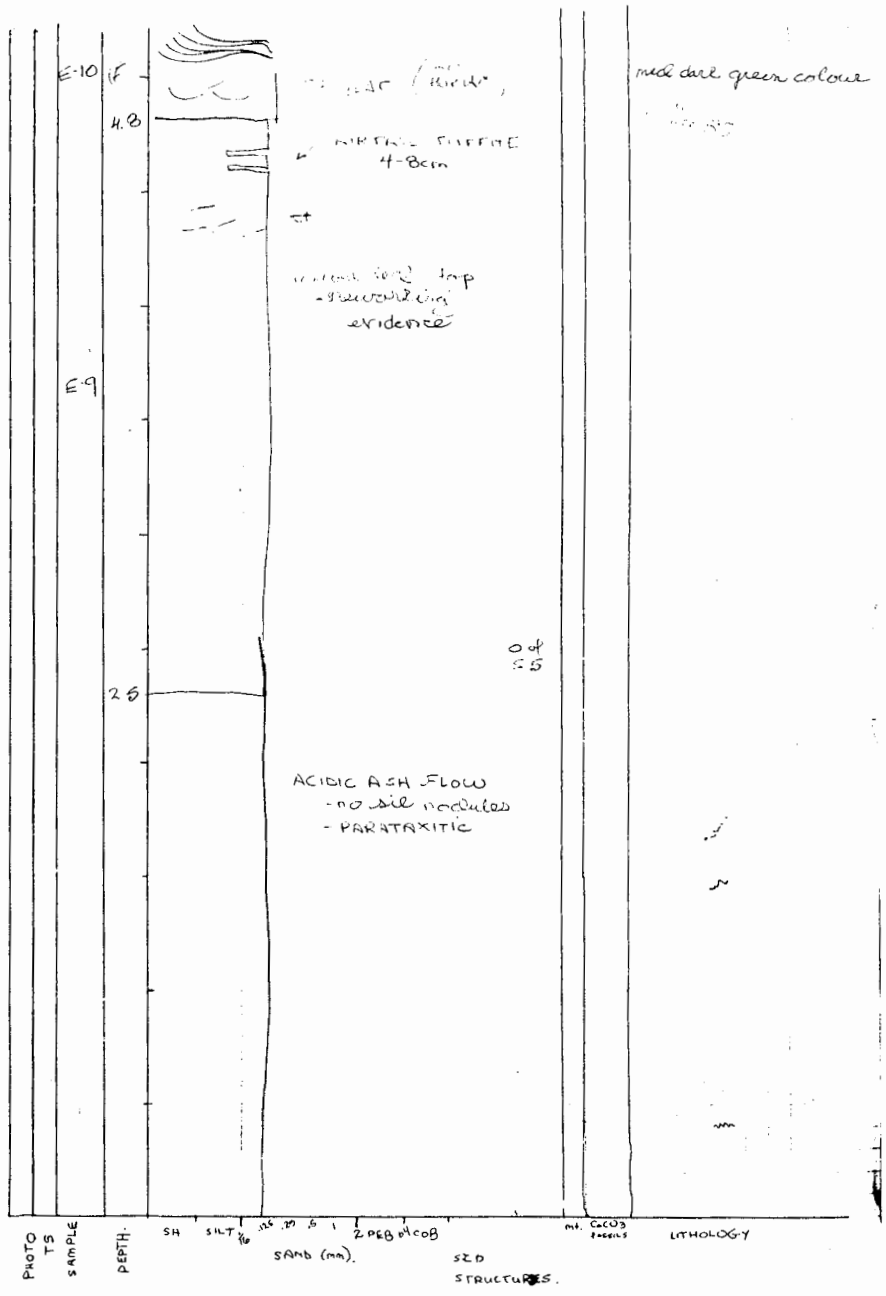
E2

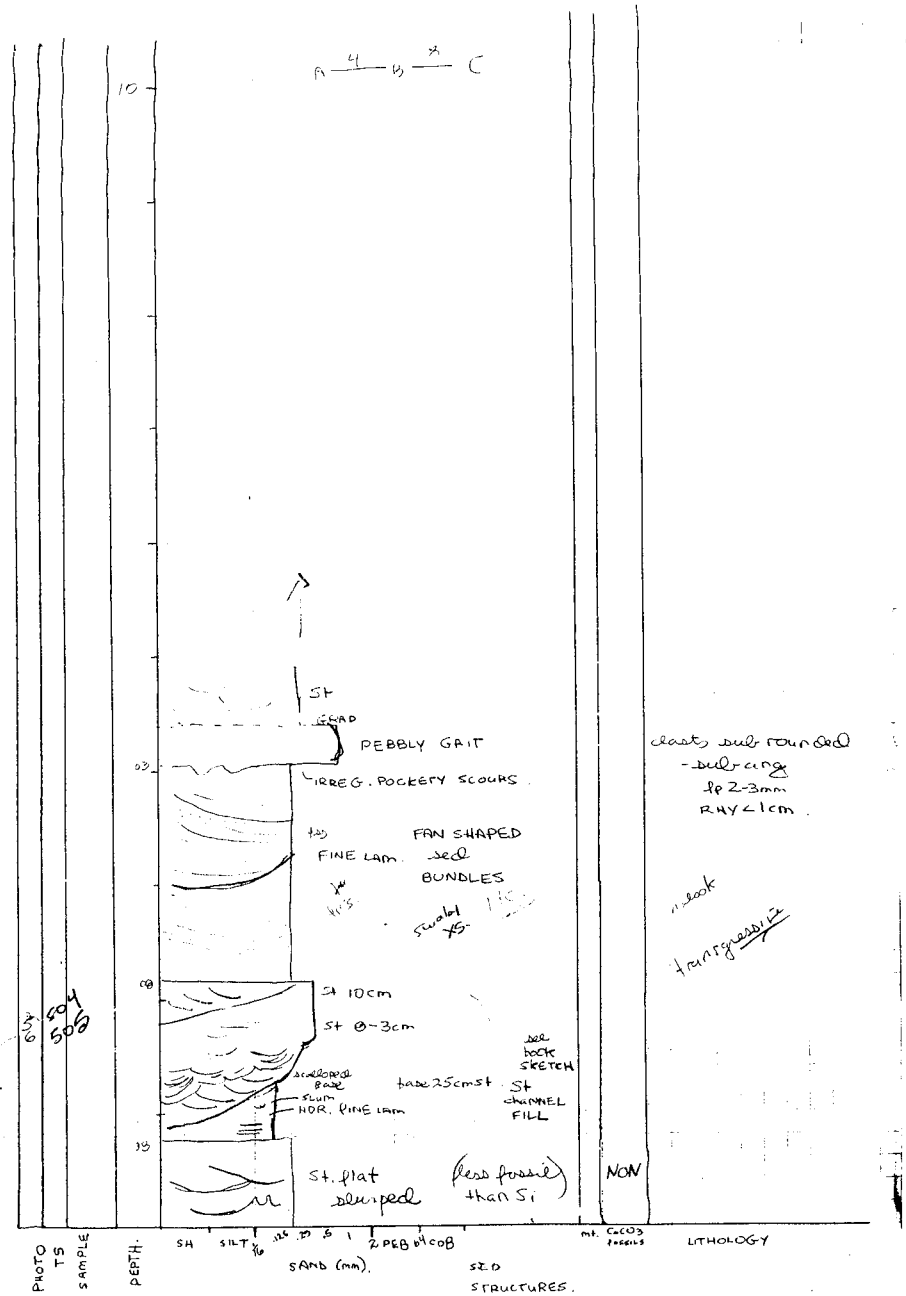
E2

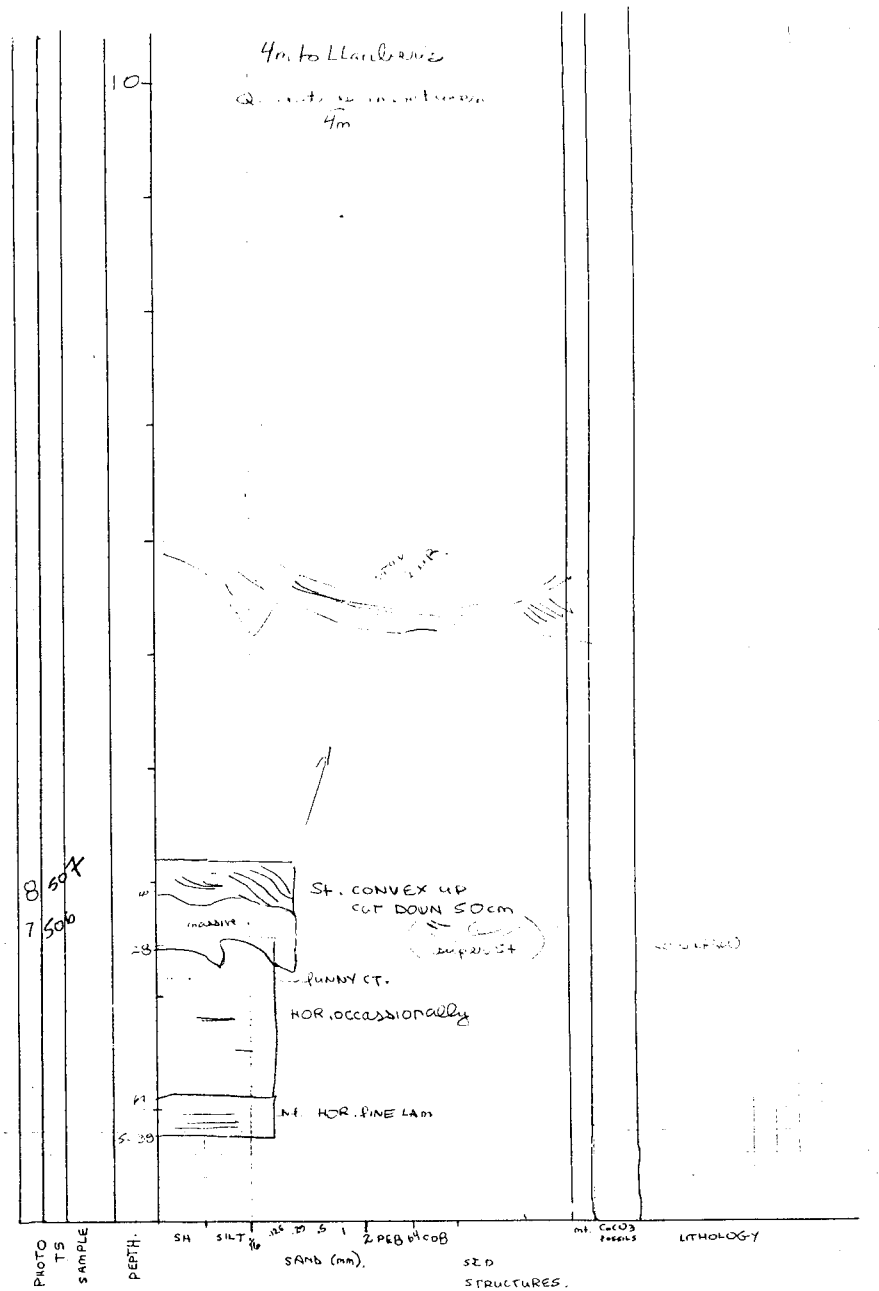
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
LITHOLOGY
SED
STRUCTURES.
w/ asbc fragments
shells (Glauc)
HOR. LAM OR VERY
low angle xB

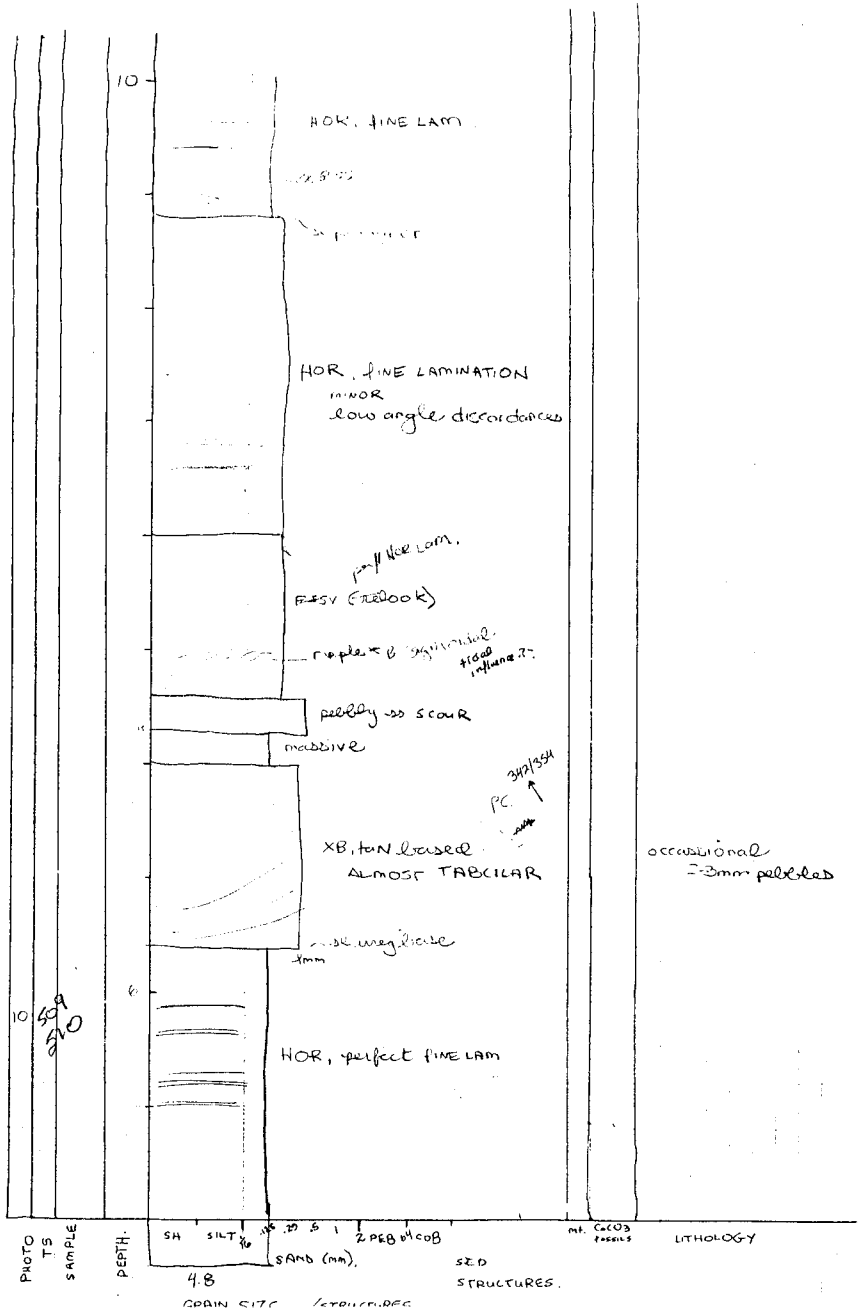
SECTION E3

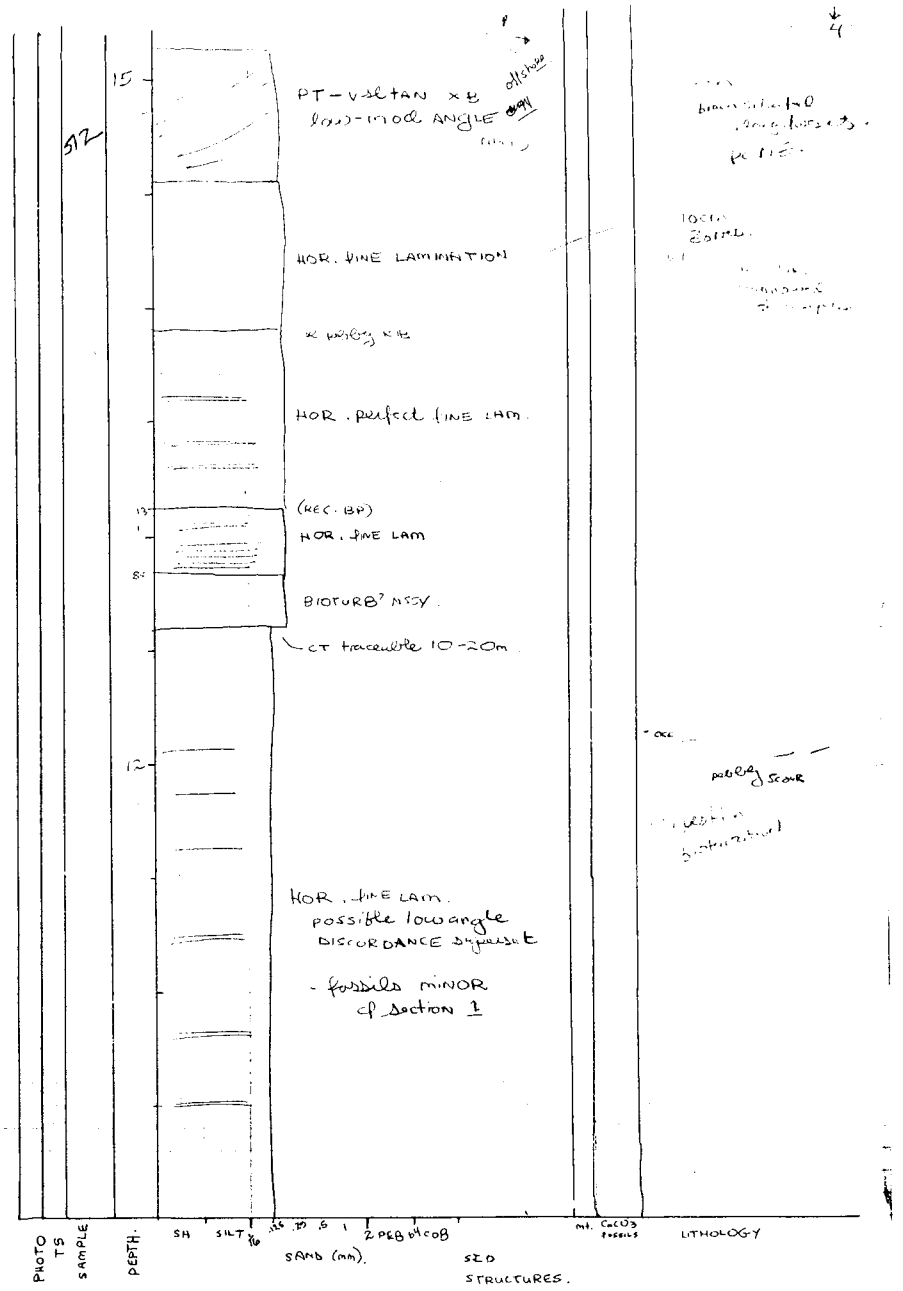
SECTION E3 LOCATION: Locate top of Pitts Head Tuff 50 m to west of "The Nose" and continue until base of Lower Rhyolitic Tuff Fm.

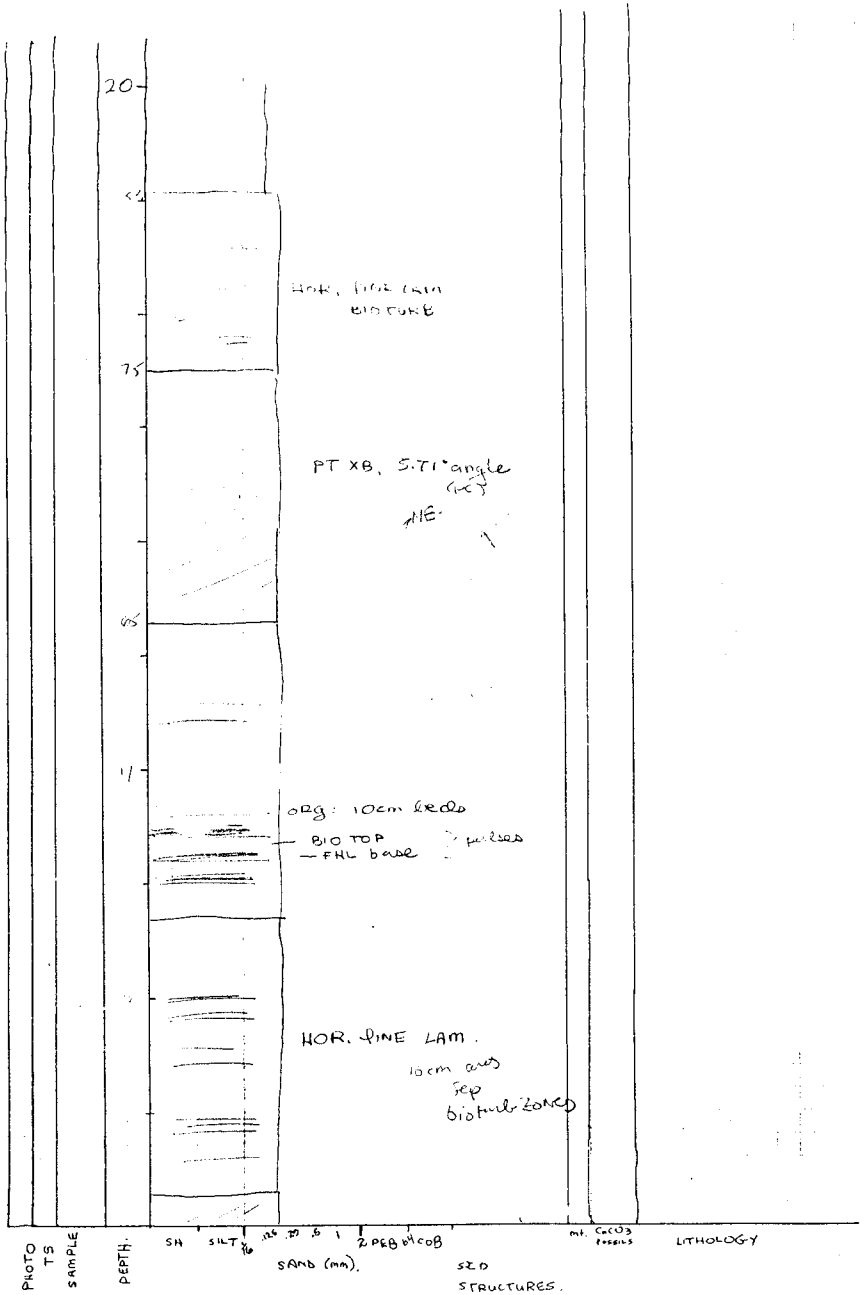


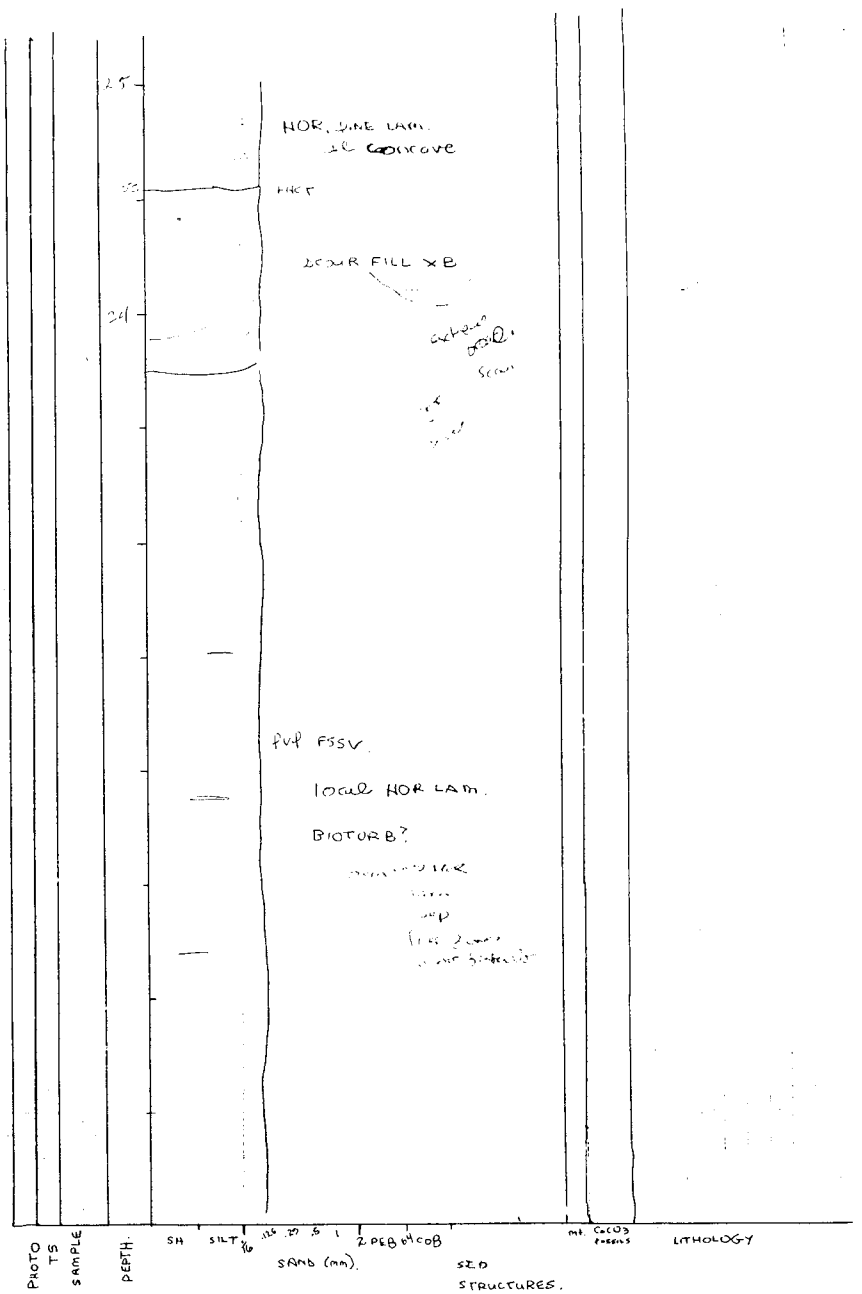

A
B
C
10
09
08
St
ERAD
PEBBLY GAIT
IRREG. POCKETY SCOURS
FINE LAM.
FAN SHAPED
sed
BUNDLES
St 10cm
St 0-3cm
scalloped base
slump
HOR. FINE LAM
base 25cm St
see ROCK SKETCH
St CHANNEL FILL
St. flat shaped
(less fossil) than Si
NON
clasts sub rounded
- sub ang
lp 2-3mm
RHY < 1cm.
look
transgressive
5047
5048
last year
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3 fossils
LITHOLOGY
SED STRUCTURES.

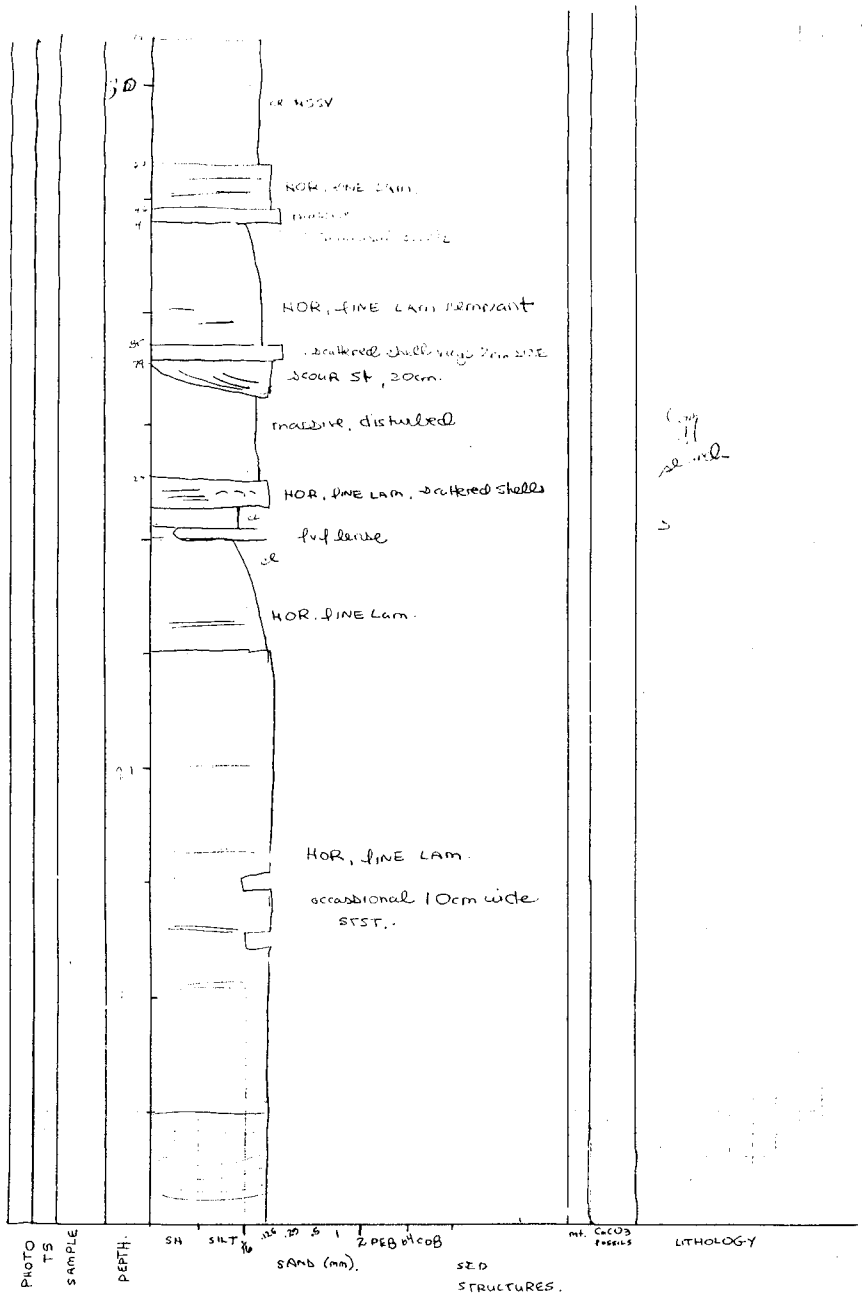

4m. to Llanbedrog
4m
10
8 5047
7 5046
last year
St. CONVEX UP
massive
CUT DOWN 50cm
wispy St
FUNNY CT.
HOR. occasionally
Mt HOR. FINE LAM
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt.
CaCO3 fossils
LITHOLOGY
SED STRUCTURES.

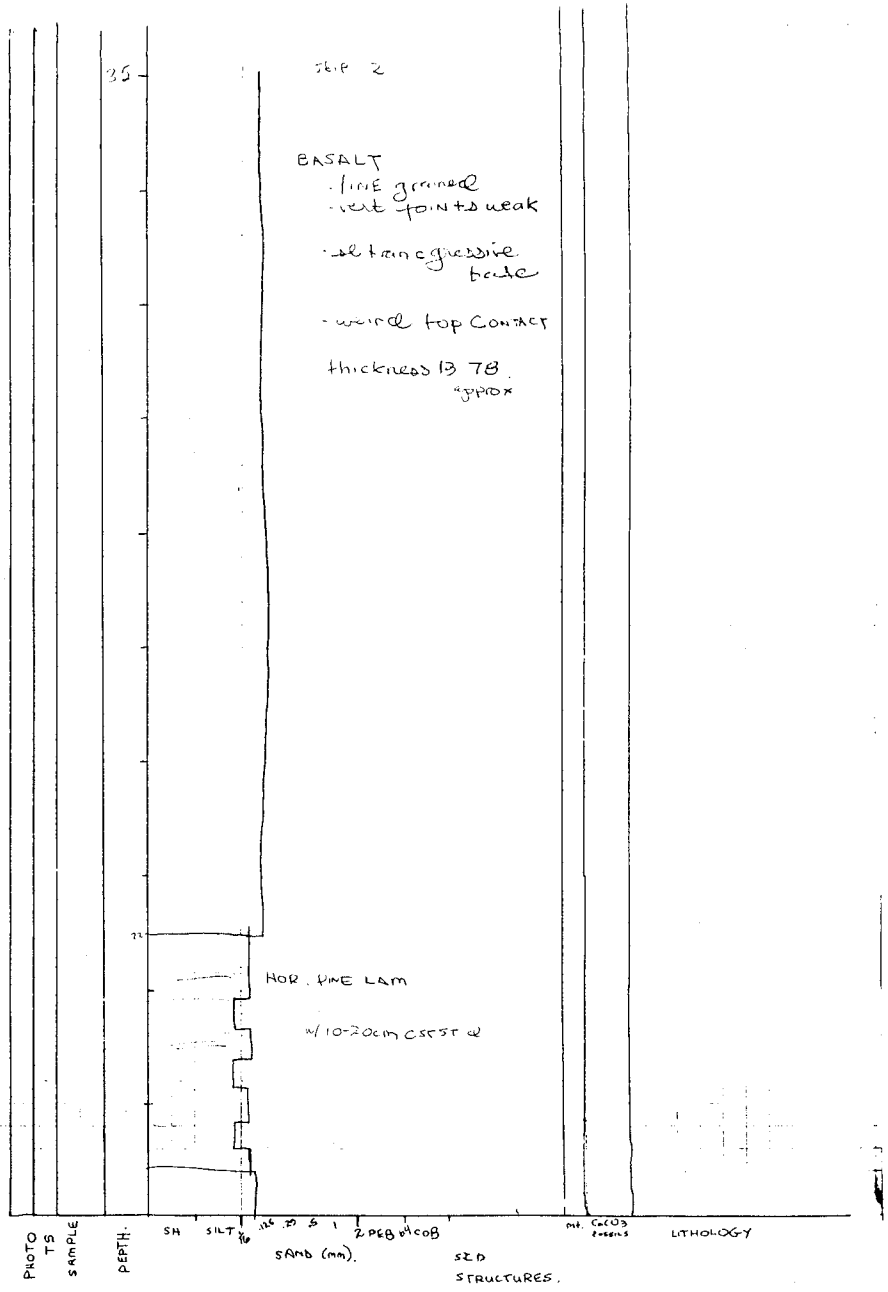

10
HOR. FINE LAM.
HOR. FINE LAMINATION
MINOR
low angle discordances
FISSY (FREBOOK)
ripples
pebbly ss scour
massive
XB, ten bioturb
ALMOST TABULAR
occasional
2-3mm pebbles
HOR, perfect FINE LAM
4.8
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
CaCO3
FOSSILS
LITHOLOGY
SED
STRUCTURES.

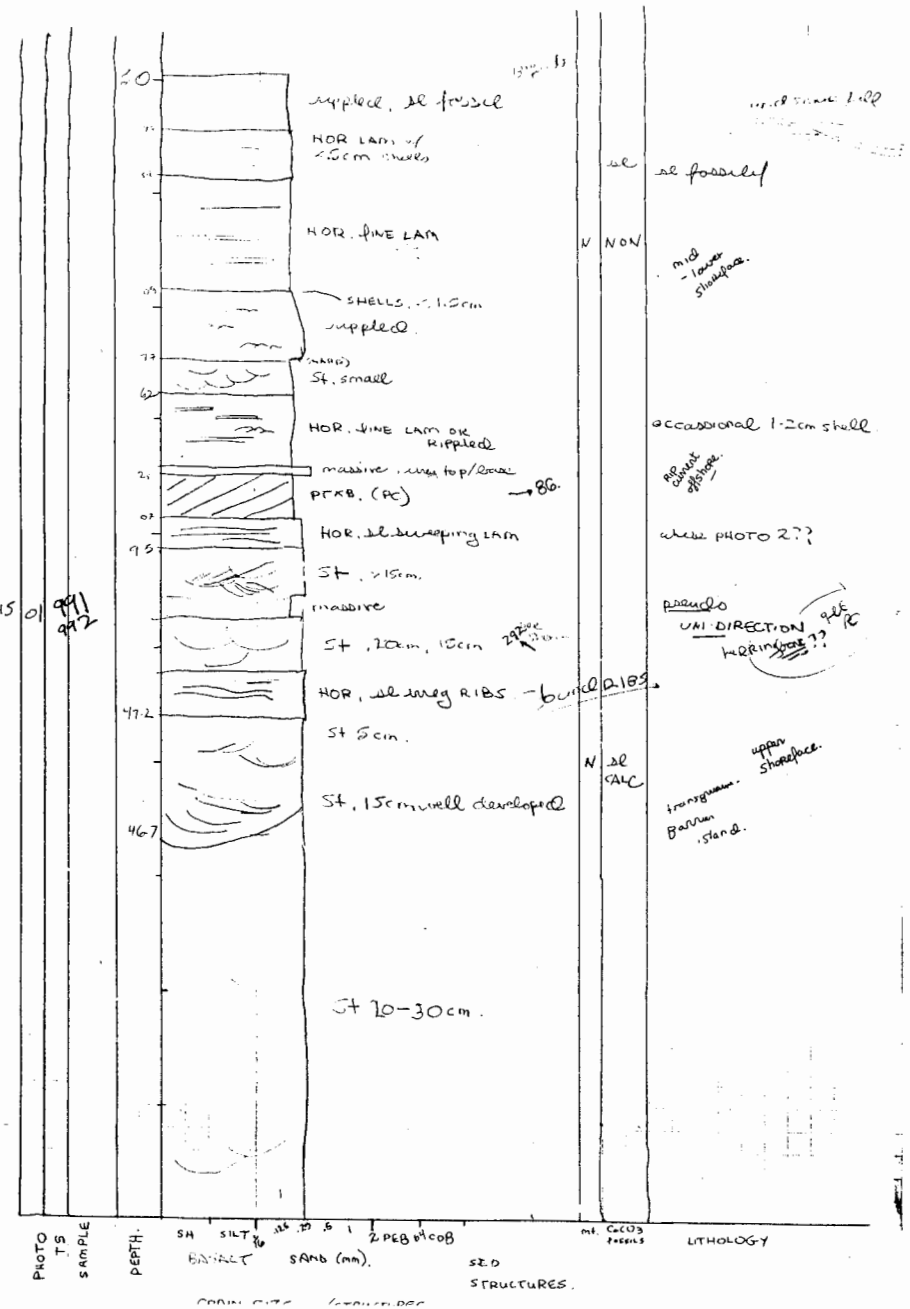

15
12
PT-vsltan xB
low-mod ANGLE
HOR. FINE LAMINATION
HOR. perfect FINE LAM.
(REC. BP)
HOR. FINE LAM
BIOTURB' MSSY.
CT traceable 10-20m
HOR. FINE LAM.
possible low angle
DISCORDANCE
- fossils MINOR
cf Section 1
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
CaCO3
FOSSILS
LITHOLOGY
SED
STRUCTURES.

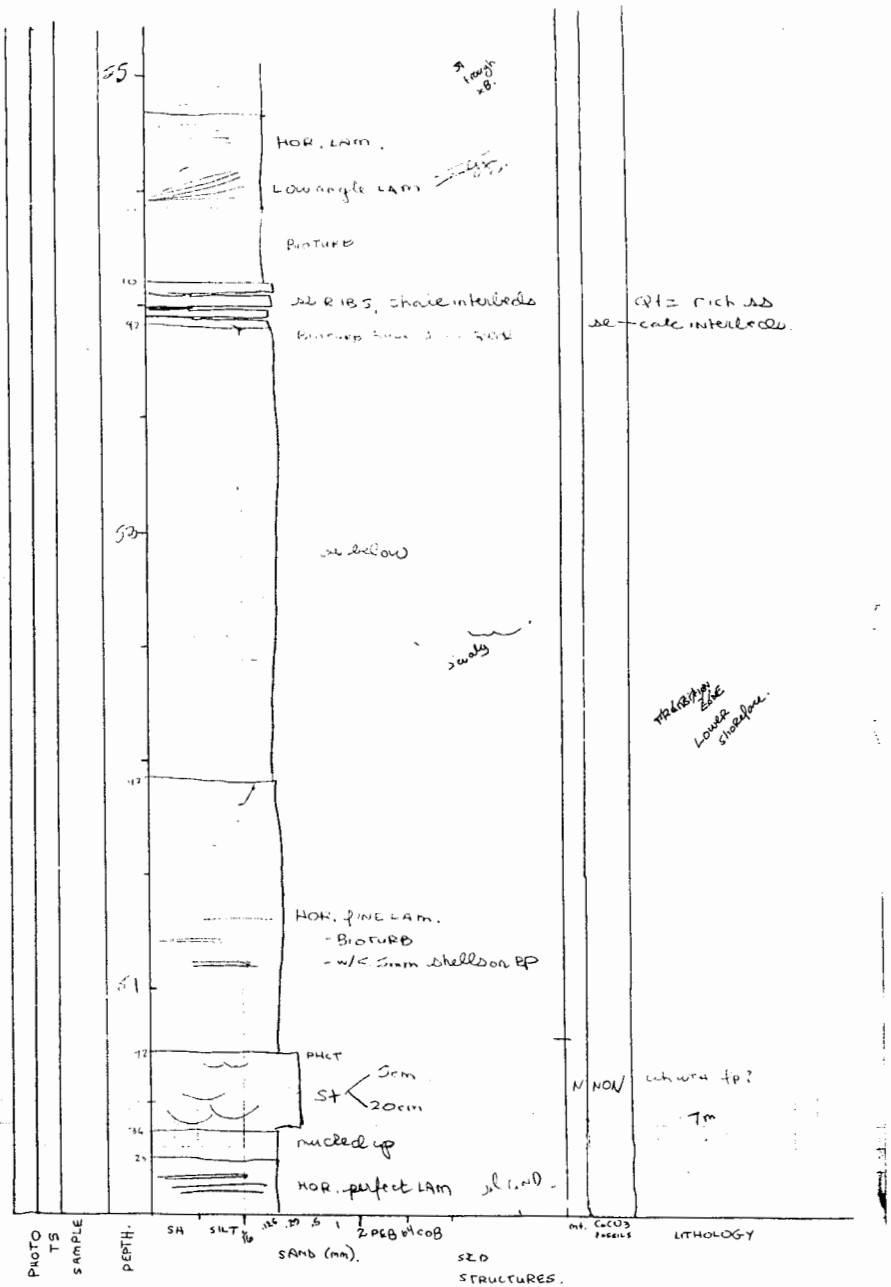

20
HOR. fine lam
BIOTURB
PT XB. 5.TI angle
HE.
org: 10cm leads
BIO TOP
FHL base
HOR. fine LAM.
10cm wvy
sep
bioturb zoned
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
CALC
fossils
LITHOLOGY
SED
STRUCTURES.

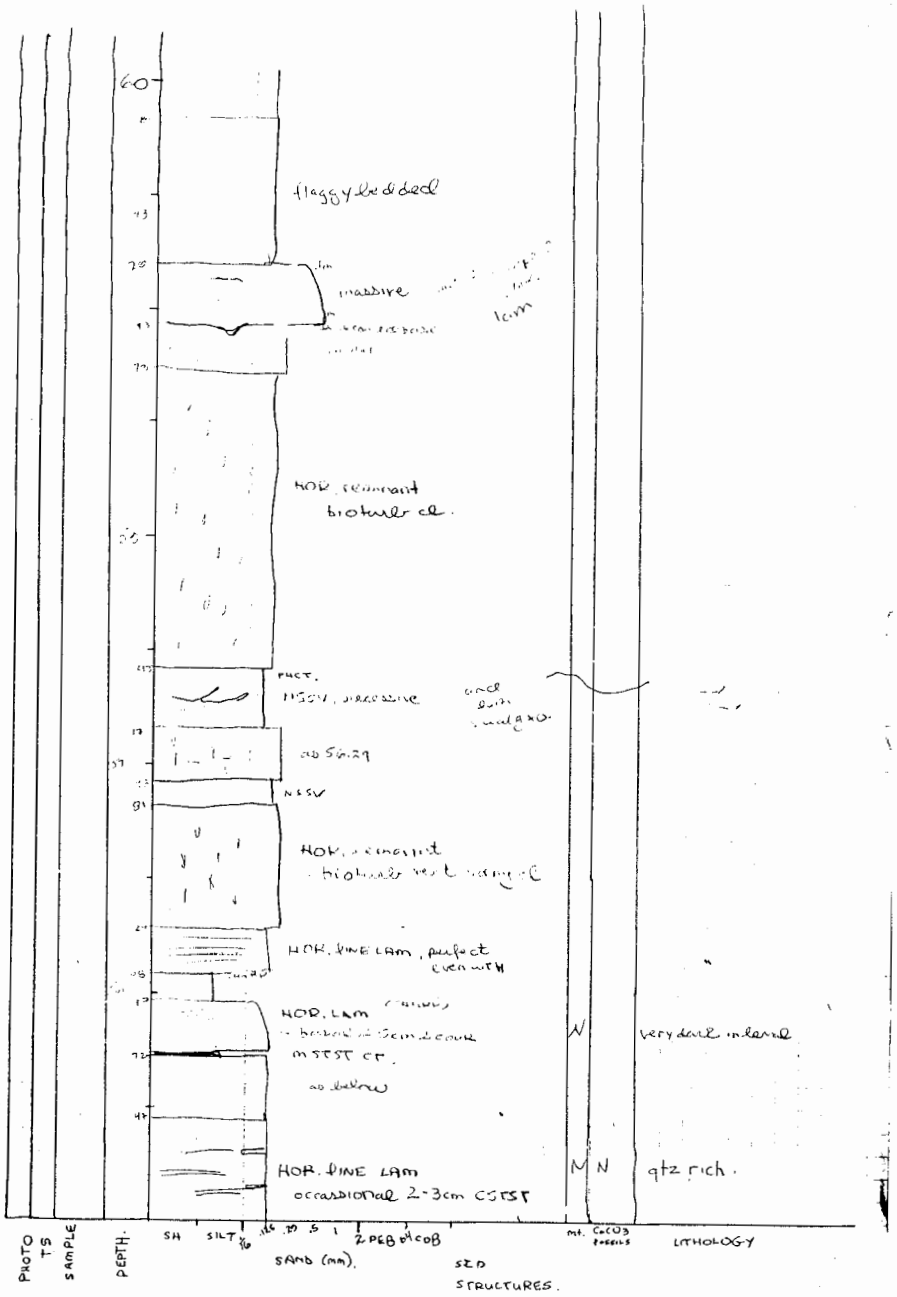

HOR. fine lam.
FHCF
LOWER FILL XB
PVF FSSV.
local HOR LAM.
BIOTURB?
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
CALC
fossils
LITHOLOGY
SED
STRUCTURES.

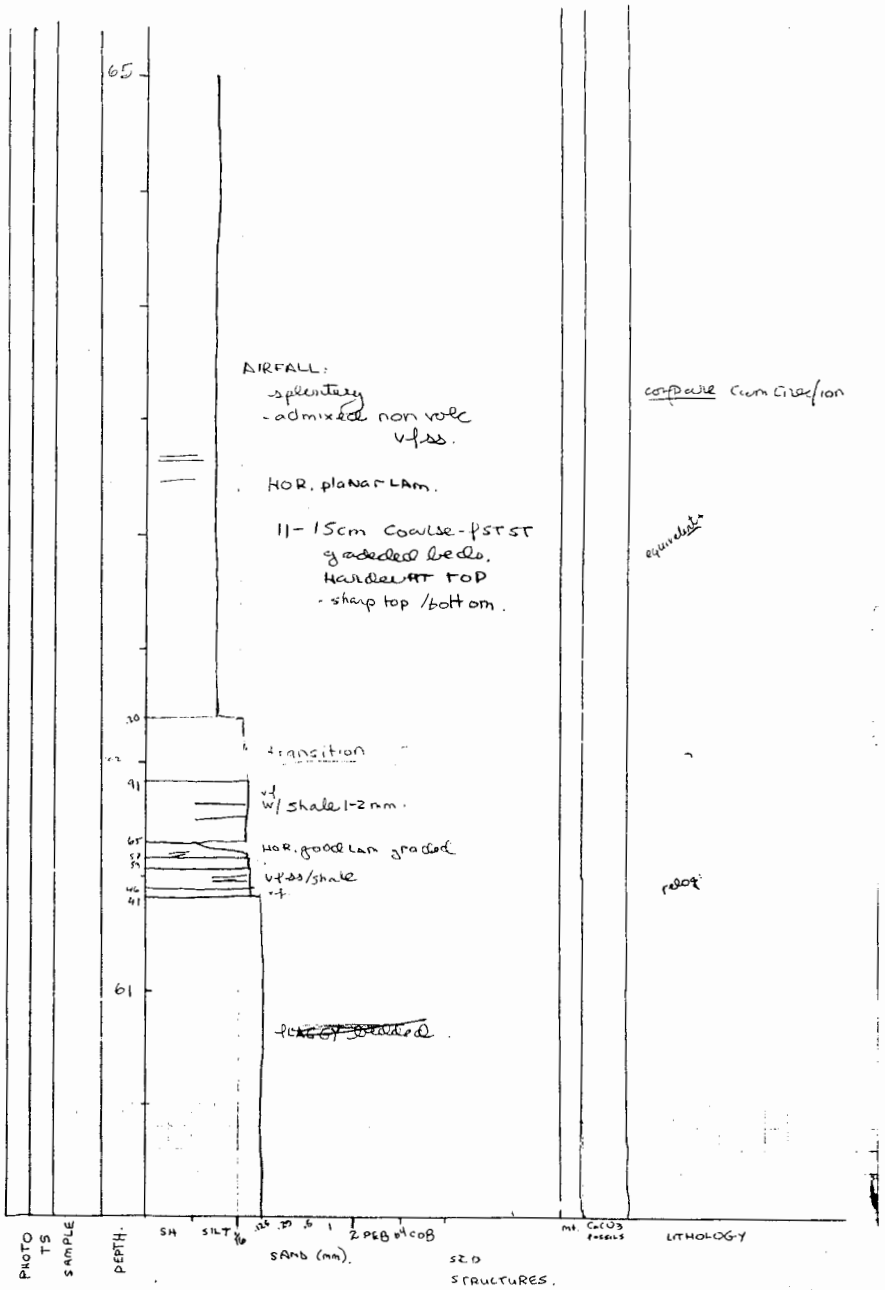

MASSIV
HOR. FINE LAM.
HOR. FINE LAM REMNANT
scattered shells
SCOUR SF, 20cm.
massive, disturbed
HOR. FINE LAM. scattered shells
fuf lense
HOR. FINE LAM.
HOR. FINE LAM.
occasional 10cm wide SFST.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.


STEP 2
BASALT
· fine grained
· vert joints weak
· slt trangressive base
· weird top CONTACT
thickness IS 78. *APPROX
HOR. FINE LAM
w/ 10-20cm CSFST @
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.

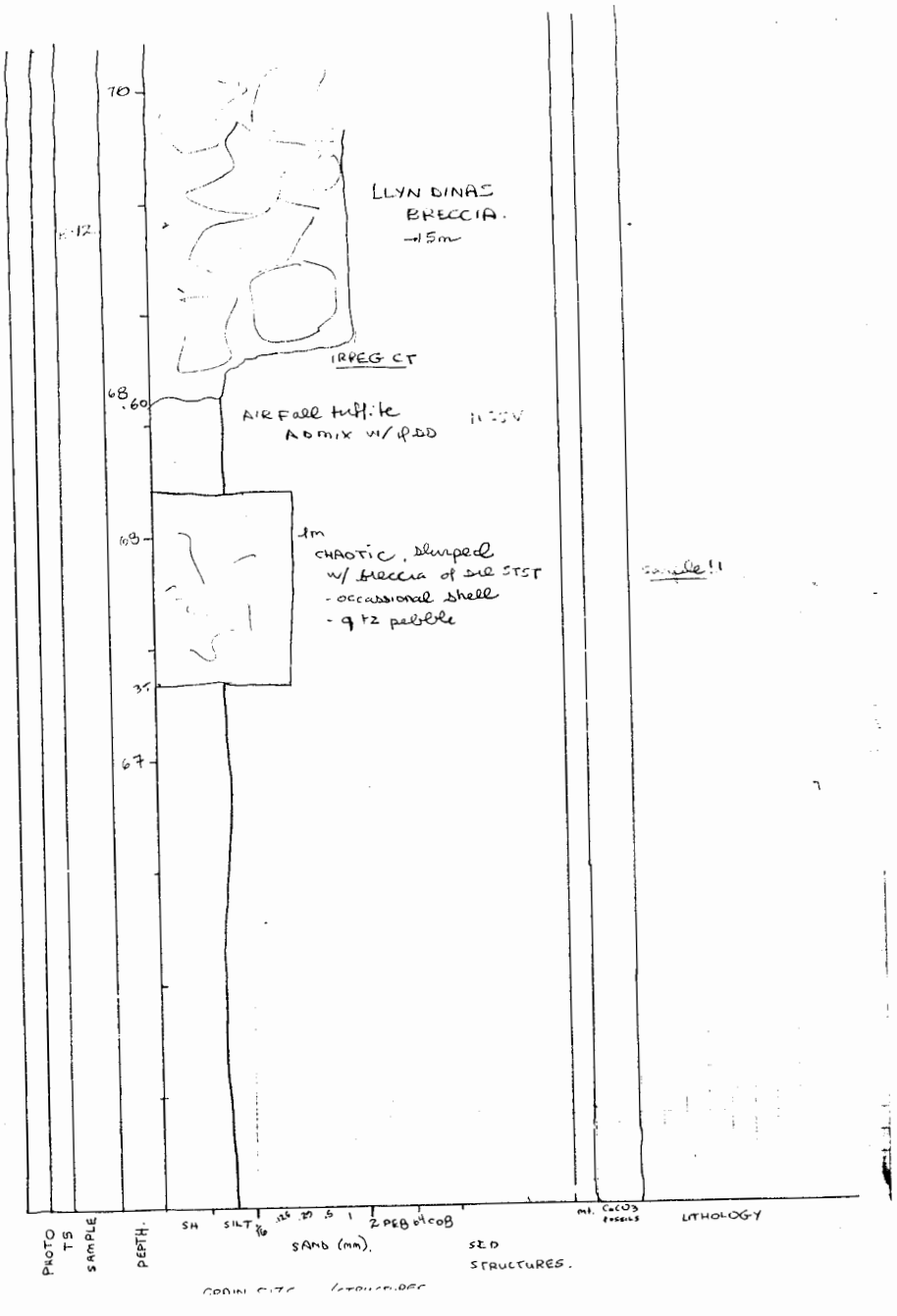

rippled, sl fossil
HOR LAM. of <.5cm shells
HOR. FINE LAM
SHELLS, <1.5cm
rippled.
(SAND)
St. small
HOR. FINE LAM OR RIPPLED
massive, sharp top/base
PRXB. (PC)
HOR. sl sweeping LAM
St, >15cm.
massive
St, 20cm, 15cm
HOR, sl irreg RIBS
St 5cm.
St, 15cm, well developed
St 20-30cm.
sl fossils
NON
occasional 1-2cm shell
where PHOTO 2??
pseudo UNI-DIRECTION HERRING??
upper shoreface.
transgressive.
Barrier stand.
sl CALC
PHOTO
T.S
SAMPLE
DEPTH.
SH
SILT
BASALT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.


HOR. LAM.
LOW ANGLE LAM
PICTURE
sl RIBS, shale interbeds
sl below
HOR. FINE LAM.
- BIOTURB
- w/< 5mm shell on BP
PHCT
St 5cm 20cm
rucked up
HOR. perfect LAM
NON
Lithwork fp?
7m
Qrt= rich ss
calc interbeds.
Lower shoreface.
PHOTO
T.S
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 FOSSILS
LITHOLOGY
SED STRUCTURES.


60
flaggy bedded
massive
HOR. remnant bioturb cl.
FACT.
MSSV, massive
NSSV
HOR. remnant bioturb
HOR. FINE LAM, perfect even with
HOR. LAM
MSTST cr.
as below
HOR. FINE LAM
occasional 2-3cm CSTST
very dark inclusions
qtz rich.
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
SED STRUCTURES.
LITHOLOGY

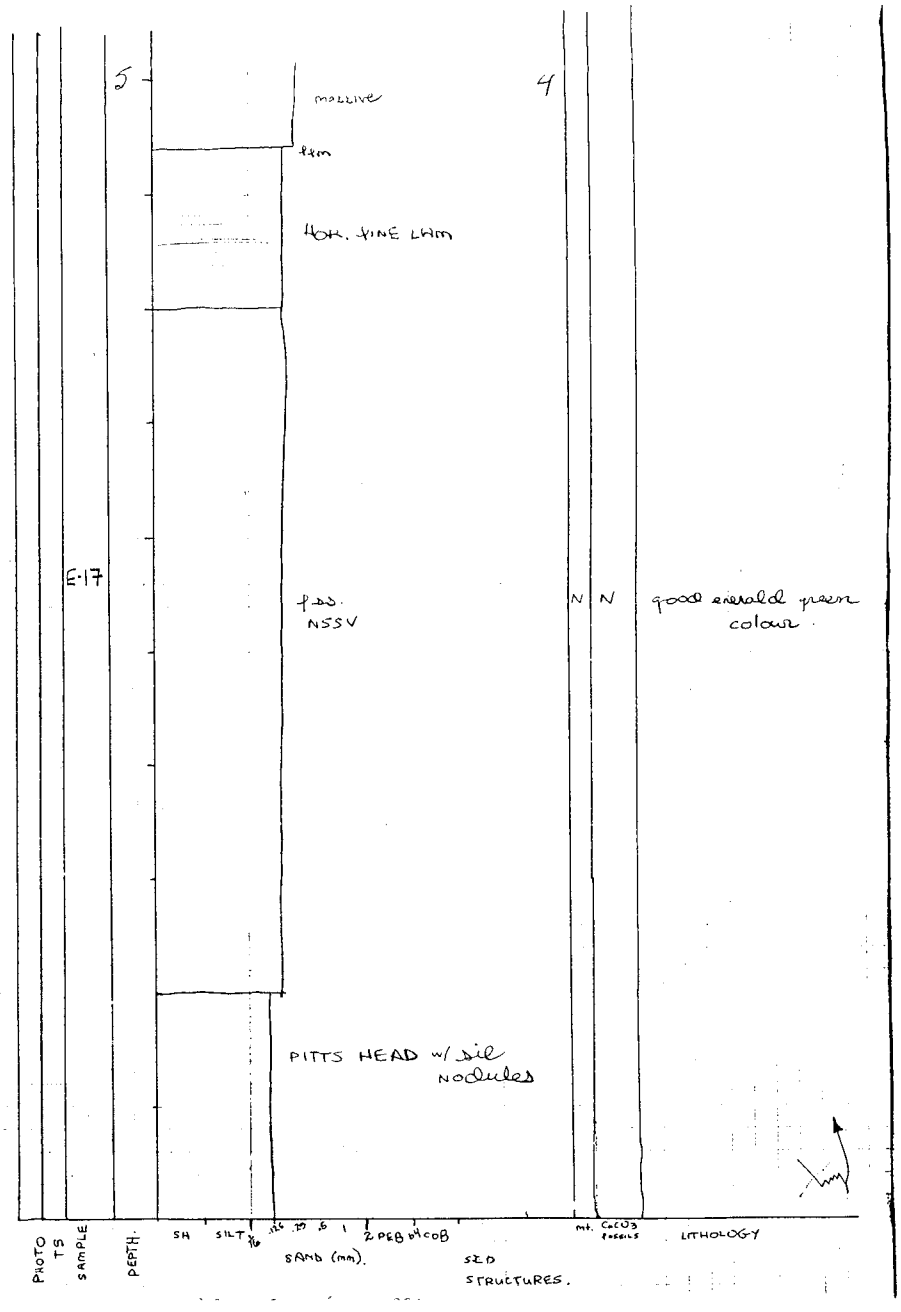

65
AIRFALL:
- splintery
- admixed non volc v-f ss.
HOR. planar LAM.
11-15cm coarse-pstst graded beds.
HARD GROUND TOP
- sharp top/bottom.
transition
v-f w/ shale 1-2mm.
HOR. good LAM graded
vf-ss/shale
61
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
2 PEB
COB
SED STRUCTURES.
LITHOLOGY

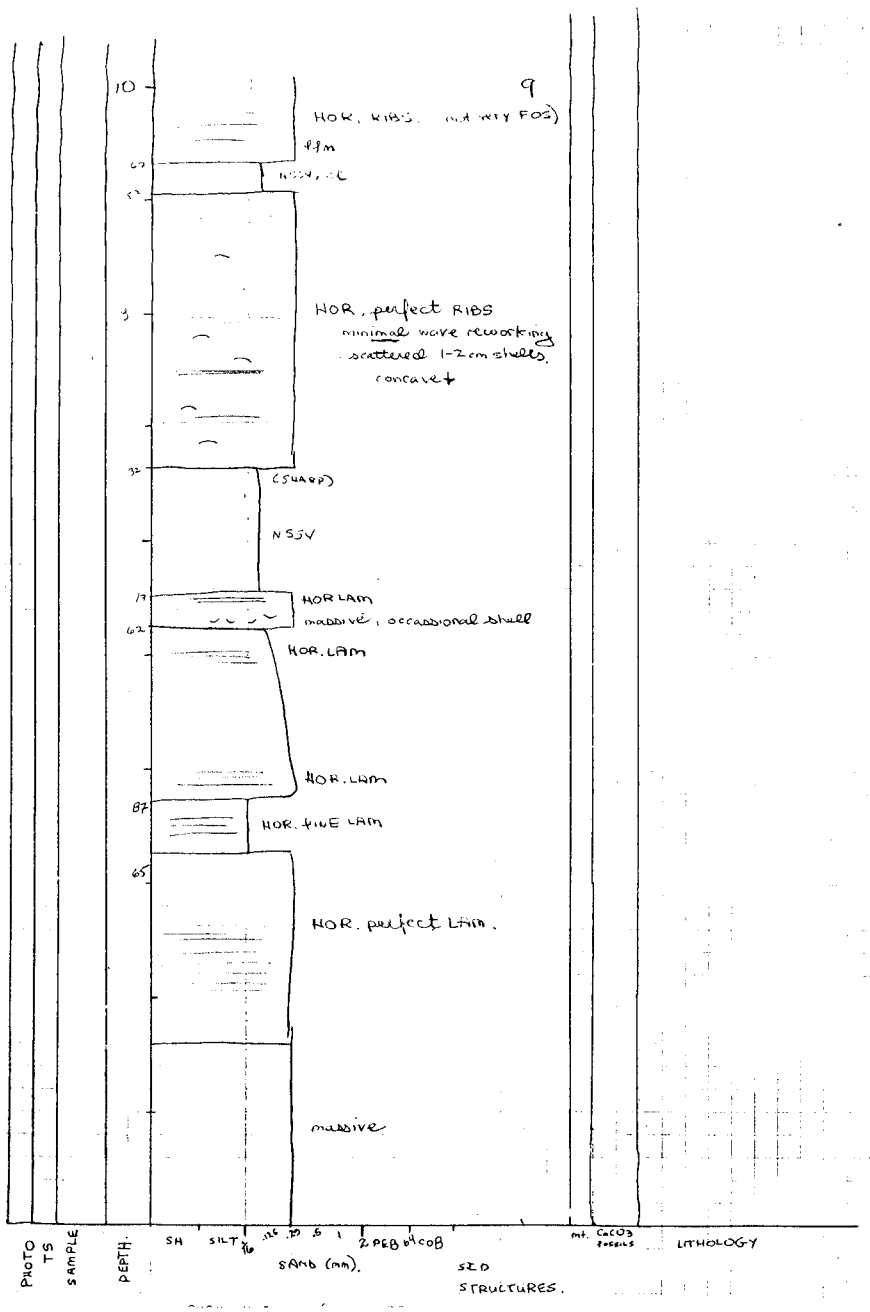
E3

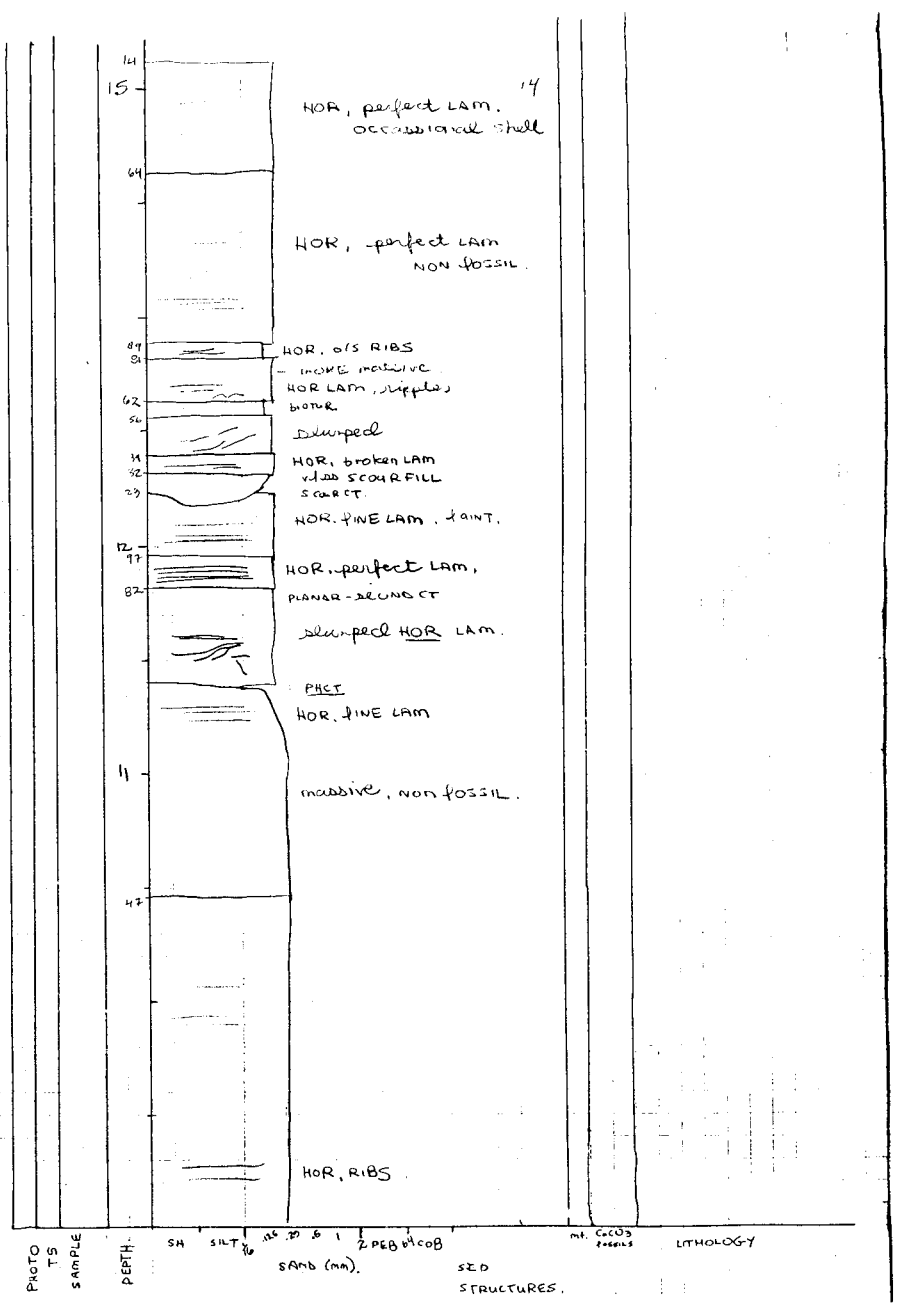

70
68
.60
69
67
LLYN DINAS
BRECCIA.
~1.5m~
IRREG CT
AIR FALL tuffite
ADMIX w/ RDD
1m
CHAOTIC, slumped
w/ breccia of the STST
- occassional shell
- qtz pebble
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
SED
STRUCTURES.
LITHOLOGY

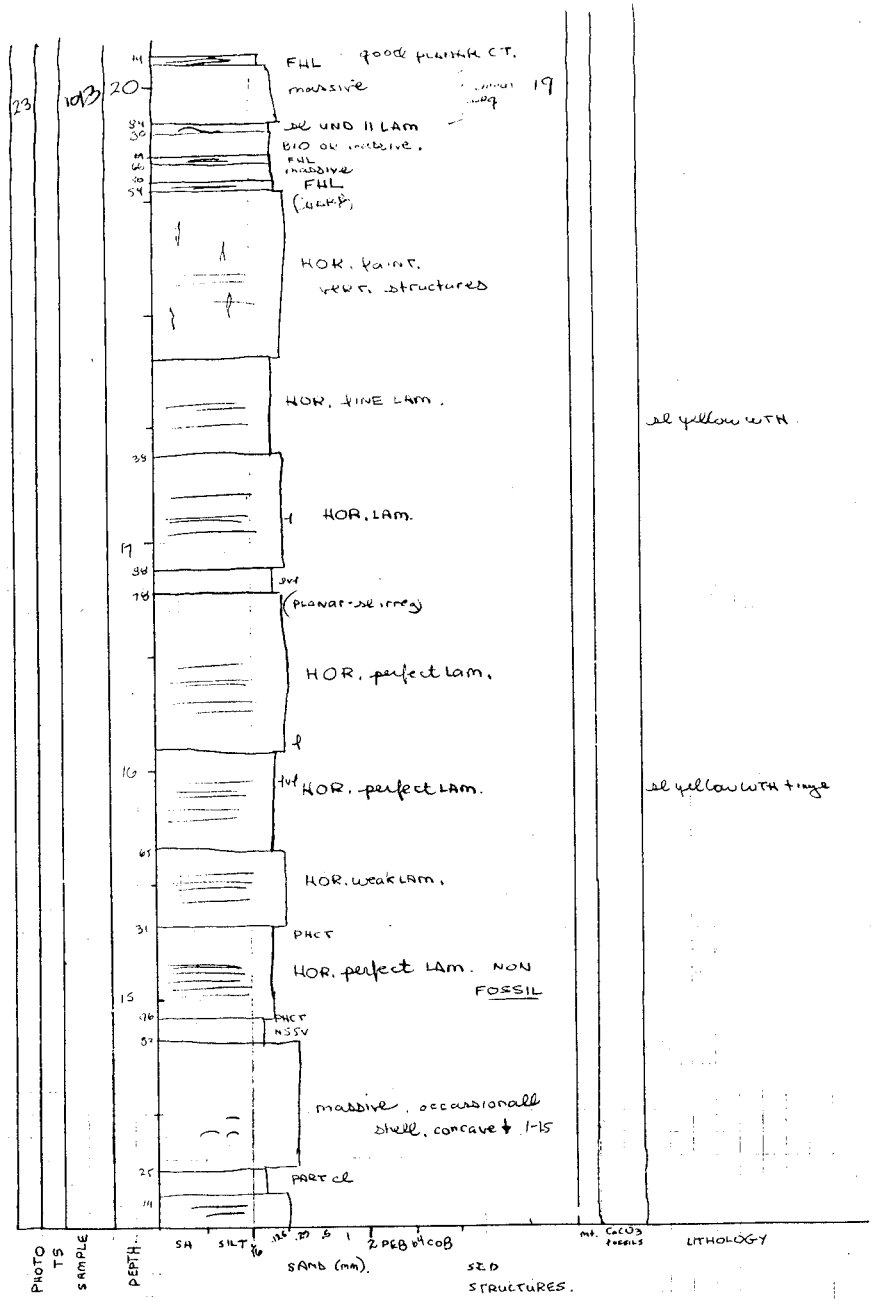
SECTION E5

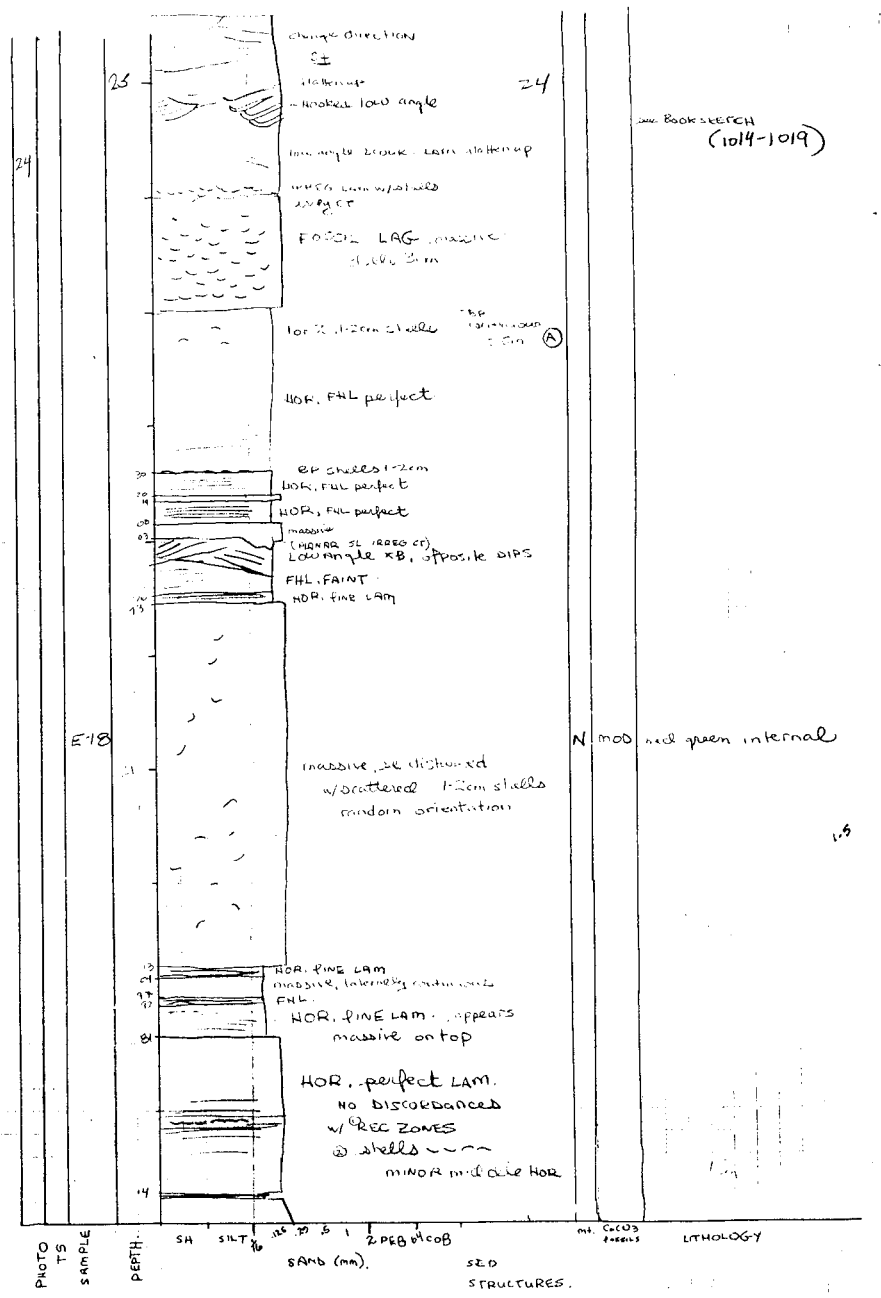
SECTION E5 LOCATION: Section starts immediately to west (not as shown on map) of Afon Bryn Du at top of Pitts Head Tuff and proceeds up steep dangerous (bedding planes dip down slope off cliffs) slope to base of Lower Rhyolitic Tuff.




9
10
HOR. RIBS. (MATRIX FOS)
ffm
67
NSSV, SL
HOR. perfect RIBS
minimal wave reworking
scattered 1-2cm shells.
concave+
32
(SHARP)
NSSV
19
HOR LAM
massive; occassional shell
62
HOR. LAM
HOR. LAM
87
HOR. fine LAM
65
HOR. perfect LAM.
massive
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
.125
.25
.5
1
2
PEB
GR
COB
mt. CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.


14
15
HOR, perfect LAM.
occassional shell
64
HOR, perfect LAM
NON FOSSIL.
89
91
HOR. O/S RIBS
- INCRE massive
62
HOR LAM, ripples
BIOTUR.
56
slumped
38
42
HOR, broken LAM
v/ss SCOUR FILL
CORRECT.
29
HOR. fine LAM. faint.
12
17
HOR. perfect LAM,
82
PLANAR-ROUNDED
slumped HOR LAM.
PHOT
HOR. fine LAM
11
massive, NON FOSSIL.
47
HOR, RIBS
PHOTO
TS
SAMPLE
DEPTH.
SH
SILT
SAND (mm).
.125
.25
.5
1
2
PEB
GR
COB
mt. CaCO3
fossils
LITHOLOGY
SED
STRUCTURES.


FHL · good planar ct.
massive
sl UND ll LAM
BIO or inclusive.
FHL massive
FHL (laminae)
HOR. faint. very structured
HOR. fine LAM.
sl yellow WTH
HOR. LAM.
(planar-sl irreg)
HOR. perfect lam.
HOR. perfect LAM.
sl yellow WTH fringe
HOR. weak LAM.
HOR. perfect LAM. NON FOSSIL
massive, occasional shell, concave ↓ 1-15
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY


change direction
sl
flattens up
~ hooked fold angle
low angle broad lam flattens up
massive
FOSSIL LAG massive
HOR. FNL perfect
BP shells 1-2cm
HOR. FNL perfect
massive (MANY SL IRREG CT)
LOW ANGLE XB, opposite DIPS
FHL. FAINT
HOR. fine LAM
massive, sl disturbed w/scattered 1-2cm shells
random orientation
HOR. fine LAM
massive, laterally continuous
FNL
HOR. fine LAM. appears massive on top
HOR. perfect LAM.
NO DISCORDANCES
w/ REC ZONES
② shells
MINOR mid-dble HOR
see BOOK SKETCH (1014-1019)
N mod med green internal
PHOTO
TS
SAMPLE
DEPTH
SAND (mm).
STRUCTURES.
LITHOLOGY

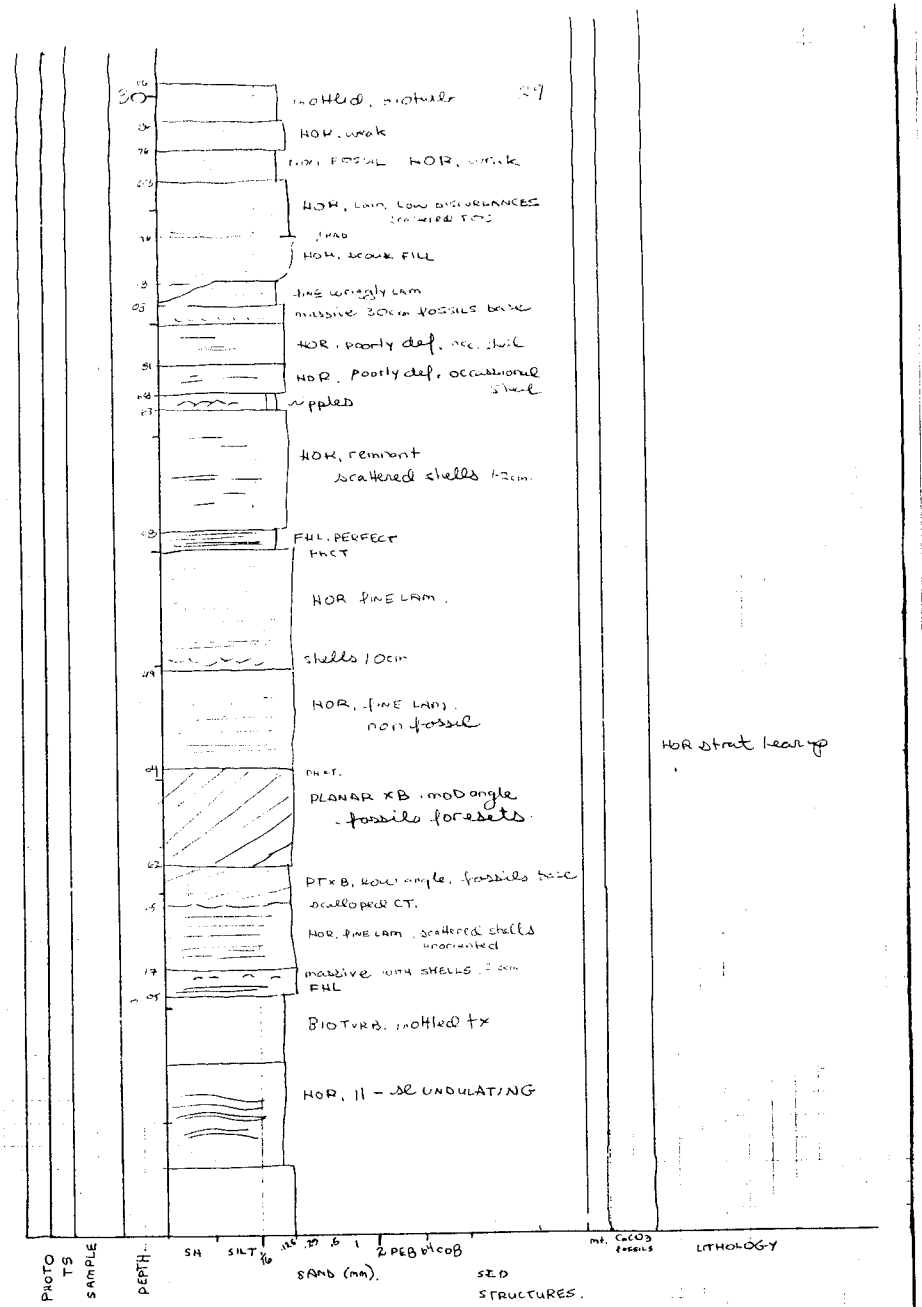
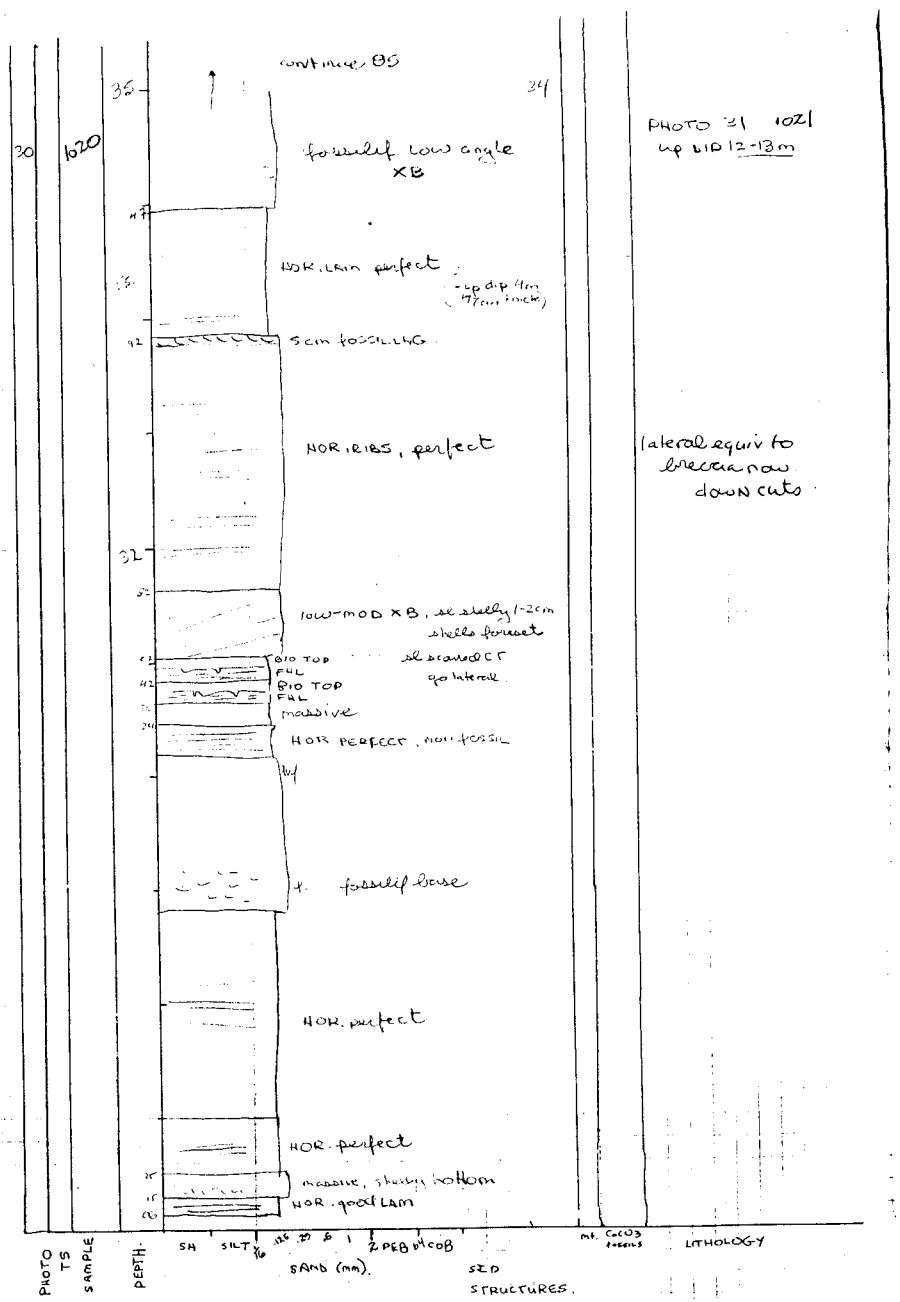
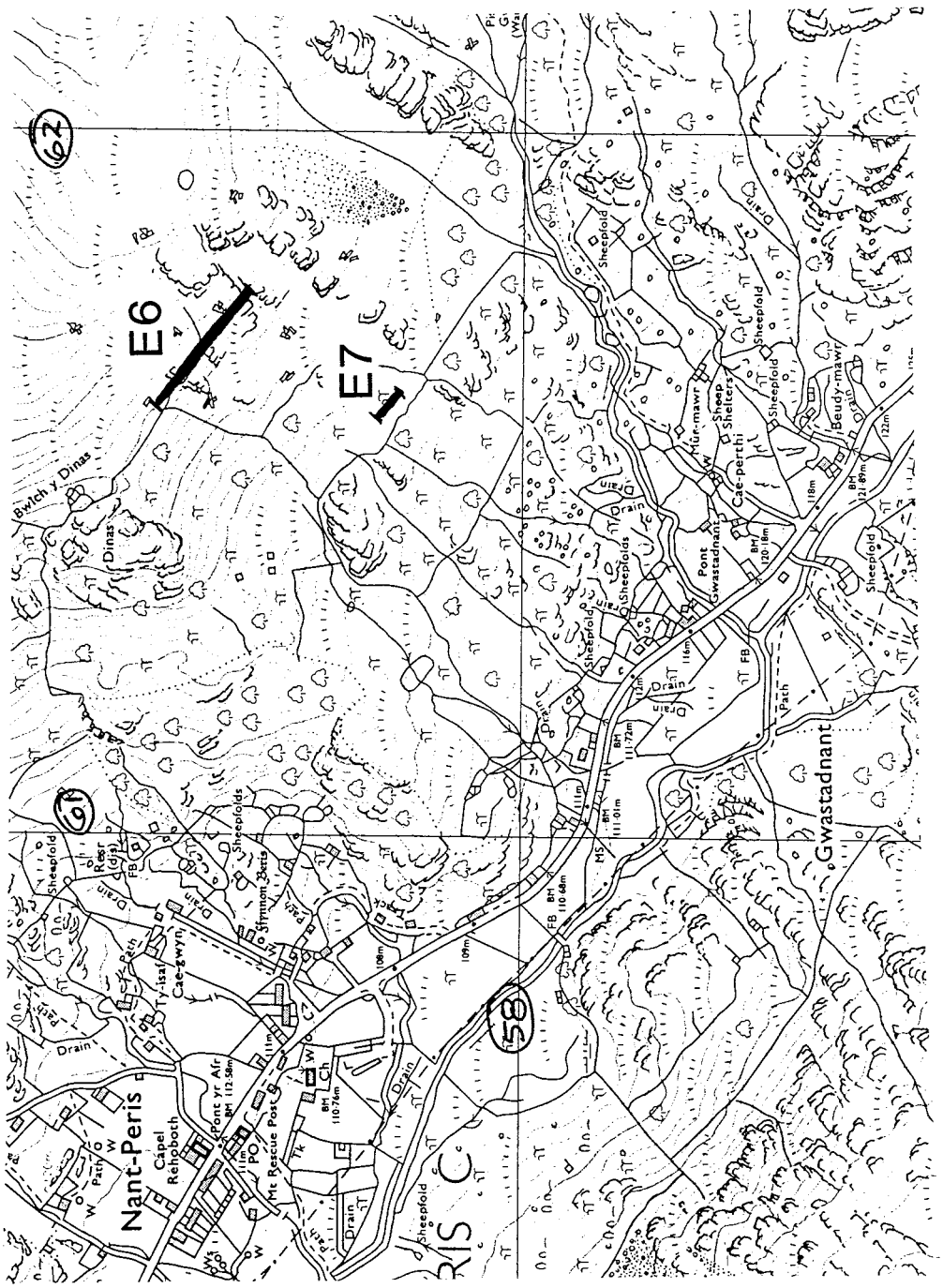


PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.
massive, mottled, patchy
HOR. weak
FAINT FOSSIL HOR. weak
HOR. faint, low disturbances
HOR. weak FILL
fine wriggly lam
massive 30cm fossils base
HOR. poorly def. occ. shell
HOR. poorly def. occasional shell
rippled
HOR. remnant scattered shells 1-2cm
FHL. PERFECT
FACT
HOR fine lam.
shells 10cm
HOR. (fine lam).
non fossil
PLANAR XB. mod angle
fossils foresets.
PT XB. low angle. fossils toe
developed CT.
HOR. fine lam. scattered shells unoriented
massive with shells 2 cm
FHL
BIOTURB. mottled tx
HOR. II - sl UNDULATING
HOR strat lean up

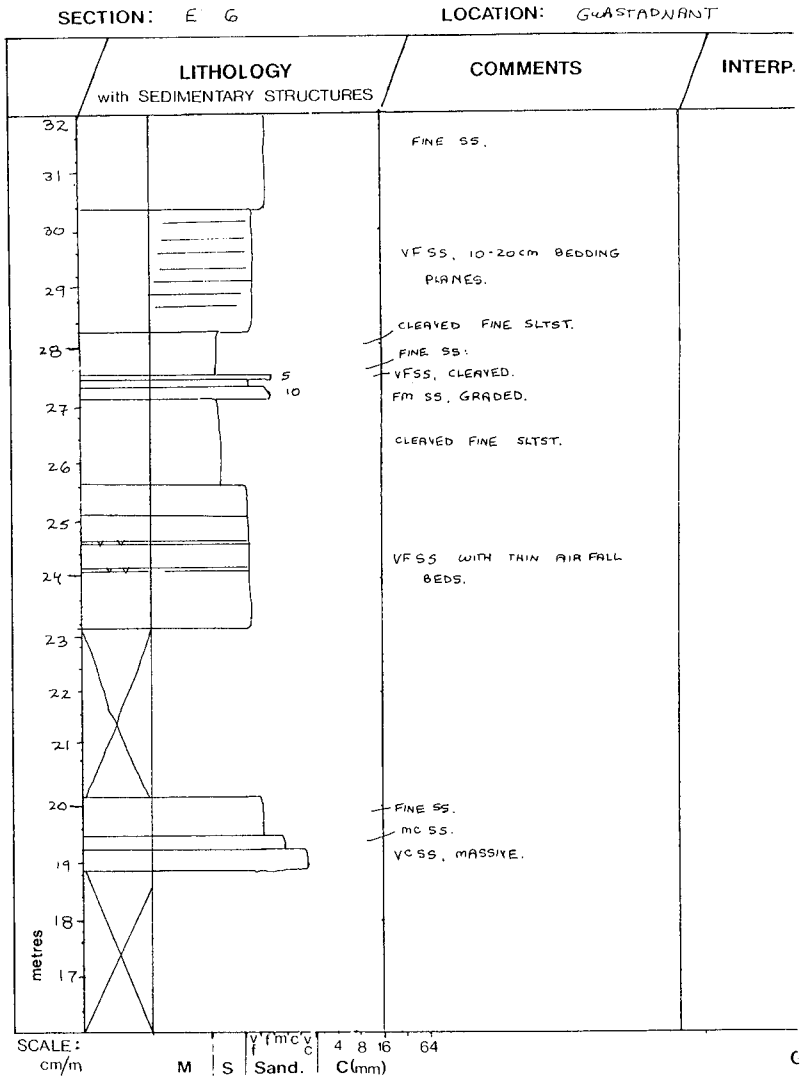

continued BS
fossilif low angle XB
HOR. faint perfect
- up dip 4m (47cm, inset)
5cm fossiling
HOR. RIBS, perfect
low-mod XB, sl shelly 1-2cm shells foreset
sl scoured CT
go laterally
BIO TOP
FHL
BIO TOP
FHL
massive
HOR PERFECT, non fossil
fossilif base
HOR. perfect
HOR. perfect
massive, shelly bottom
HOR. good LAM
PHOTO 31 1021
up DIP 12-13m
lateral equiv to breccia now down cuts
PHOTO
TS
SAMPLE
DEPTH
SH
SILT
SAND (mm).
PEB
COB
mt. CaCO3 fossils
LITHOLOGY
SED STRUCTURES.

LOCATION MAP.

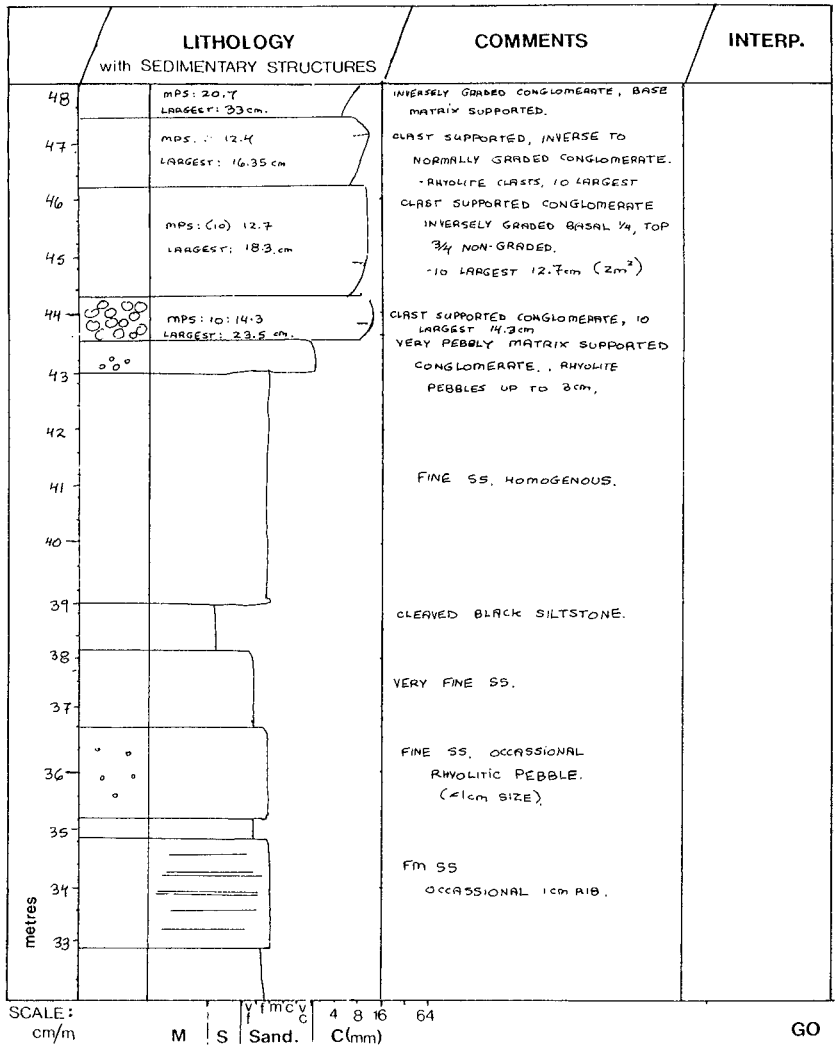


SECTION E6

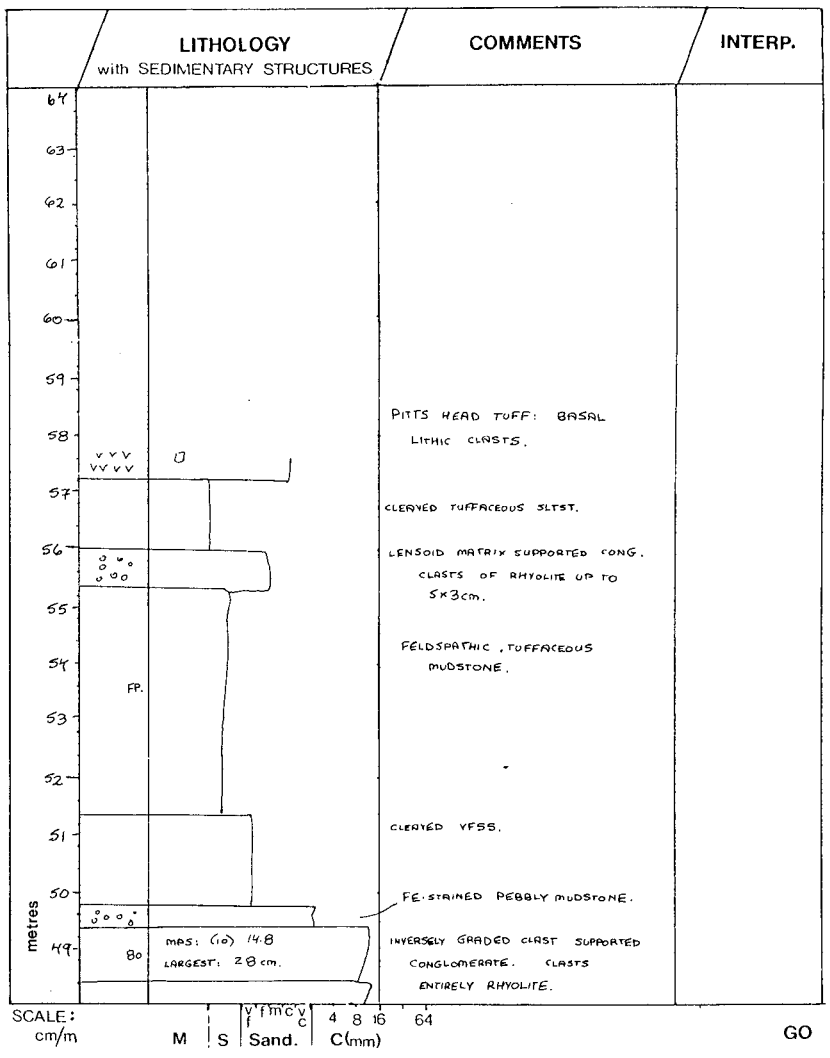
SECTION E6 LOCATION: Section starts 200 m to SE of Dinas (near Nant Peris) and continues along topographic contour to base of Pitts Head Tuff.



SECTION: E 6 LOCATION: GWASTADNANT

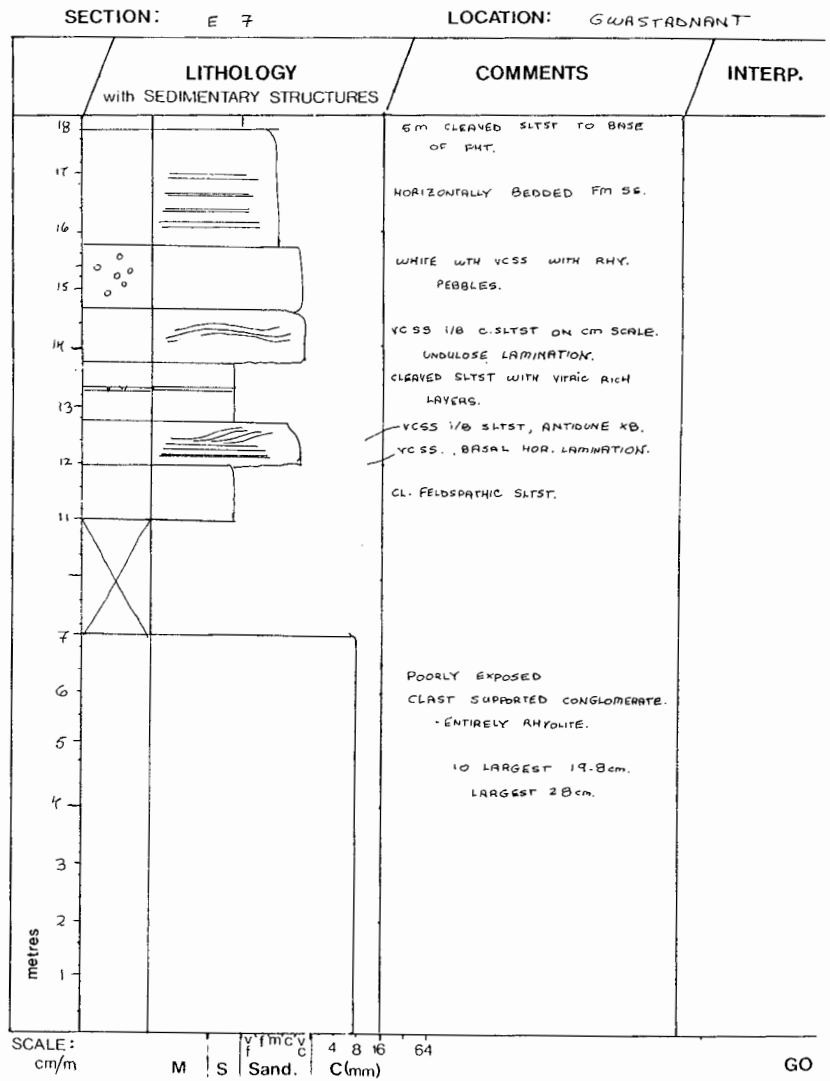


SECTION: E6 LOCATION: GWASTADNANT

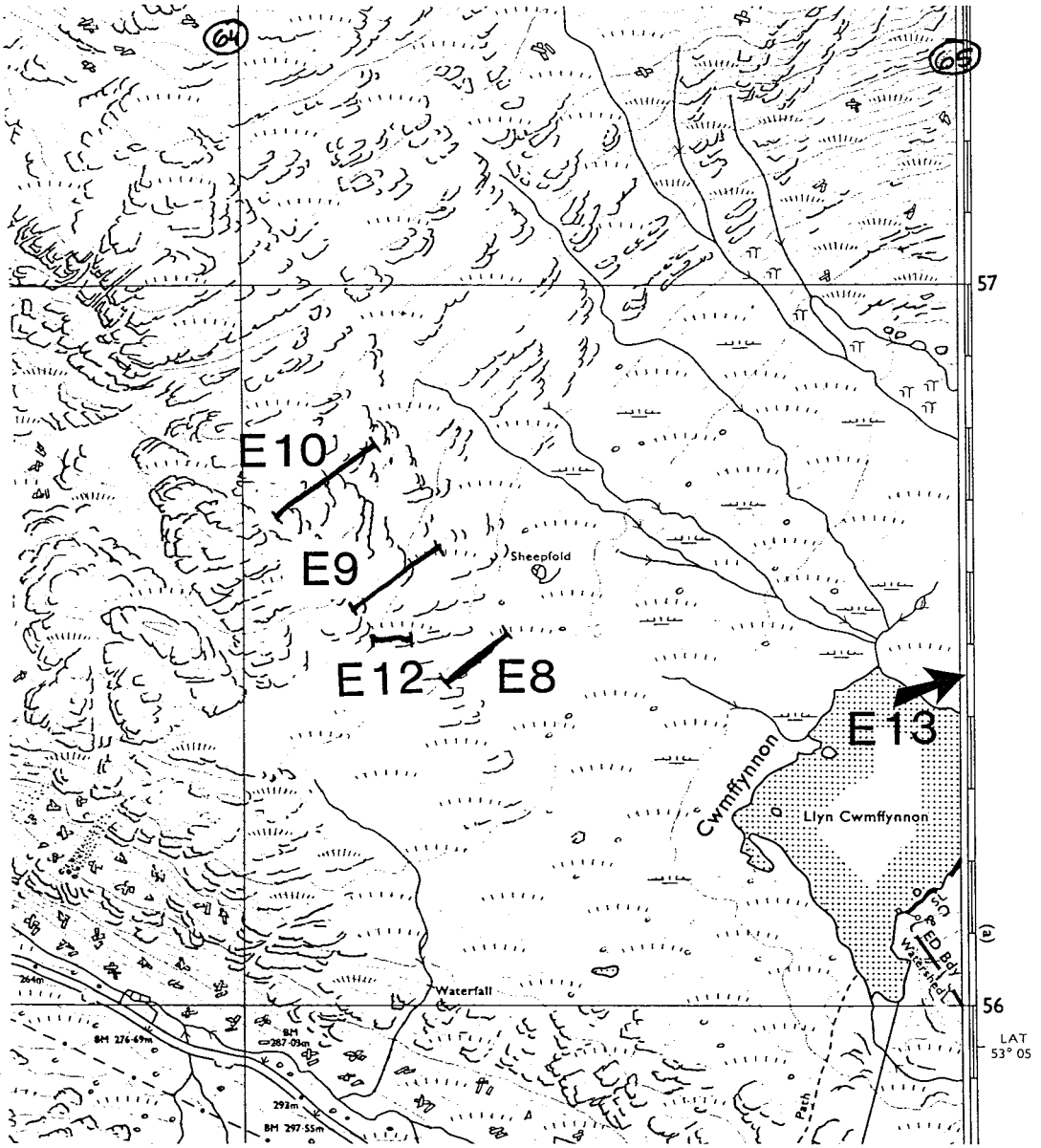


SECTION E7

SECTION E7 LOCATION: Section commences 50 m above discontinuous dry stone wall, 30 horizontal metres to WNW of base of Pitts Head Tuff and 250 horizontal metres to SW of top of SECTION E6.

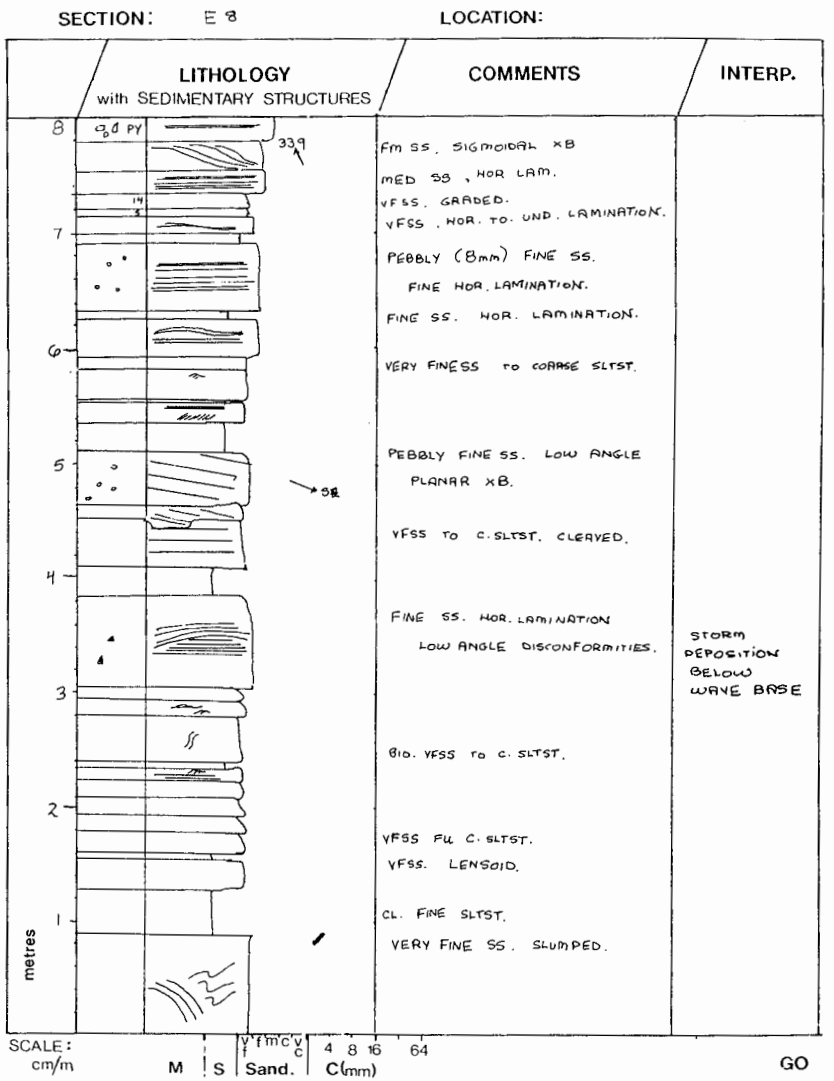


LOCATION MAP.

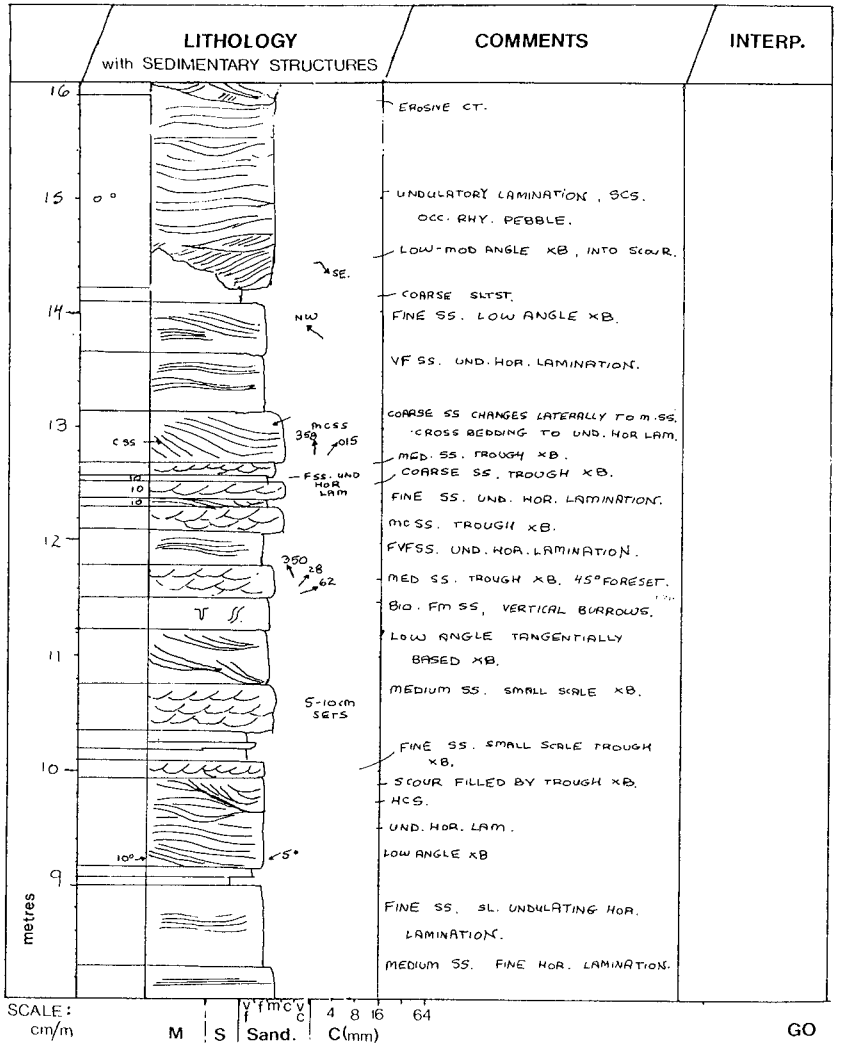


SECTION E8

SECTION E8 to E12 LOCATIONS: All sections located ca. 500 m to NW of Llyn Cwm-y-fynnon in crags beneath Pitts Head Tuff.

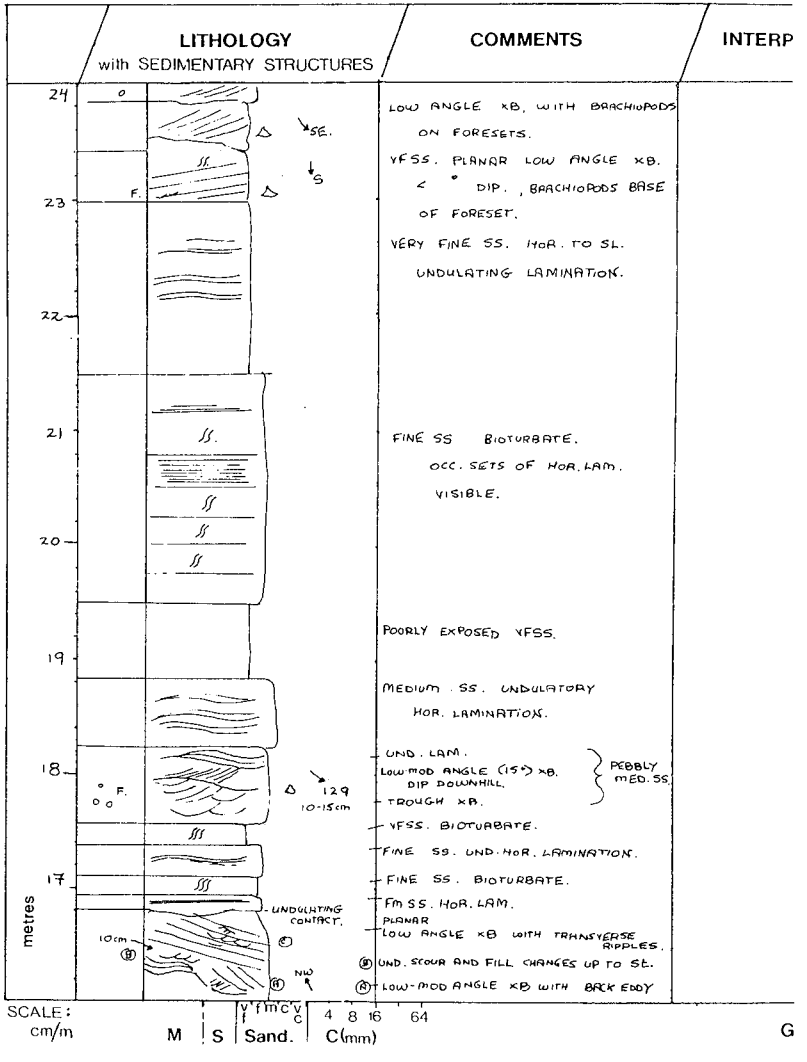


SECTION: E8 LOCATION:



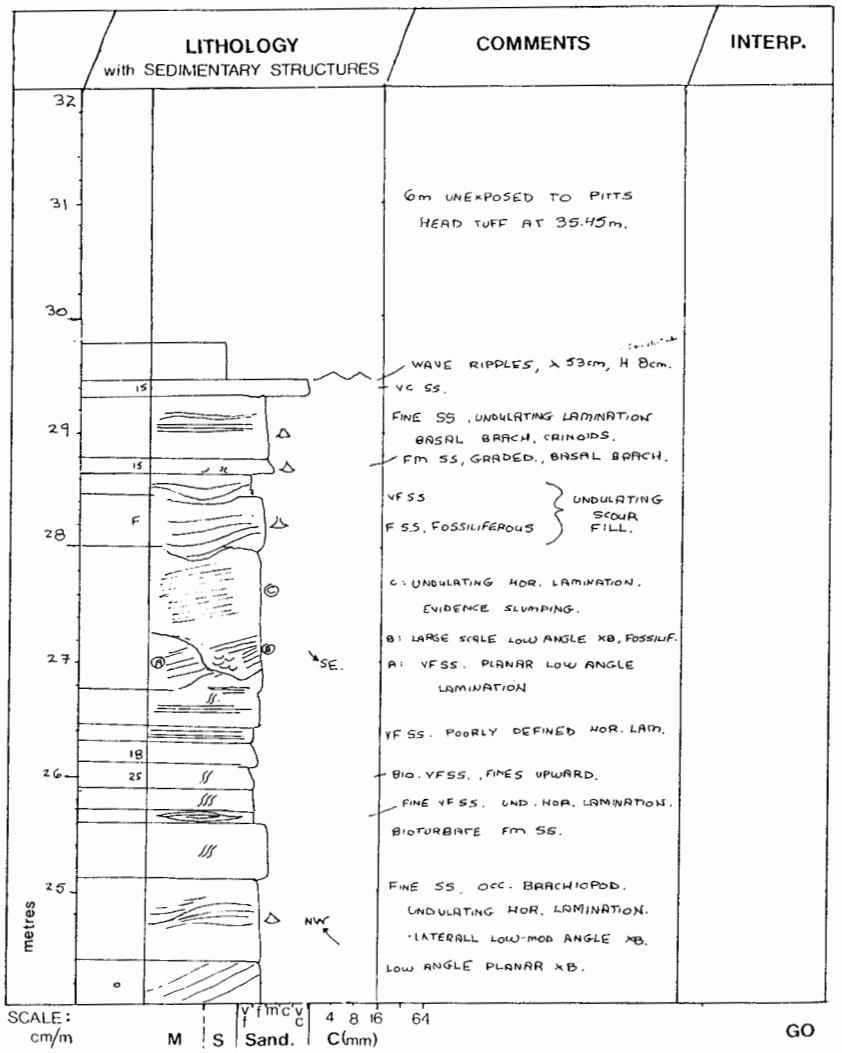
GO

SECTION: E8 LOCATION:

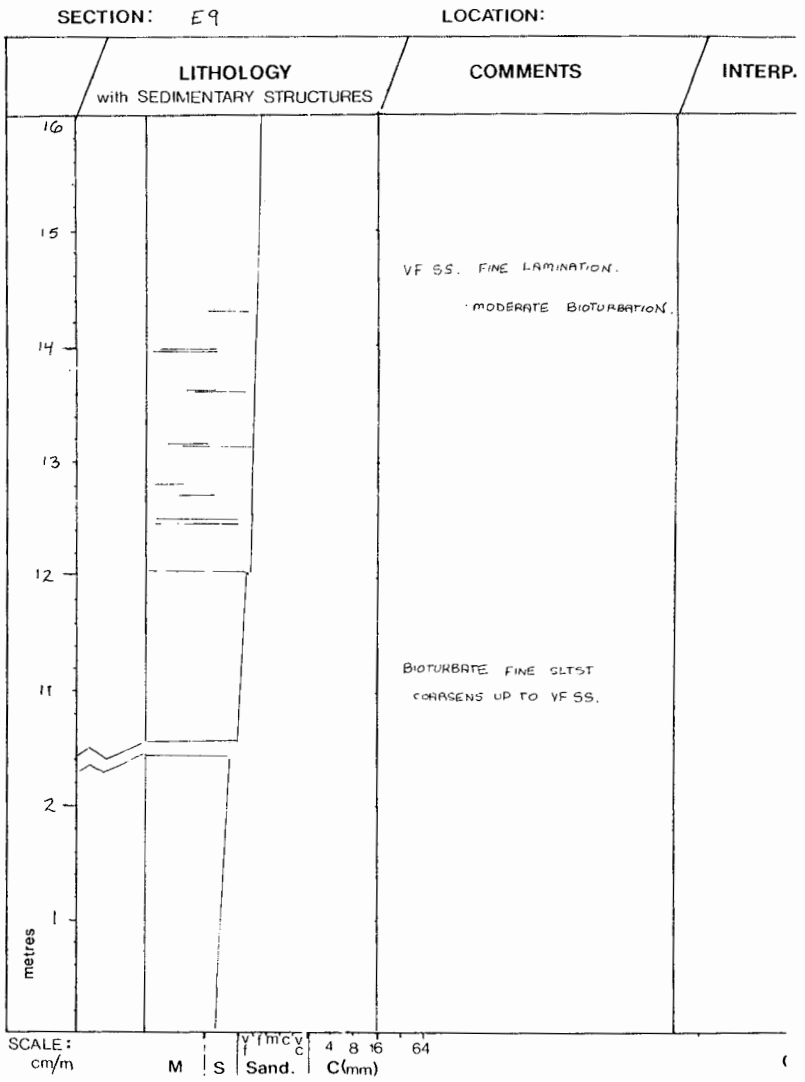


G

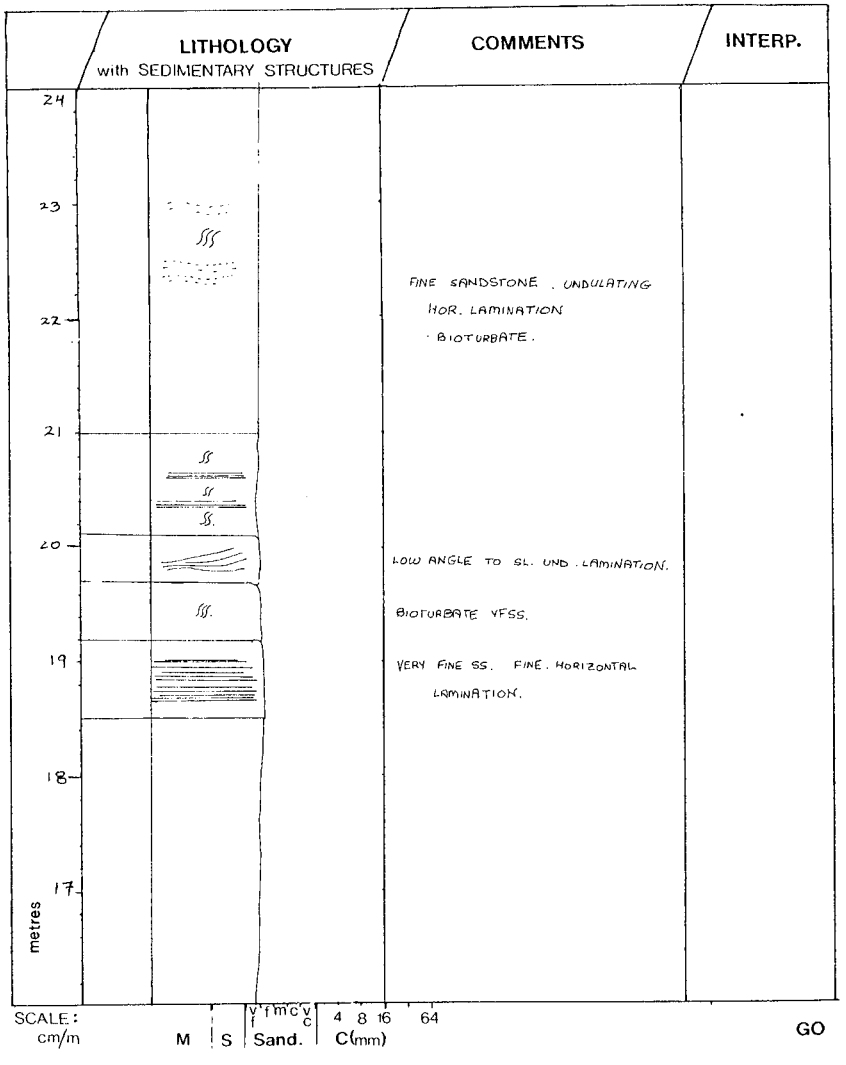
SECTION: E 8 LOCATION:



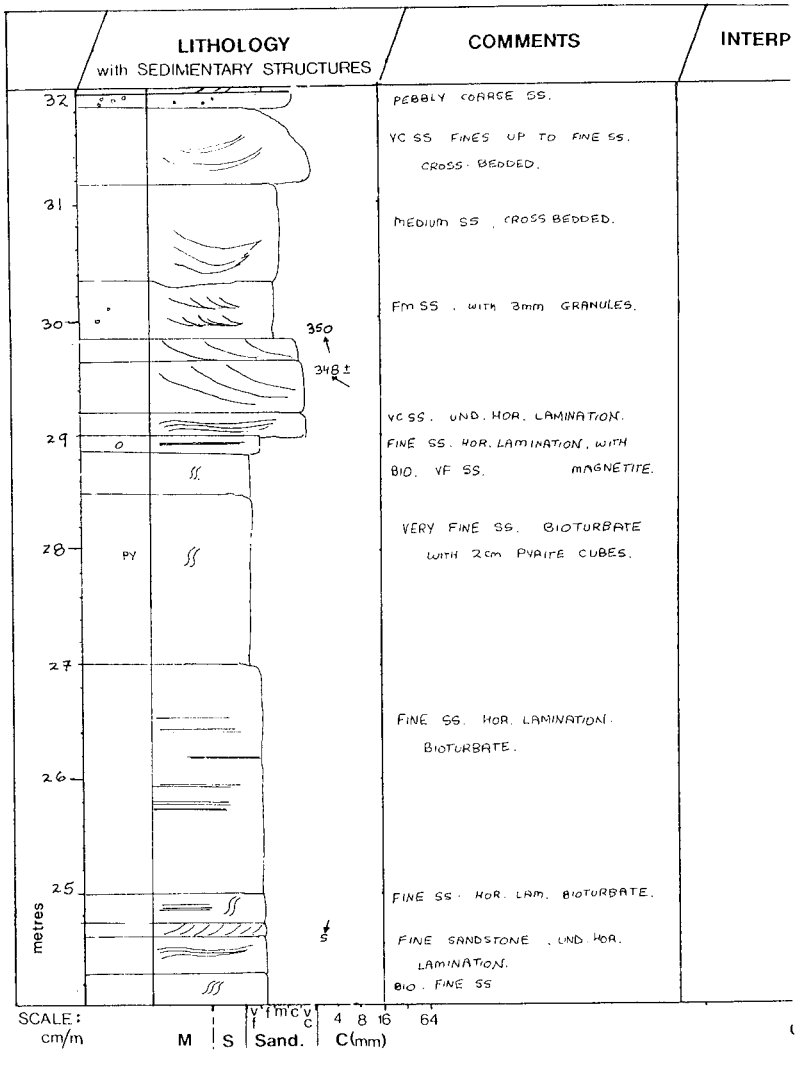
SECTION E9


SECTION: E9
LOCATION:
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTERP.
16
15
14
13
12
11
2
1
metres
VF SS. FINE LAMINATION.
· MODERATE BIOTURBATION.
BIOTURBATE FINE SLTST
COARSENS UP TO VF SS.
SCALE:
cm/m
M
S
v f
f
m
c
v c
Sand.
4 8 16 64
C(mm)

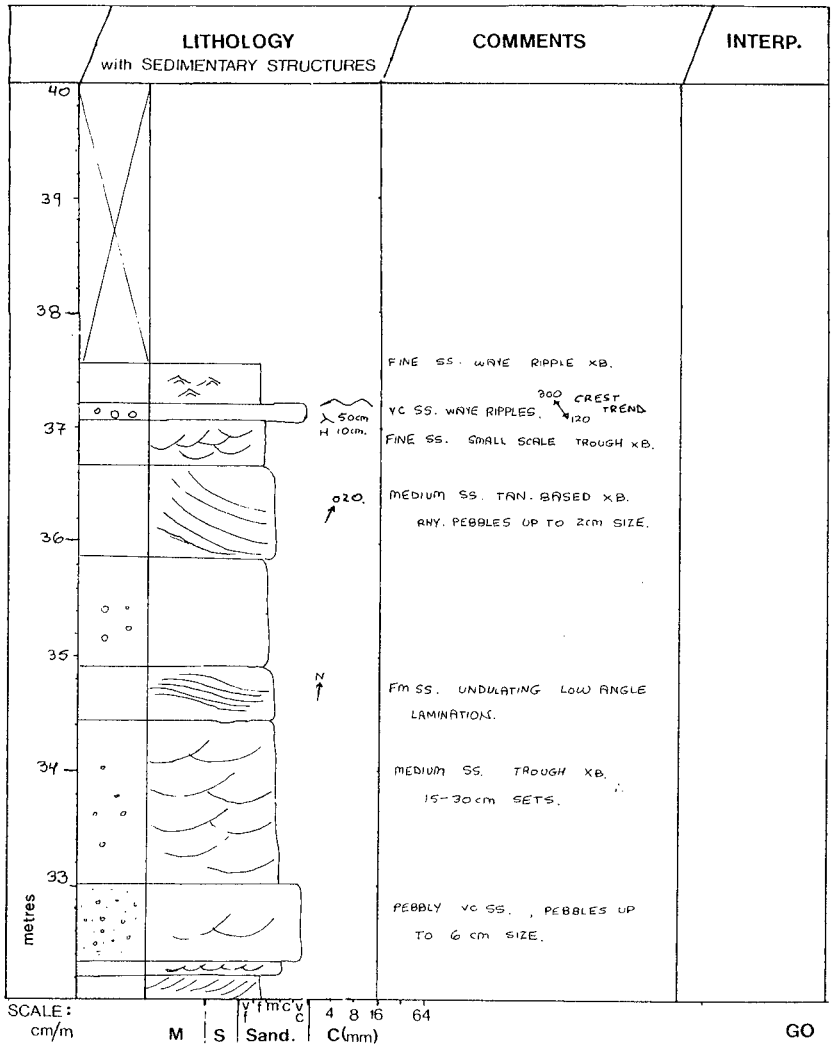
SECTION: E-9 LOCATION:



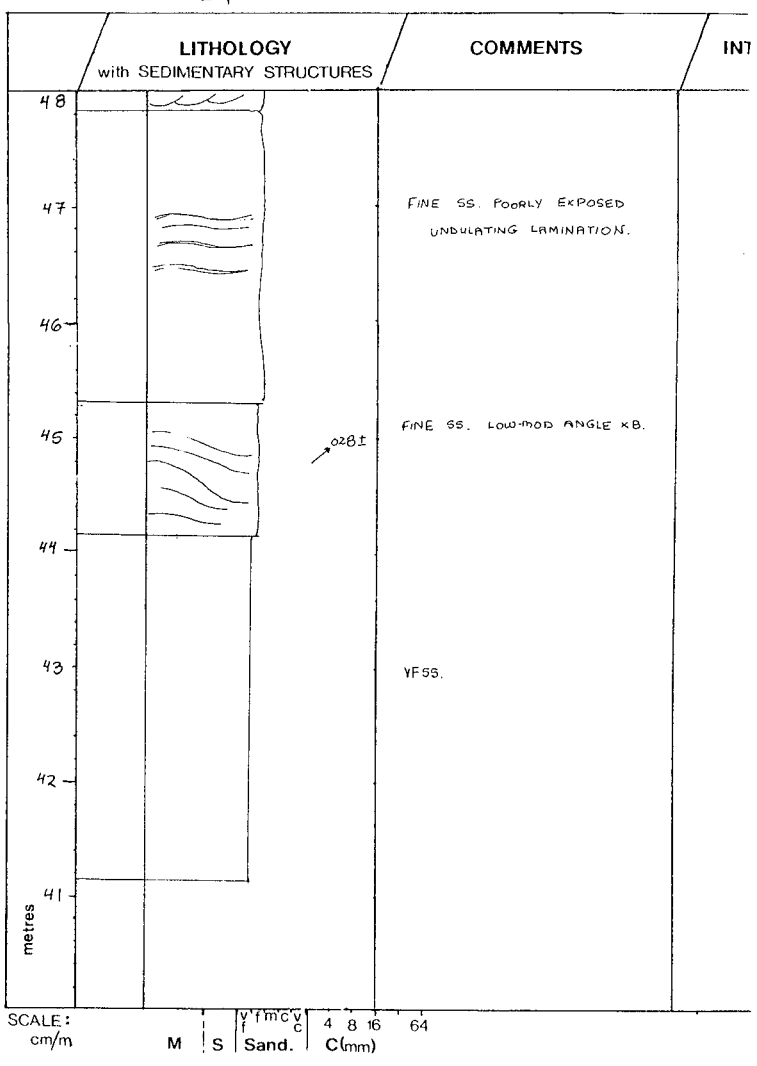
SECTION: E 9 LOCATION:



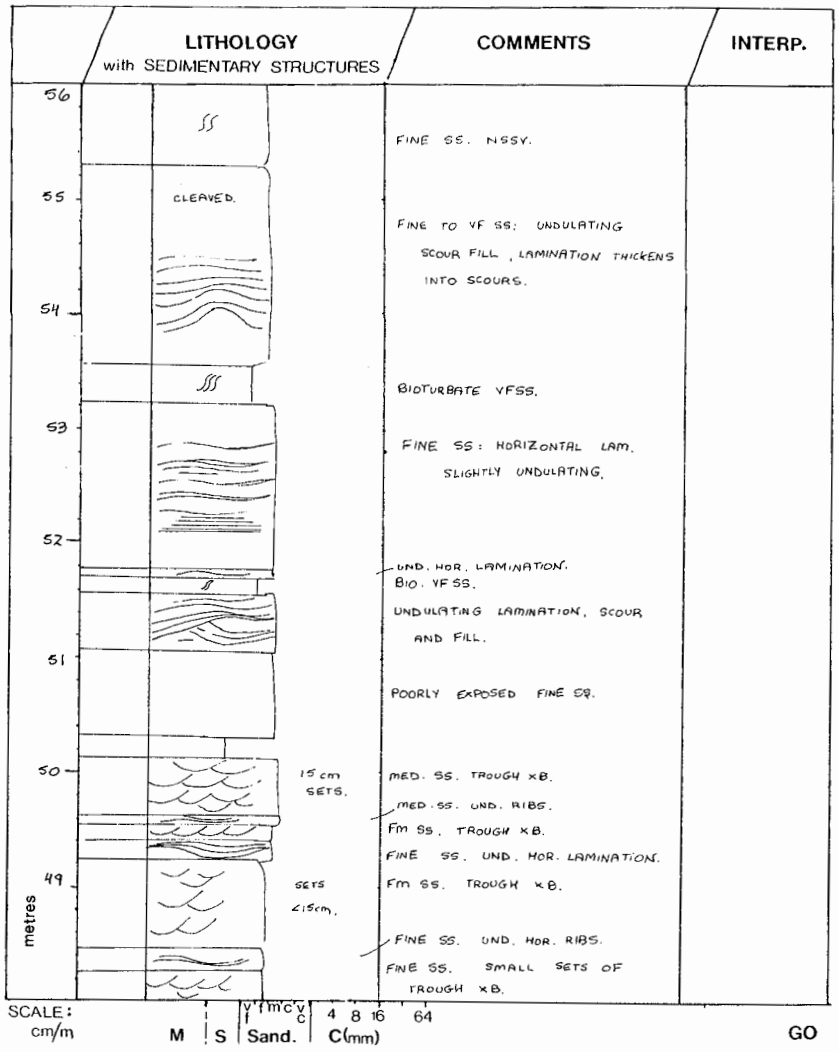
SECTION: E9 LOCATION:



SECTION: E9 LOCATION:

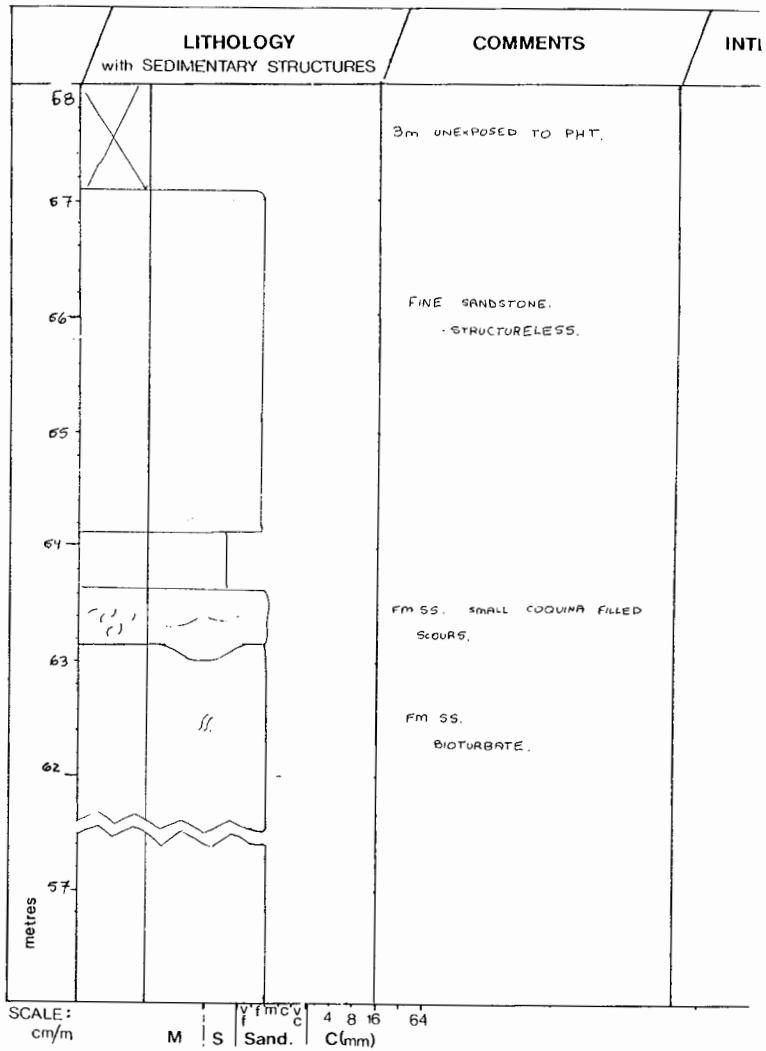


SECTION: E9 LOCATION:

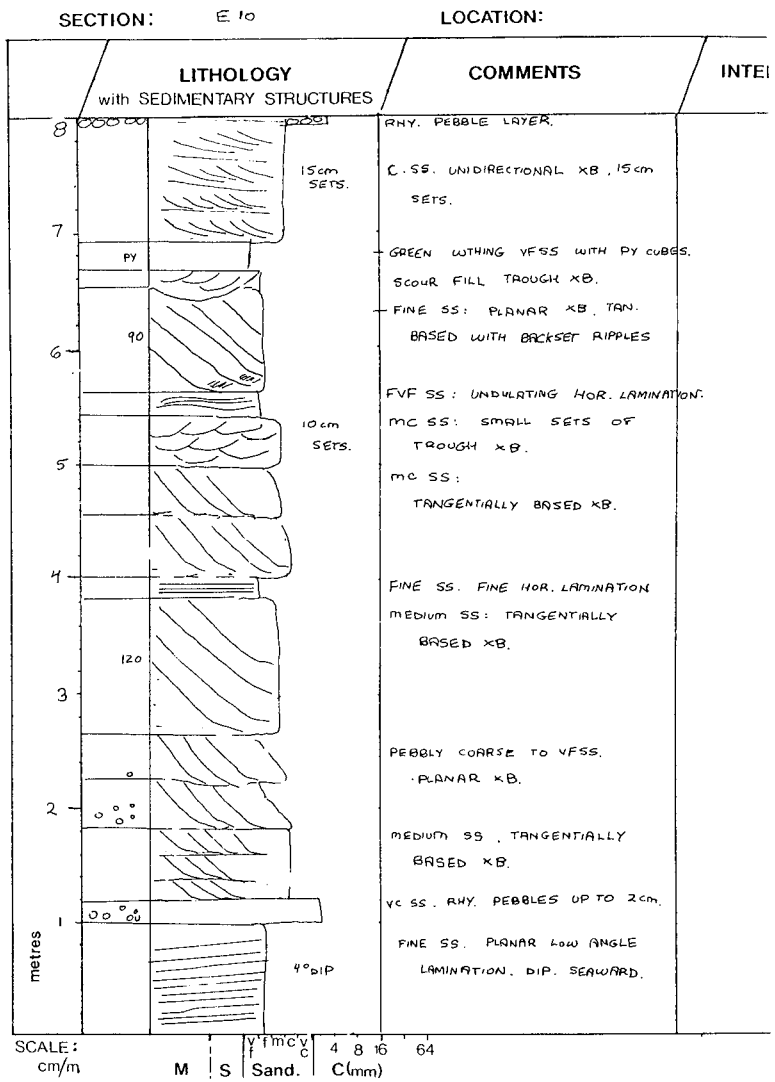


GO

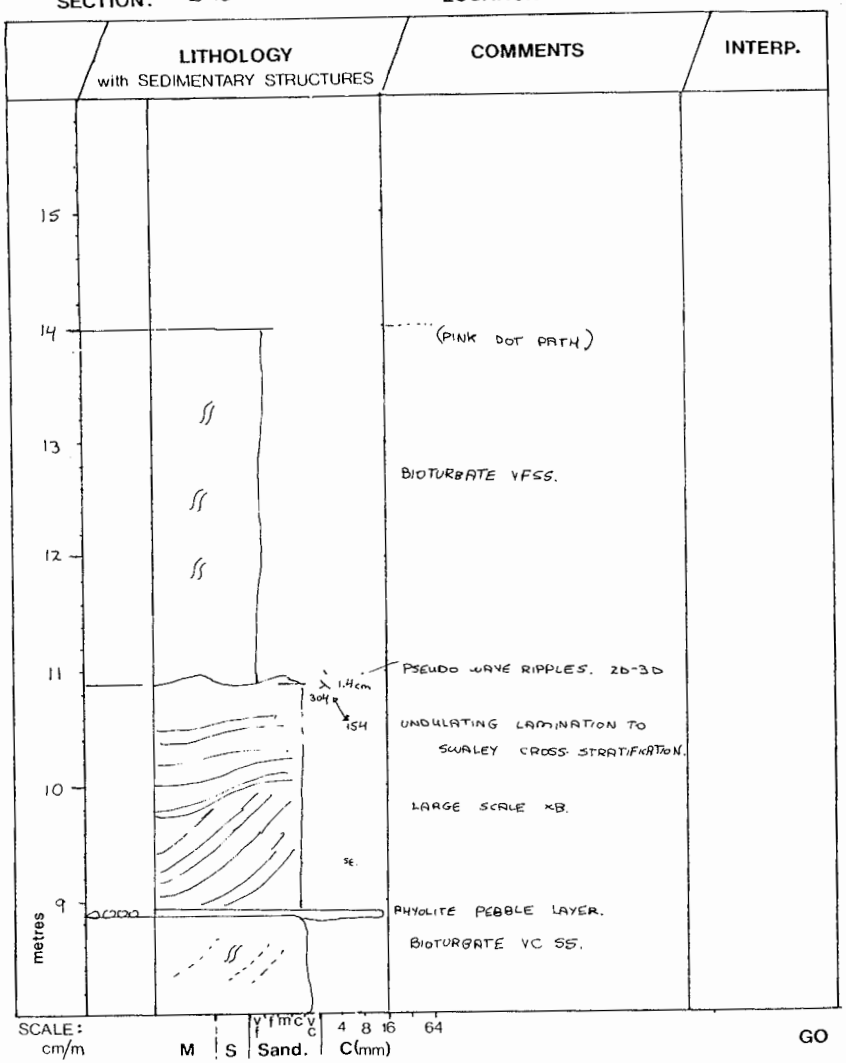
SECTION: E 9 LOCATION:



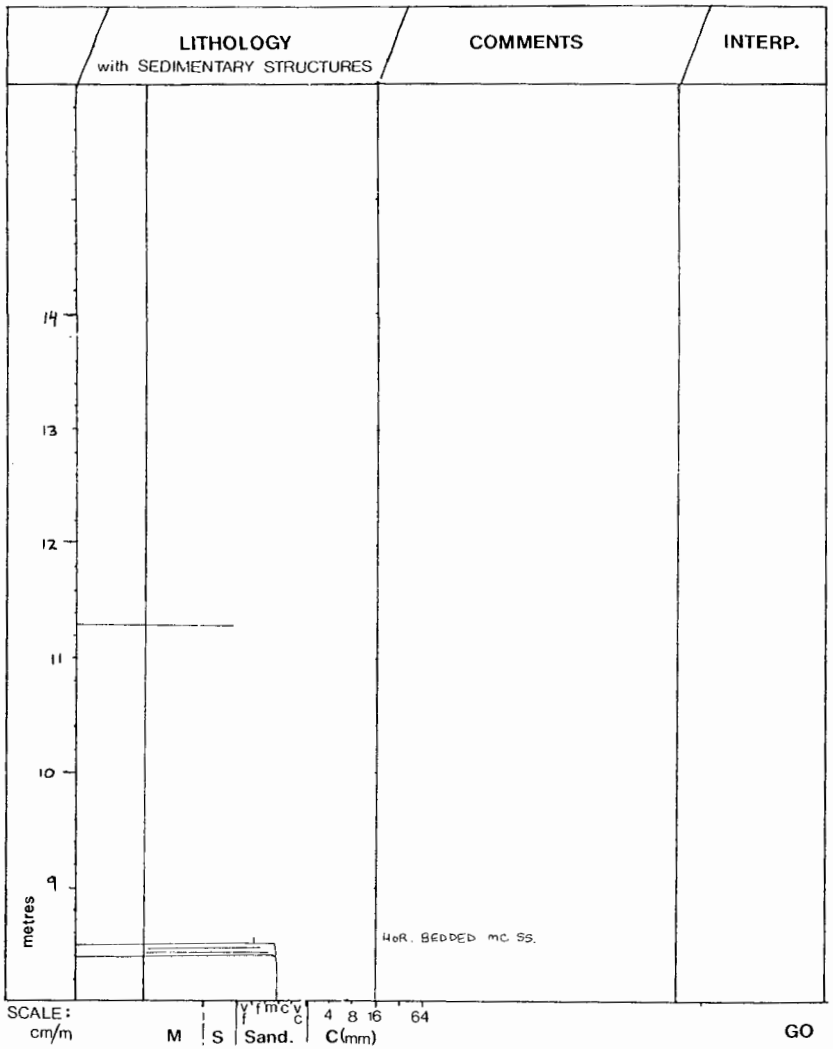
SECTION E10


SECTION: E 10
LOCATION:
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTE
RHY. PEBBLE LAYER.
C. SS. UNIDIRECTIONAL XB, 15cm SETS.
GREEN WTHING VFSS WITH PY CUBES.
SCOUR FILL TROUGH XB.
FINE SS: PLANAR XB. TAN.
BASED WITH BACKSET RIPPLES
FVF SS: UNDULATING HOR. LAMINATION.
MC SS: SMALL SETS OF TROUGH XB.
mc SS: TANGENTIALLY BASED XB.
FINE SS. FINE HOR. LAMINATION
MEDIUM SS: TANGENTIALLY BASED XB.
PEBBLY COARSE TO VFSS. PLANAR XB.
MEDIUM SS, TANGENTIALLY BASED XB.
vc SS. RHY. PEBBLES UP TO 2cm.
FINE SS. PLANAR LOW ANGLE LAMINATION. DIP. SEAWARD.
15cm SETS.
10cm SETS.
PY
90
120
4° DIP
metres
1
2
3
4
5
6
7
8
SCALE: cm/m
M
S
vf f m c vc
Sand.
4 8 16 64
C(mm)

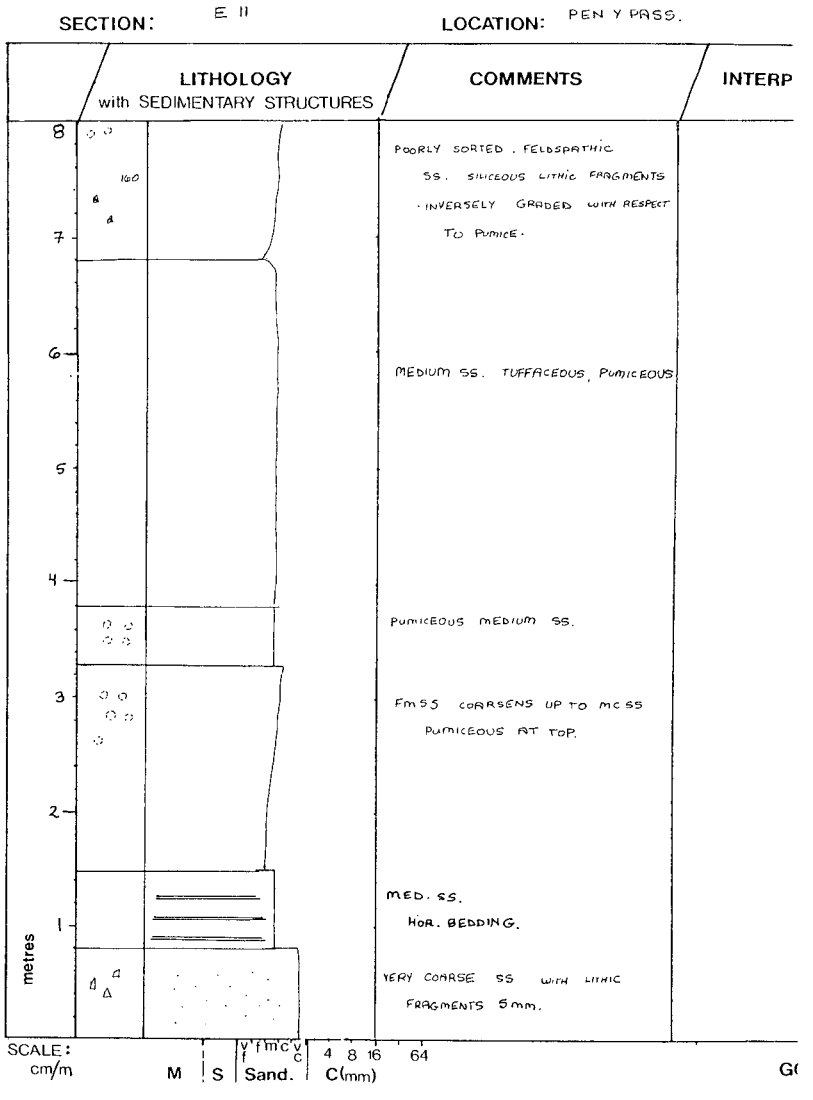
SECTION: E 10 LOCATION:



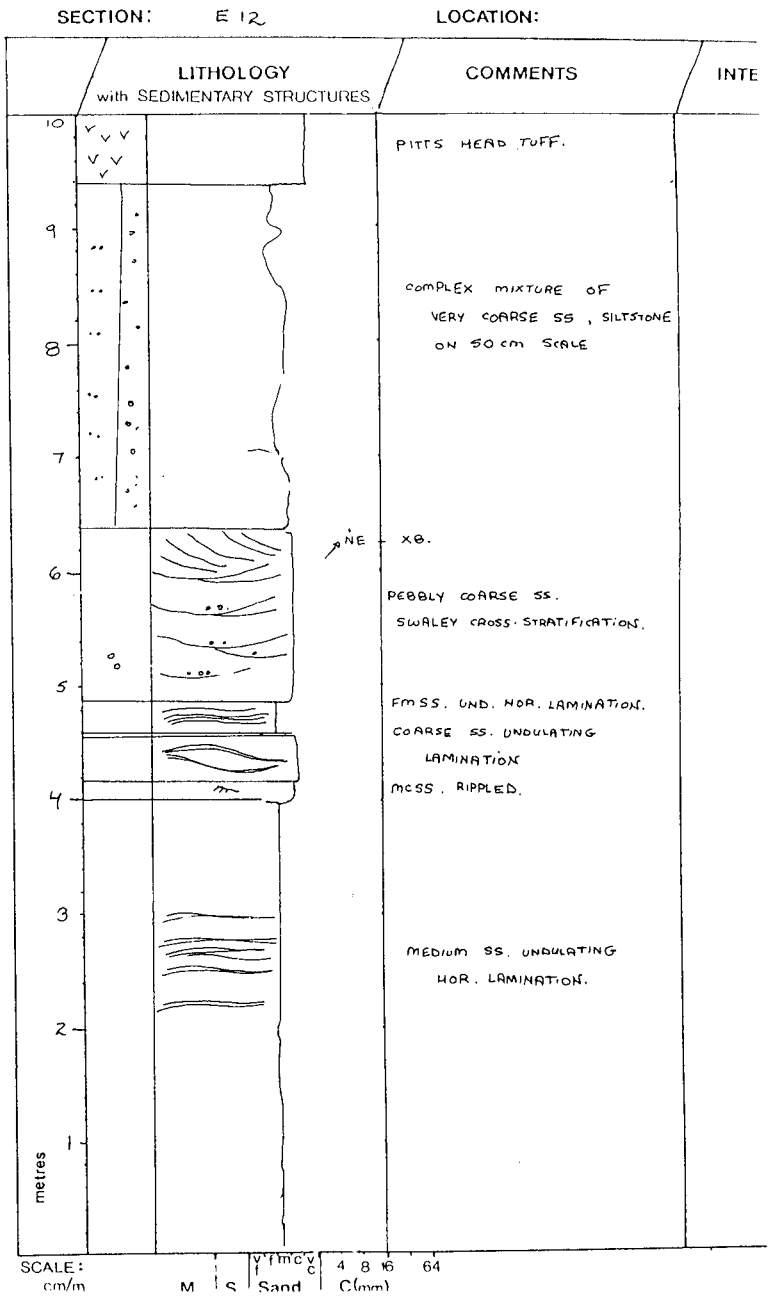
SECTION: E II LOCATION: PEN Y PASS



SECTION E11

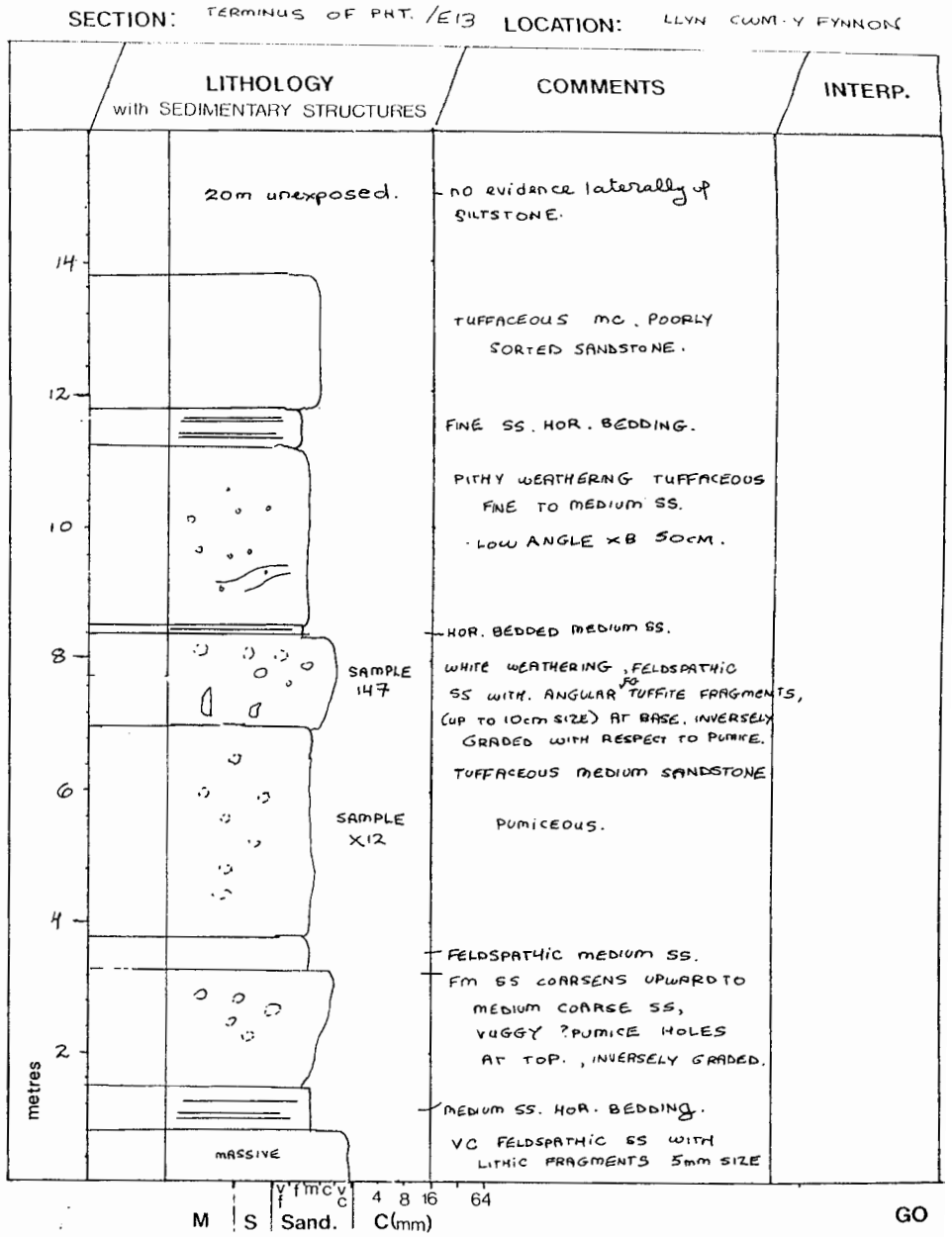

SECTION: E 11
LOCATION: PEN Y PASS.
LITHOLOGY with SEDIMENTARY STRUCTURES
COMMENTS
INTERP
8
7
6
5
4
3
2
1
metres
POORLY SORTED . FELDSPATHIC SS. SILICEOUS LITHIC FRAGMENTS . INVERSELY GRADED WITH RESPECT TO PUMICE.
MEDIUM SS. TUFFACEOUS, PUMICEOUS
PUMICEOUS MEDIUM SS.
Fm SS COARSENS UP TO mc SS PUMICEOUS AT TOP.
MED. SS. HOR. BEDDING.
VERY COARSE SS WITH LITHIC FRAGMENTS 5mm.
SCALE: cm/m
M
S
v f f m c v c
Sand.
4 8 16 64
C(mm)
G(

SECTION E12

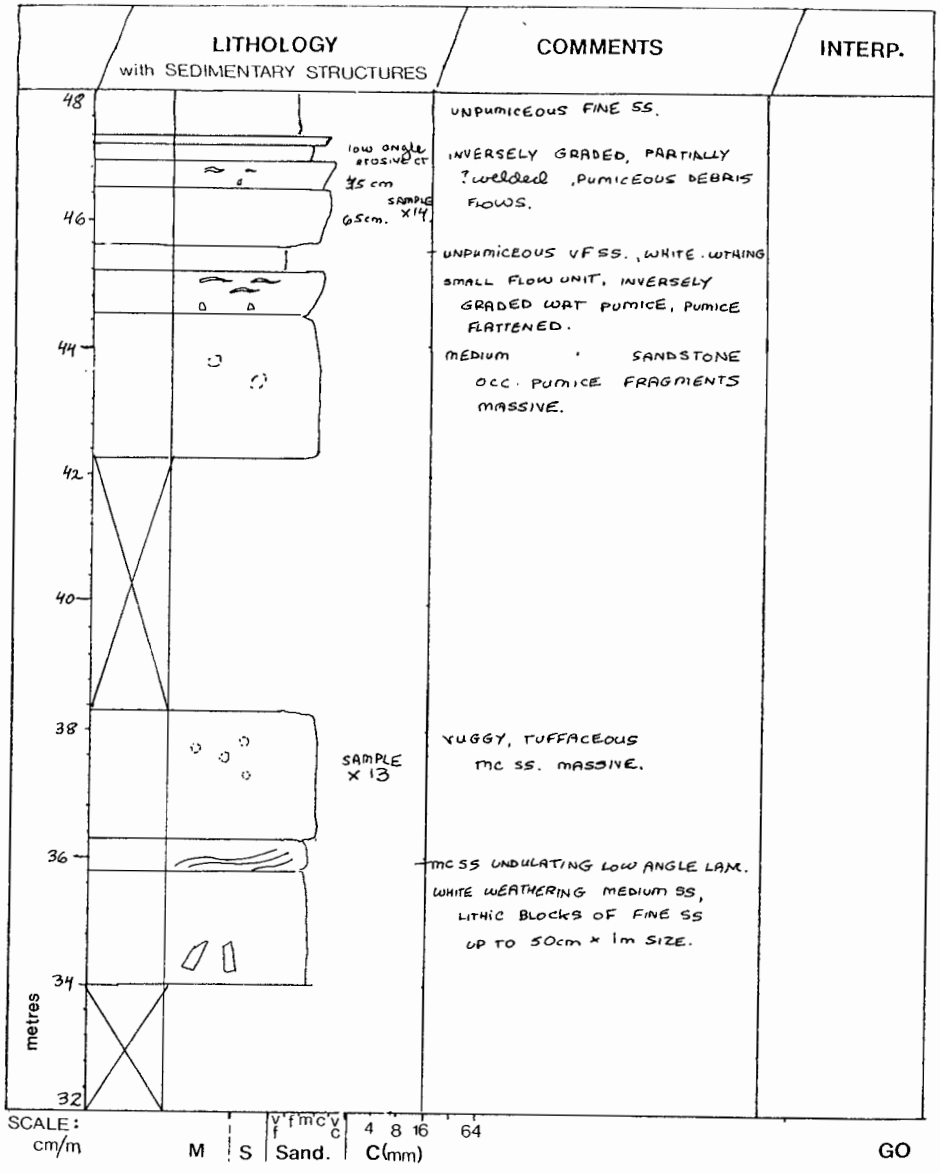

SECTION: E 12
LOCATION:
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTE
PITTS HEAD TUFF.
COMPLEX MIXTURE OF
VERY COARSE SS, SILTSTONE
ON 50 cm SCALE
NE
XB.
PEBBLY COARSE SS.
SWALEY CROSS-STRATIFICATION.
FmSS. UND. HOR. LAMINATION.
COARSE SS. UNDULATING
LAMINATION
mcSS. RIPPLED.
MEDIUM SS. UNDULATING
HOR. LAMINATION.
metres
10
9
8
7
6
5
4
3
2
1
SCALE:
cm/m
M
S
Sand
v f m c v c
4 8 16 64
C (mm)

SECTION E 13

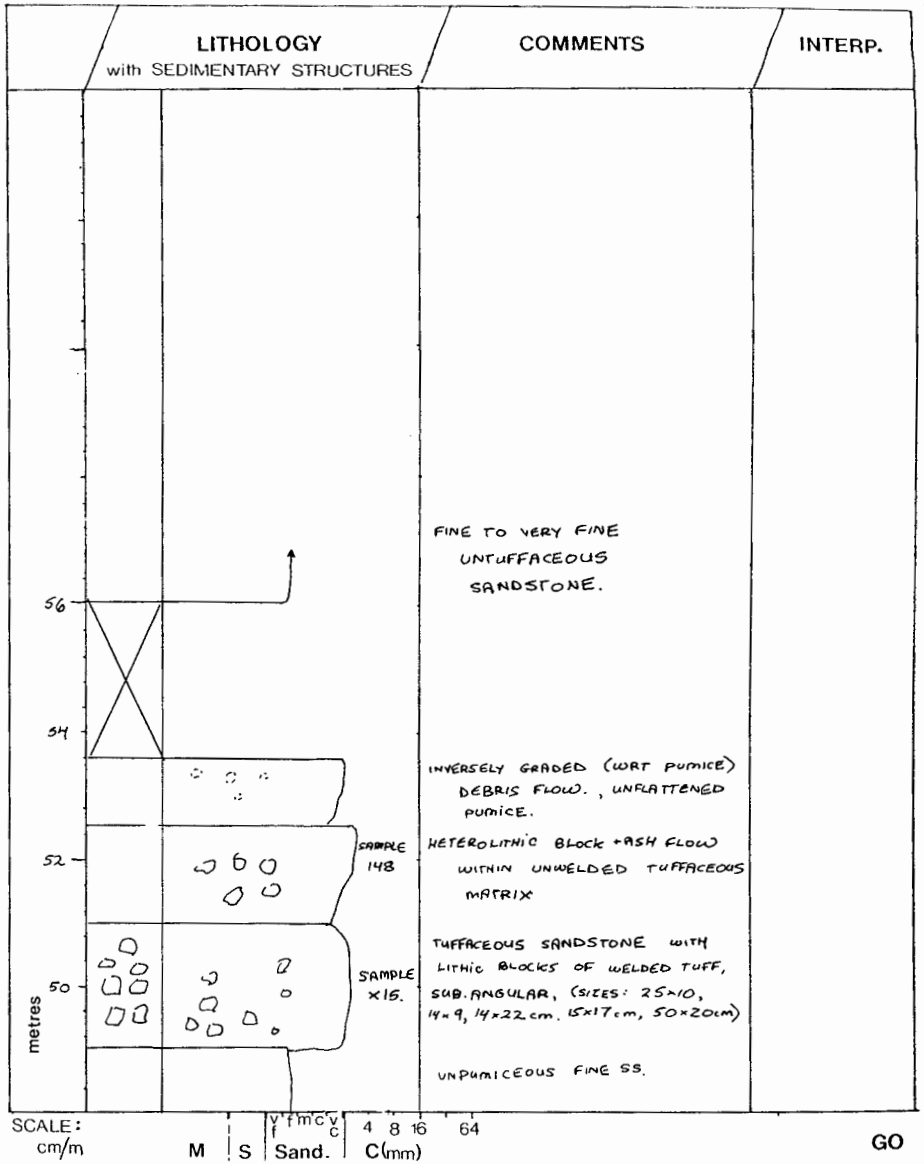
SECTION E13 LOCATION: Section through Pitts Head Tuff at Cwmyffynnon. Section starts at lowest oucrops of distal facies of Pitts Head Tuff directly to SW of Nantygwryd stream.



SECTION: TERMINUS OF PRT. E13 LOCATION: LLYN CWM-Y-FYNNON.

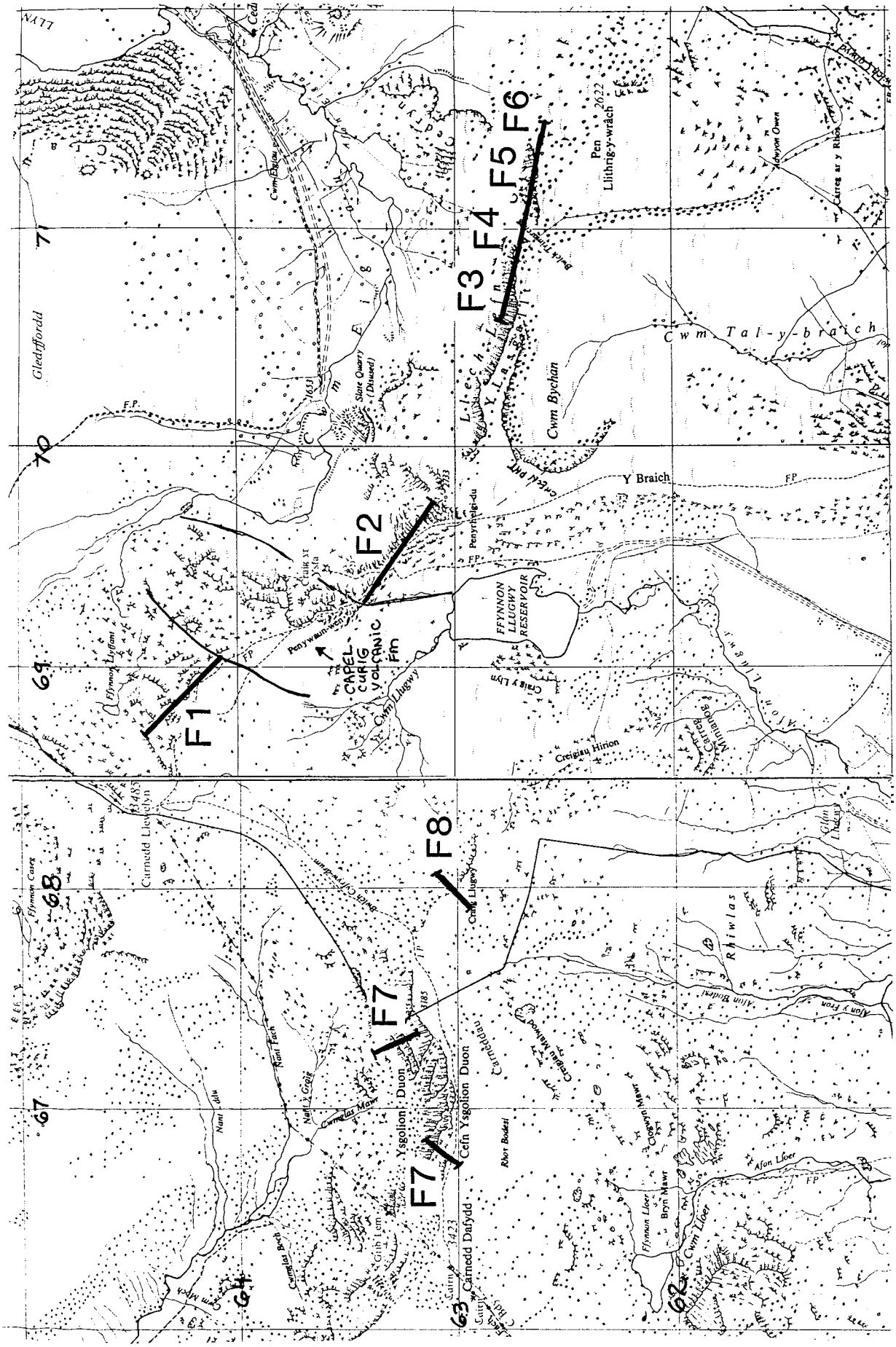


SECTION: TERMINUS OF PITTS HEAD TUFF. E13 LOCATION:



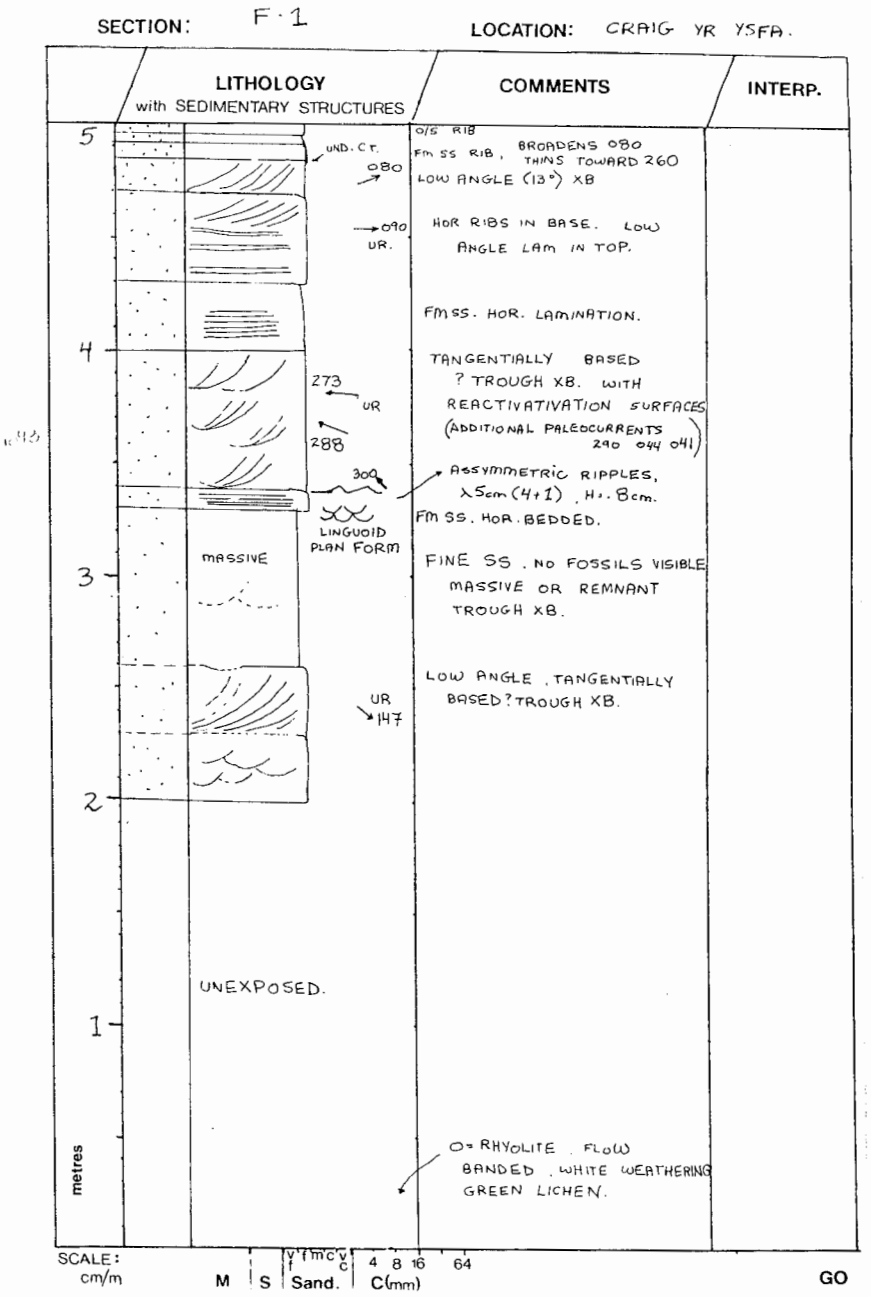
AREA F

LOCATION MAP.

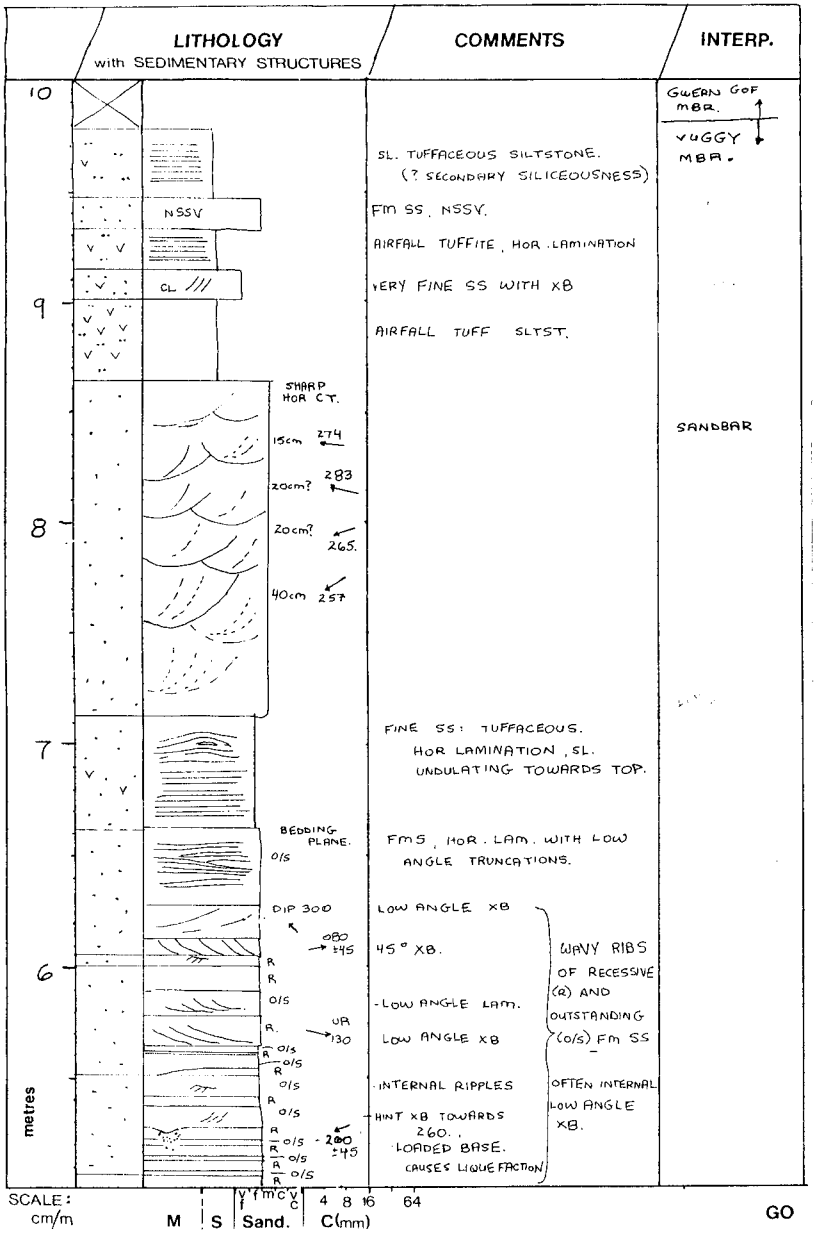

F1
F2
F3
F4
F5
F6
F7
F7
F8
CAPEL CURIG volcanic rm
Gledffordd
Cwm Tal-y-braich
Y Braich
Cwm Bychan
Pen Llithrig-y-wrach 2622
Carnedd Dafydd 3423
Carnedd Llewelyn 3485
Cefn Ysgolion Duon
Ysgolion Duon
Ffynnon Llugwy
Afon Llugwy
Afon Lledr
Afon Llafar
Afon Llyfni
Afon Llyfnant
Afon Lloer
Ffynnon Lloer
Cwm Llugwy
Cwm Llafar
Cwm Eigiau
Cwm Lloer
Cwm Llyfnant
Cwm Dyli
Cwm Cowlyd
Cwm Llafar
Cwm Llugwy
Cwm Eigiau
Cwm Lloer
Cwm Llyfnant
Cwm Dyli
Cwm Cowlyd
Llyn Cowlyd
Llyn Eigiau
Llyn Llugwy
Llyn Lloer
Llyn Llyfnant
Llyn Dyli

SECTION F1

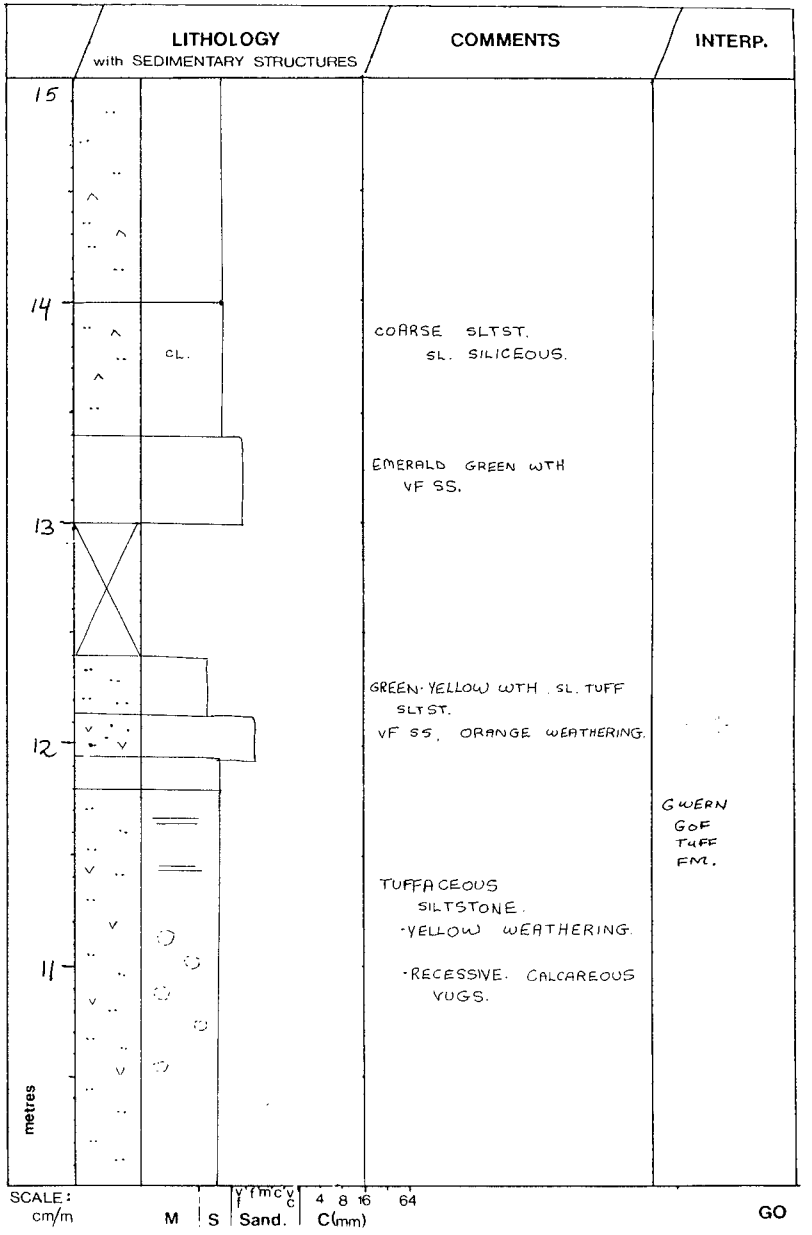
SECTION F1 LOCATION: Locate rhyolite pluton to SE of Ffynnon Llyffant. Section starts at stratigraphic top of rhyolite pluton 50 metres to NE of footpath between Bwlch Craig and Carnedd Llewelyn, and steps to ESE along top slops of Cwm to base of Garth Tuff (CCVF).



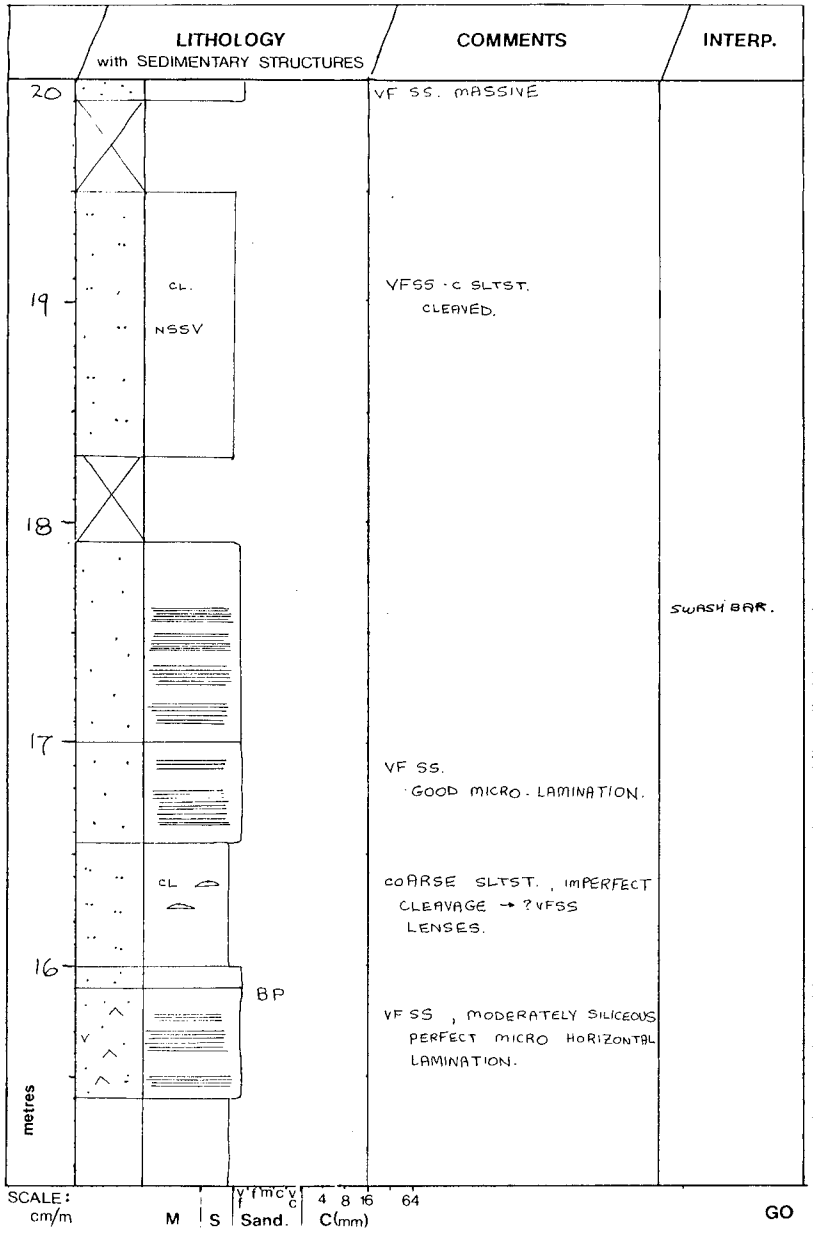
SECTION: F·1 LOCATION: CRAIG YR YSFA.



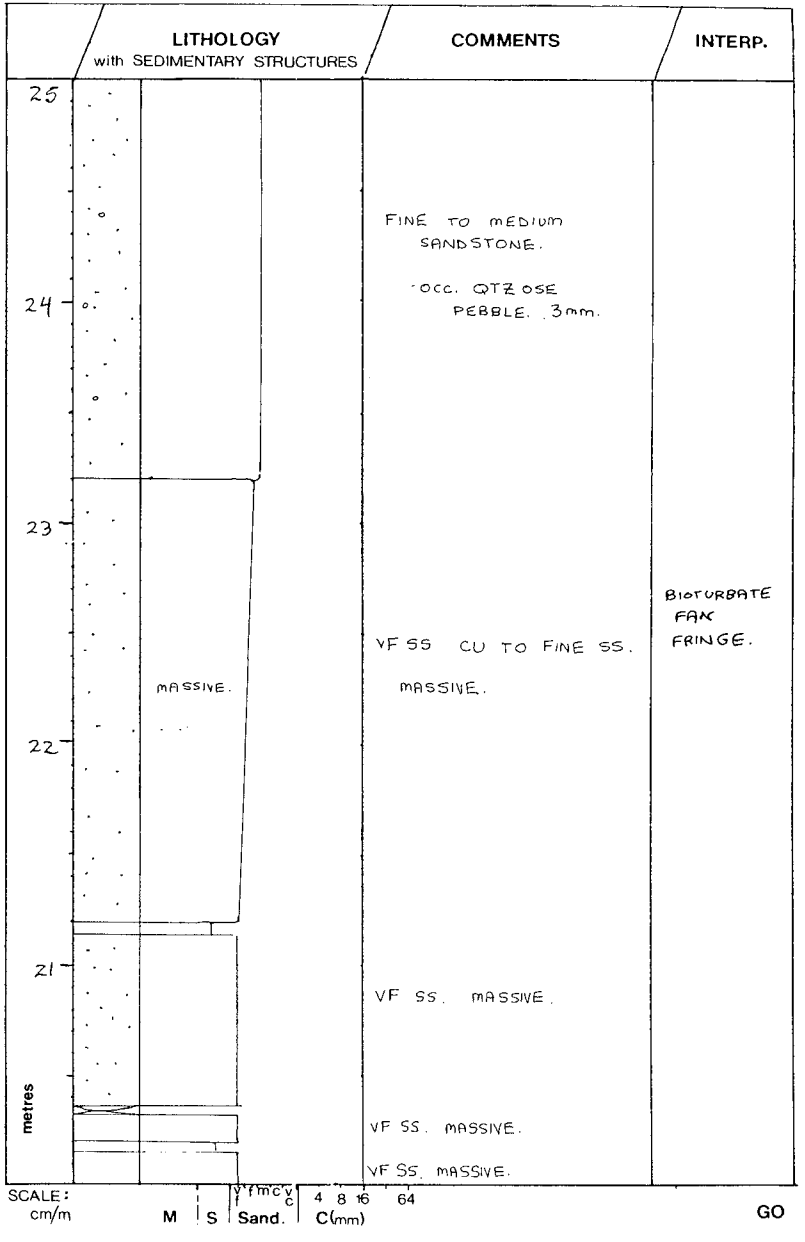
SECTION: LOCATION:



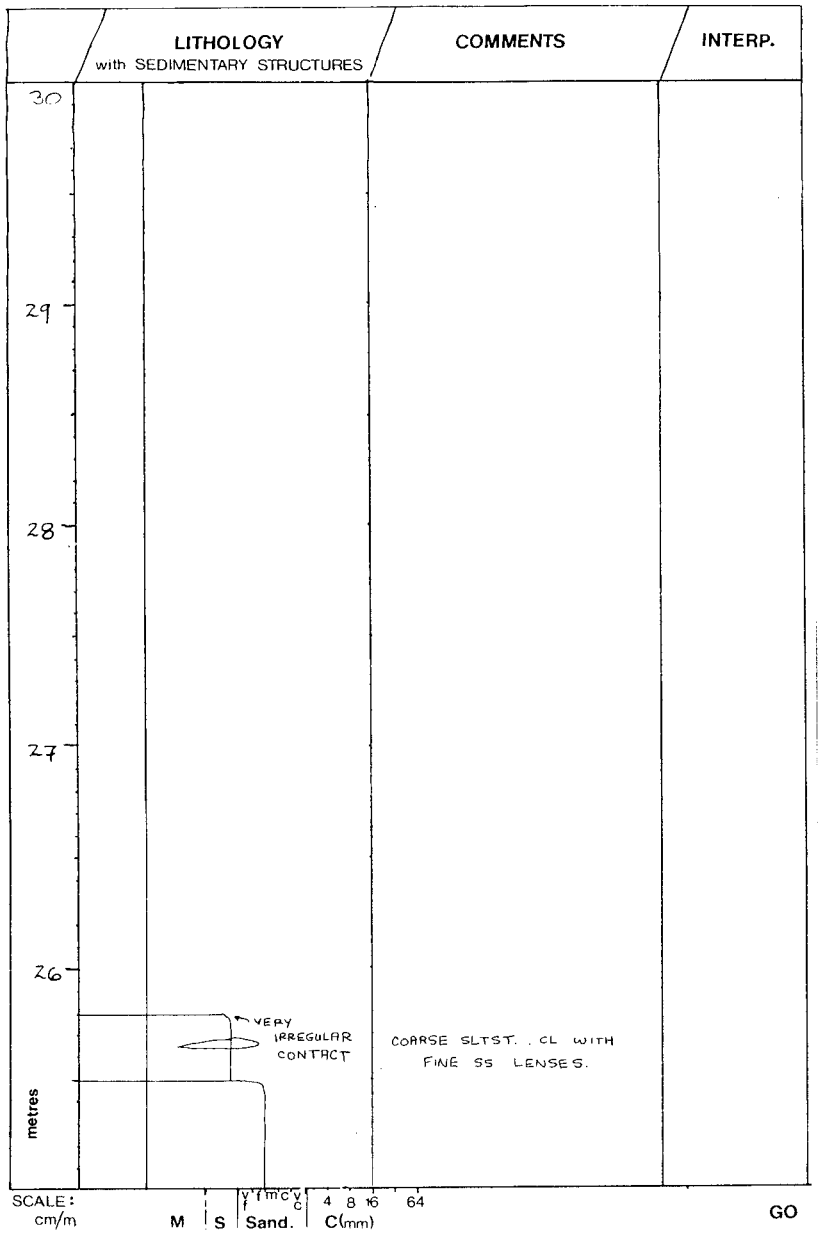
SECTION: LOCATION:



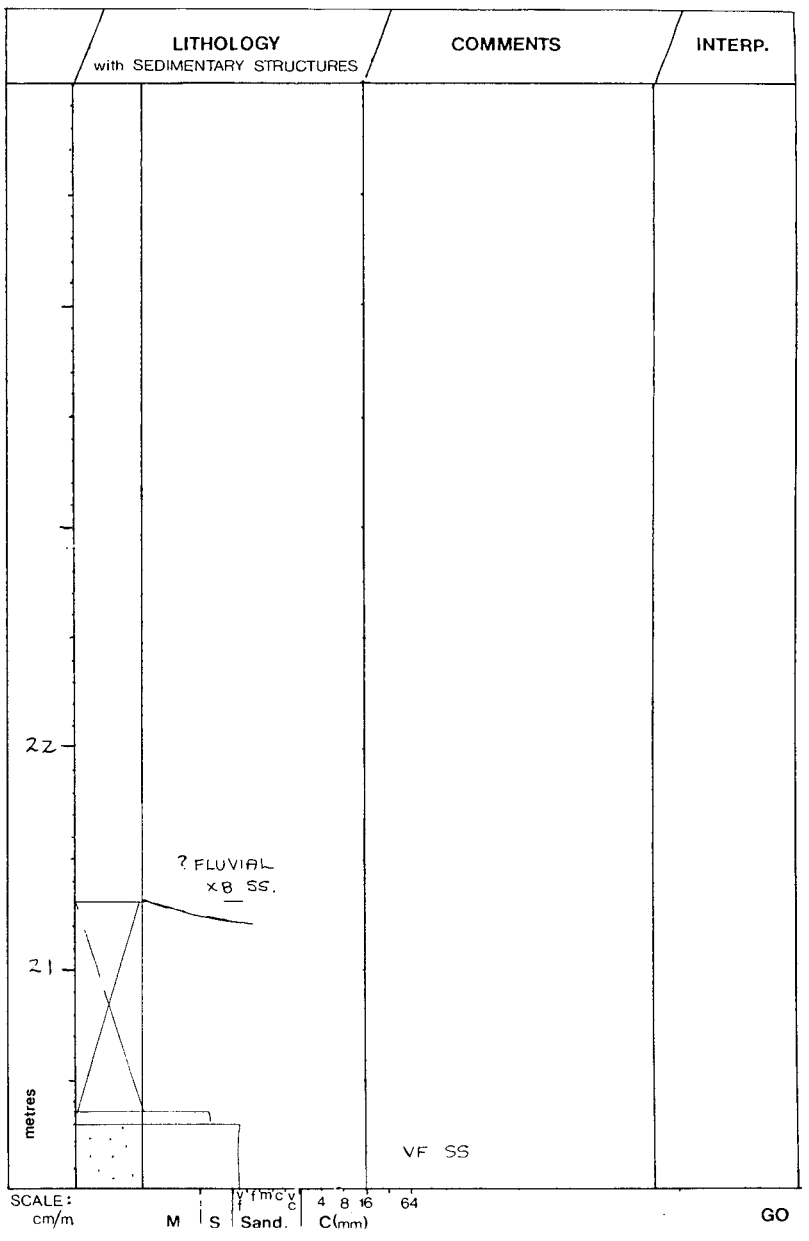
SECTION: F.1A LOCATION: CRAIG YR YSFA



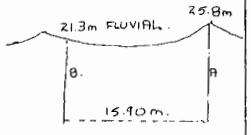
SECTION: F-1A LOCATION: CRAIG YR YSFA.



SECTION: F-1 B LOCATION: CRAIG YR YSFA



SECTION: F-1B LOCATION: CRAIG YR YSFA

LITHOLOGY with SEDIMENTARY STRUCTURES	COMMENTS	INTERP.
20	FVF SS YELLOW WEATHERING COLOUR.	
19		
18	VF SS	BIOTURBATE SANDS LOWER SHOREFACE
17	VERY FINE SS.	
	COARSE SILTSTONE.	
16	CL.	
metres	mini SECTION B 50m LATERAL.	
	SKETCH  	

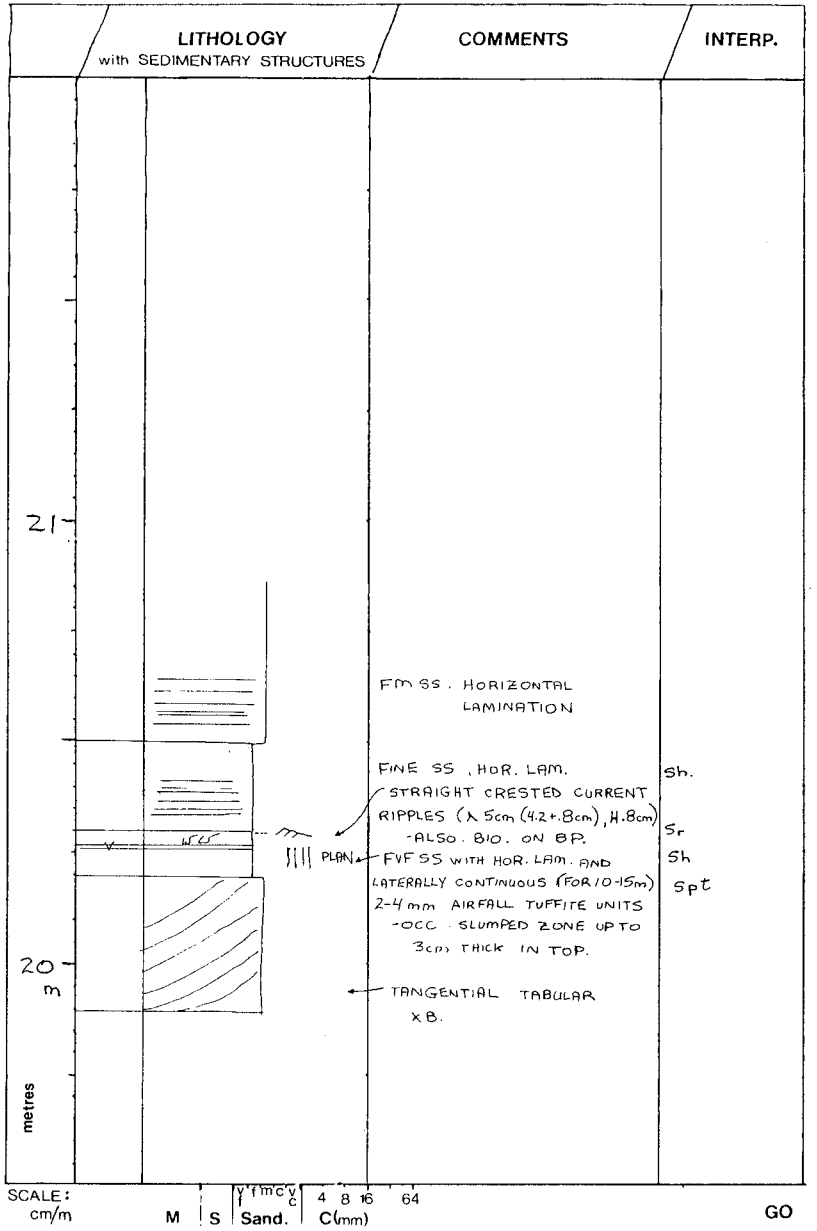
SCALE: cm/m M | S | Sand | C(mm) 4 8 16 64 GO

SECTION: F-1C / TRYFAN MBR. LOCATION: CRAIG YR YSFA

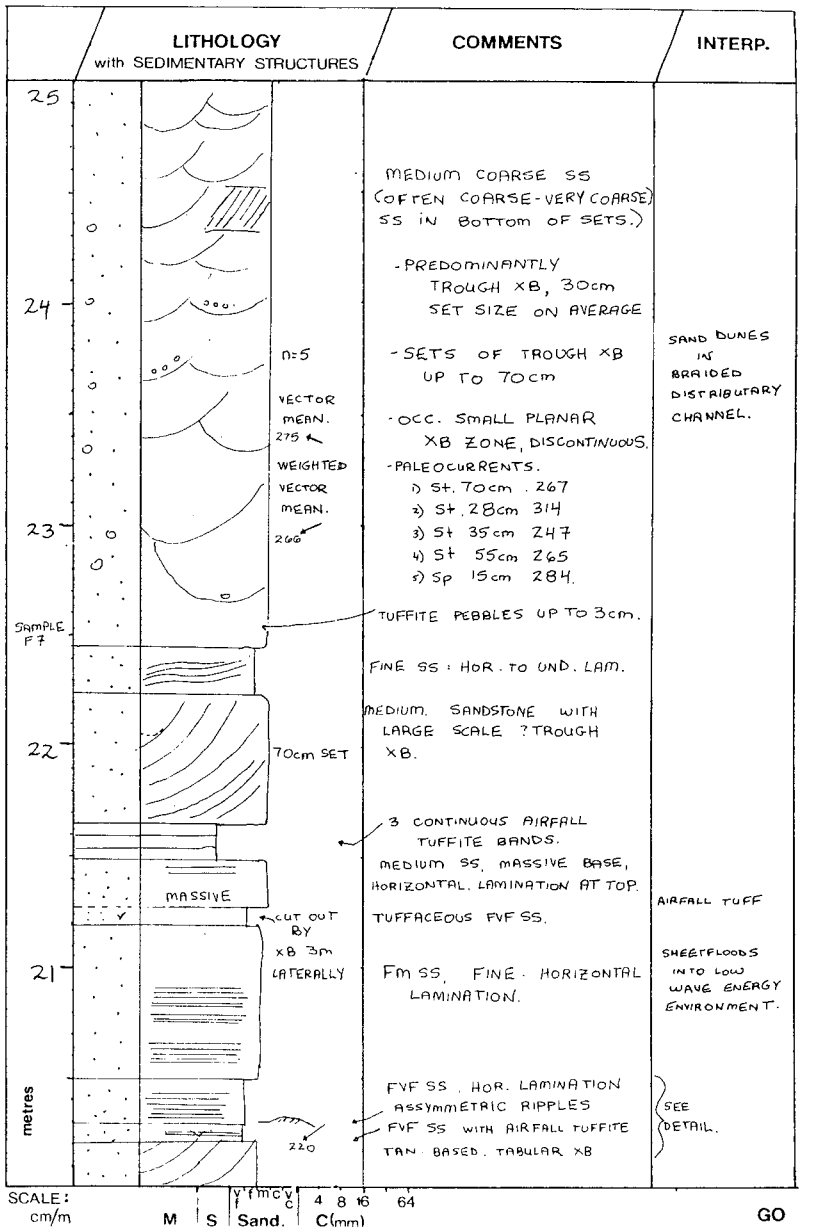
LITHOLOGY with SEDIMENTARY STRUCTURES	COMMENTS	INTERP.
20	fm SS TAN BASED PLANAR SILICEOUS C SLTST. xB	
	CUT OUT 2m LATERALLY	
	TUFFITE. FVF SS. HOR. LAM. OCC. RIPPLE. SILICEOUS AIRFALL	
	FVF SS. PERFECT HOR. LAM.	UPPER FLOW REGIME SHEETFLOODS. INTO LOW WAVE ENERGY LAKE.
19	F SS. MASSIVE. OCC. 3-4mm QTZ PEBBLE.	
	FINE TO VERY FINE SS - PERFECT HORIZONTAL LAMINATION - OCC. SILT FLASER SUGGESTS RIPPLING.	
18		
17		
metres		

SCALE: cm/m M | S | Sand. | C(mm) 4 8 16 64 GO

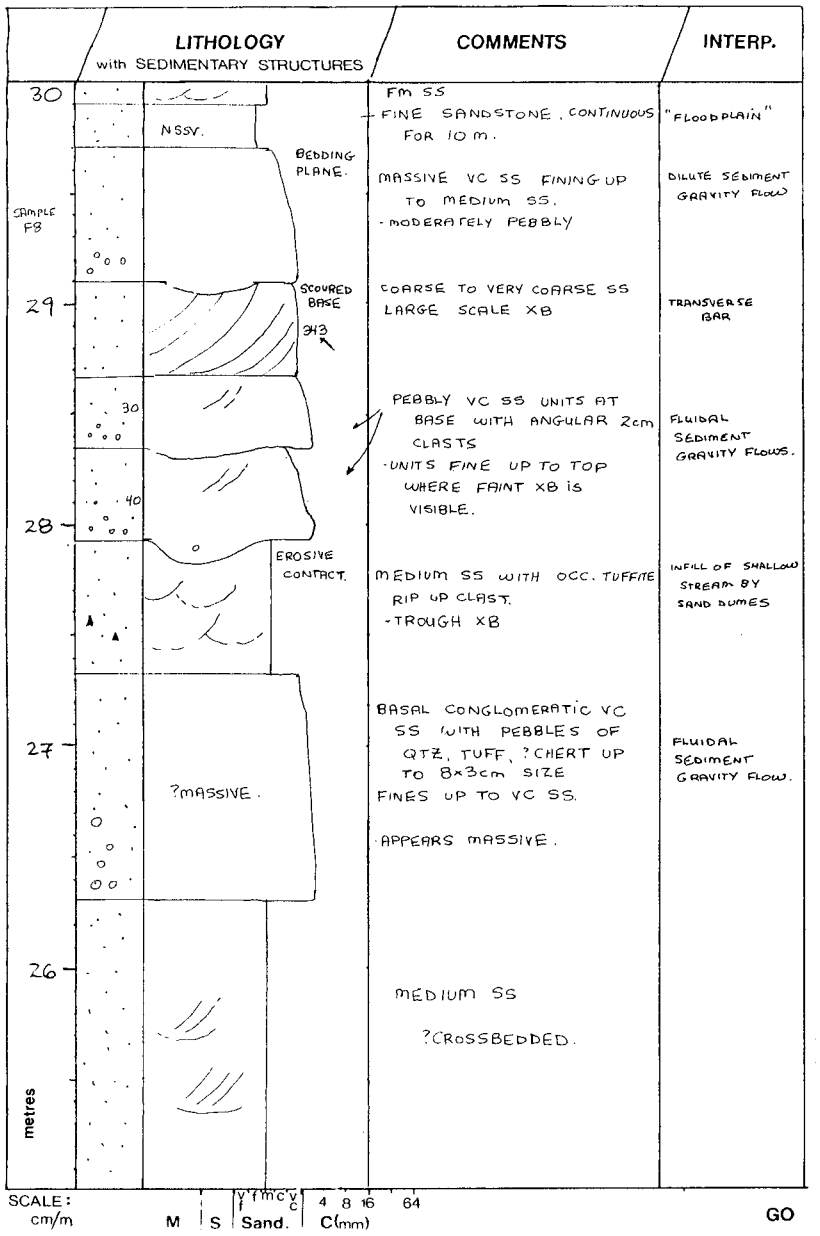
SECTION: DETAIL F·1C LOCATION:



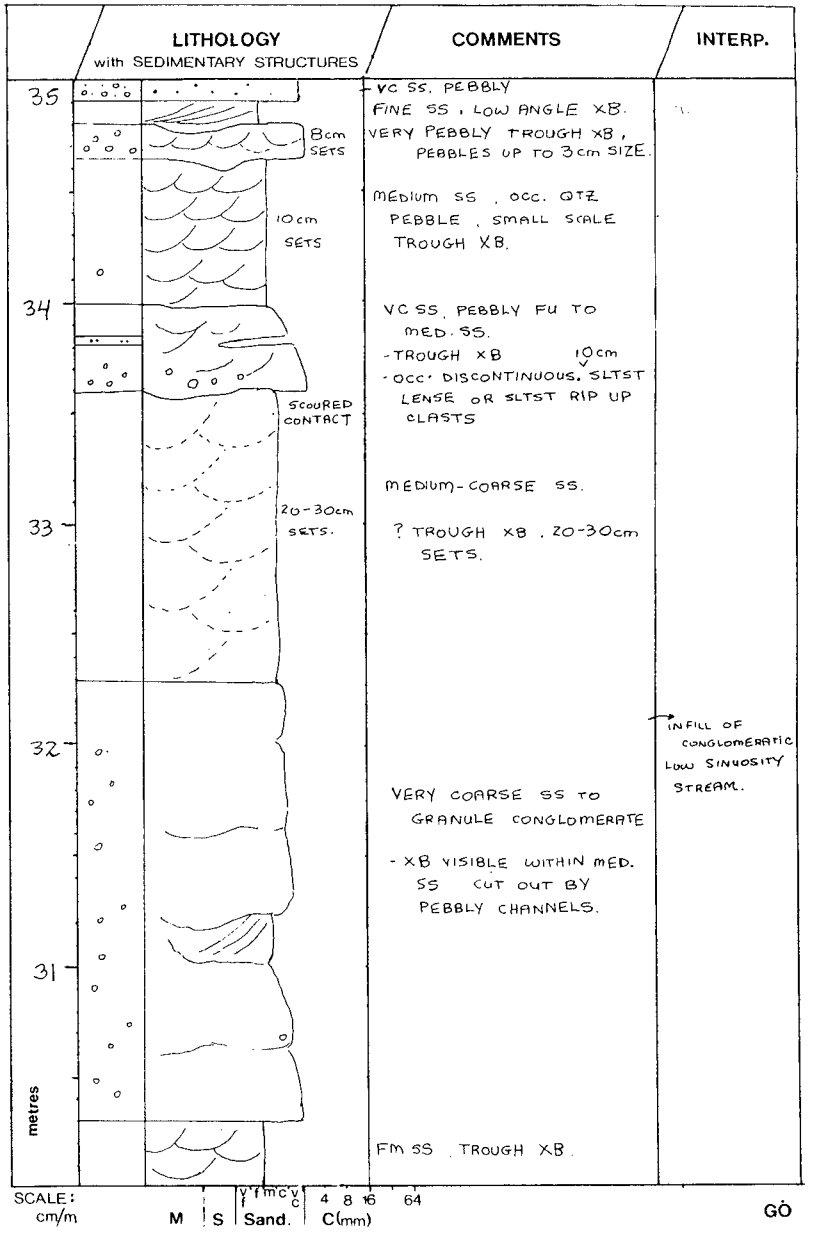
SECTION: F-1C LOCATION: CRAIG YR YSFA



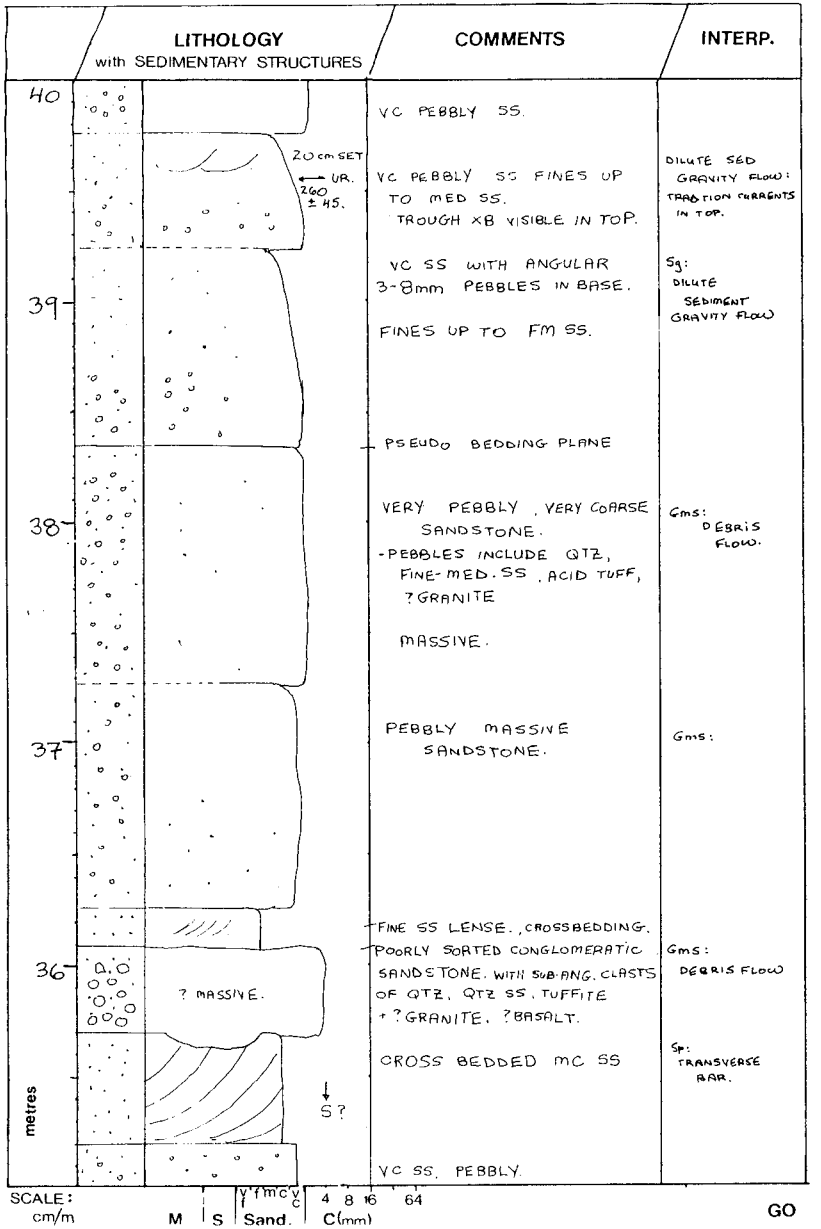
SECTION: F-1C LOCATION: CRAIG YR YSFA.



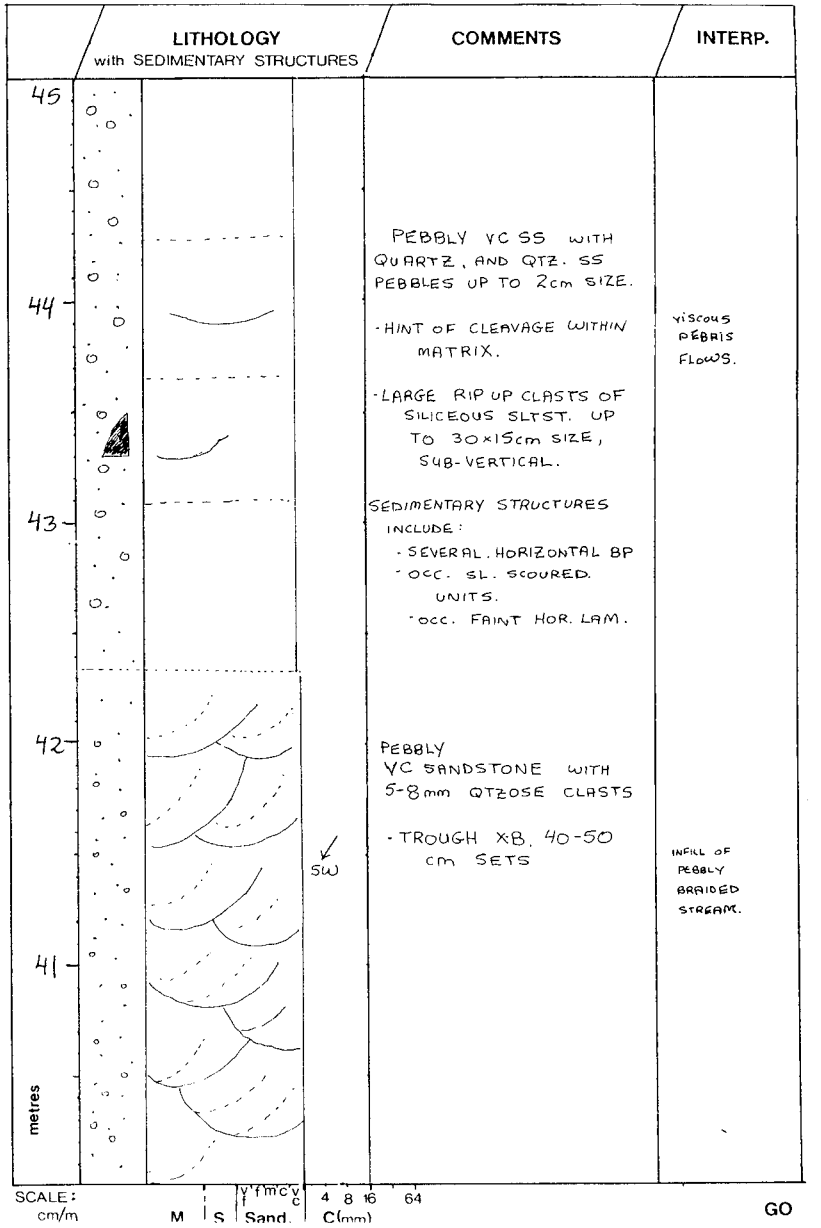
SECTION: F-1C LOCATION: CRAIG YR YSFA



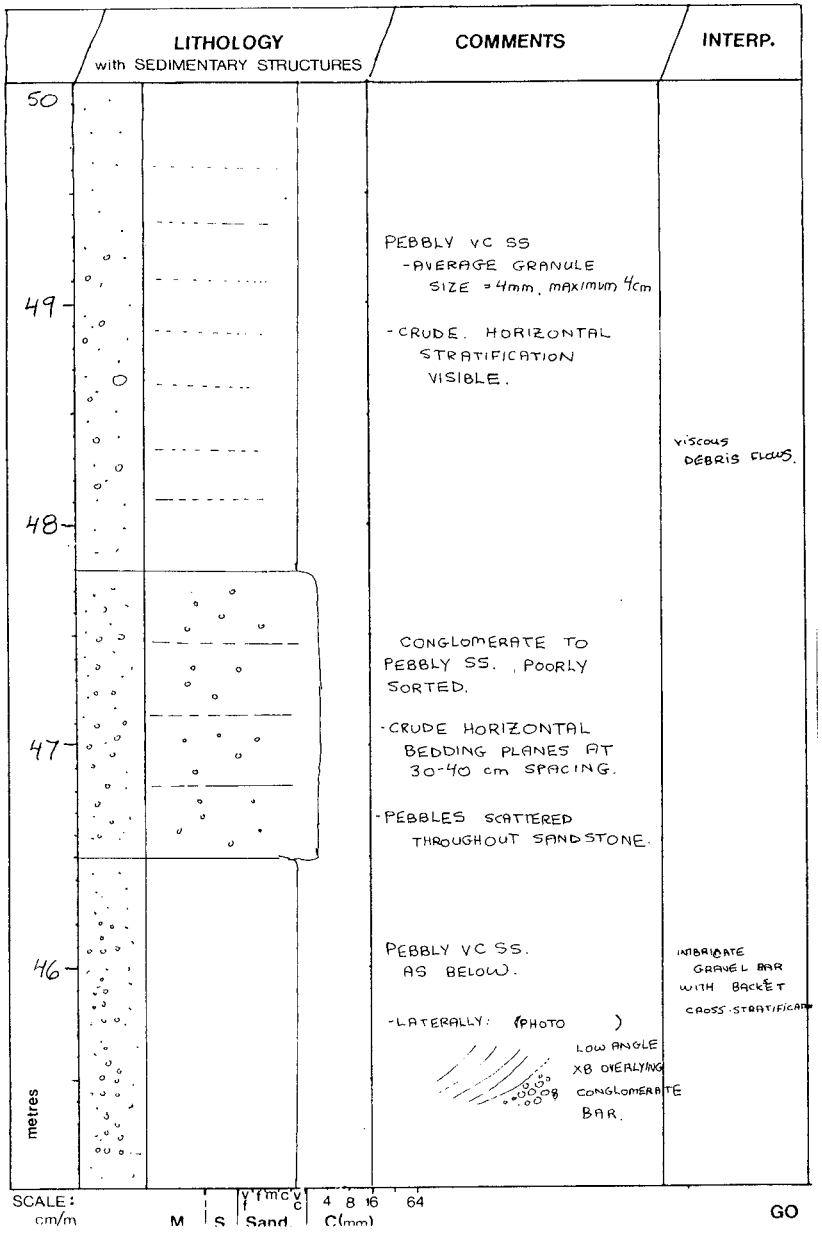
SECTION: F·1C LOCATION: CRAIG YR YSFA.



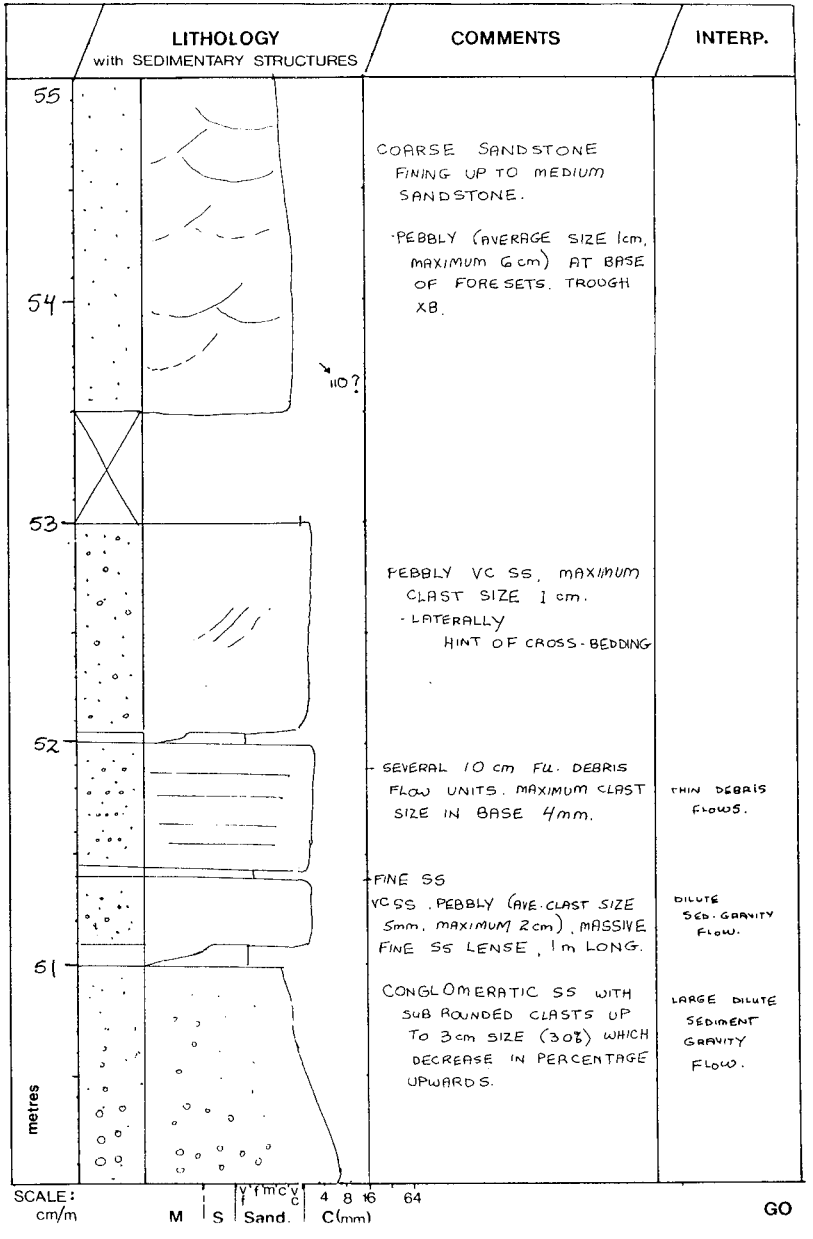
SECTION: F·1C LOCATION: CRAIG YR YSFA



SECTION: F-1C LOCATION: CRAIG YR YSFA.



SECTION: F-1C LOCATION: CRAIG YR YSFA.



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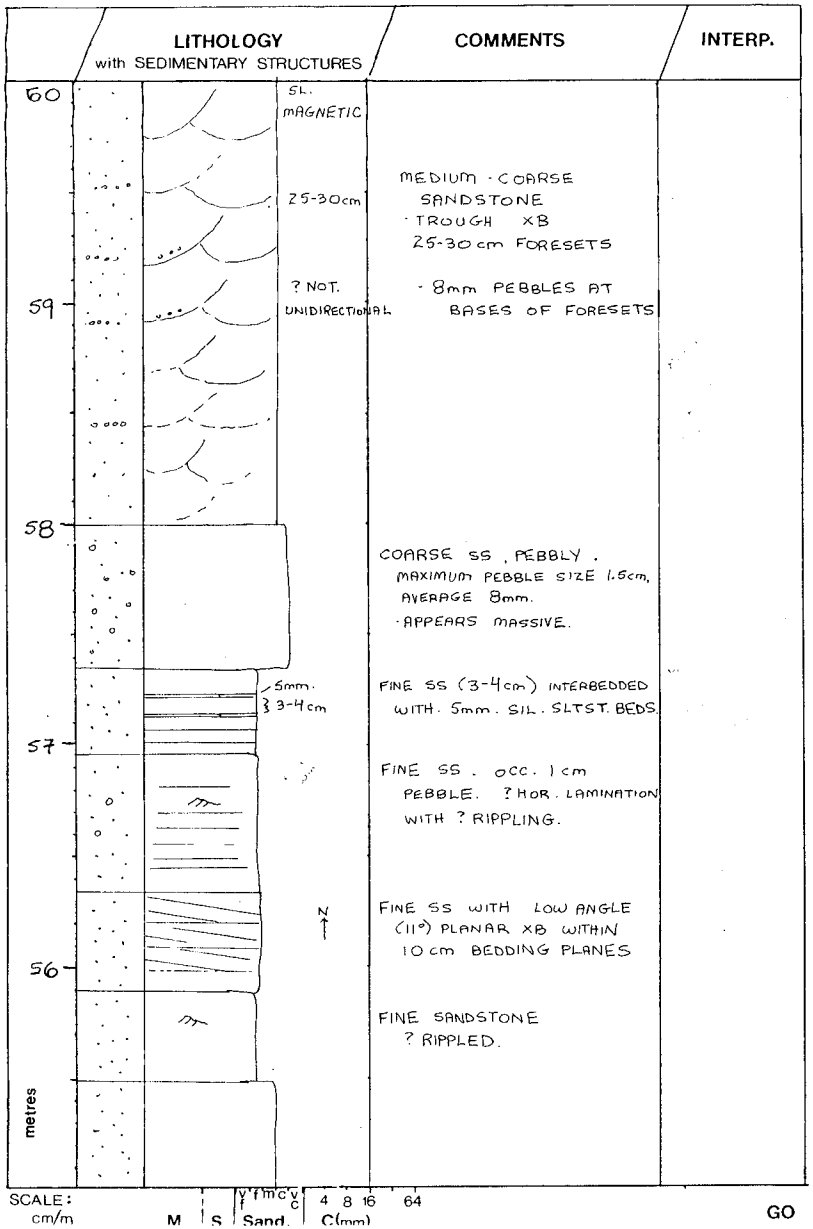
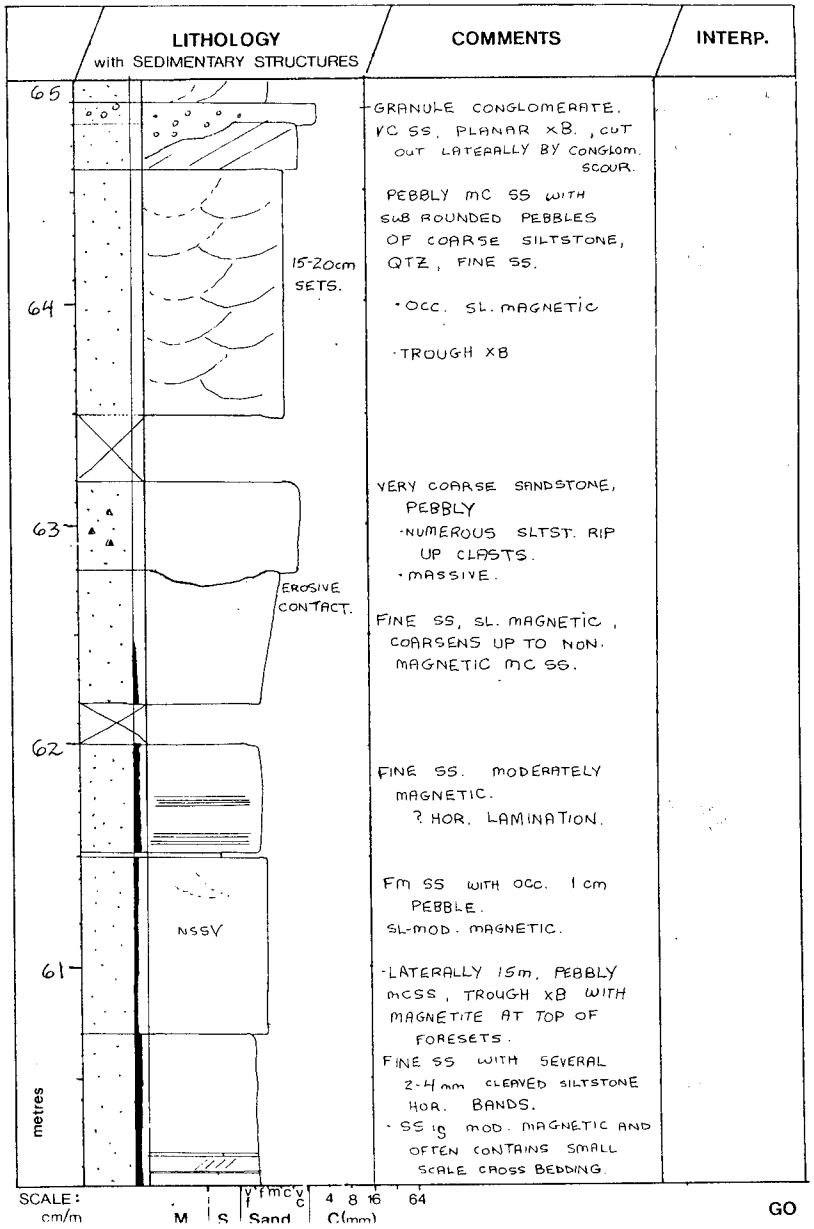
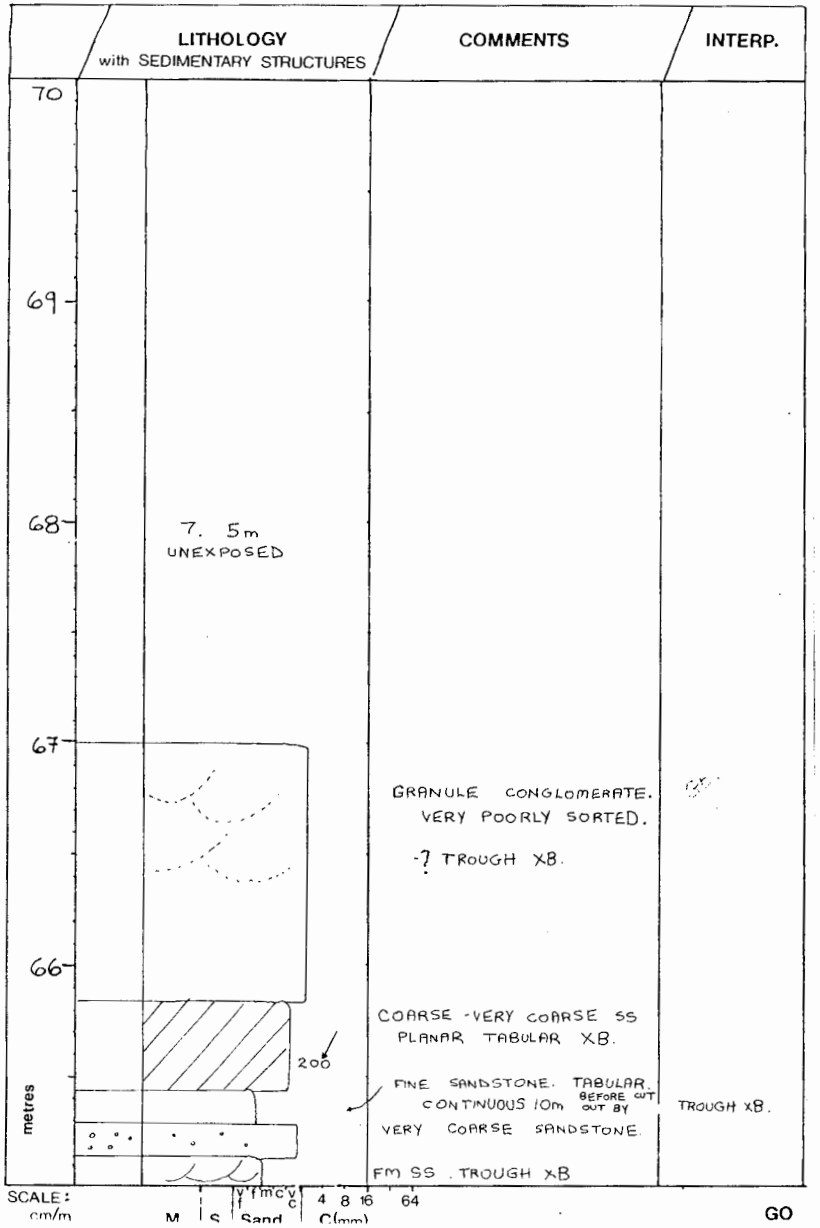


SECTION: F-1C LOCATION: CRAIG YR YSFA.



SECTION: F·1C LOCATION: CRAIG YR YSFA



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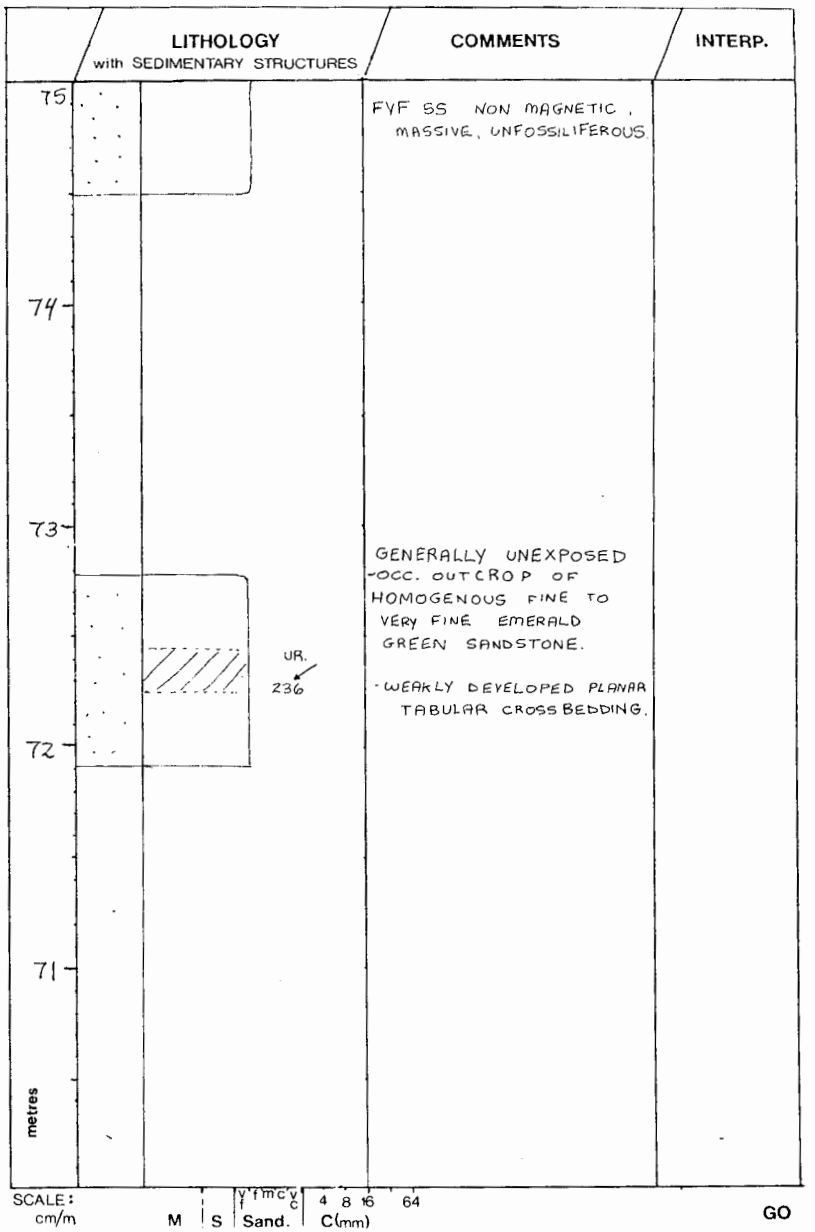
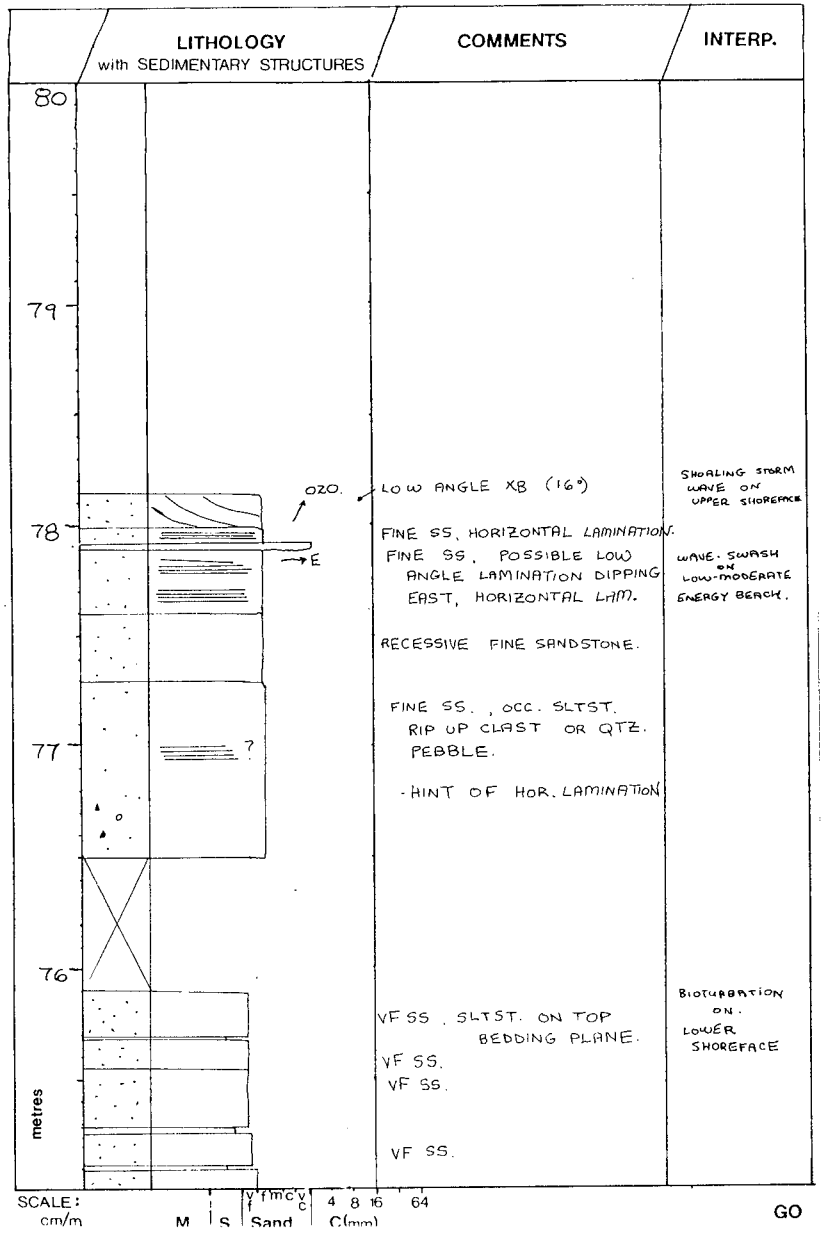


SECTION: F-1B LOCATION: CRAIG YR YSFA.



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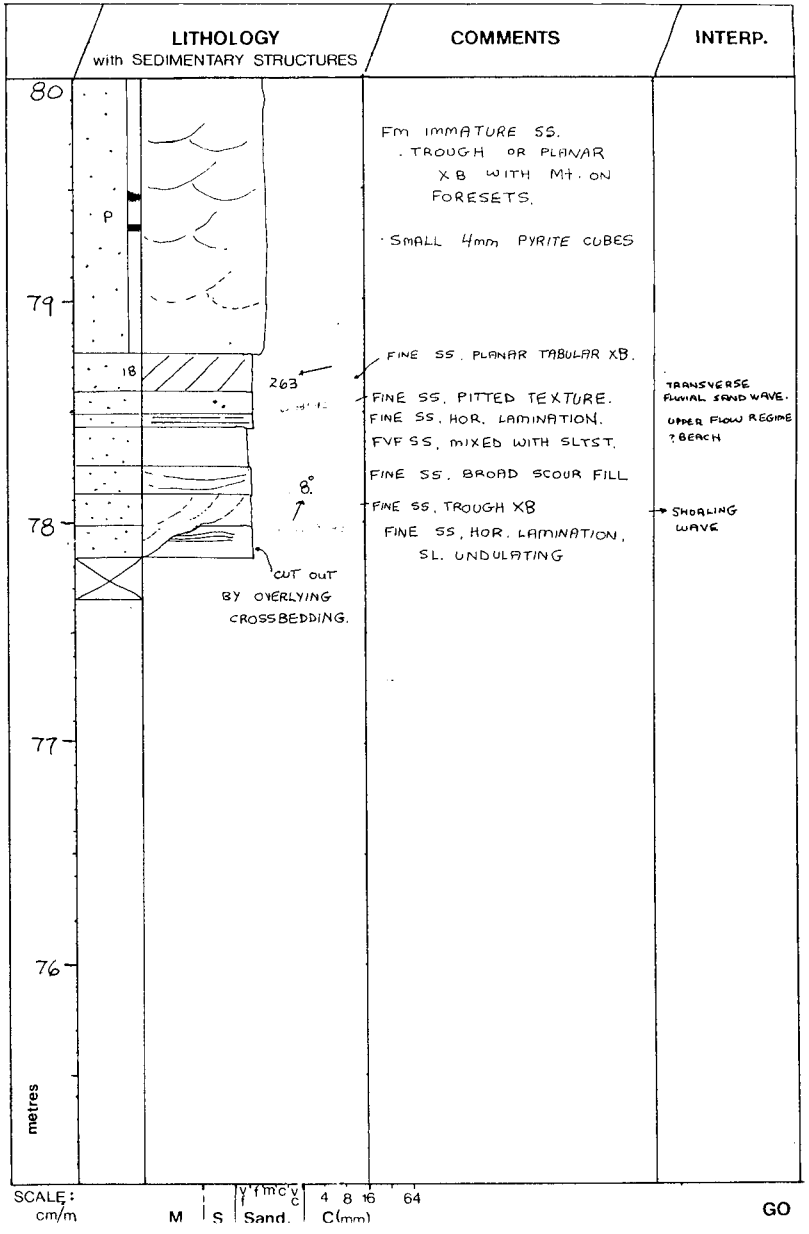
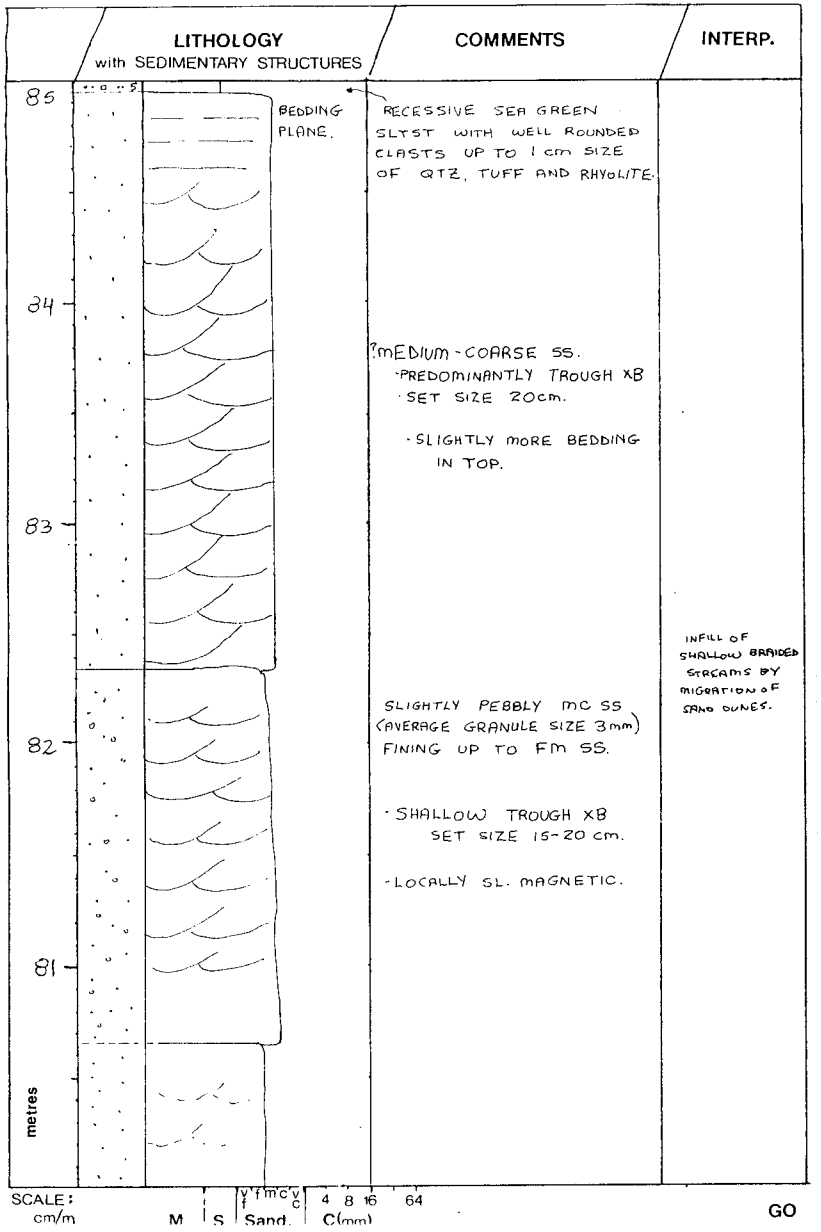
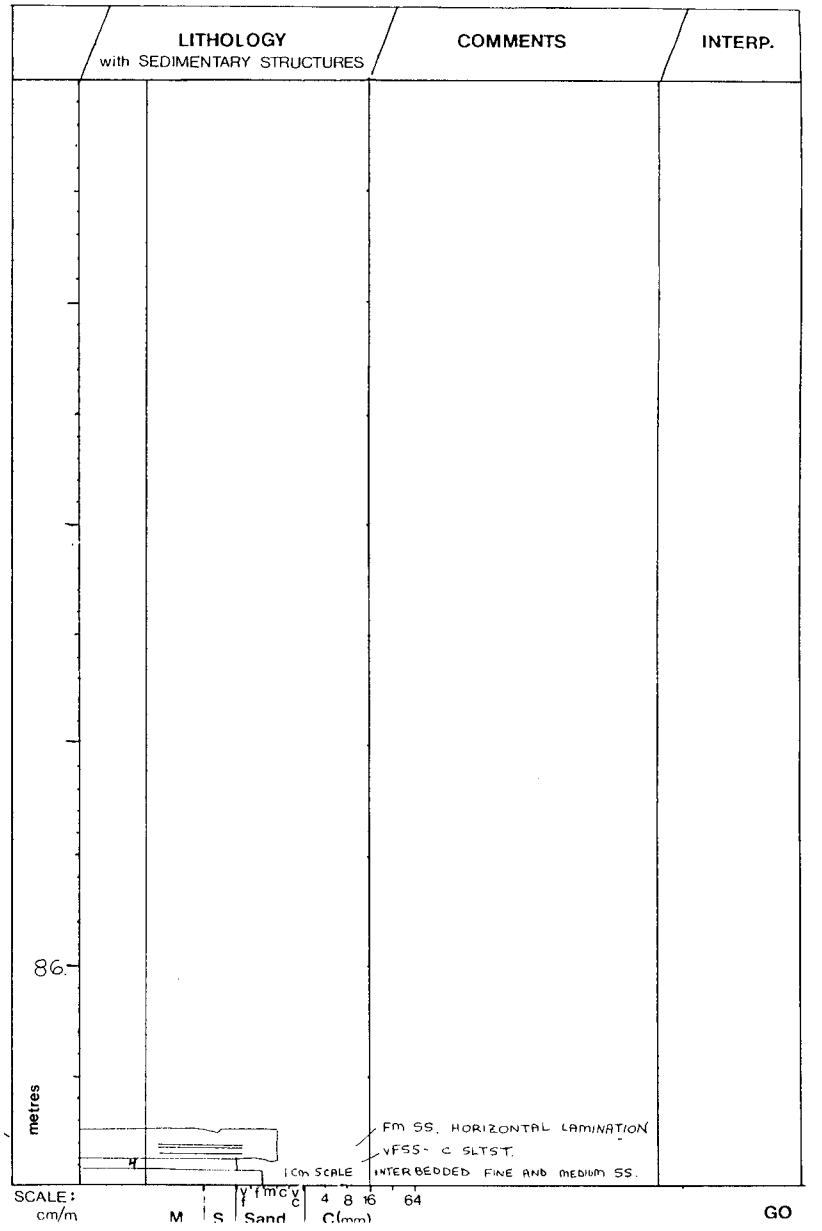


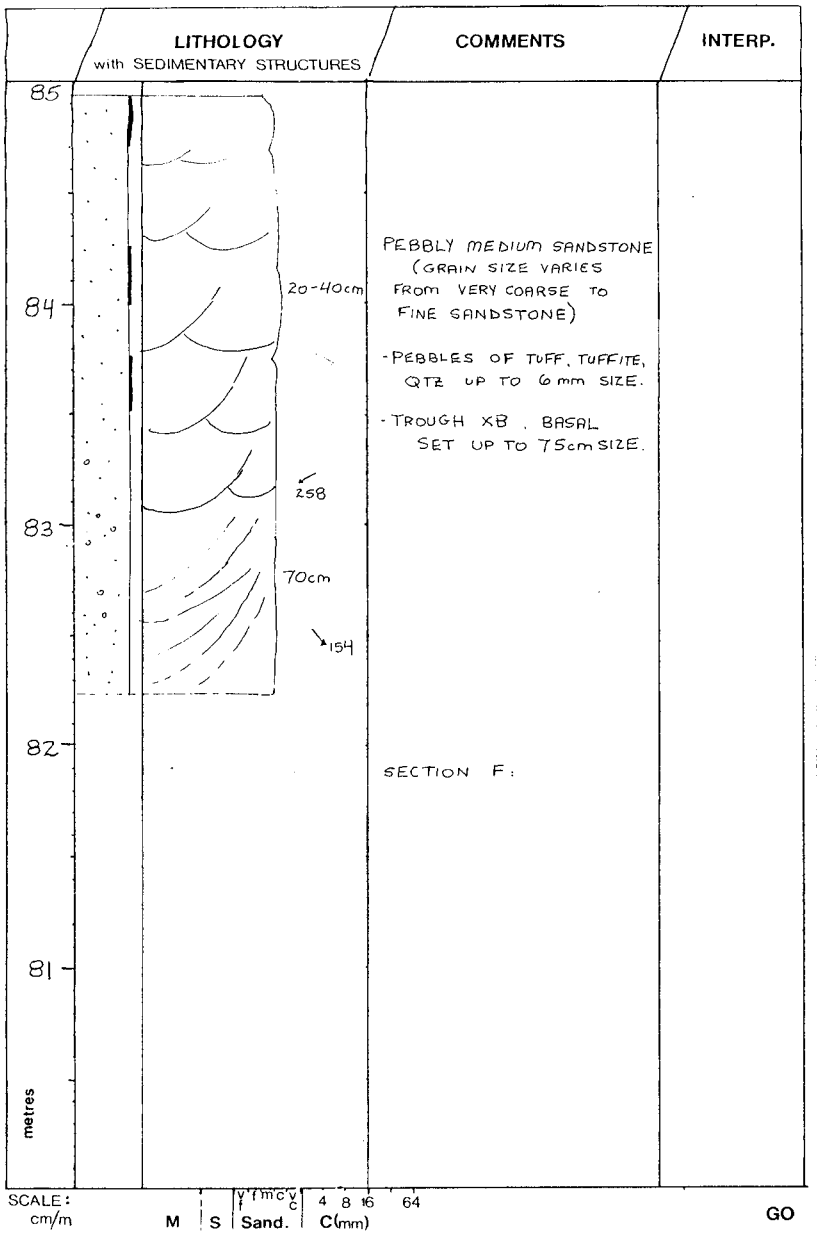
SECTION: F·1E LOCATION: CRAIG YR YSFA.



SECTION: F·1E LOCATION: CRAIG YR YSFA.



SECTION: F·1F LOCATION: CRAIG YR YSFA



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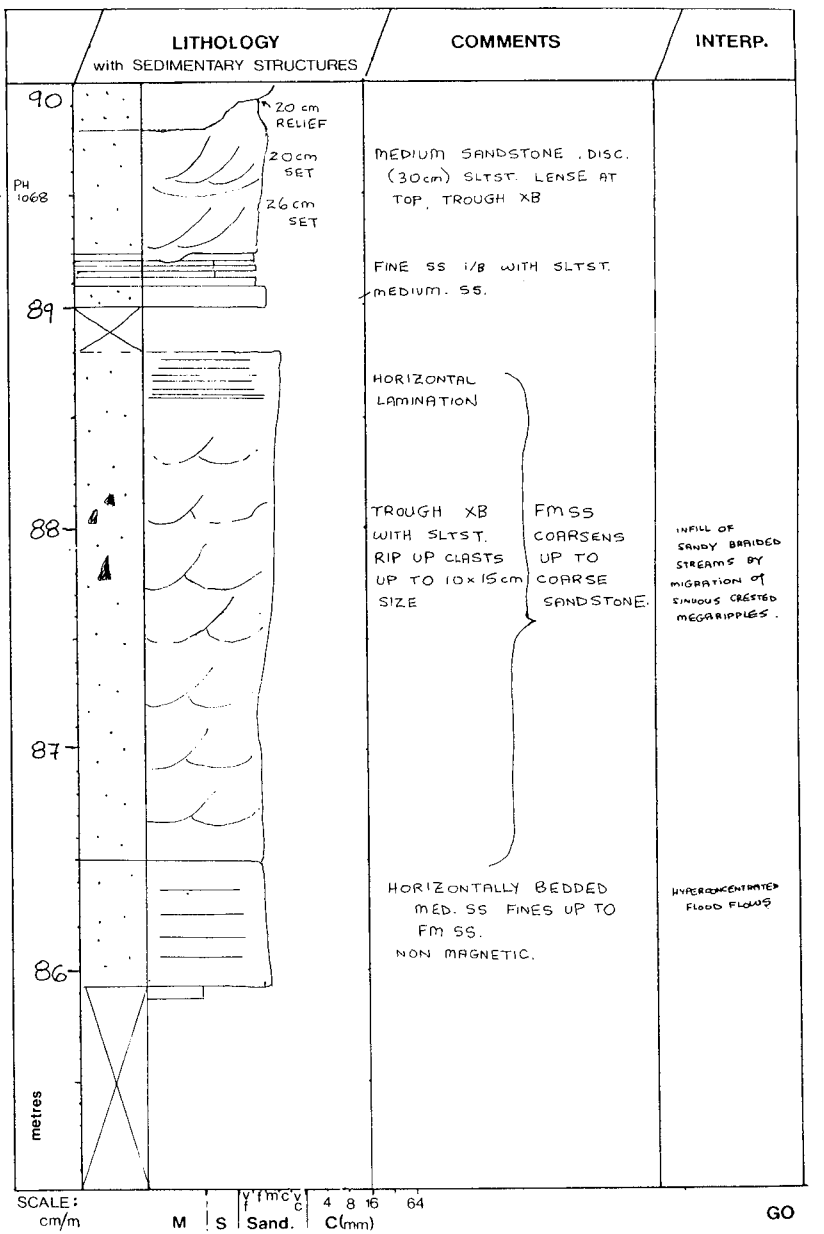
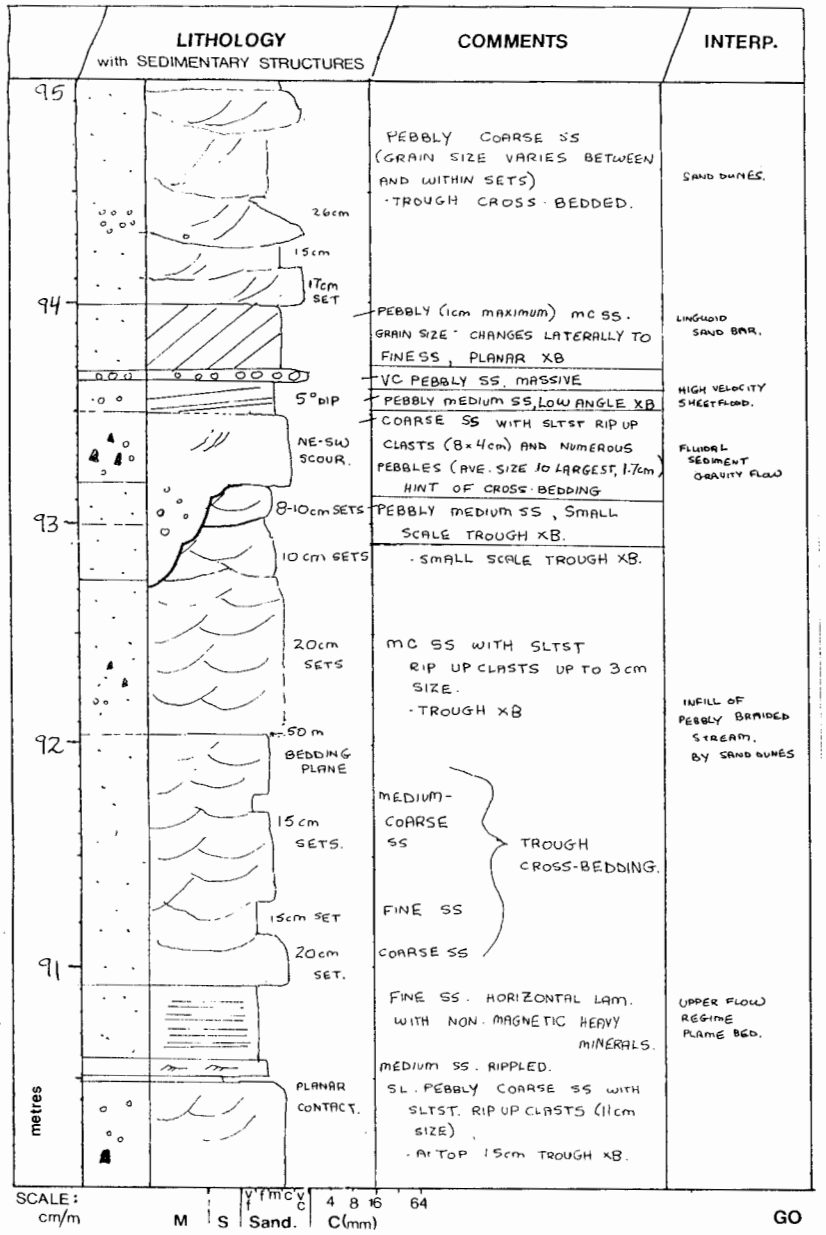


SECTION: F·1F LOCATION: CRAIG YR YSFA



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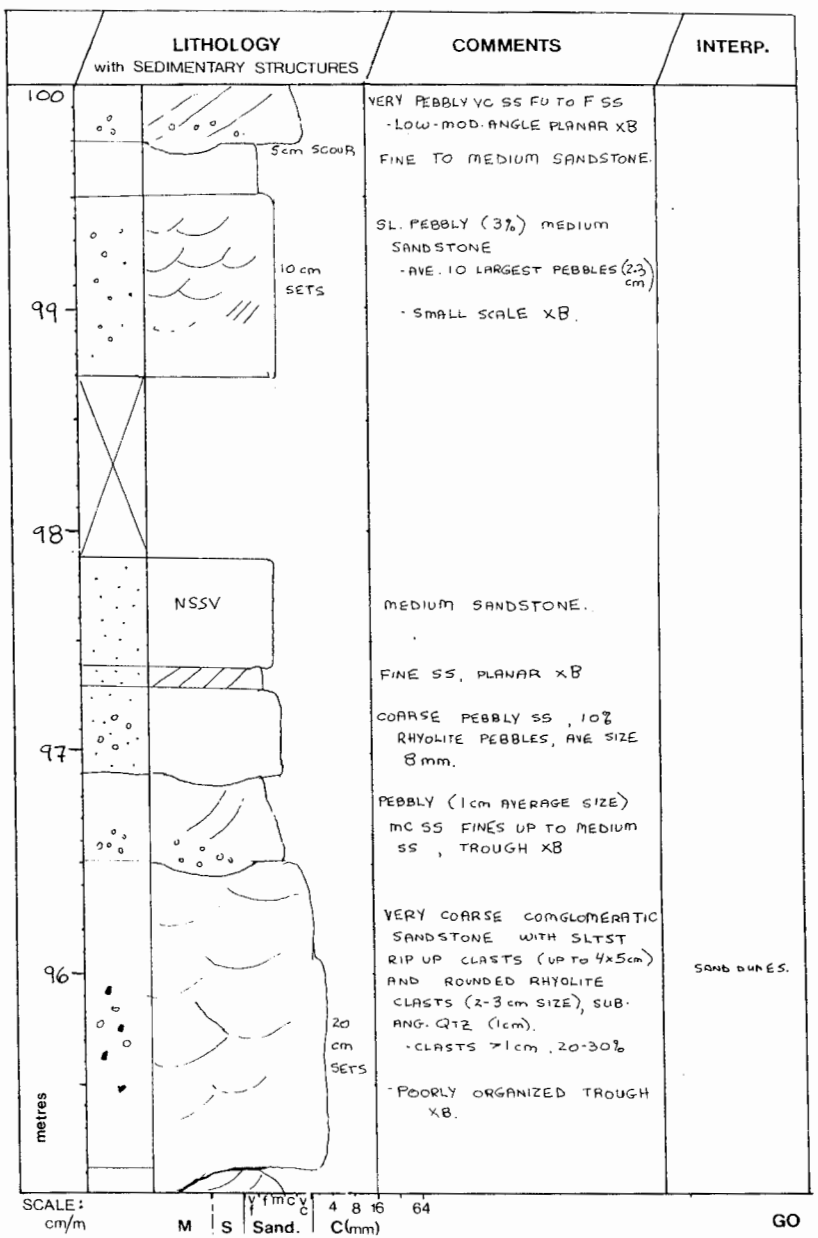

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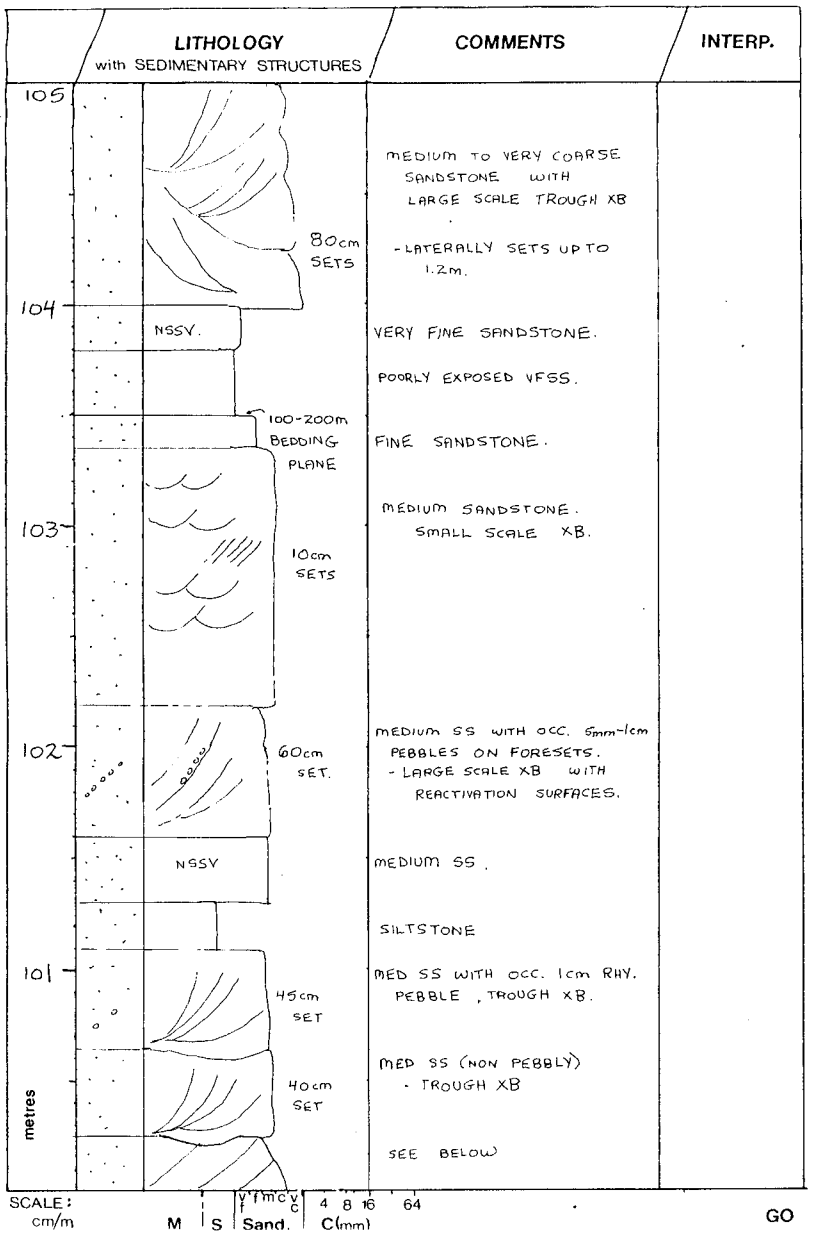
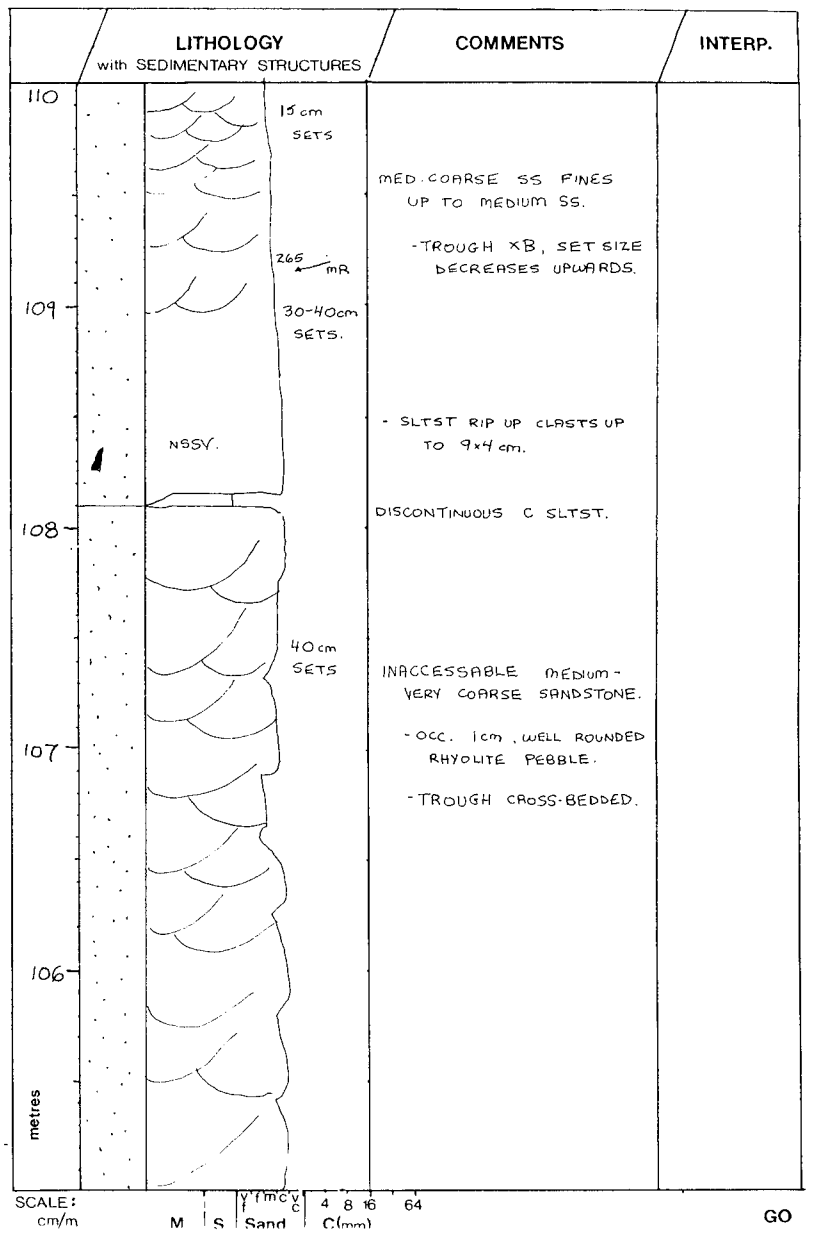


SECTION: LOCATION:



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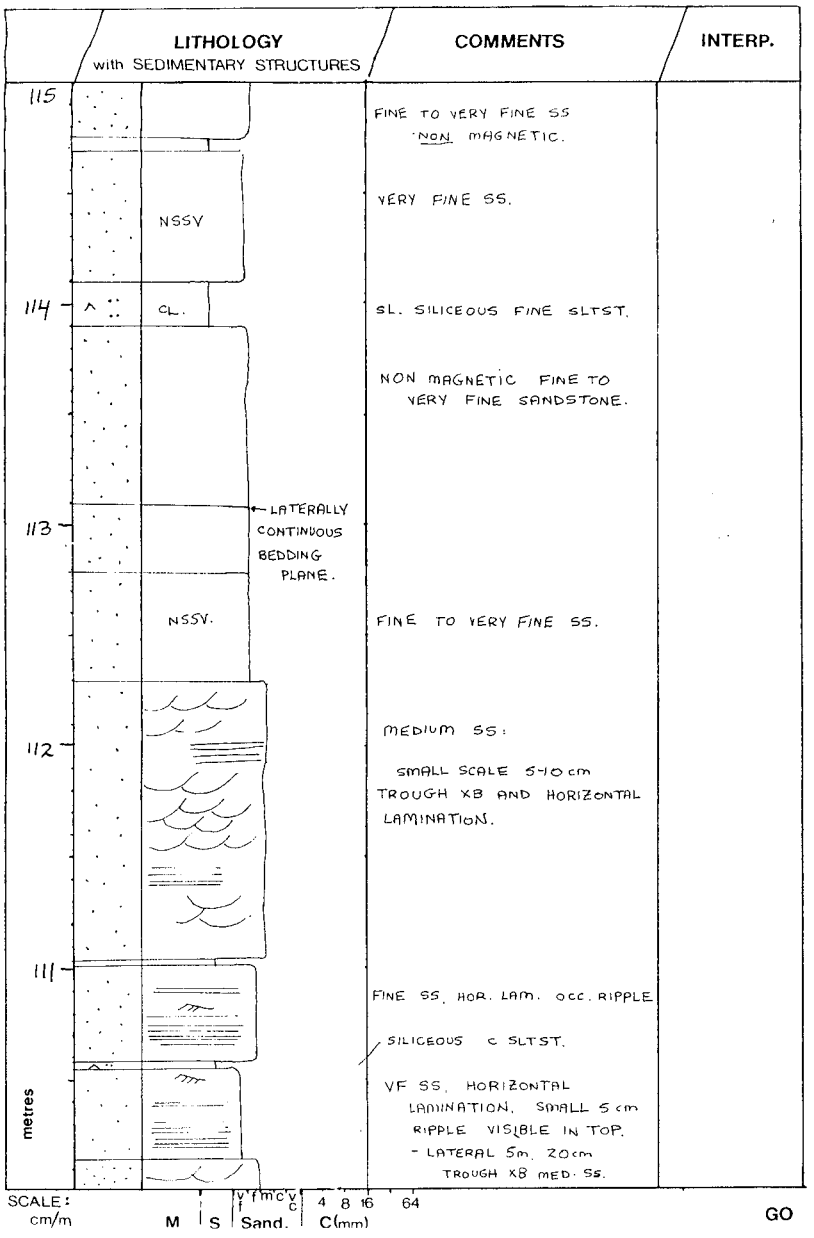

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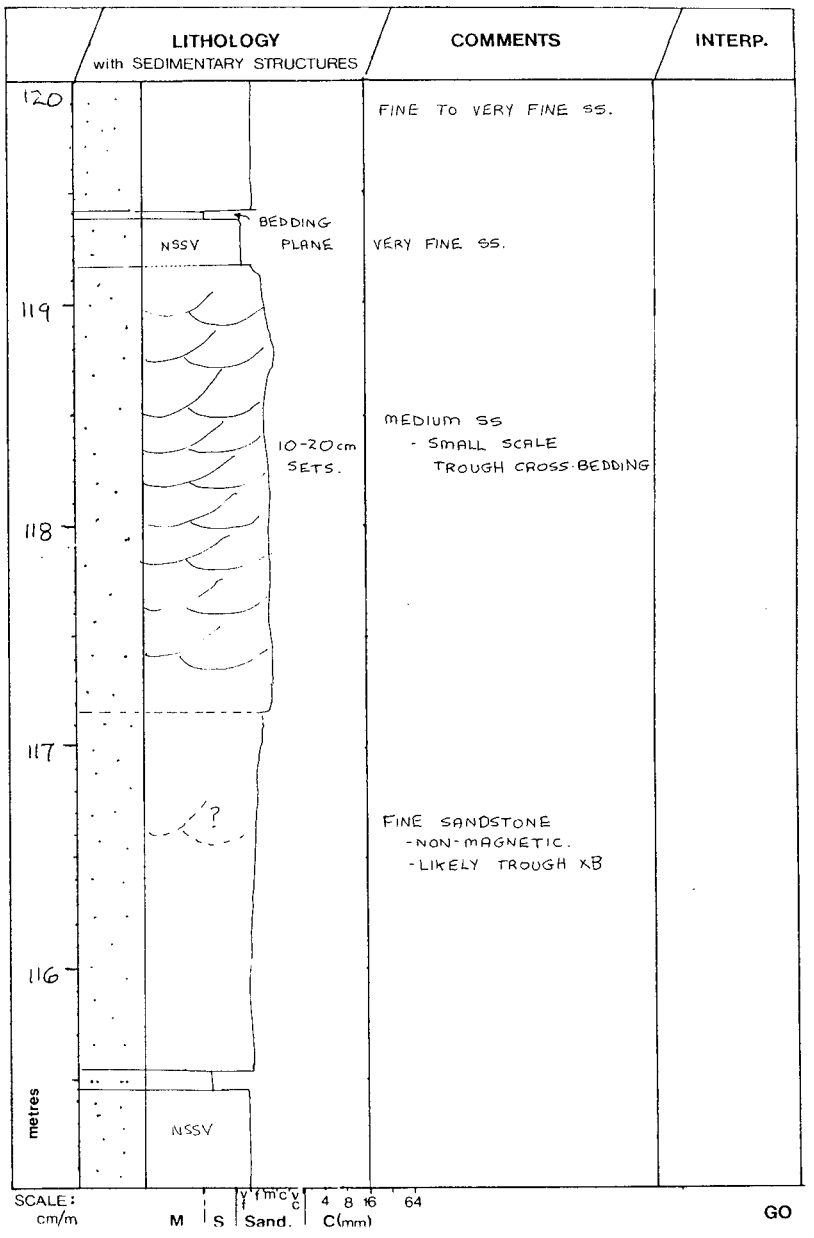

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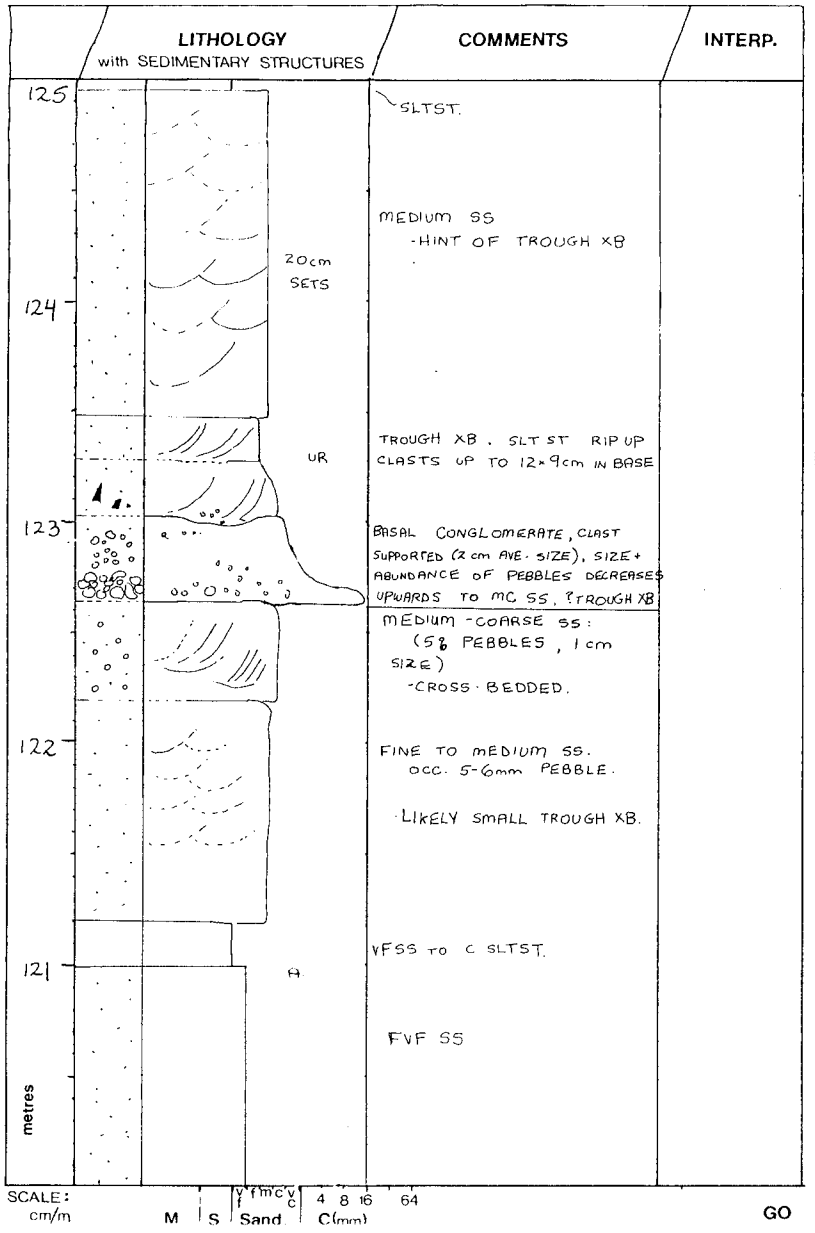
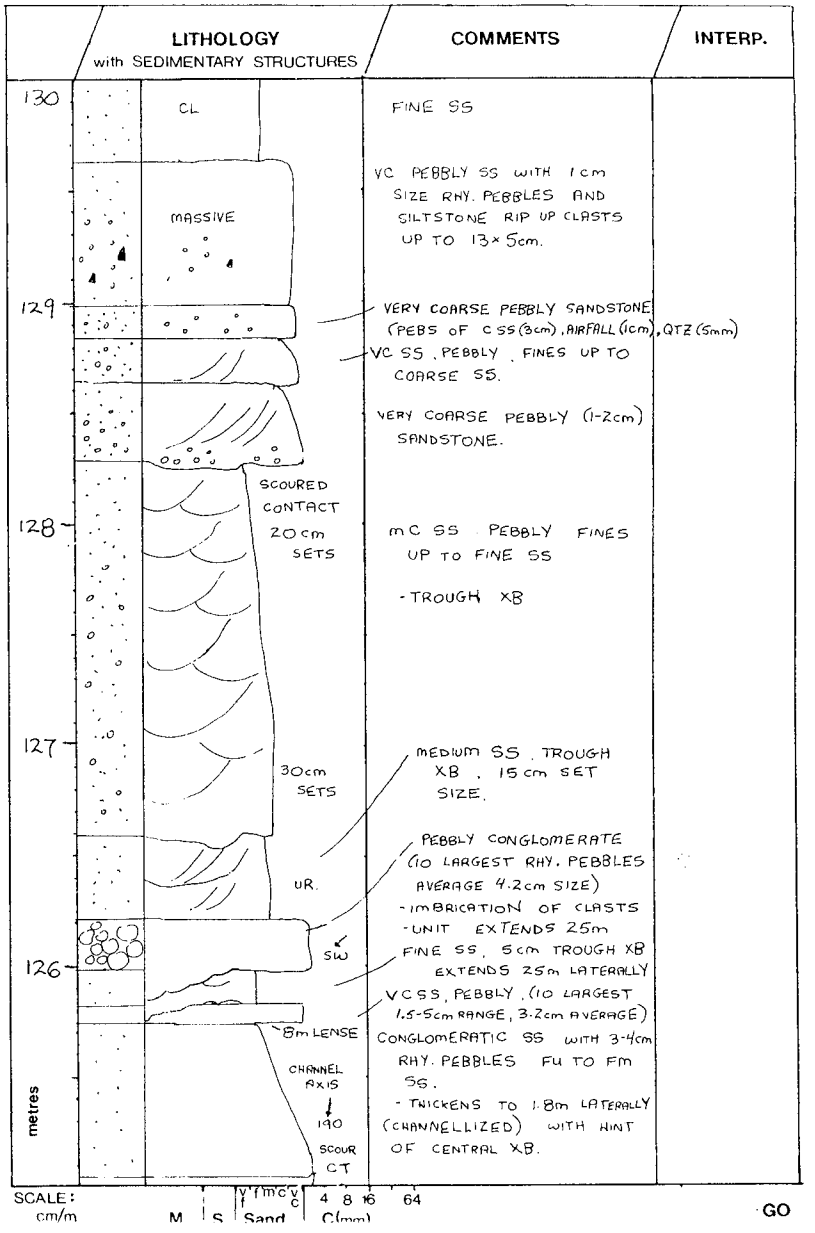
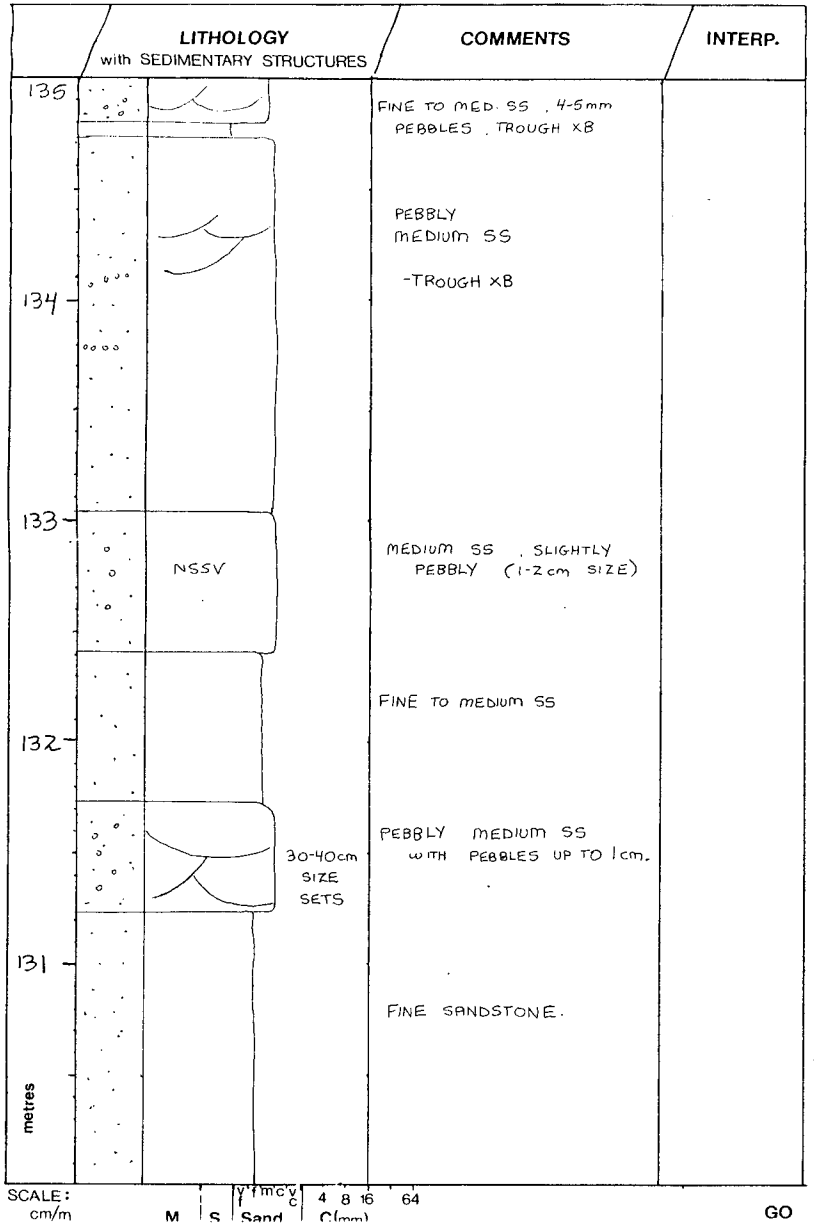


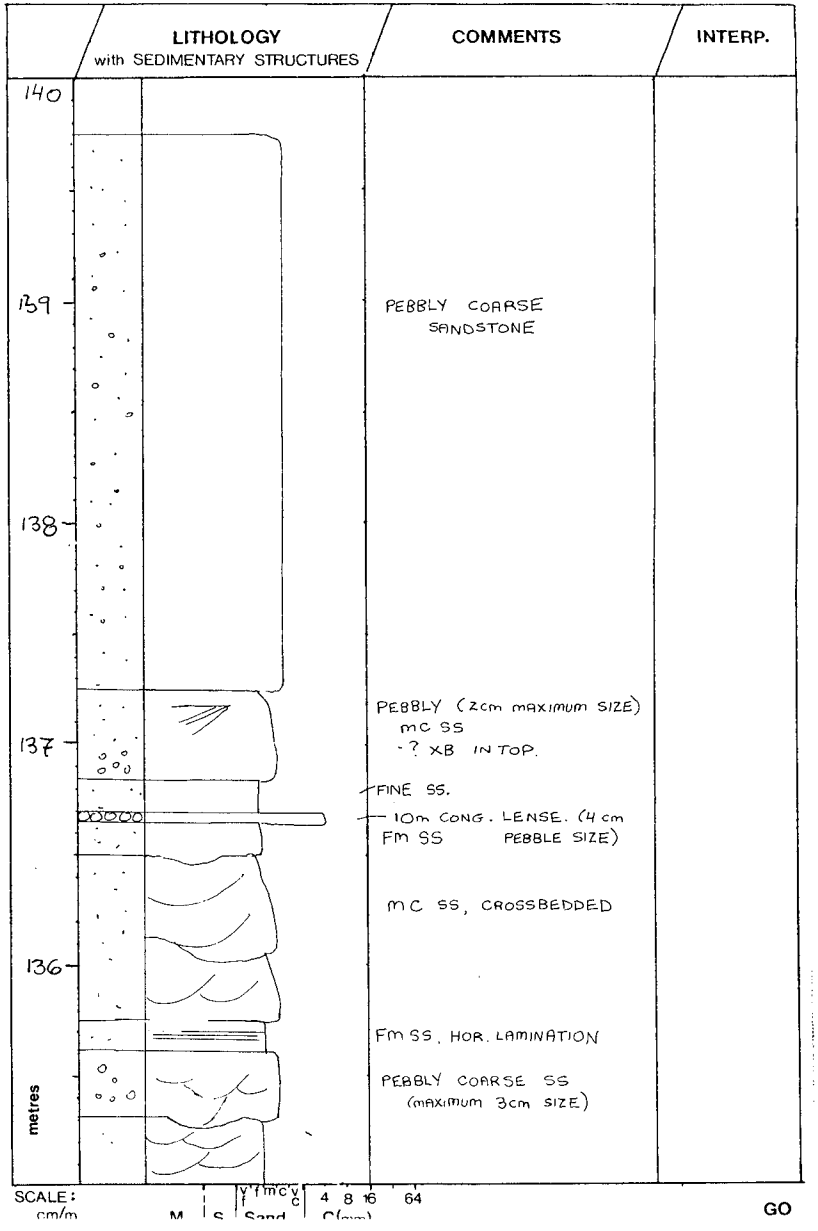
SECTION: C LOCATION: TRYFAN EAST



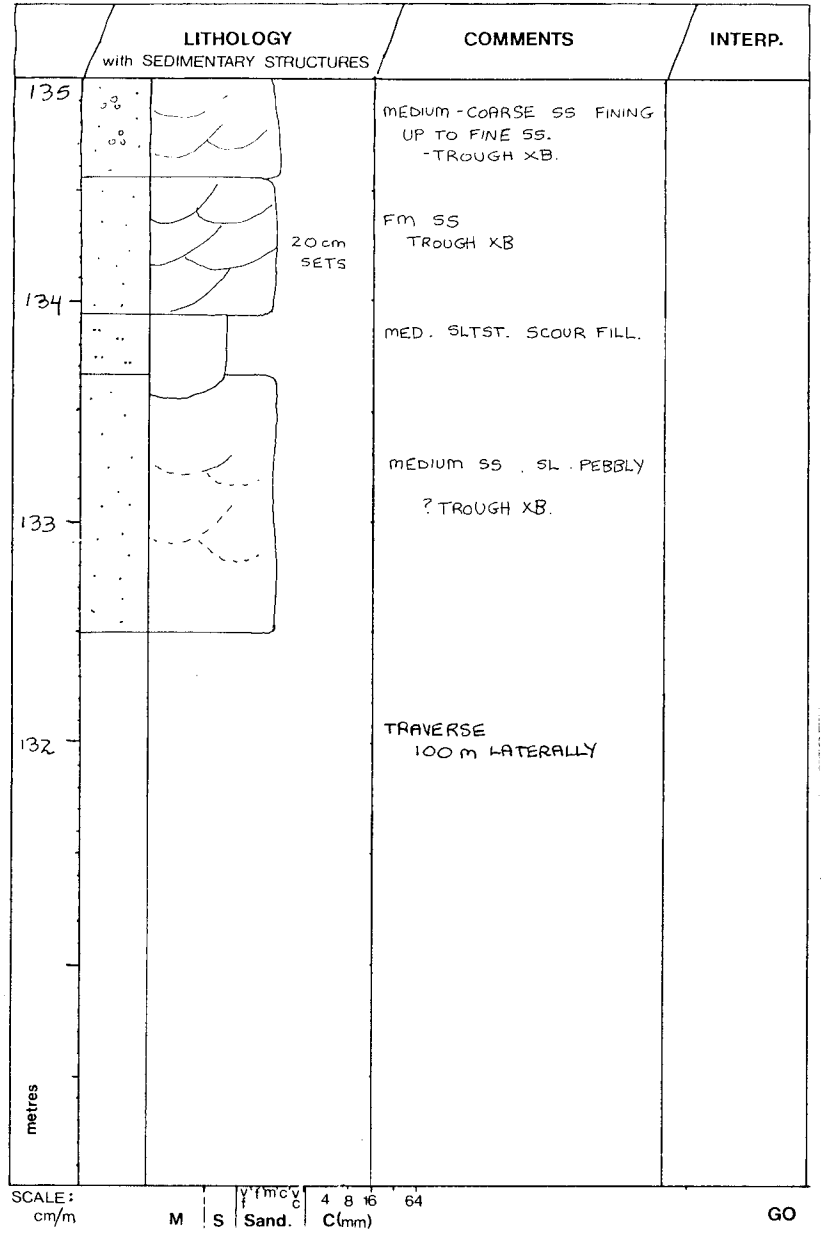
SECTION: F-1F LOCATION: CRAIG YR YSFA



SECTION: F-1F LOCATION: CRAIG YR YSFA



SECTION: F-1G LOCATION: CRAIG YK YSFH.



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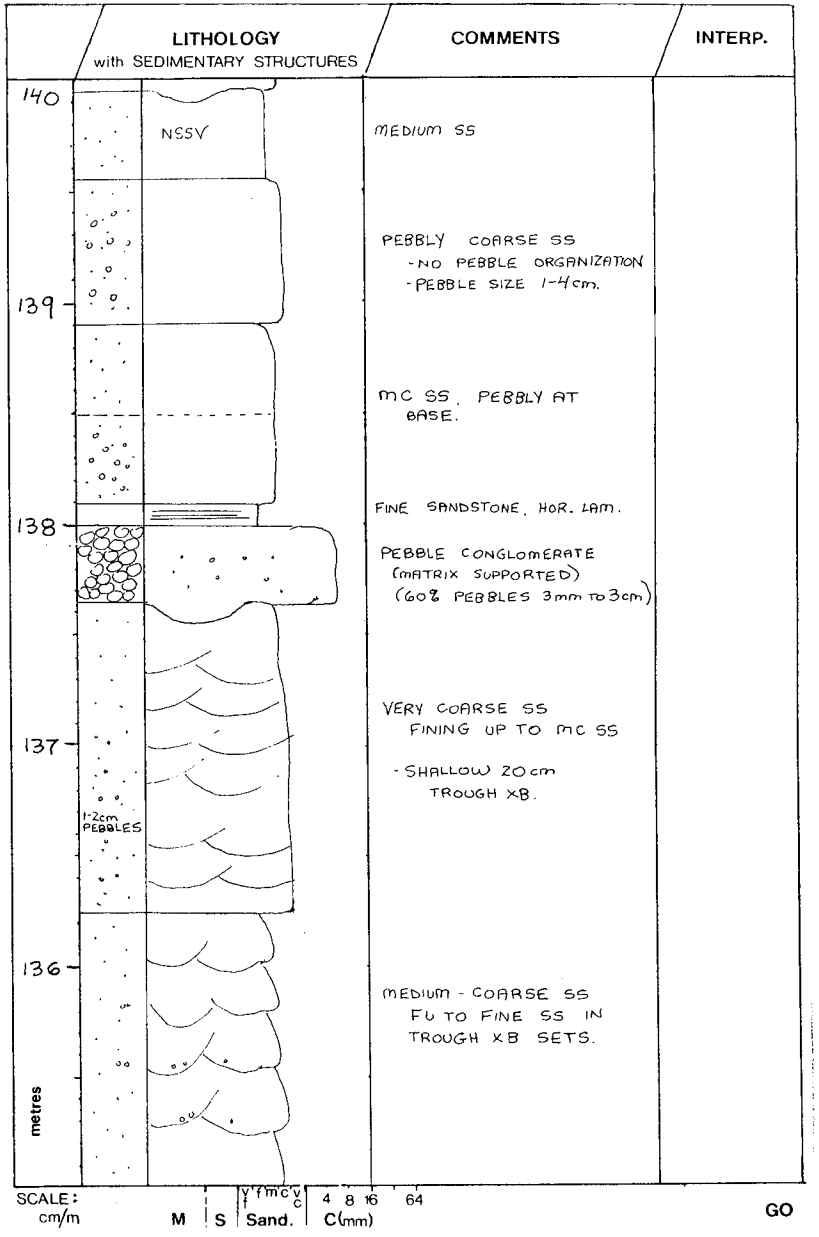

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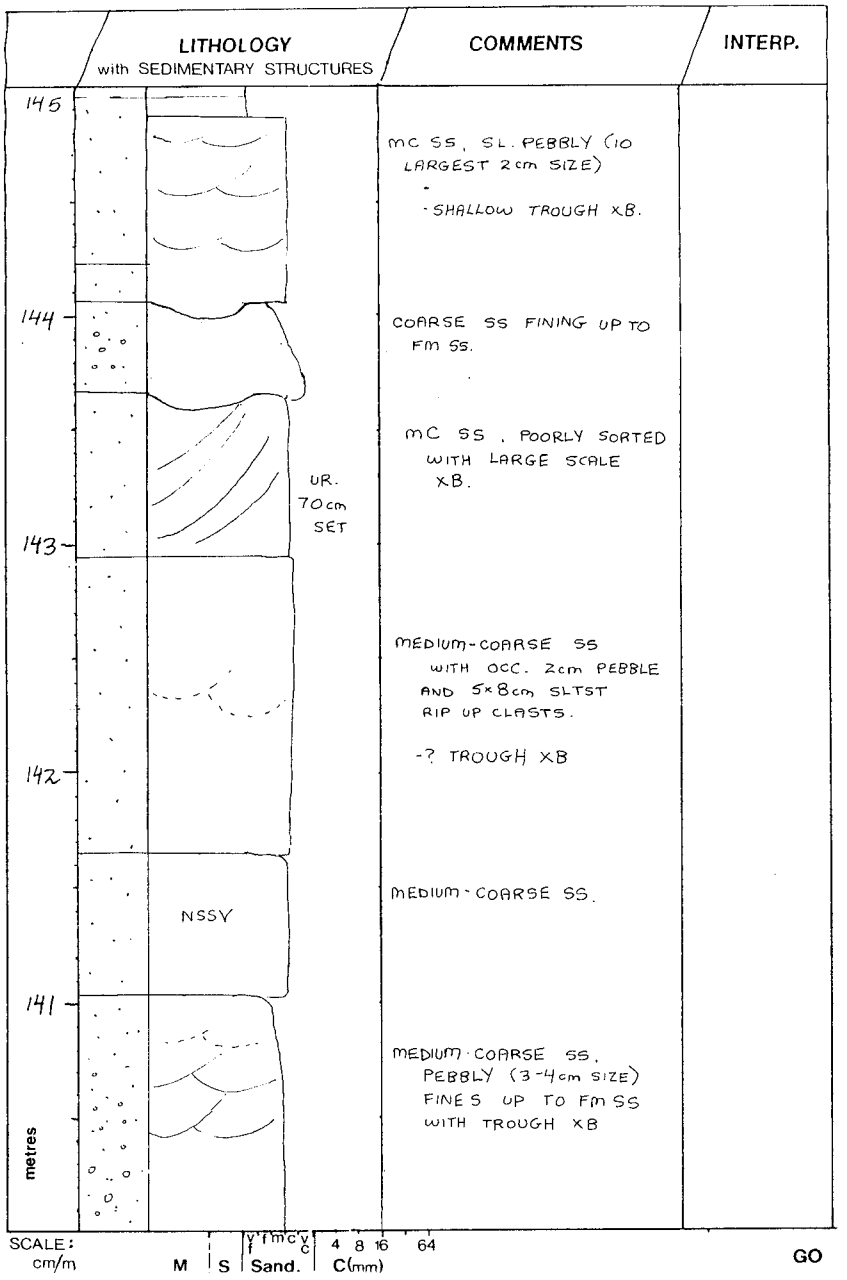
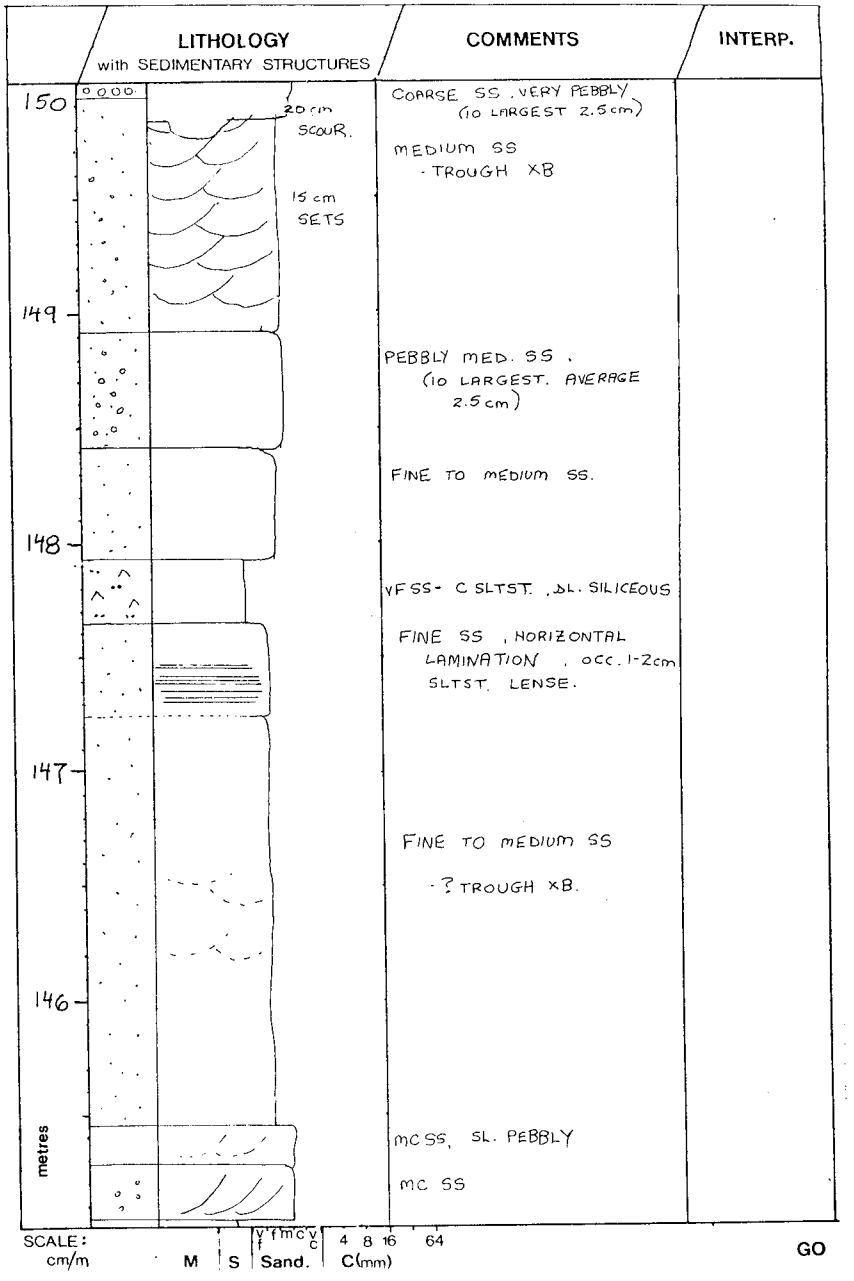
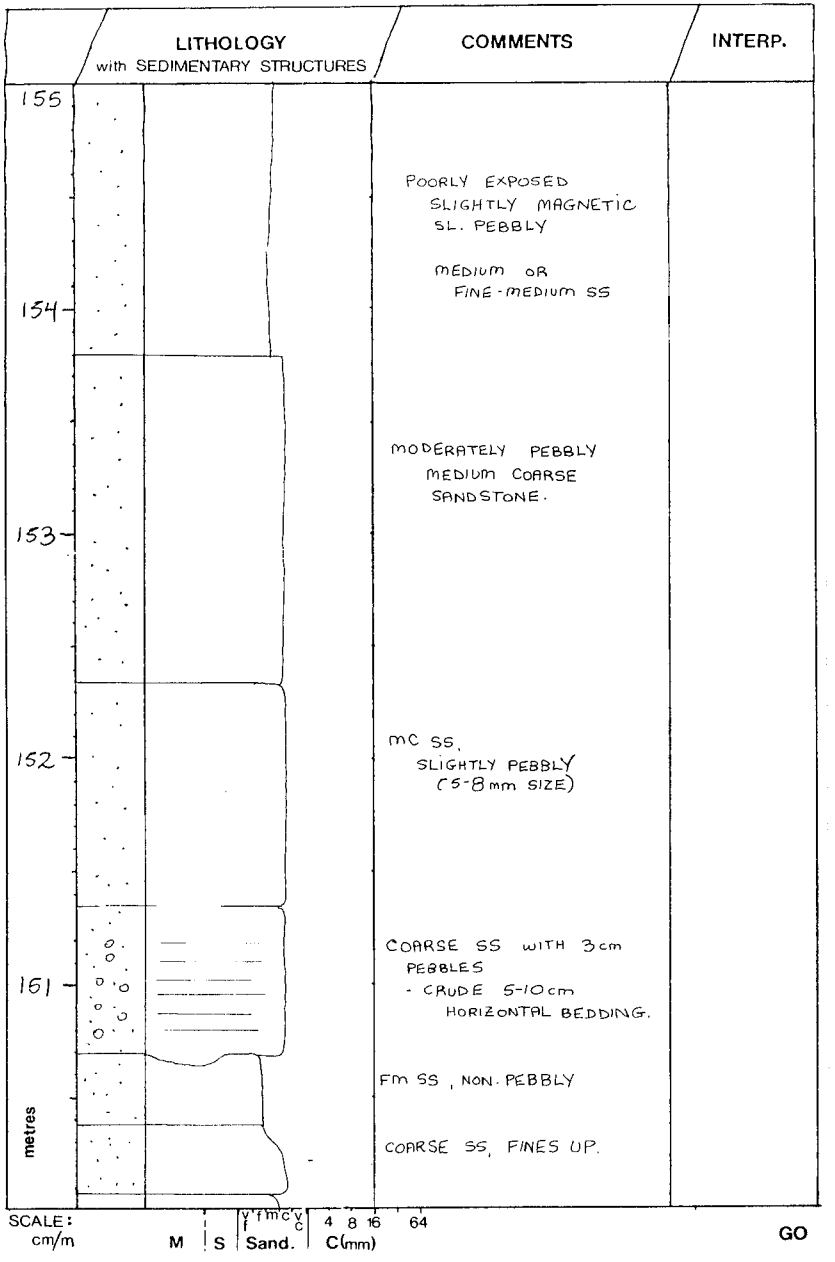


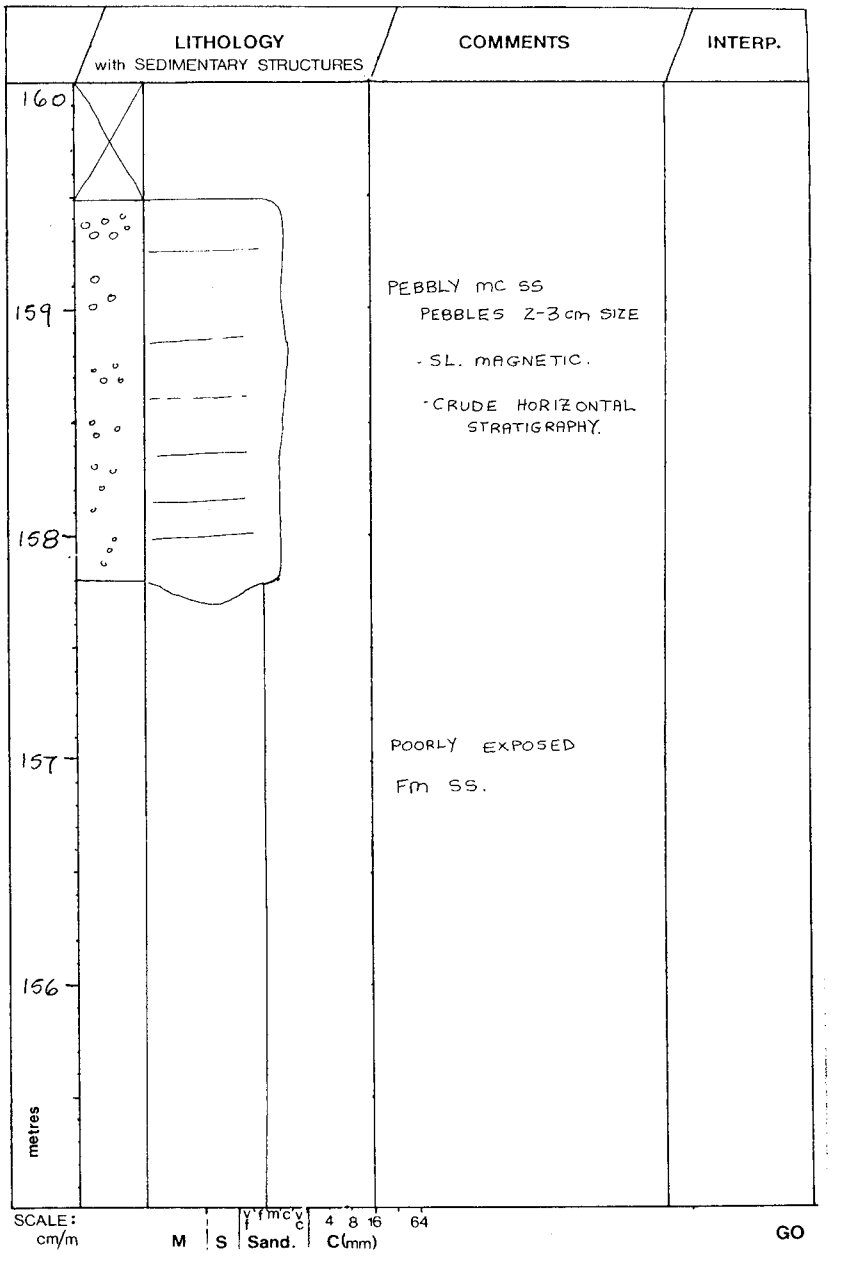
SECTION: F-1G LOCATION: CRAIG YR YSFA



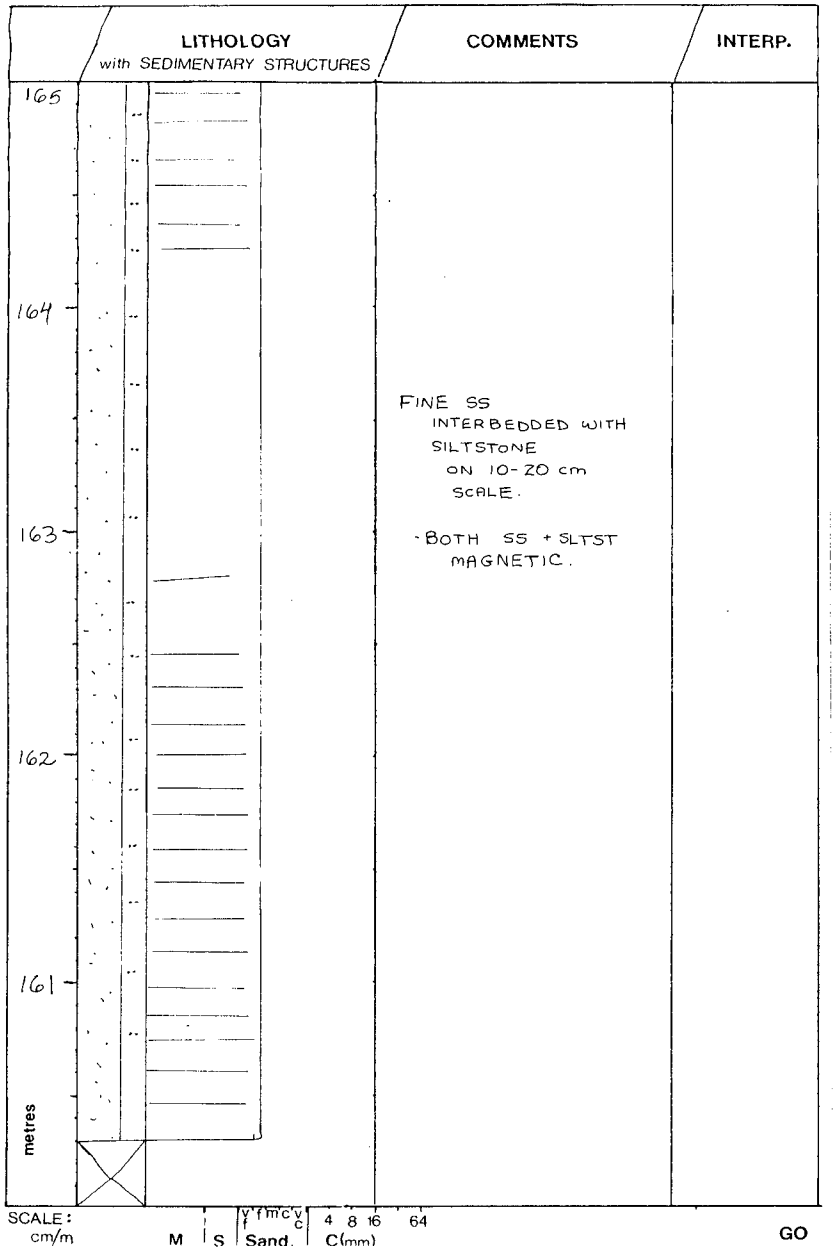
SECTION: [illegible] LOCATION: [illegible]



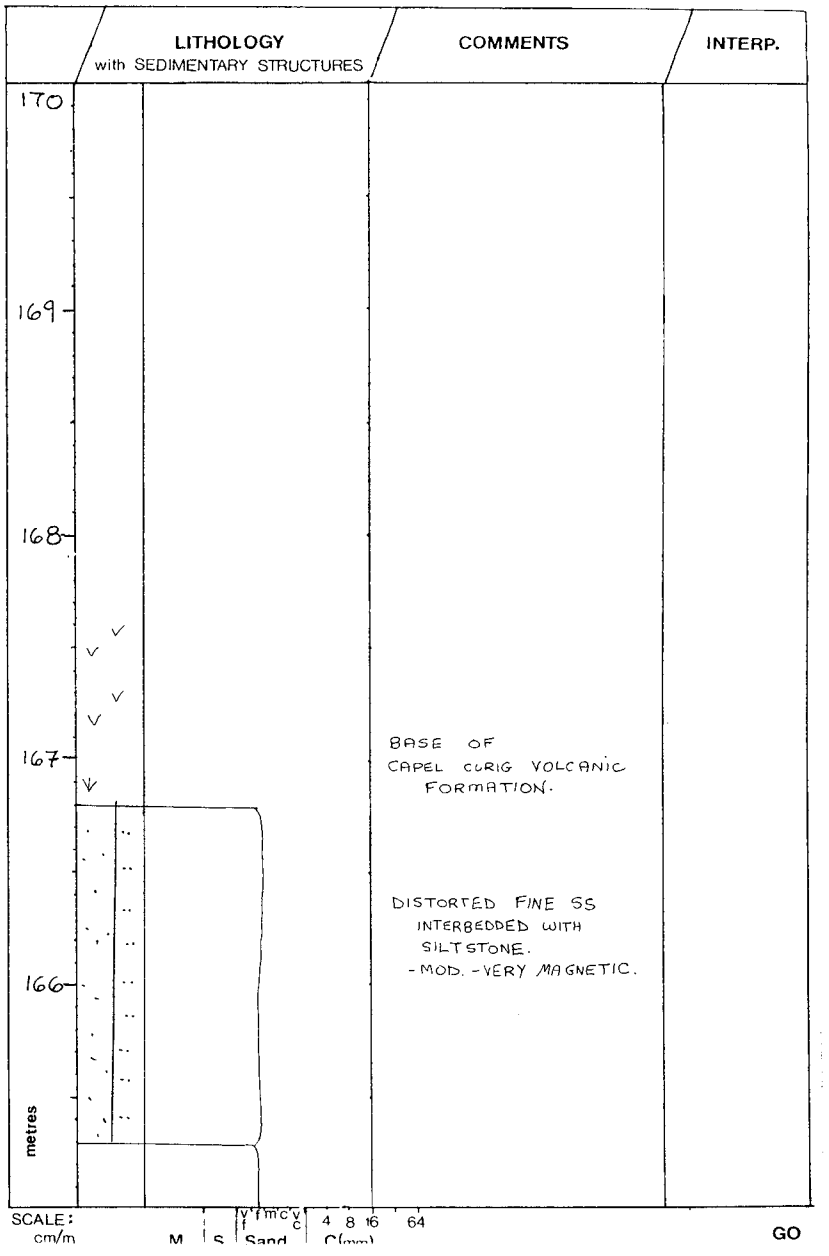
SECTION: [illegible] LOCATION: [illegible]



SECTION: F-16 LOCATION: CRAIG YR YSFA

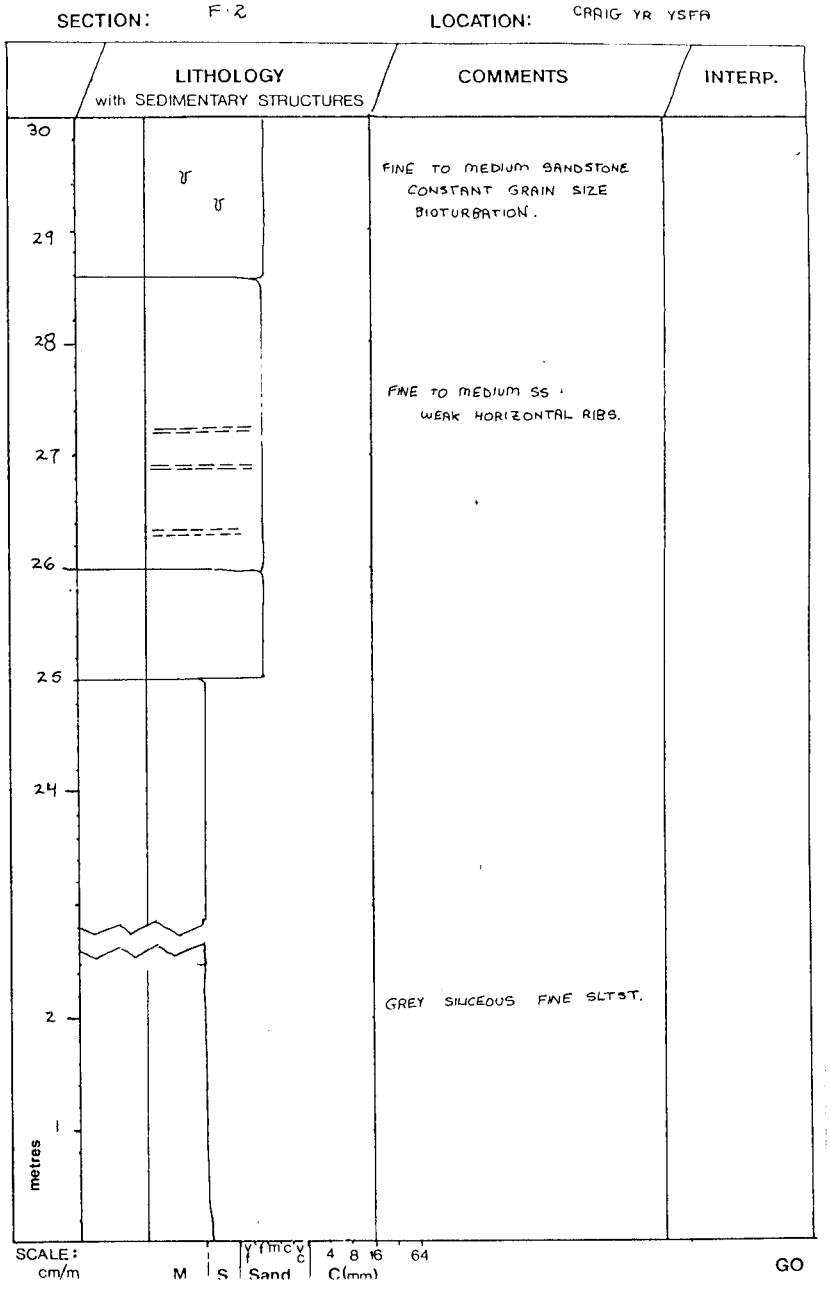


SECTION: LOCATION:

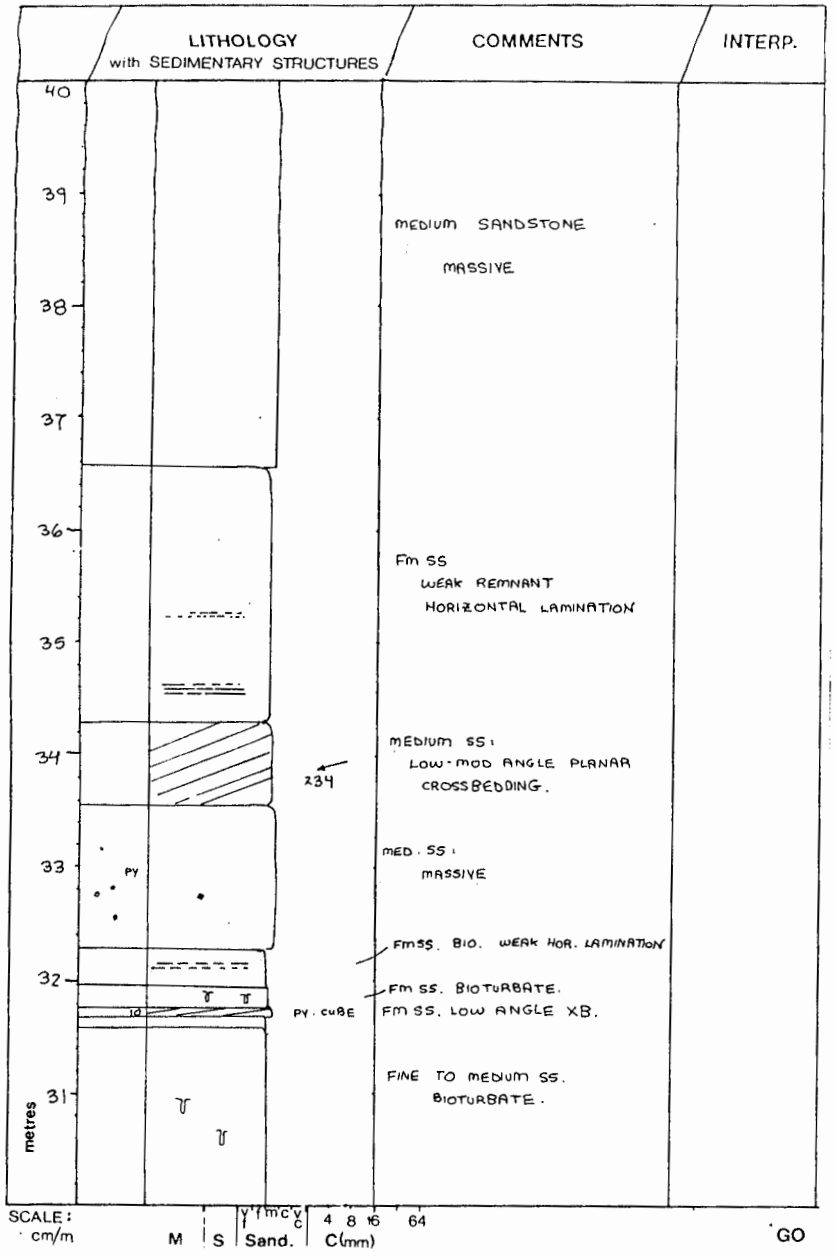


SECTION F2

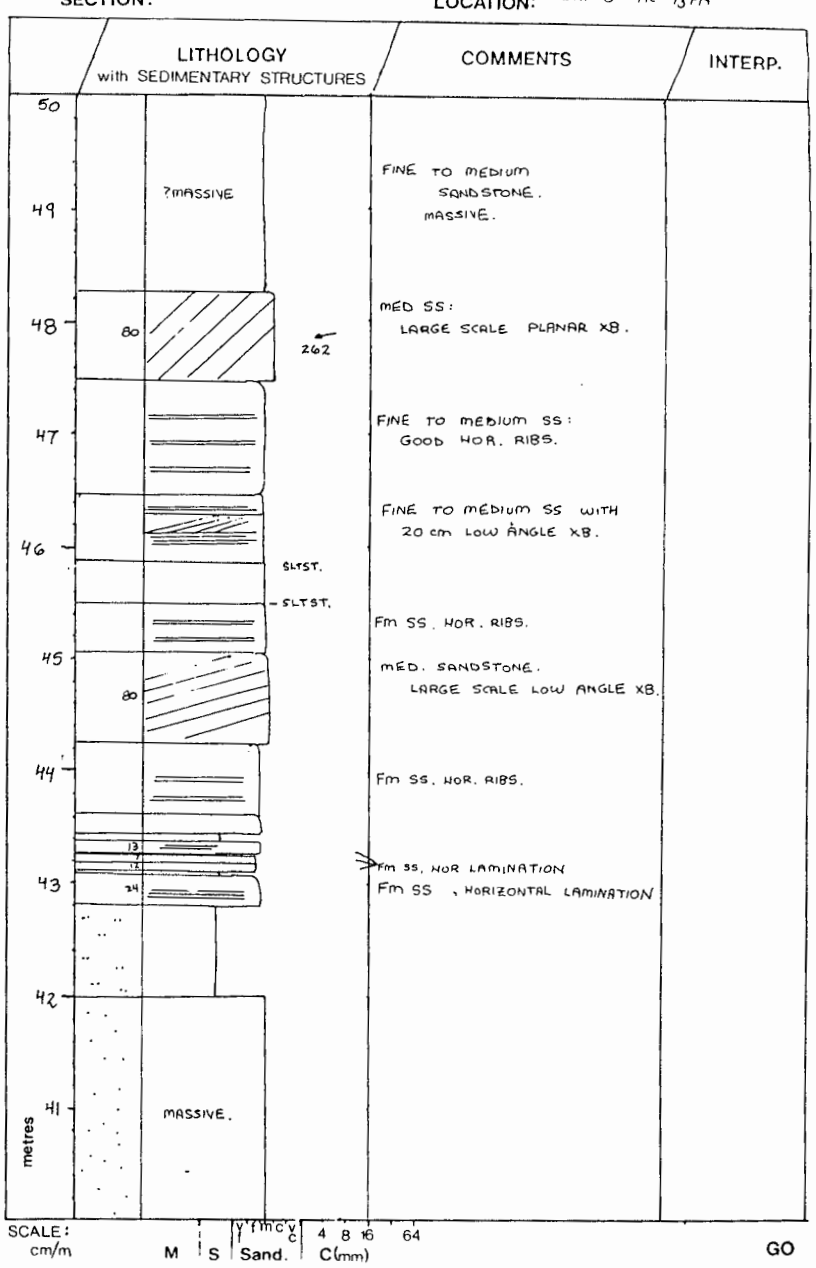
SECTION F2 LOCATION: Section starts at top of Capel Curig Volcanic Formation 50 m to west of footpath between Ffynnon Llugwy and Bwlch Craig. Section continues along SE side of Bwlch Craig stepping topographically higher towards Pen-yr Helgi Du.



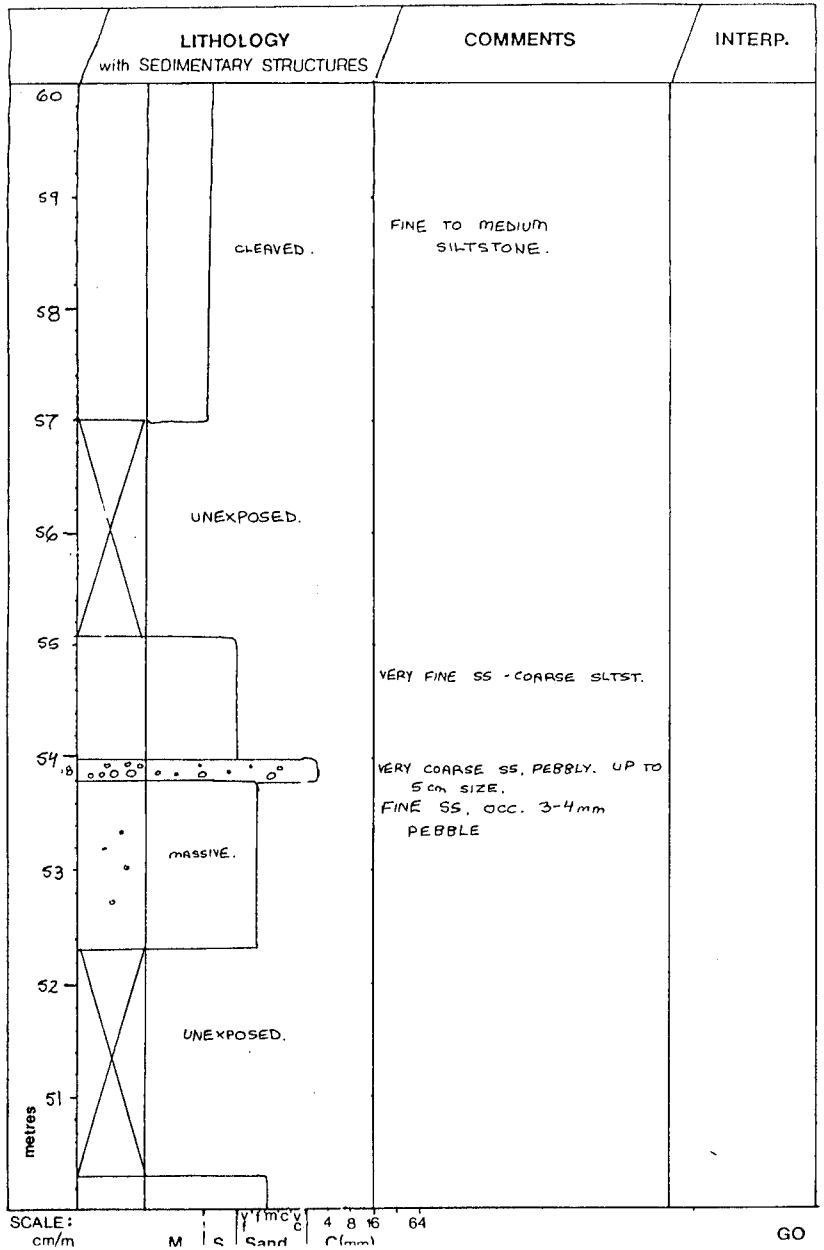
SECTION: F·2 LOCATION: CRAIG YR YSFA.



SECTION: F·2 LOCATION: CRAIG YR YSFA



SECTION: F.2 LOCATION: CRAIG YR YSFA



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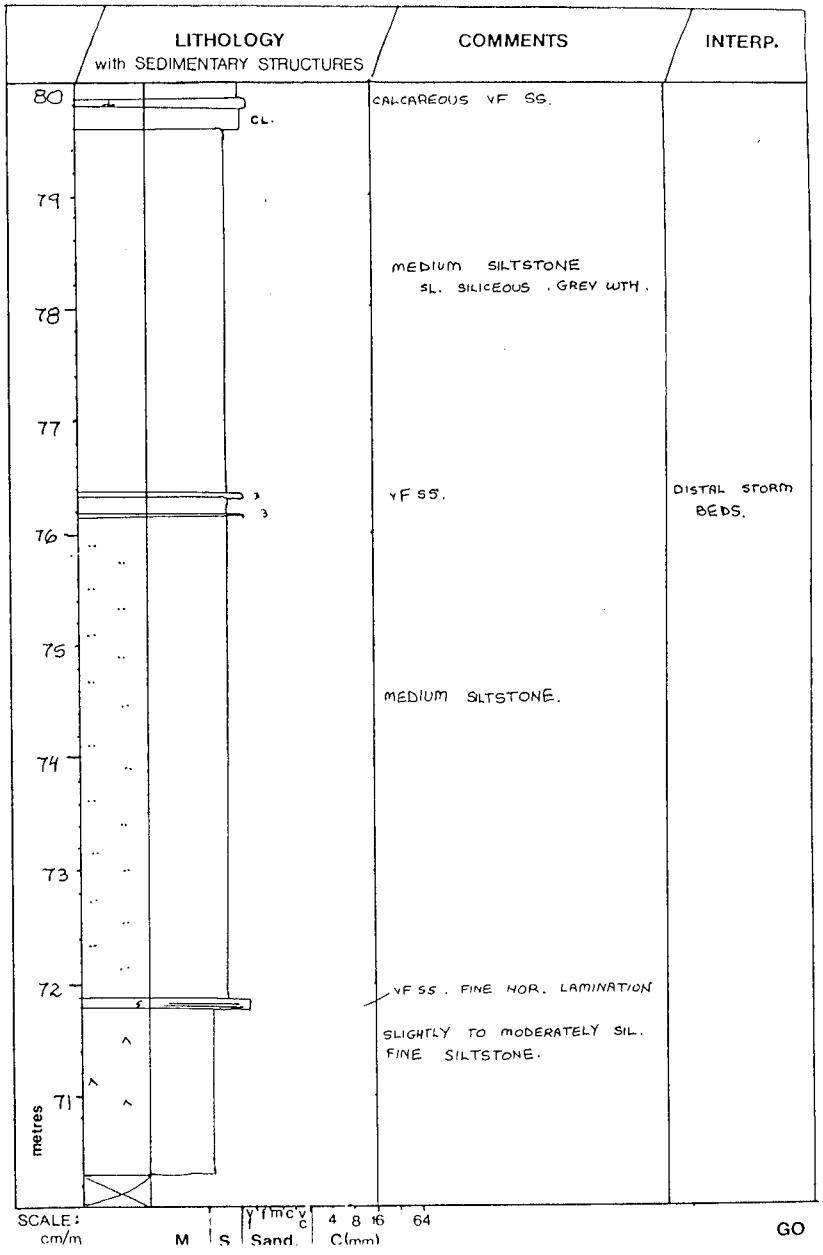
SECTION: LOCATION:



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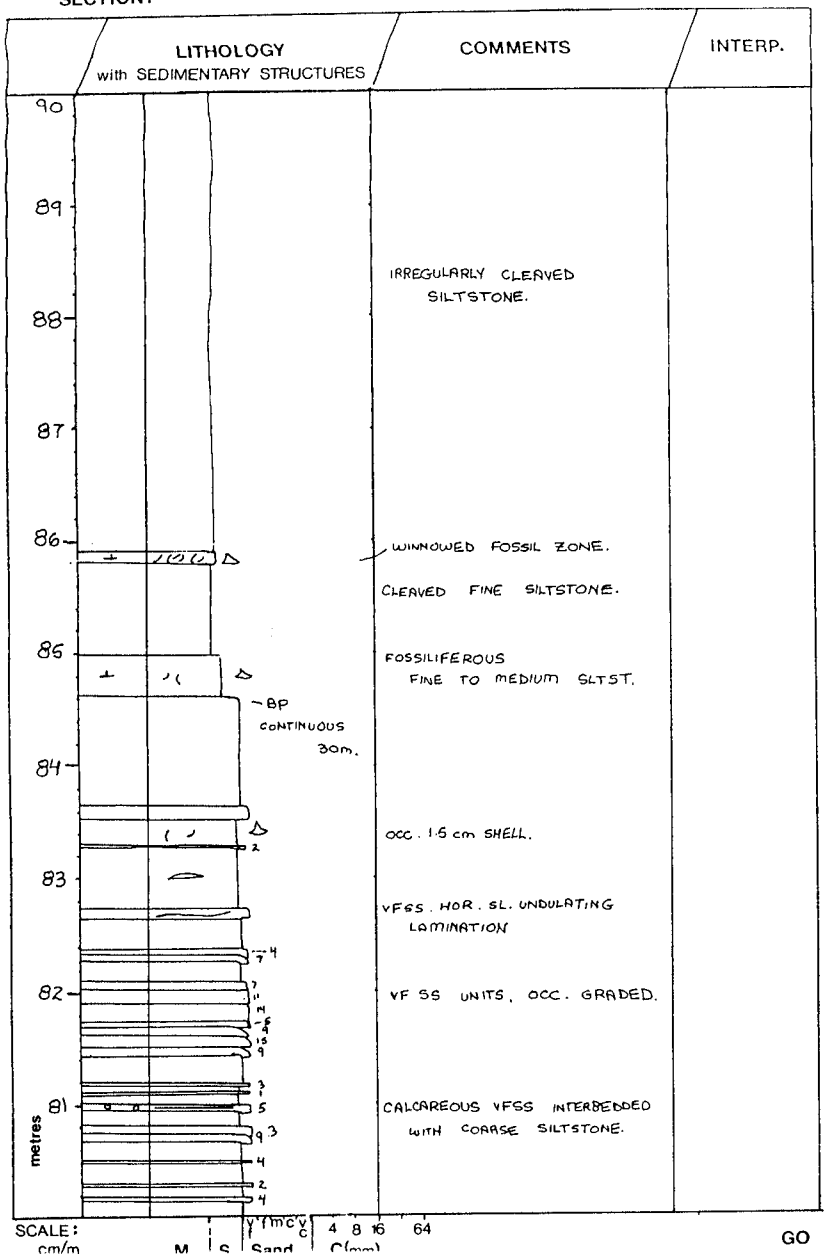
SECTION: F·2 LOCATION: CRAIG YR YSFA.



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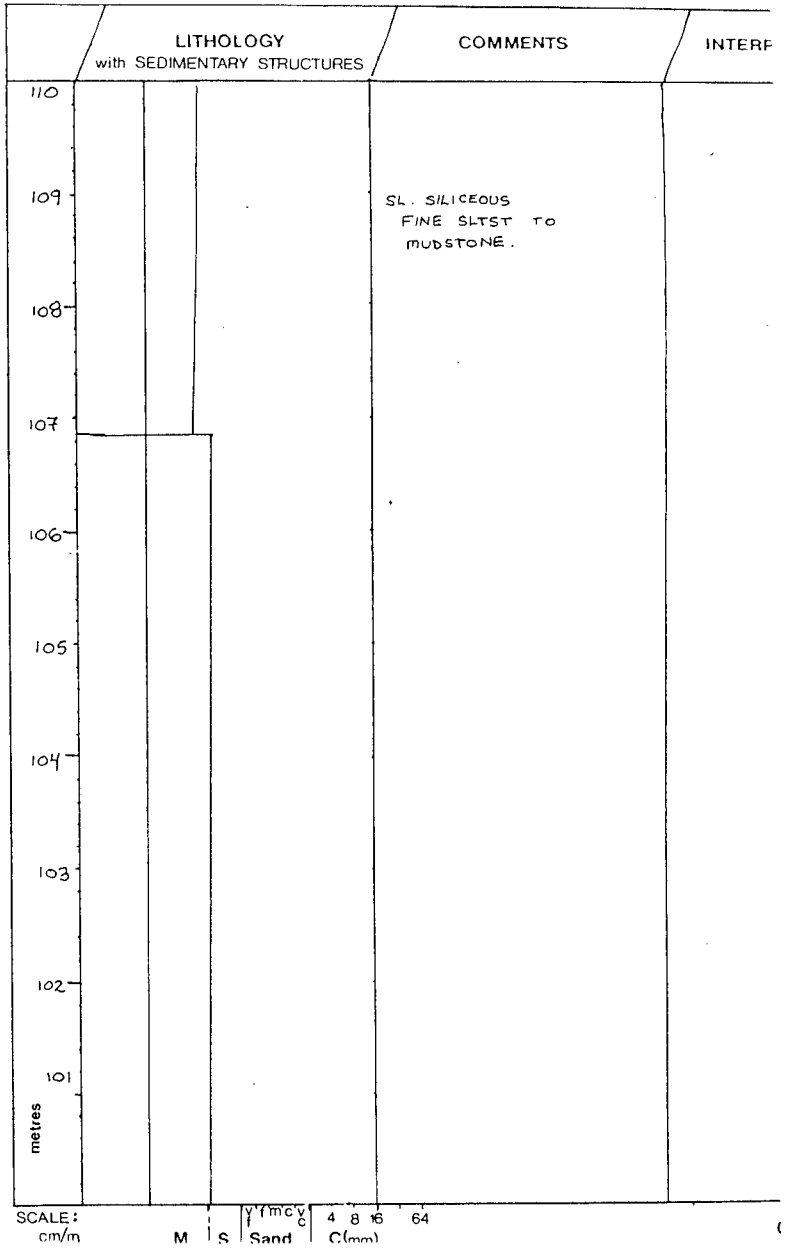
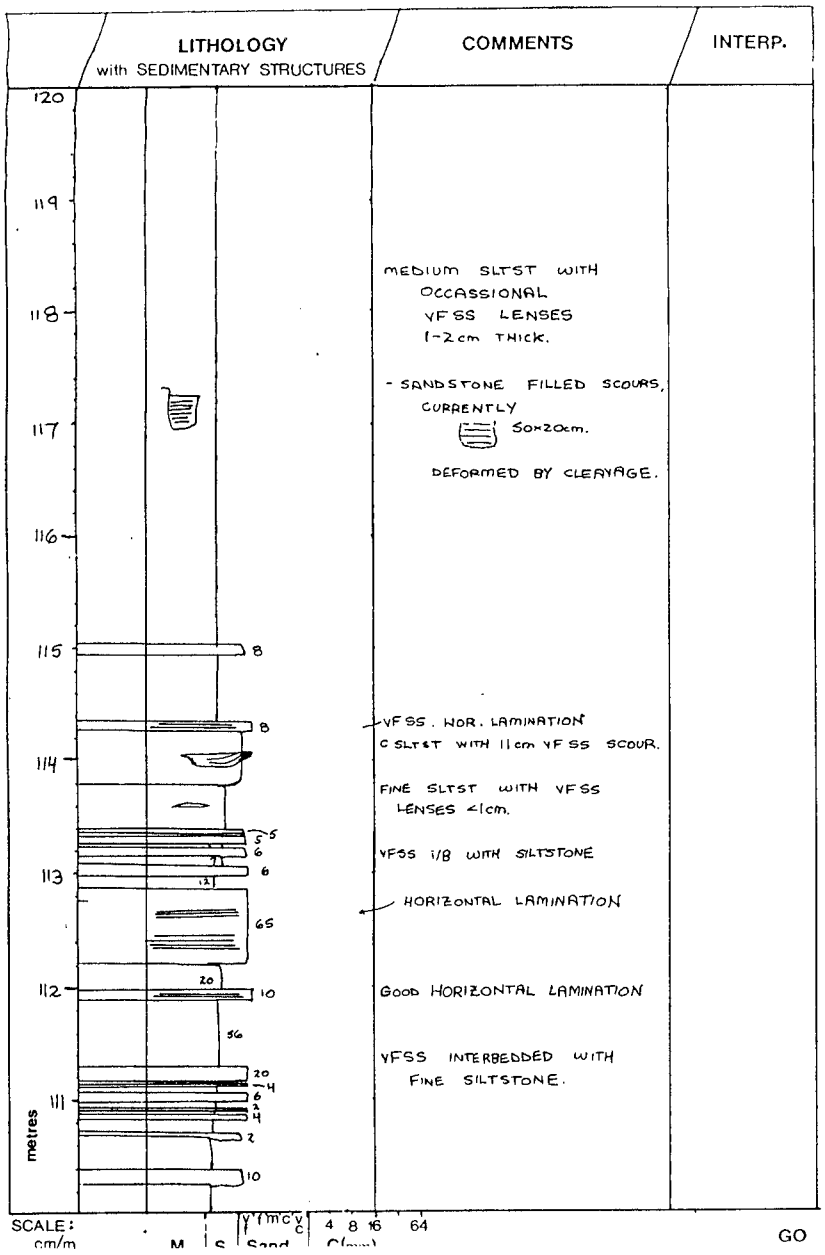
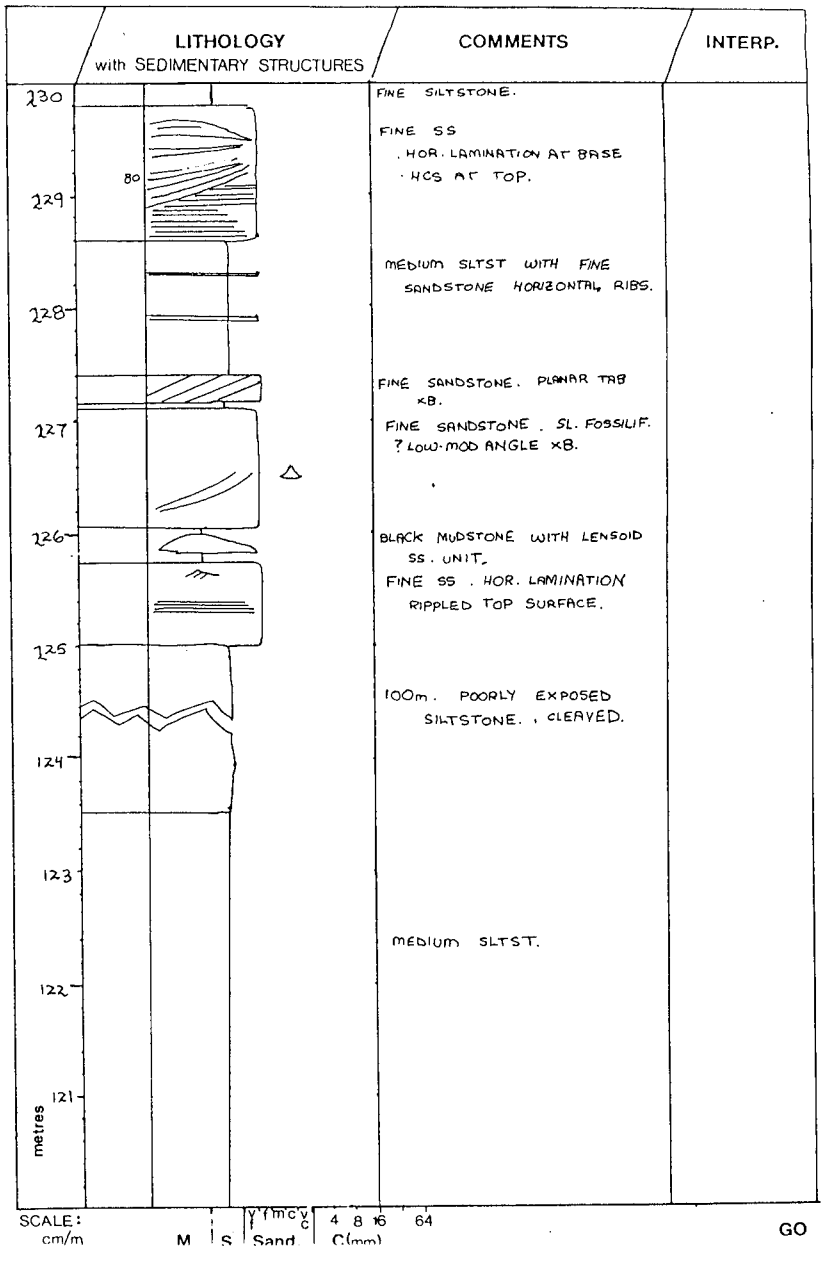
SECTION: F·2 LOCATION: CRAIG YR YSFA



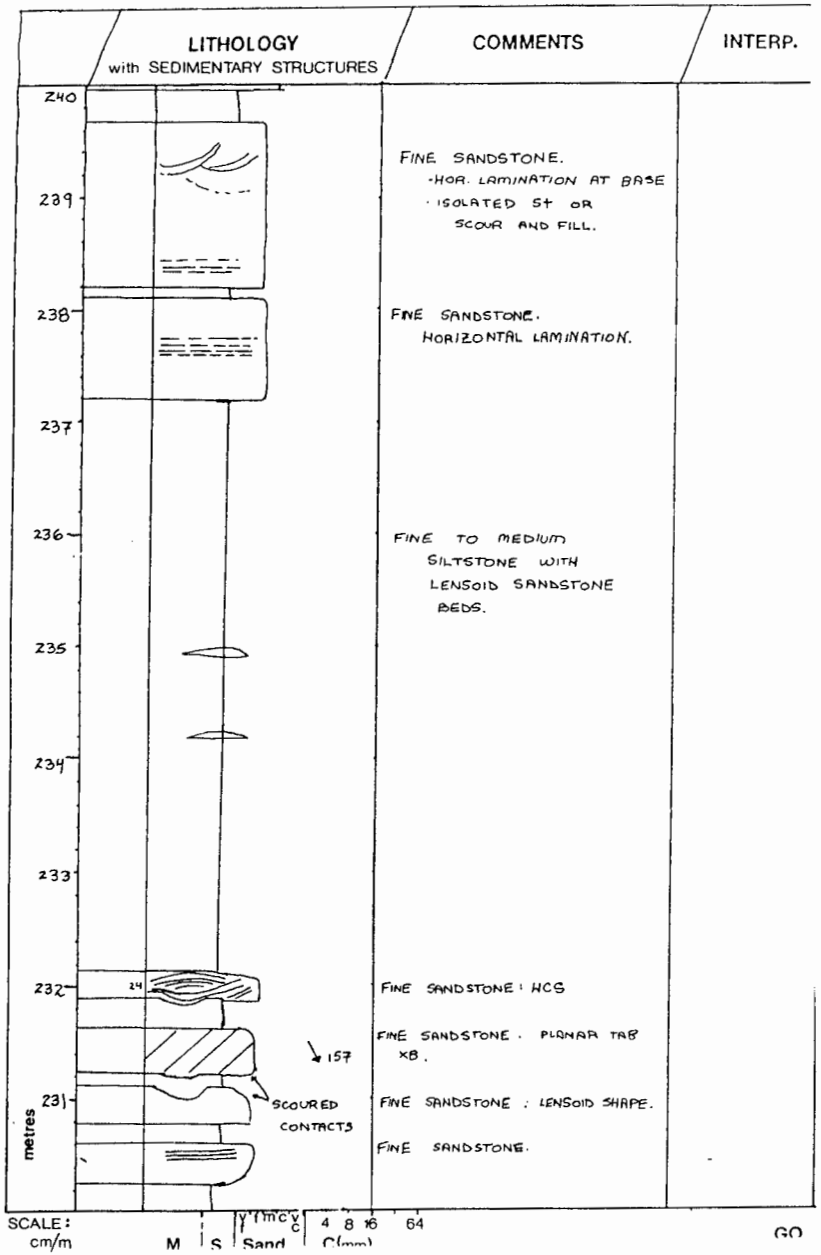
SECTION: F·2 LOCATION: CRAIG YR YSFA



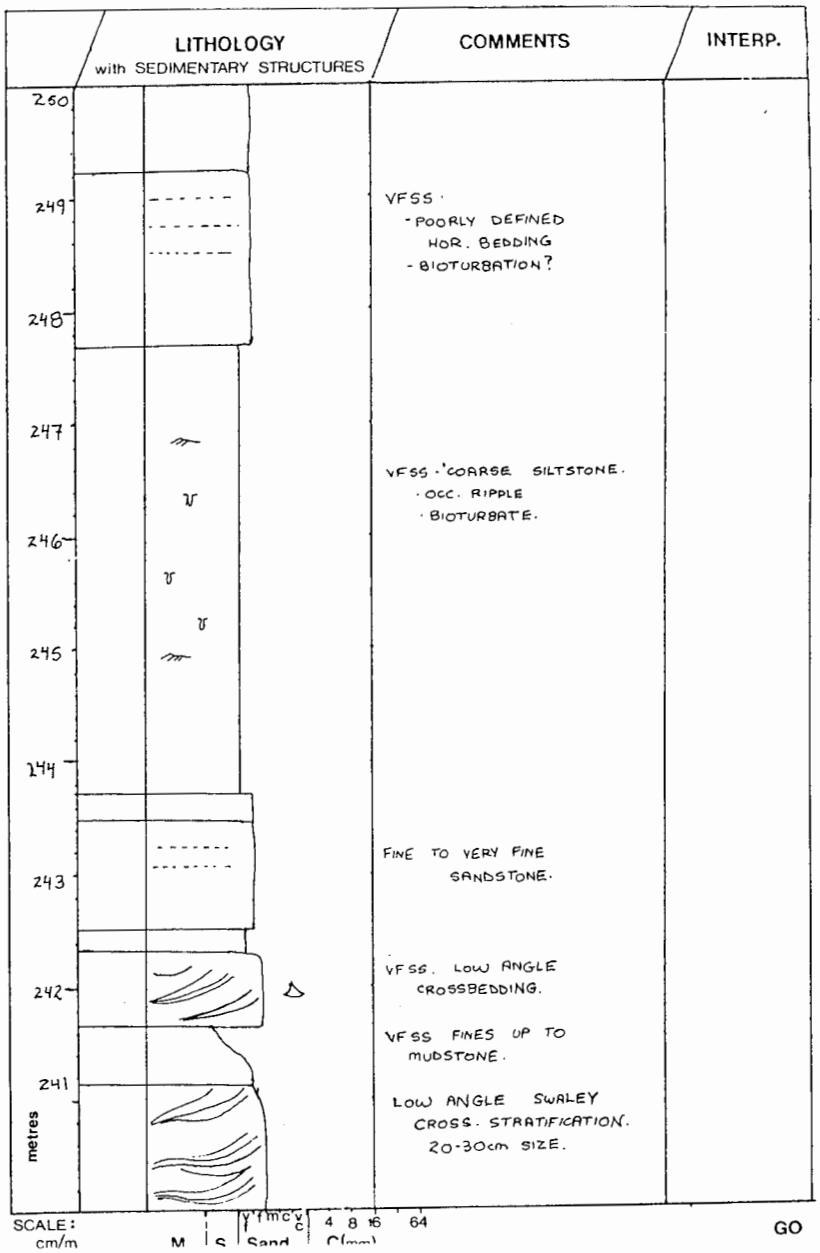
SECTION: F·2 LOCATION: CRAIG YR YSFA



SECTION: F·2 LOCATION: CRAIG YR YSFA



SECTION: F·2 LOCATION: CRAIG YR YSFA.



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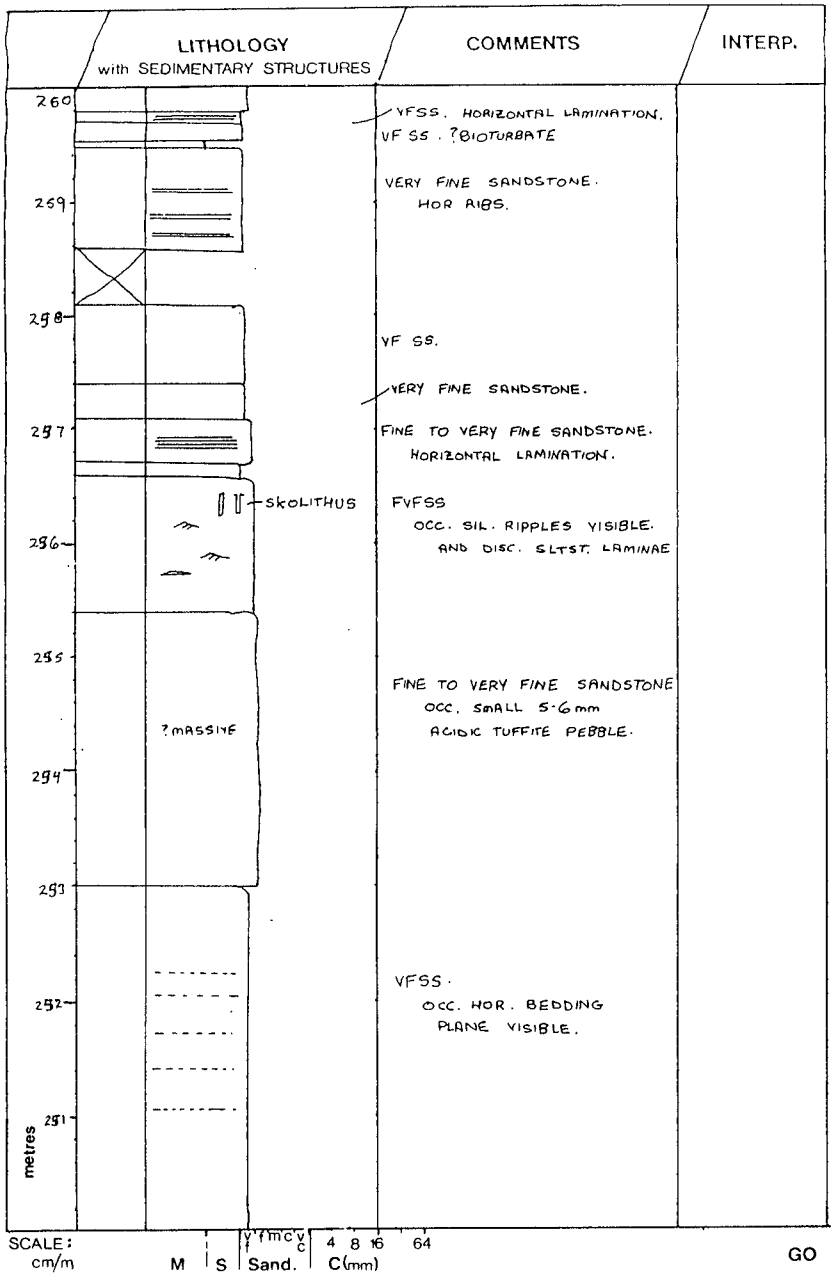
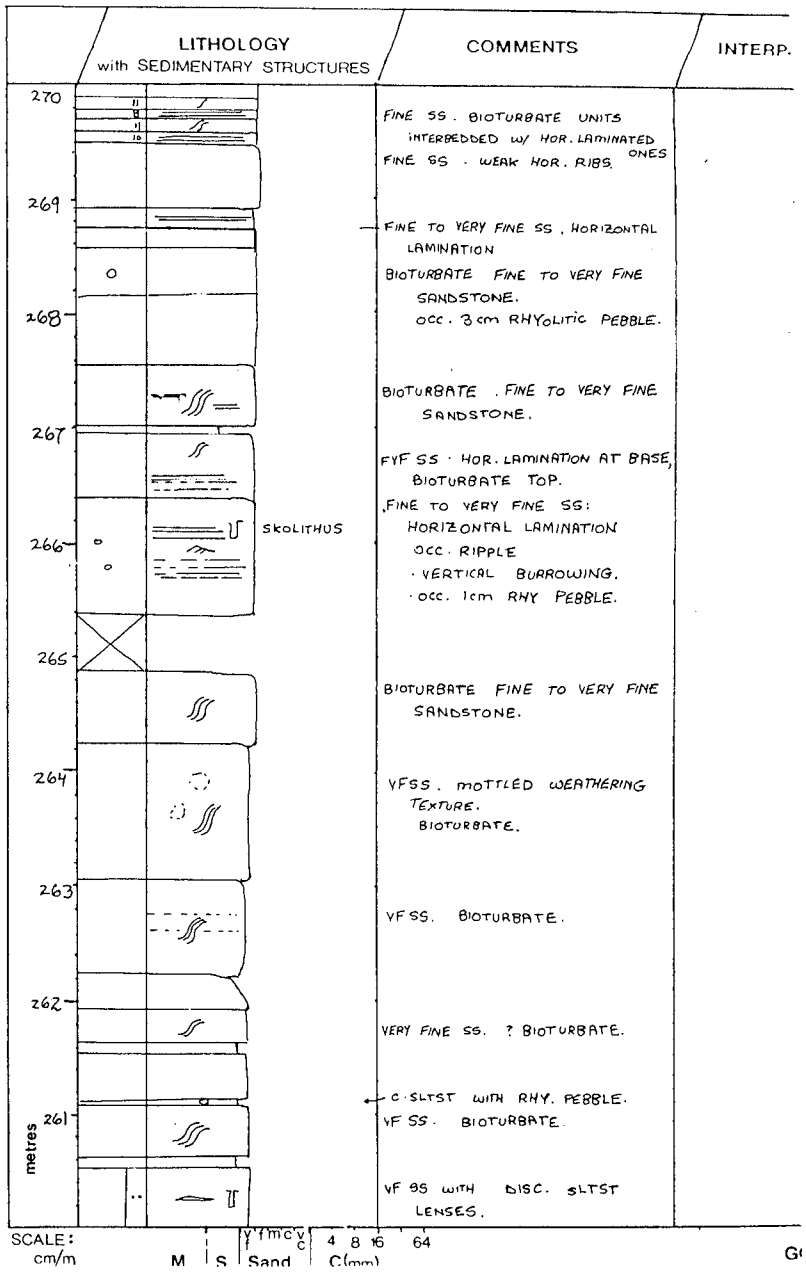
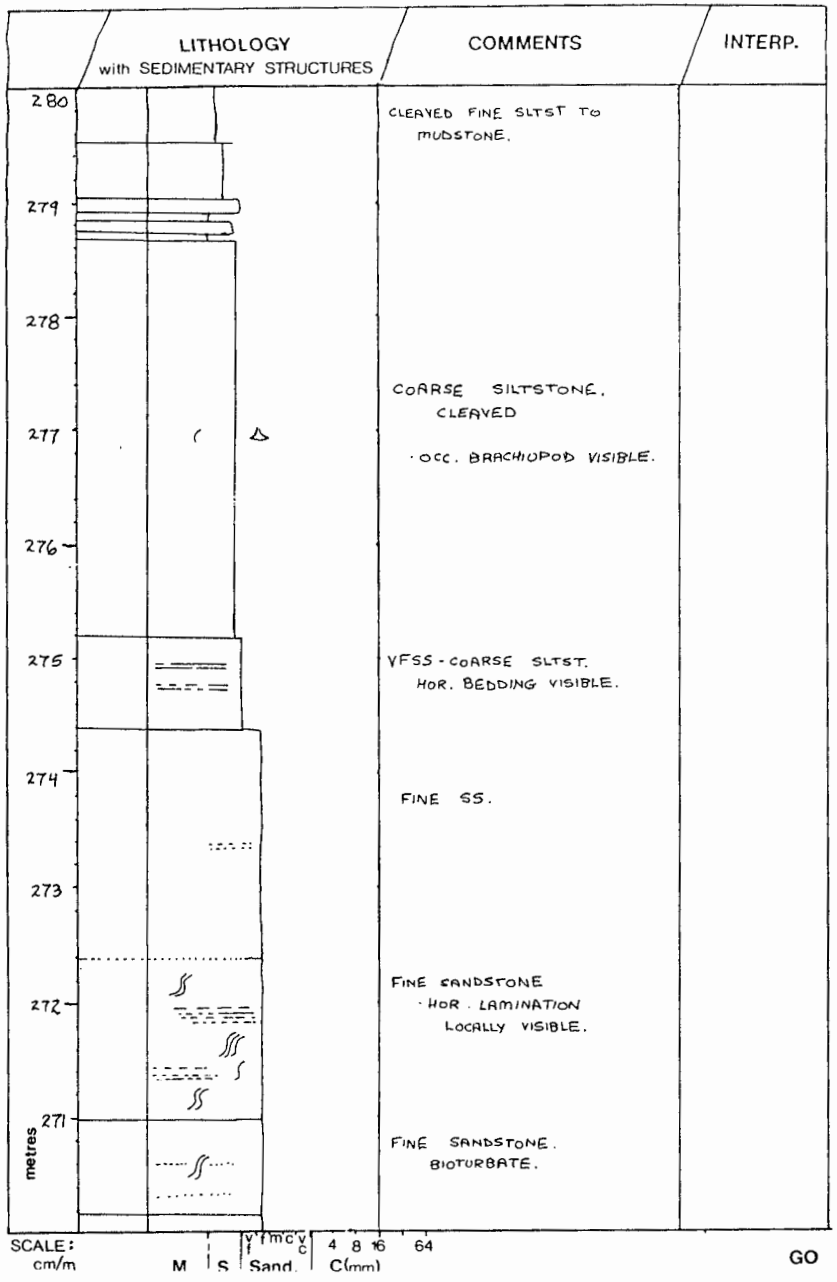


SECTION: F·2 LOCATION: CRAIG YR YSFA.

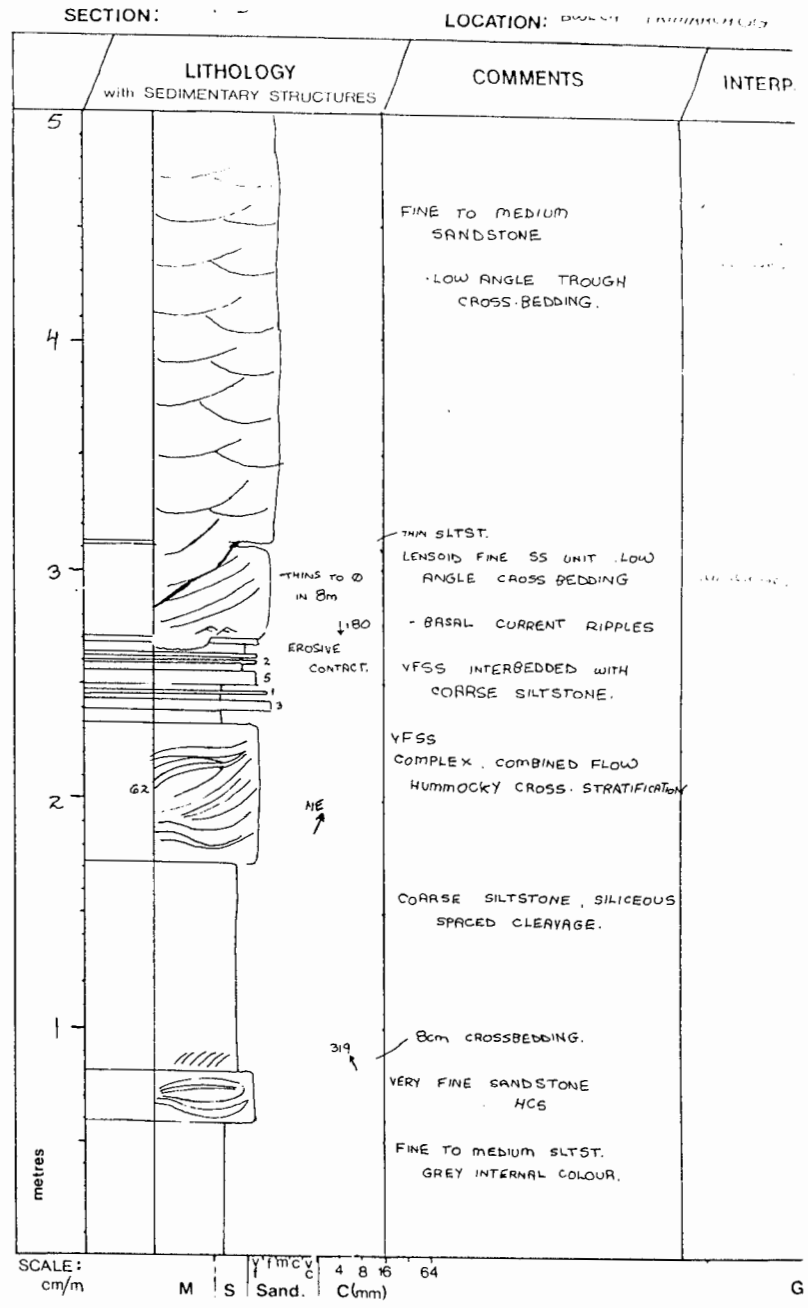


SECTION: F·2 LOCATION: CRAIG YR YSFA

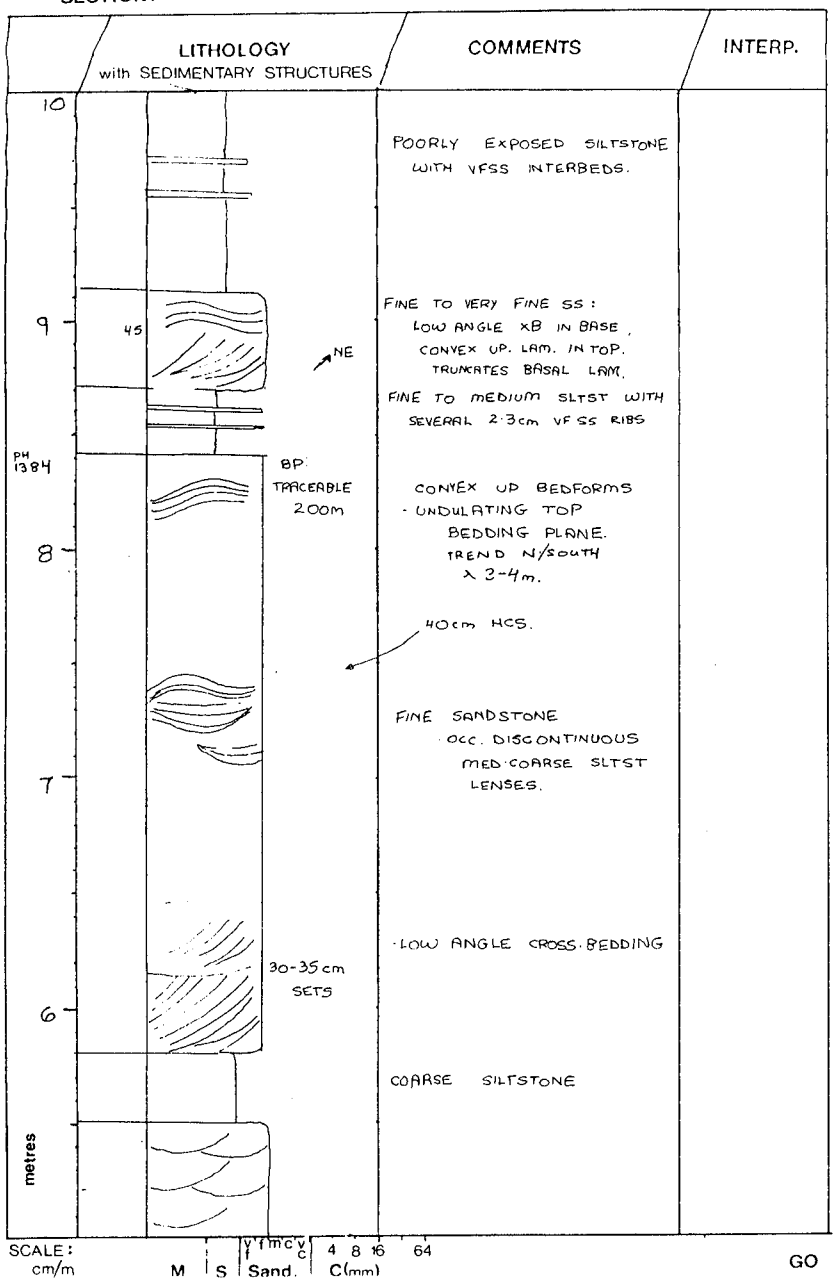


SECTION F3

SECTION F3 LOCATION: Sections starts at first outcrop of sandstones encountered along Llech Lefn Y Lasgallt ridge as one descends towards Bwlch Trimarchog. Continue measuring along NE lip of Bwlch Trimarchog to dolerite intrusion.



SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



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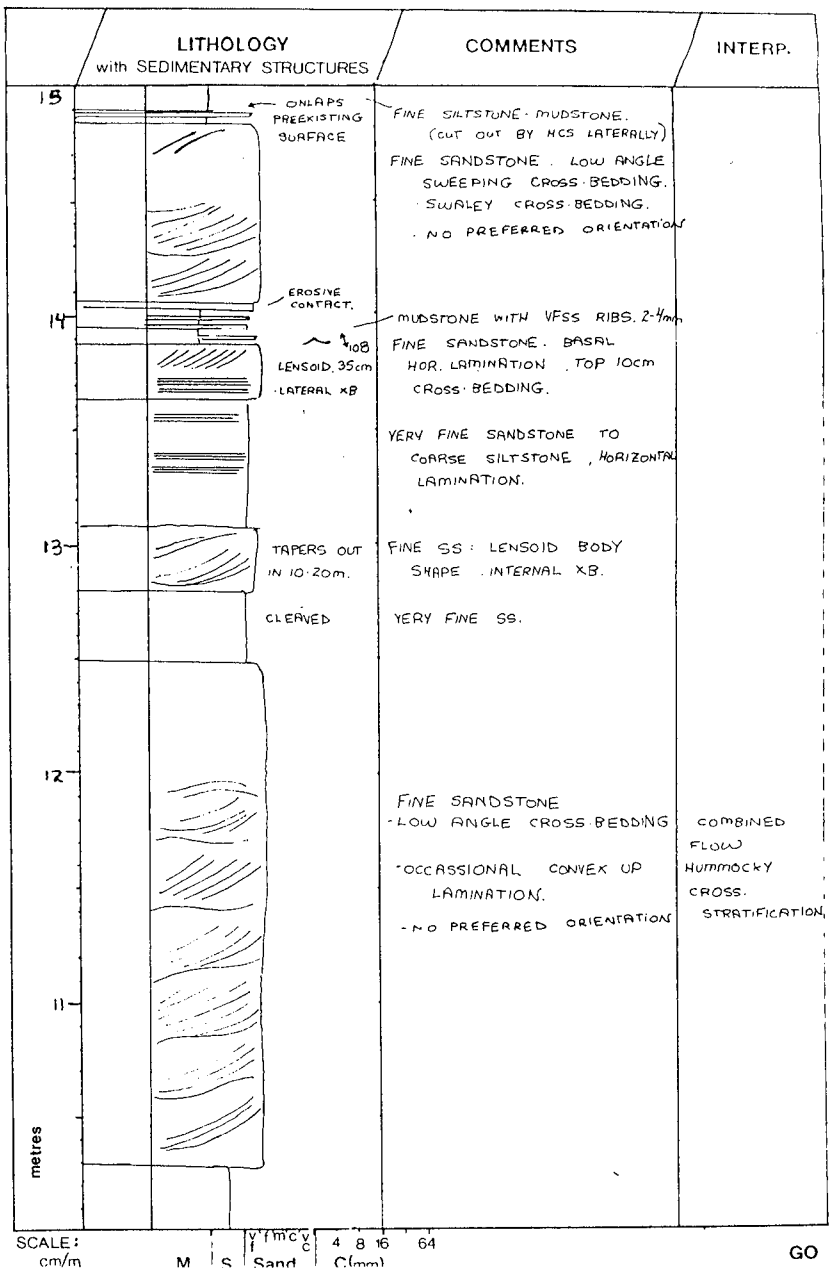
SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



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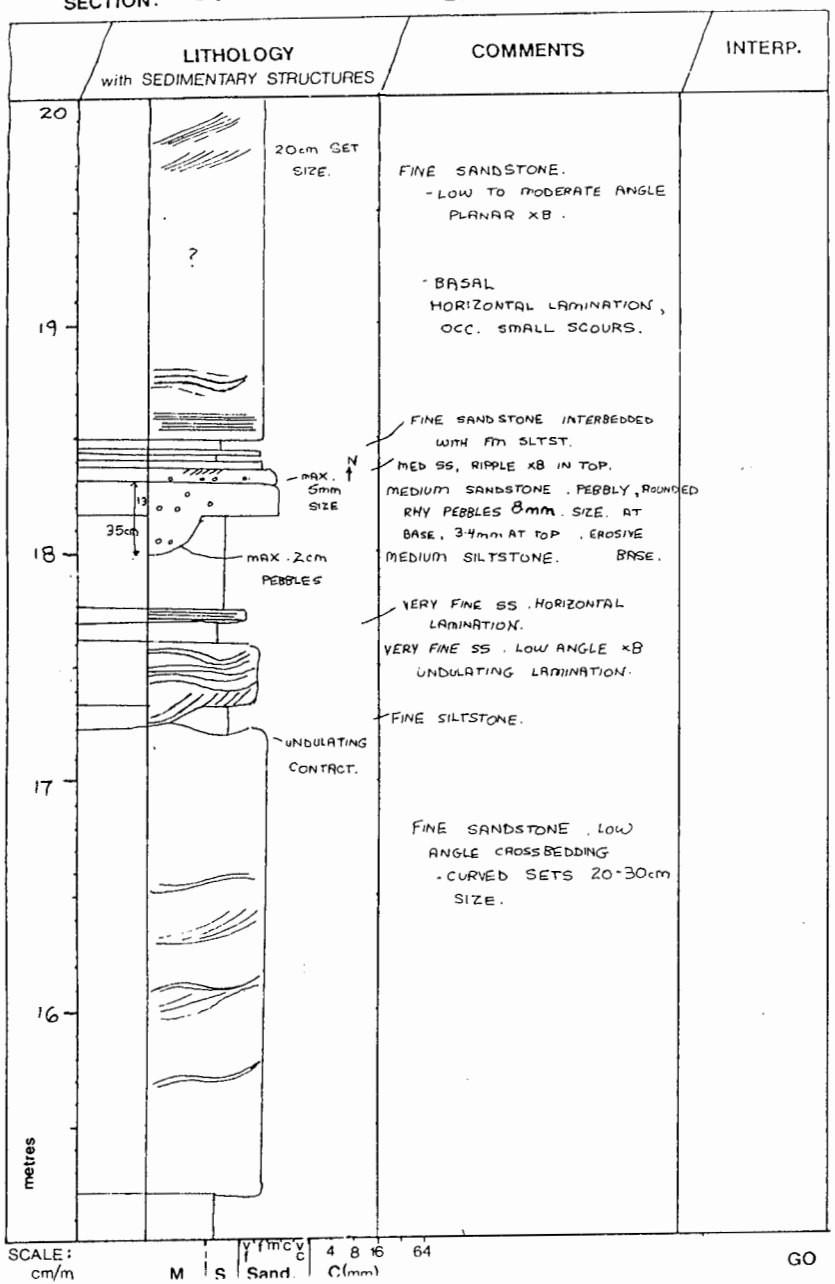
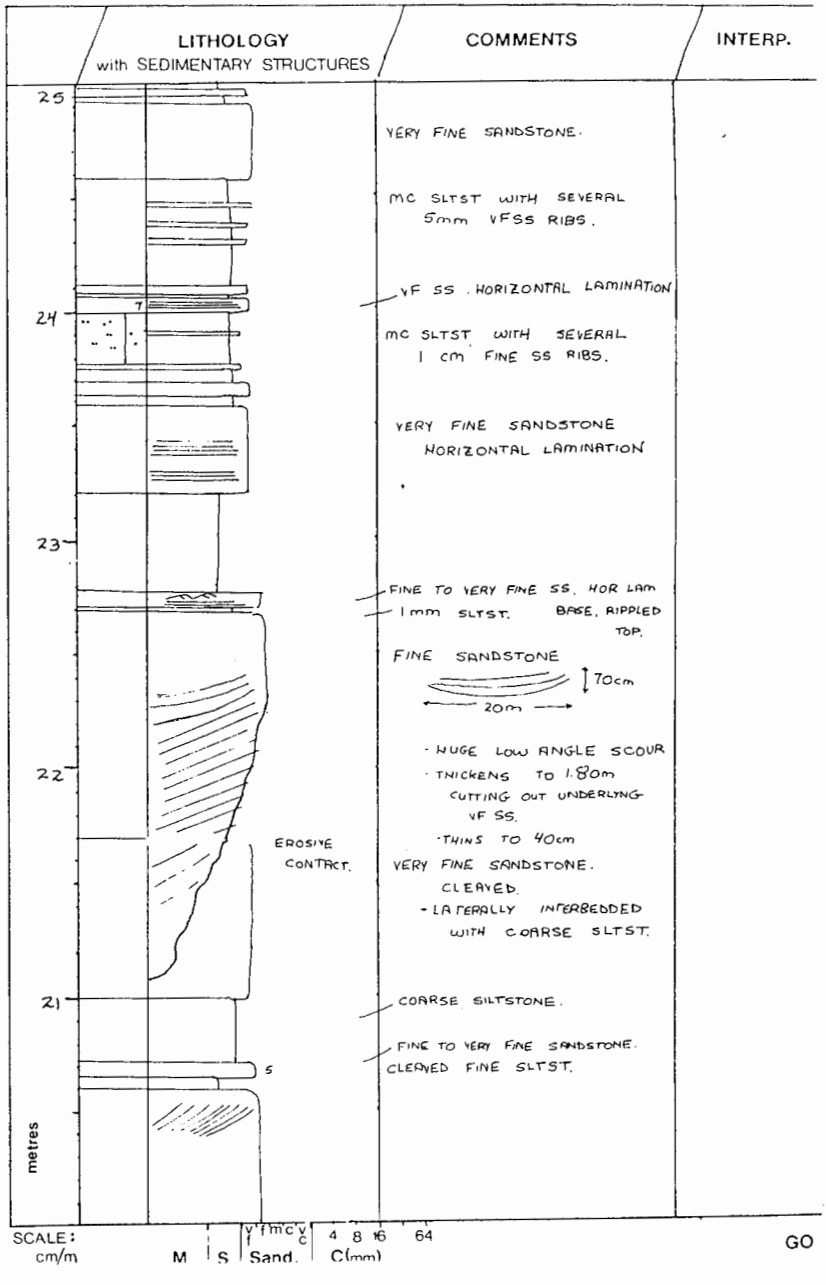
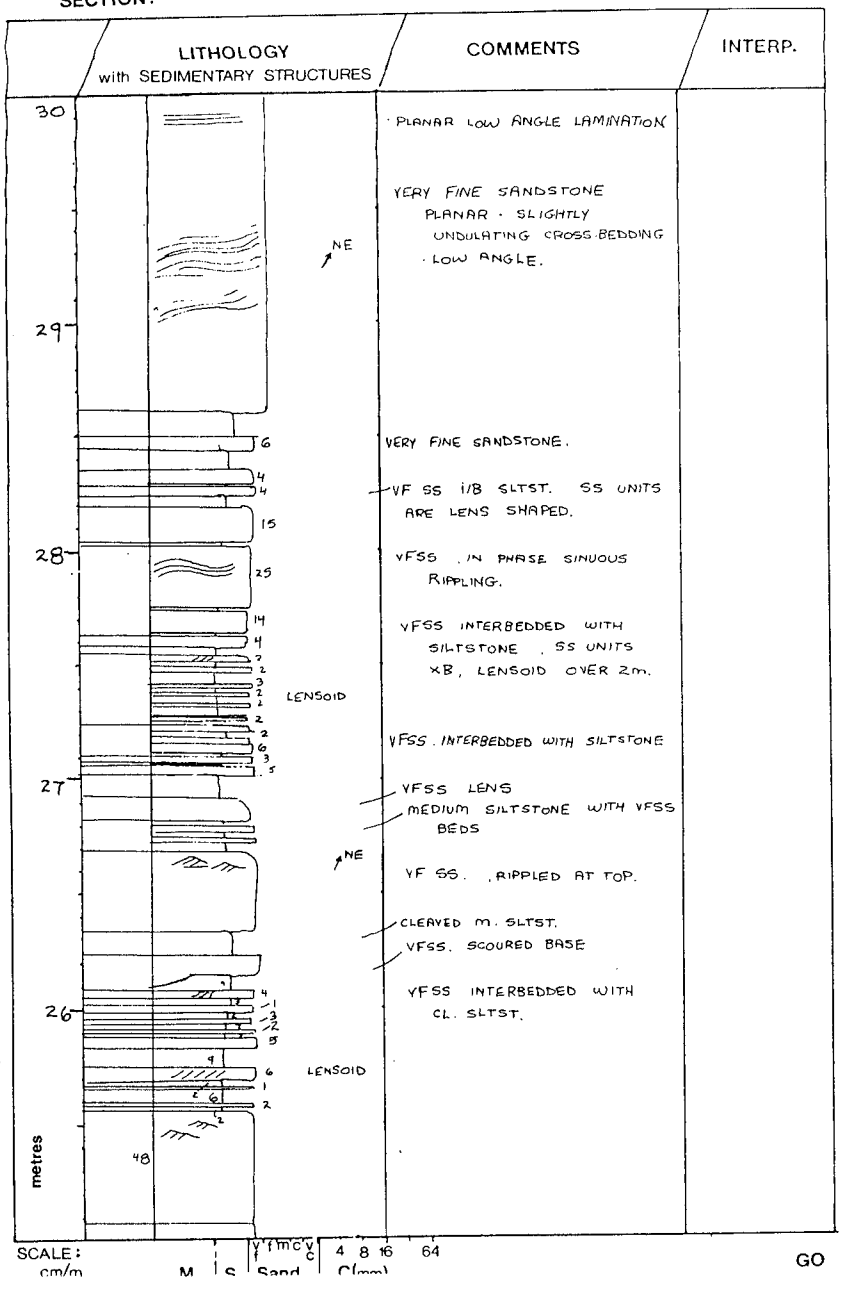
SECTION: BWLCH TRIMARCHOG LOCATION: F·3



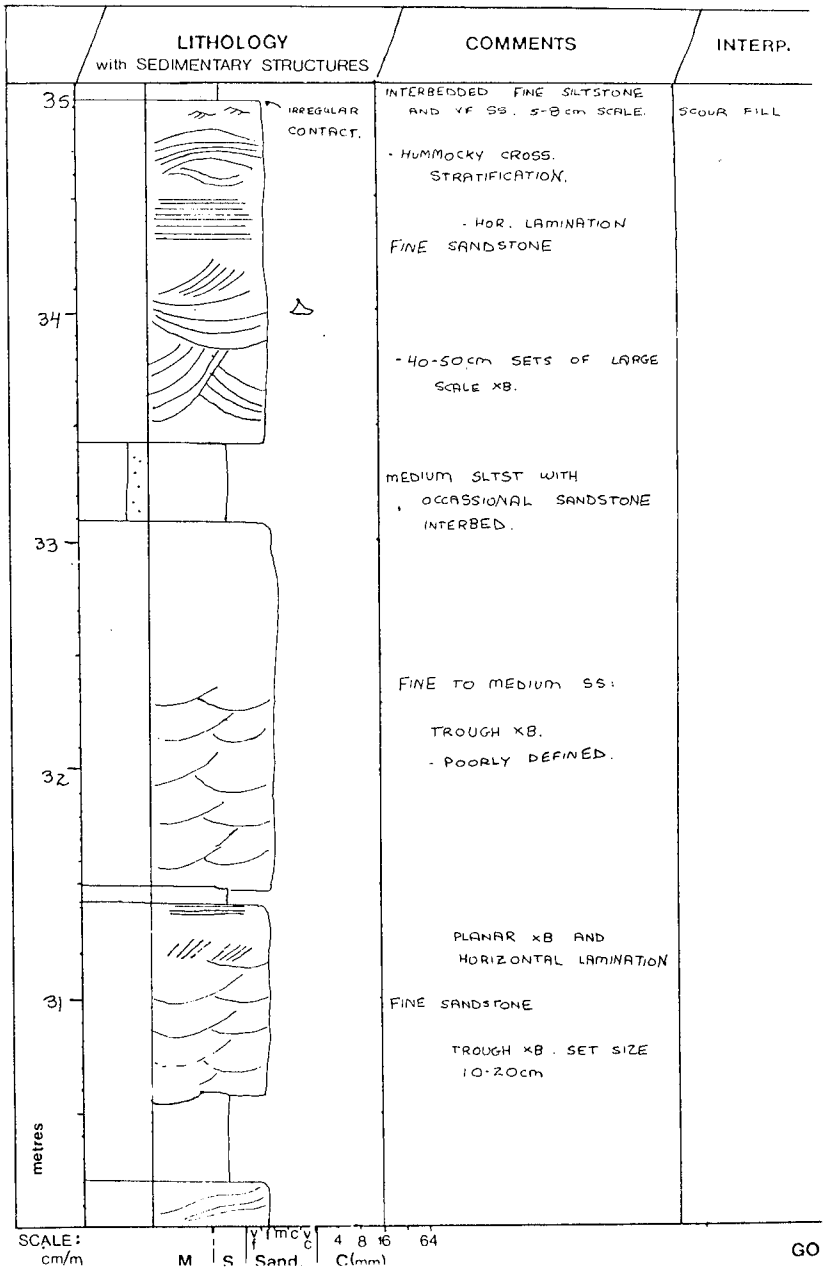
SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



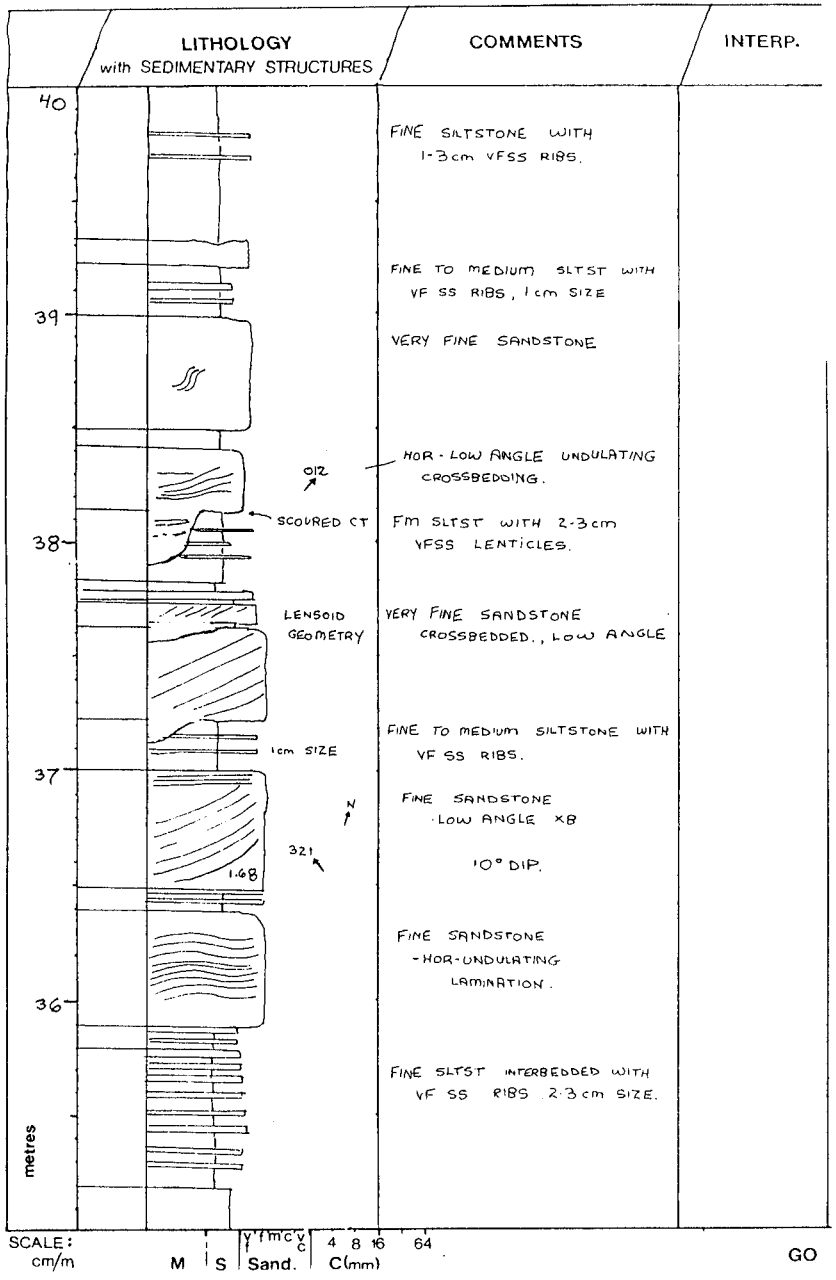
SECTION: LOCATION:



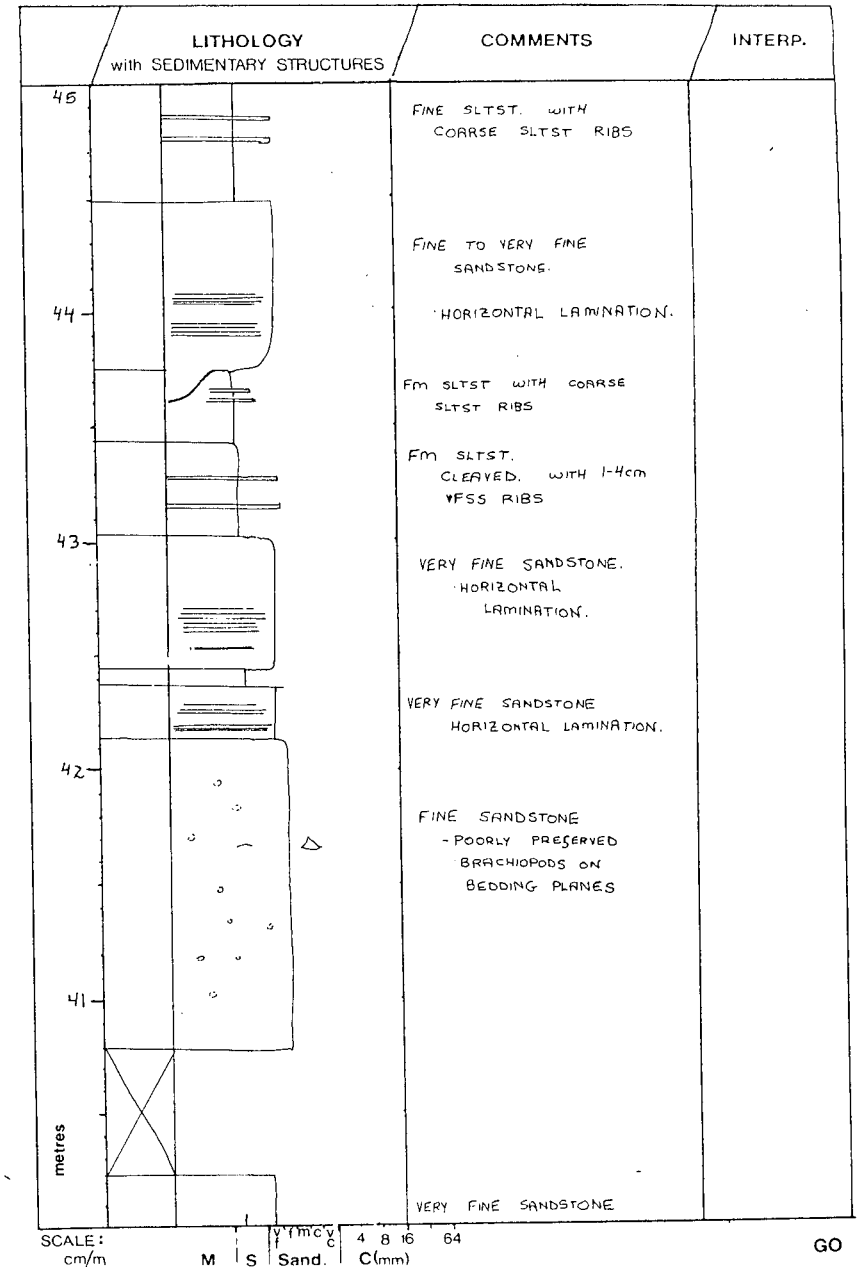
SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



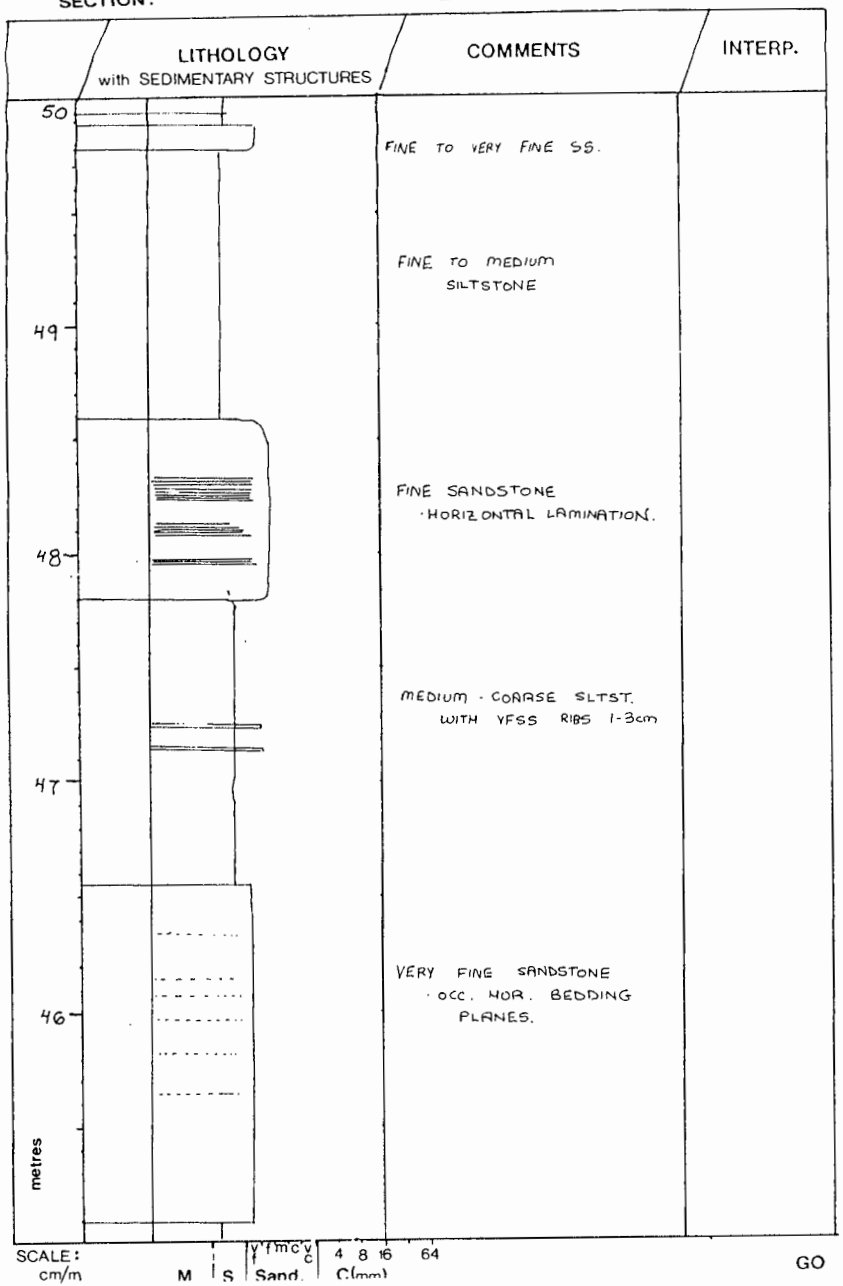
SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



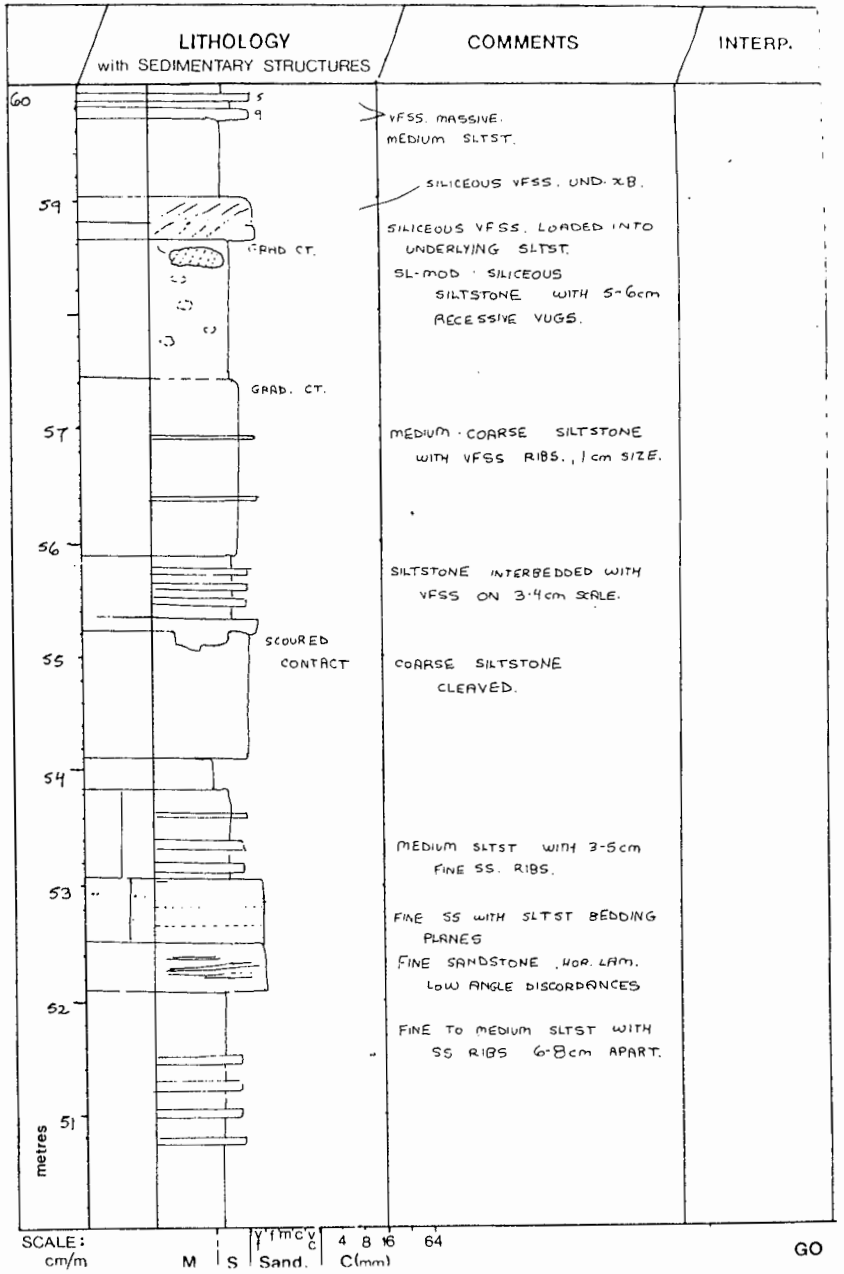
SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



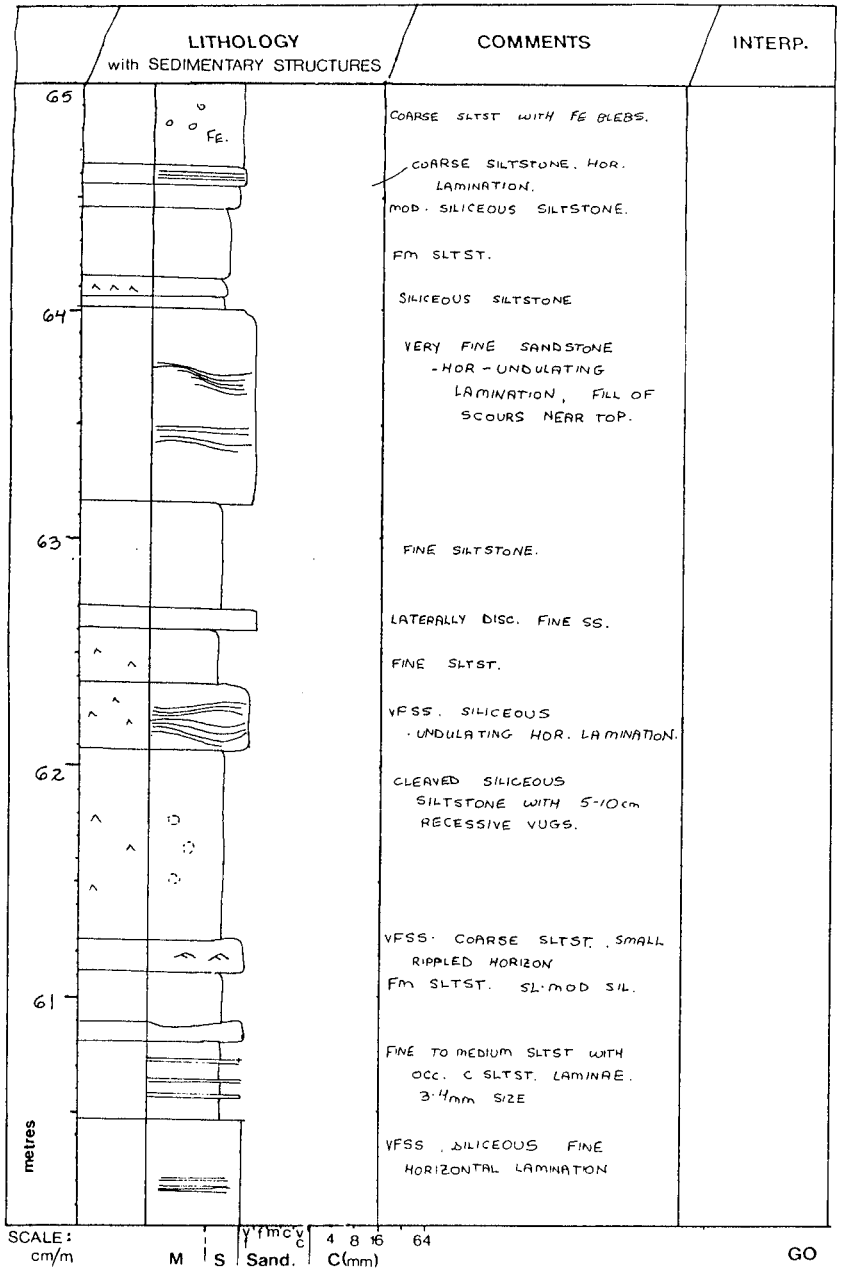
SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



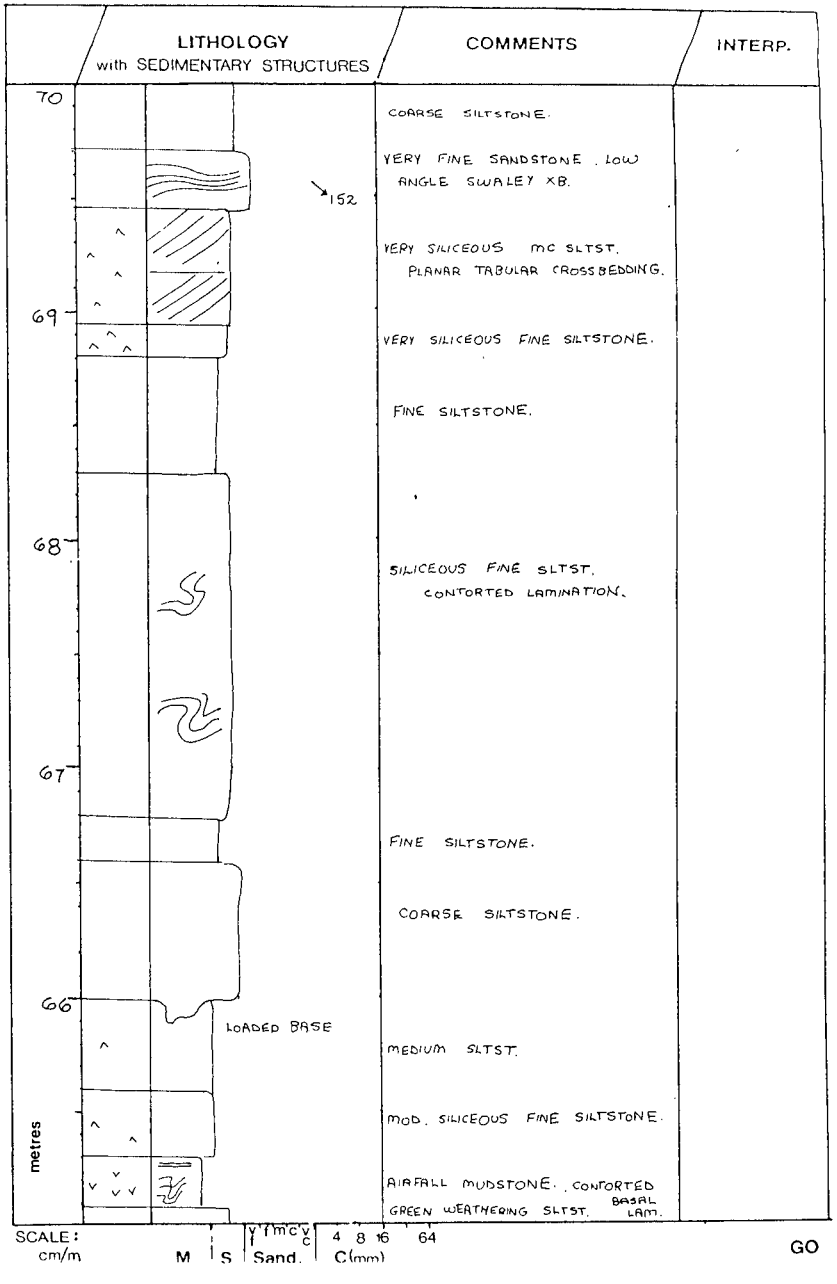
SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



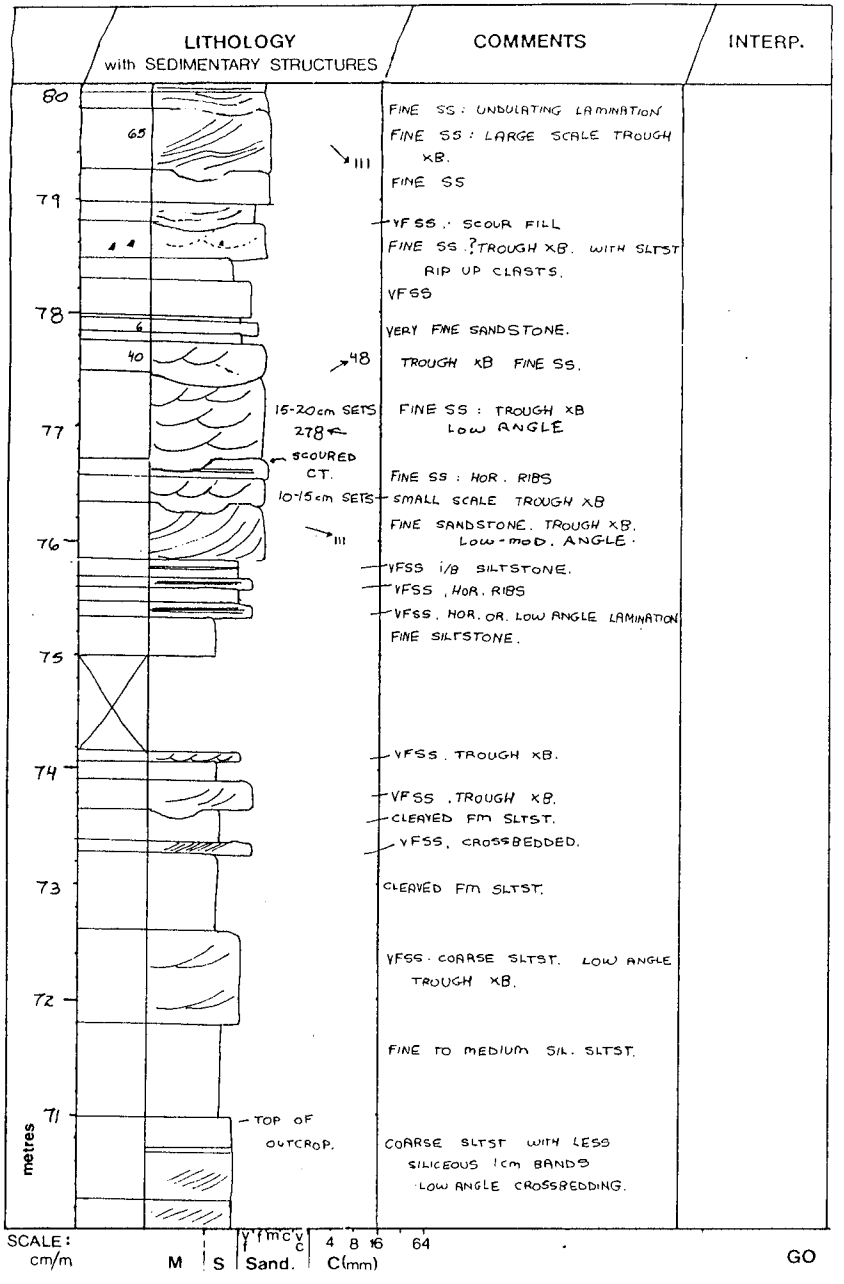
SECTION: LOCATION:



SECTION: F·3 LOCATION: BULCH TRIMARCHOG



SECTION: F3 LOCATION: BWLCH TRIMARCHOG.



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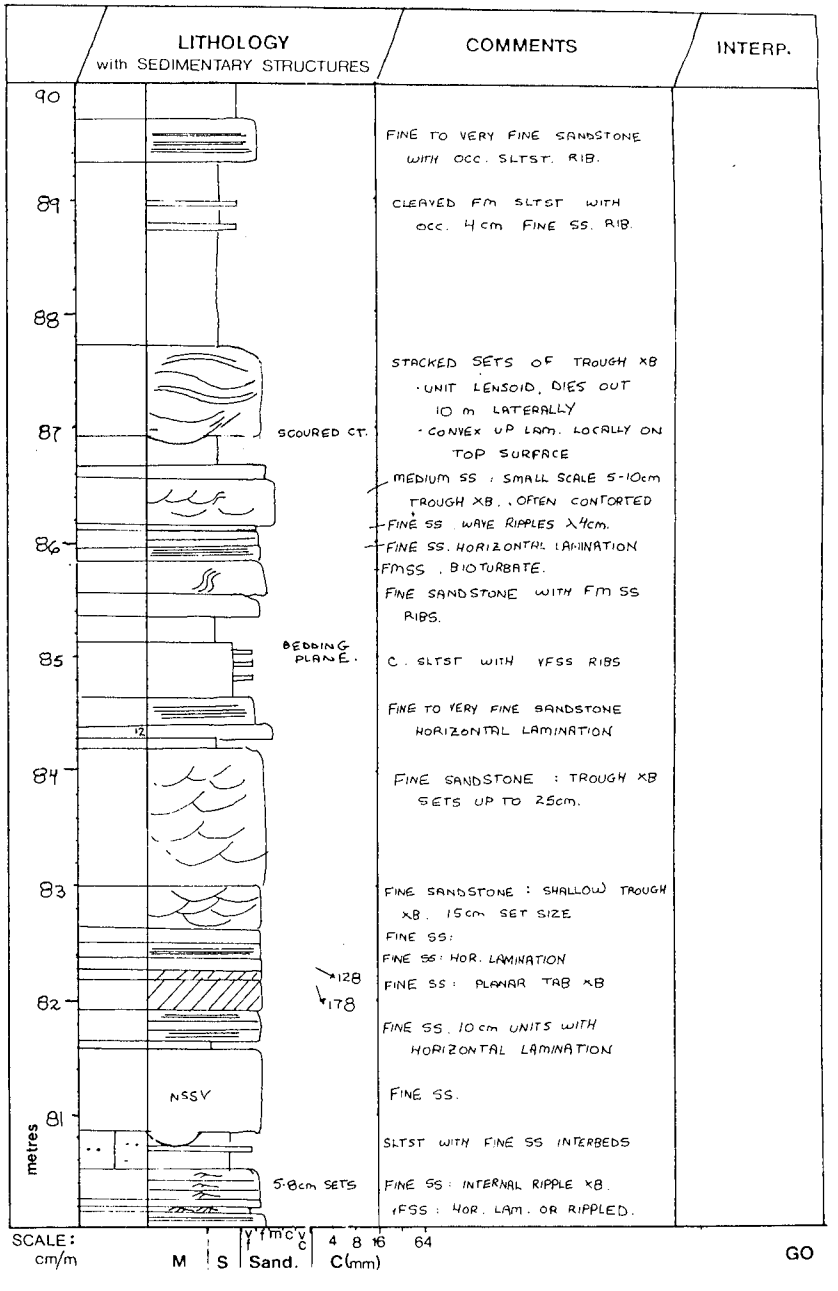

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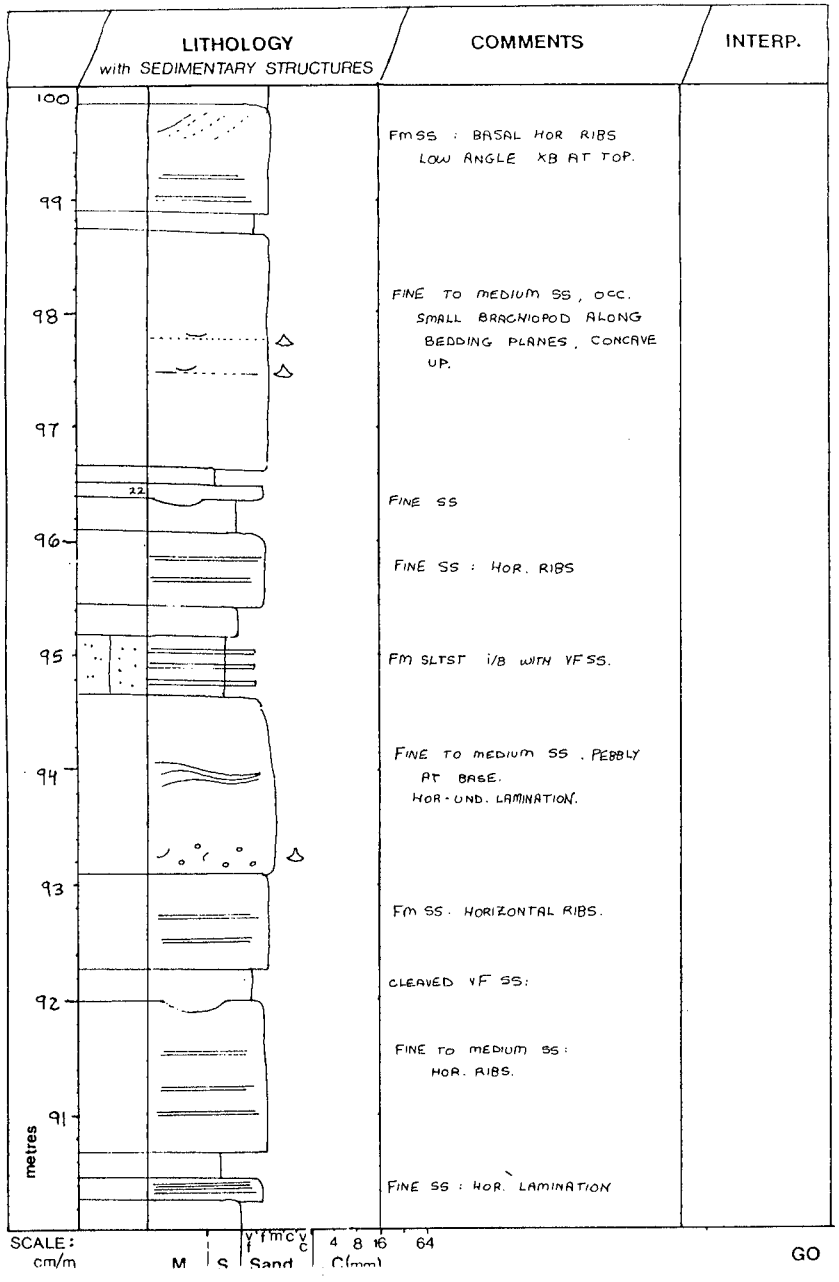
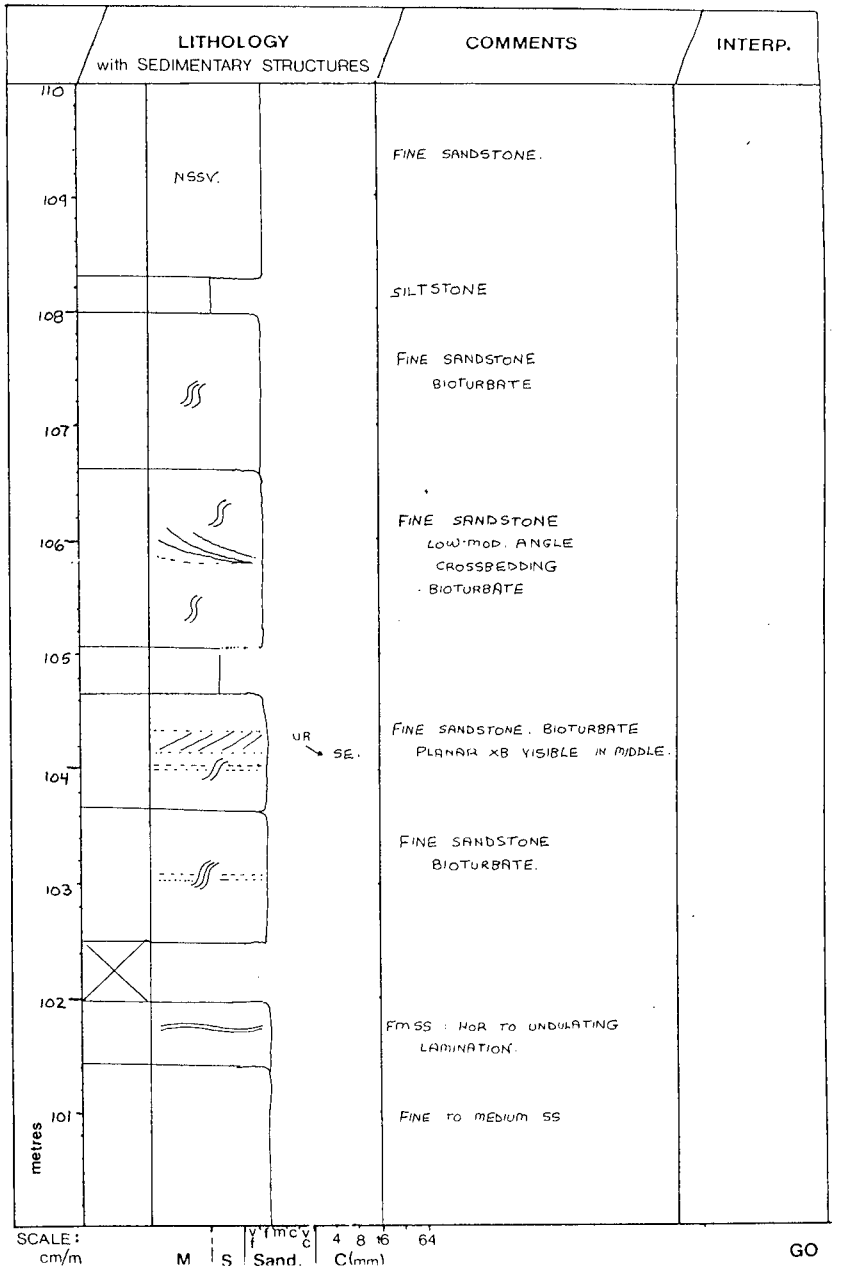
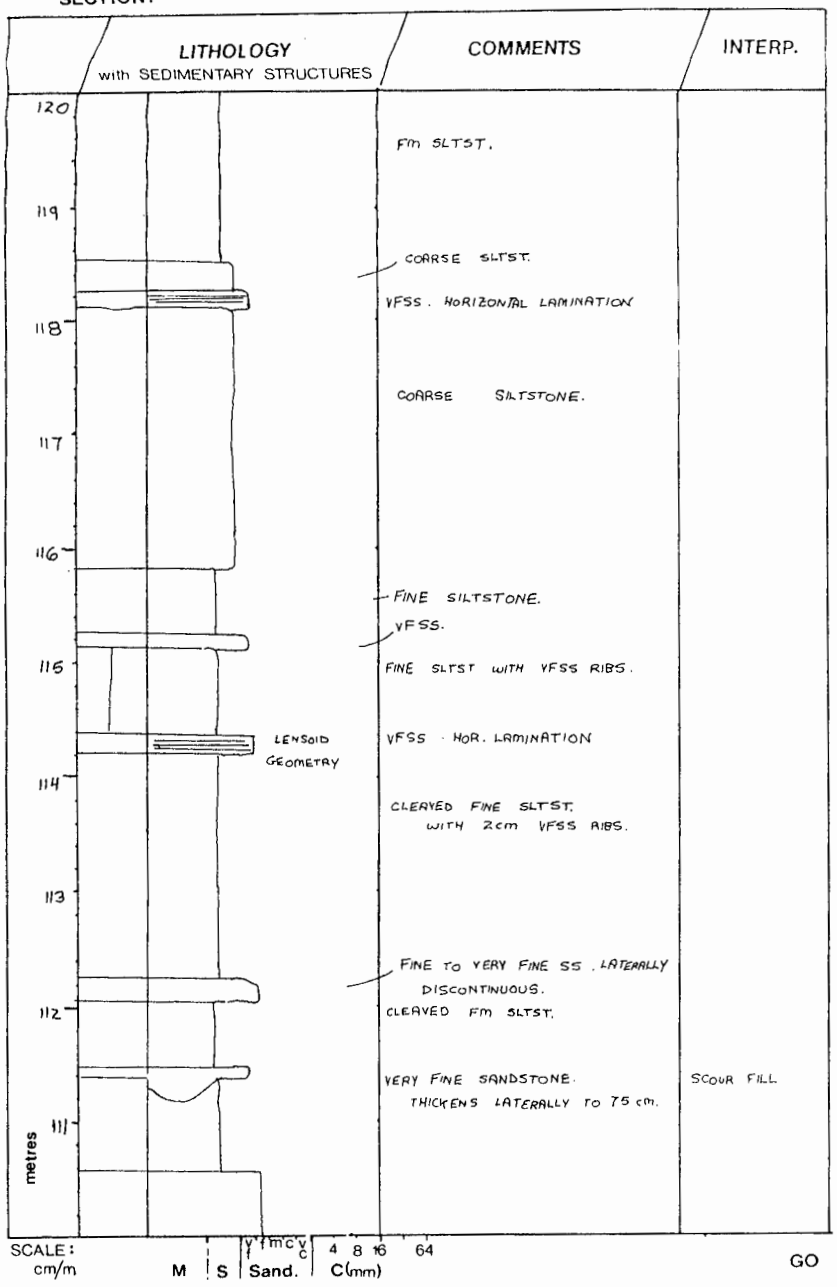


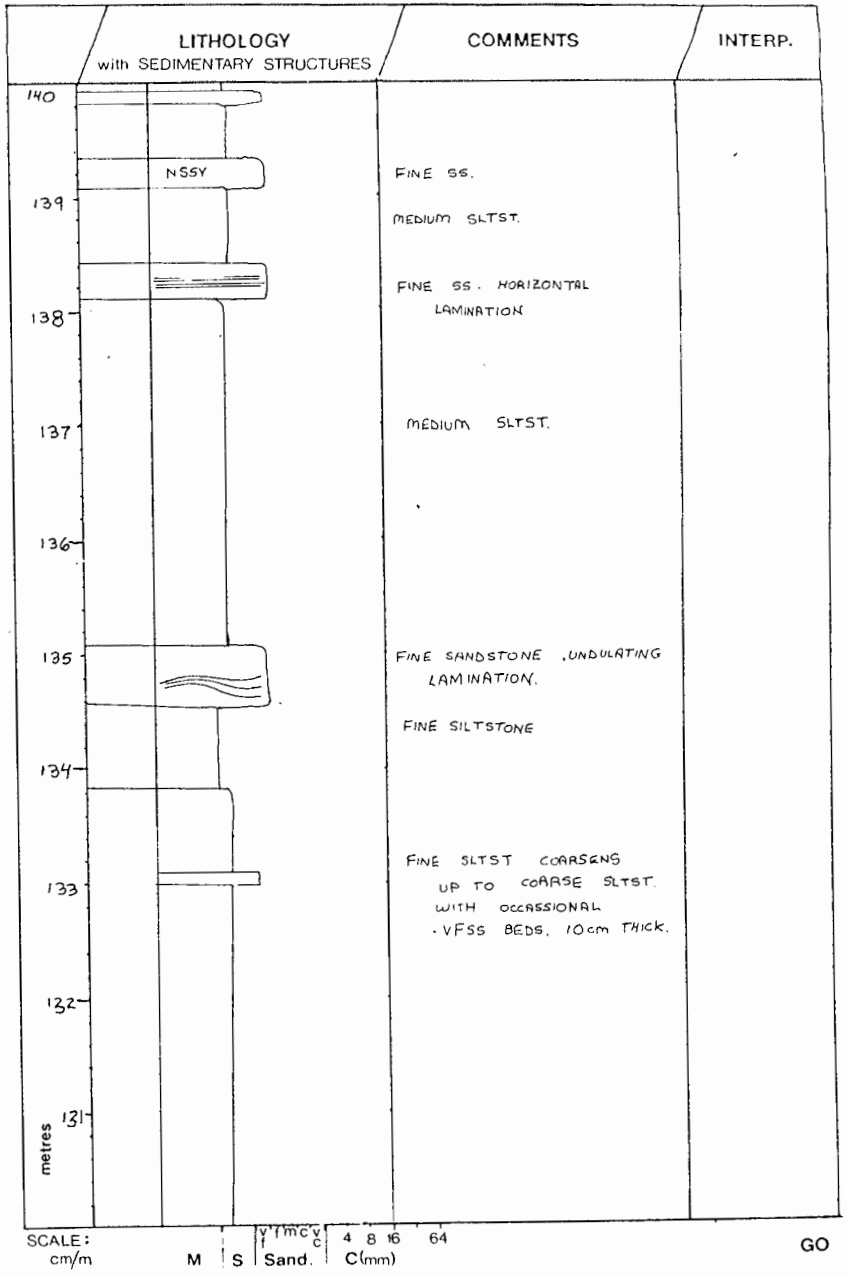
SECTION: F3 LOCATION: BWLCH TRIMARCHOG.



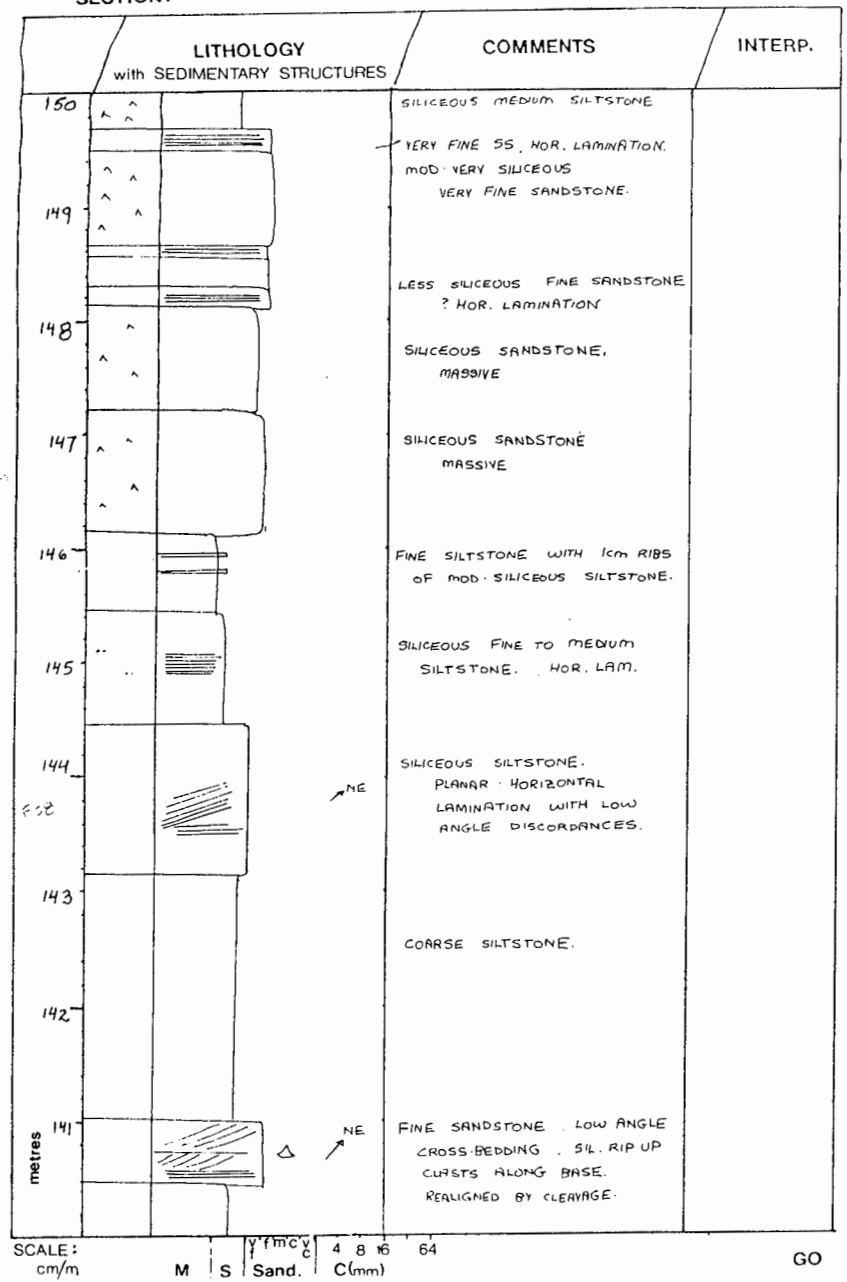
SECTION: F 3 LOCATION: BWLCH TRIMARCHOG



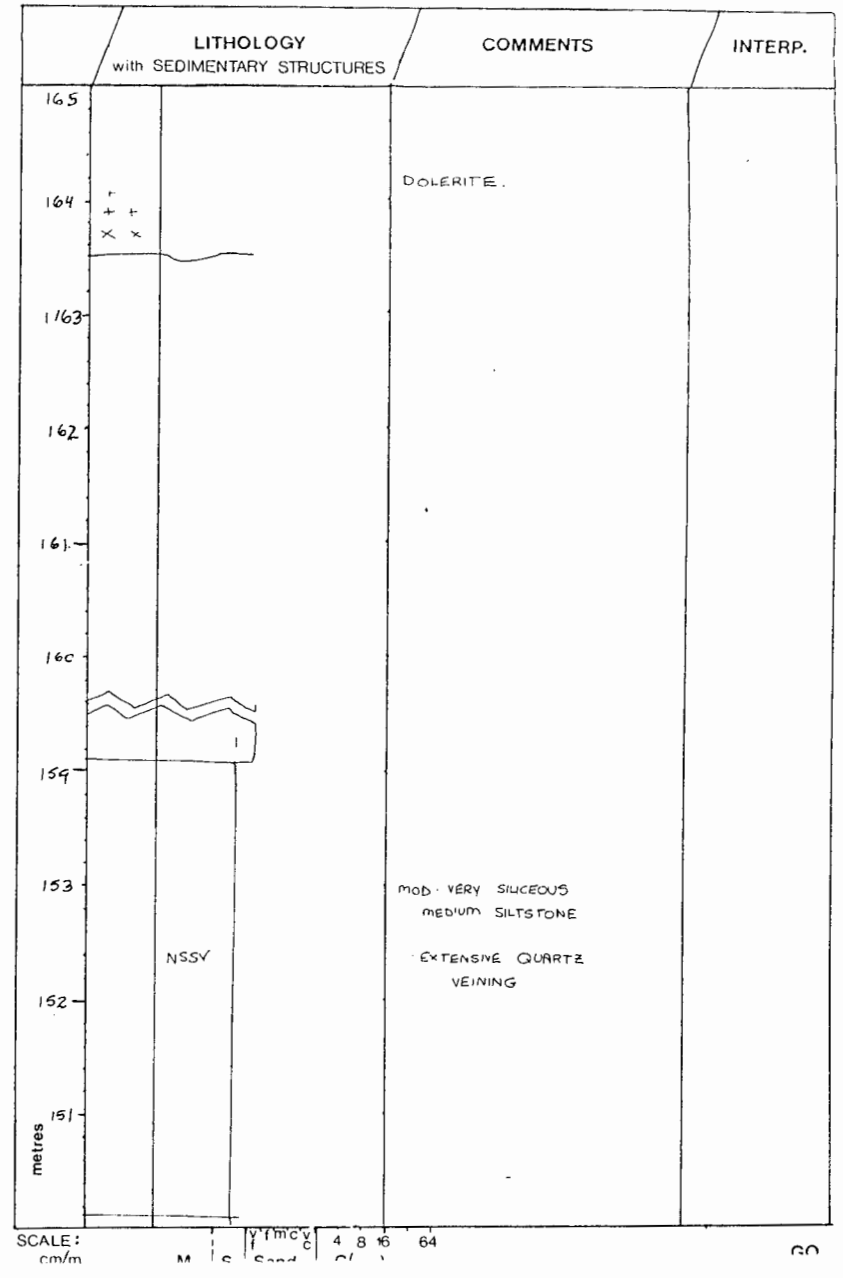
SECTION: F 3 LOCATION: BWLCH TRIMARCHOG



SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



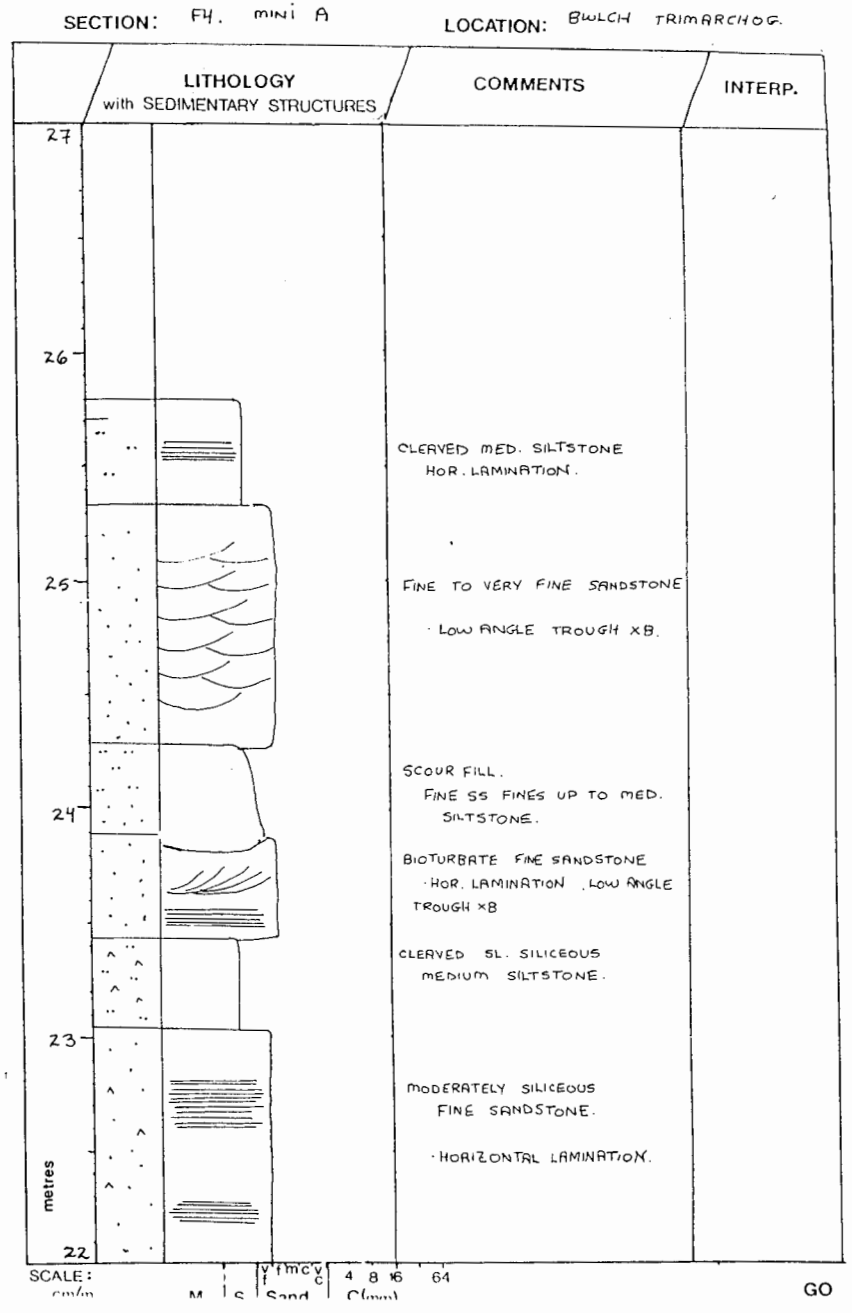
SECTION: F·3 LOCATION: BWLCH TRIMARCHOG



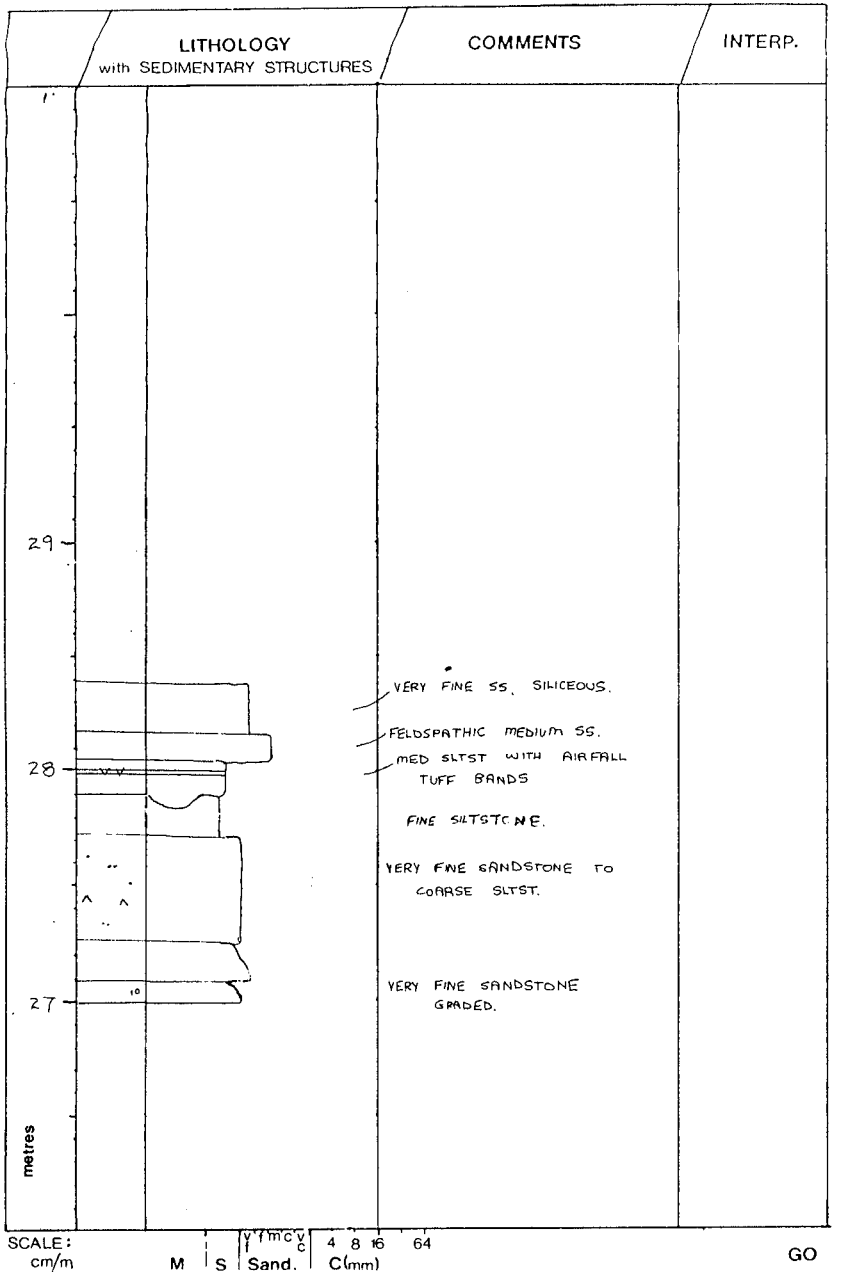
SECTION F4

SECTION F4 LOCATION: Scrappy section along south side of Bwlch Trimarchog from top

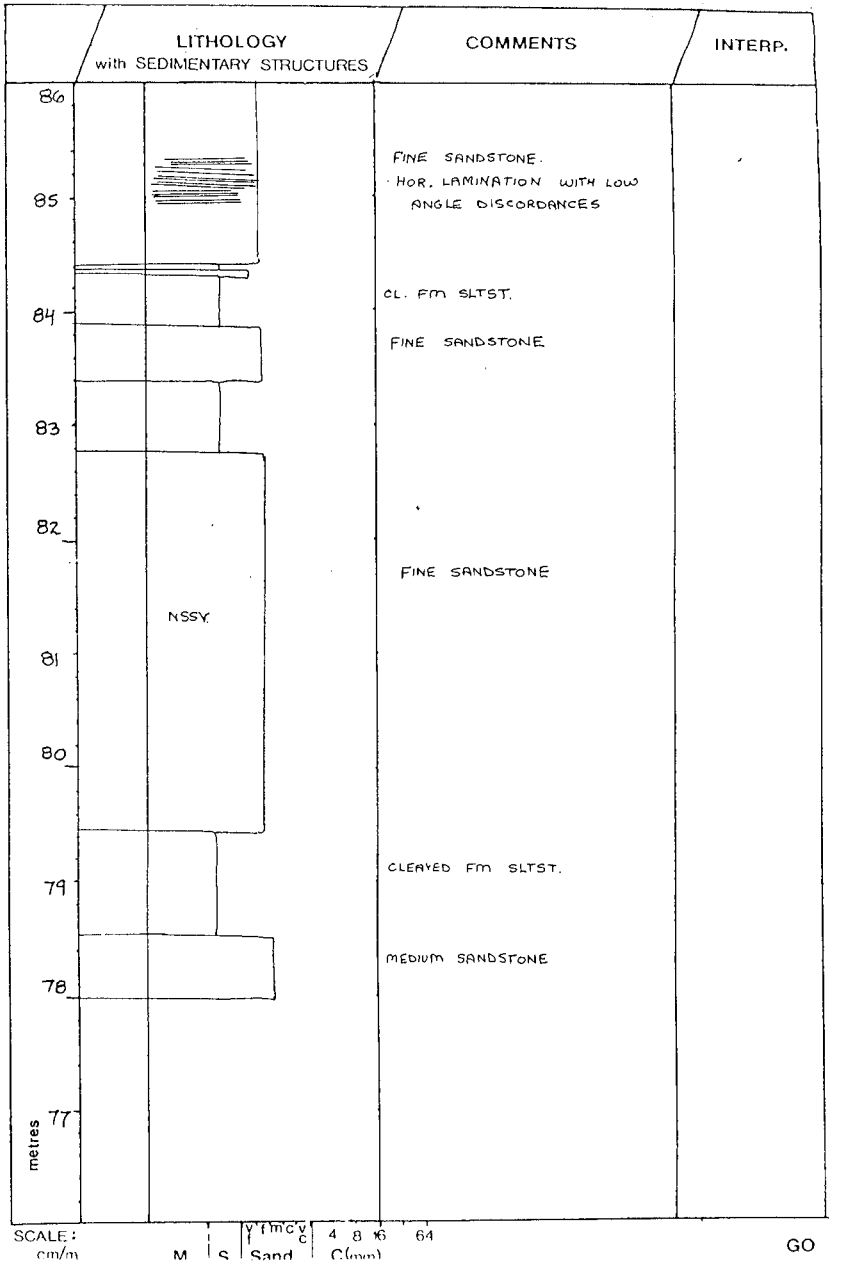
of dolerite intrusion to first decent sandstone outcrop.



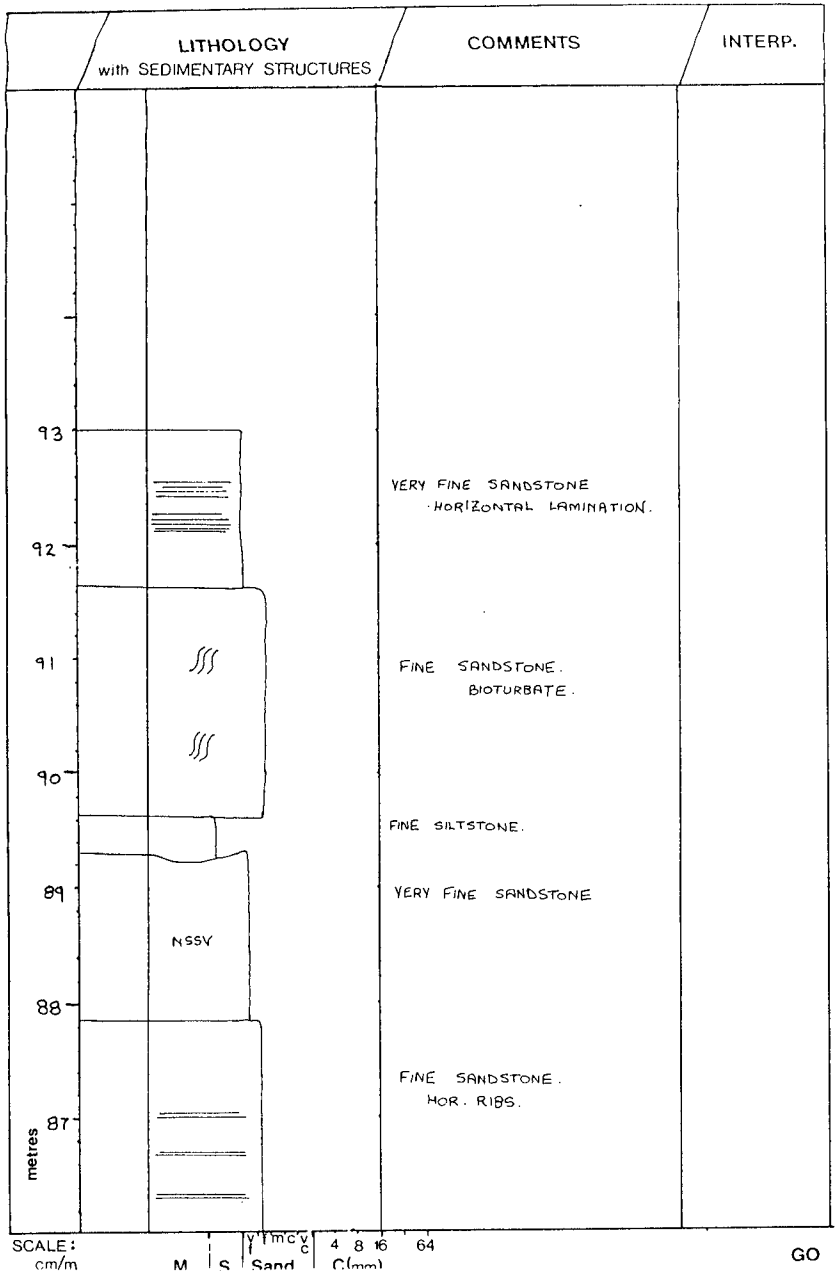
SECTION: F·4 mini SECTION B LOCATION: BWLCH TRIMARCHOG



SECTION: F4C LOCATION: BWLCH TRIMARCHOG

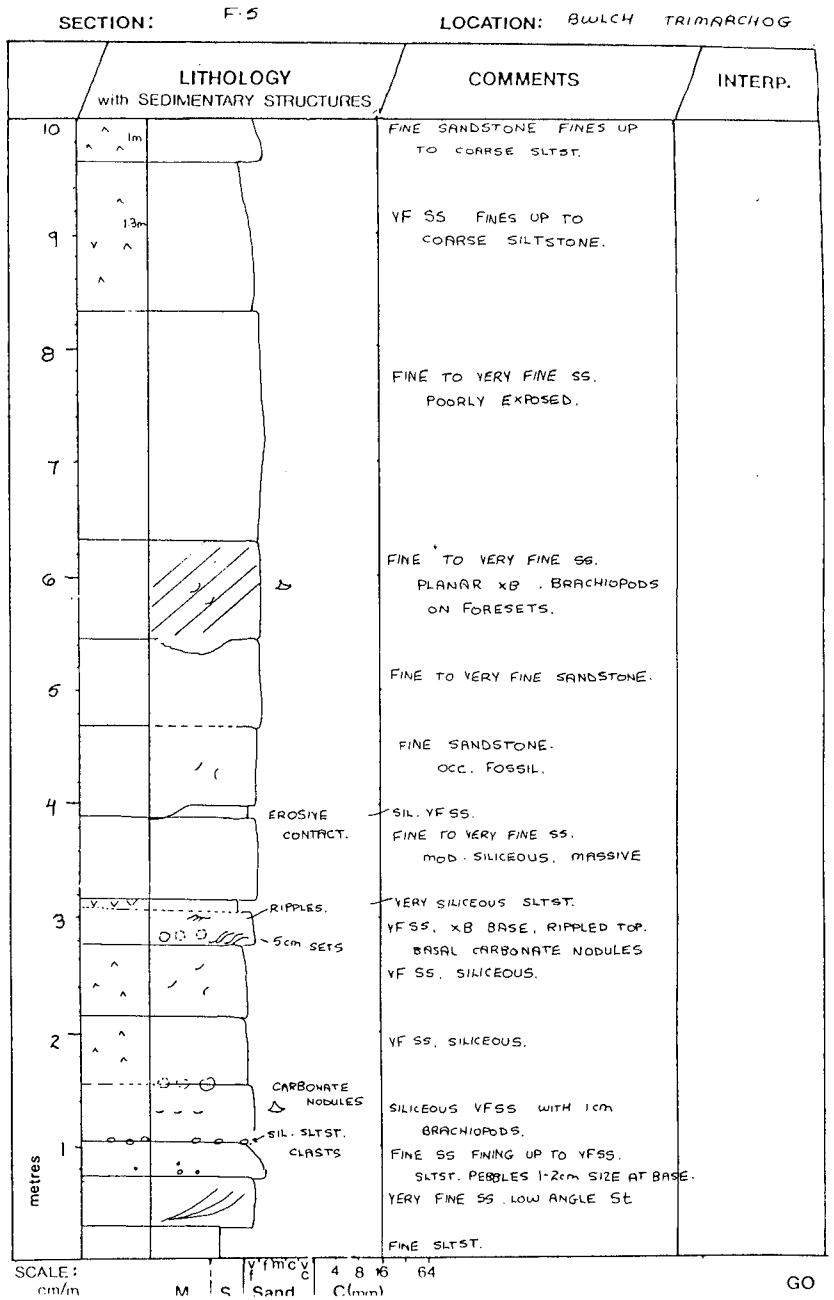


SECTION: FHC LOCATION: BWLCH TRIMARCHOG

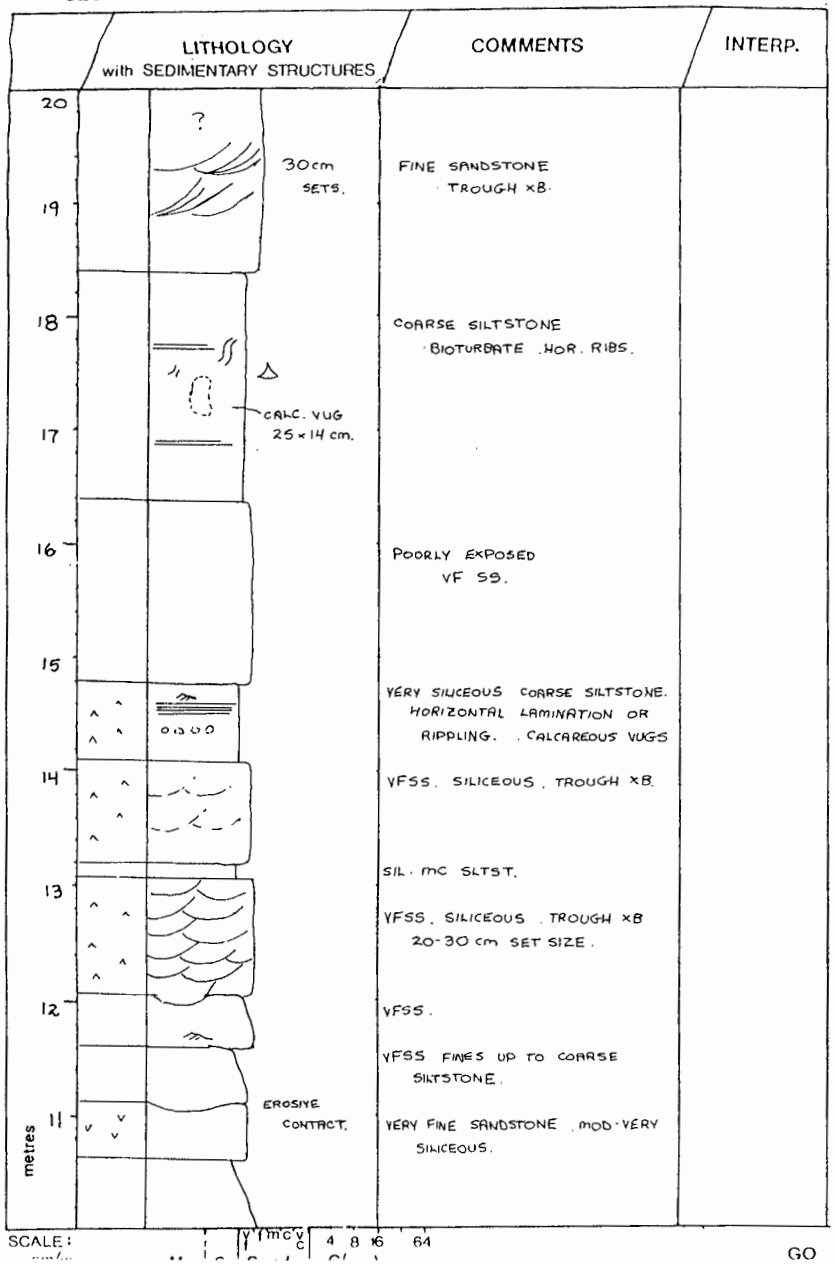


SECTION F5

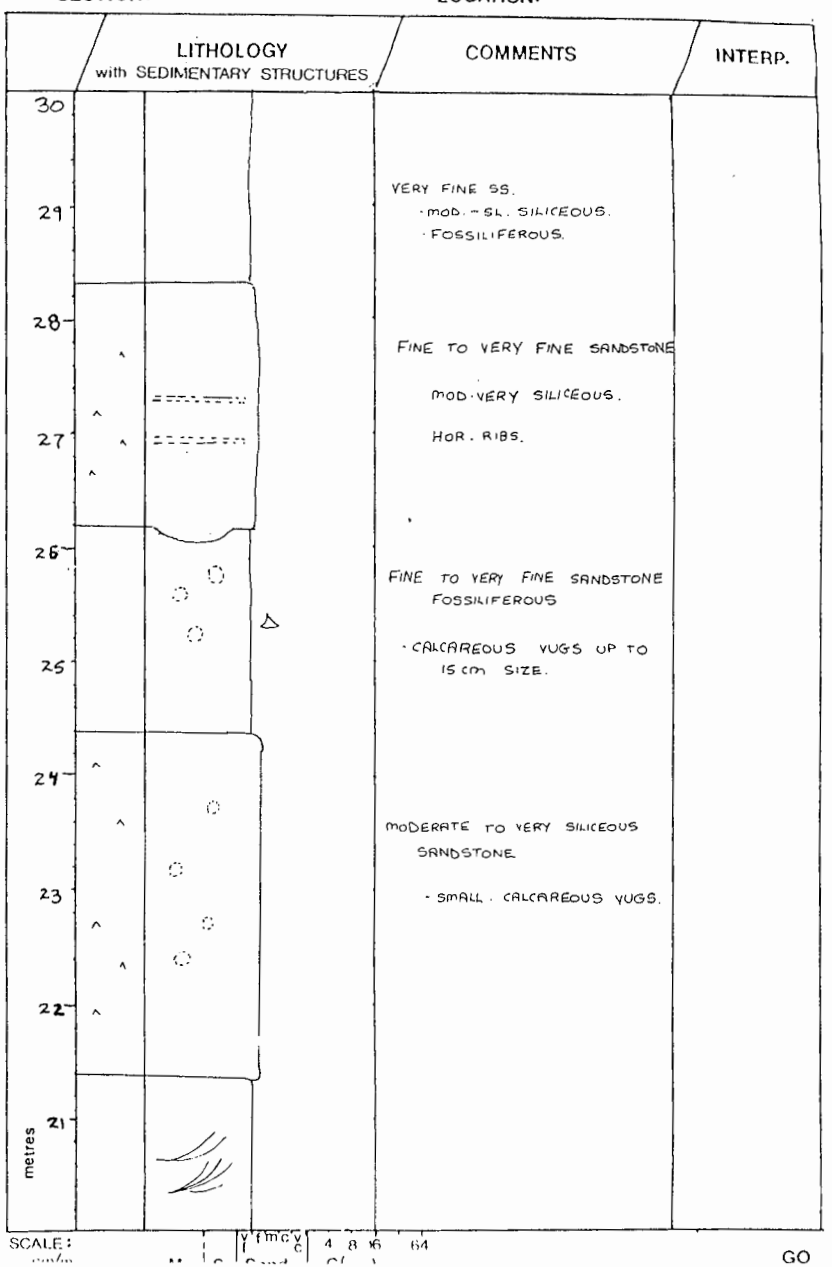
SECTION F5 LOCATION: Section starts at first decent outcrops of sandstone (break in slope) directly to east of the Bwlch Trimarchog fence stile and directly north of fence.



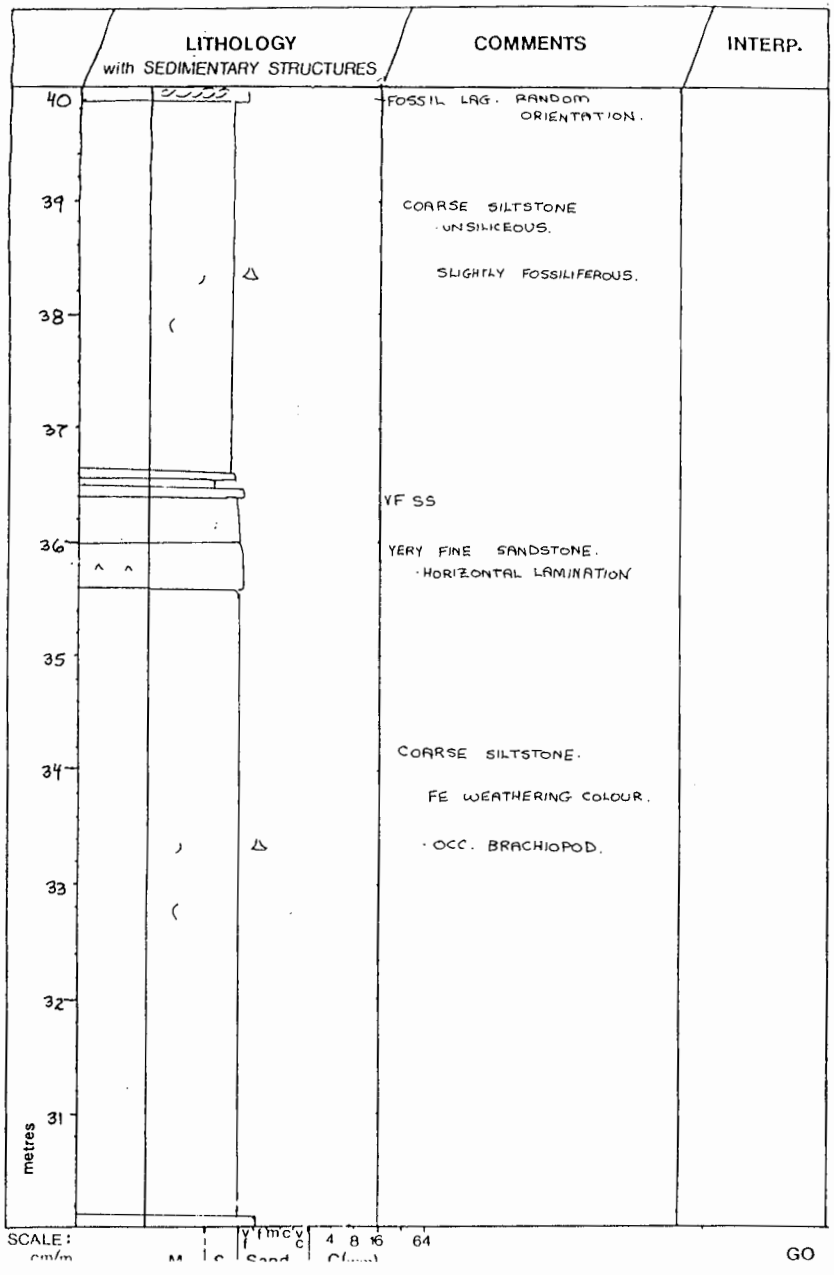
SECTION: LOCATION:



SECTION: F5. LOCATION: BWLCH TRIMARCHOG



SECTION: F·5 LOCATION: BWLCH TRIMARCHOG



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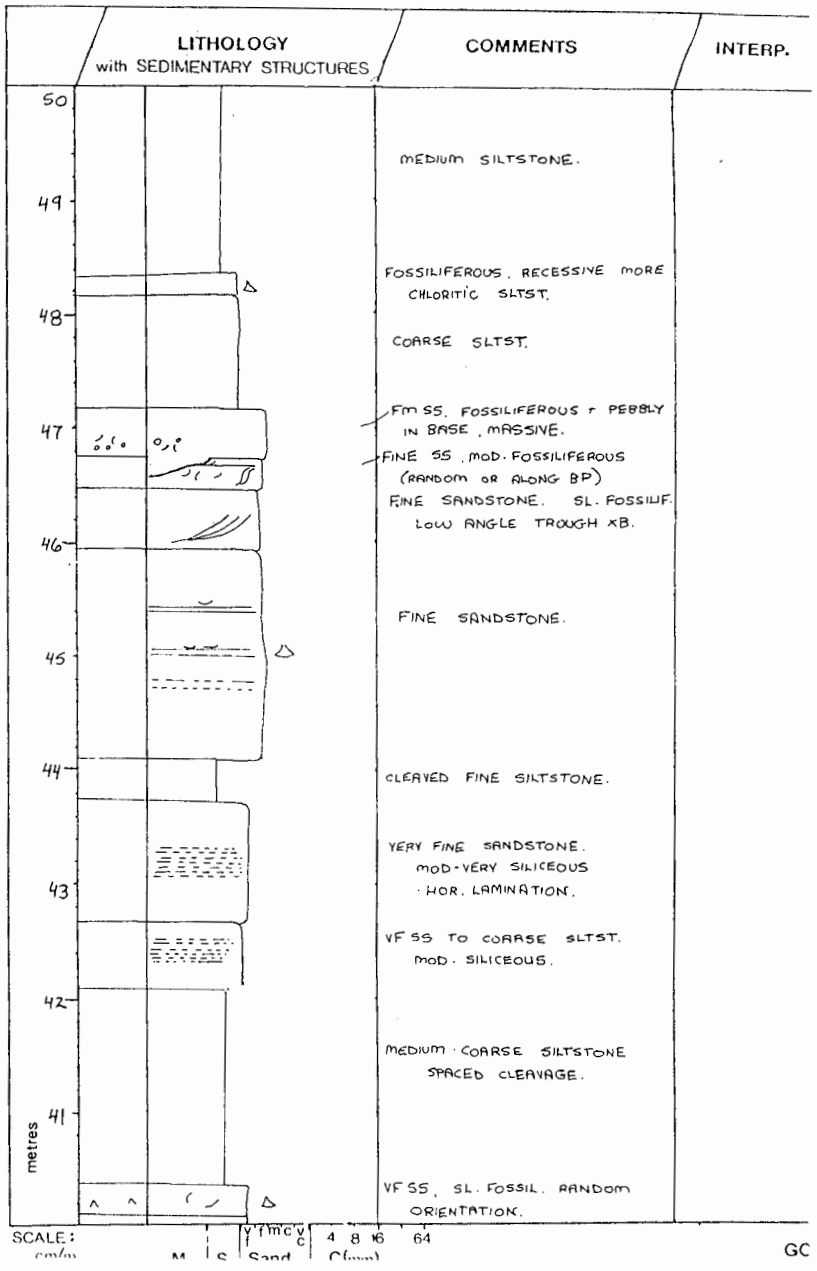
SECTION: F·5 LOCATION: MOEL DDU.



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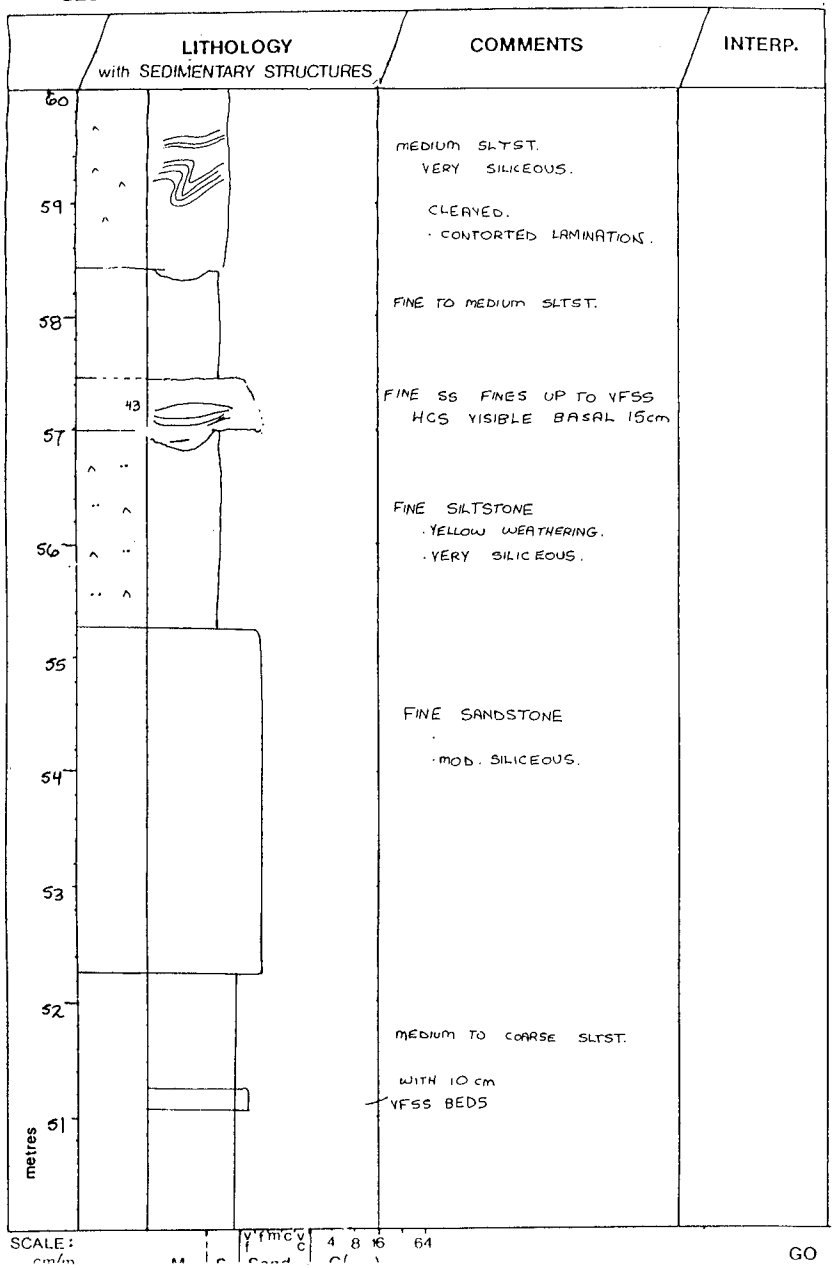
SECTION: F·5 LOCATION: BWLCH TRIMARCHOG



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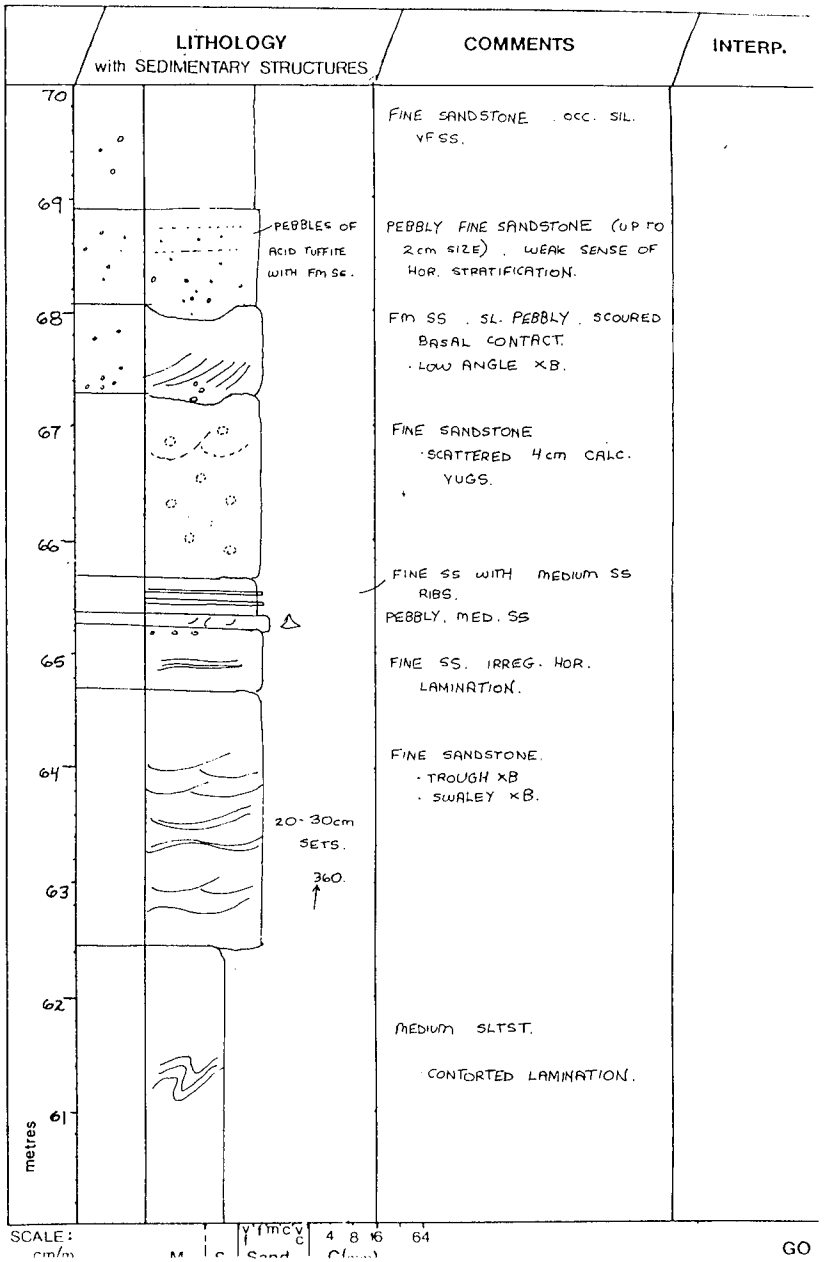
SECTION: F·5 LOCATION: BWLCH TRIMARCH



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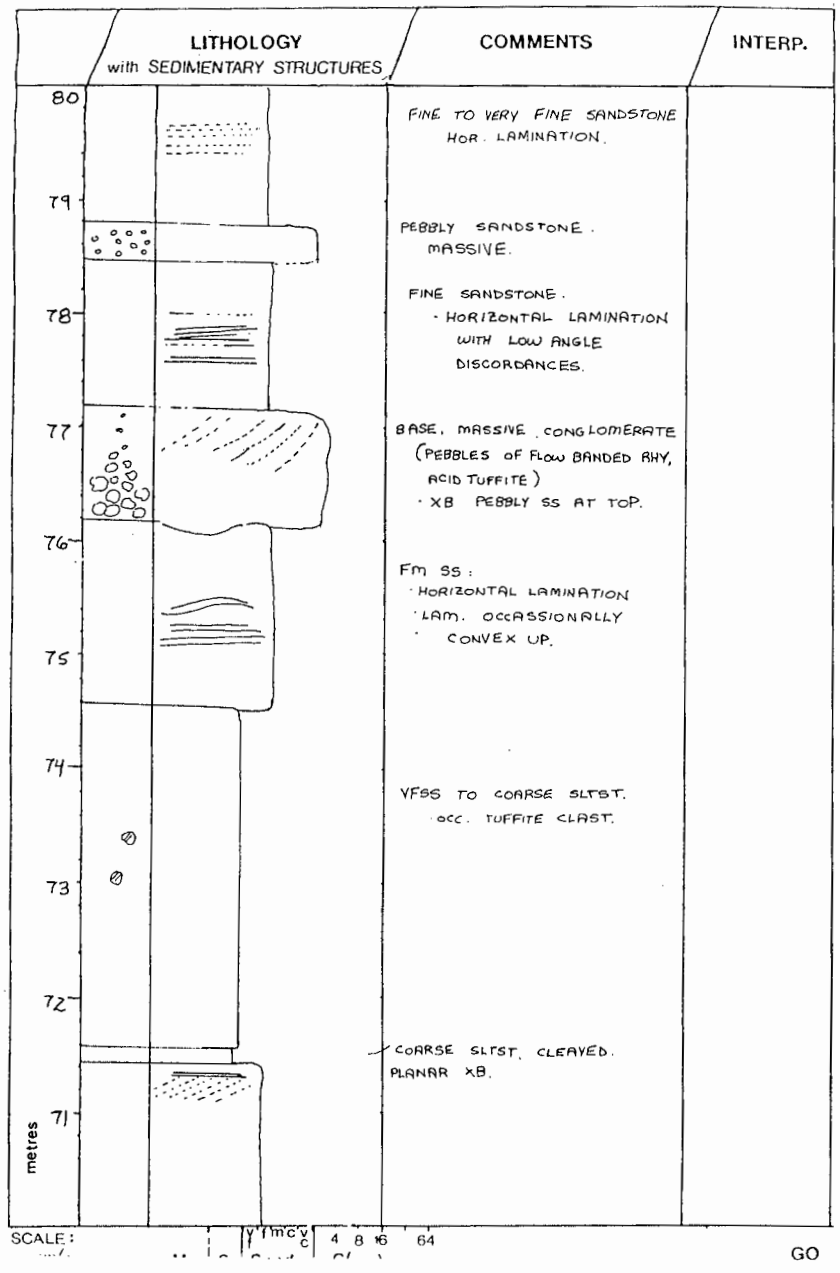
SECTION: F·5 LOCATION: BWLCH TRIMARCHOG.



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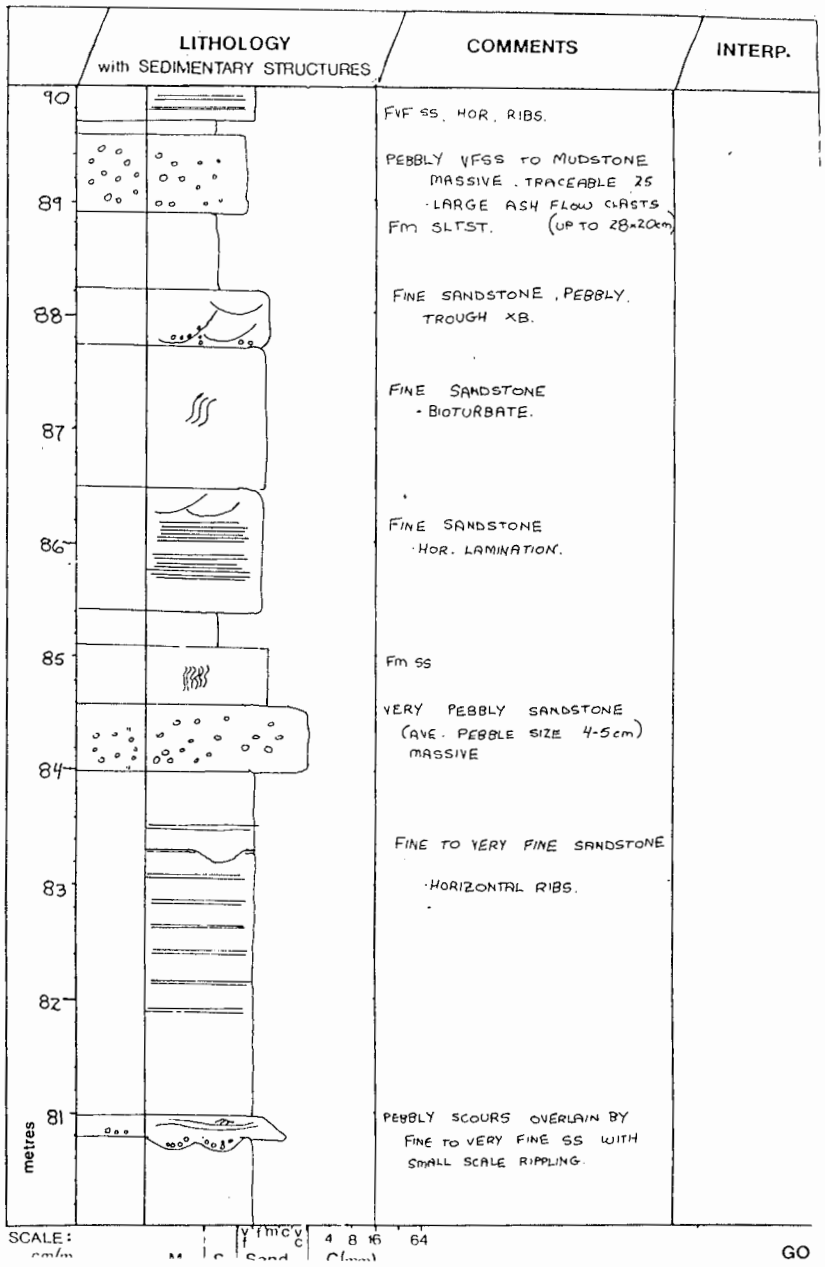
SECTION: F·5 LOCATION: BWLCH TRIMARCHOG



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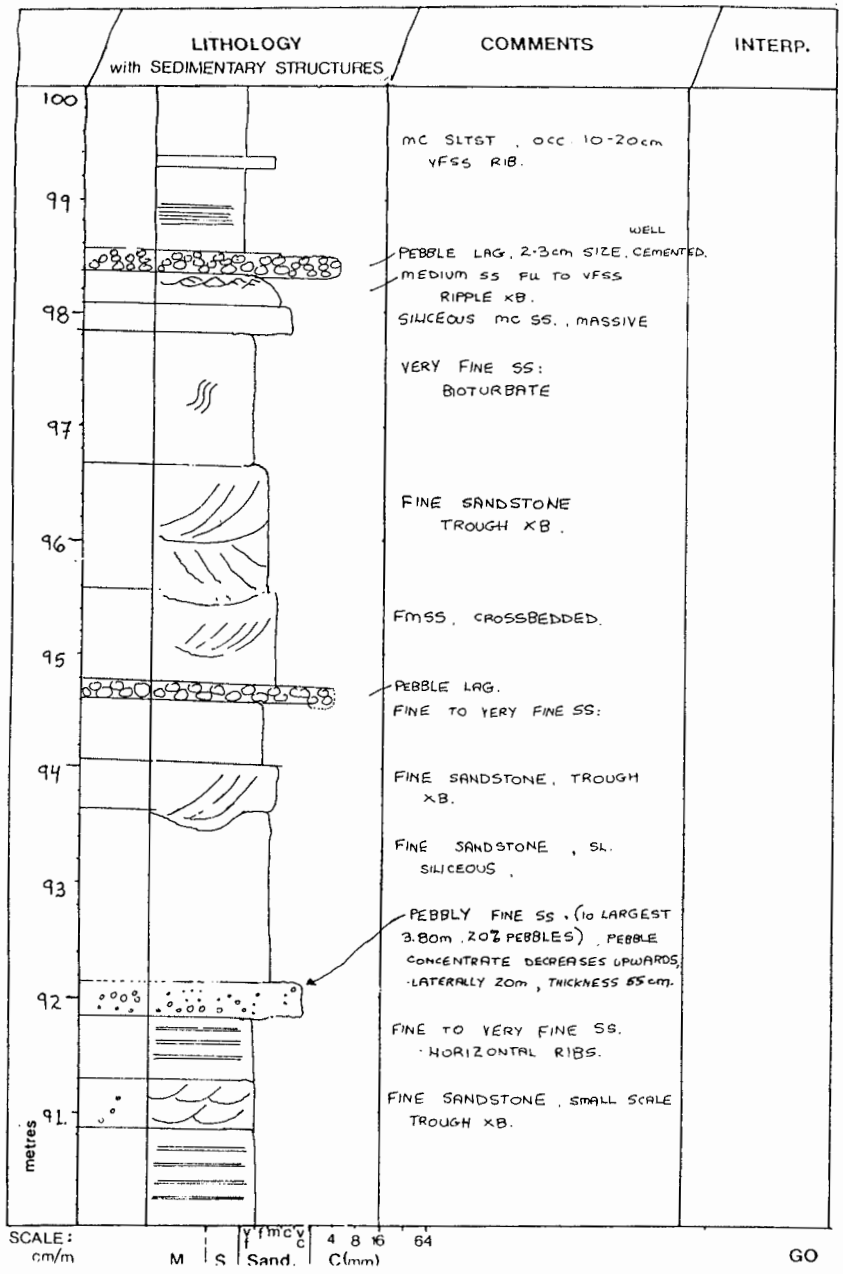
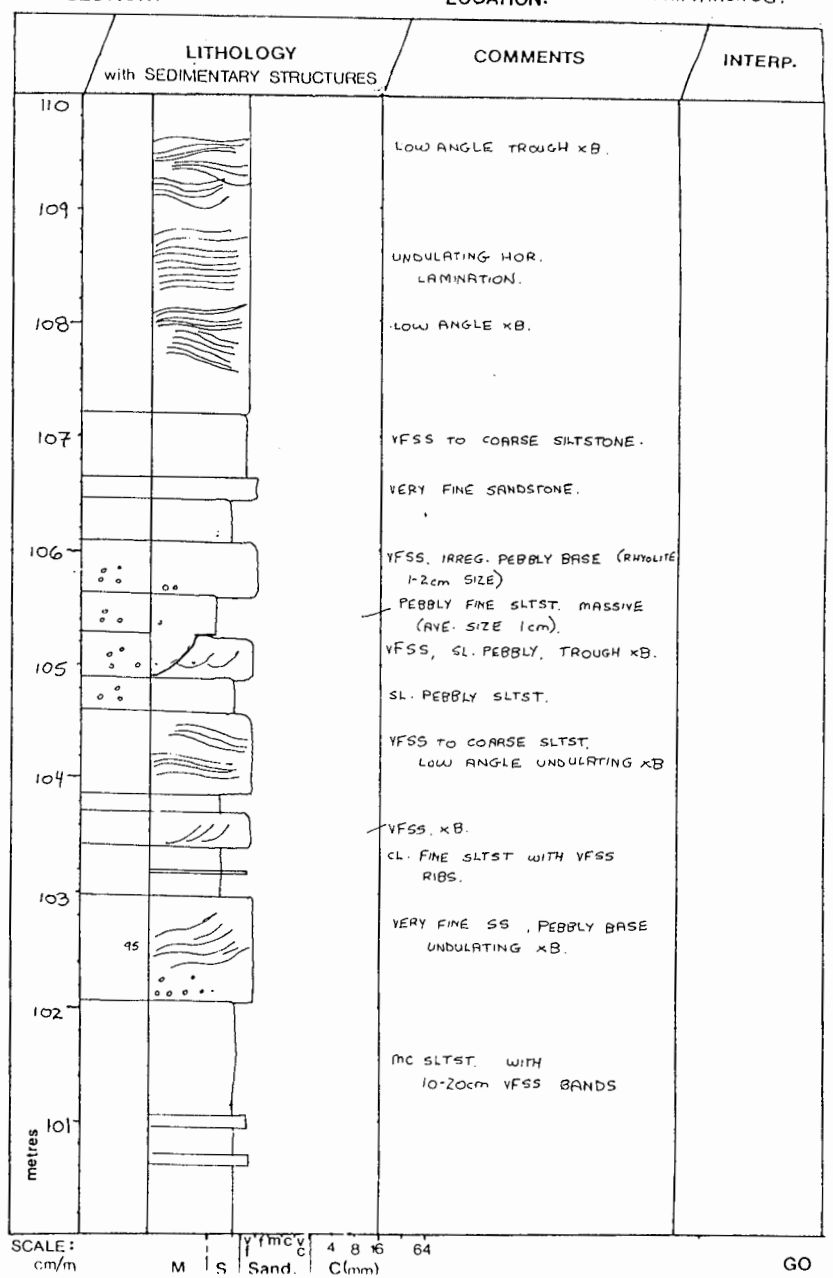
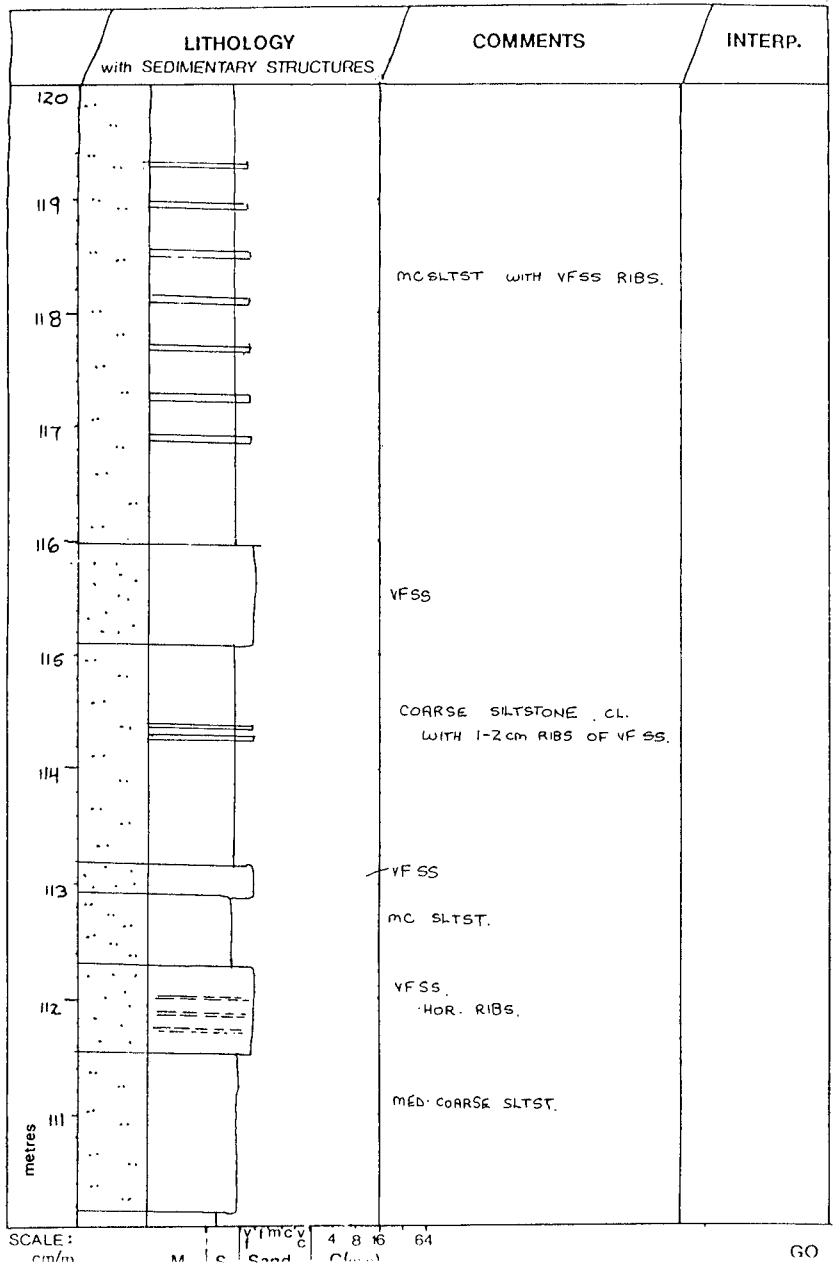
SECTION: F. 5 LOCATION: BWLCH TRIMARCHOG.



SECTION: F.5 LOCATION: BWLCH TRIMARCHOG.

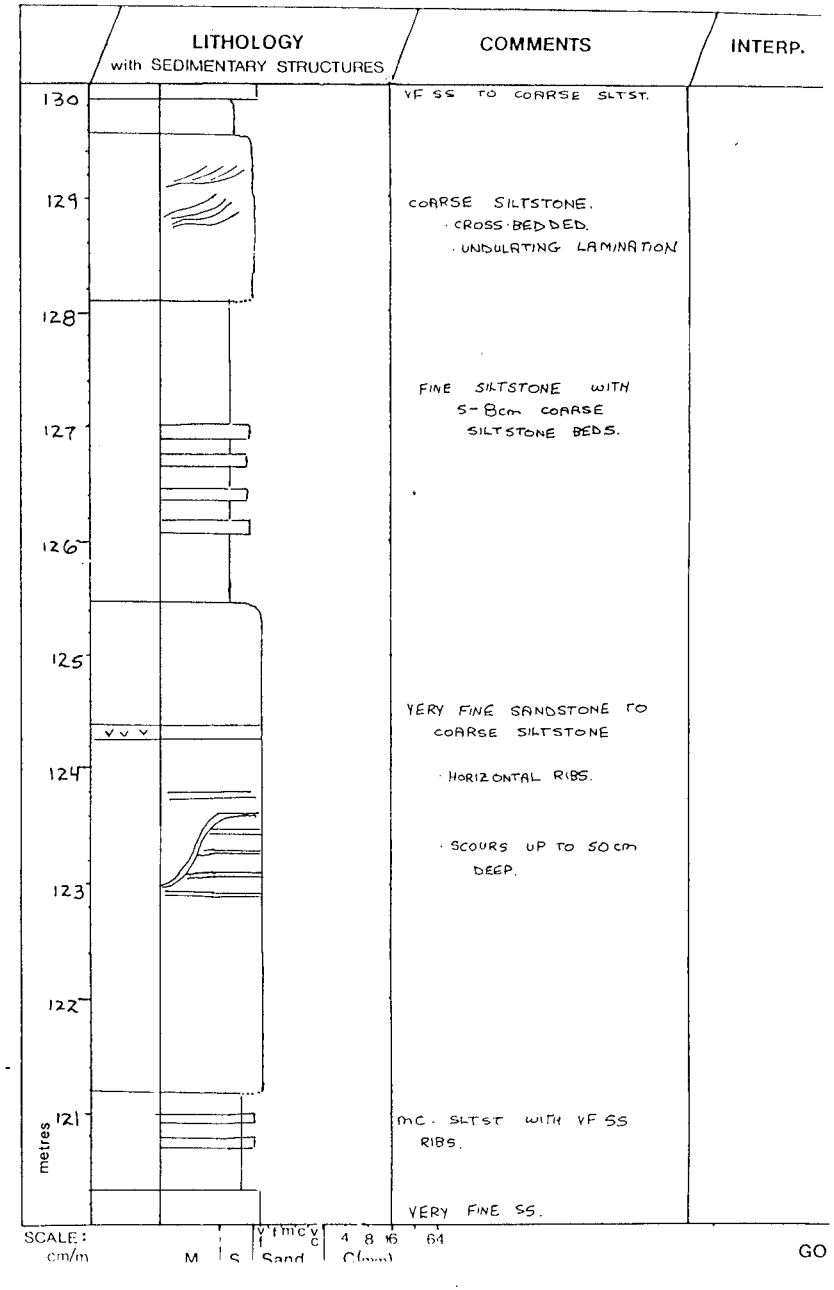


SECTION: F·5 LOCATION: BWLCH TRIMARCHOG.



GO

SECTION: F·5 LOCATION: BWLCH TRIMARCHOG.



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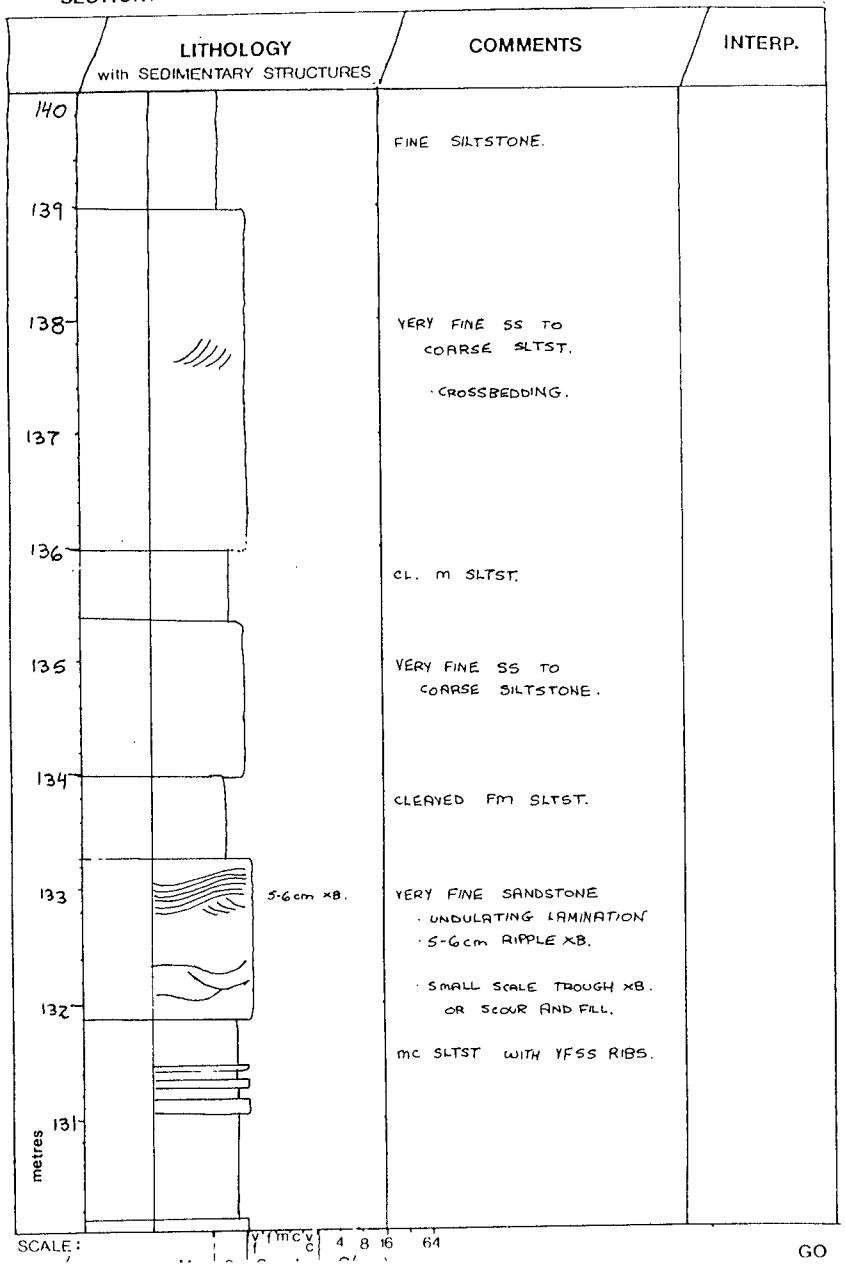
SECTION: F·5. LOCATION: BWLCH TRIMARCHOG.



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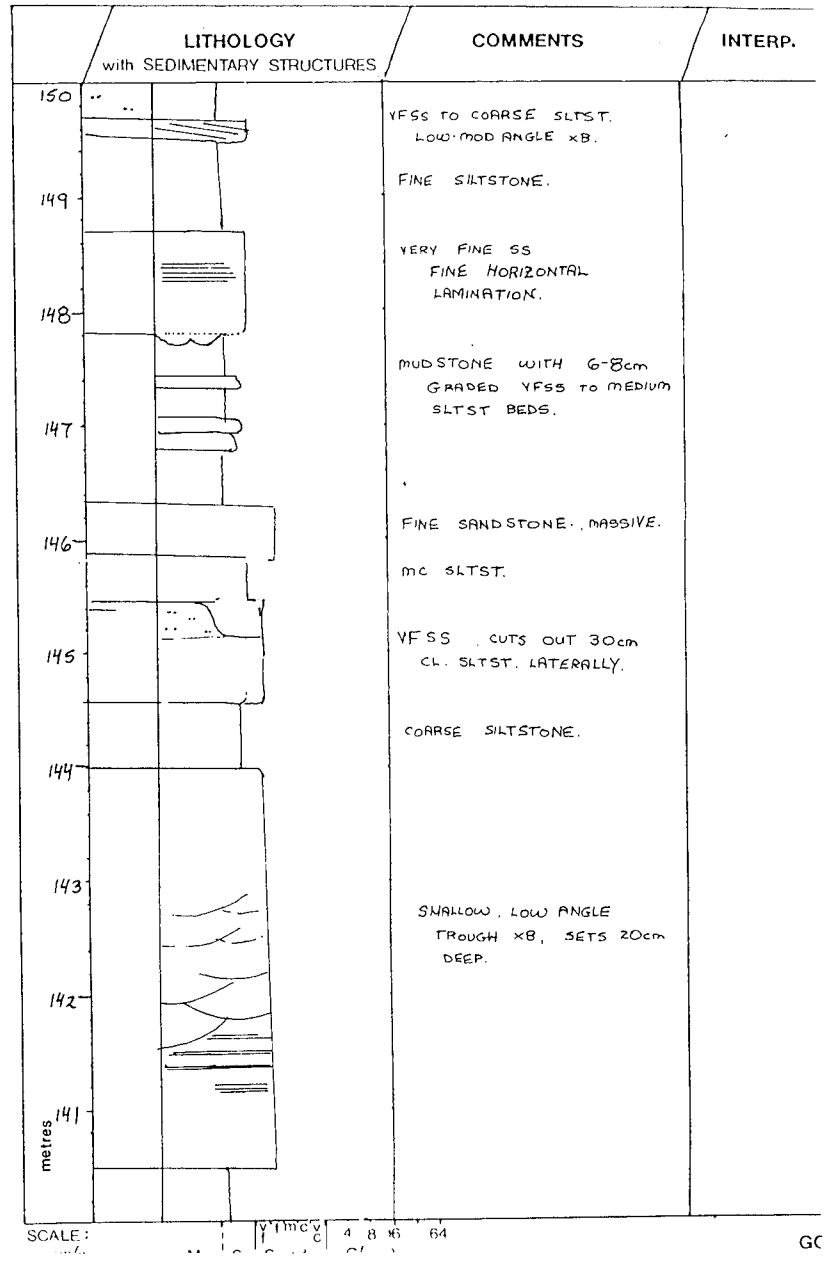
SECTION: F·5 LOCATION: BWLCH TRIMARCHOG



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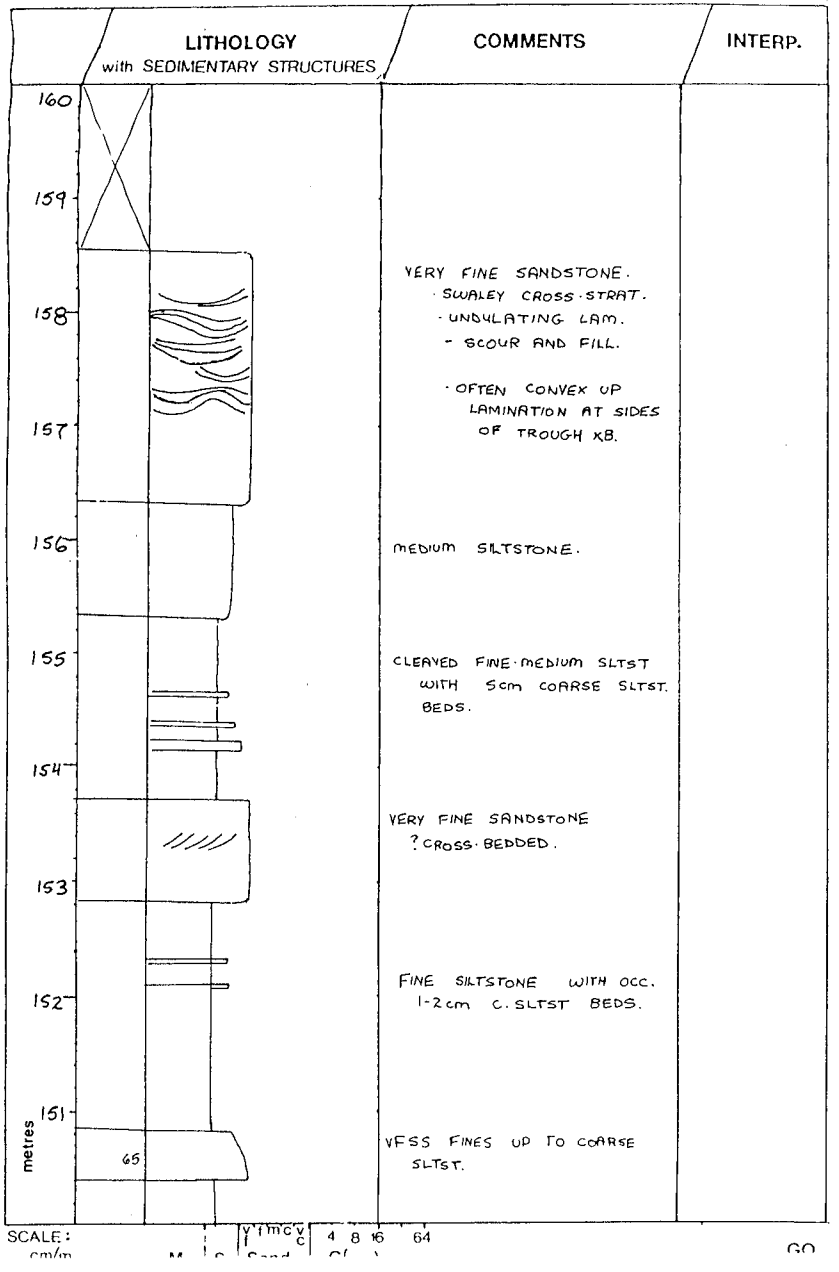
SECTION: F·5 LOCATION: BWLCH TRIMARCHOG



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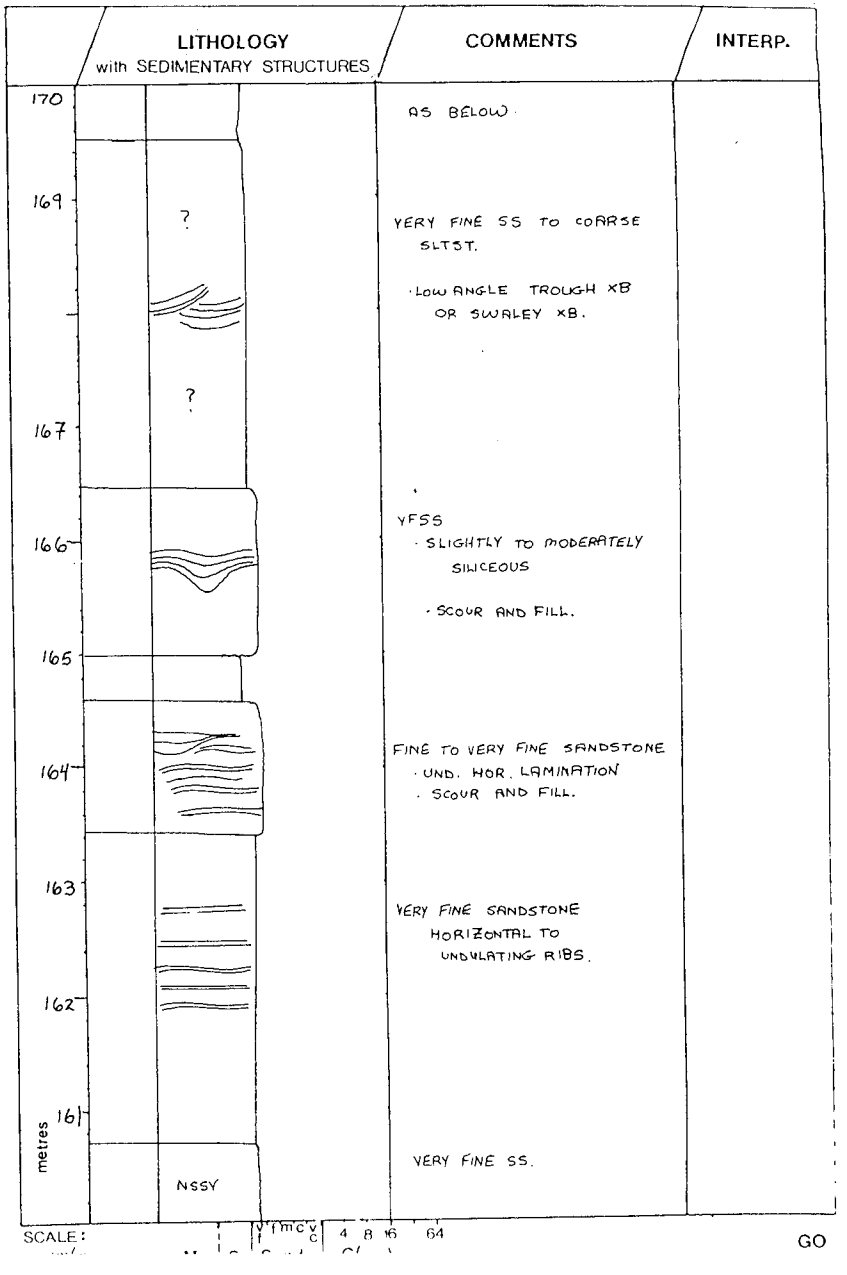
SECTION: F·5 LOCATION: BWLCH TRIMARCHOG



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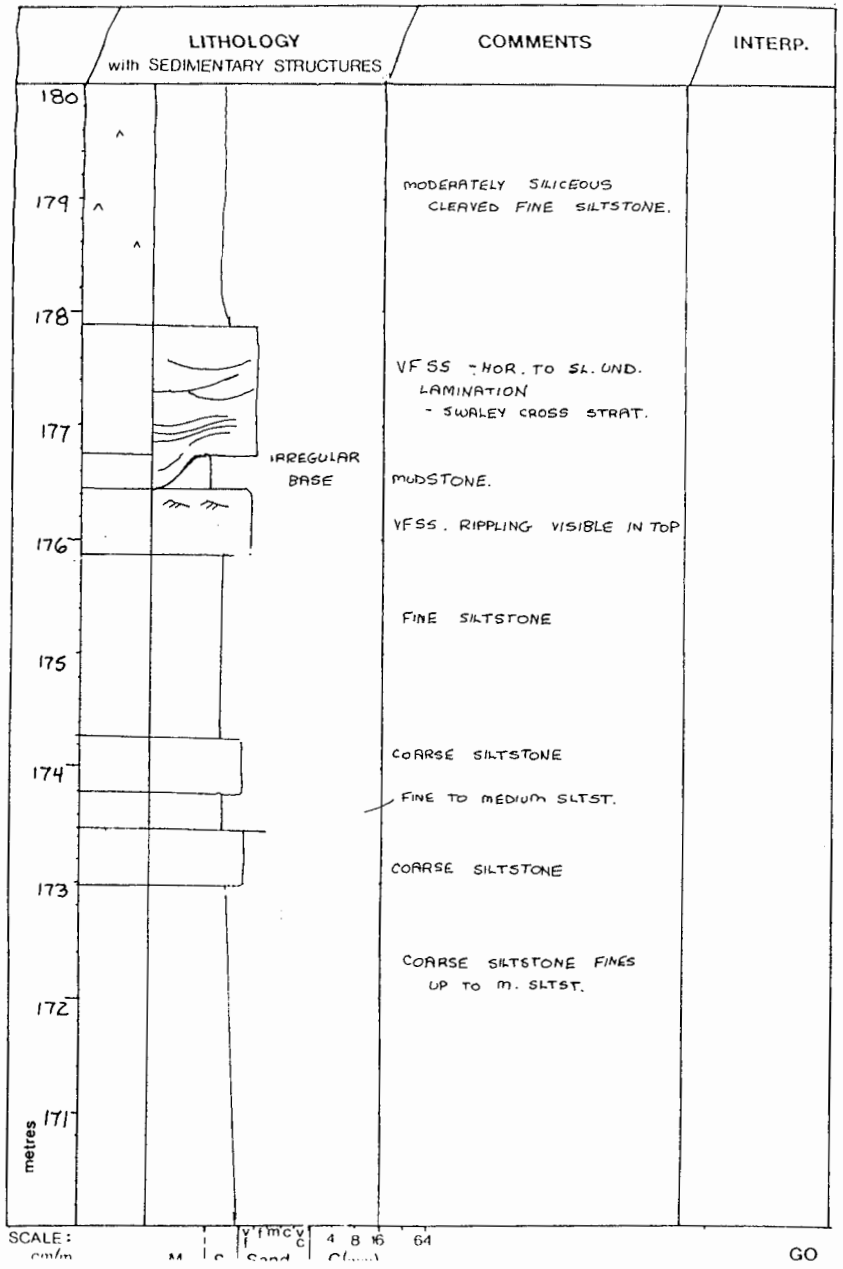
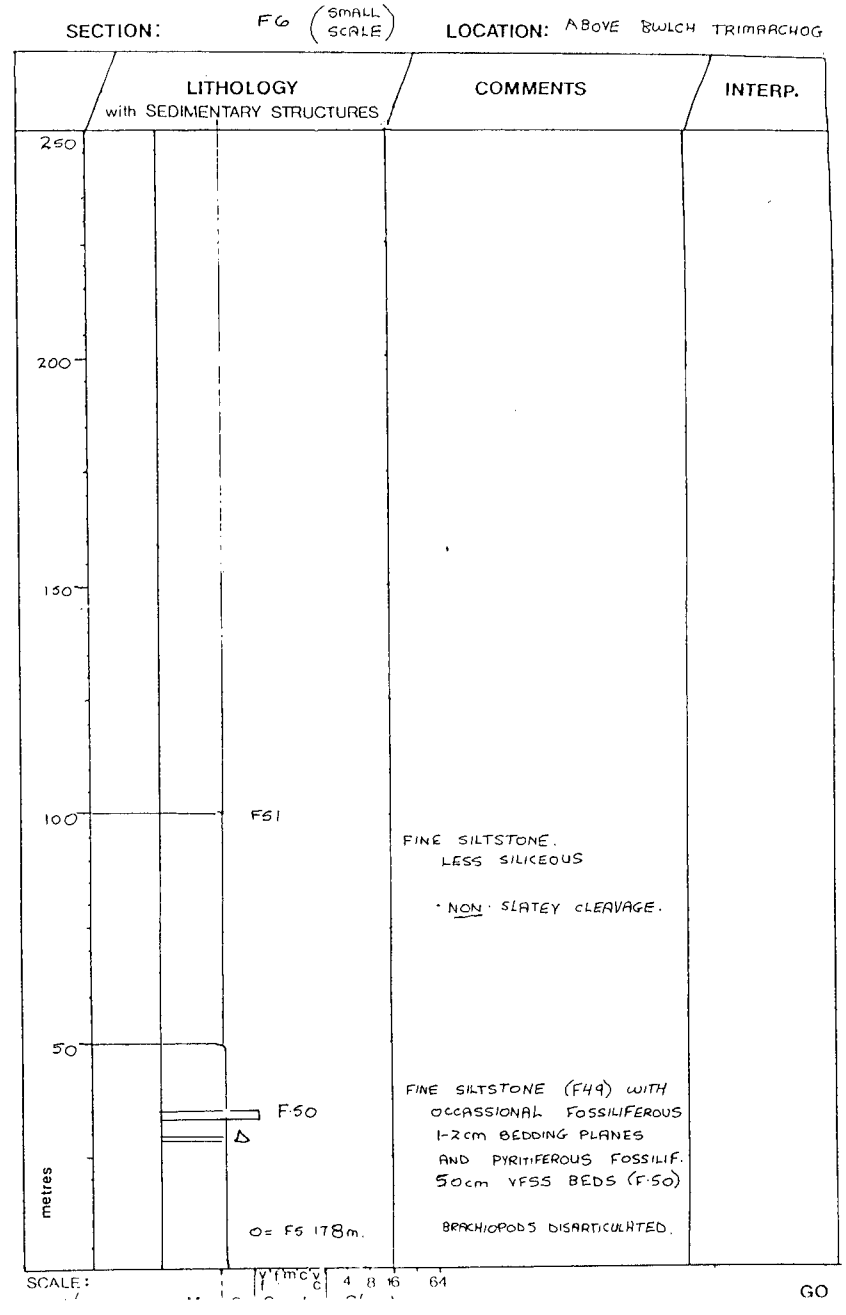
SECTION: F·5 LOCATION: BWLCH TRIMARCHOG.

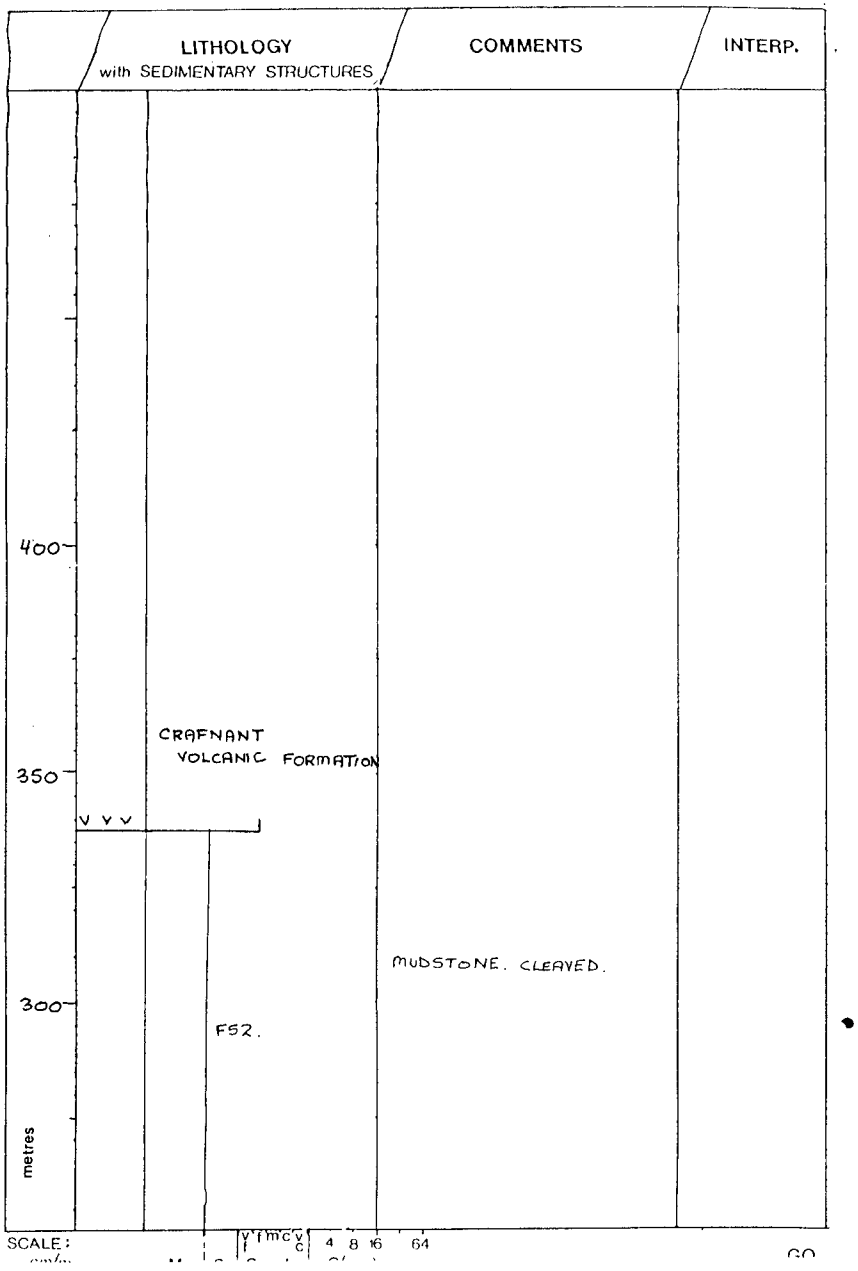


SECTION F6

SECTION F6 LOCATION: Cleaved siltstone from top of section F5 to top of Pen Llithrig-yr-Wrach. Section thickness paced by foot or extrapolated from map rather than measured.



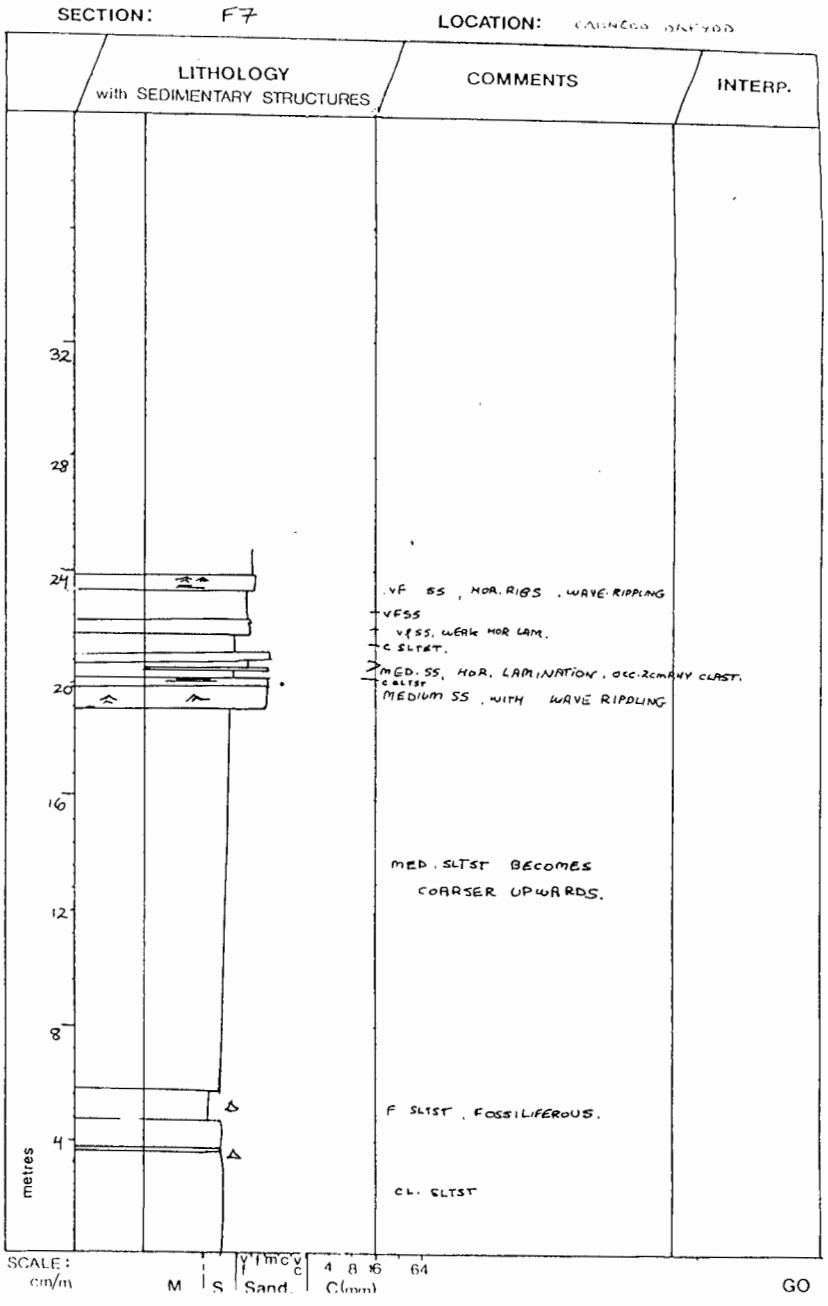
SECTION: F·6 LOCATION: ABOVE BWLCH TRIMARCHOG



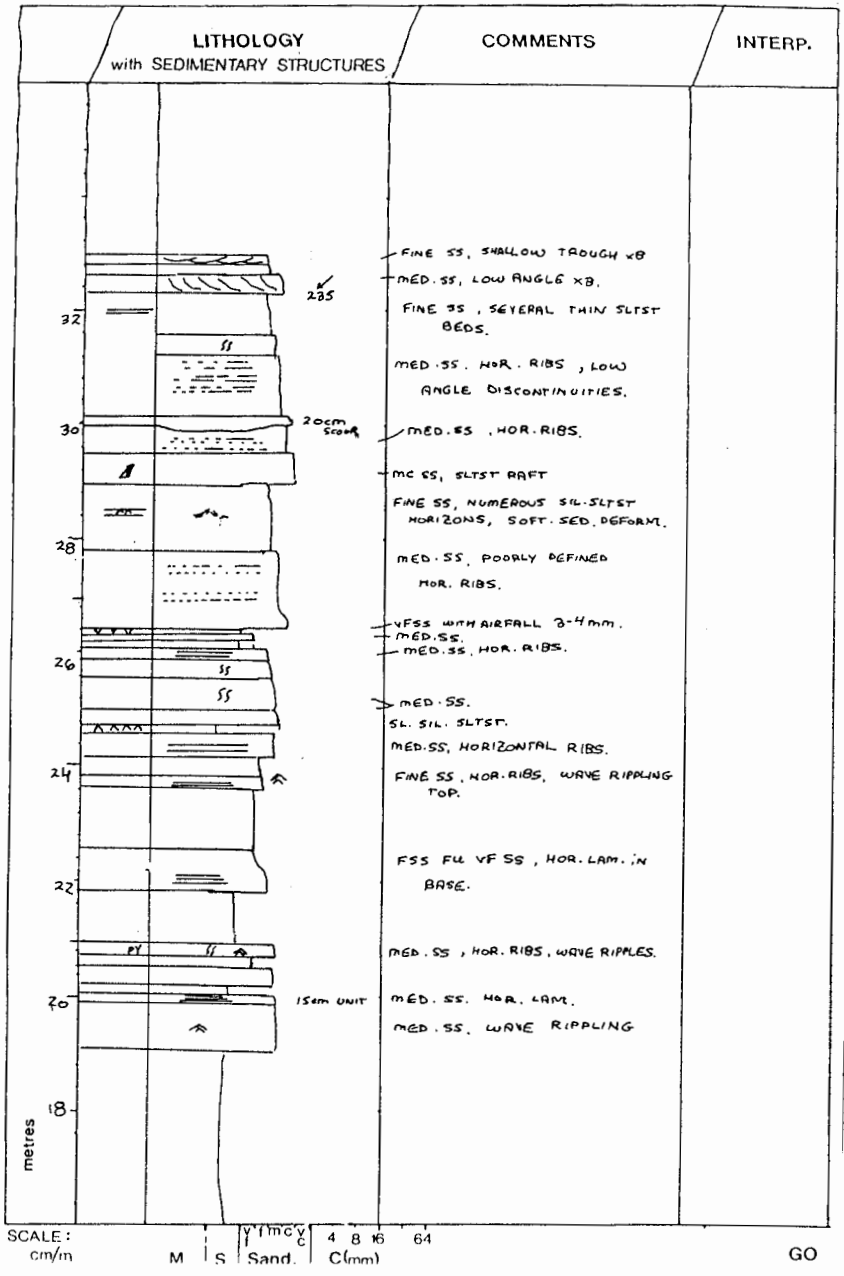
SECTION F7

SECTION F7a LOCATION: Trace rhyolite intrusion at Bwlch Cyfryw-drum downhill into the cwm towards source region of Nant y Graig stream. Section starts above rhyolite intrusion where bedding first becomes discernible within cleaved siltstones. Section continues up slope to dolerite intrusion.

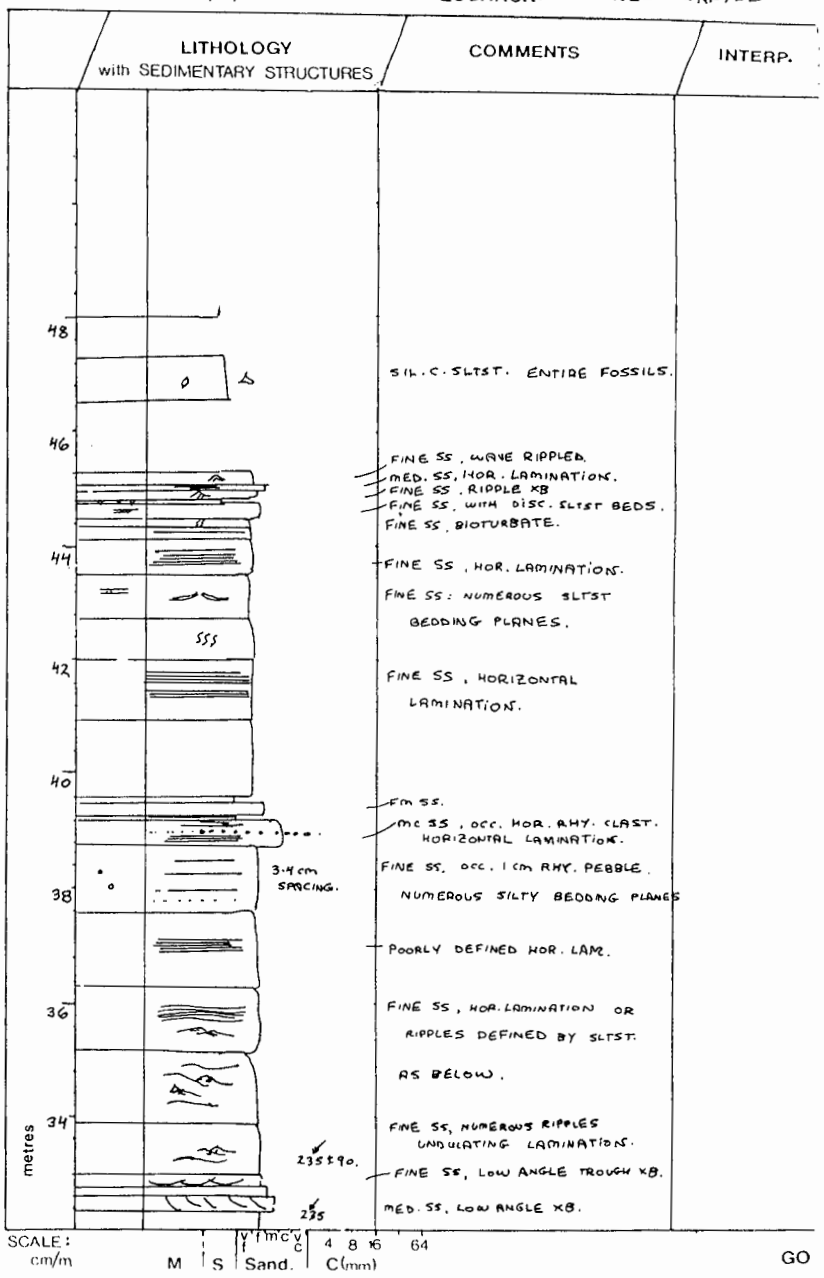
SECTION F7b LOCATION: Section starts at top of dolerite intrusion near Ysgolion Duon and continues to base of Capel Curig Volcanic Formation (Garth tuff) near Cefn Ysgolion Duon/ Carnedd Dafydd.



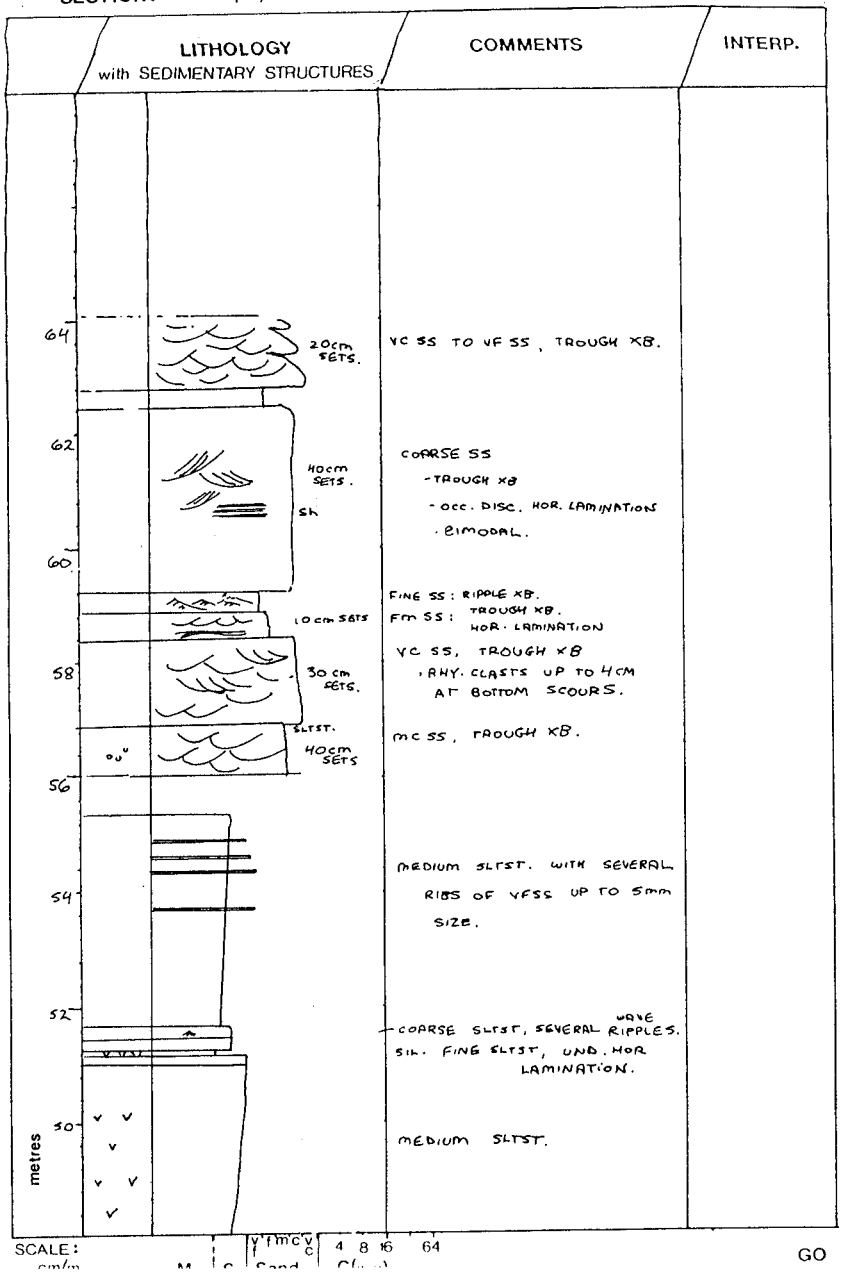
SECTION: F7 LOCATION: CARNEDD DAFYDD.



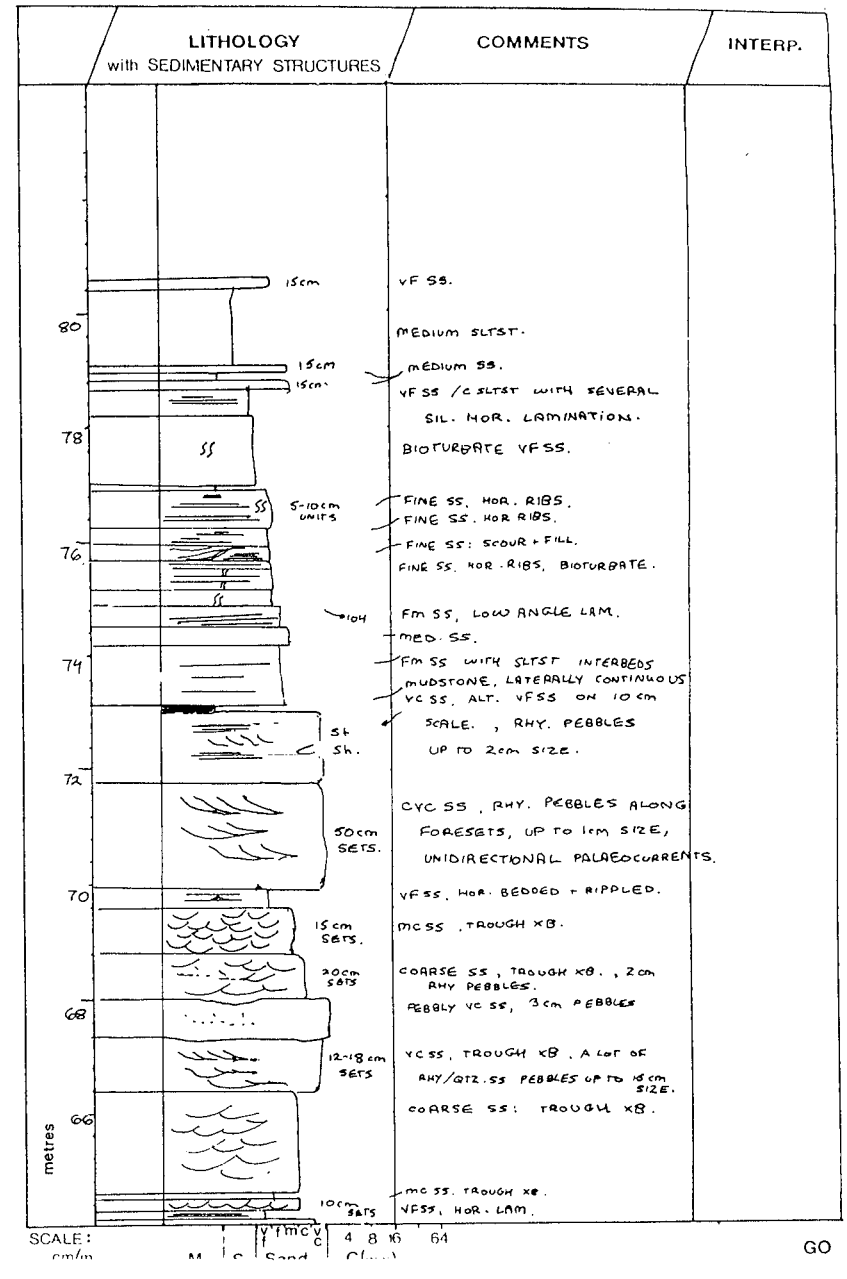
SECTION: F7 LOCATION: CARNEDD DAFYDD



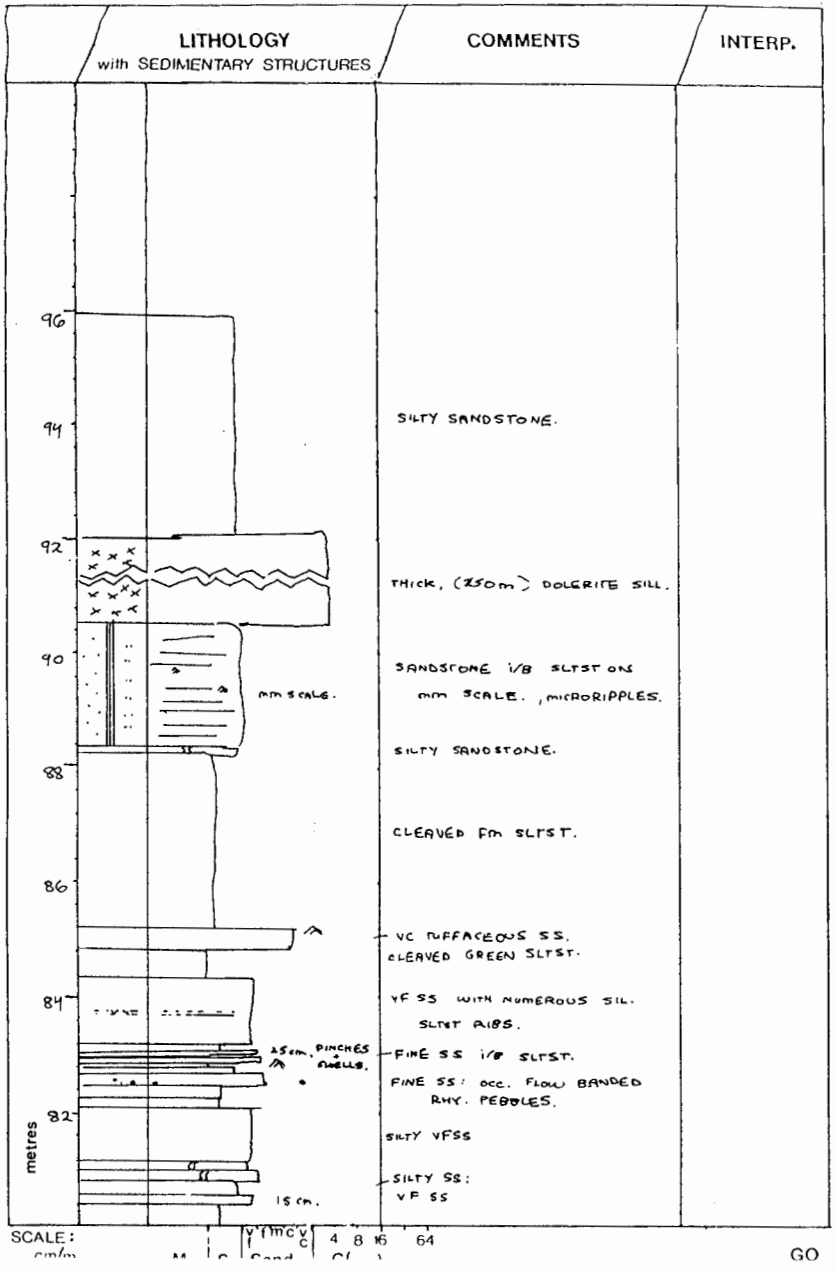
SECTION: F7 LOCATION: CARNEDD DAFYDD.



SECTION: F7 LOCATION: CARNEDD DAFYDD.



SECTION: F7 LOCATION: CARNEDD DAFYDD



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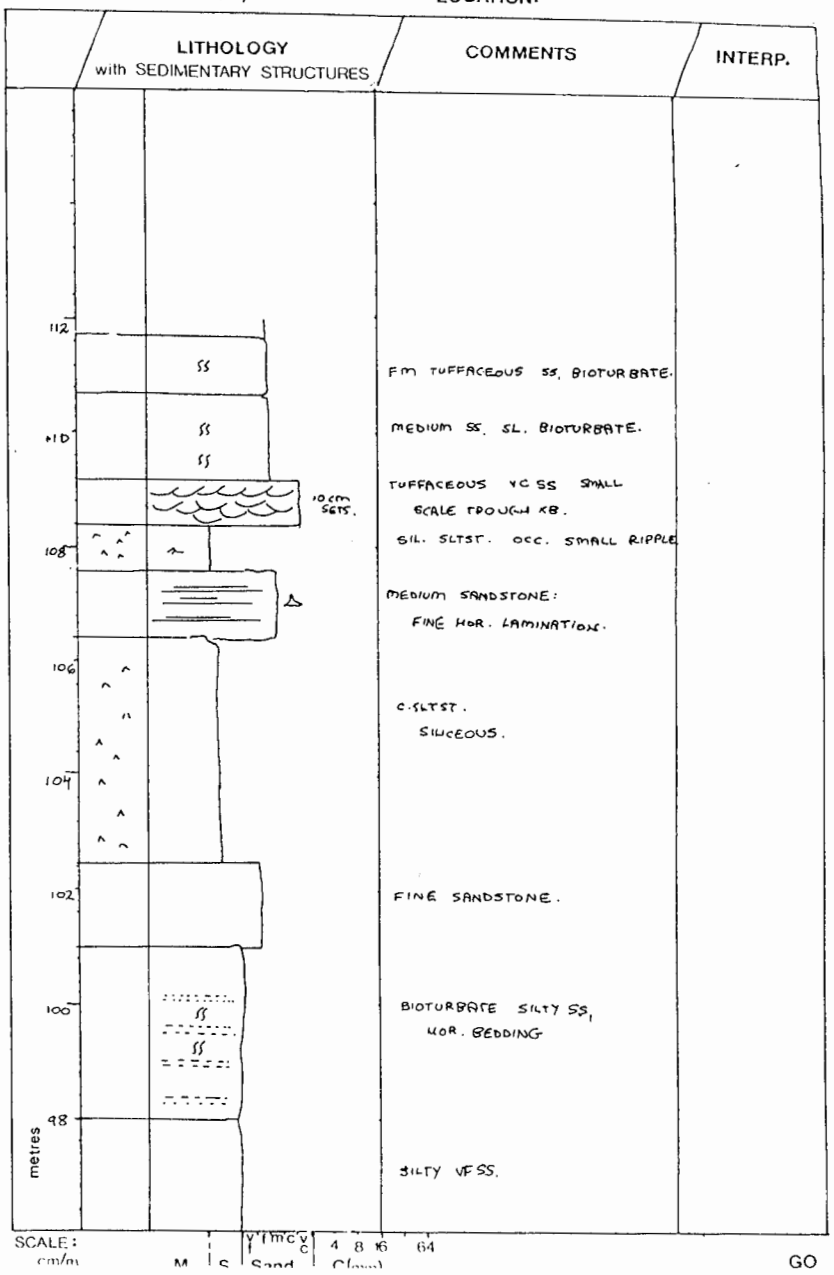
SECTION: F7 LOCATION:



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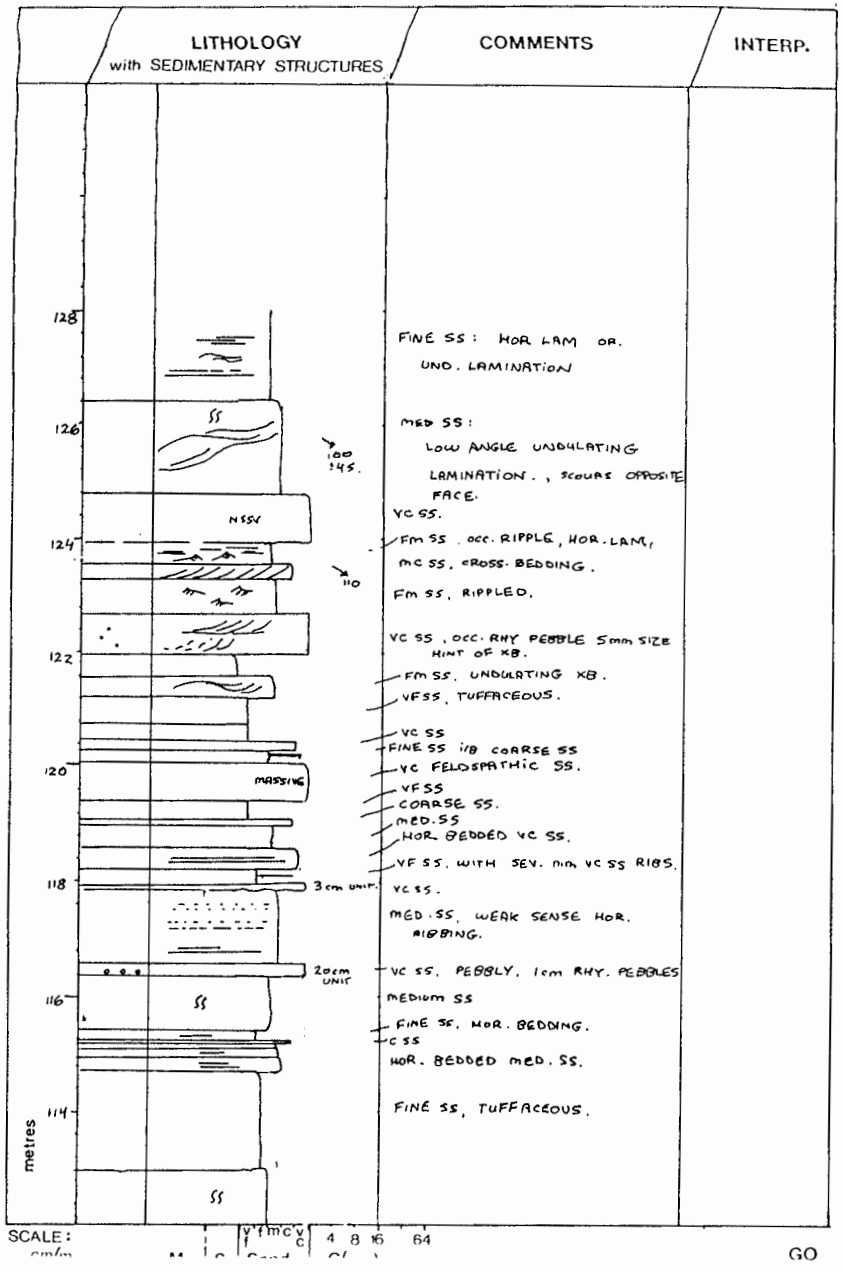
SECTION: F7 LOCATION:



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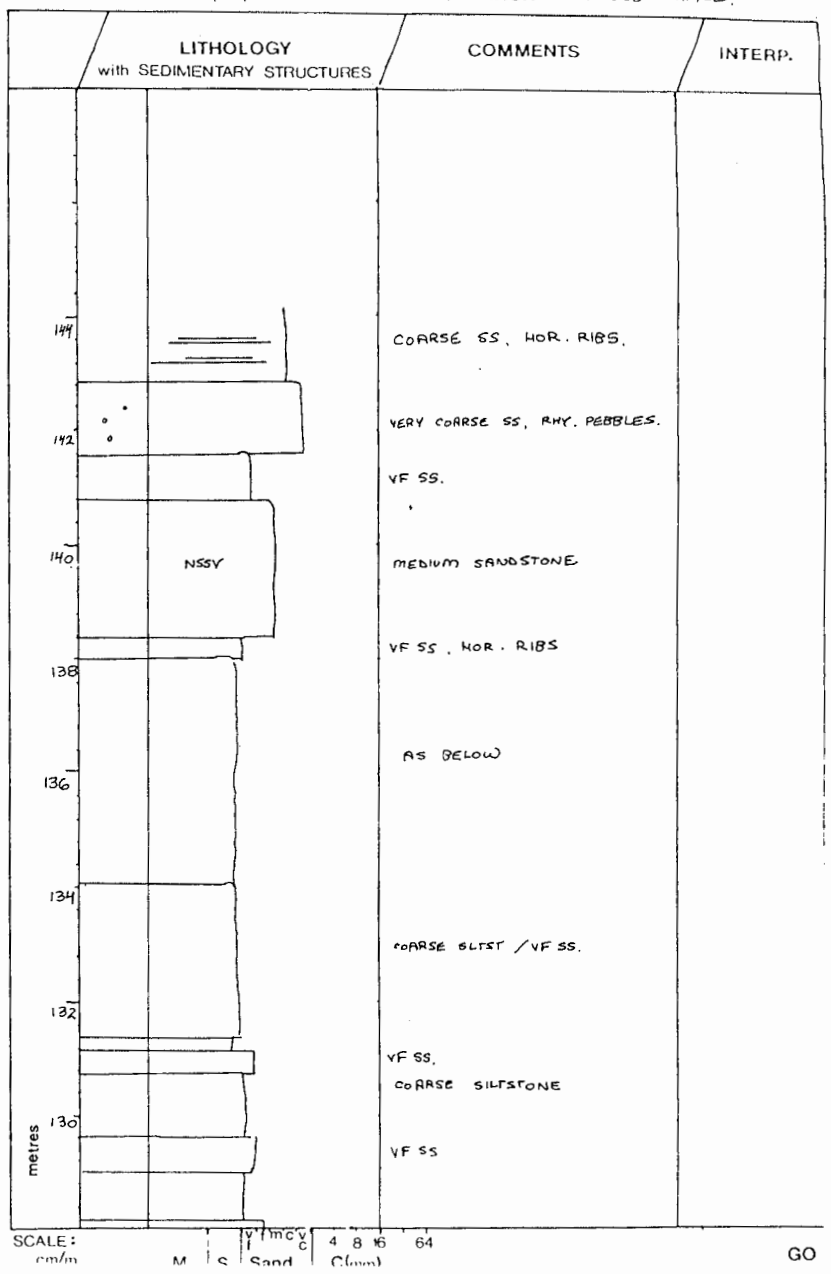
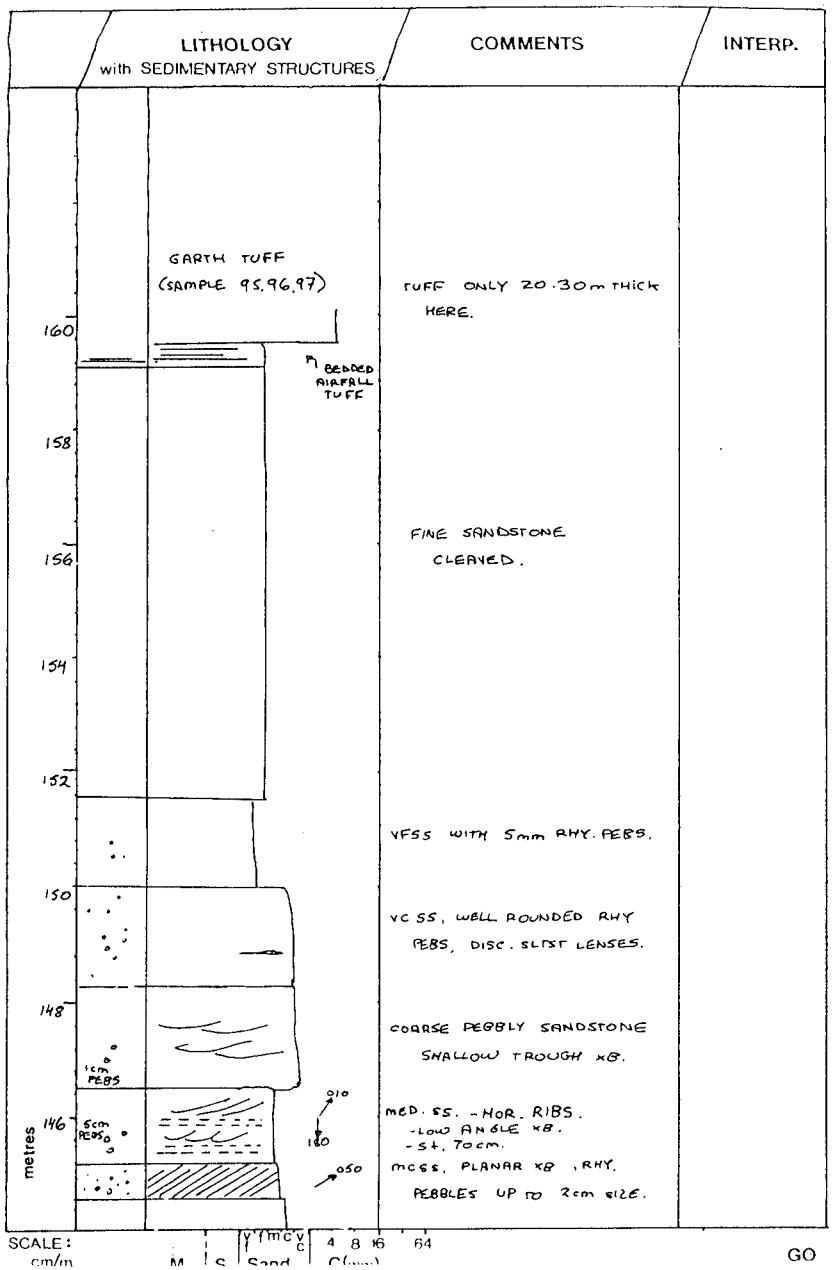


SECTION: F7 LOCATION: CARNEDD CAFYDD.



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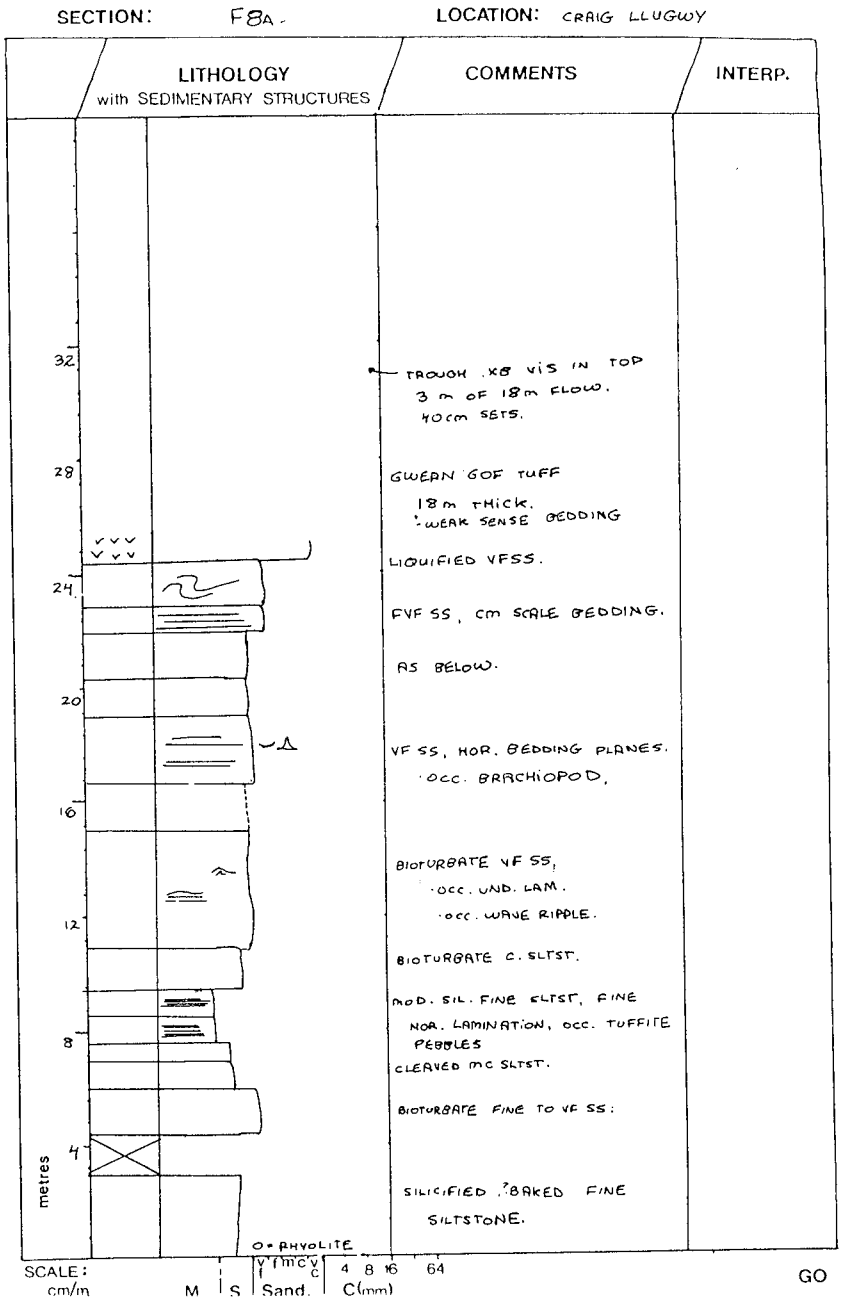
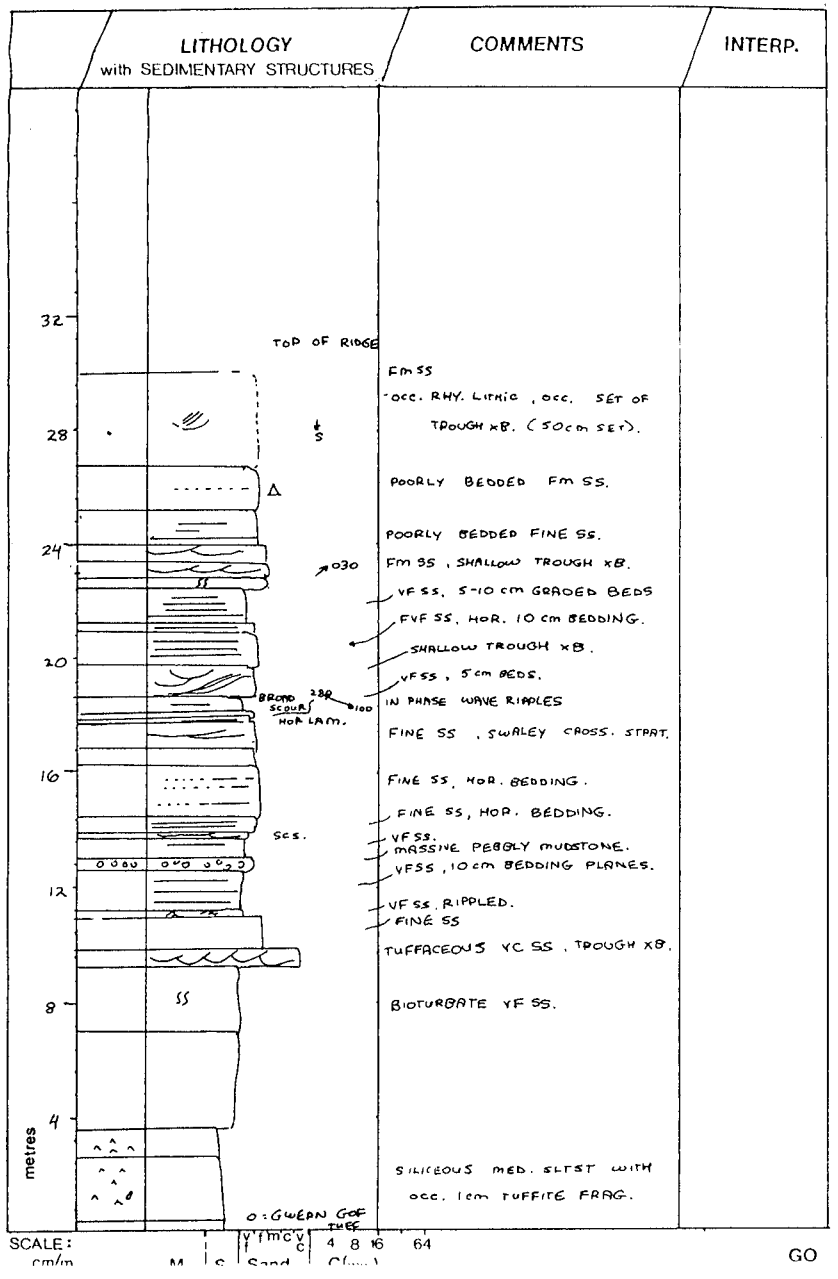
SECTION F8

SECTION F8 LOCATION: Section starts at top of rhyolite intusion along SW side of Cwm Llugwy. It proceeds to SW across Gwern Gof Tuff to footpath along Craig Llugwy ridge.

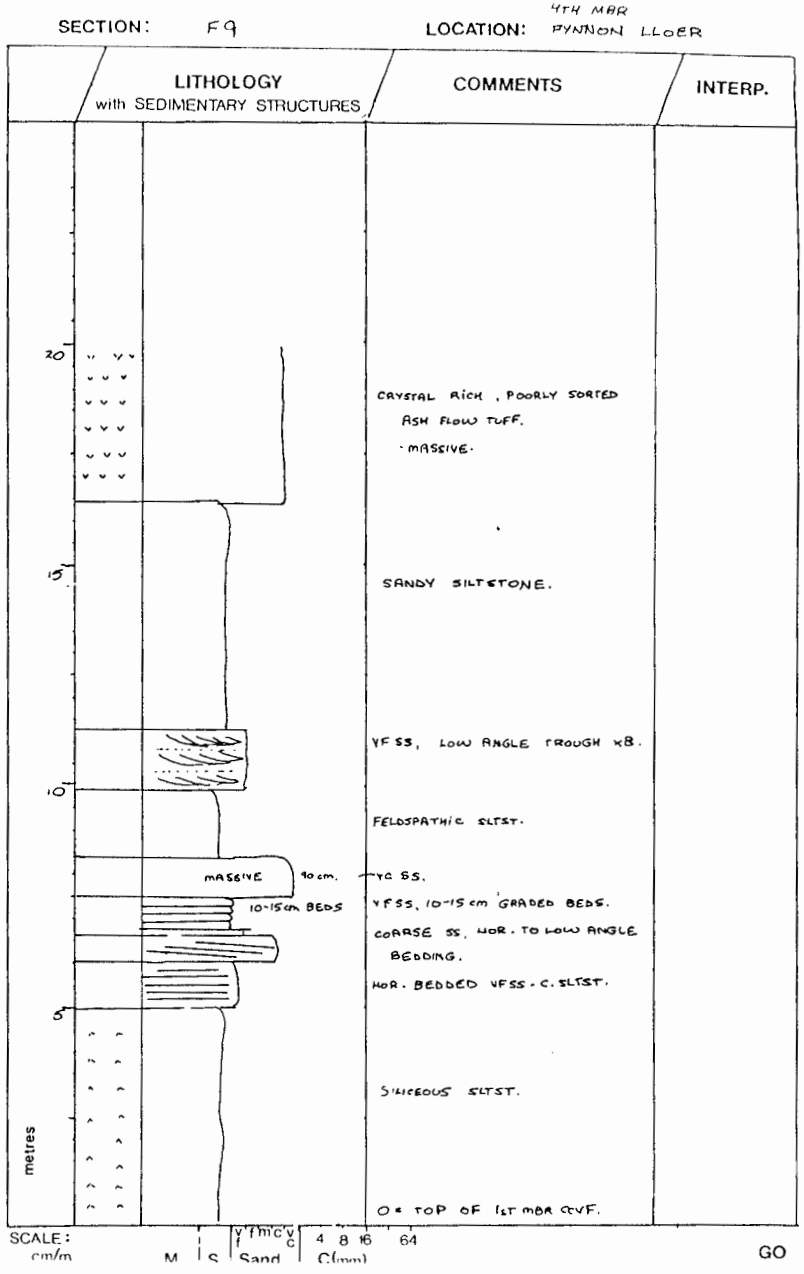


SECTION: F8B LOCATION: CRAIG LLUGWY

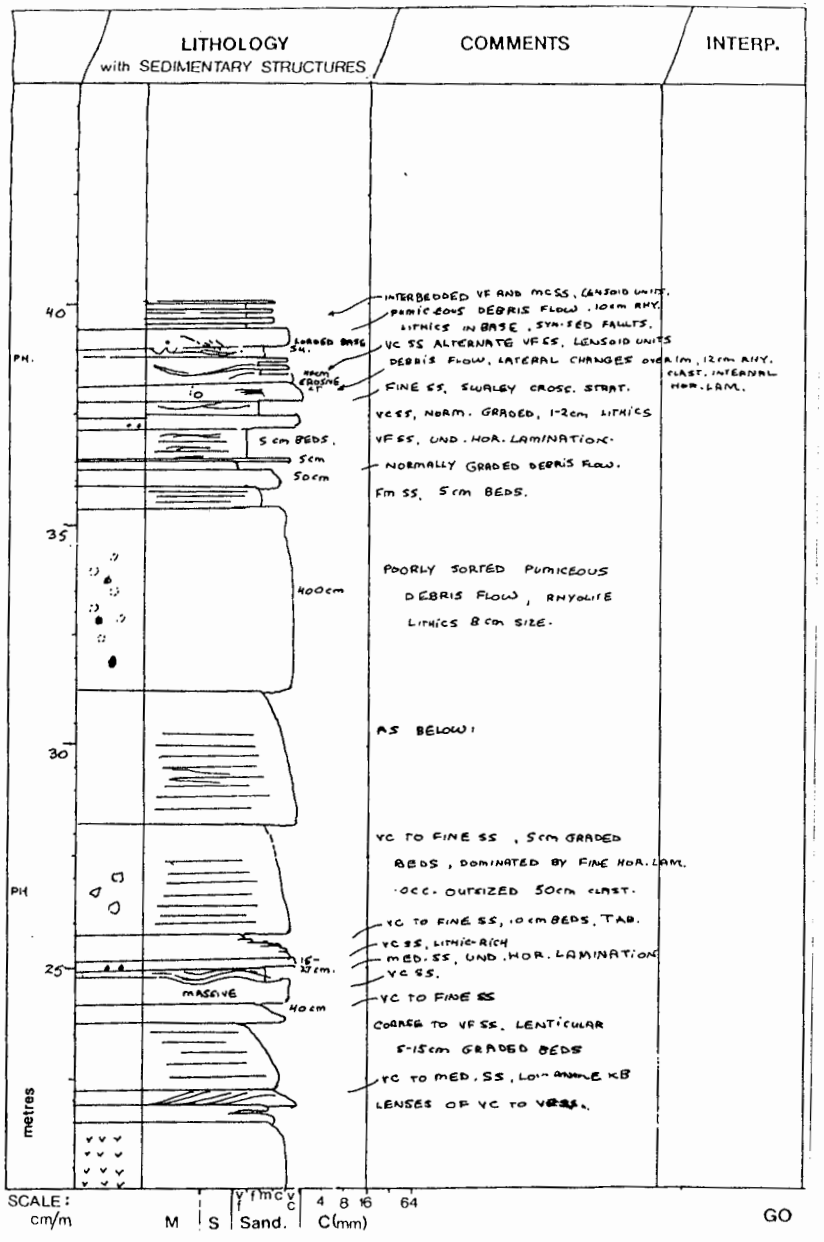


SECTION F9

SECTION F9 LOCATION: Locate Garth tuff near Ffynnon Lloer. Section starts at top of Garth tuff 250 metres to west of lake and proceeds up slope (SW) through the 4th Volcanic Mbr. of the Capel Curig Volcanic Fm.



SECTION: F9 LOCATION:



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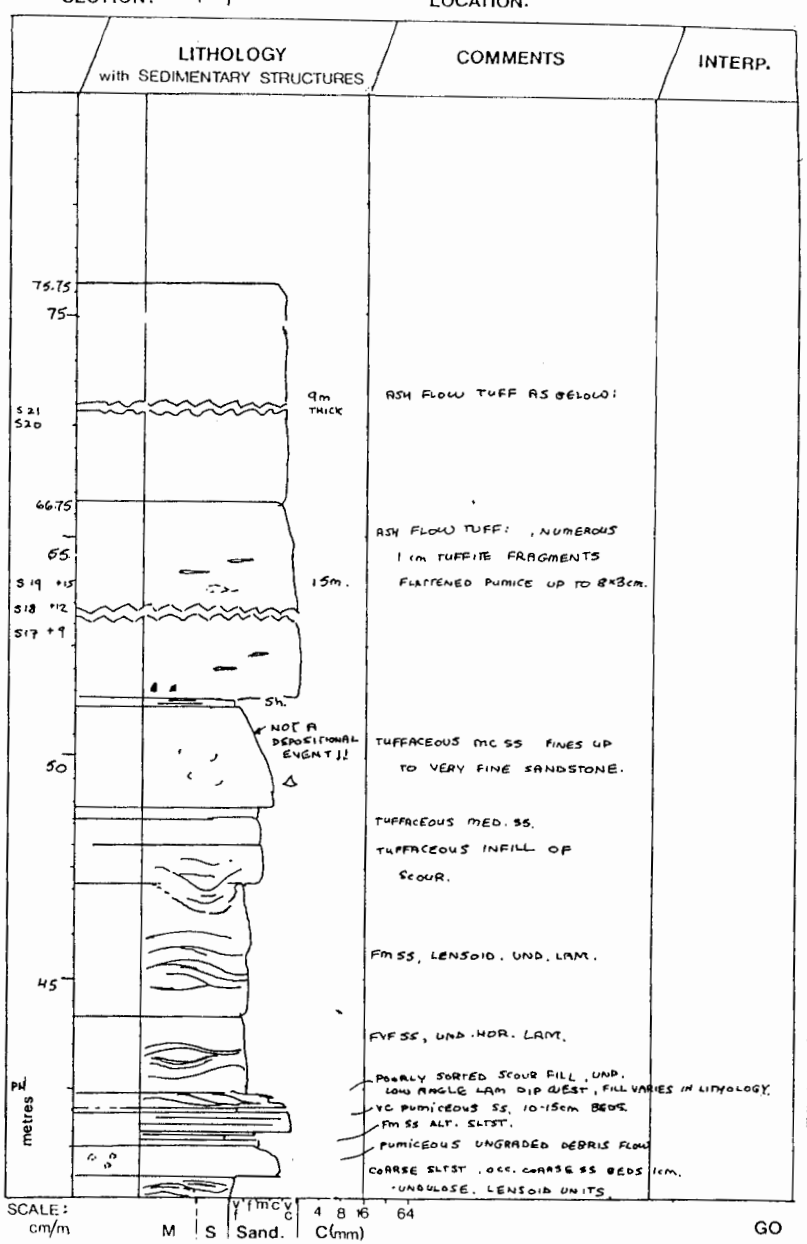
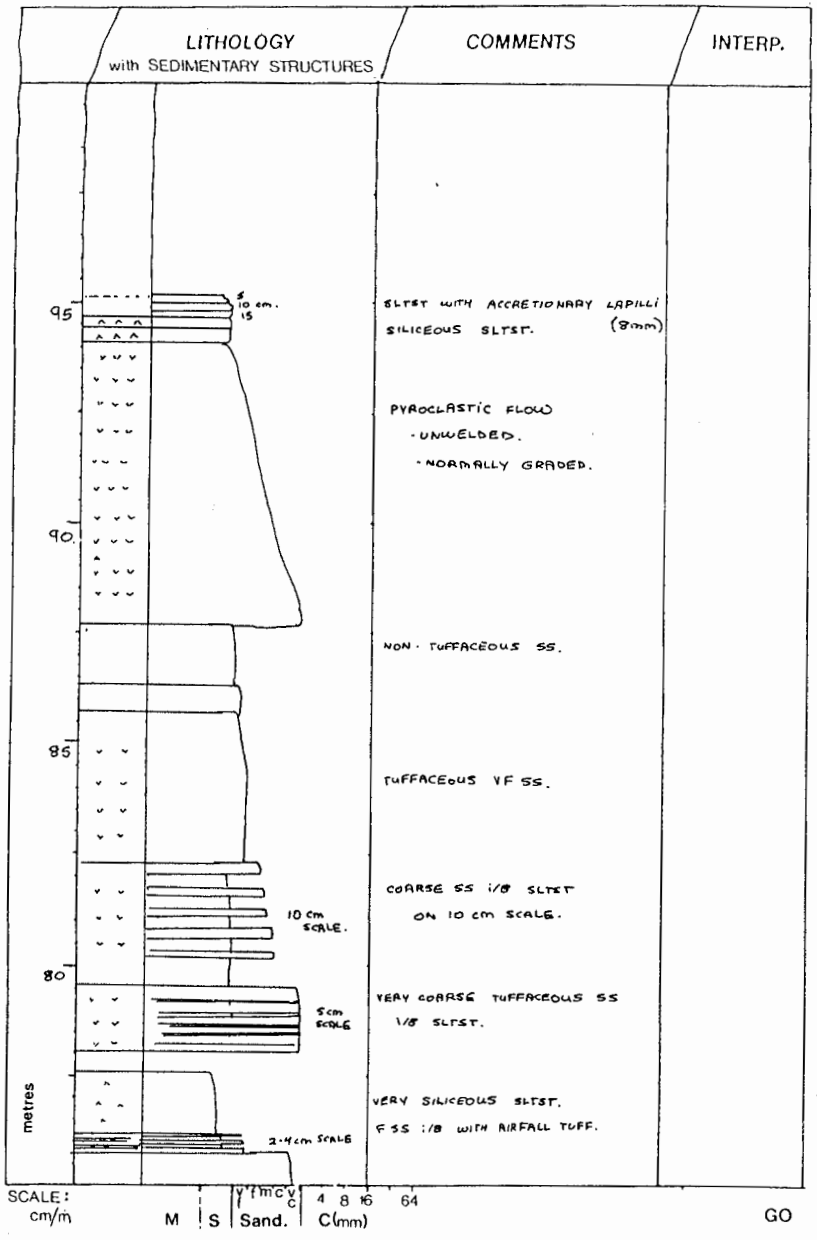
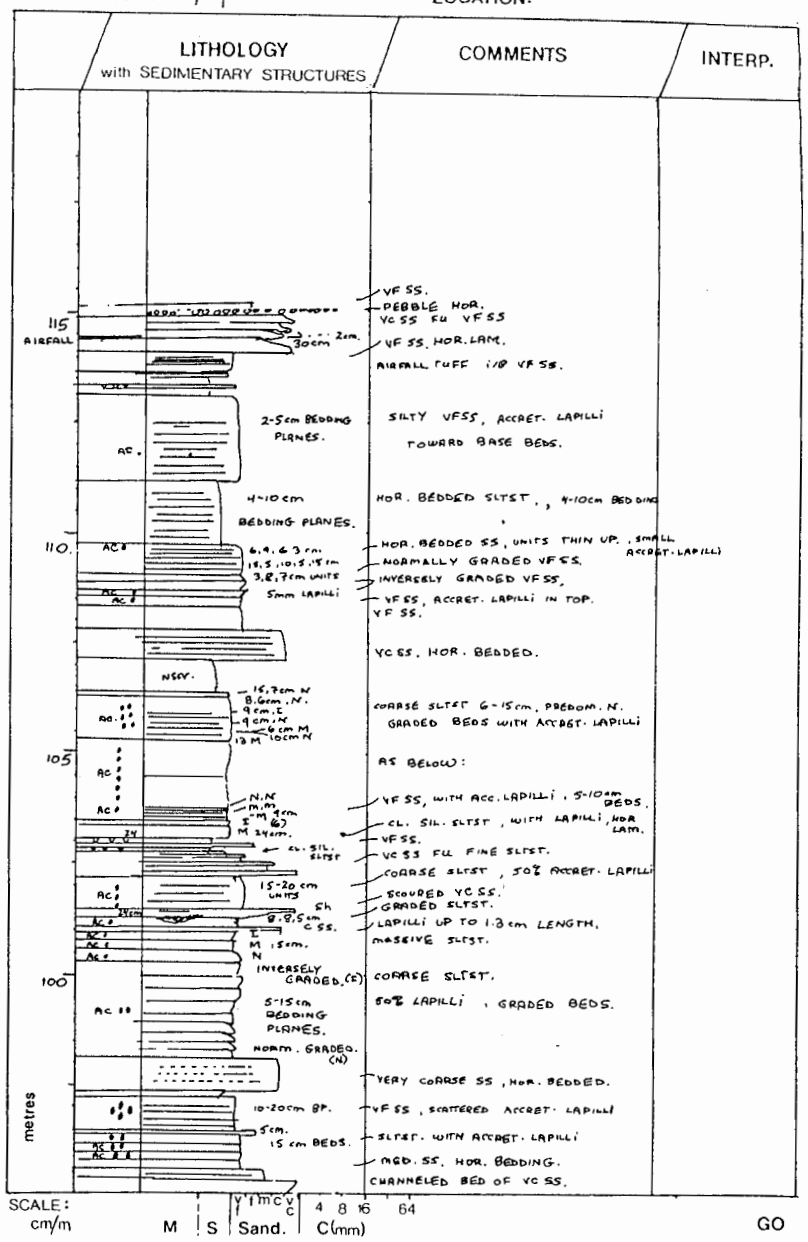


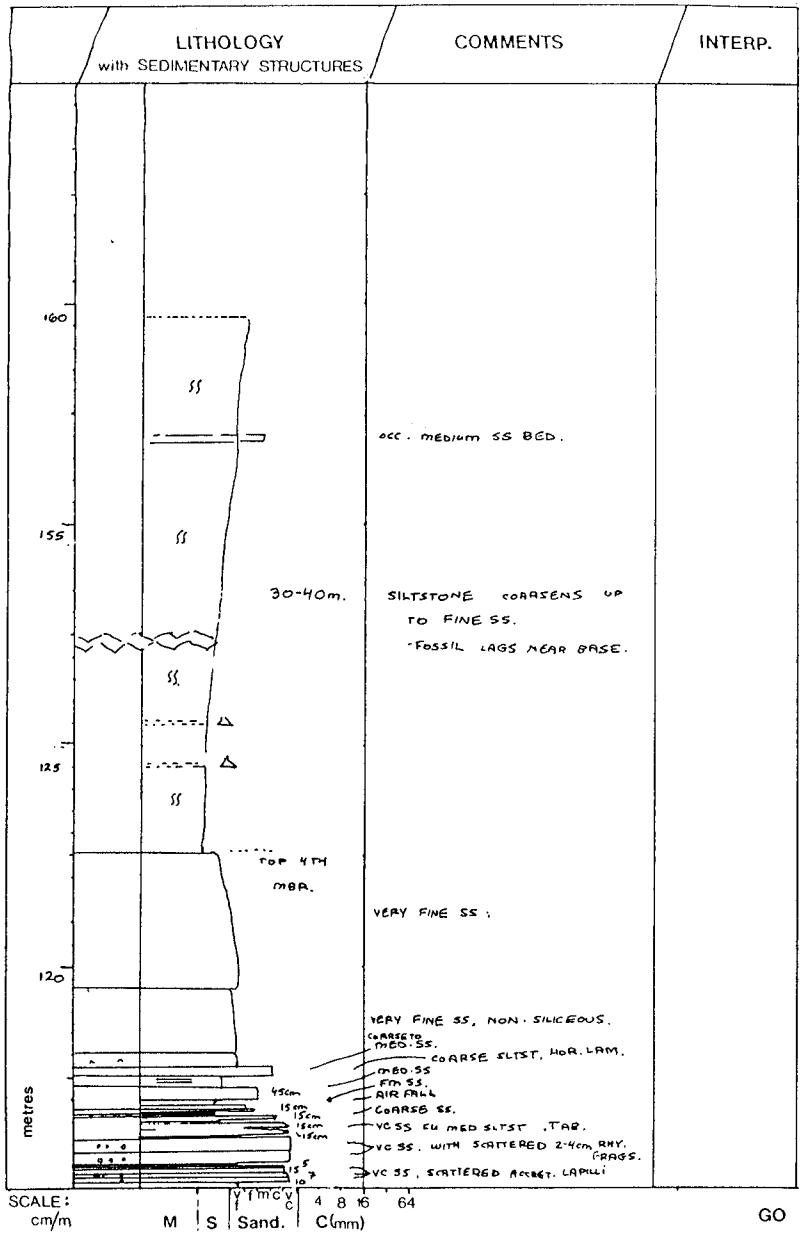
SECTION: F9 LOCATION:



SECTION: F9 LOCATION:

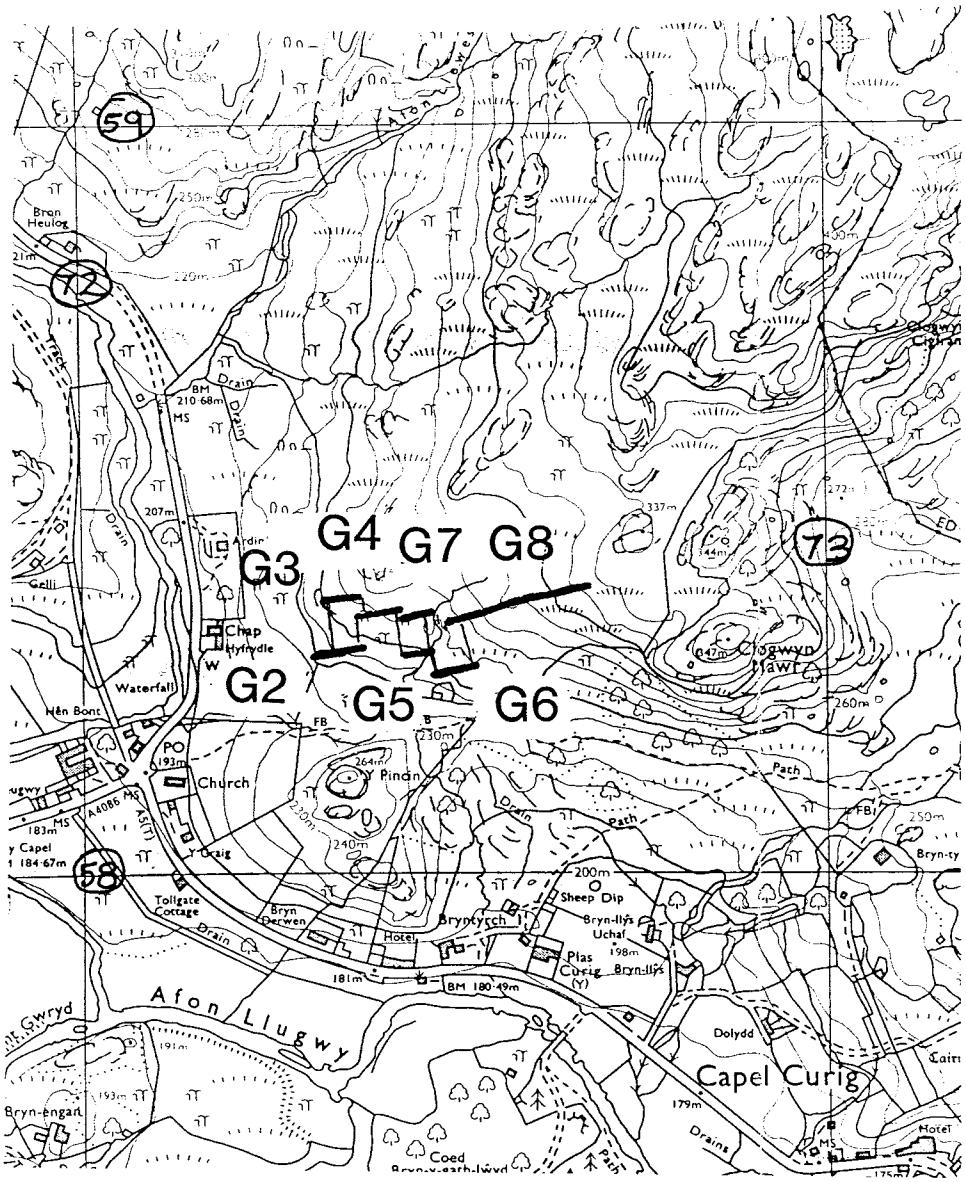


SECTION: F4. LOCATION:

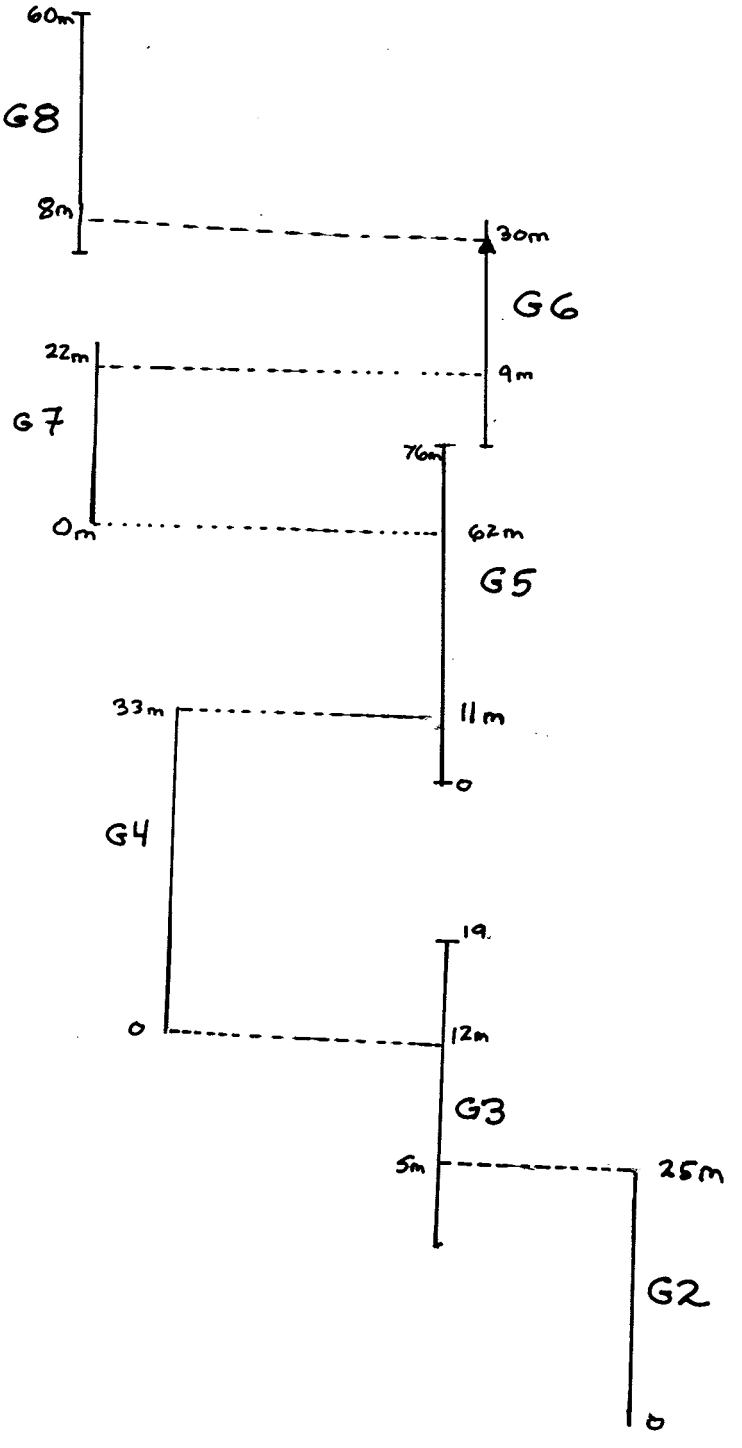


AREA G

LOCATION MAP.



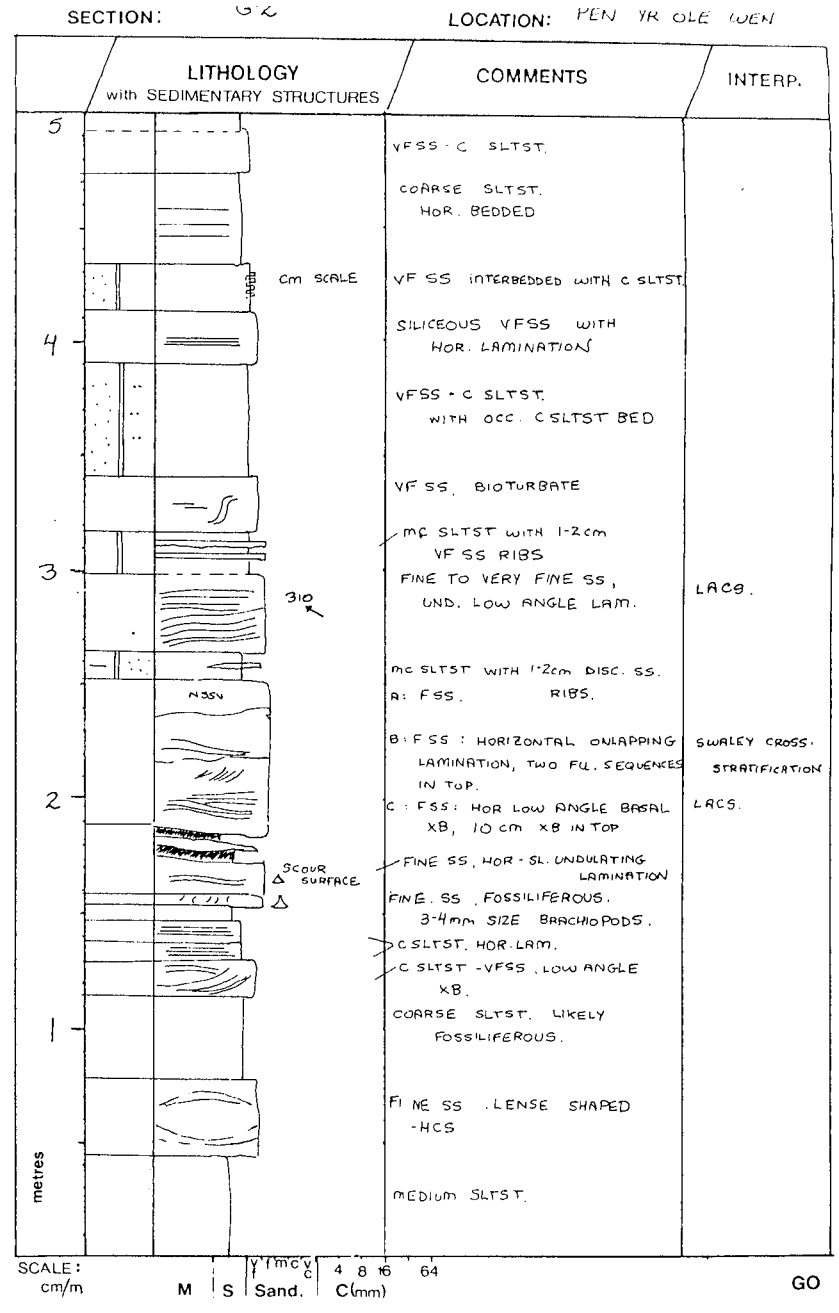
CORRELATION OF SECTIONS AREA G



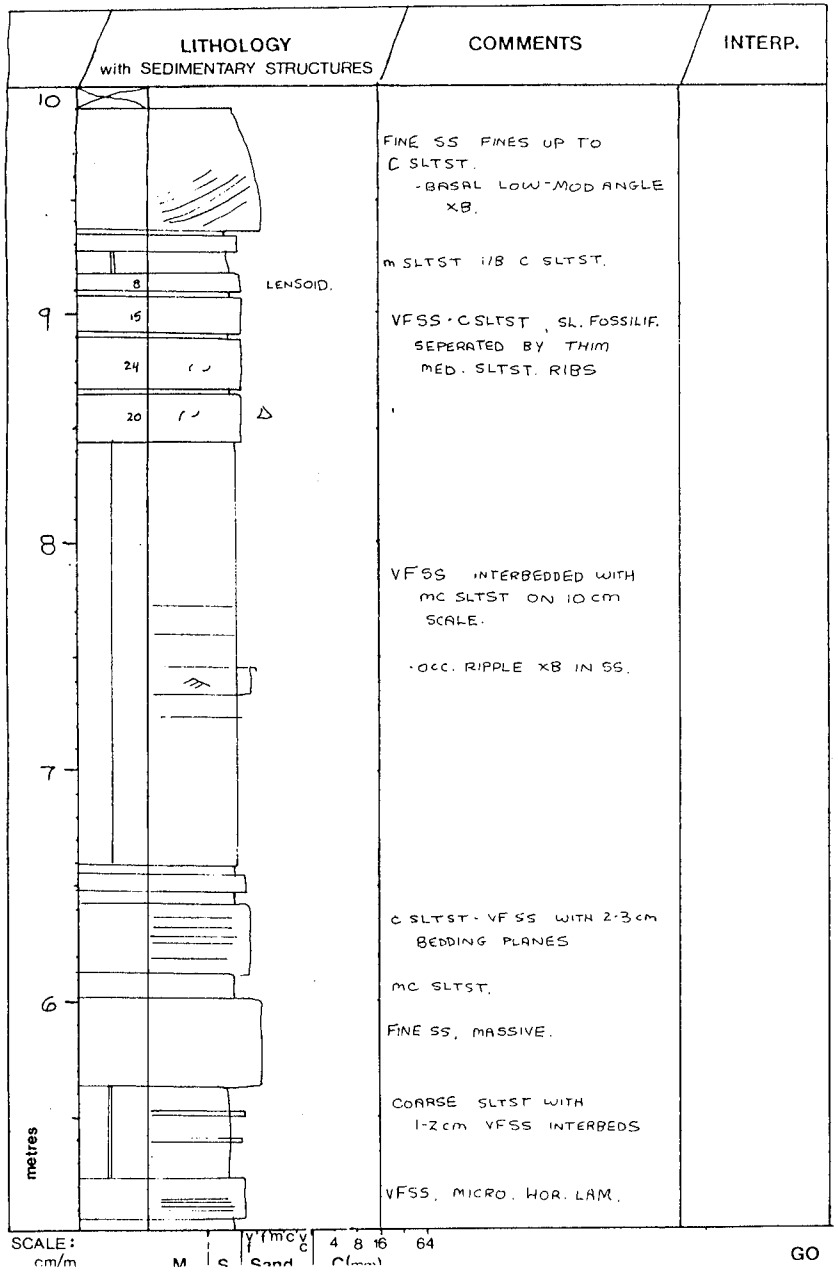
SECTION G2 to G8

SECTIONS G2 to G8 LOCATIONS: All sections located 150 to 200 metres NNW of Y Pinan hill near Capel Curig.

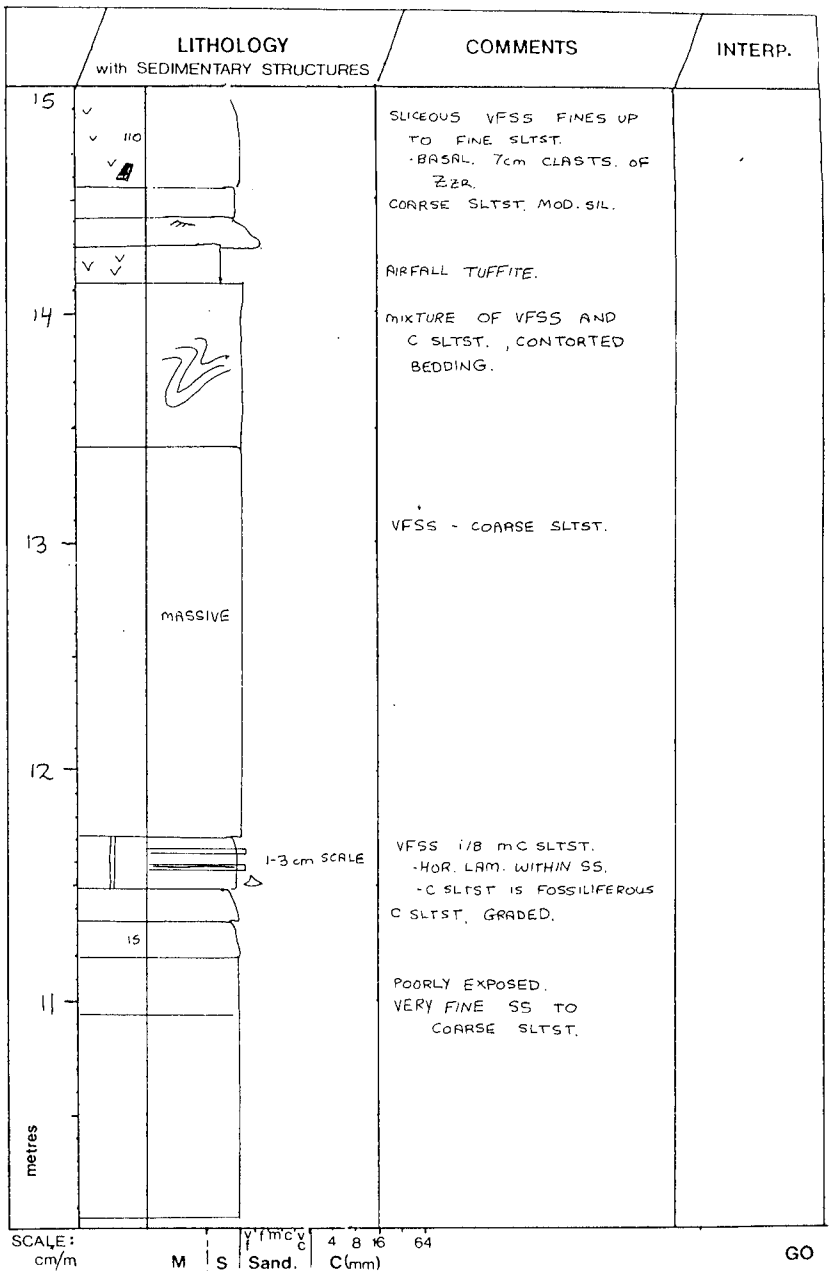
SECTION G2 LOCATION: Locate small crags of sandstone 50 metres to NNW of foot bridge across small stream running towards Capel Curig. Section continues to highest crags at top of white-weathering rhyolitic tuffs.



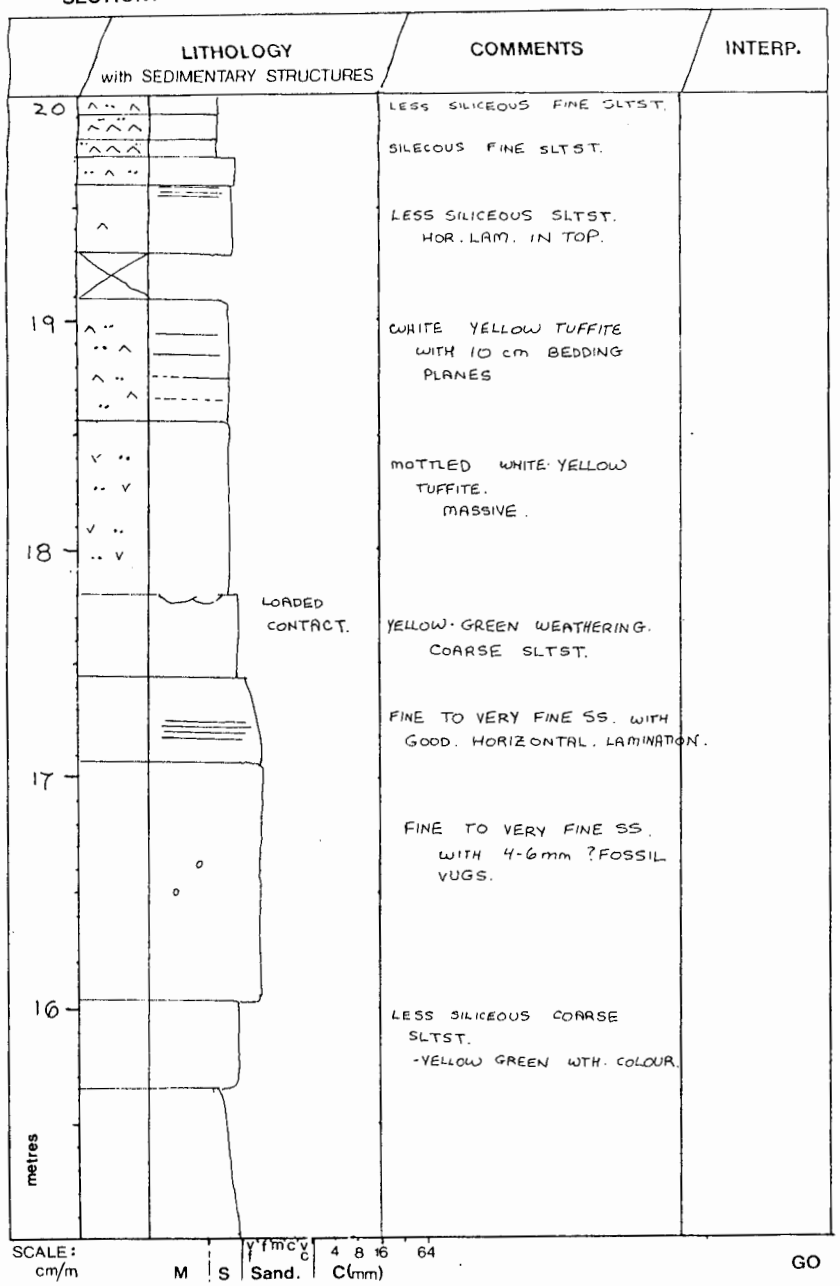
SECTION: G·2 LOCATION: CAPEL HILL



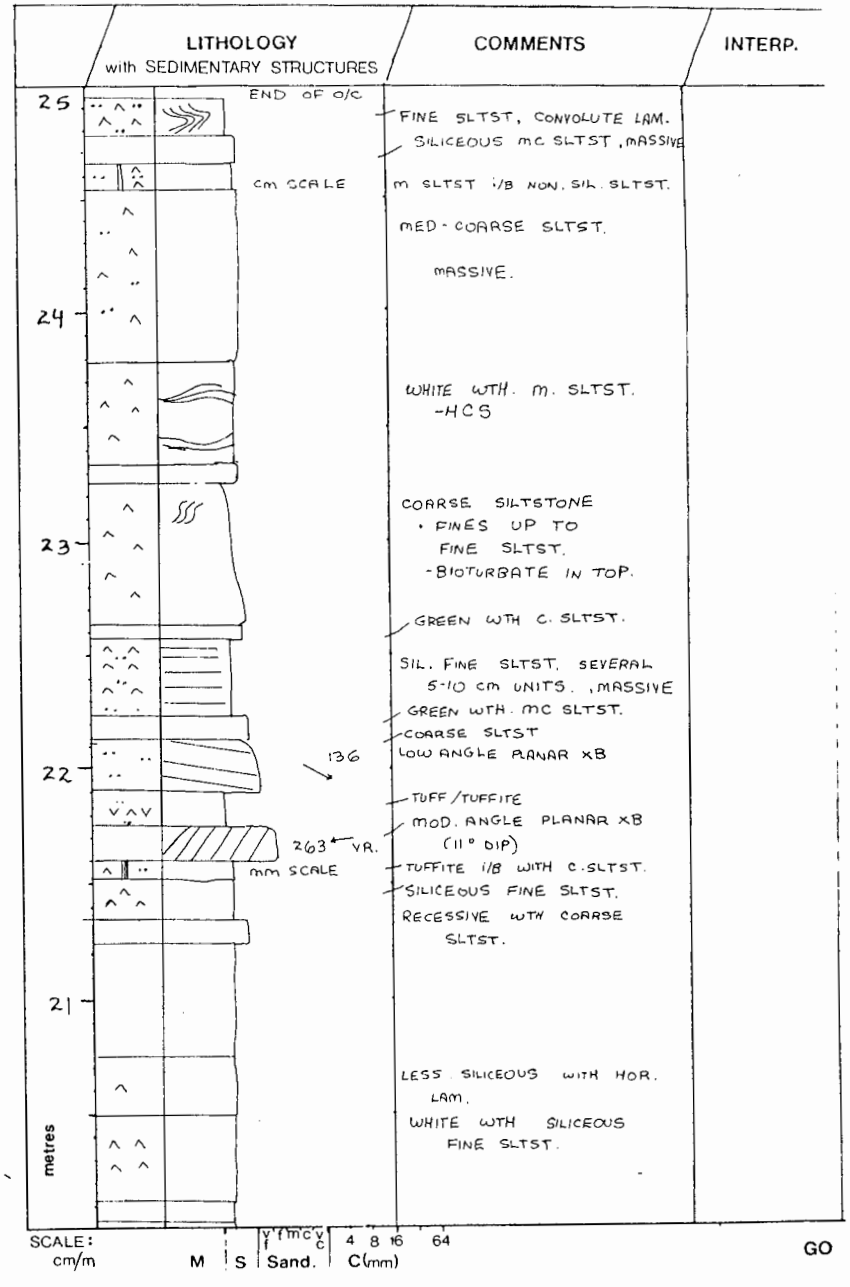
SECTION: G·2 LOCATION: PEN YR OLE WEN



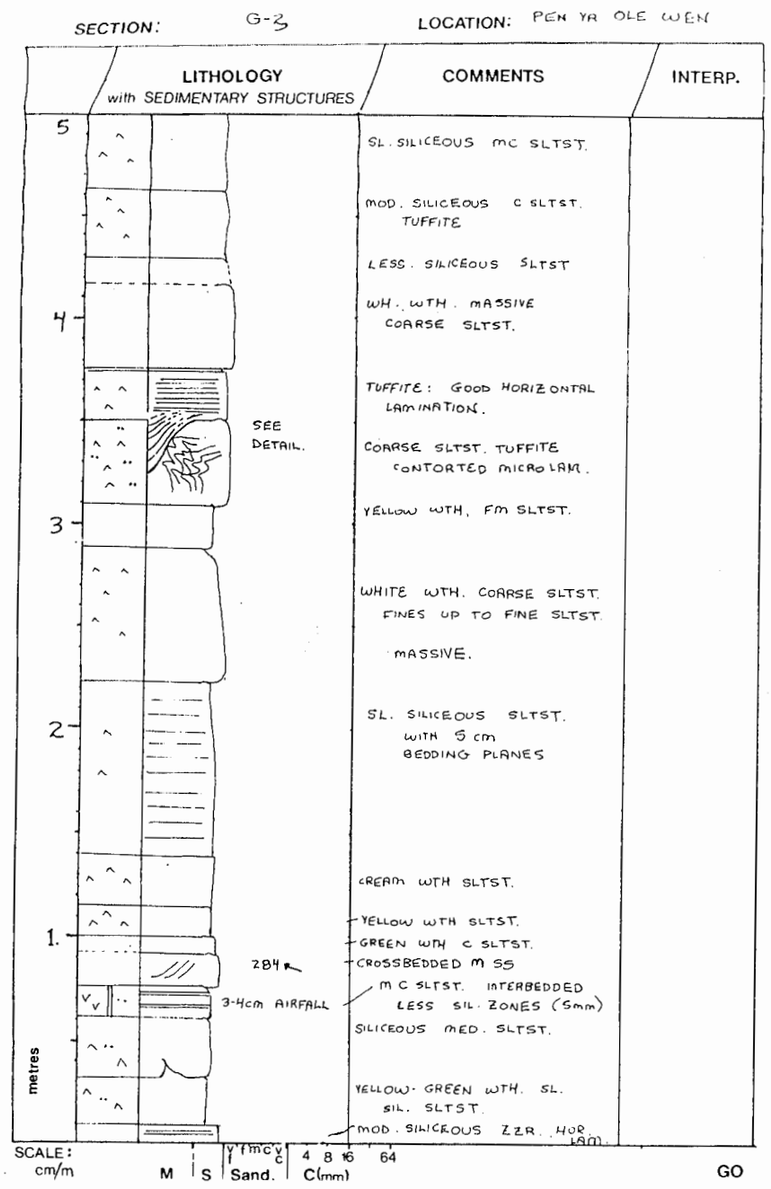
SECTION: U A LOCATION: CAPEL HILL

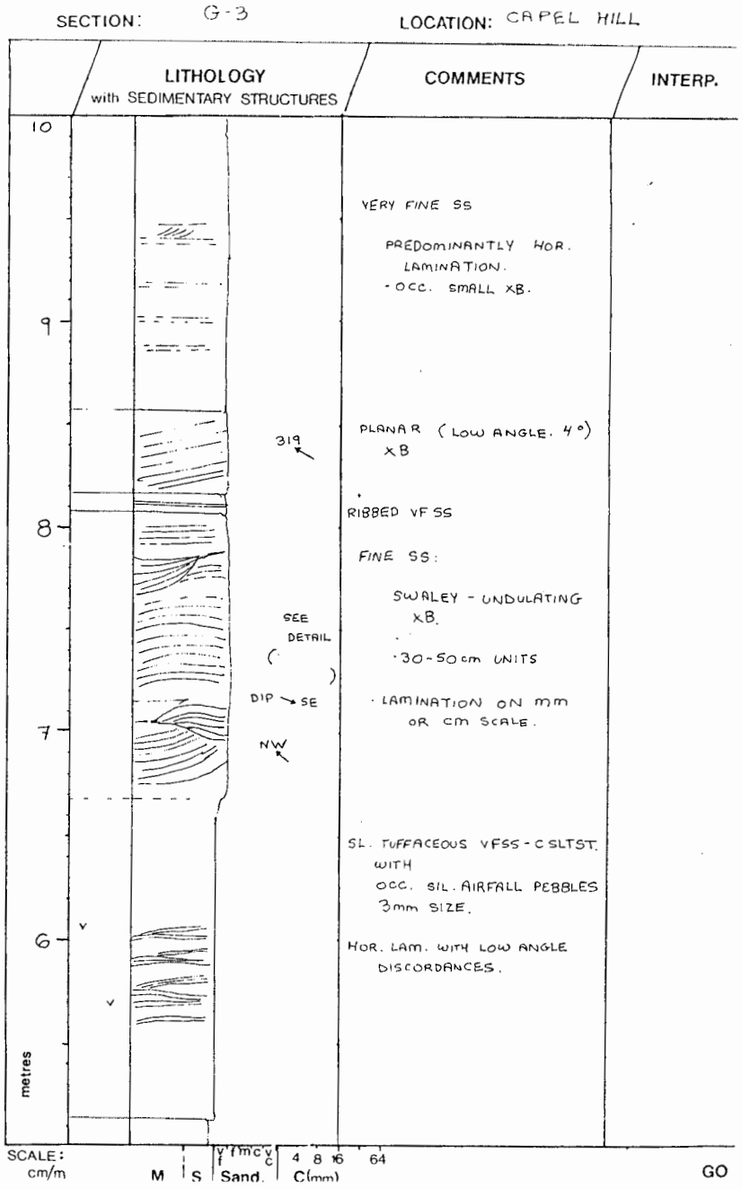


SECTION: G-2 LOCATION: CAPEL HILL

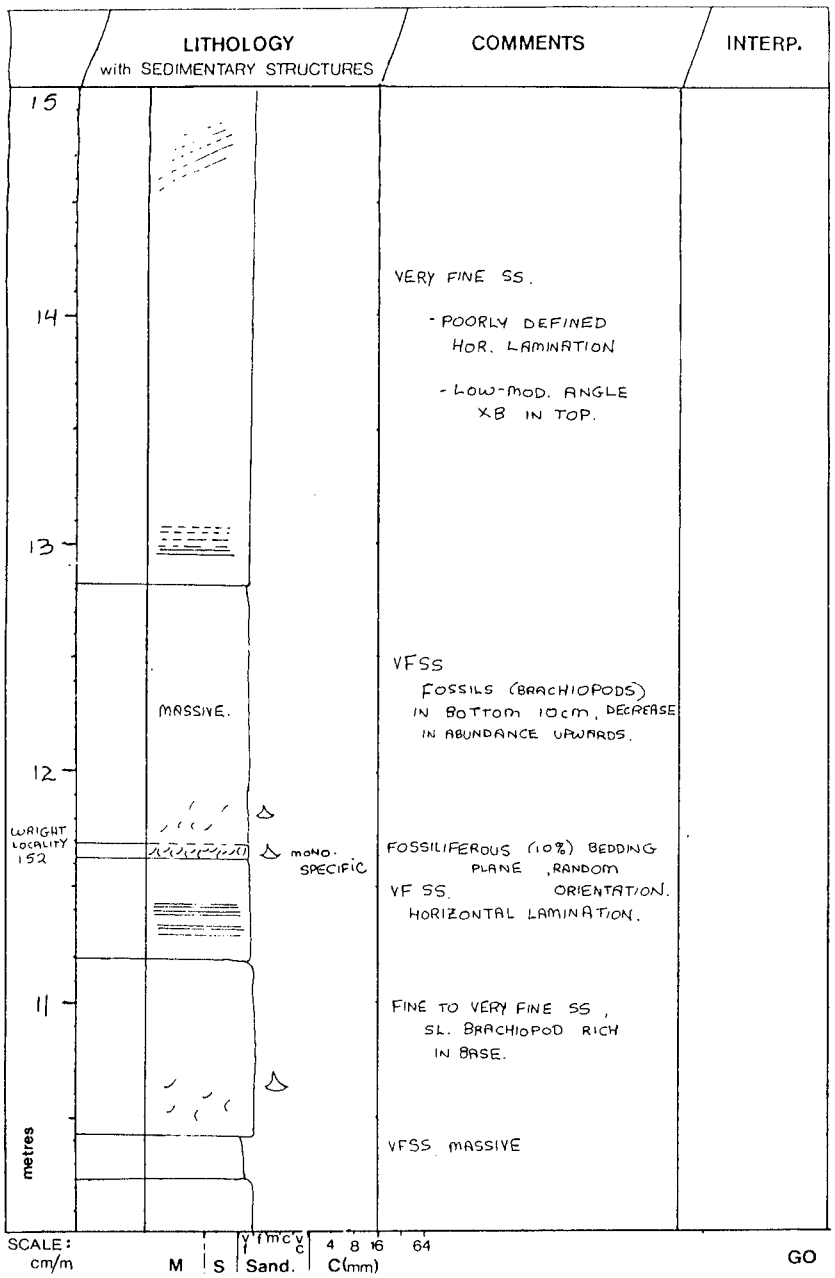


SECTION G3 LOCATION: Section starts near top of tuffite unit (from section G2) immediately to south of wire fence.

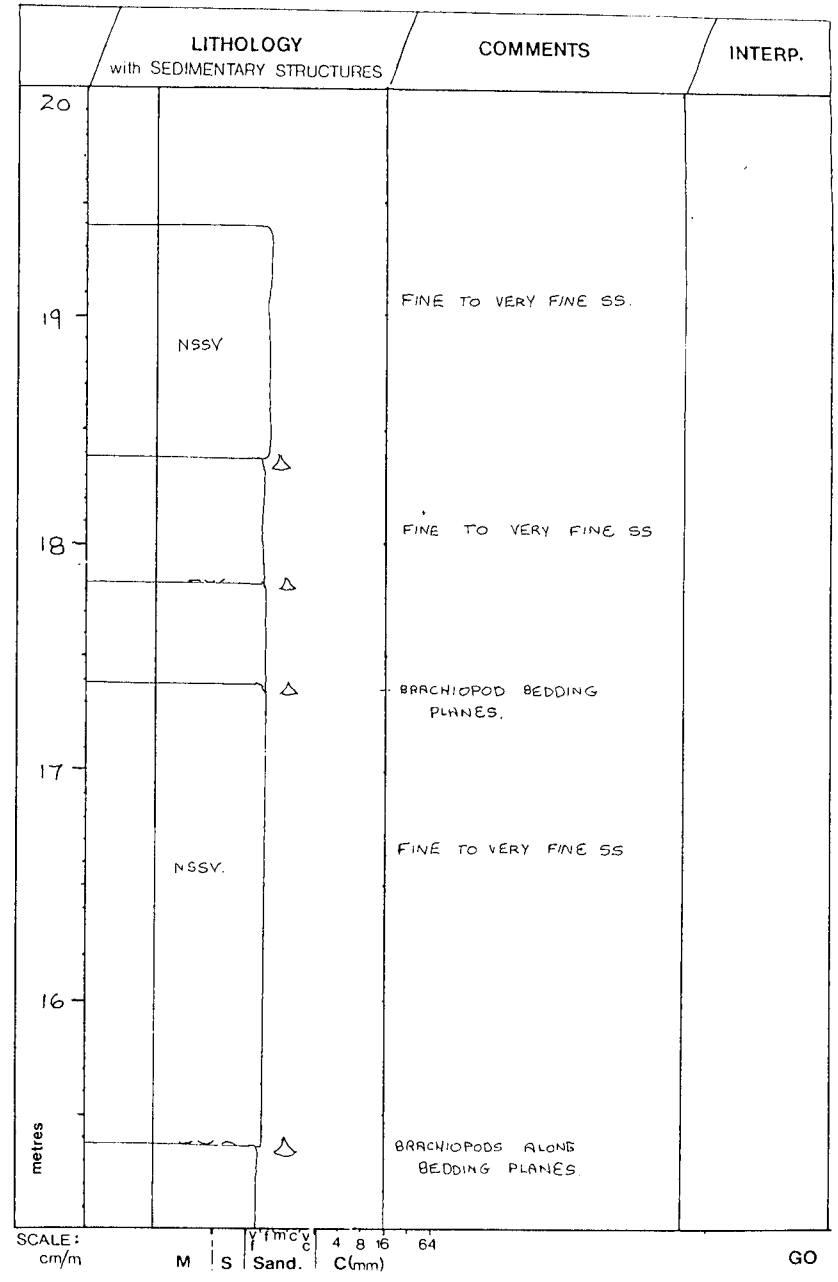




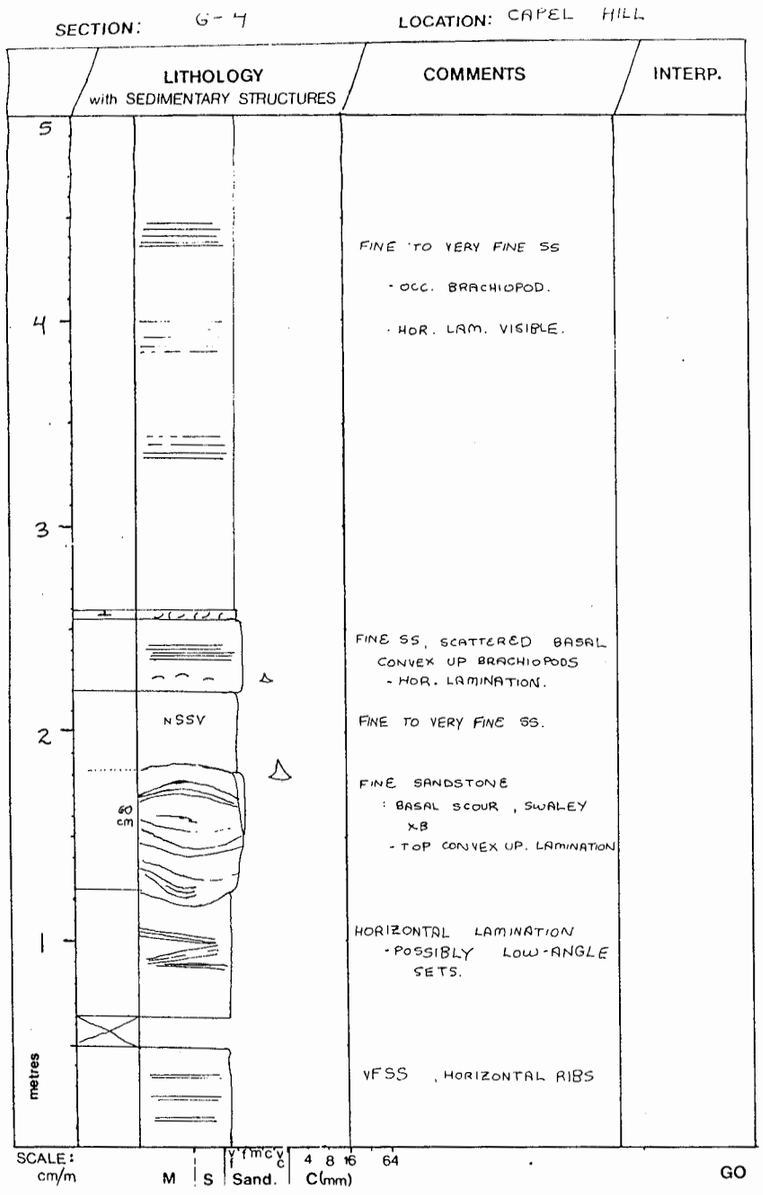
SECTION: G·3 LOCATION: CAPEL HILL

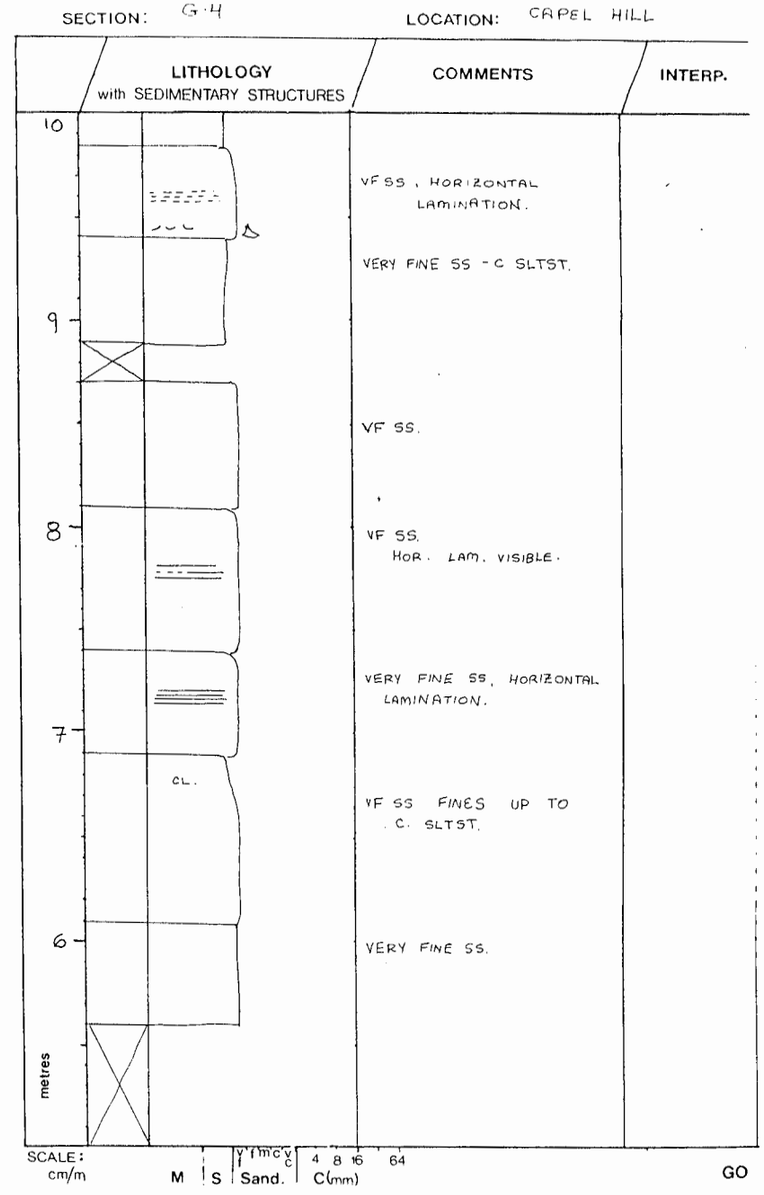


SECTION: G·3 LOCATION: CAPEL HILL

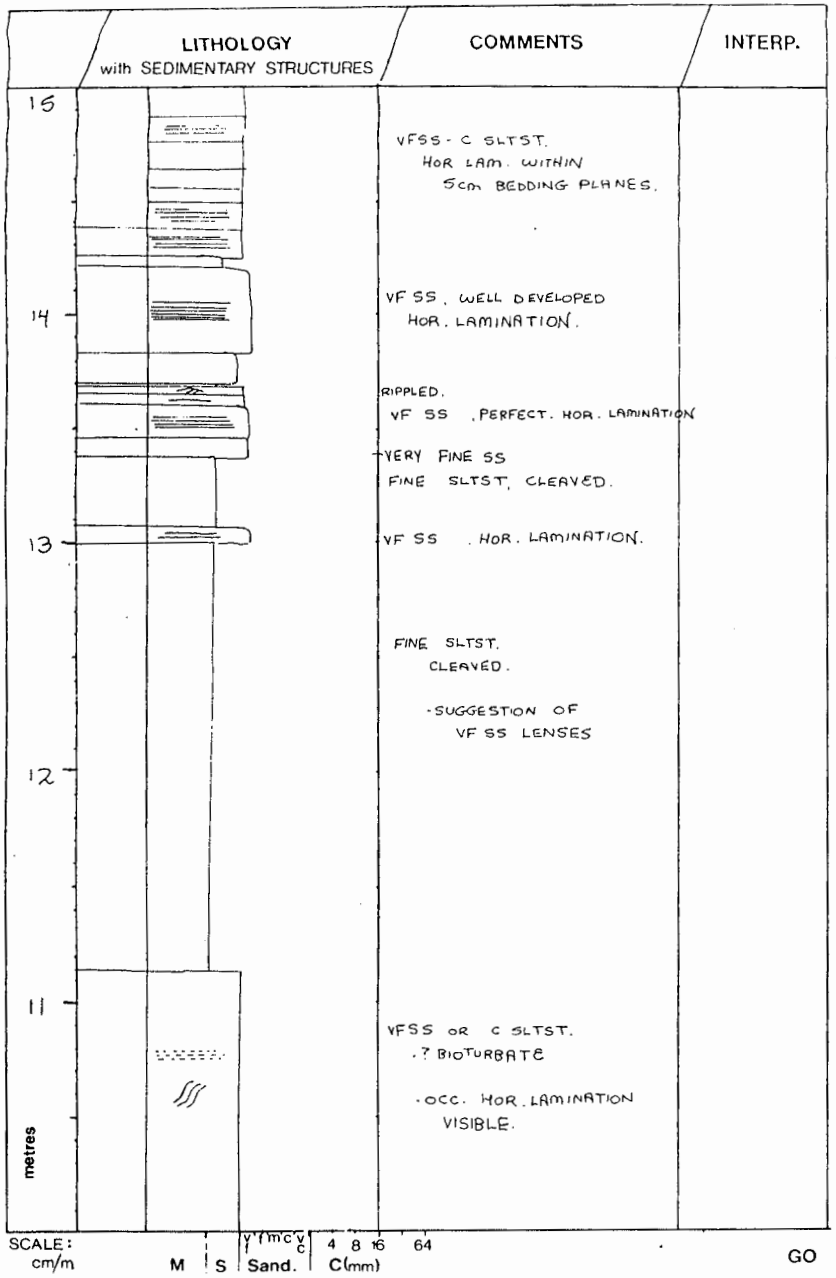


SECTION G4 LOCATION: Section starts 40 m to west of wire fence.

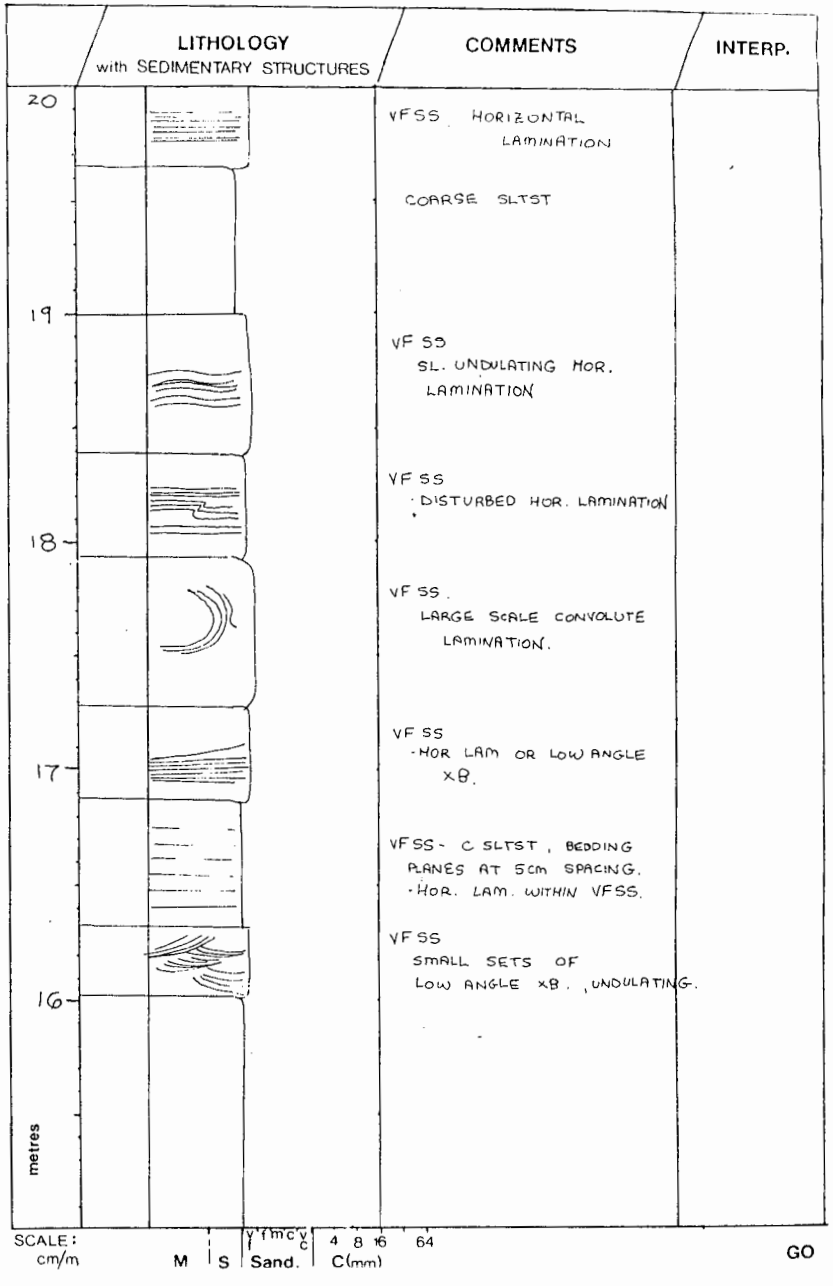




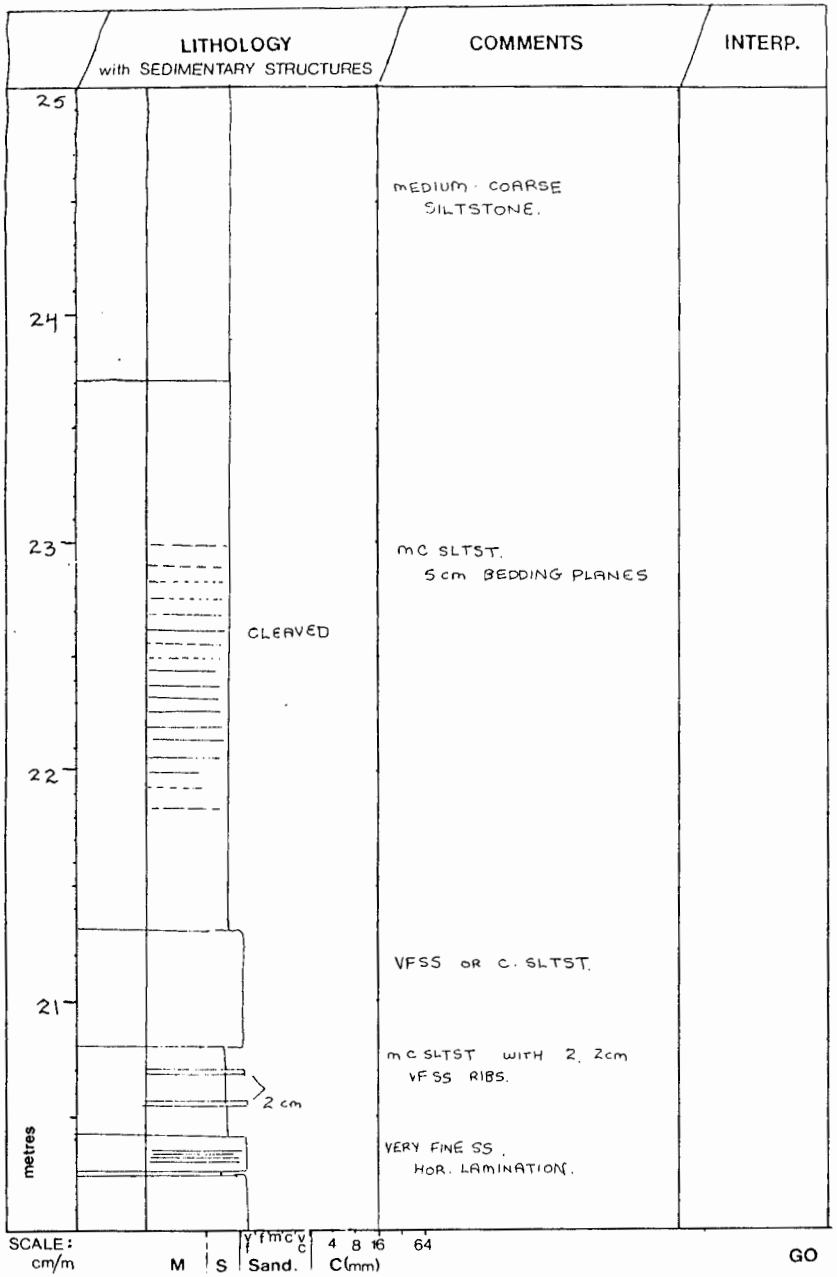
SECTION: G·4 LOCATION: CAPEL HILL



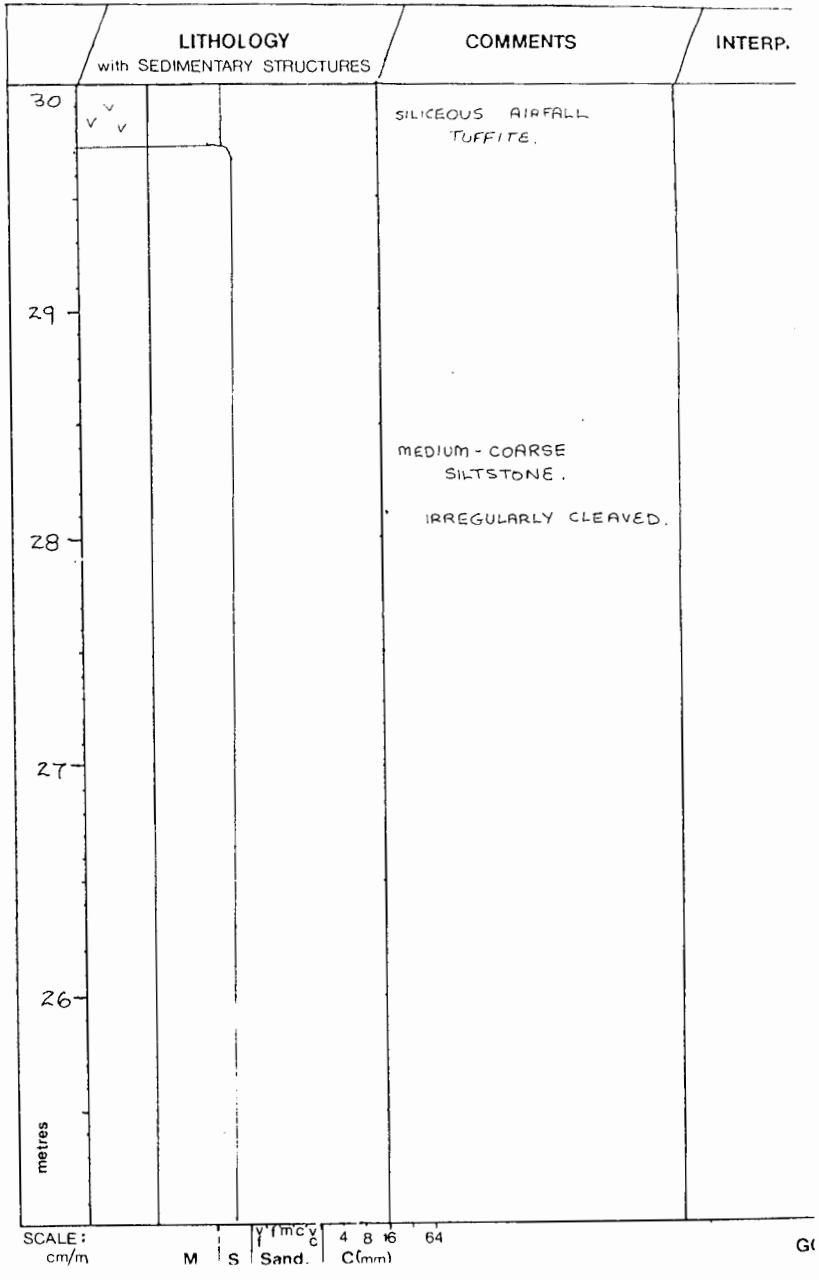
SECTION: G·4 LOCATION: CAPEL HILL



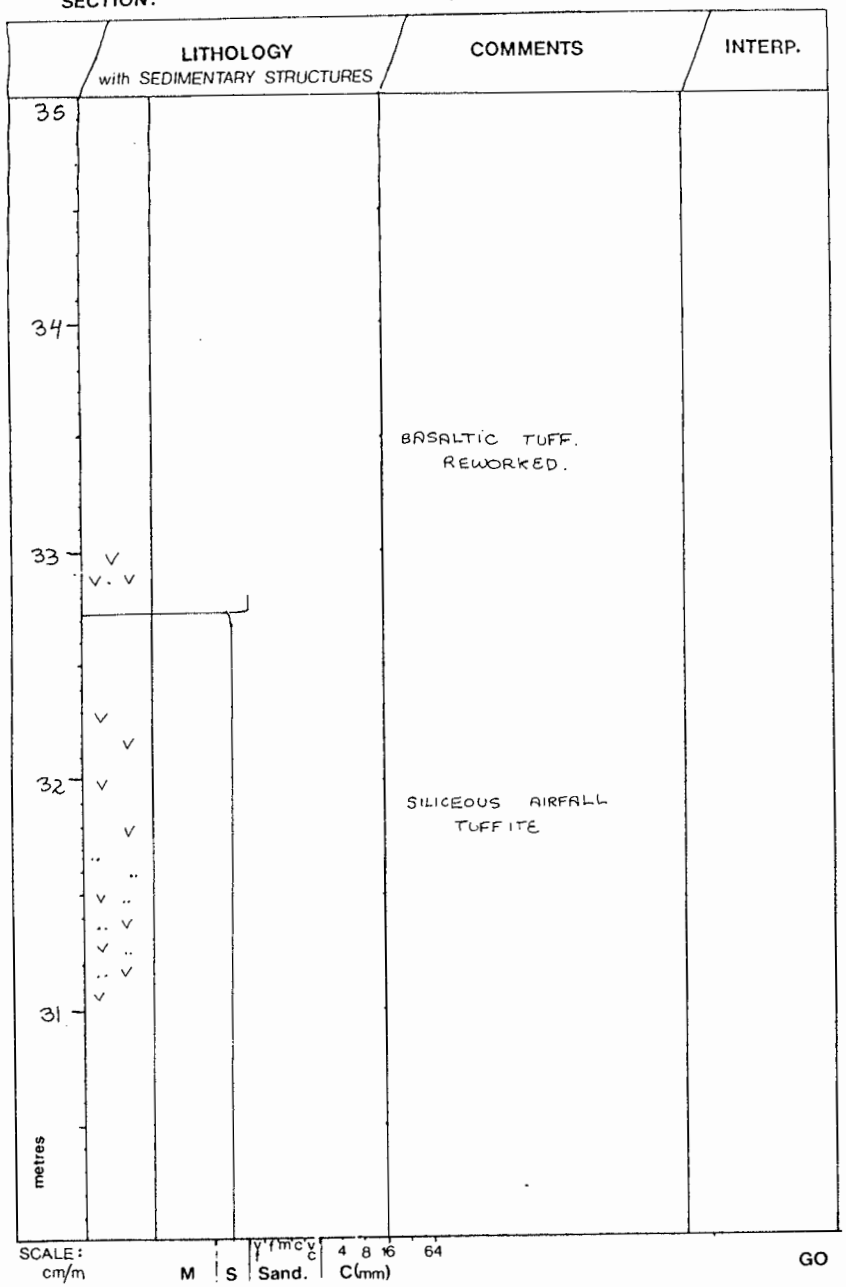
SECTION: G·4 LOCATION: CAPEL HILL



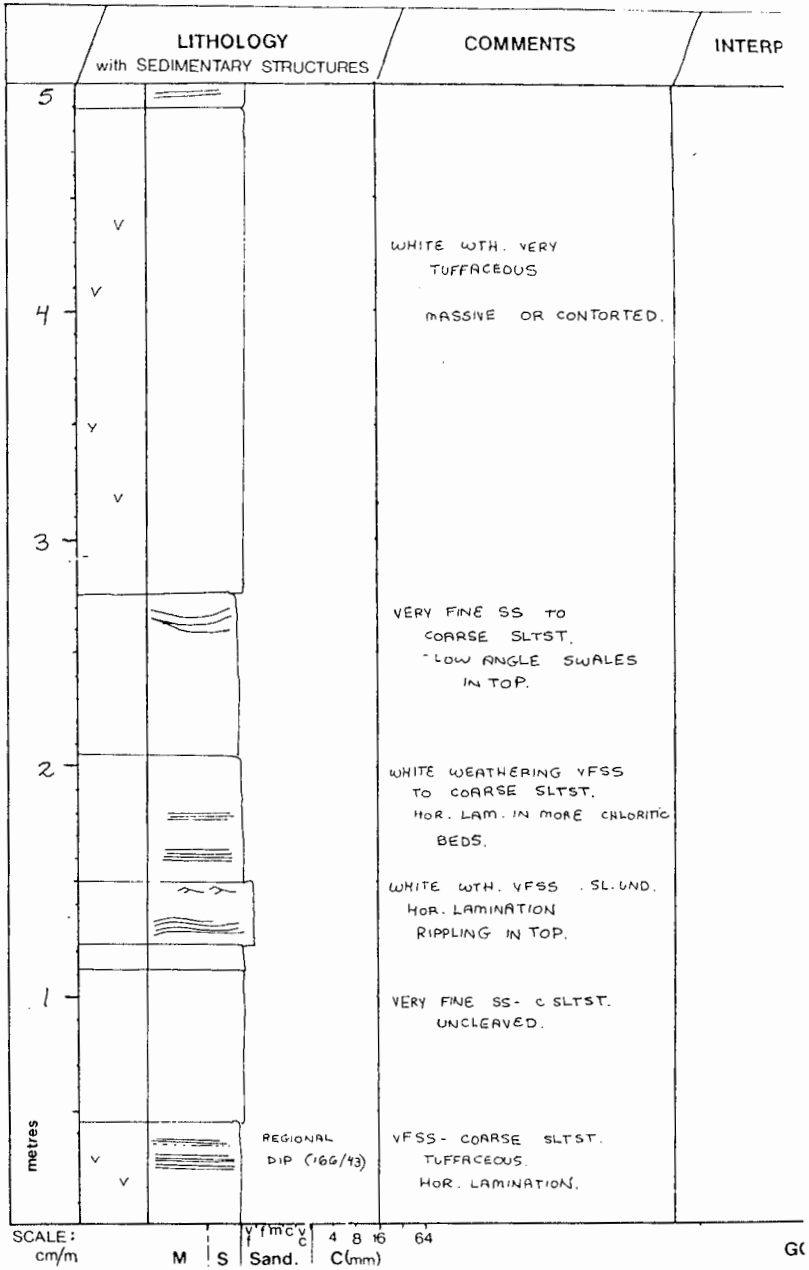
SECTION: G·4 LOCATION: CAPEL HILL



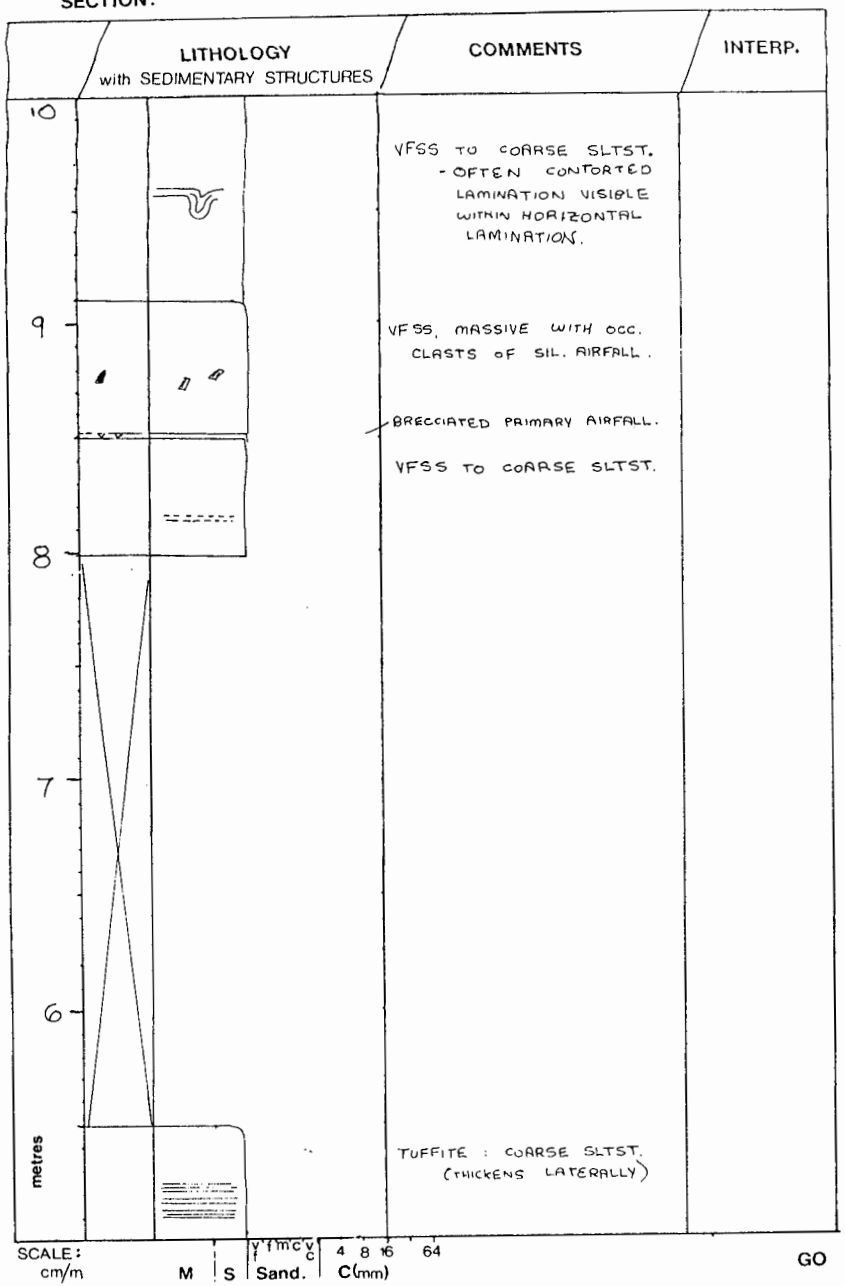
SECTION: G·1 LOCATION: CAPEL HILL



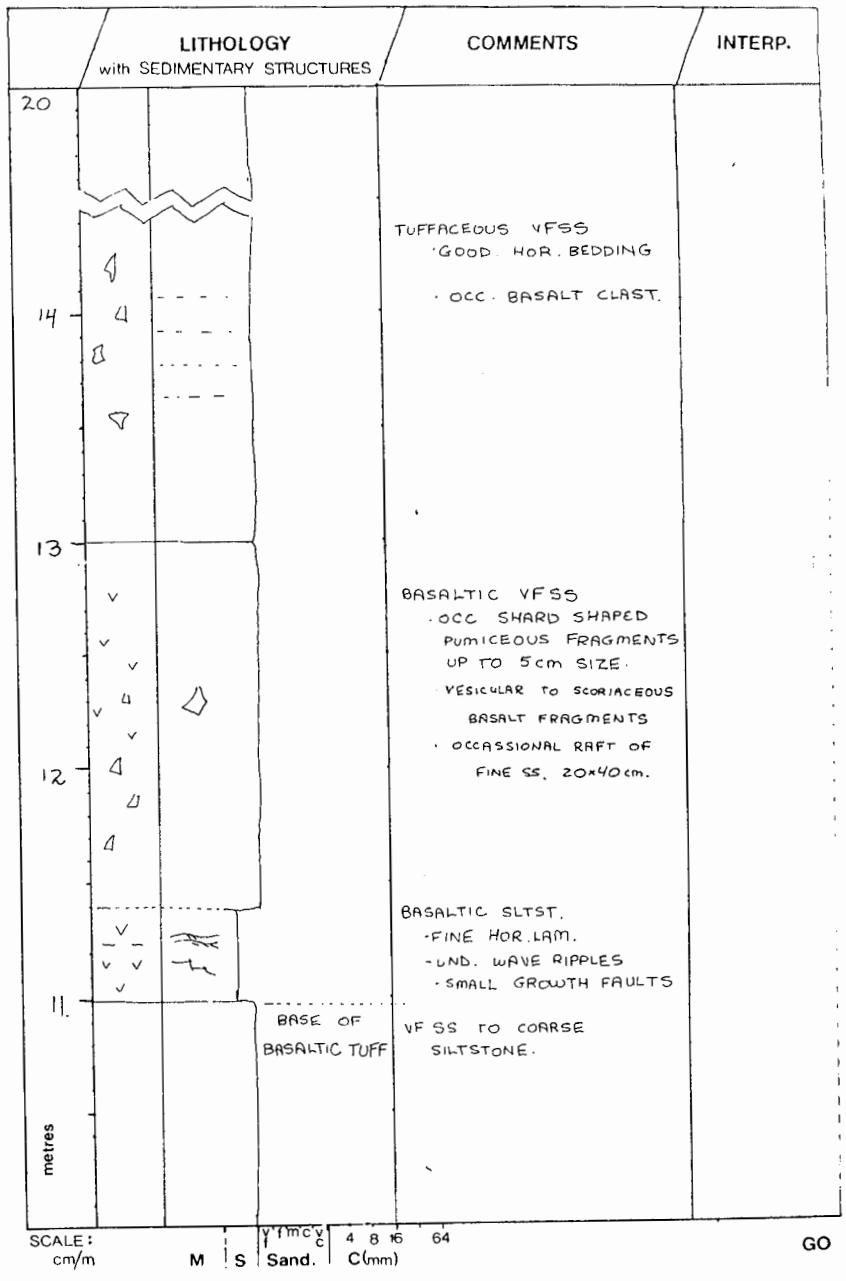
SECTION: G·5 LOCATION: CAPEL HILL



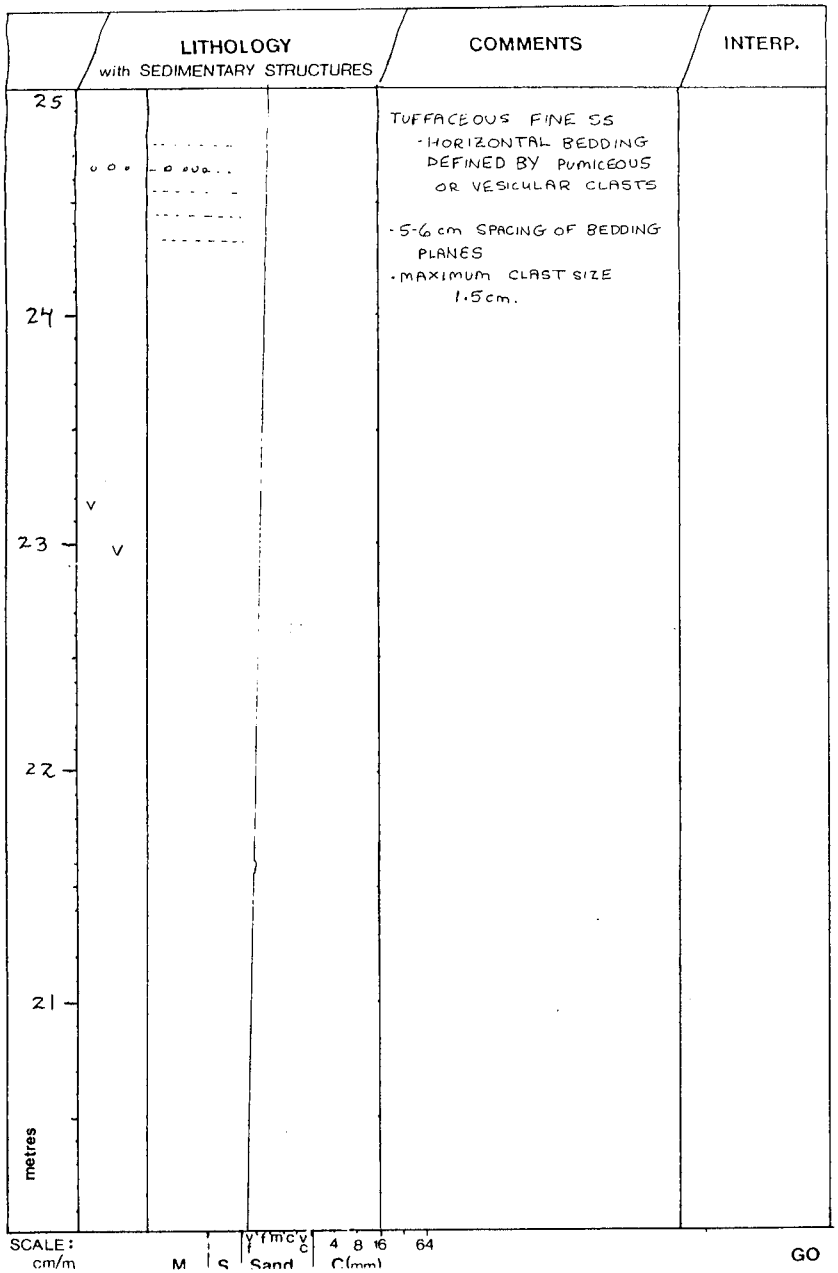
SECTION: G·5 LOCATION: CAPEL HILL.



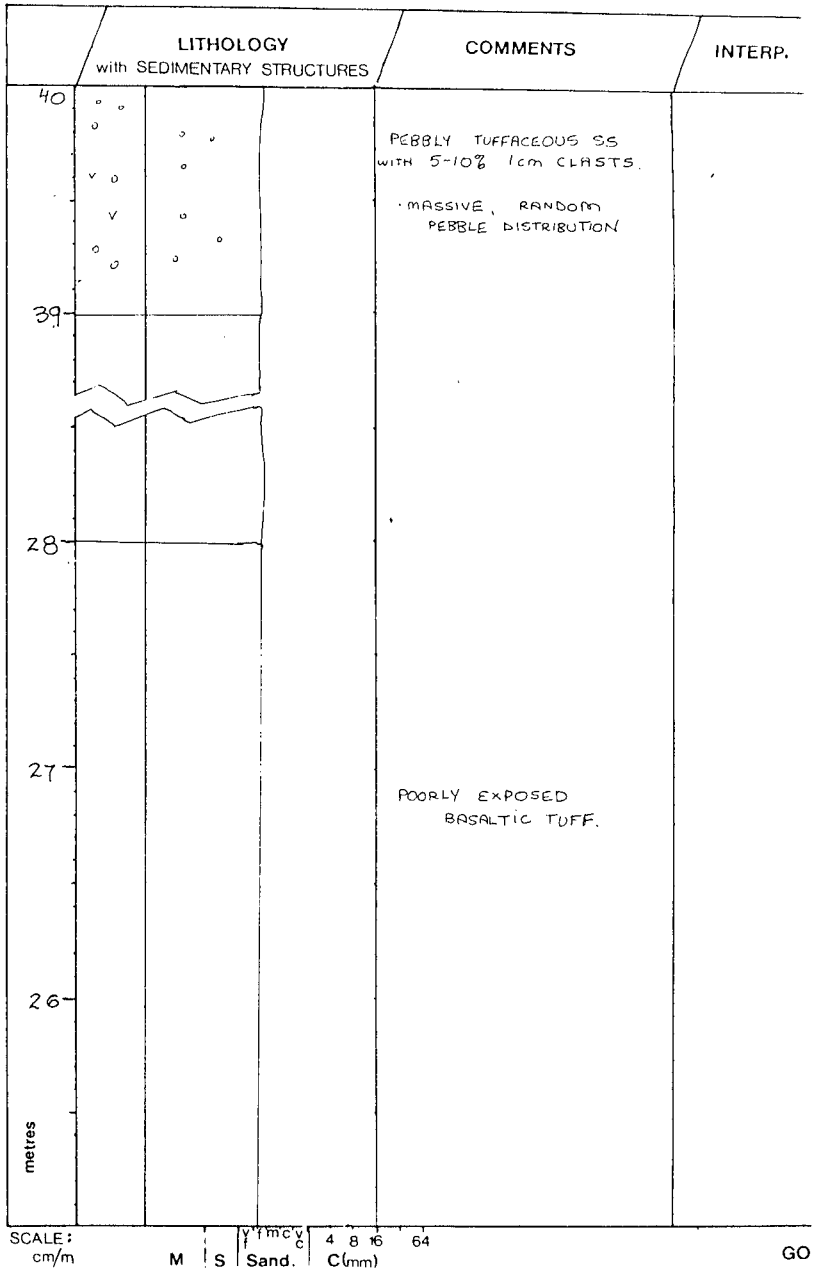
SECTION: G·5 LOCATION: CAPEL HILL.



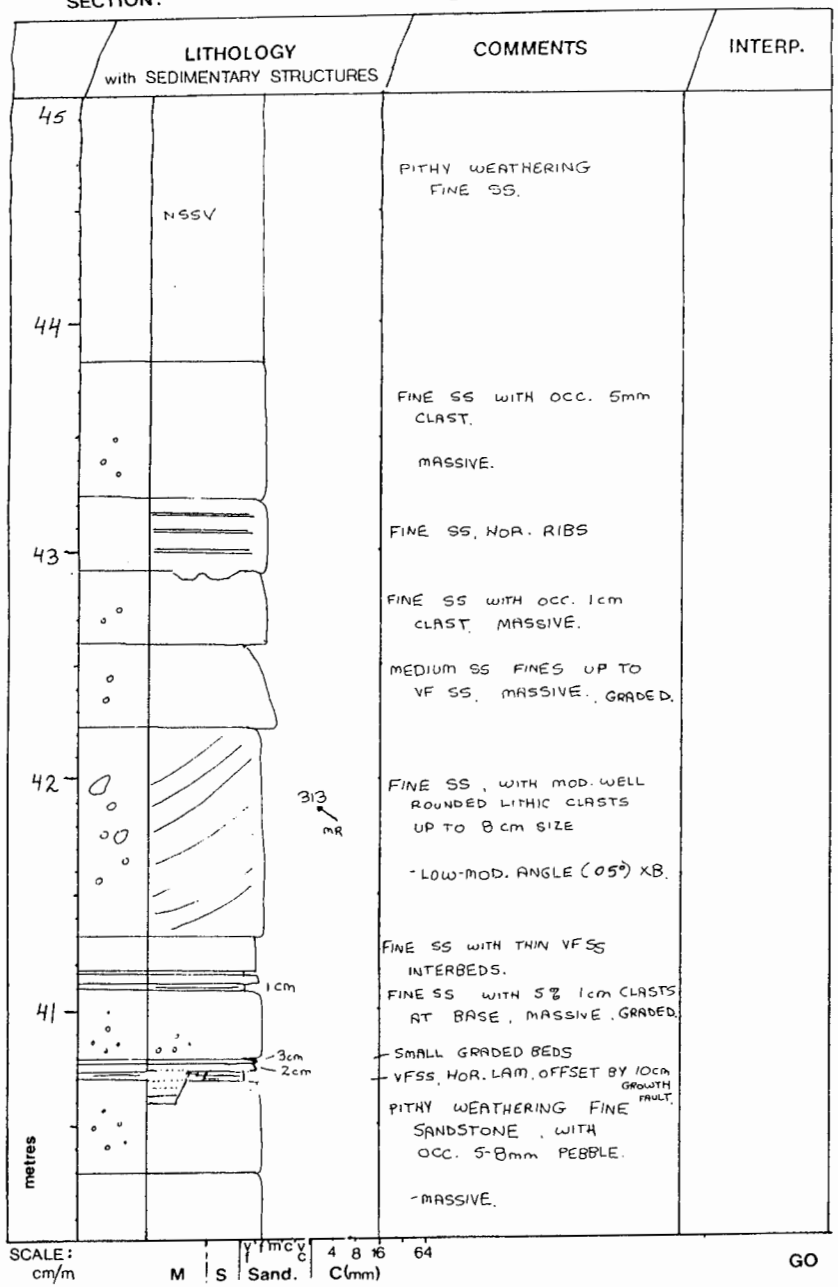
SECTION: G-5 LOCATION: CAPEL HILL



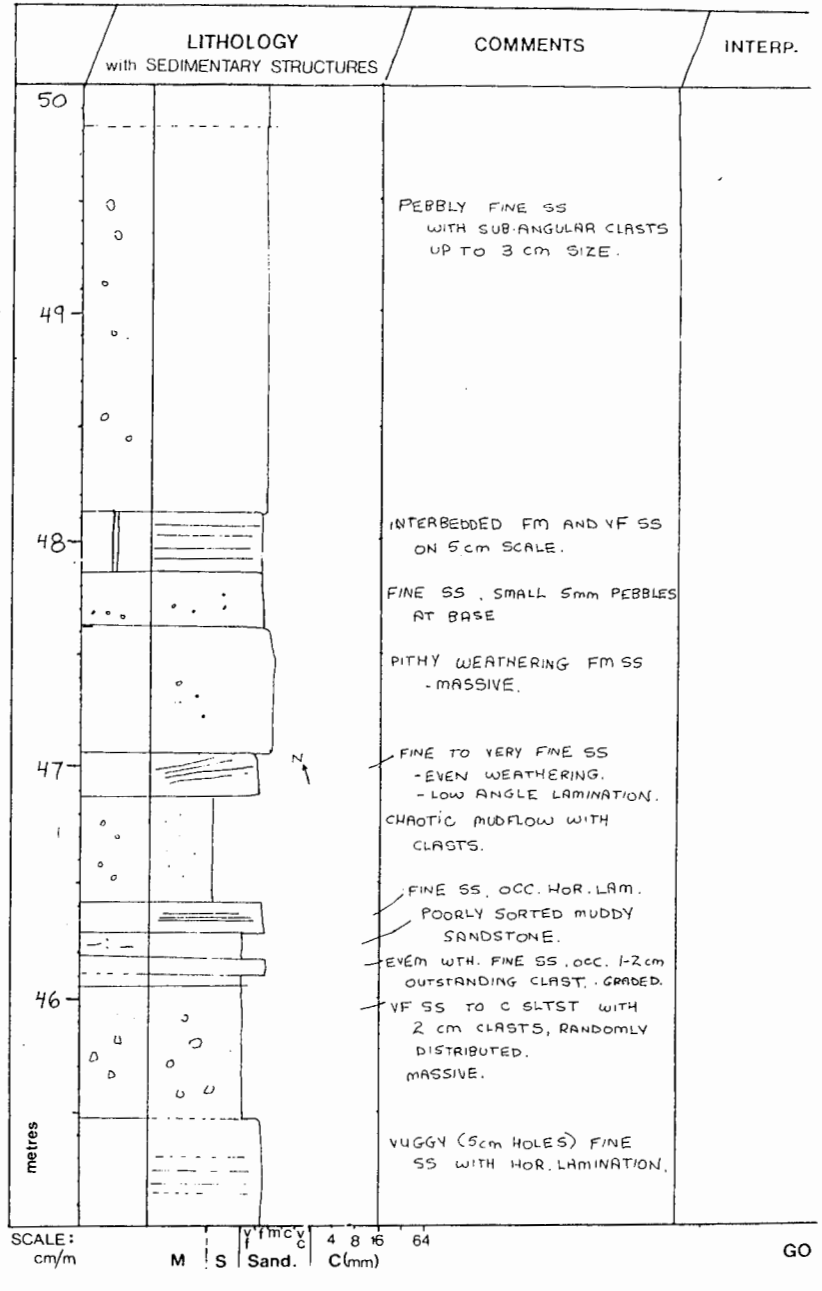
SECTION: G-5 LOCATION: CAPEL HILL



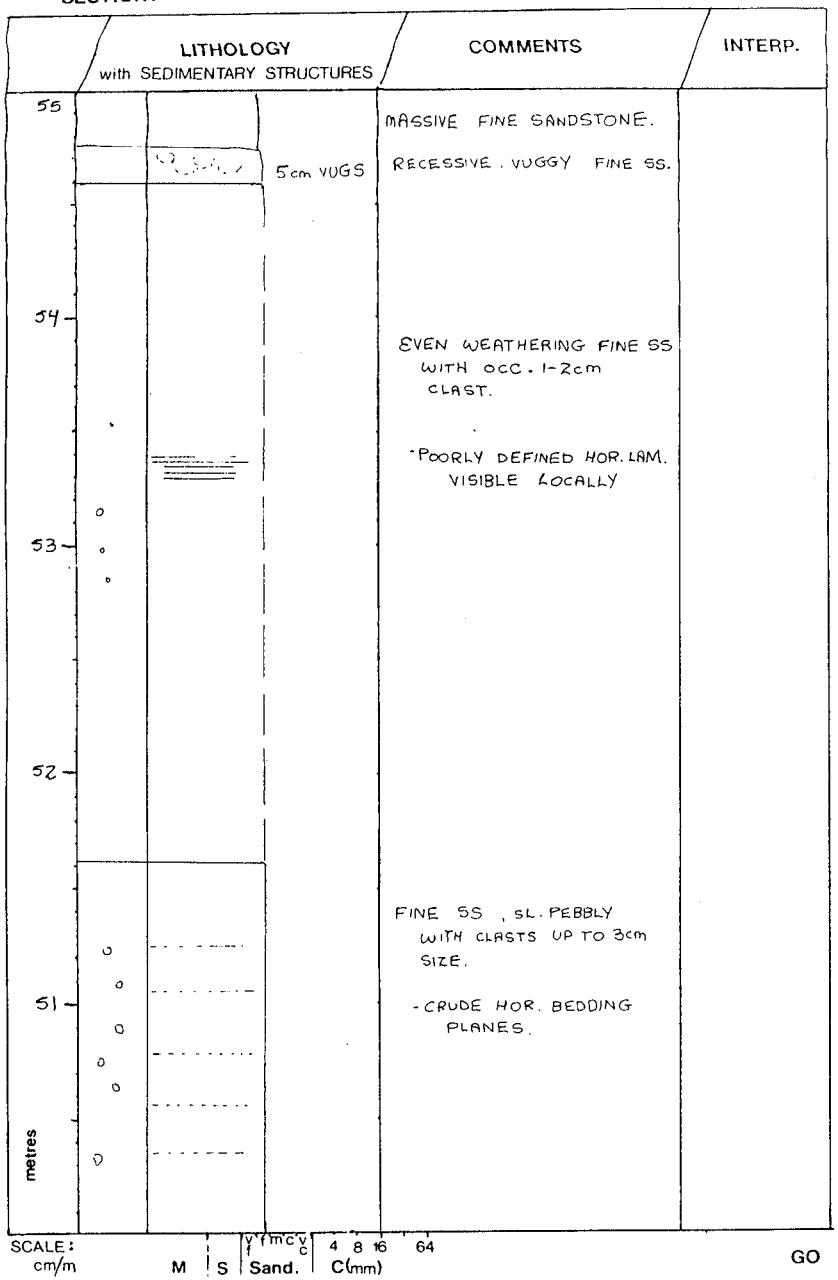
SECTION: G·5 LOCATION: CHAPEL HILL



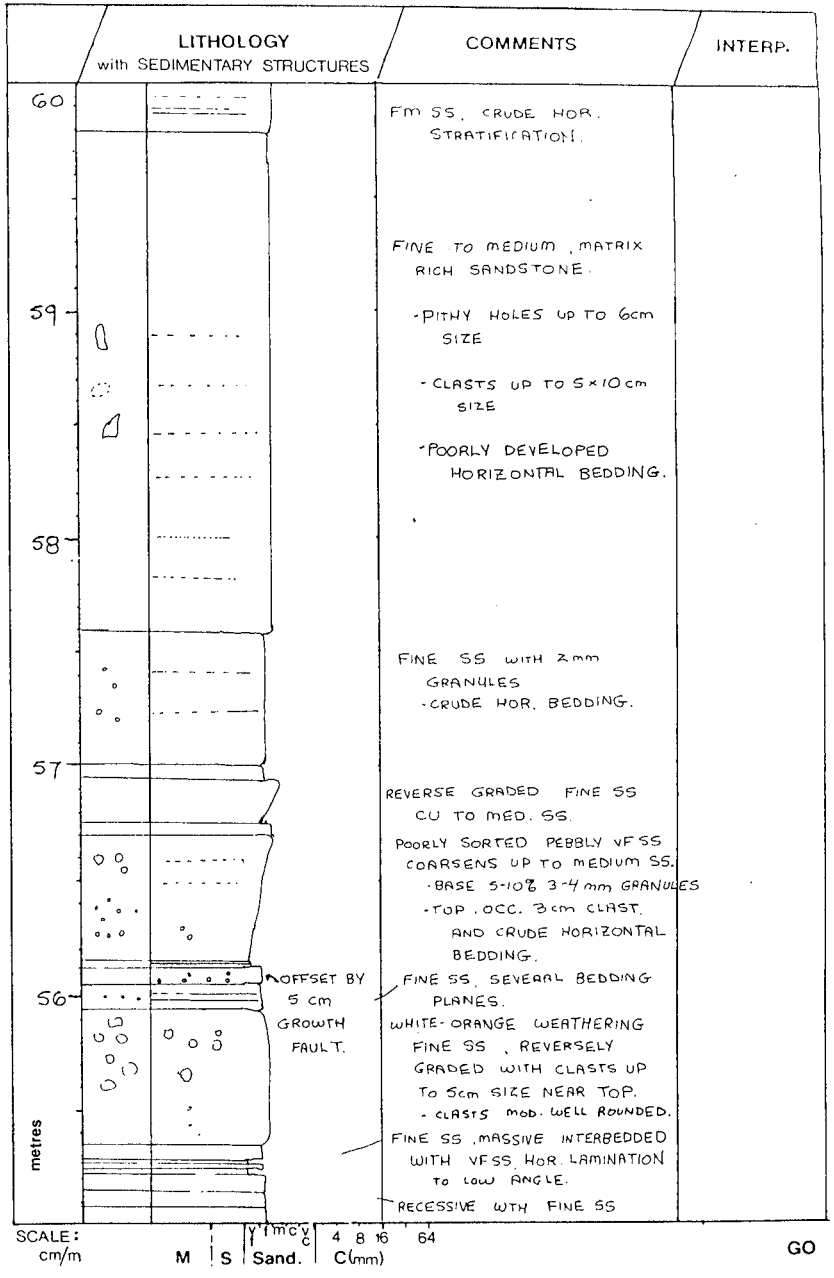
SECTION: LOCATION: CHAPEL HILL



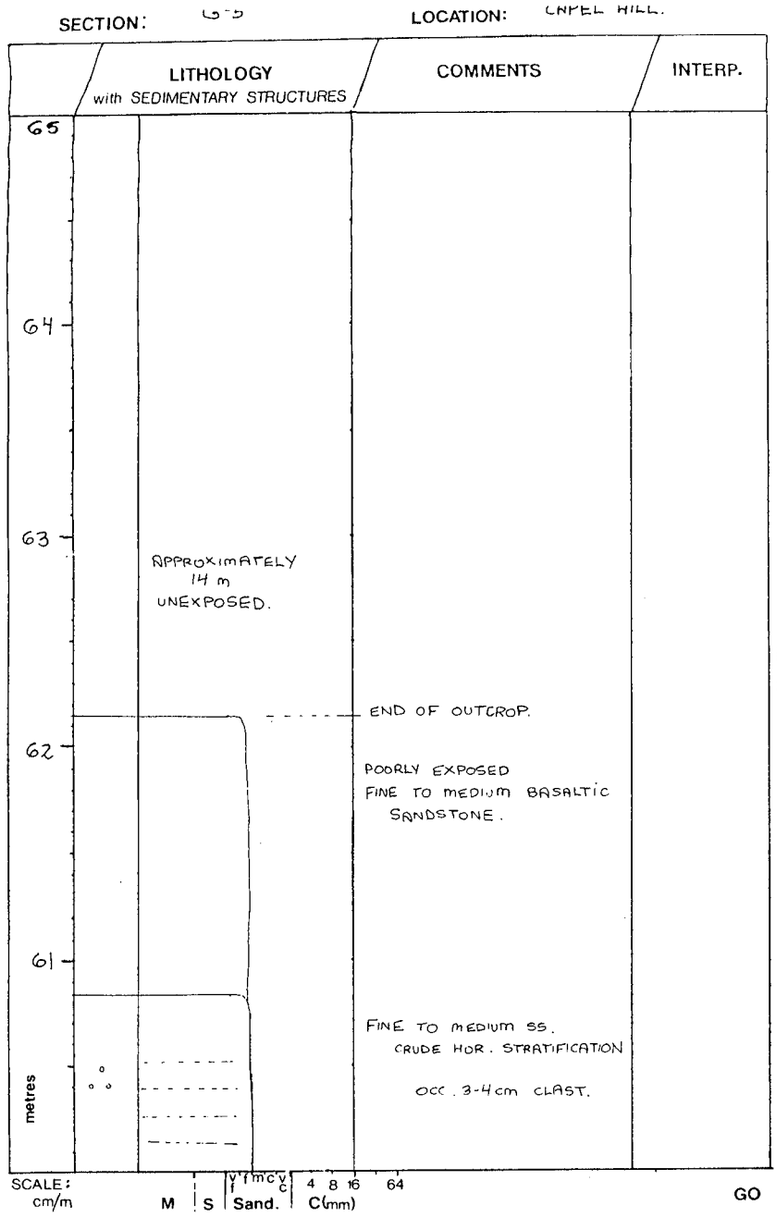
SECTION: G-5 LOCATION: CHAPEL HILL

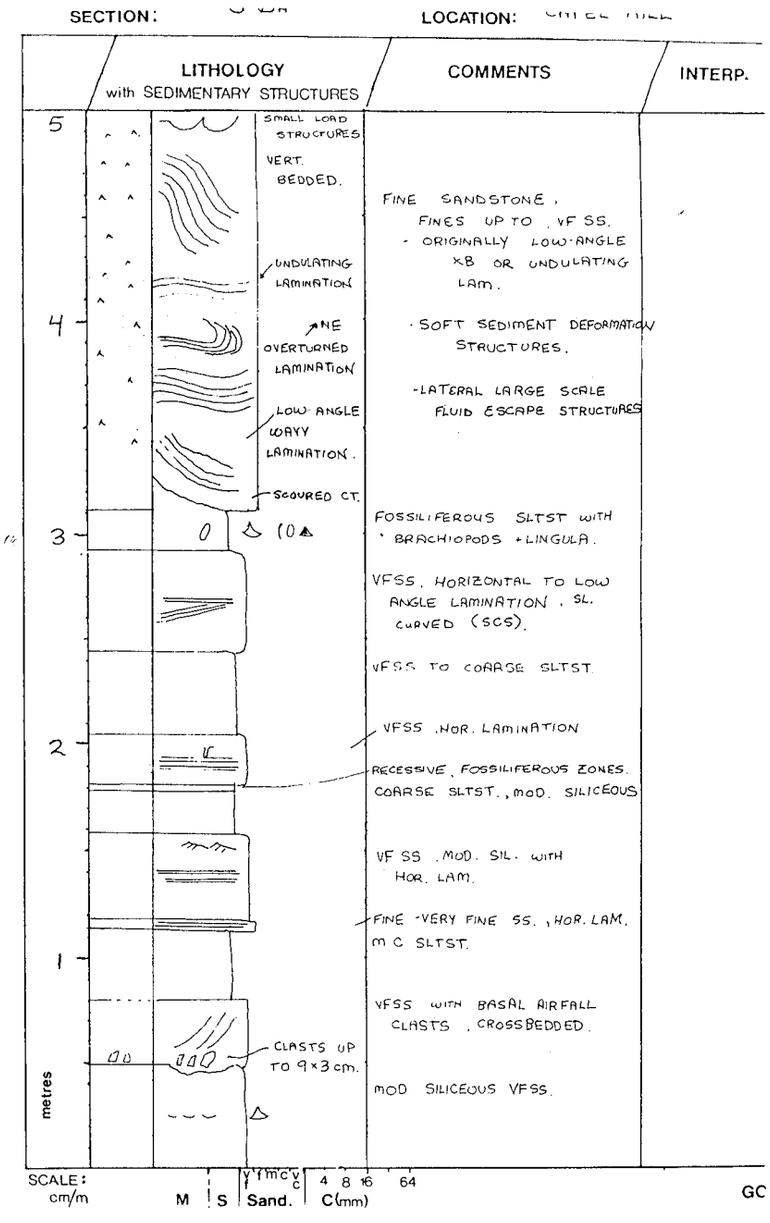


SECTION: G-5 LOCATION: CHAPEL HILL

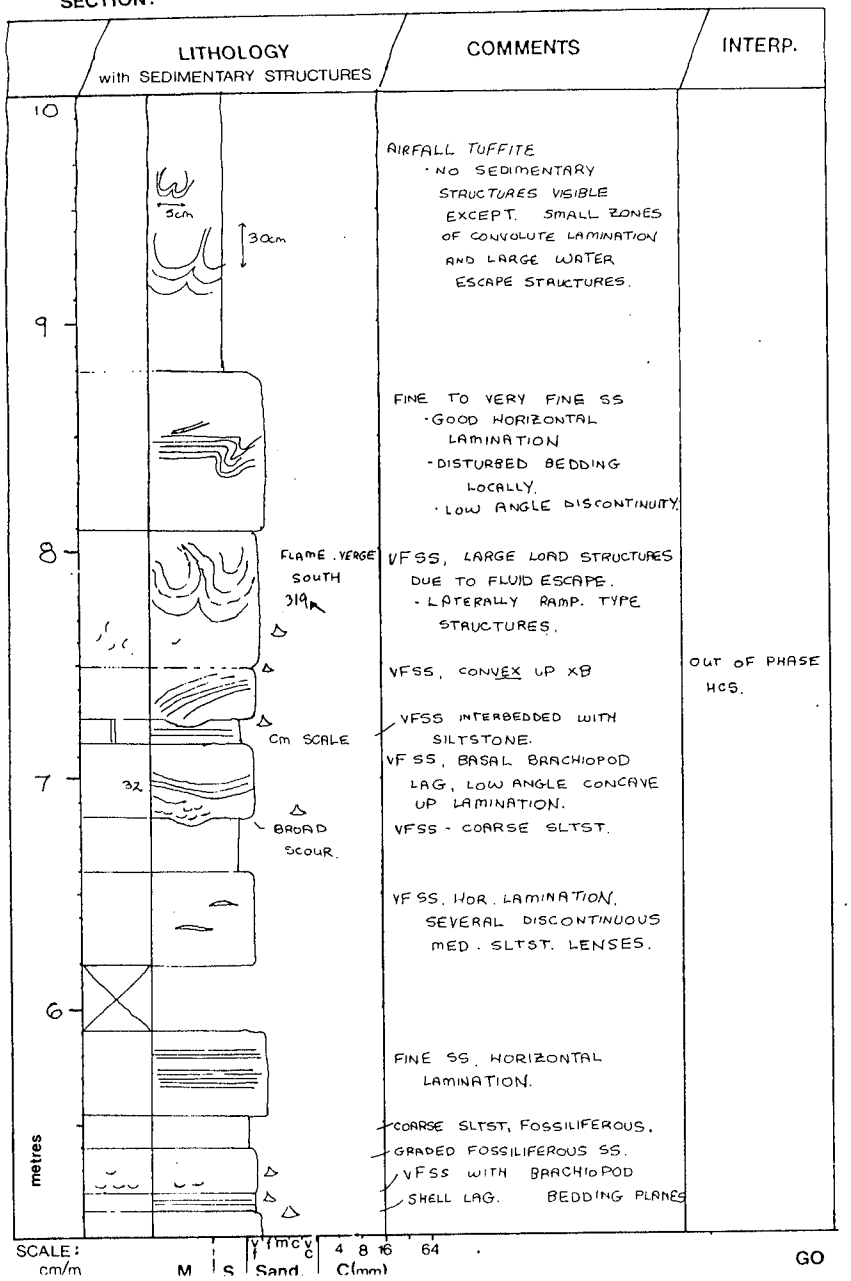


SECTION G6 LOCATION: Locate stream which runs for a short distance parallel to regional strike along outcrops of a white weathering rhyolitic tuff. Section starts 15 stratigraphic metres beneath top of tuff horizon.





SECTION: G·6A LOCATION: CAPEL HILL



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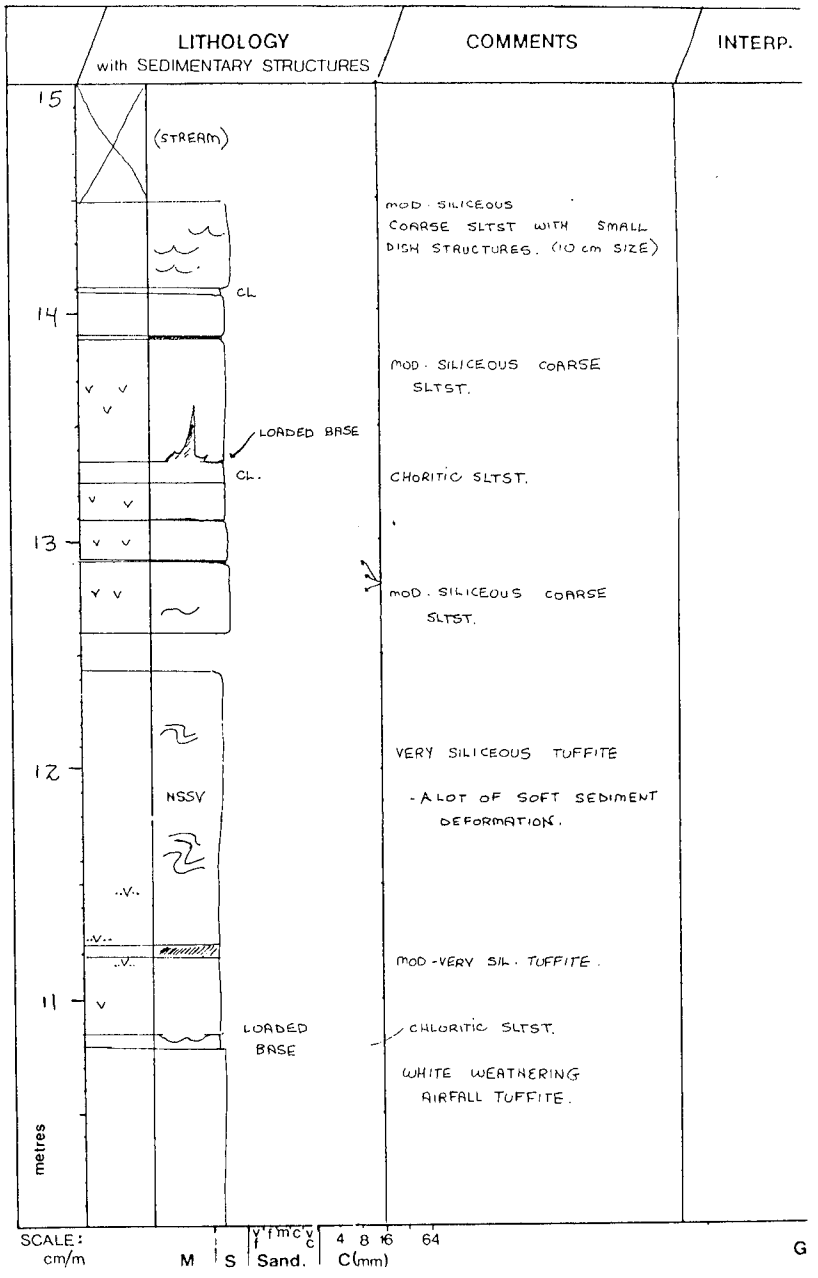
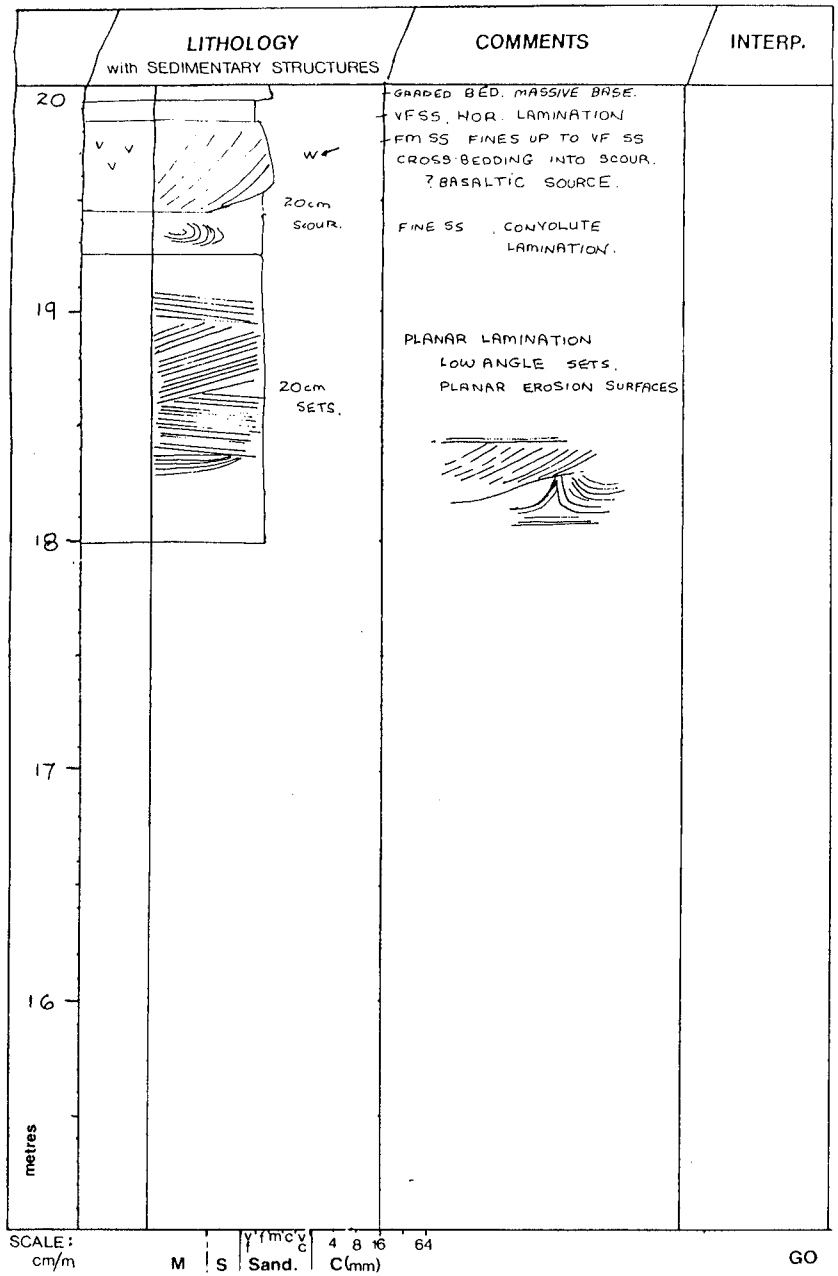
SECTION: G·6A LOCATION: CAPEL HILL.



G

SECTION: LOCATION:



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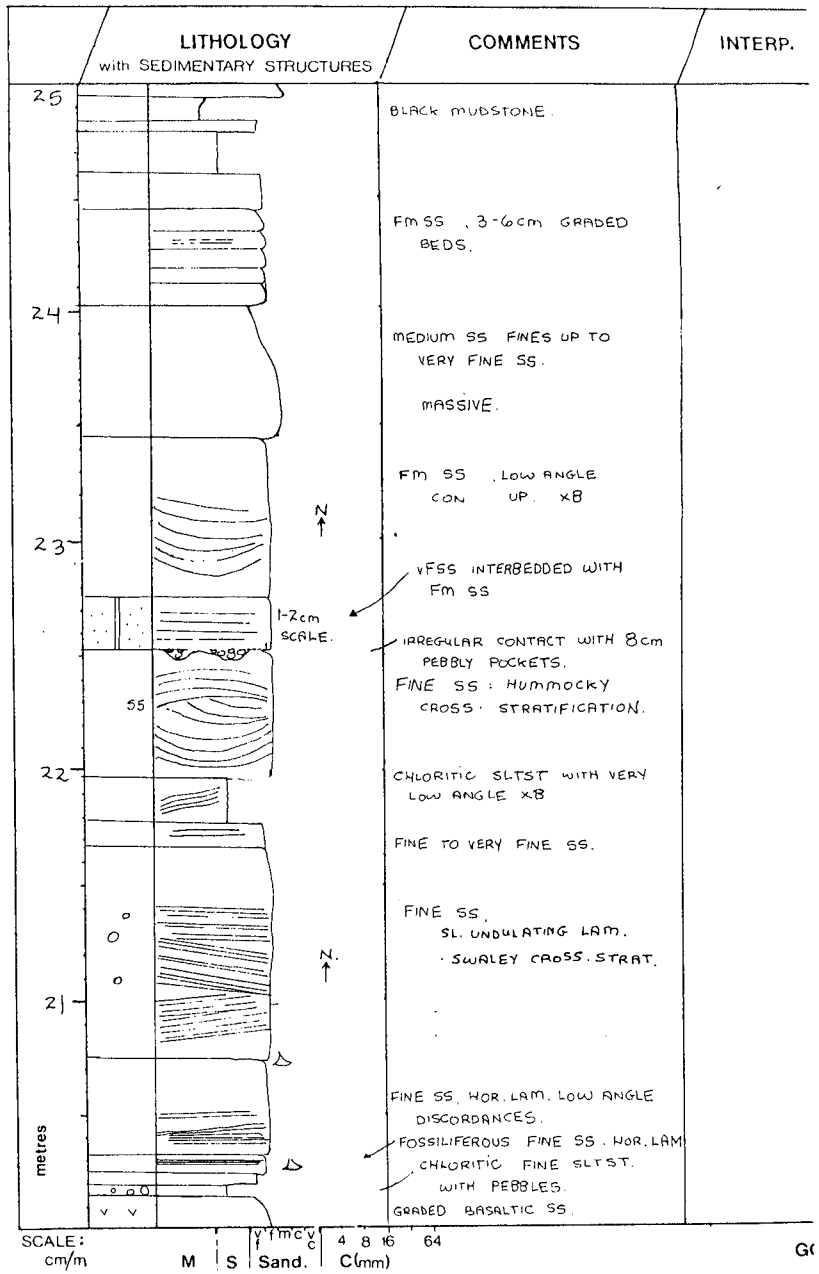

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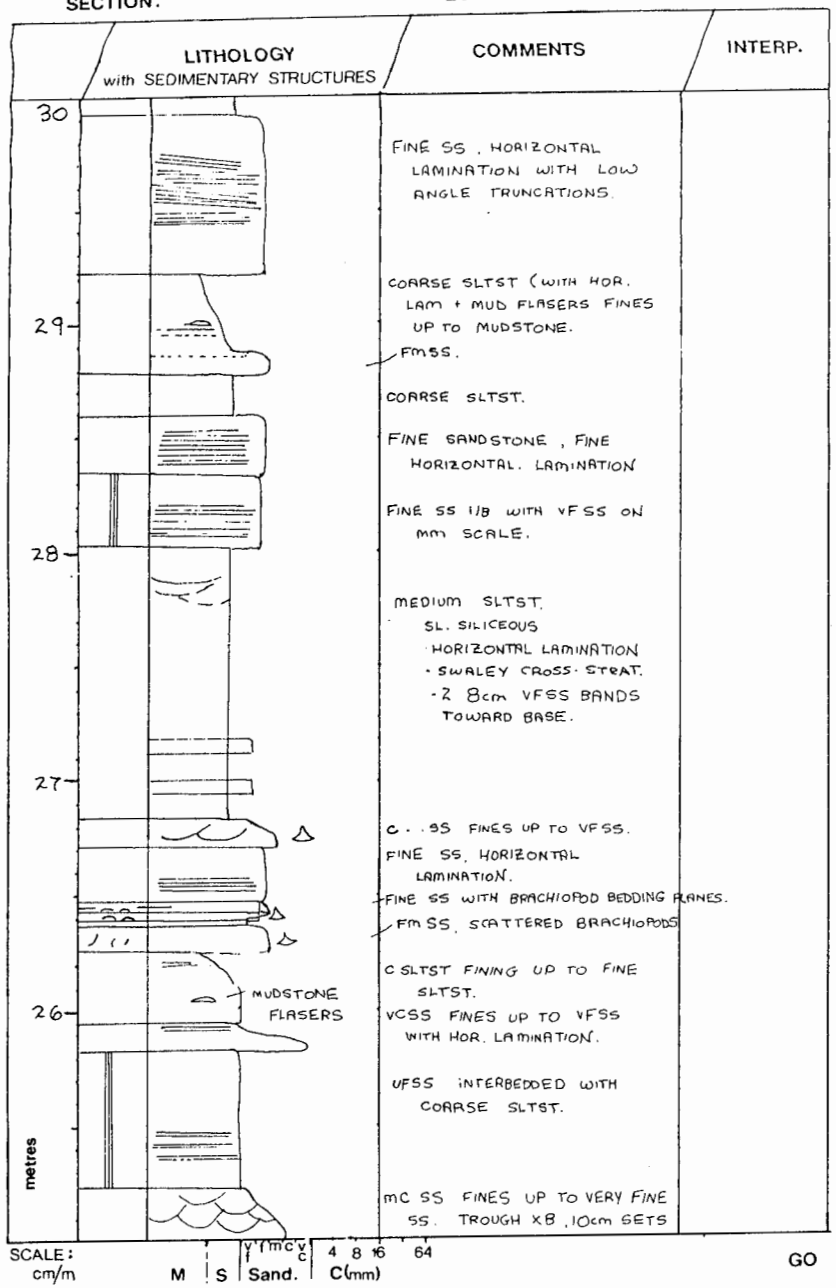
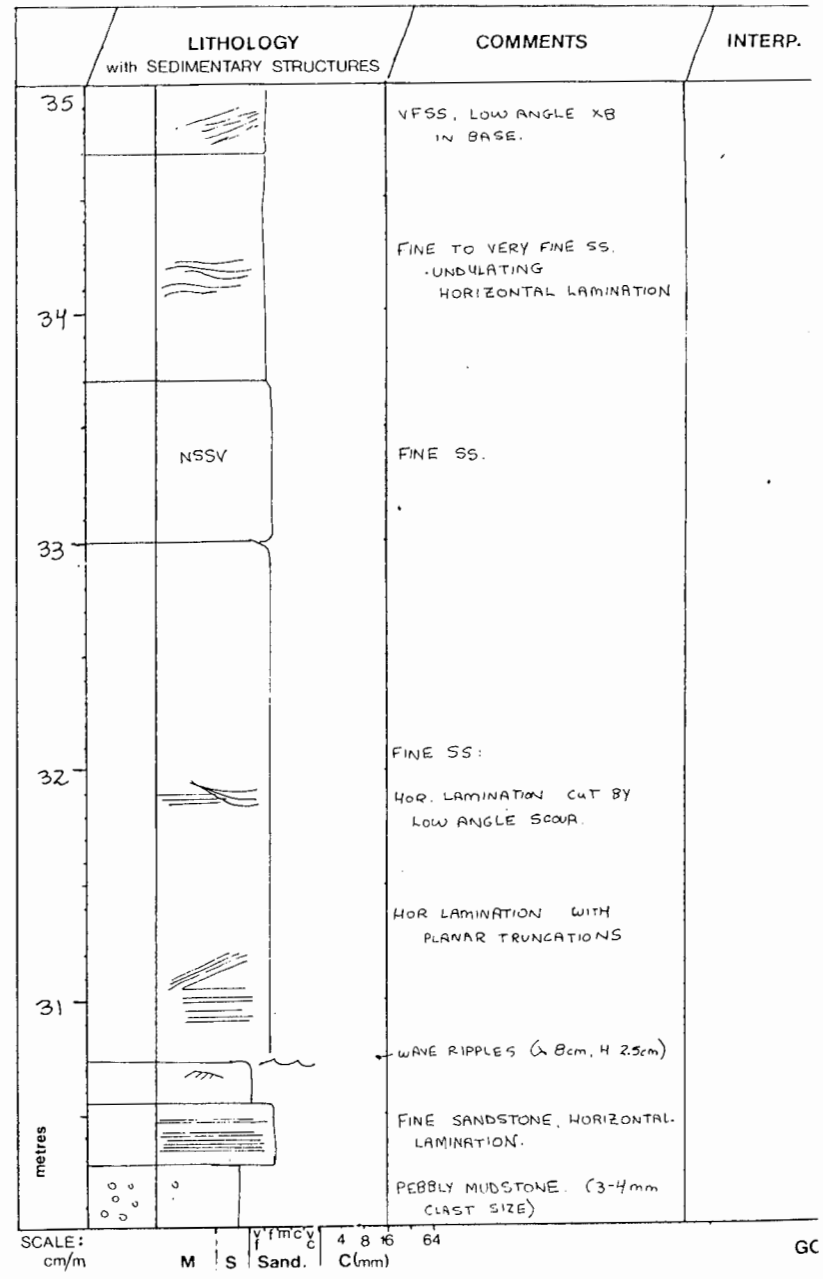
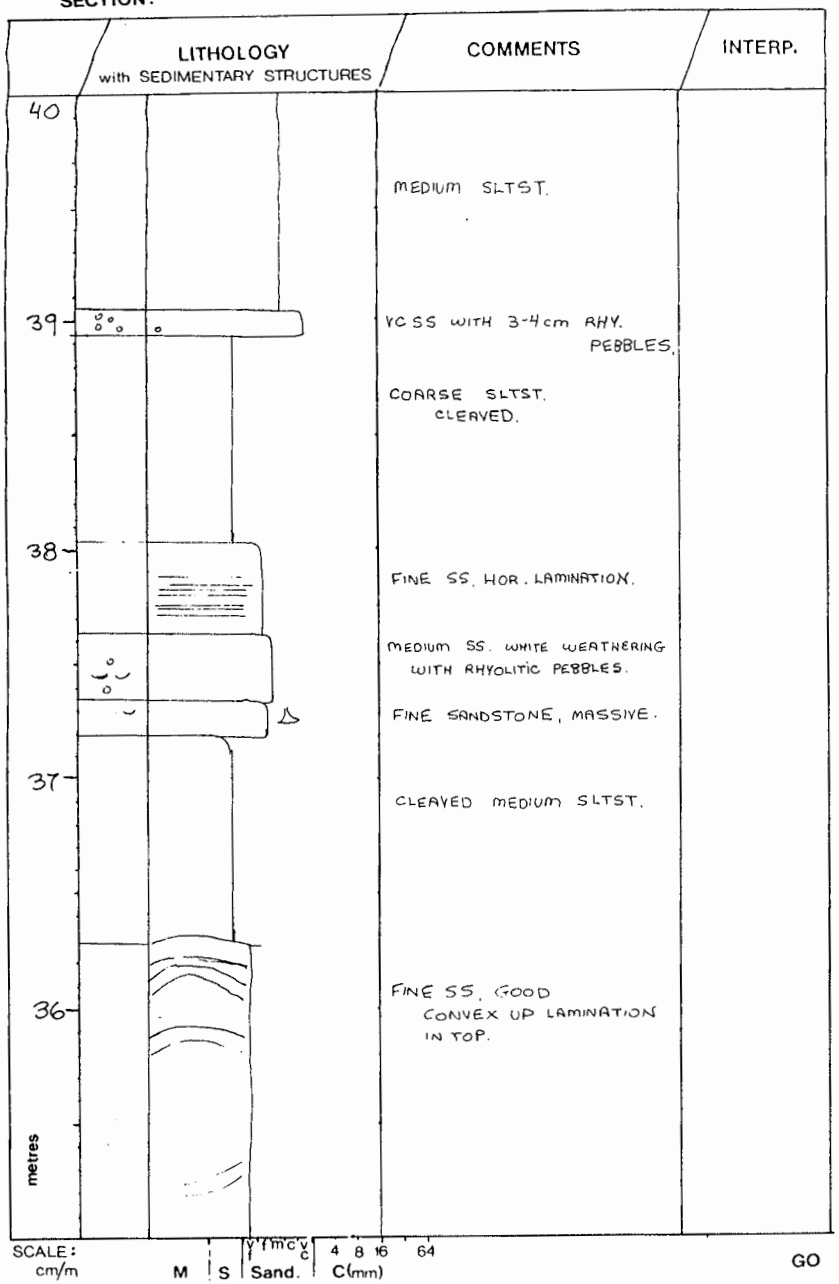
SECTION: [illegible] LOCATION: CAPEL HILL



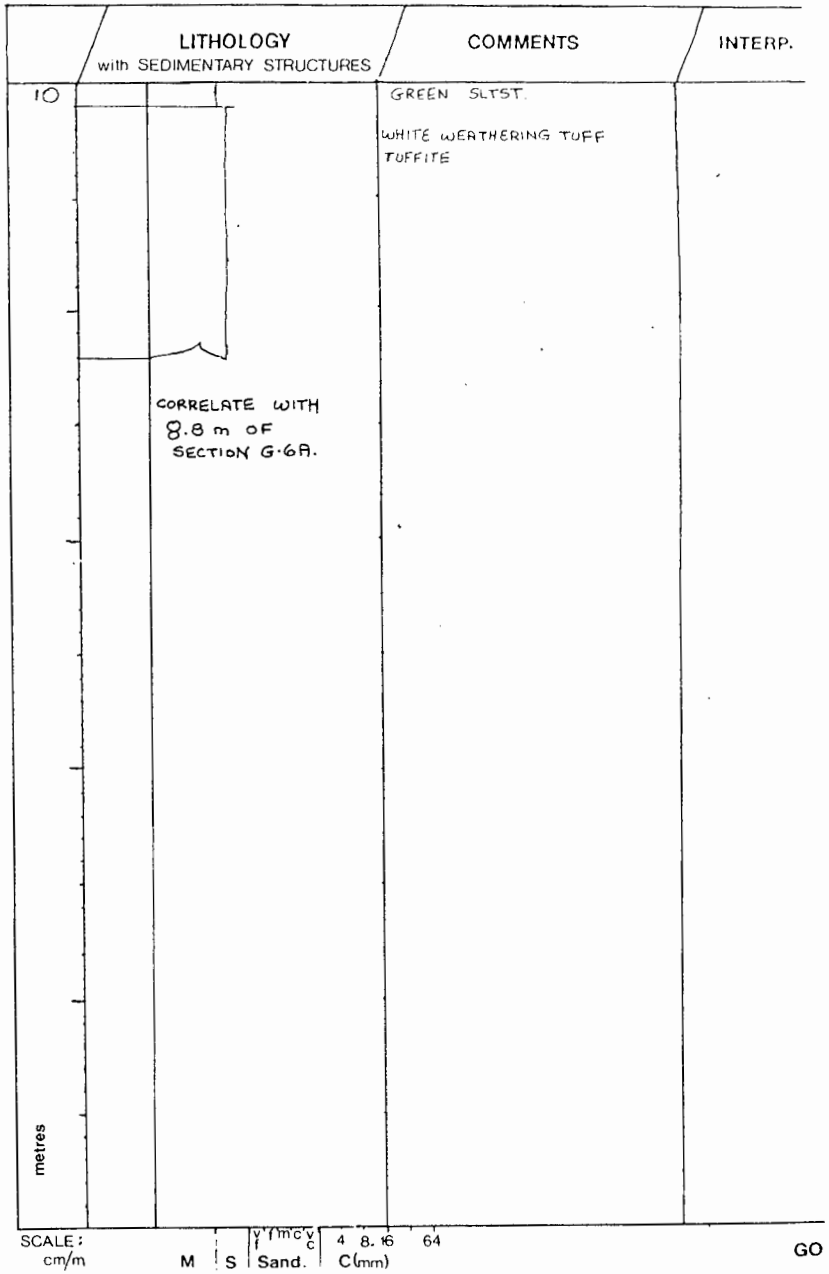
SECTION: G·6A LOCATION: CAPEL HILL



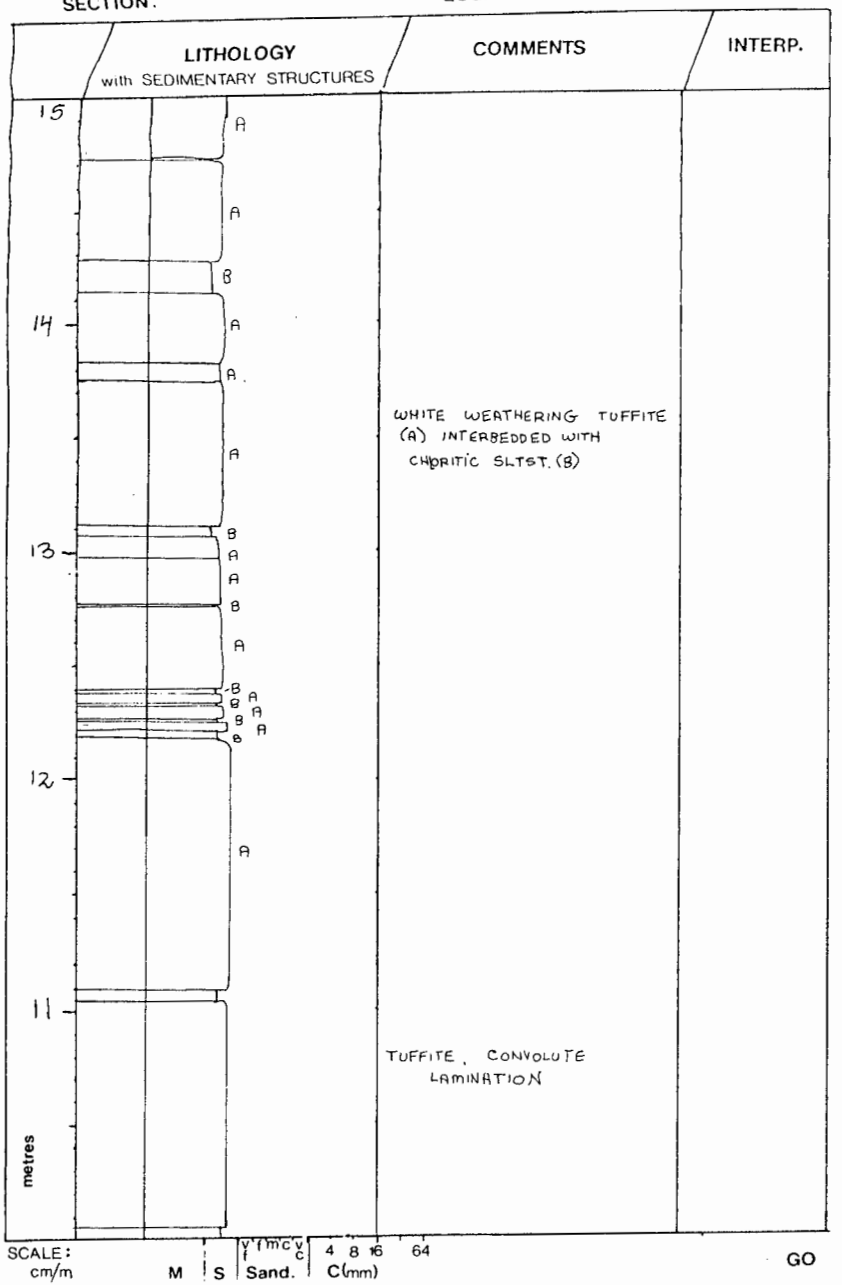
SECTION: G·6 LOCATION: CAPEL HILL.



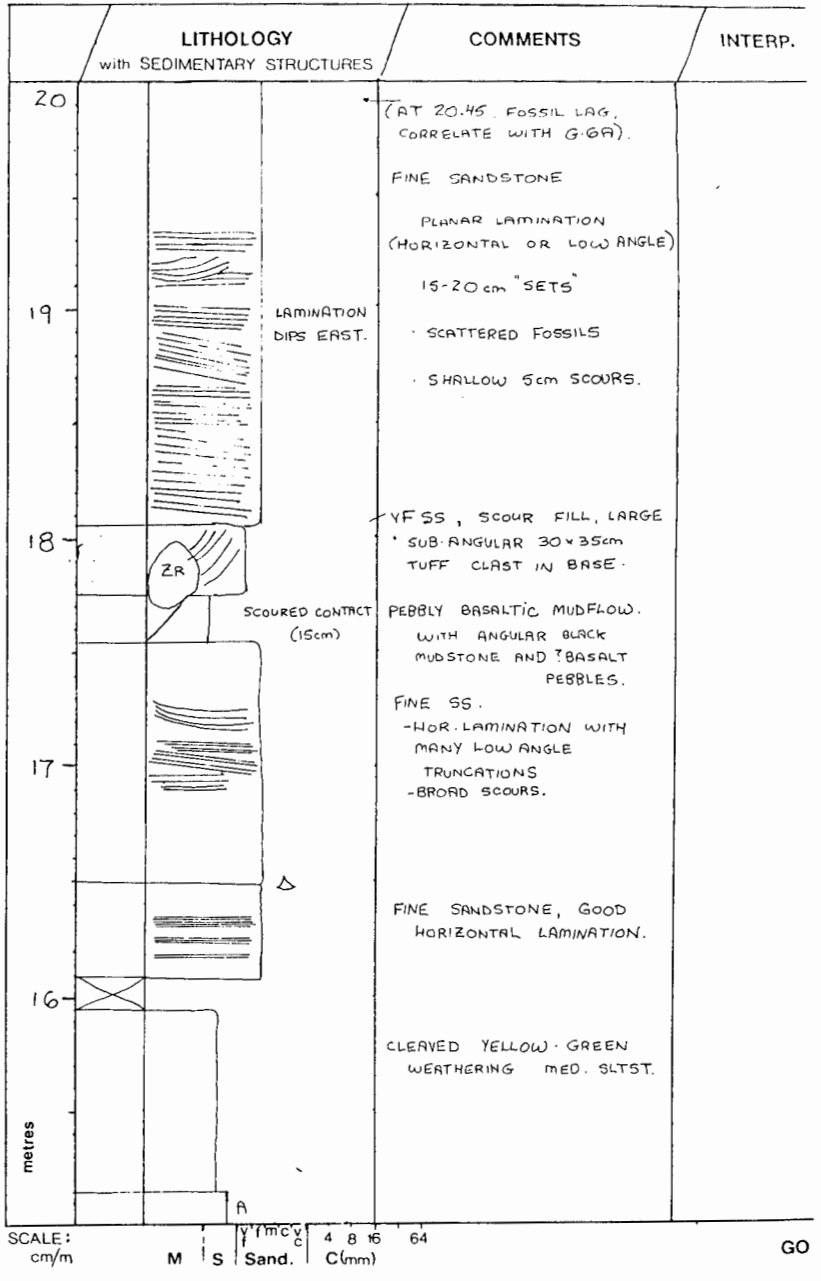
SECTION: G·6B LOCATION: CAPEL HILL



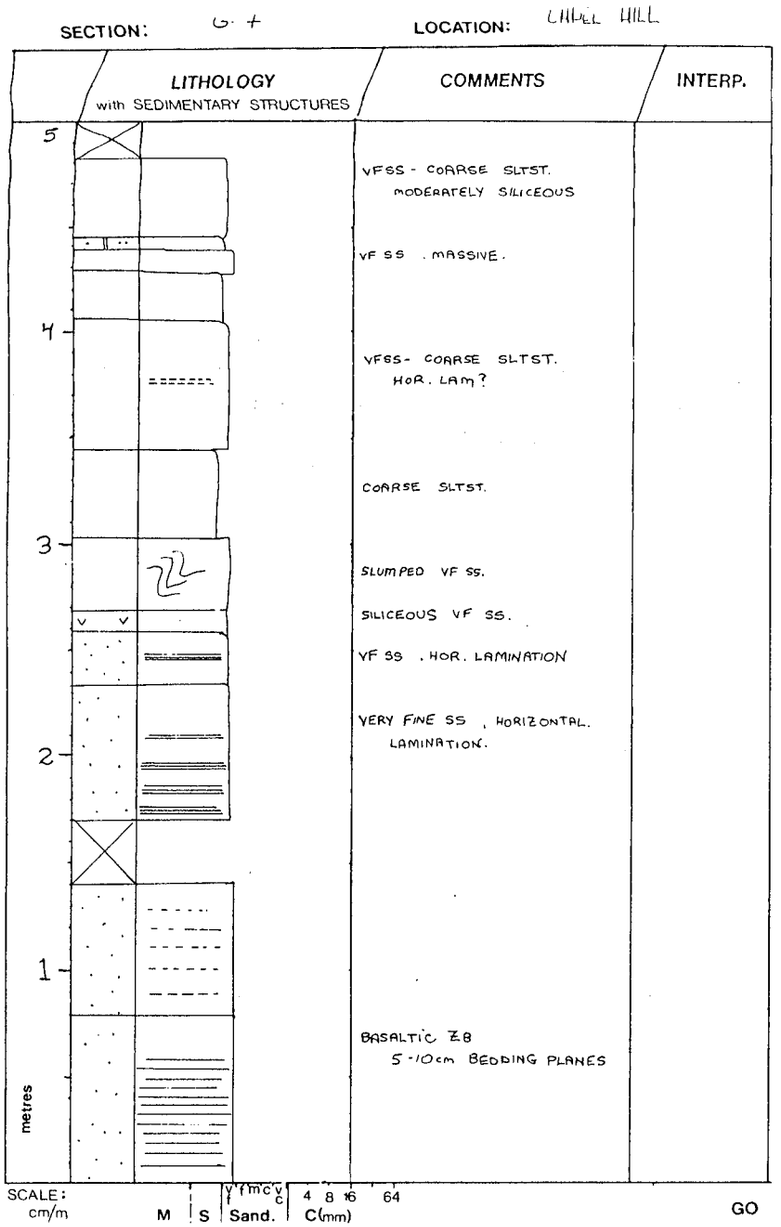
SECTION: LOCATION:

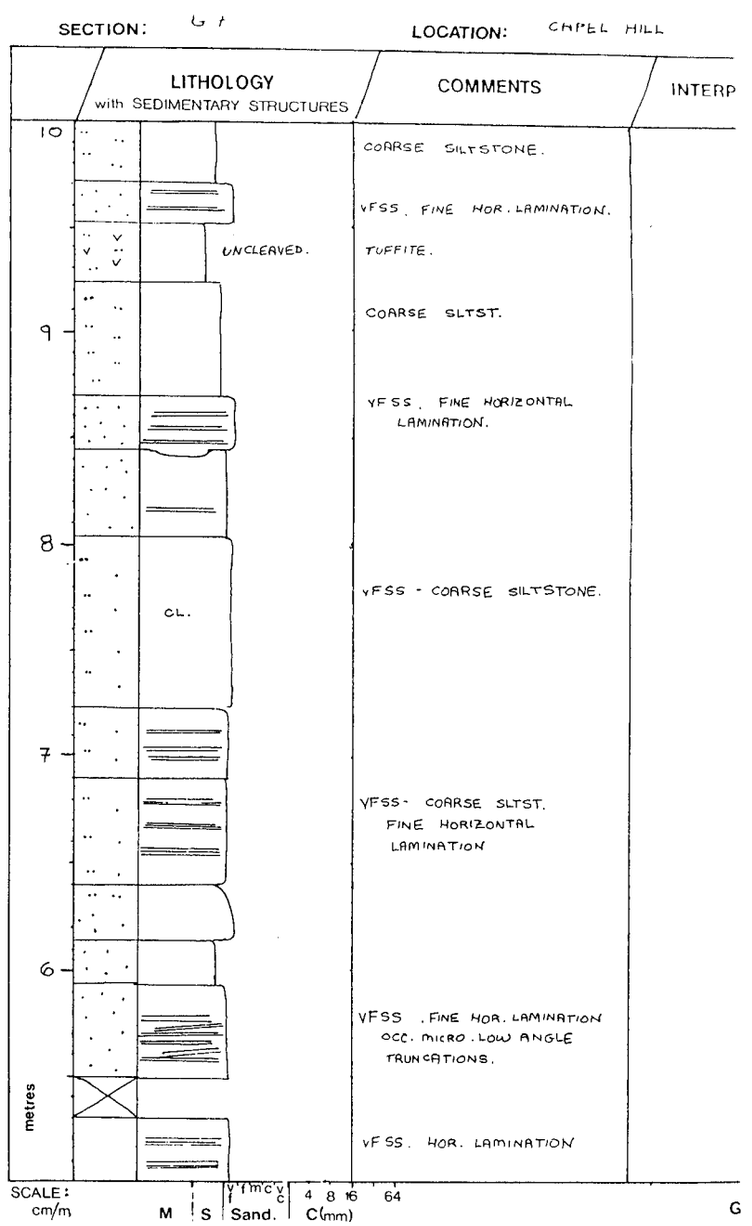


SECTION: LOCATION: MT. E. HILL

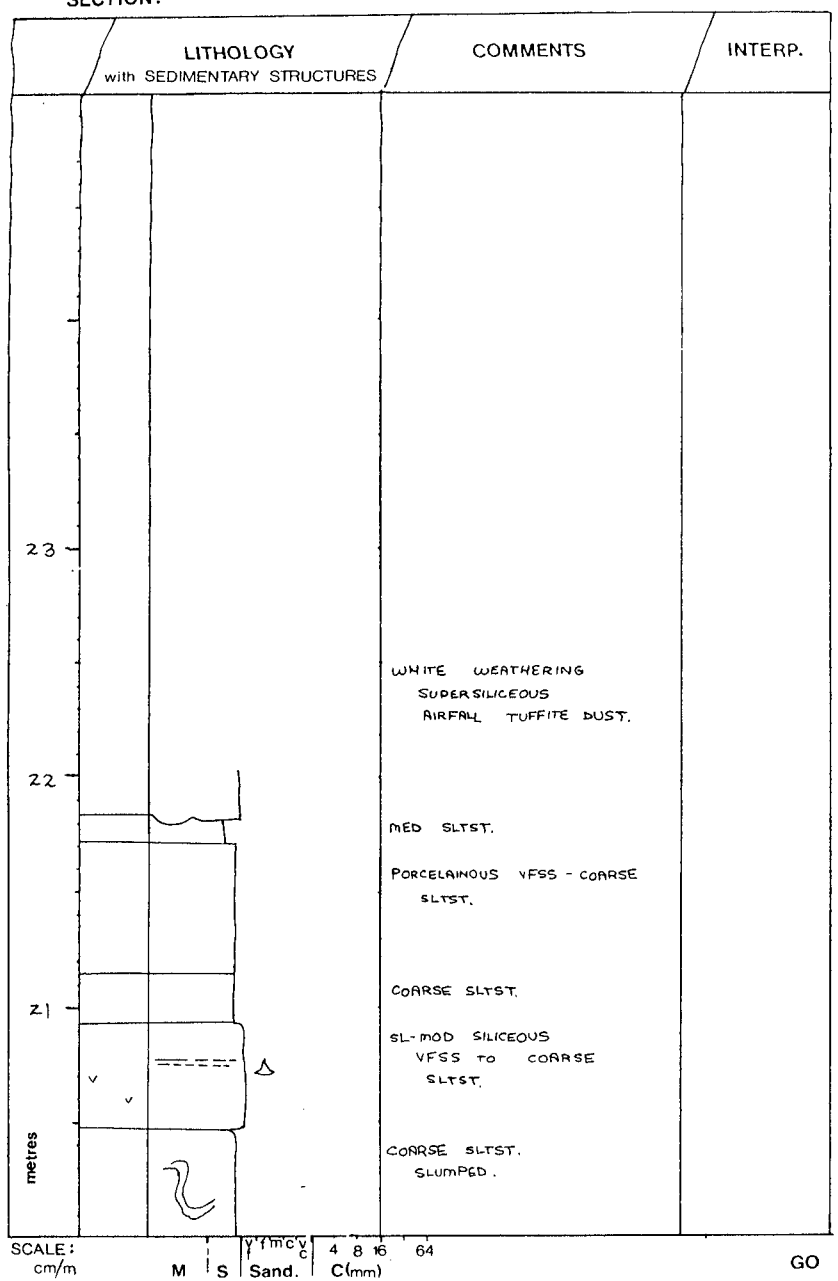


SECTION G7 LOCATION: Locate top of basaltic tuff horizon that forms Y Pinan. Section proceeds along top of rises (northern flank of tuff outcrop) to overlap stratigraphically with section G6.

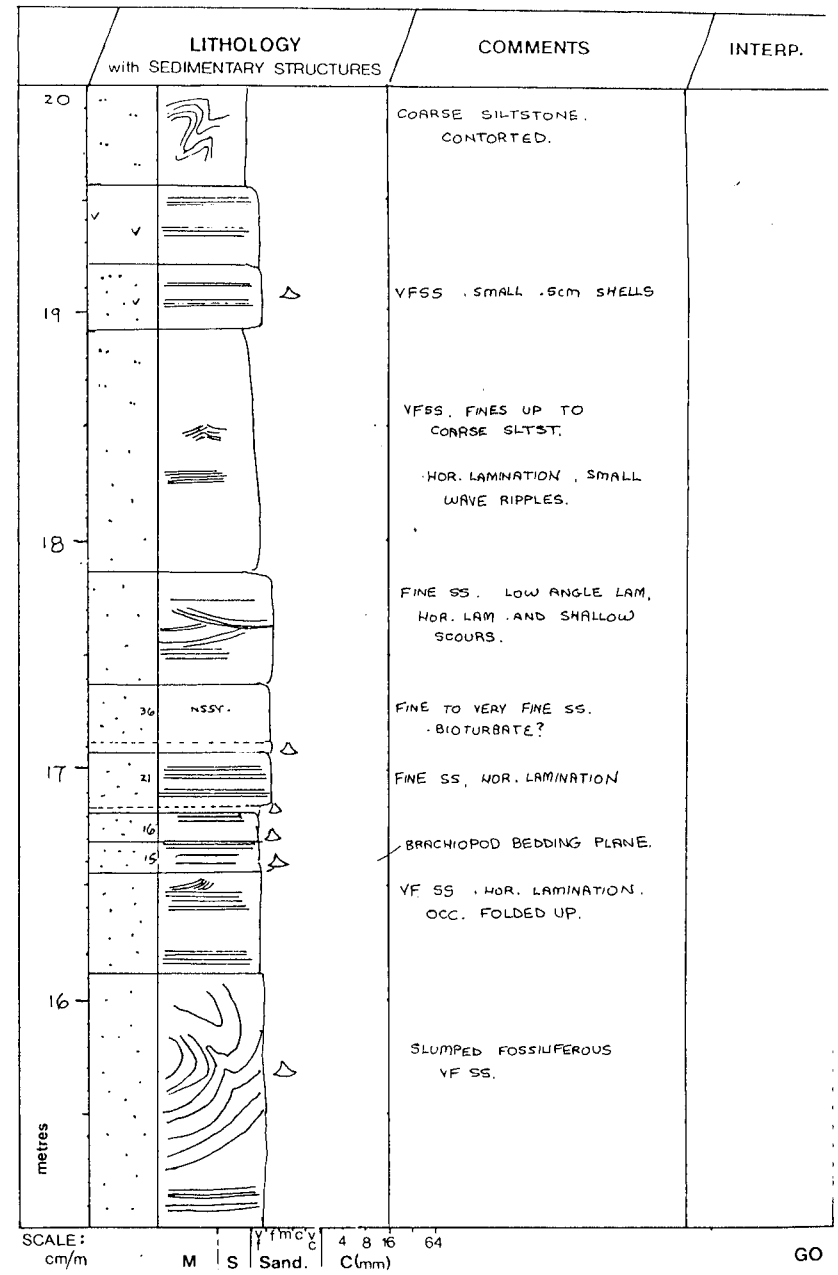




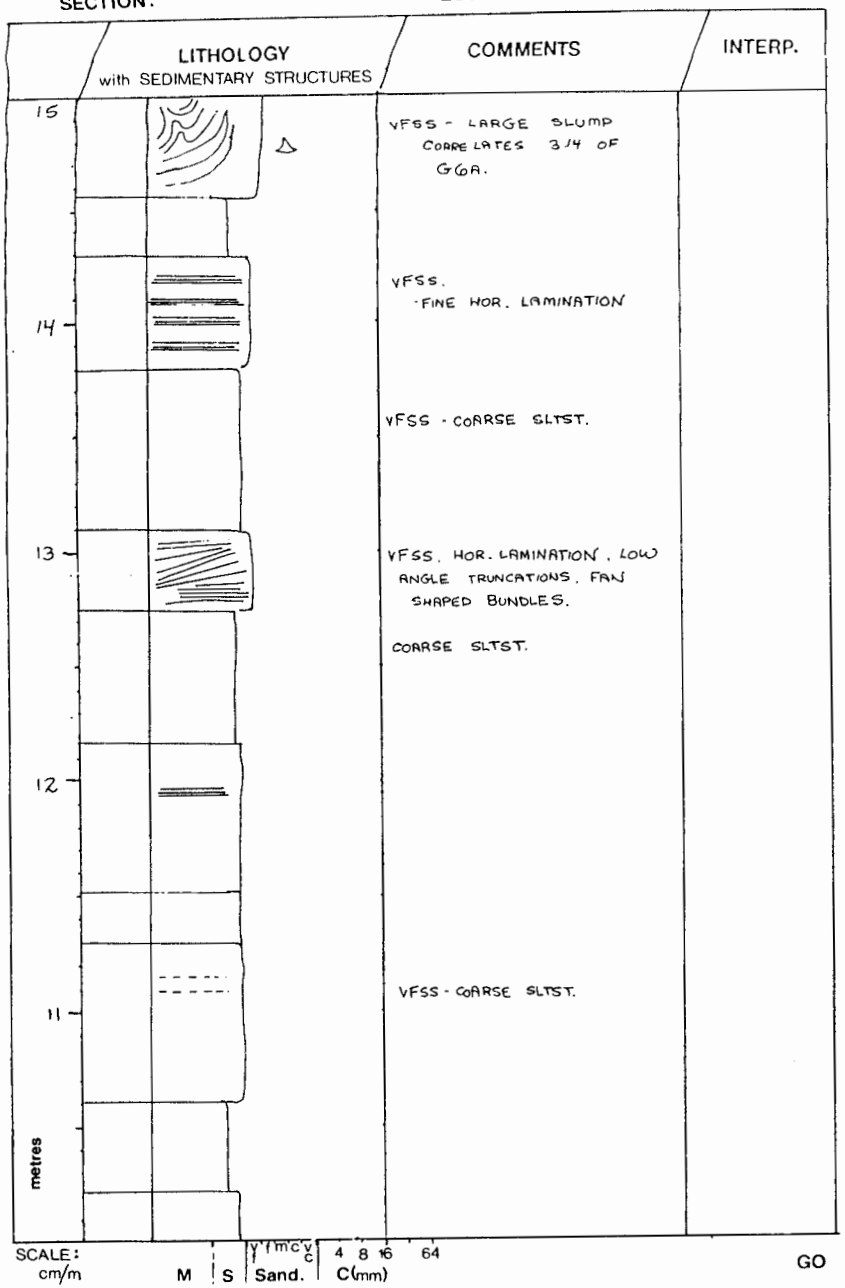
SECTION: G·7 LOCATION: CAPEL HILL



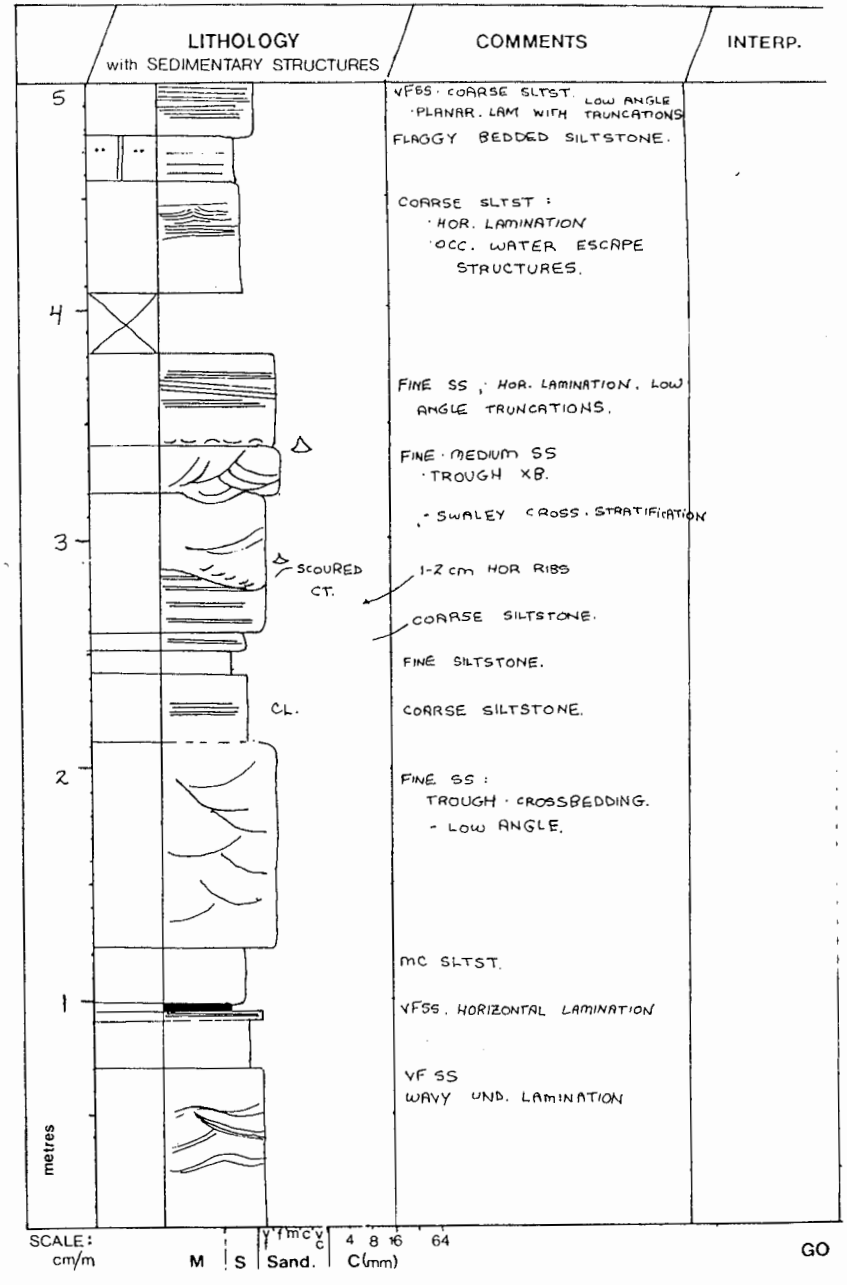
SECTION: G·7 LOCATION: CAPEL HILL



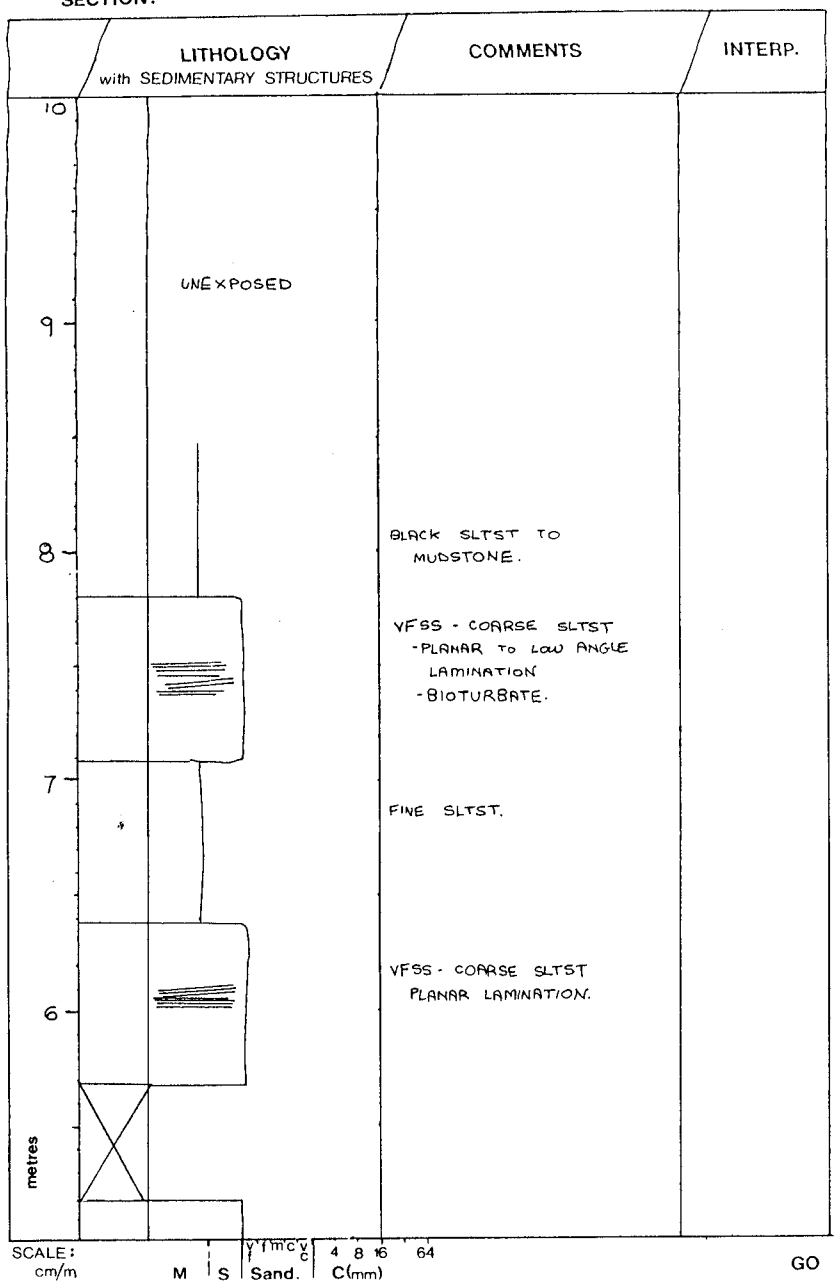
SECTION: G · LOCATION: CAPEL HILL



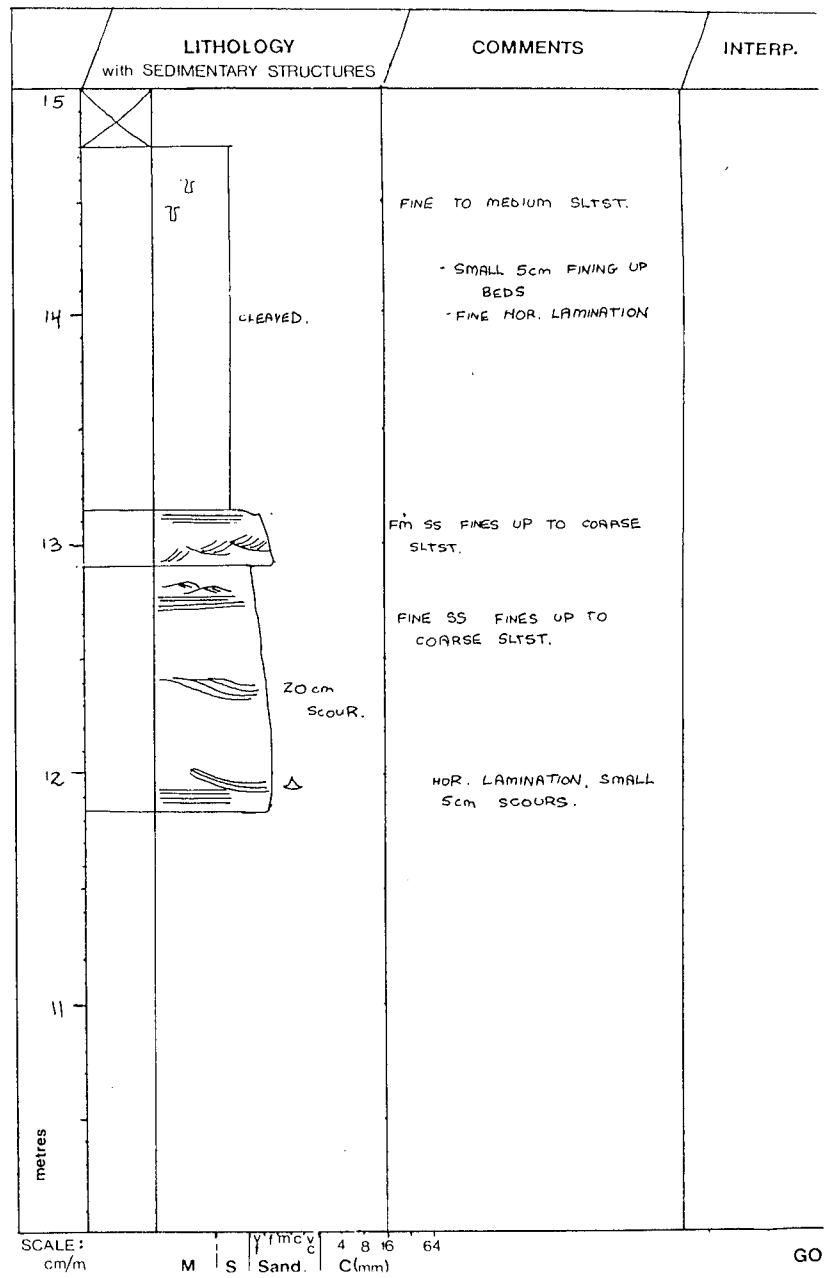
SECTION: G 8 LOCATION: CAPEL HILL



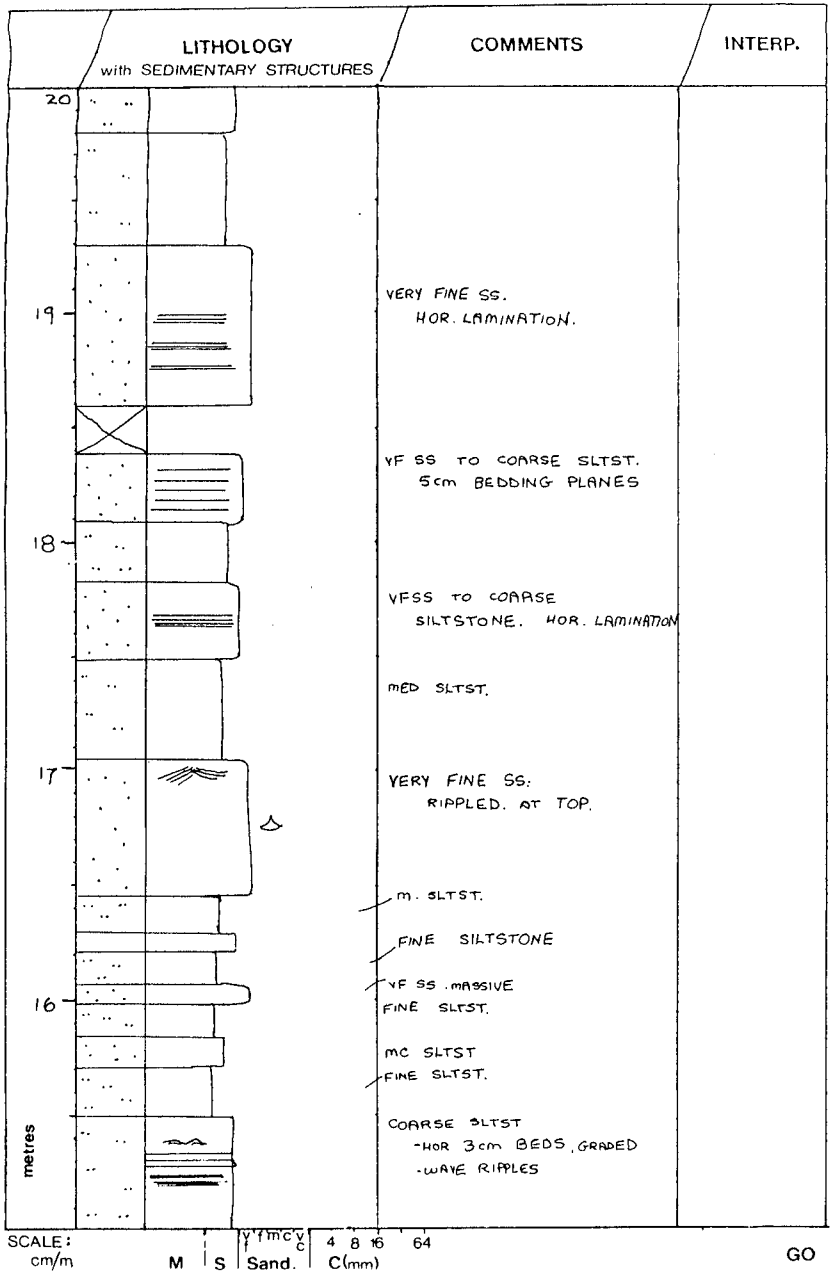
SECTION: LOCATION:



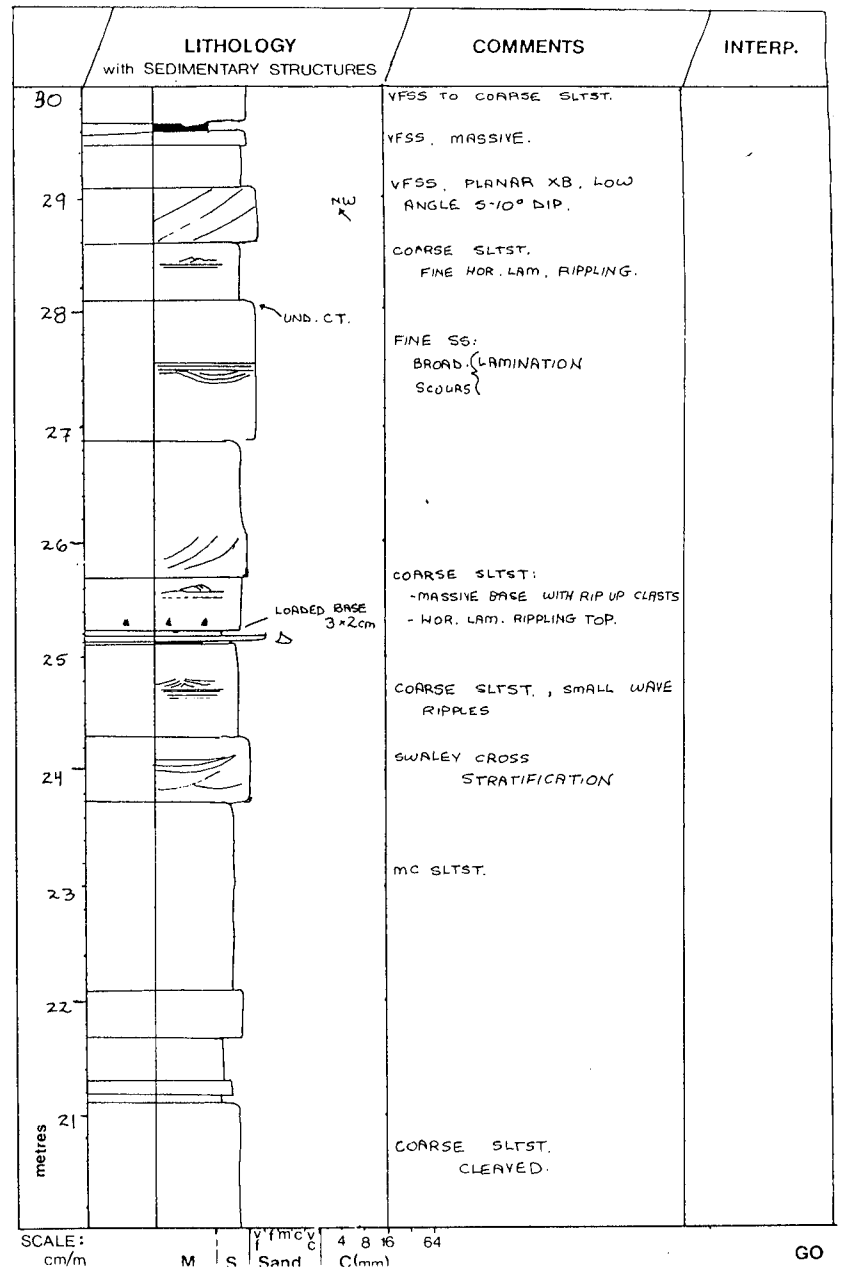
SECTION: G·8. LOCATION: CAPEL HILL



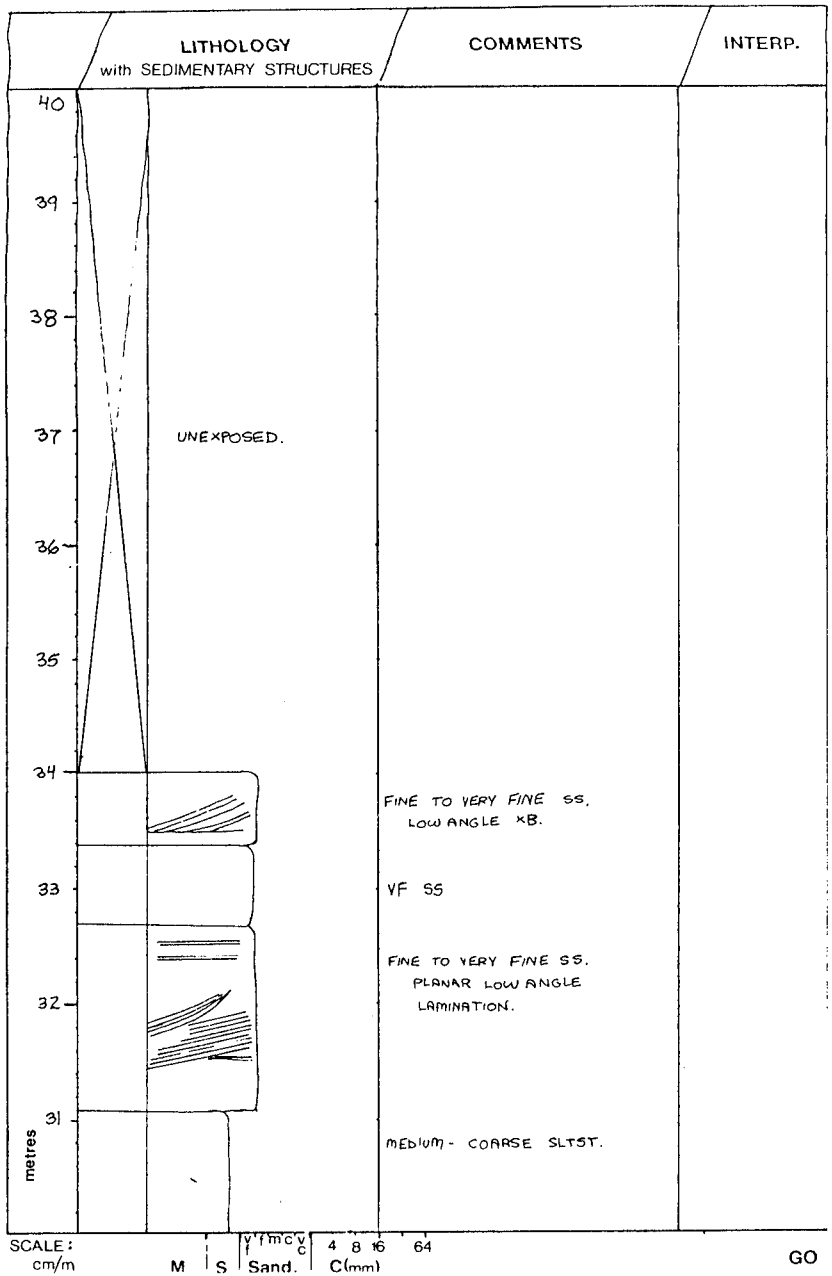
SECTION: G·8 LOCATION: CAPEL HILL.



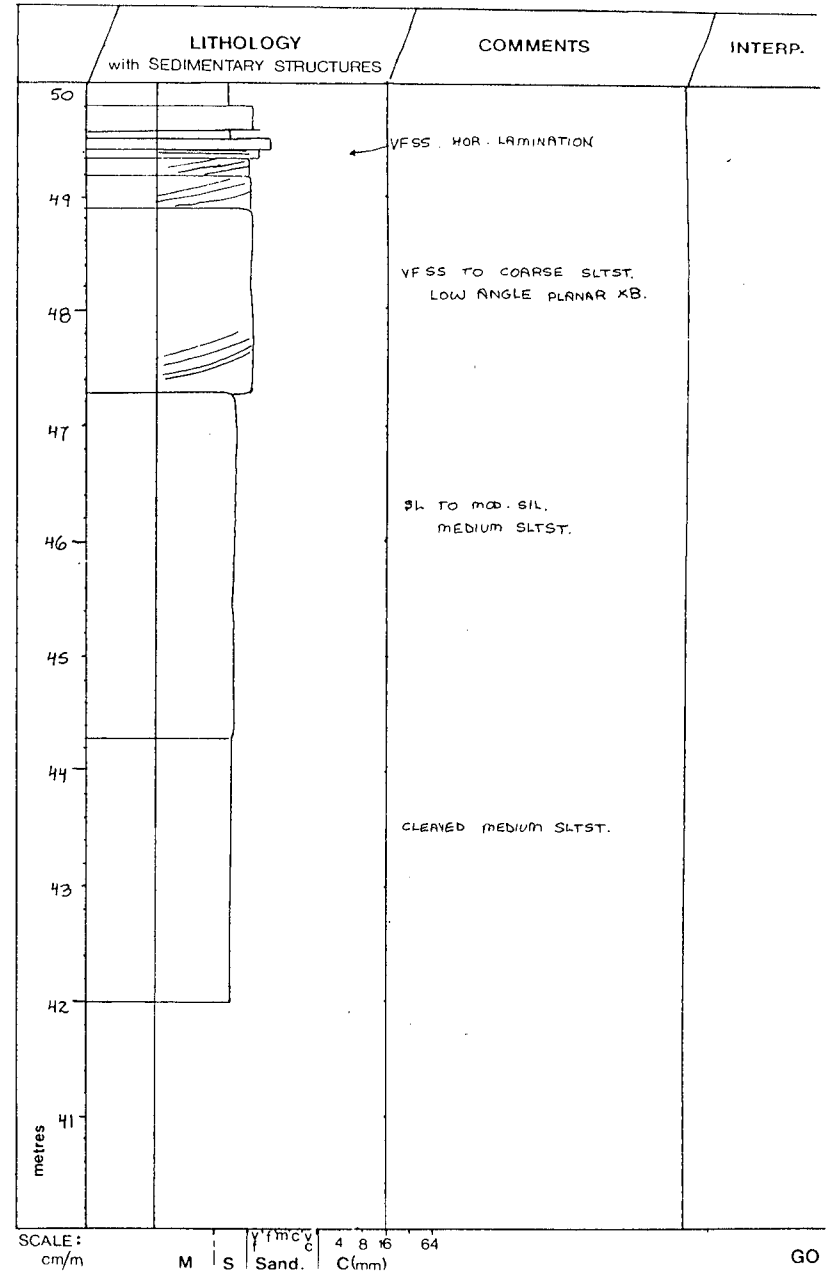
SECTION: G·8 LOCATION: CAPEL HILL



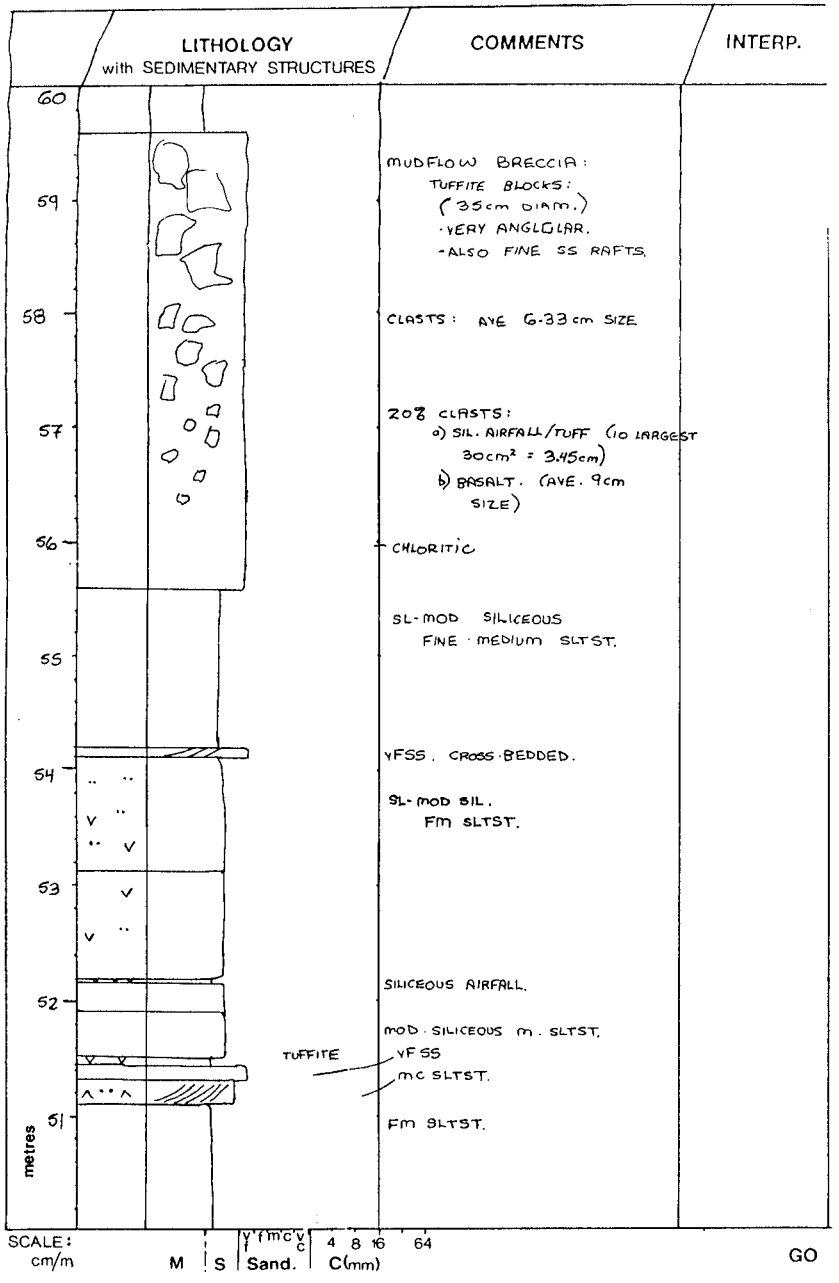
SECTION: G·8 LOCATION: CAPEL HILL



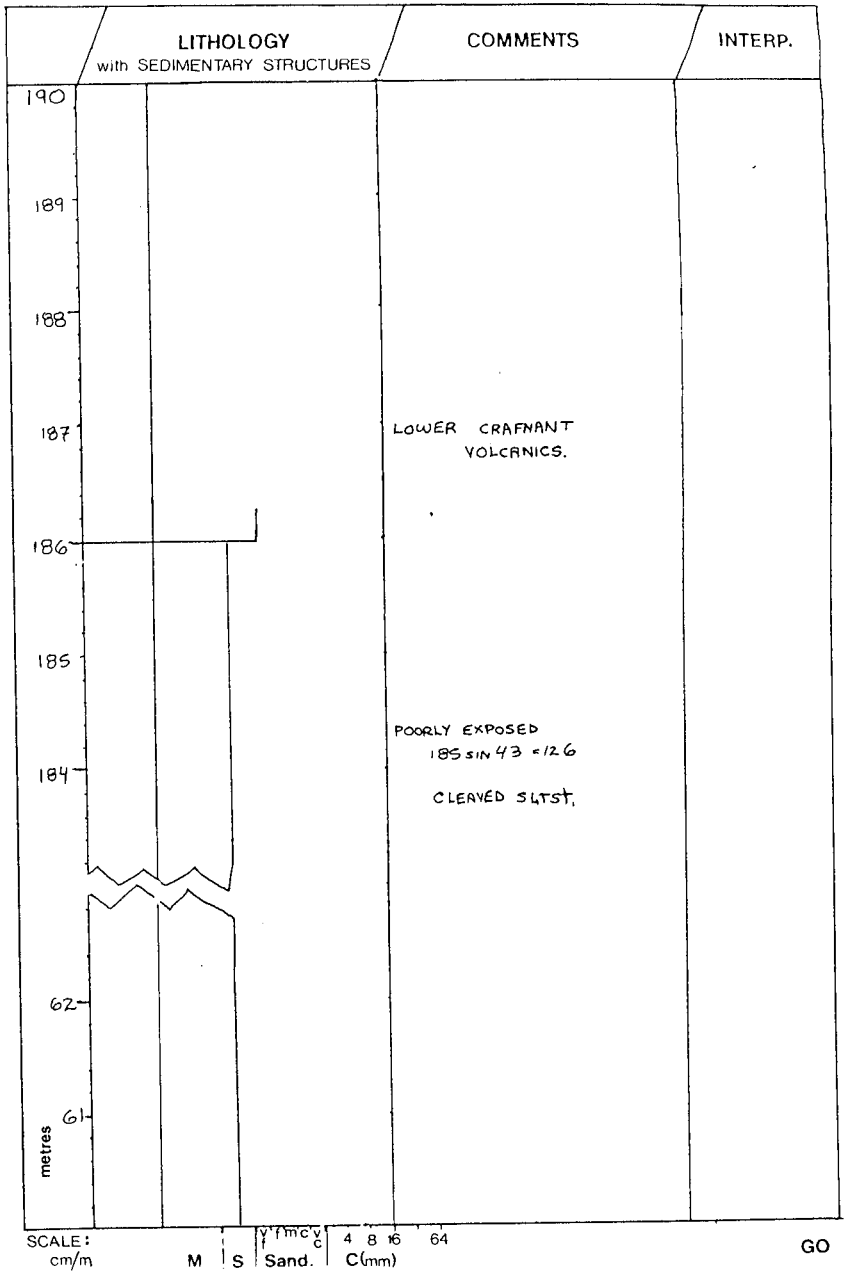
SECTION: G·8 LOCATION: CAPEL HILL



SECTION: G·8 LOCATION: CAPEL HILL

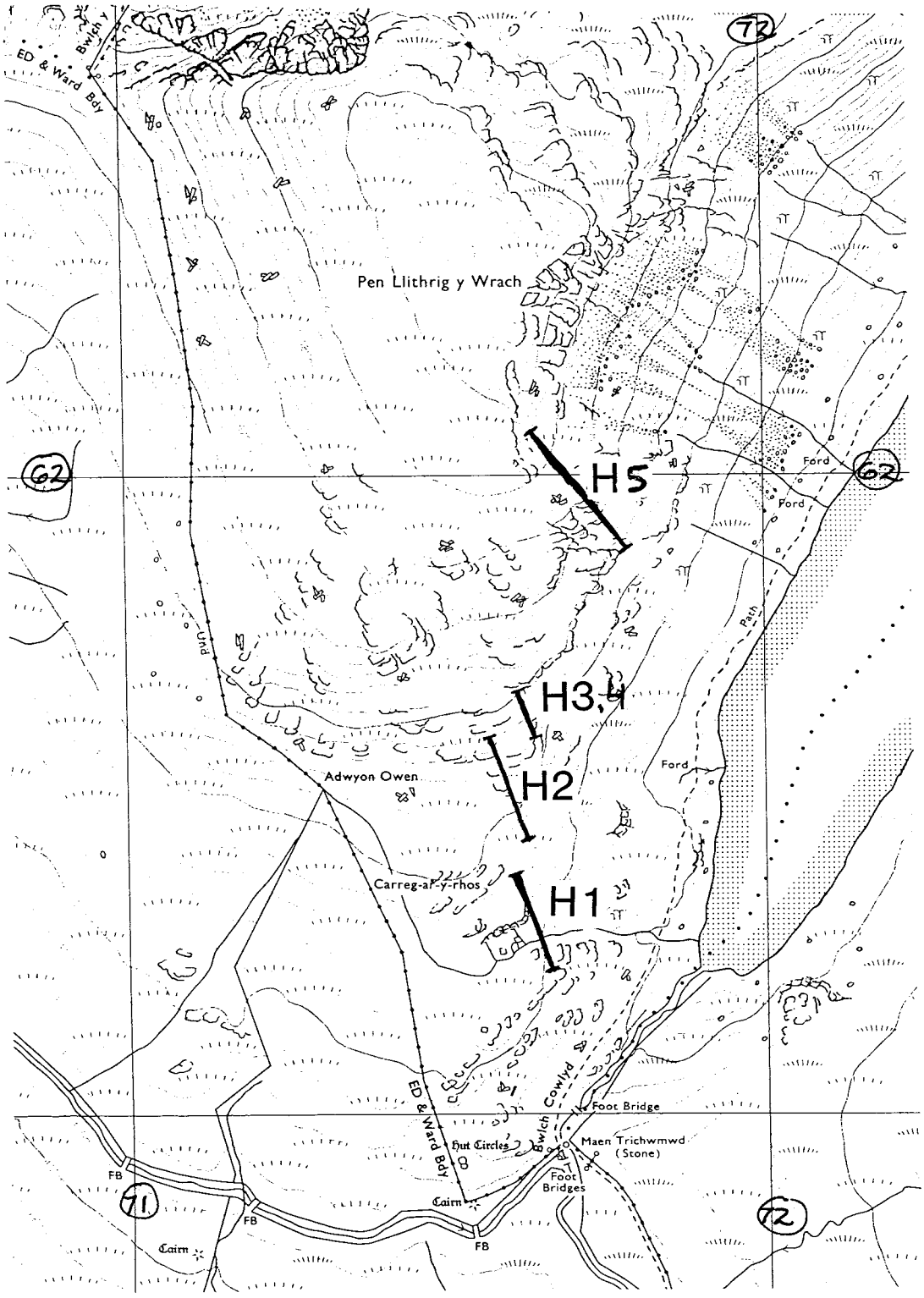


SECTION: G·8 LOCATION: CAPEL HILL



AREA H

LOCATION MAP.



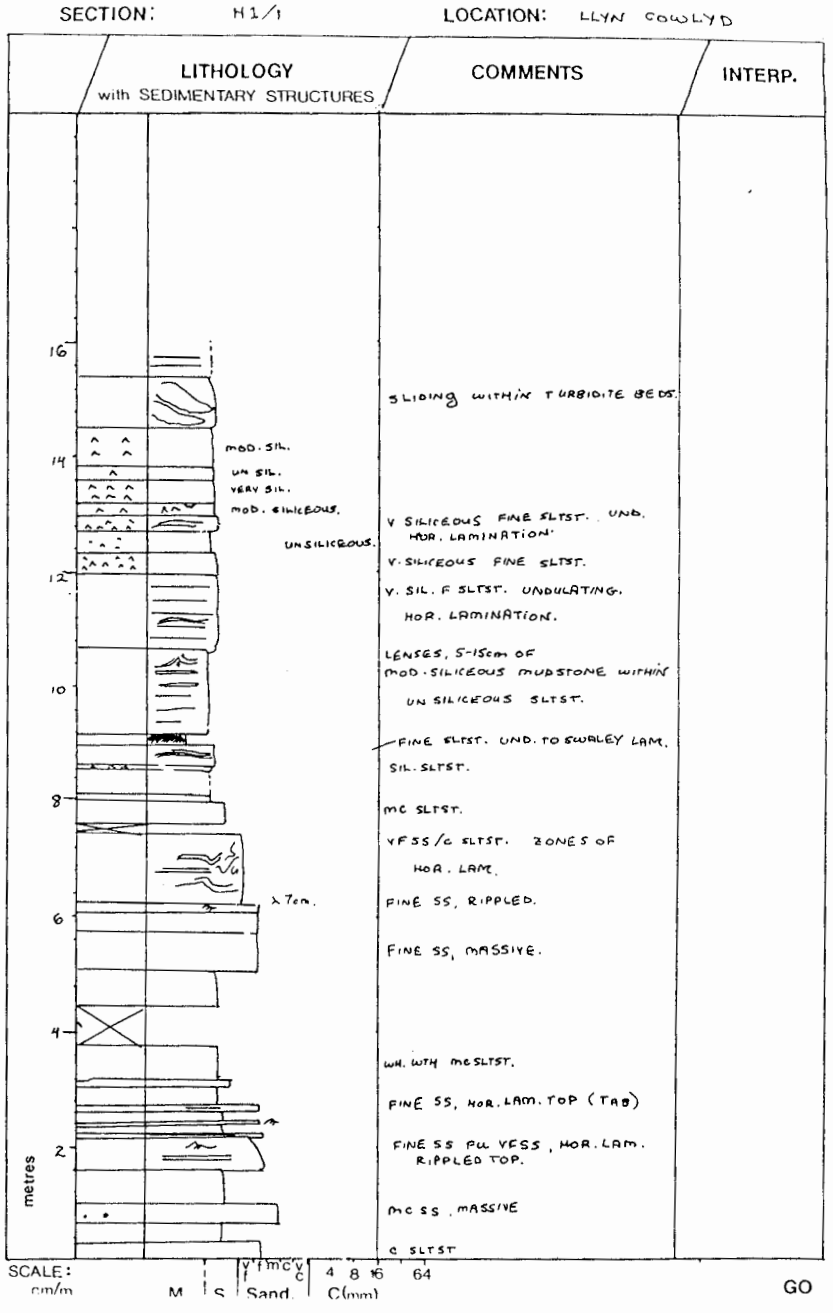
SECTION H1 to H4

SECTION H1 LOCATION: Locate dolerite sill 200 m to west of southern end of Llyn Cowlyd near Careg-ar-y-rhos. Section through sandstone outcrops immediately beneath sill.

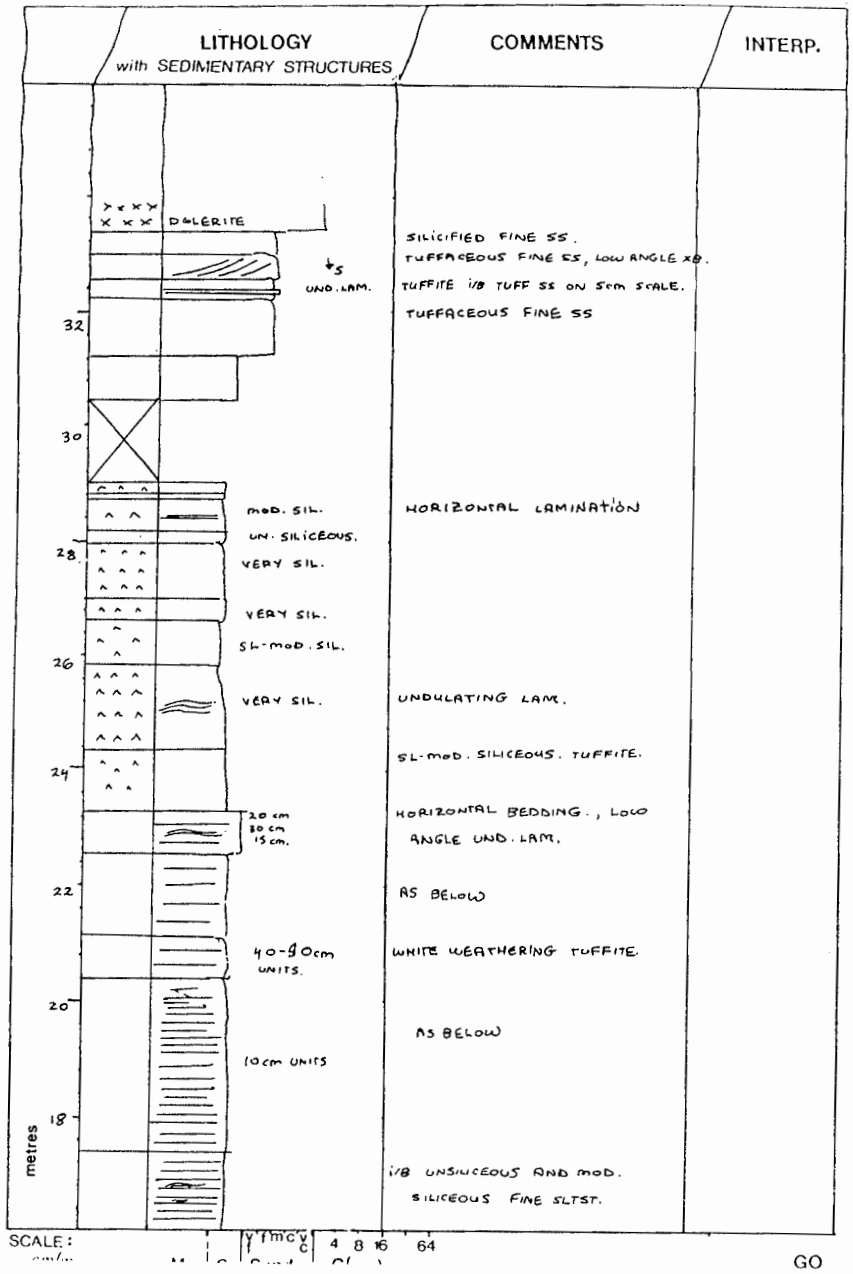
SECTION H2 LOCATION: Section from top of dolerite sill to fossiliferous sandstone horizon.

SECTION H3 LOCATION: Continue statigraphically up-section to white-weathering tuff horizon.

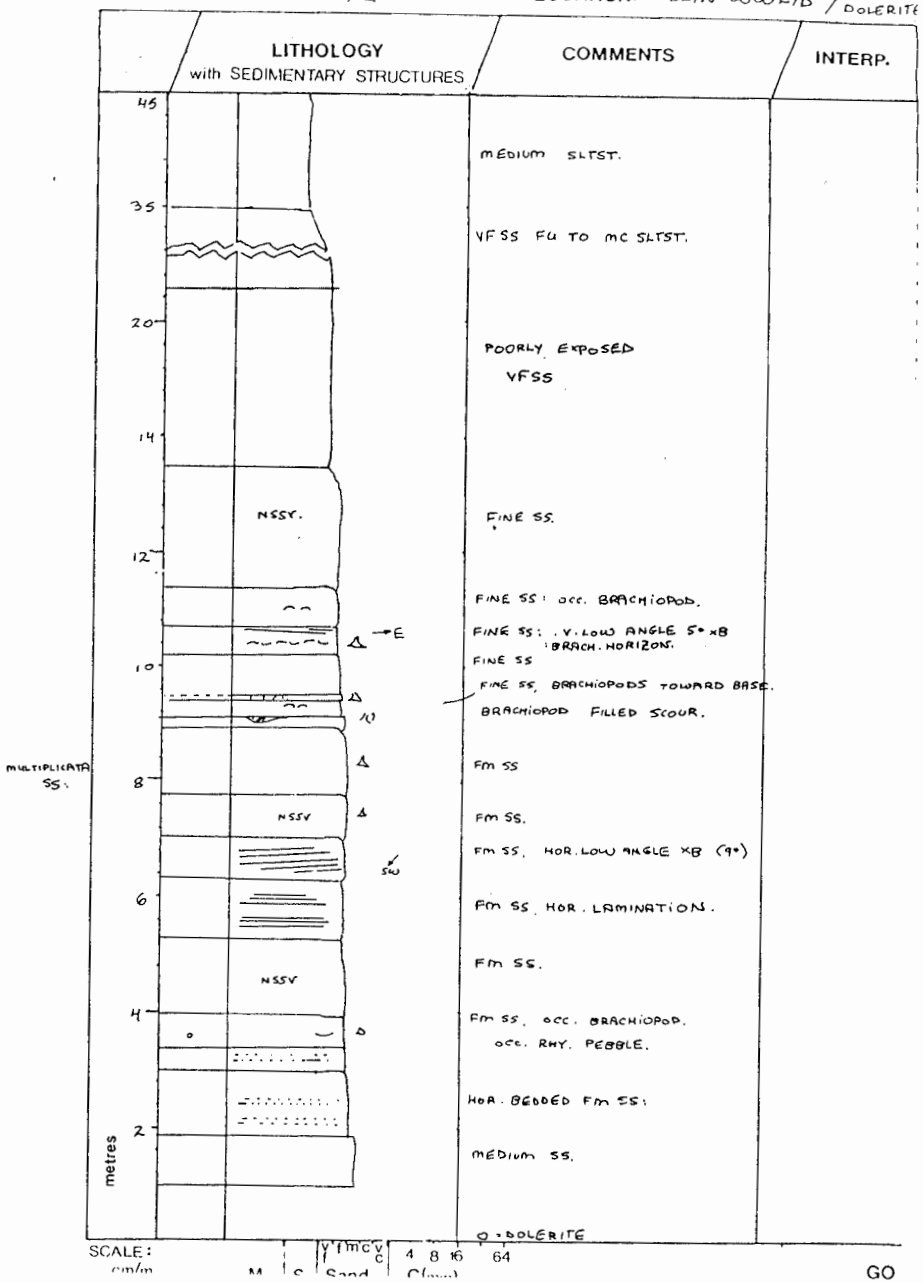
SECTION H4 LOCATION: Section through white-weathering tuff horizon, immediately to west of crags with prominant cliff.



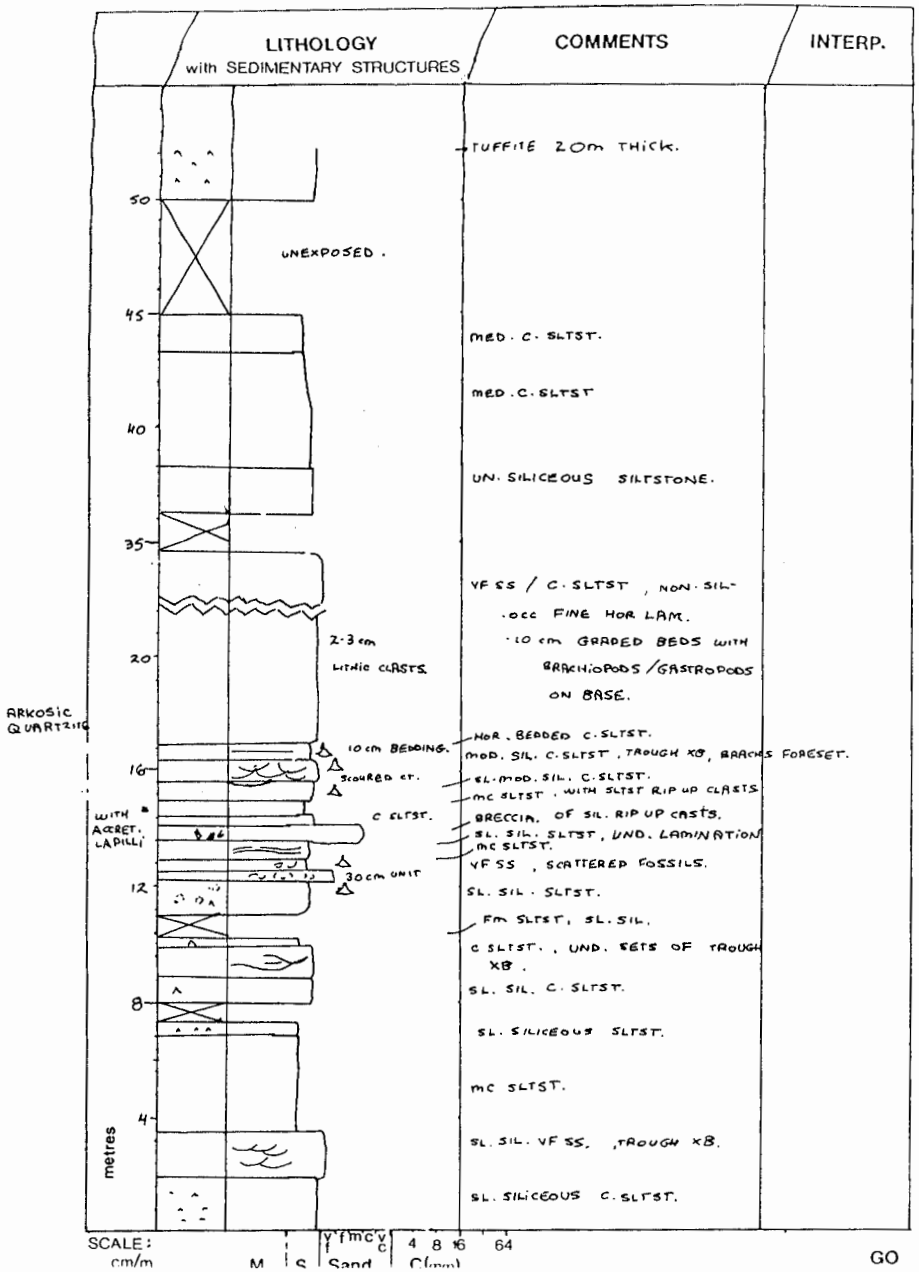
SECTION: H1/2 LOCATION: LLYN COWLYD.



SECTION: H2/1 LOCATION: LLYN COWLYD / ABOVE DOLERITE



SECTION: H3/1 LOCATION: LLYN COWLYD



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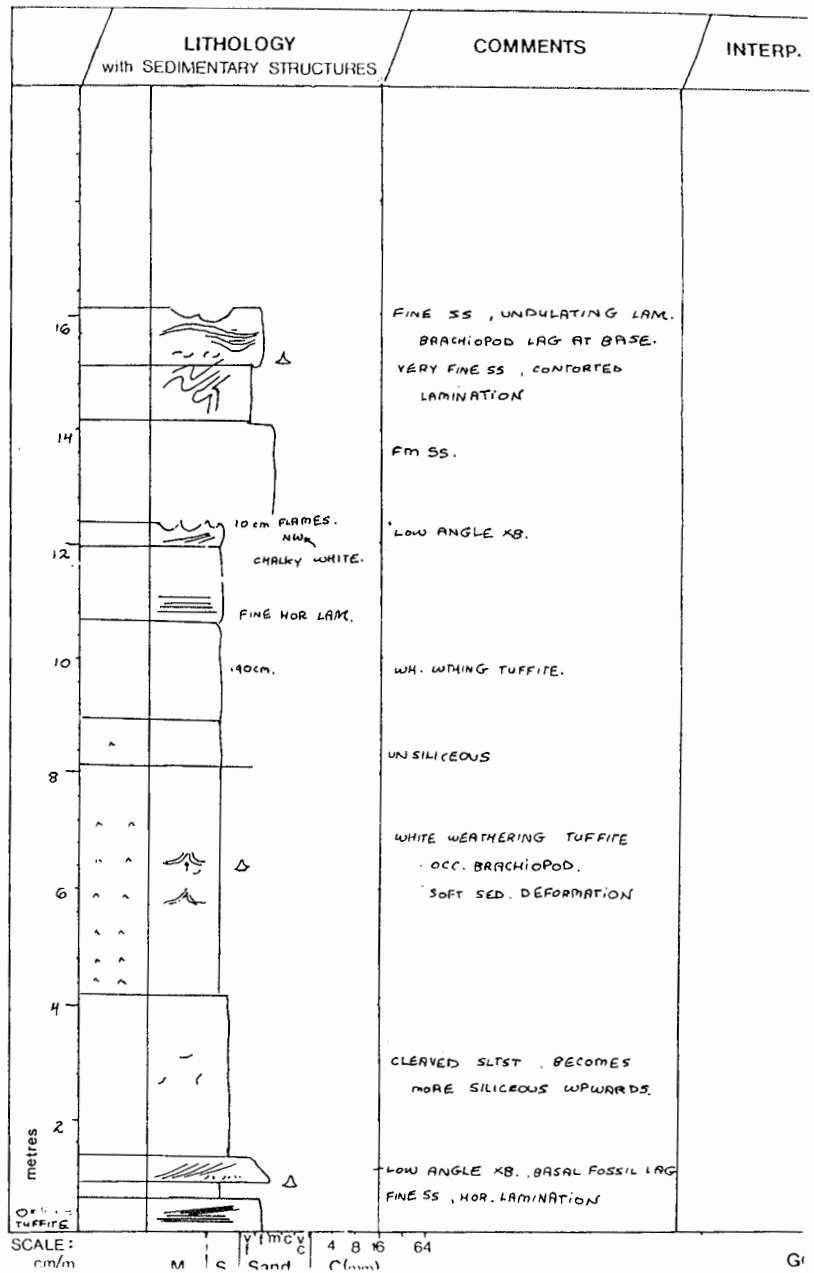
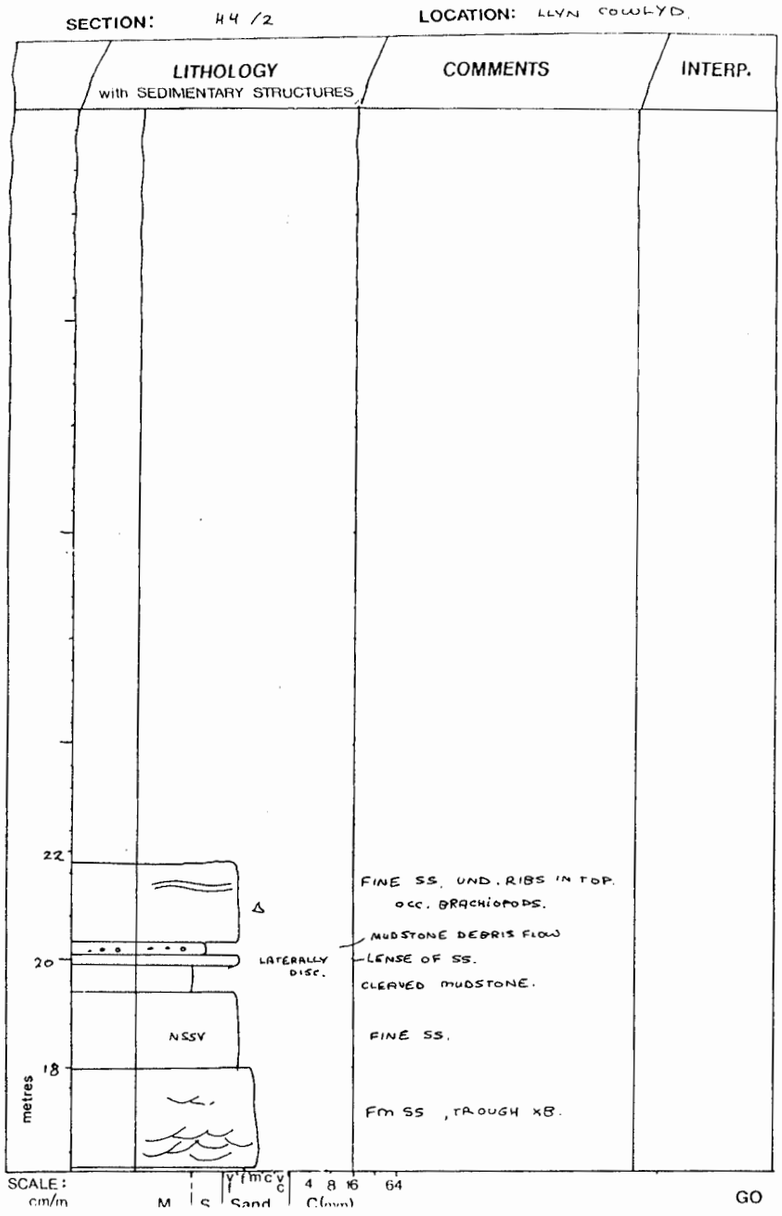
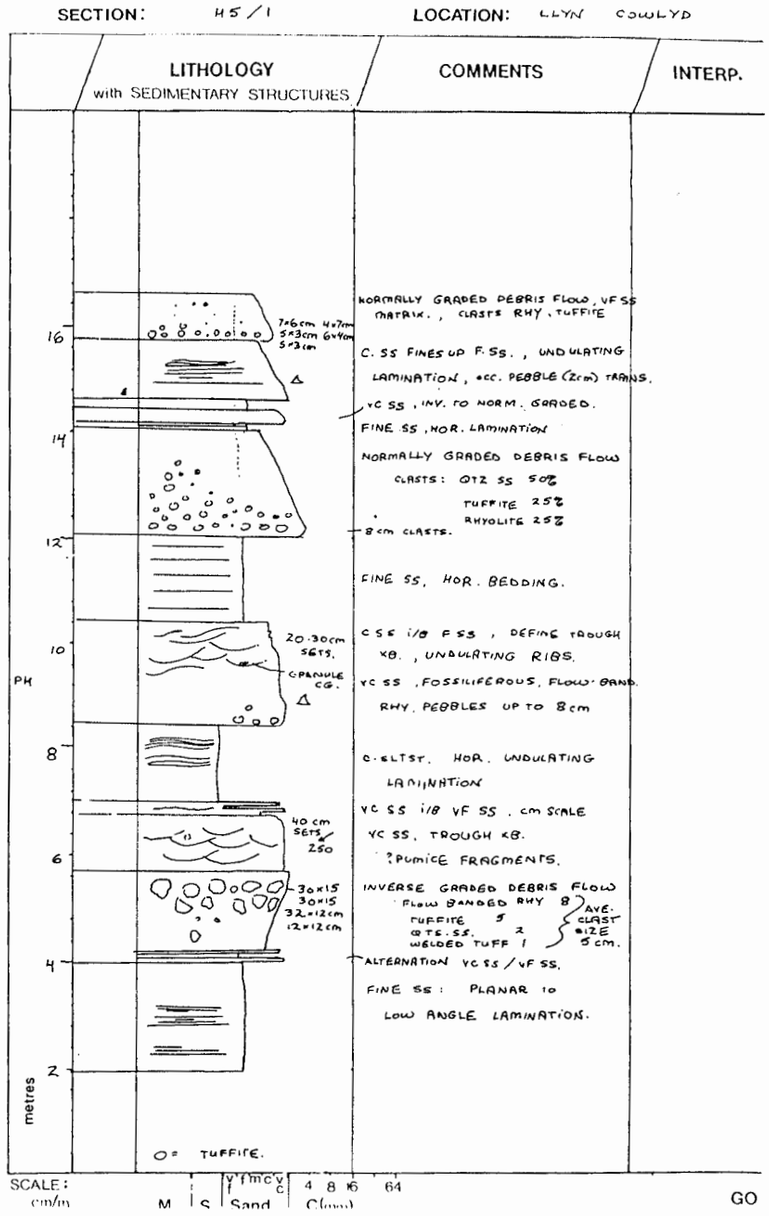
SECTION: H4/1 LOCATION: LLYN COWLYD



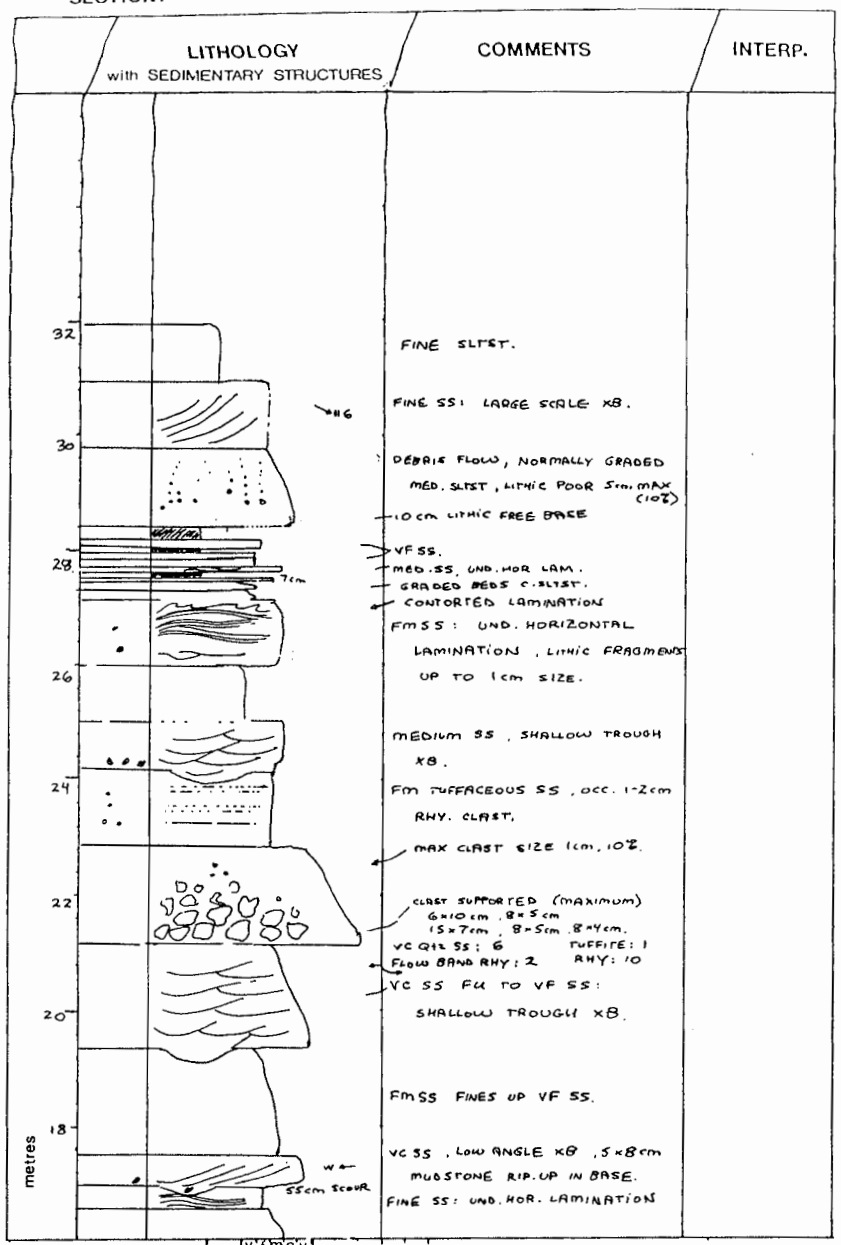
G

SECTION H5 LOCATION: Locate white-weathering rhyolitic tuff(s) at top of talus slopes to NW of Llyn Cowlyd on SE face of Pen Llithrig-y-wrach. Section continues up slope until sedimentary structures become indiscernible.

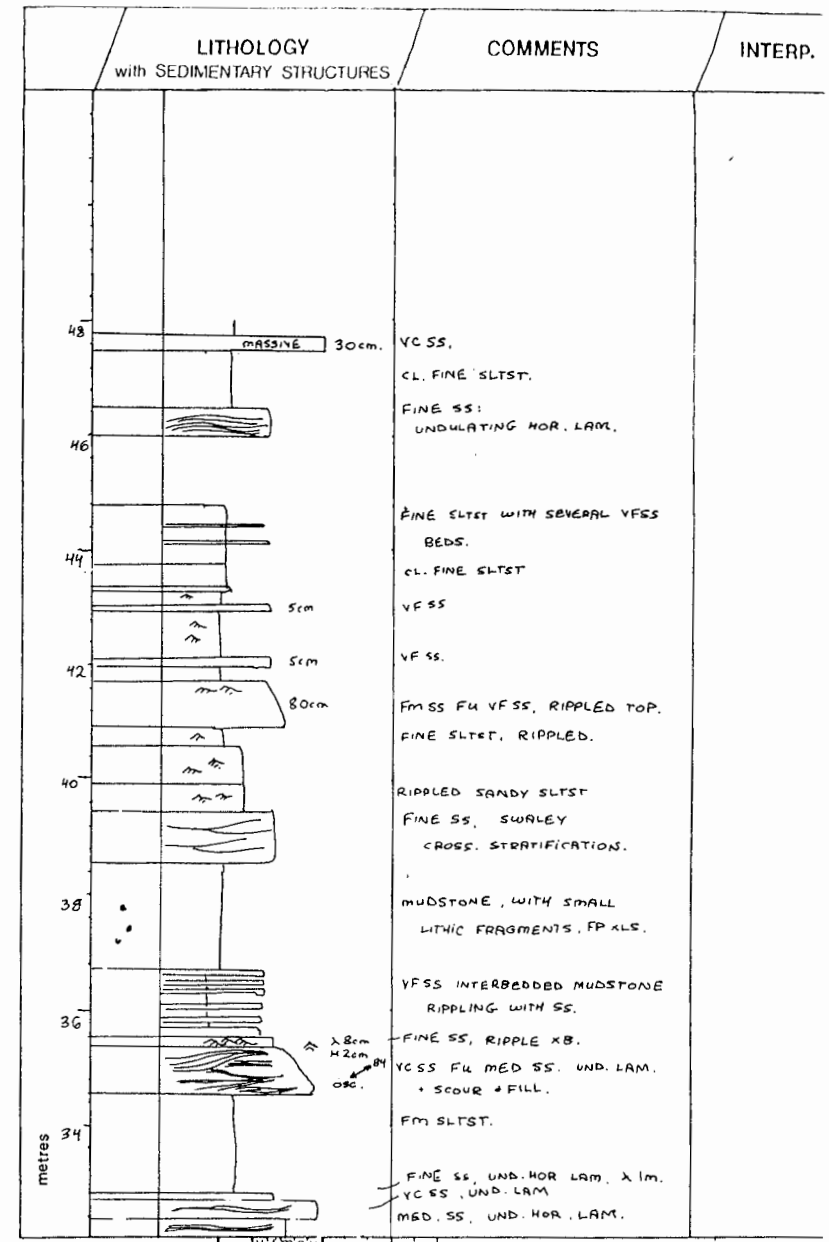




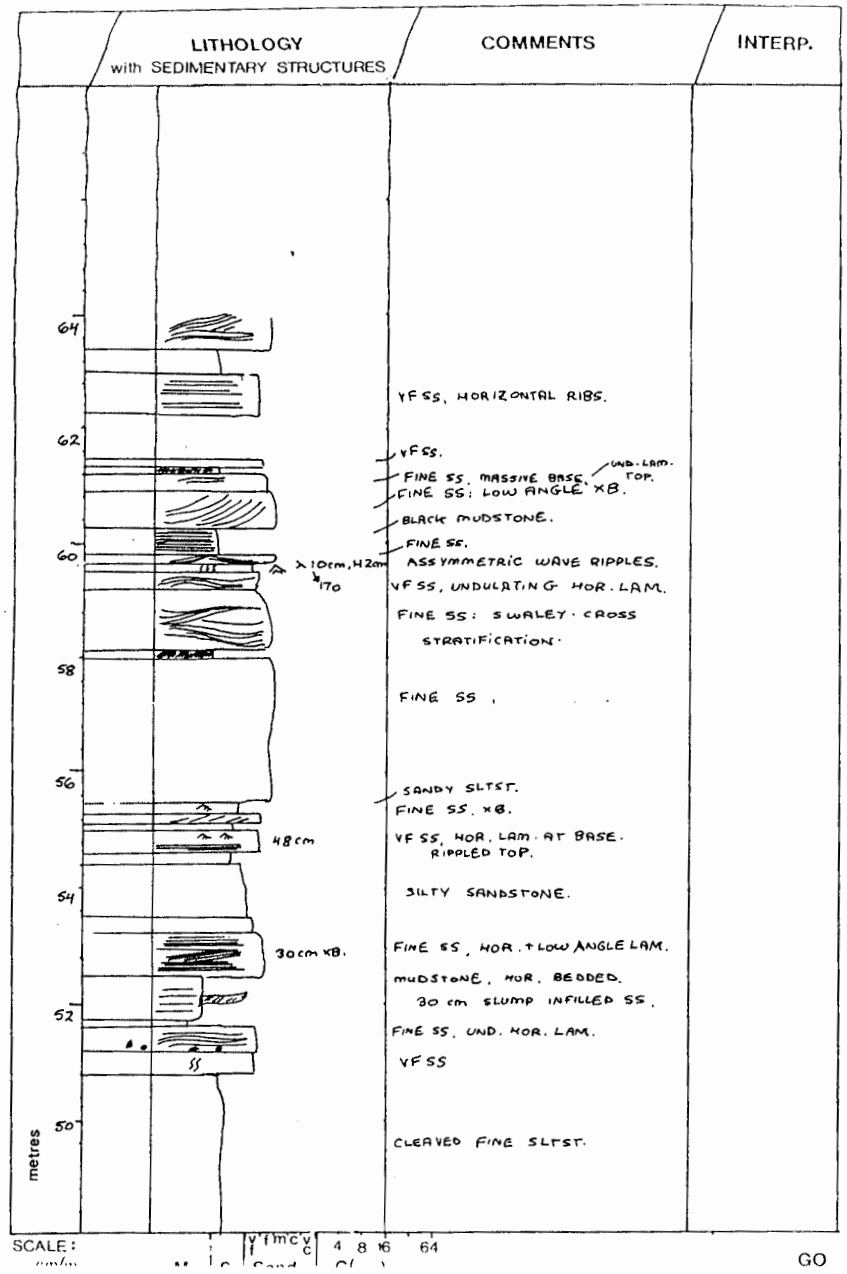
SECTION: H5/2 LOCATION:



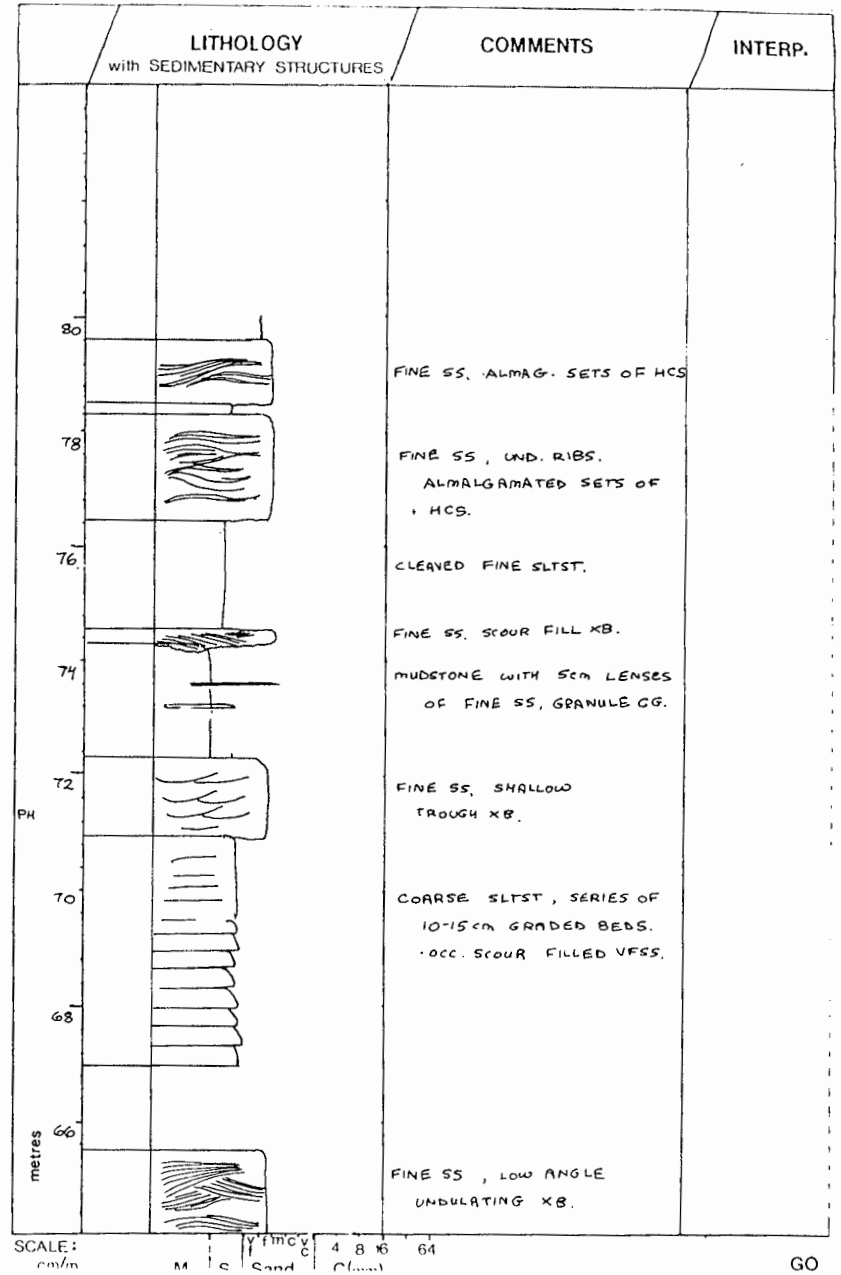
SECTION: H5/3 LOCATION: LLYN COWLYD



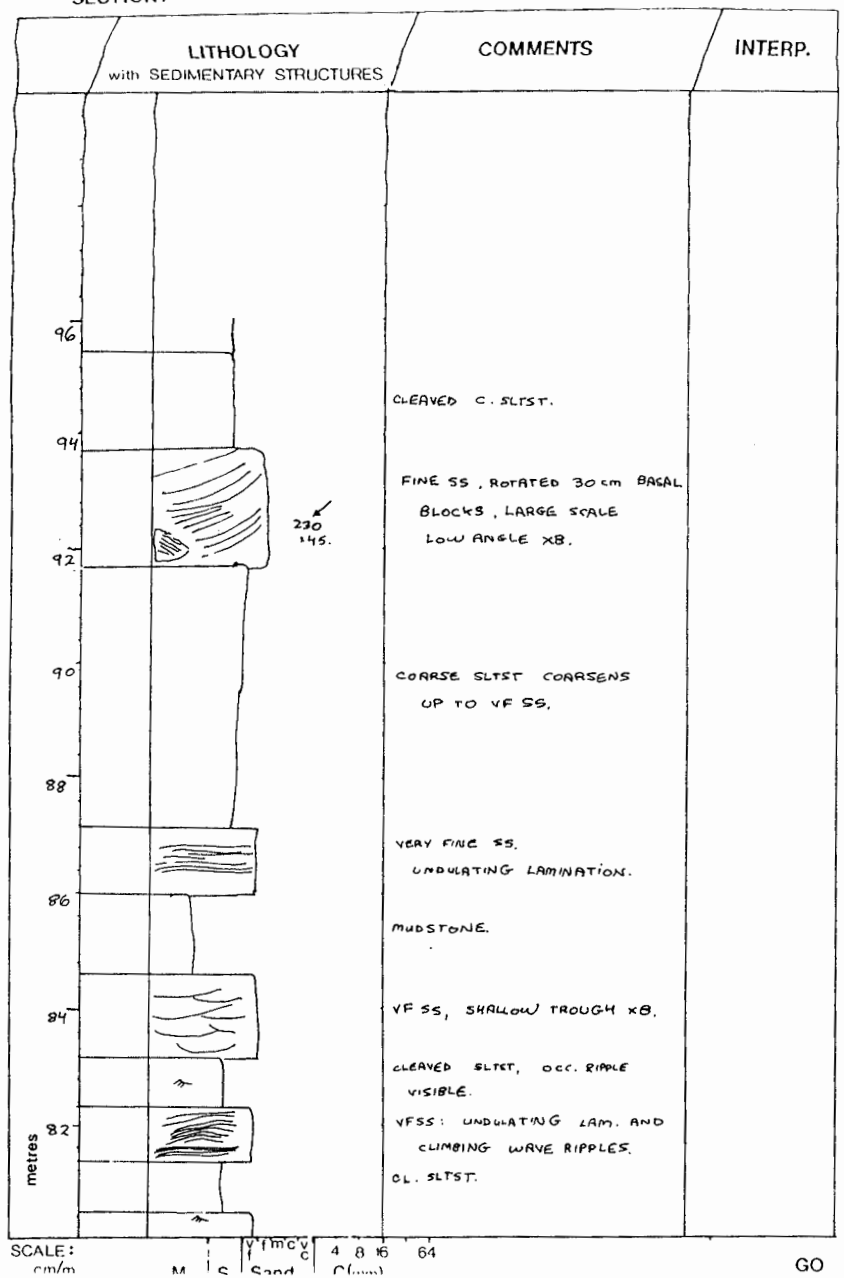
SECTION: HS/4 LOCATION: LLYN COWLYD



SECTION: HS/5 LOCATION: LLYN COWLYD



SECTION: H5/6 LOCATION: LLYN COWLYD



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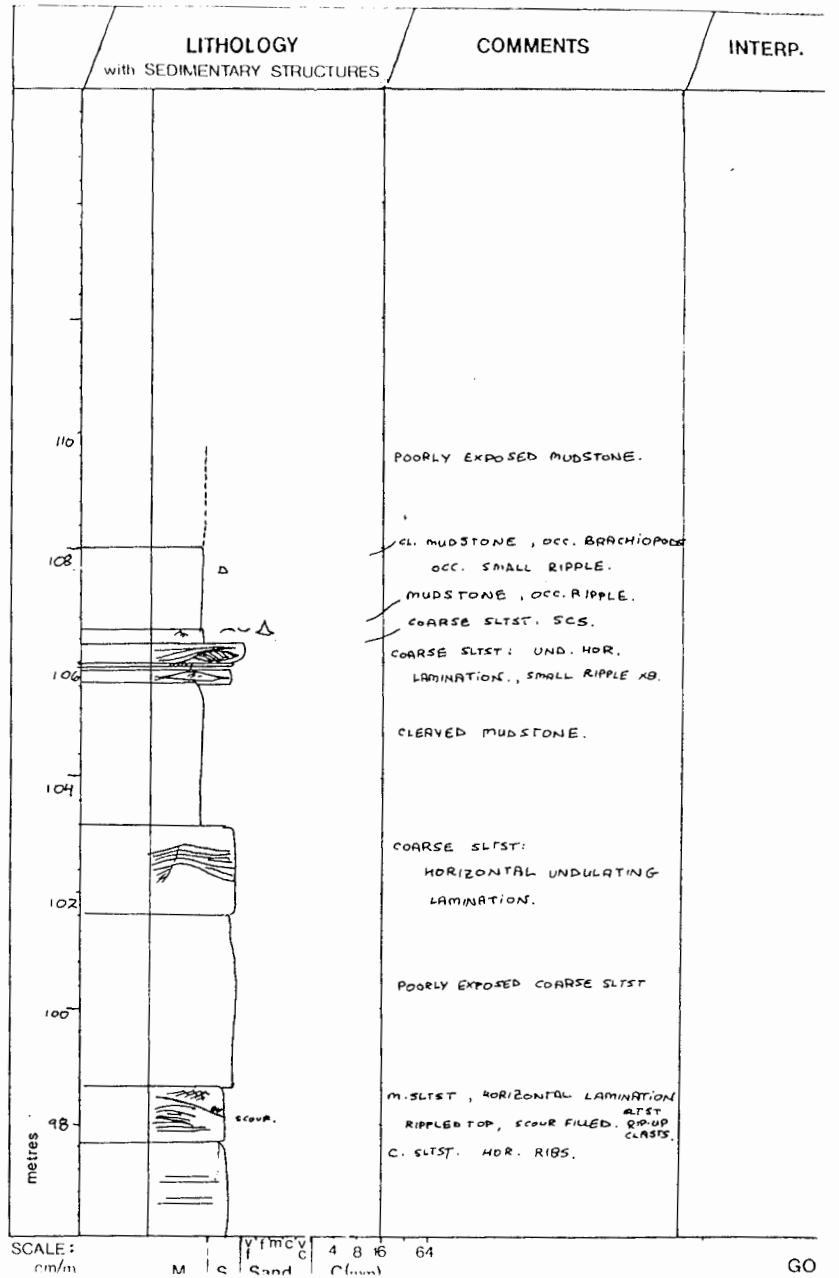
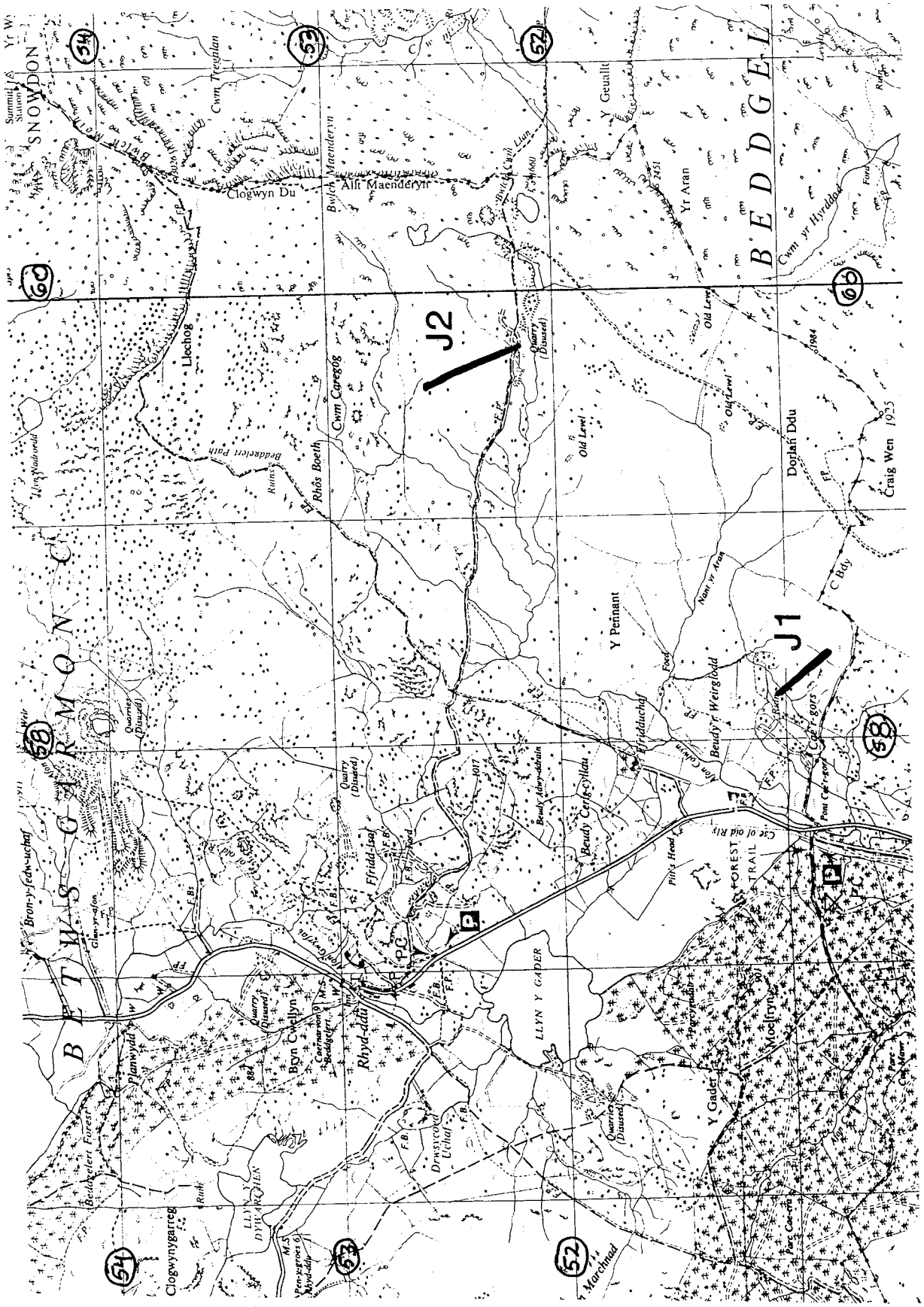
SECTION: H5/7 LOCATION: LLYN COWLYD.



GO

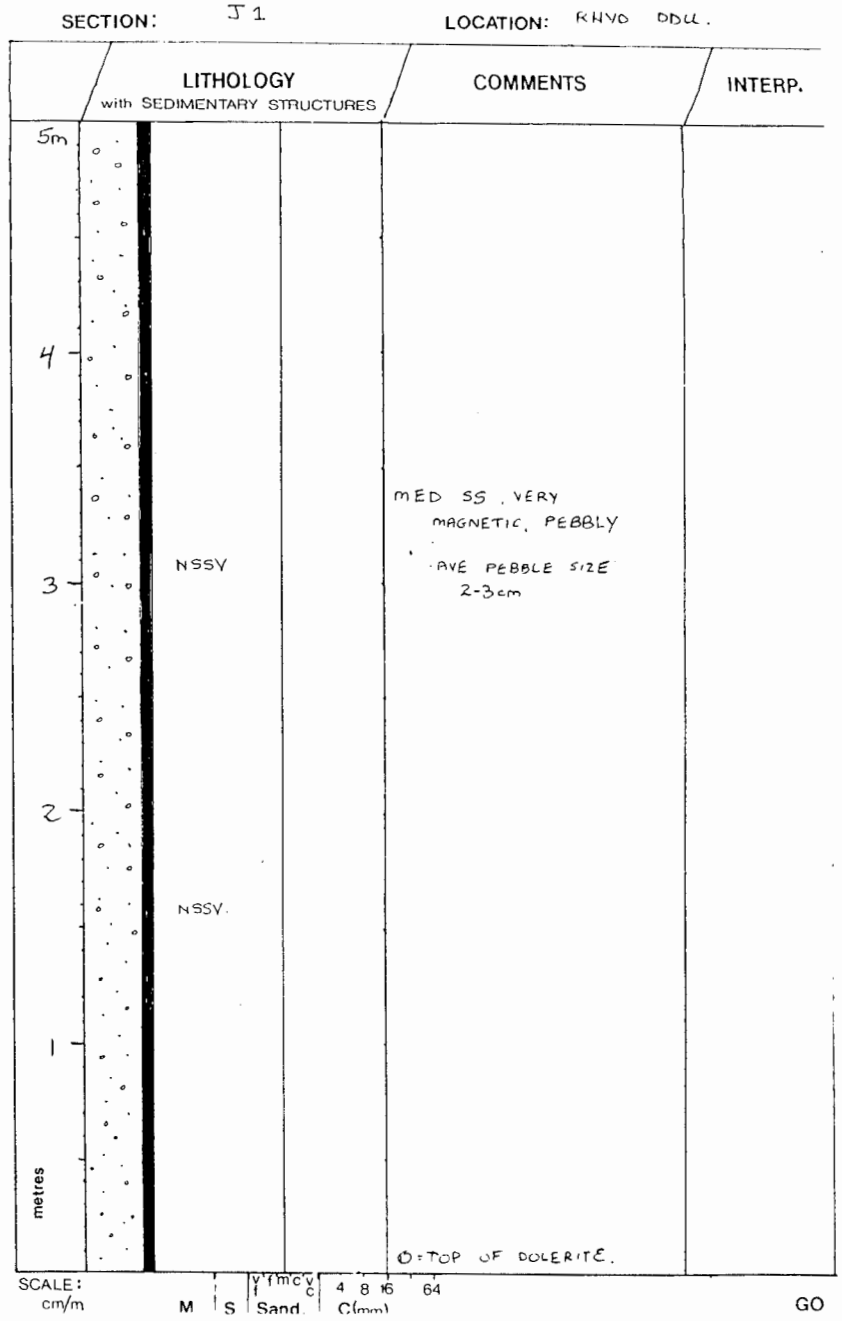
AREA J

LOCATION MAP.

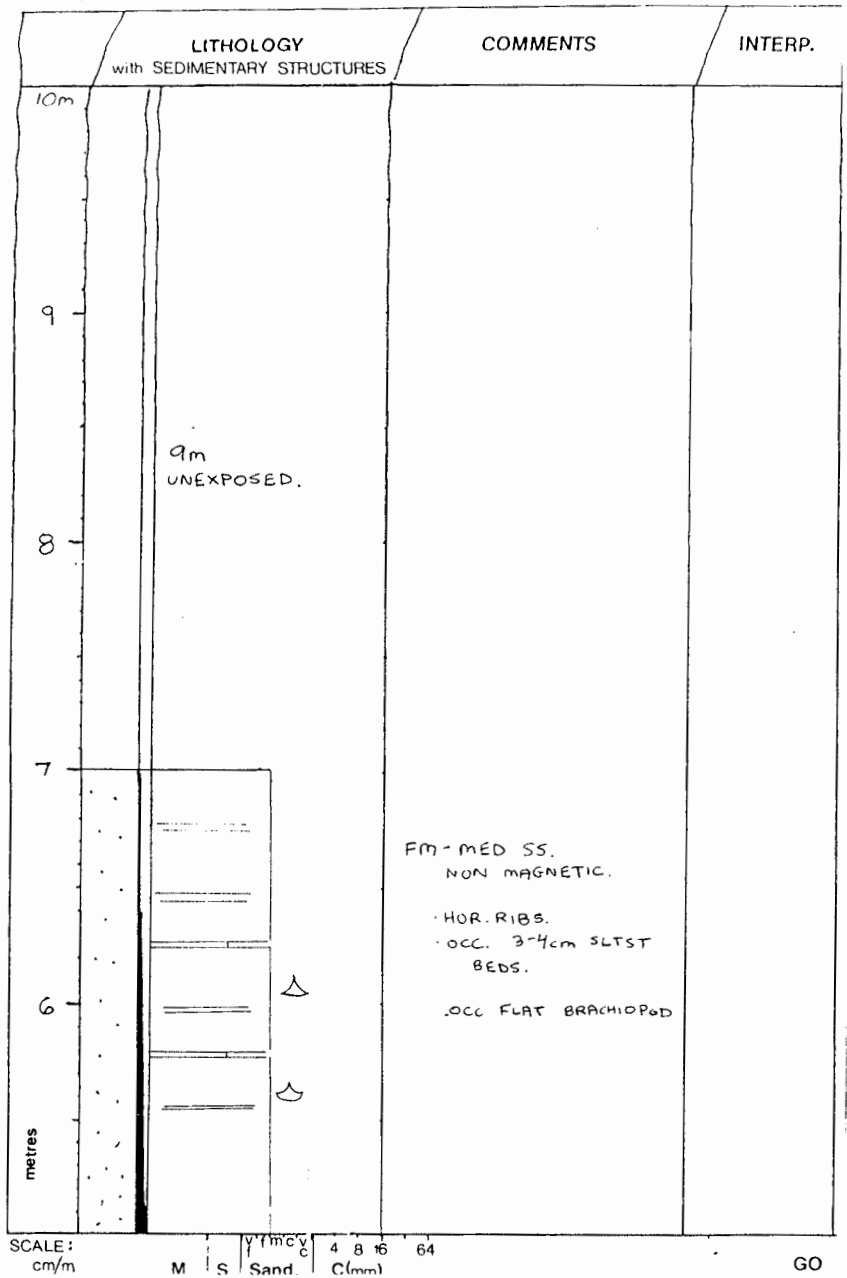


SECTION J1

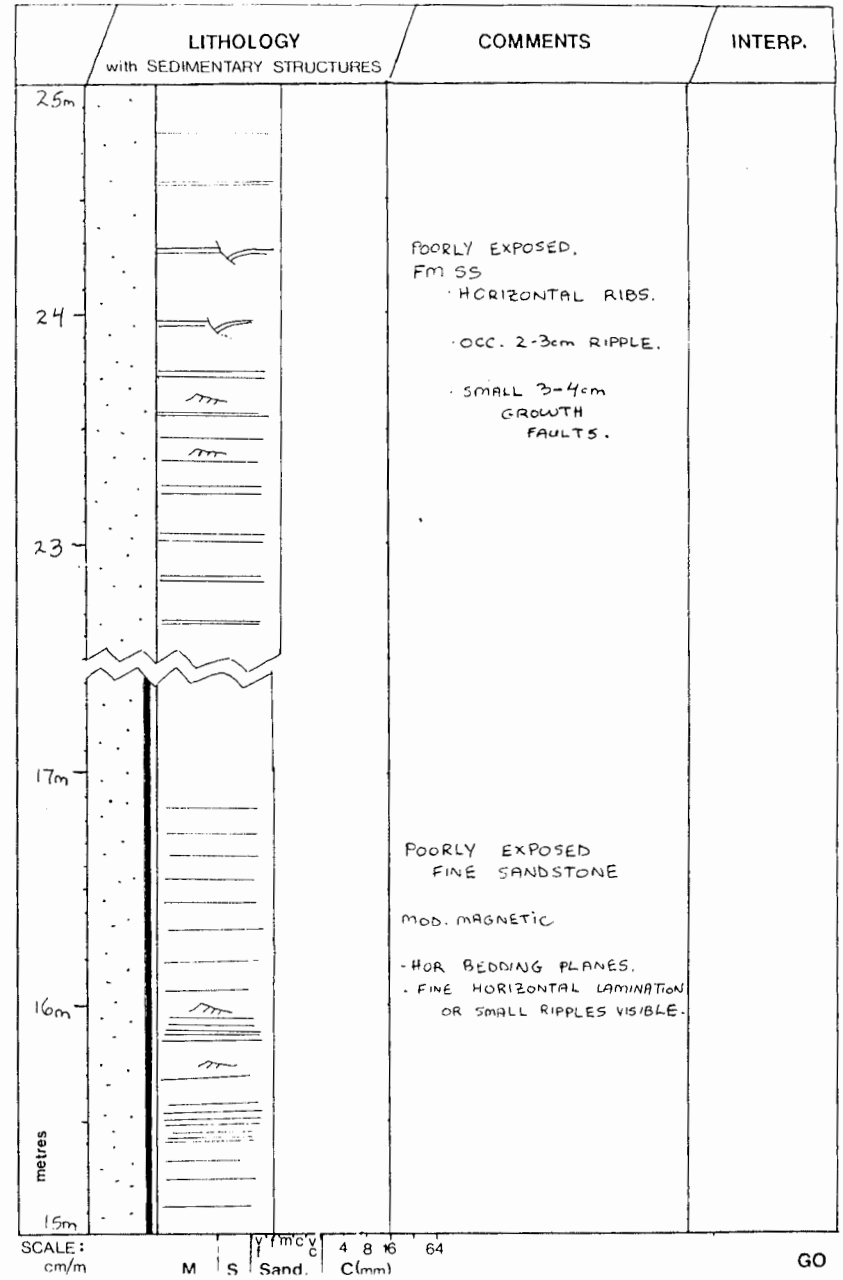
SECTION J1 LOCATION: Locate dolerite sill ca. 300 m due west of Cae'r Gors farm. Section starts at top of sill and continues to NW towards Beudy Cerig across dry stone wall to poorly exposed base of Pitts Head Tuff.



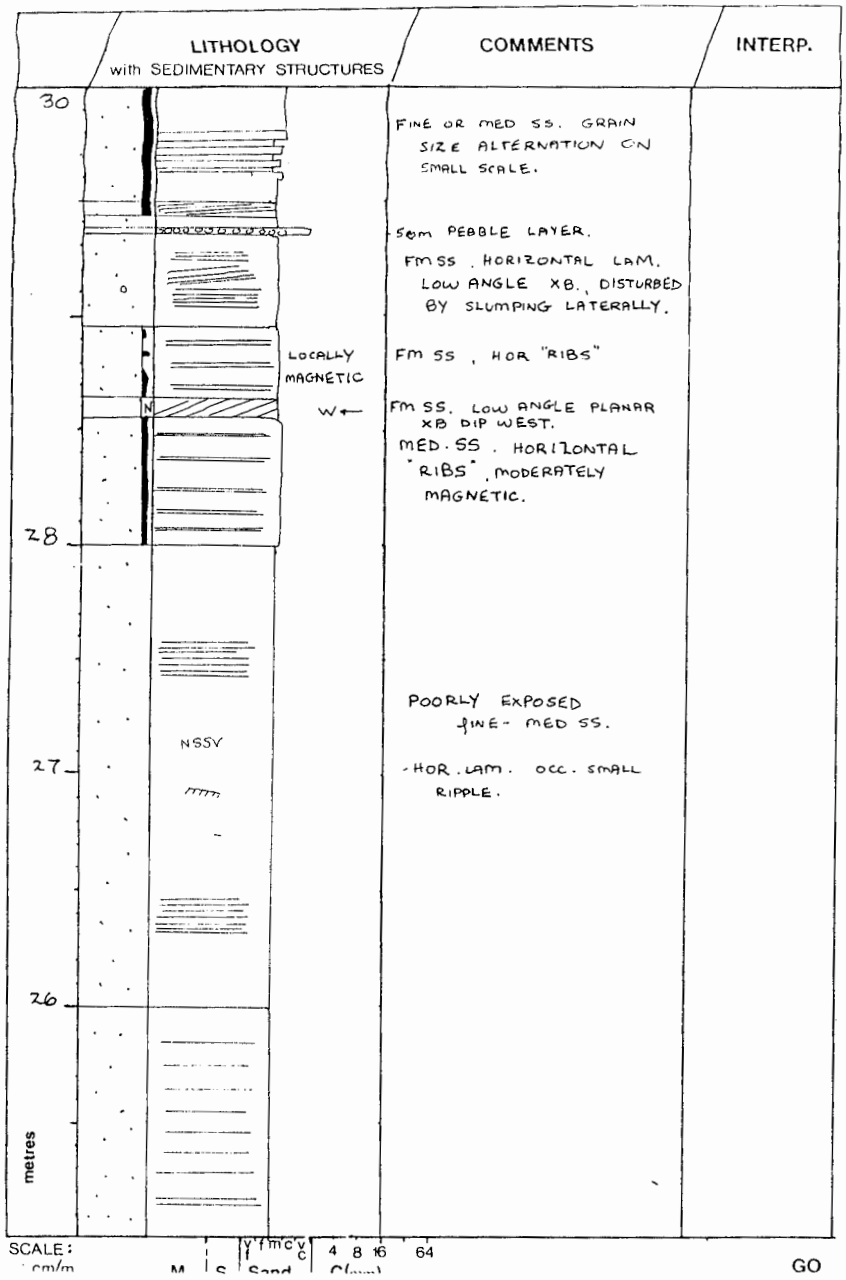
SECTION: J 1 LOCATION: RHYD DDU.



SECTION: J 1 LOCATION: RHYD DDU.



SECTION: J 1 LOCATION: RHYD DDLL.



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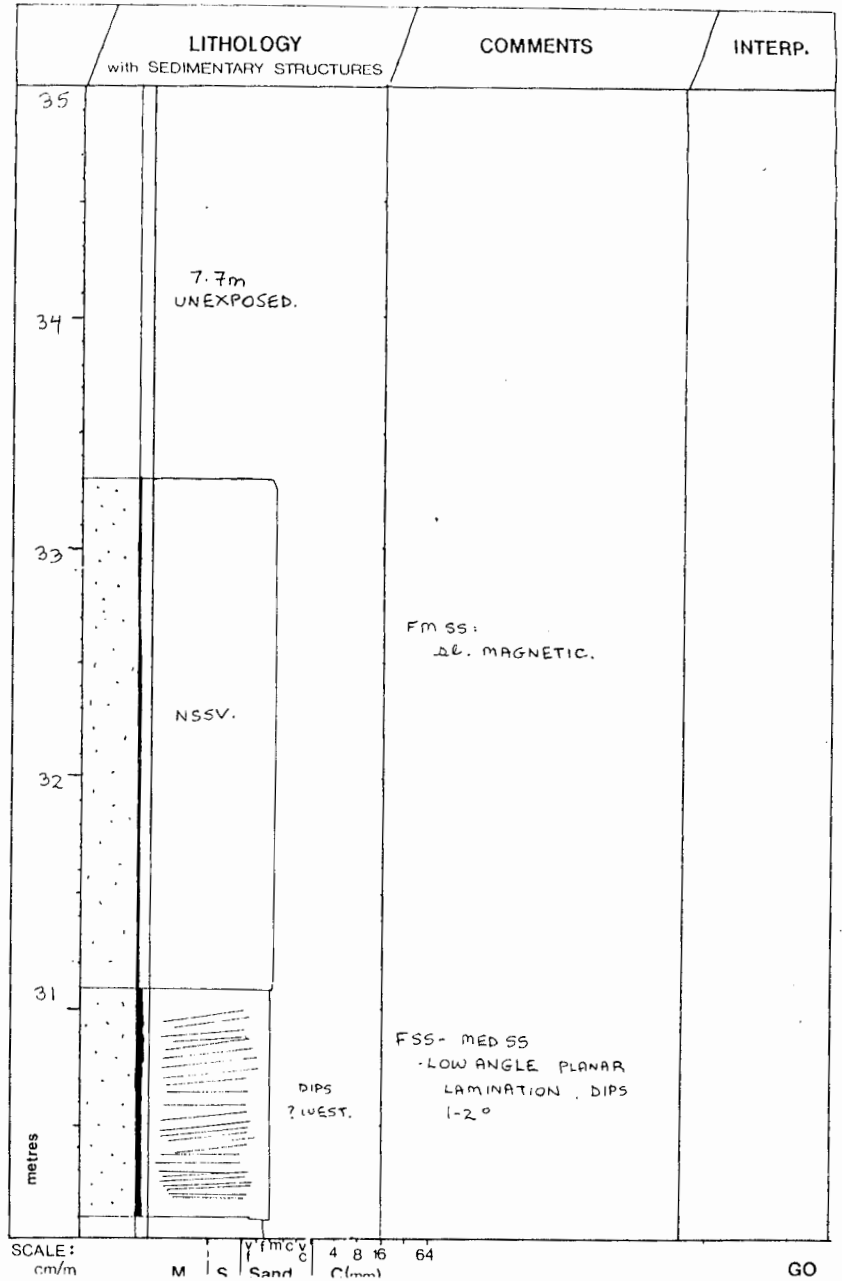
SECTION: J 1 LOCATION: RHYD DDLL.



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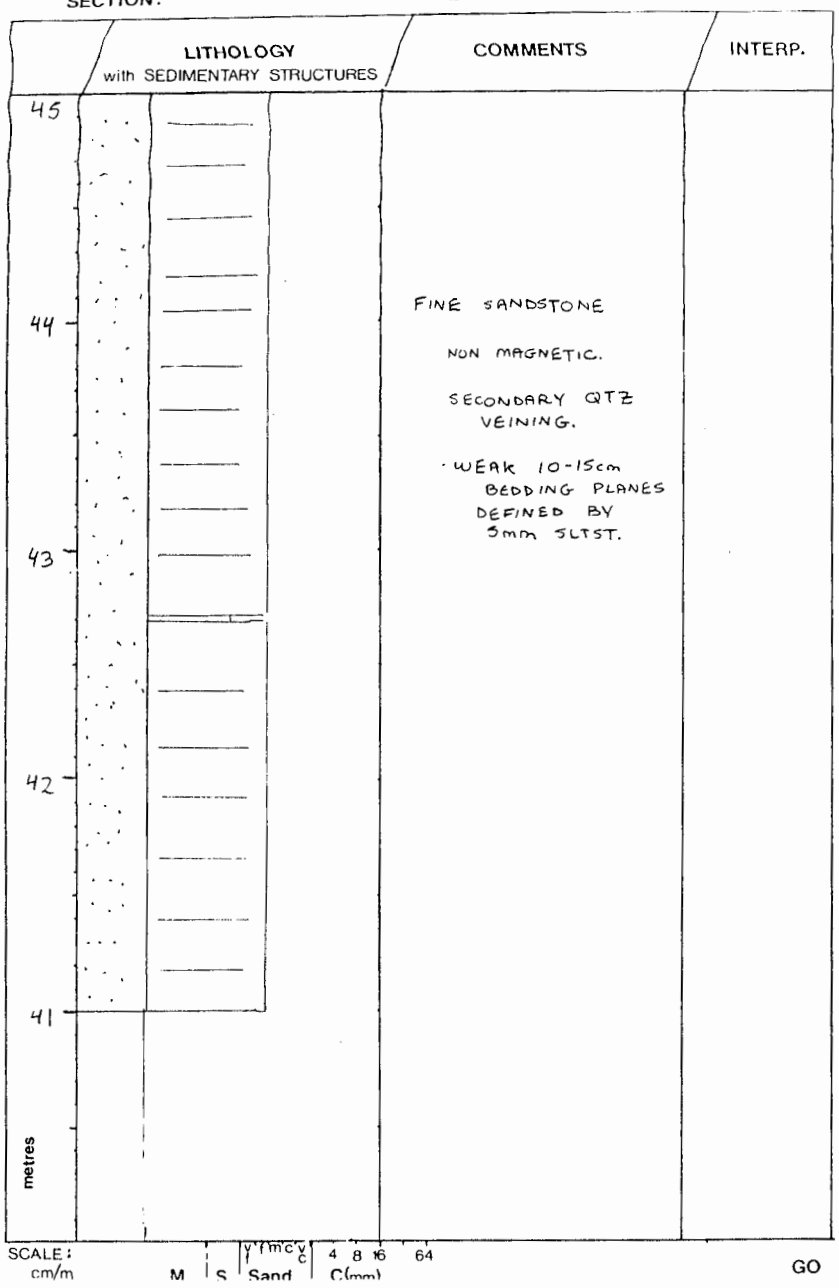
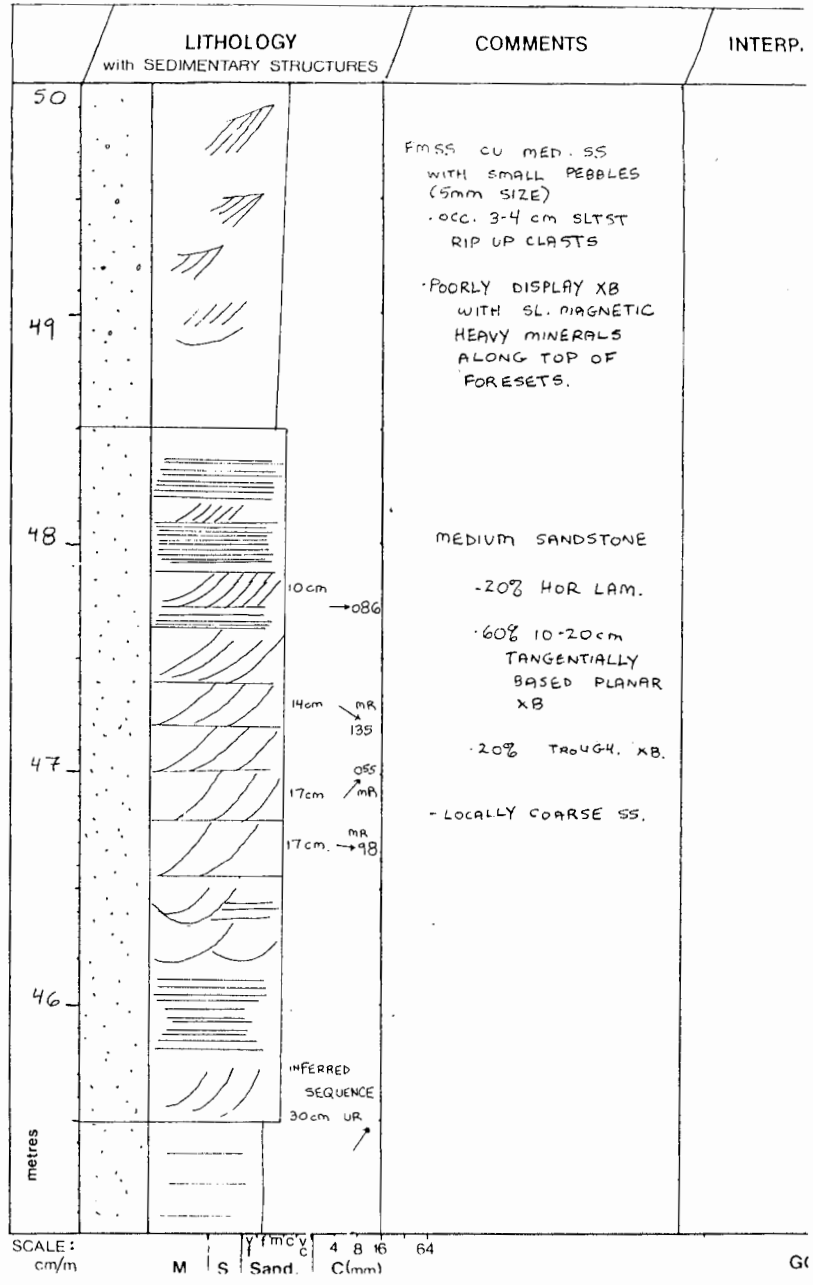
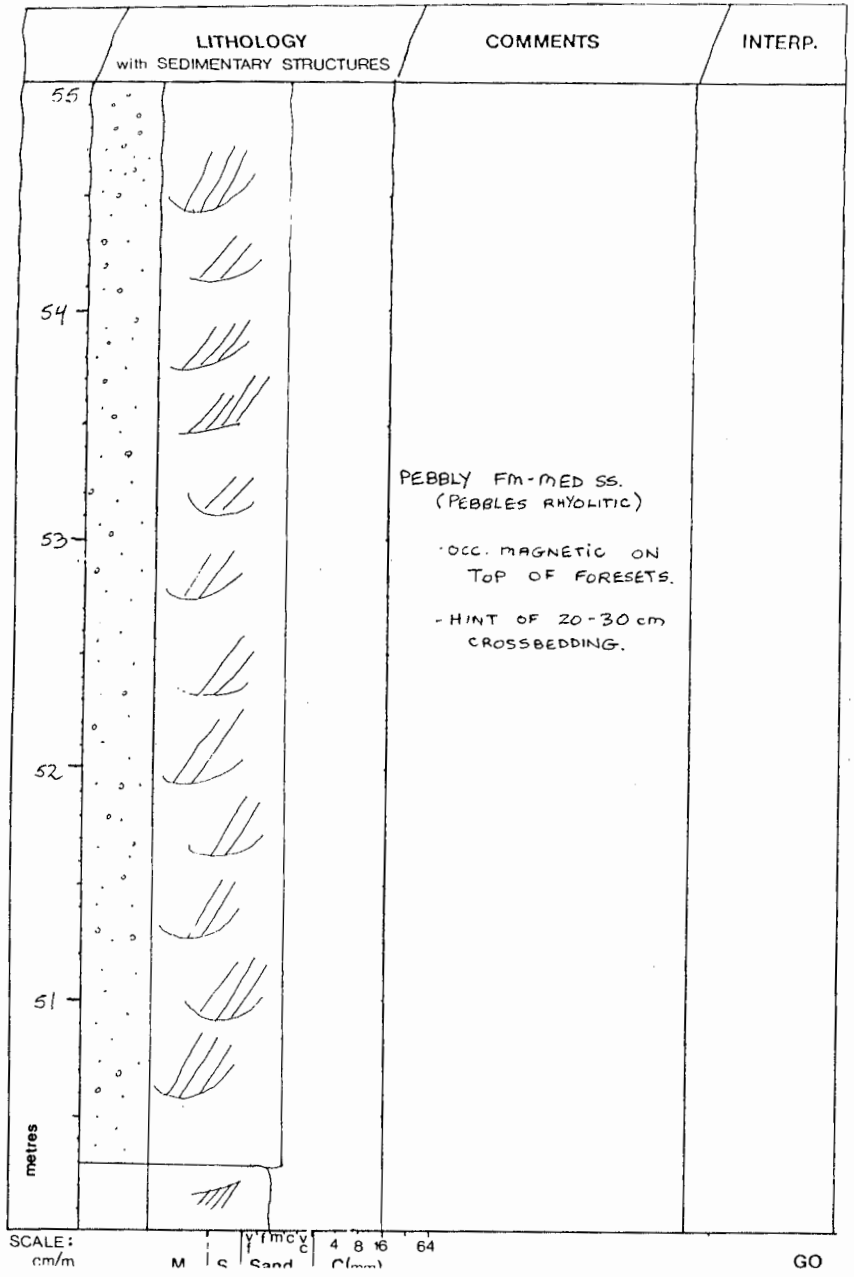
SECTION: J1 LOCATION: RHYD DDU



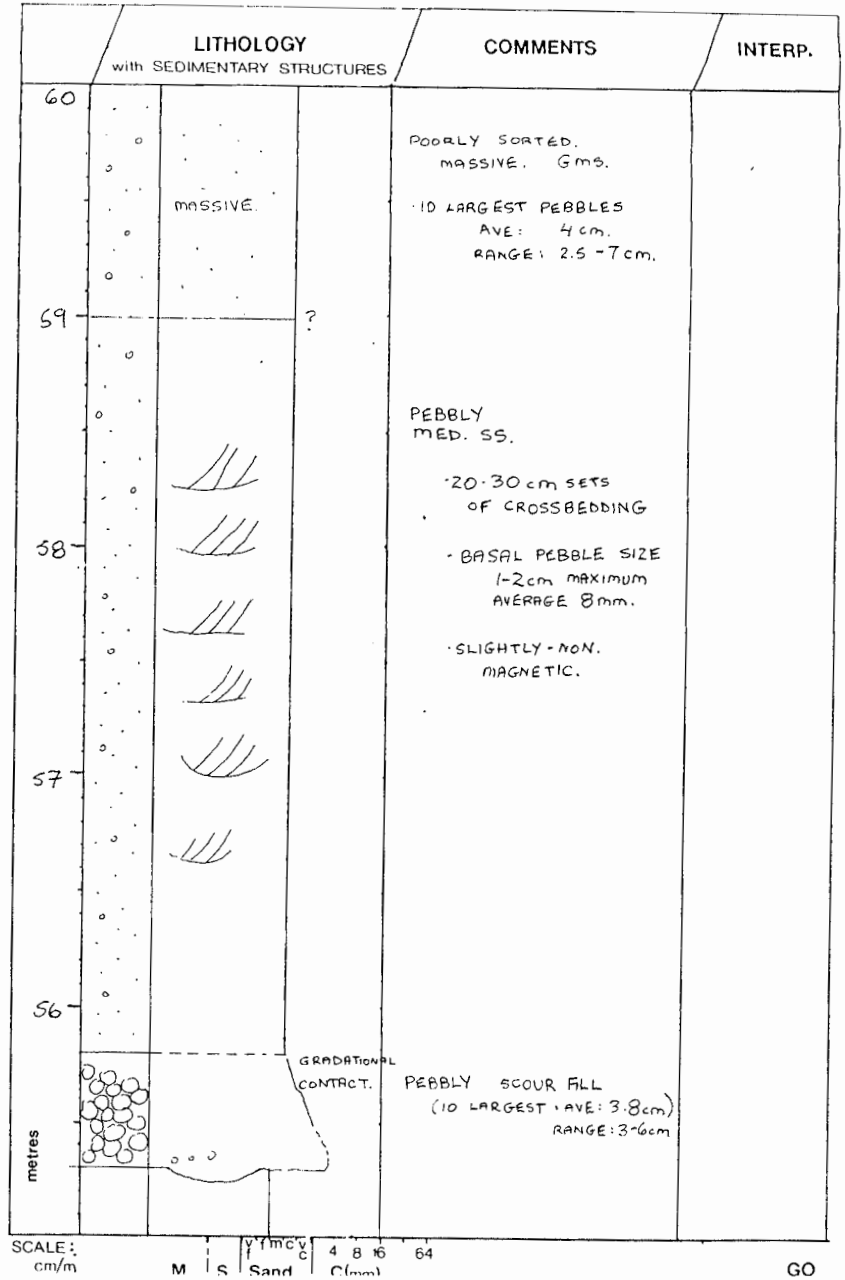
SECTION: J1. LOCATION: RHYD DDU



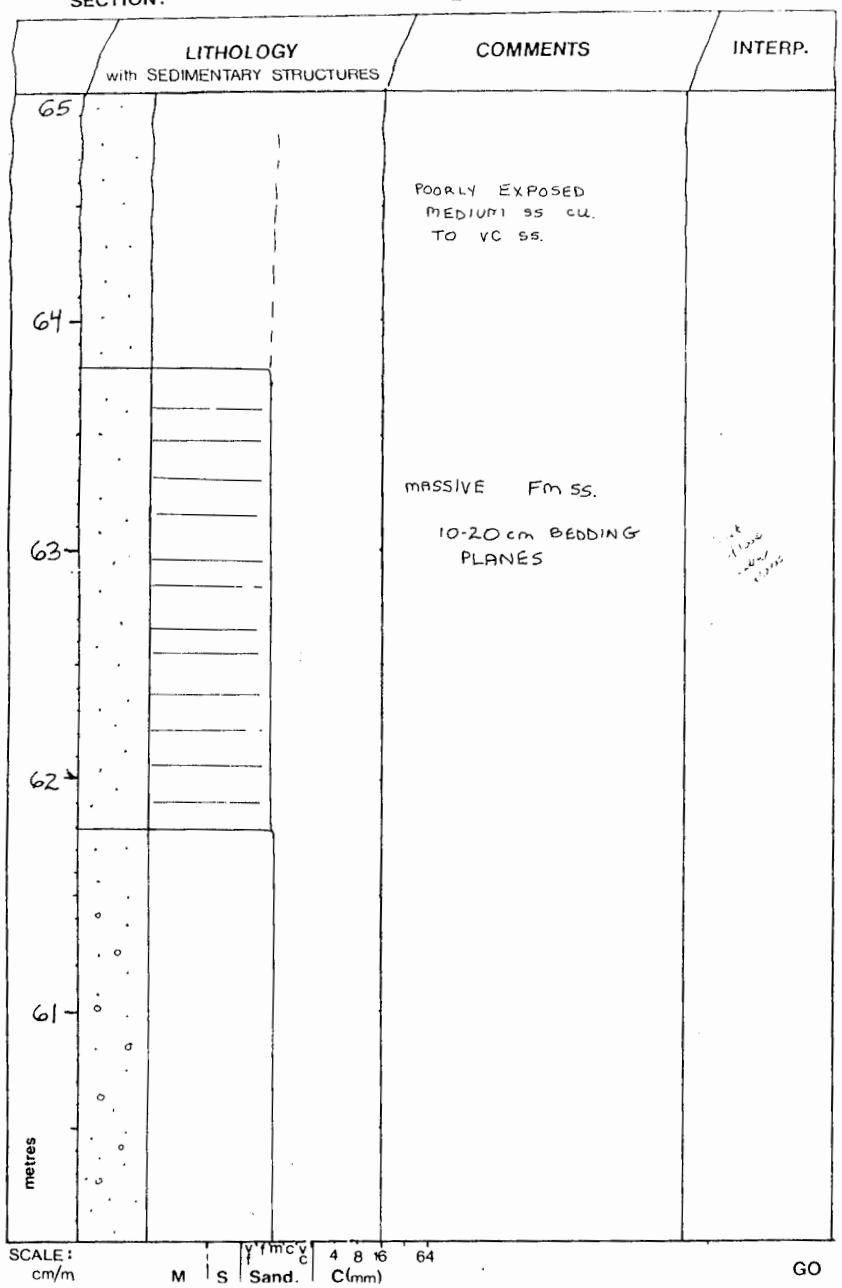
SECTION: J1 LOCATION: RHYD DDU.



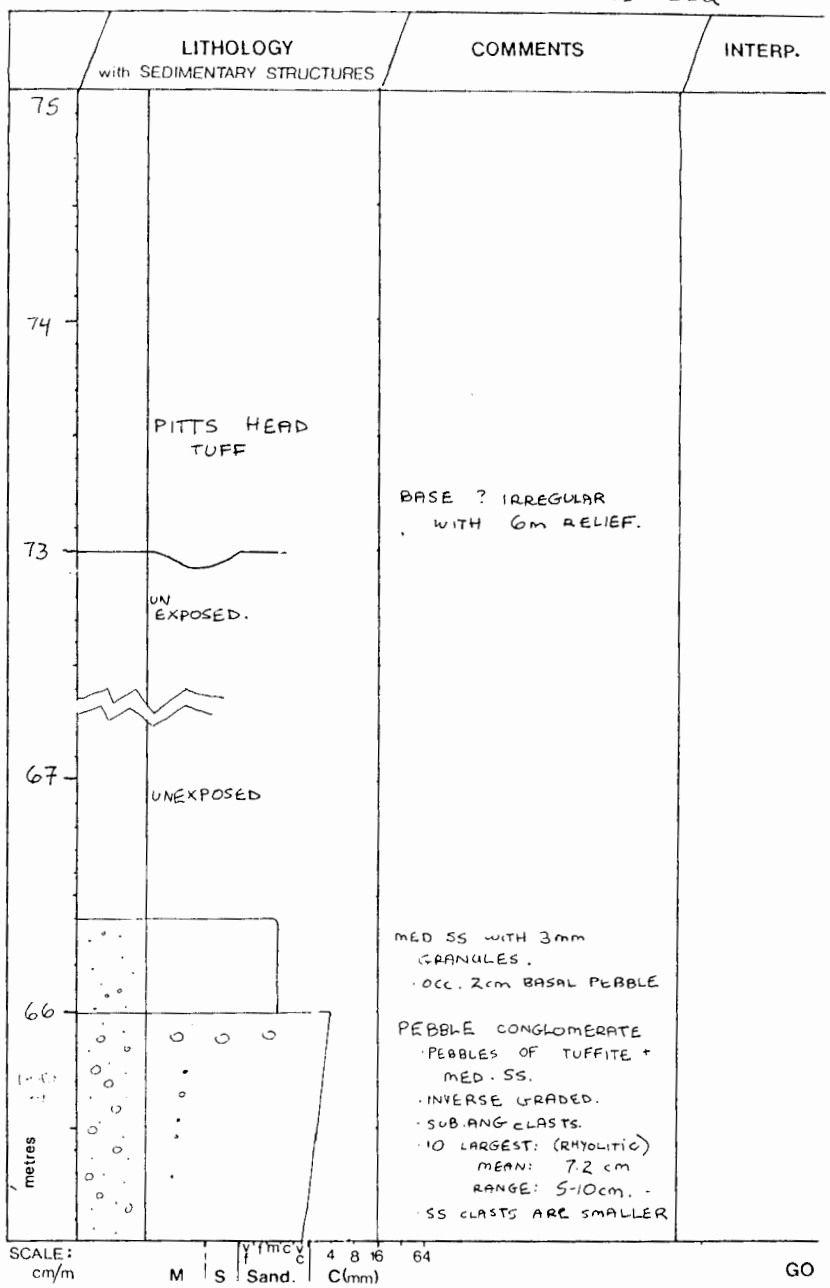
SECTION: J1 LOCATION: RHYD DDU



SECTION: J1 LOCATION: RHYD DDU.

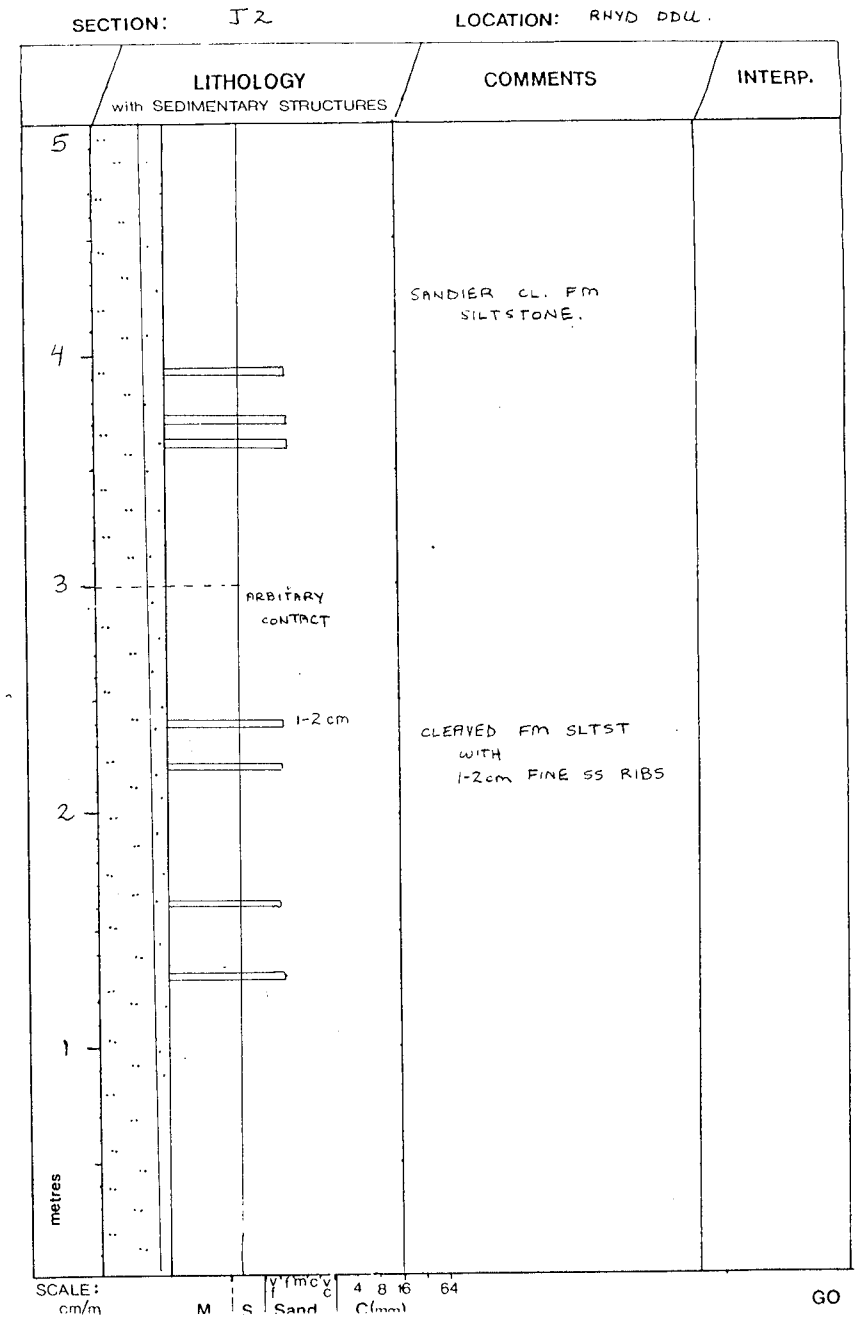


SECTION: J1. LOCATION: RHYD DDU

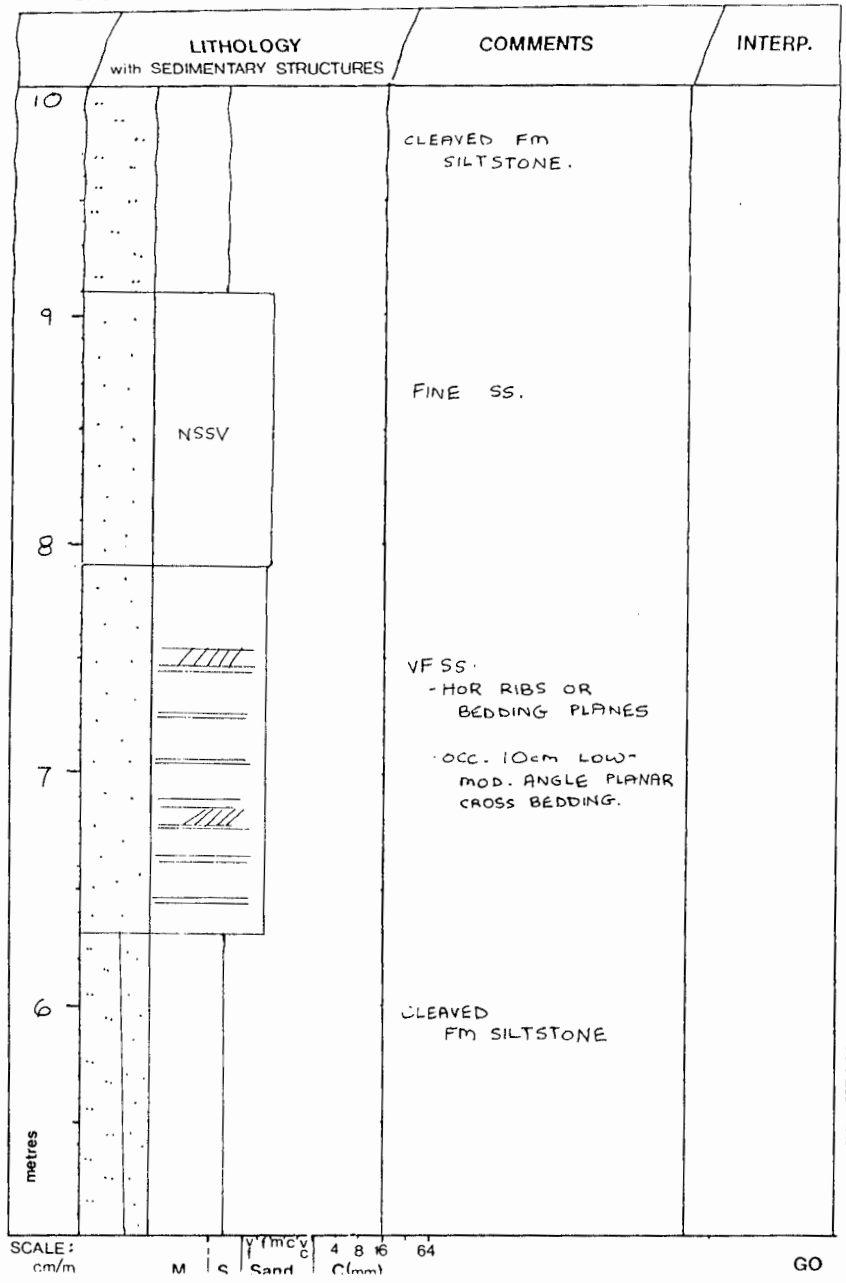


SECTION J2

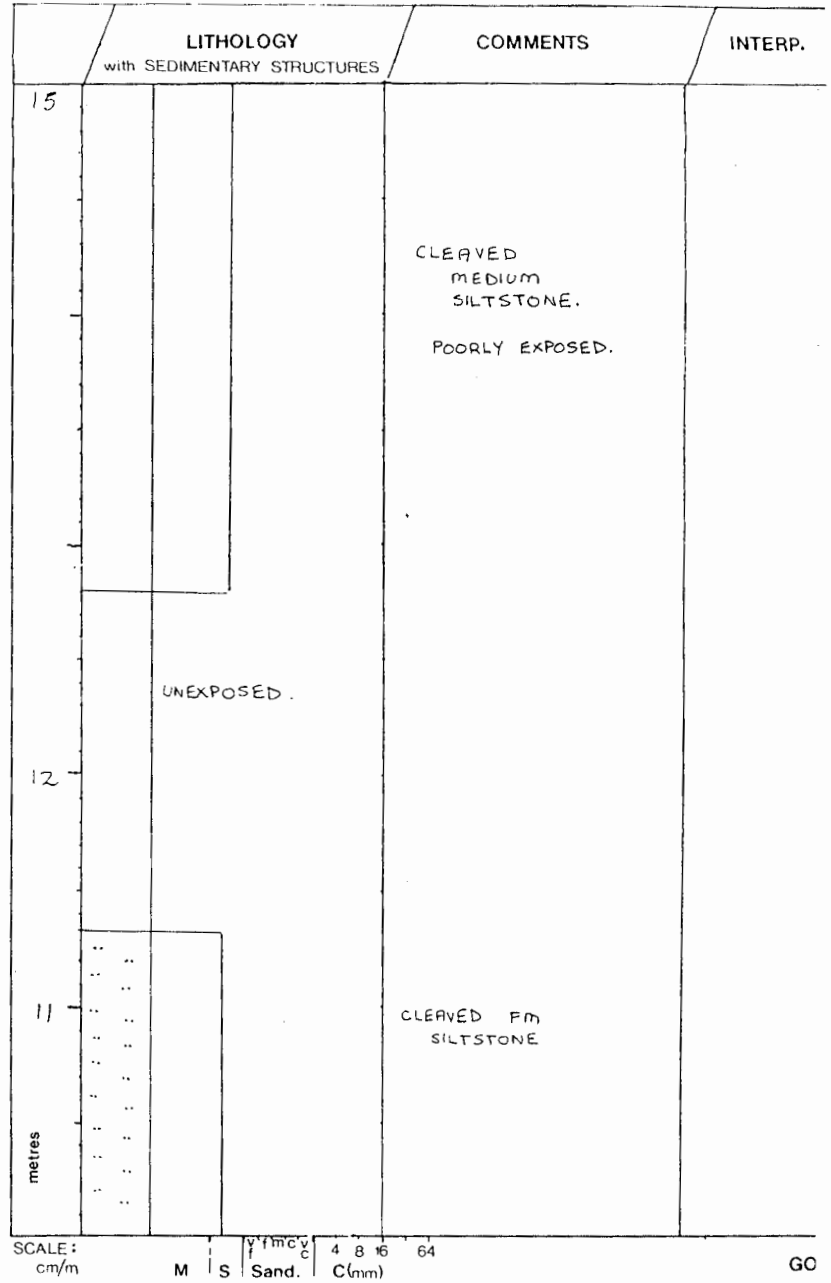
SECTION J2 LOCATION: Locate West Snowdon slate quarry (disused) 500 m to west of Bwlch Cwm Llan along foot path. Section starts ca. 100 m north of footpath and continues NNW to base of Pitts Head Tuff.



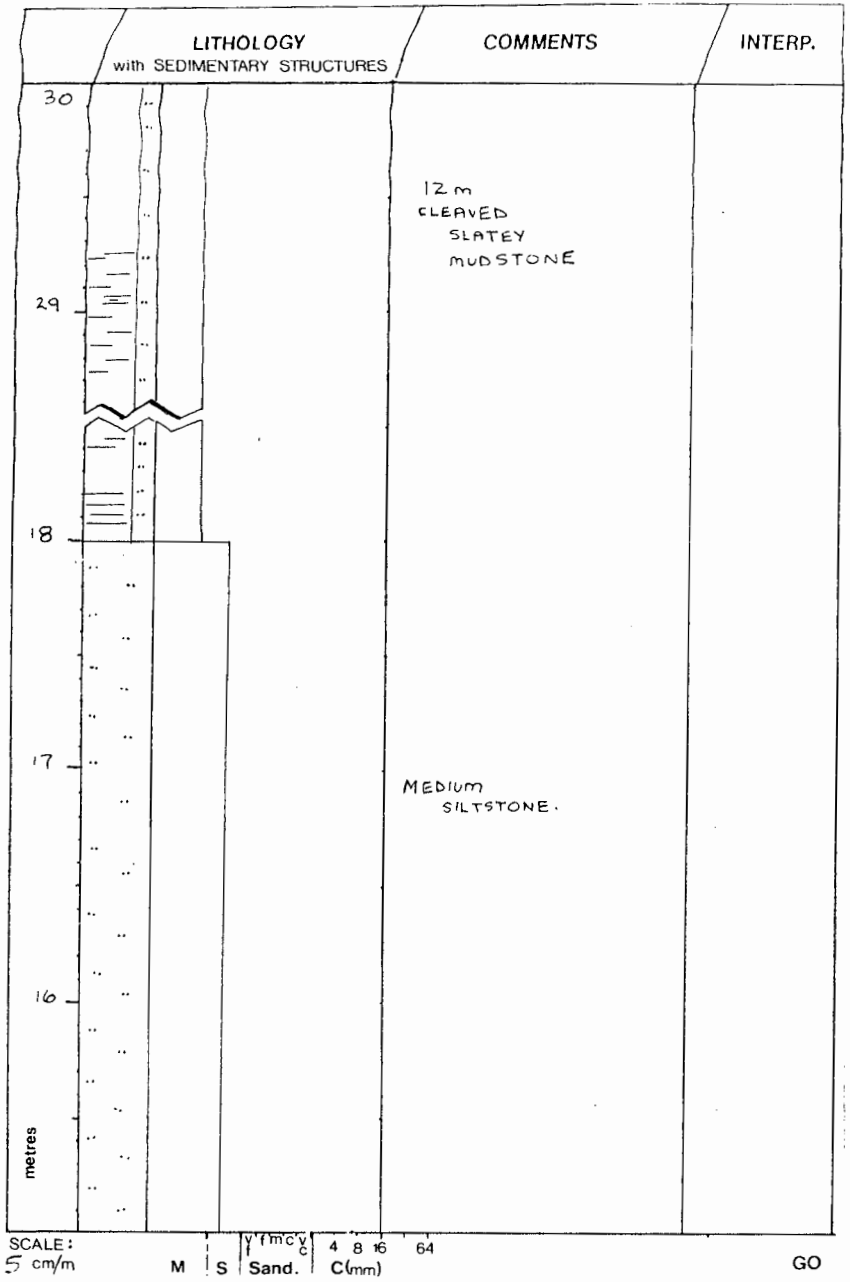
SECTION: J2 LOCATION: RHYD DDU



SECTION: J2 LOCATION: RHYD DDU.

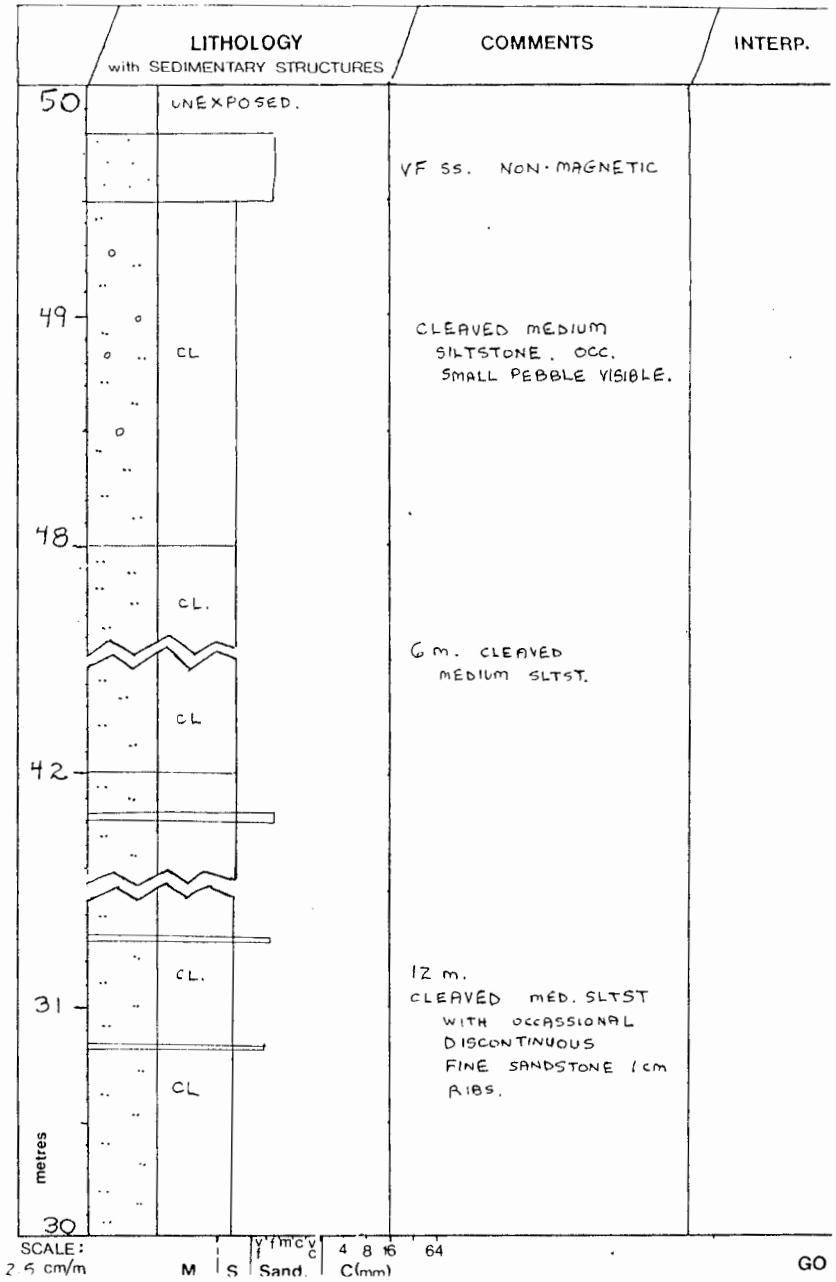


SECTION: J2 LOCATION: RHYD DDU

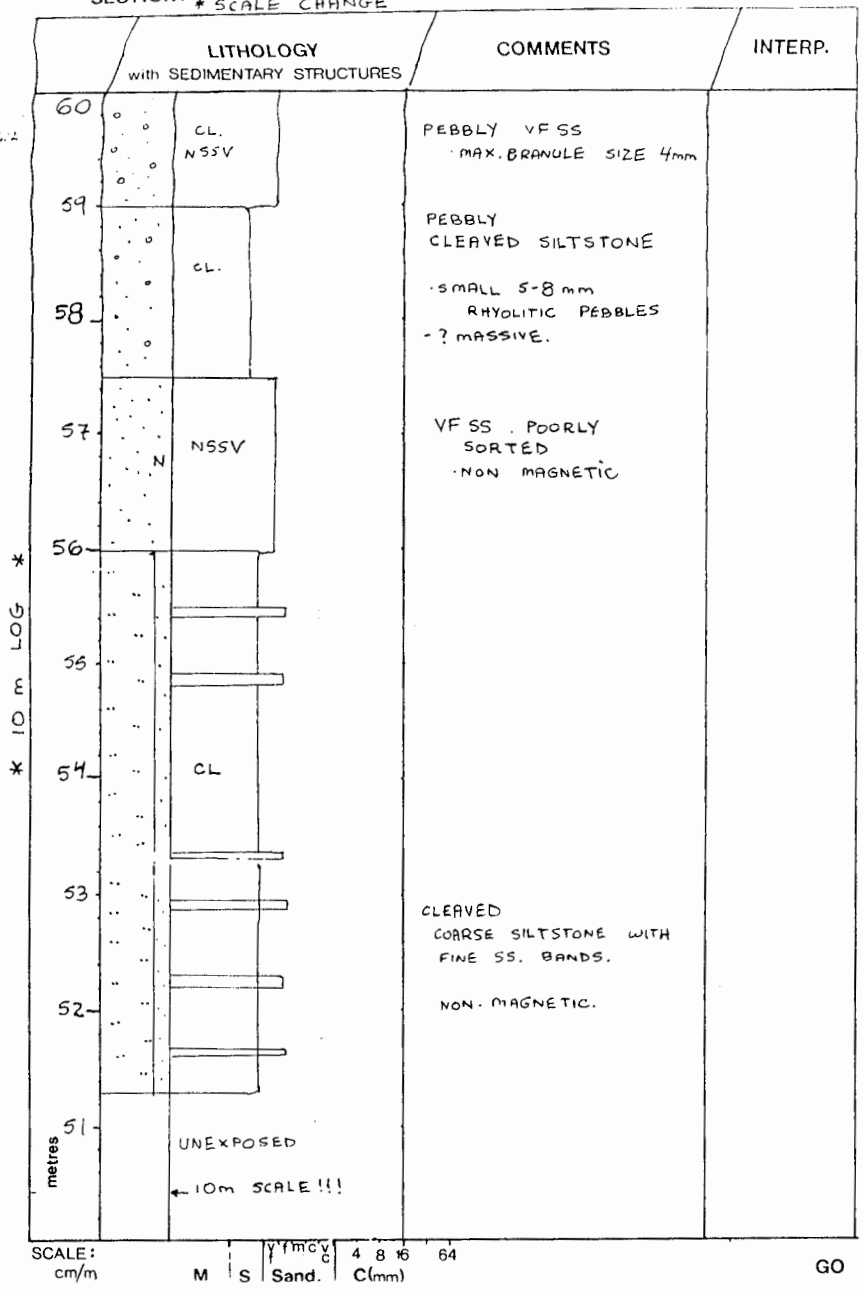


J21

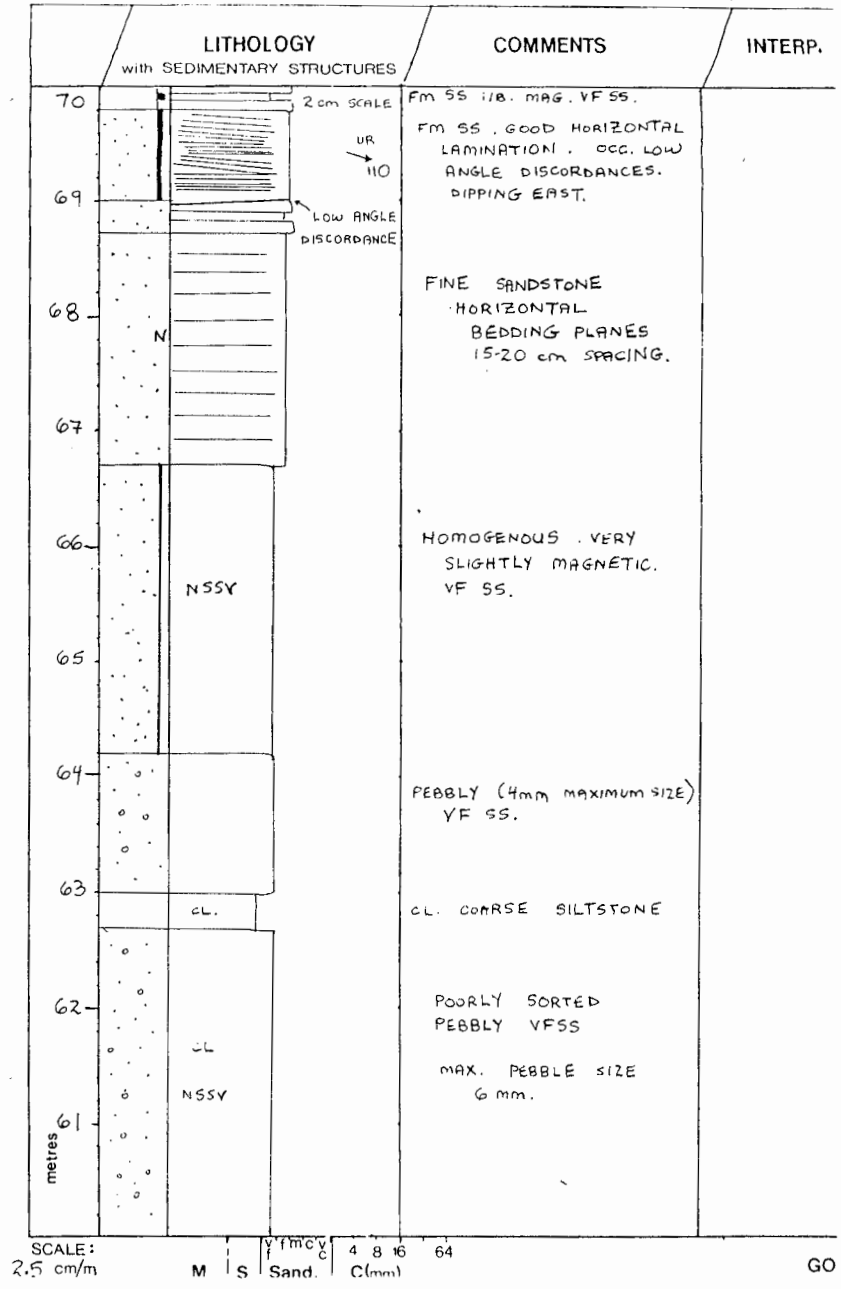
SECTION: J2 LOCATION: RHYD DDU.



SECTION: J2 * SCALE CHANGE LOCATION: RHYD DDU

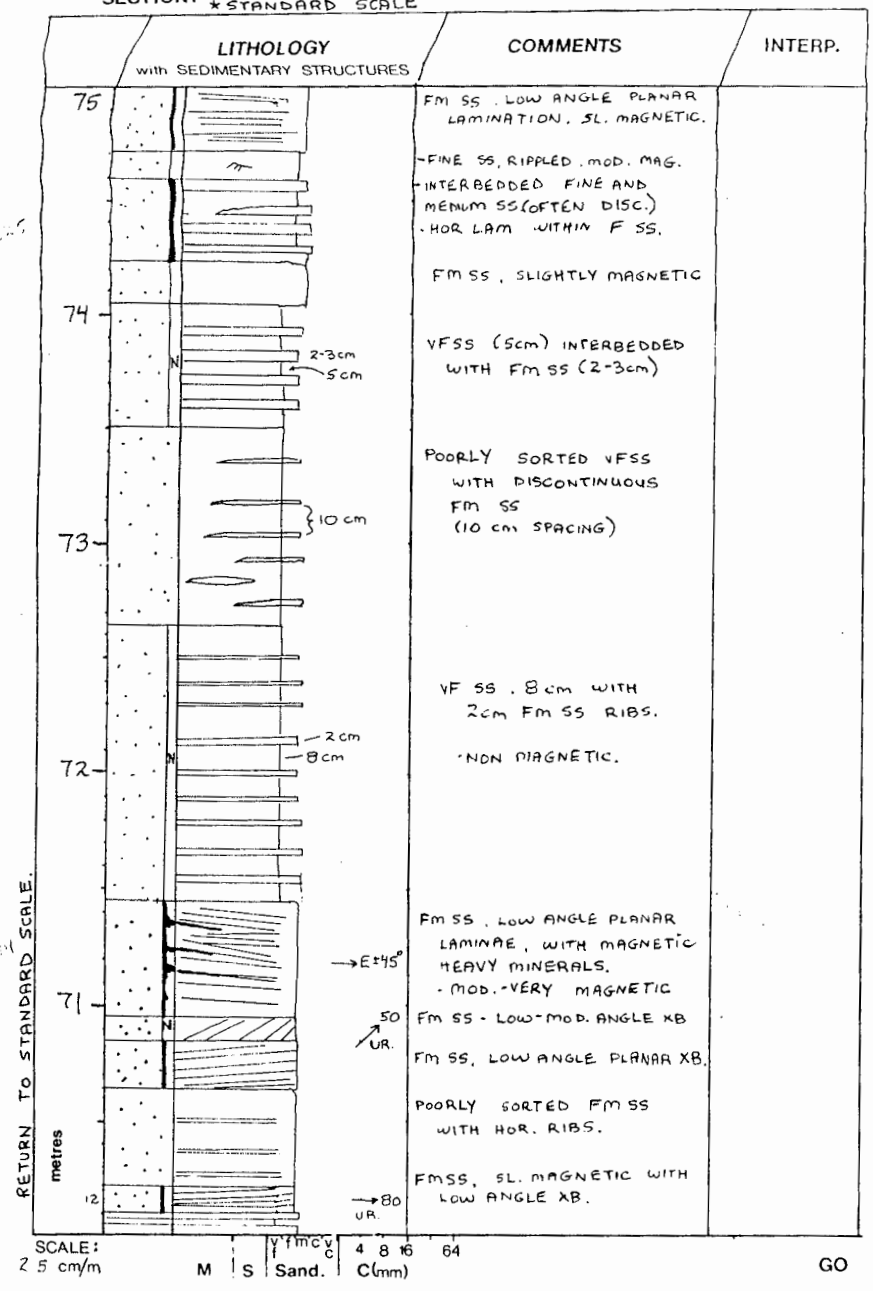


SECTION: J2 LOCATION: RHYD DDU



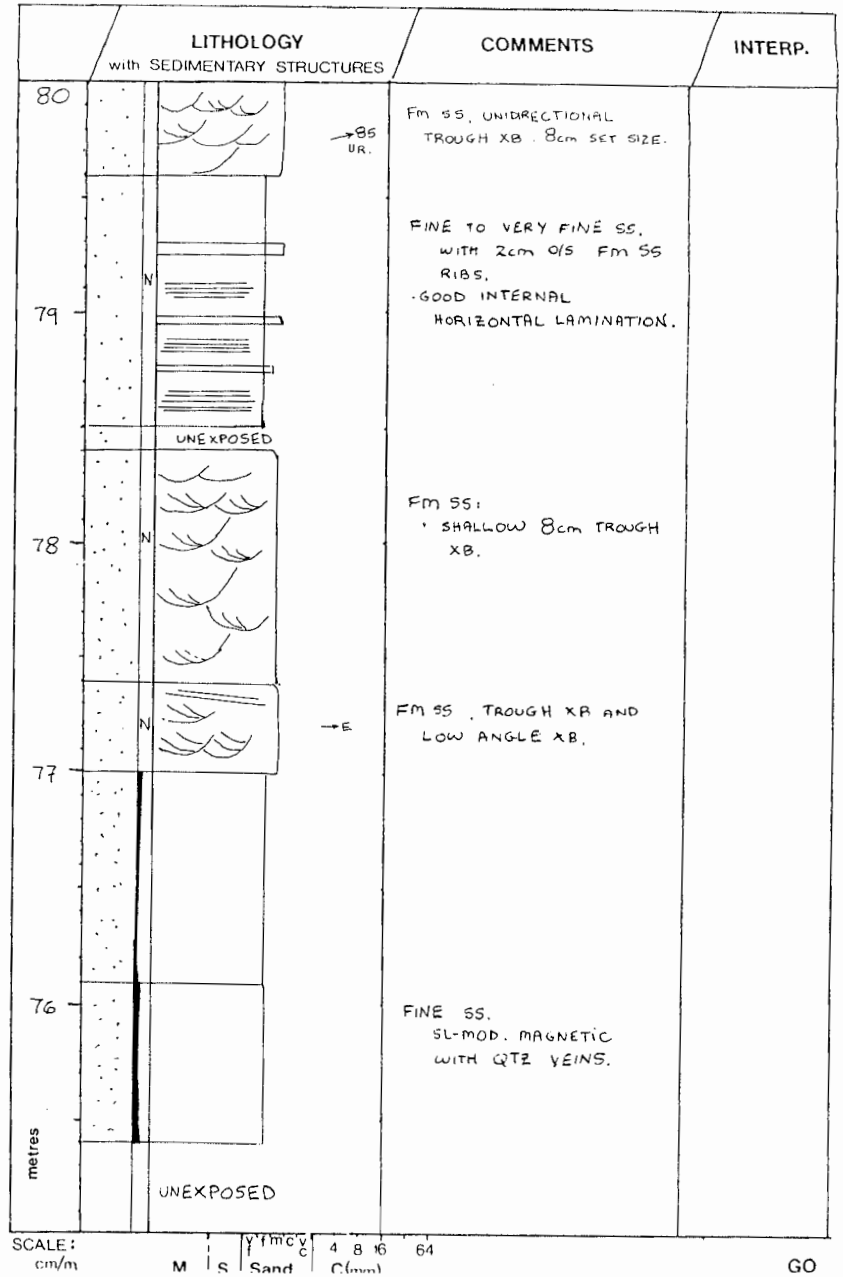
SECTION: J 2 LOCATION: KHYD DDU. (WATER)

*STANDARD SCALE

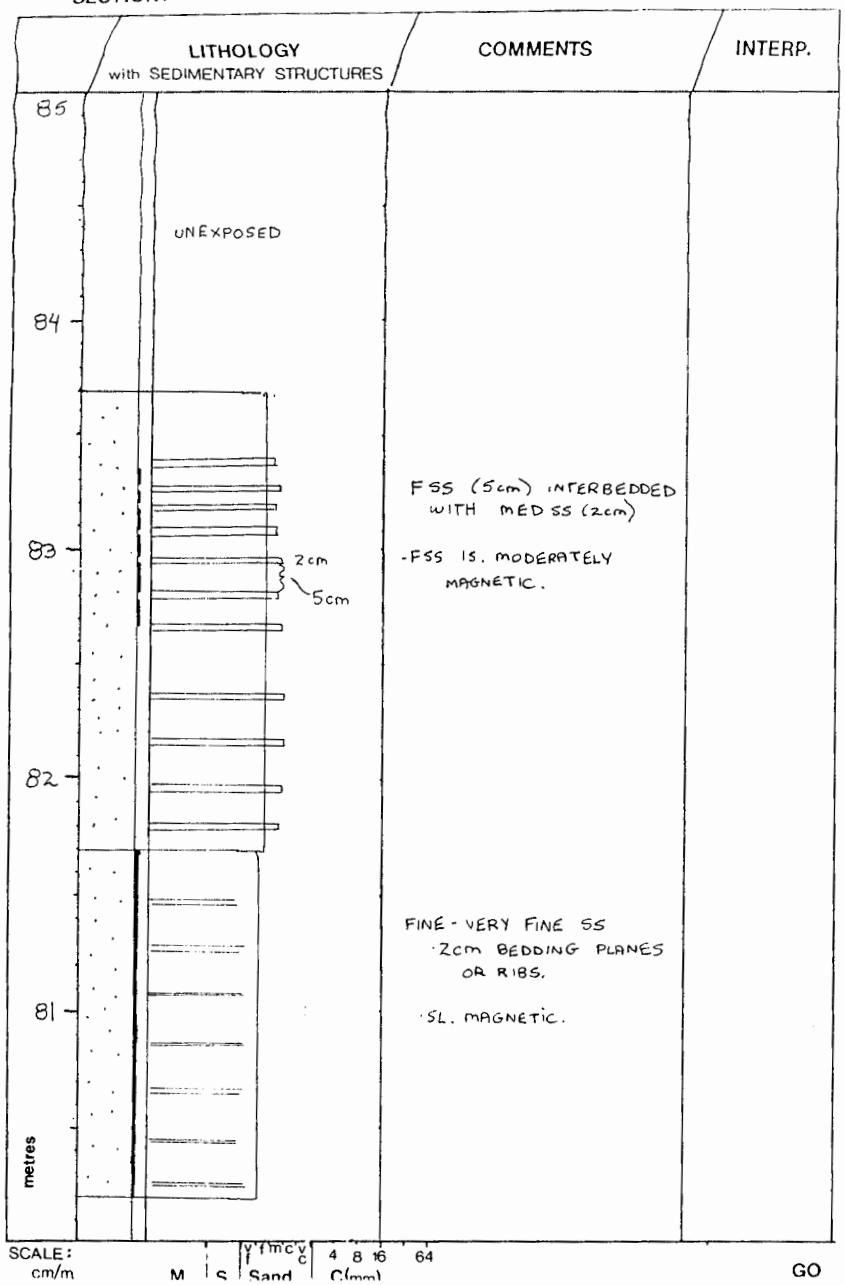


RETURN TO STANDARD SCALE.

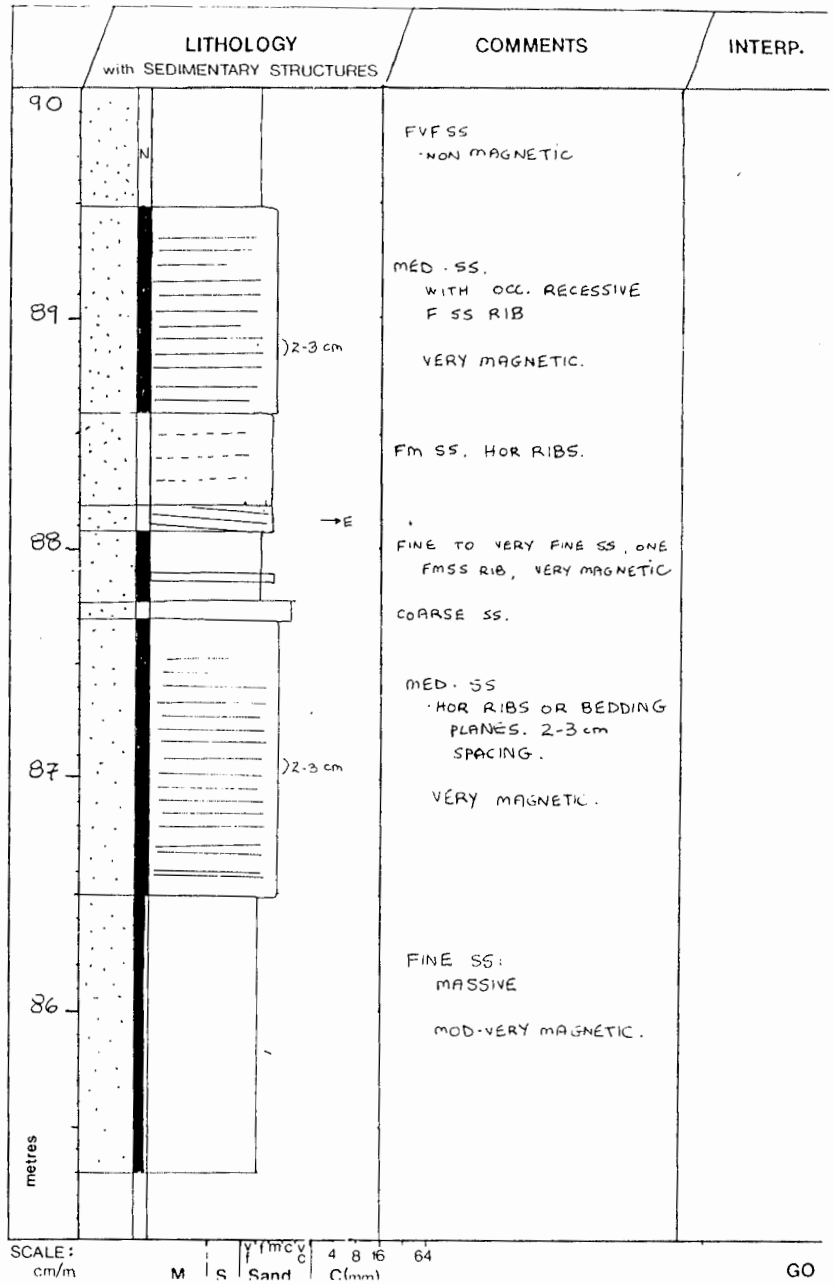
SECTION: J 2 LOCATION: KHYD DDU.



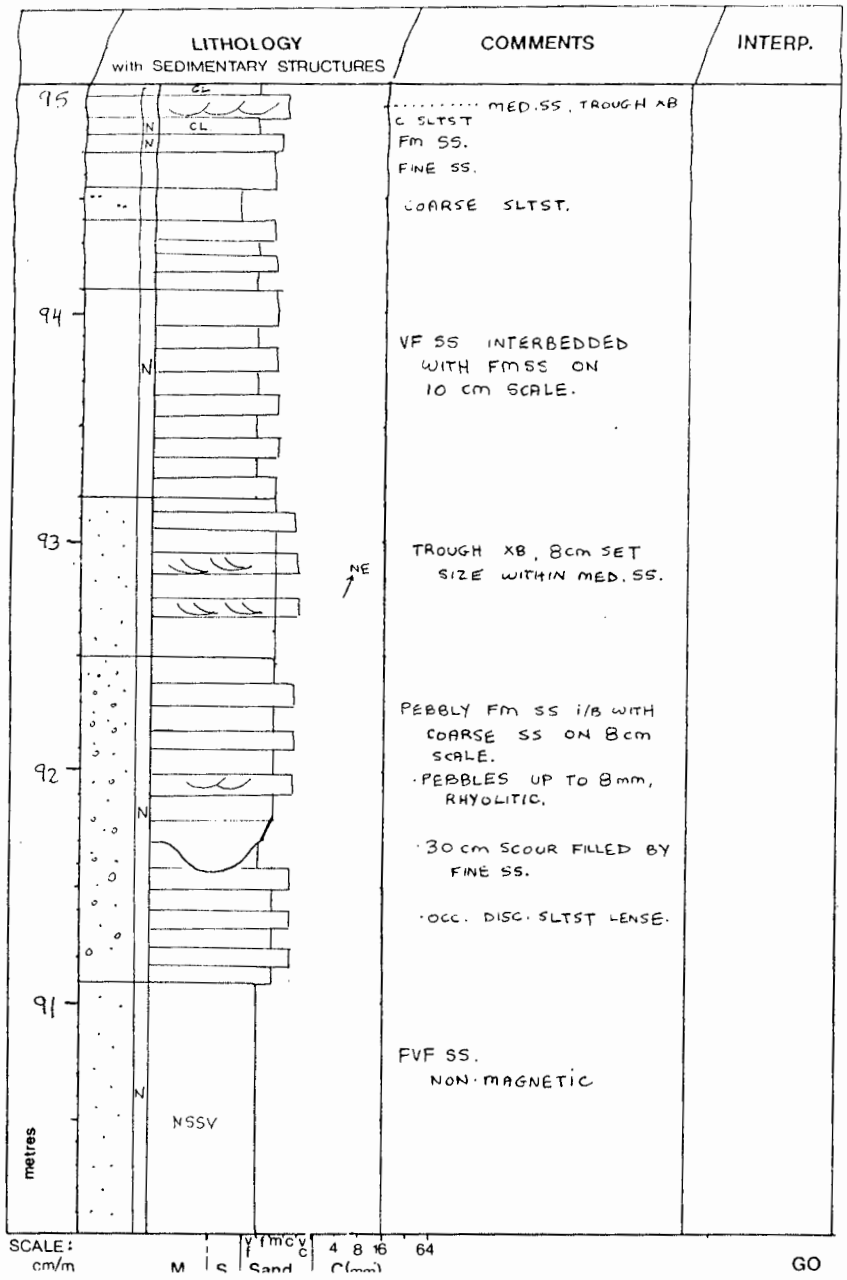
SECTION: J2 LOCATION: RHYD DDU.



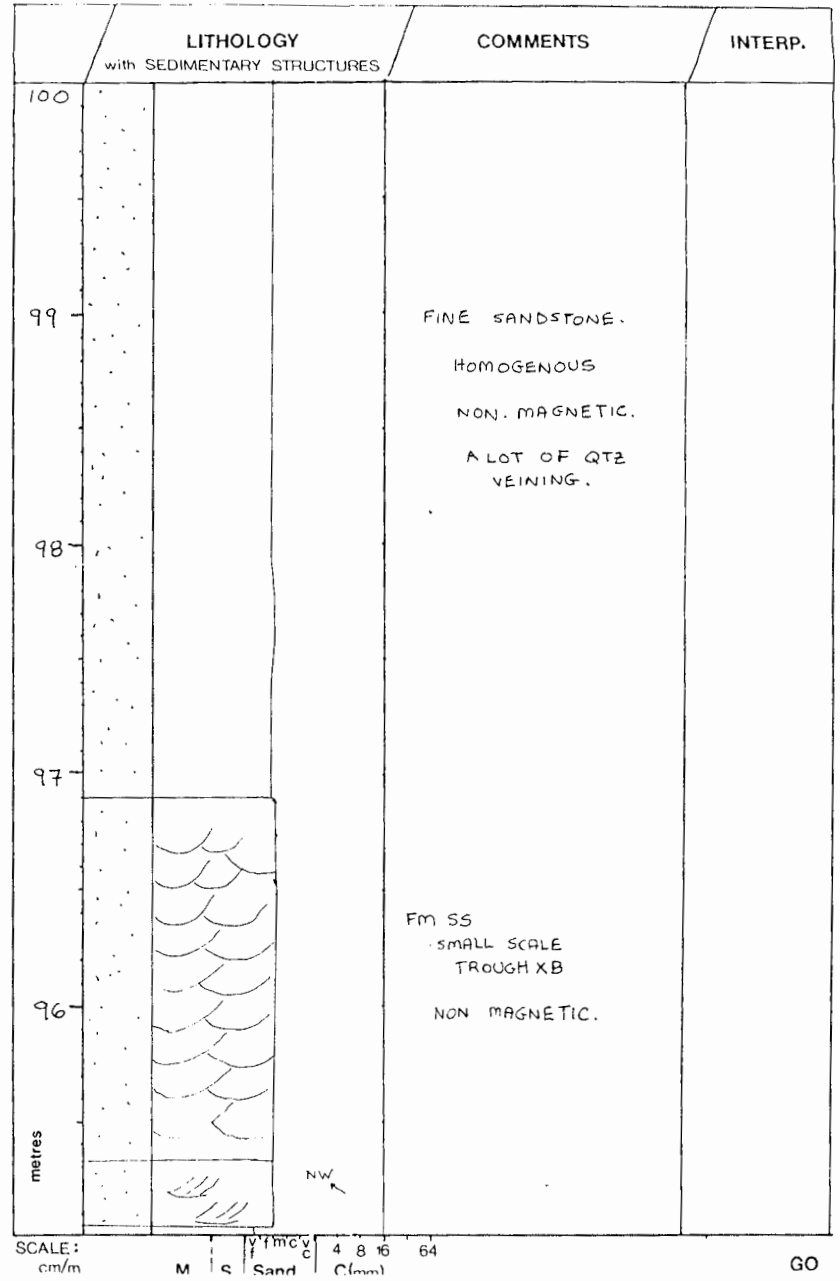
SECTION: J2 LOCATION: RHYD DDU.



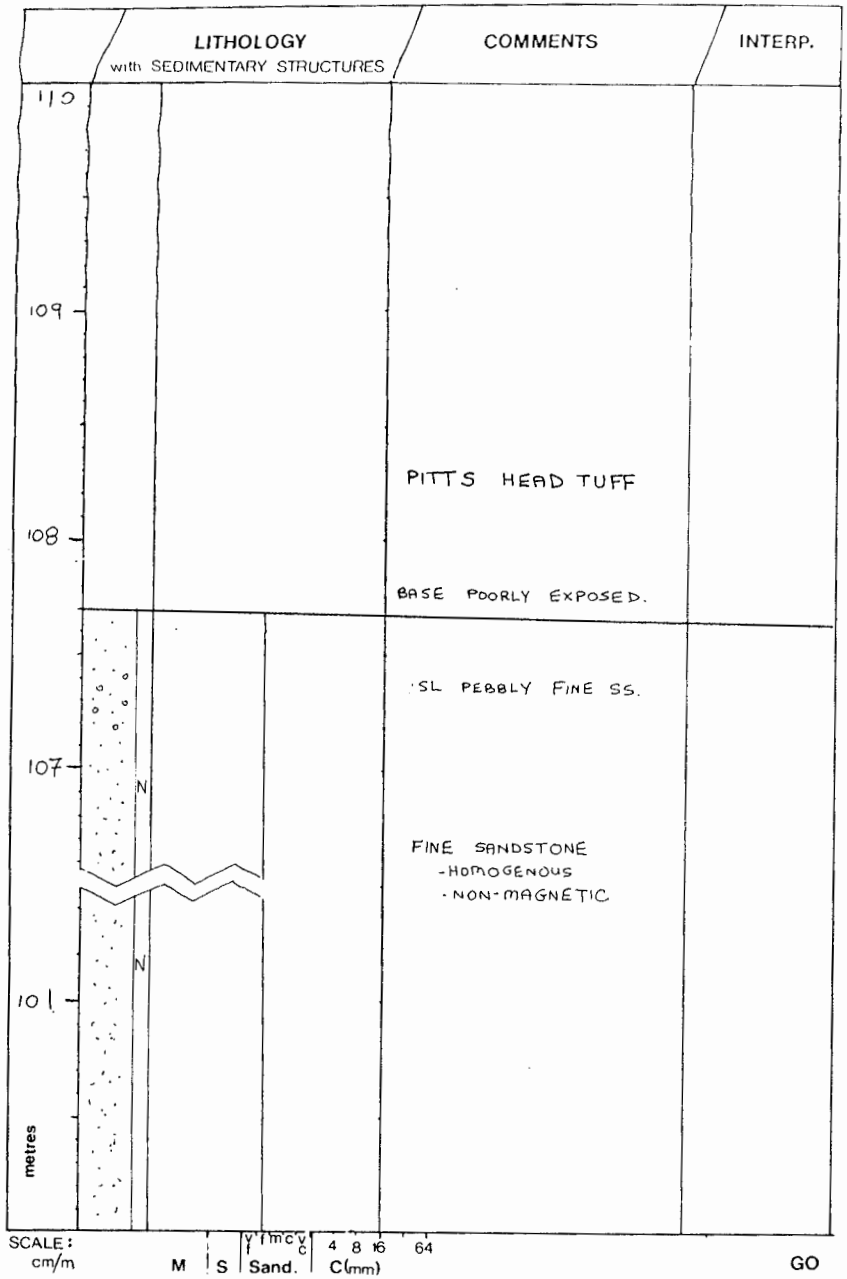
SECTION: J2 LOCATION: RHYD DDU



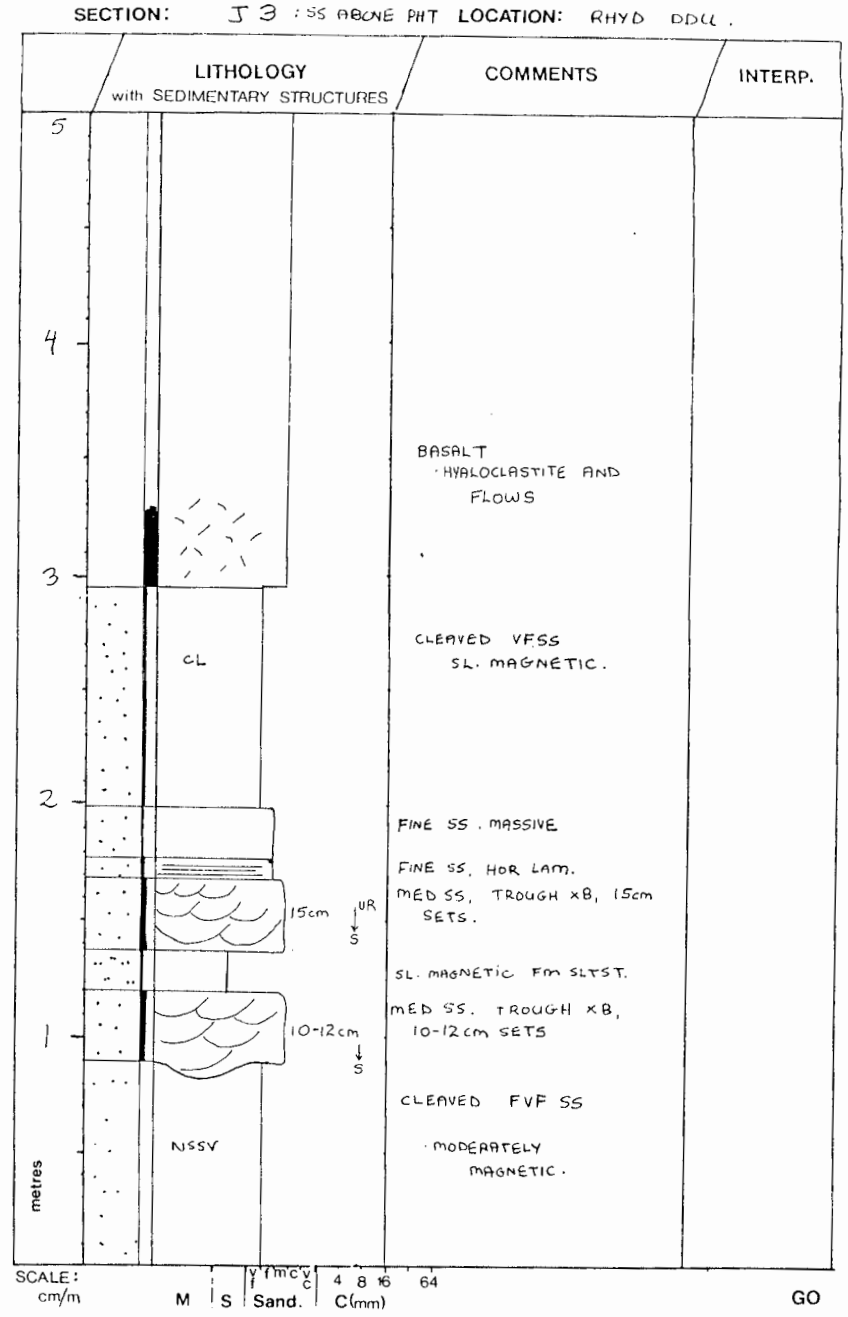
SECTION: J2 LOCATION: RHYD DDU



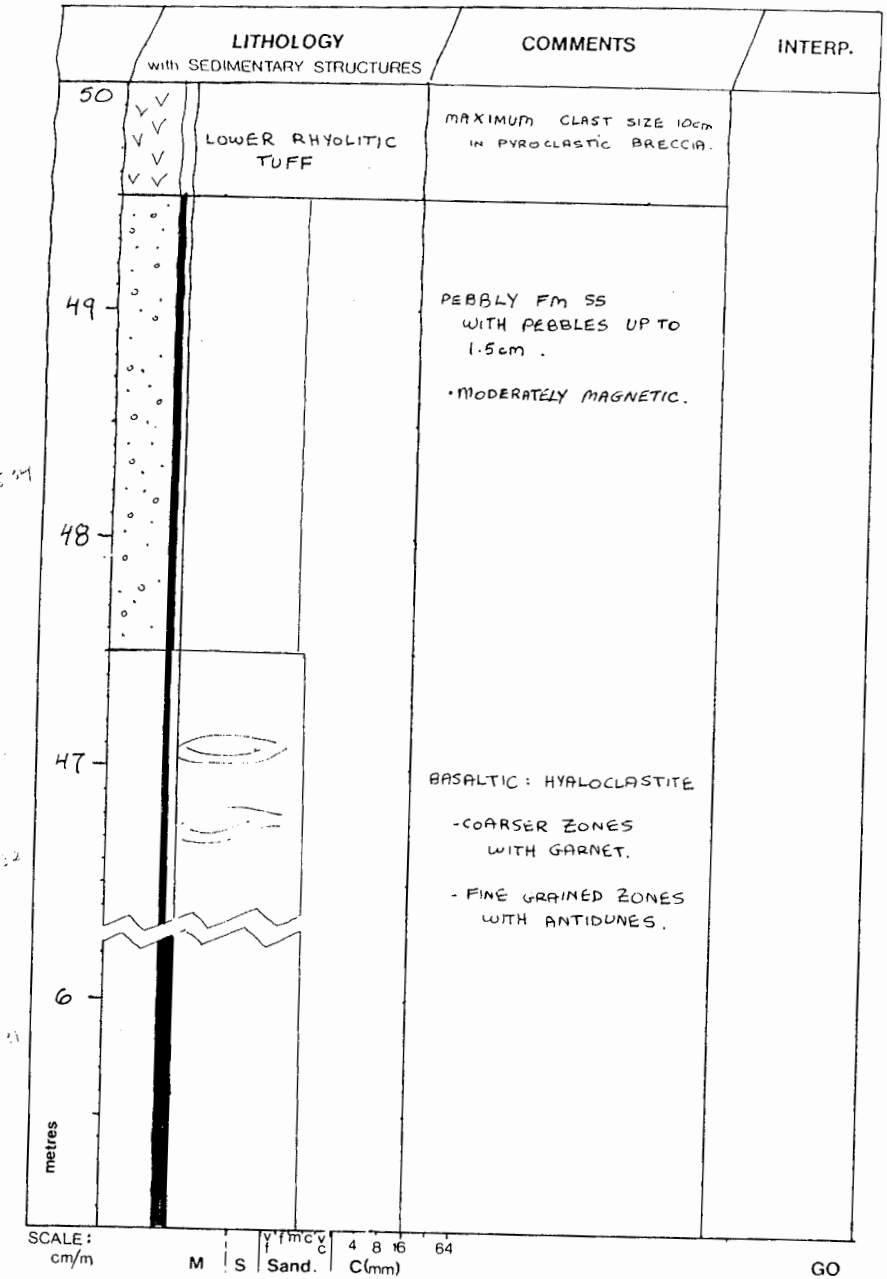
SECTION: 12 LOCATION: RIVER BLUFF



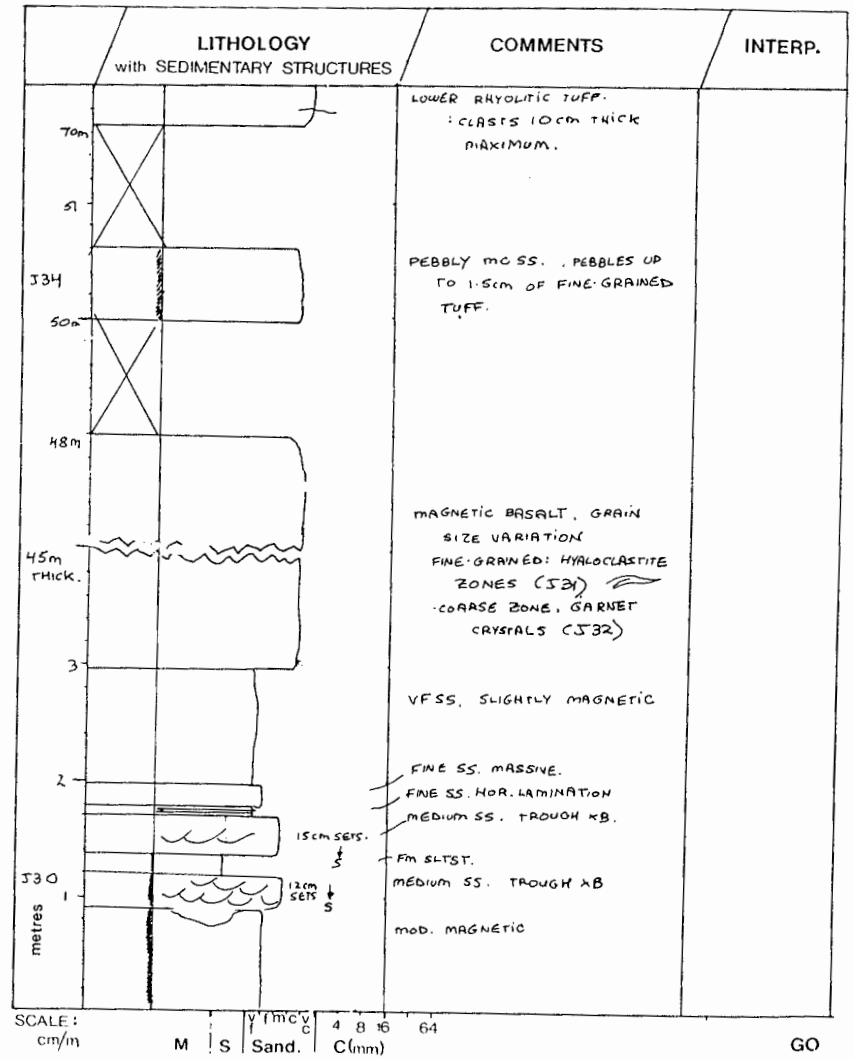
SECTION J3 to J4

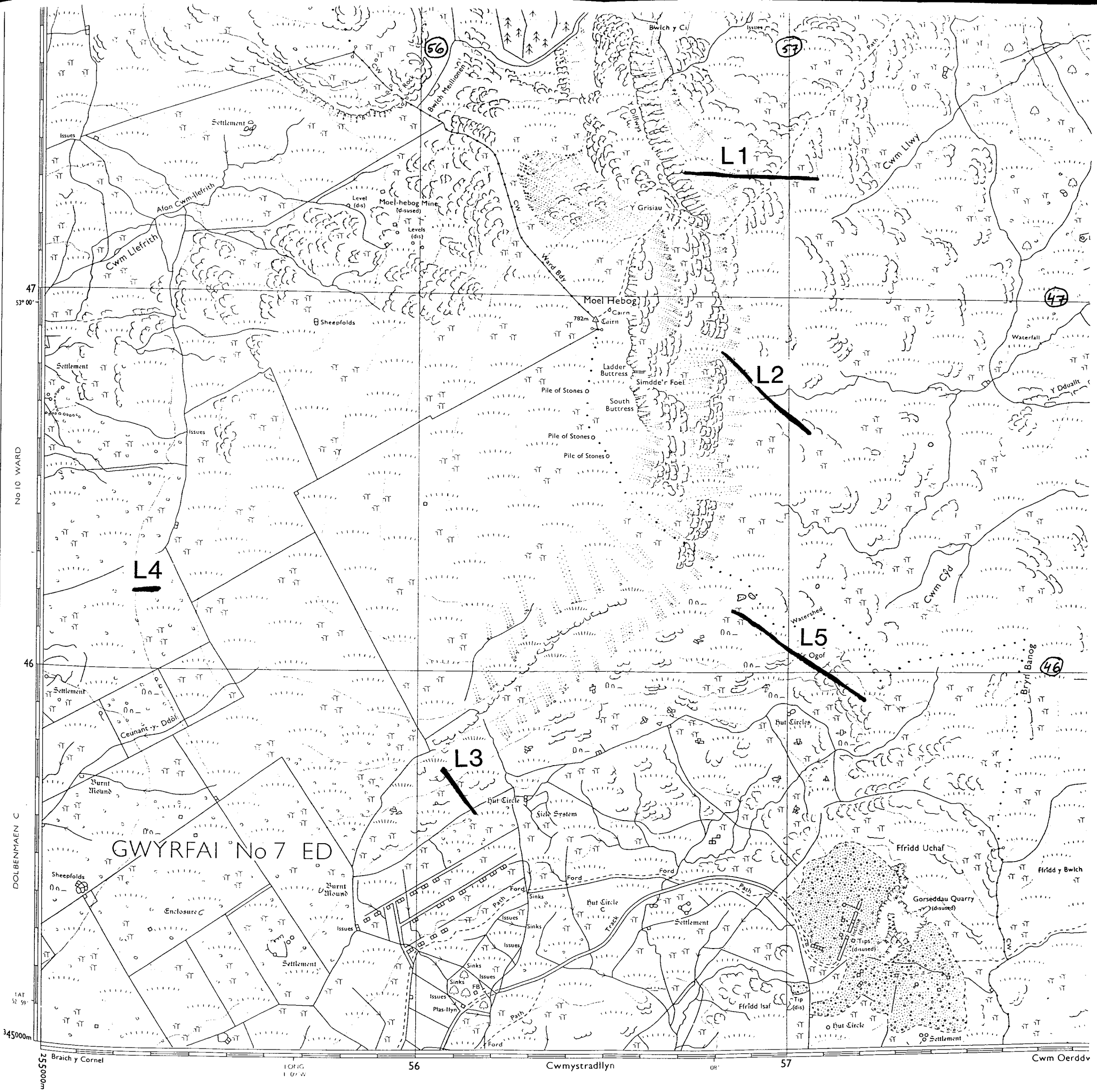


SECTION: J 3 LOCATION: RHYD DDU.



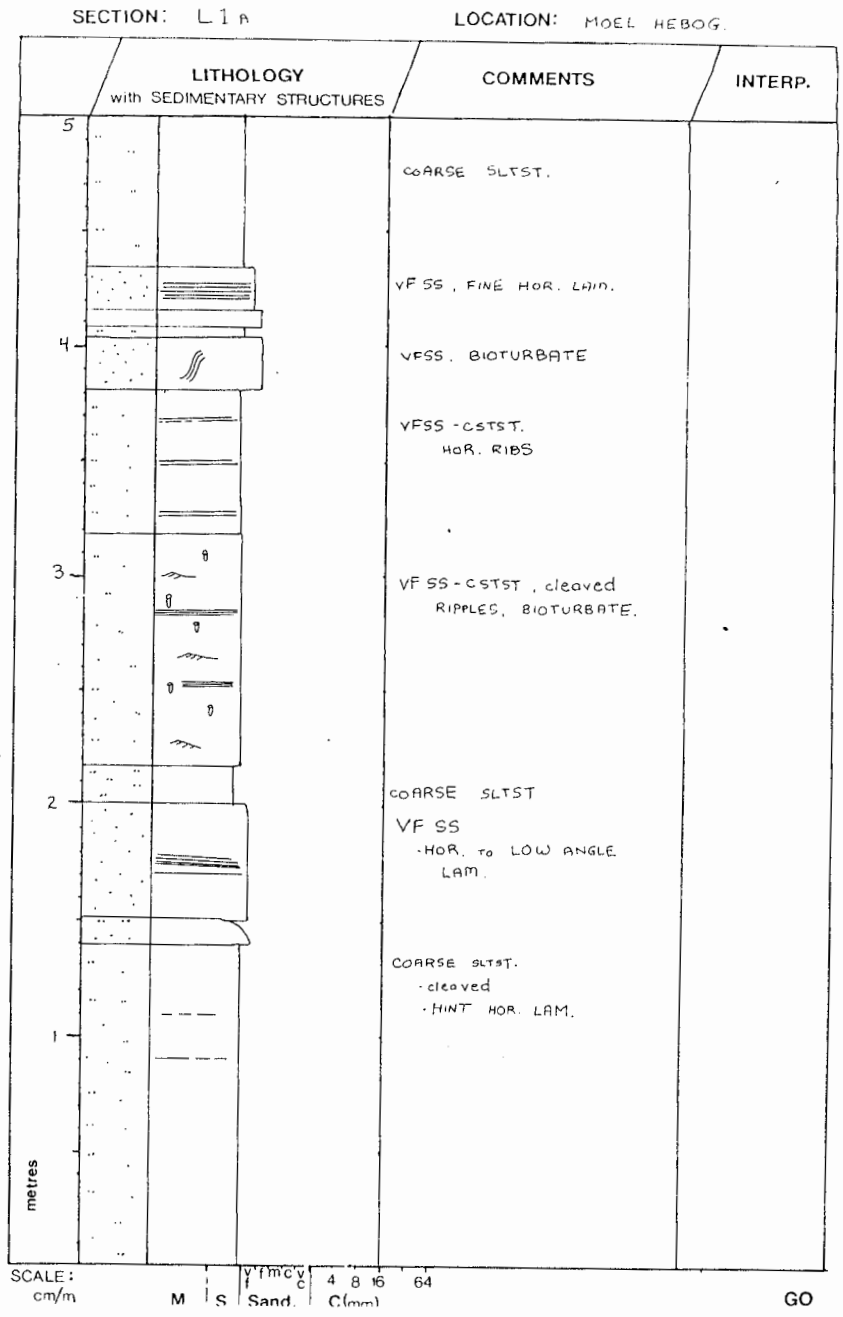
SECTION: J4 LOCATION: RHYD DDU.



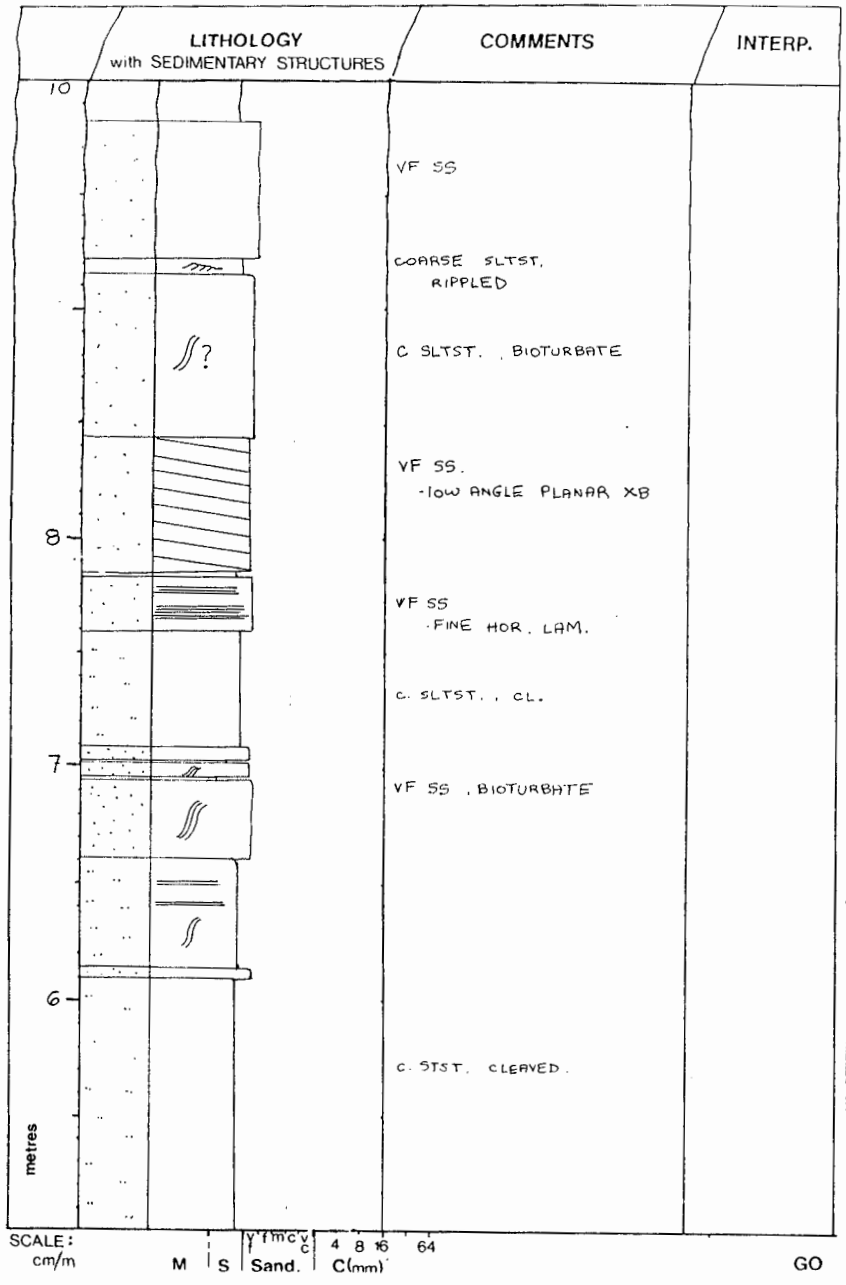

L1
L2
L3
L4
L5
GWYRFAI No 7 ED
No 10 WARD
DOLBENMAEN C
Moel Hebog
782m
Cairn
Moel-hebog Mine (disused)
Level (dis)
Levels (dis)
Afon Cwm-llefrith
Cwm Llefrith
Cwm Llwy
Ward Bdy
Bwlch y Ci
Bwlch Meillionen
Y Grisiau
Y Dillwys
Waterfall
Y Ddualit
Ladder Buttress
Simdde'r Foel
South Buttress
Pile of Stones
Sheepfolds
Settlement
Issues
Ceunant-y-Ddol
Burnt Mound
Enclosure C
Hut Circle
Field System
Hut Circles
Ffridd Uchaf
Ffridd y Bwlch
Ffridd Isaf
Gorseddau Quarry (disused)
Tips (disused)
Tip (dis)
Ford
Path
Track
Sinks
FB
Plas-llyn
Watershed
Y Ogof
Bryn Banog
Cwm Cyd
Braich y Cornel
Cwmystradllyn
Cwm Oerddv
47
46
56
57
53° 00'
345000m
255000m

SECTION L1

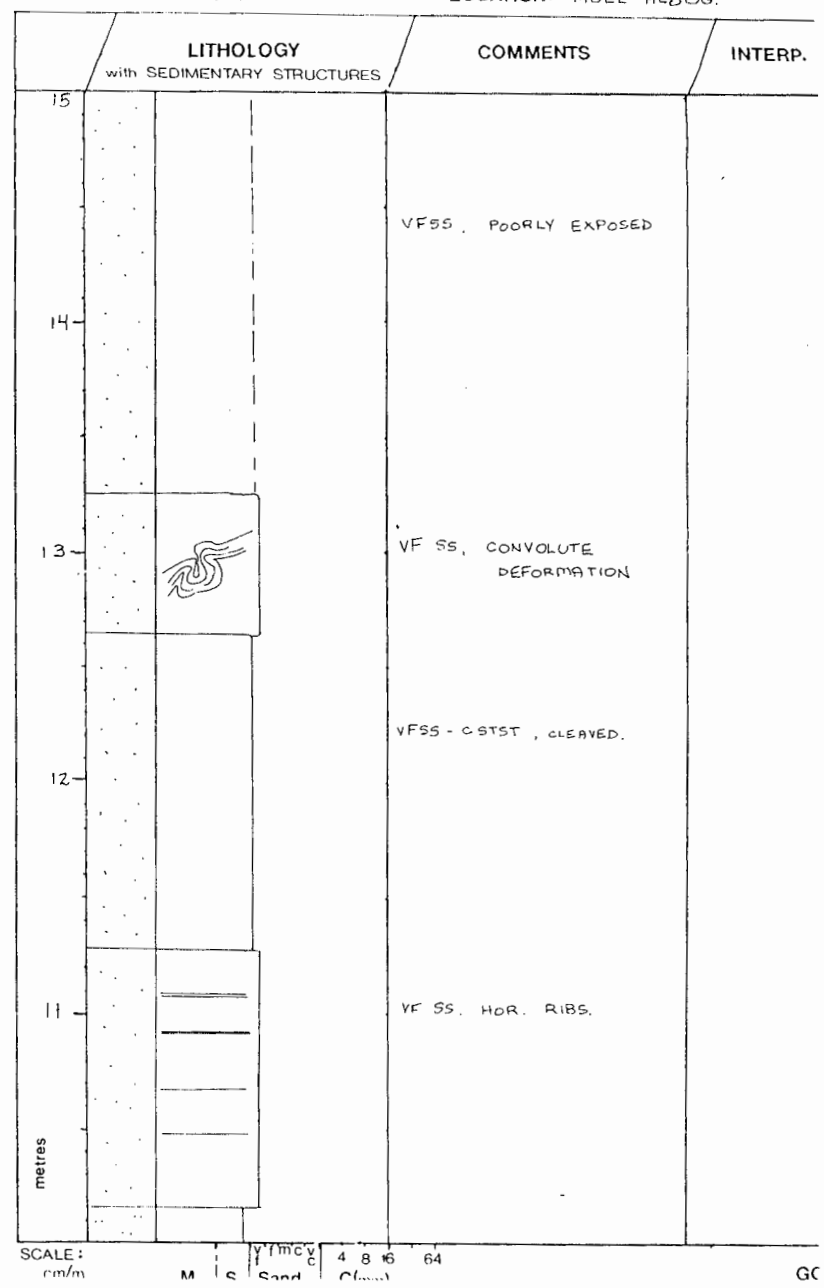
SECTION L1 LOCATION: Locate footpath running from Beddgelert to Moel Hebog along ridge between Cwm Blaiddiaid and Cwm Llwy. Section starts 200 m to north of footpath (Cwm Blaiddiaid) and 200 m to east of dolerite sill at head of Cwm Blaiddiaid.



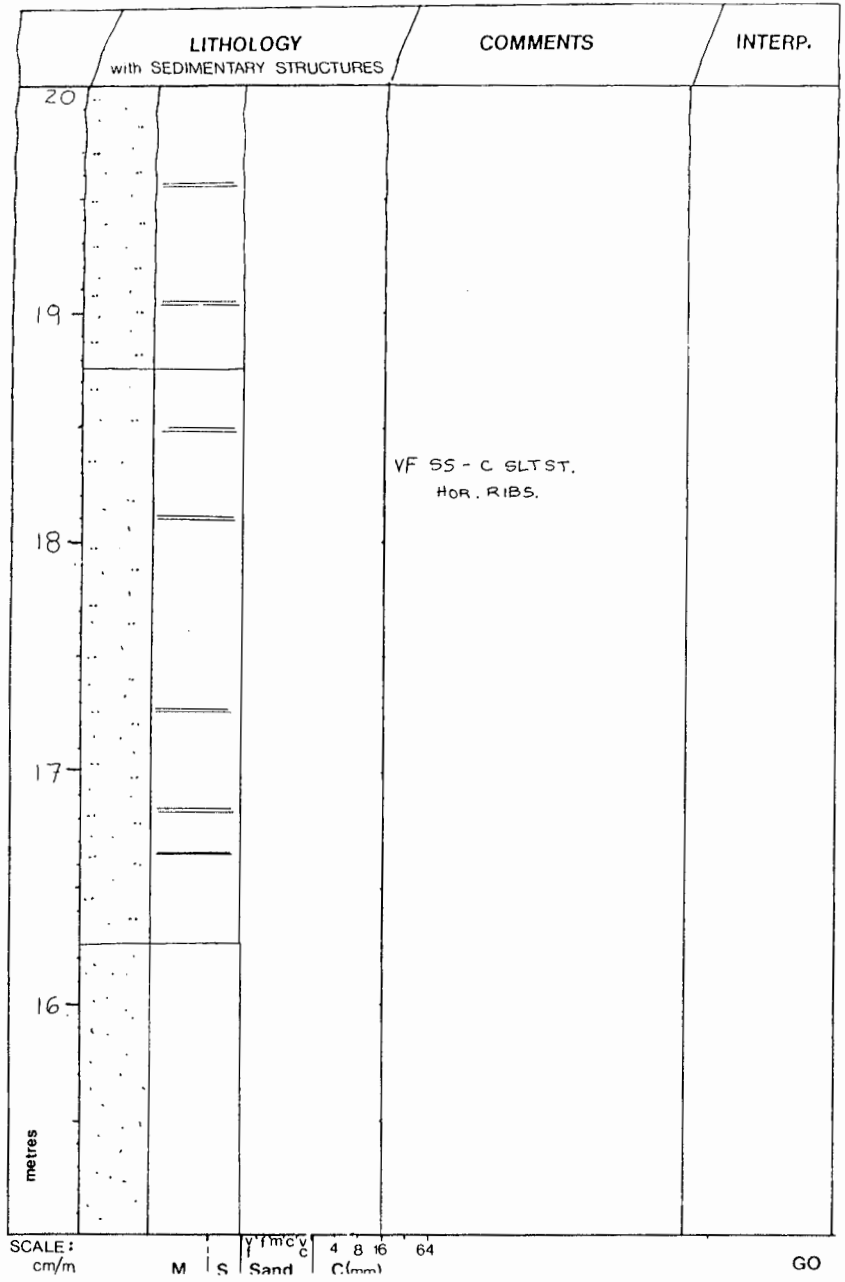
SECTION: L 1 A LOCATION: MOEL HEBOG.



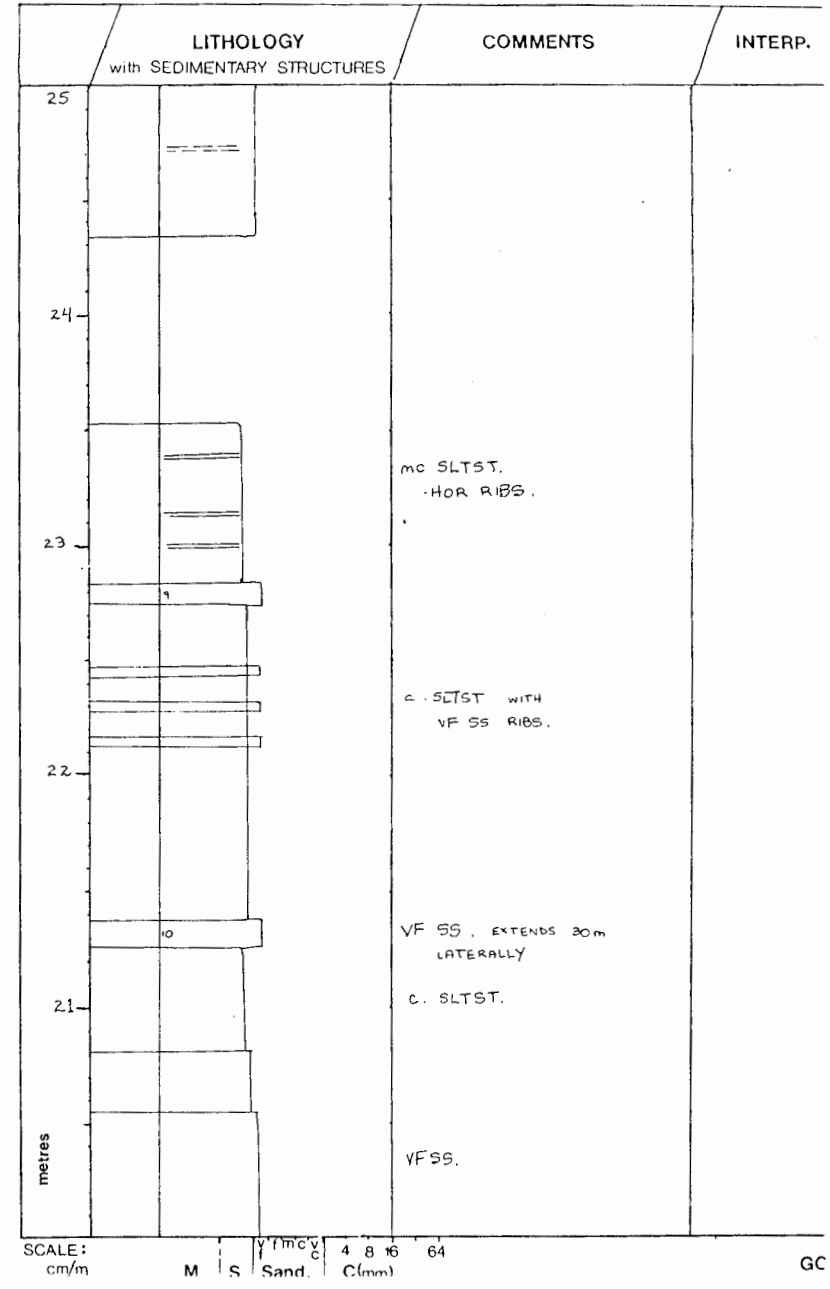
SECTION: L 1 A LOCATION: MOEL HEBOG.



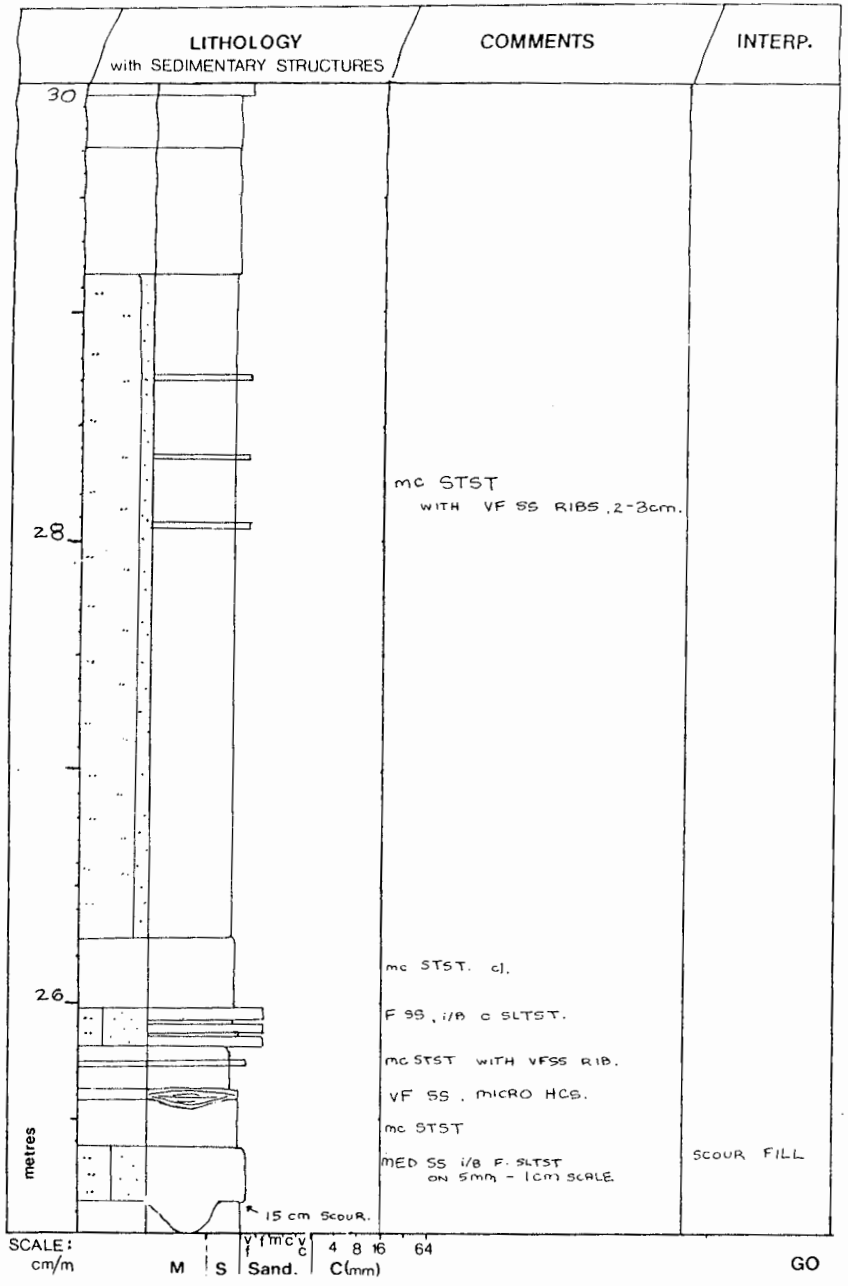
SECTION: L1a LOCATION: MOEL HEBOG.



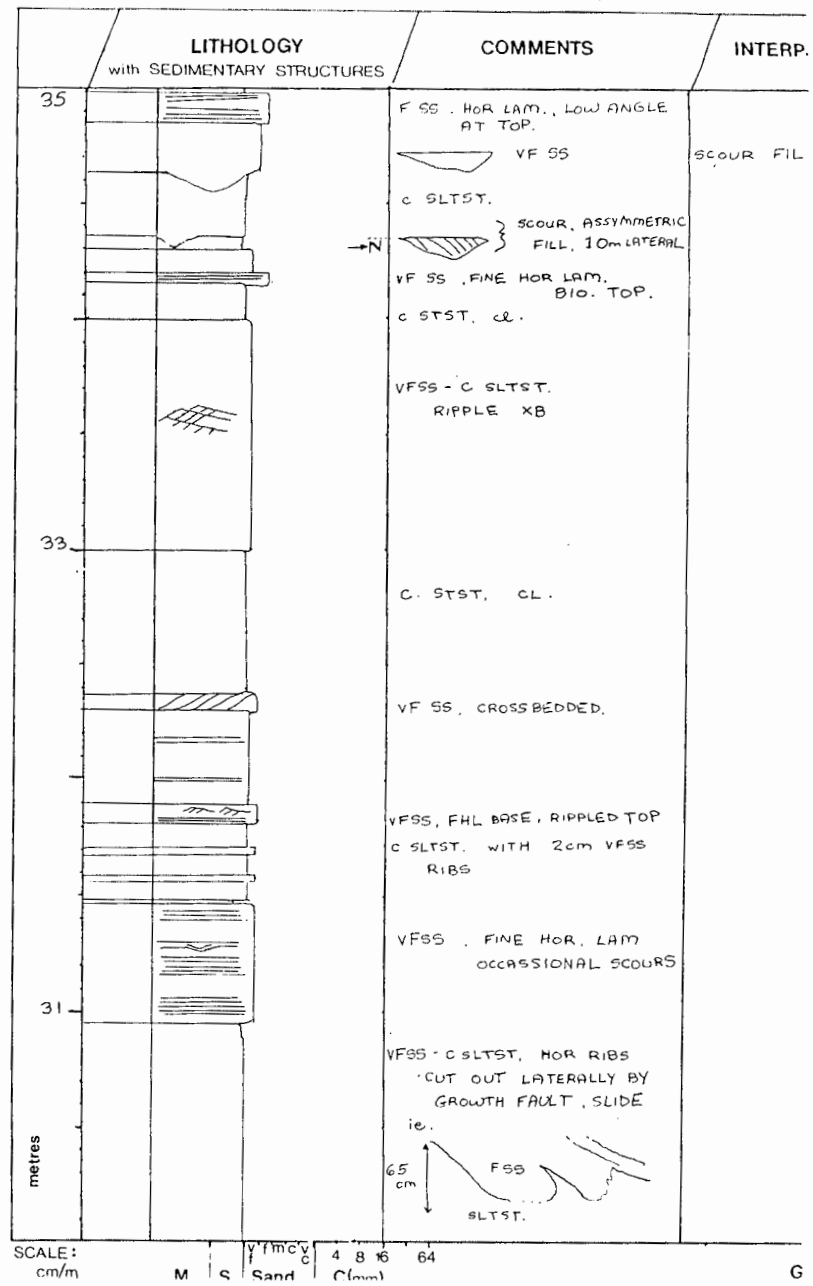
SECTION: L1a LOCATION: MOEL HEBOG.



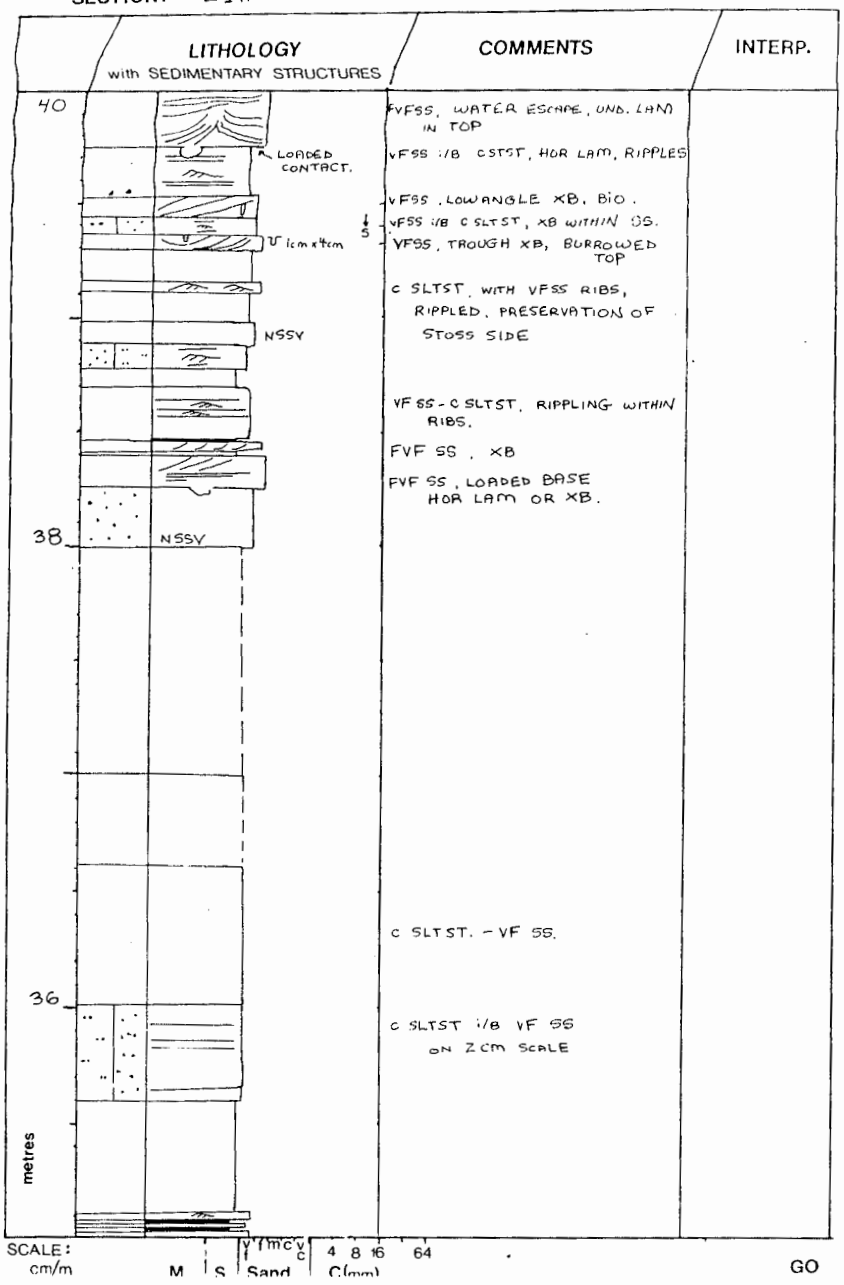
SECTION: L1a LOCATION: MOEL HEBOG.



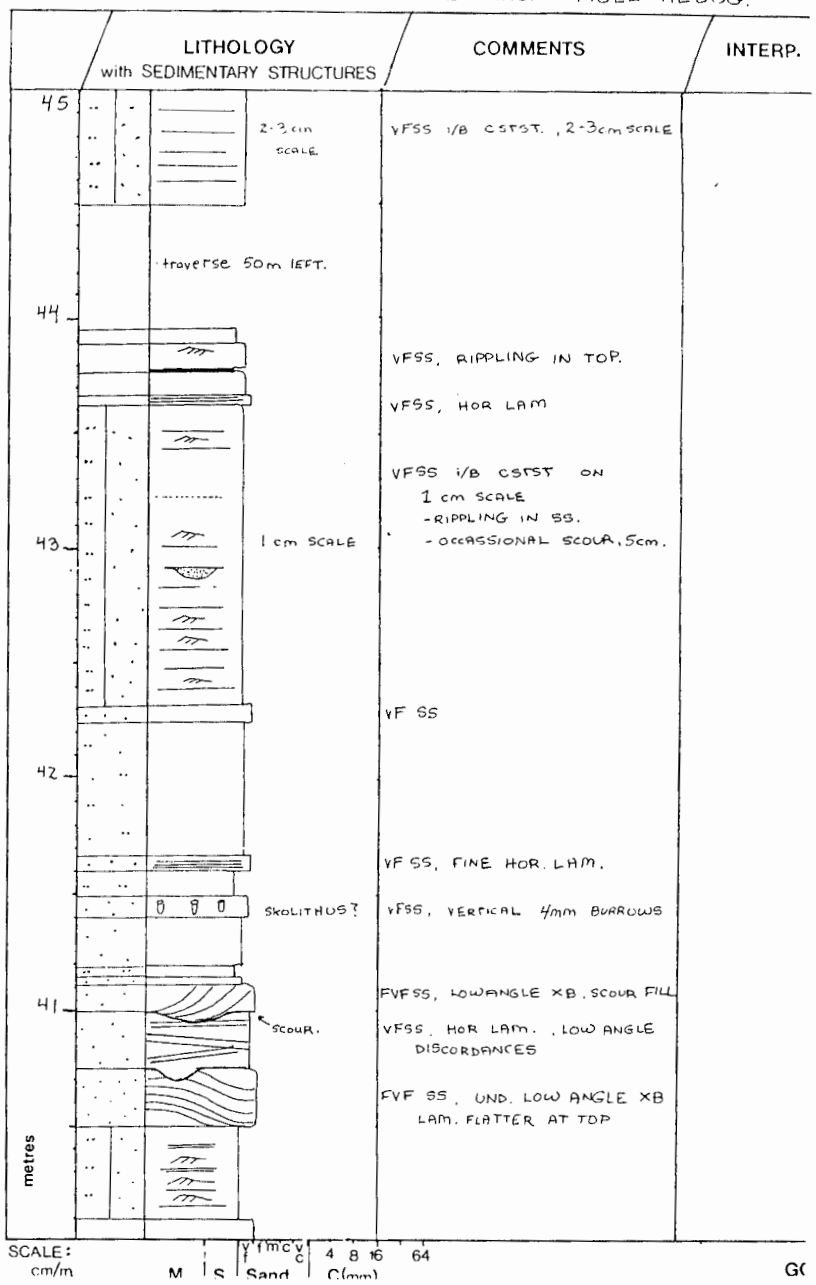
SECTION: L1a LOCATION: MOEL HEBOG



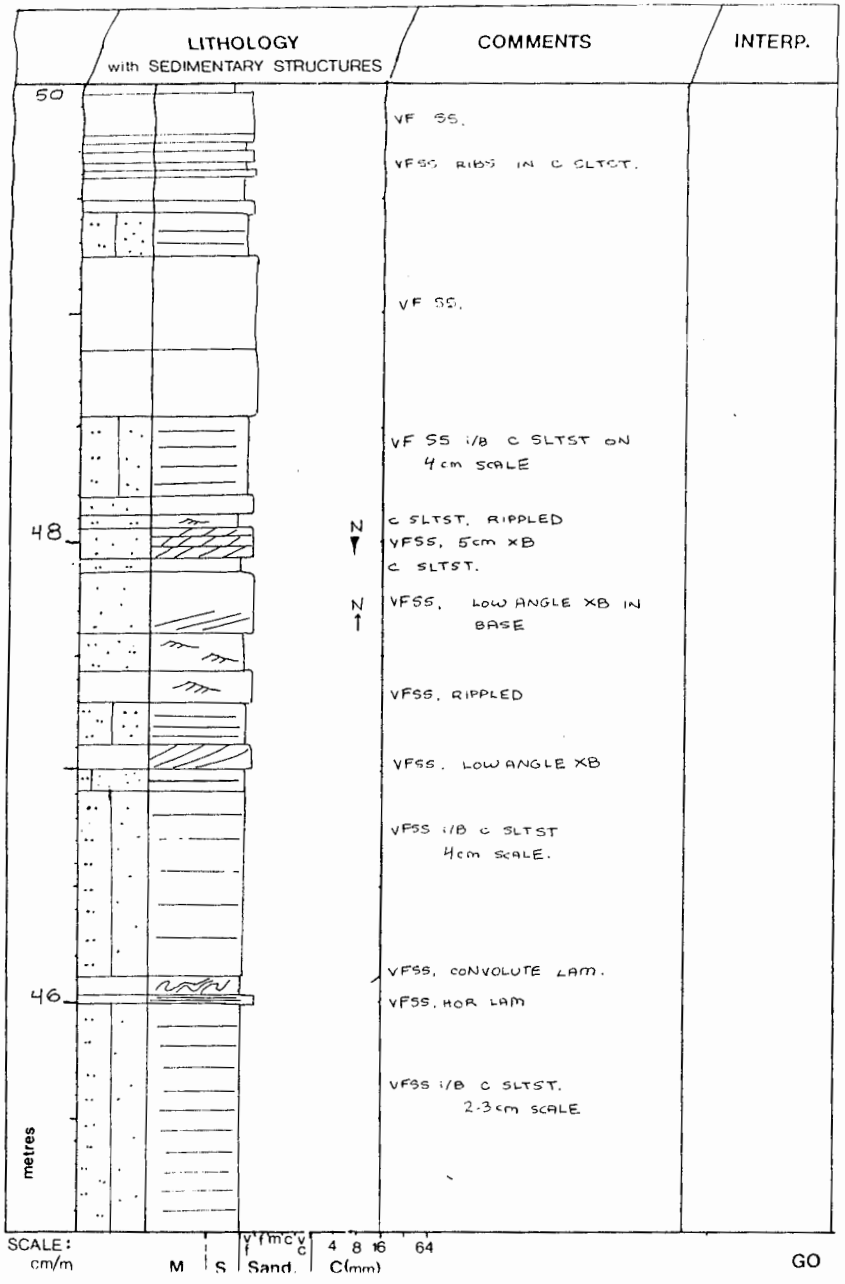
SECTION: L1A LOCATION: MOEL HEBOG.



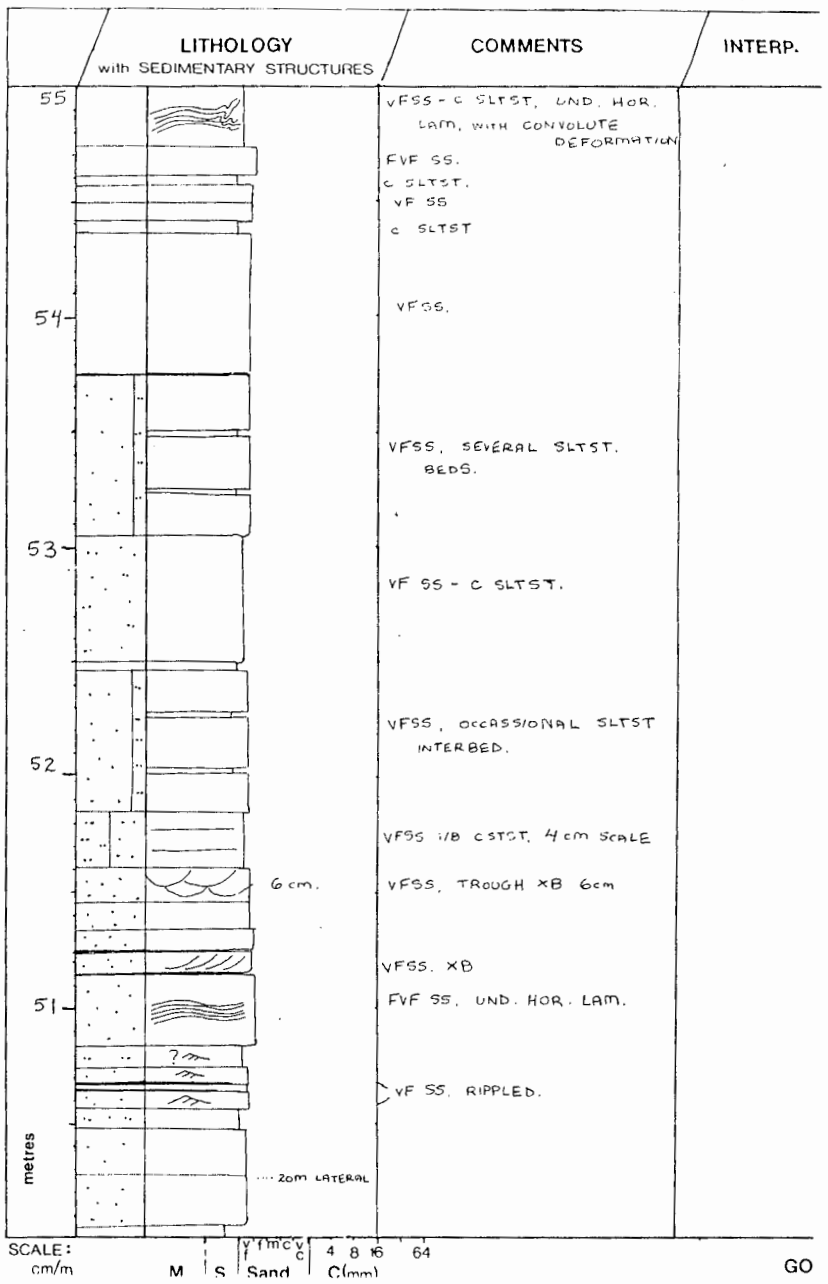
SECTION: L1A LOCATION: MOEL HEBOG.



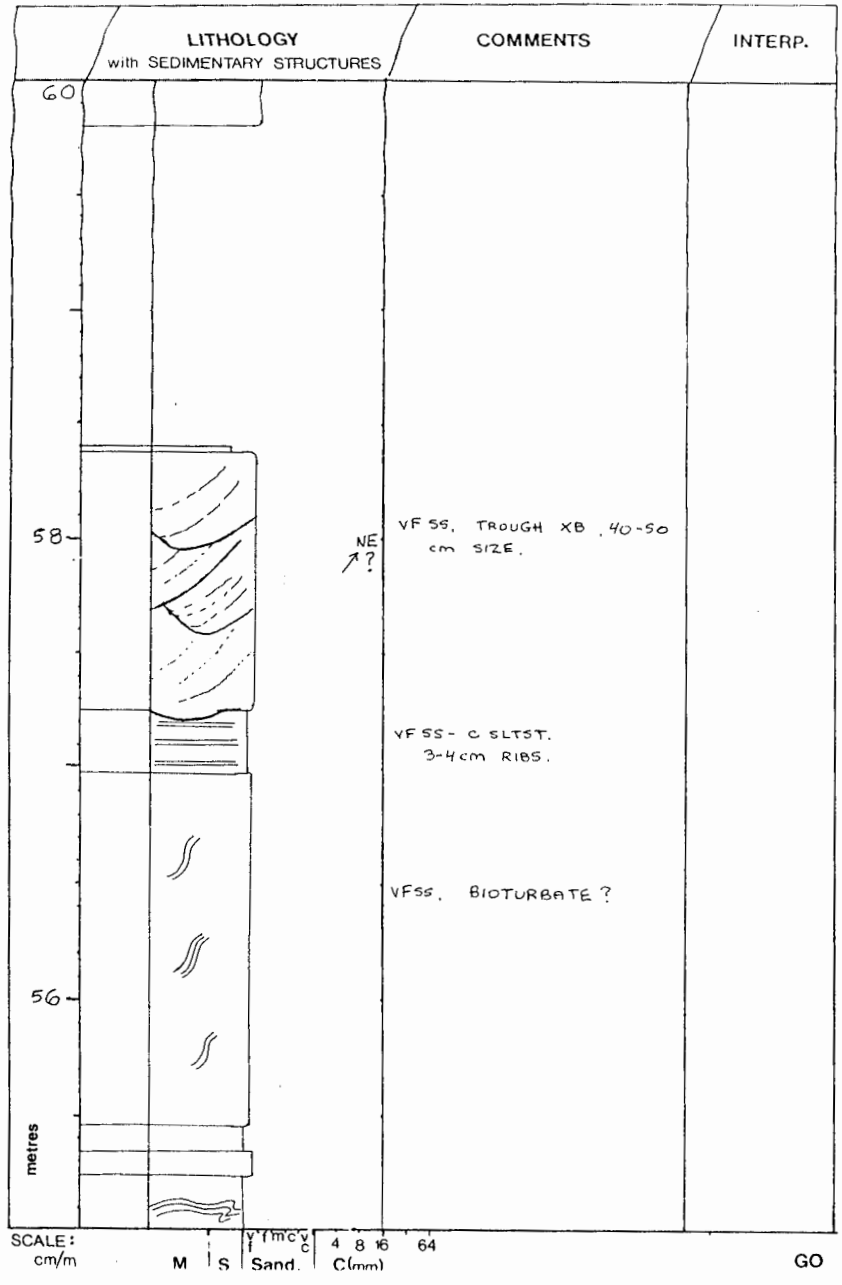
SECTION: L1A LOCATION: MOEL HEBOG



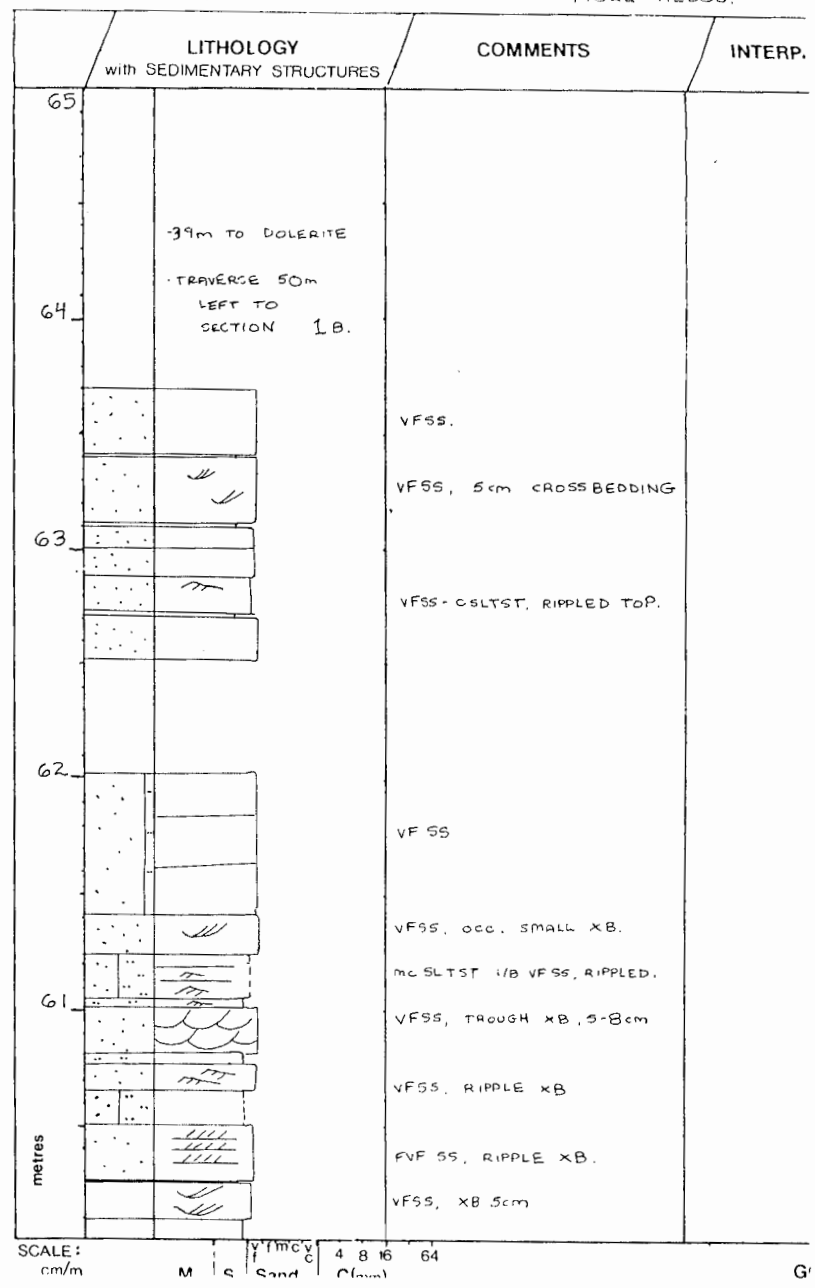
SECTION: L1A LOCATION: MOEL HEBOG.



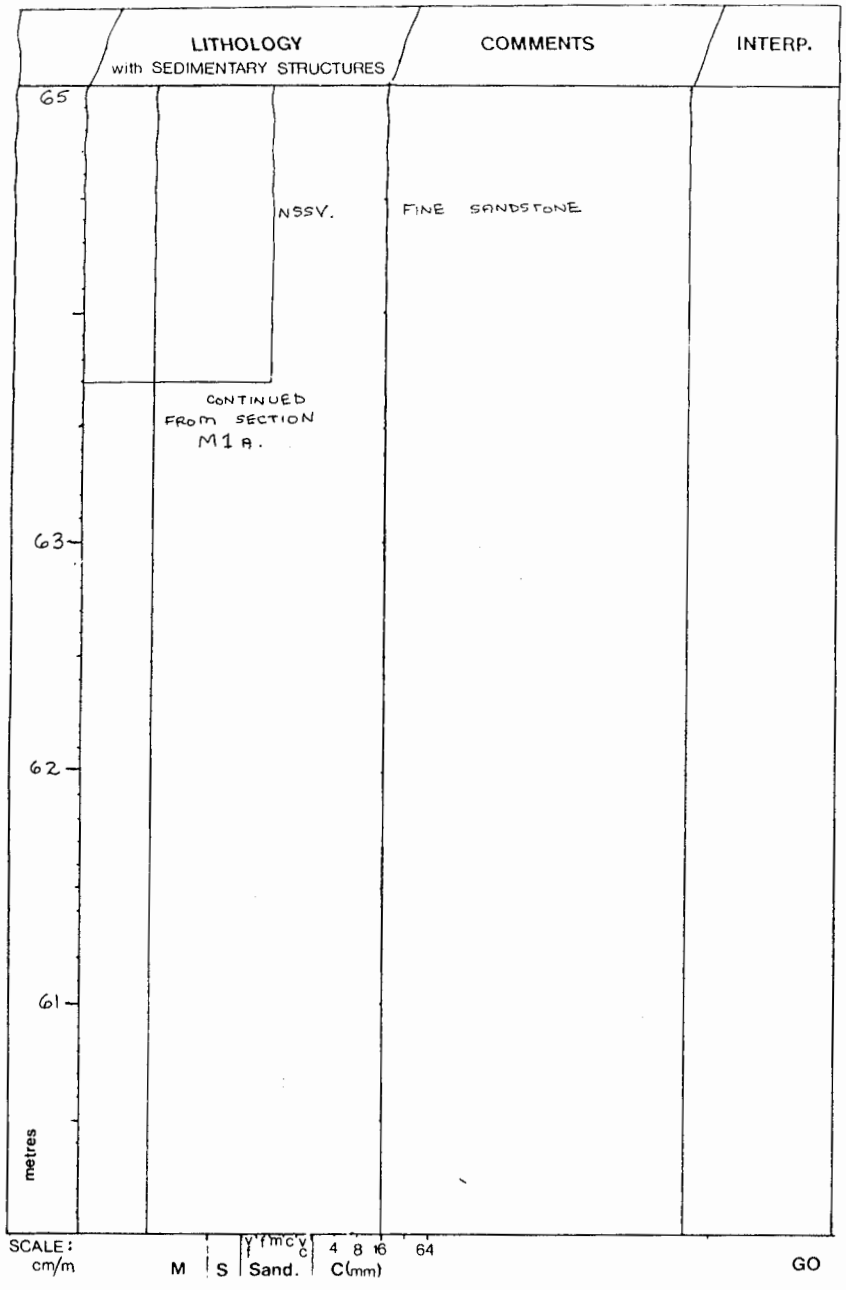
SECTION: L 1 A LOCATION: MOEL HEBOG



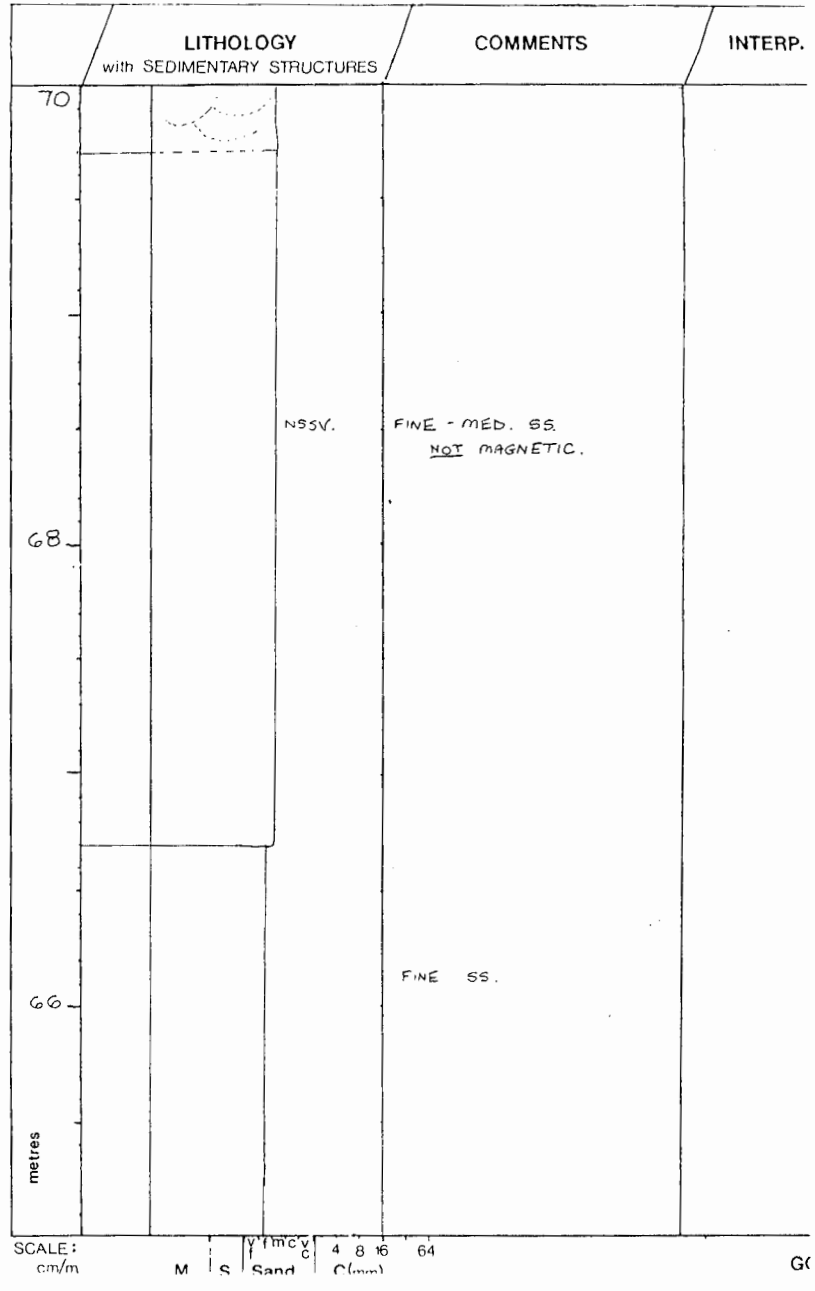
SECTION: L 1 A LOCATION: MOEL HEBOG.



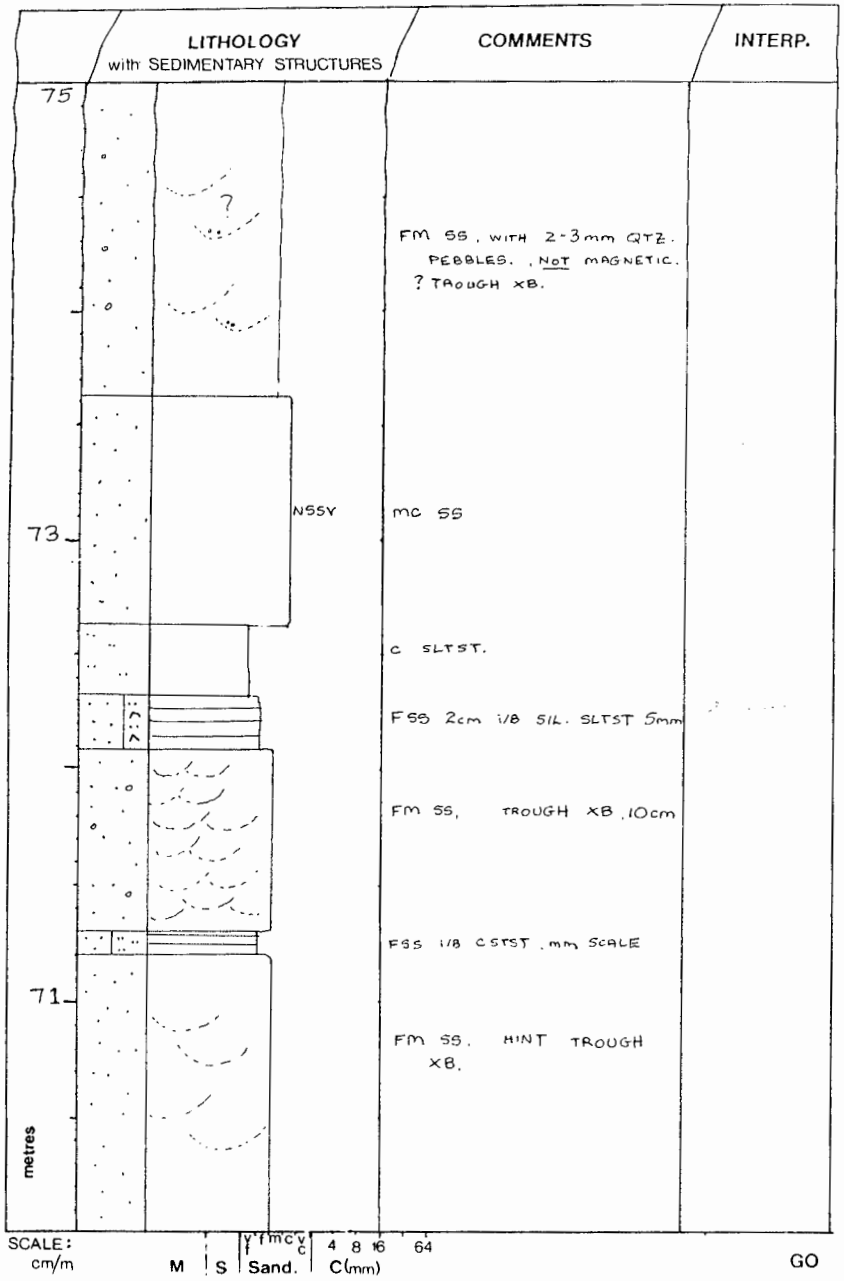
SECTION: L1B LOCATION: MOEL HEBOG.



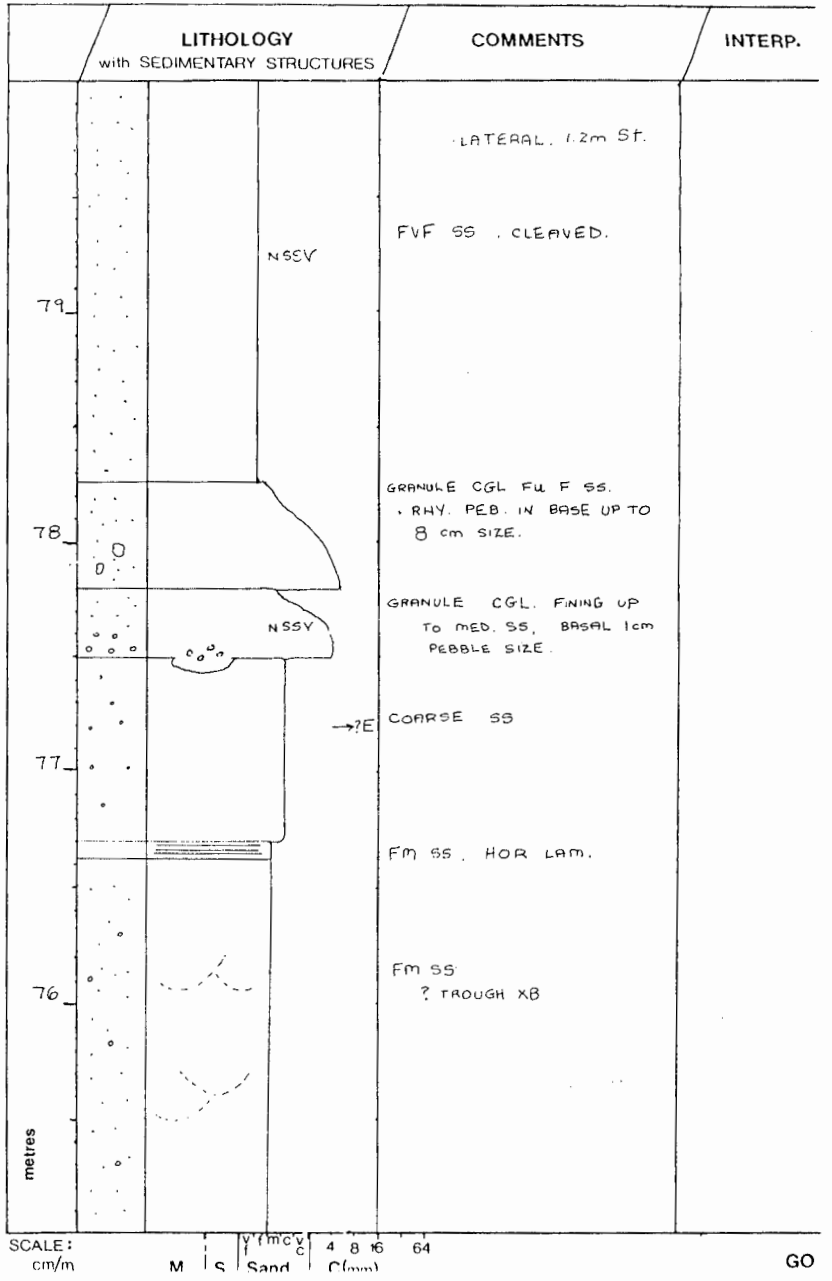
SECTION: L1B LOCATION: MOEL HEBOG.



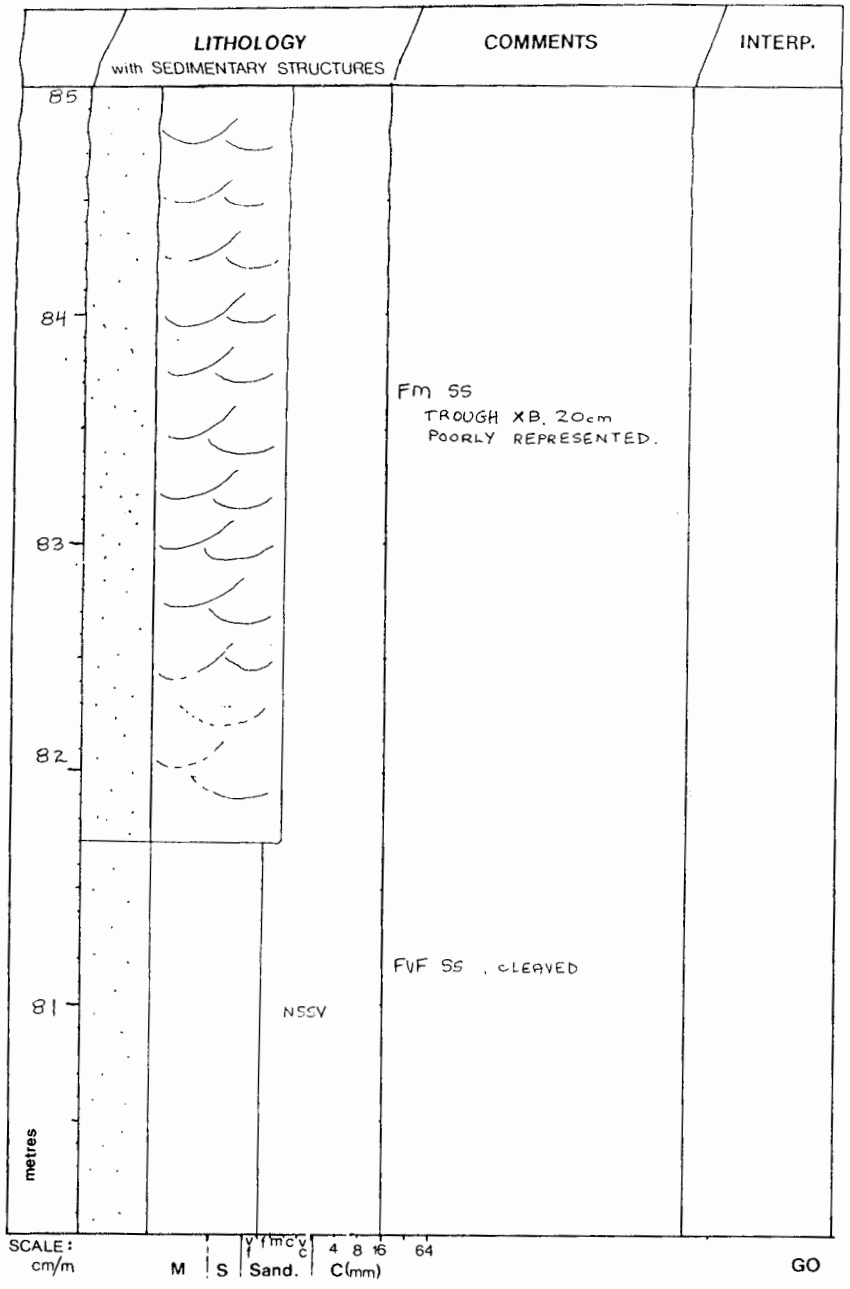
SECTION: L1B LOCATION: MOEL HEBOG.



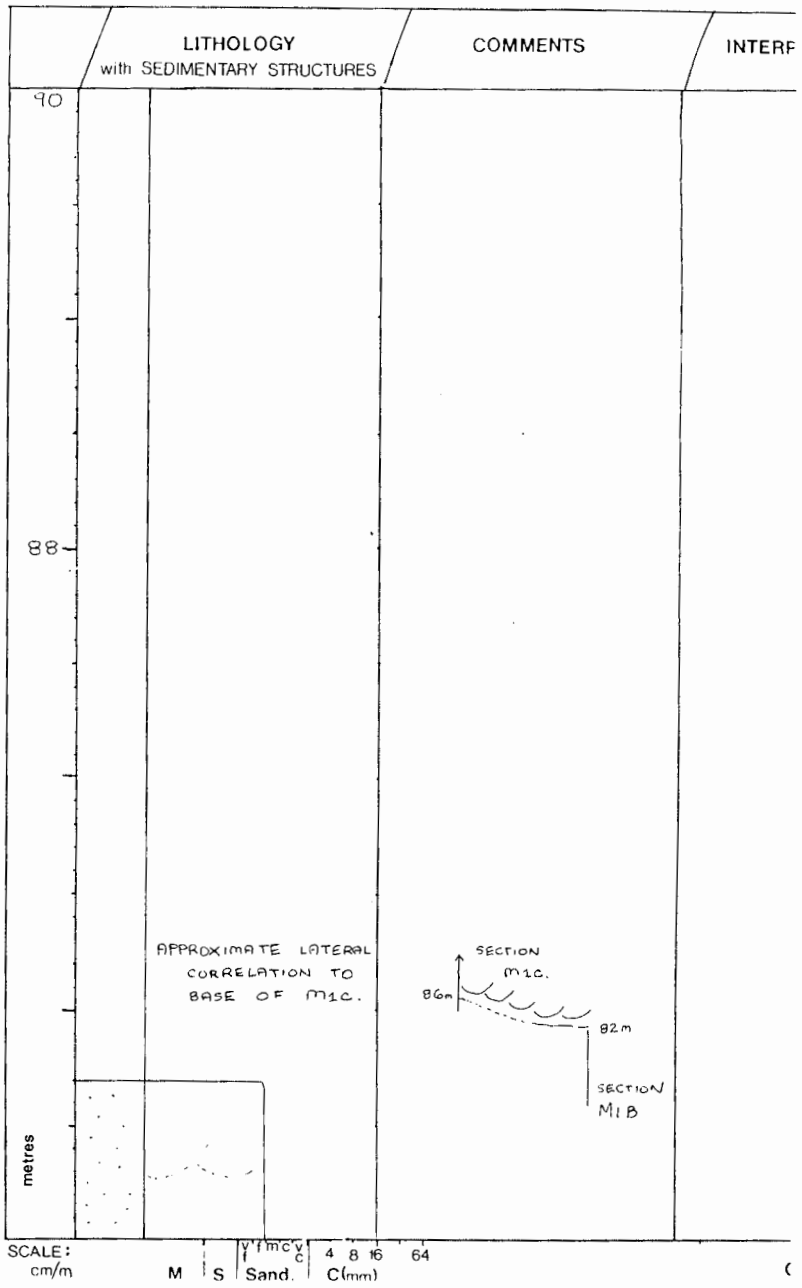
SECTION: L1B LOCATION: MOEL HEBOG.



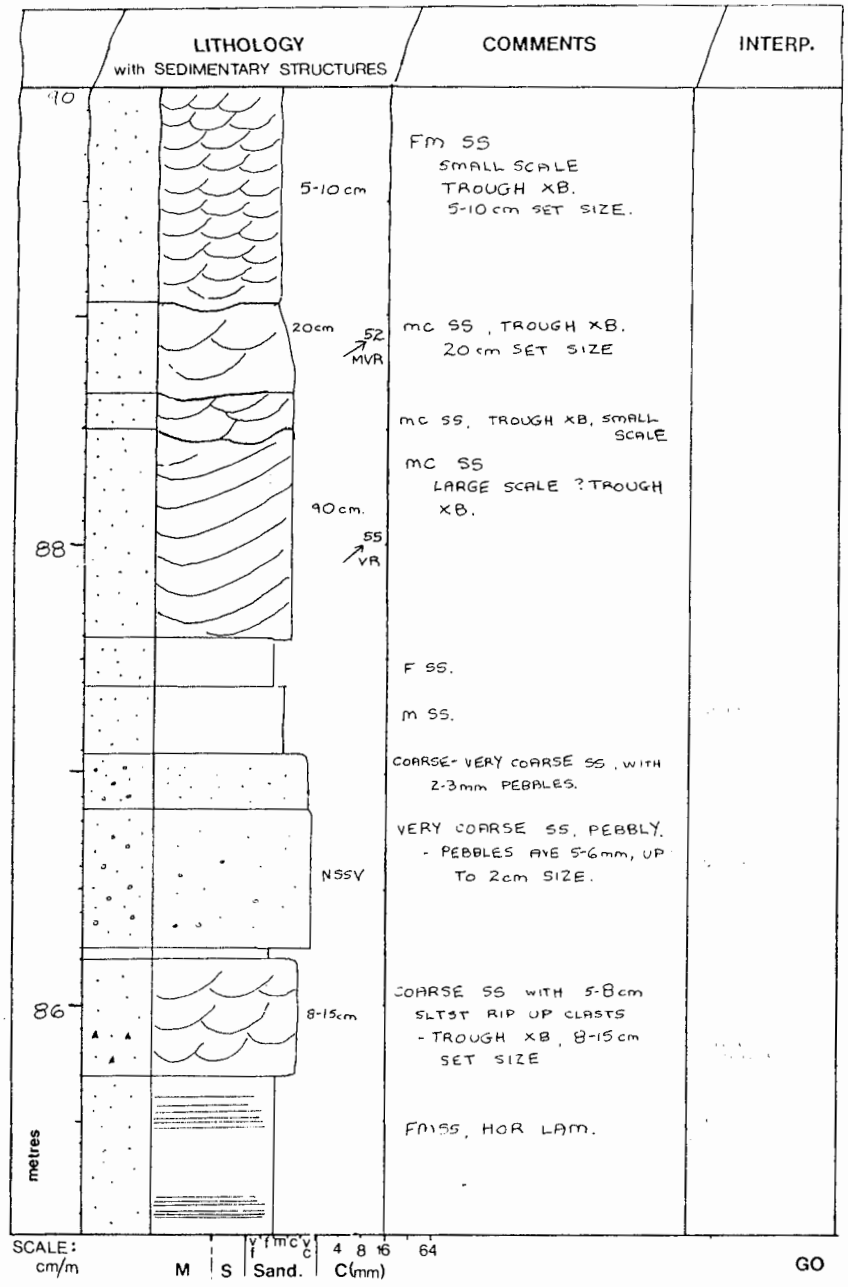
SECTION: L1 B LOCATION: MOEL HEBOG



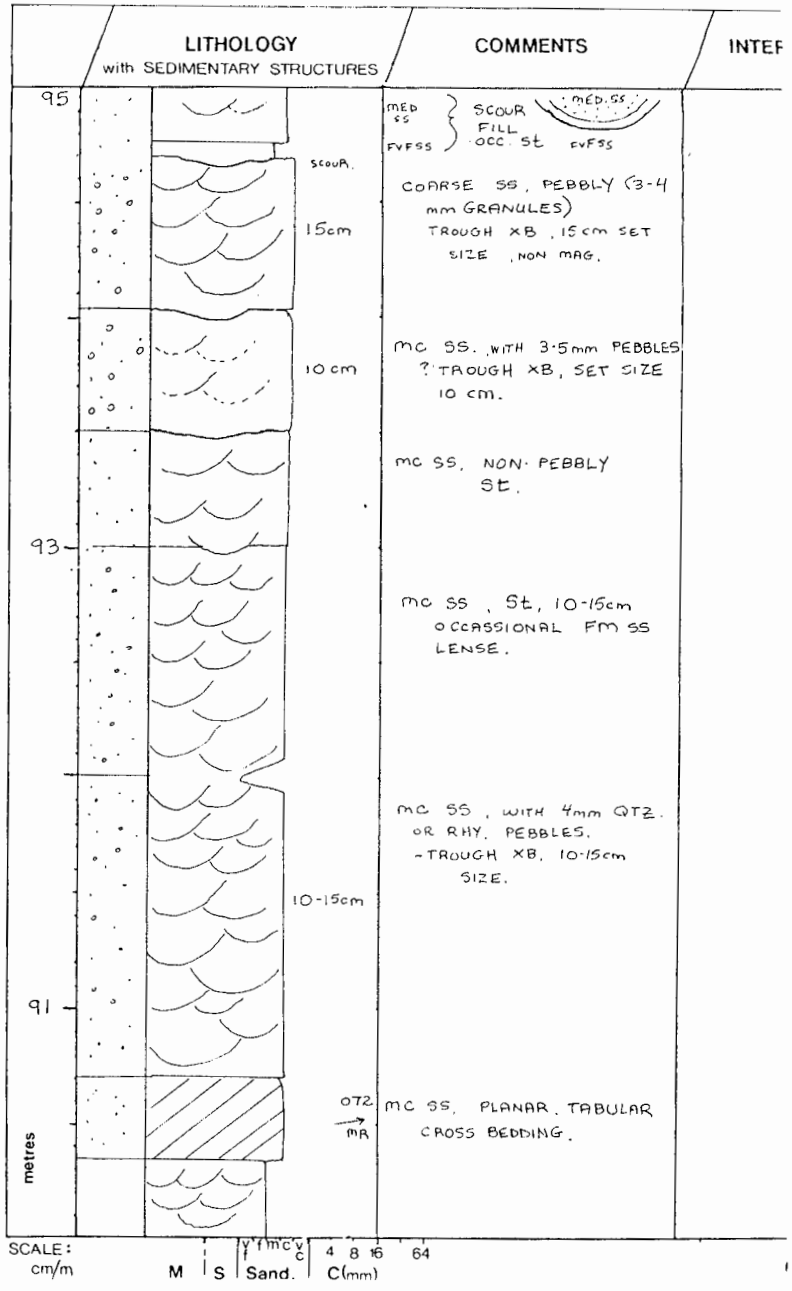
SECTION: L1 B LOCATION:



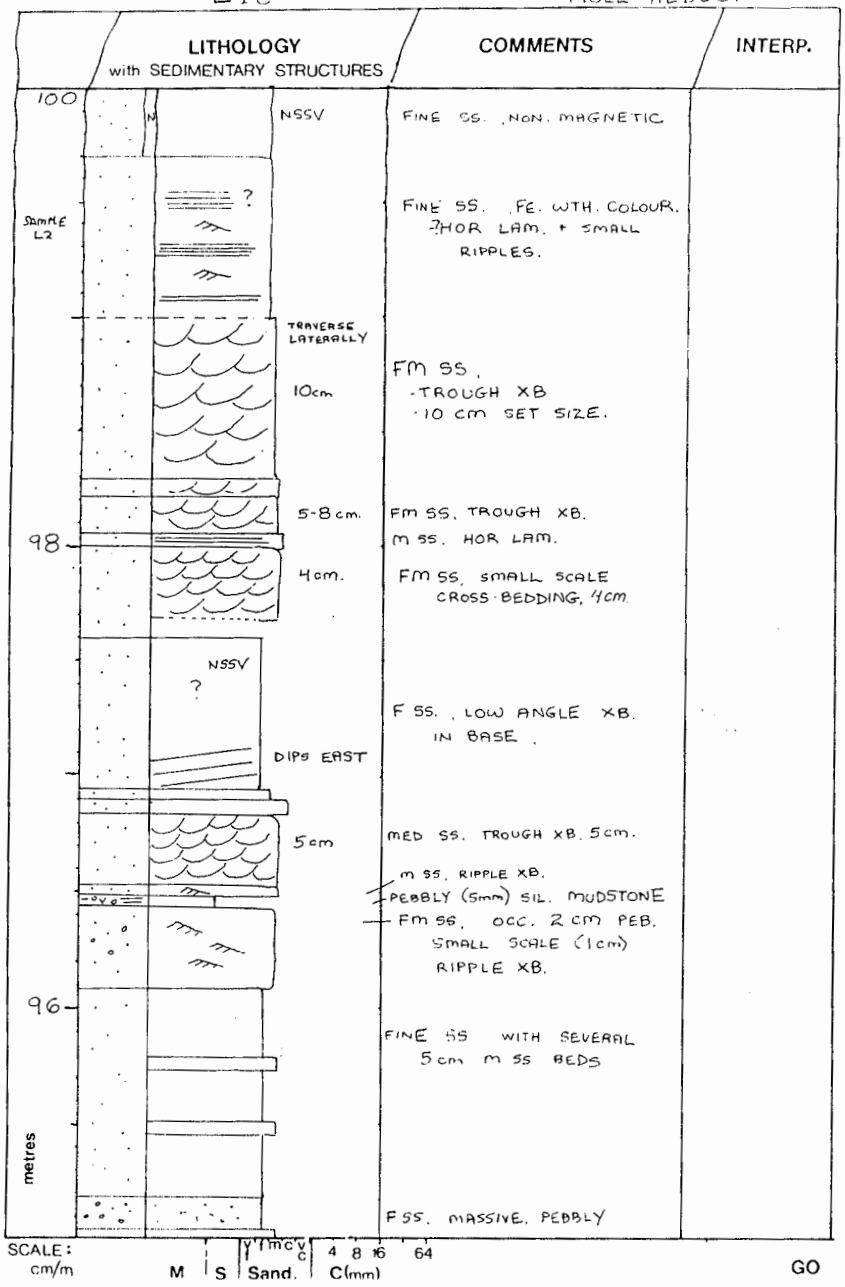
SECTION: L1c LOCATION: MOEL HEBOG.



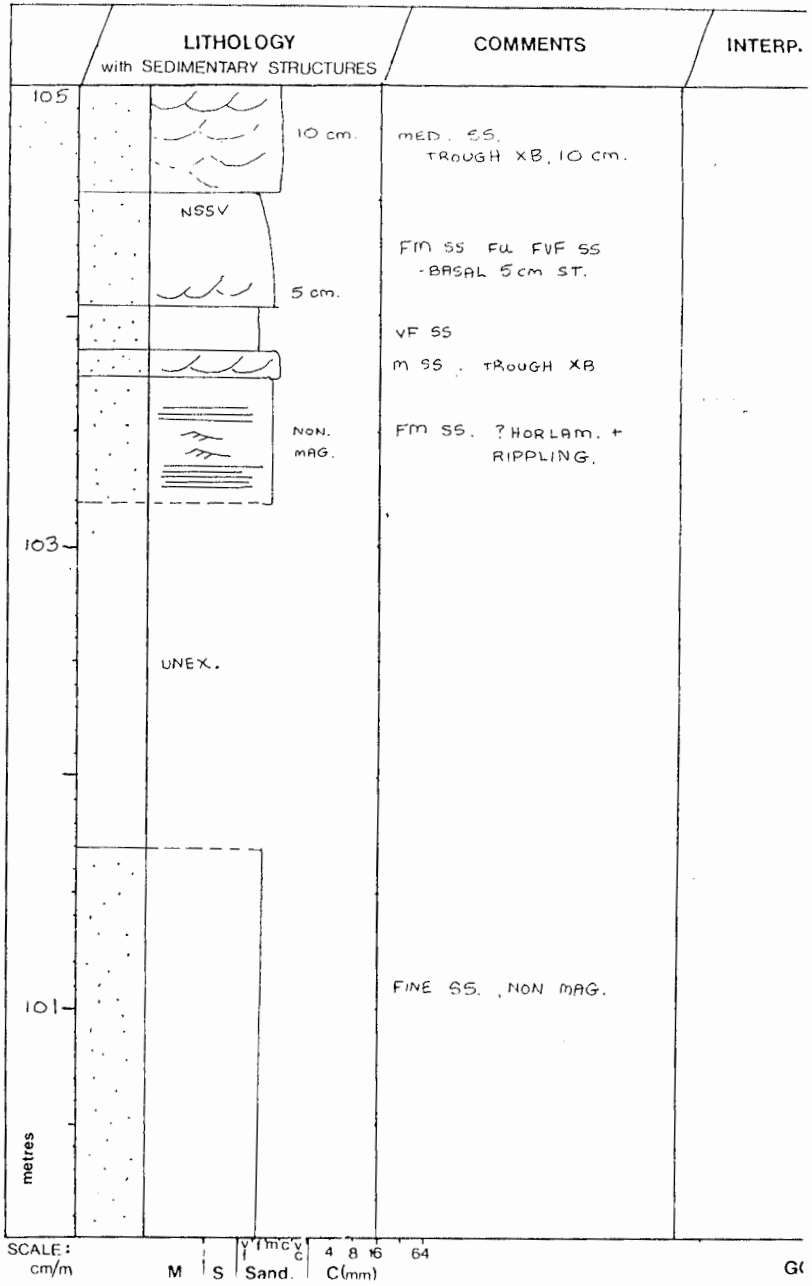
SECTION: L1c LOCATION: MOEL HEBOG.



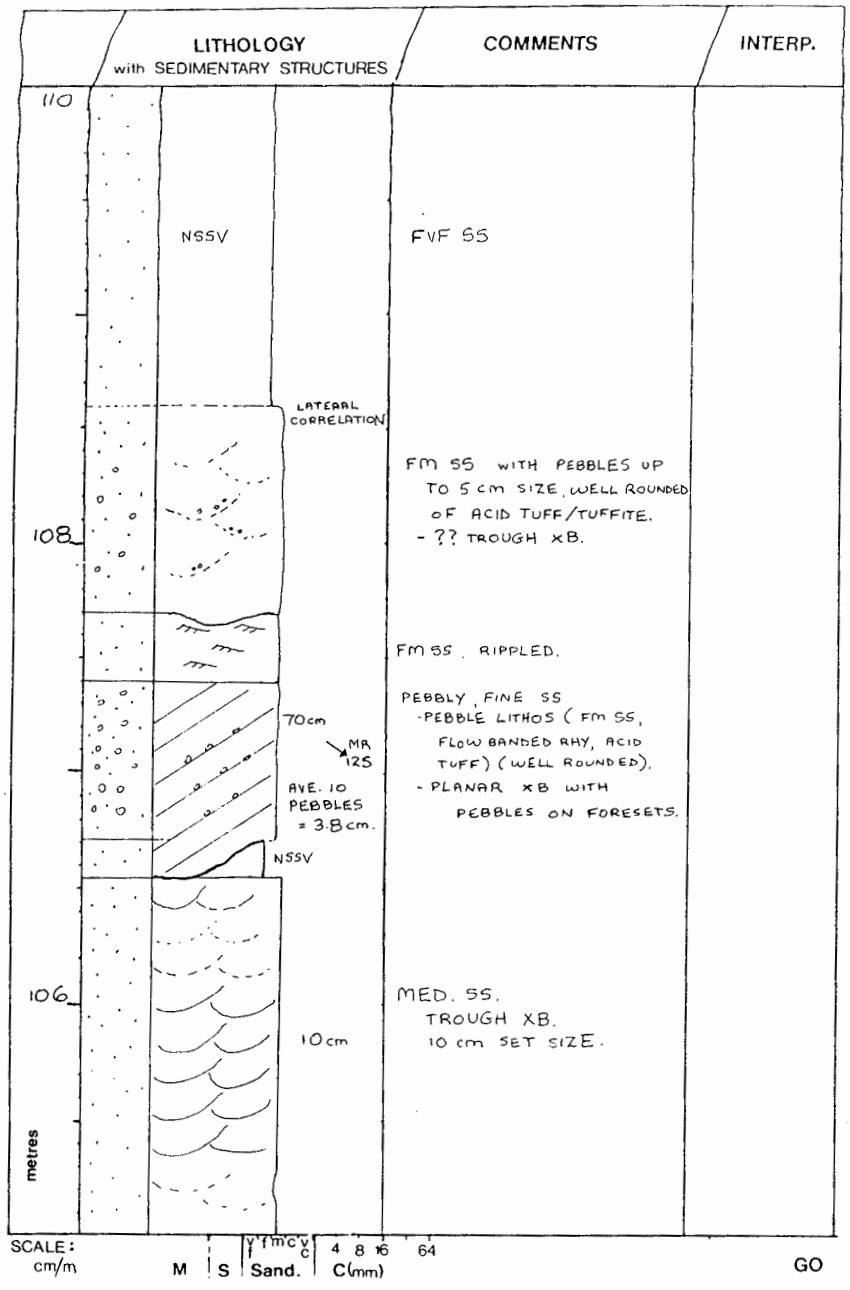
SECTION: L1c LOCATION: MOEL HEBOG.



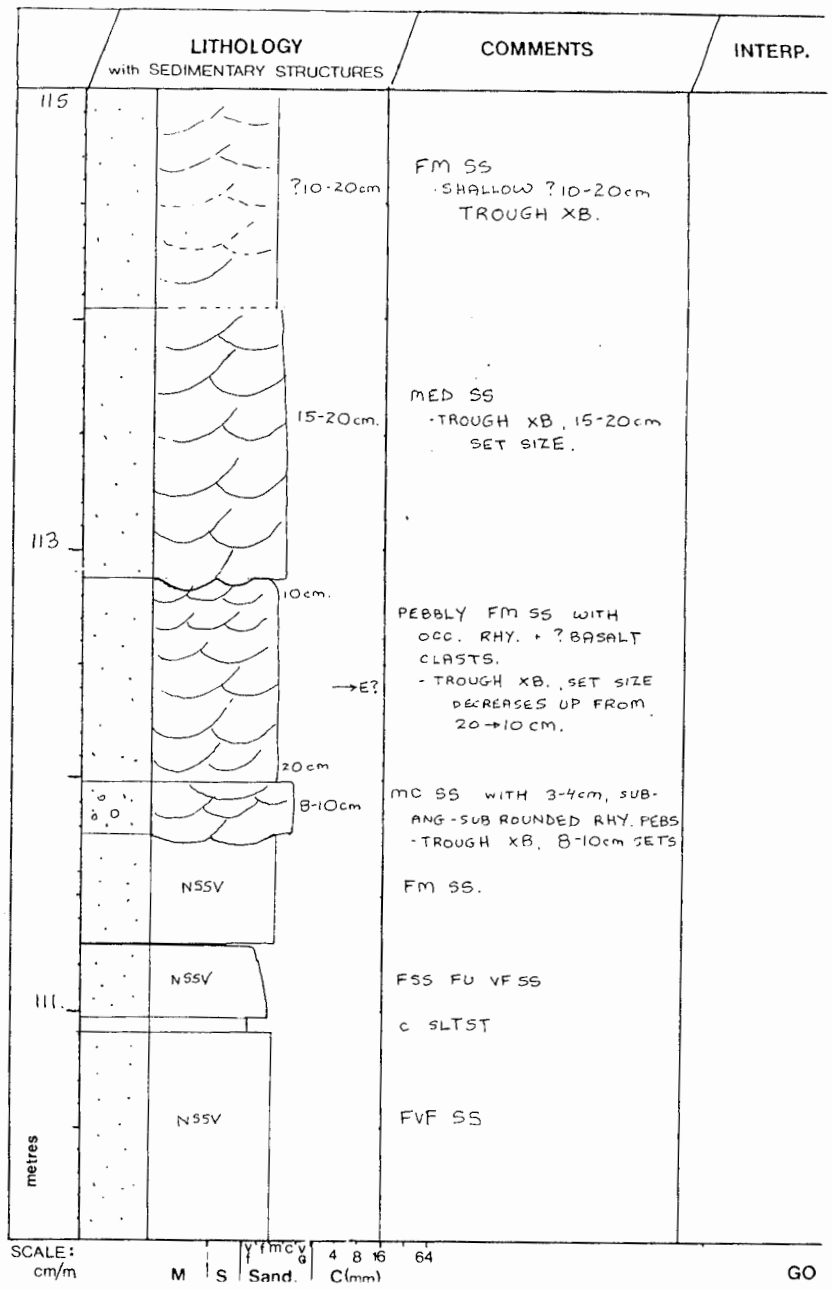
SECTION: L1c LOCATION: MOEL HEBOG.



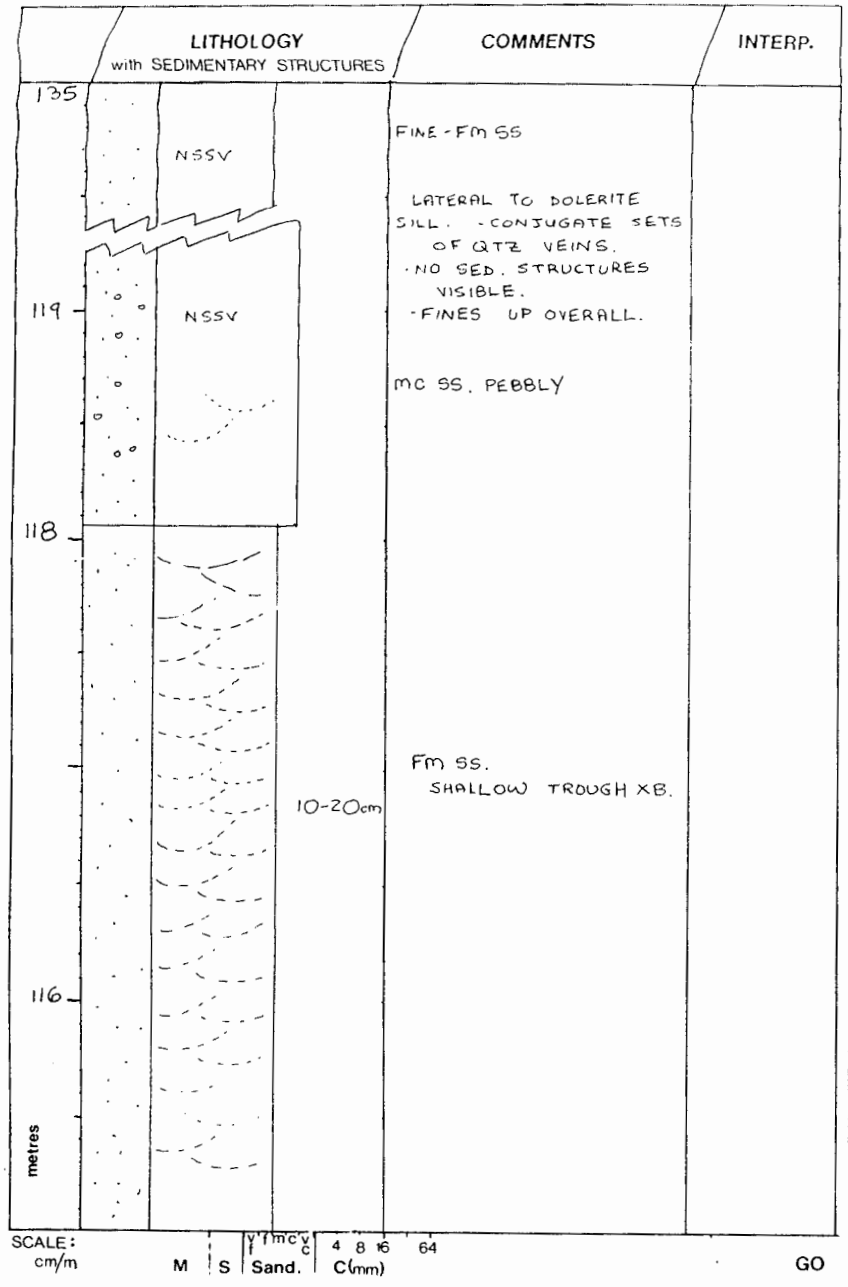
SECTION: L1 c LOCATION: MOEL HEBOG.



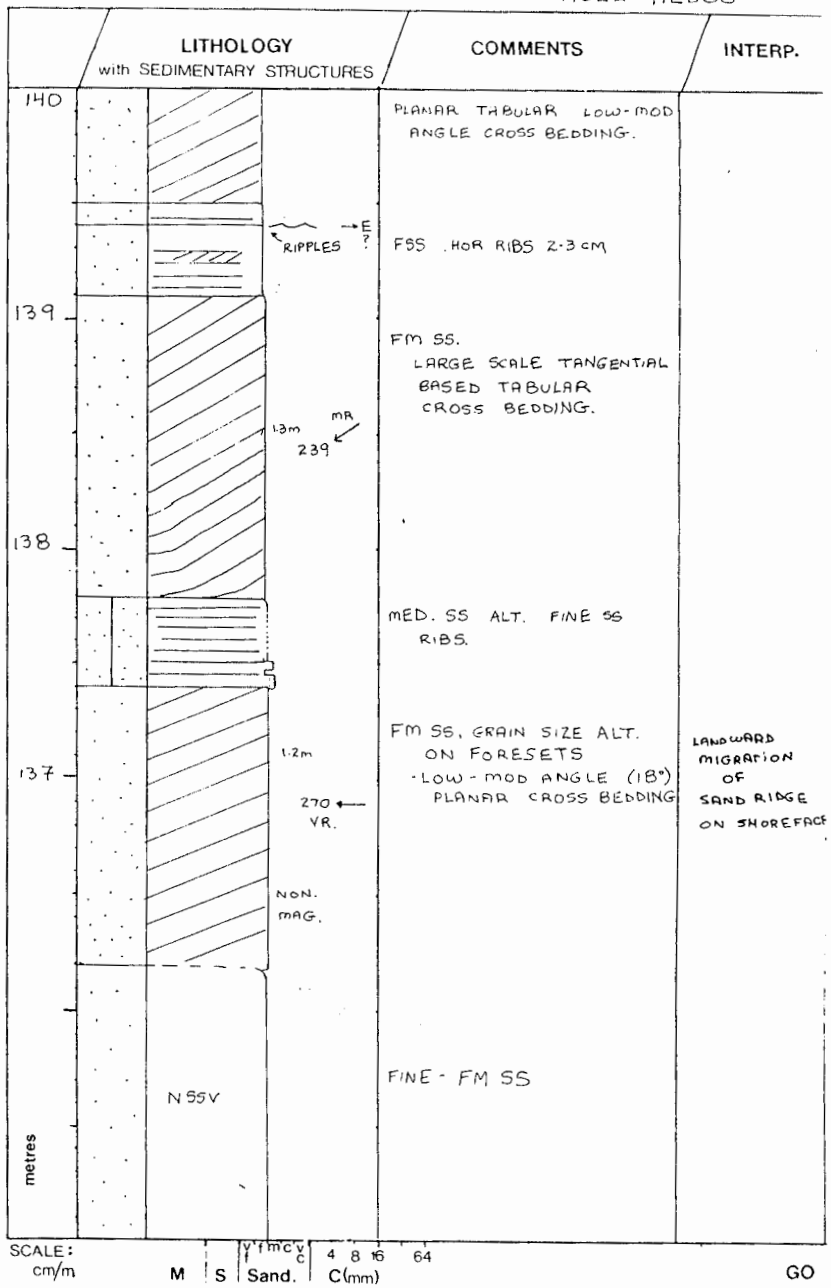
SECTION: L1 c LOCATION: MOEL HEBOG.



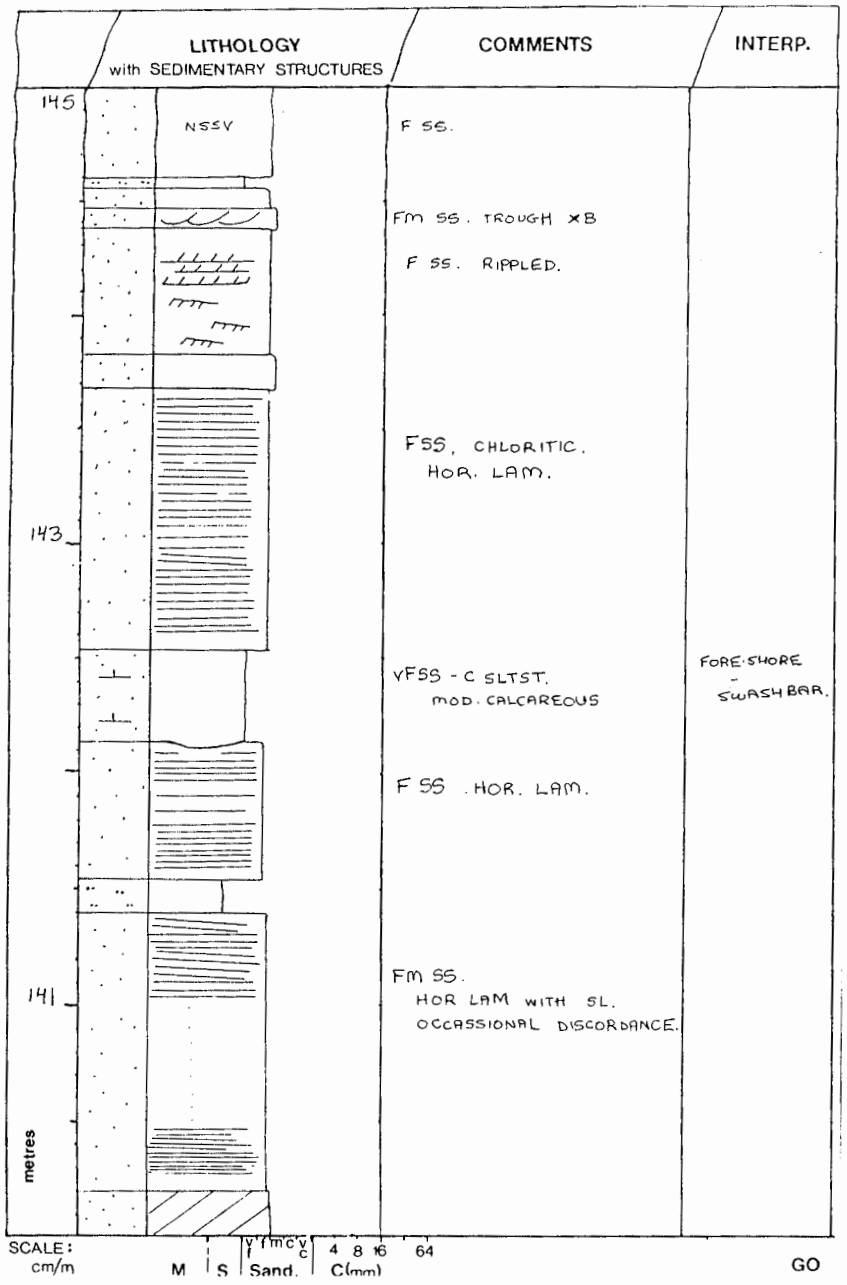
SECTION: L 1 c LOCATION: MOEL HEBOG.



SECTION: L 1 c LOCATION: MOEL HEBOG



SECTION: L 1 c LOCATION: MOEL HEBOG.



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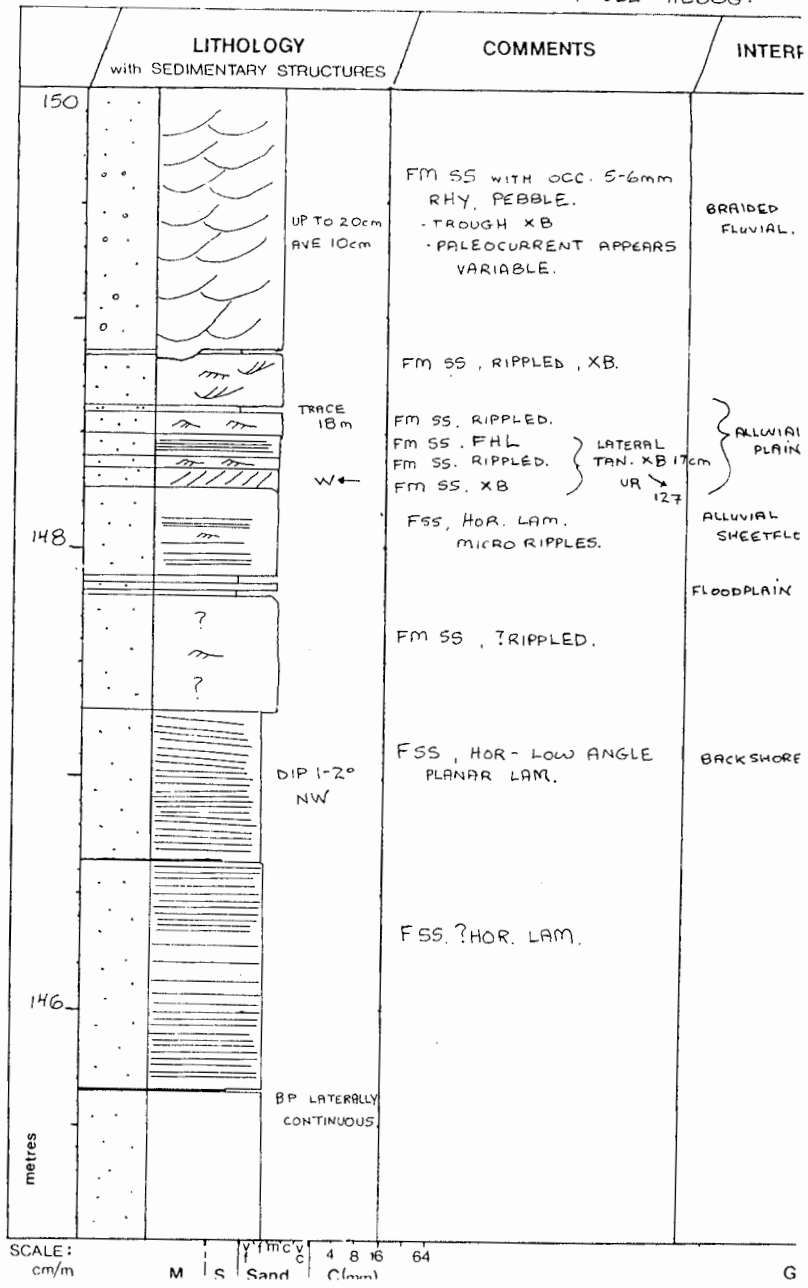
SECTION: L 1 c LOCATION: MOEL HEBOG.



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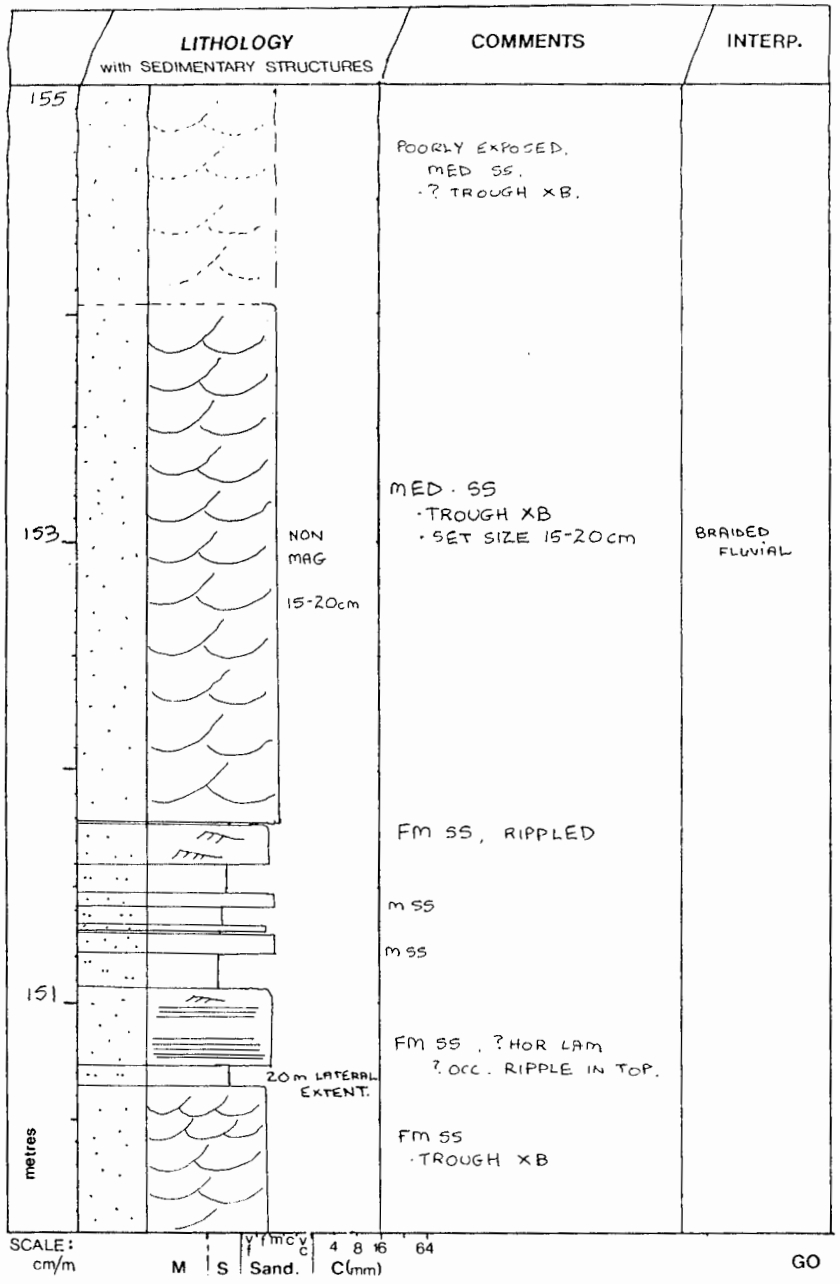
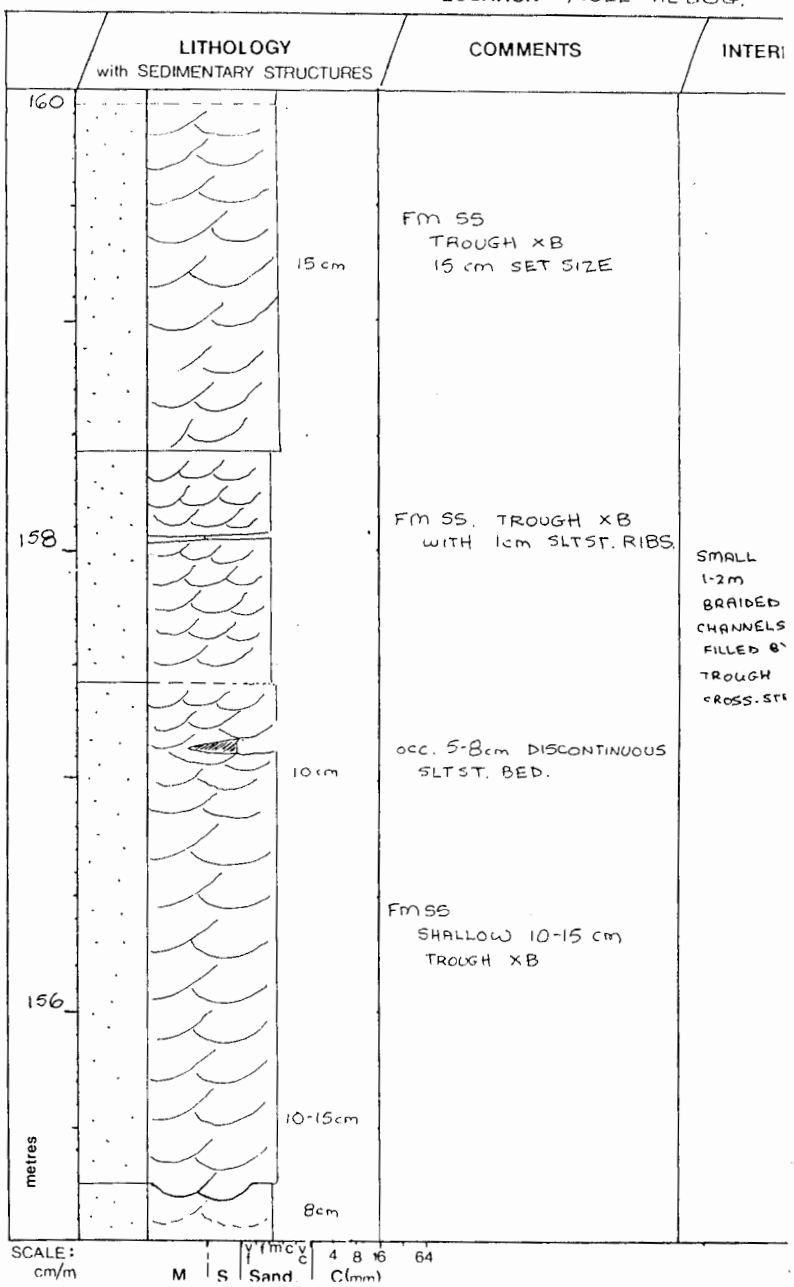
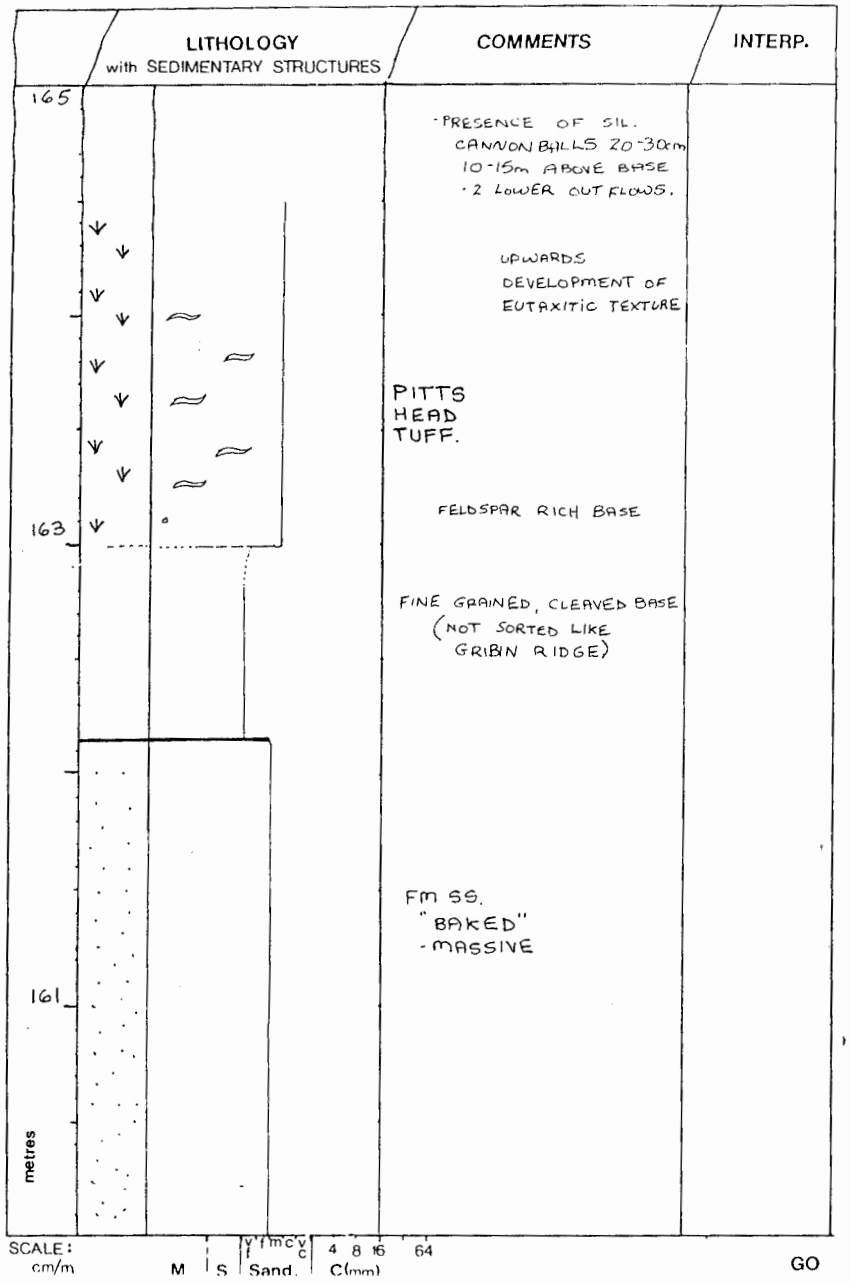
SECTION: L1 c LOCATION: MOEL HEBOG



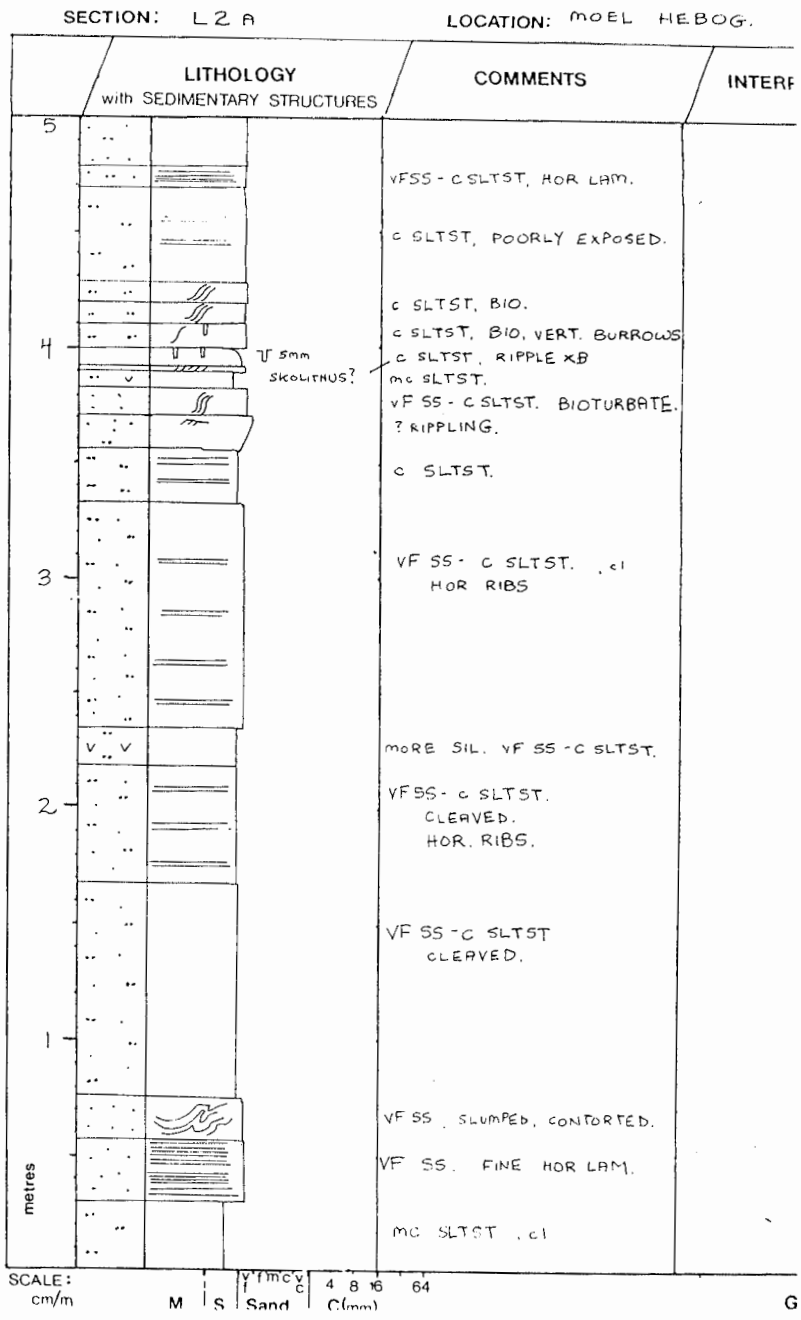
SECTION: L1c LOCATION: MOEL HEBOG.



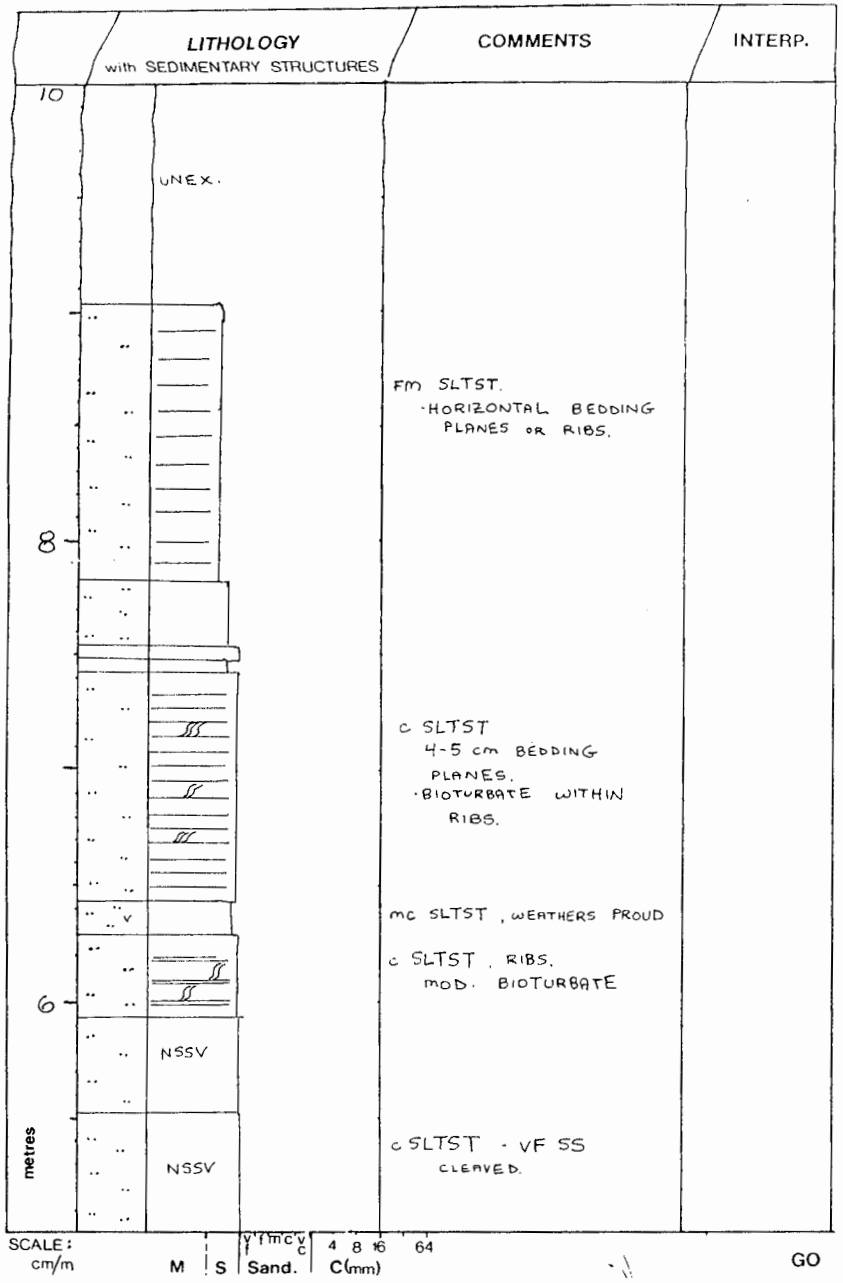
SECTION: L1c LOCATION: MOEL HEBOG



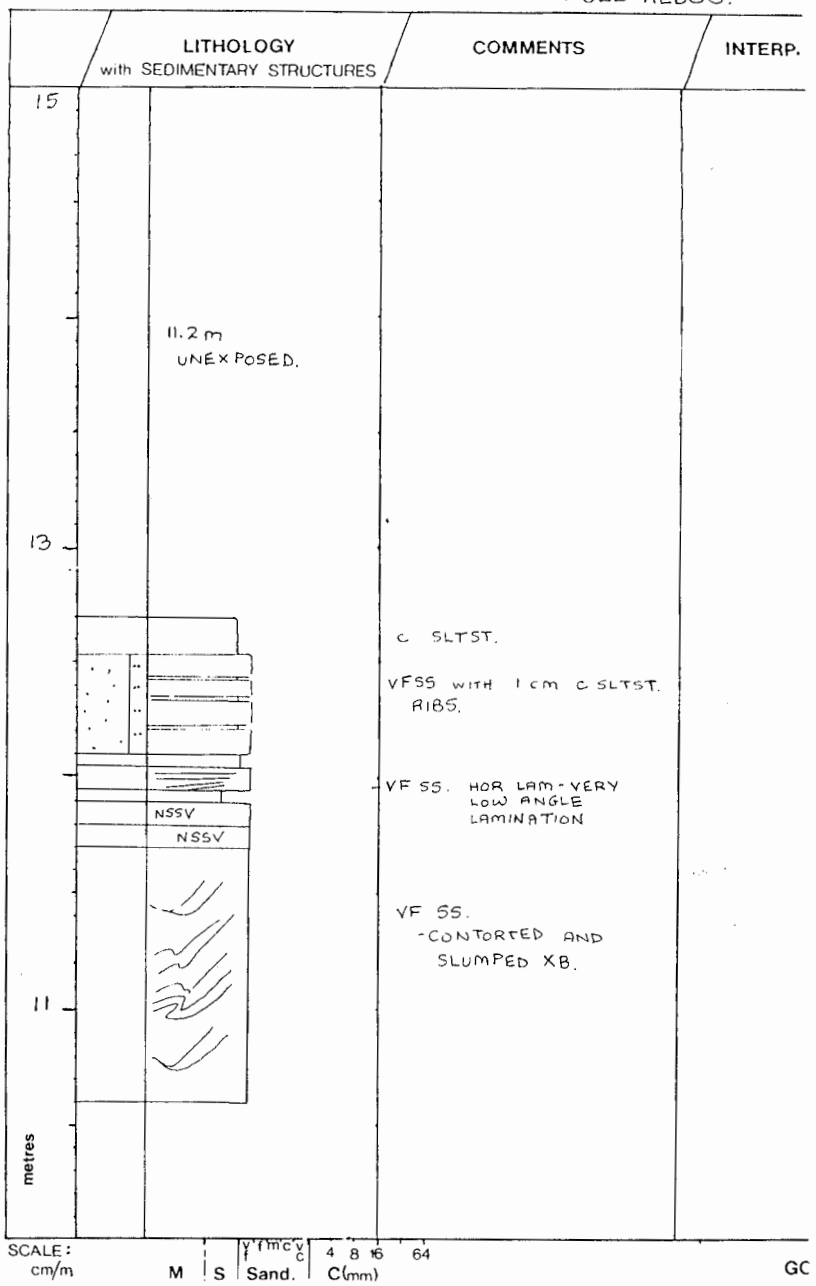
SECTION L2


SECTION: L2 A
LOCATION: MOEL HEBOG.
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTERP
5
4
3
2
1
metres
V 5mm
SKOLITHUS?
vFSS - C SLTST, HOR LAM.
C SLTST, POORLY EXPOSED.
C SLTST, BIO.
C SLTST, BIO, VERT. BURROWS
C SLTST, RIPPLE XB
mc SLTST.
vF SS - C SLTST. BIOTURBATE.
? RIPPLING.
C SLTST.
VF SS - C SLTST. , cl
HOR RIBS
moRE SIL. VF SS - C SLTST.
VF SS - C SLTST.
CLEAVED.
HOR. RIBS.
VF SS - C SLTST
CLEAVED.
VF SS . SLUMPED, CONTORTED.
VF SS. FINE HOR LAM.
MC SLTST . cl
SCALE:
cm/m
M
S
Sand
C(mm)
4 8 16 64
G

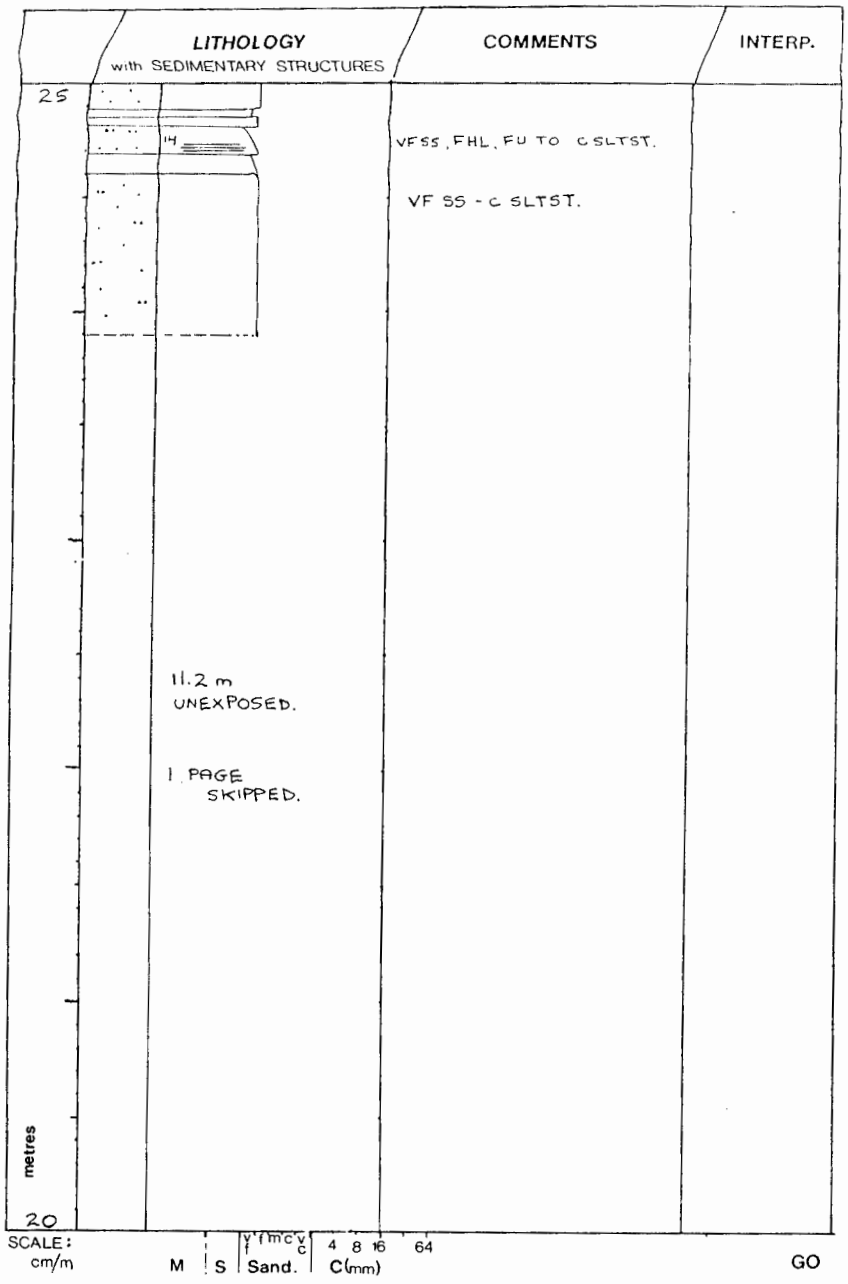
SECTION: L2 A LOCATION: MOEL HEBOG.



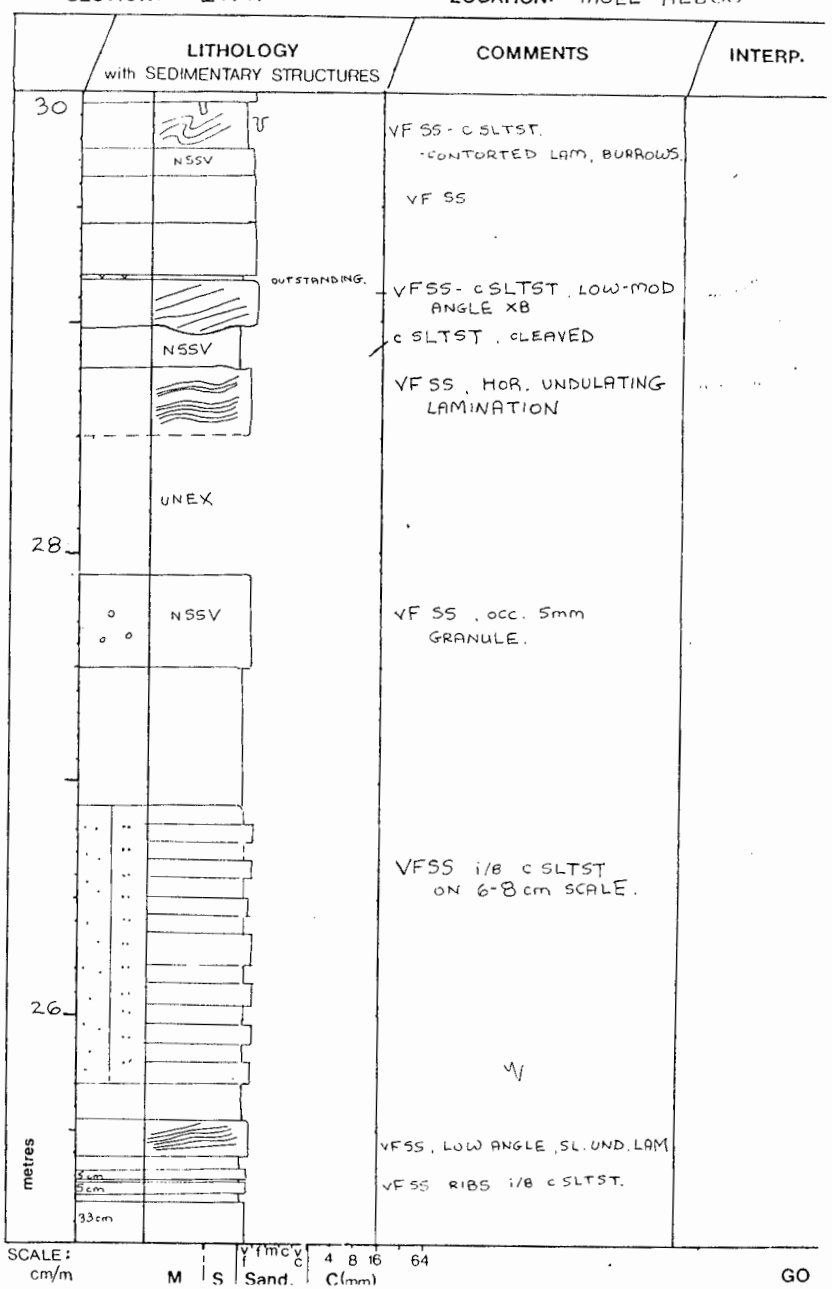
SECTION: L2 A LOCATION: MOEL HEBOG.



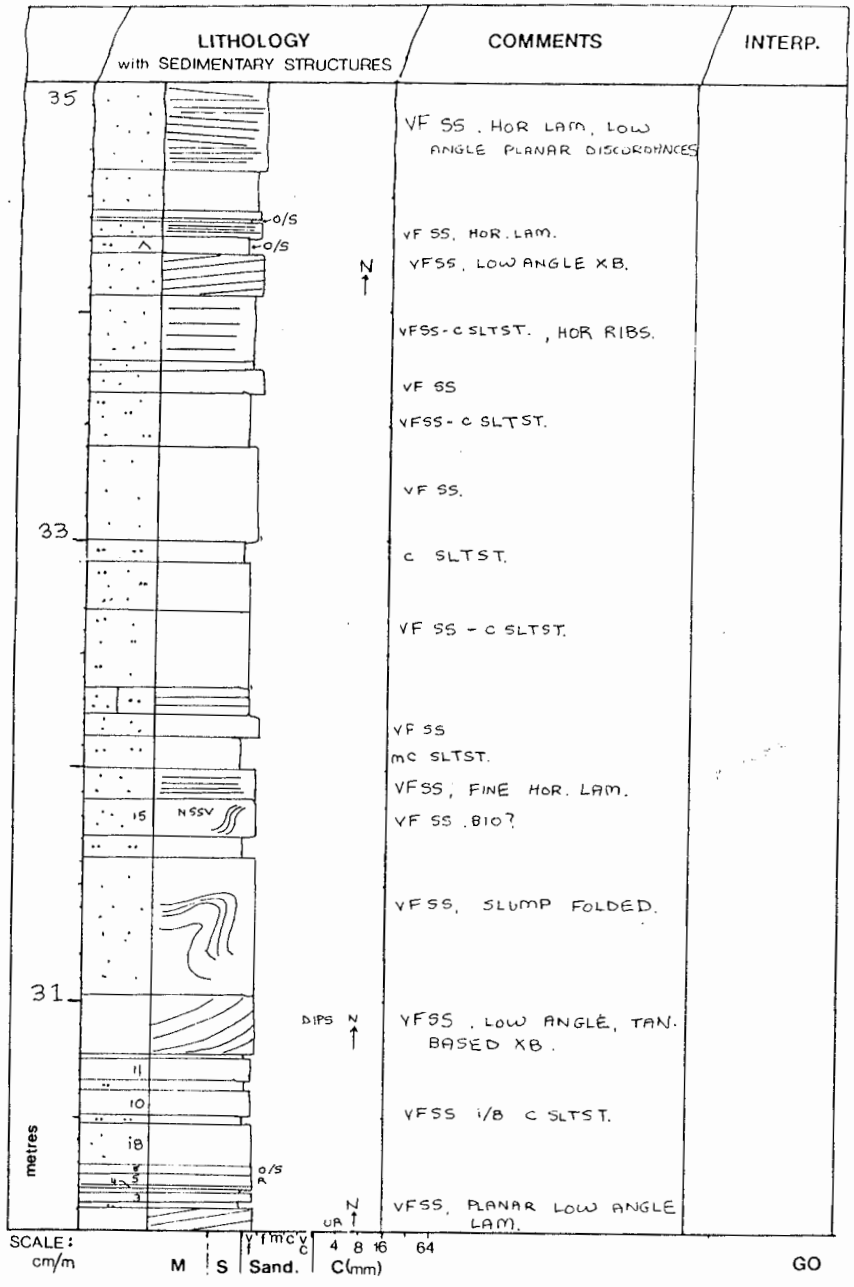
SECTION: L 2 A LOCATION: MOEL HEBOG



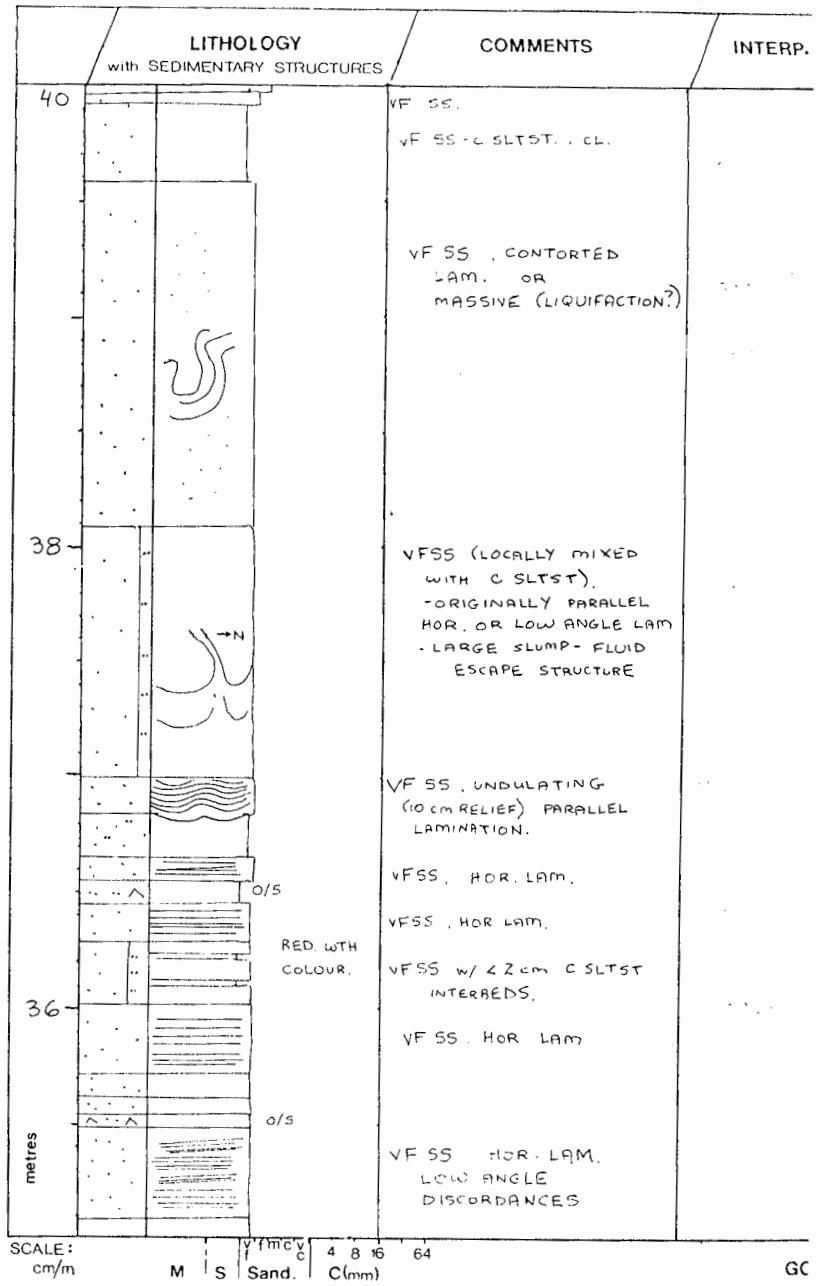
SECTION: L 2 A LOCATION: MOEL HEBOG



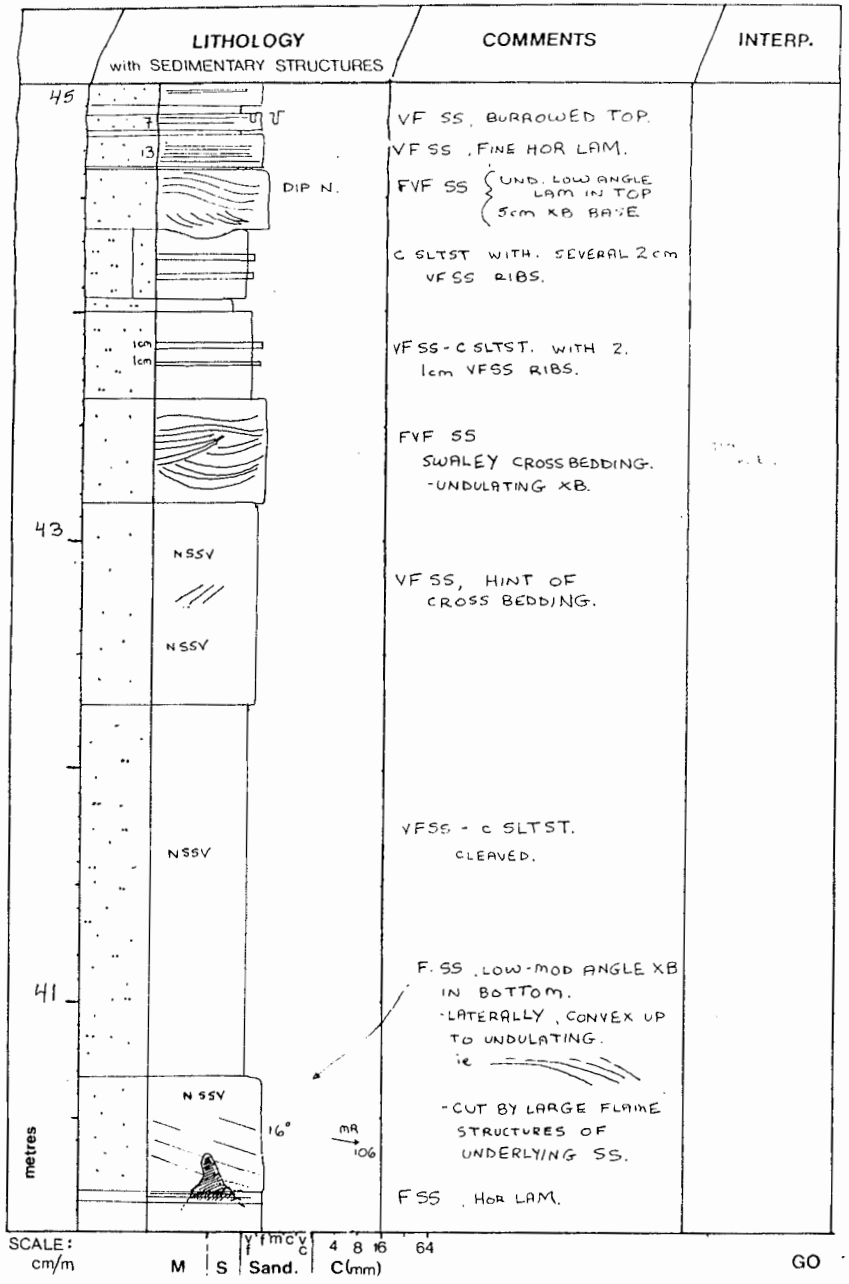
SECTION: L2A LOCATION: MOEL HEBOG.



SECTION: L2A LOCATION: MOEL HEBOG

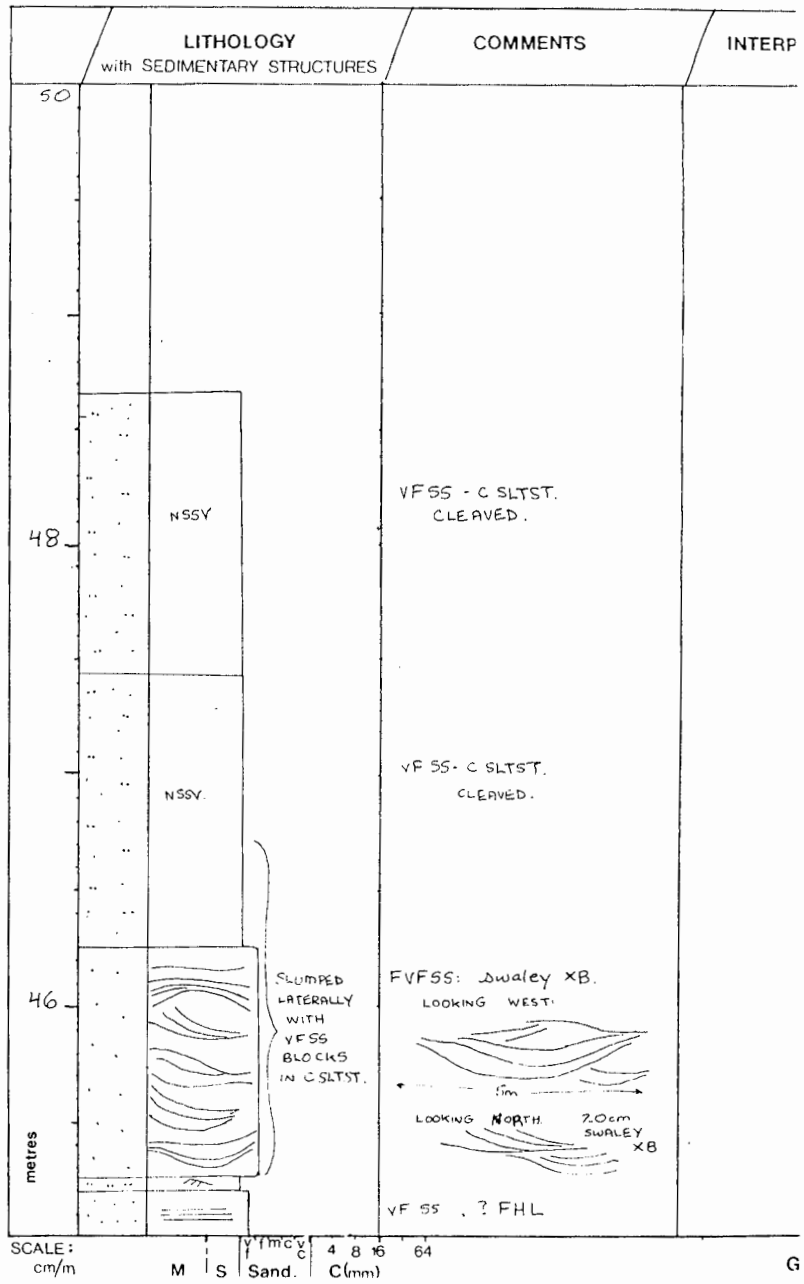


SECTION: L 2 A LOCATION: MOEL HEBOG



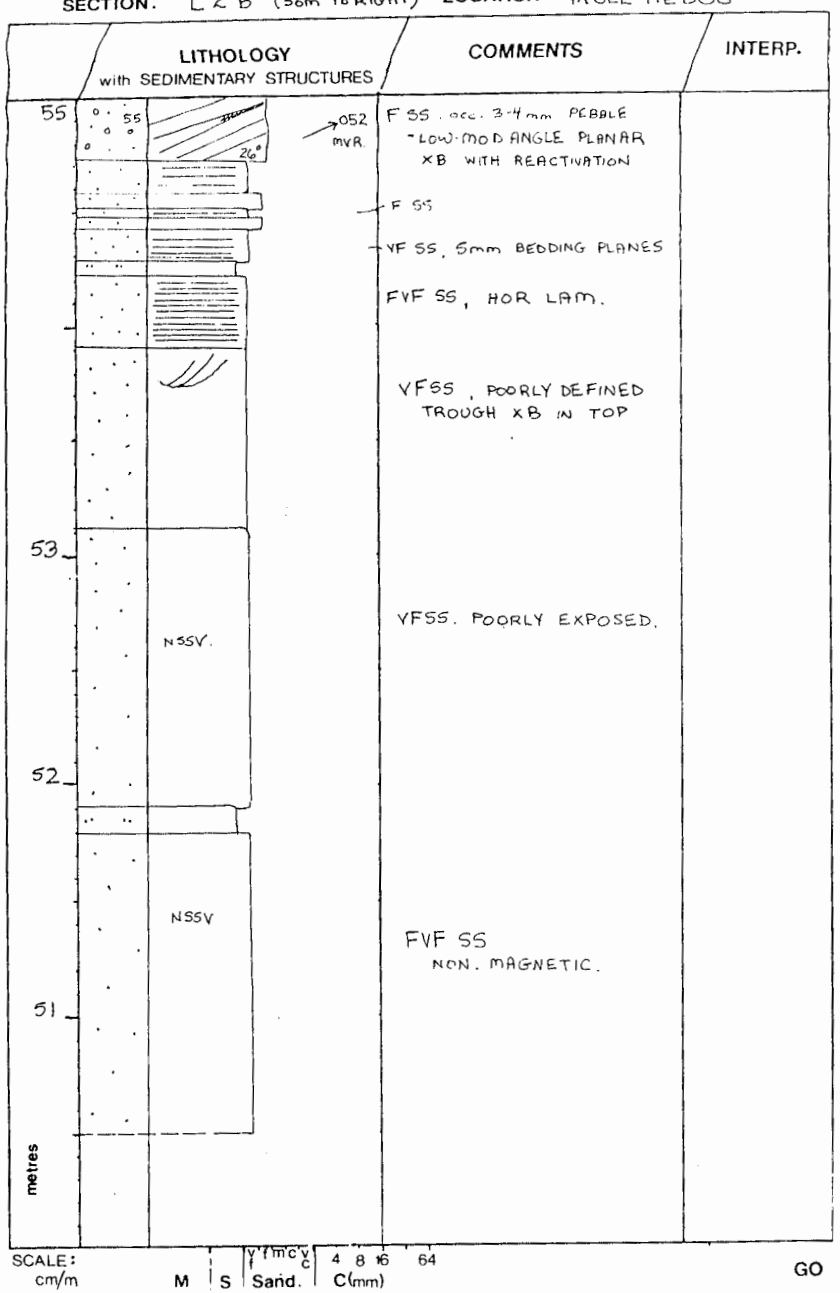
GO

SECTION: L 2 A LOCATION: MOEL HEBOG

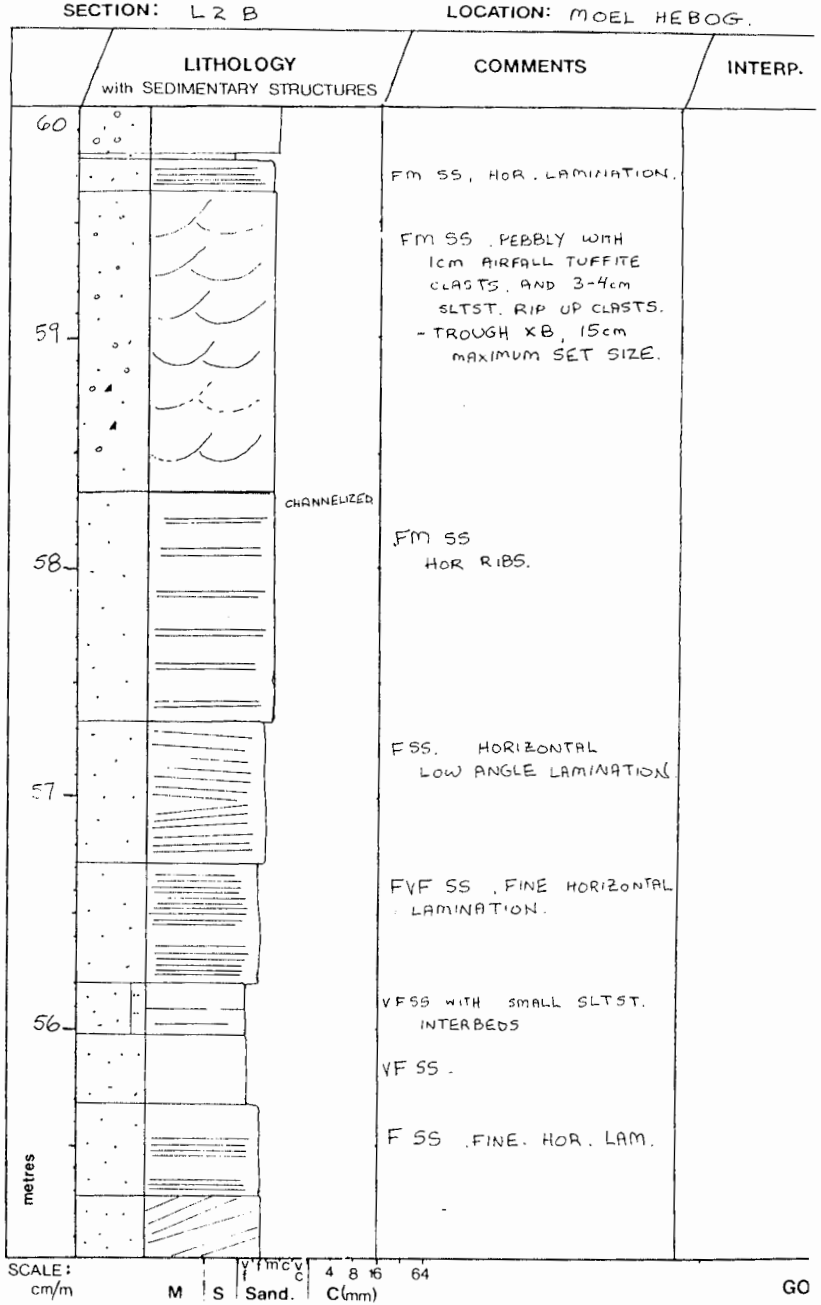


G

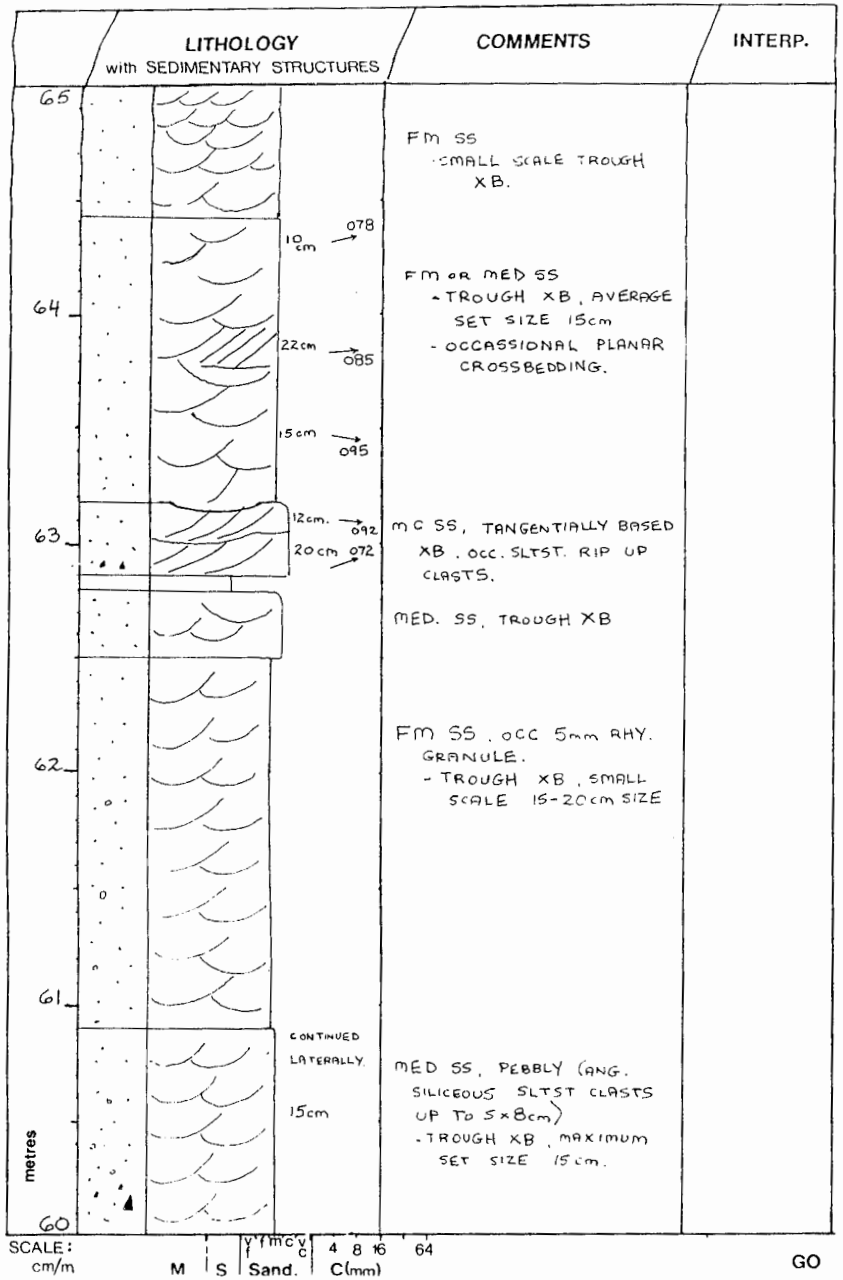
SECTION: L 2 B (50m TO RIGHT) LOCATION: MOEL HEBOG



SECTION: L 2 B LOCATION: MOEL HEBOG.

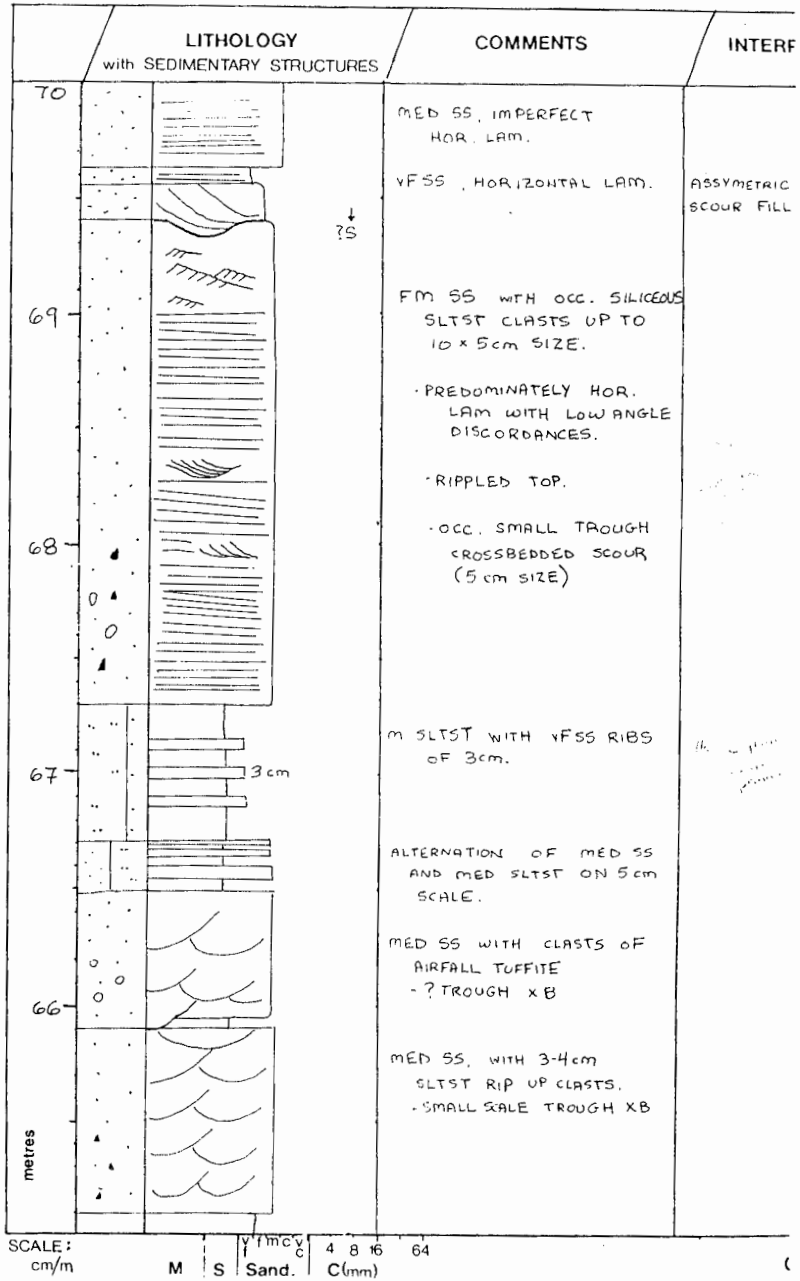


SECTION: L 2 B LOCATION: MOEL HEBOG.

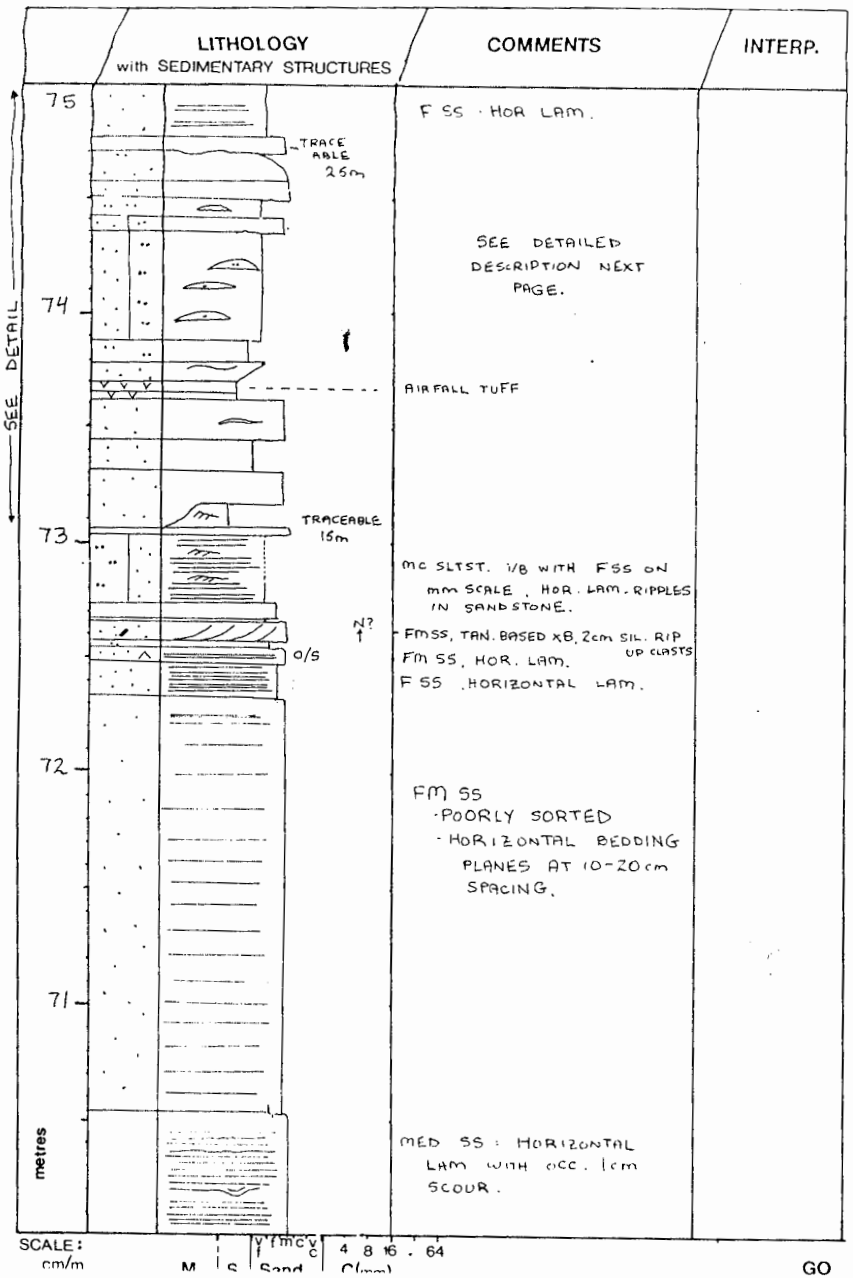


GO

SECTION: L 1 LOCATION: MOEL HEBOG.

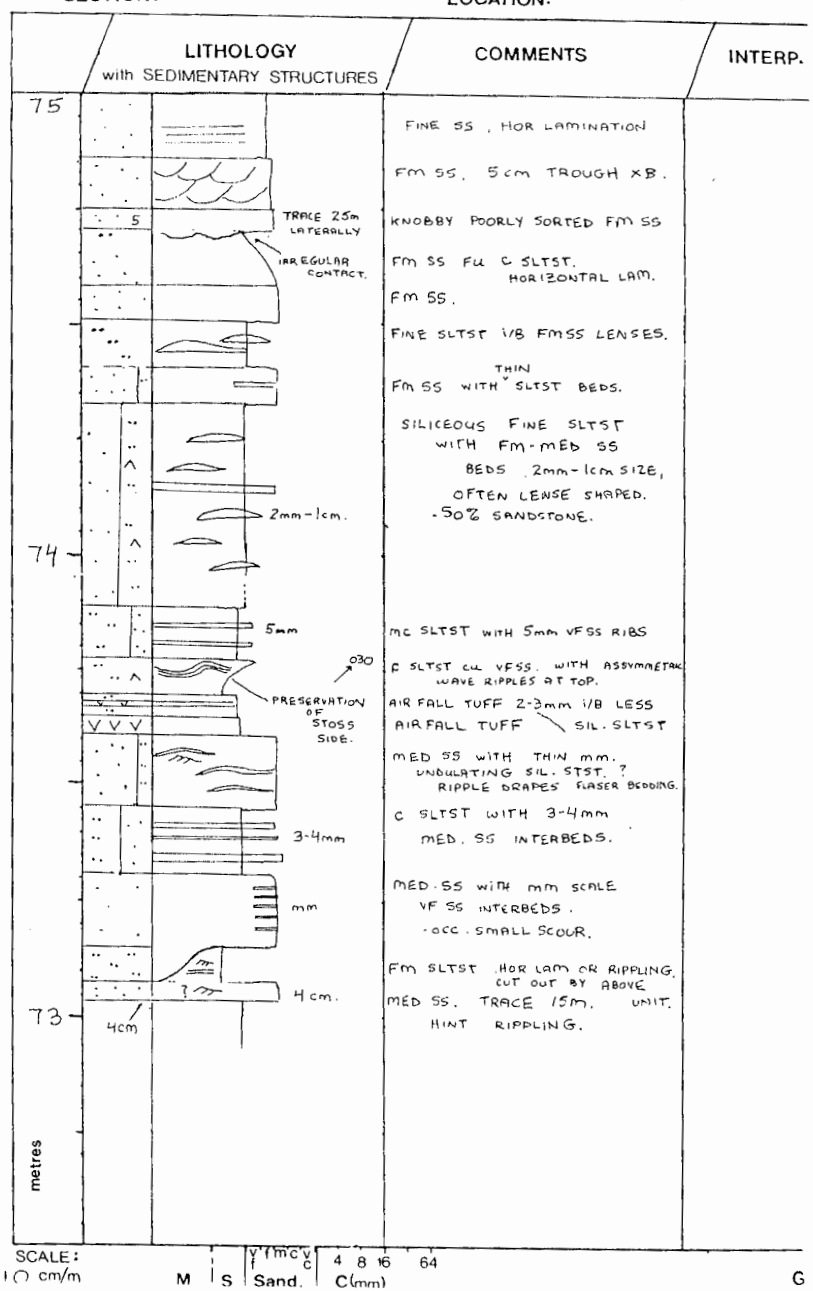


SECTION: L 2 B LOCATION: MOEL HEBOG.



GO

SECTION: DETAIL L2 B LOCATION: MOEL HEBOG



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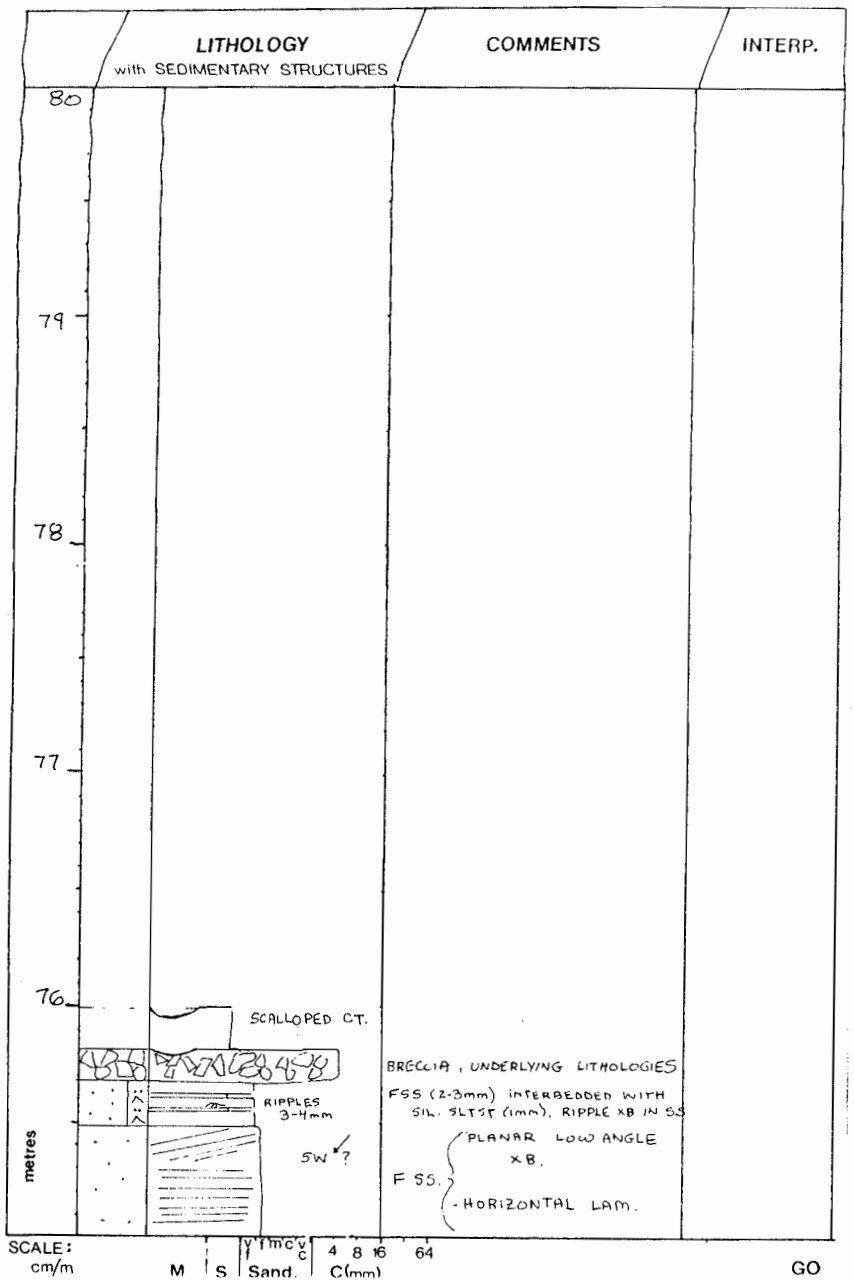
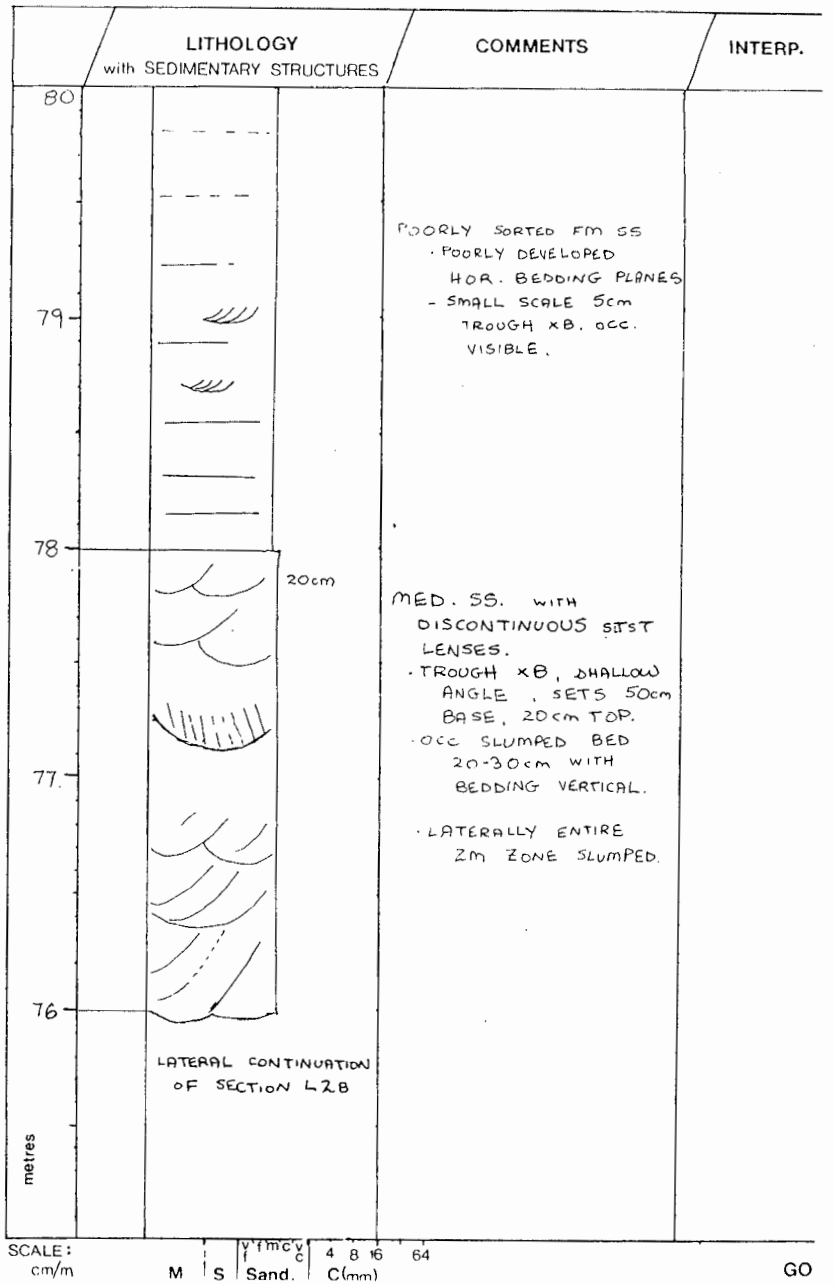
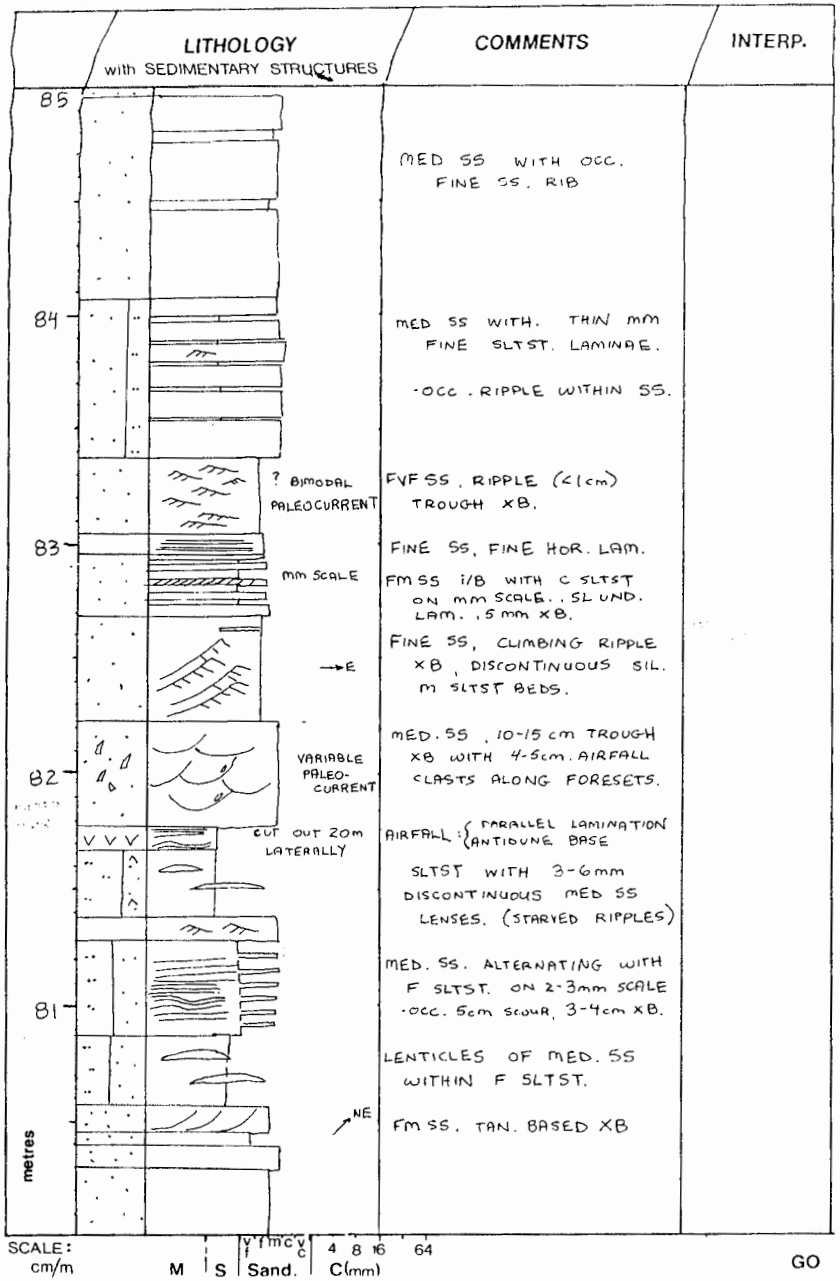
SECTION: L 2 B LOCATION: MOEL HEBOG



SECTION: L 2 C LOCATION: MOEL HEBOG.



SECTION: L Z C LOCATION: MOEL HEBOG.



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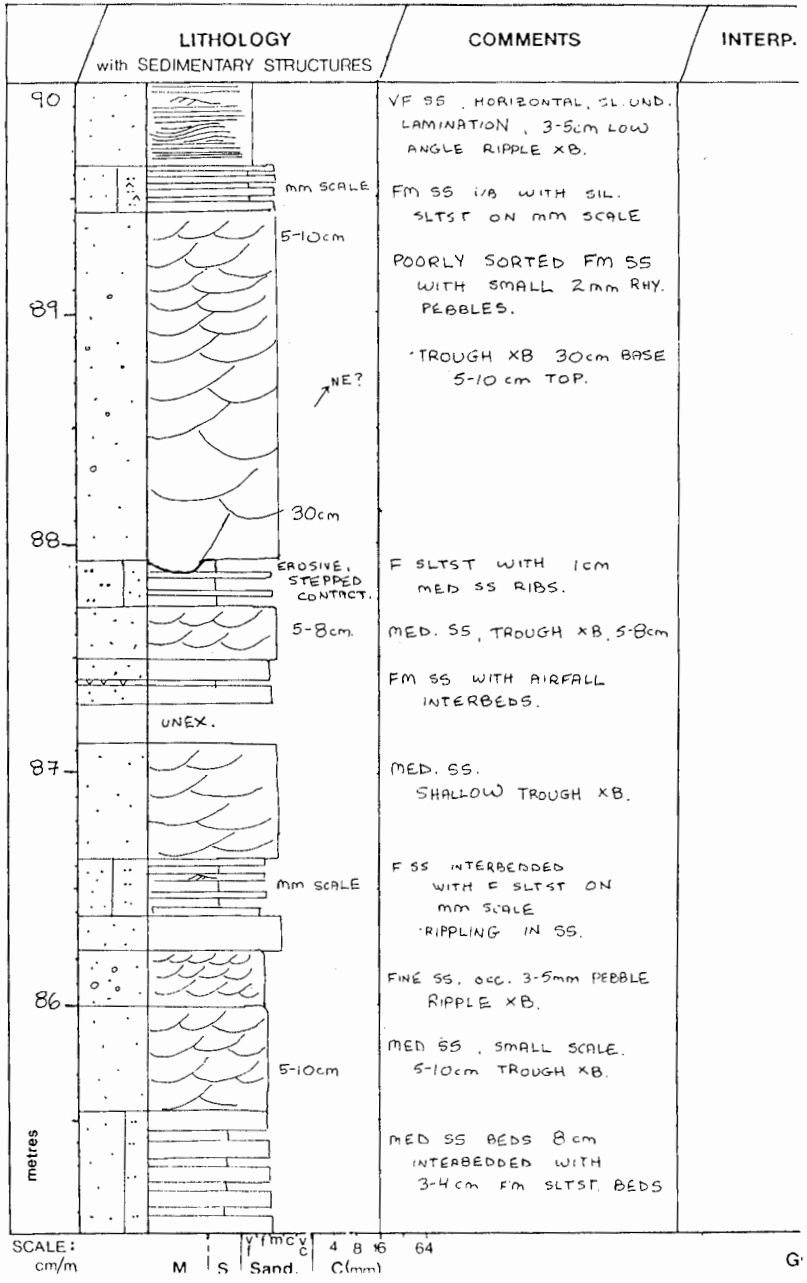
SECTION: L Z C LOCATION: MOEL HEBOG



G·

SECTION: L2C LOCATION: MOLL HEBOG.

LITHOLOGY with SEDIMENTARY STRUCTURES	COMMENTS	INTERP.

95
94
93
92
91

metres

1 cm SCALE

MED. SS INTERBEDDED WITH SLTST ON cm SCALE.

SCALE: cm/m M | S | Sand. v f m c v c | C(mm) 4 8 16 64

GO

SECTION: L1C LOCATION: [illegible]

LITHOLOGY with SEDIMENTARY STRUCTURES	COMMENTS	INTERP.

60
59
58
57
56
55

metres

NSSV

?20cm.

15cm

25cm

Fm SS.
- ? 15cm TROUGH XB
- OCC. 5-10cm DISCONTINUOUS SLTST BEDS.

Fm SS, HOR LAM.
2cm SLTST RIP UP CLASTS IN BASE.

Fm SS, OCC. WELL ROUNDED 5-6mm. RHY. PEBBLE.
- POORLY DEFINED TROUGH XB., SETS UP TO 20 cm.

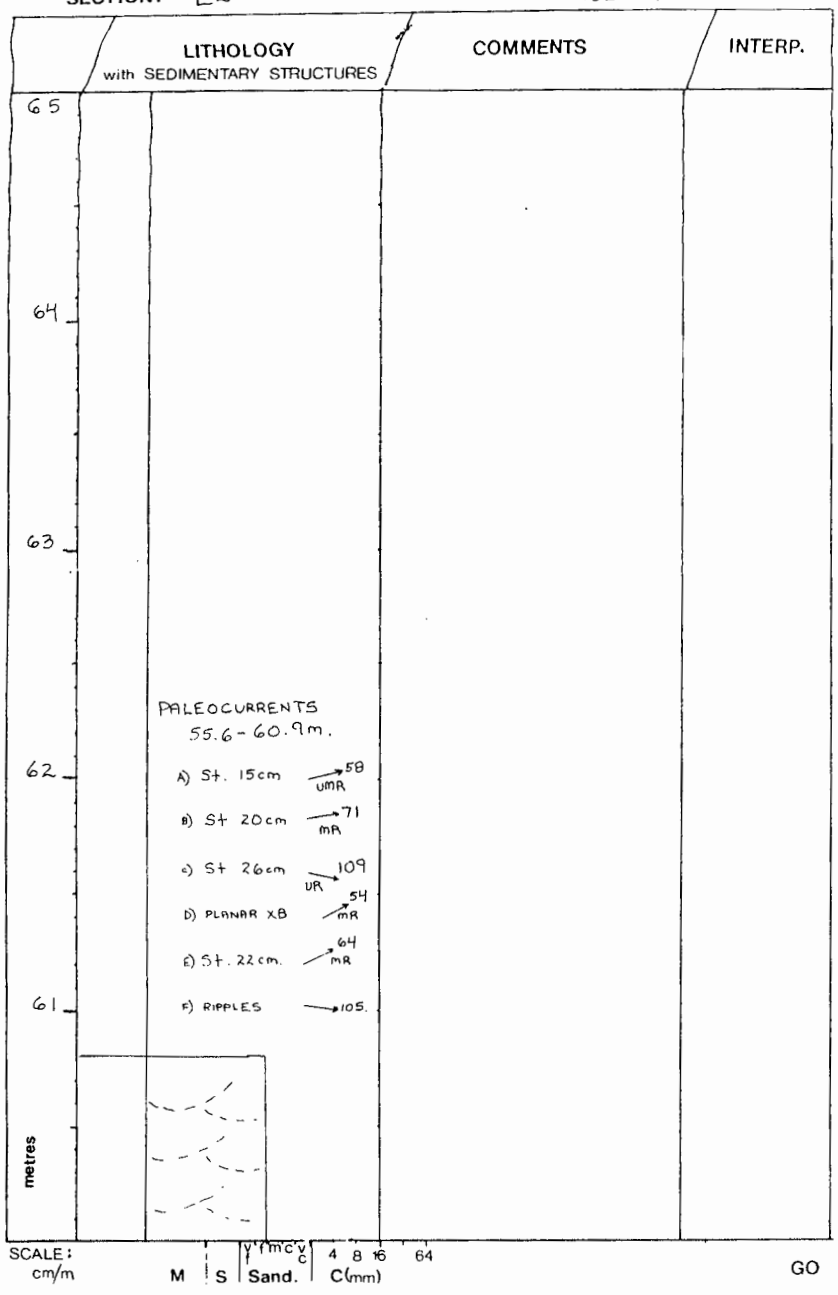
PEBBLY MED. SS (PEBBLES OF ACIDIC TUFF UP TO 2 cm SIZE)
- SETS UP TO 25 cm IN BASE

MINI SECTION C
-20 m LATERAL TO B.

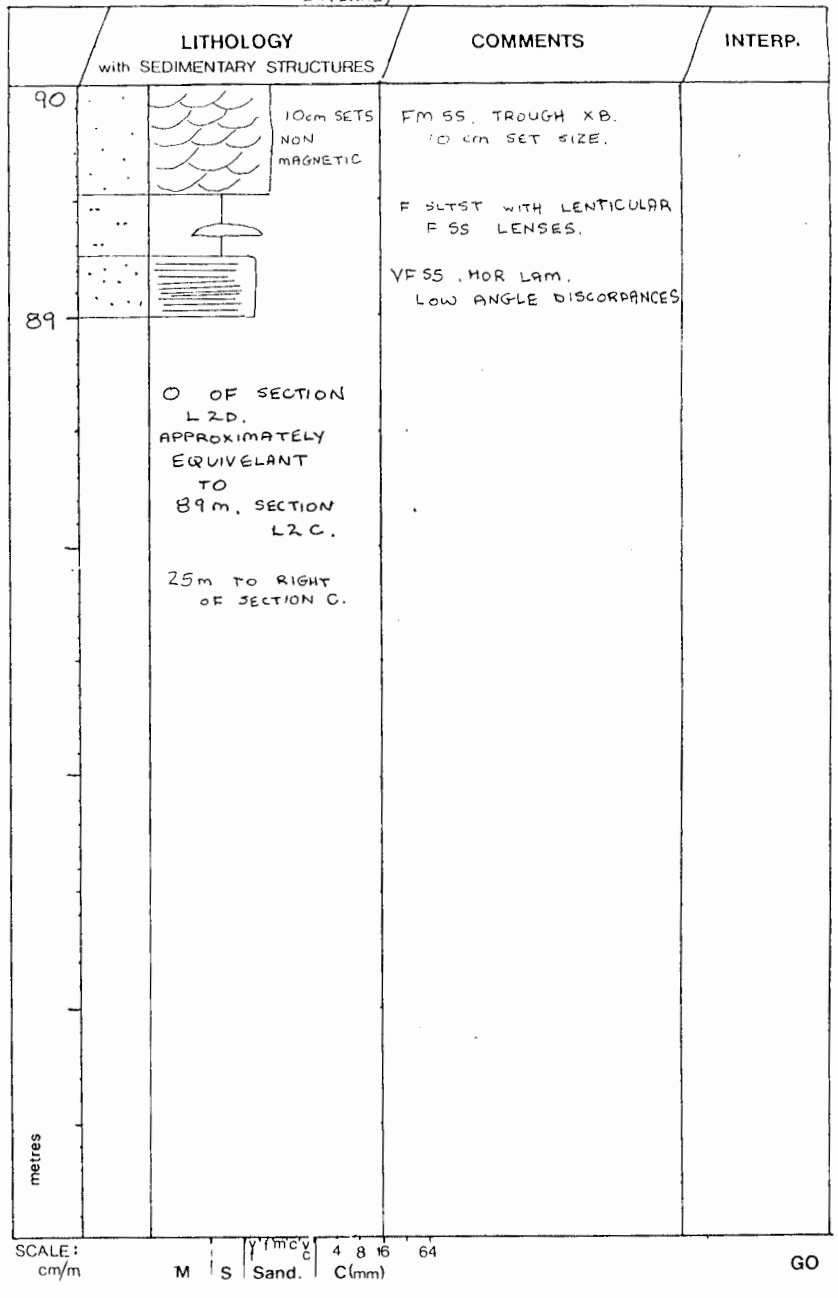
SCALE: cm/m M | S | Sand. v f m c v c | C(mm) 4 8 16 64

GO

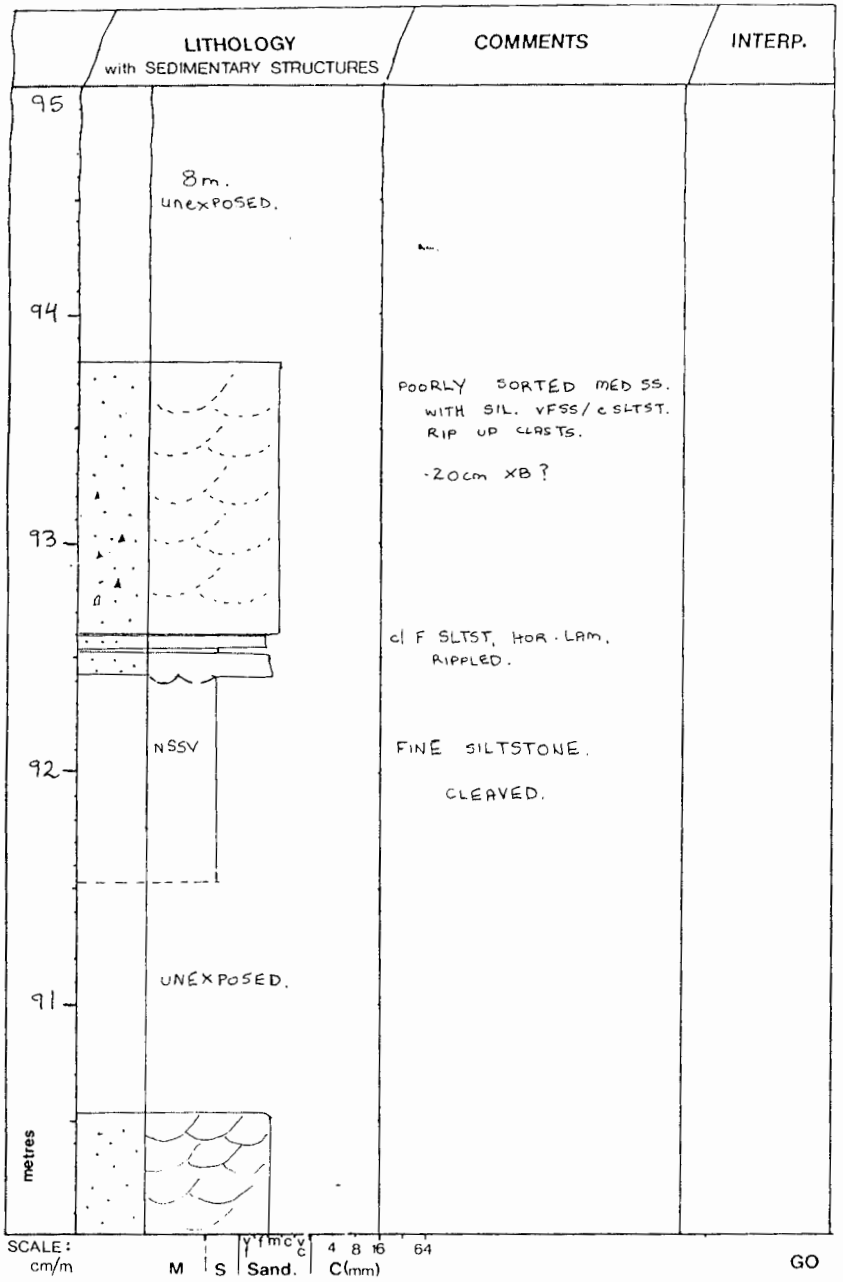
SECTION: L2 - C LOCATION: MOEL HEBOG



SECTION: L 2 D (25m LATERAL) LOCATION: MOEL HEBOG.



SECTION: L2 D LOCATION: MOEL HEBOG.



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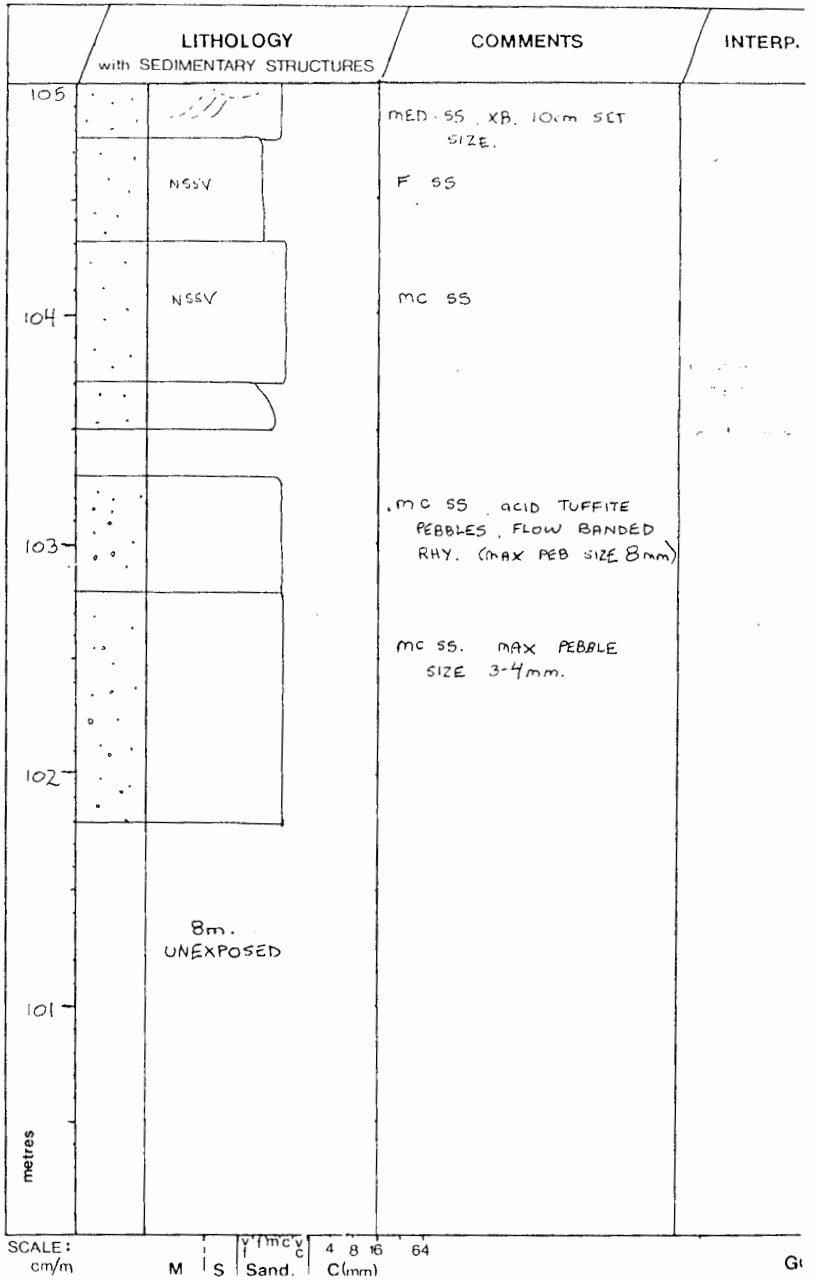
SECTION: L2 D. LOCATION: MOEL HEBOG.



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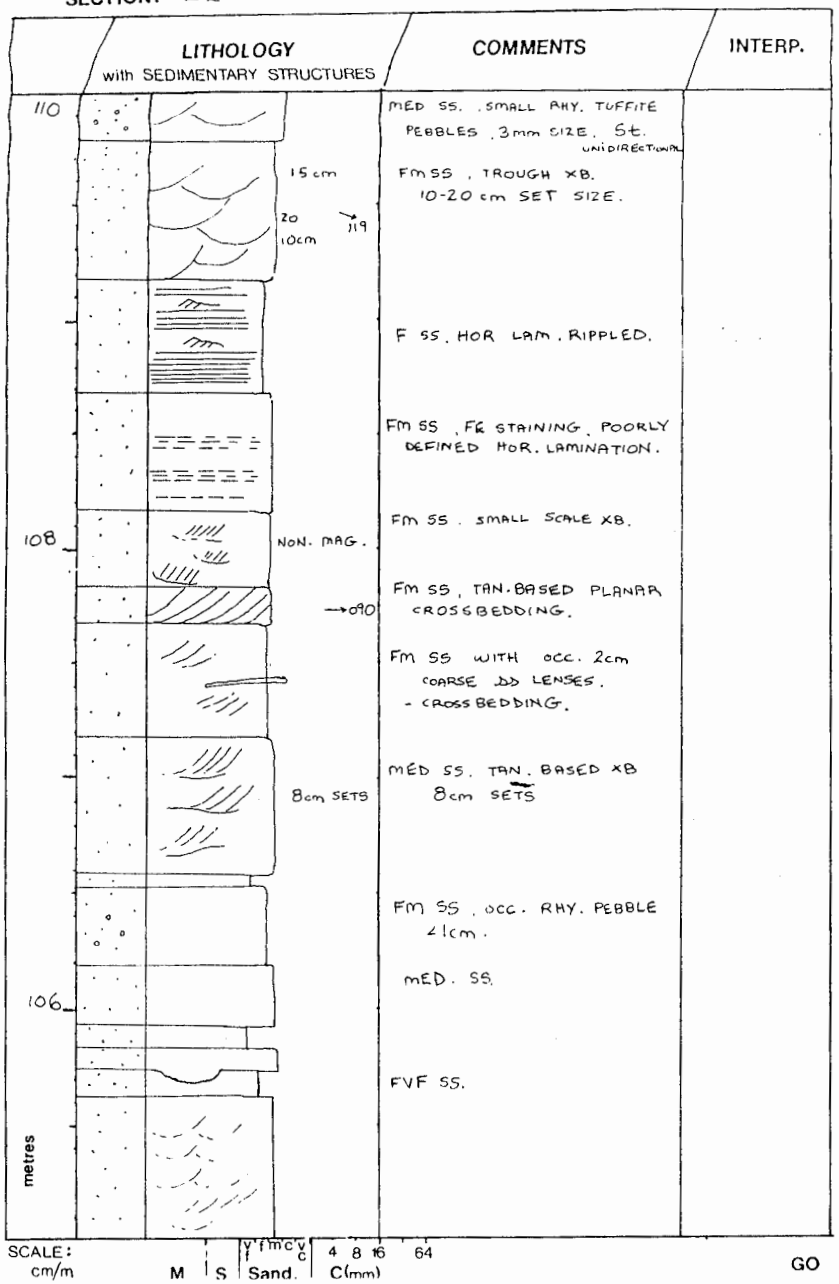
SECTION: L2 D LOCATION: MOEL HEBOG.



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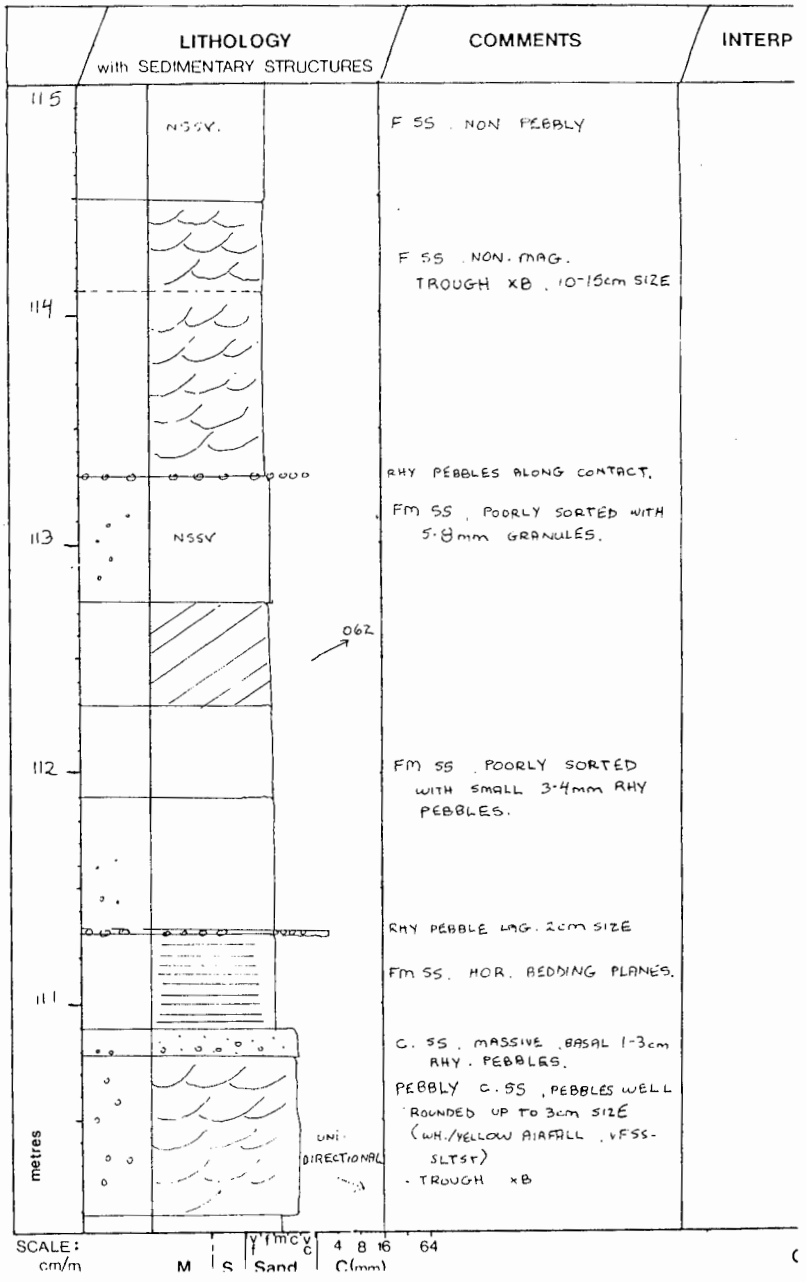
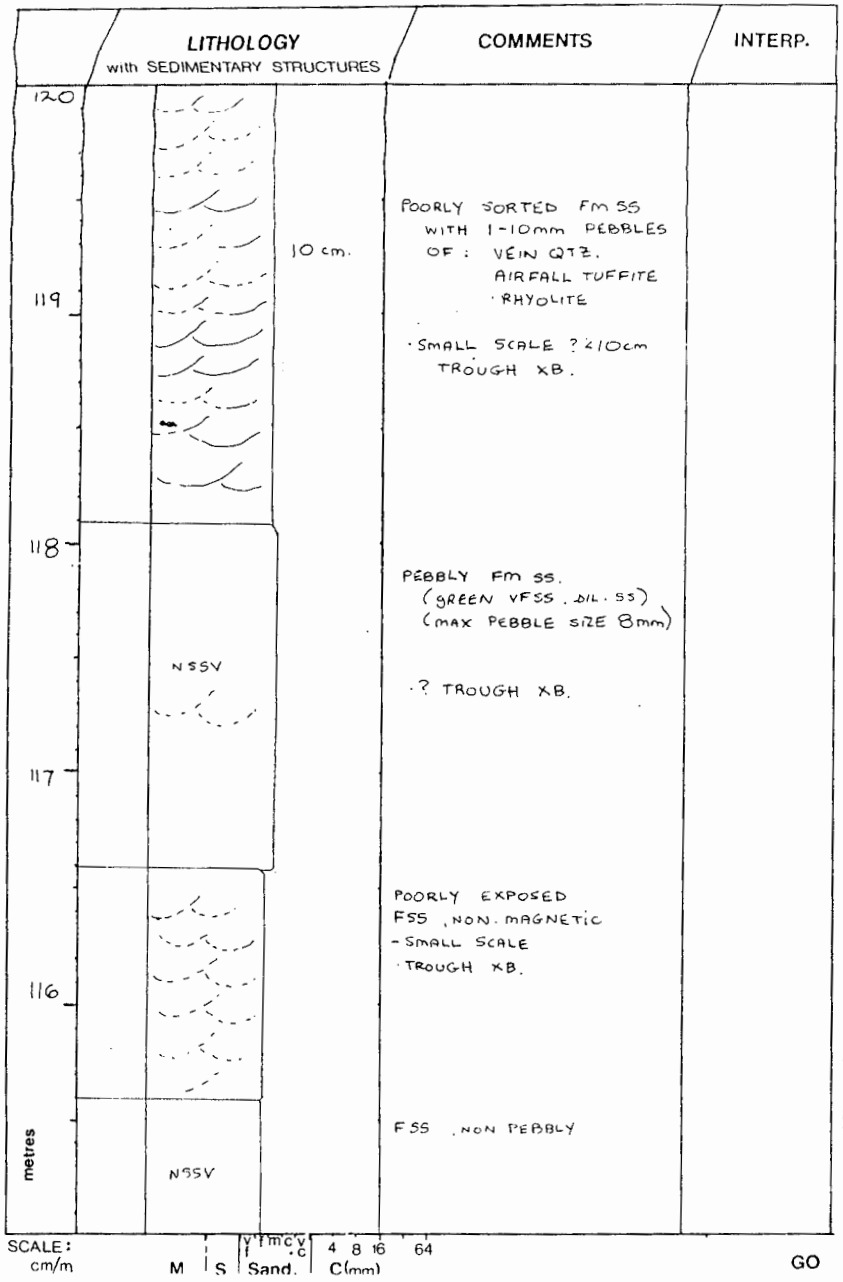
SECTION: L2 D LOCATION: MOEL HEBOG



SECTION: L2 D LOCATION: INOEL HEBOG



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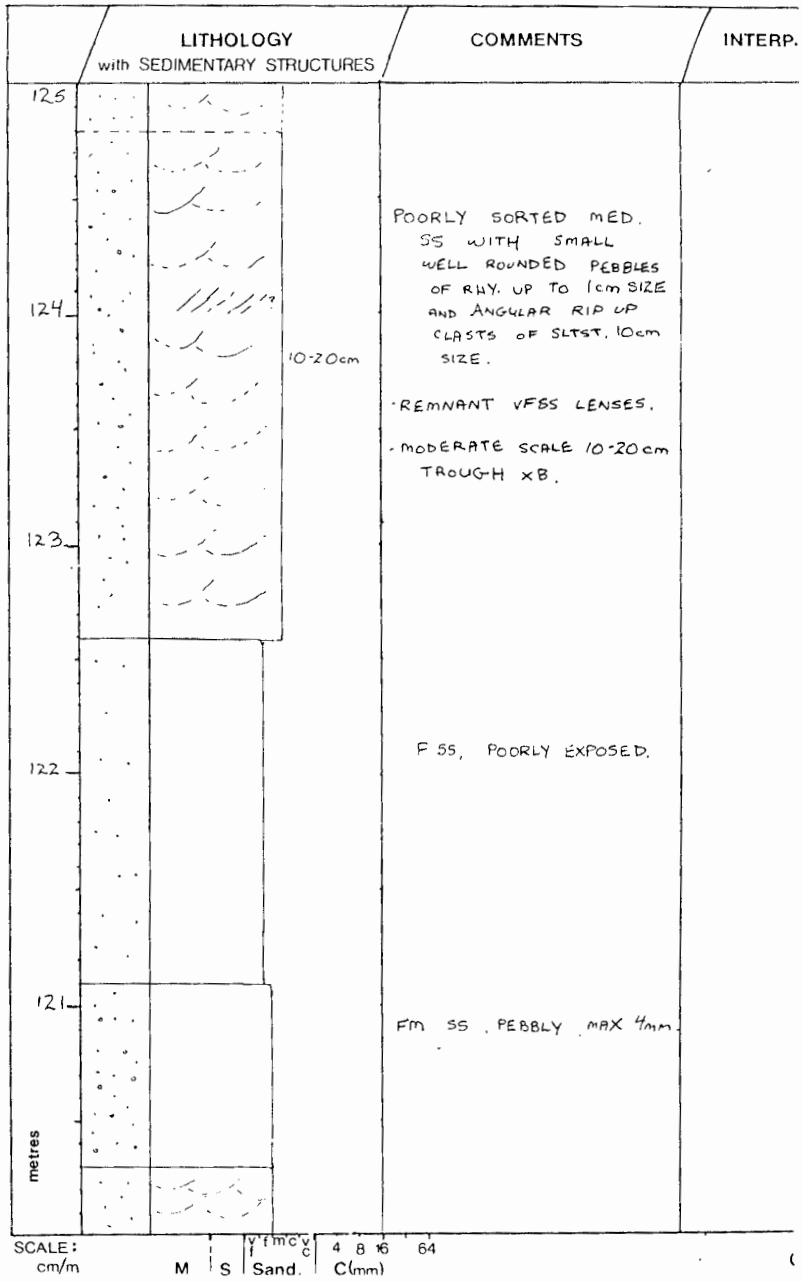
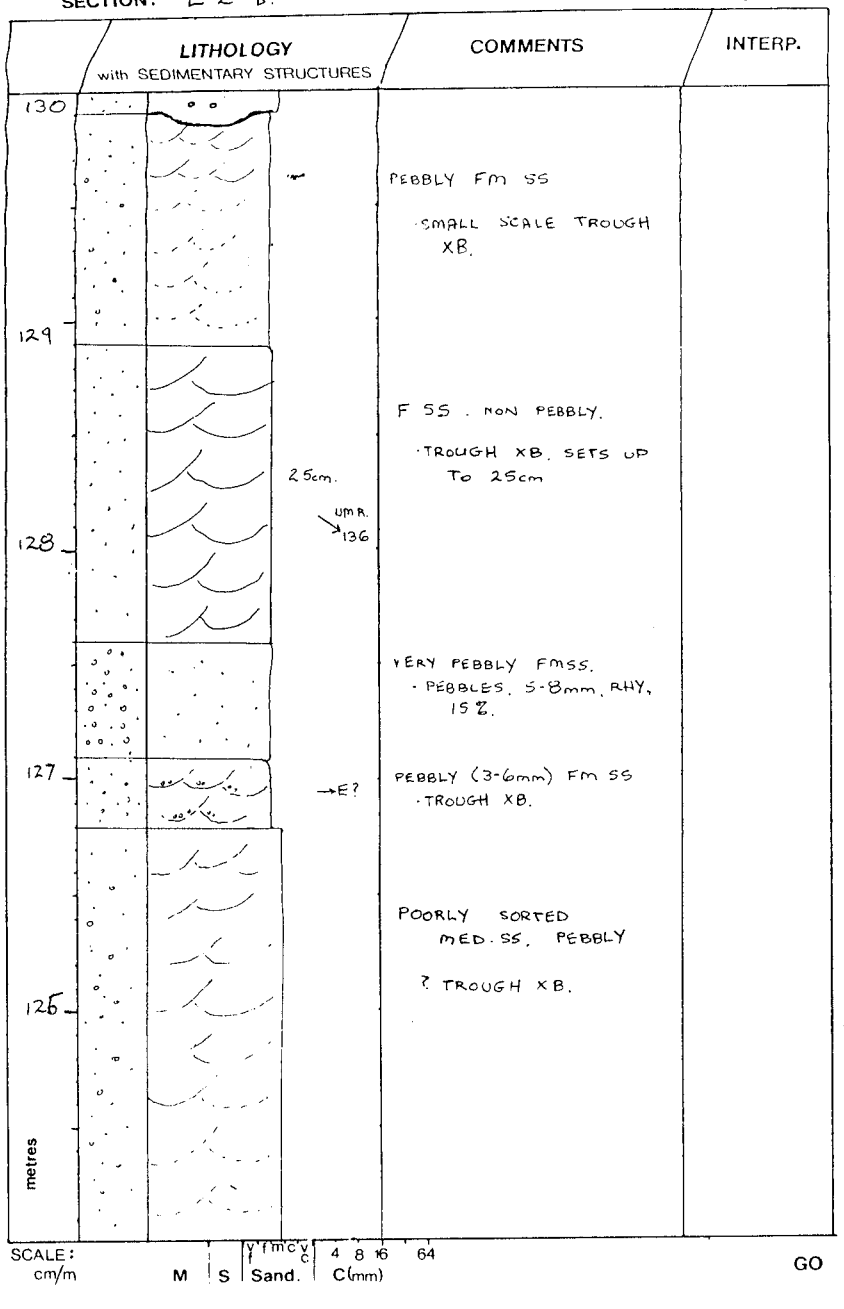
SECTION: L2 D LOCATION: INOEL HEBOG



SECTION: L 2 D. LOCATION: MOEL HEBOG.



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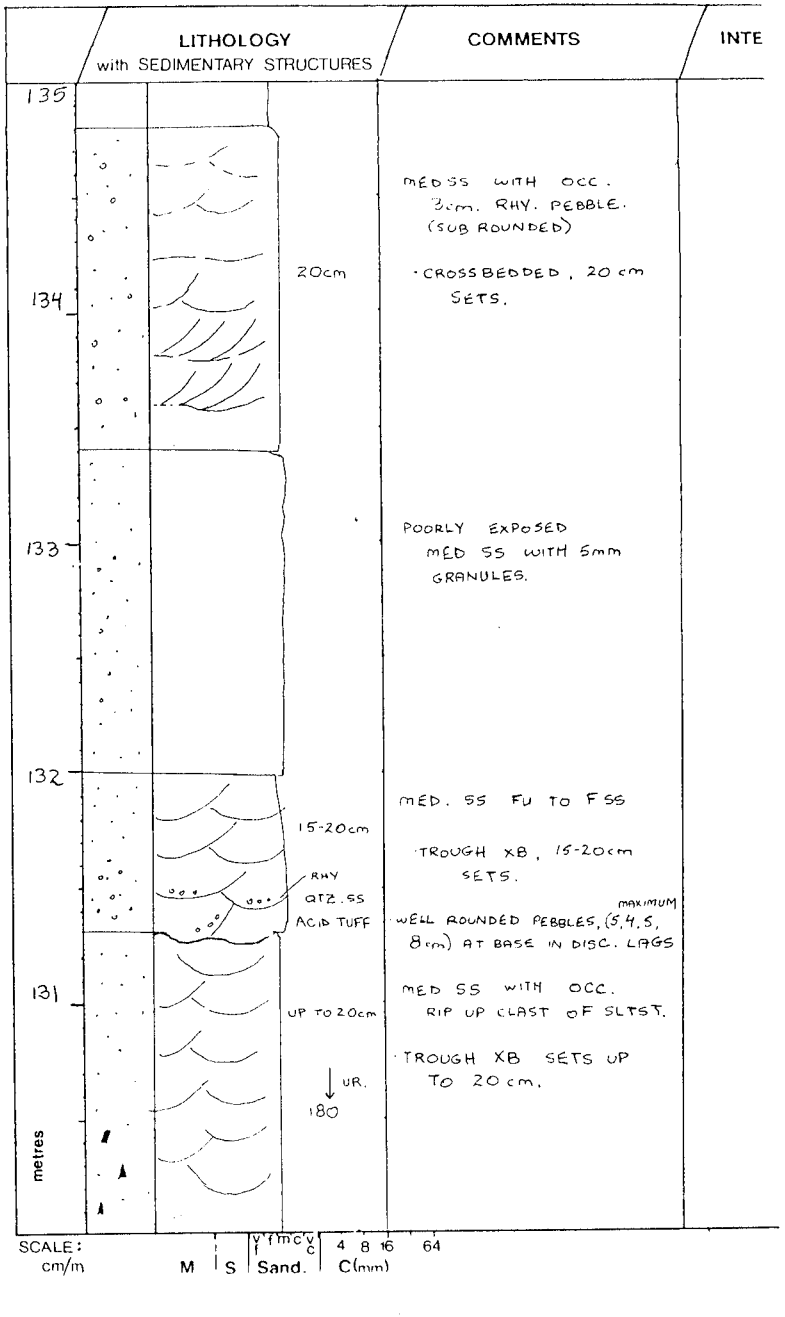
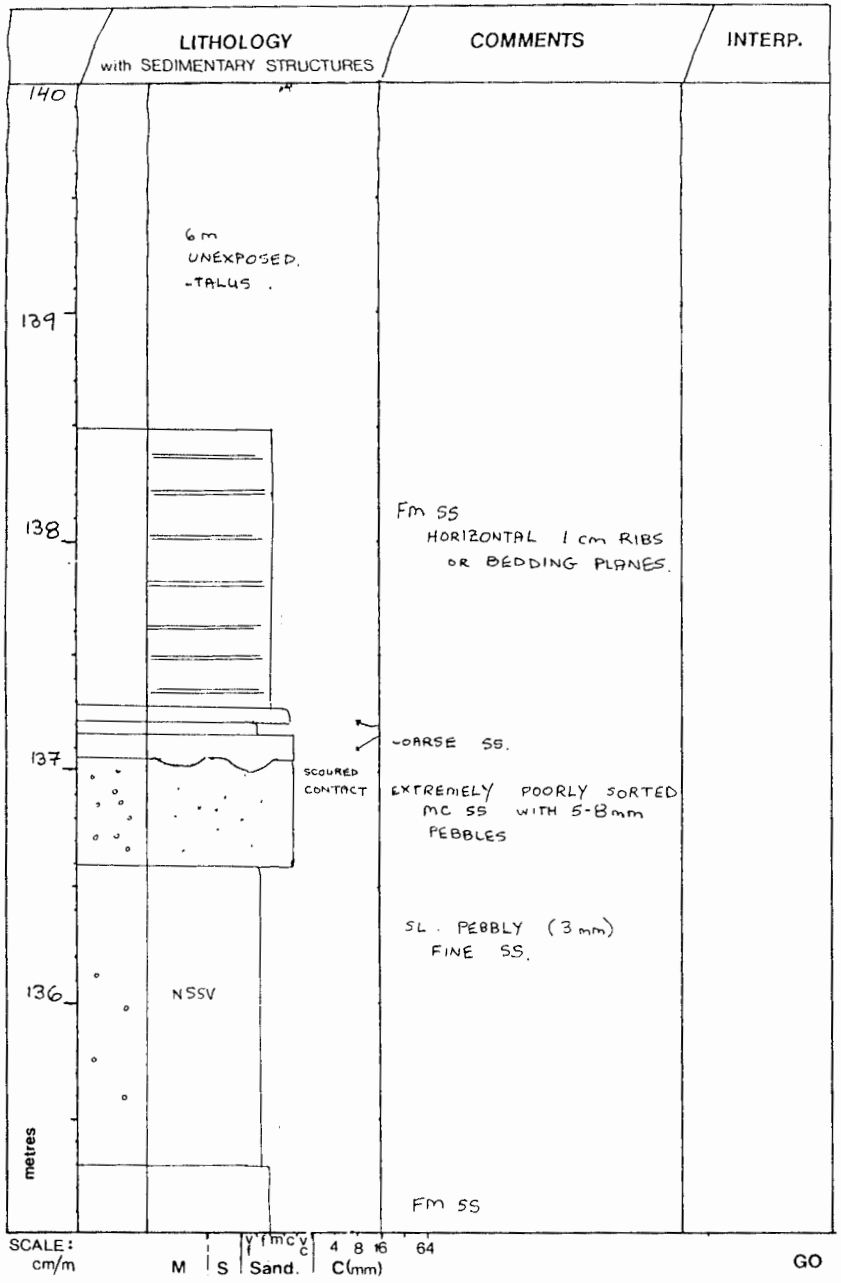
SECTION: L 1 LOCATION: MOEL HEBOG.



SECTION: L 2 D LOCATION: MOEL HEBOG



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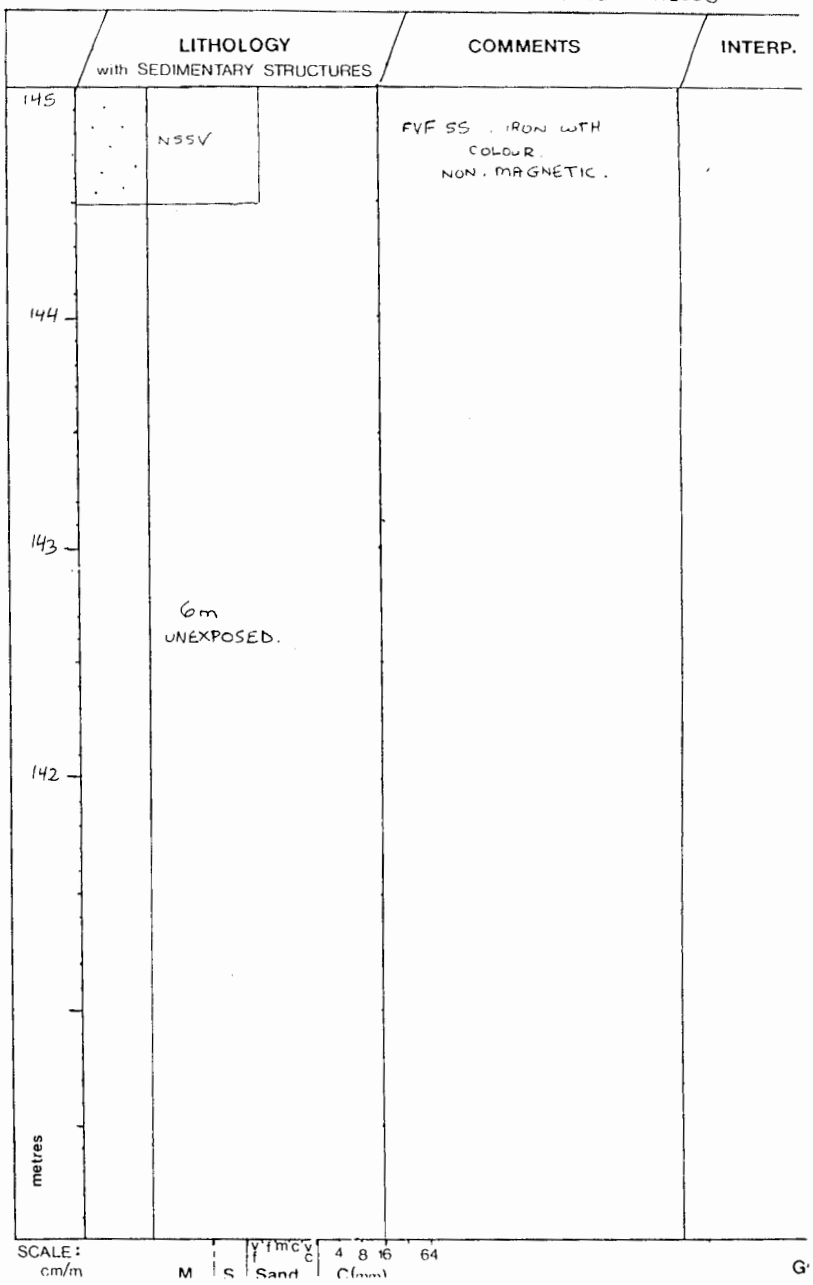
SECTION: L 2 D LOCATION: MOEL HEBOG



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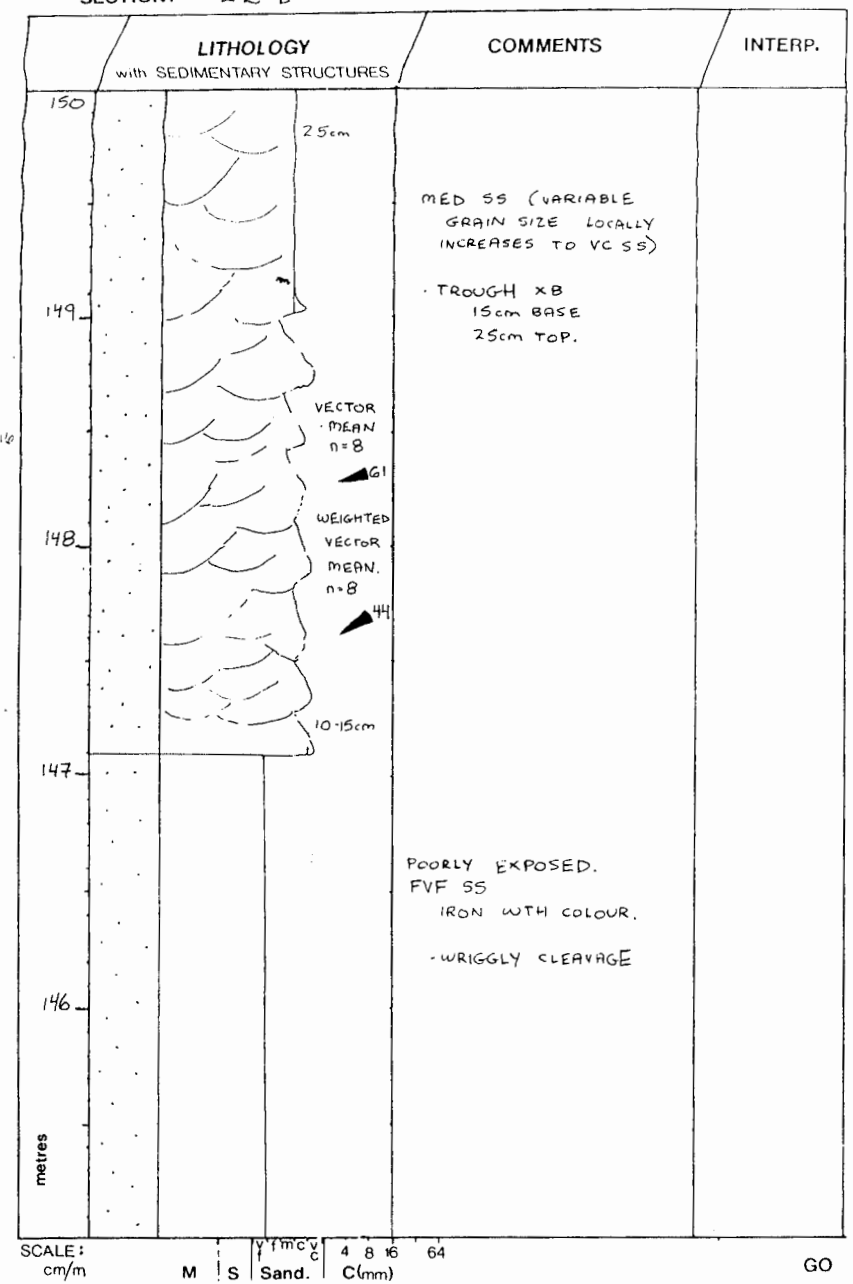
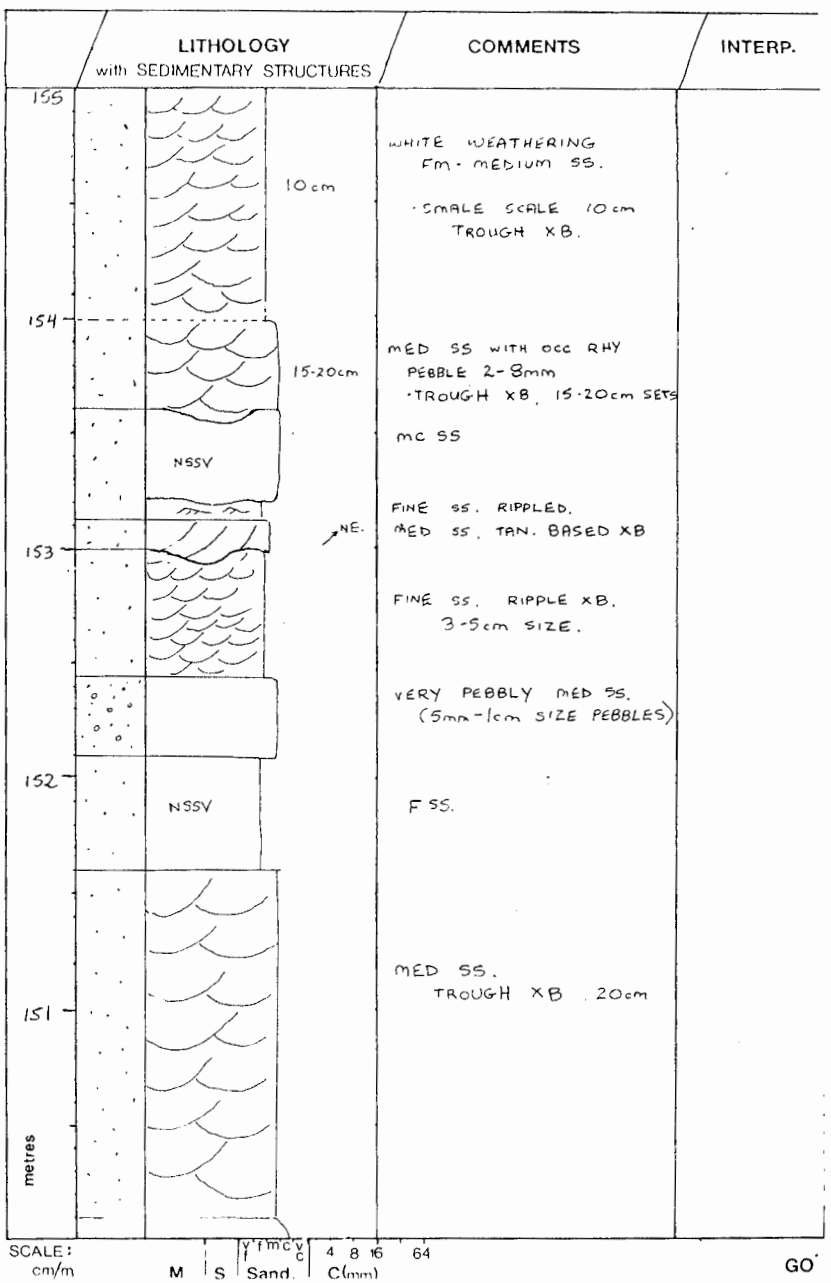
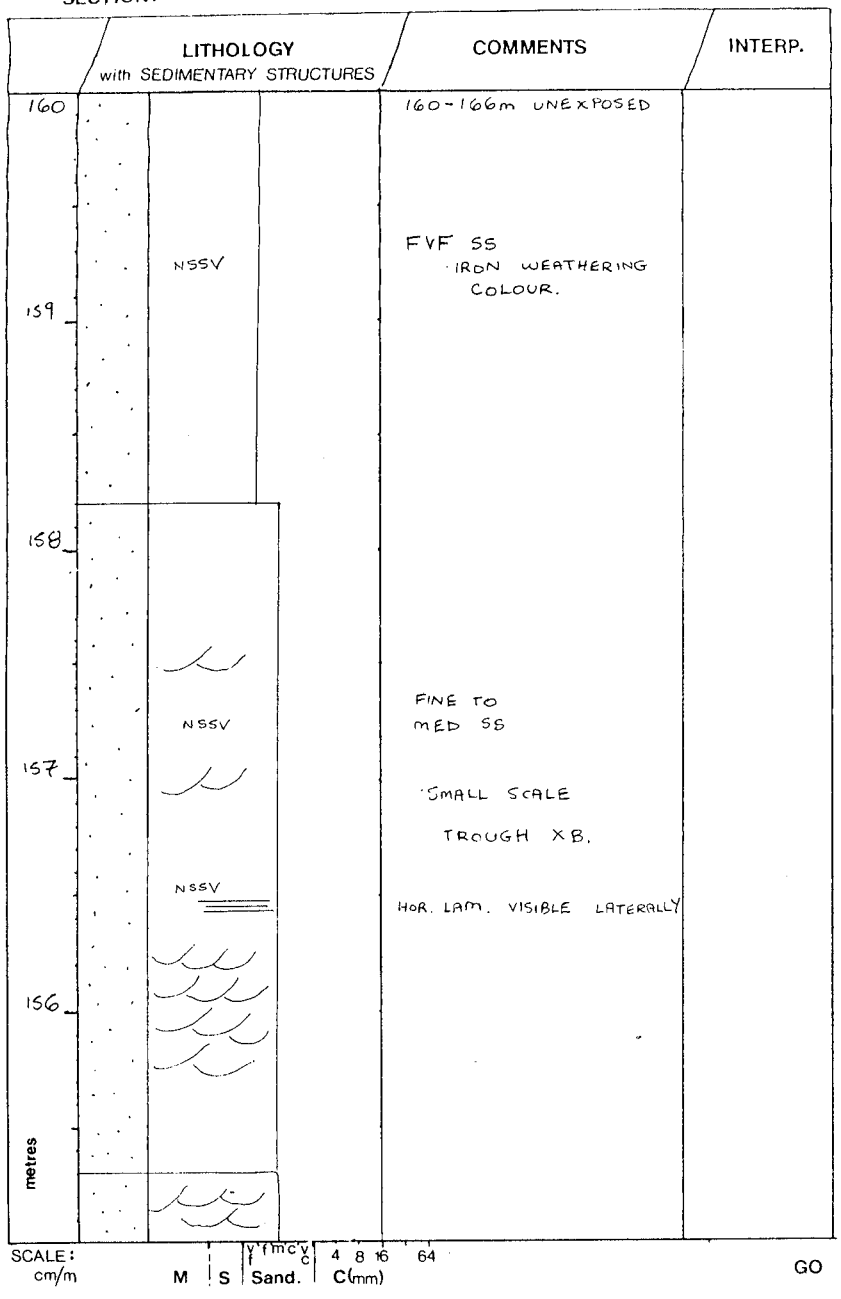
SECTION: L2 D LOCATION: MOEL HEBOG



SECTION: L2 D LOCATION: Moel Hebog



SECTION: L 2 D LOCATION: MOEL HEBOG.



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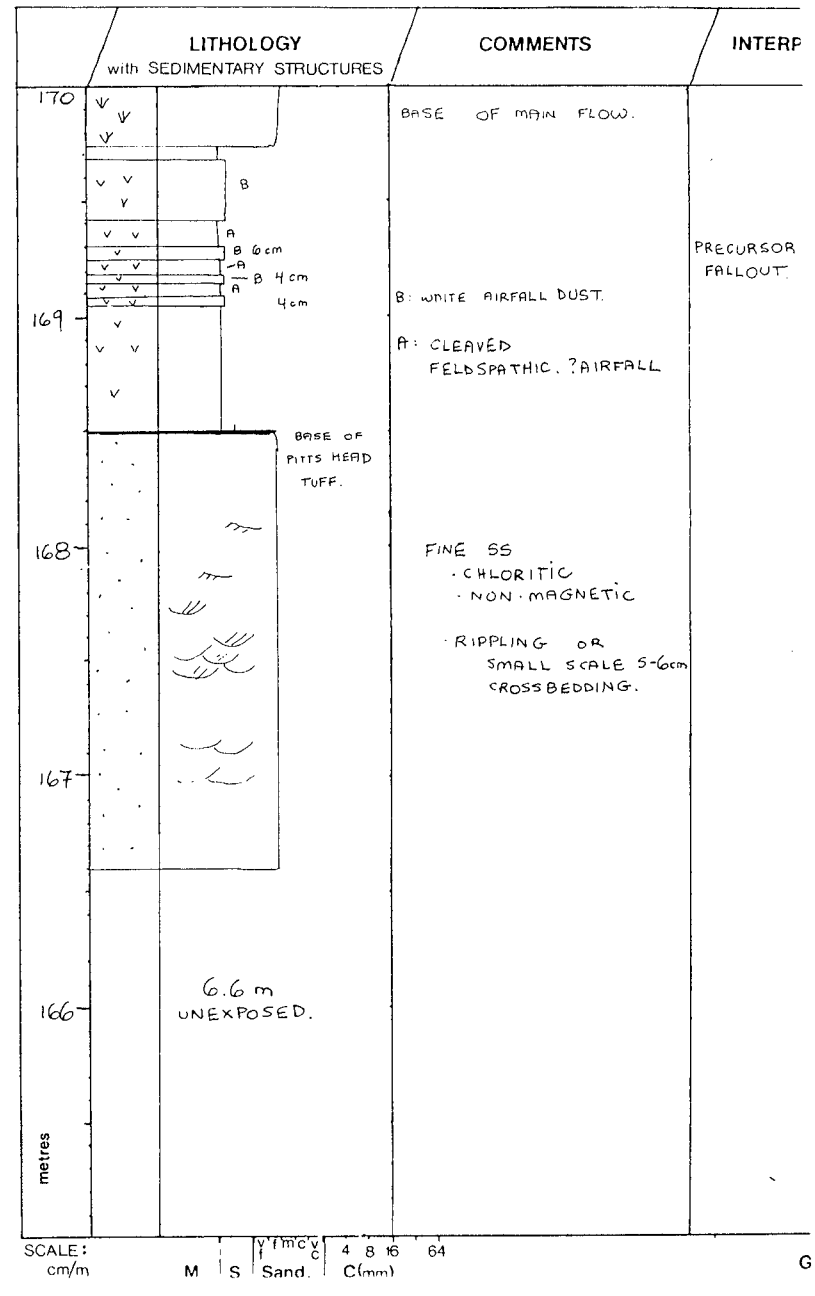
SECTION: L 2 D LOCATION: MOEL HEBOG



G

SECTION: L 2 D LOCATION: MOEL HEBOG

LITHOLOGY with SEDIMENTARY STRUCTURES	COMMENTS	INTERP.
180	PITTS HEAD TUFF	
	SECONDARY SILICIFICATION OF PUMICE FRAGMENTS	
178	"PALEOCANNONBALL" SILICEOUS NODULES - UP TO 25 cm SIZE - SEVERAL ISOLATED NODULES OCCURR UP TO 1m BELOW HORIZON - NODULE DEVELOP DURING AND POST WELDING.	
176	- PREDOMINANTLY PARATAXITIC WELDING TEXTURE.	
174	- RECESSIVE CHLORITIC PUMICE FRAGMENTS UP TO 1.5 × 6cm	
172		
metres		

SCALE: cm/m — M | S | Sand. v f m c v c | C(mm) 4 8 16 64

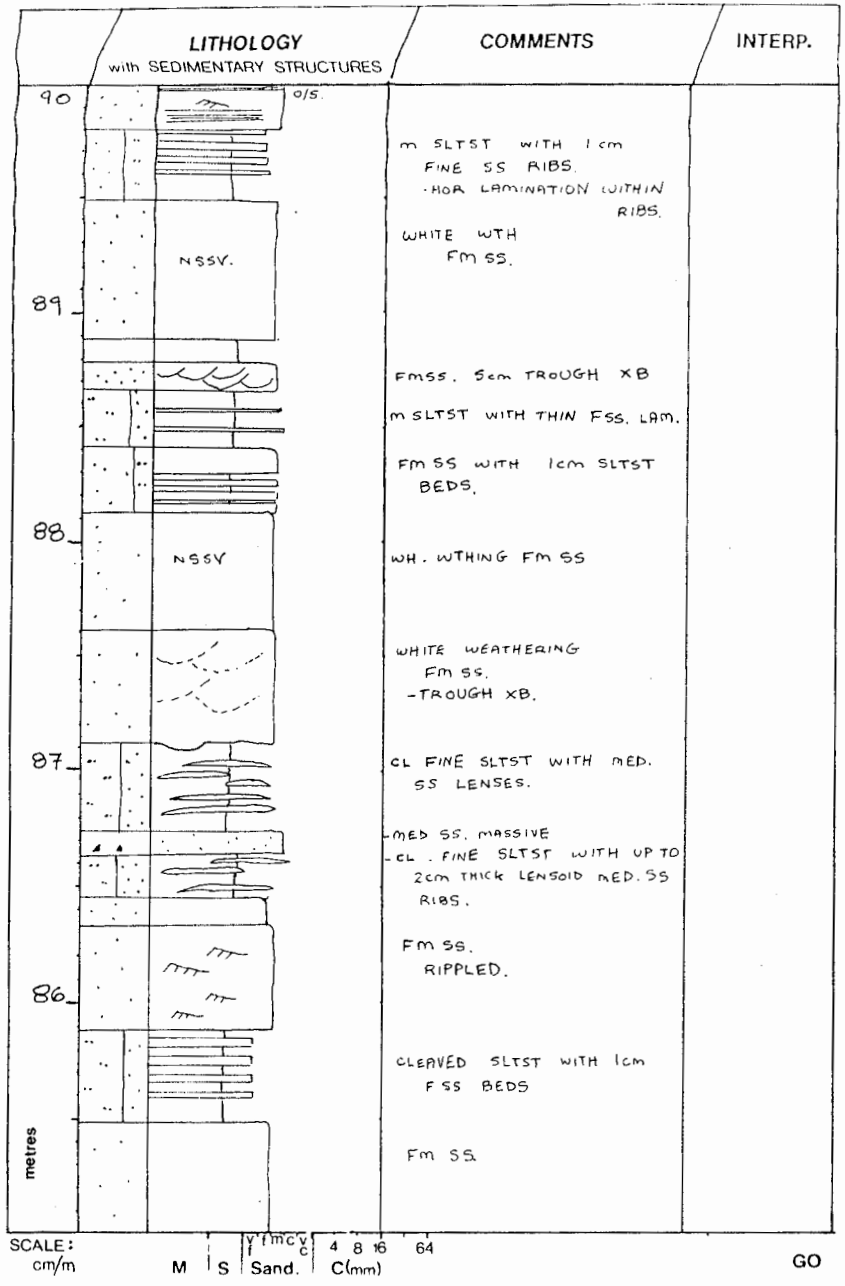
GO

SECTION: L 2 E LOCATION: MOEL HEBOG.

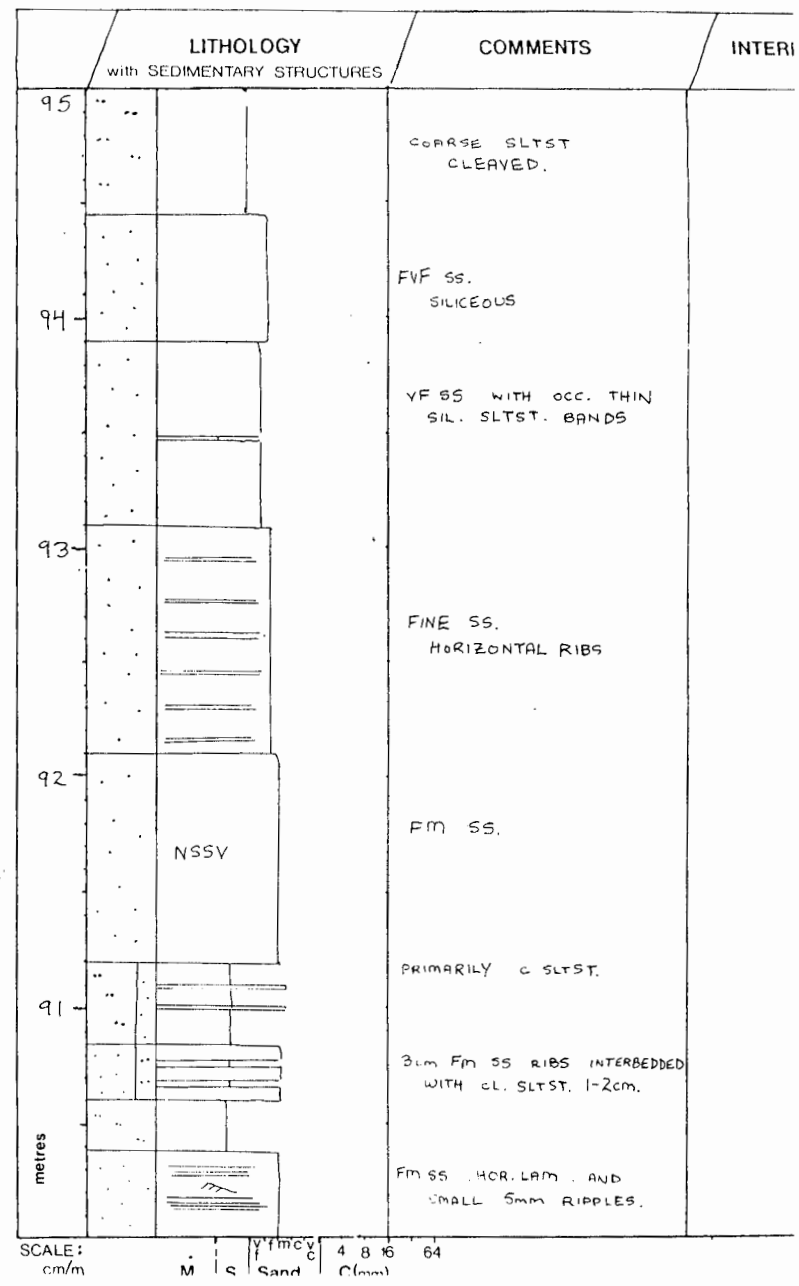
LITHOLOGY with SEDIMENTARY STRUCTURES	COMMENTS	INTER
85	SLTST WITH F SS BEDS.	
- RIPPLED	FSS. HOR LAM: UNDULATING WITH MILRO RIPPLES.	
	FINE SILTSTONE CLEAVED.	
	FVF SS	
	SLUMPED FM SS	
	FM SS, TROUGH XB.	
83	F SS WITH 1cm SLTST. BEDS.	
	F SS. SL. UND. HOR. LAMINATION OCC. SMALL RIPPLES.	
	FM SS. RIPPLE XB.	
82 15cm	MED. SS. TROUGH XB 15cm	
v v v	AIRFALL	
81	L2E / L2D	
metres		

SCALE: cm/m — M | S | Sand. v f m c v c | C(mm) 4 8 16 64

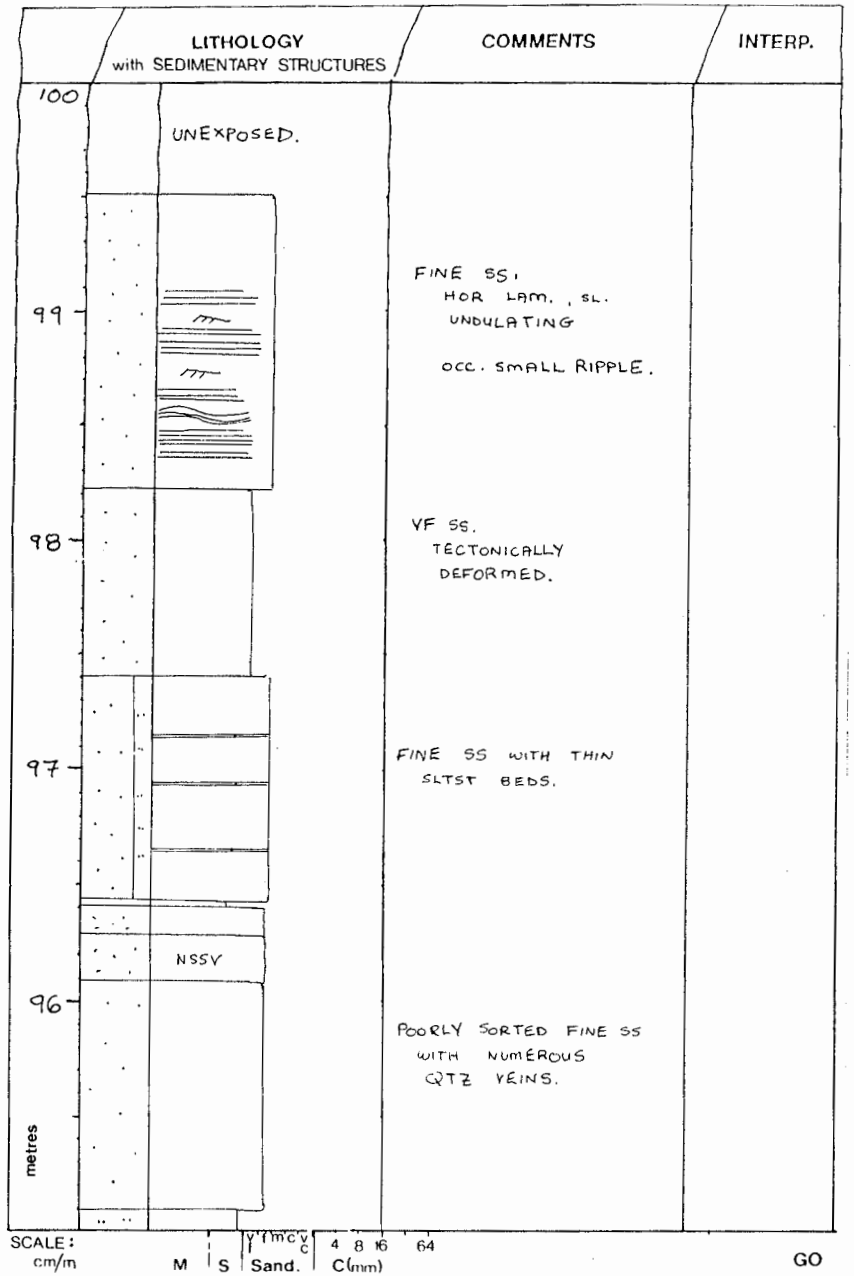
SECTION: L 2 E LOCATION: MOEL HEBOG.



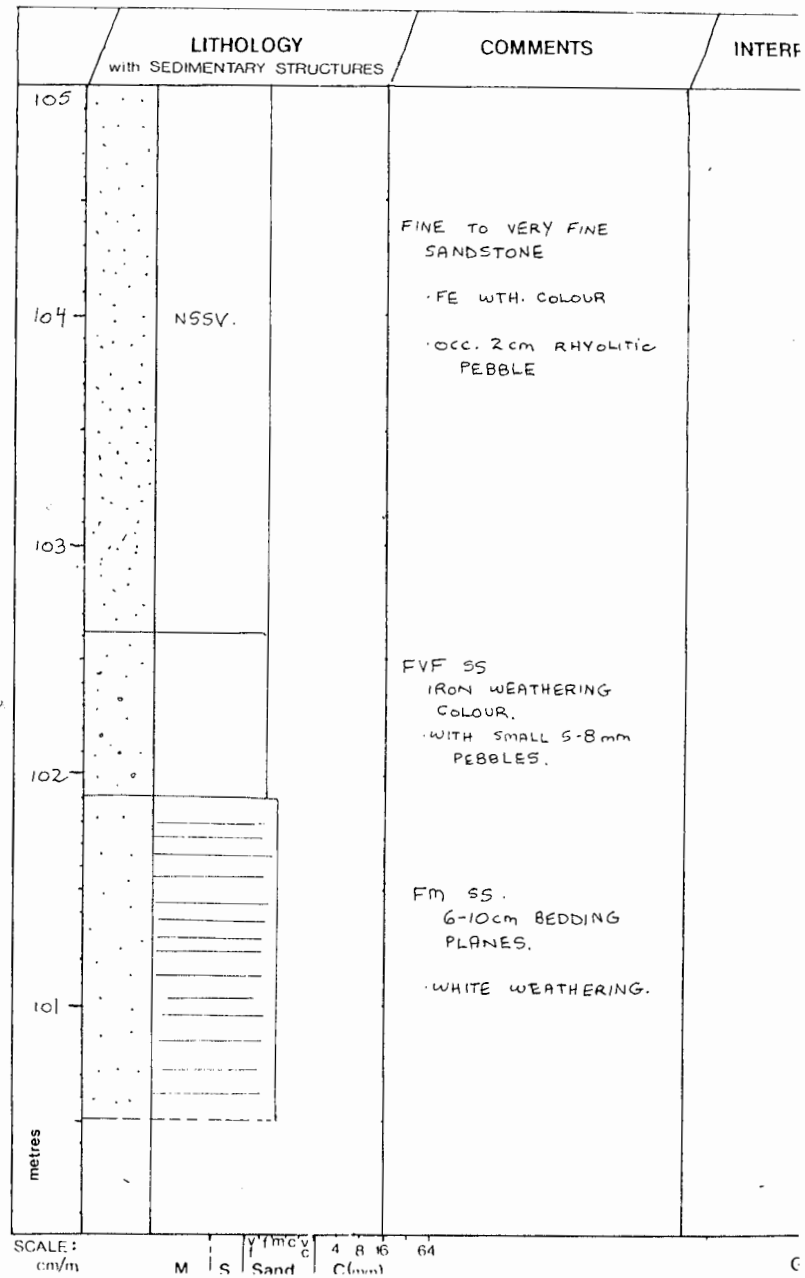
SECTION: L 2 E LOCATION: MOEL HEBOG



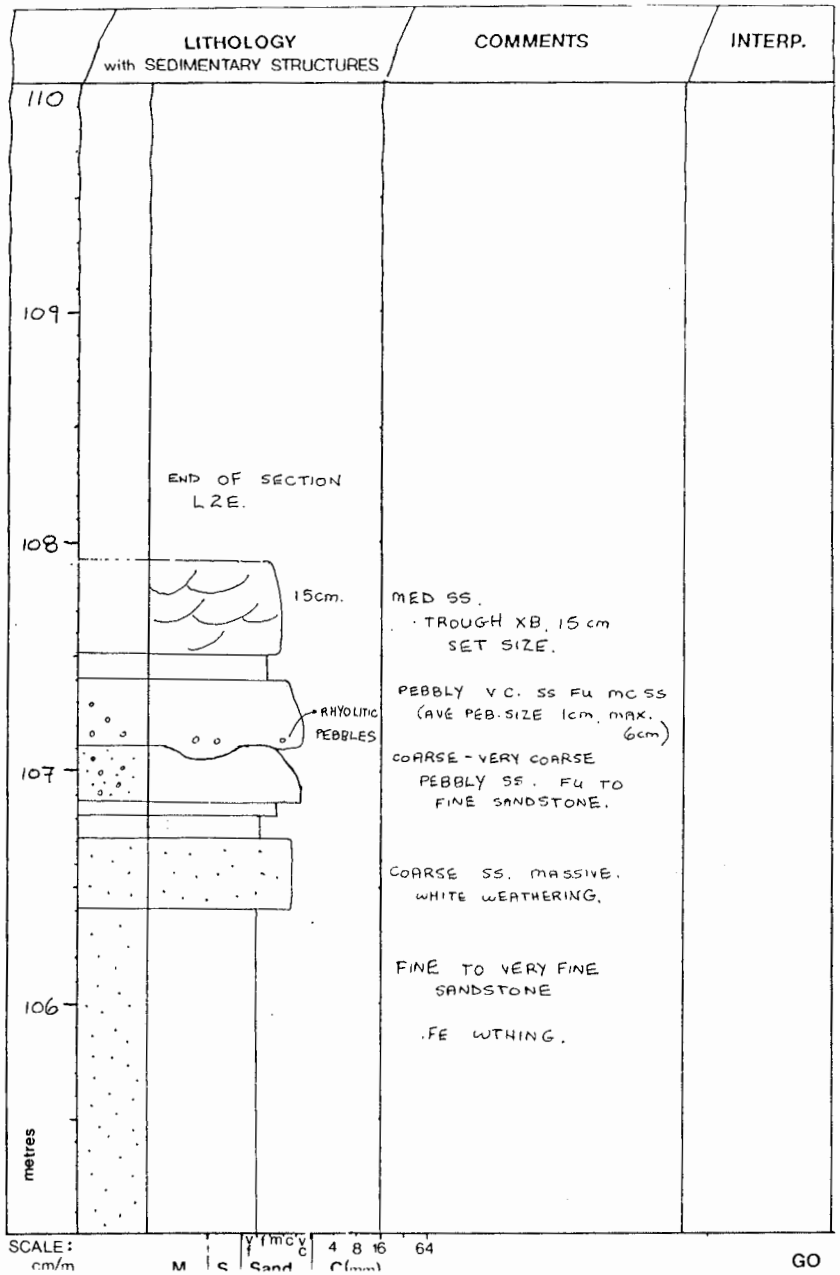
SECTION: L2 E LOCATION: MOEL HEBOG



SECTION: L2 E LOCATION: MOEL HEBOG.

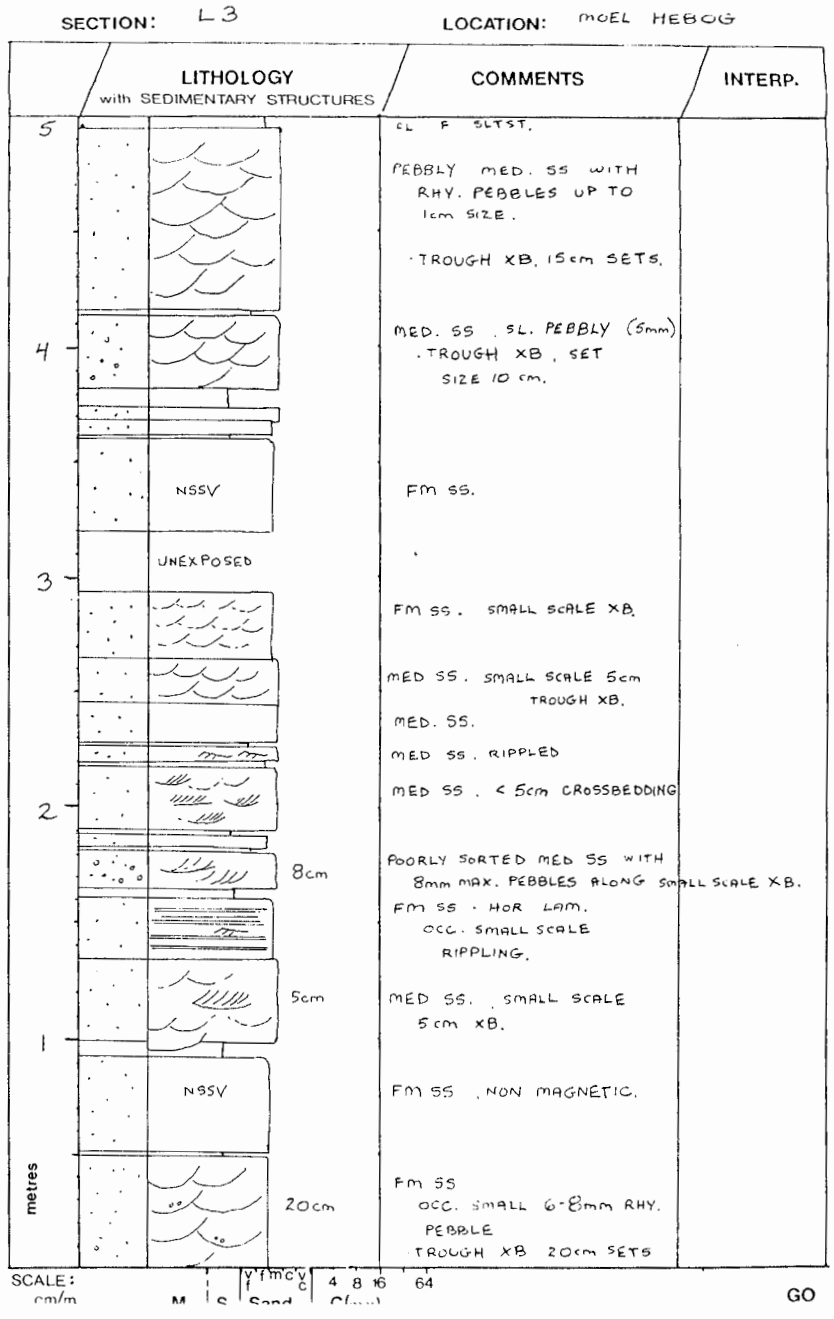


SECTION: L 2 E LOCATION: MOEL HEBOG

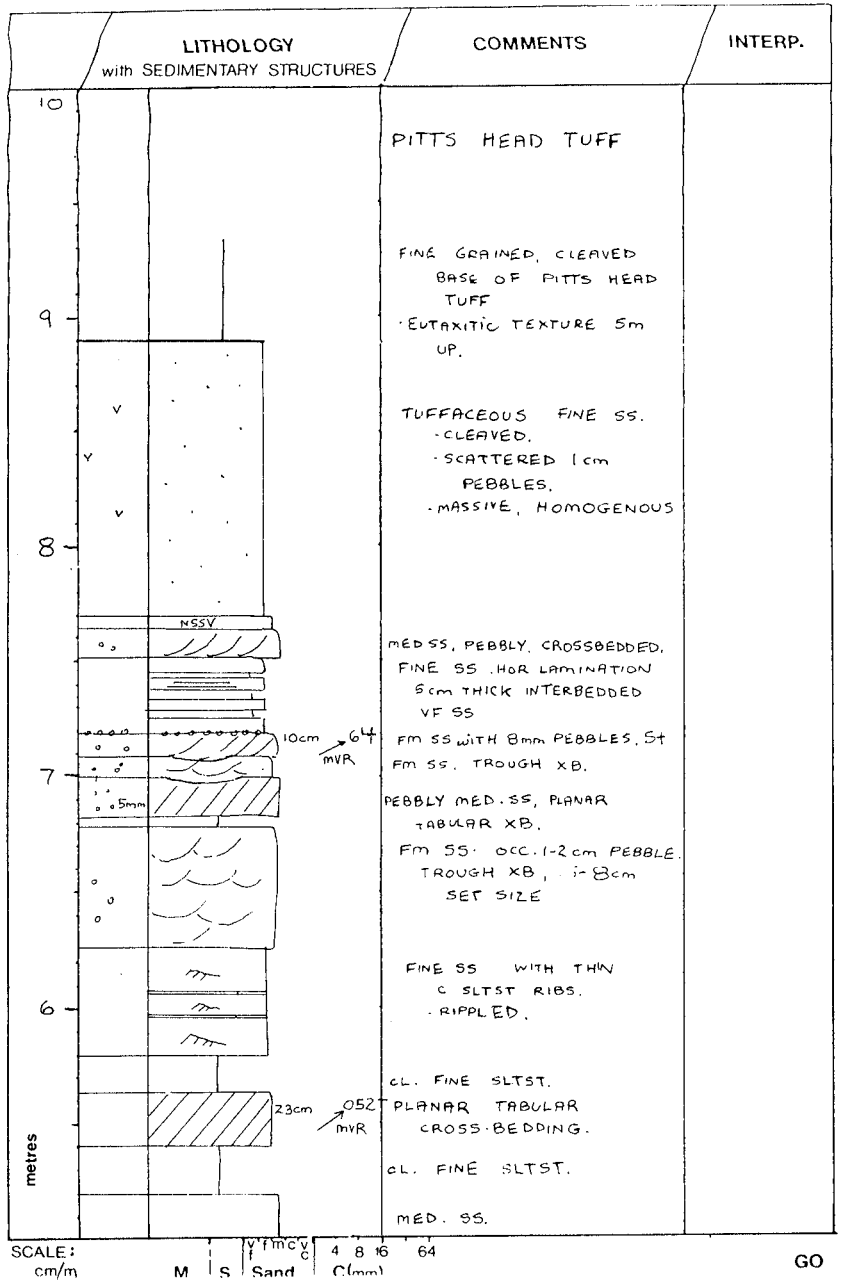


SECTION L3

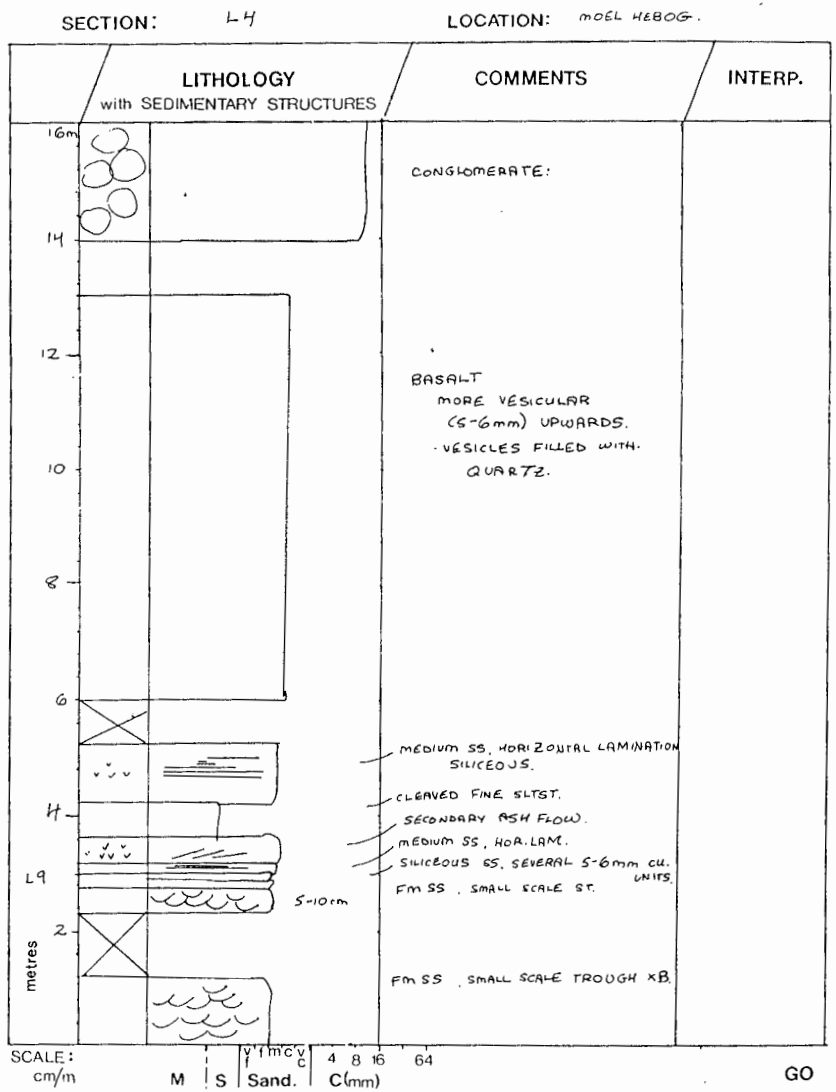
SECTION L3 LOCATION: Section immediately beneath Pitts Head Tuff to NW of hut circles near Llyn Cwmystradllyn.



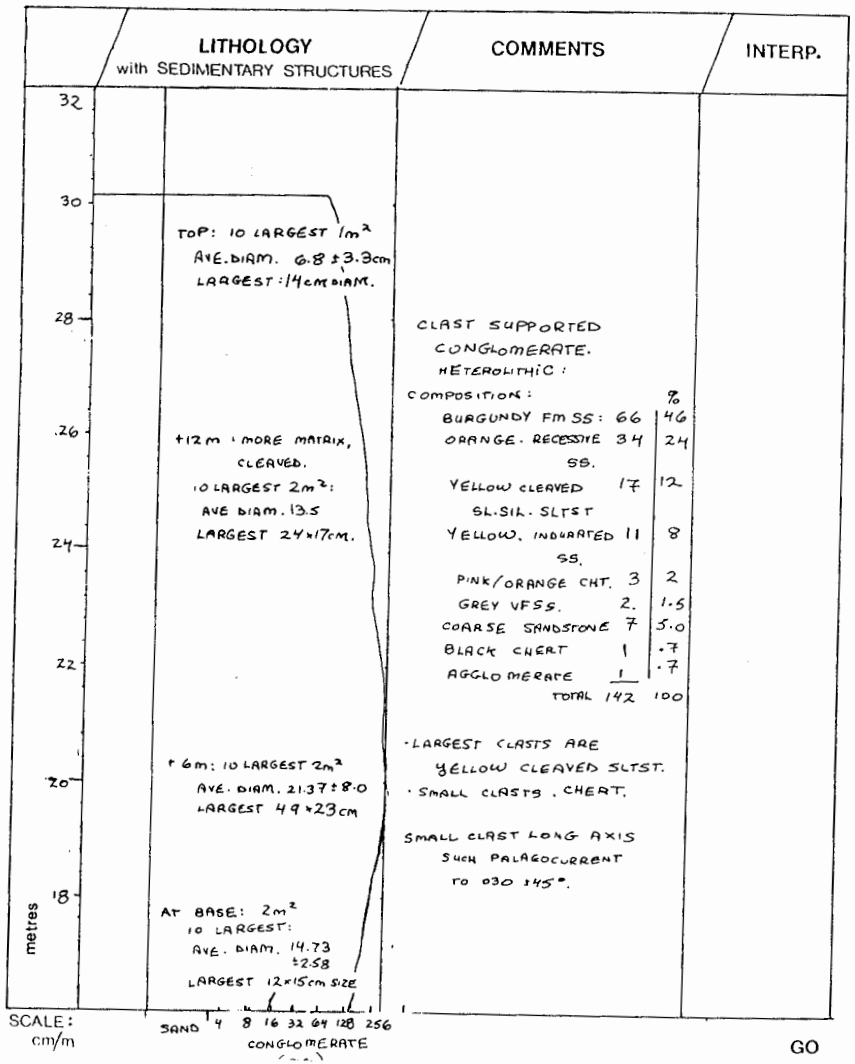
SECTION: L 3 LOCATION: MOEL HEBOG.



SECTION L4


SECTION: L4
LOCATION: MOEL HEBOG.
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTERP.
16m
14
12
10
8
6
4
2
metres
L9
CONGLOMERATE:
BASALT
MORE VESICULAR
(5-6mm) UPWARDS.
VESICLES FILLED WITH
QUARTZ.
MEDIUM SS, HORIZONTAL LAMINATION
SILICEOUS.
CLEAVED FINE SLTST.
SECONDARY ASH FLOW.
MEDIUM SS, HOR. LAM.
SILICEOUS SS, SEVERAL 5-6mm CU. UNITS.
FM SS, SMALL SCALE ST.
5-10cm
FM SS, SMALL SCALE TROUGH XB.
SCALE:
cm/m
M
S
v f m c v c
Sand.
4 8 16 64
C(mm)
GO

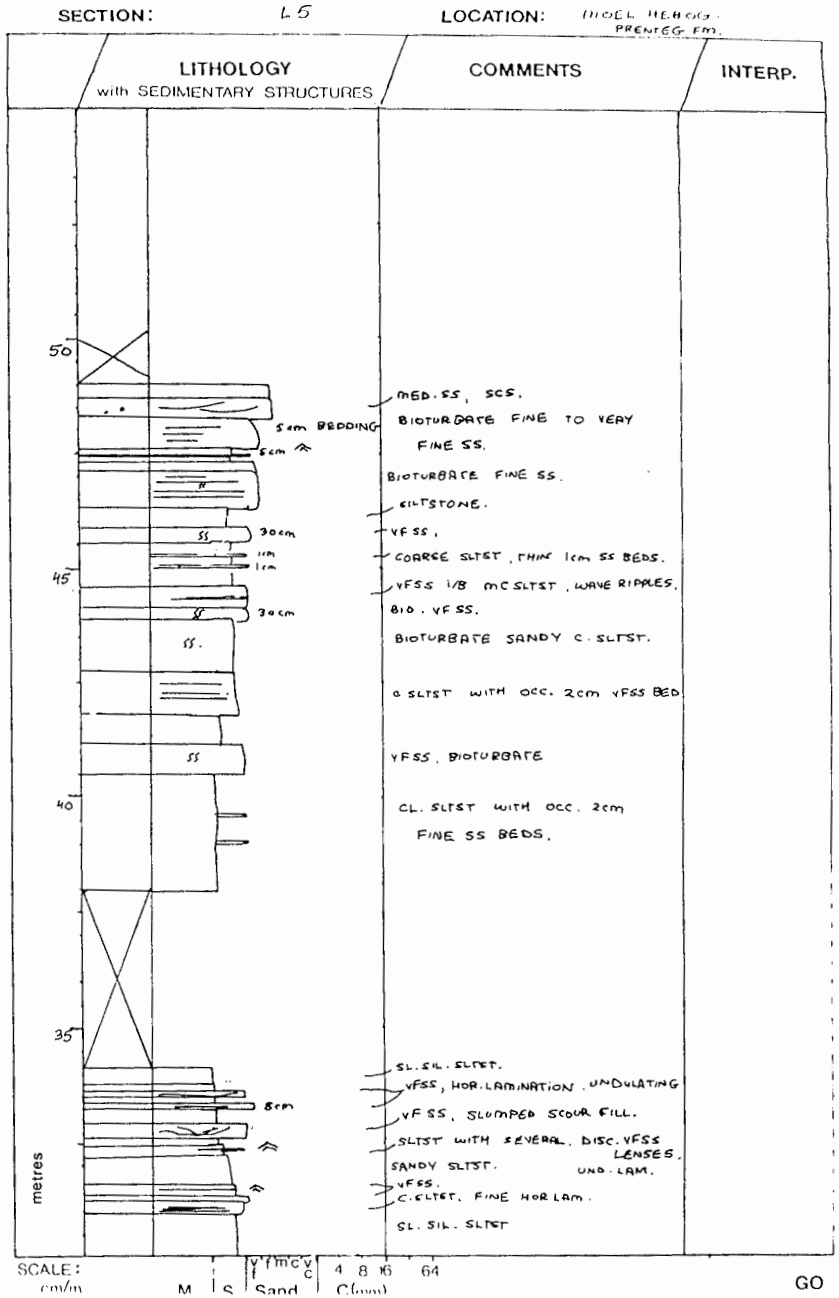
SECTION: L4 LOCATION: MOEL HEBOG.



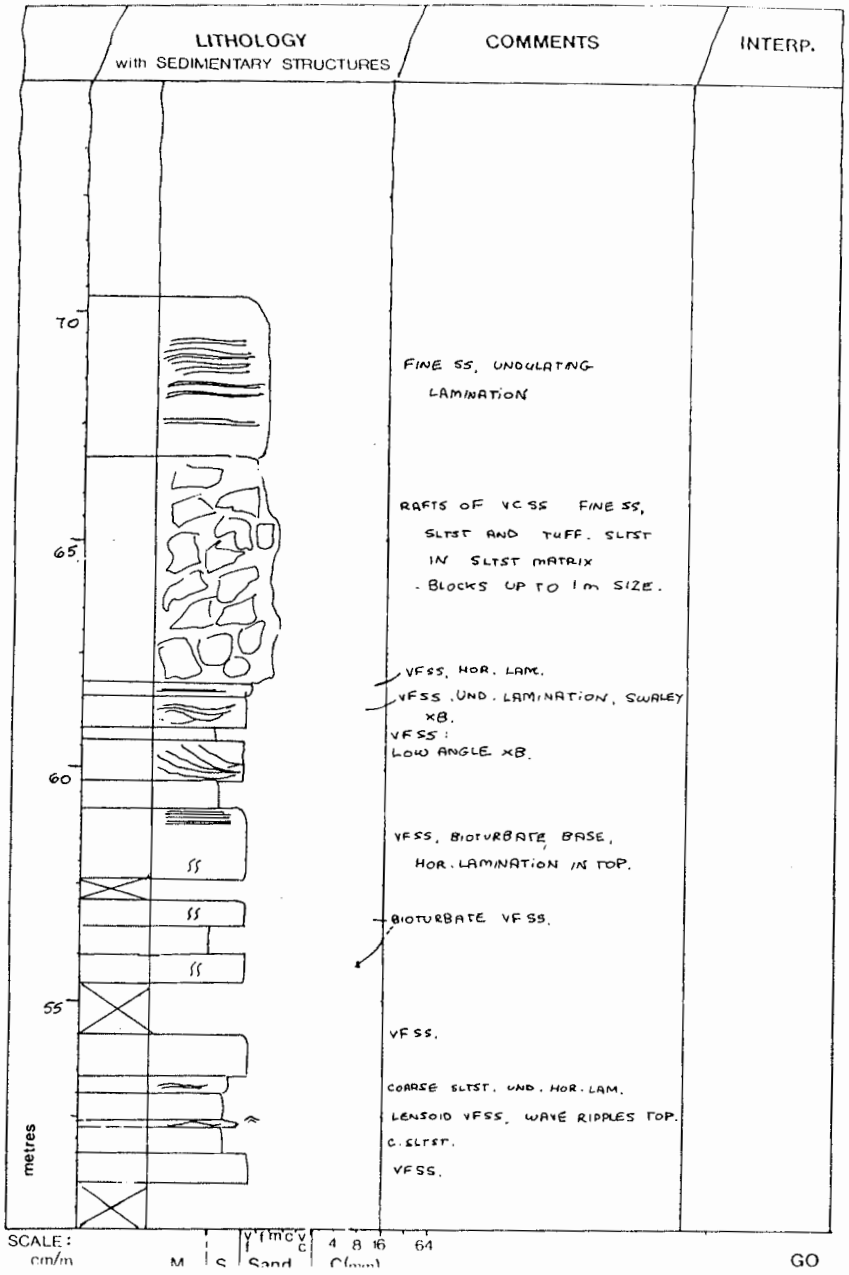
GO

SECTION L5

SECTION L5 LOCATION: Section along Yr Ogof ridge through sandstones and siltstones beneath Pitts Head Tuff.

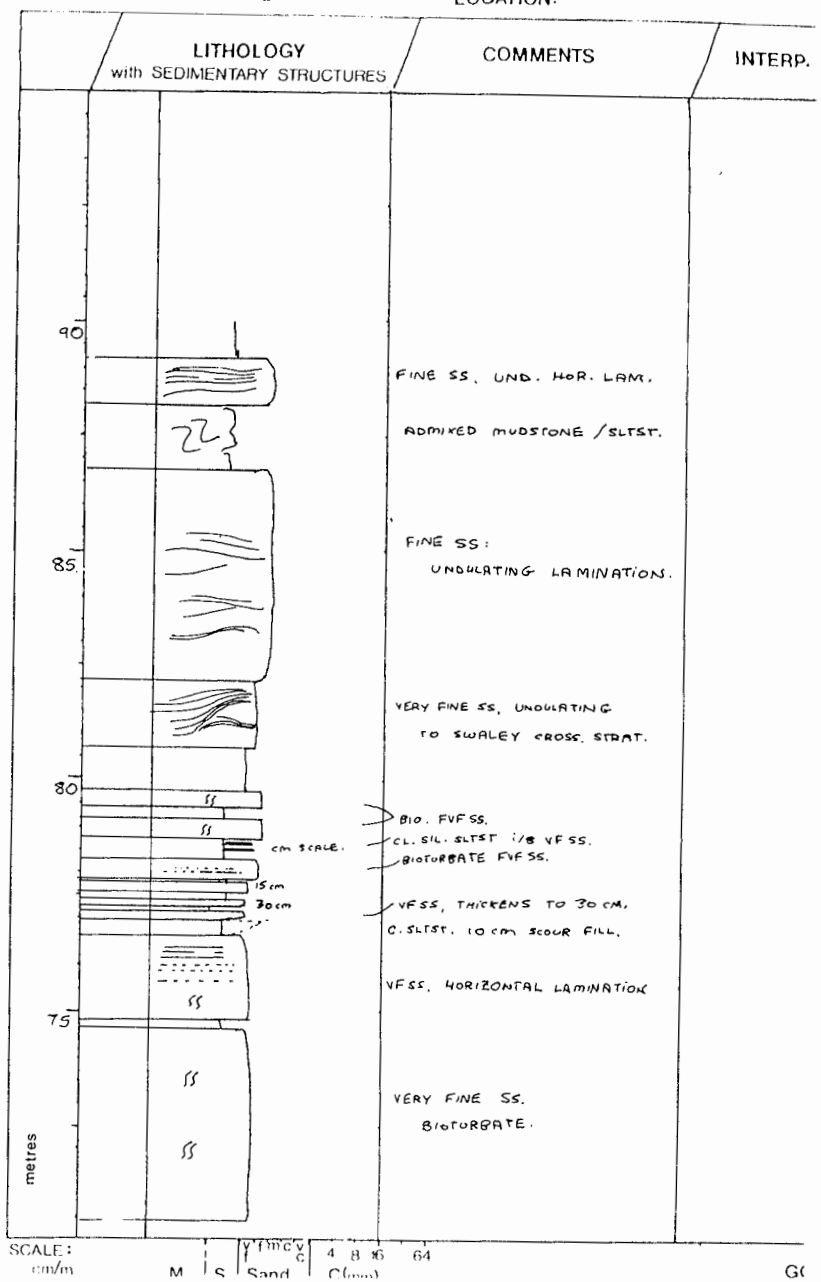


SECTION: L5 LOCATION:



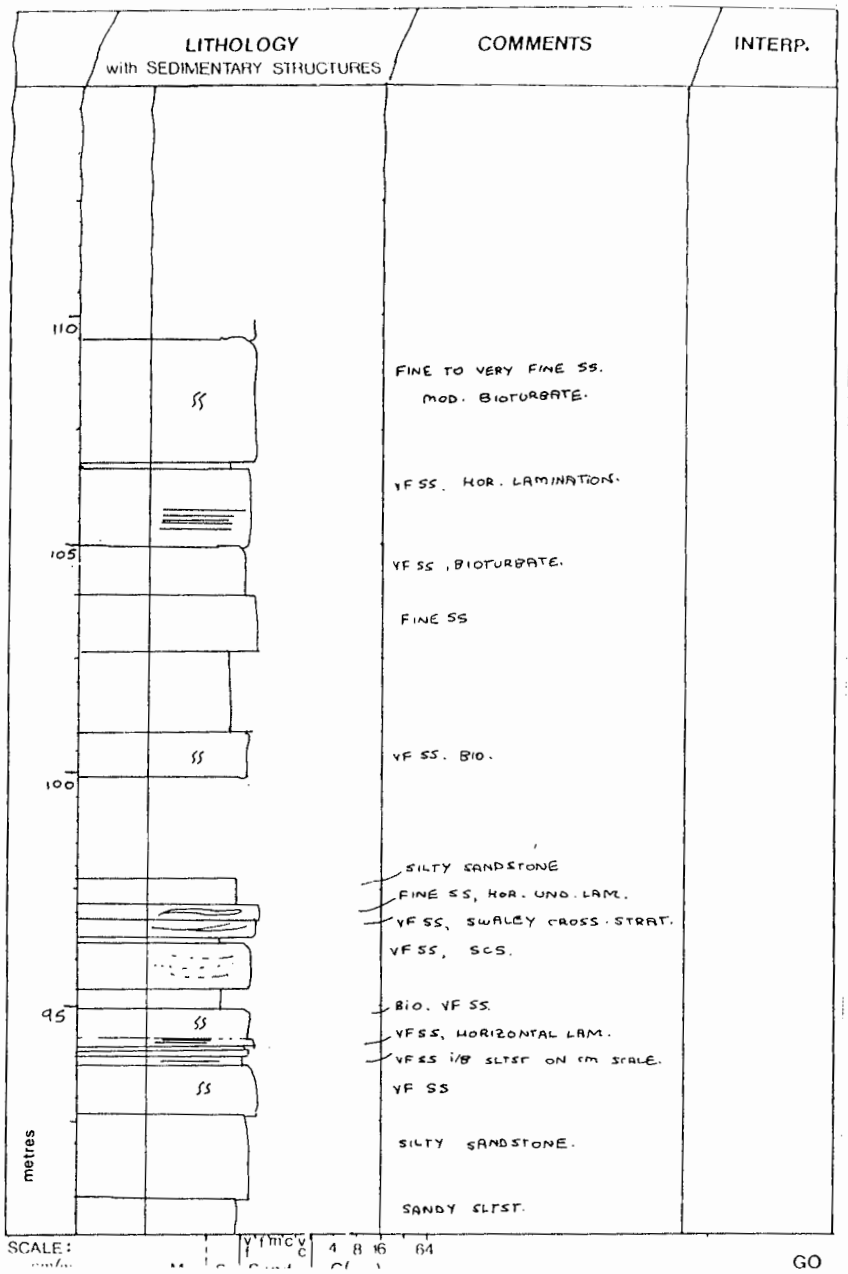
GO

SECTION: L5 LOCATION:



GO

SECTION: L5 LOCATION:



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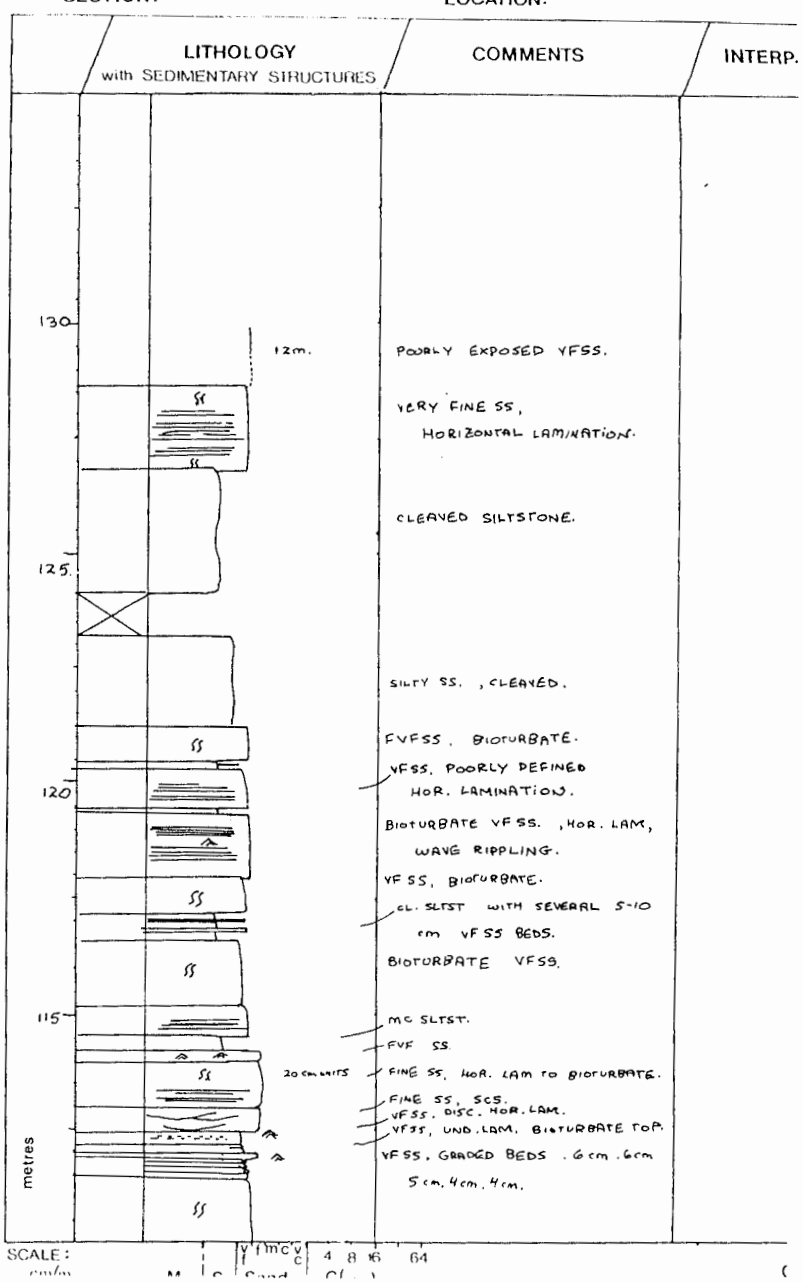
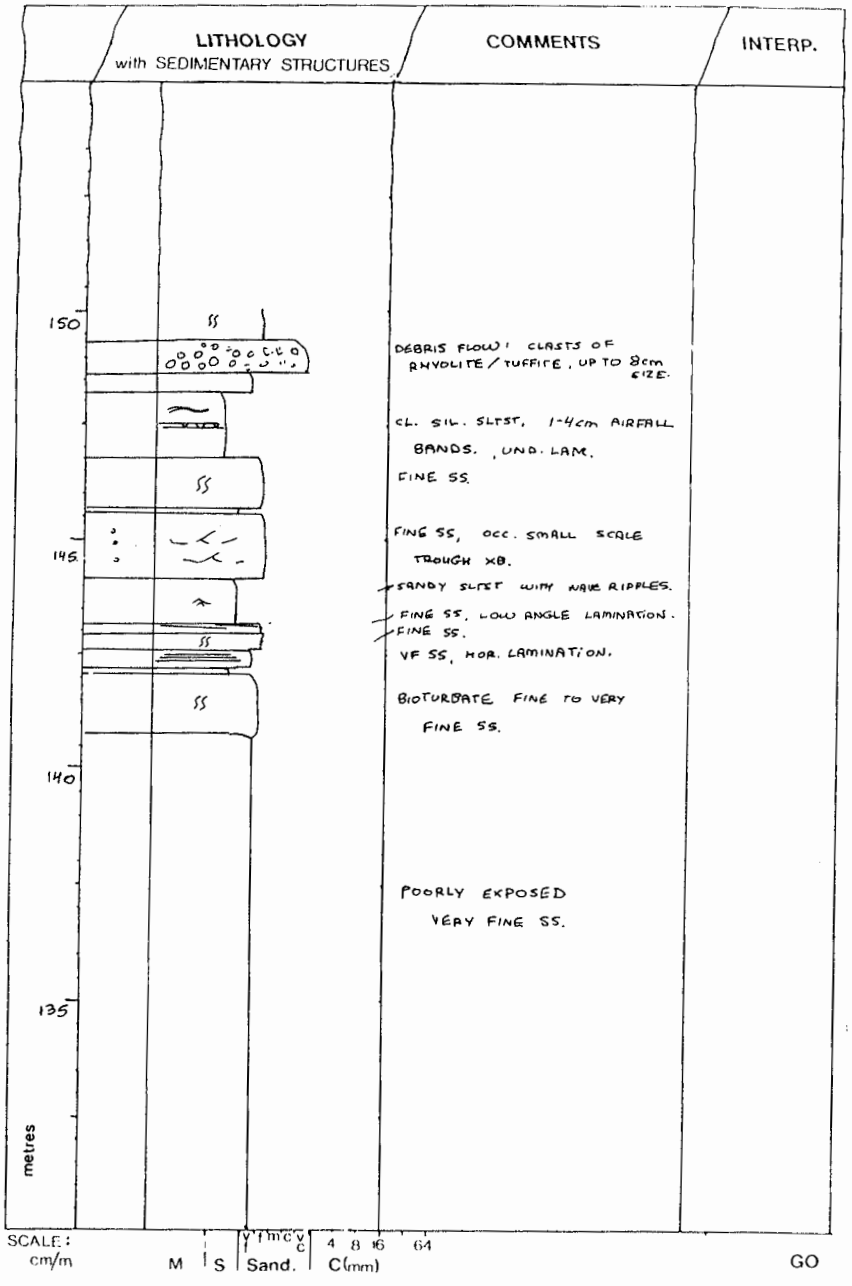
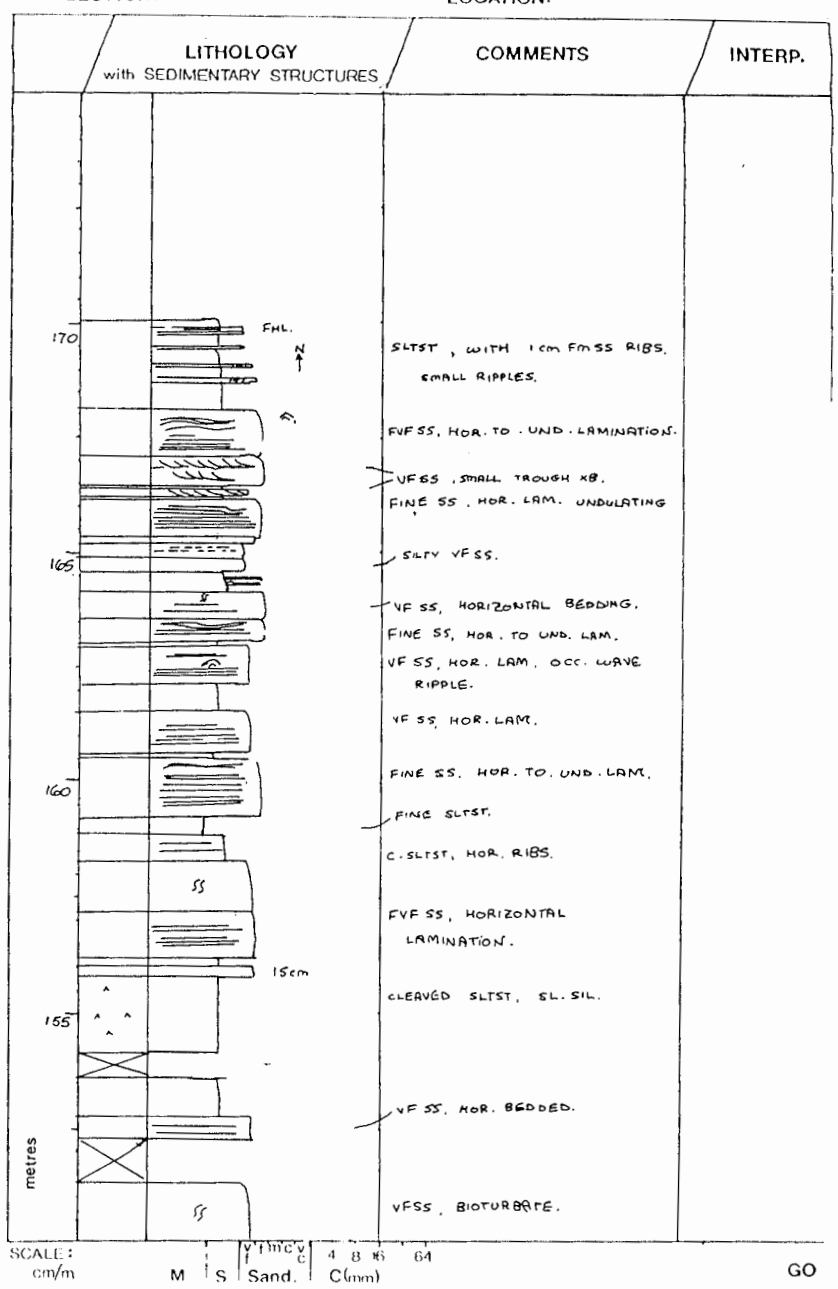
SECTION: L5 LOCATION:



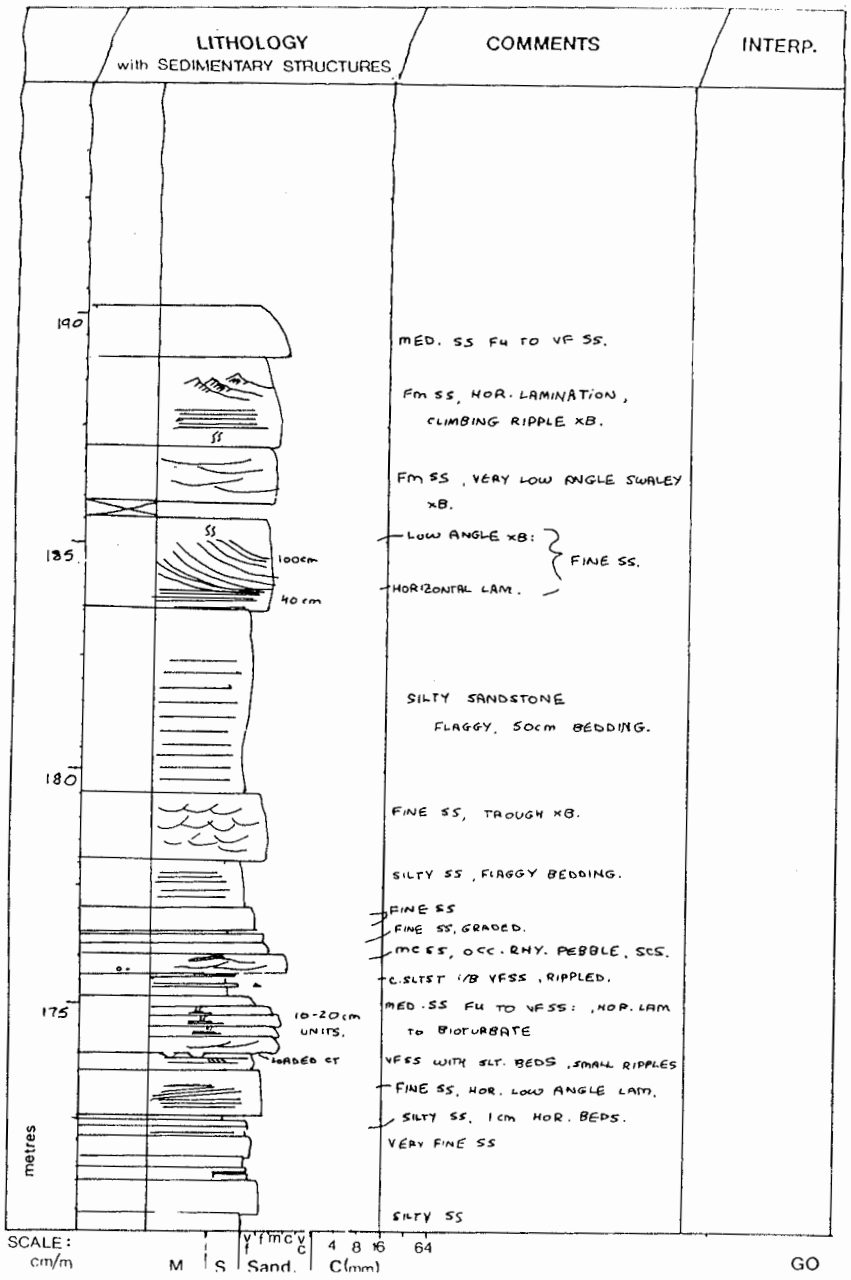
SECTION: L5 LOCATION:



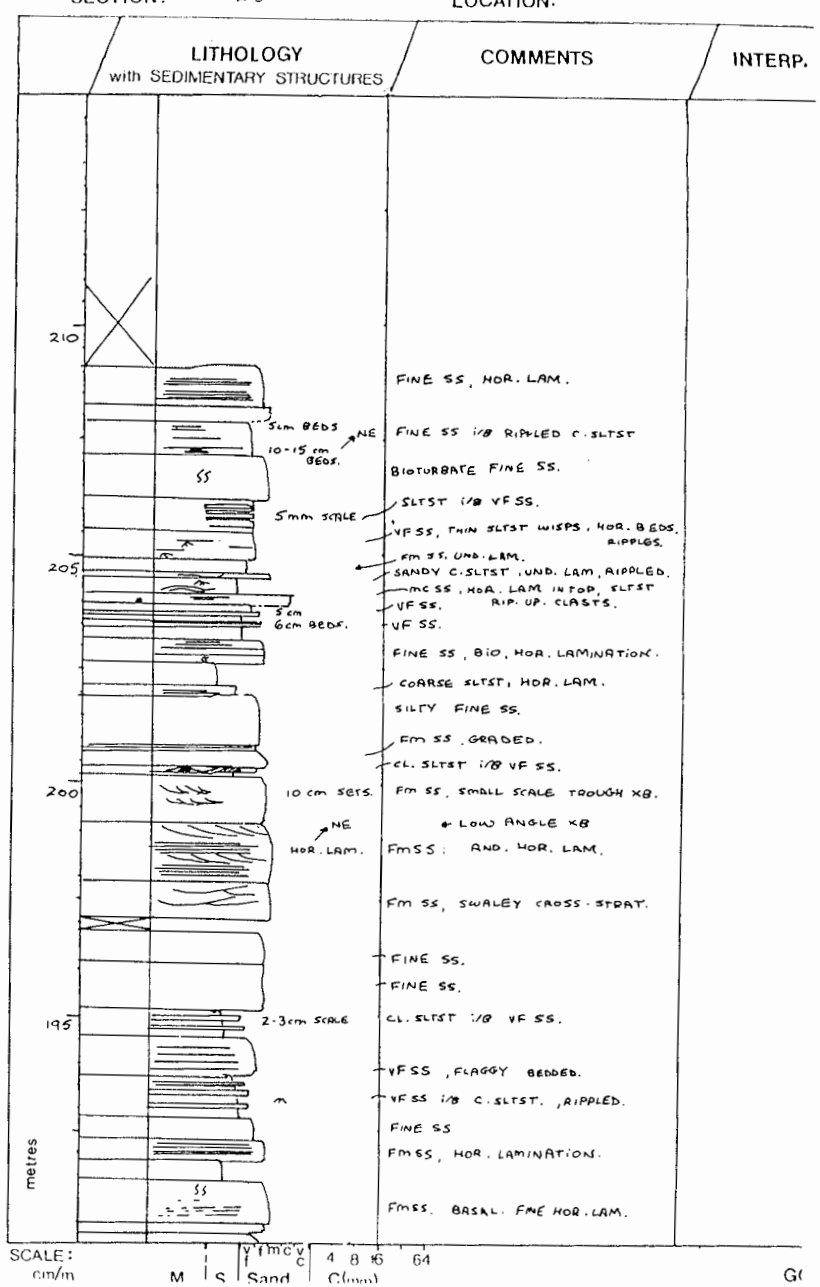
SECTION: L5 LOCATION:



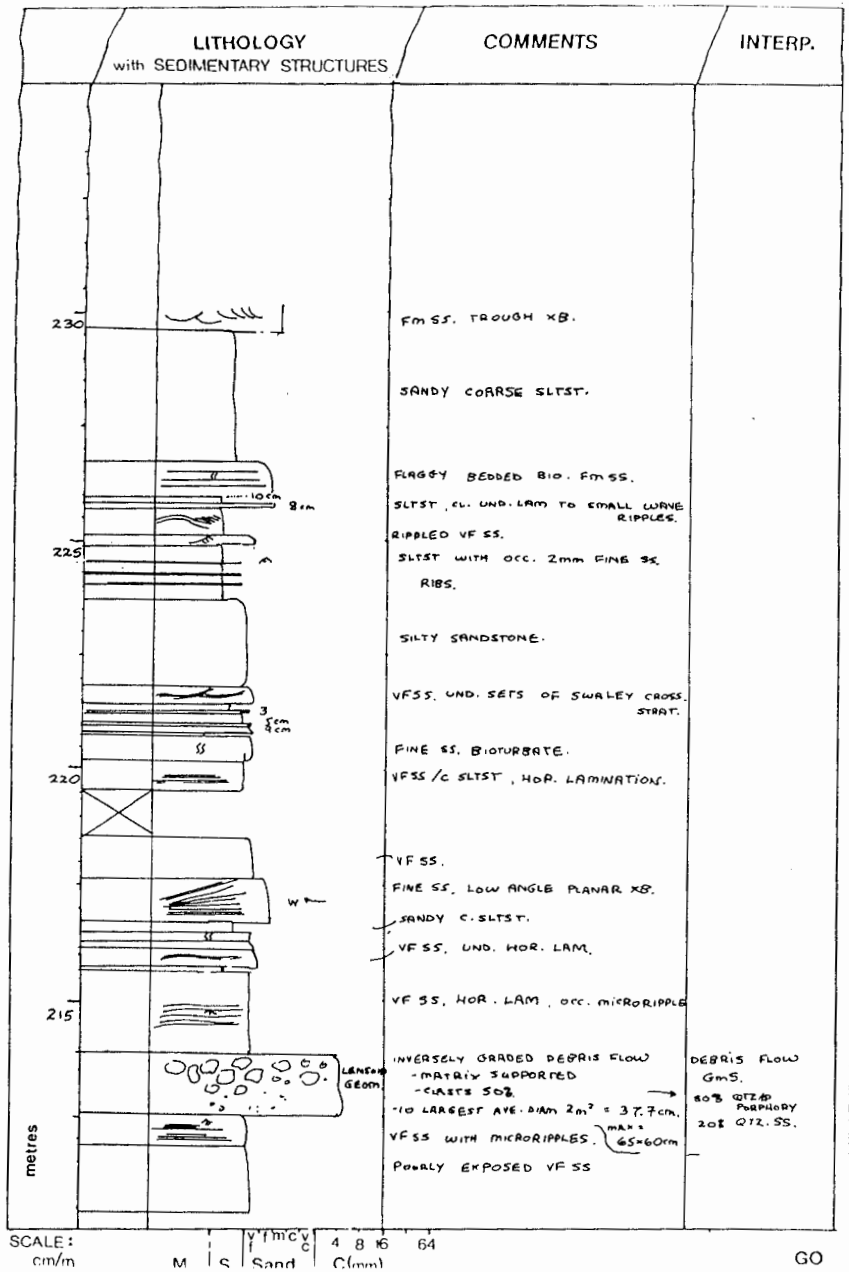
SECTION: L5 LOCATION:



SECTION: L5 LOCATION:

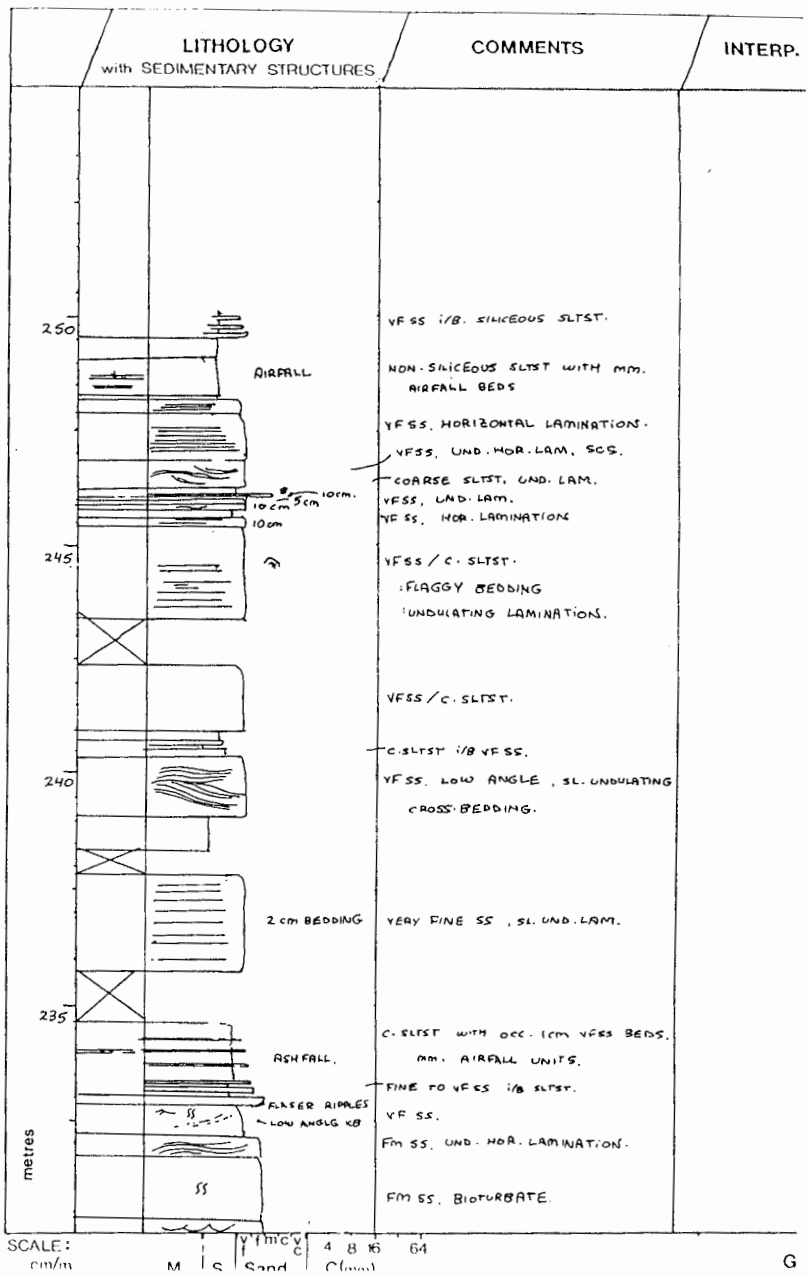


SECTION: L5 LOCATION:



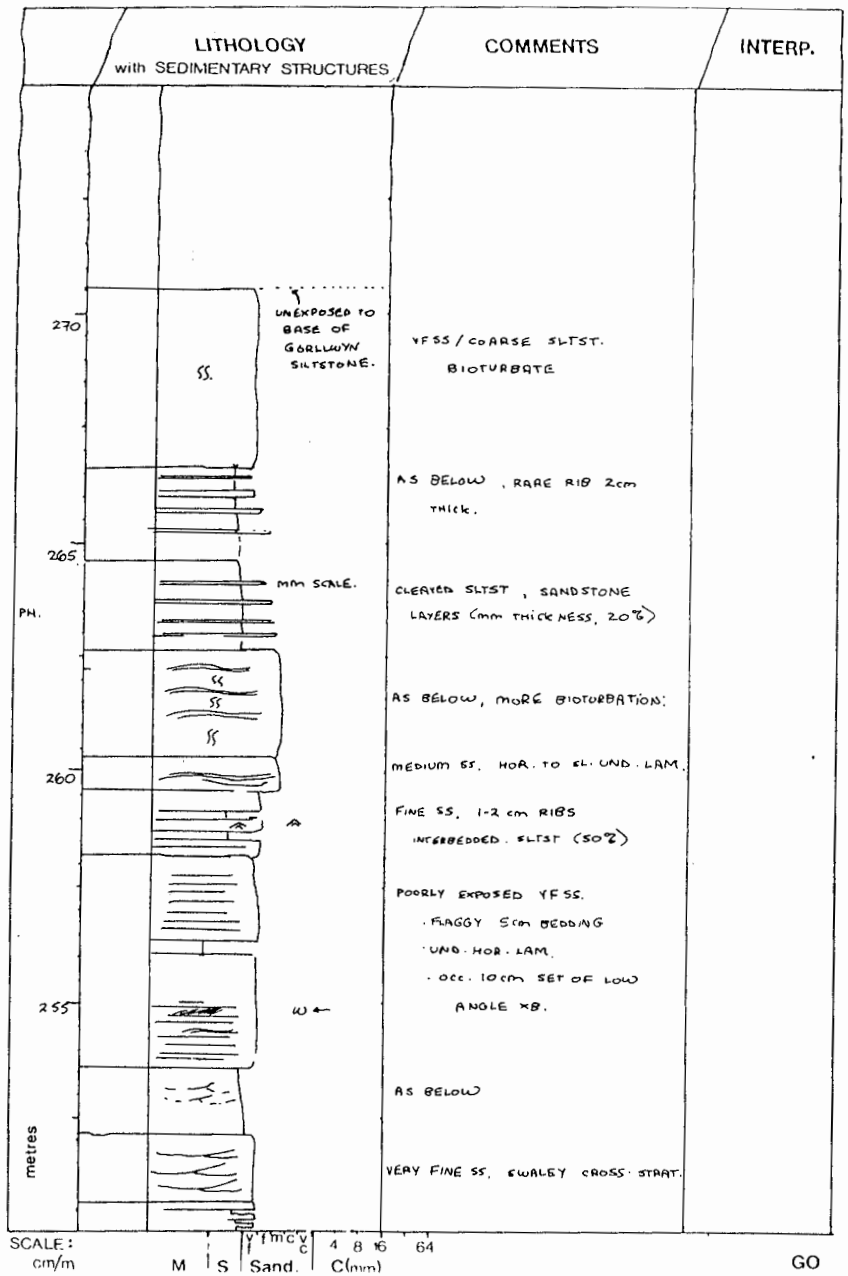
GO

SECTION: L5 LOCATION:



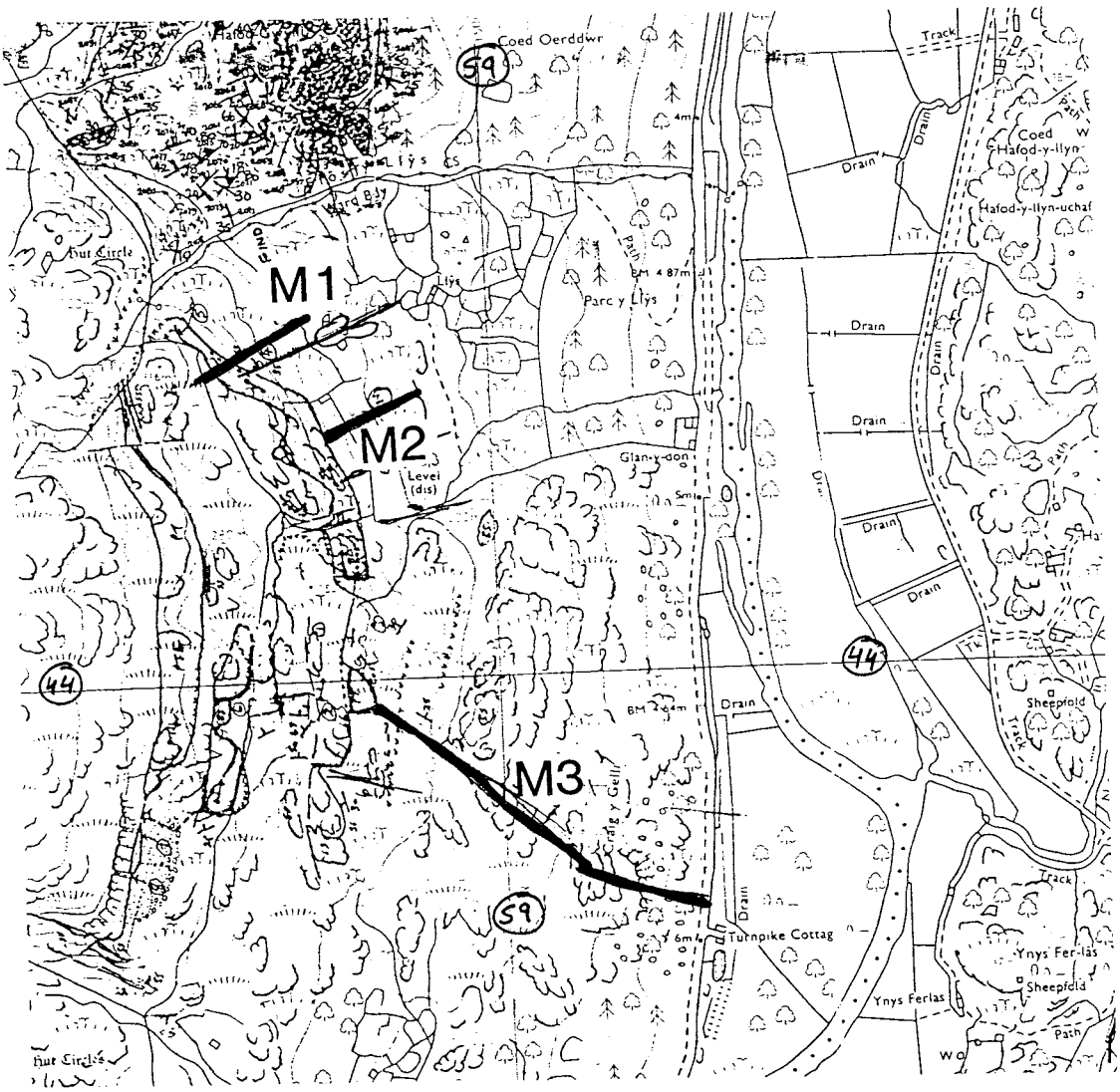
G

SECTION: L5 LOCATION:



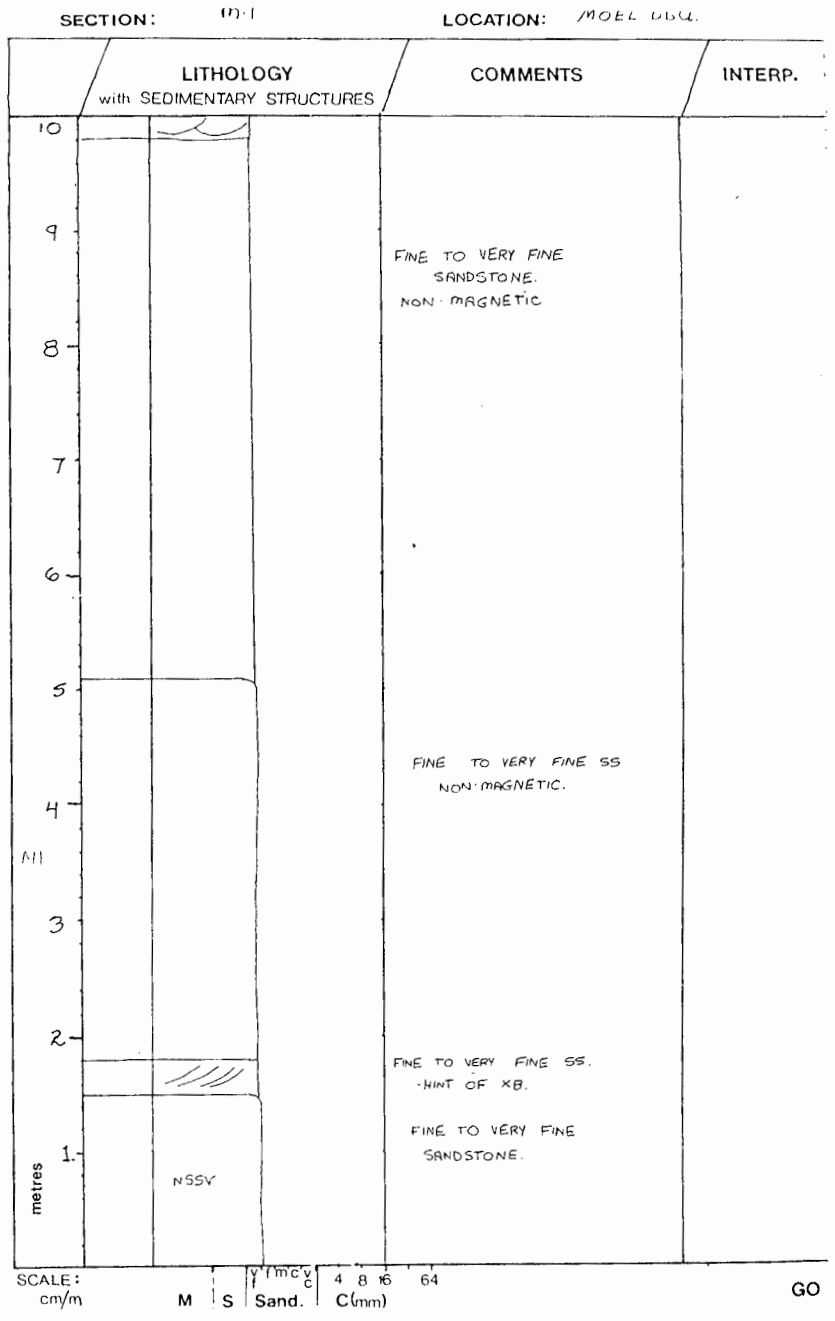
AREA M

LOCATION MAP.

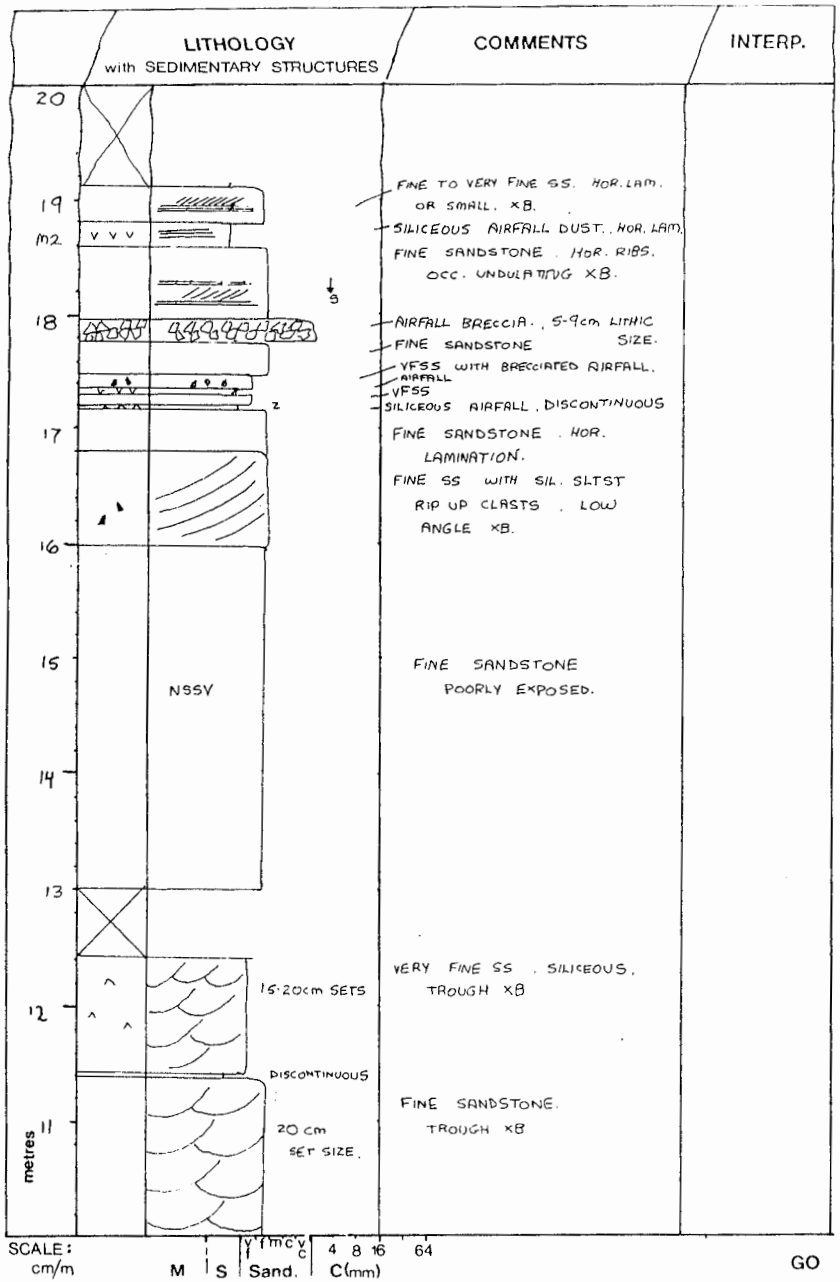


SECTION M1

SECTION M1 LOCATION: Locate sheepfold ca. 180 m to WSW of Llys farm house. Section proceeds from NNW-SSE running dry stone wall adjacent to sheepfold up slope to base of Pitts Head Tuff.

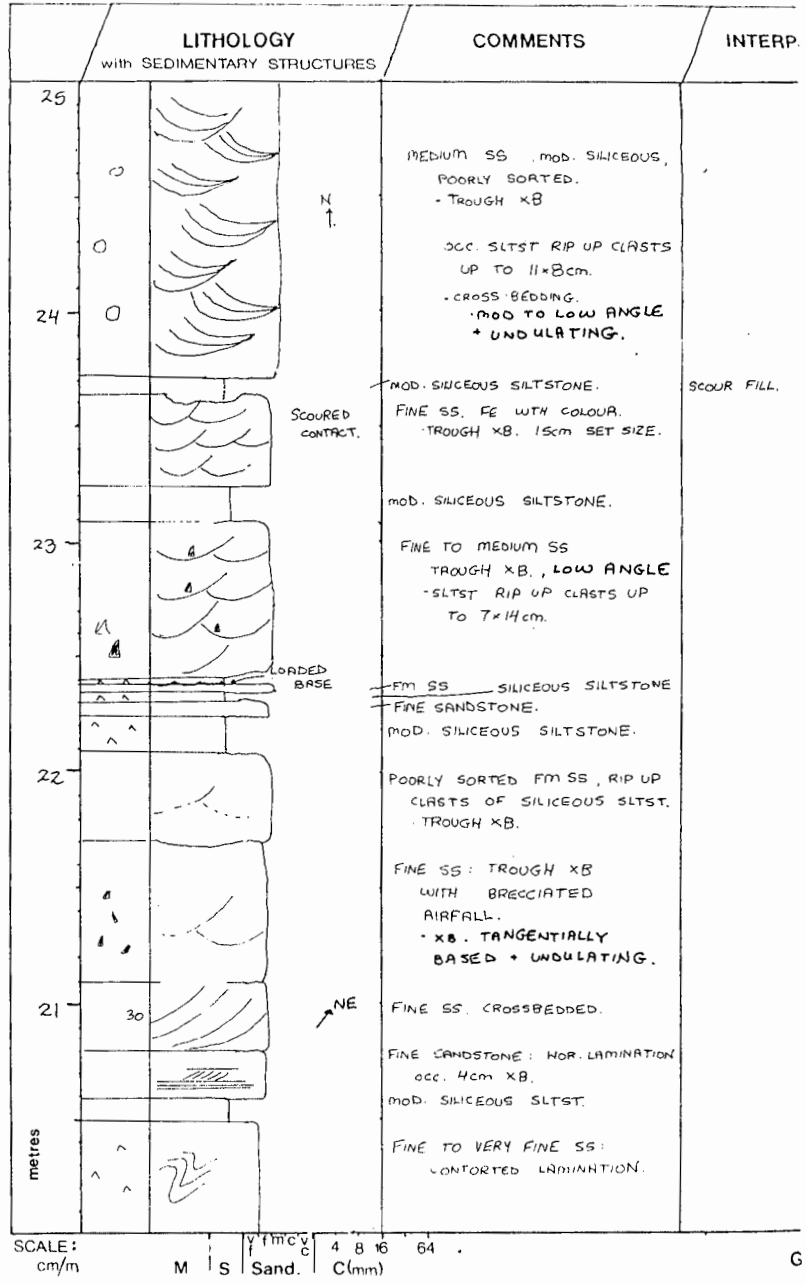


SECTION: m1 LOCATION: MOEL DDU.



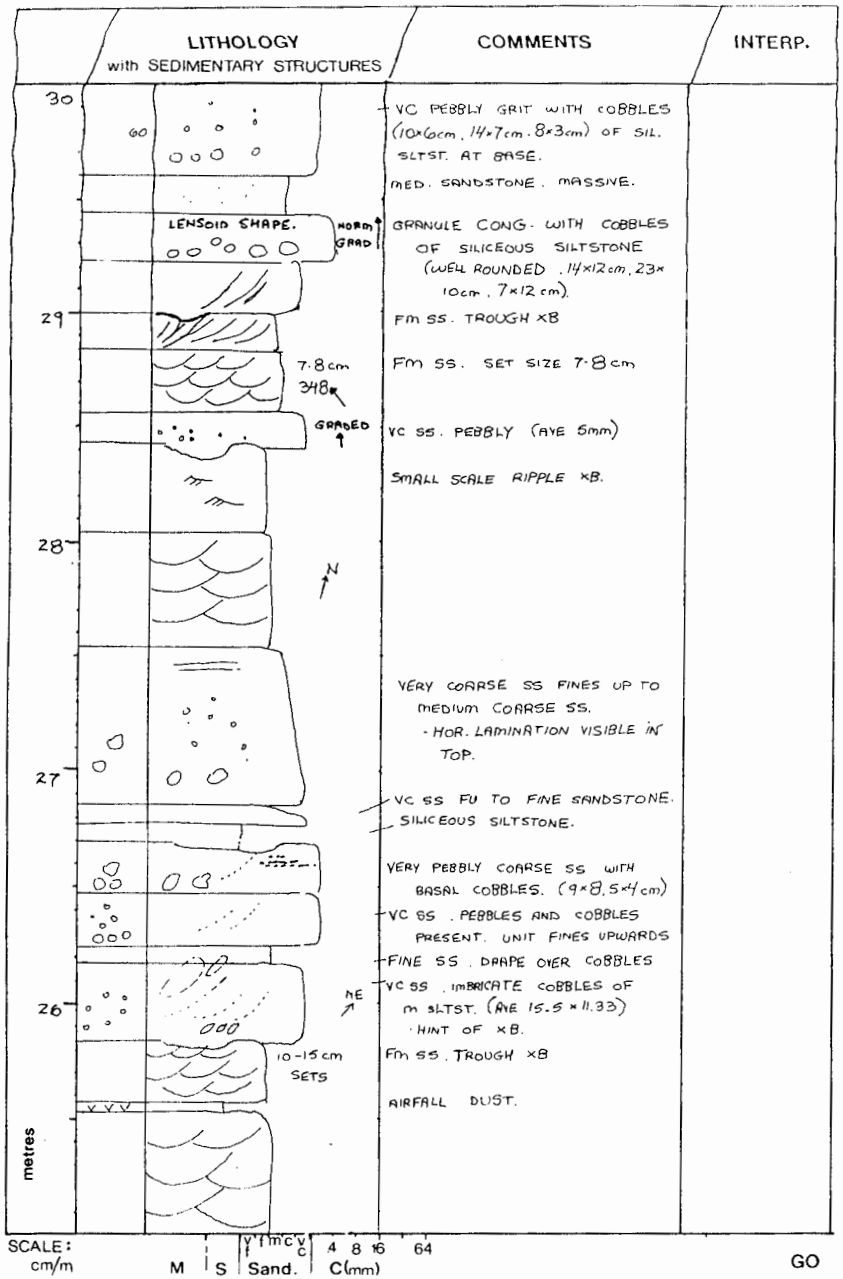
GO

SECTION: m1 LOCATION: MOEL DDU.



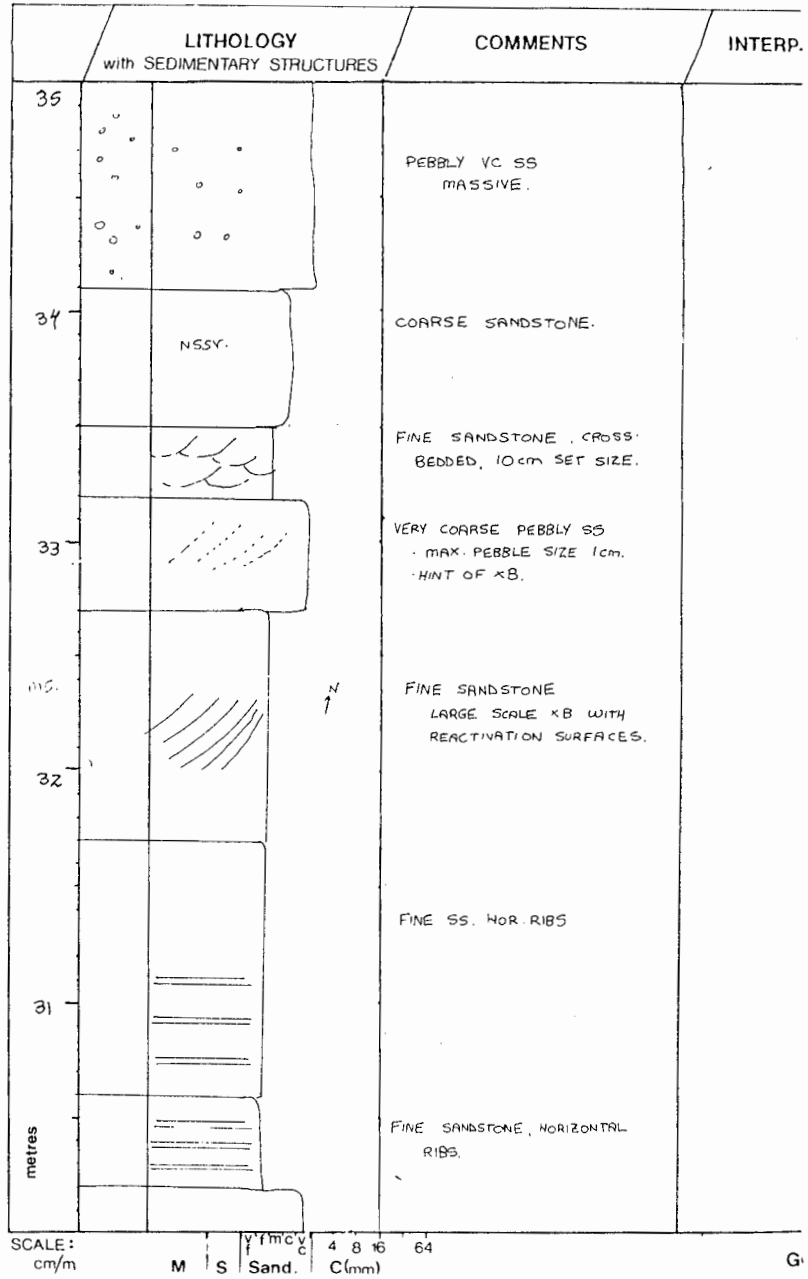
G

SECTION: m-1 LOCATION: MOEL DDU.



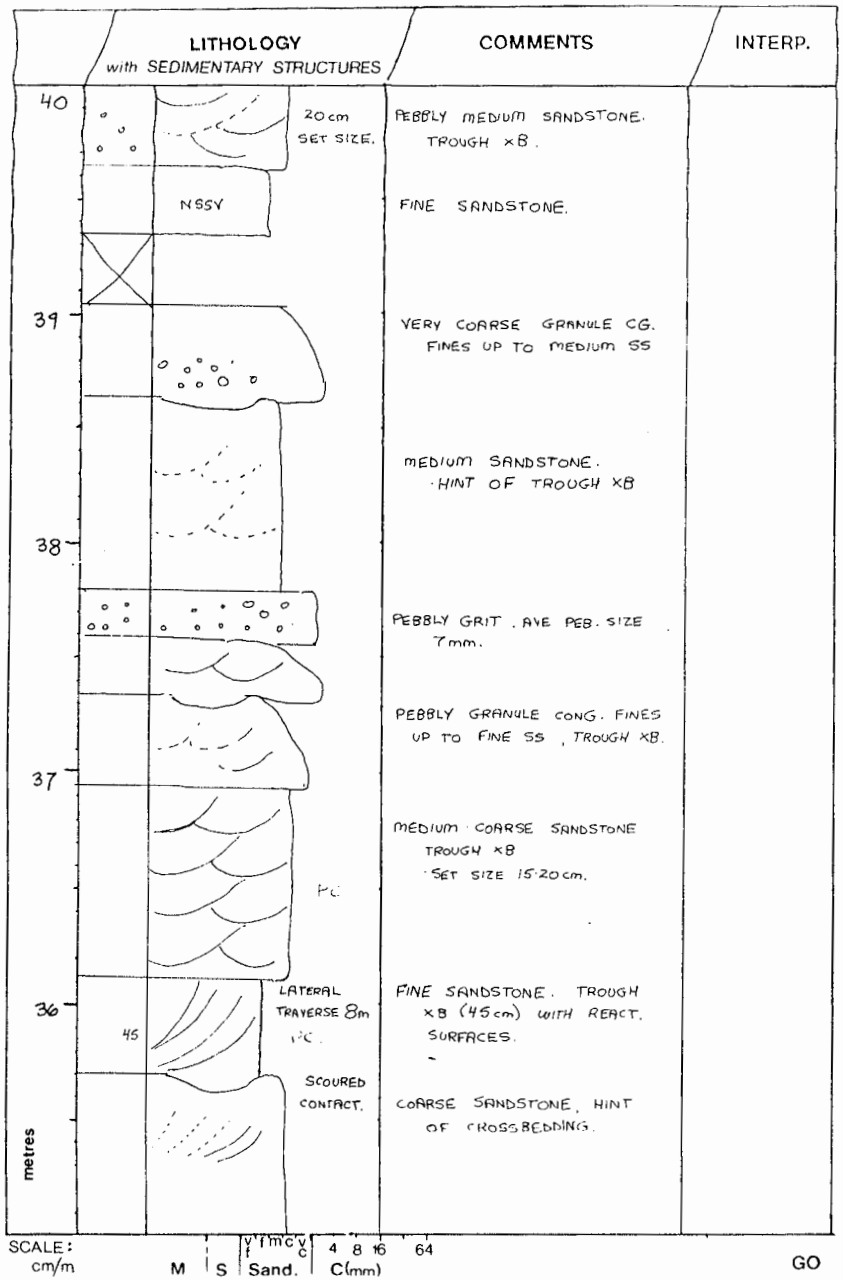
GO

SECTION: m-1 LOCATION: MOEL DDU



G

SECTION: M·1 LOCATION: MOEL DDU.



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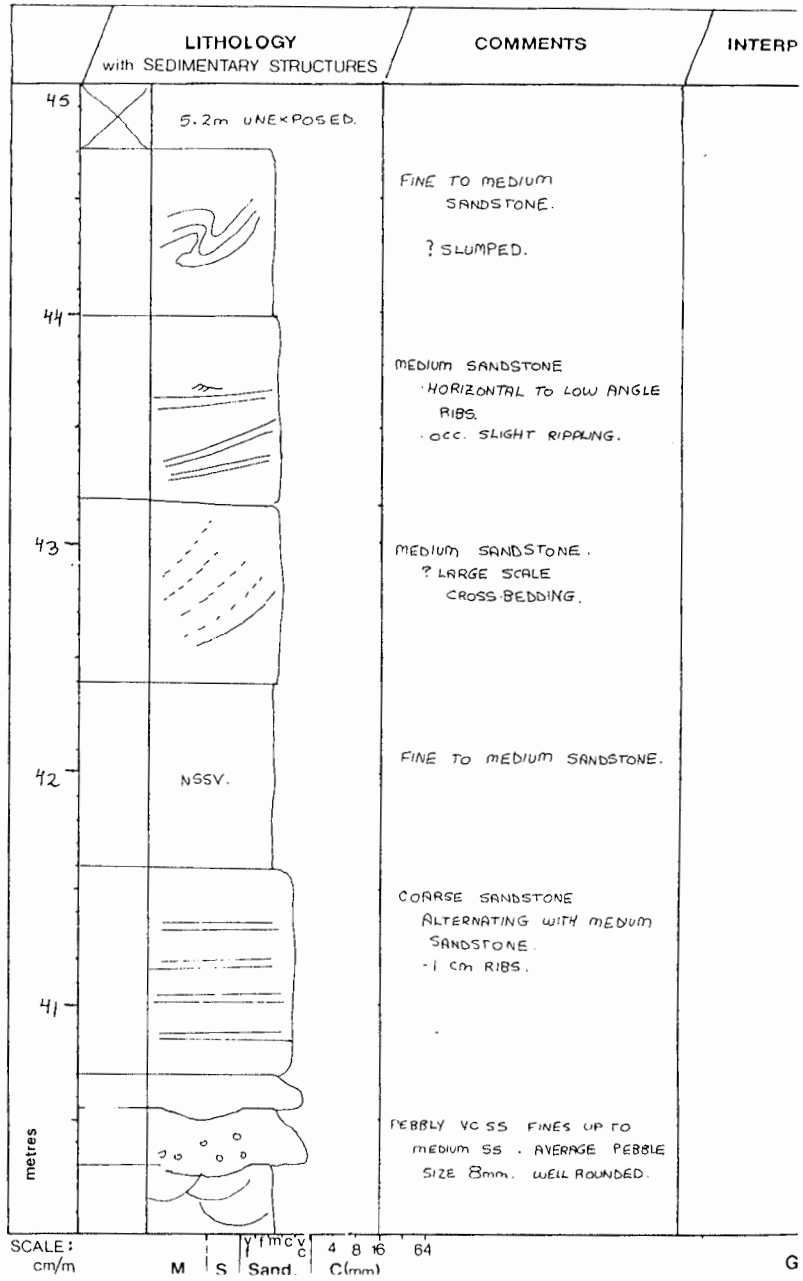
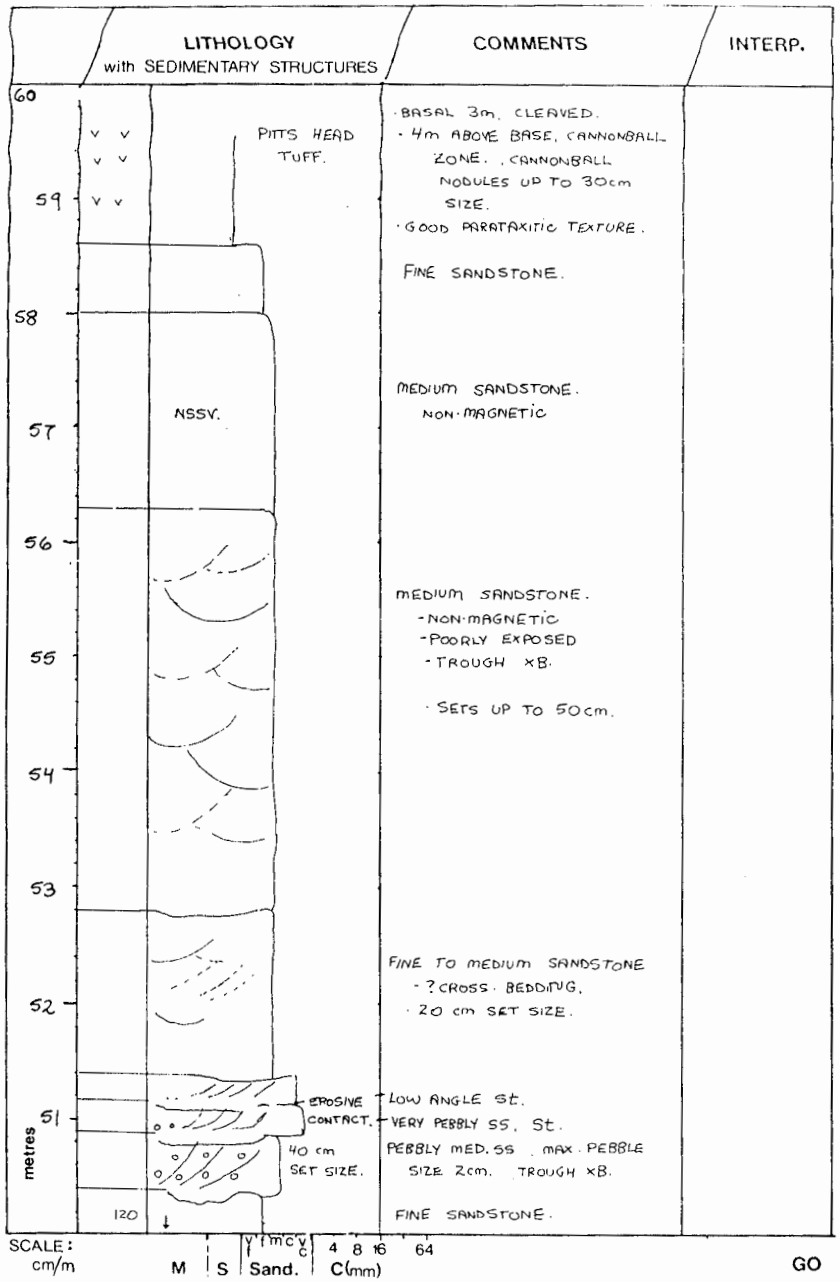
SECTION: M·1 LOCATION: MOEL DDU.



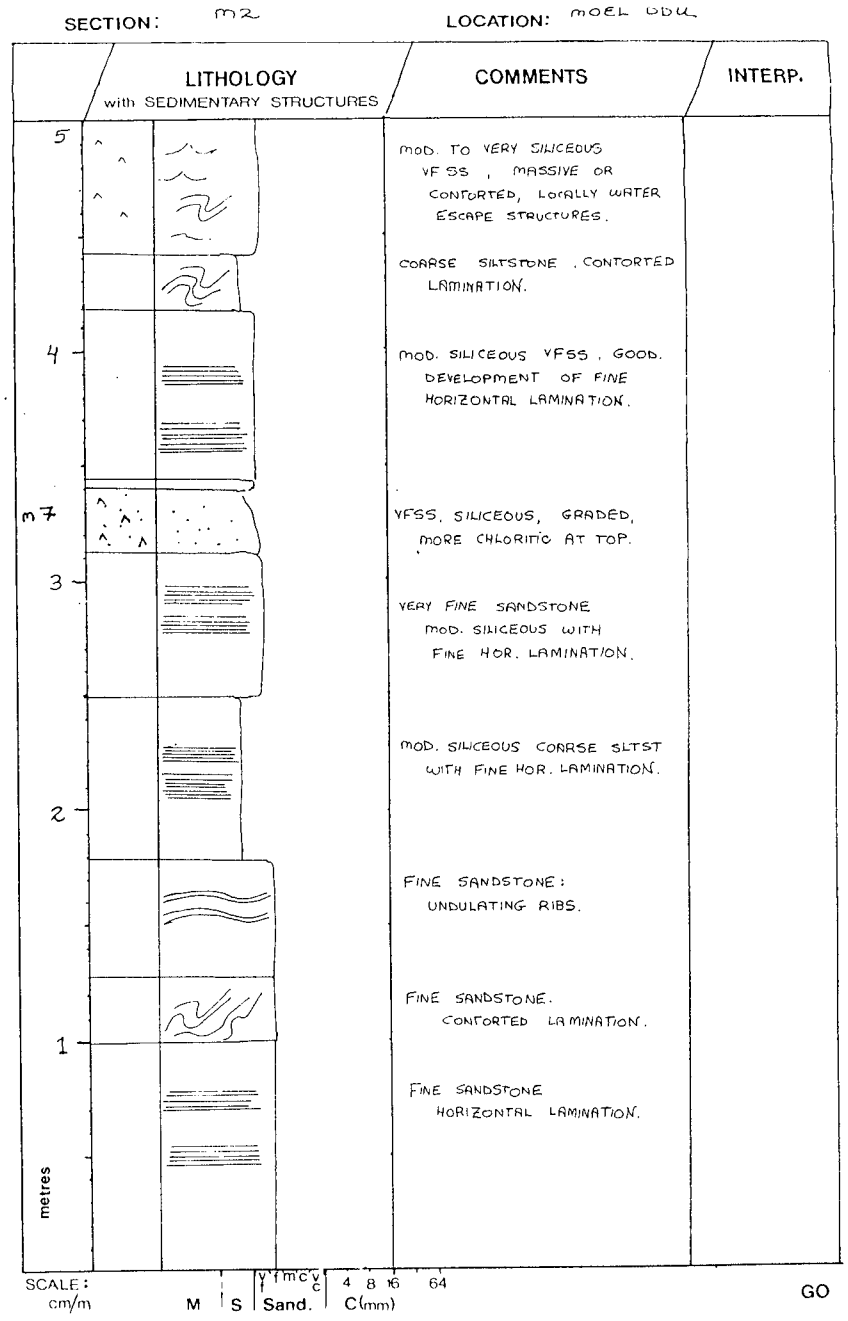
G

SECTION: M·1. LOCATION: MOEL DDU.

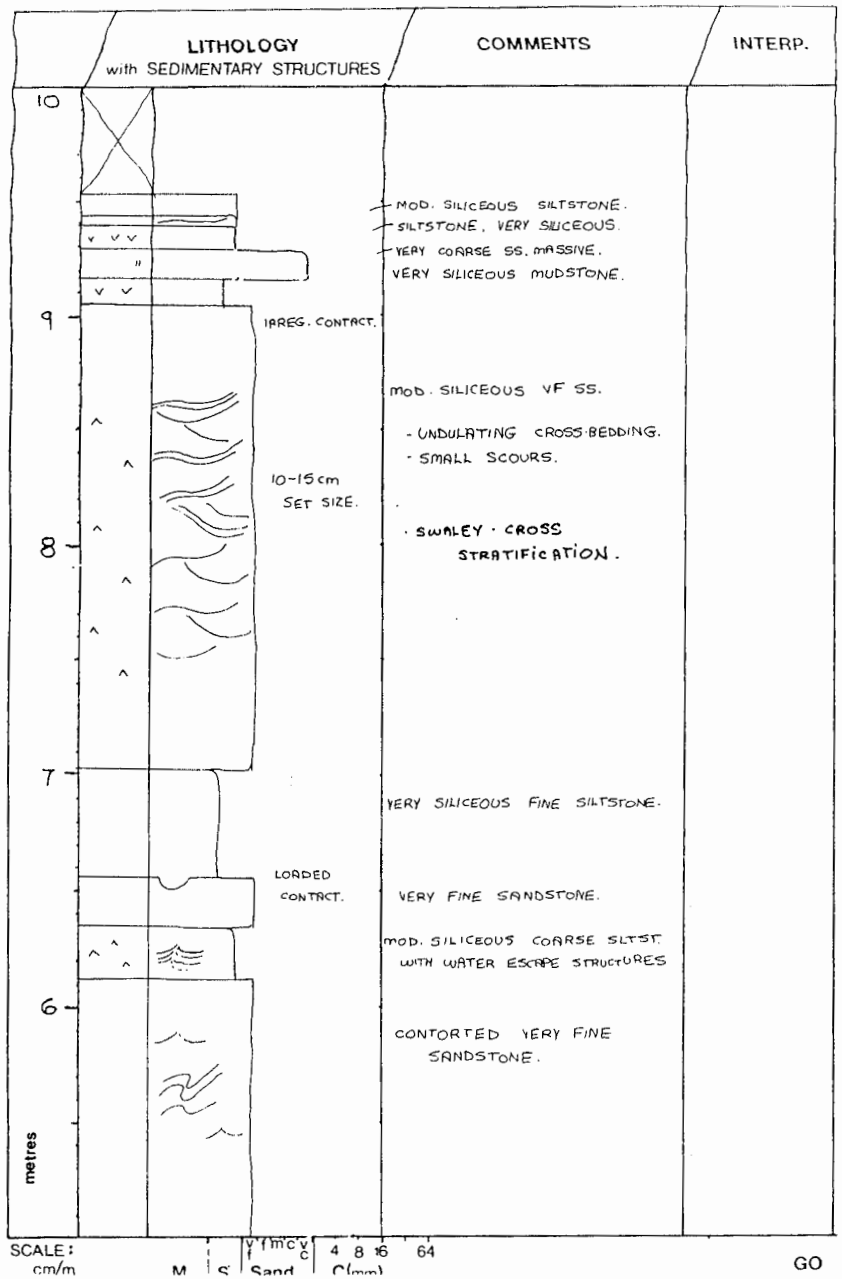


SECTION M2

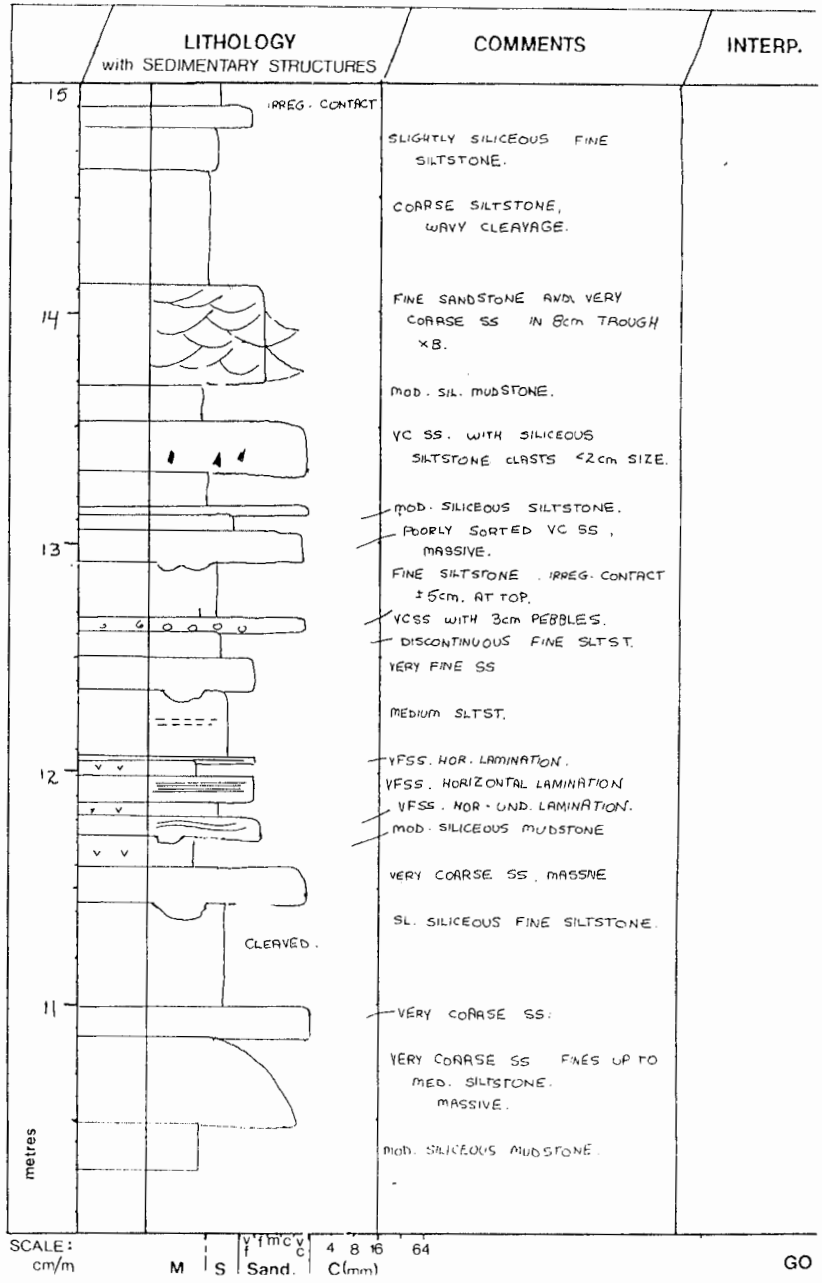
SECTION M2 LOCATION: Locate disused mine level (with small tip) at treed-break in slope. Section starts ca. 100 m to north of level and proceeds up slope across dry-stone wall to base of Pitts Head Tuff.



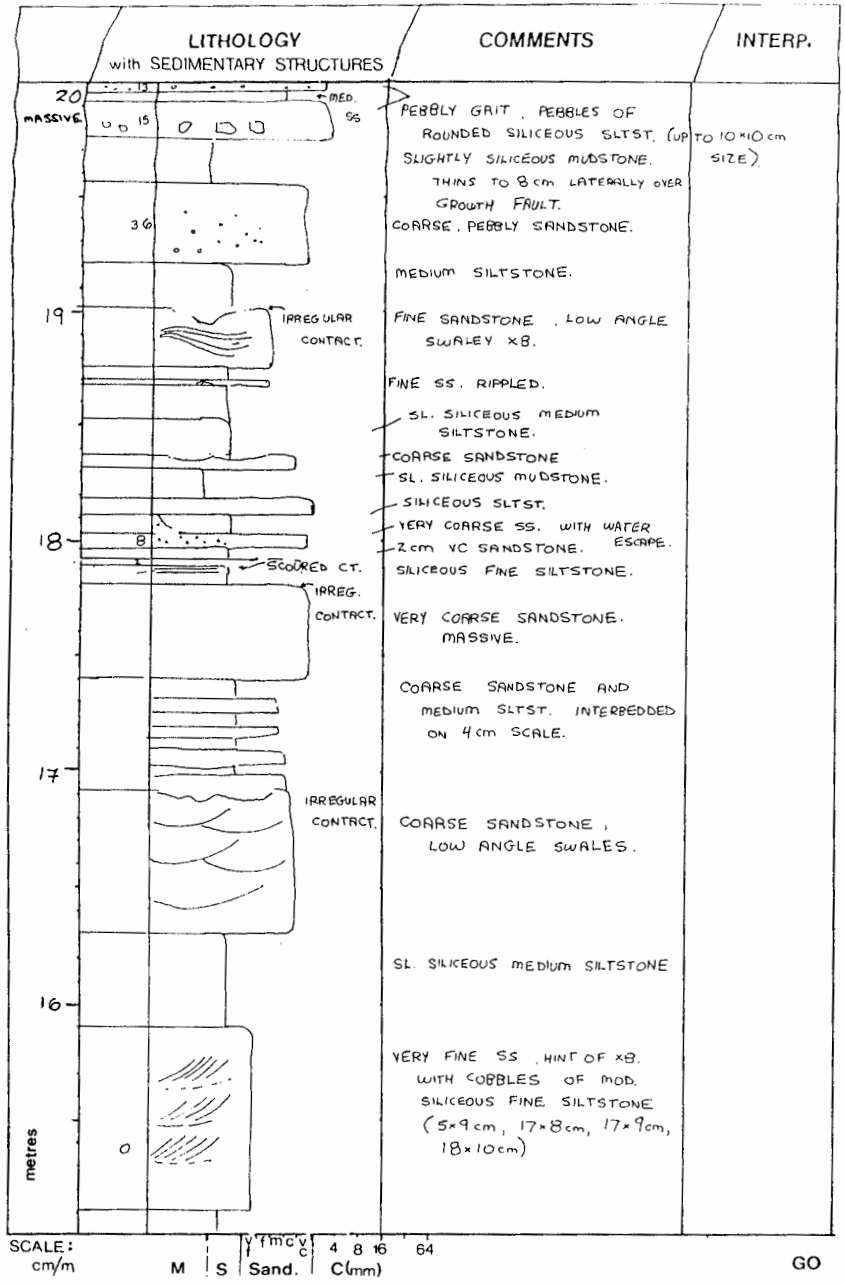
SECTION: m.2 LOCATION: MOEL DDU



SECTION: m.2 LOCATION: BWLCH TRIMARCHOG

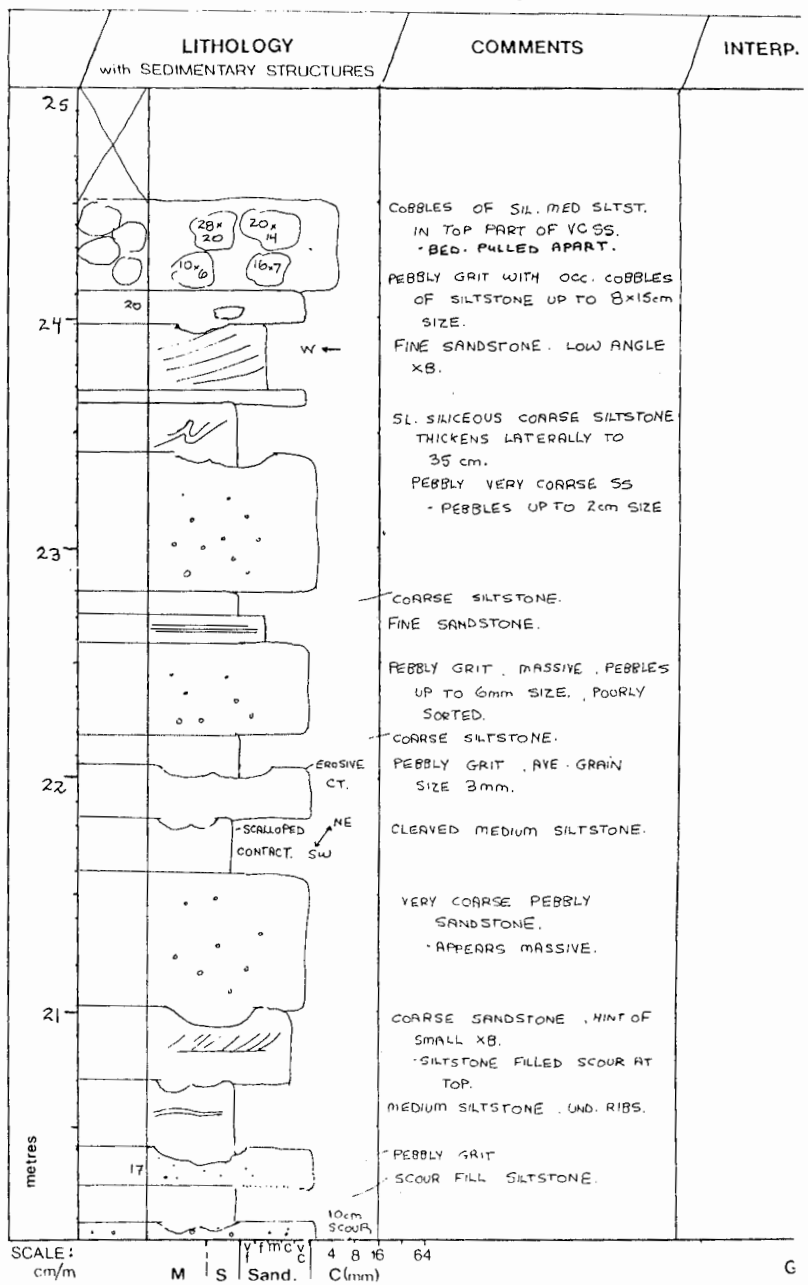


SECTION: M·2 LOCATION: MOEL DDU

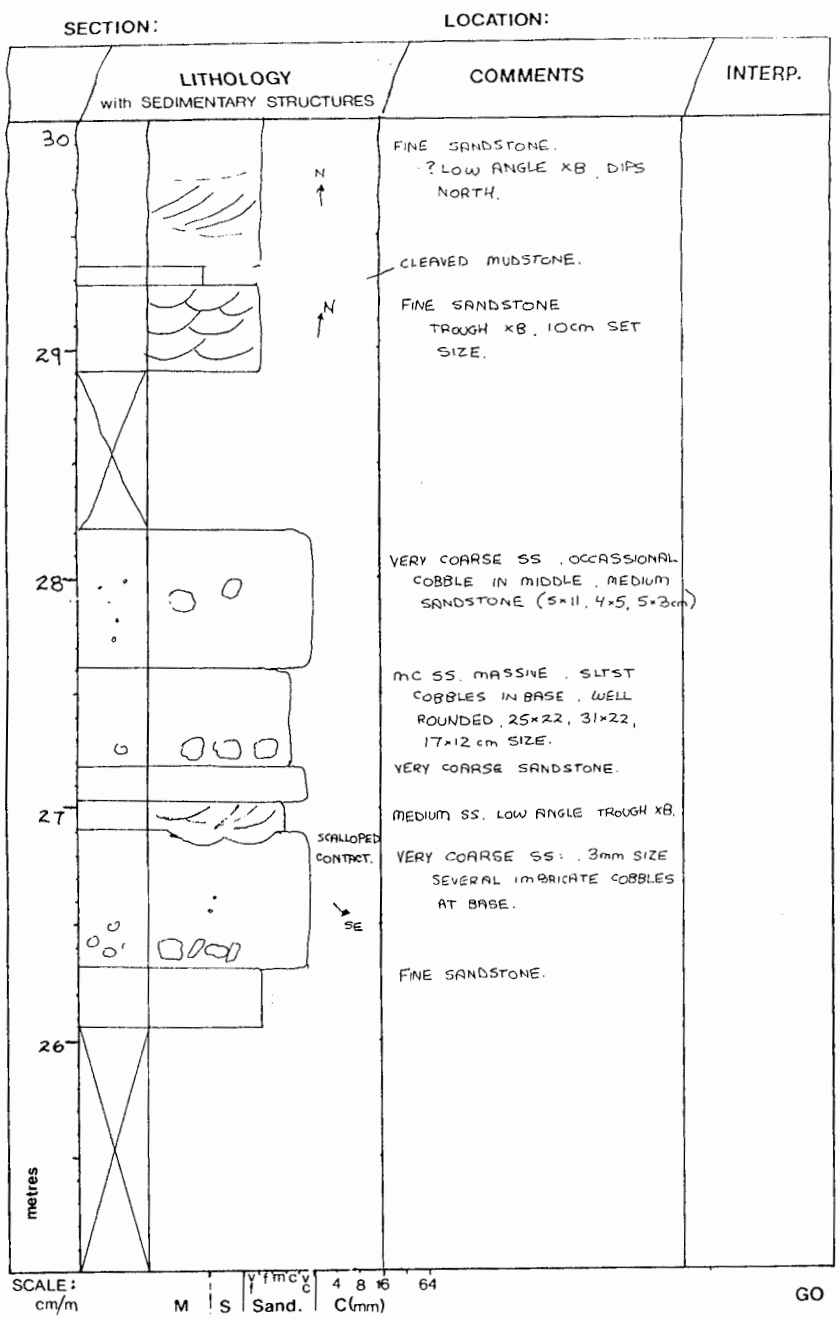


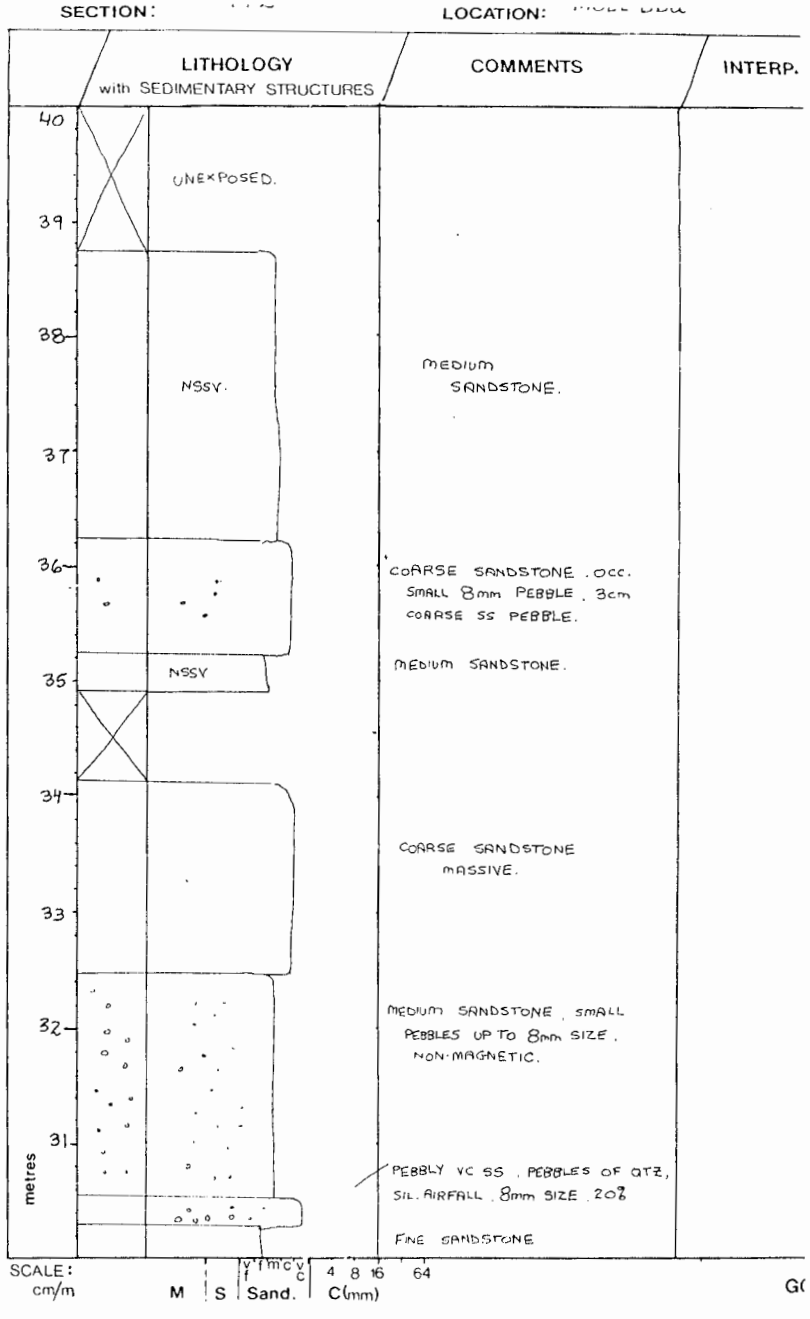
GO

SECTION: M·2 LOCATION: MOEL DDU

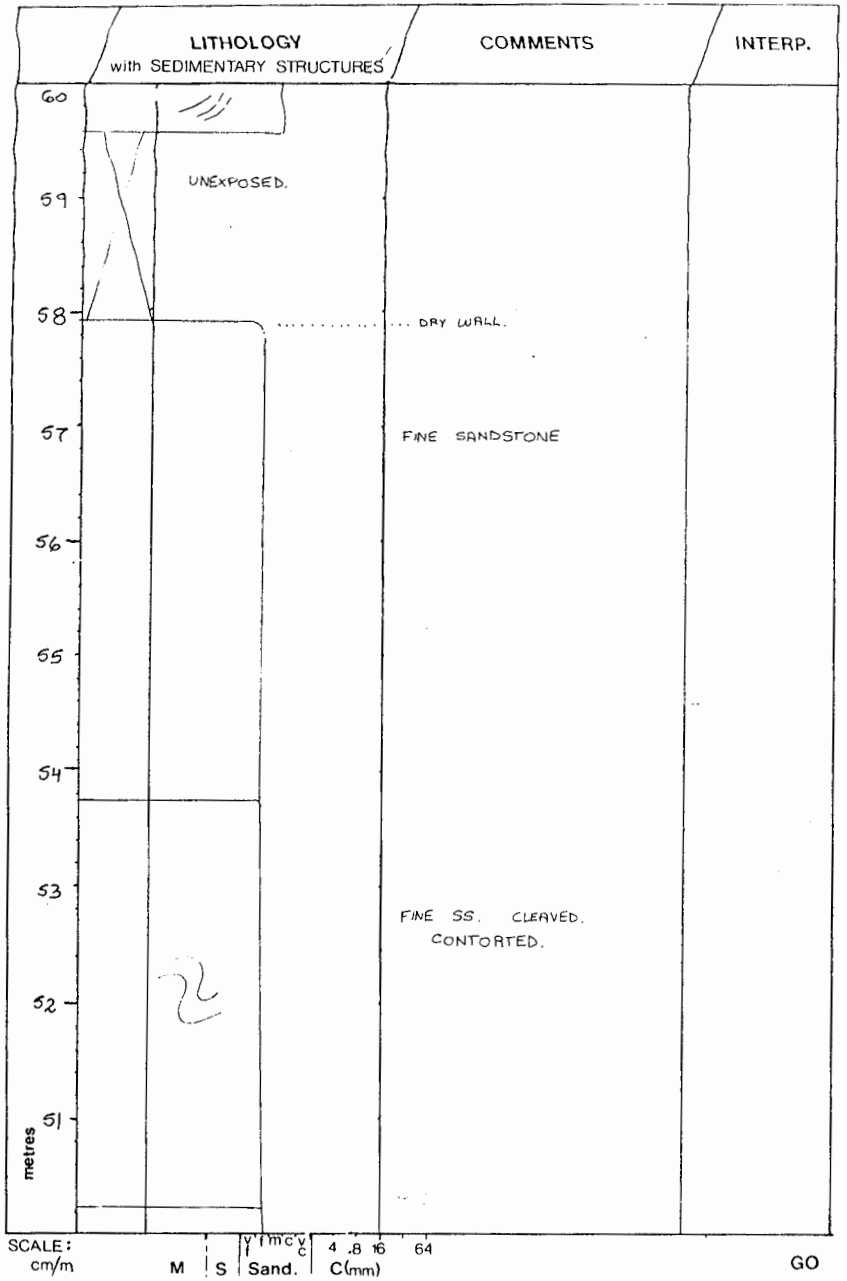


G

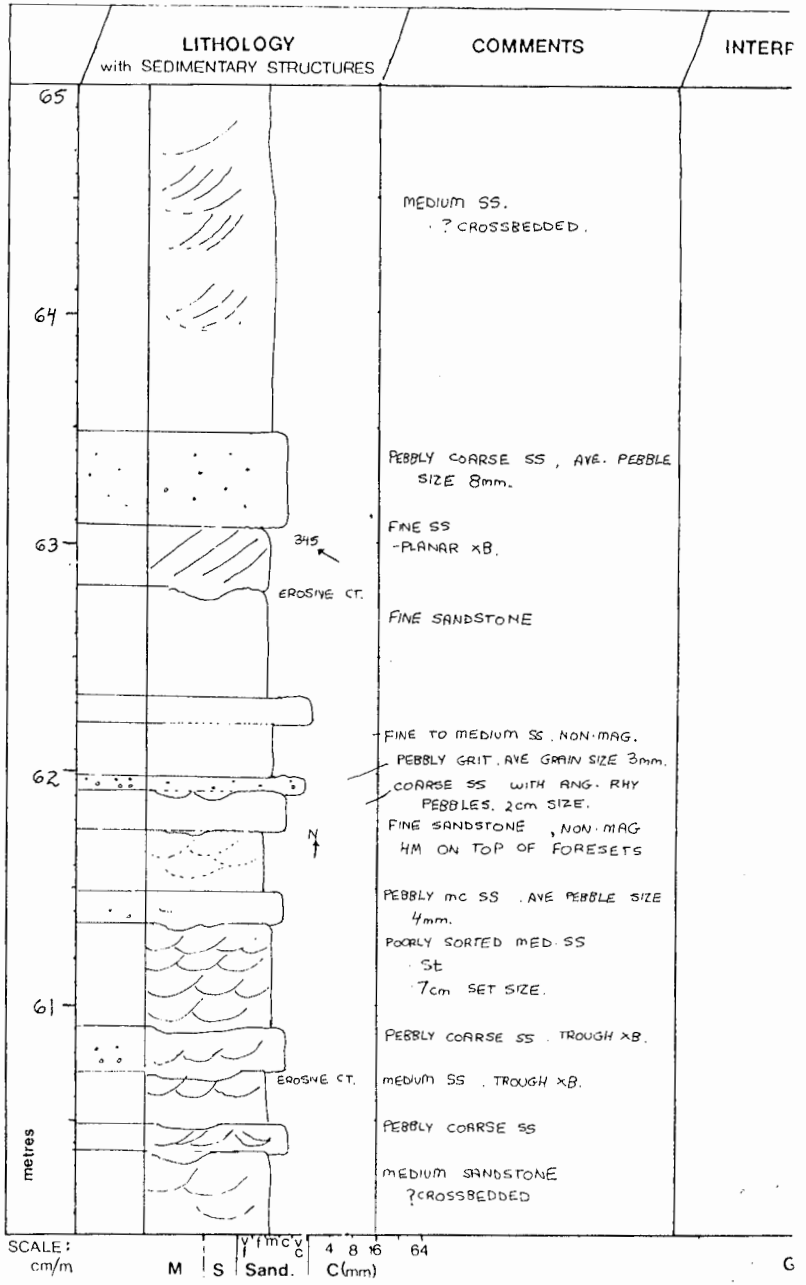

SECTION:
LOCATION:
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTERP.
30
29
28
27
26
metres
N
N
SCALLOPED CONTACT.
SE
FINE SANDSTONE.
? LOW ANGLE XB. DIPS NORTH.
CLEAVED MUDSTONE.
FINE SANDSTONE
TROUGH XB. 10cm SET SIZE.
VERY COARSE SS. OCCASSIONAL COBBLE IN MIDDLE. MEDIUM SANDSTONE (5×11, 4×5, 5×3cm)
mC SS. MASSIVE. SLTST COBBLES IN BASE. WELL ROUNDED. 25×22, 31×22, 17×12 cm SIZE.
VERY COARSE SANDSTONE.
MEDIUM SS. LOW ANGLE TROUGH XB.
VERY COARSE SS: 3mm SIZE SEVERAL IMBRICATE COBBLES AT BASE.
FINE SANDSTONE.
SCALE:
cm/m
M
S
v f f m c v c
Sand.
4 8 16 64
C(mm)
GO


SECTION:
LOCATION:
LITHOLOGY
with SEDIMENTARY STRUCTURES
COMMENTS
INTERP.
40
39
38
37
36
35
34
33
32
31
metres
UNEXPOSED.
NSSV.
NSSV
MEDIUM SANDSTONE.
COARSE SANDSTONE. OCC. SMALL 8mm PEBBLE. 3cm COARSE SS PEBBLE.
MEDIUM SANDSTONE.
COARSE SANDSTONE MASSIVE.
MEDIUM SANDSTONE, SMALL PEBBLES UP TO 8mm SIZE. NON-MAGNETIC.
PEBBLY VC SS. PEBBLES OF QTZ, SIL. AIRFALL. 8mm SIZE. 20%
FINE SANDSTONE
SCALE:
cm/m
M
S
v f f m c v c
Sand.
4 8 16 64
C(mm)
G(

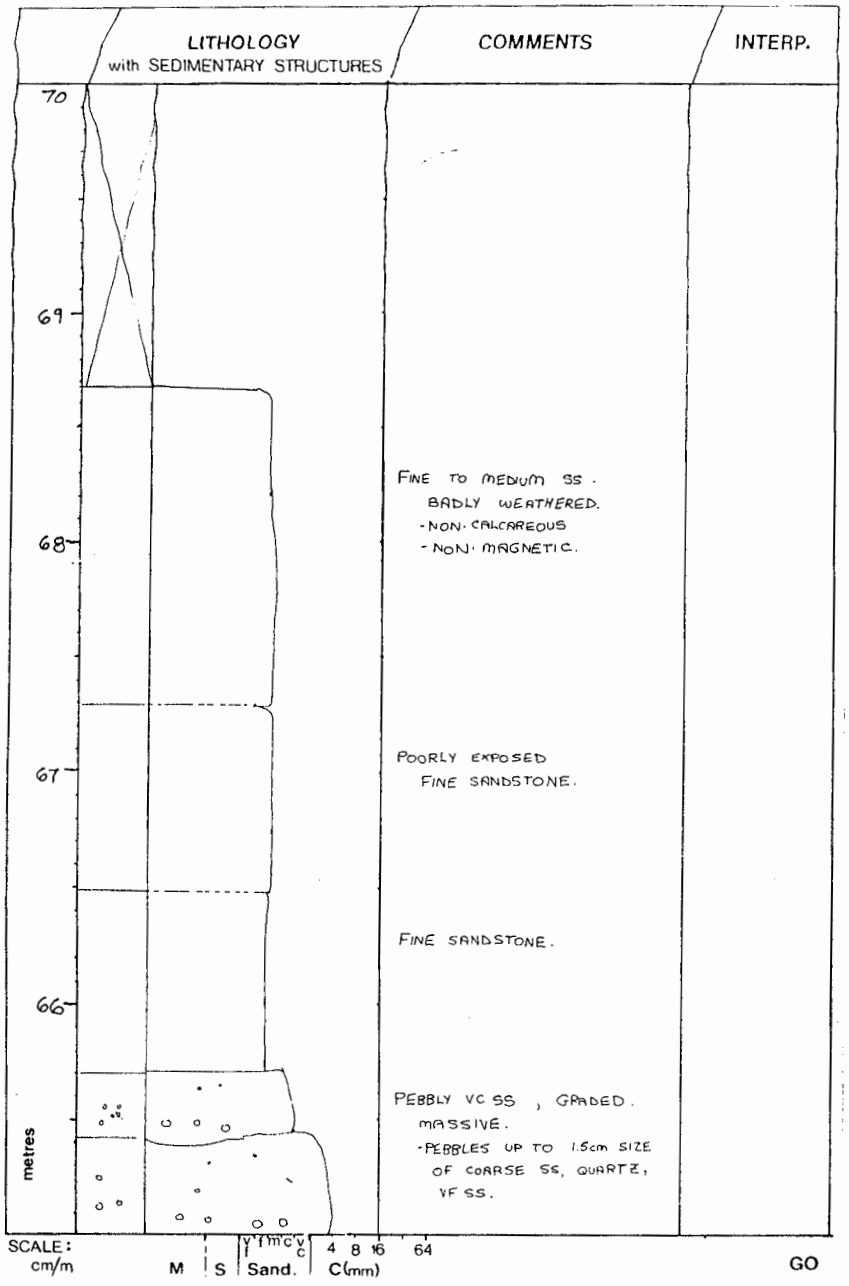
SECTION: m.1. LOCATION: MOEL DDU.



SECTION: m.1 LOCATION: MOEL DDU.

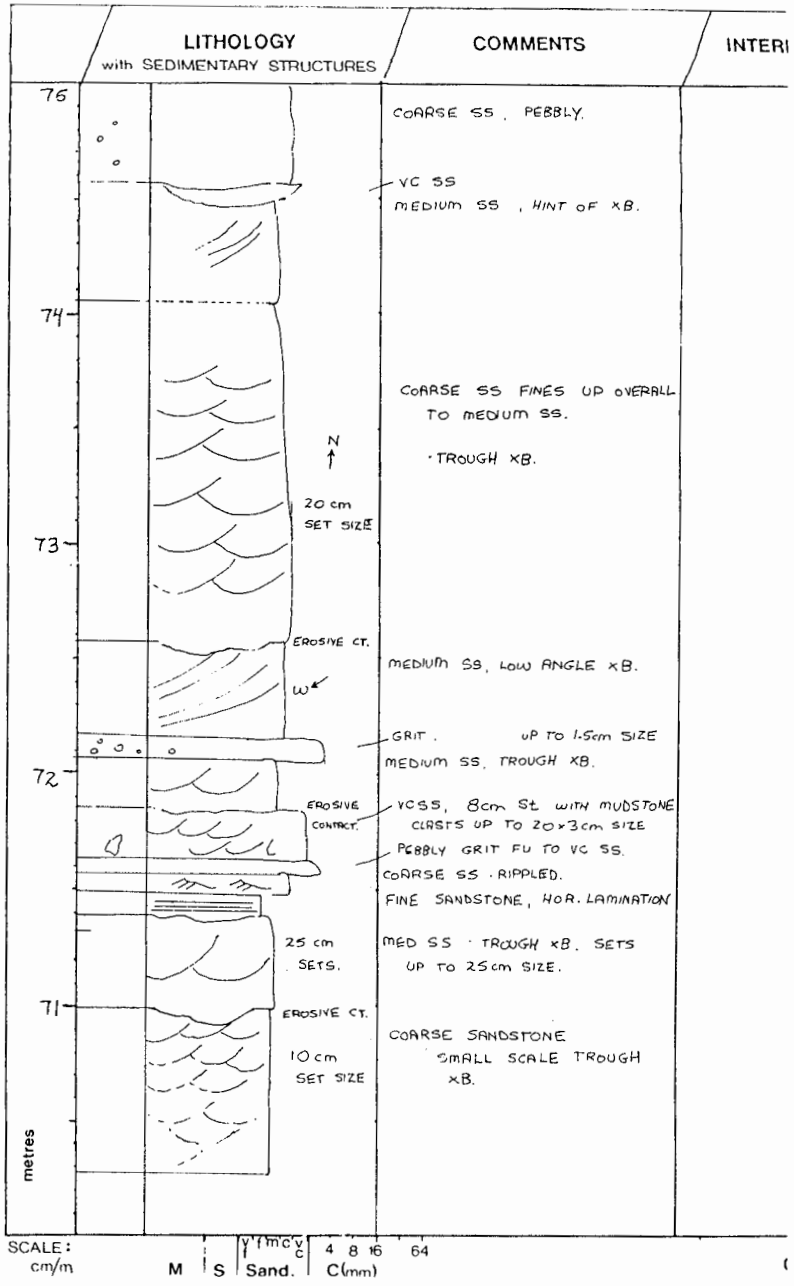


SECTION: M·1. LOCATION: MOEL DDU.

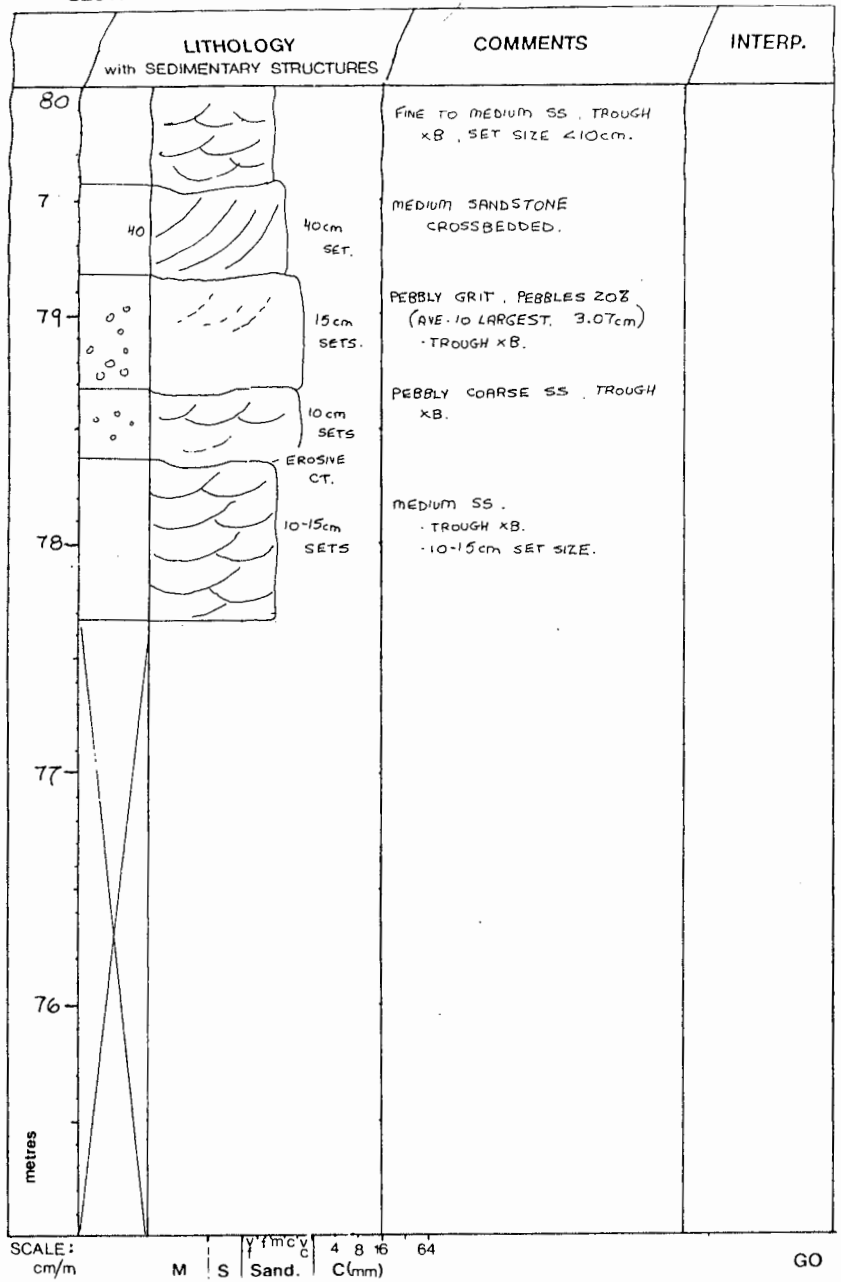


GO

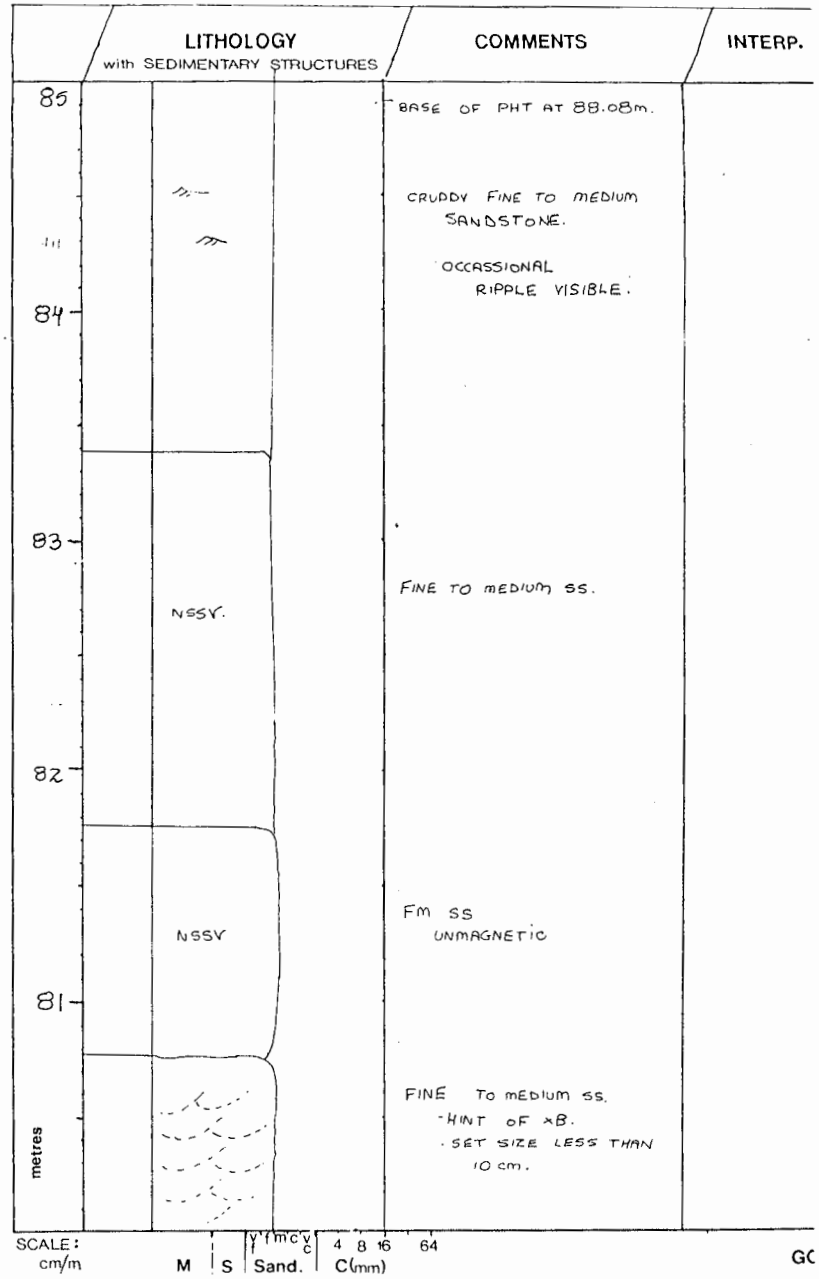
SECTION: M·2 LOCATION: MOEL DDU



SECTION: M·1. LOCATION: MOEL DDU.

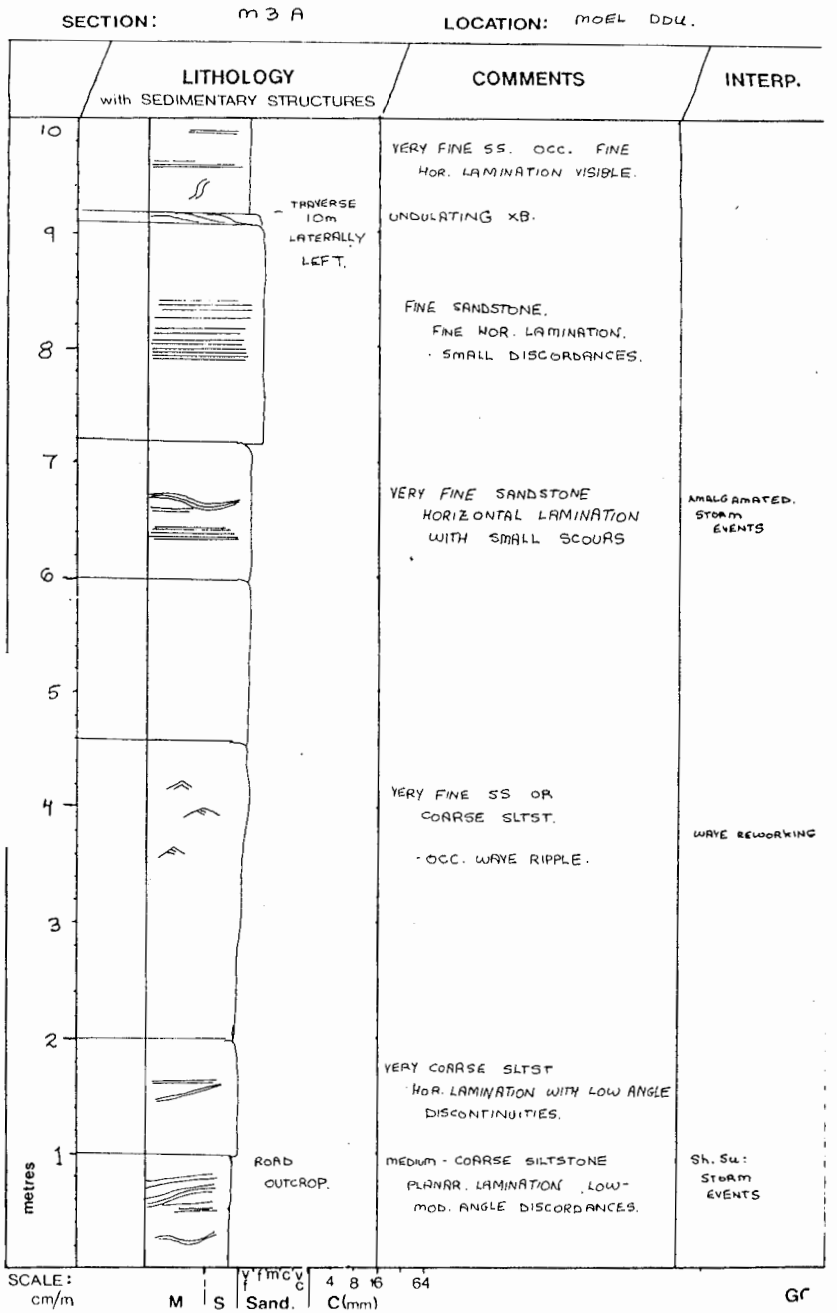


SECTION: M·2 LOCATION: MOEL DDU.

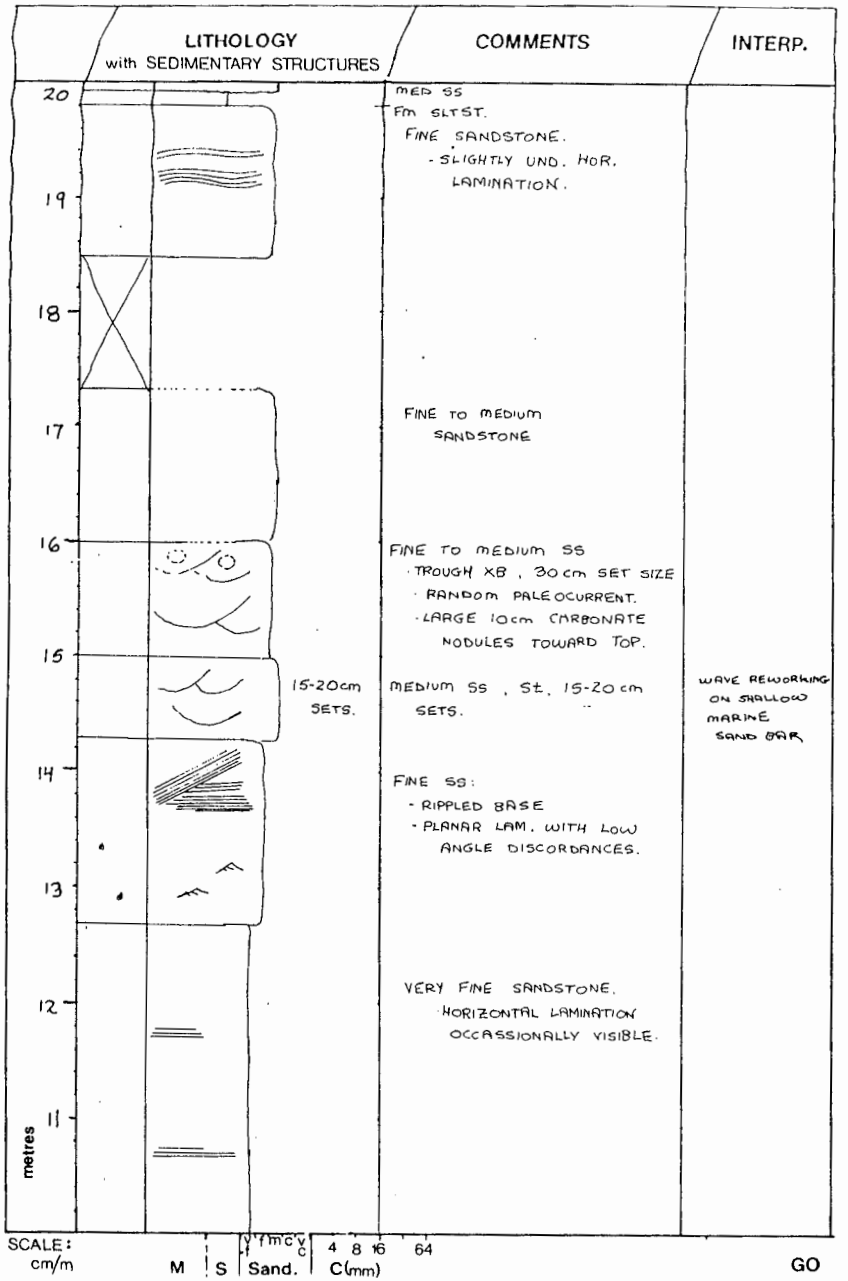


SECTION M3

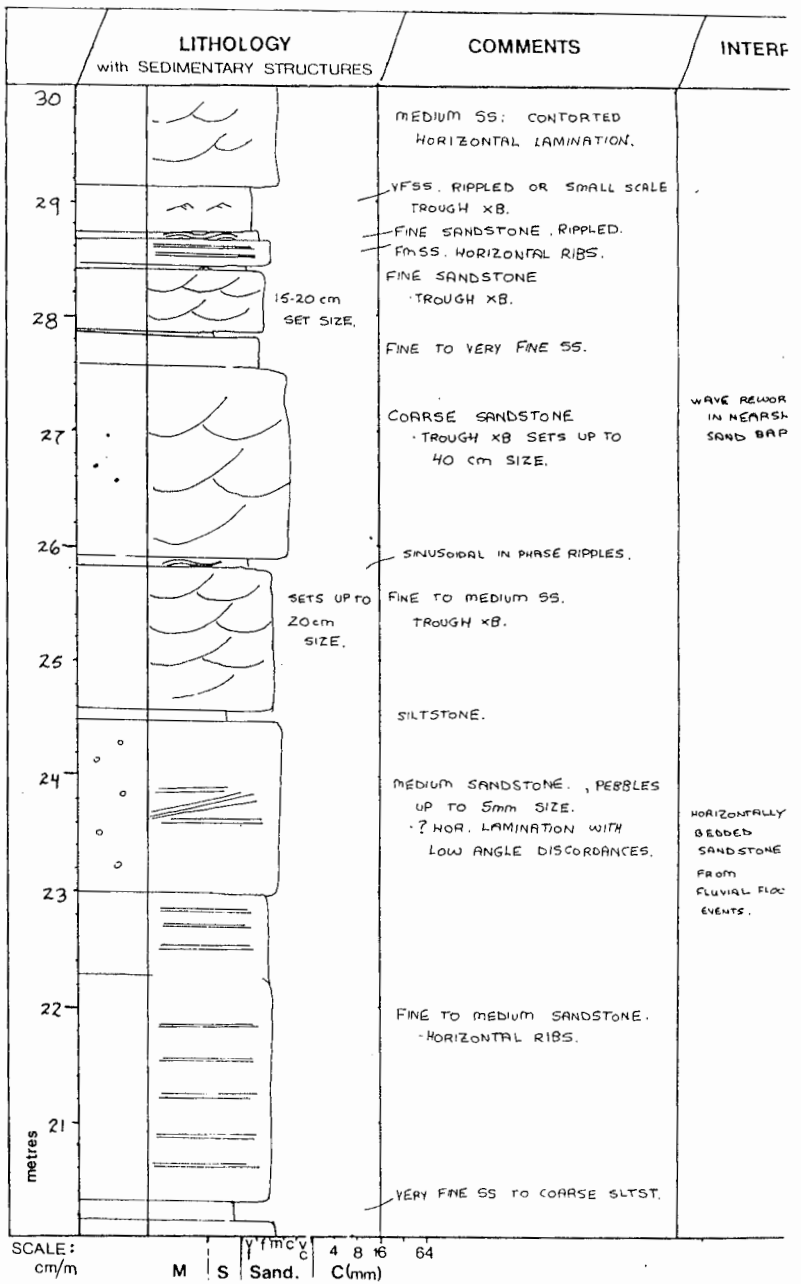
SECTION M3 LOCATION: Locate first outcrops of sandstone ca. 50 m to west of Turnpike Cottage. Section proceeds from here to west and NW across rolling craigs to base of Pitts Head Tuff slide blocks.



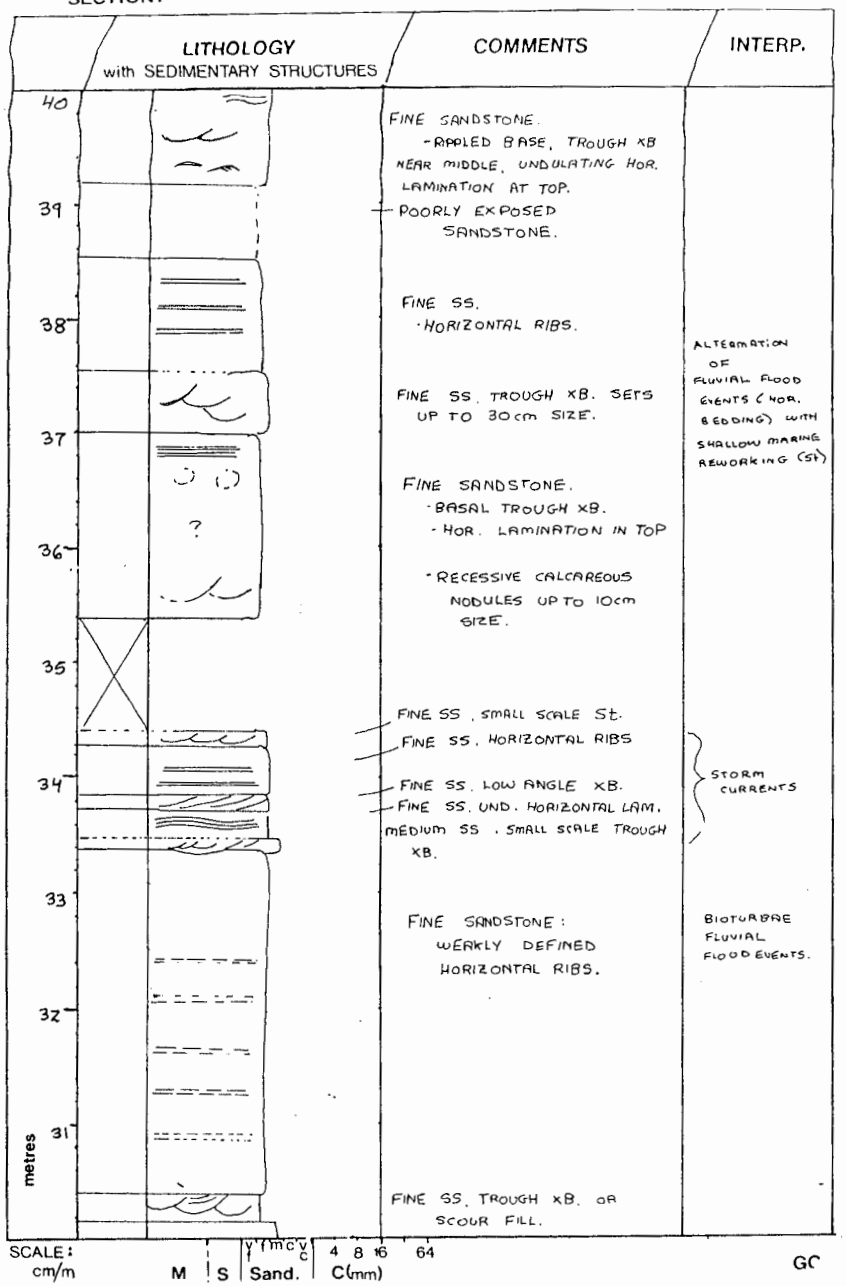
SECTION: M·3 LOCATION: [illegible]



SECTION: M·3A. LOCATION: [illegible]

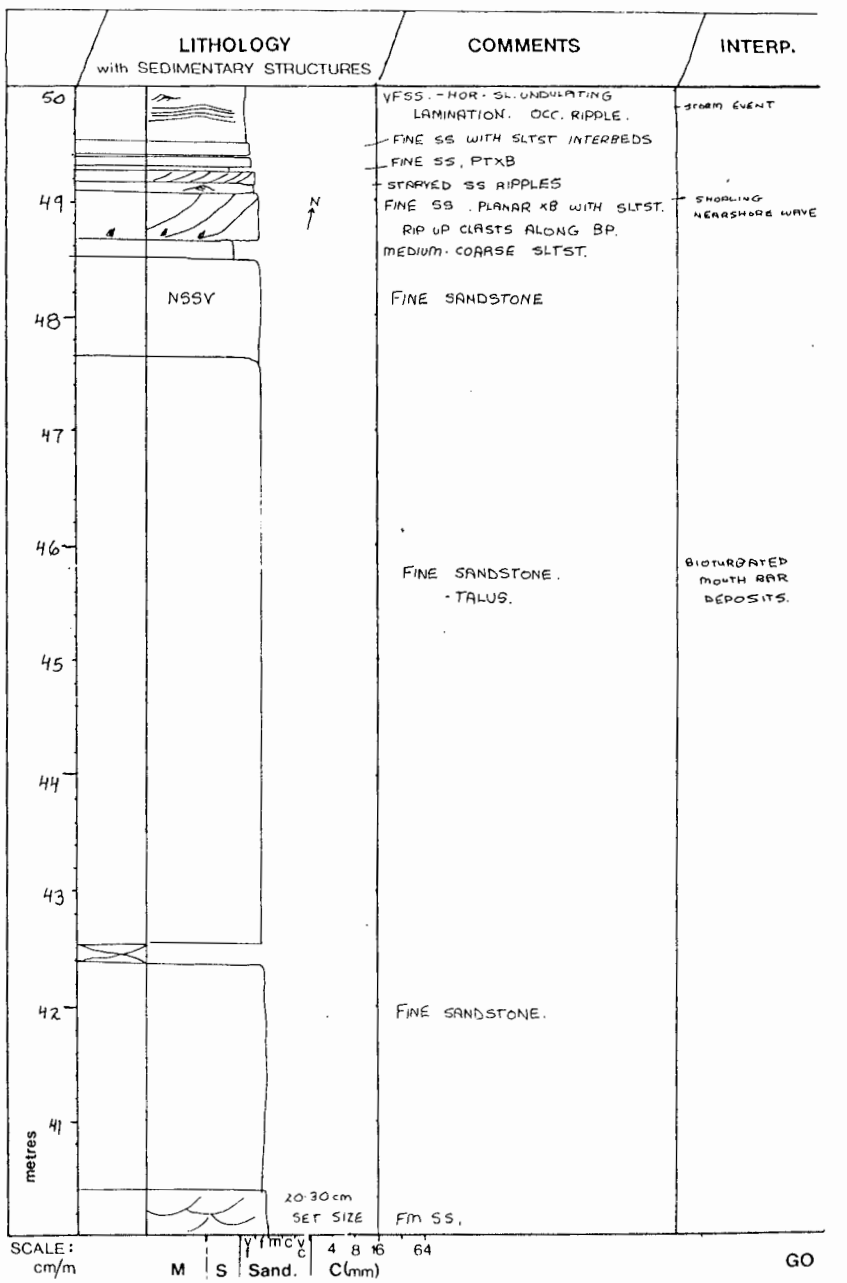


SECTION: M·1 LOCATION: MOEL DDU



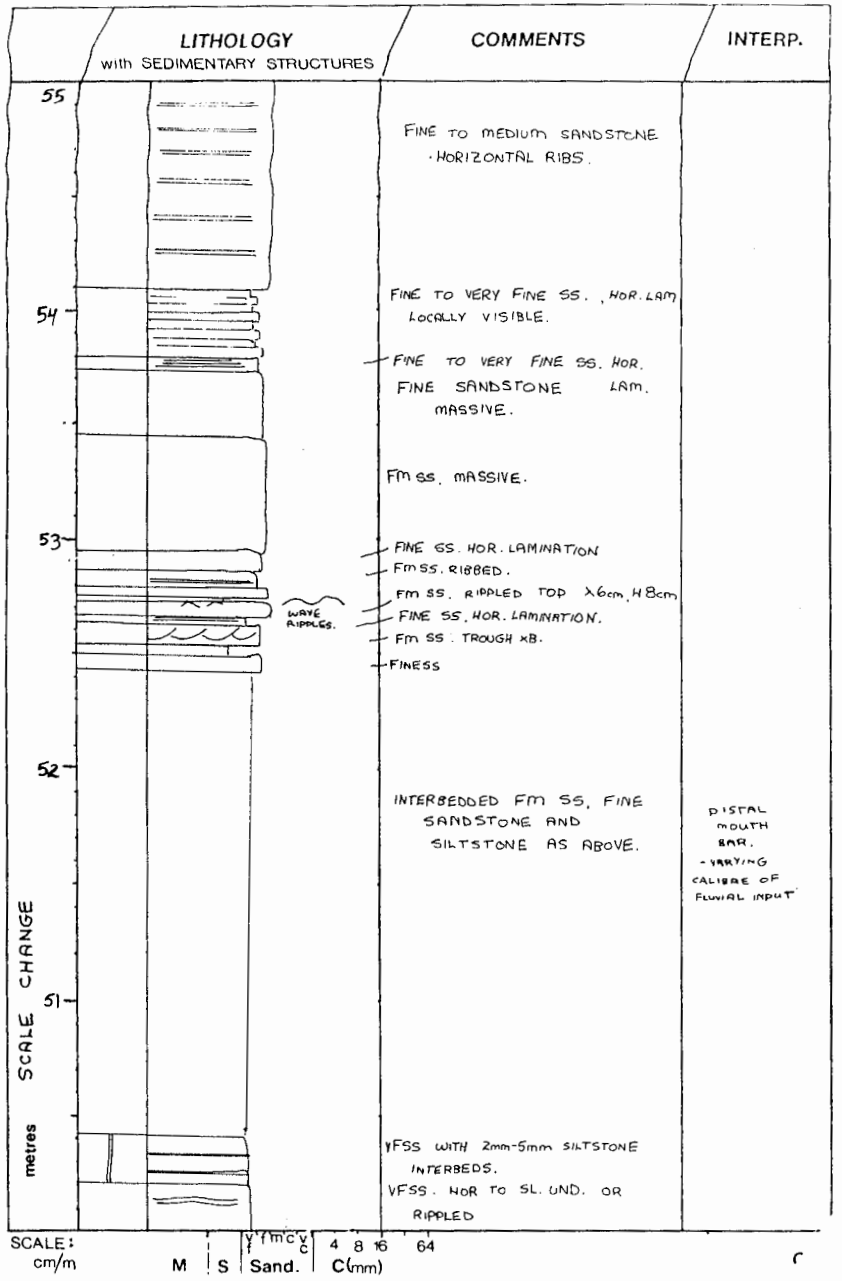
GC

SECTION: M·3 LOCATION: MOEL DDU.

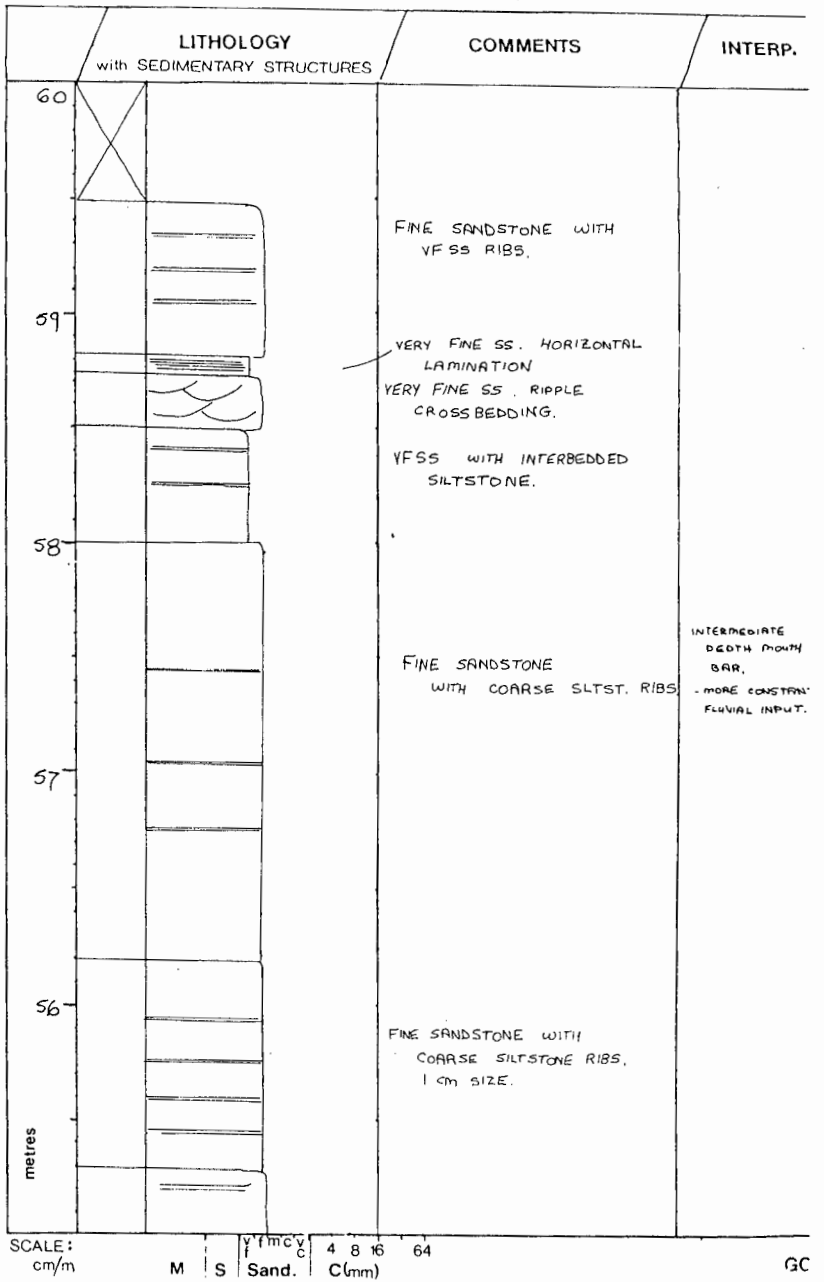


GO

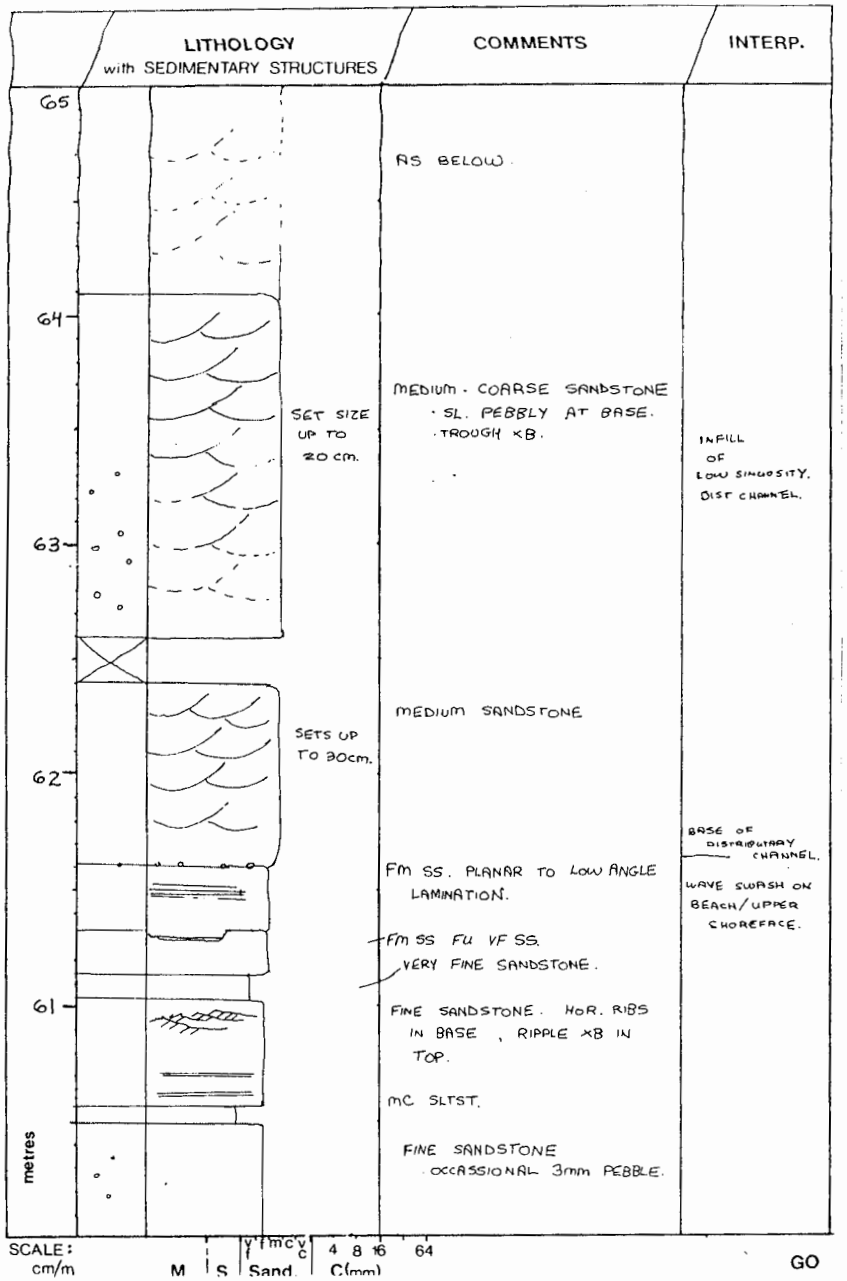
SECTION: M·3 LOCATION: MOEL DDU.



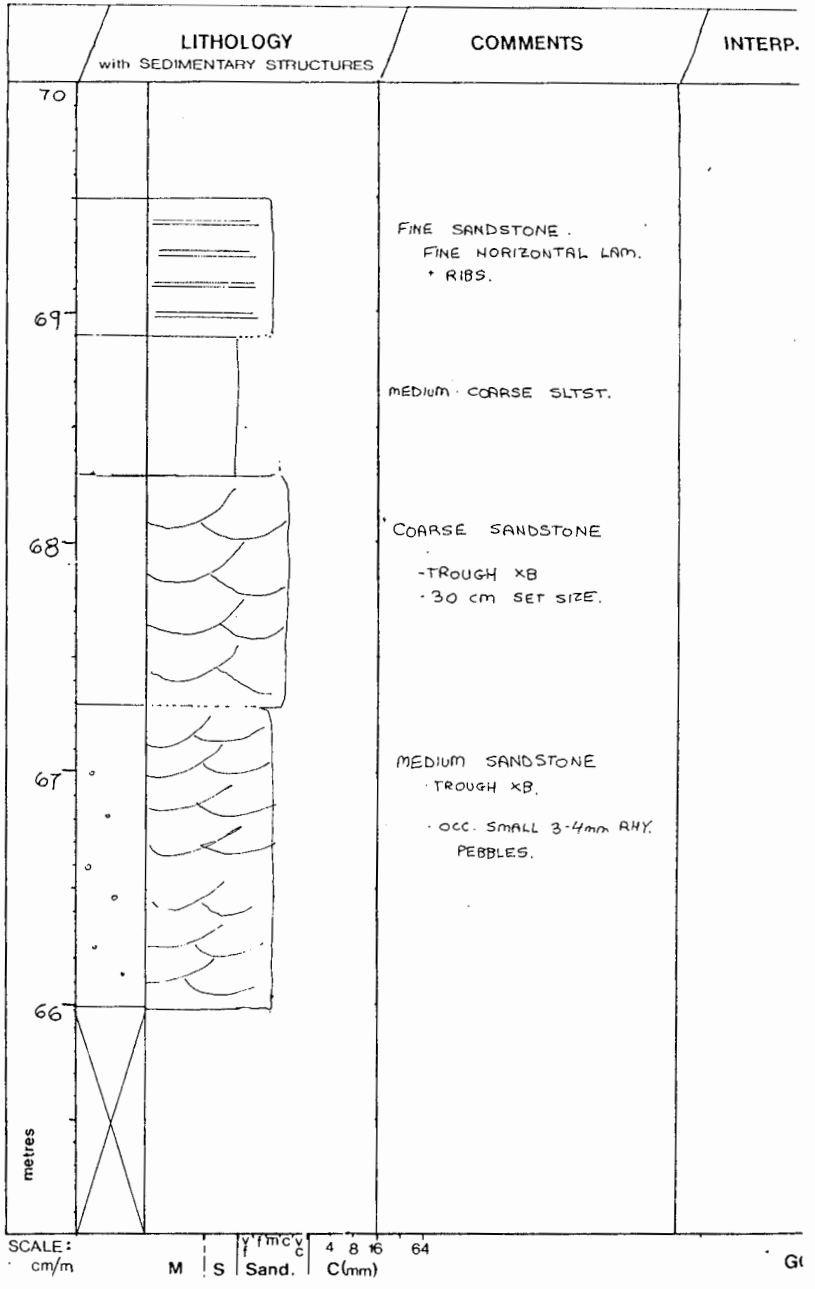
SECTION: M·3A LOCATION: MOEL DDU.



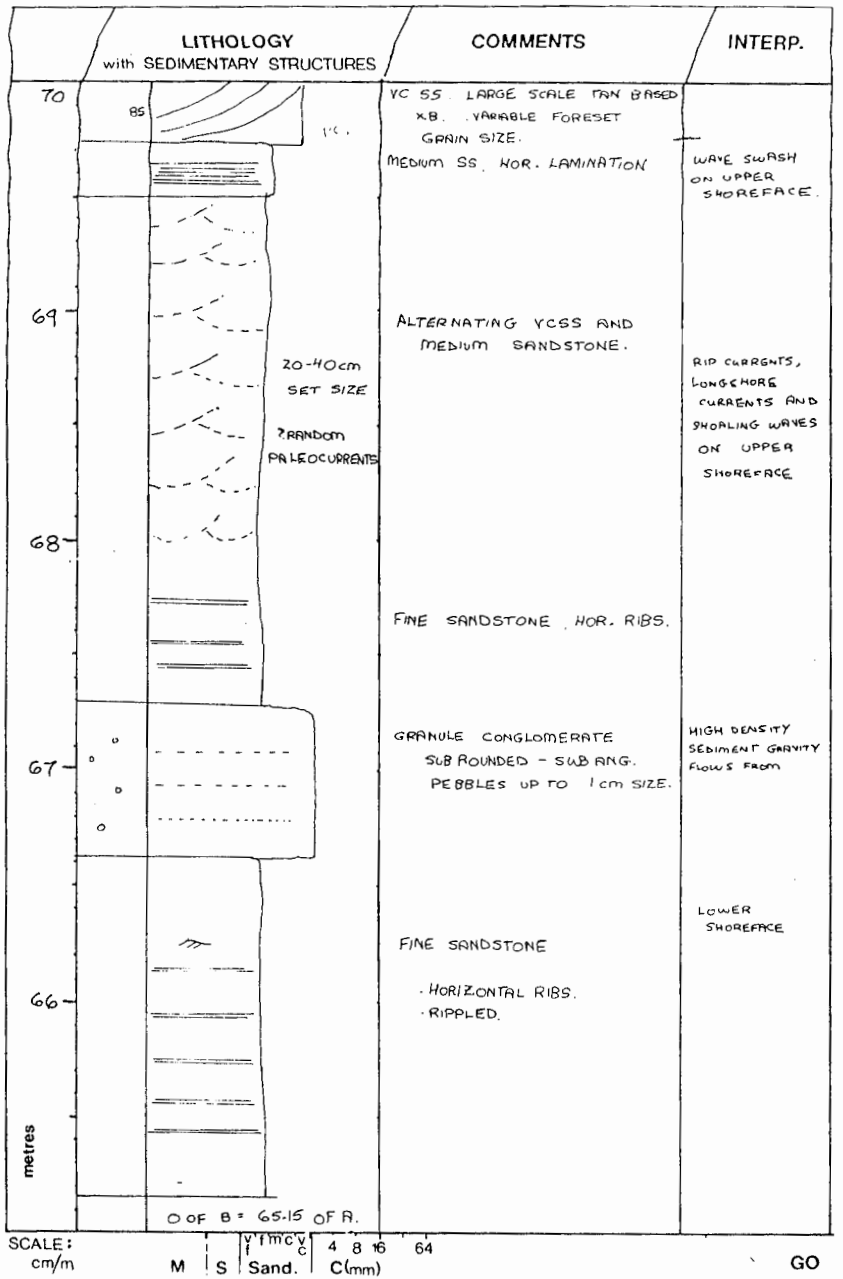
SECTION: M·3 LOCATION: MOEL DDU.



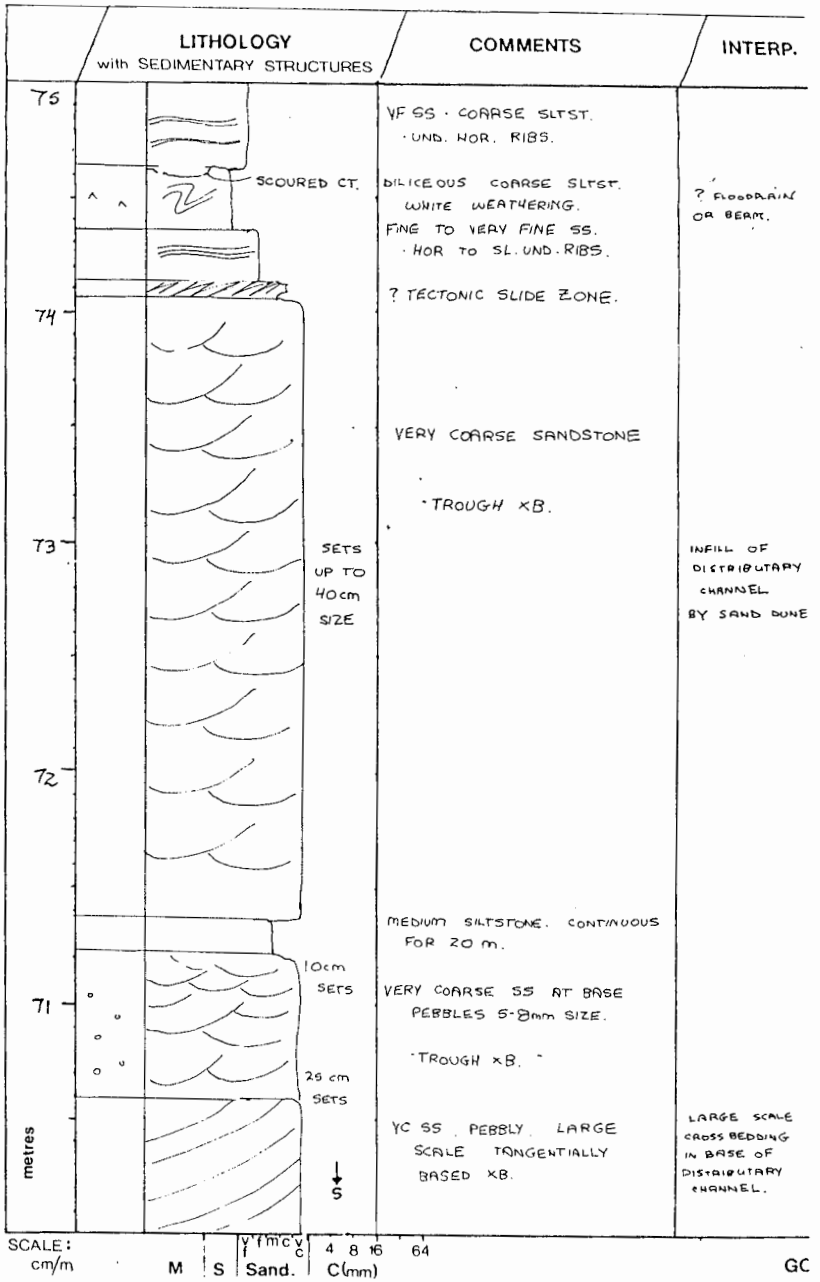
SECTION: M·3A. LOCATION: MOEL DDU

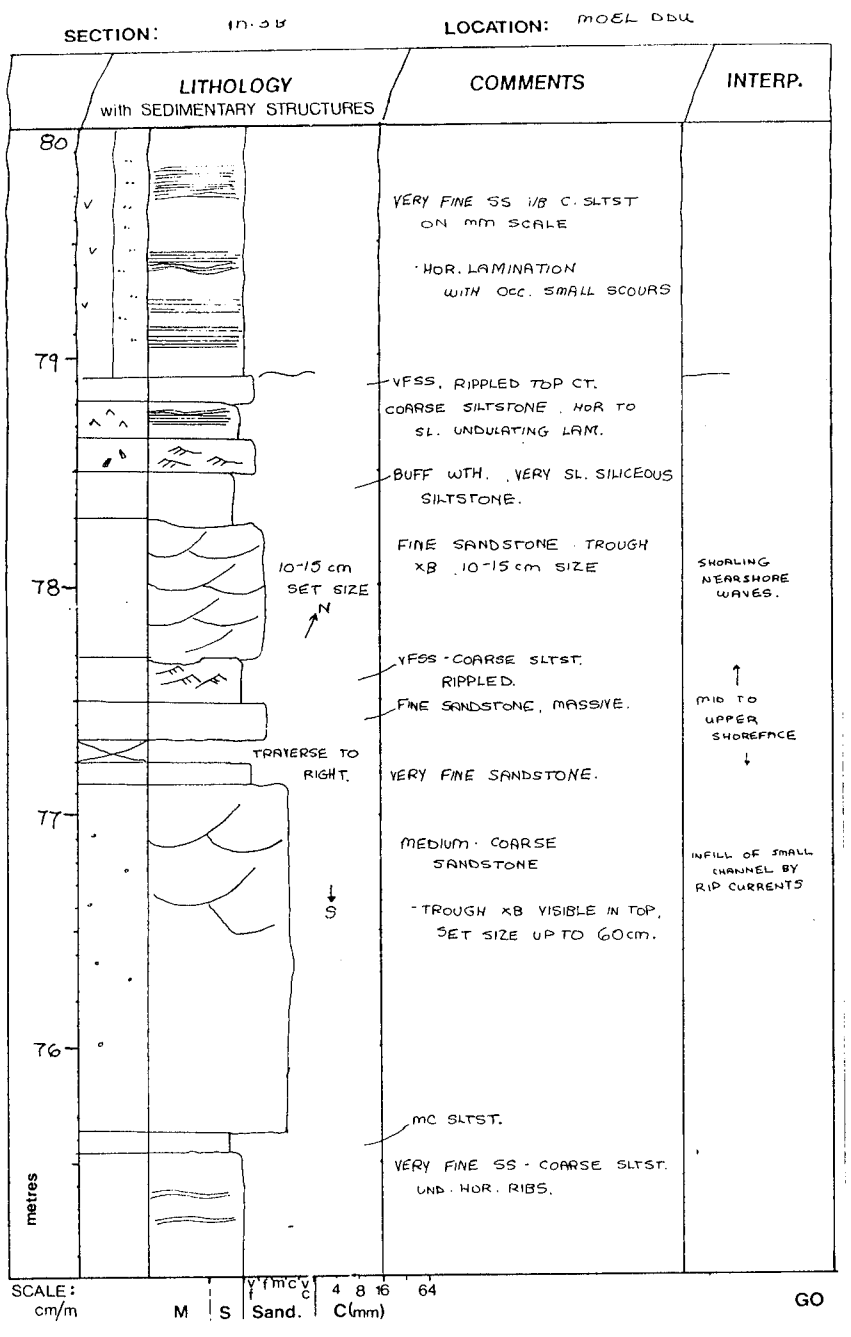


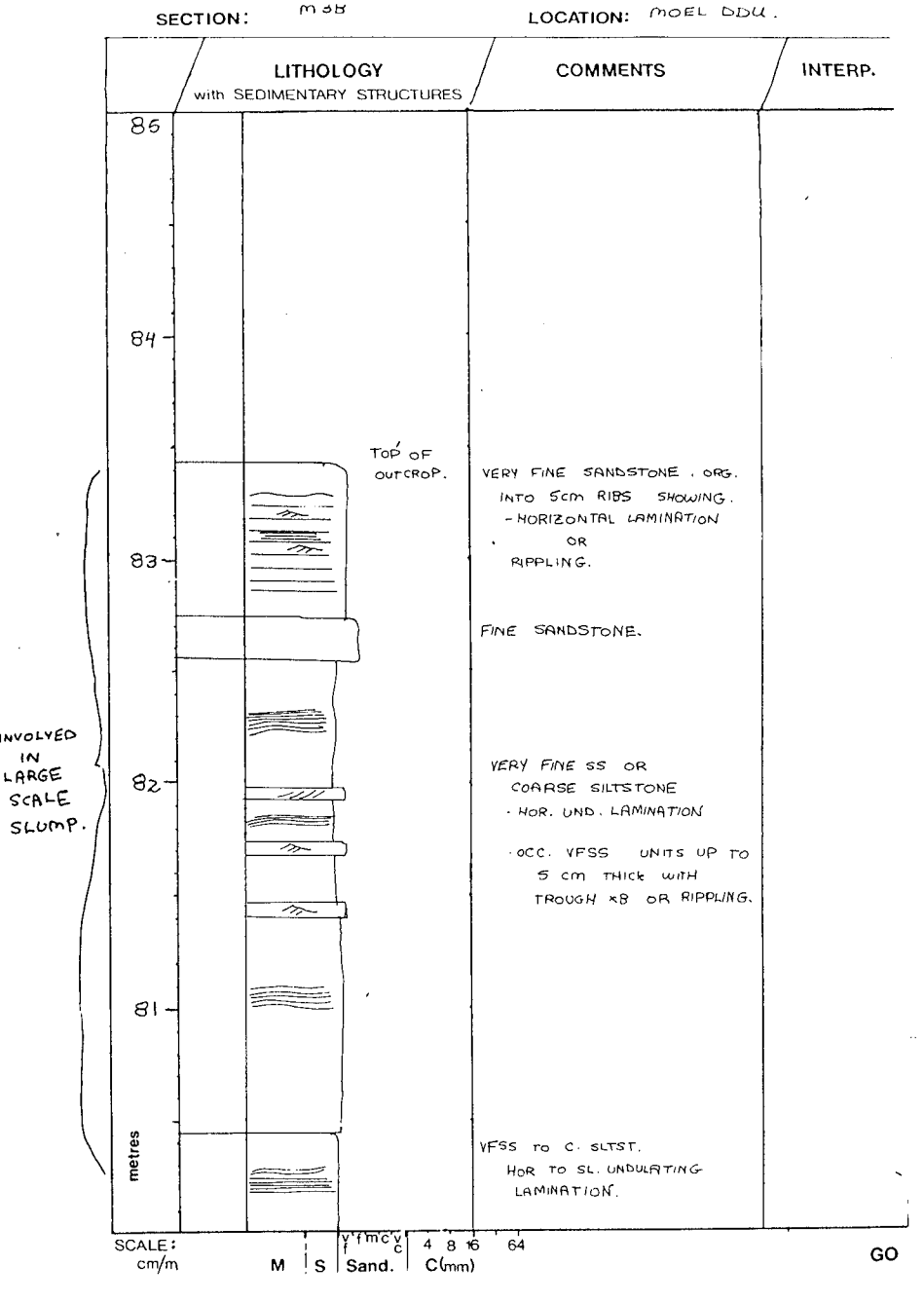
SECTION: M3B LOCATION: MOEL DDU



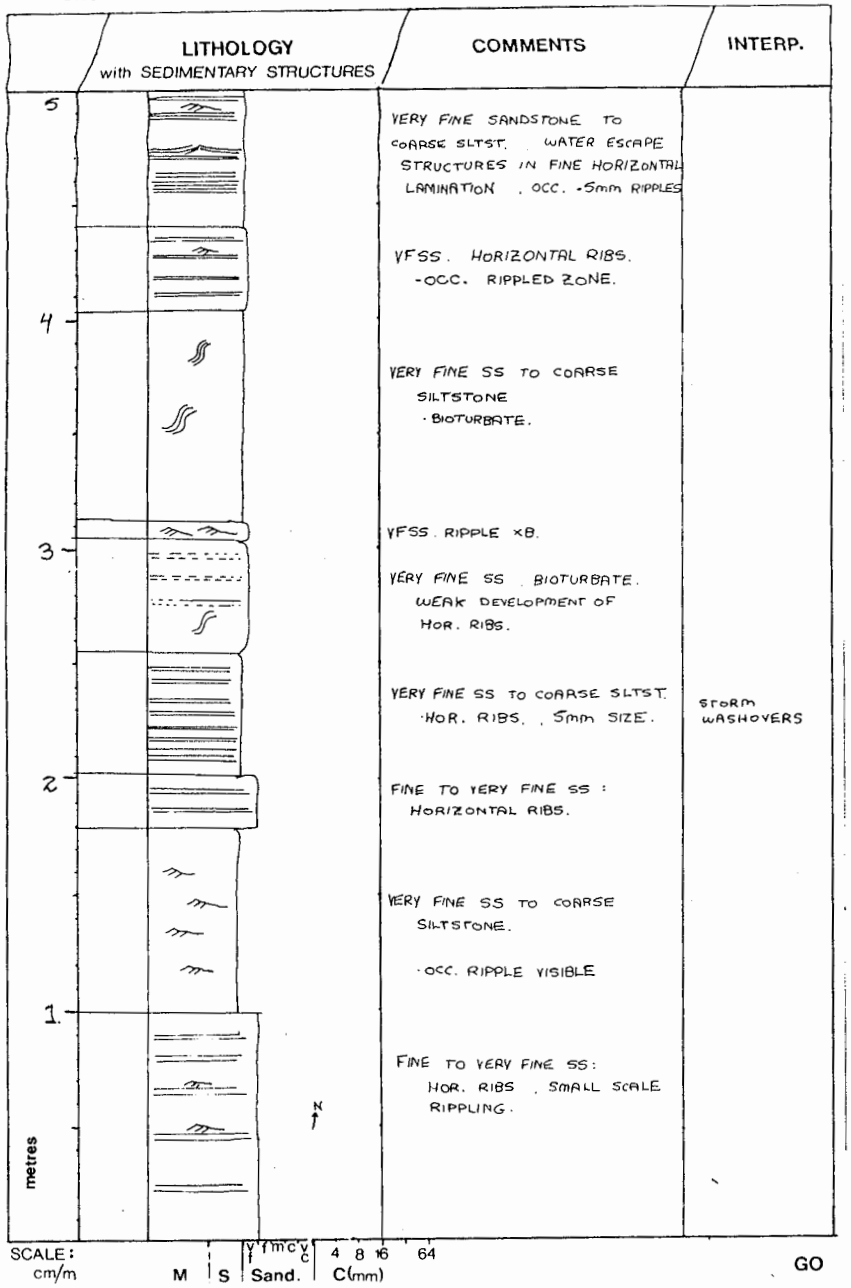
SECTION: M3B LOCATION: MOEL DDU.




SECTION: M.3B
LOCATION: MOEL DDU
LITHOLOGY with SEDIMENTARY STRUCTURES
COMMENTS
INTERP.
80
79
78
77
76
metres
VERY FINE SS 1/8 C. SLTST ON mm SCALE
· HOR. LAMINATION WITH OCC. SMALL SCOURS
VFSS, RIPPLED TOP CT.
COARSE SILTSTONE . HOR TO SL. UNDULATING LAM.
BUFF WTH. , VERY SL. SILICEOUS SILTSTONE.
FINE SANDSTONE · TROUGH xB . 10-15 cm SIZE
10-15 cm SET SIZE
N
SHORLING NEARSHORE WAVES.
VFSS - COARSE SLTST. RIPPLED.
FINE SANDSTONE, MASSIVE.
MID TO UPPER SHOREFACE
TRAVERSE TO RIGHT.
VERY FINE SANDSTONE.
MEDIUM · COARSE SANDSTONE
S
INFILL OF SMALL CHANNEL BY RIP CURRENTS
· TROUGH xB VISIBLE IN TOP, SET SIZE UP TO 60cm.
MC SLTST.
VERY FINE SS - COARSE SLTST. UND · HOR · RIBS.
SCALE: cm/m
M
S
v f f m c v c
Sand.
4 8 16 64
C(mm)
GO

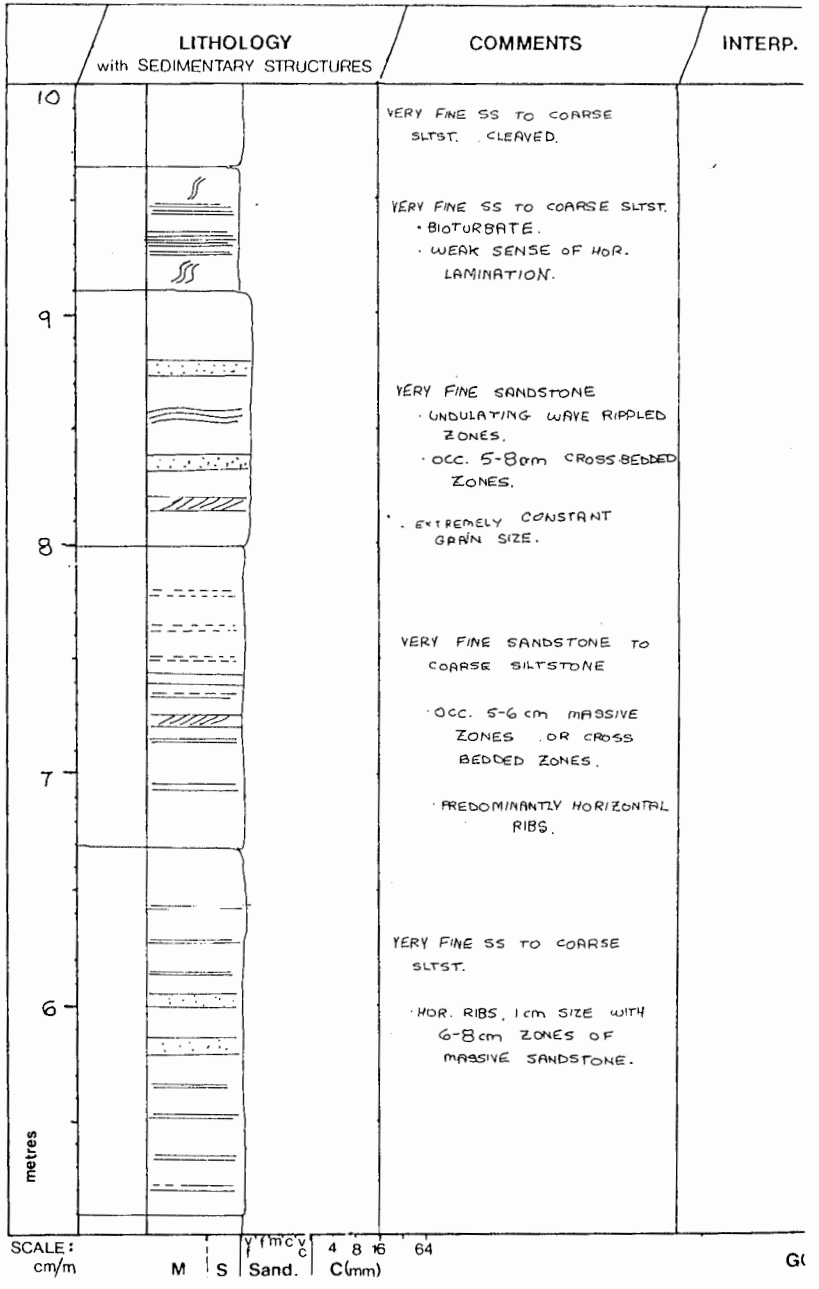

SECTION: M 3B
LOCATION: MOEL DDU.
LITHOLOGY with SEDIMENTARY STRUCTURES
COMMENTS
INTERP.
85
84
83
82
81
metres
TOP OF OUTCROP.
INVOLVED IN LARGE SCALE SLUMP.
VERY FINE SANDSTONE . ORG. INTO 5cm RIBS SHOWING. - HORIZONTAL LAMINATION OR RIPPLING.
FINE SANDSTONE.
VERY FINE SS OR COARSE SILTSTONE · HOR. UND. LAMINATION
· OCC. VFSS UNITS UP TO 5 cm THICK WITH TROUGH xB OR RIPPLING.
VFSS TO C. SLTST. HOR TO SL. UNDULATING LAMINATION.
SCALE: cm/m
M
S
v f f m c v c
Sand.
4 8 16 64
C(mm)
GO

SECTION: M3C LOCATION: MOEL DDU.



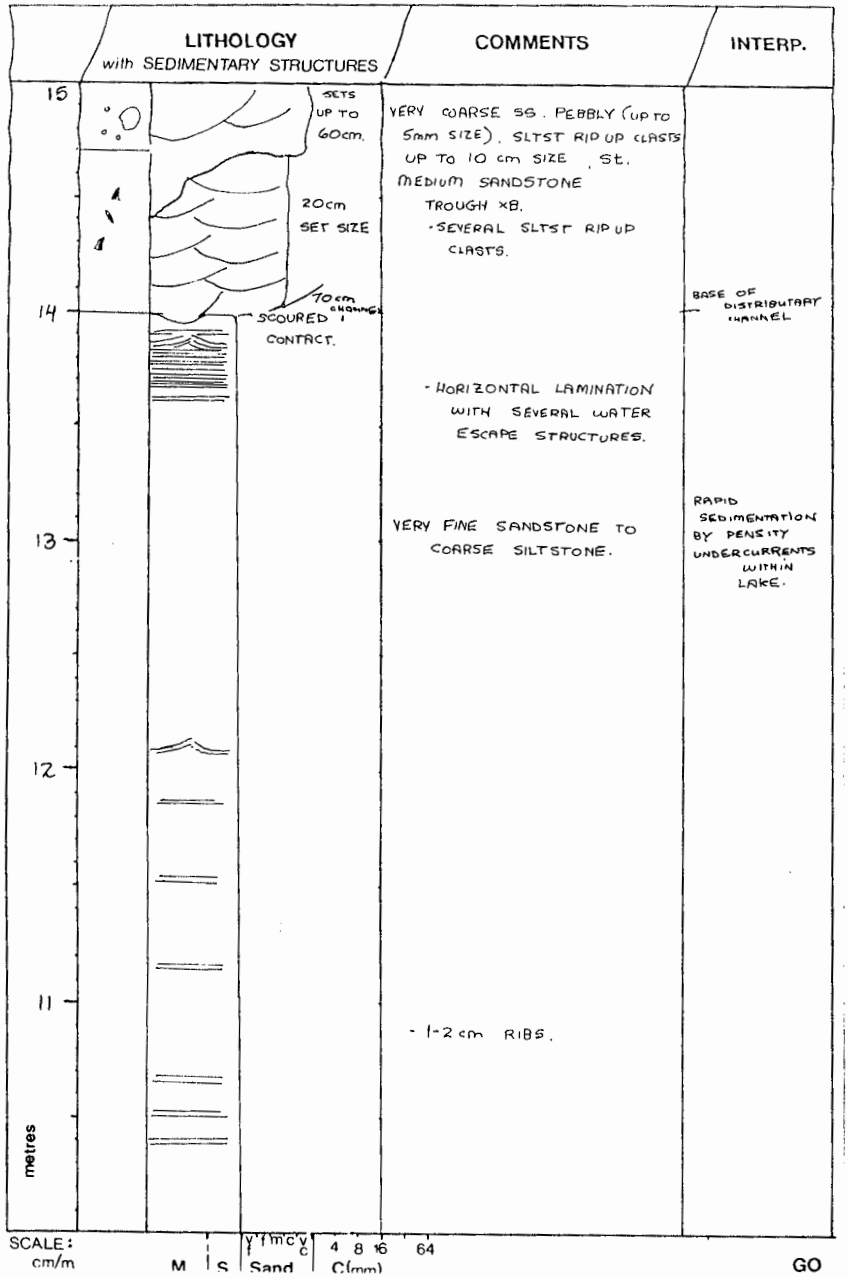
GO

SECTION: M3C LOCATION: MOEL DDU

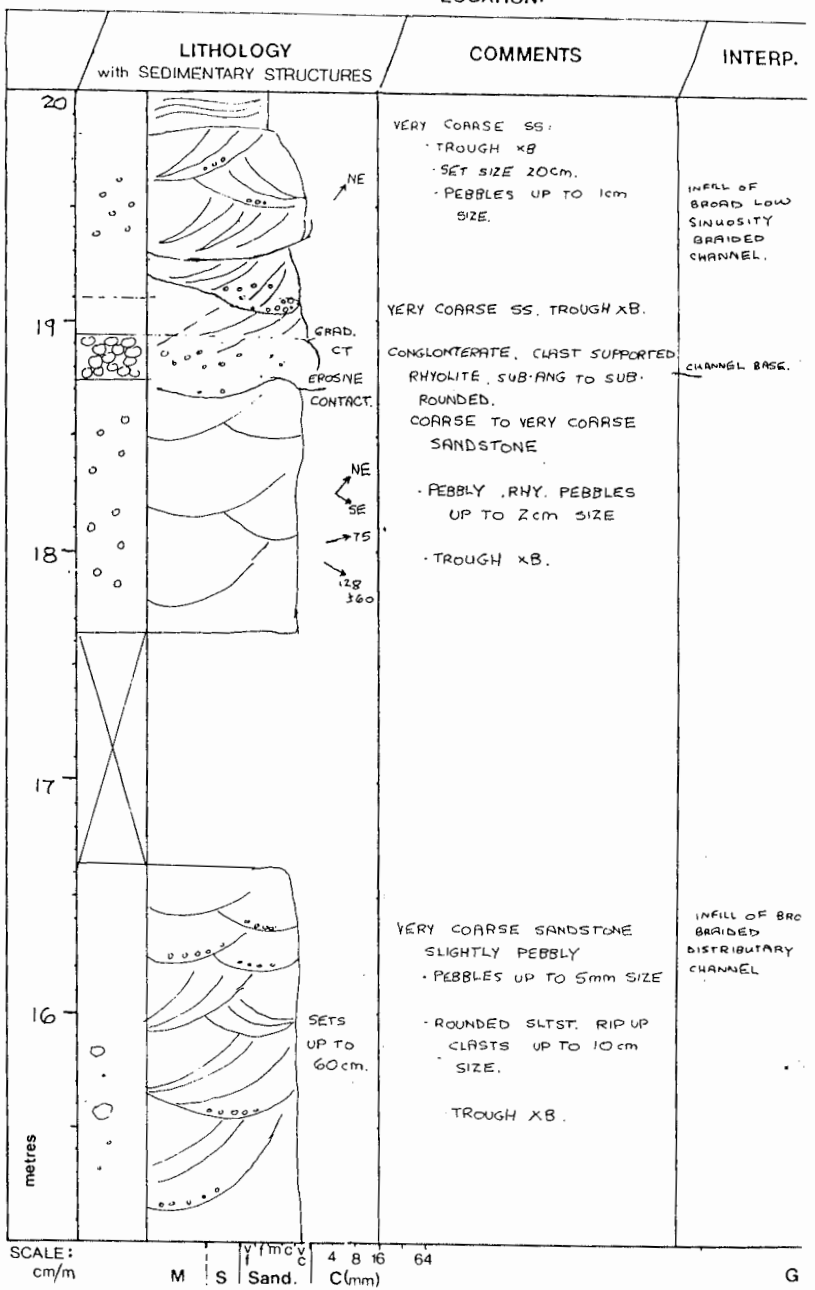


G(

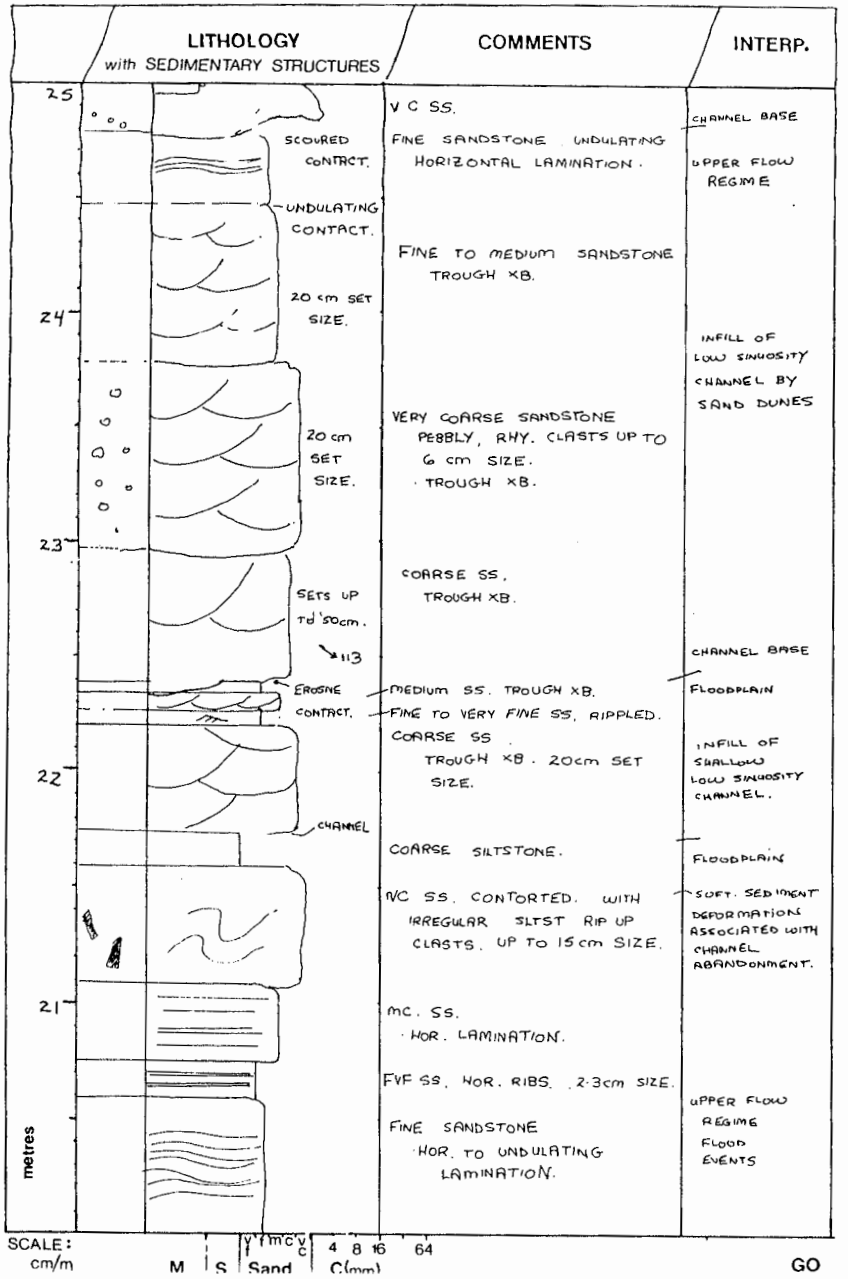
SECTION: M 3C LOCATION: MOEL DDU.



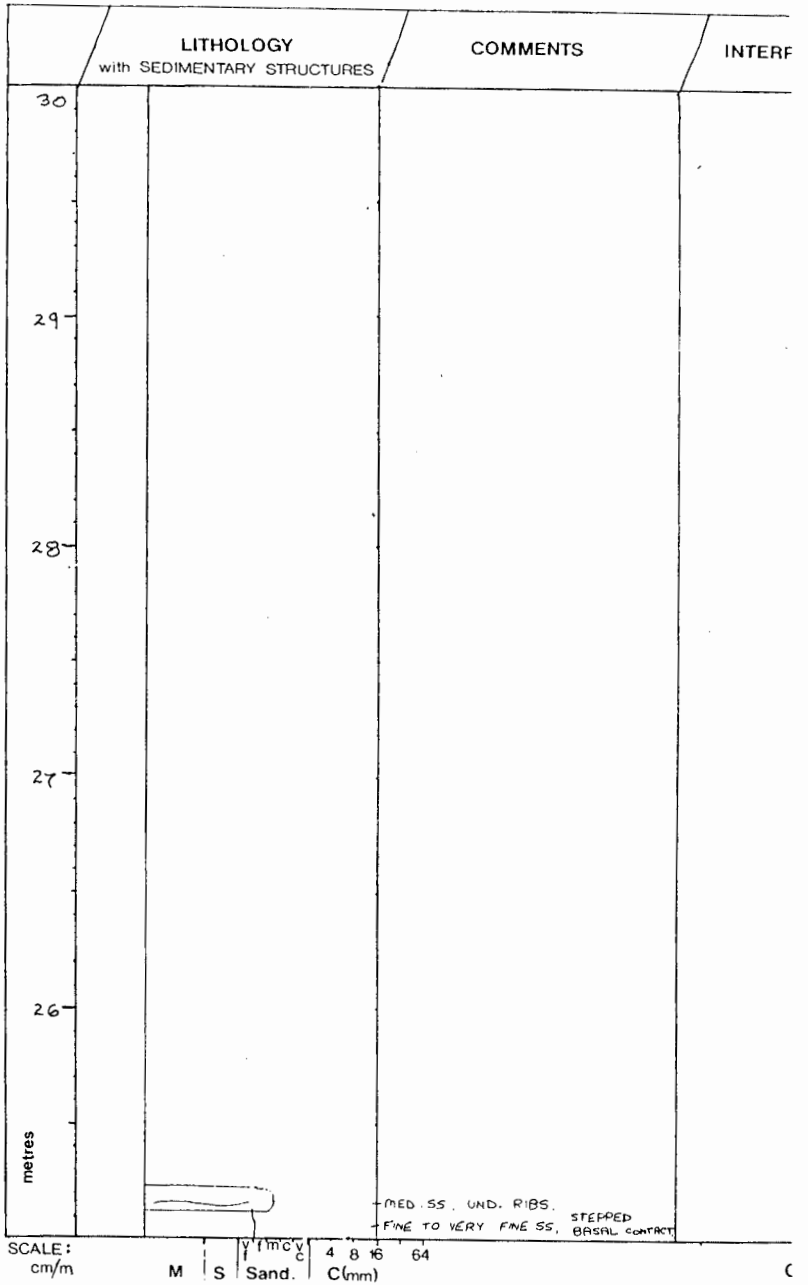
SECTION: M-3C LOCATION: MOEL DDU



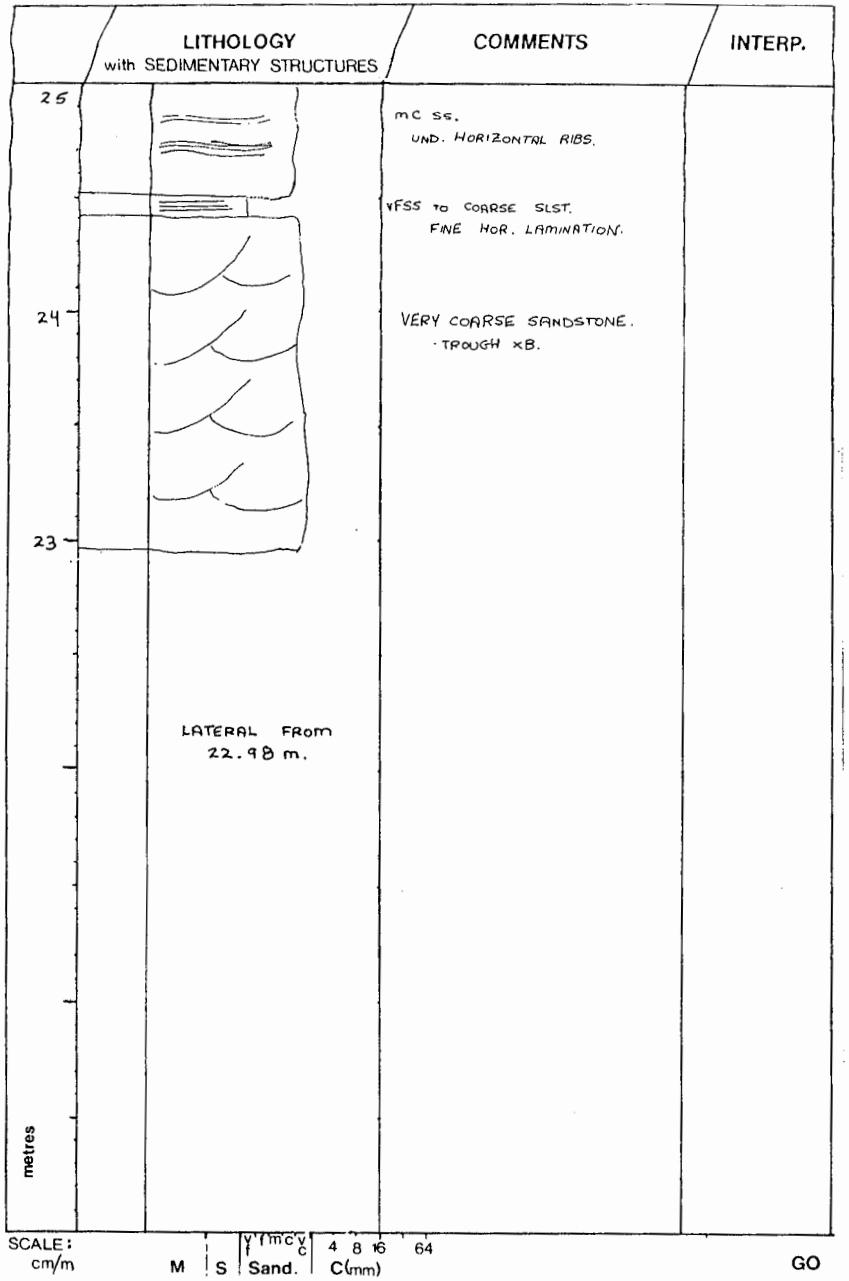
SECTION: m3c LOCATION: MOEL DDU



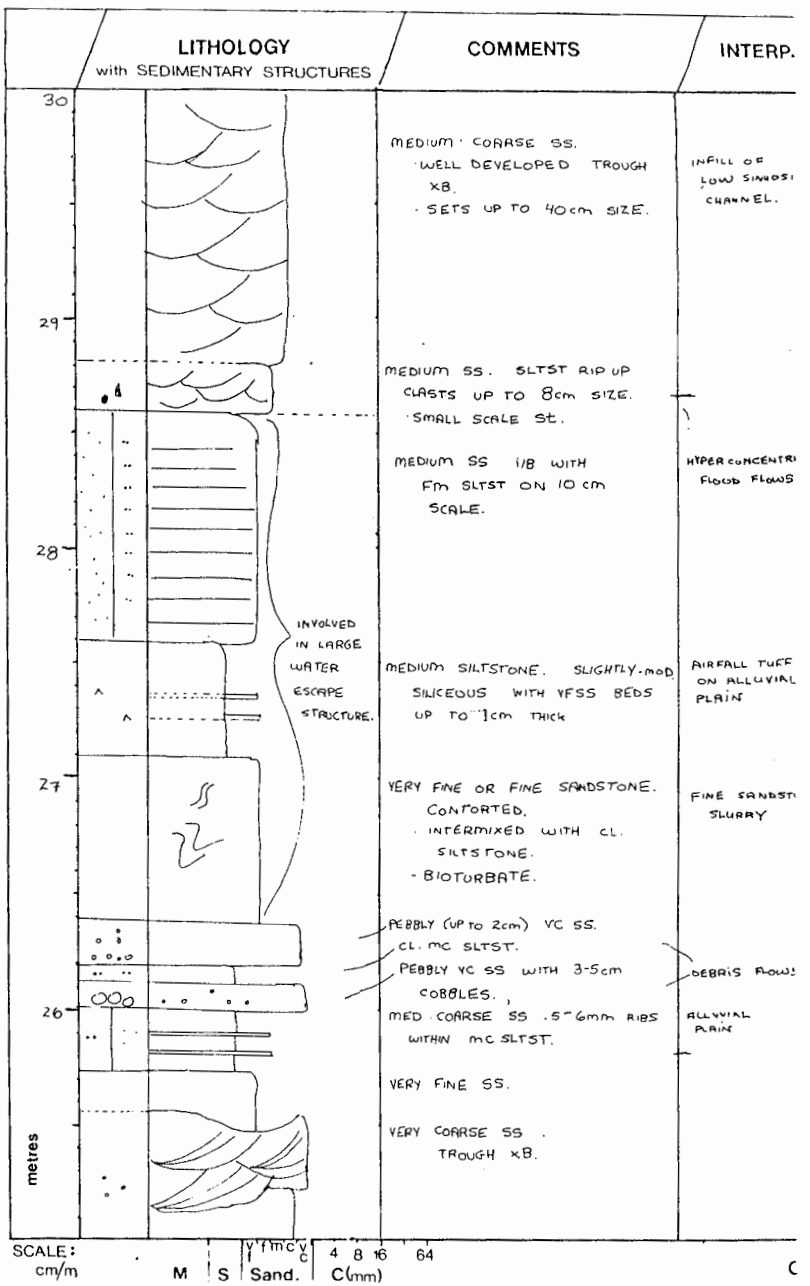
SECTION: m3c LOCATION: MOEL DDU



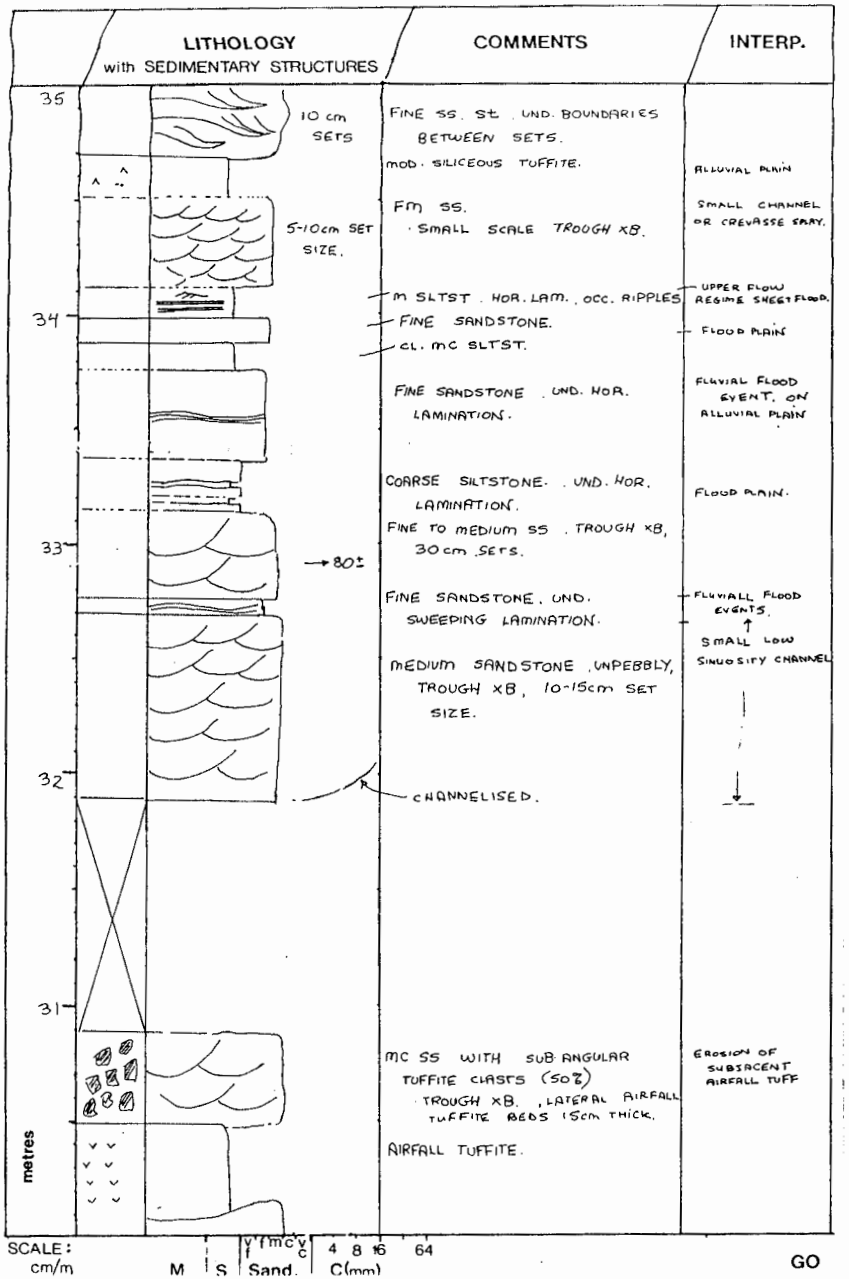
SECTION: m3D LOCATION: MOEL DDU.



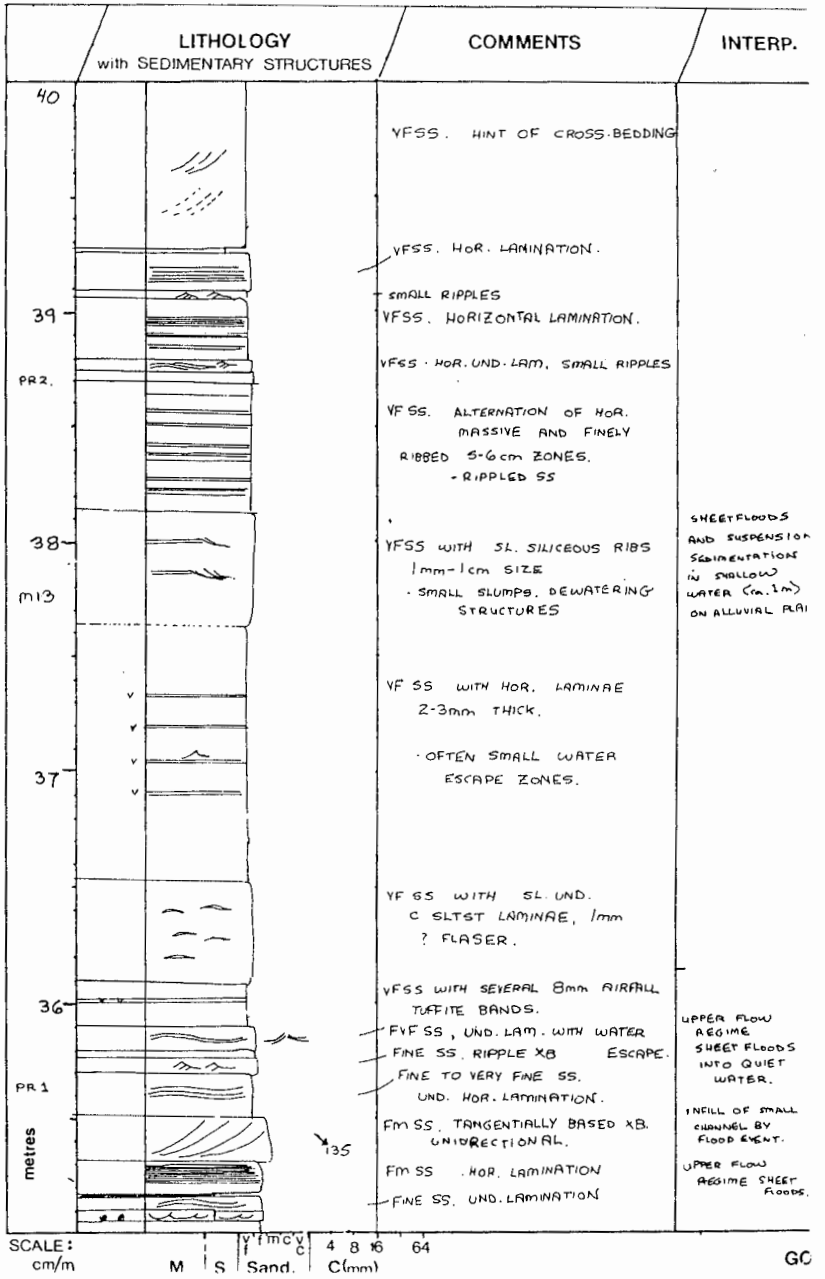
SECTION: m3D LOCATION: MOEL DDU.



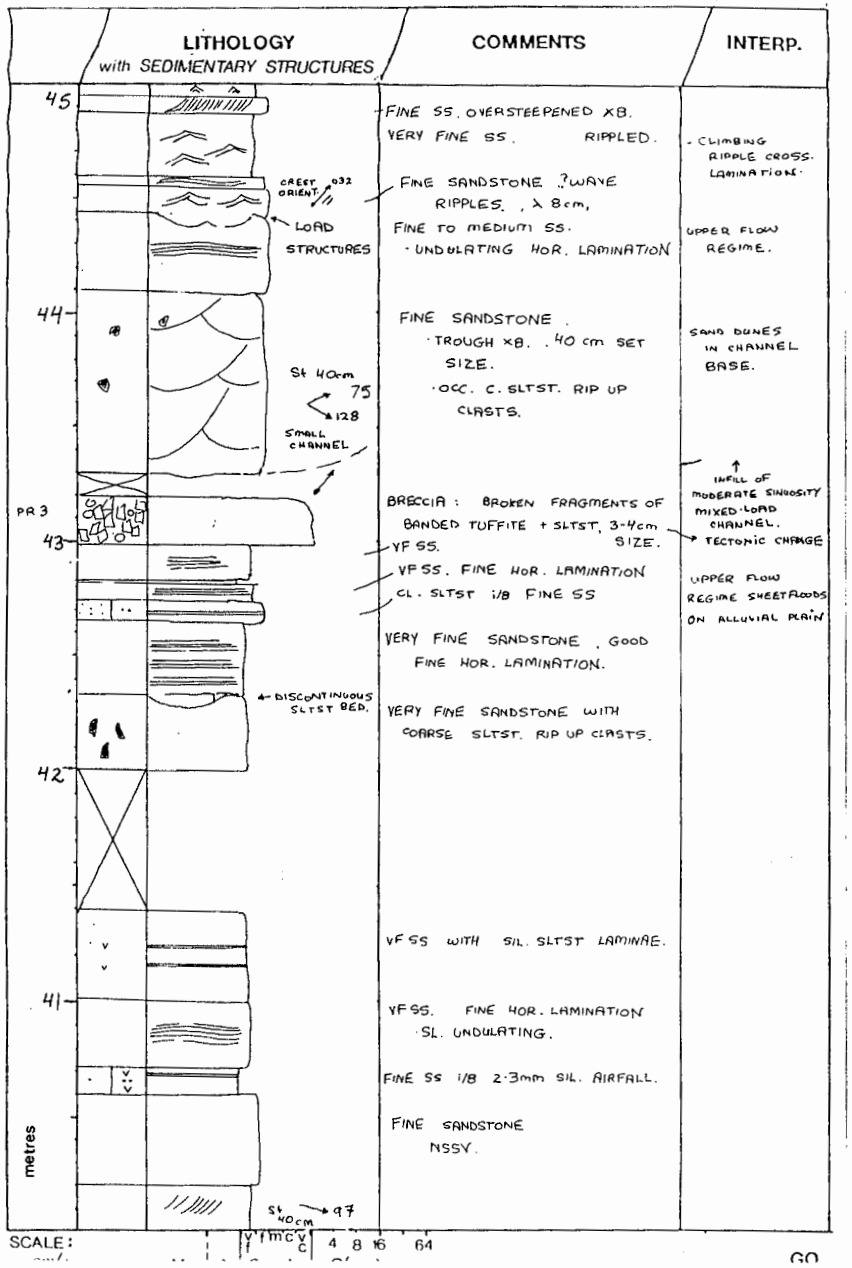
SECTION: m3D LOCATION: MOEL DDU.



SECTION: m3D LOCATION: MOEL DDU



SECTION: M3D. LOCATION: MOEL DDU



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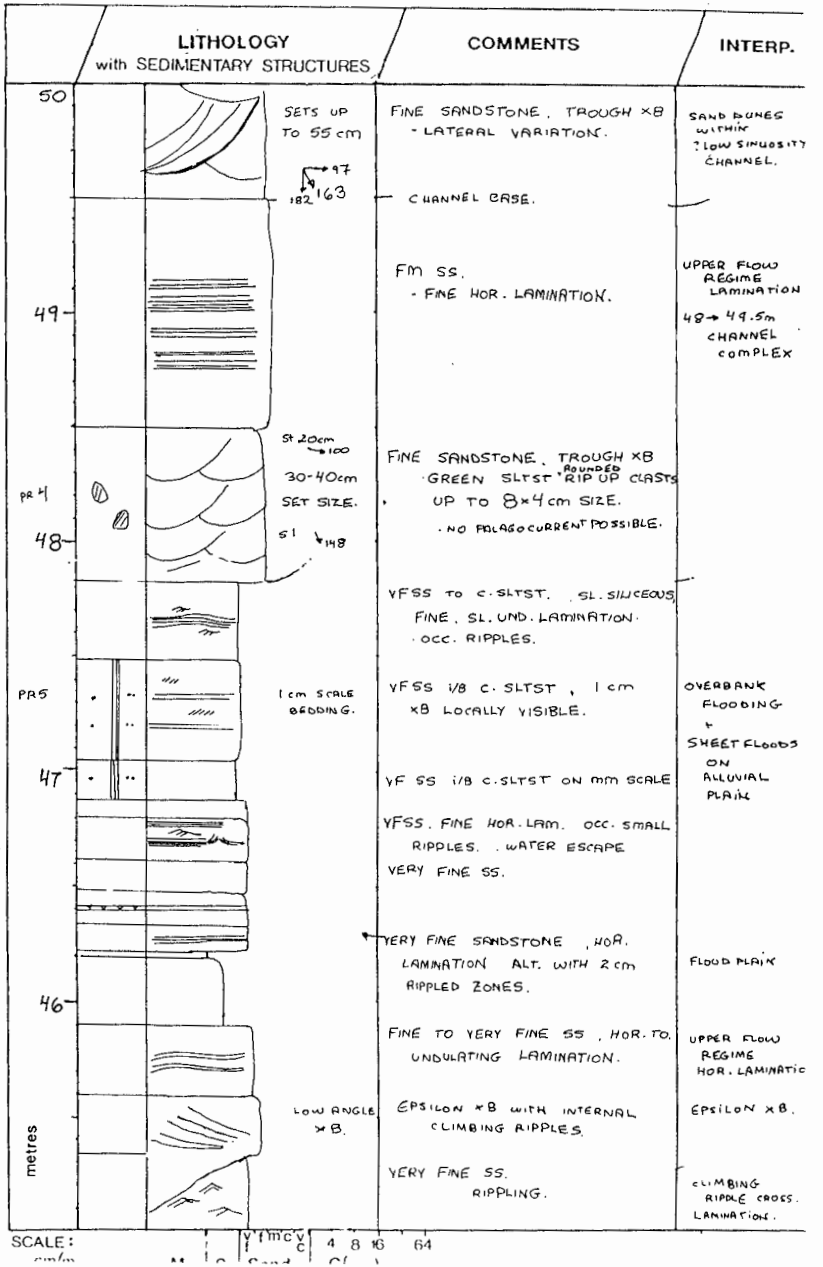
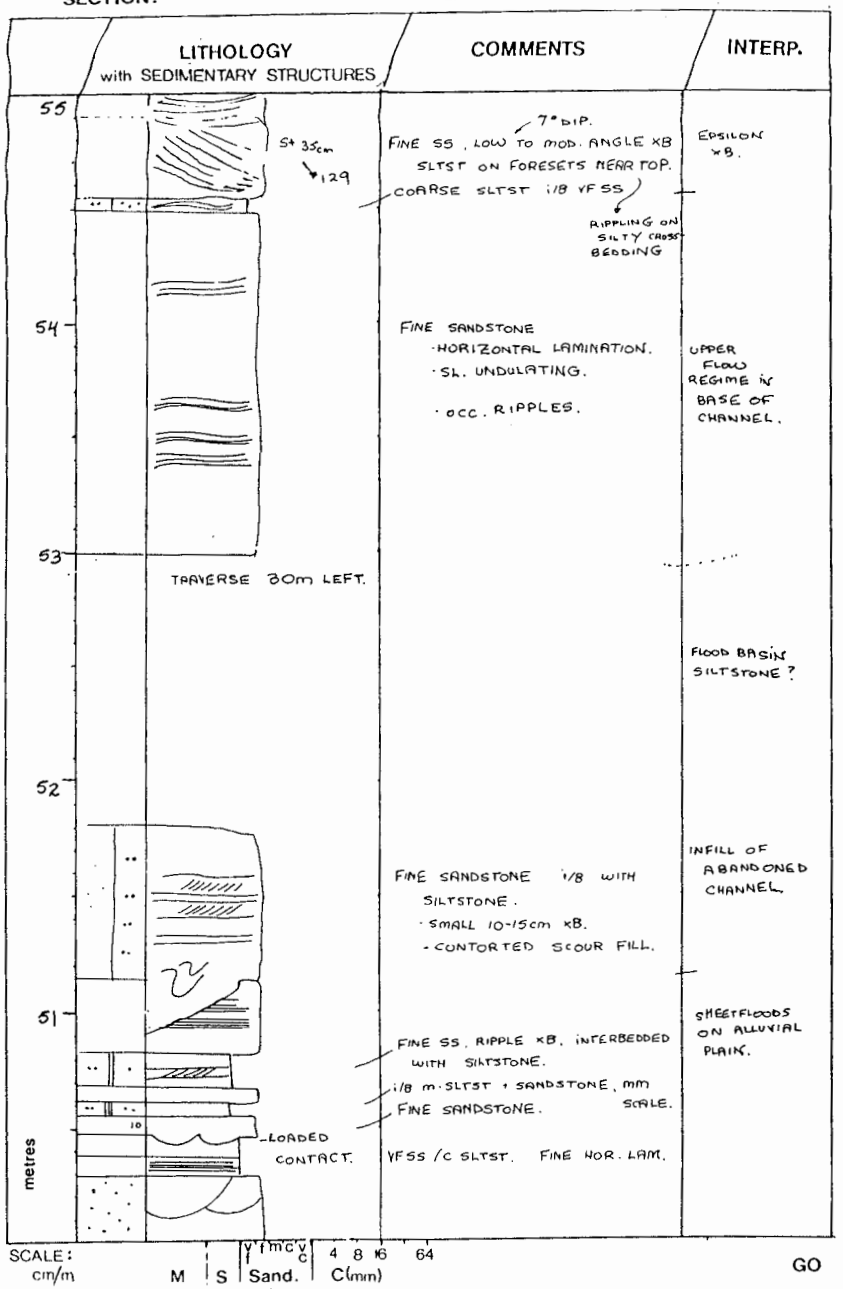
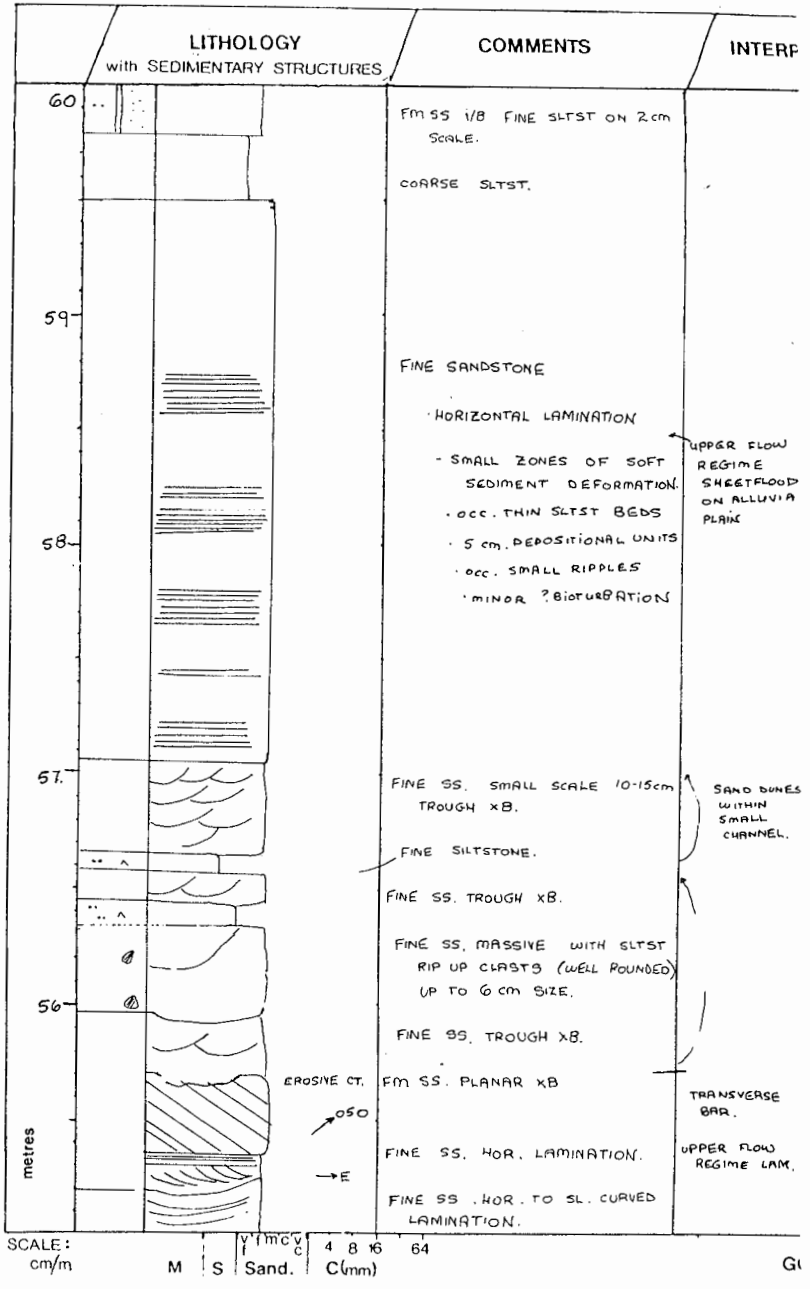
SECTION: M3D. LOCATION: MOEL DDU.



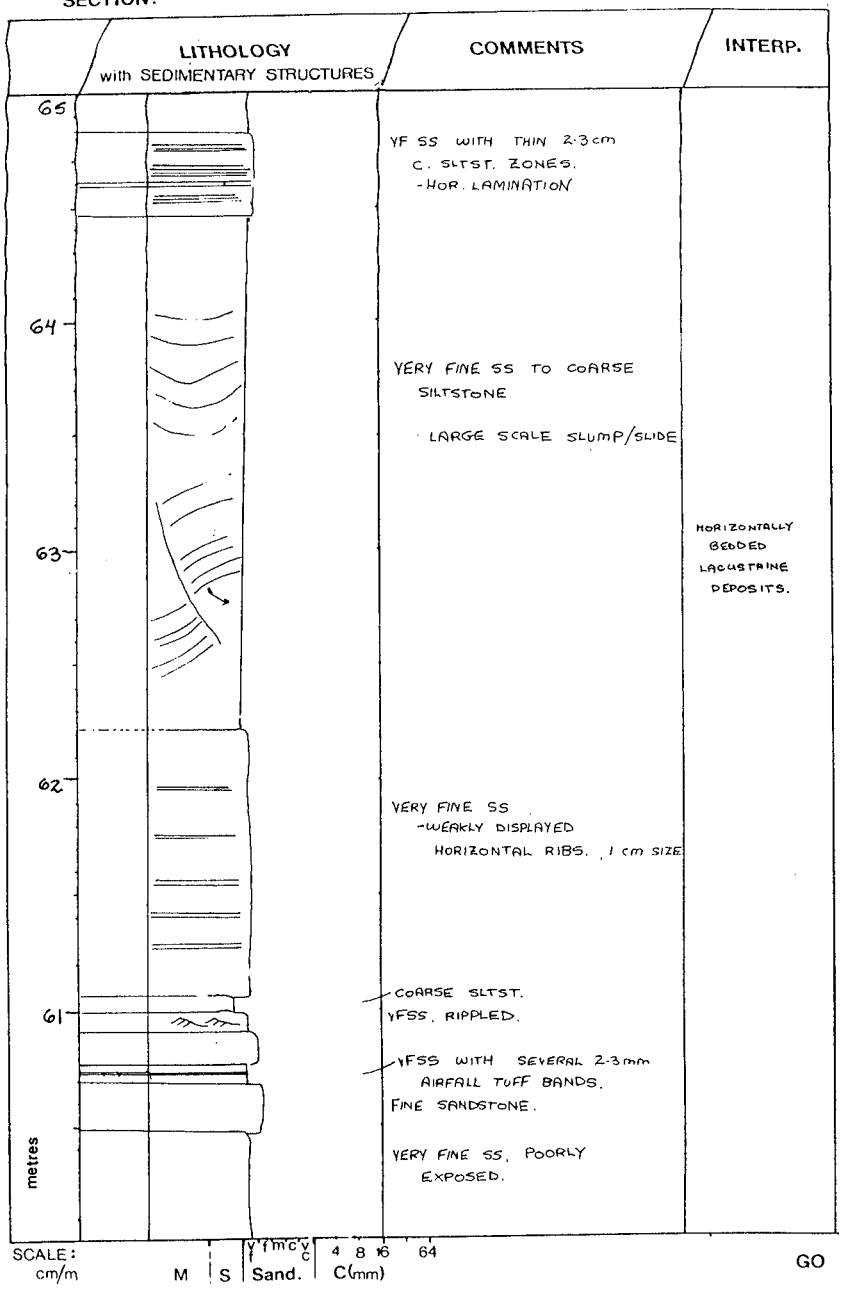
SECTION: m3D. LOCATION: MOEL DDU.



SECTION: m3D LOCATION: MOEL DDU.



SECTION: m3D. LOCATION: MOEL DDU.



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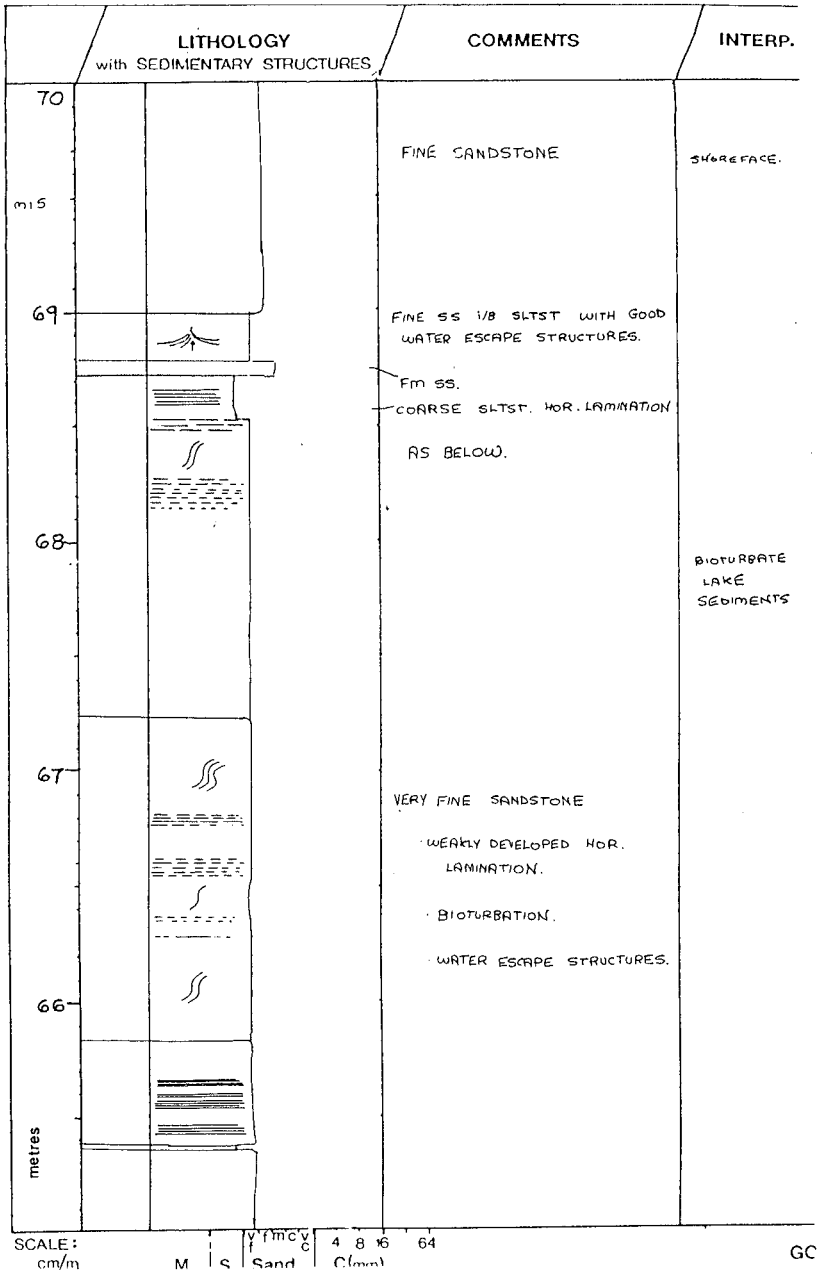
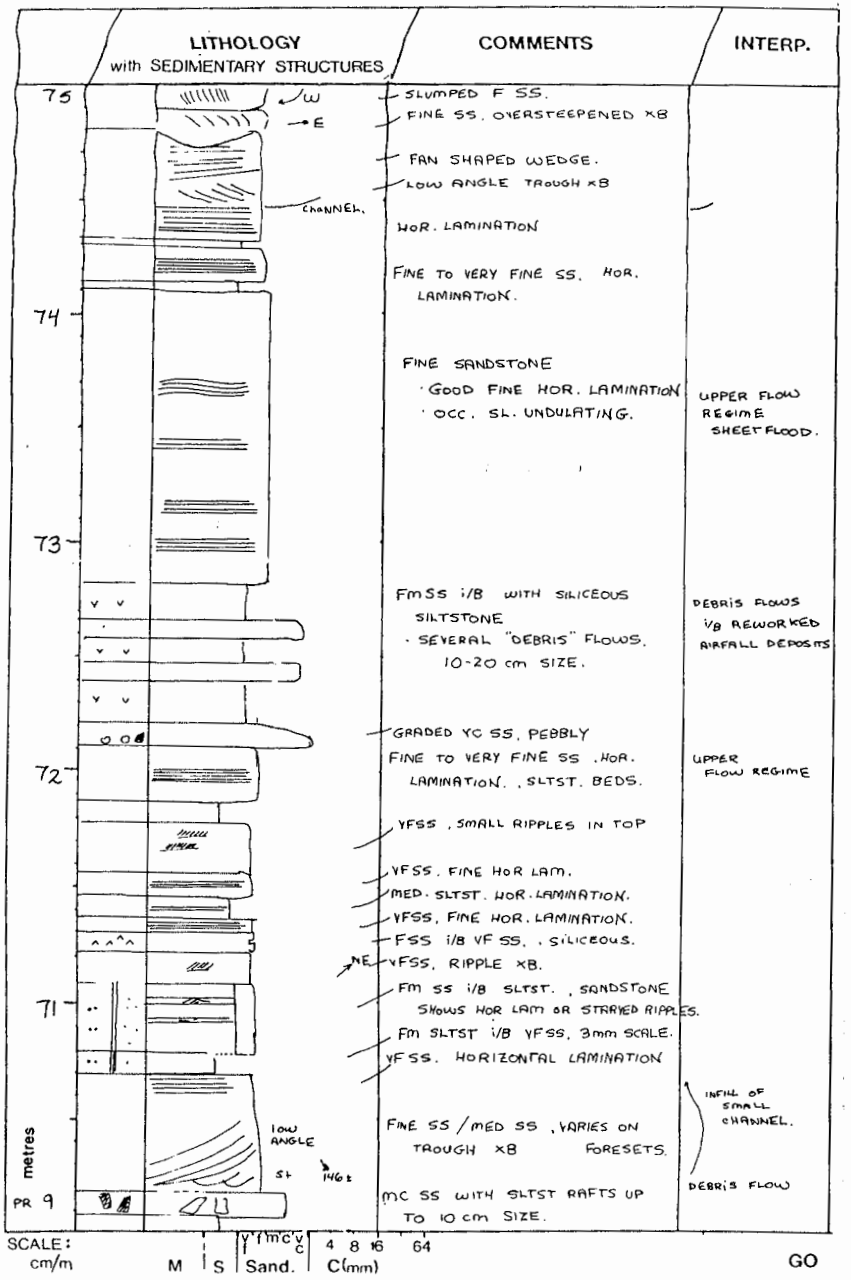
SECTION: LOCATION:

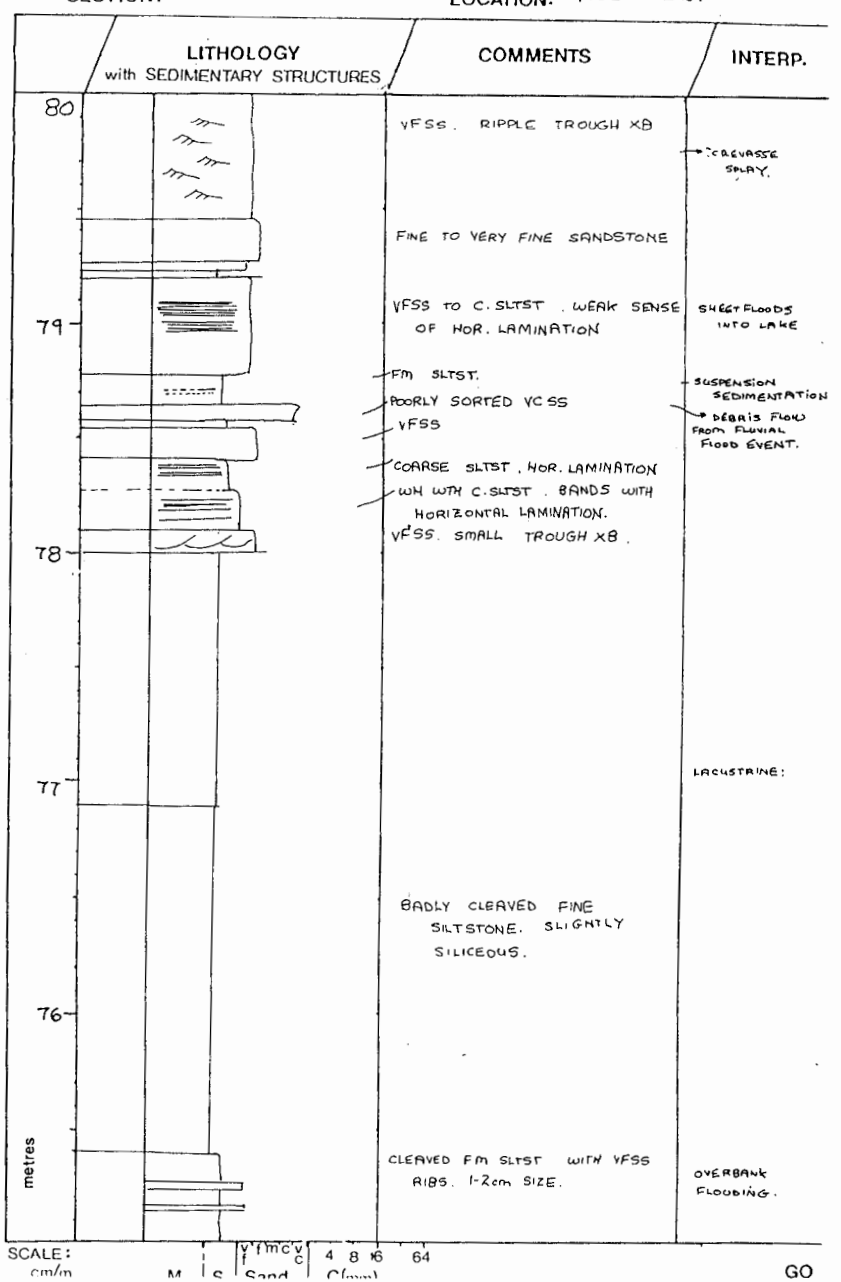


GC

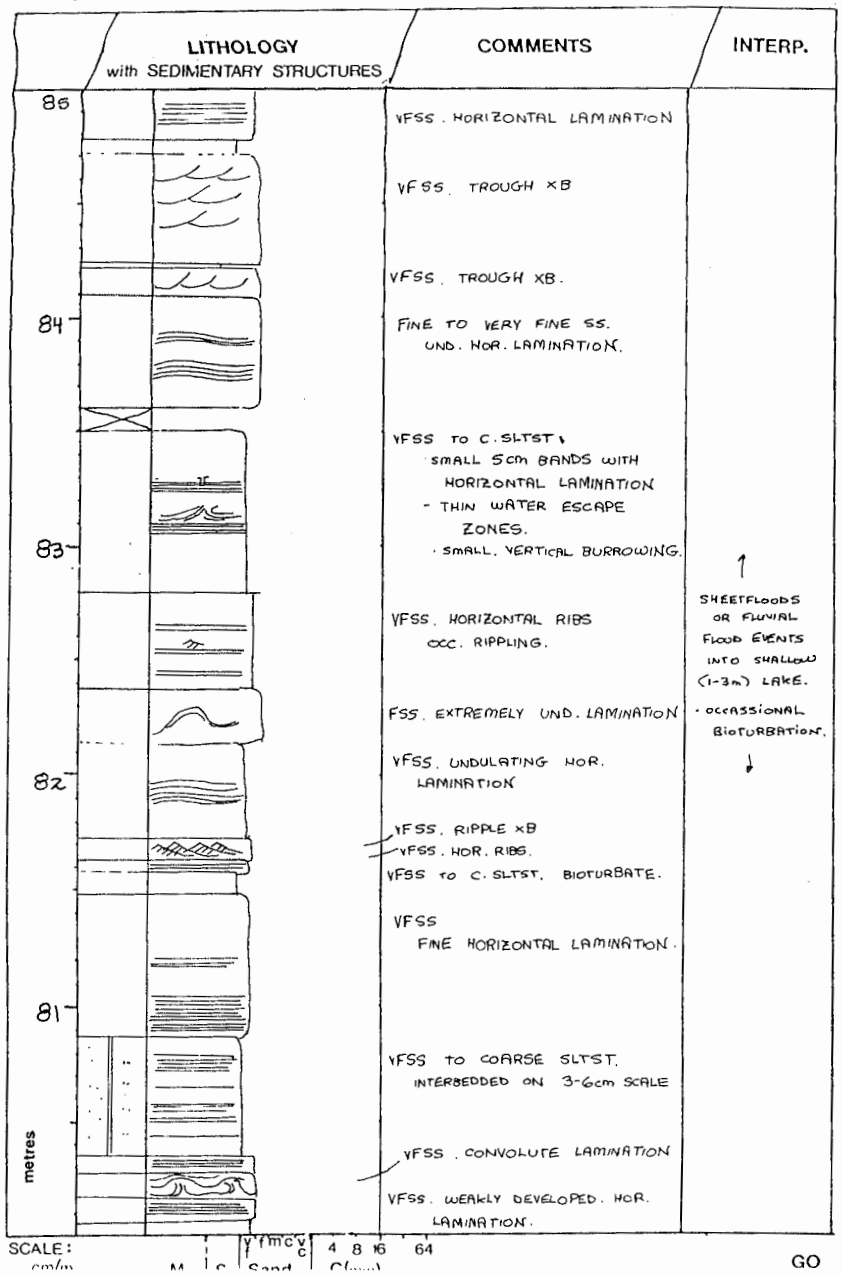
SECTION: m3D. LOCATION: MOEL DDU



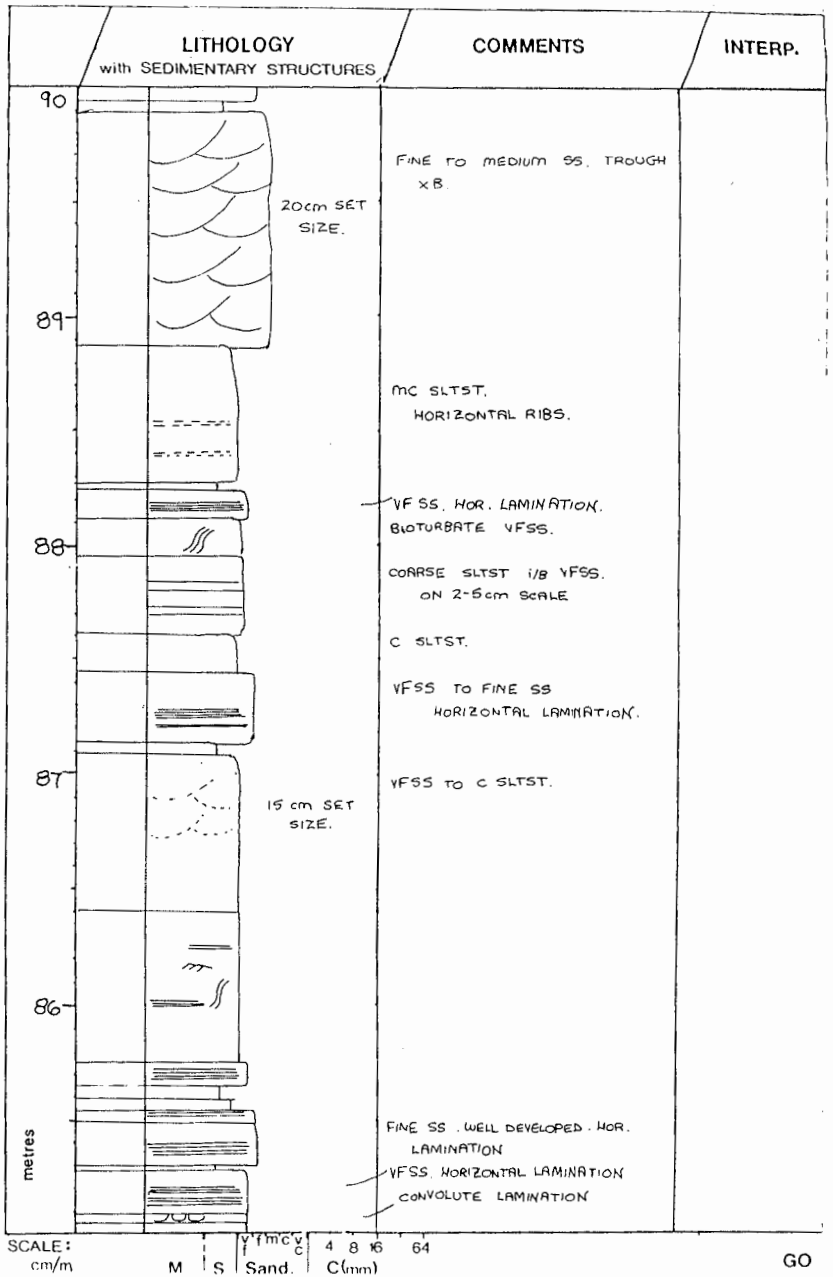
SECTION: m3D LOCATION: MOEL DDU.



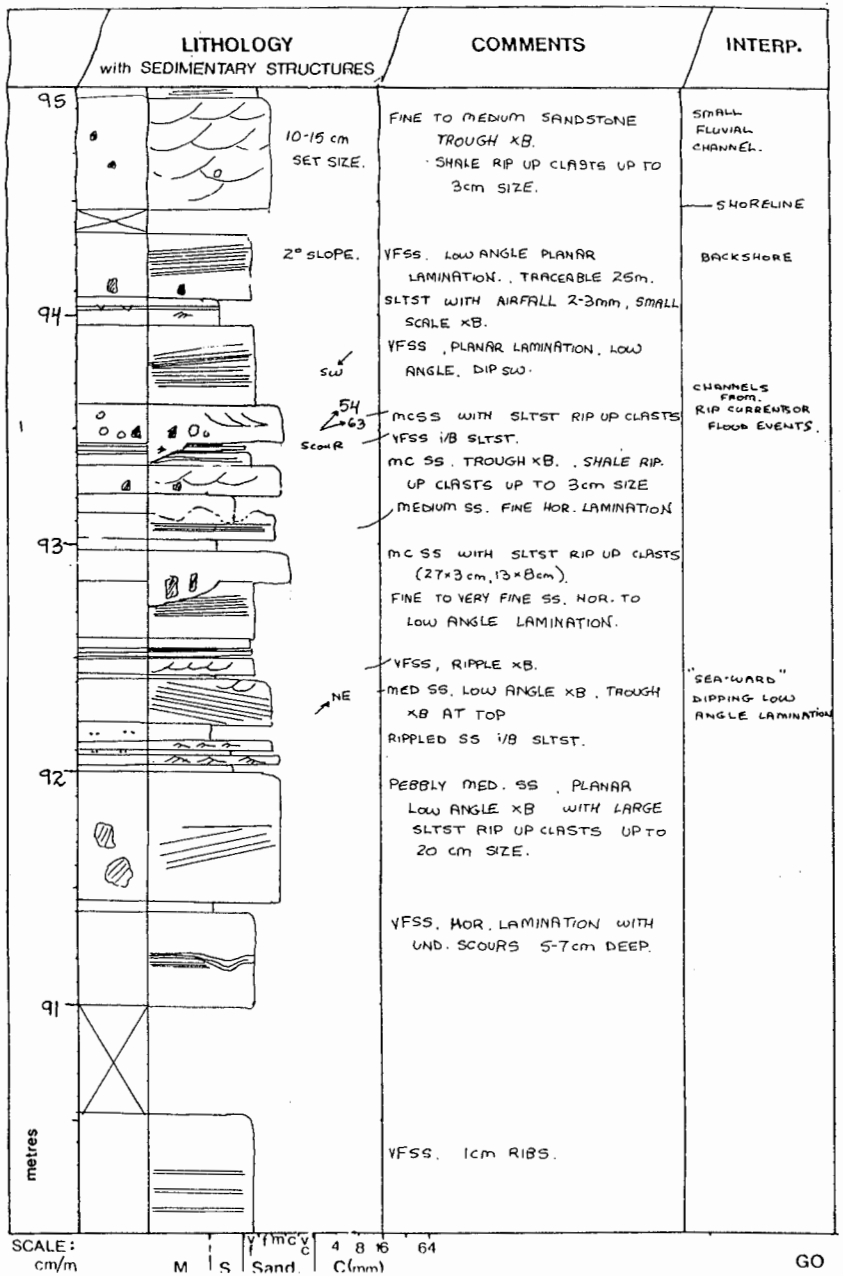
SECTION: M3D LOCATION: MOEL DDU



SECTION: M3D. LOCATION: MOEL DDU.



SECTION: M3D LOCATION: MOEL DDU



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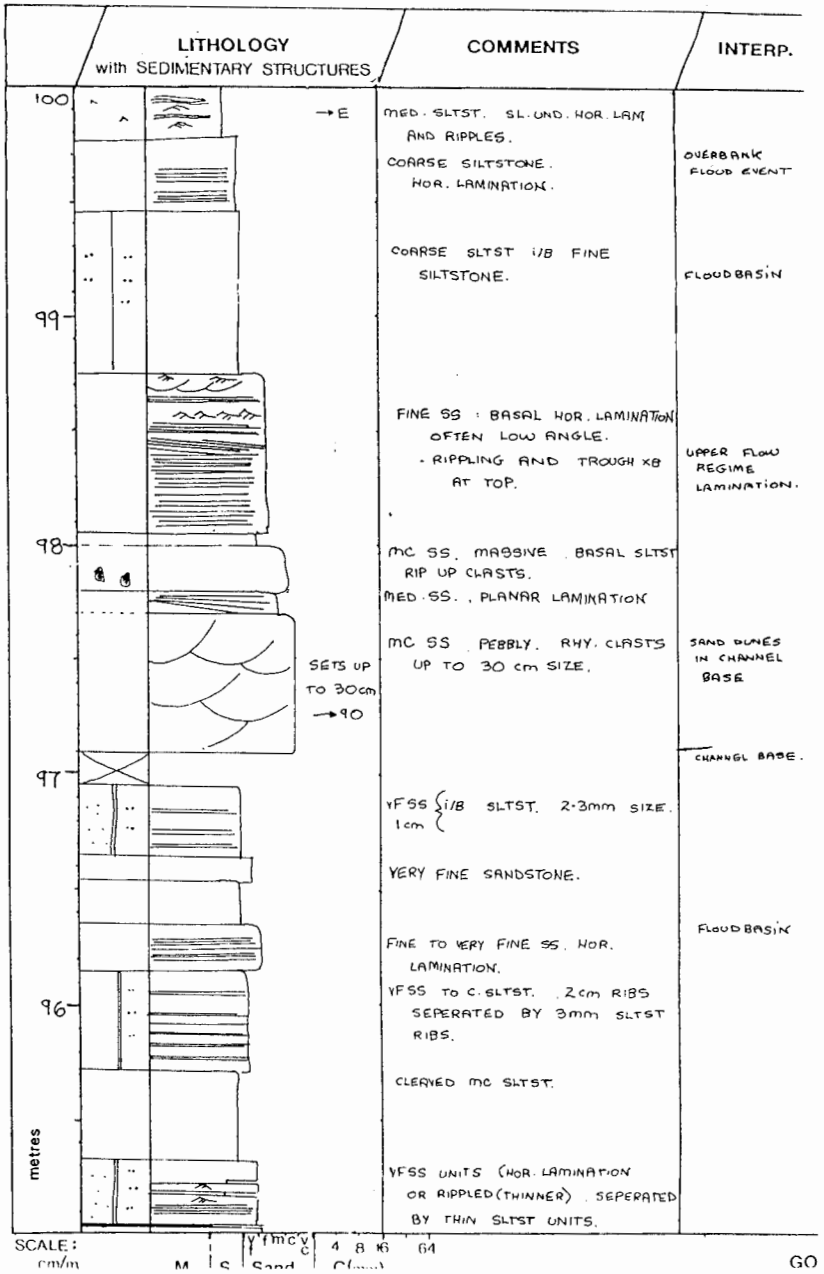

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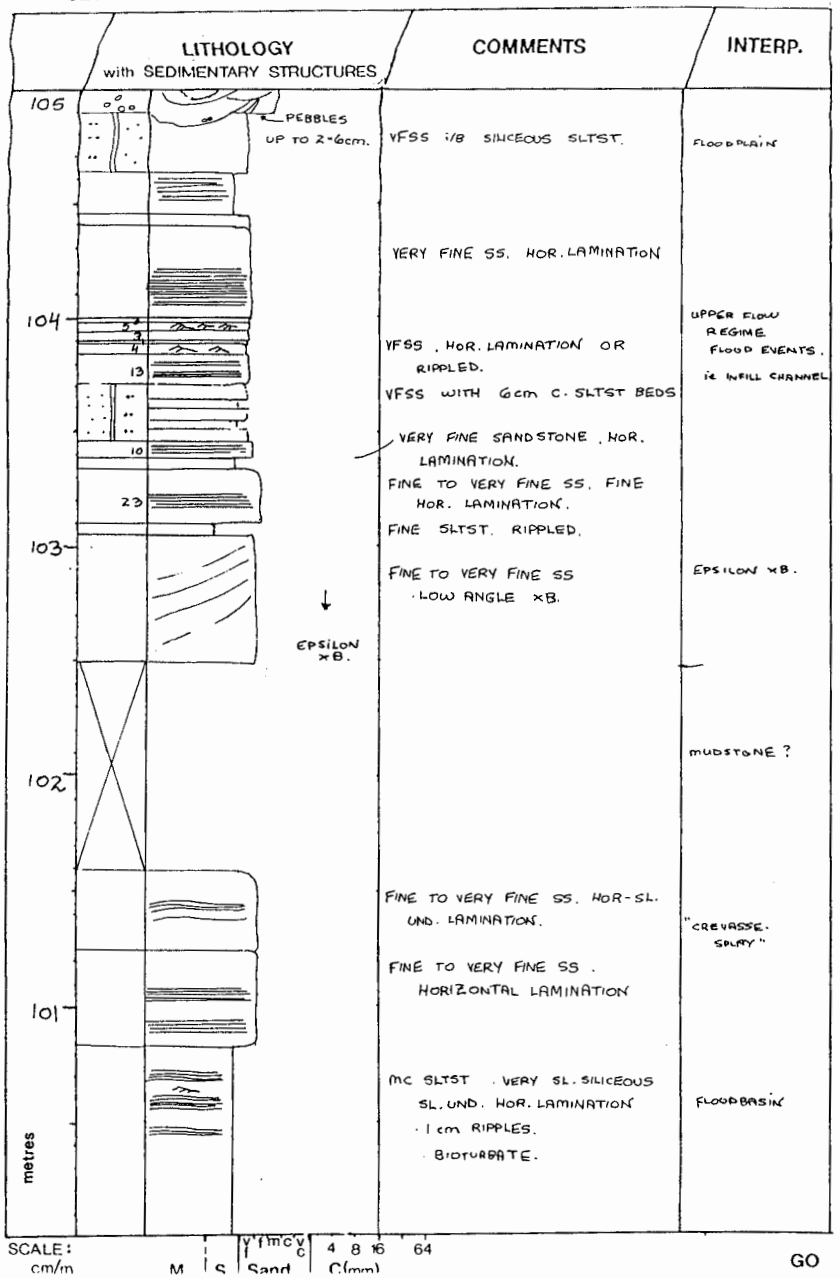

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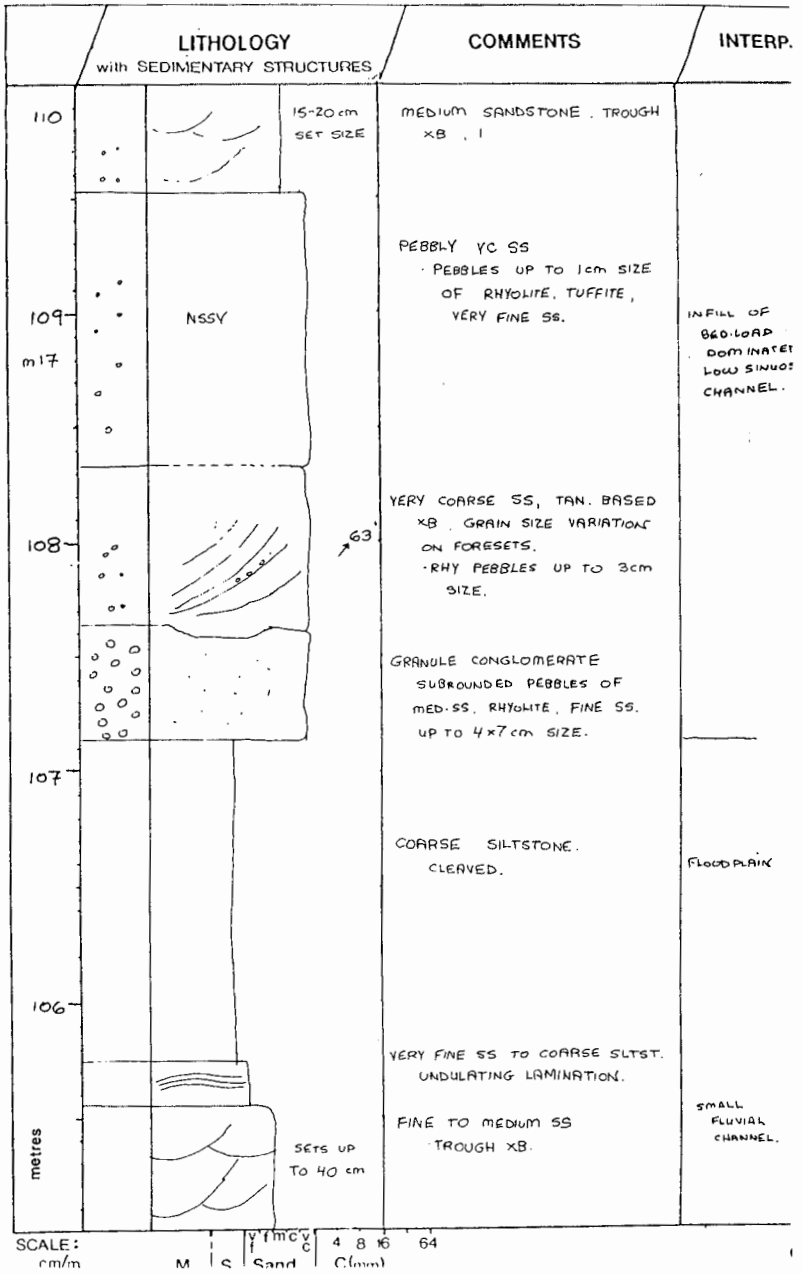
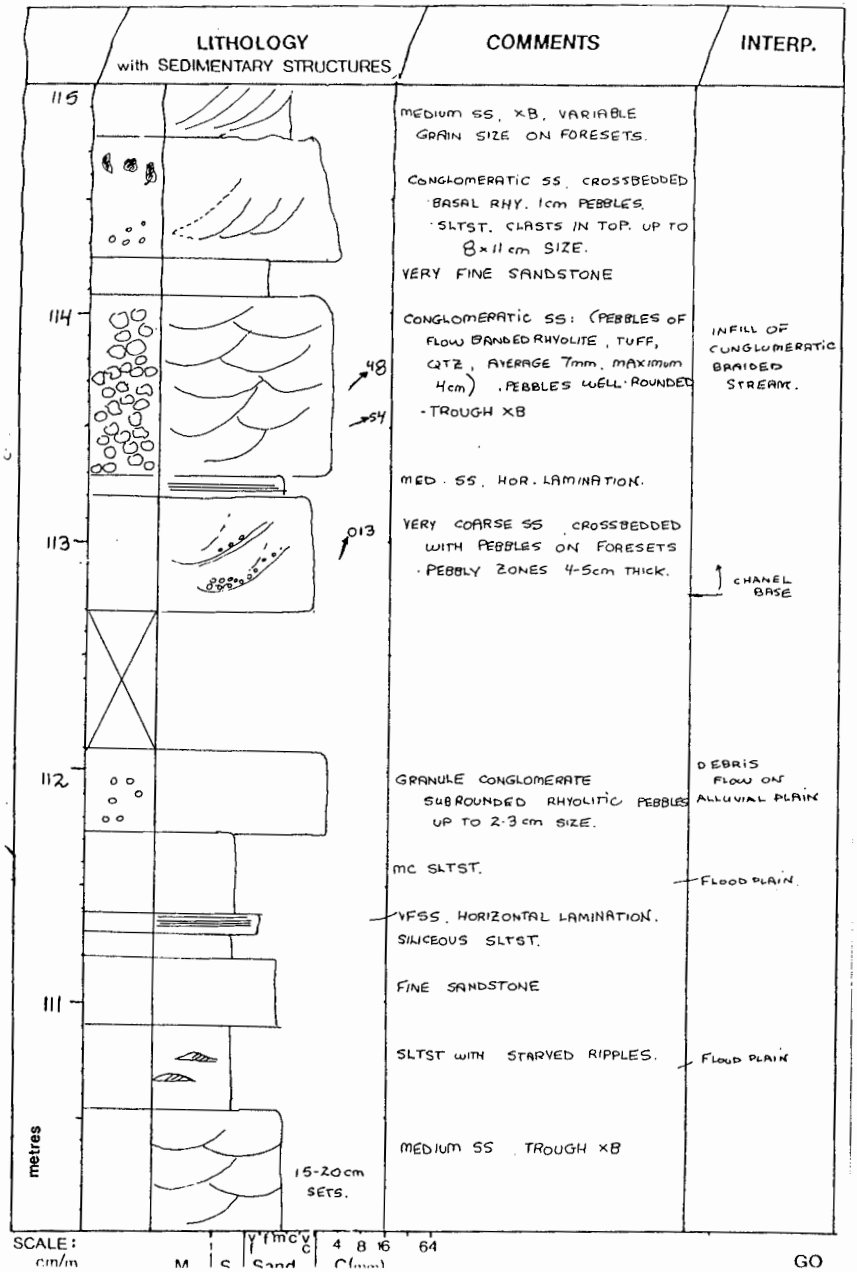
SECTION: M3D LOCATION: MOEL DDU.



SECTION: M3D. LOCATION: MOEL DDU.



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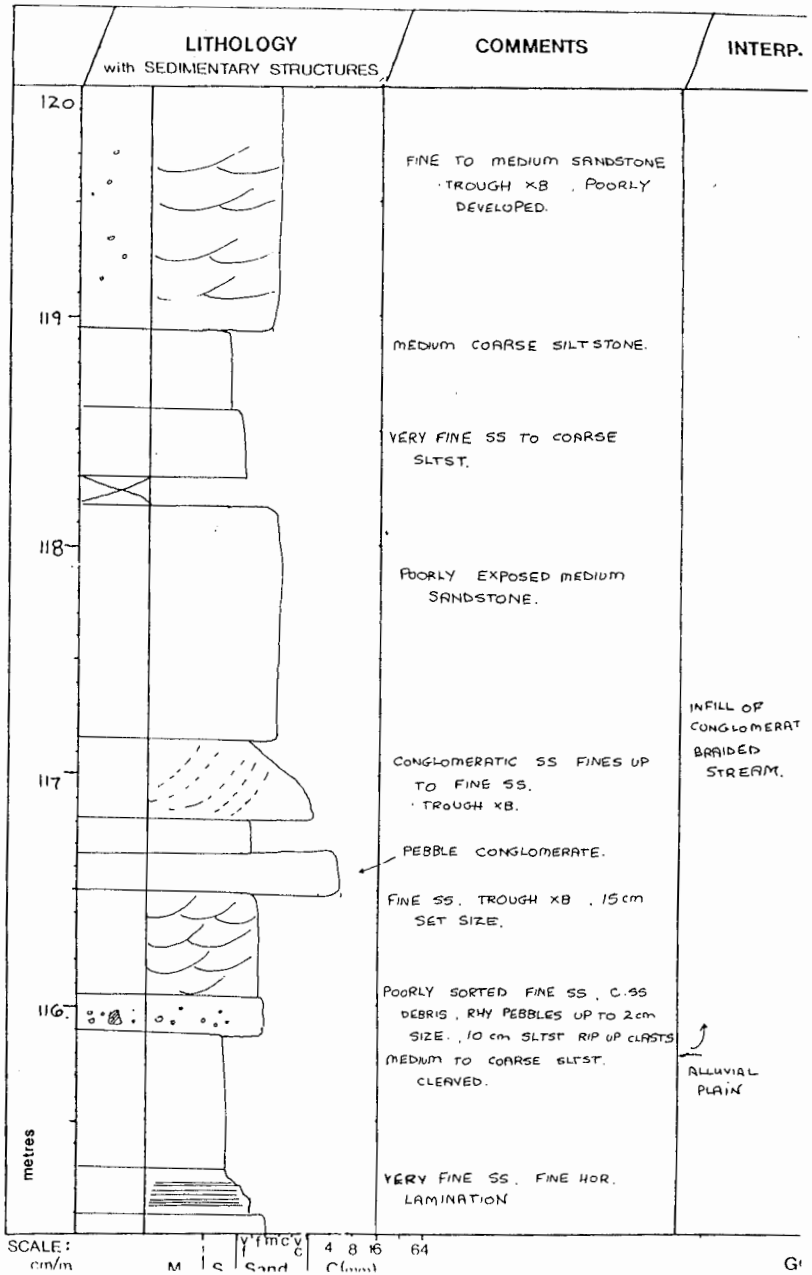
SECTION: M3D LOCATION: MOEL DDU.



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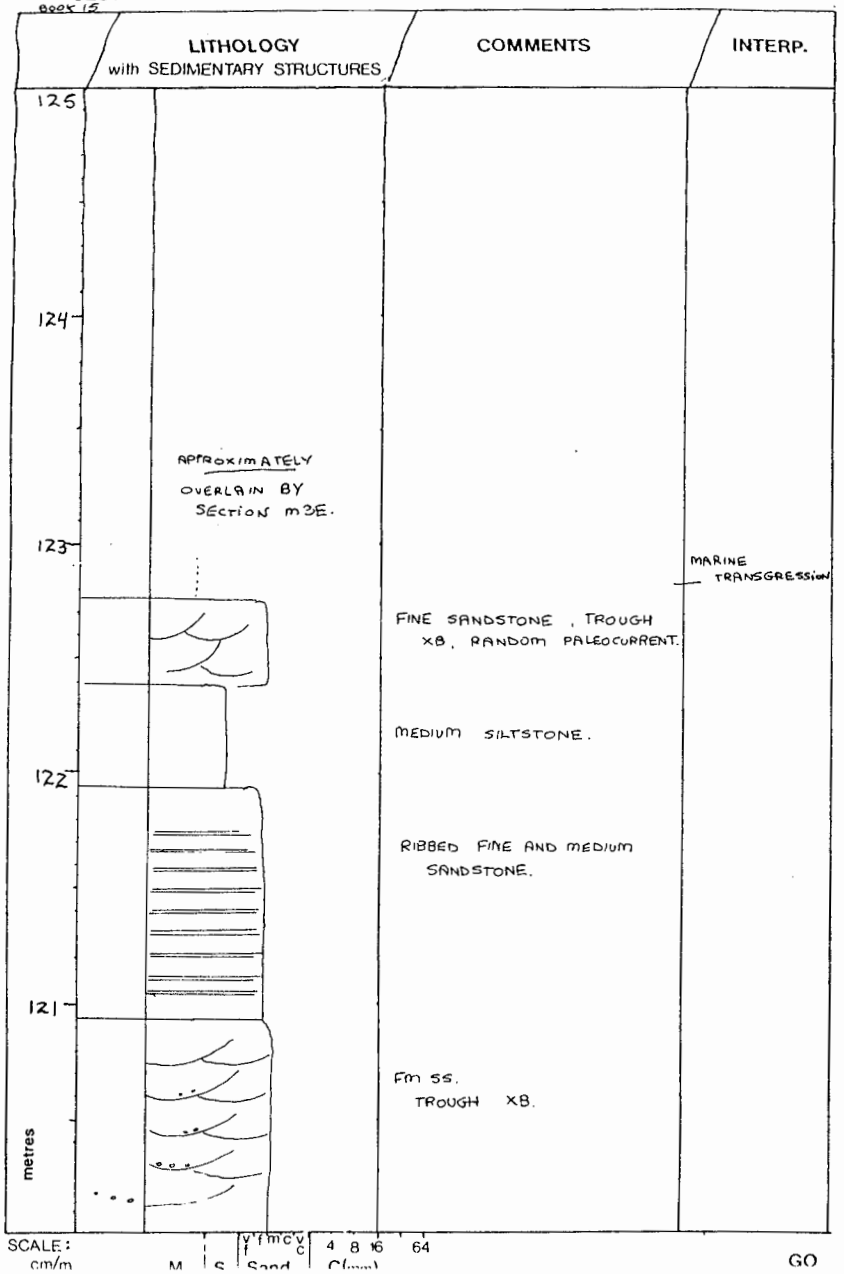
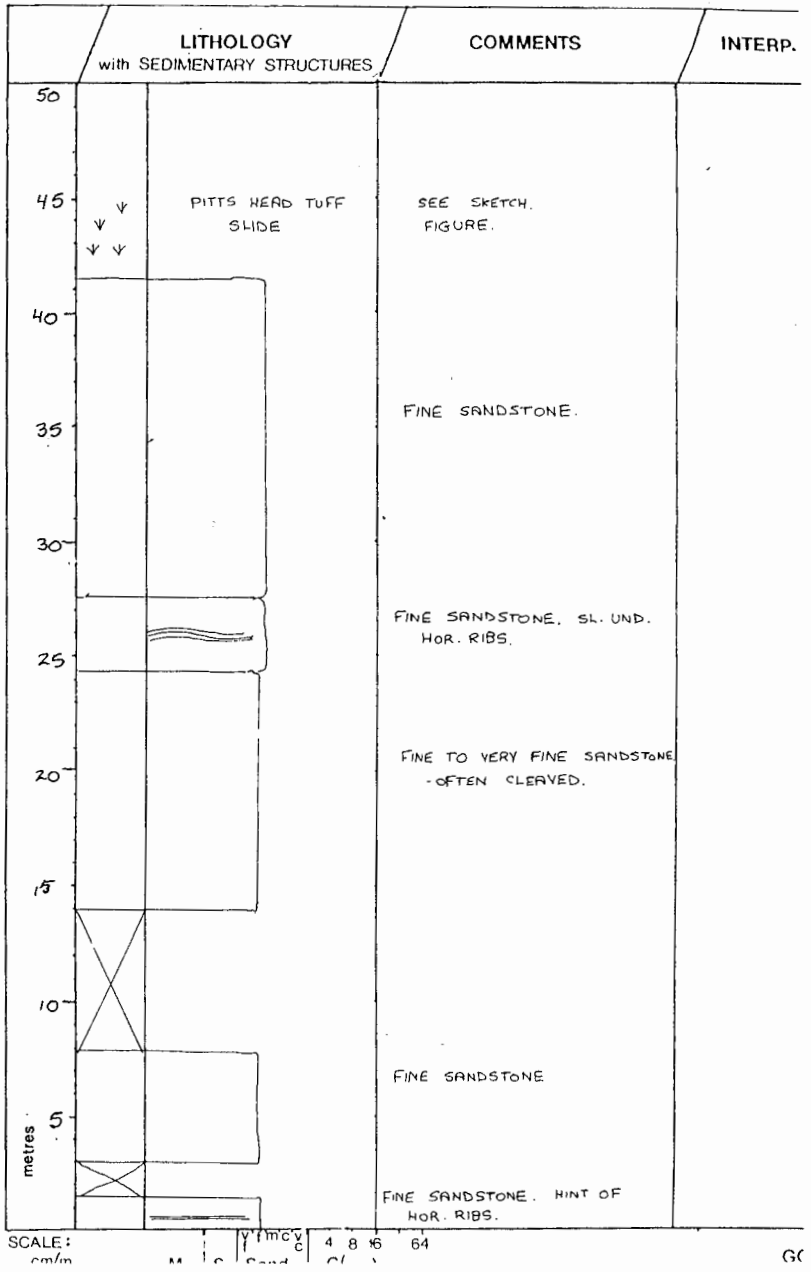
SECTION: m3D LOCATION: MOEL DDU.

Book 15



GO

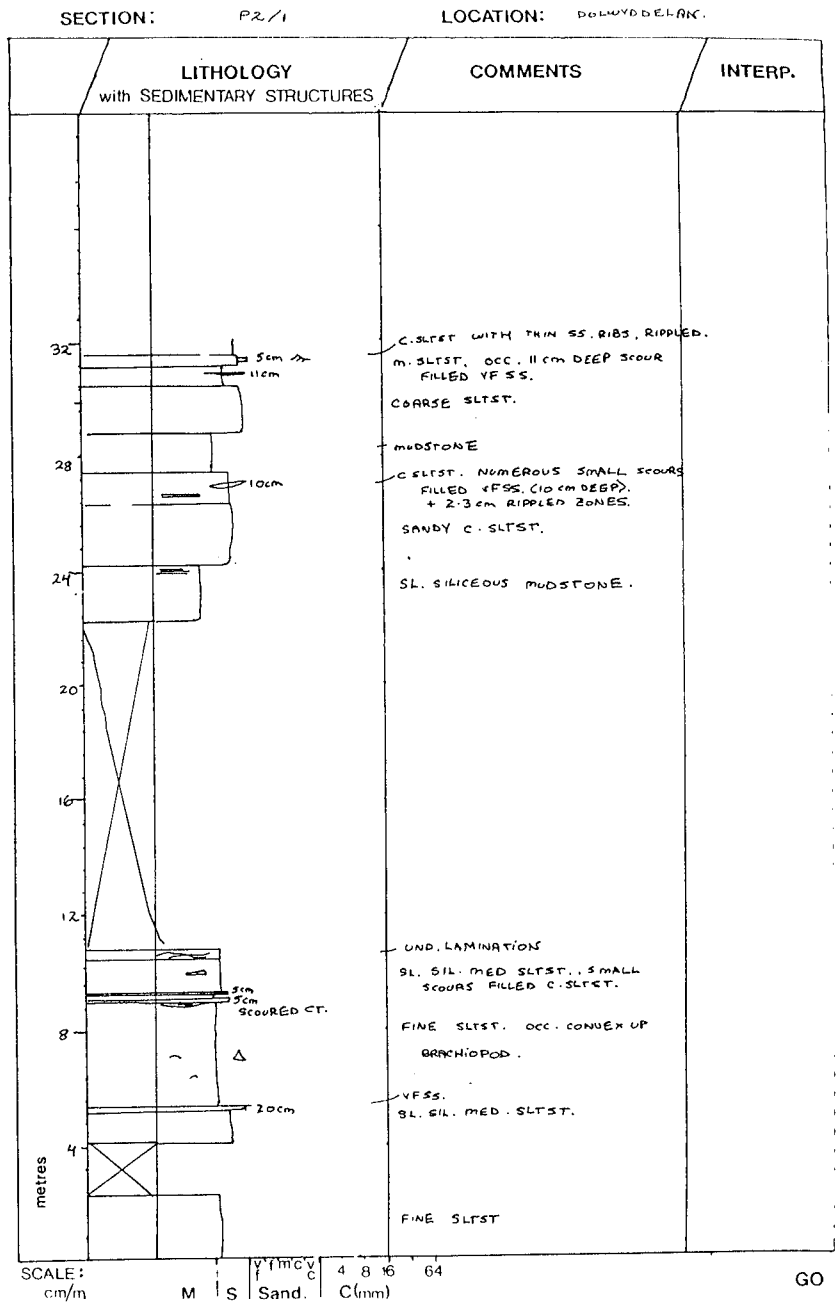
SECTION: m3E SMALL SCALE LOCATION: MOEL DDU.



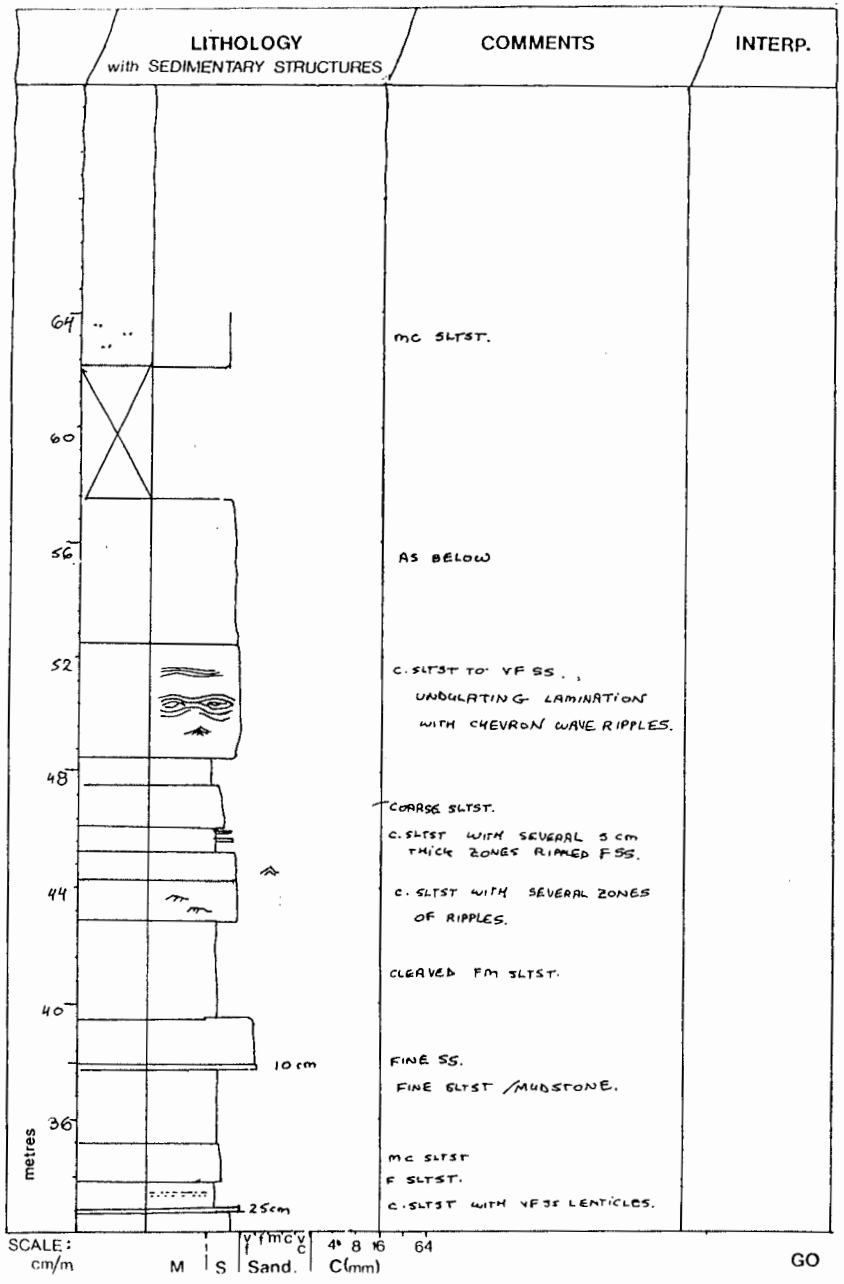
GC

SECTION P1 to P3

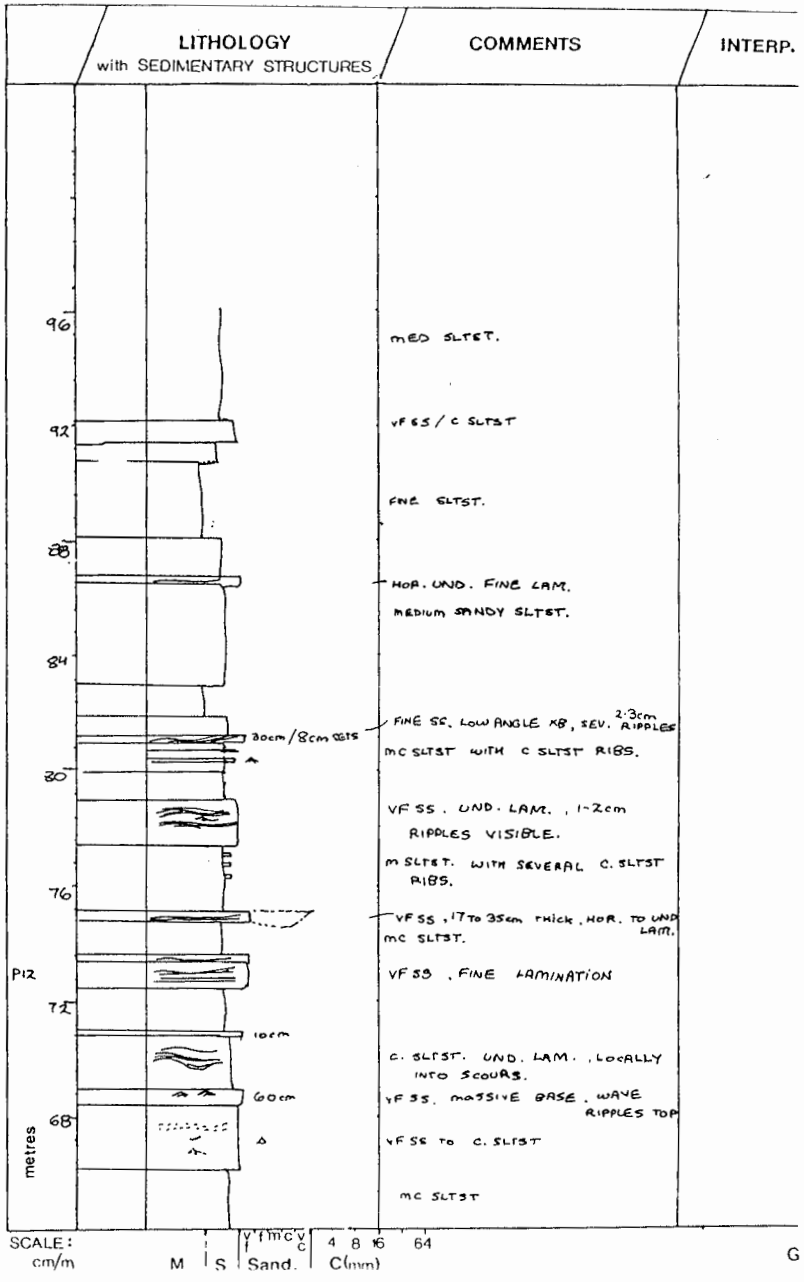
SECTIONS P2 and P3 LOCATION: Outcrops beneath LOwer Rhyolitic tuff to west of un-named river and railway tunnel.



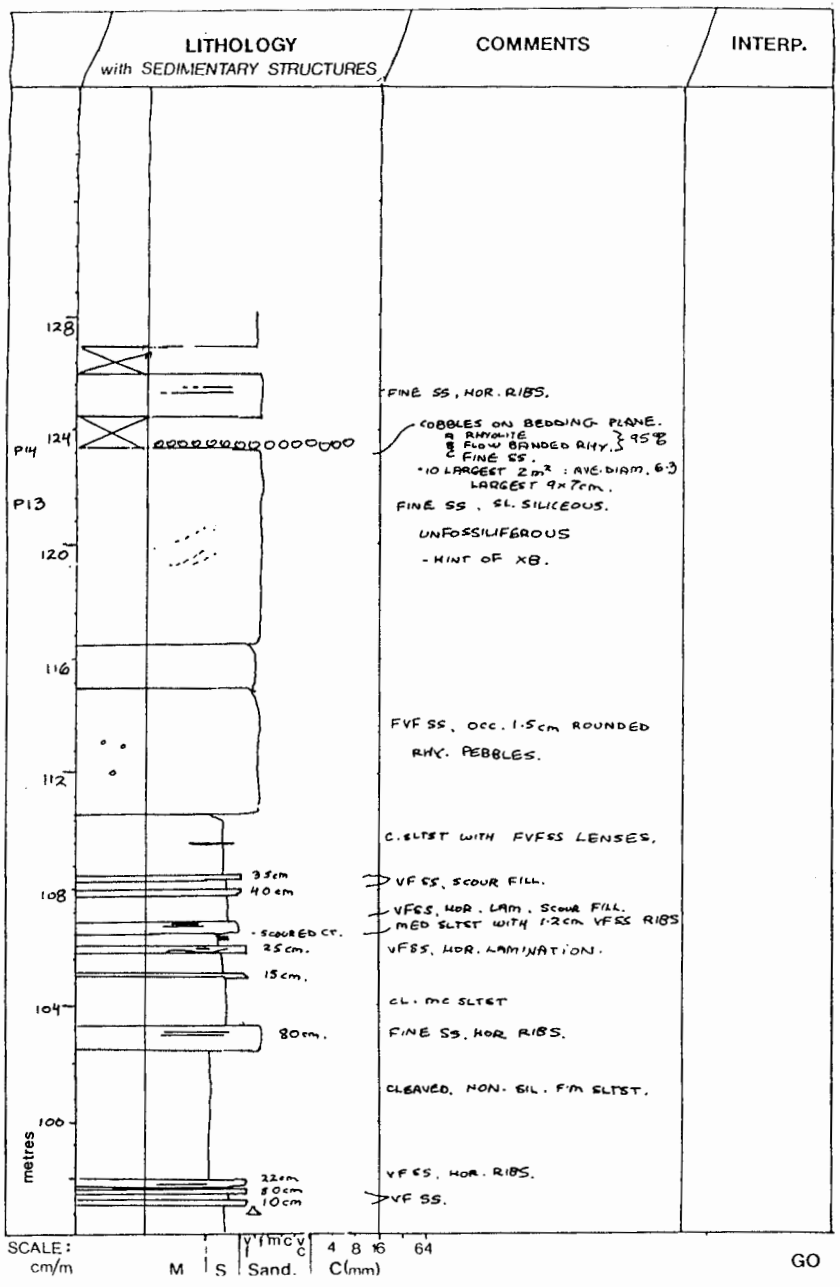
SECTION: P2/2 LOCATION: DOLWYDDELAN



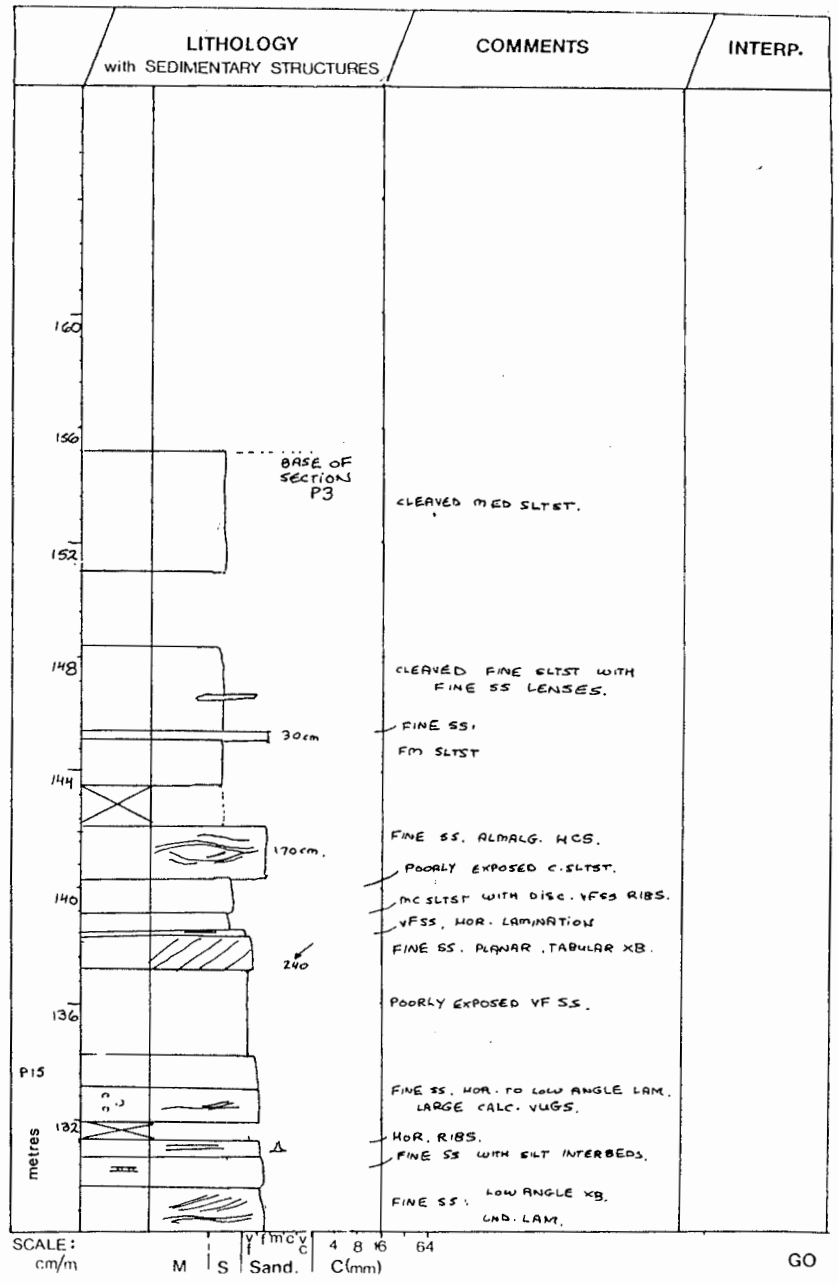
SECTION: P2/3 LOCATION: DOLWYDDELAN



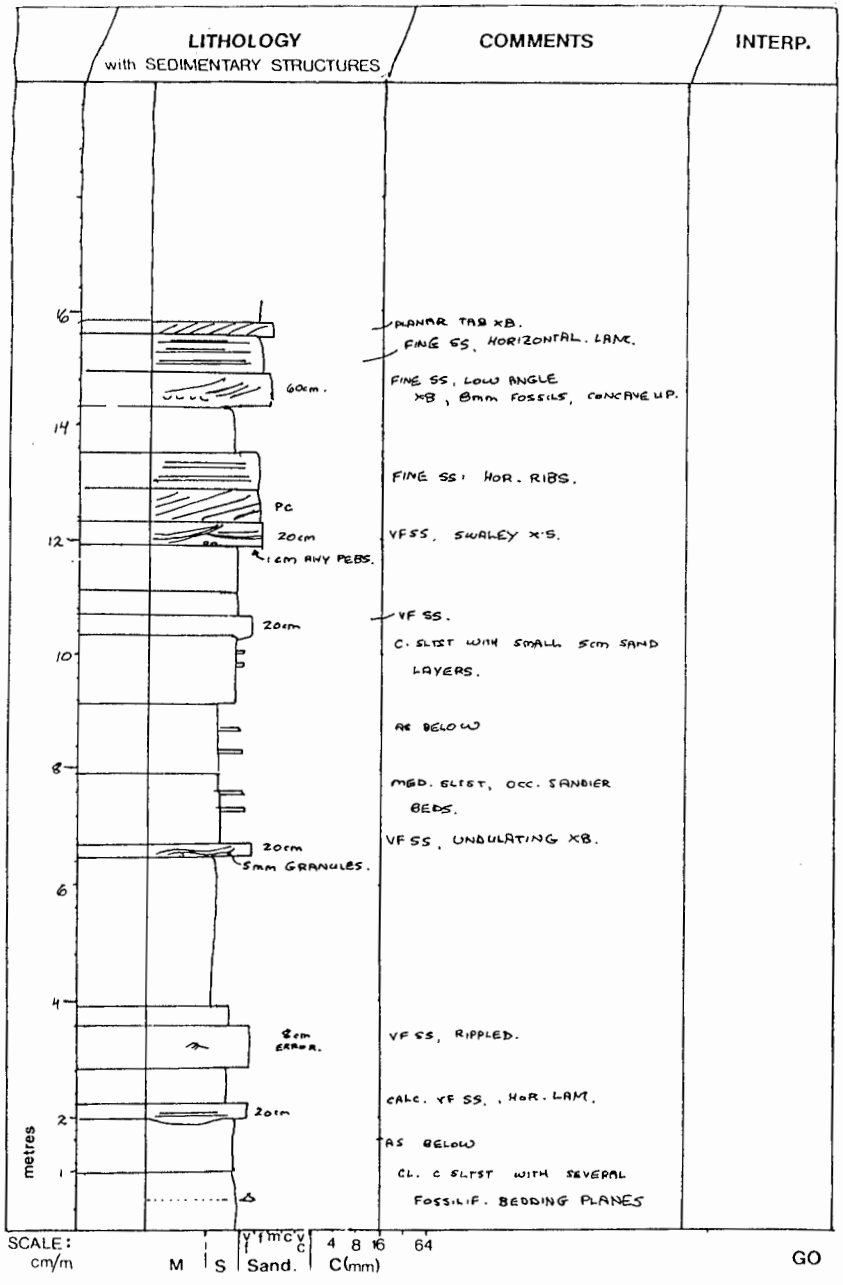
SECTION: P2/4 LOCATION:



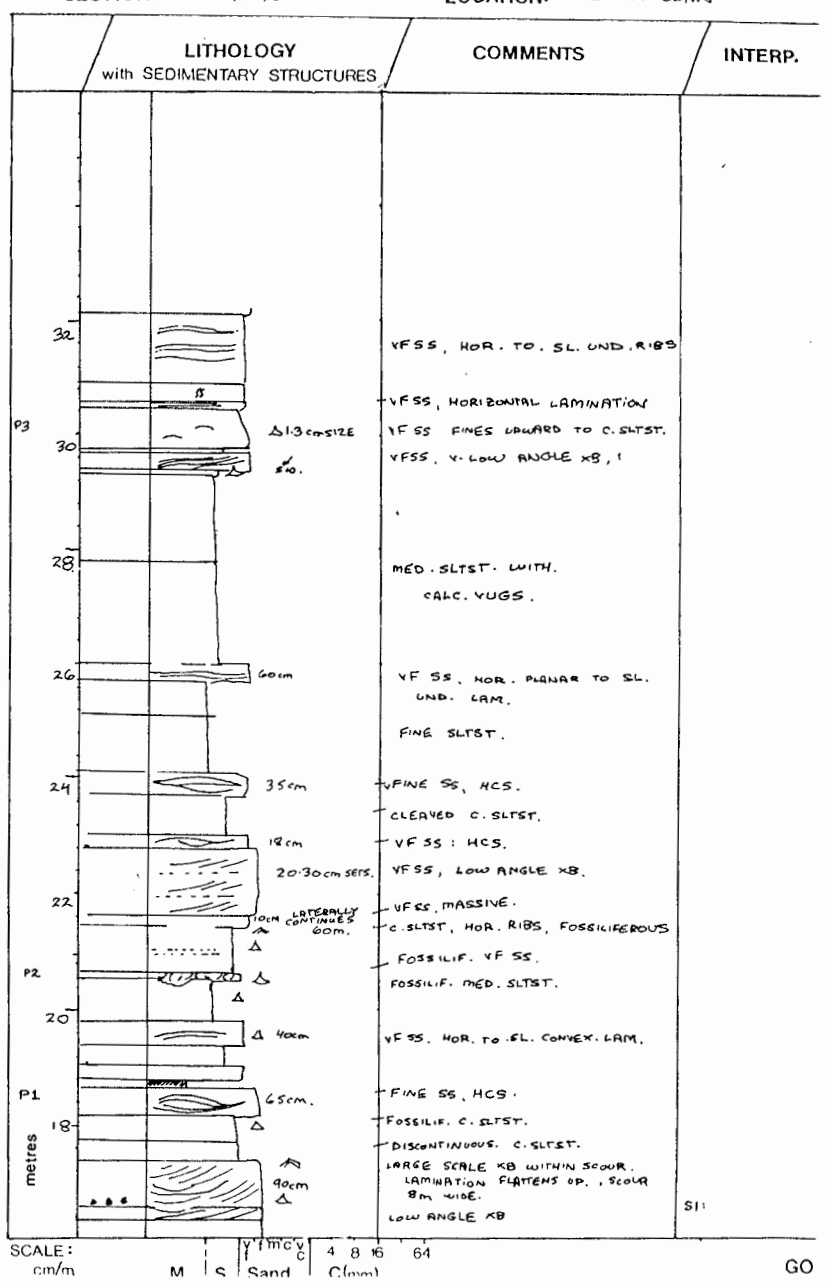
SECTION: P2/5. LOCATION: DOLLWYDDELLAN.



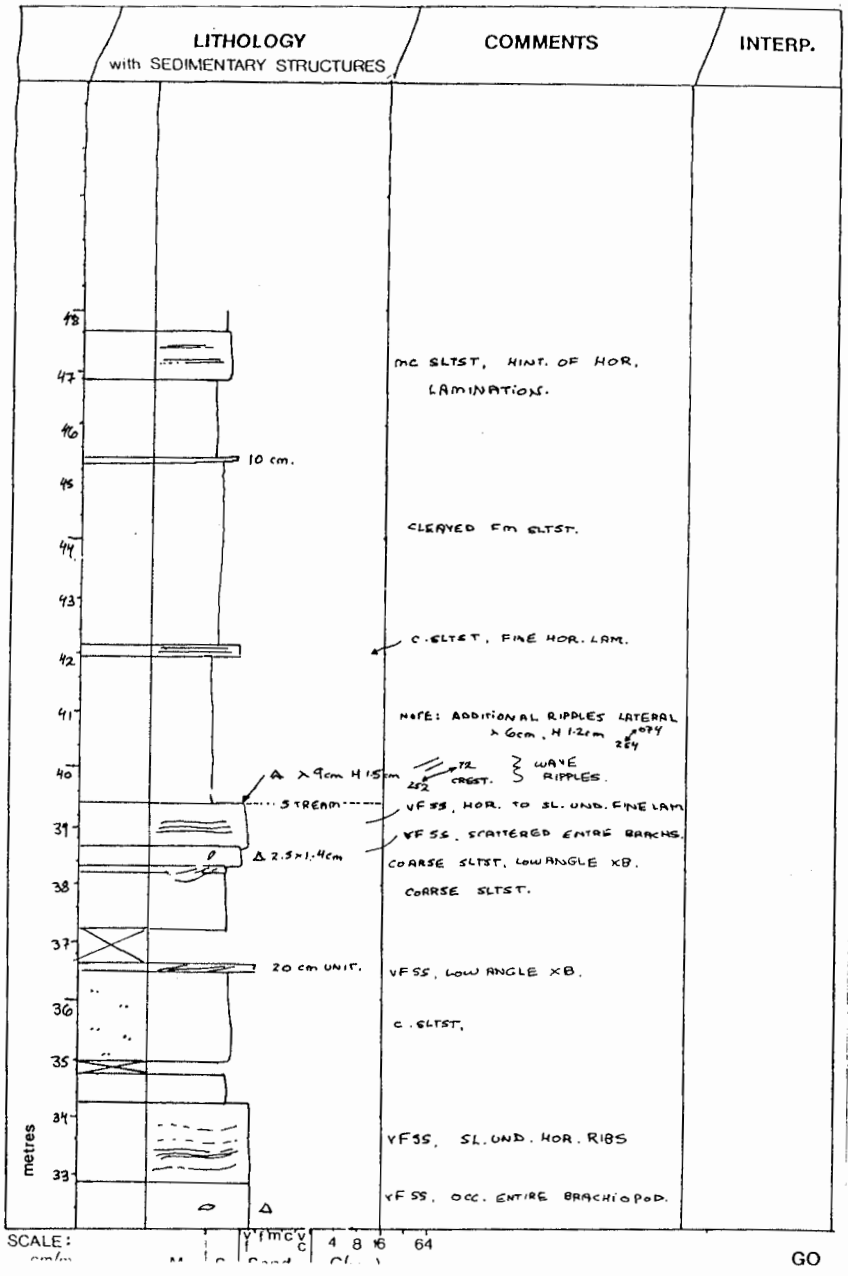
SECTION: P3/1 LOCATION: DOLWYDDELAN



SECTION: P3/2 LOCATION: DOLWYDDELAN

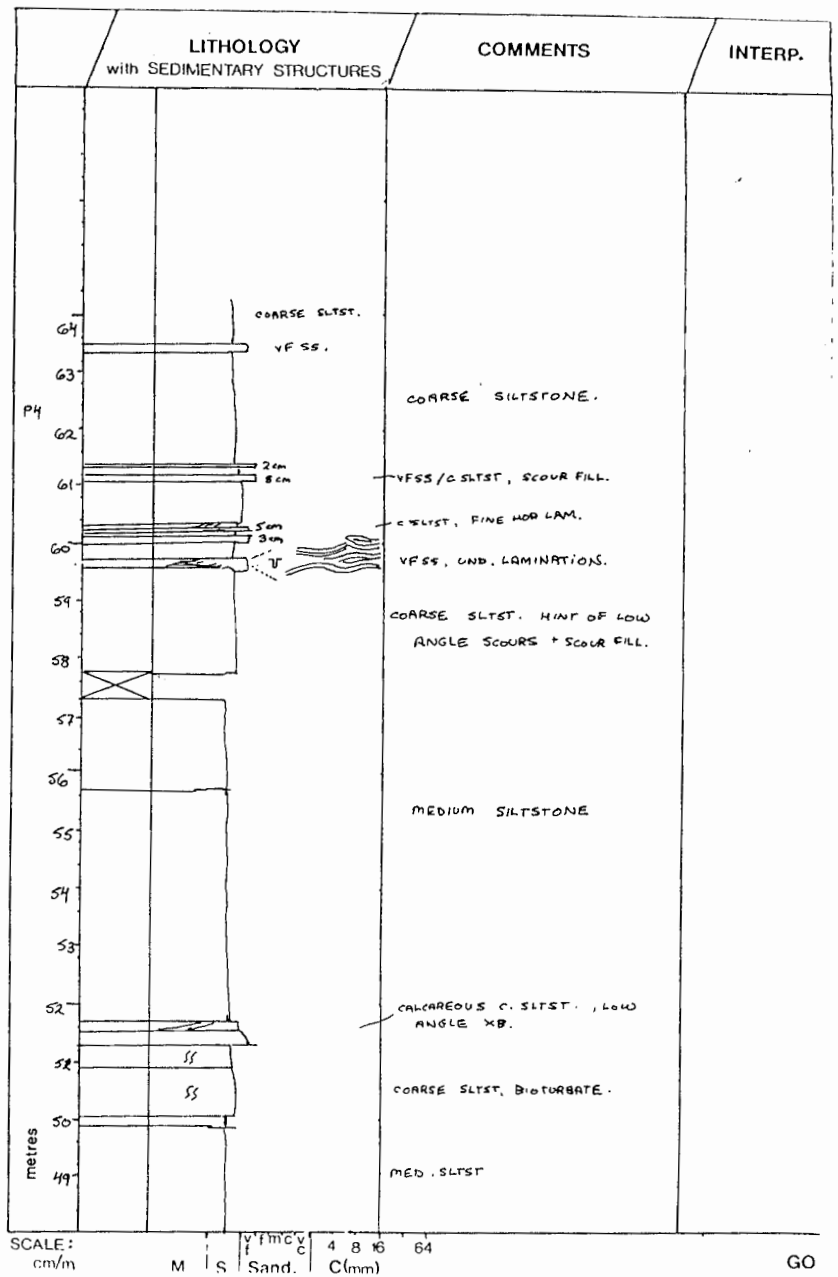


SECTION: P3/3 LOCATION: DOLWYDDELAN



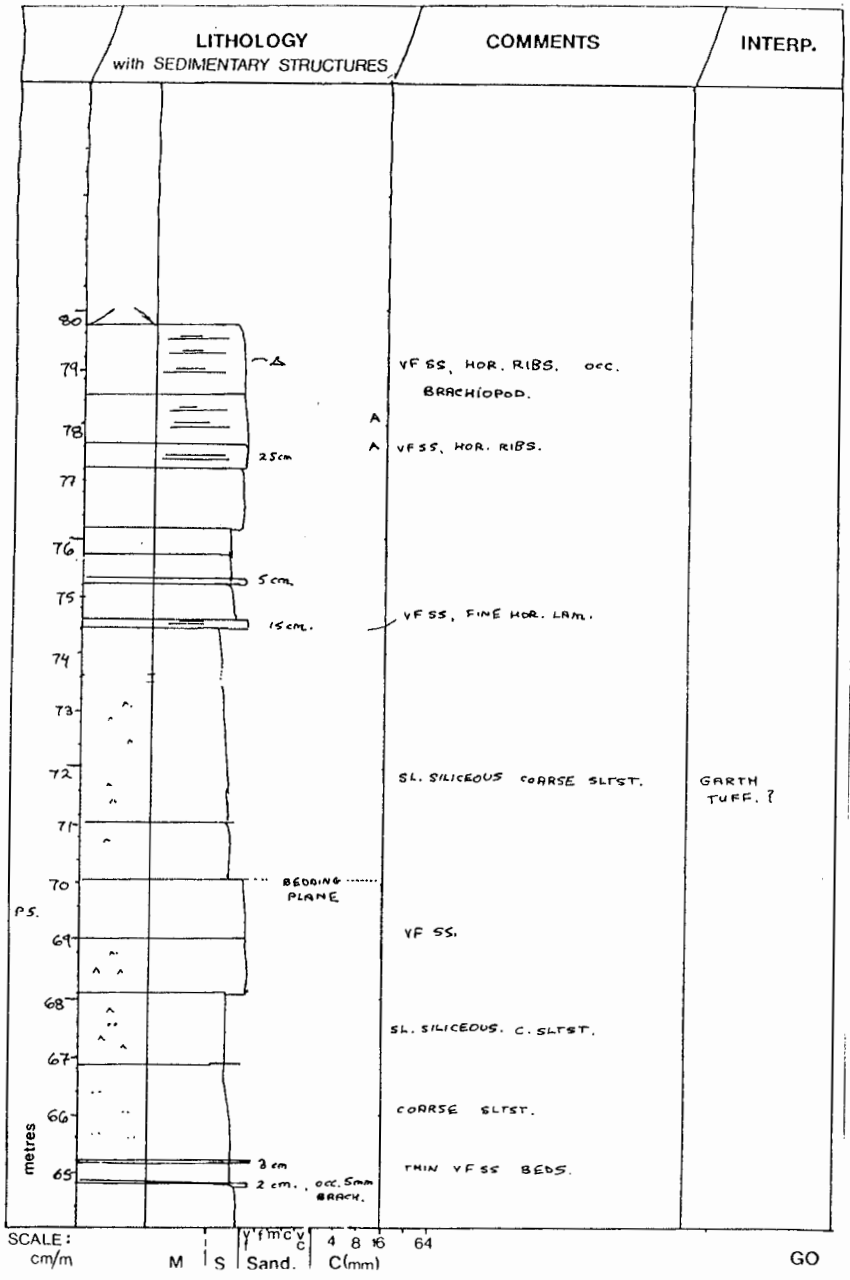
GO

SECTION: P3 LOCATION:

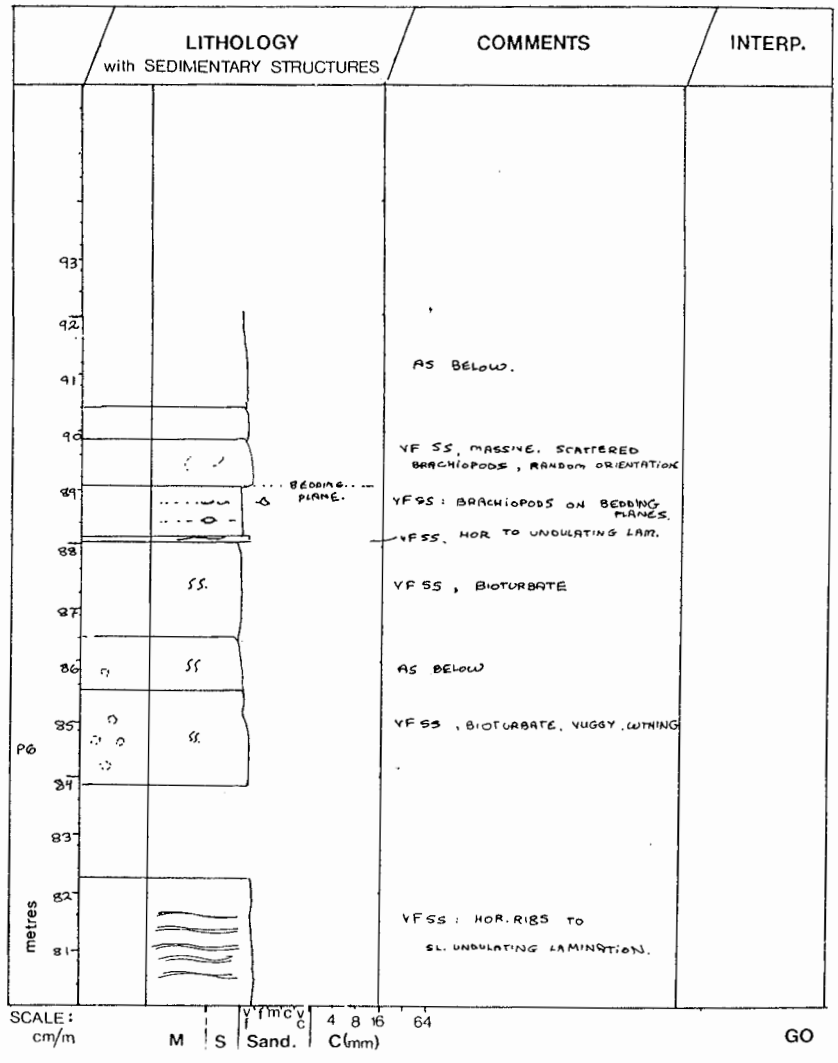


GO

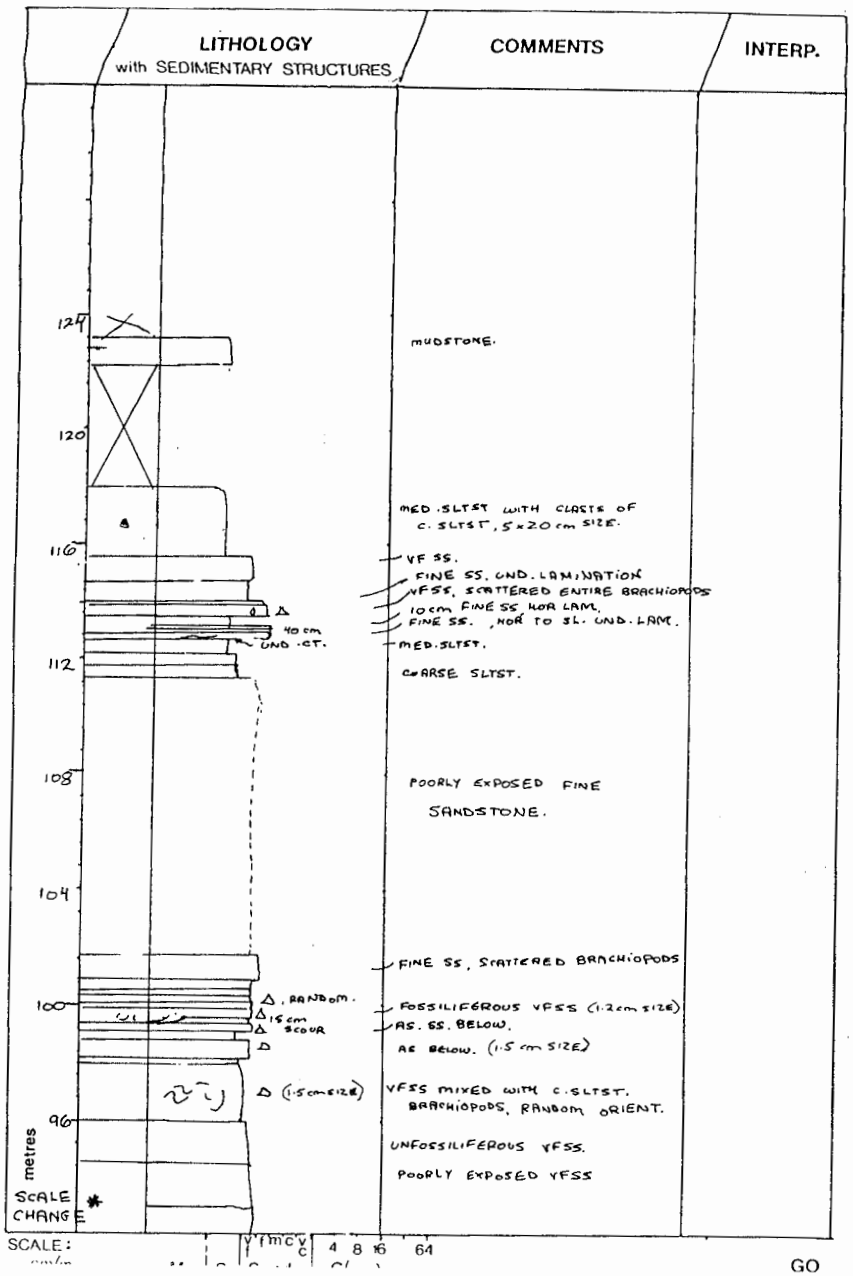
SECTION: P3 LOCATION:



SECTION: P3 LOCATION:



SECTION: P3 LOCATION: DOLWYDDELAN 1



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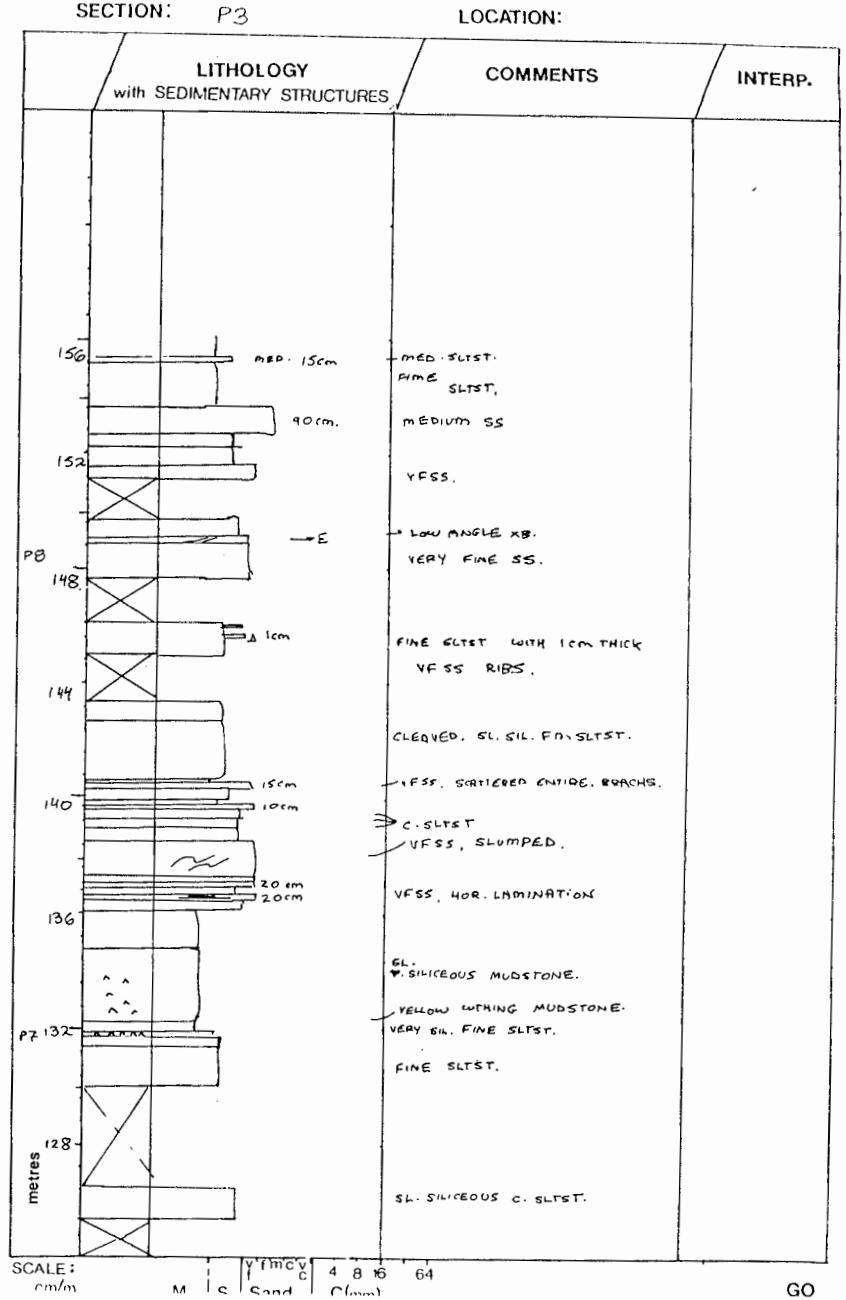
SECTION: P3 LOCATION:



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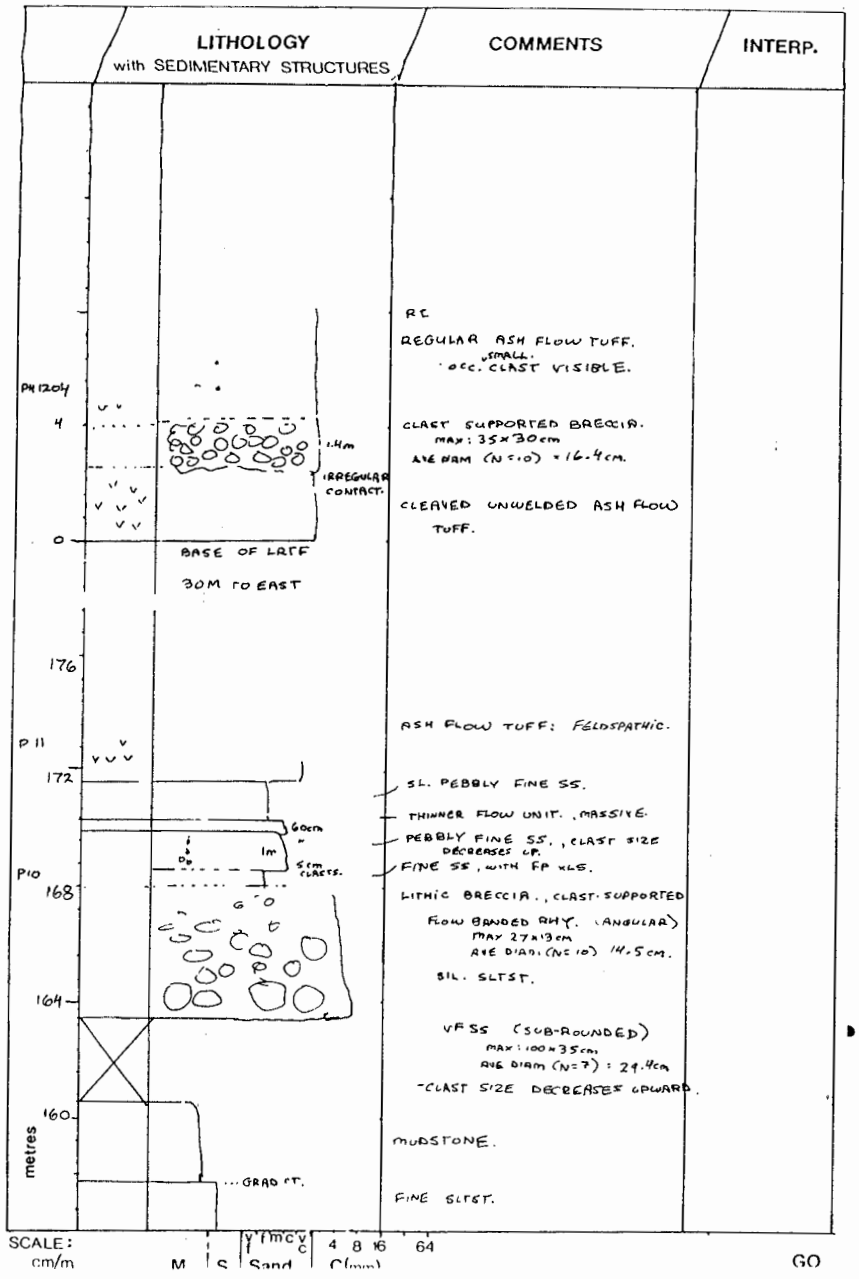
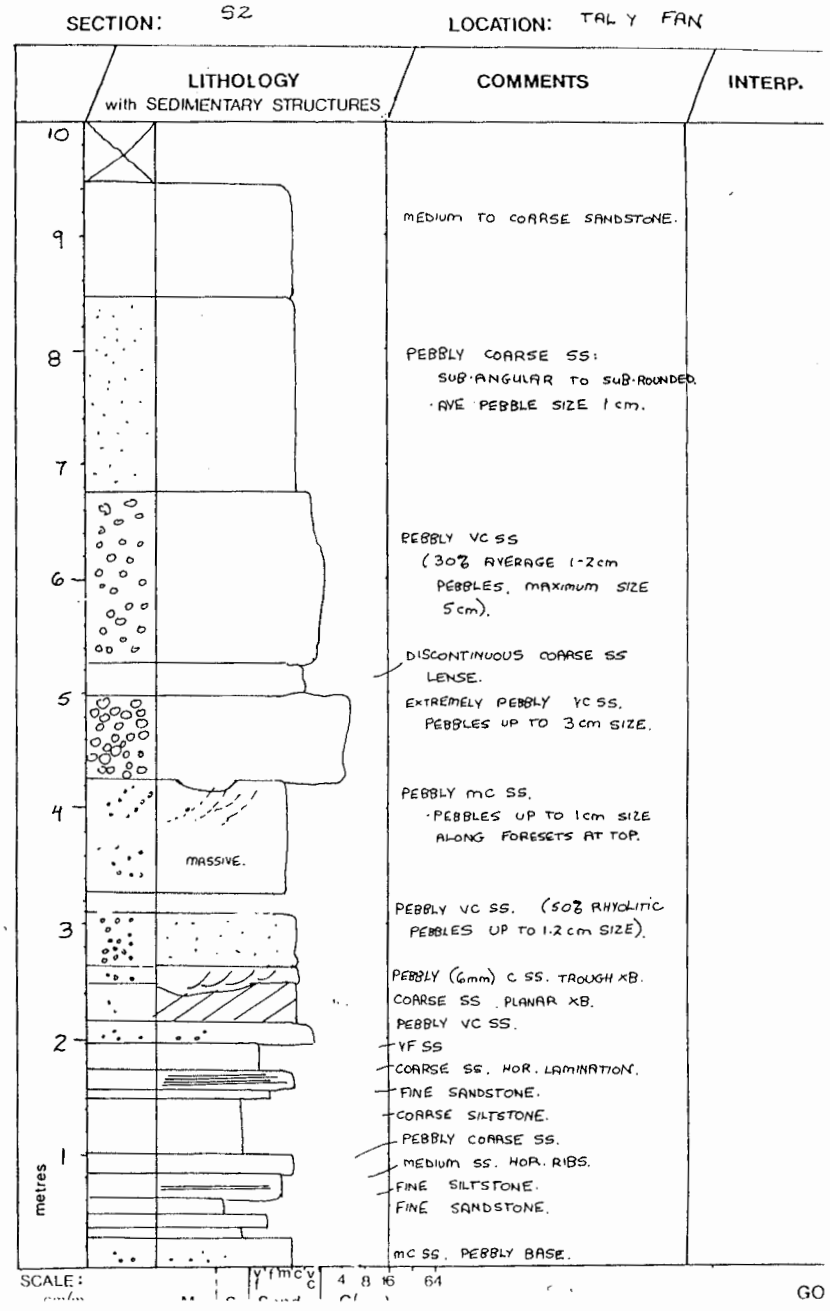
SECTION: P3 LOCATION: DOLWYDDELAN



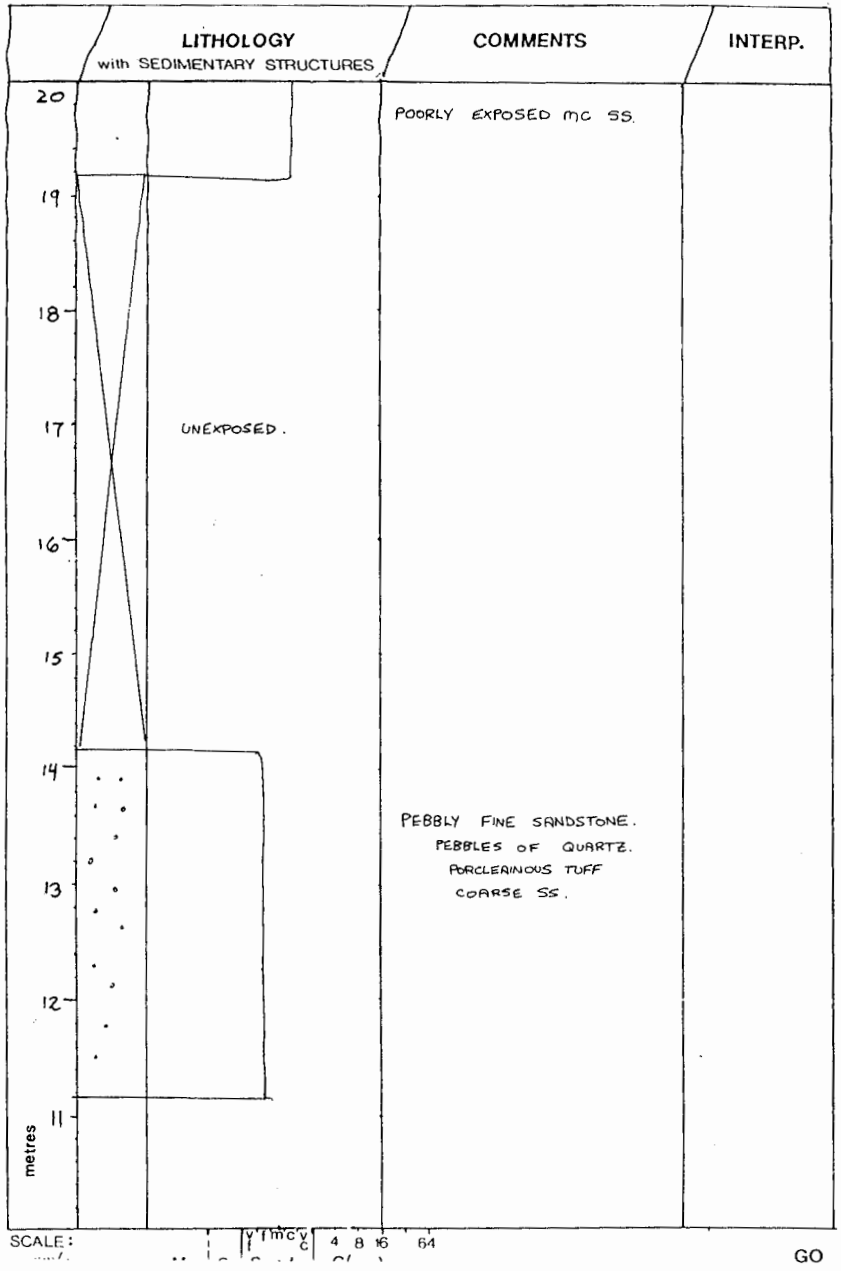
SECTION S1 to S2

SECTION S2 LOCATION: Locate rhyolite intrusiion at Foel Lwyd. Section starts at top of intrusion and proceeds to SW to base of Capel Curig Volcanic Fm.

SECTION S3 LOCATION: No nearby geographic featues. Section through reworked tuff horizon within Upper Cwm Eigiau Fm to base of Crafnant Volcanic Fm.



SECTION: S2 LOCATION: TAL Y FAN



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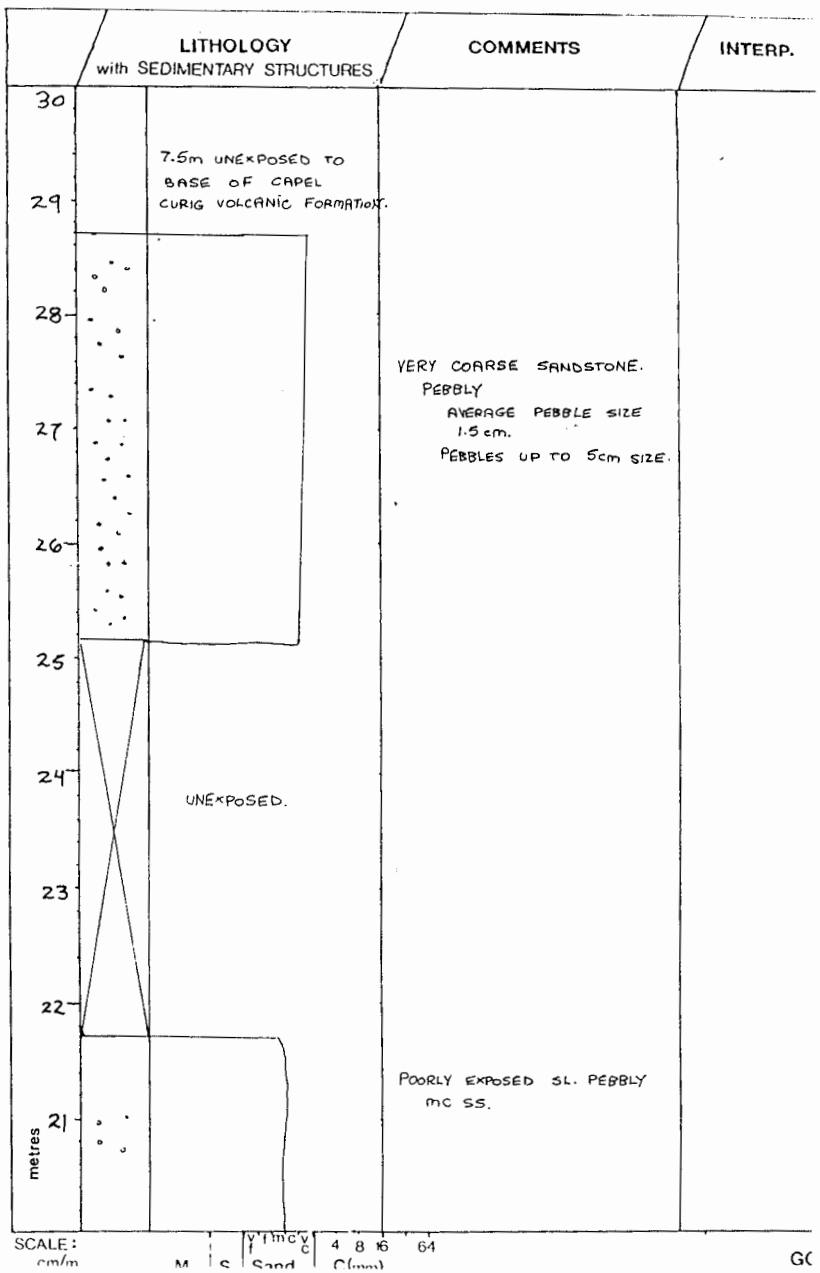
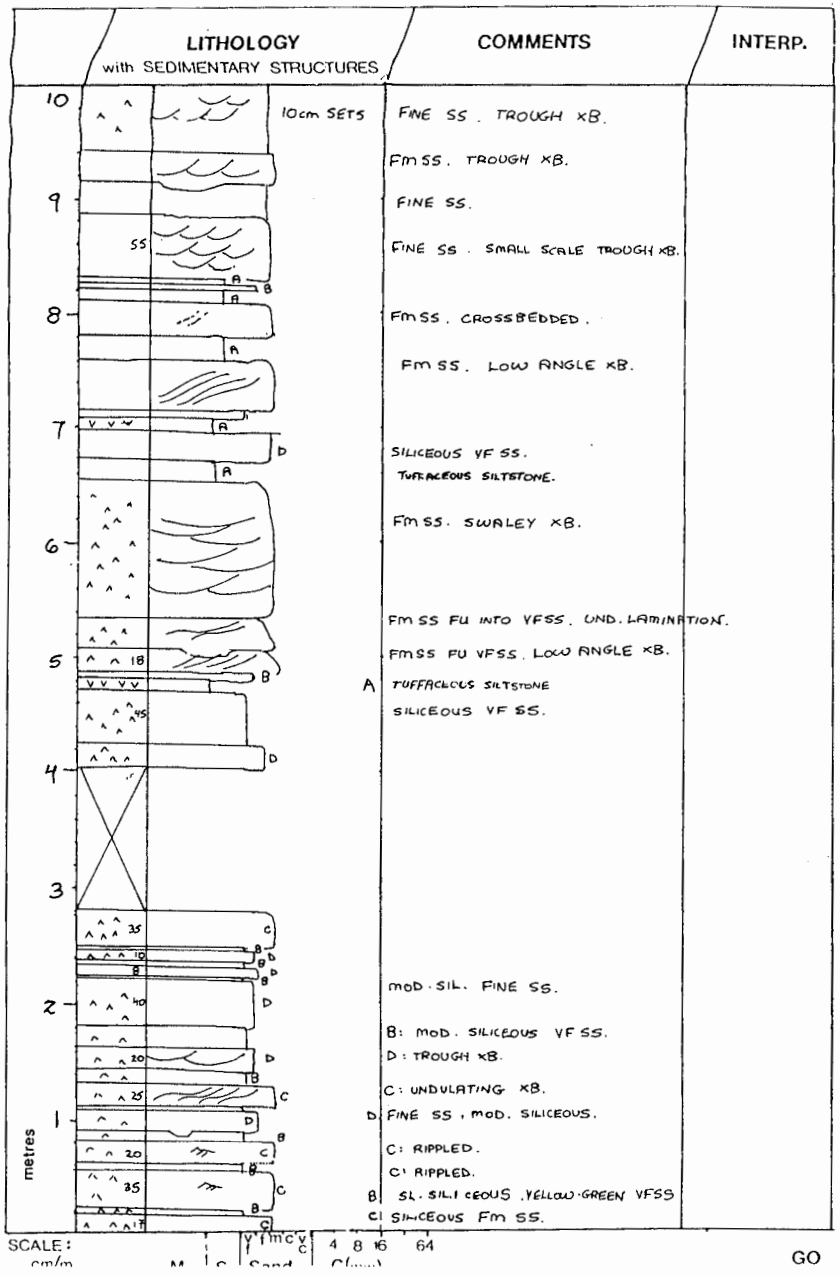
SECTION: S2 LOCATION: TAL Y FAN

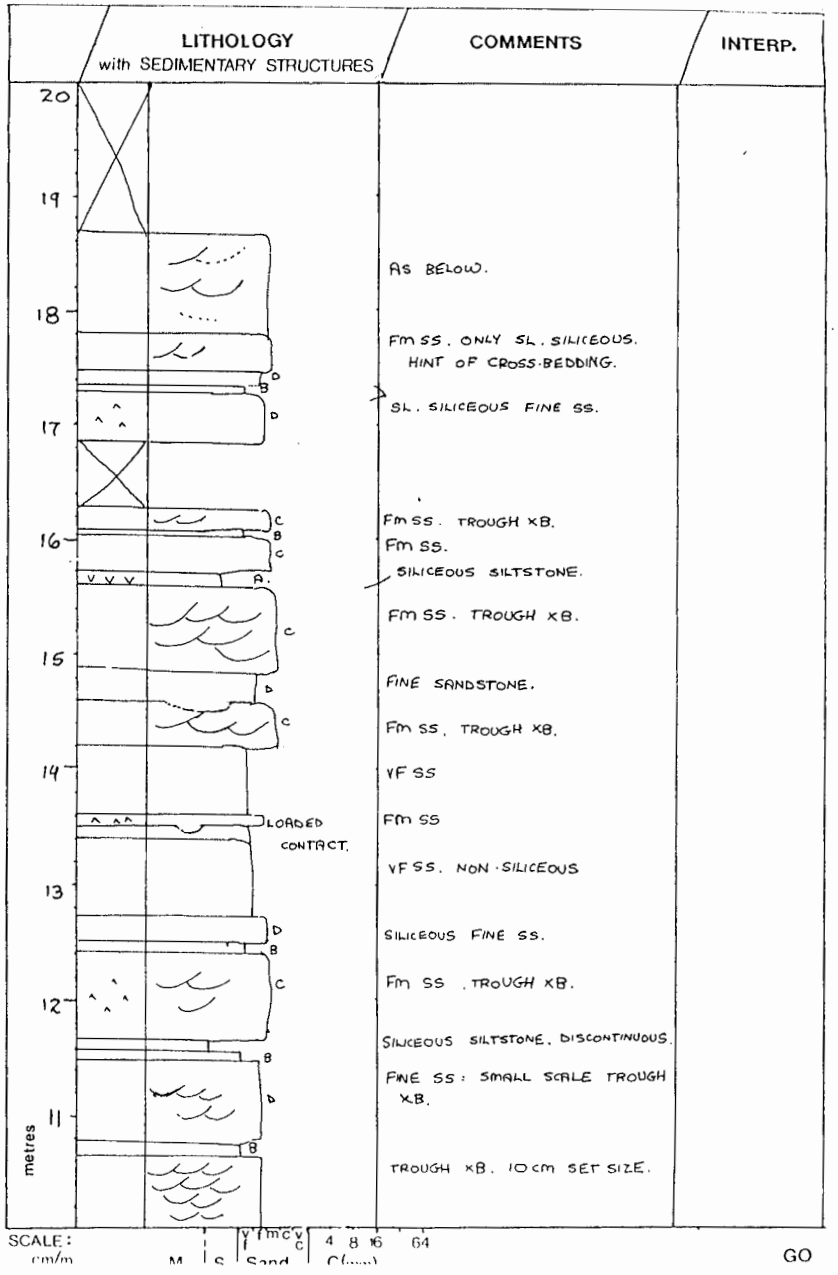


GC

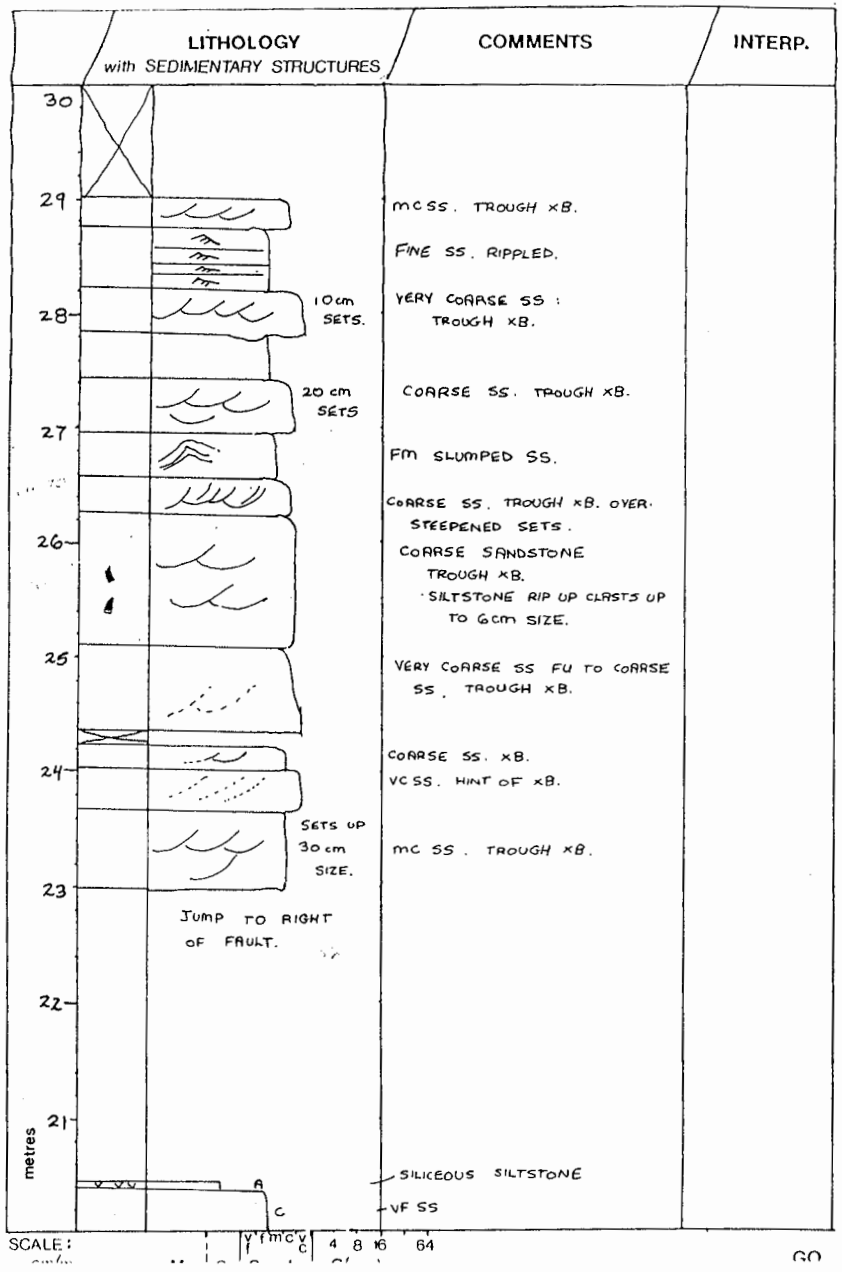
SECTION: S.3 LOCATION: TAL Y FAN



SECTION: S.3 LOCATION: TAL Y FAN



SECTION: S3 LOCATION:



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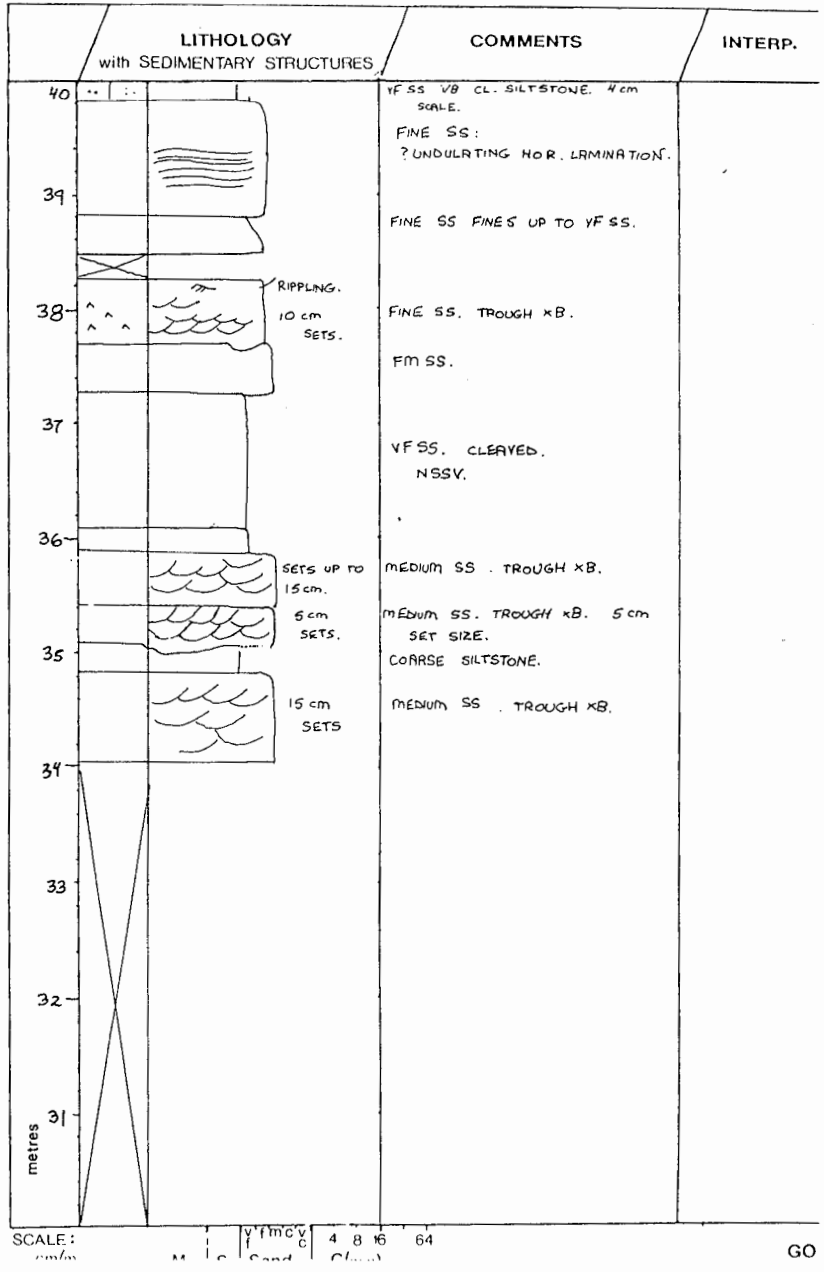
SECTION: S3 LOCATION: TAL Y FAN.



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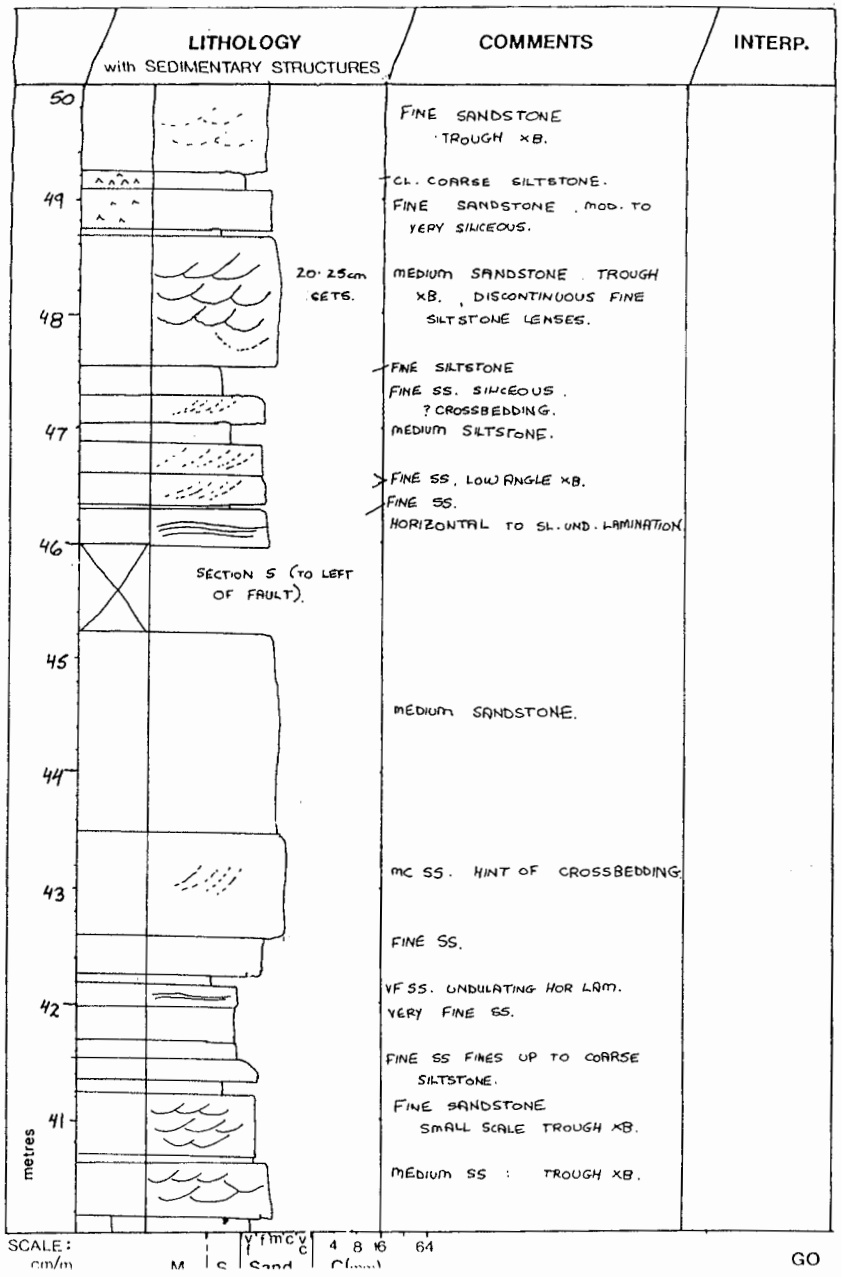
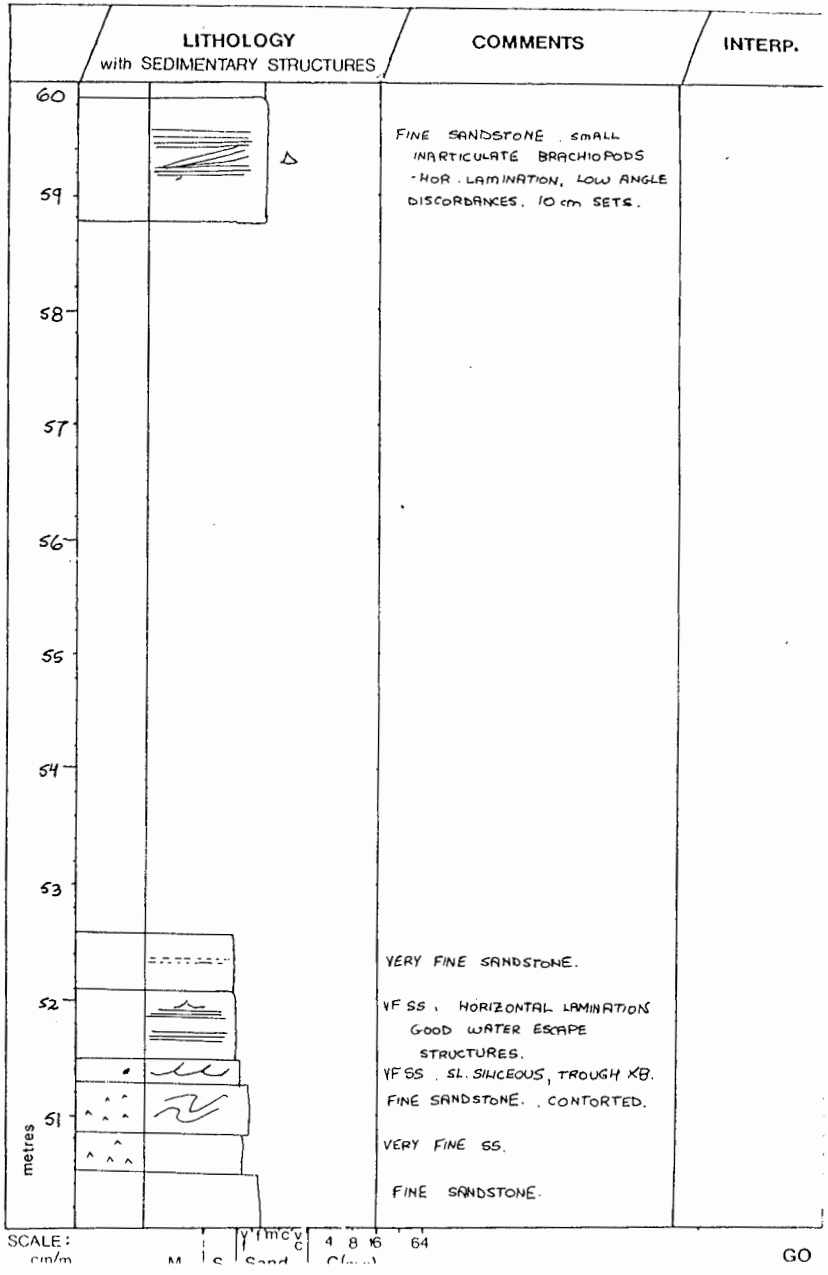
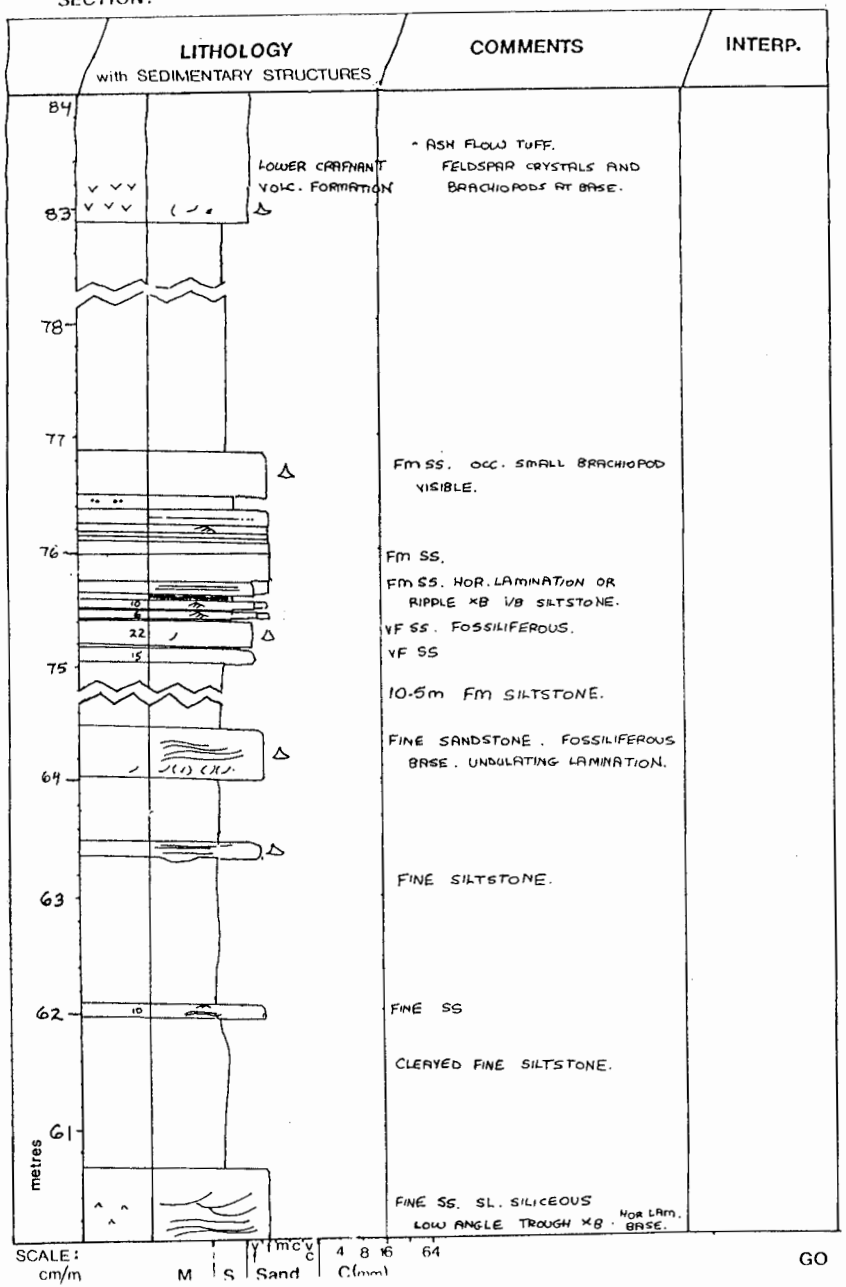
SECTION: S·3 LOCATION: TAL Y FAN



SECTION: S 3 LOCATION: TAL Y FAN

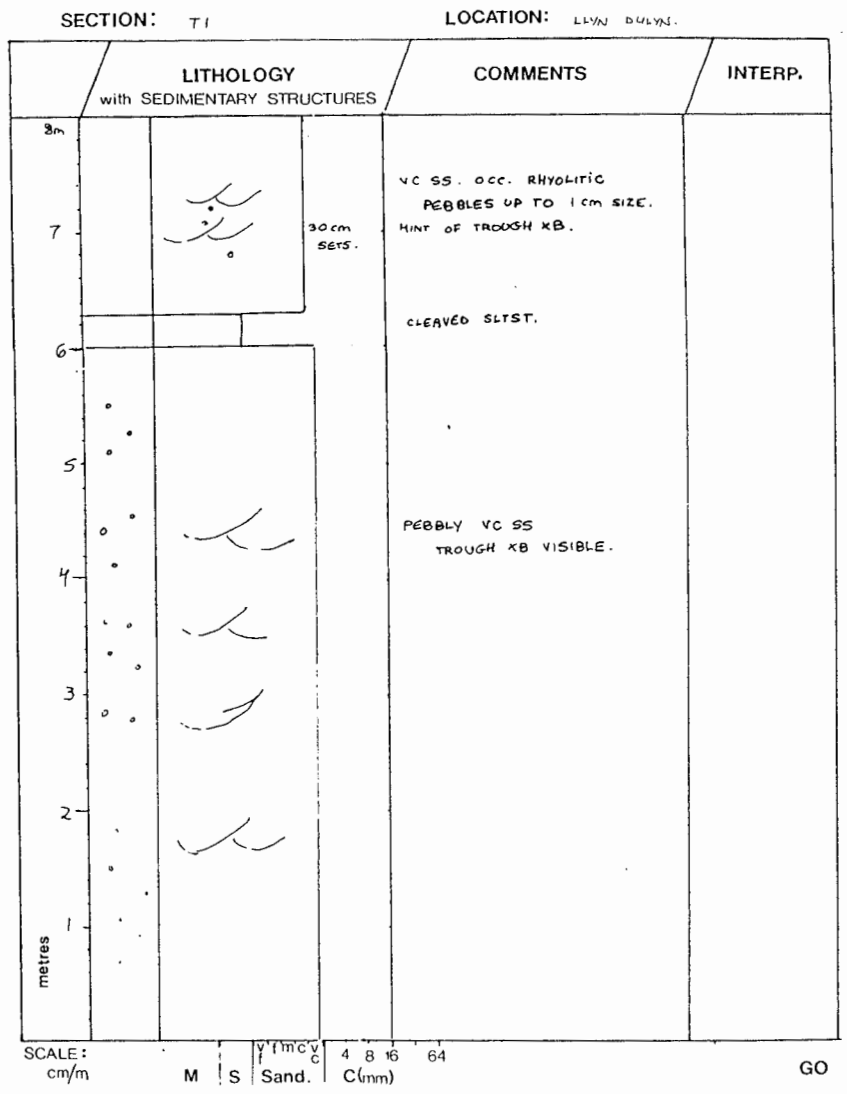


SECTION: S3 LOCATION: TAL Y FAN

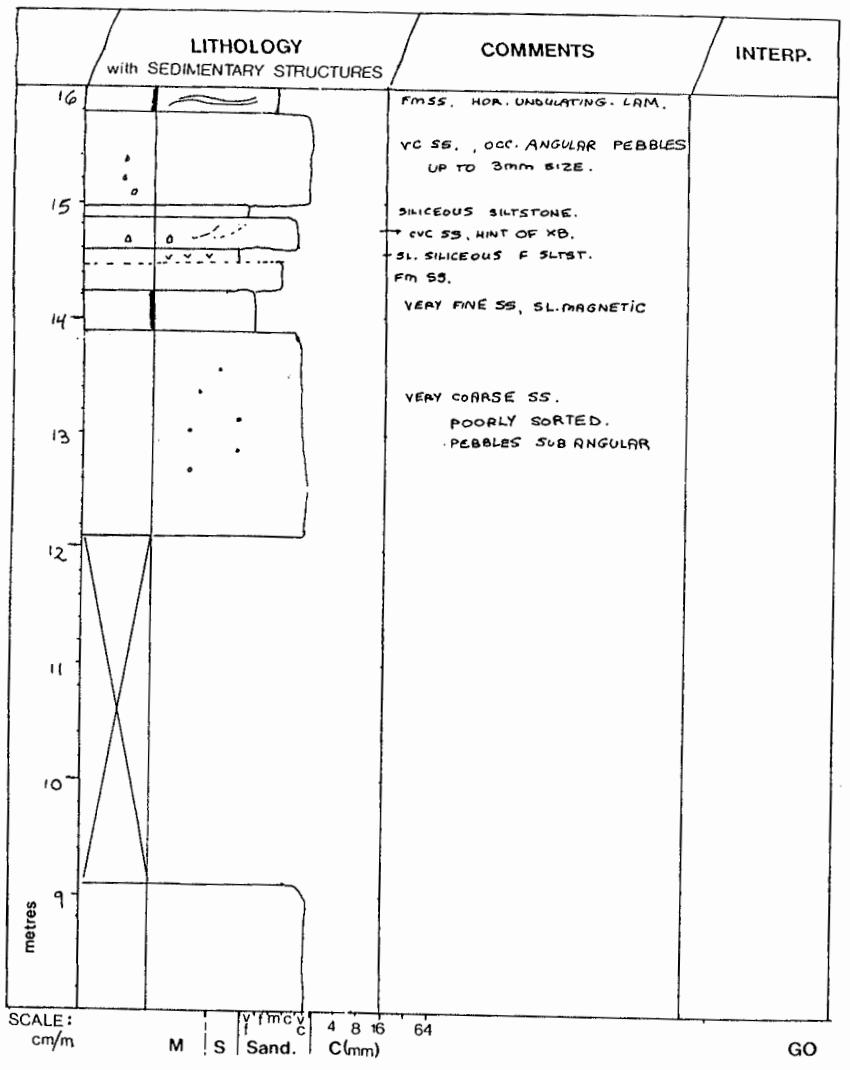


SECTION T1

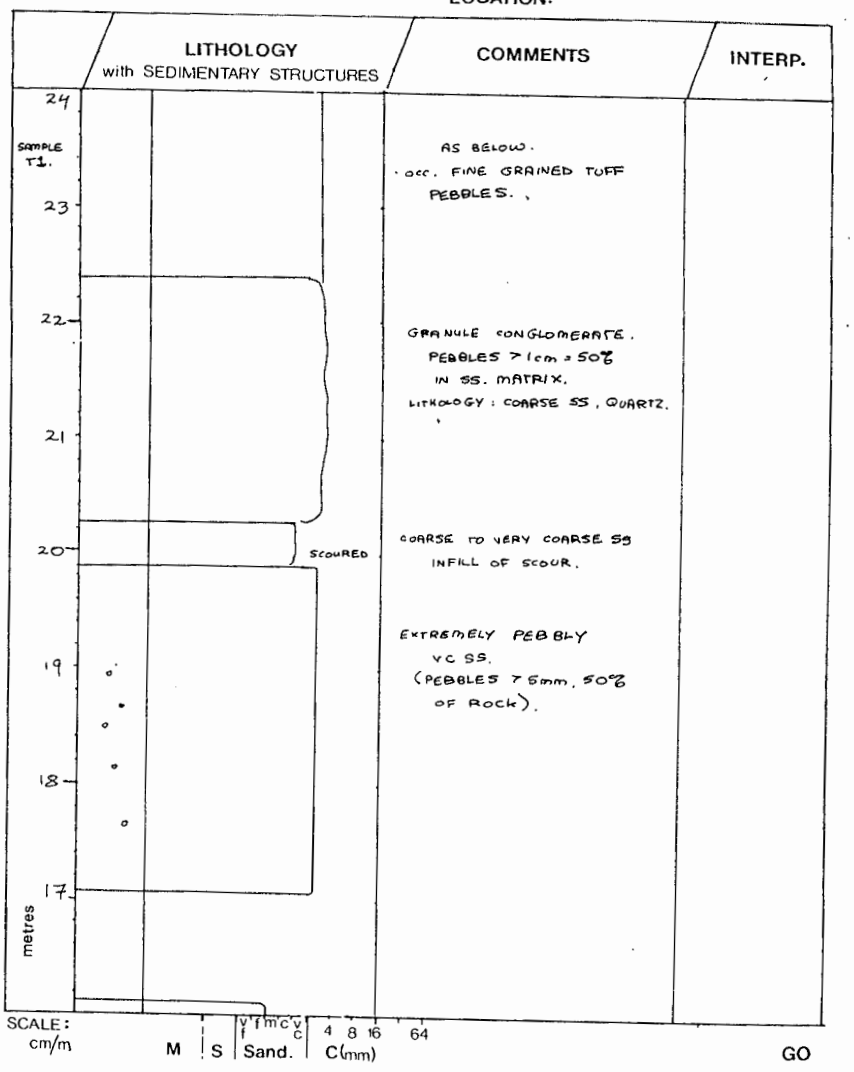
SECTION T1 LOCATION: Locate coarse gabbroic dolerite forming steep cliffs at west end of Llyn Dulyn. Section starts at top of sill and proceeds east talong south shore of lake through conglomeratic sandstones to base of Capel Curig Volcanic Fm.



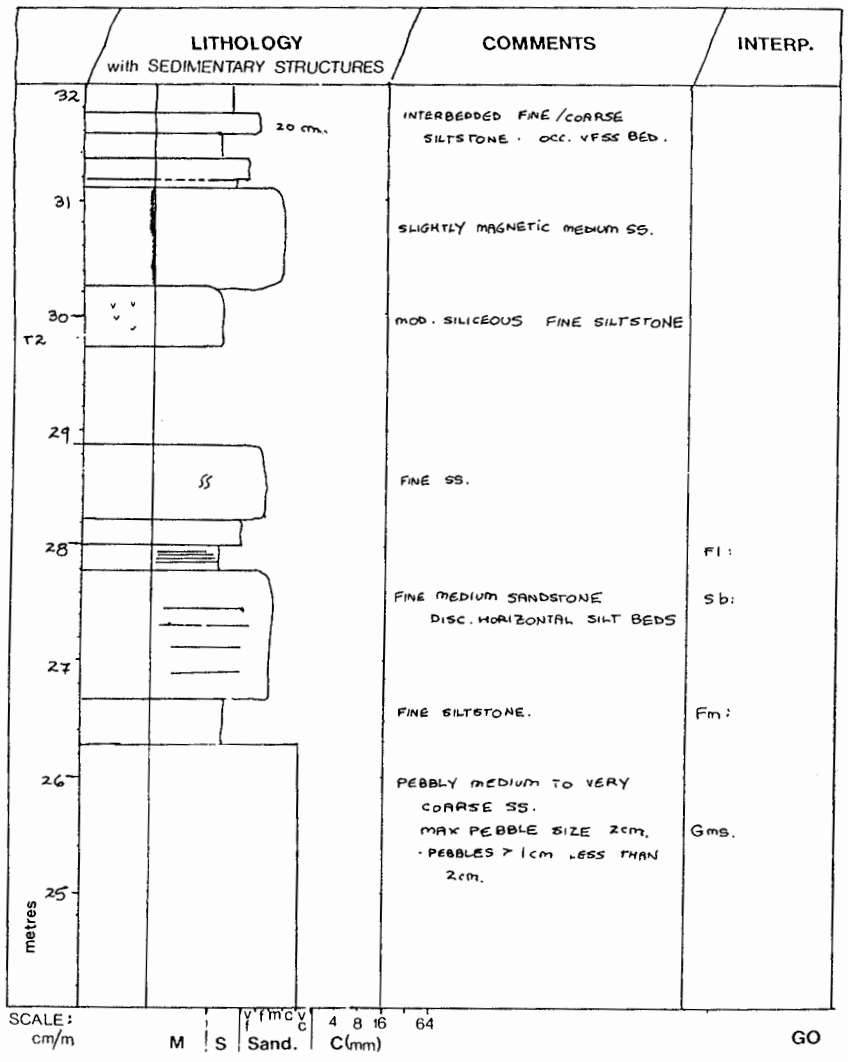
SECTION: T1 LOCATION: LLYN DULYN



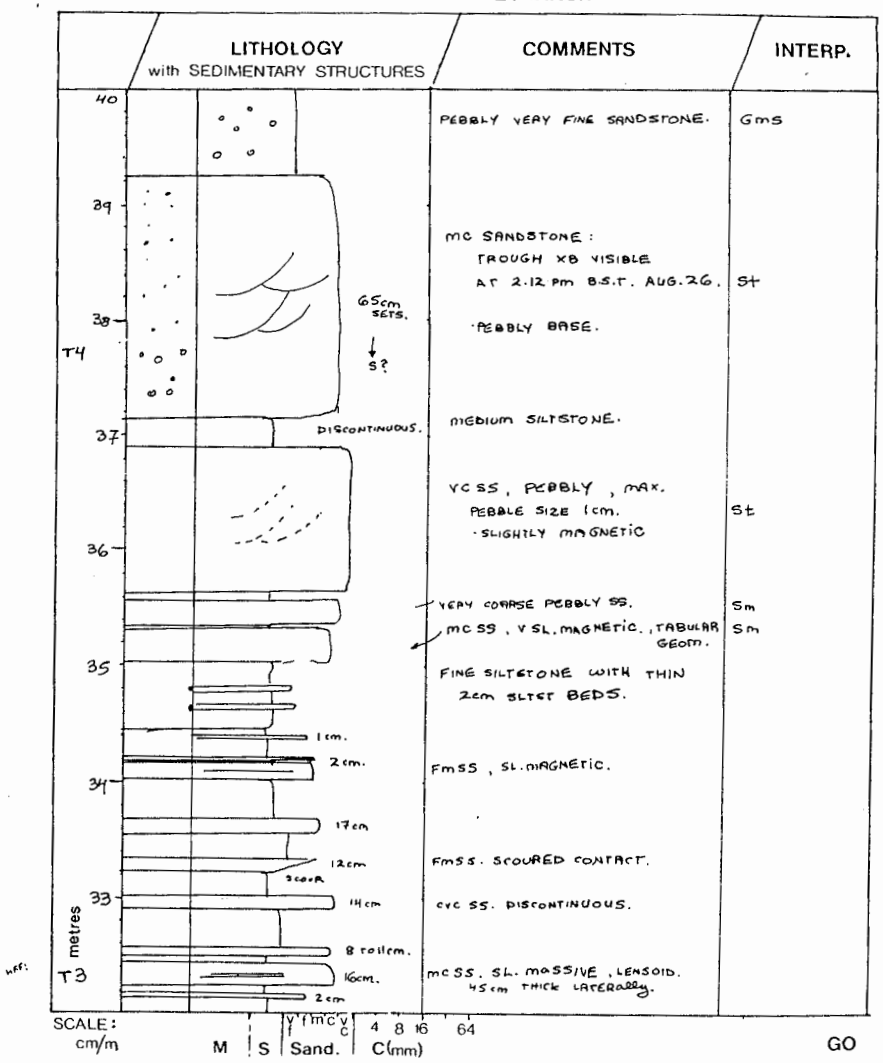
SECTION: T1 LOCATION: LLYN DULYN.



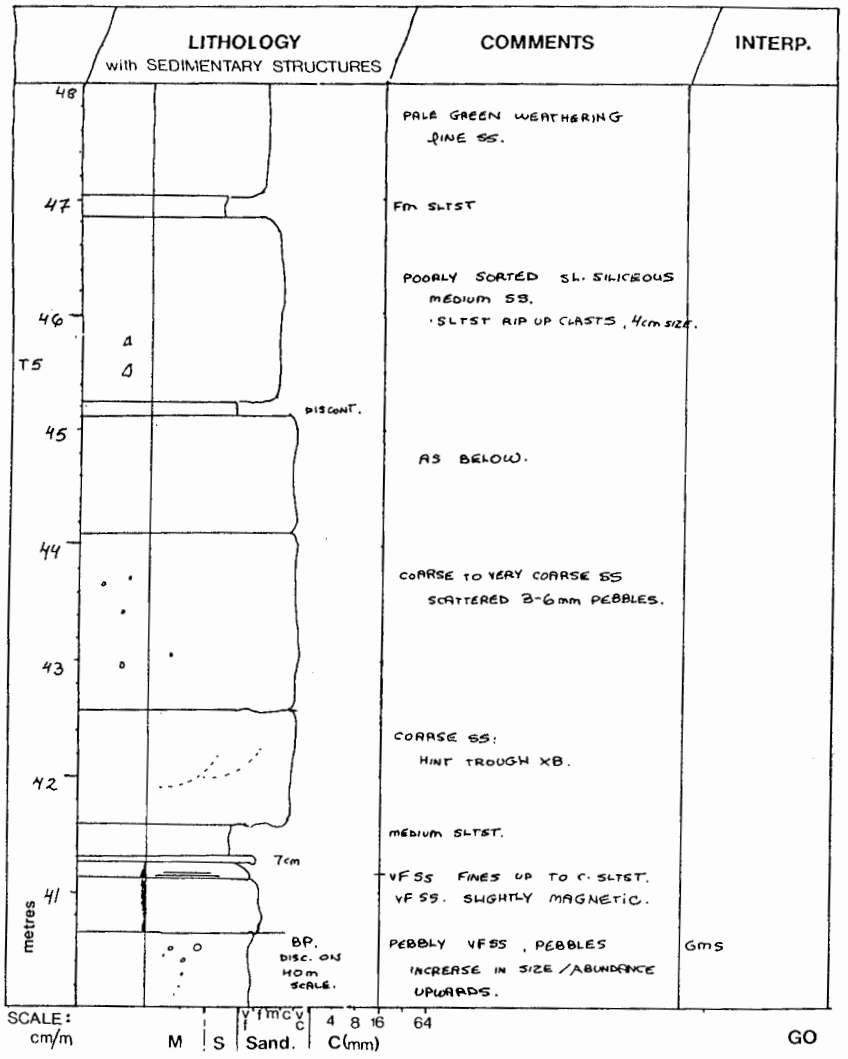
SECTION: T1. LOCATION: LLYN DULYN.



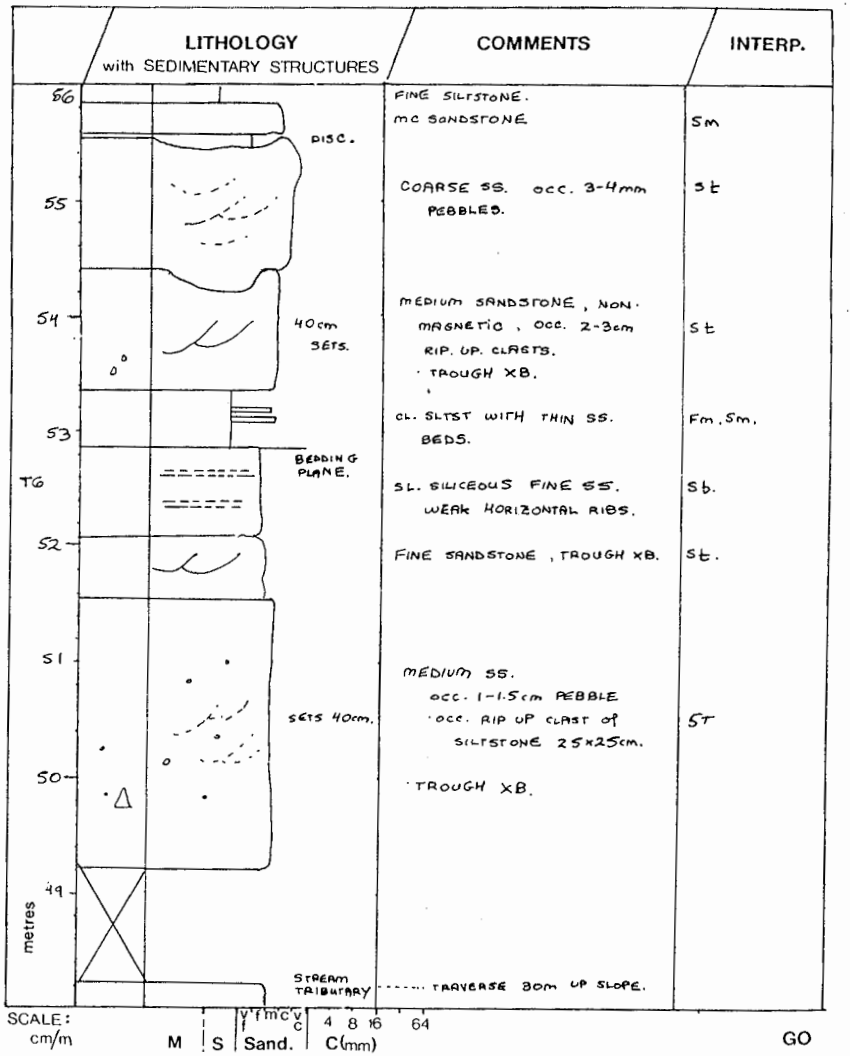
SECTION: T1 LOCATION: LLYN DULYN



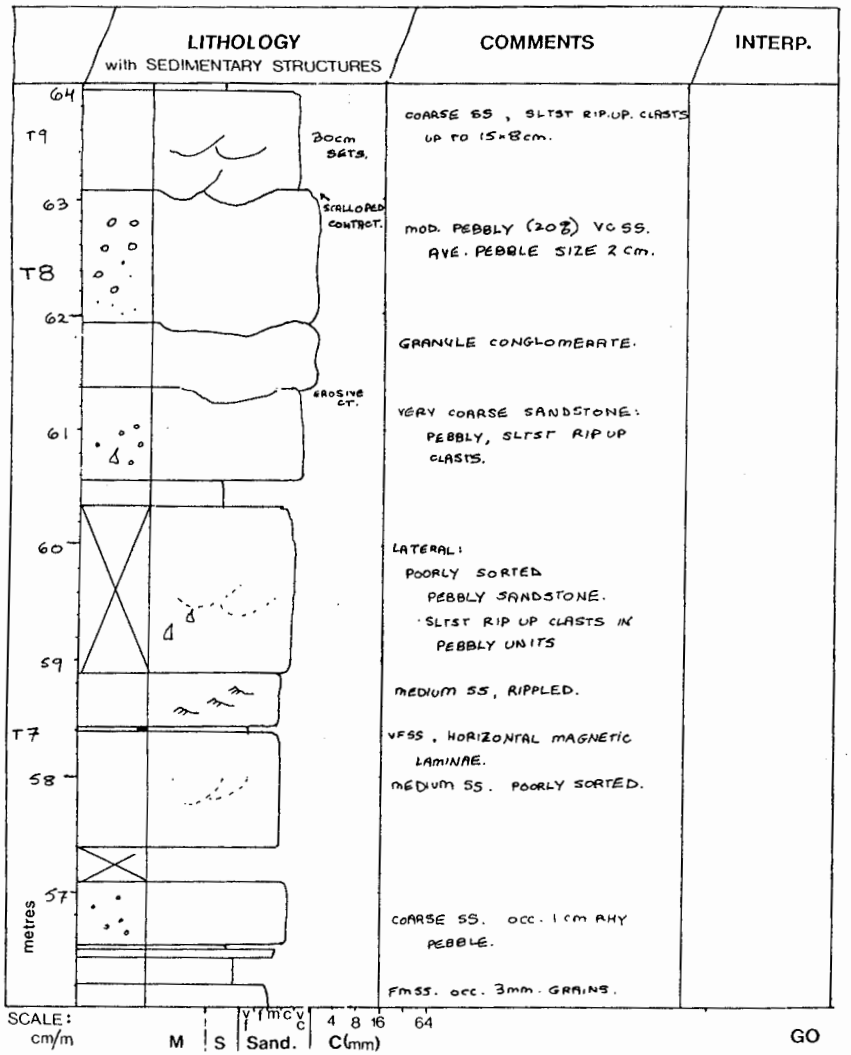
SECTION: T1. LOCATION: LLYN DULYN.



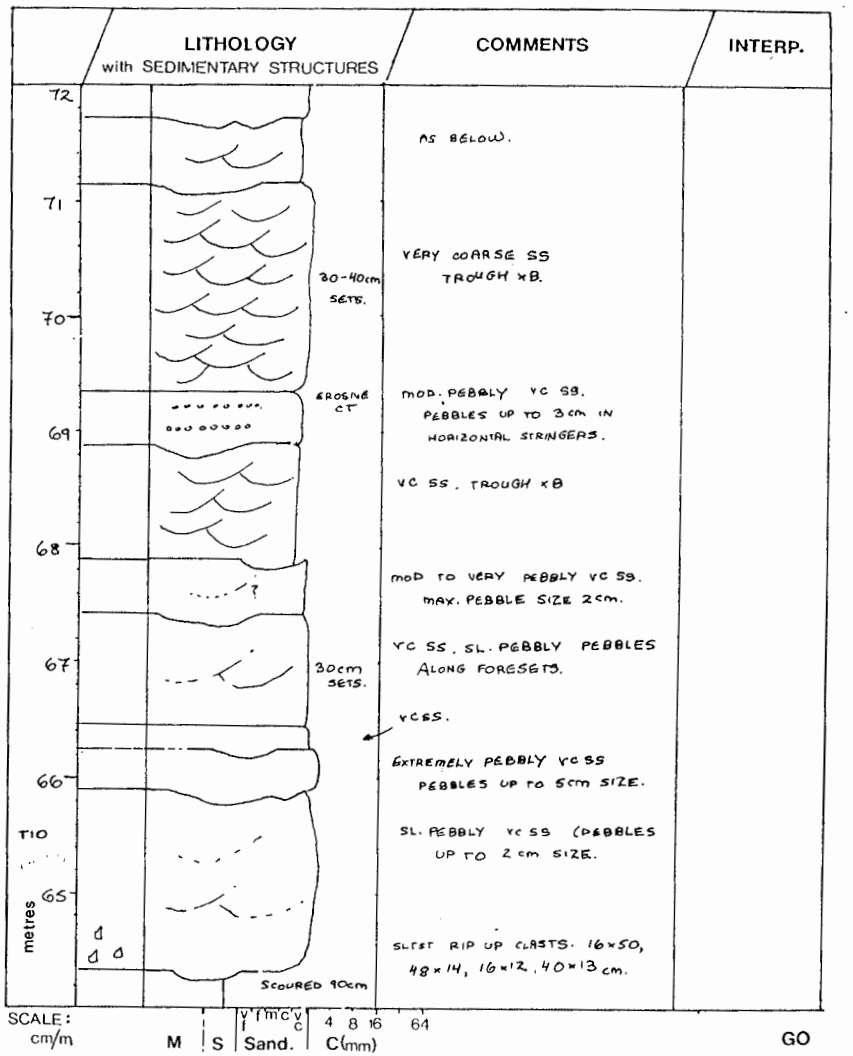
SECTION: T1 LOCATION: LLYN DULYN.



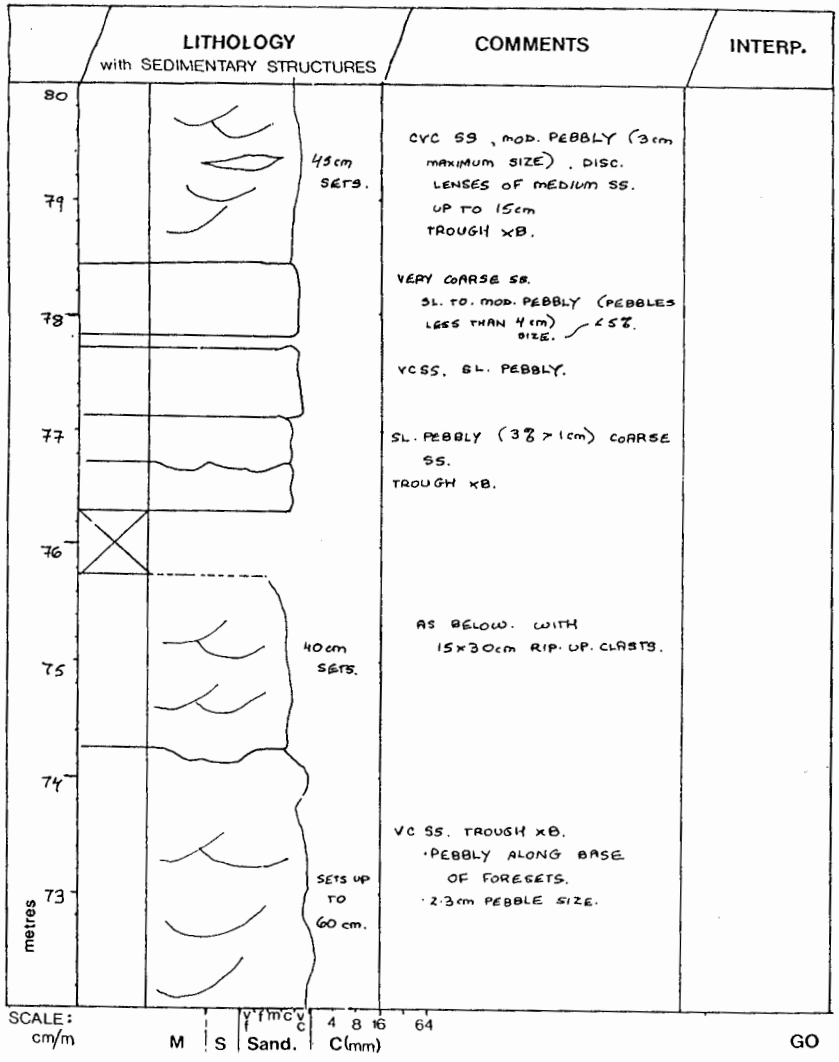
SECTION: T1 LOCATION: LLYN DULYN.



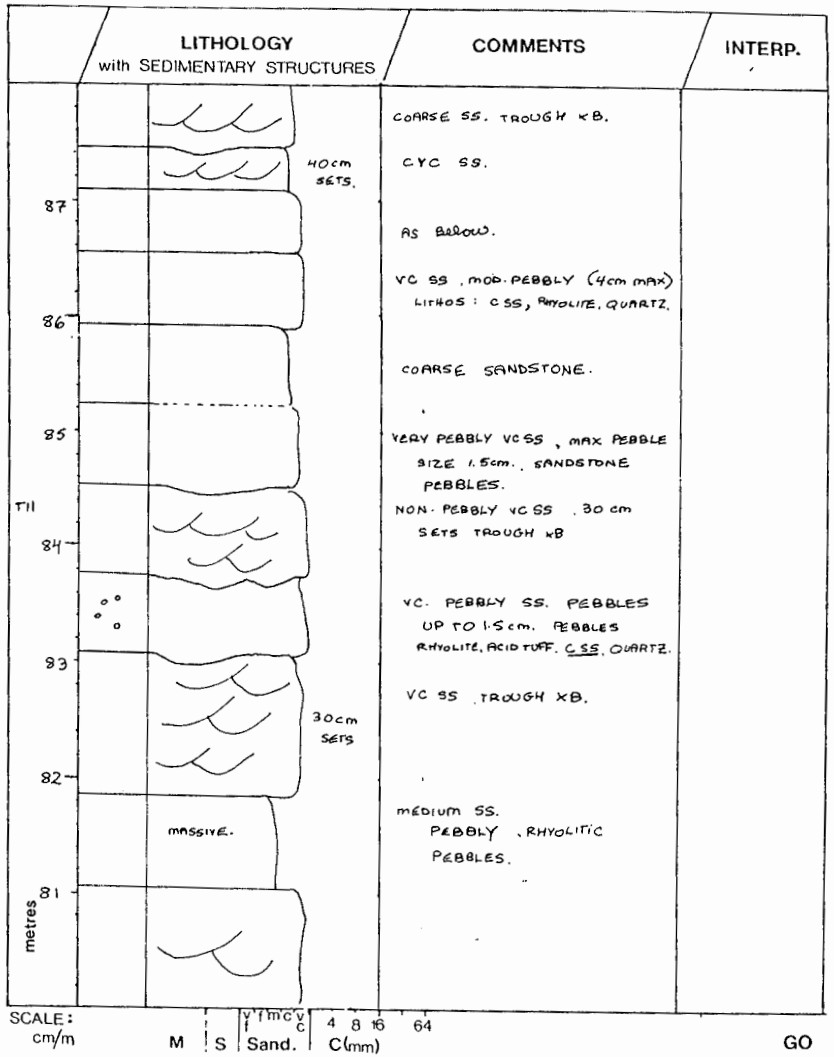
SECTION: T1 LOCATION: LLYN DULYN.



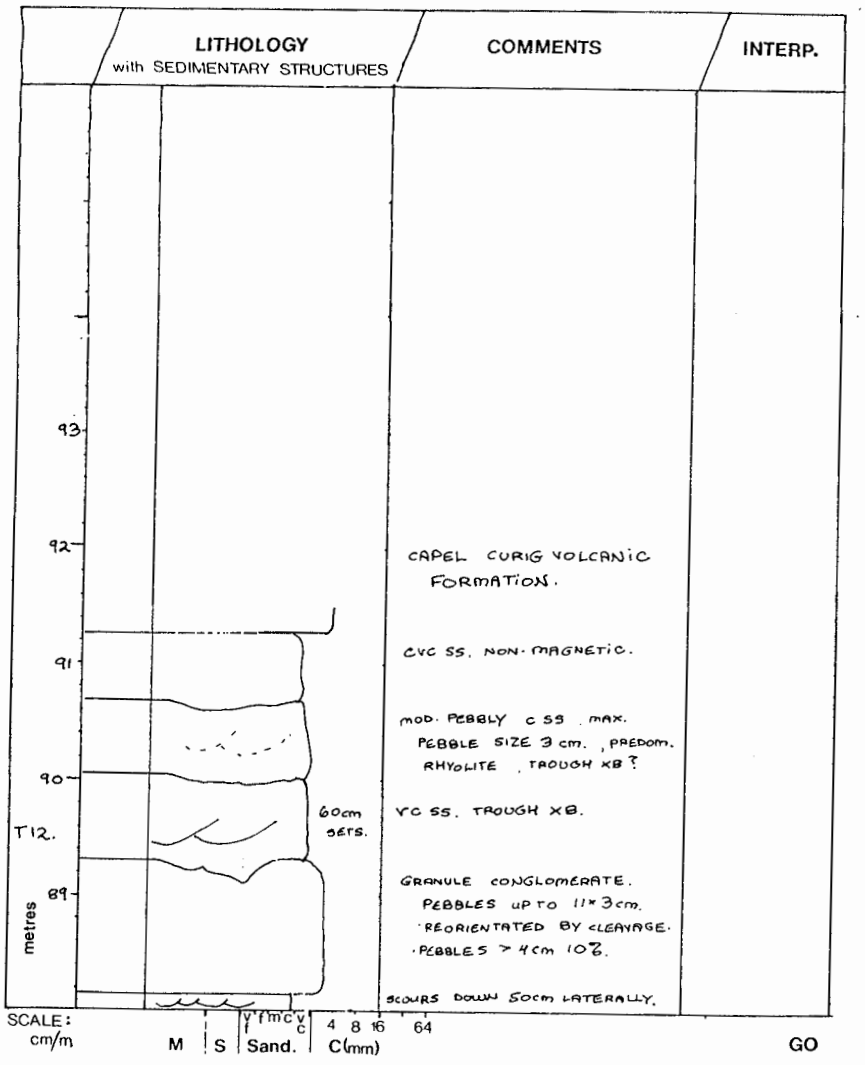
SECTION: T1 LOCATION: LLYN DULYN.



SECTION: T1 LOCATION: LLYN DULYN

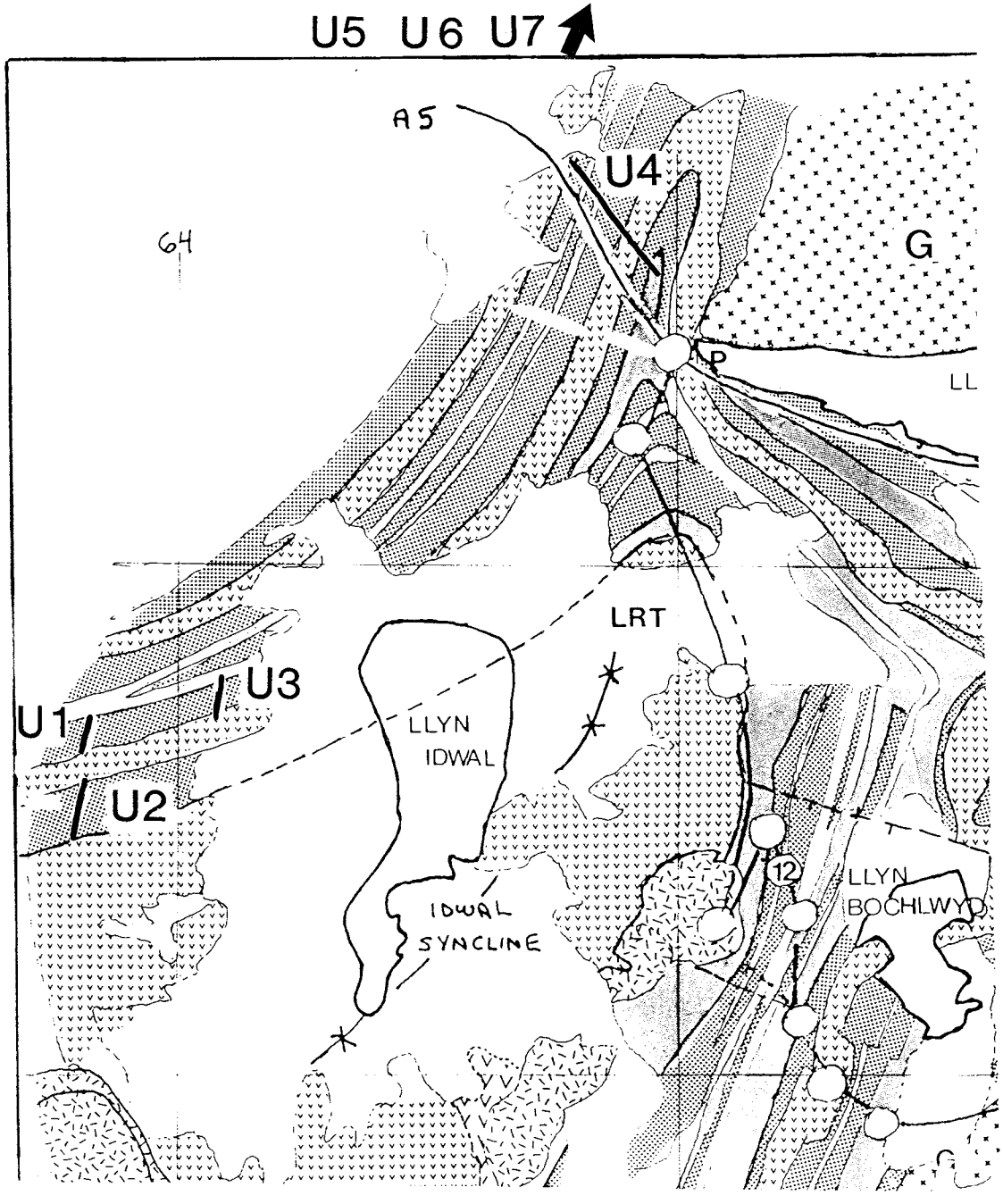


SECTION: T1 LOCATION: LLYN DULYN



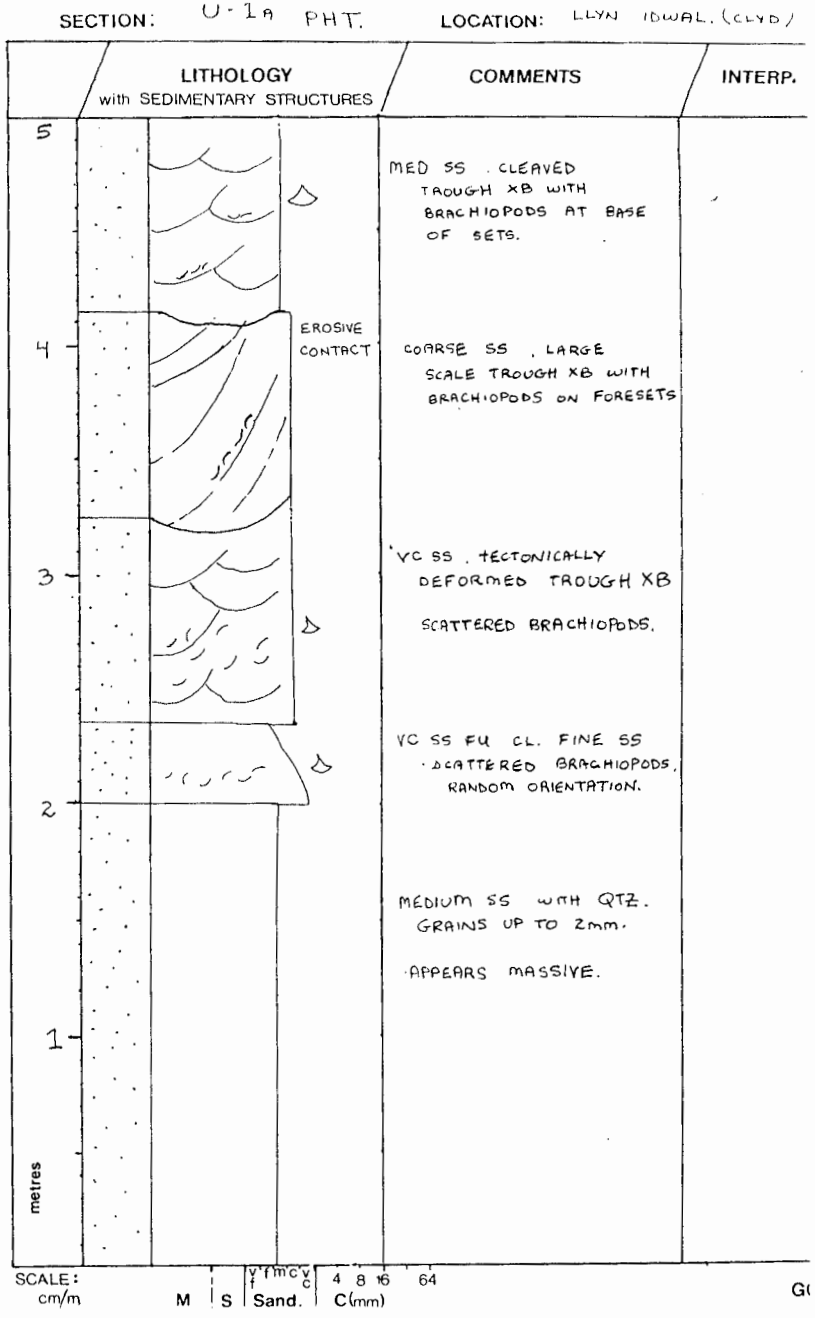
AREA U

LOCATION MAP.

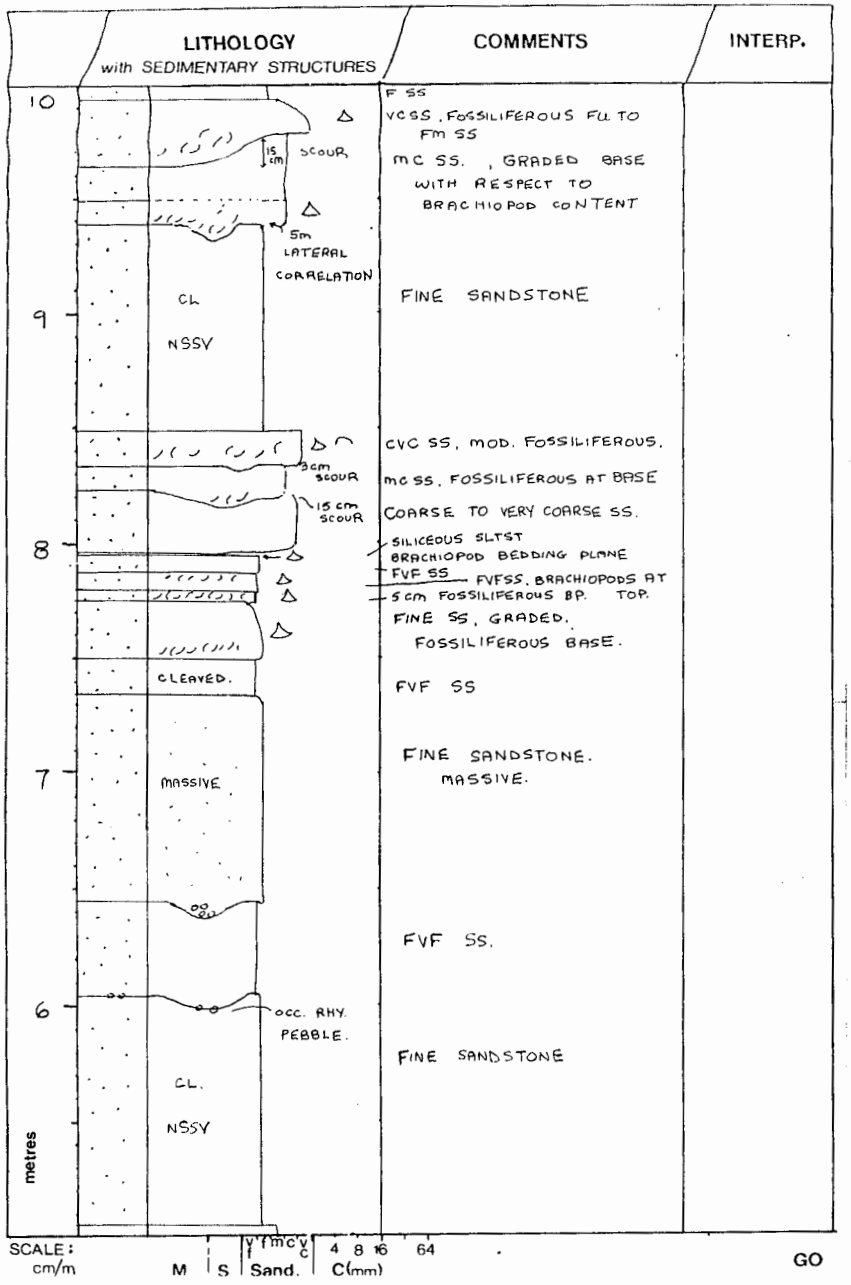


SECTION U1

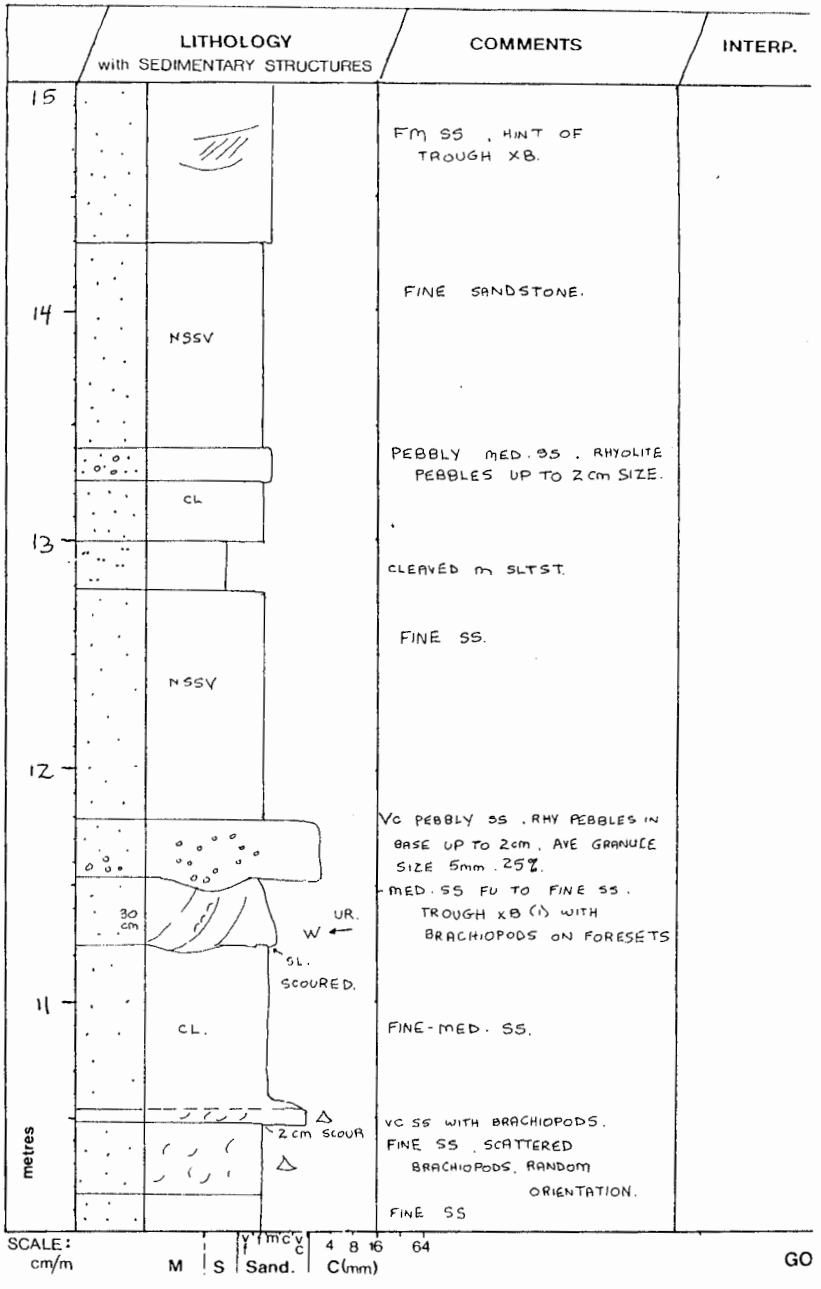
SECTION U1 LOCATION: Locate stream 100 m to east of Llyn Clyd. Section starts in siltstones along stream and proceeds to SSE to base of Pitts Head Tuff.



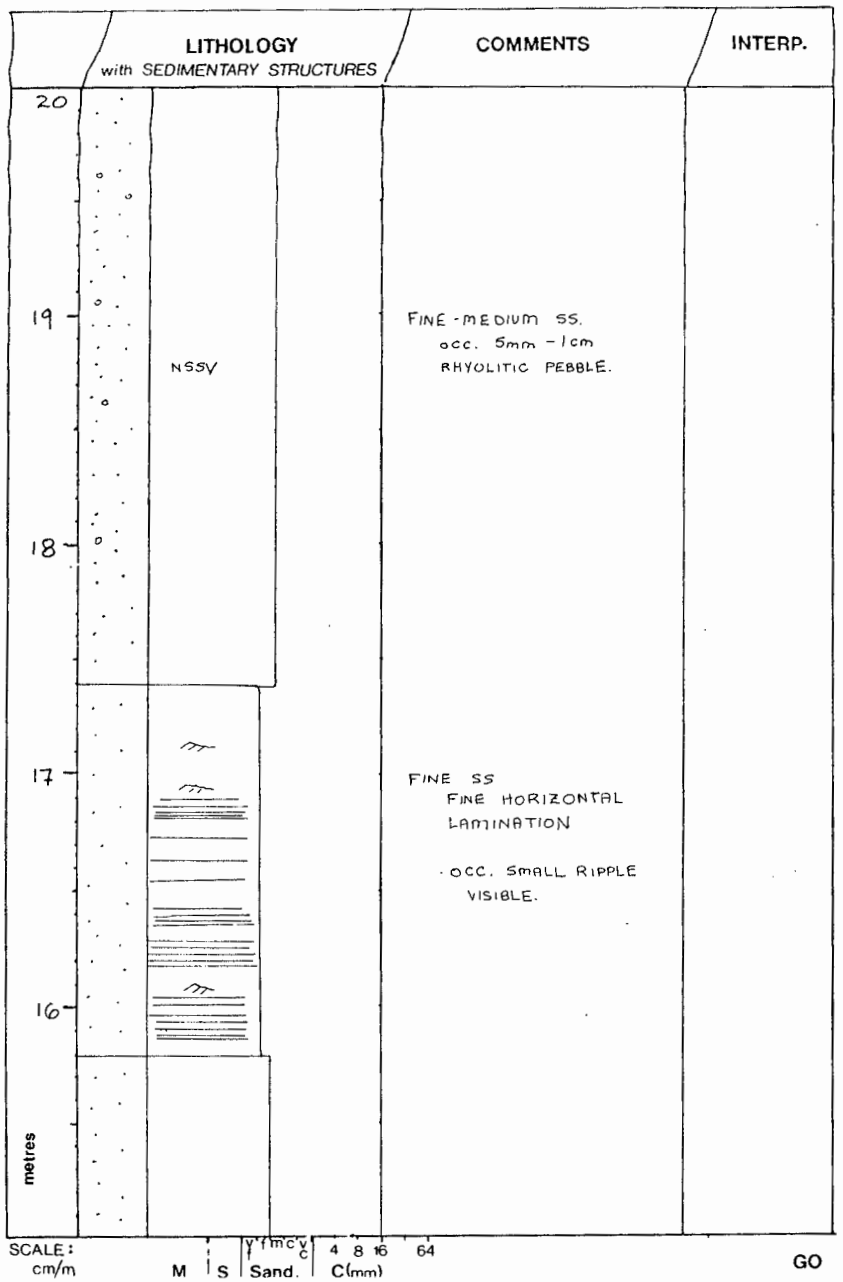
SECTION: U-1A LOCATION: LLYN IDWAL



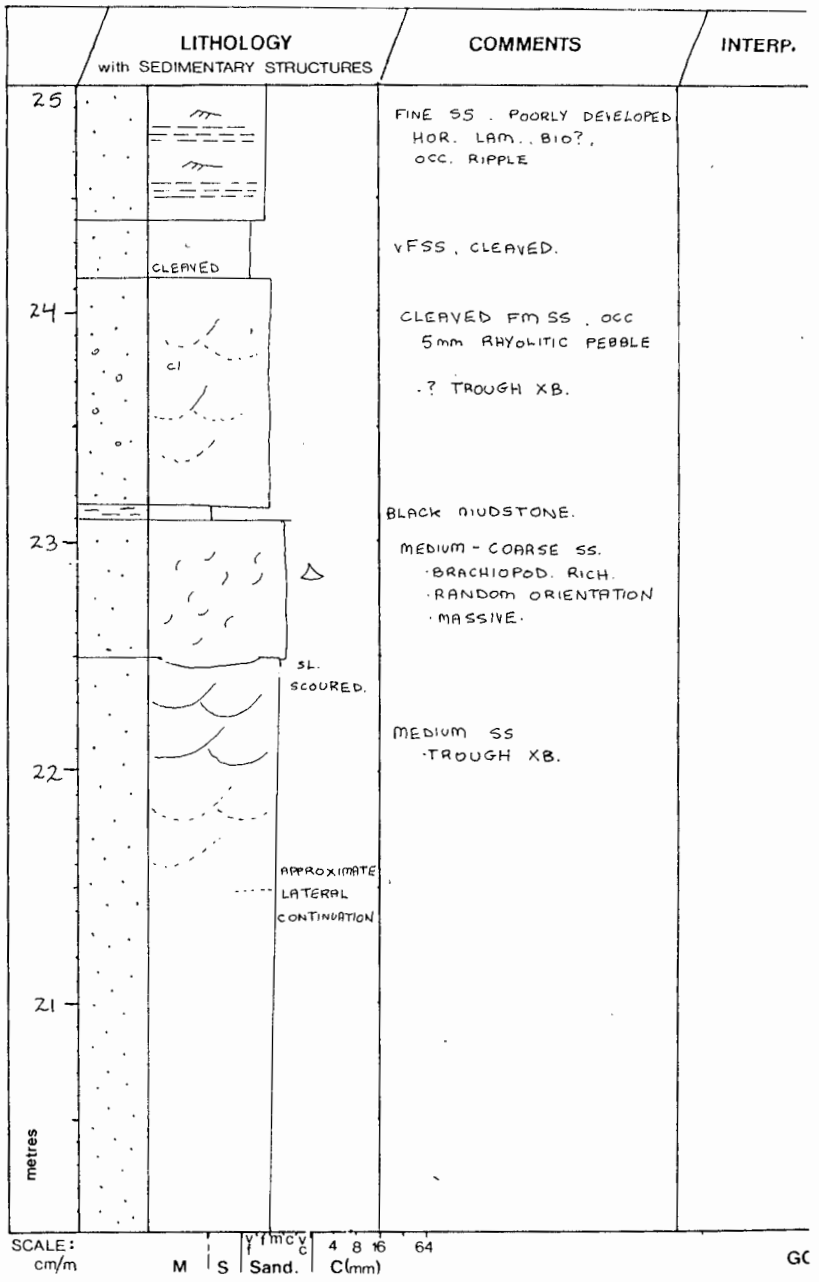
SECTION: U-1A LOCATION: LLYN IDWAL



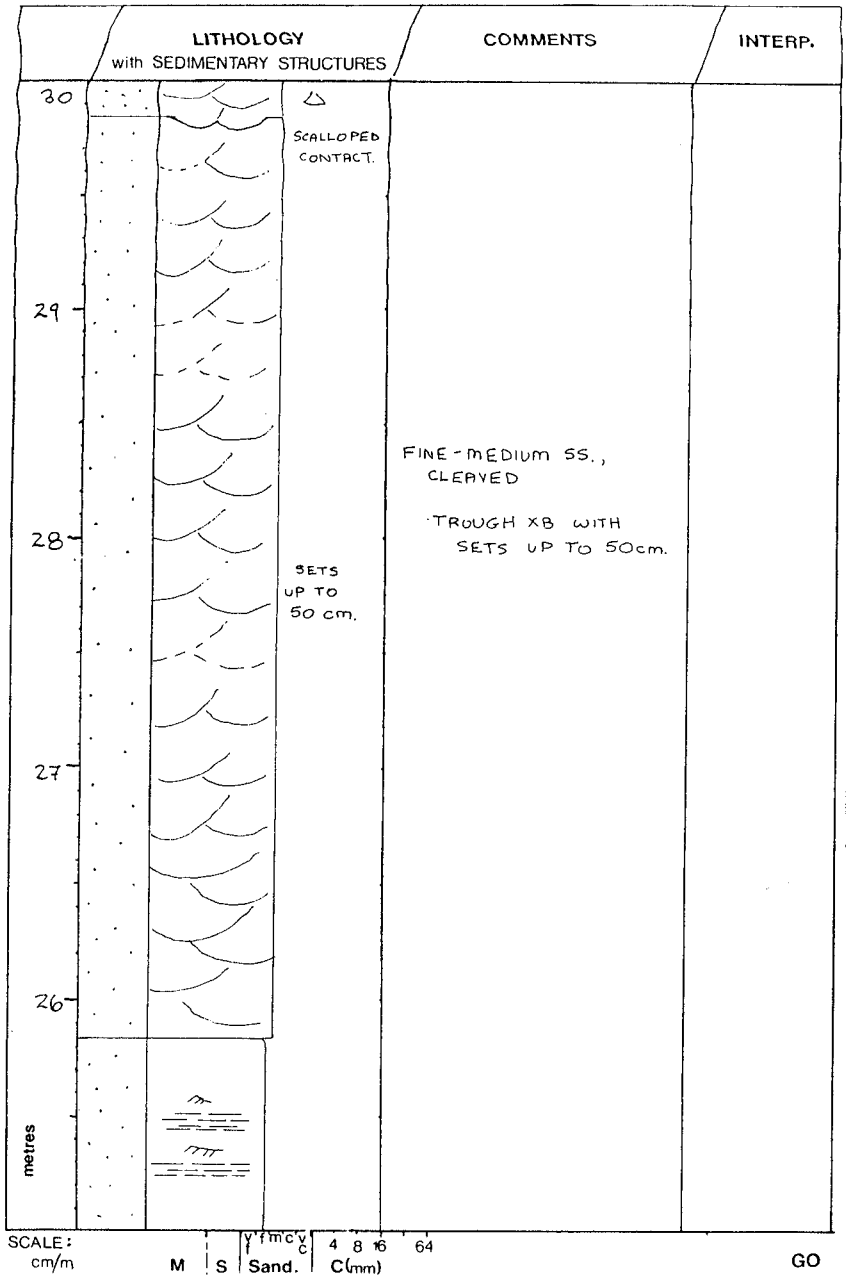
SECTION: U·1A LOCATION: LLYN IDWAL



SECTION: U·1 LOCATION: LLYN IDWAL.



SECTION: U-1 LOCATION: LLYN IDWAL



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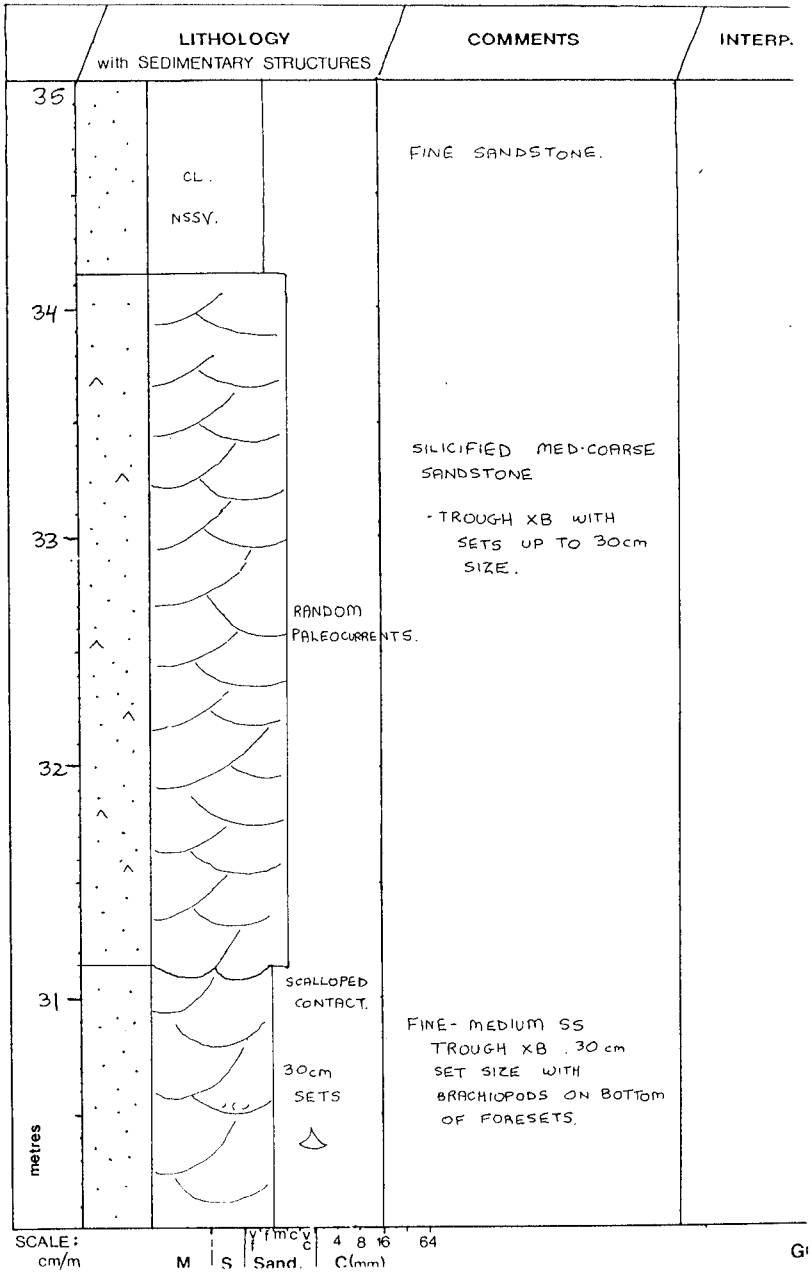
SECTION: U-1 LOCATION: LLYN IDWAL



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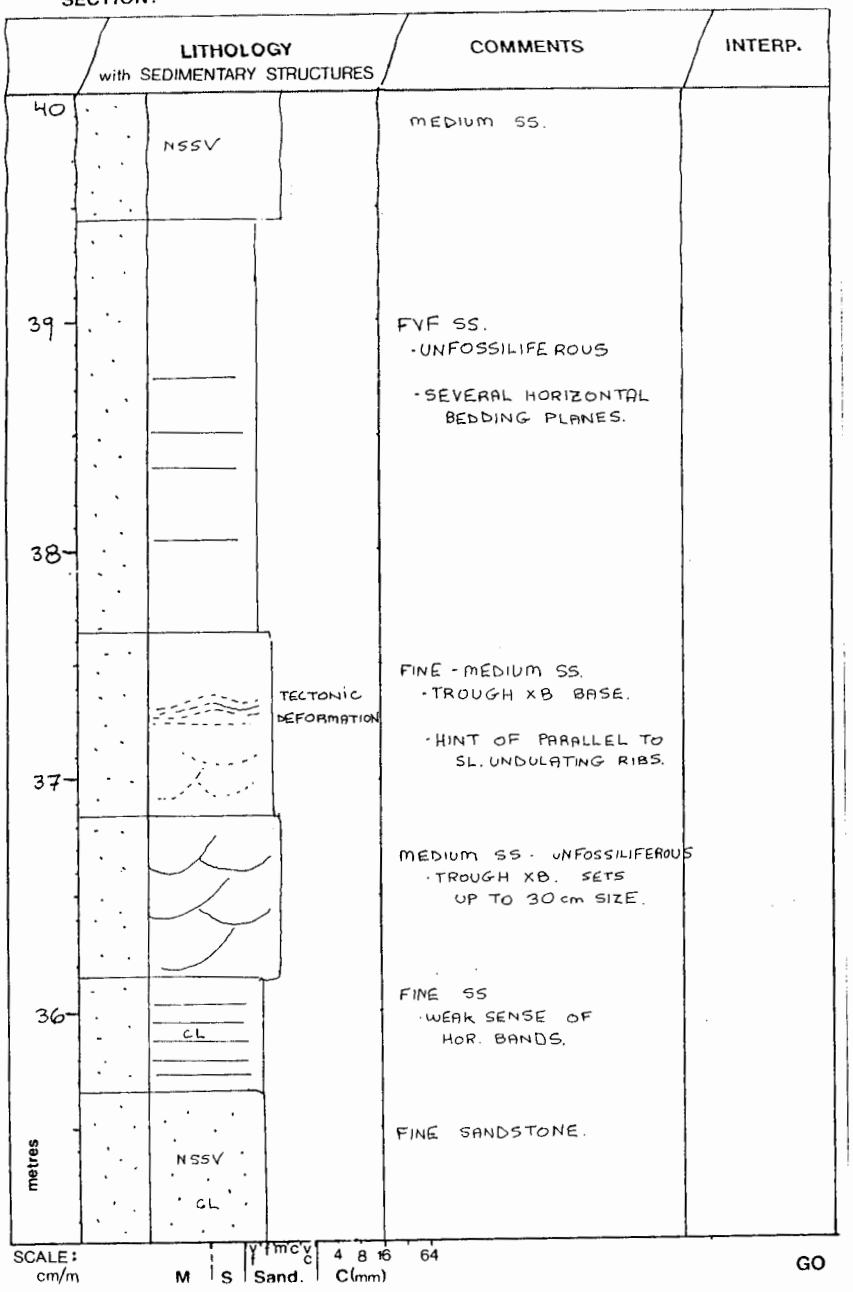
SECTION: U-1 LOCATION: LLYN IDWAL



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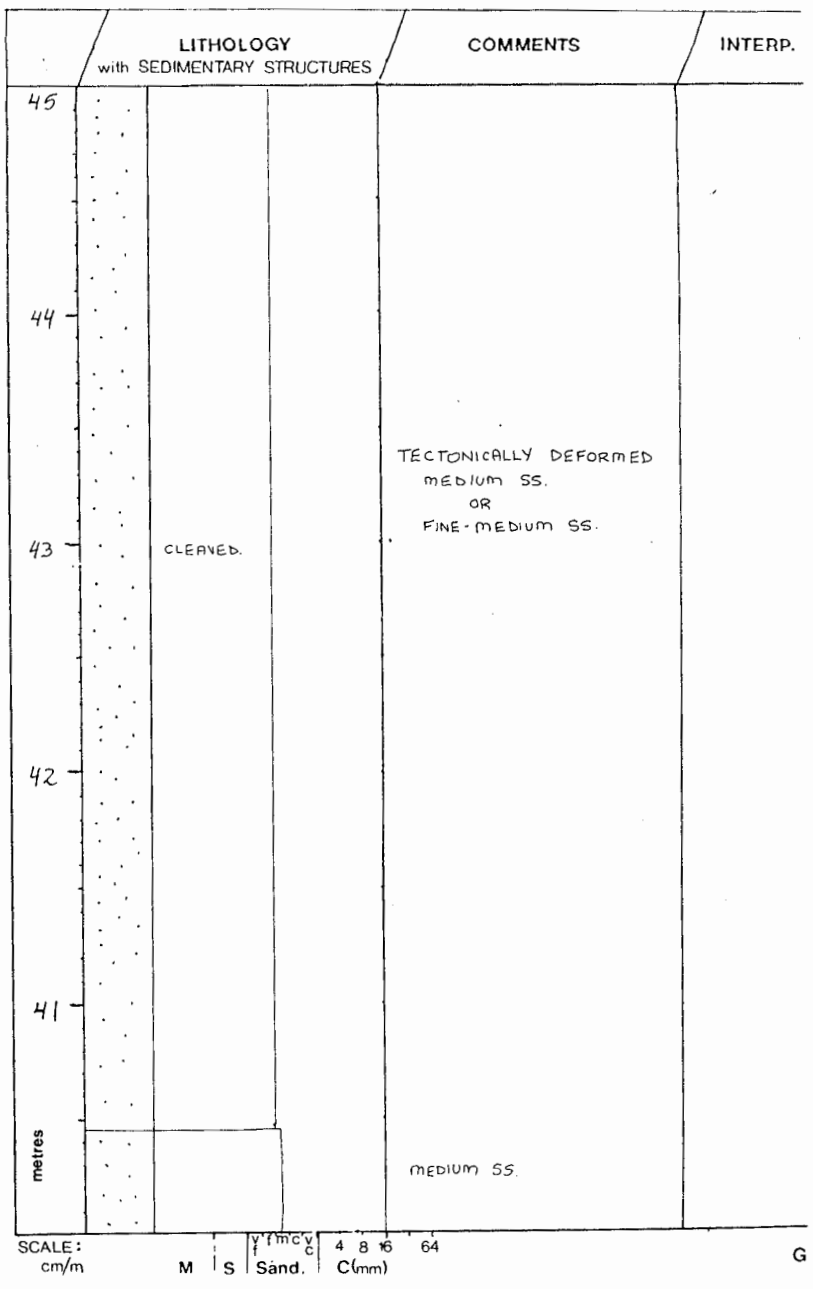
SECTION: U-1 LOCATION: LLYN IDWAL



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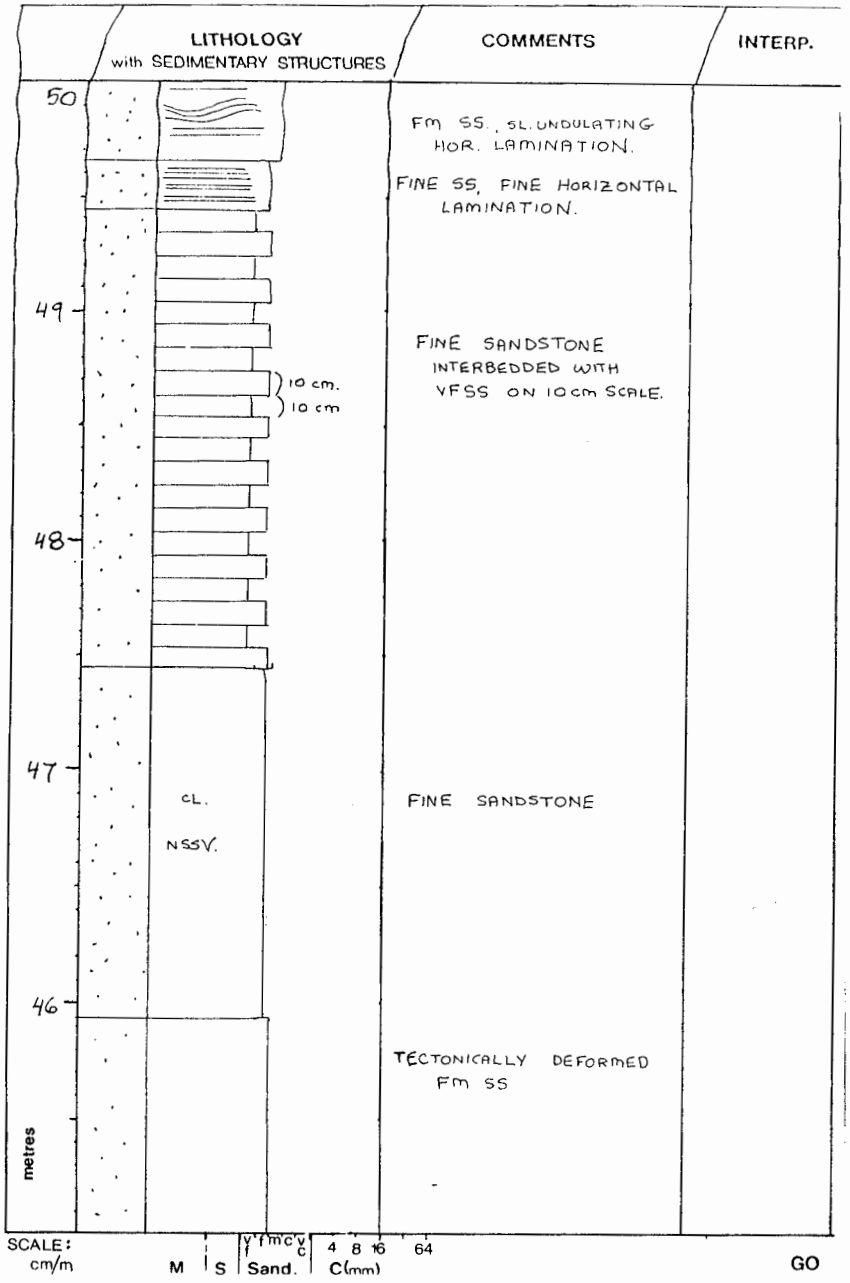
SECTION: U-1 LOCATION: LLYN IDWAL



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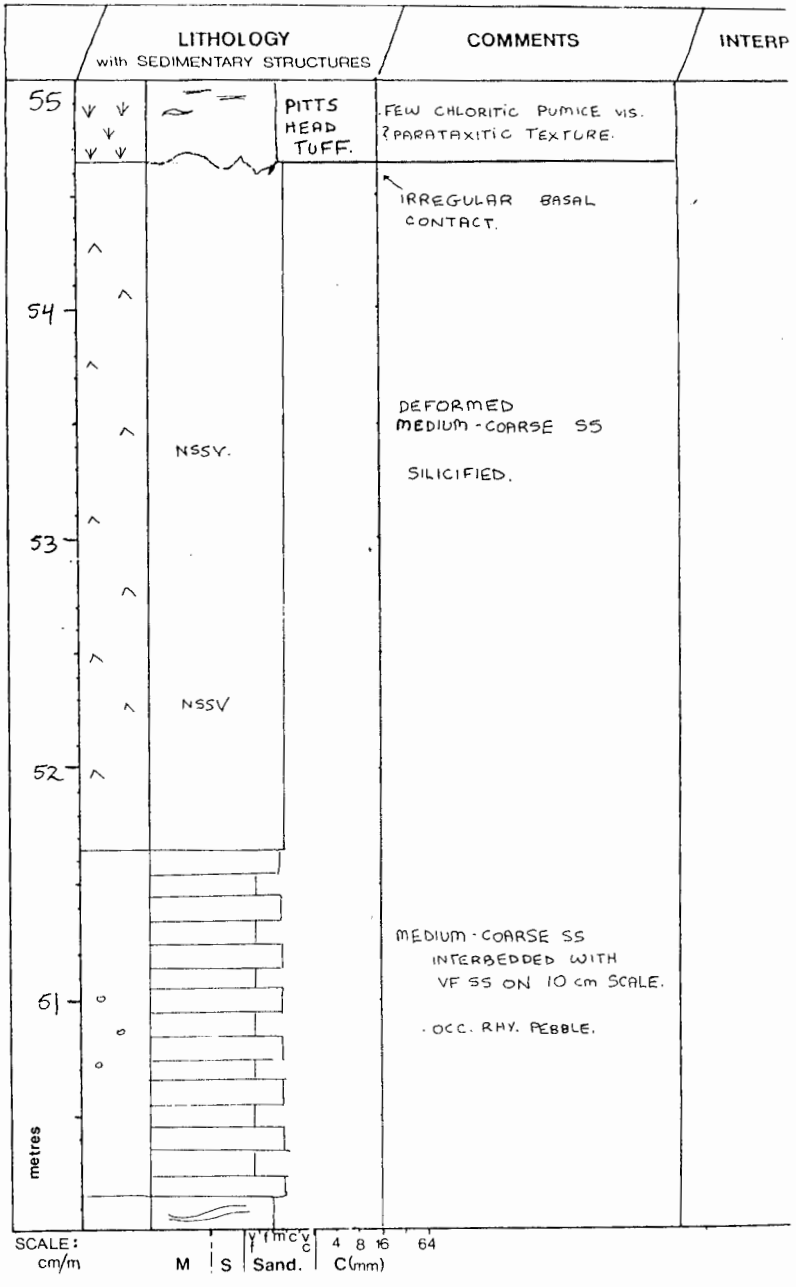
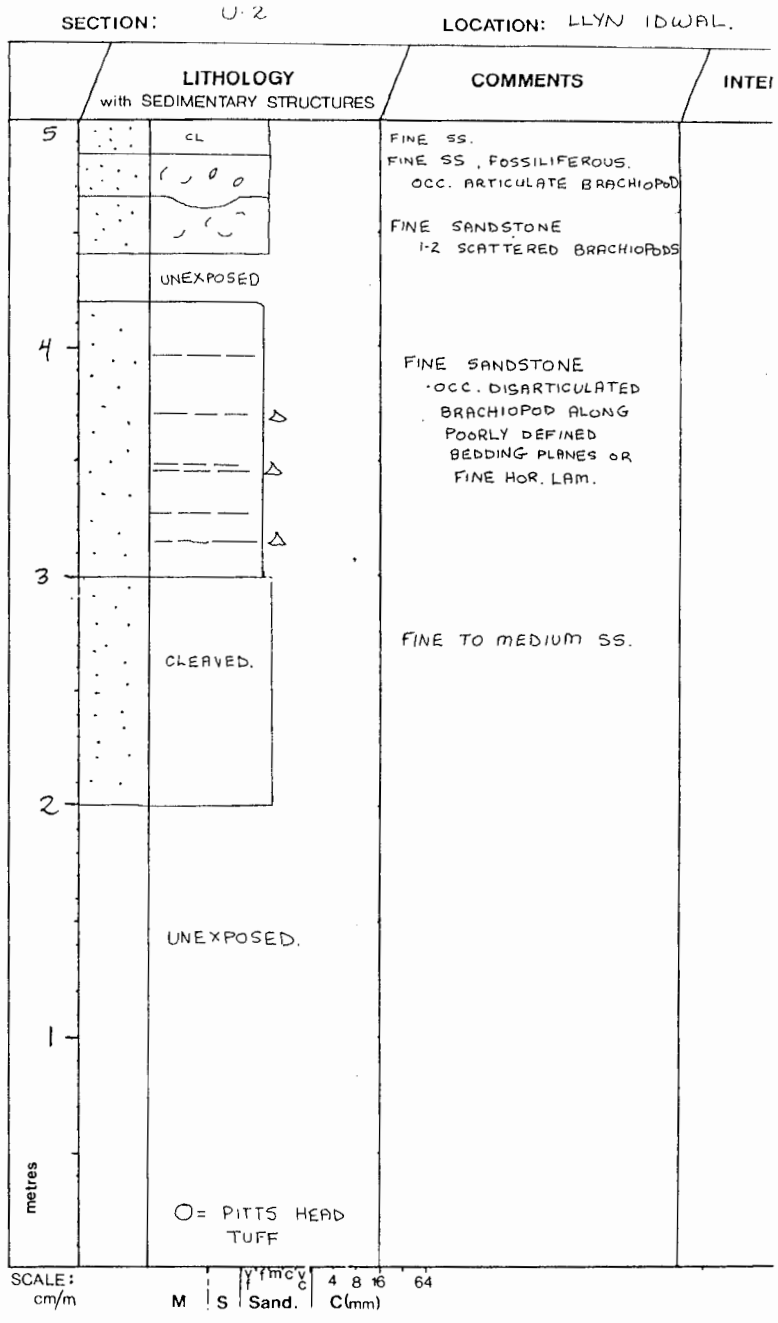
SECTION: U-1 LOCATION: LLYN IDWAL

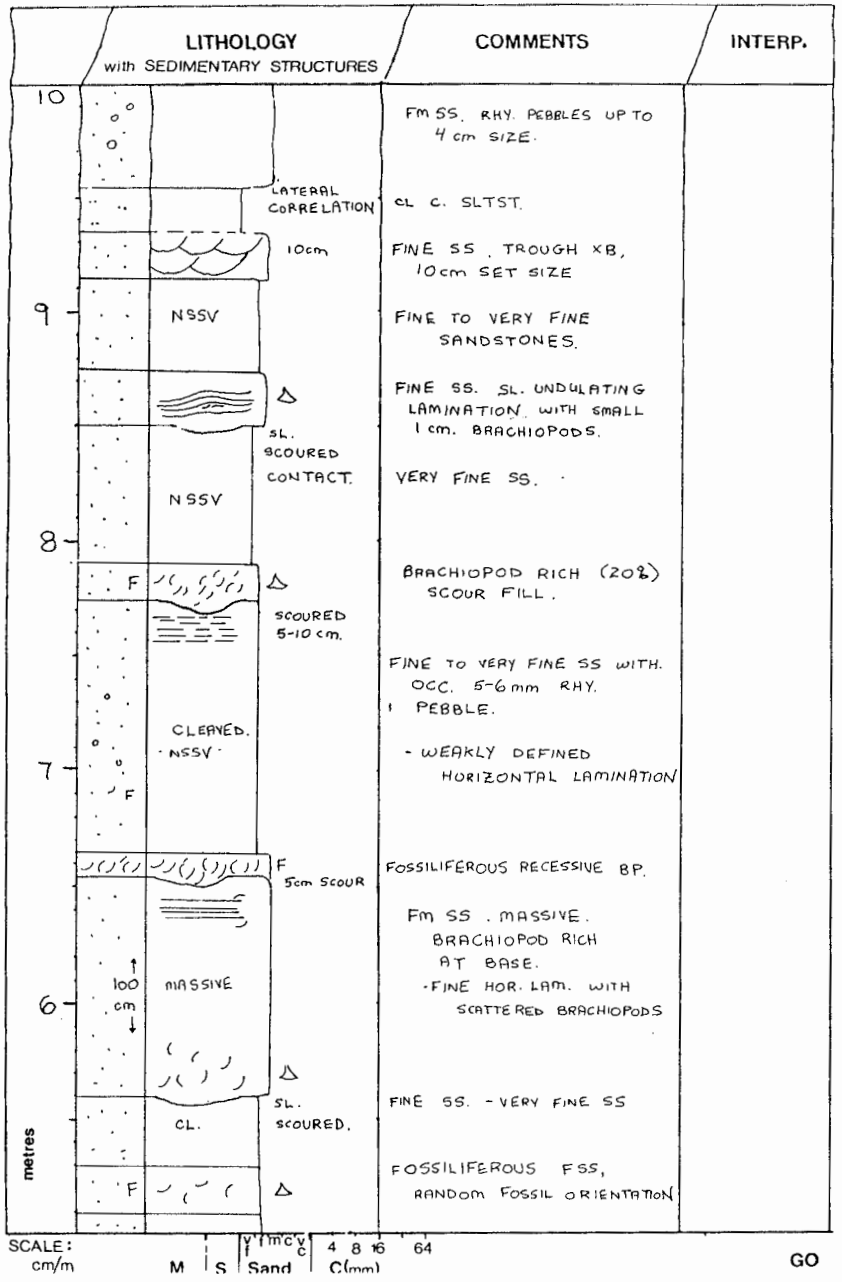


SECTION U2

SECTION U2 LOCATION: Continuation of section U1 from top of Pitts Head Tuff to base of Lower Rhyolitic Tuff.



SECTION: LOCATION:



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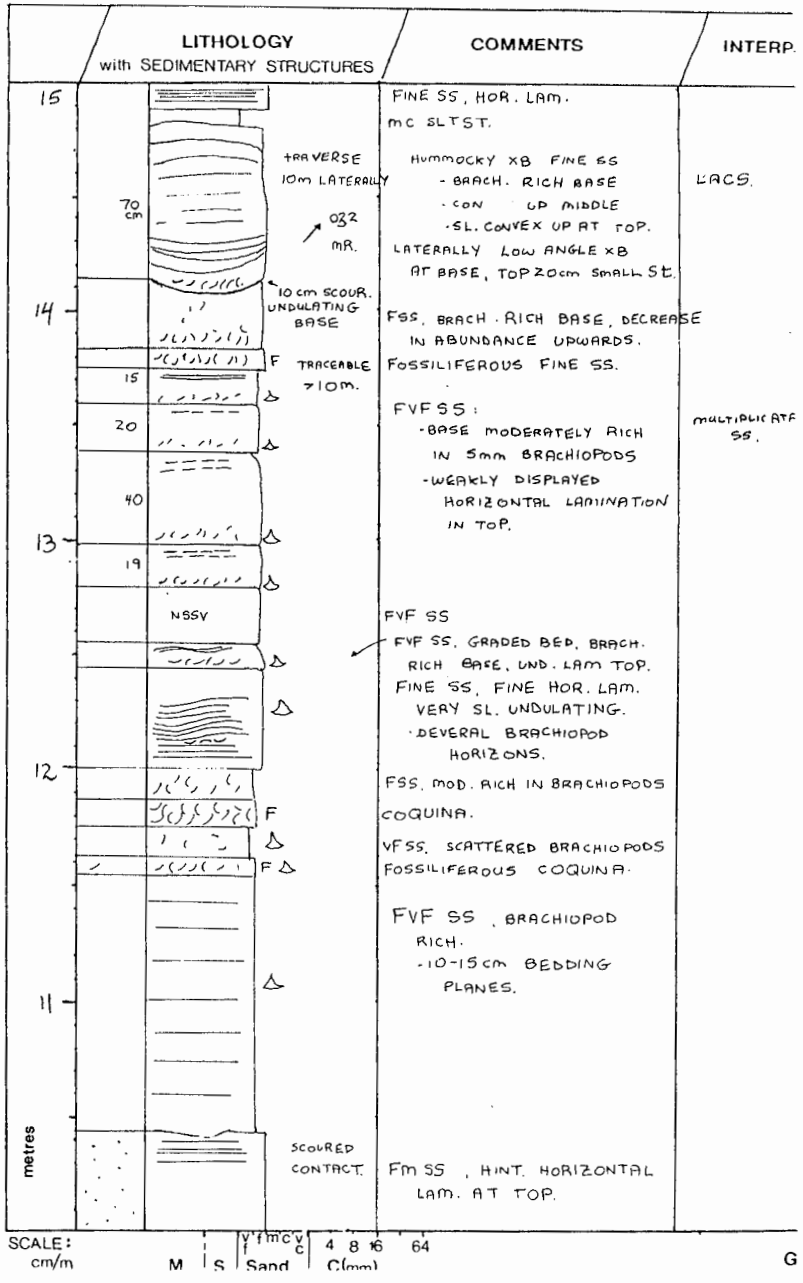
SECTION: U-2 LOCATION: LLYN IDWAL



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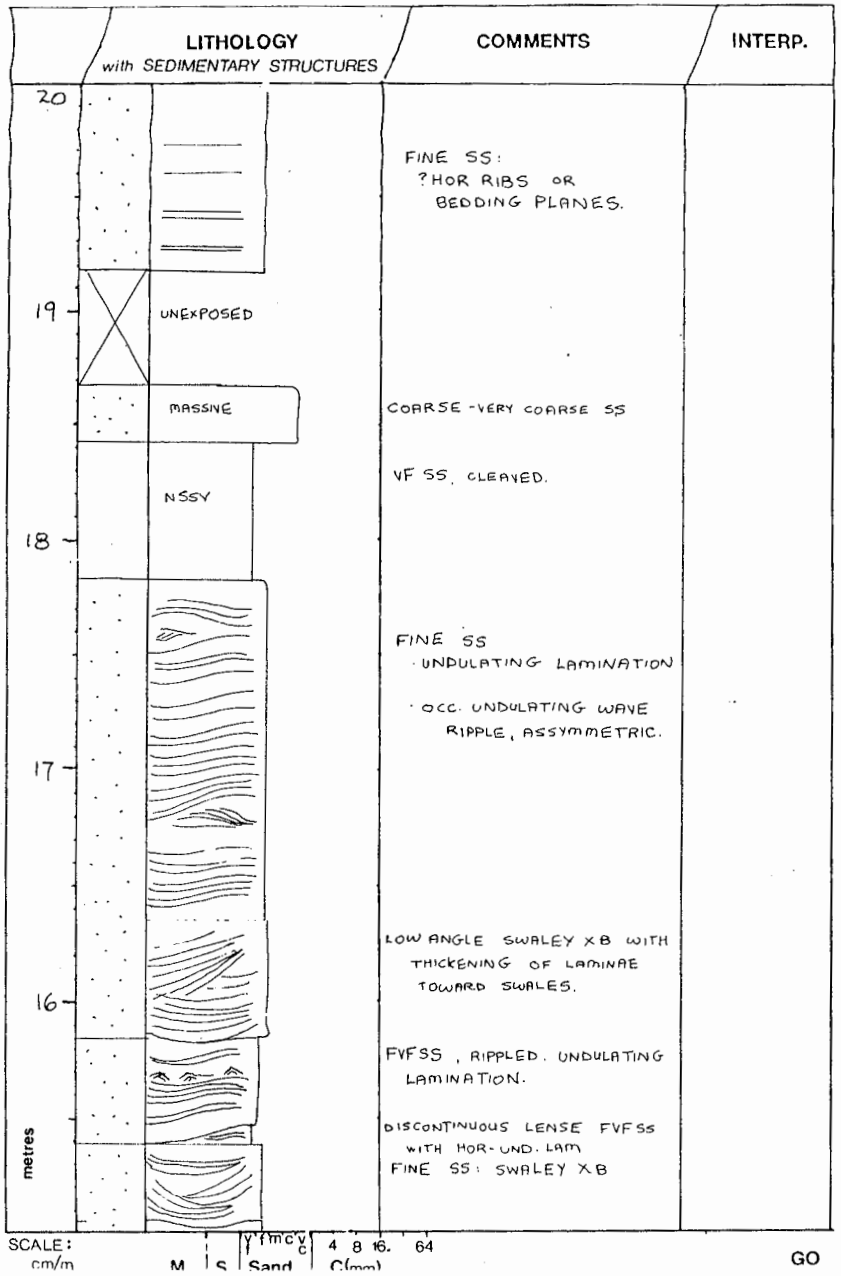
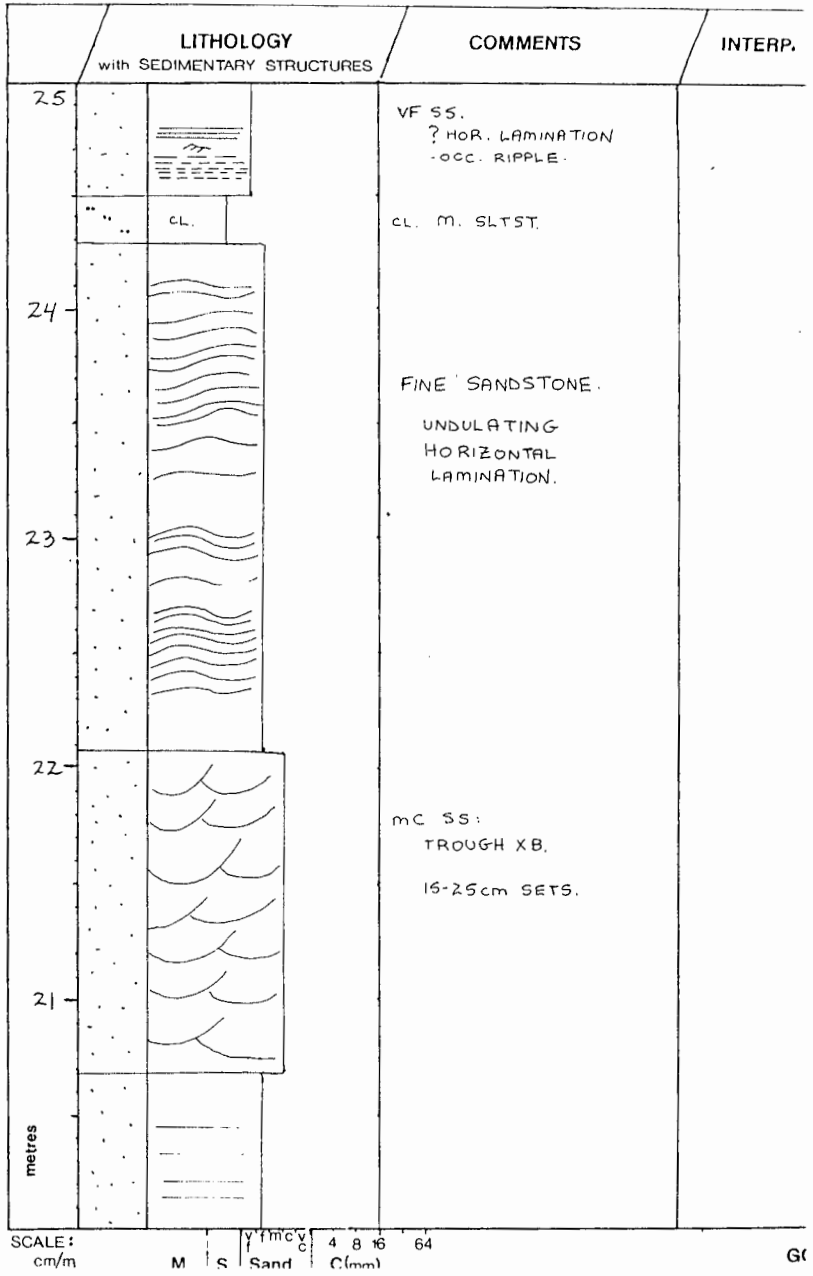
SECTION: U·2 LOCATION: LLYN IDWAL.



GO

SECTION: U·2 LOCATION: LLYN IDWAL



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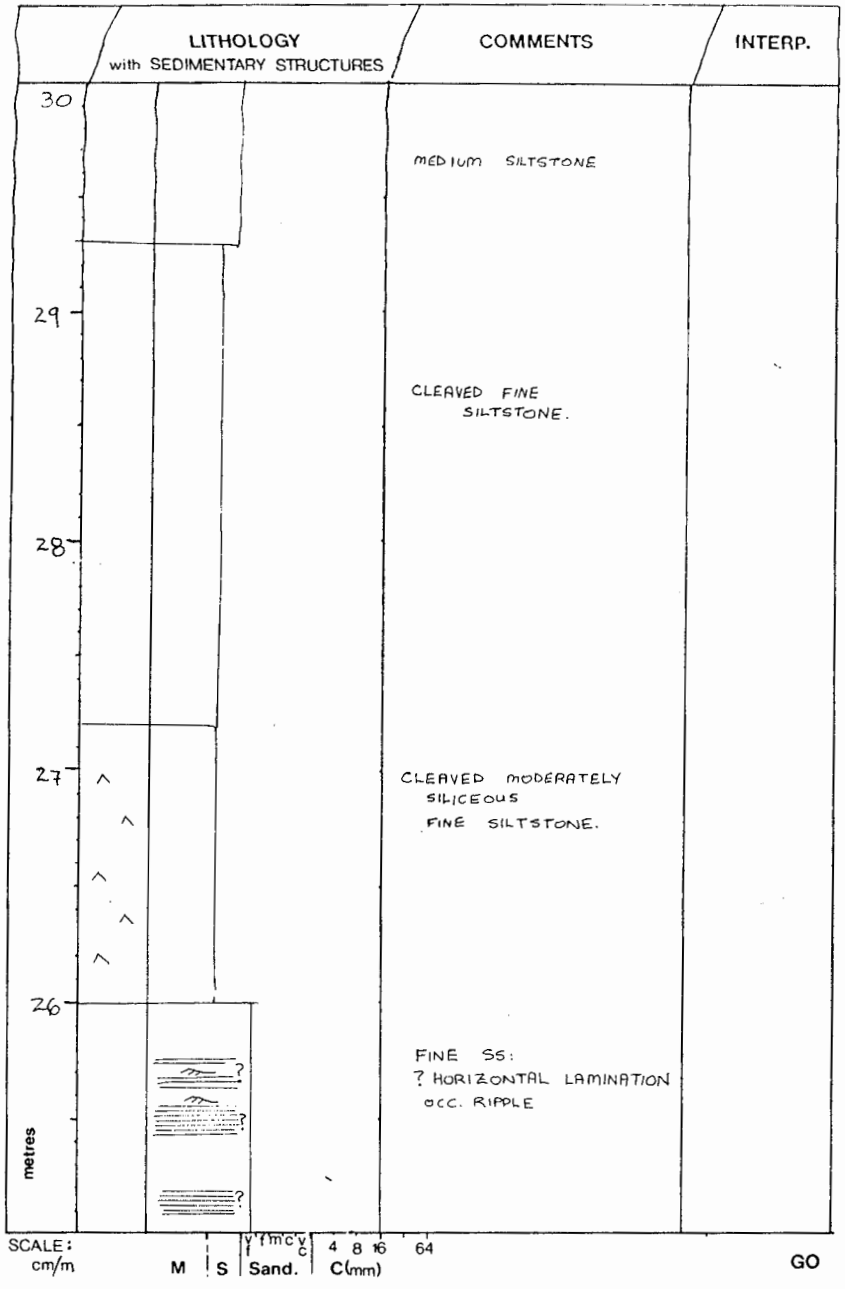
SECTION: [illegible] LOCATION: [illegible]



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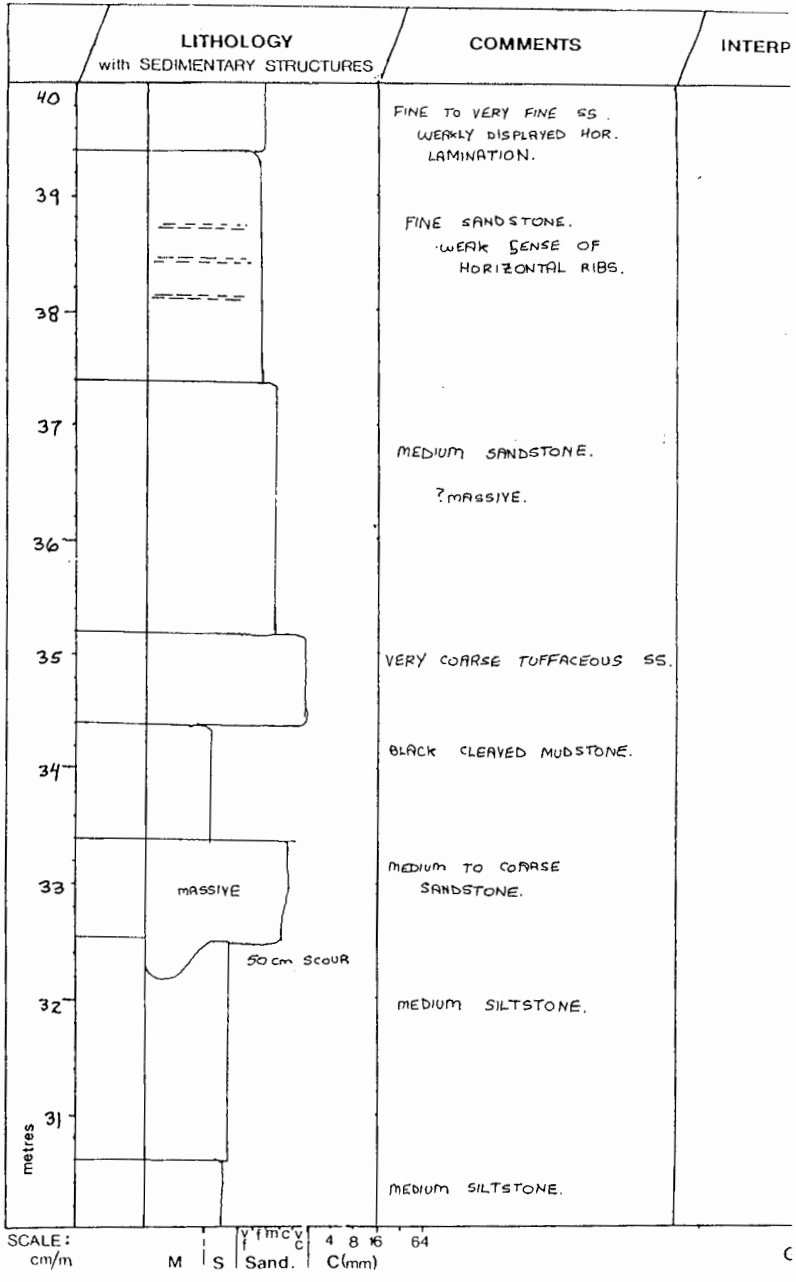
SECTION: U·2 LOCATION: LLYN IDWAL



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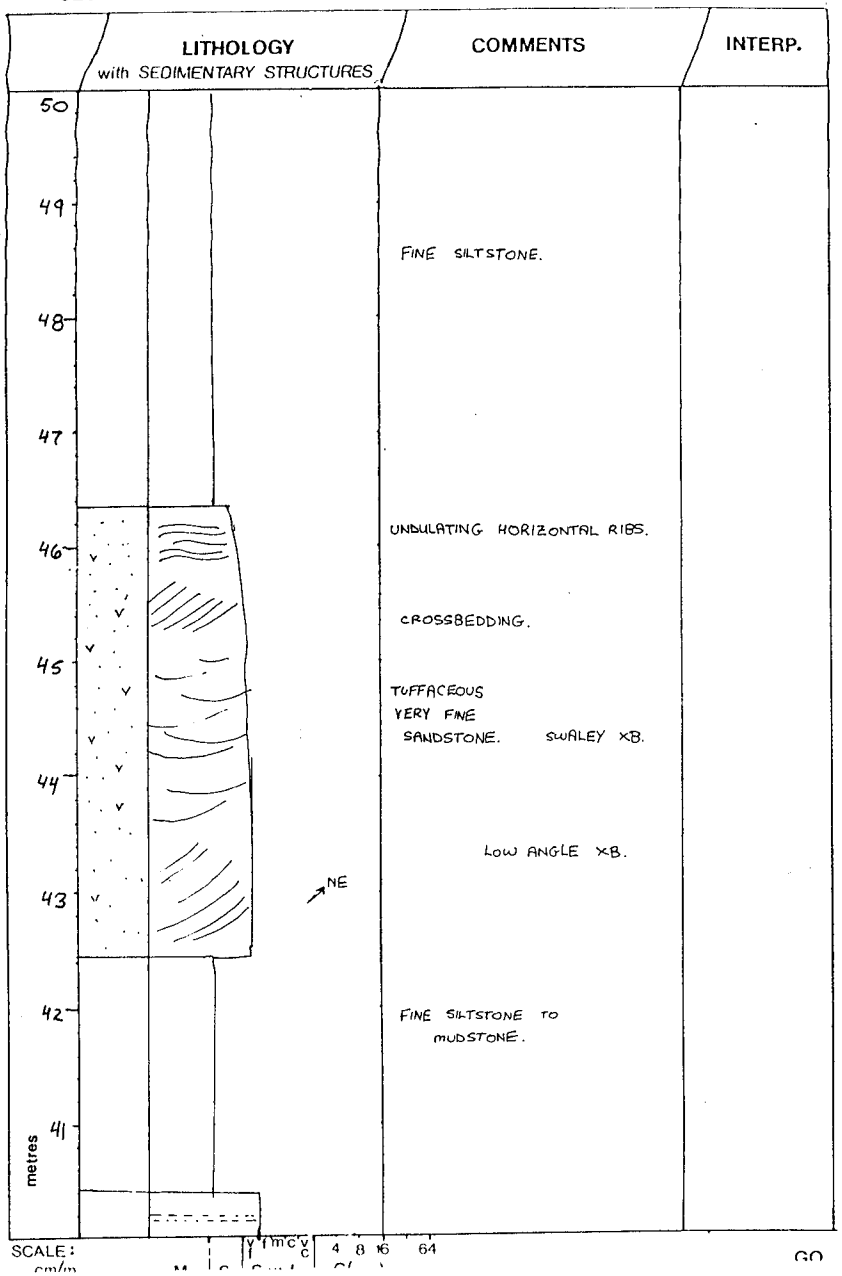
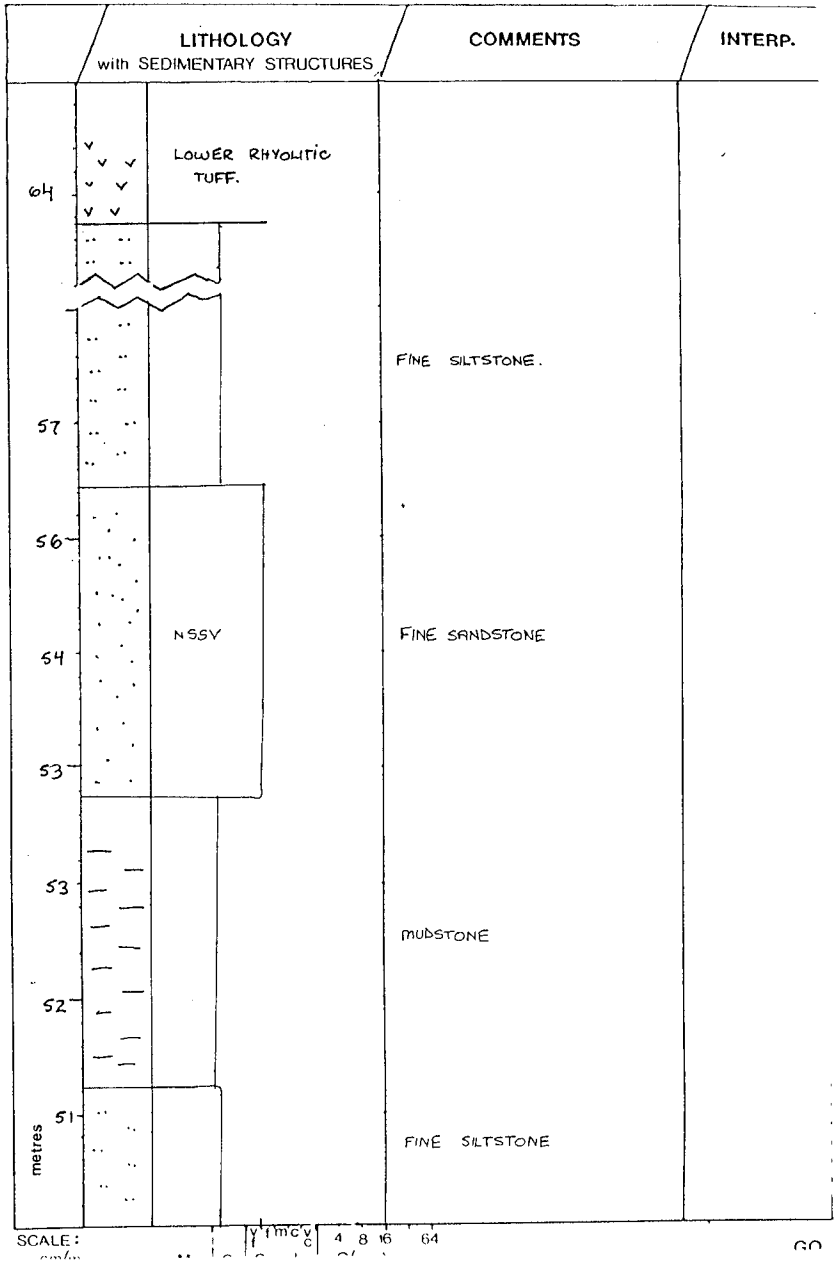
SECTION: U·2 LOCATION: LLYN IDWAL.

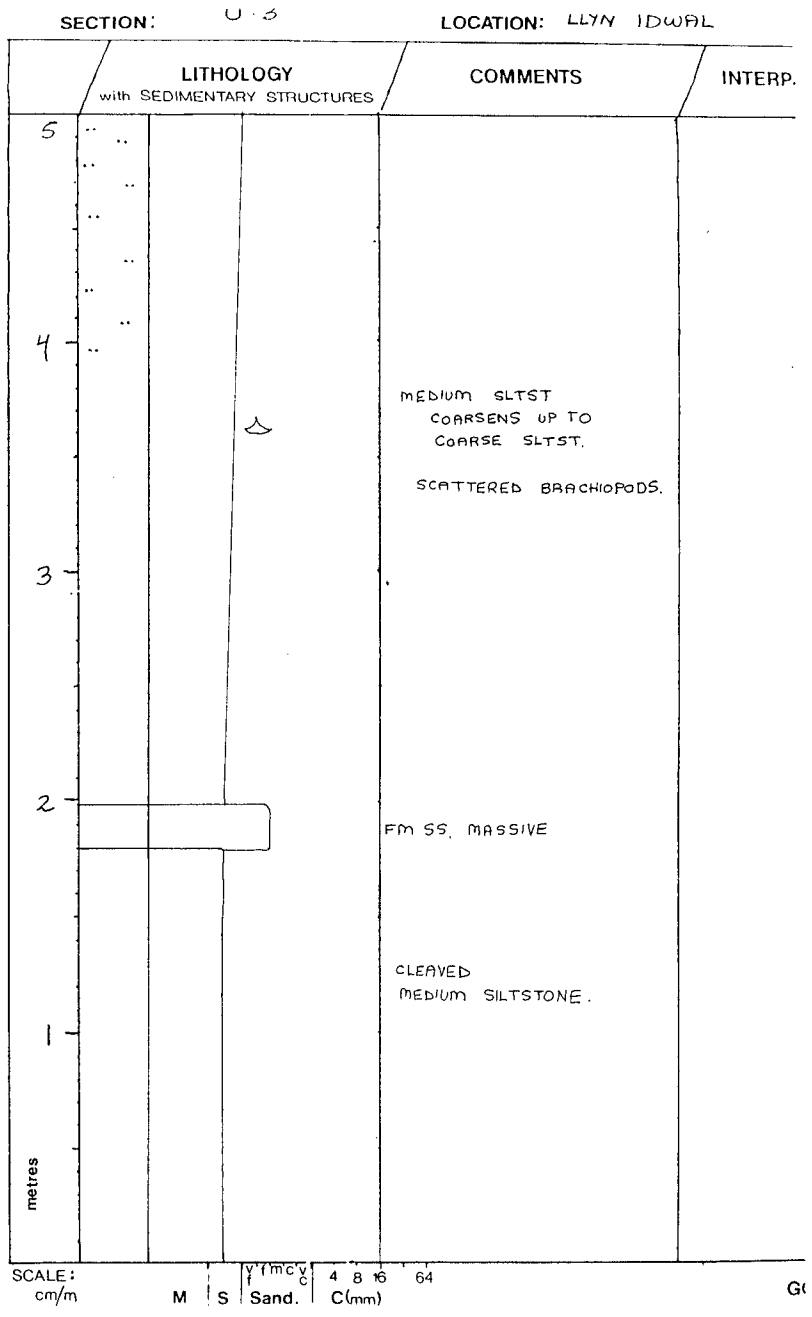


SECTION: U·2 LOCATION: LLYN IDWAL.

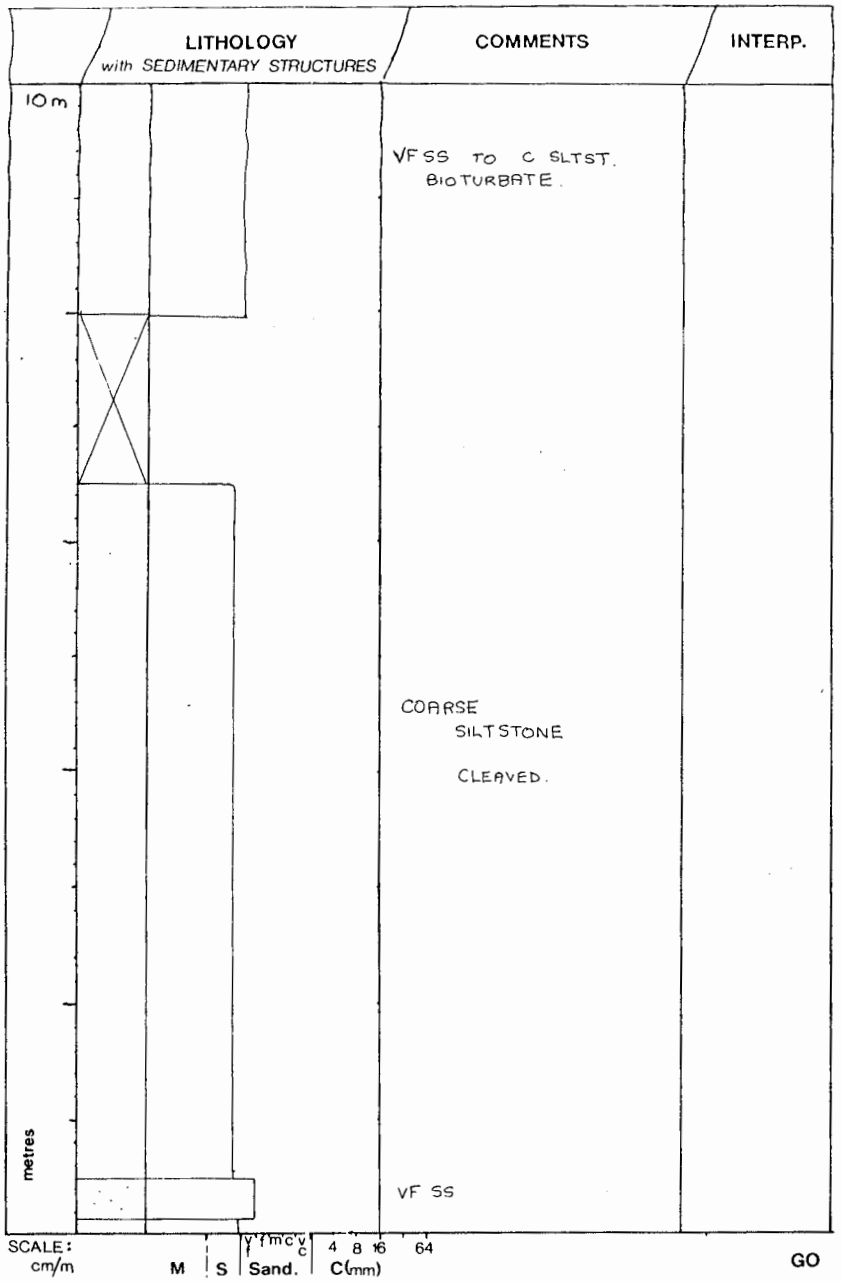


SECTION U3

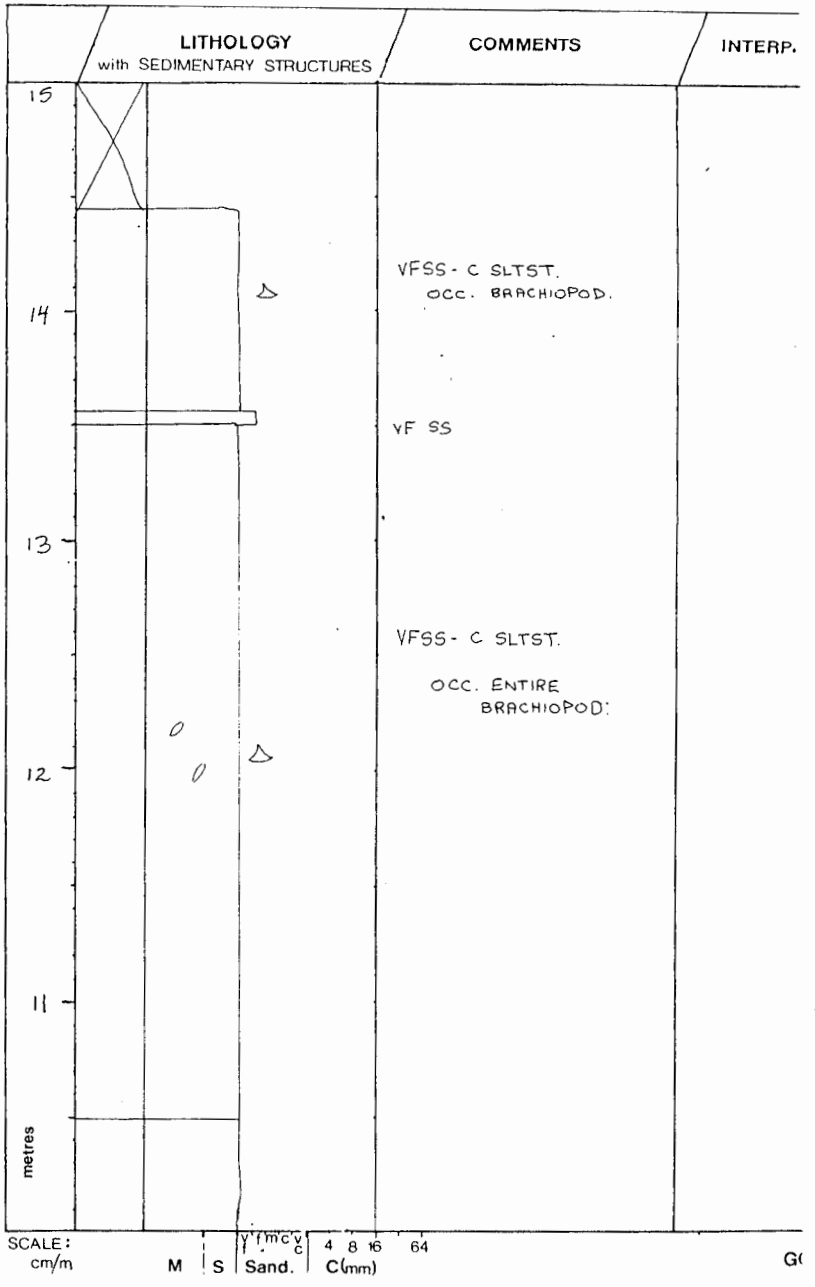
SECTION U3 LOCATION: Section along lowest crags to west of Llyn Idwal. Section starts at stream draining Llyn Clyd and proceeds south to base of Pitts Head Tuff.



SECTION: U-3 LOCATION: LLYN IDWAL



SECTION: LOCATION:



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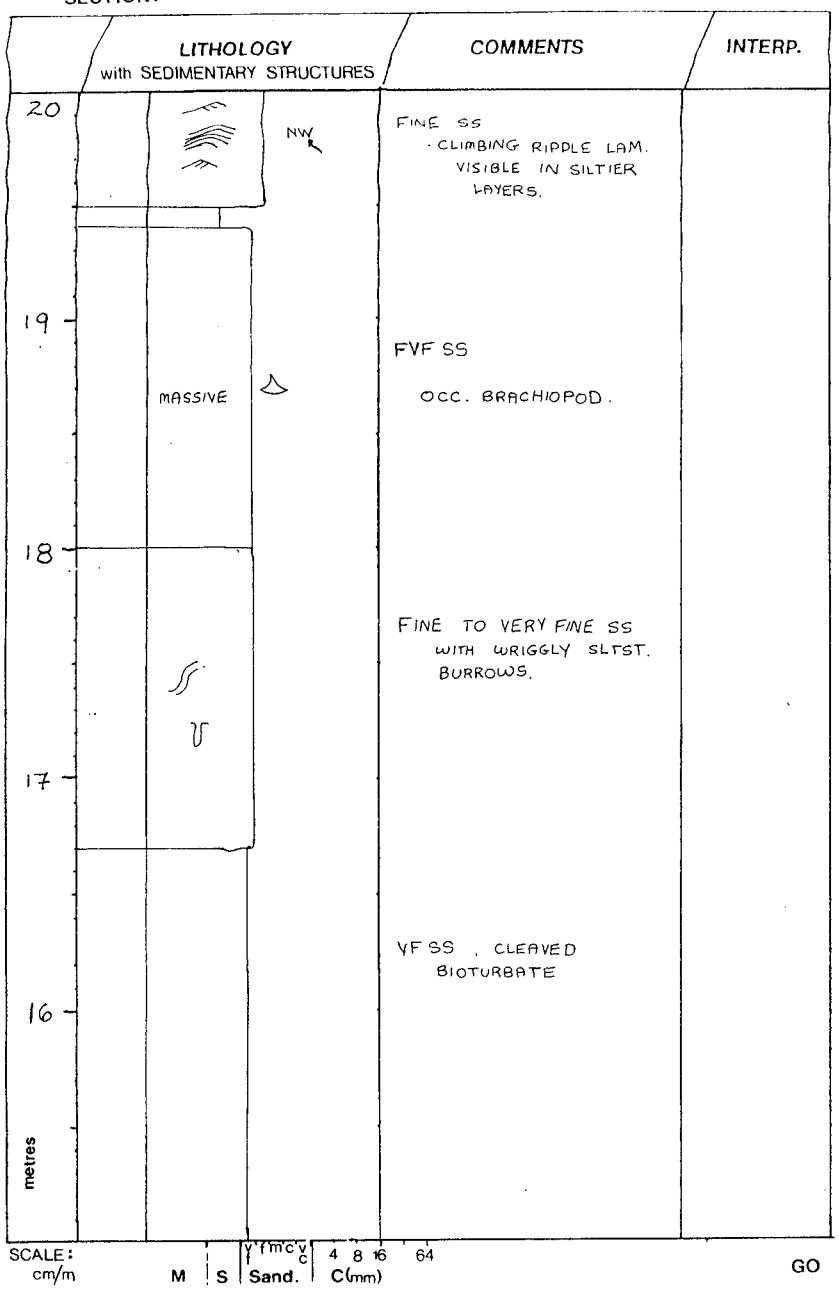

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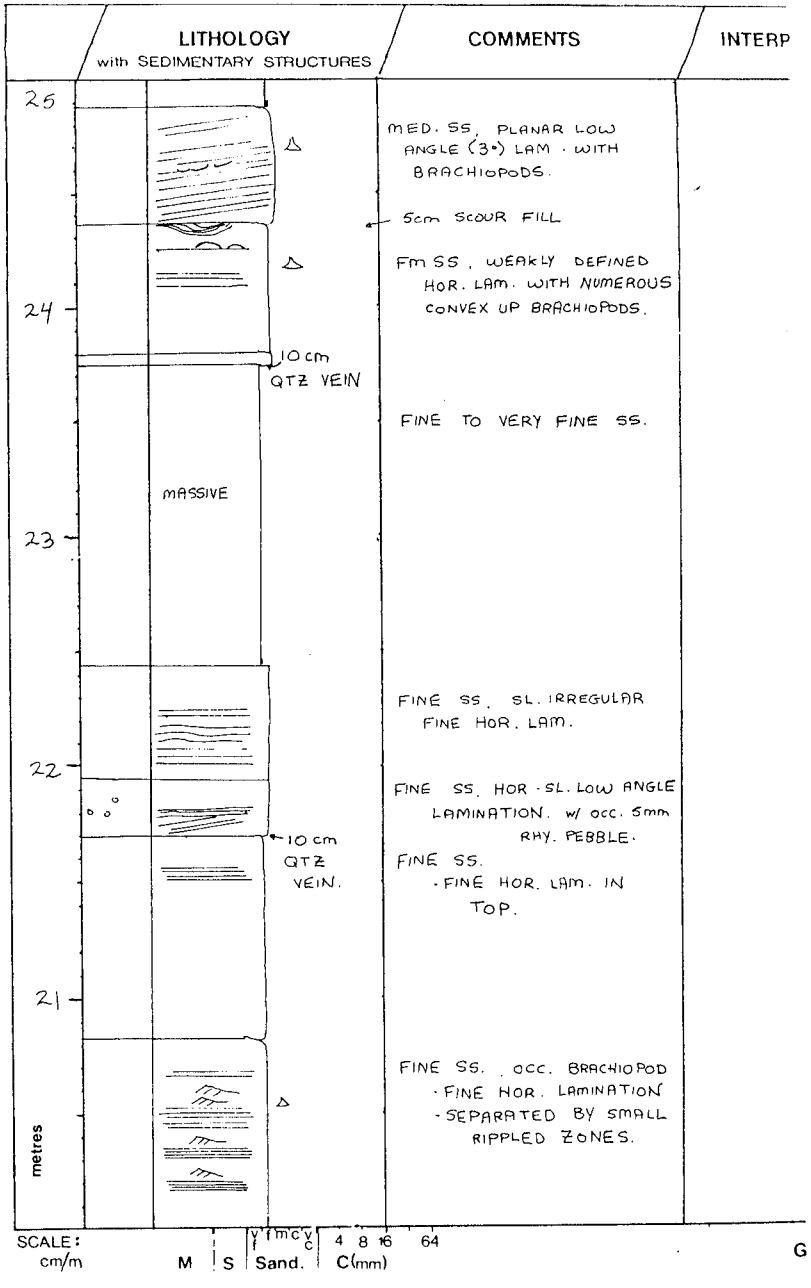

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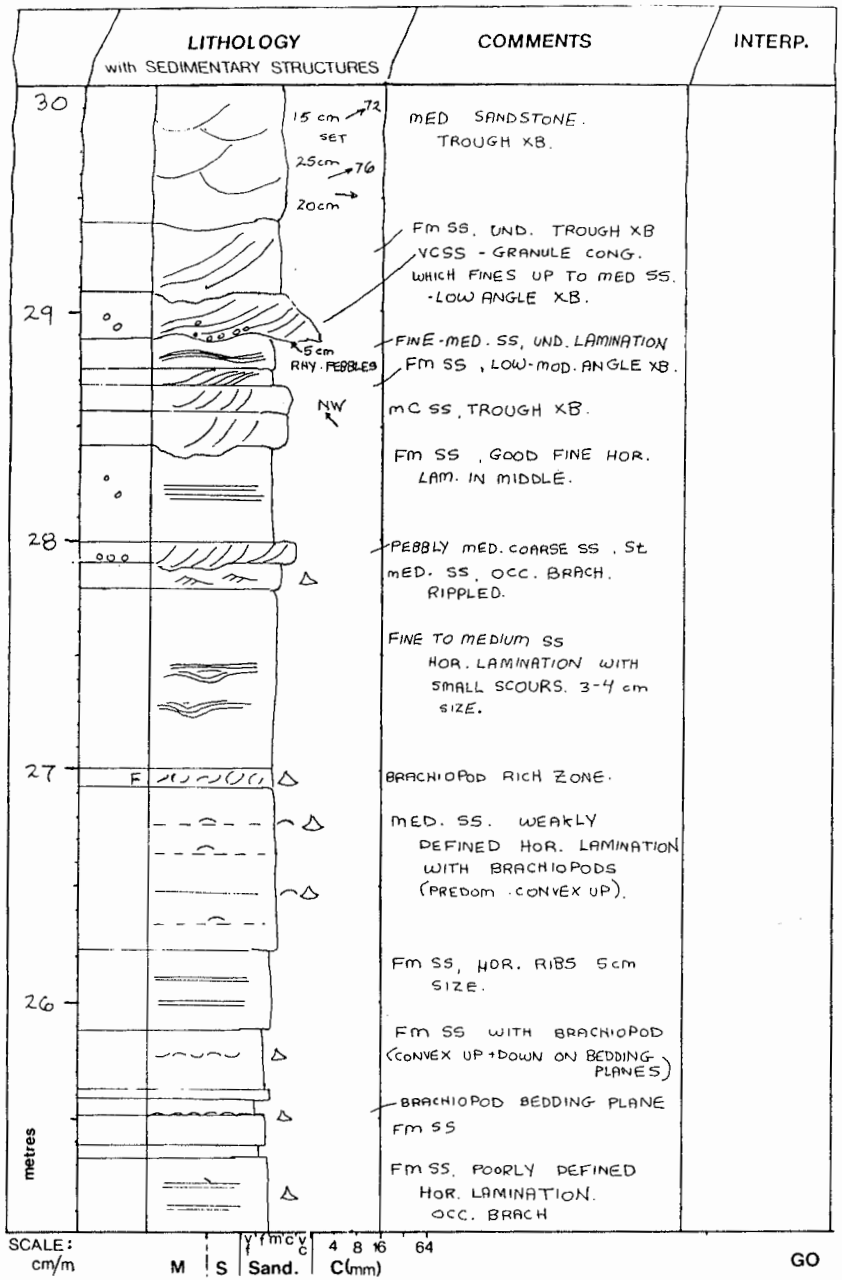

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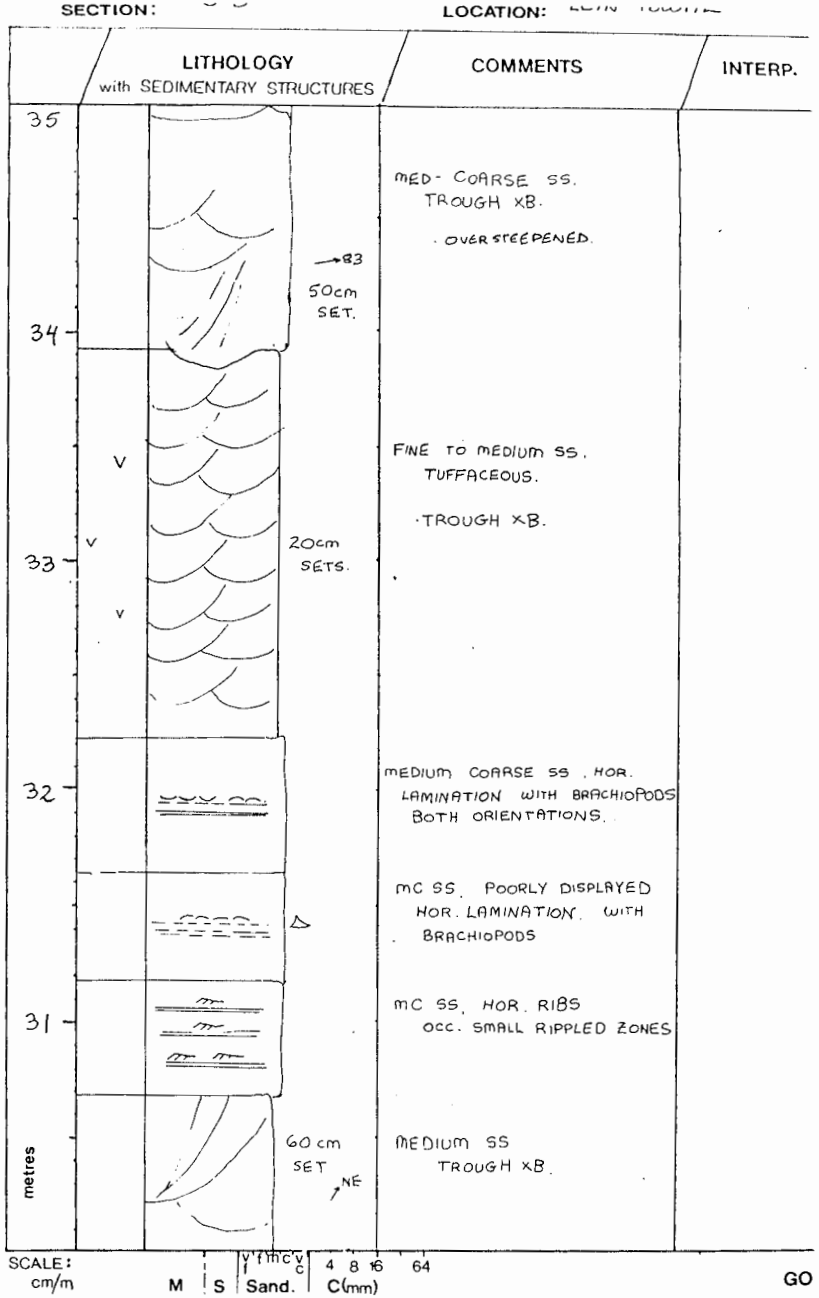
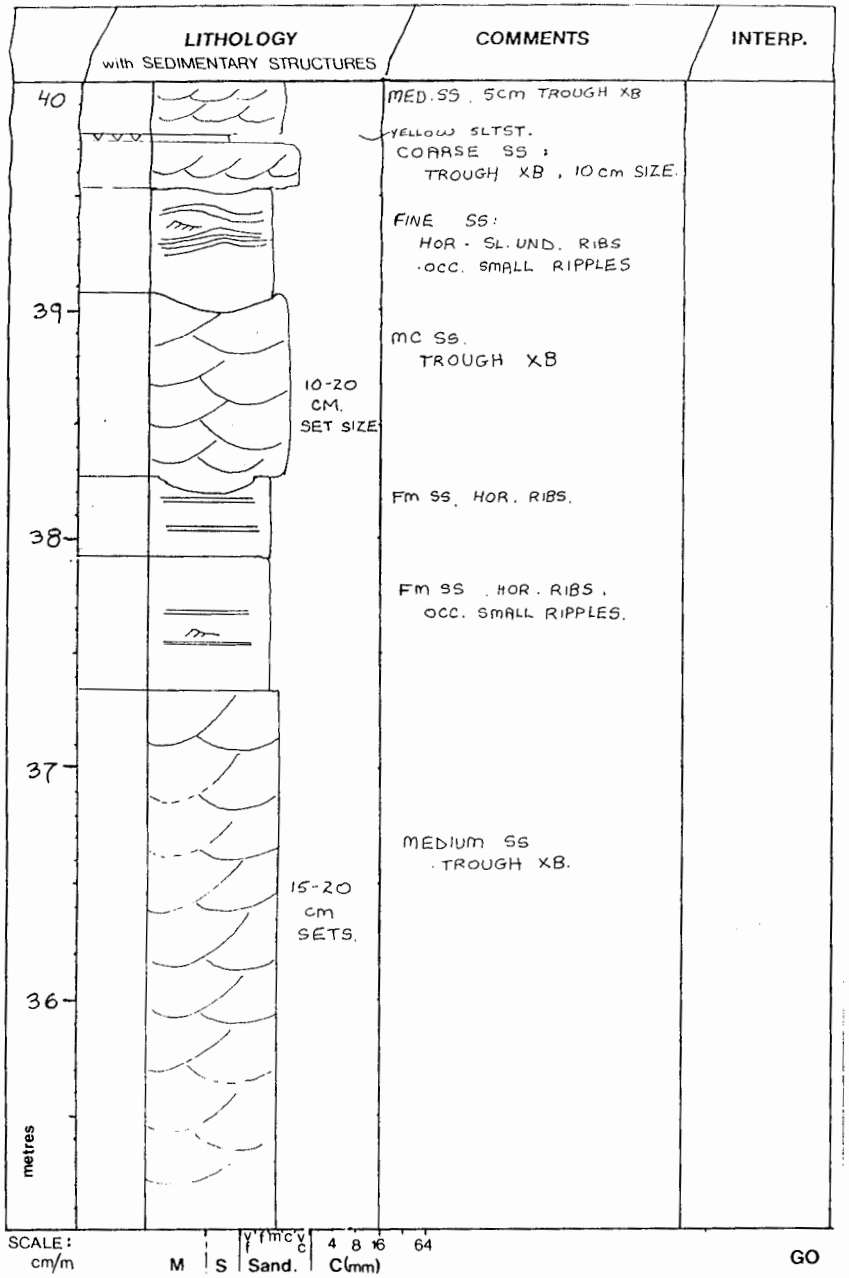


SECTION: U-3 LOCATION: CLYNDERWEN



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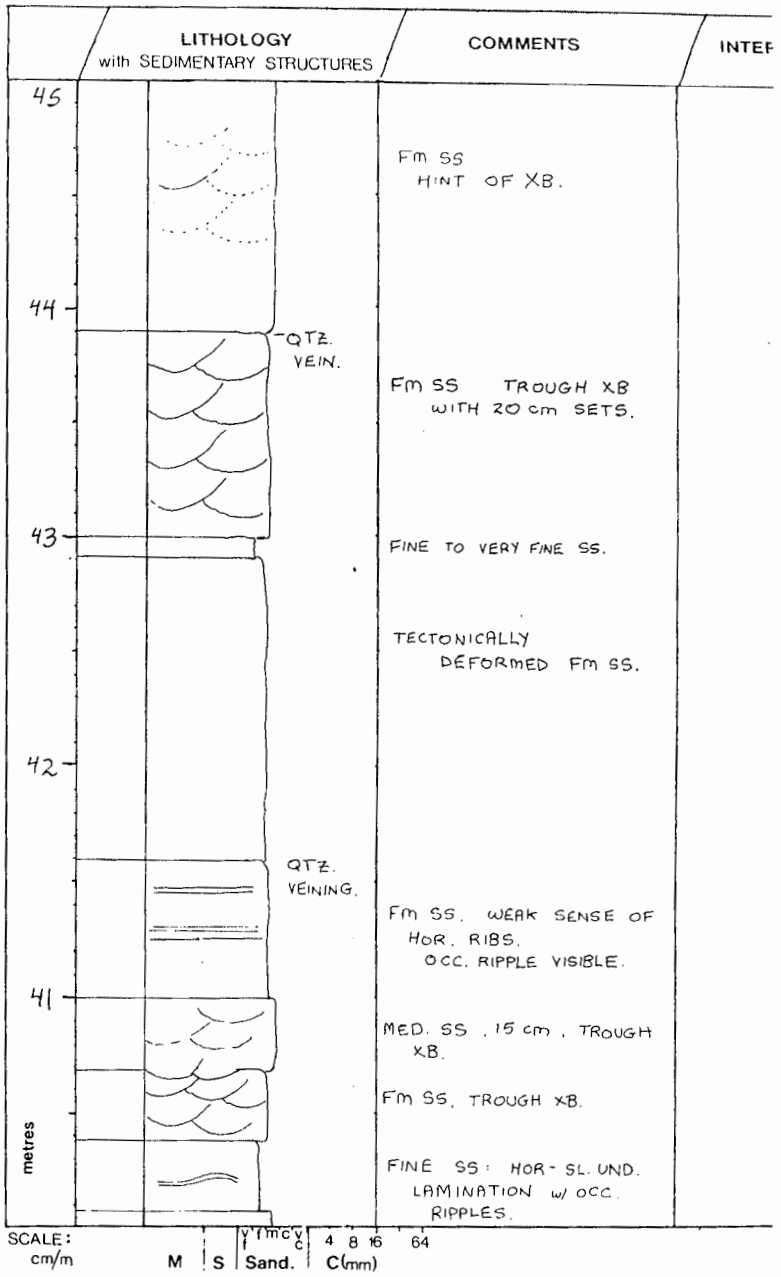
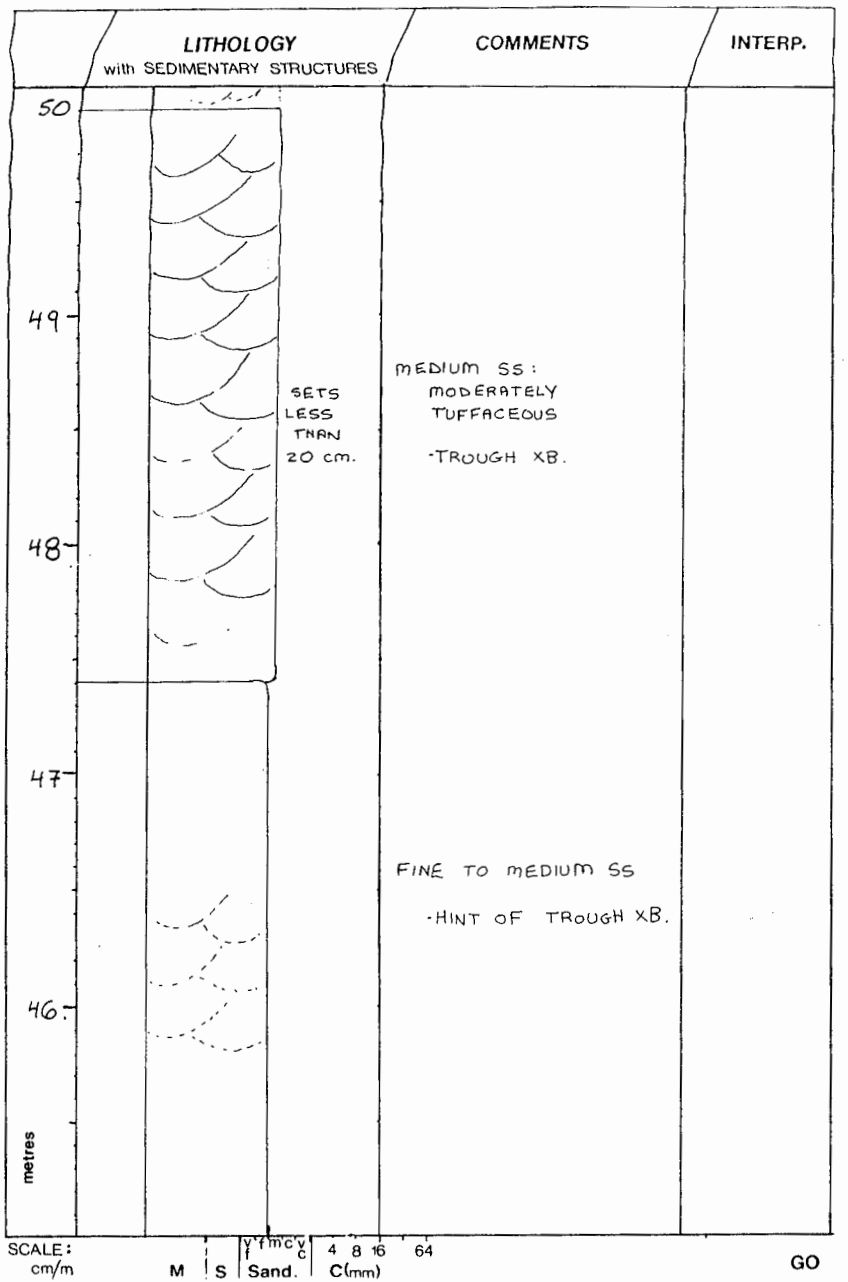


SECTION: U·3 LOCATION: LLYN IDWAL.



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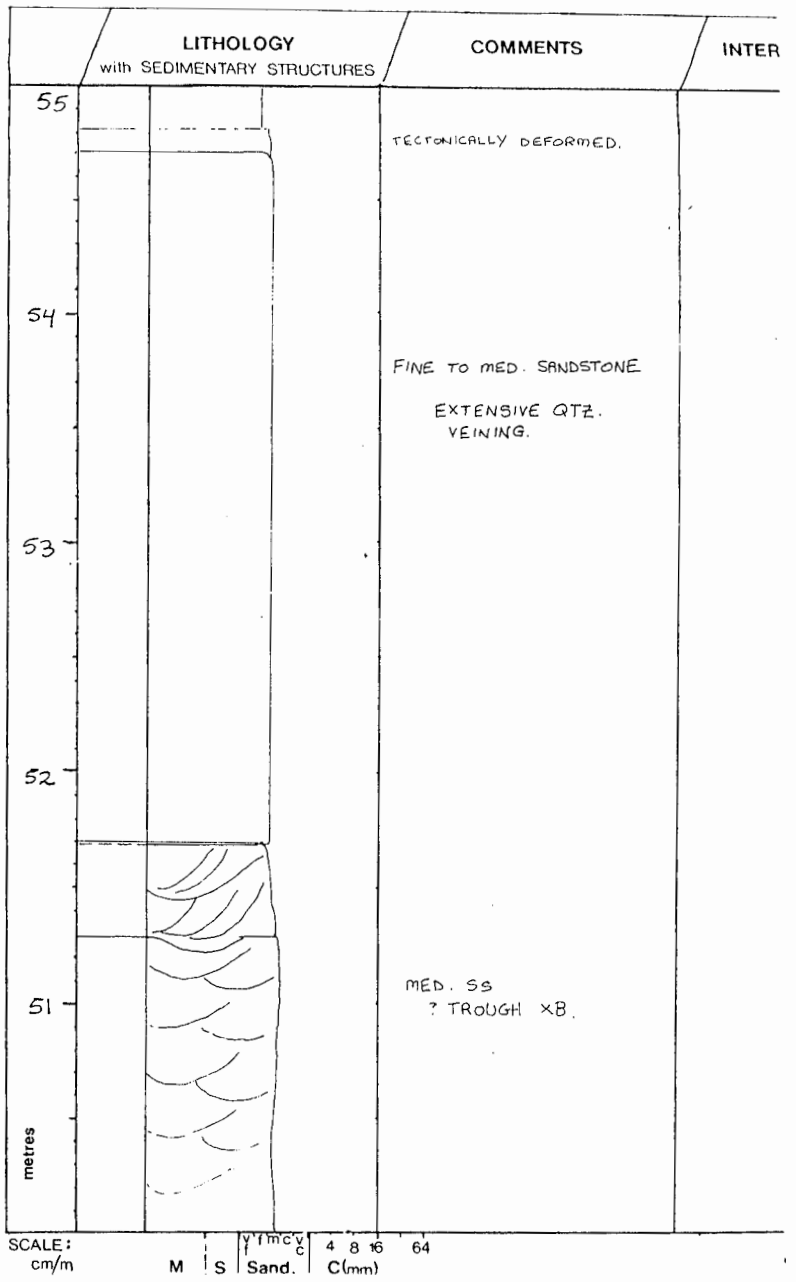

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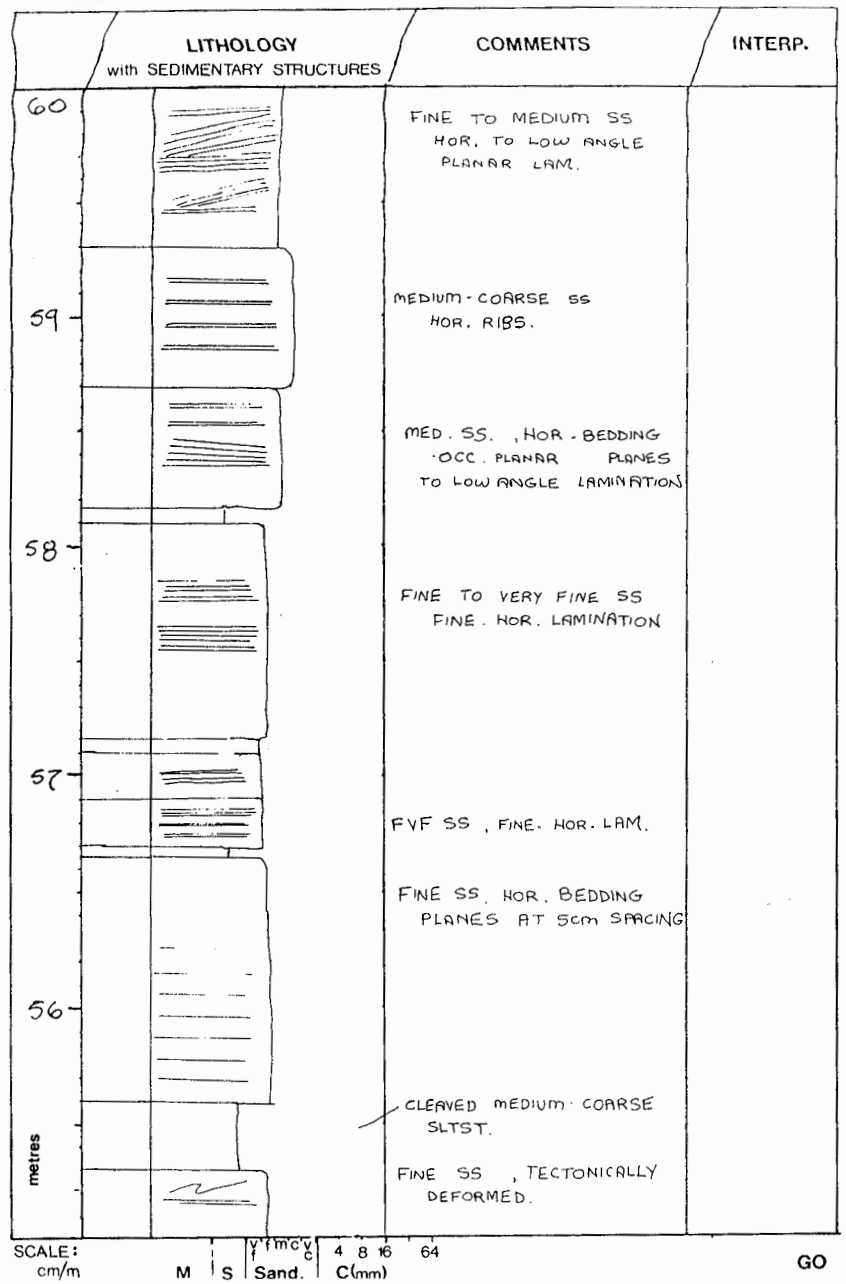

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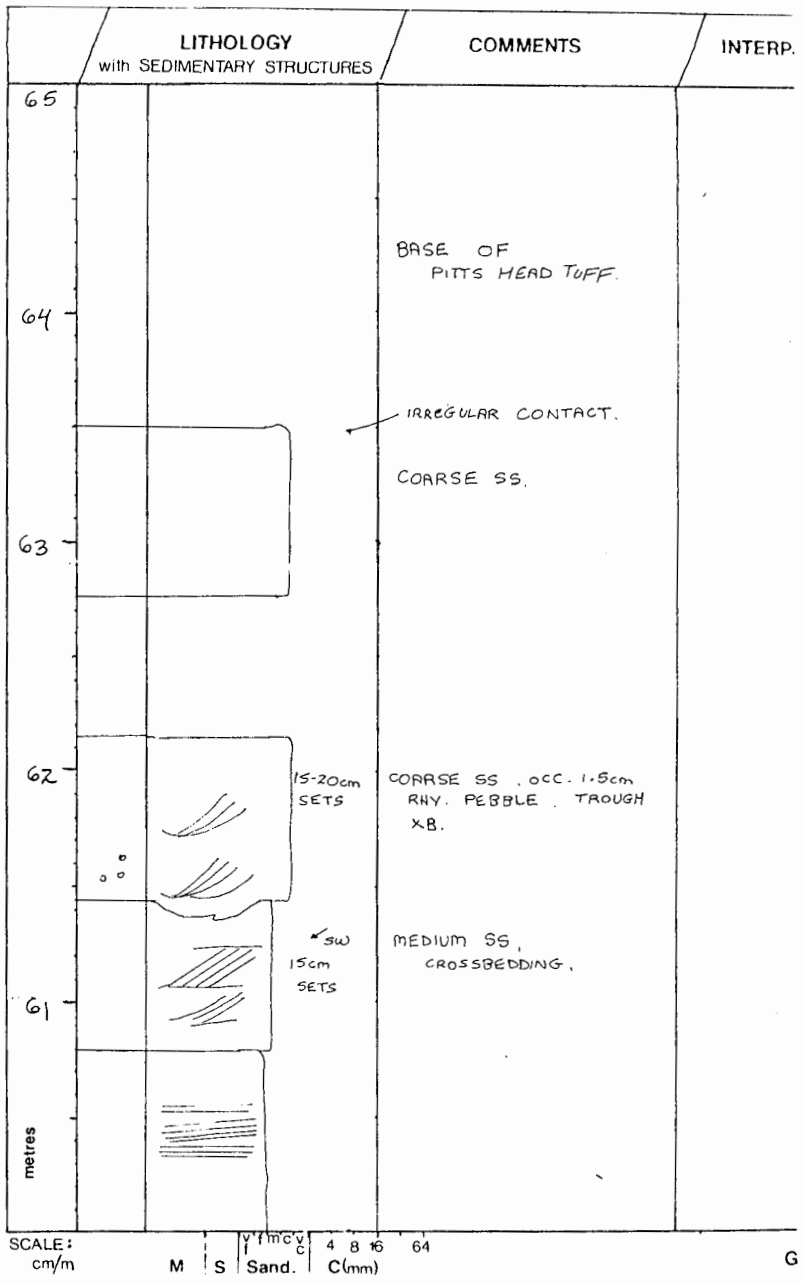
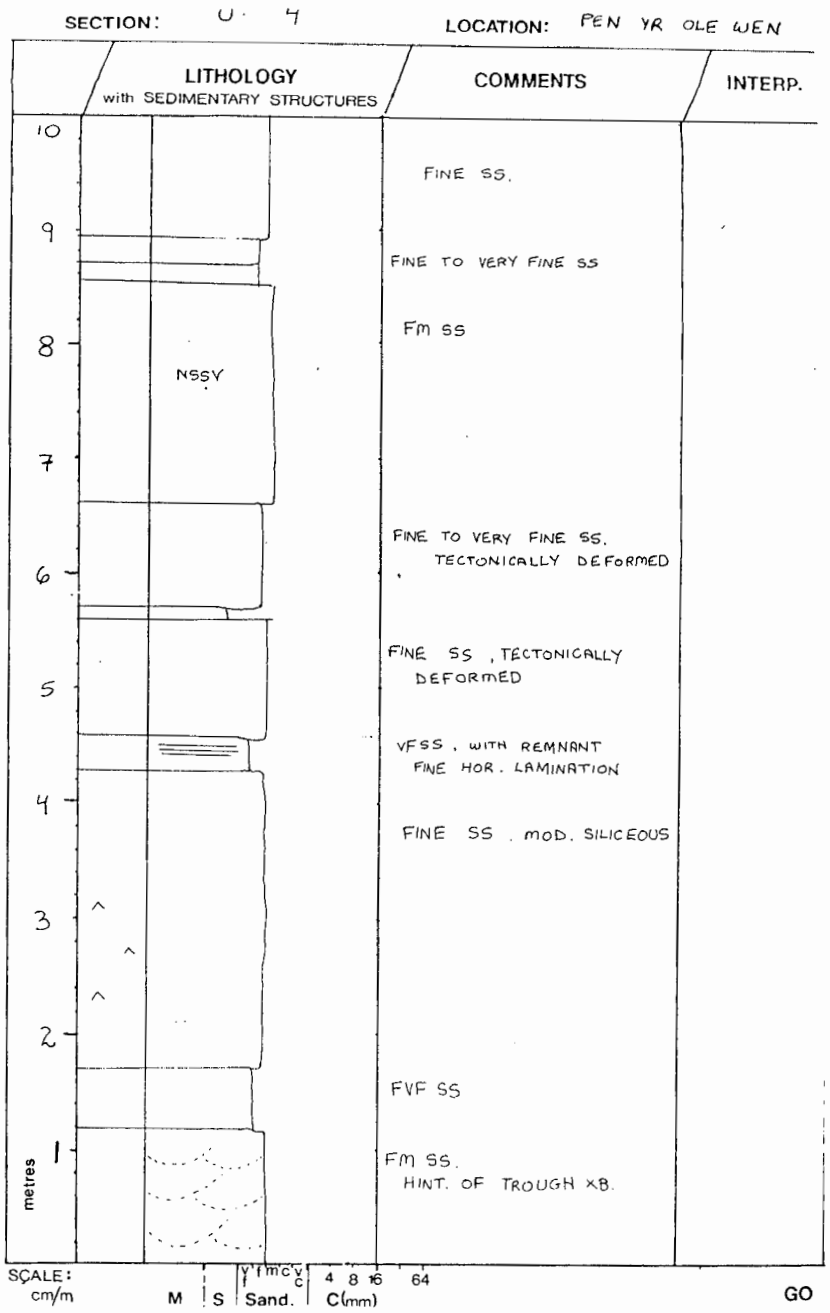


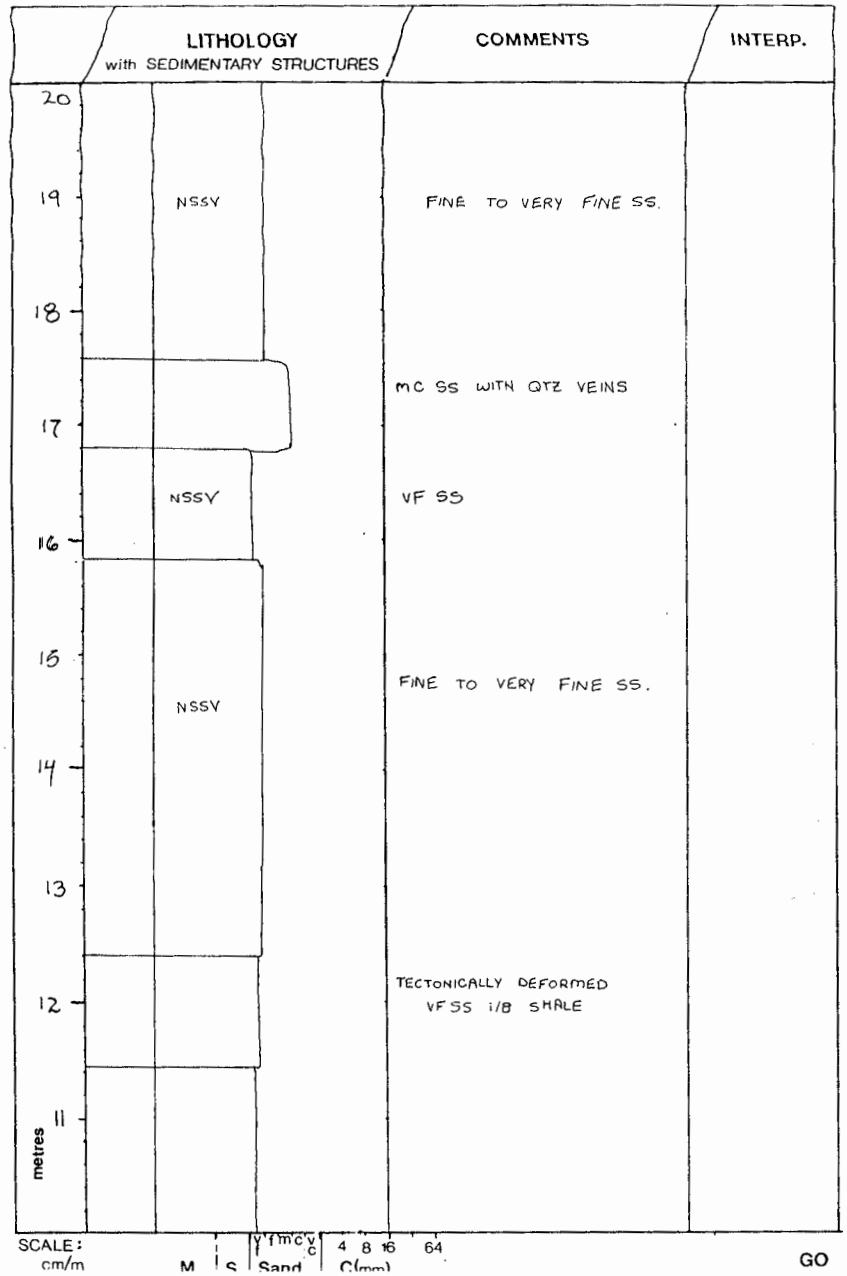
G

SECTION U4

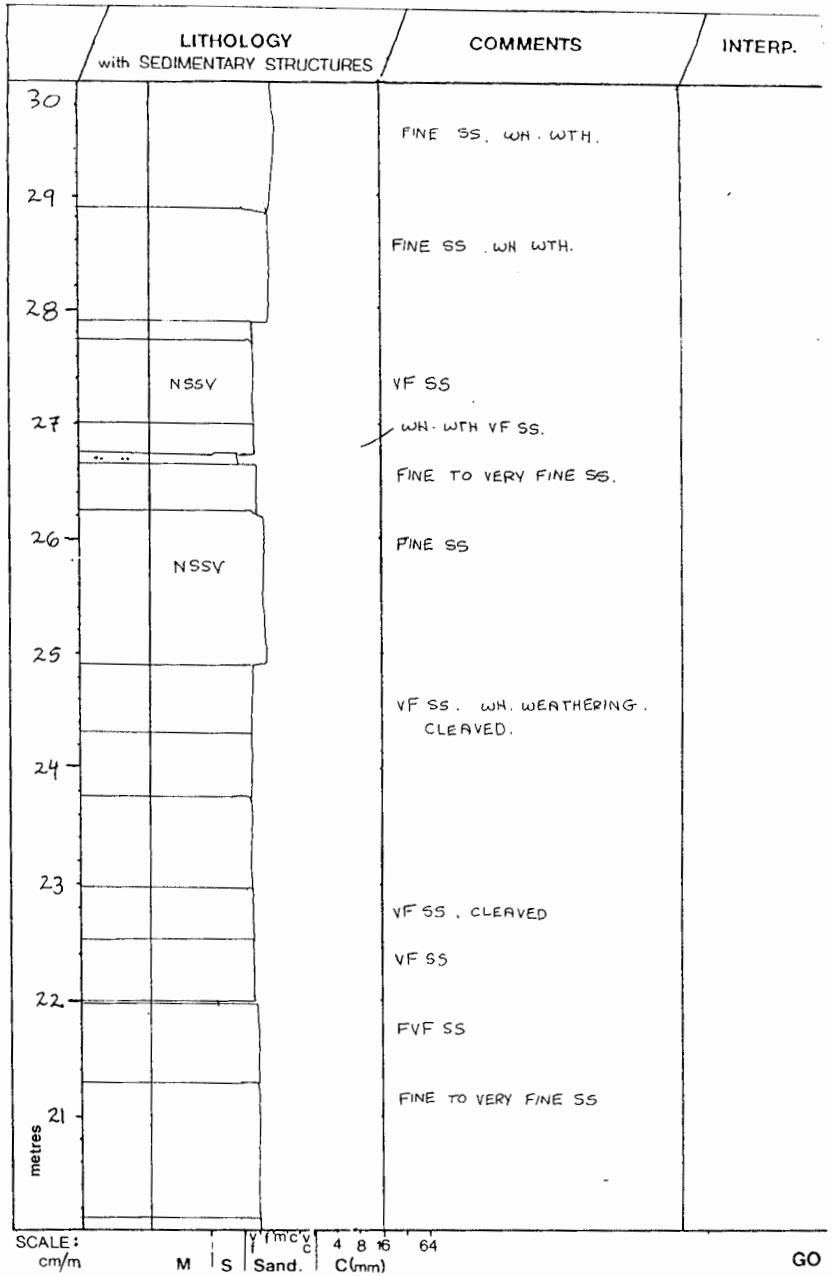
SECTION U4 LOCATION: Section along A5. Locate top of Capel Curig Volcanic Fm. Section proceeds to SE to base of Pitts Head Tuff. Section U4b in sandstones directly overlying Pitts Head Tuff near Idwal Cottage.



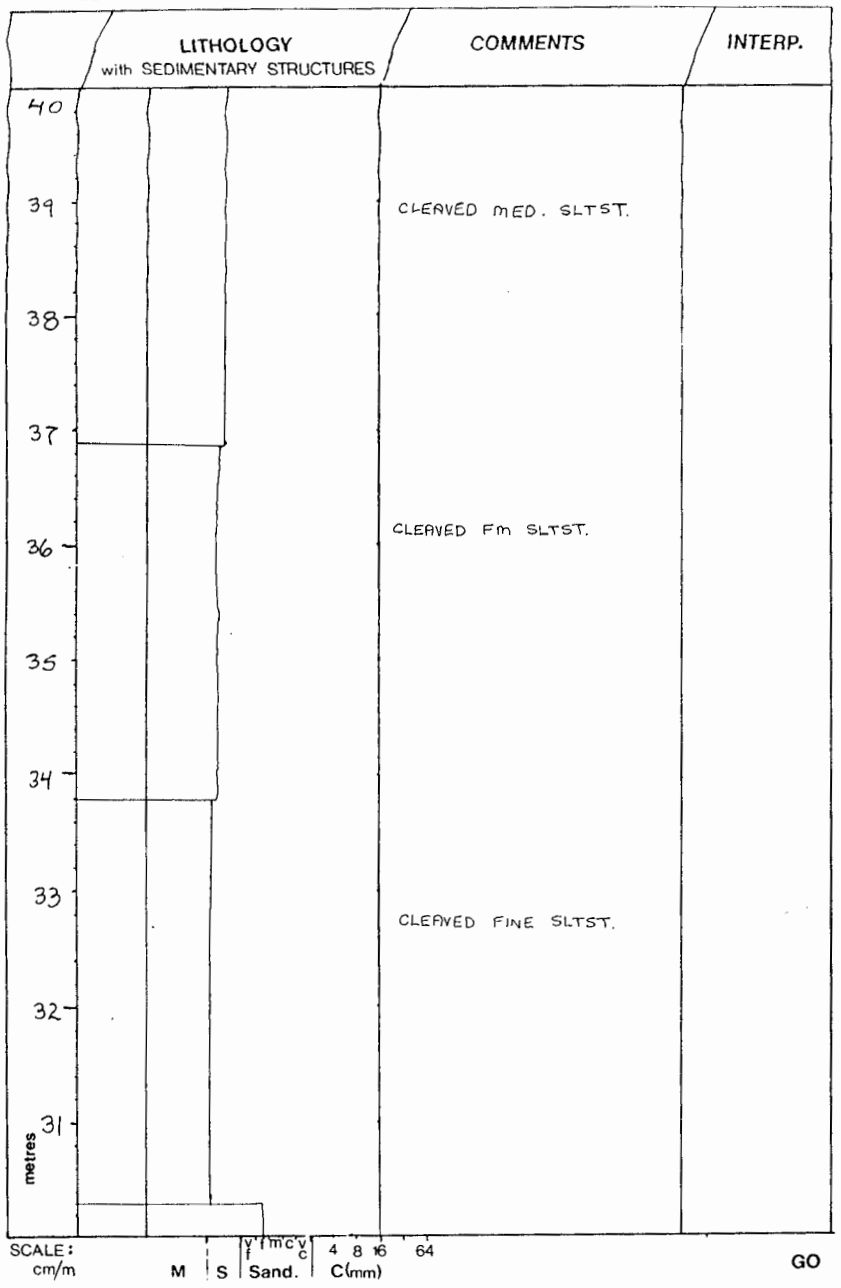
SECTION: U·4 LOCATION: PEN YR OLE WEN



SECTION: U·4 LOCATION: PEN YR OLE WEN



SECTION: U·4 LOCATION: PEN YR OLE WEN



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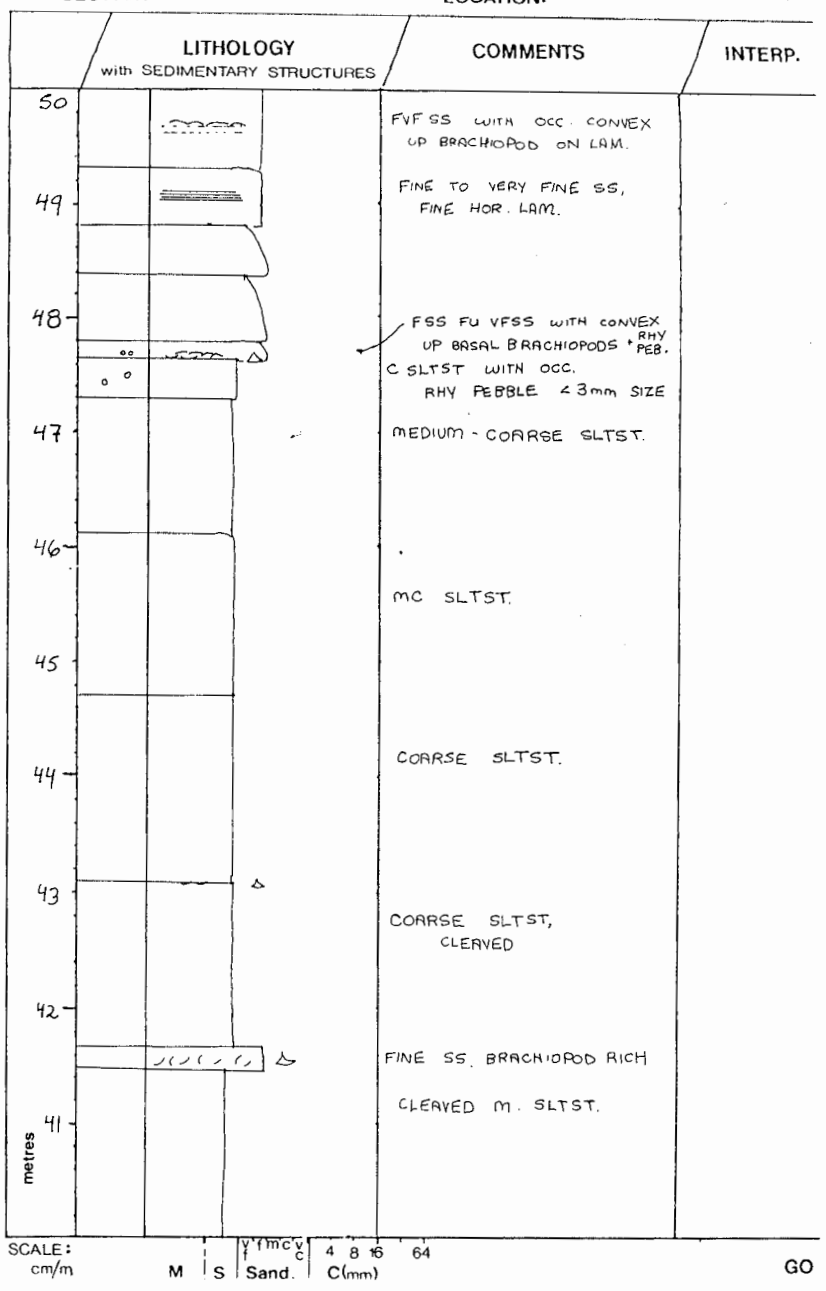
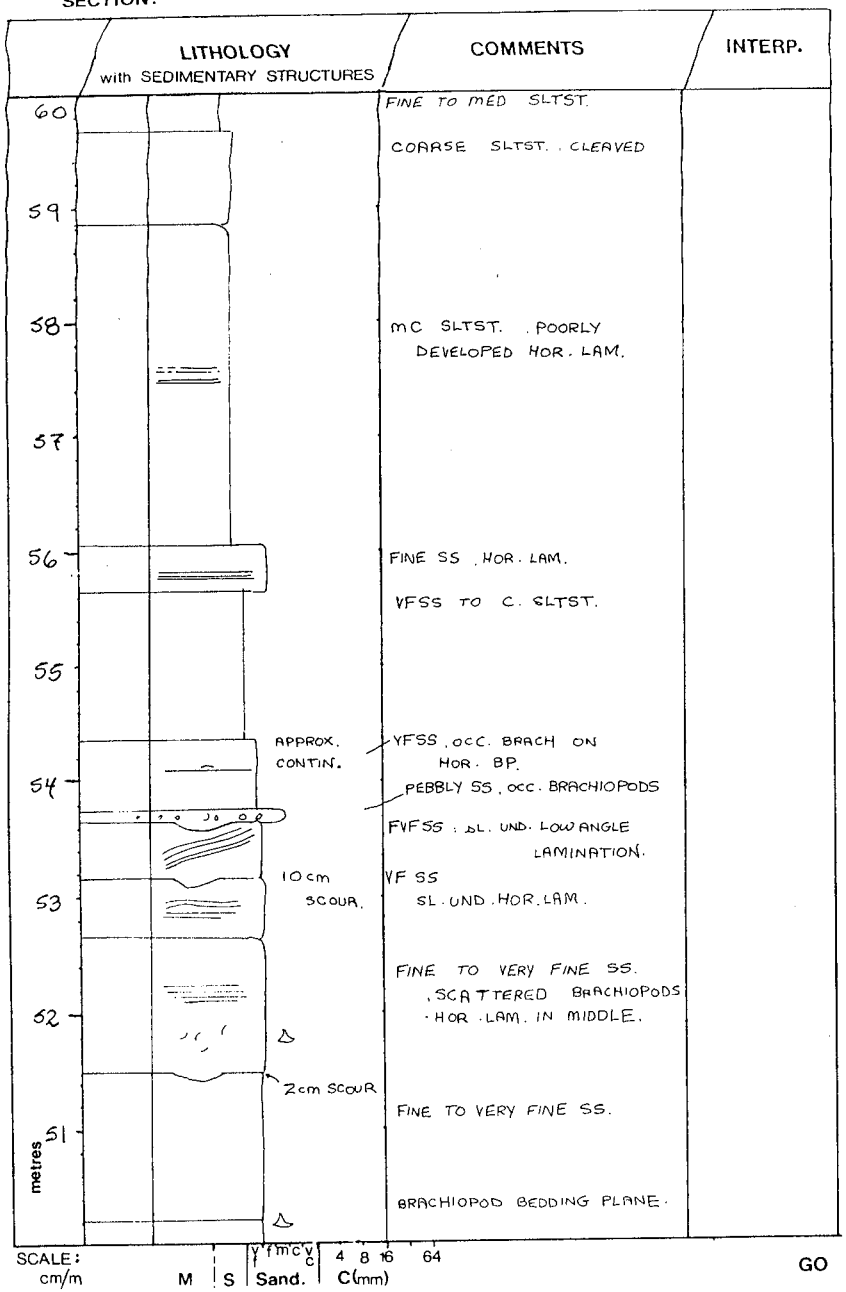
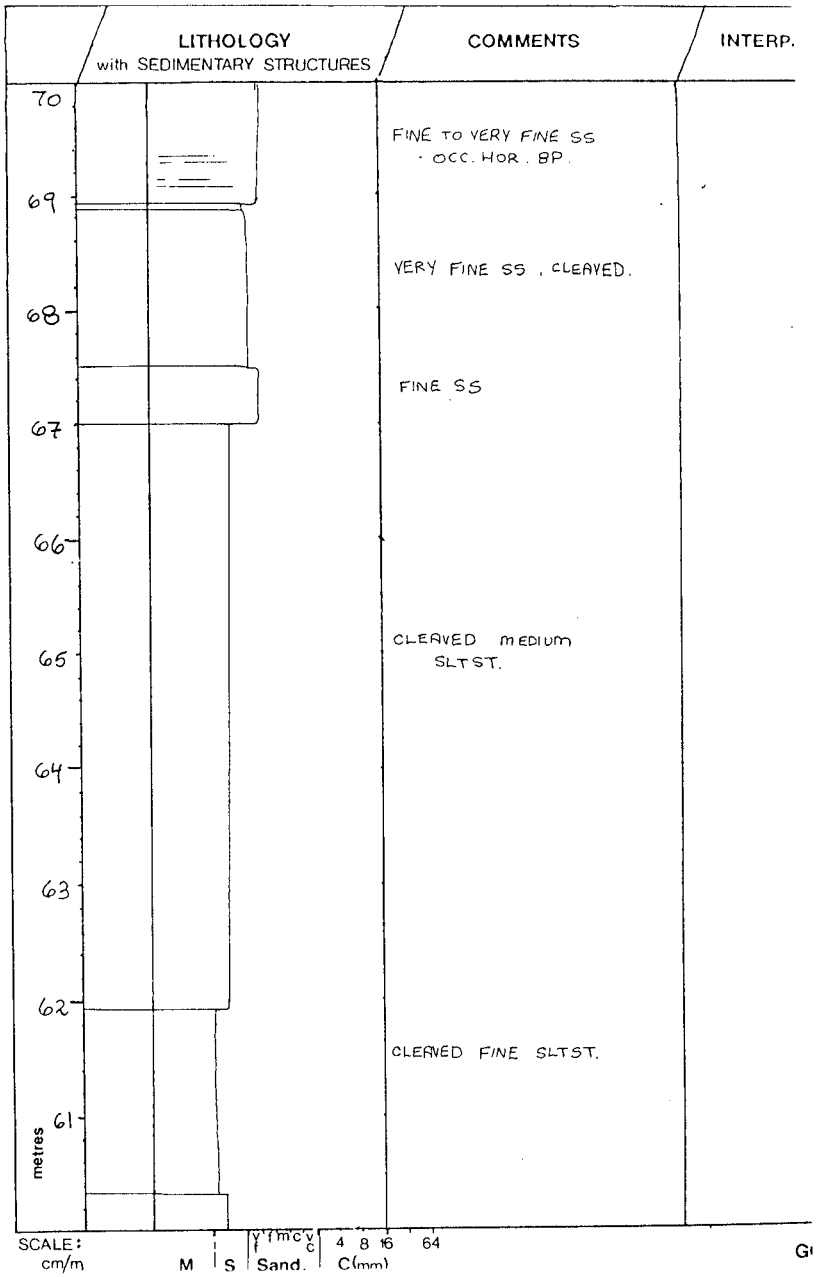


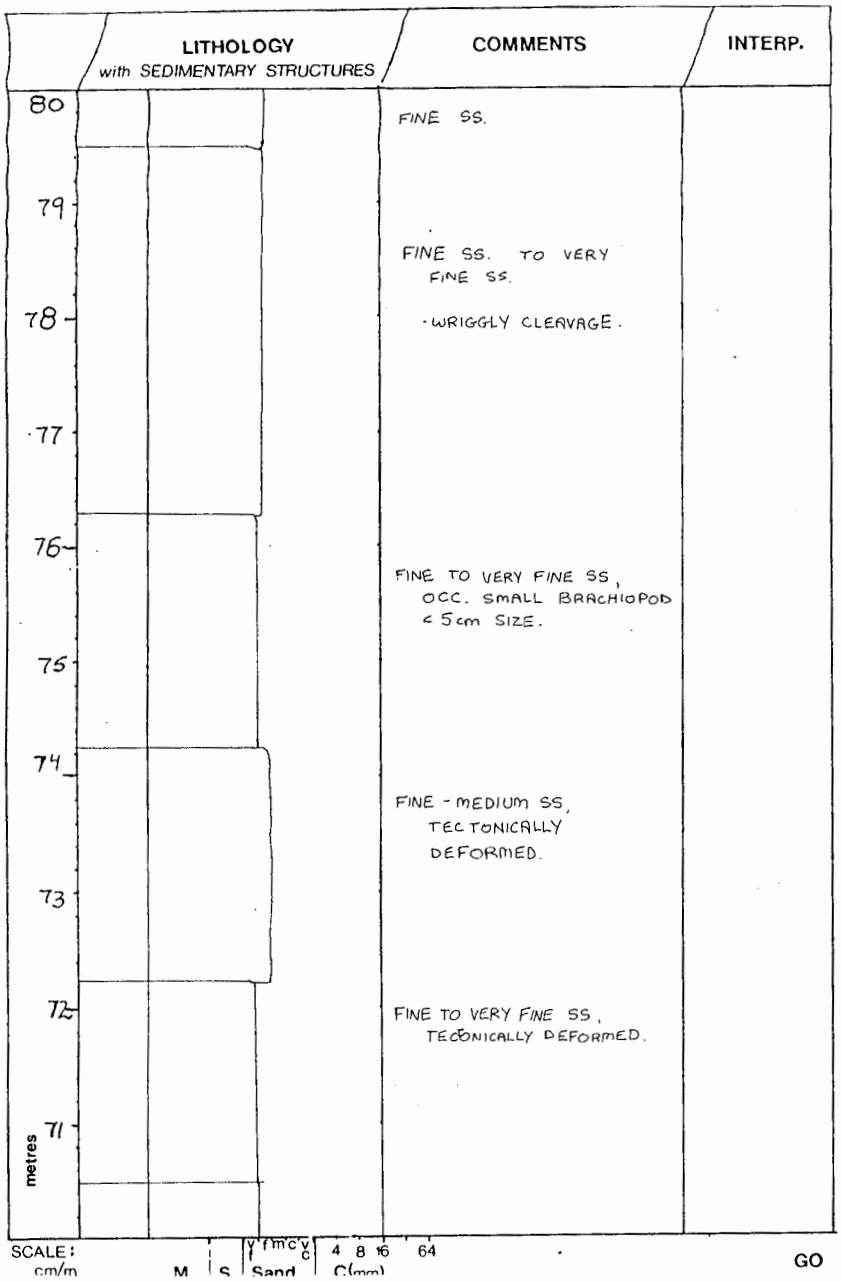
SECTION: U. LOCATION: PEN YR OLE WEN



SECTION: U -4 LOCATION: PEN YR OLE WEN



SECTION: U.4 LOCATION: PEN YR OLE WEN



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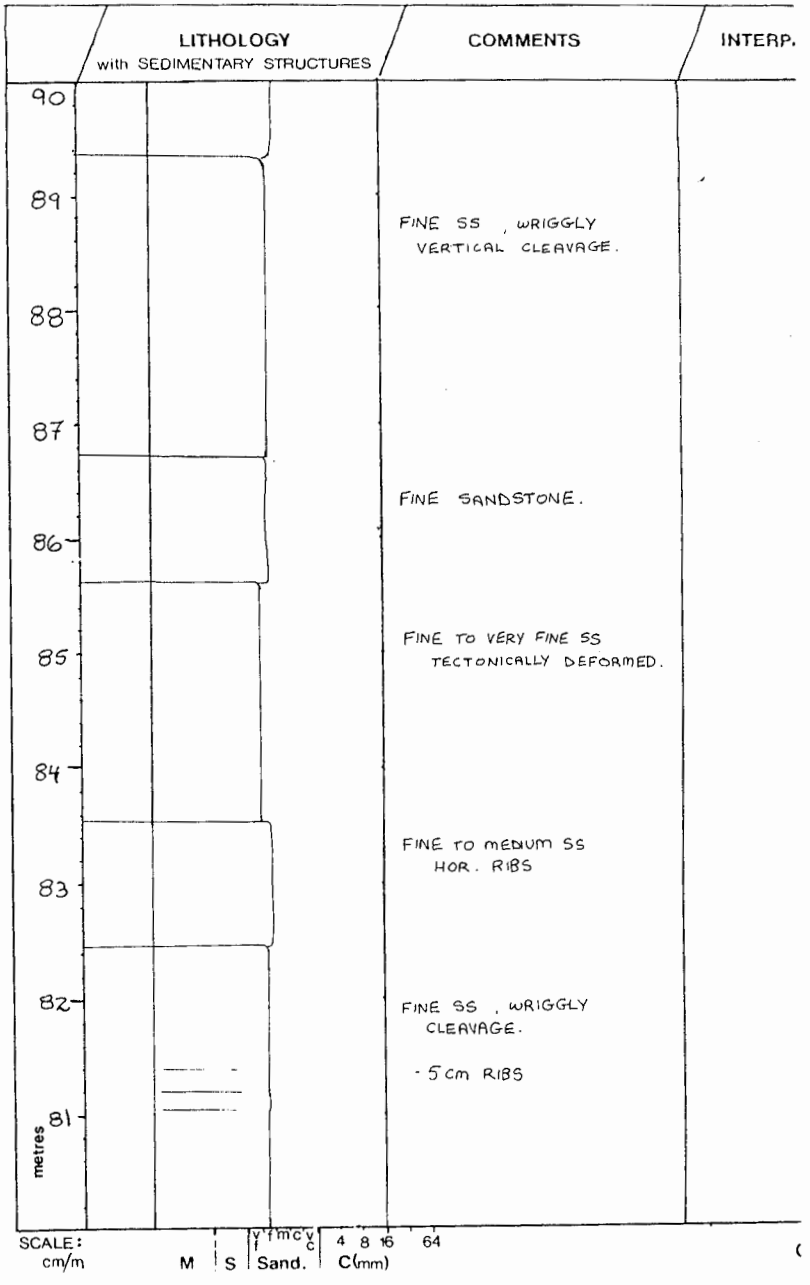
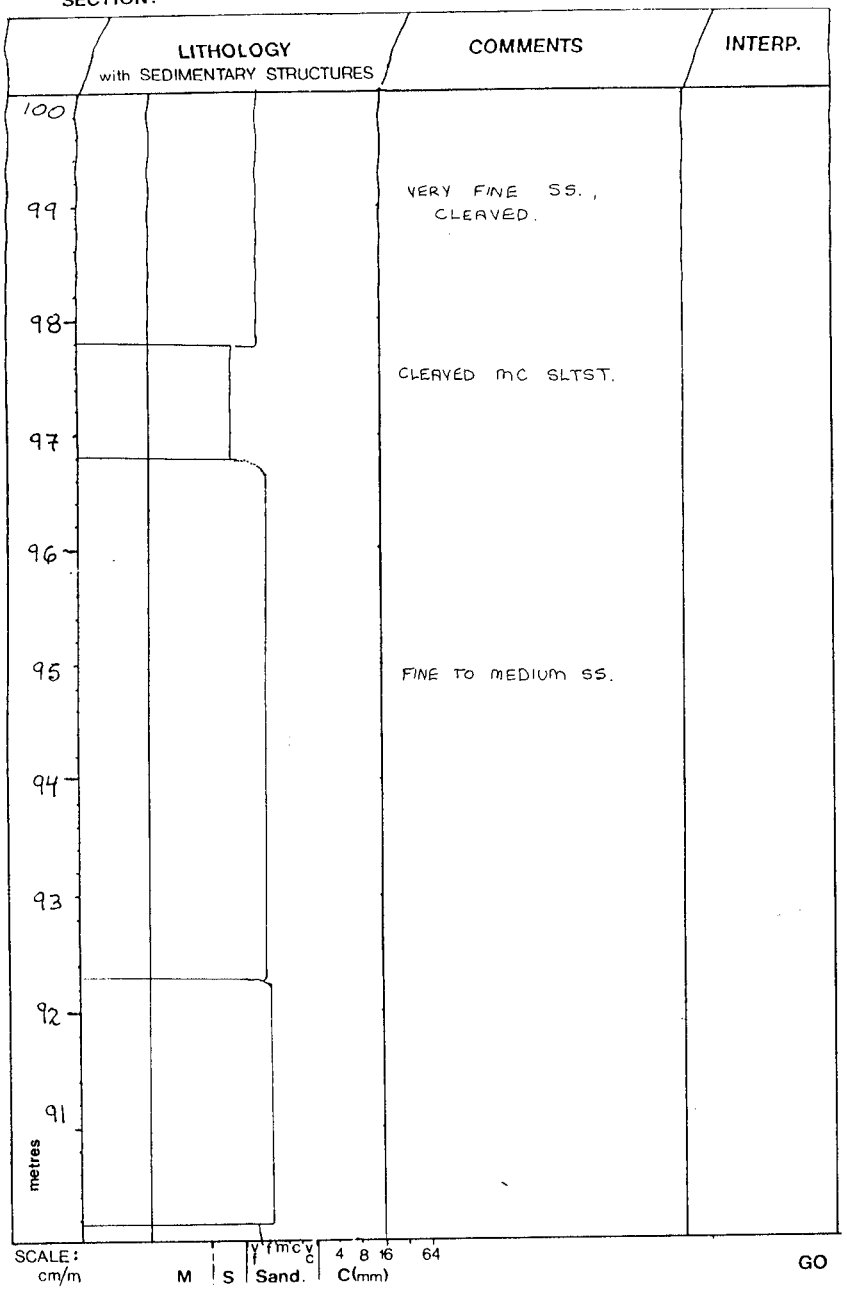
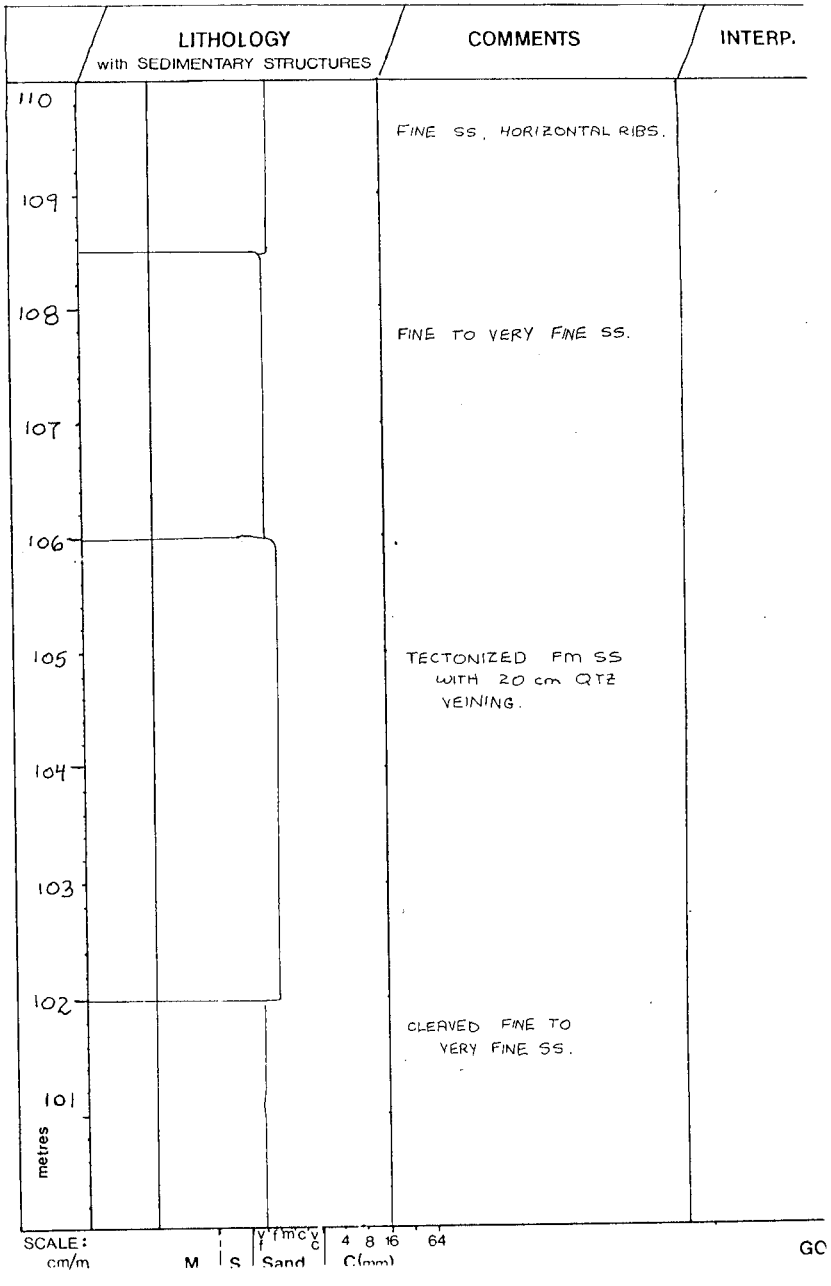


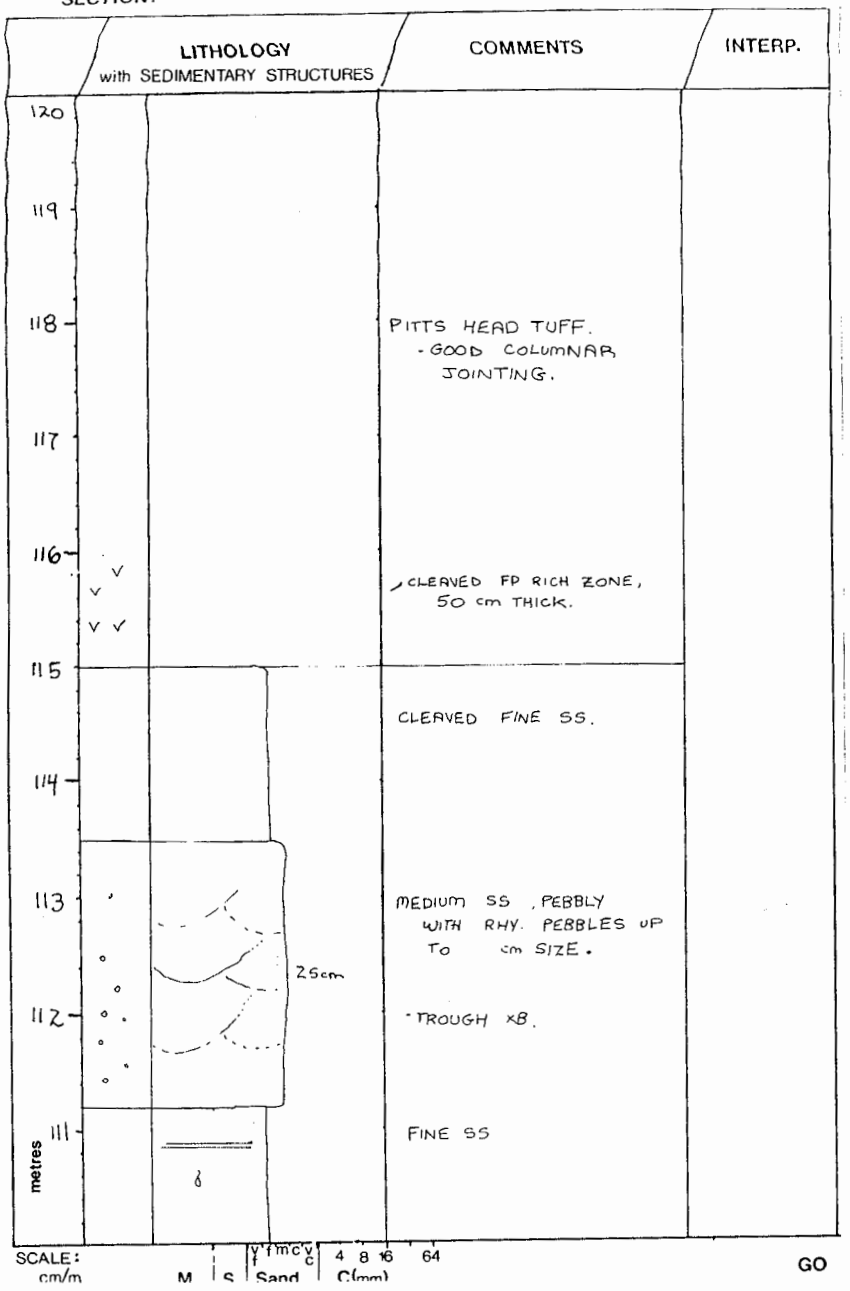
SECTION: U. 4 LOCATION: PEN YR OLE WEN



SECTION: LOCATION:

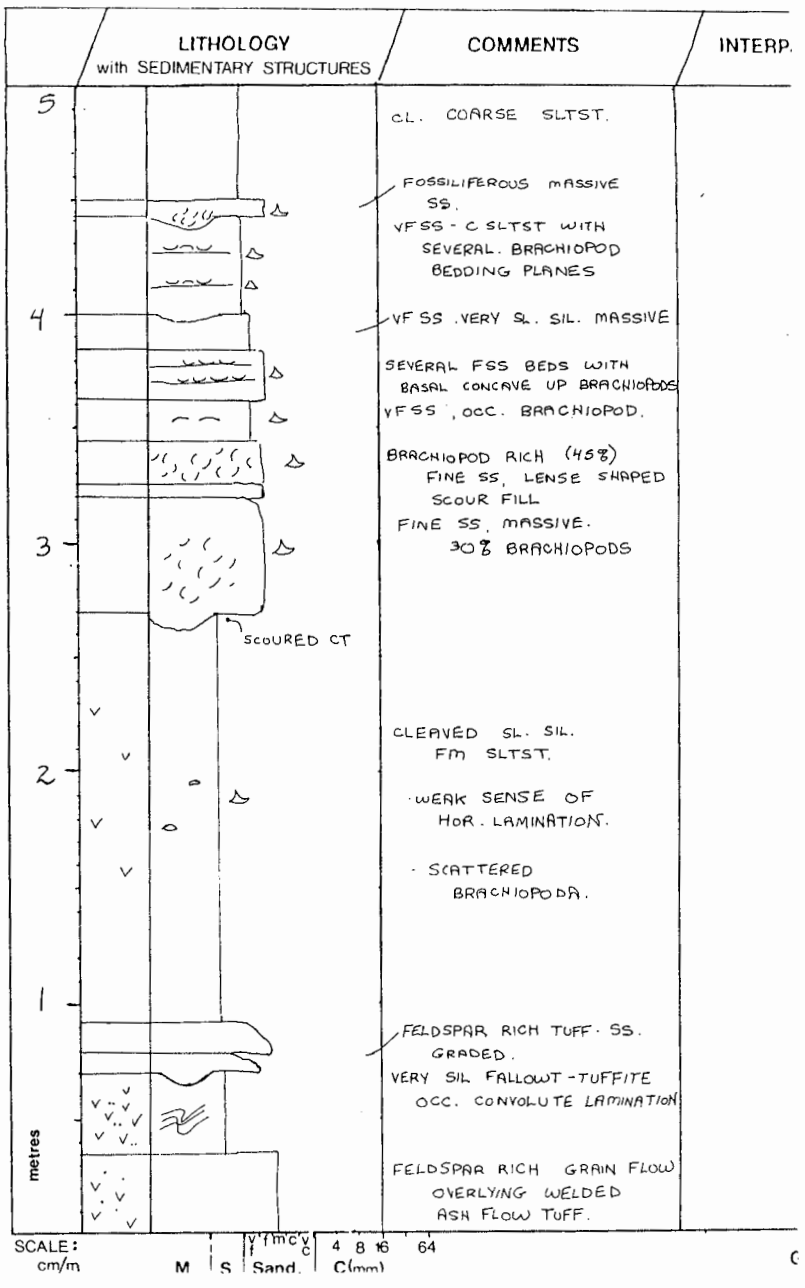


SECTION: U-4 LOCATION: PEN YR OLE WEN



GO

SECTION: 4-4B LOCATION: LLYN OGWEN



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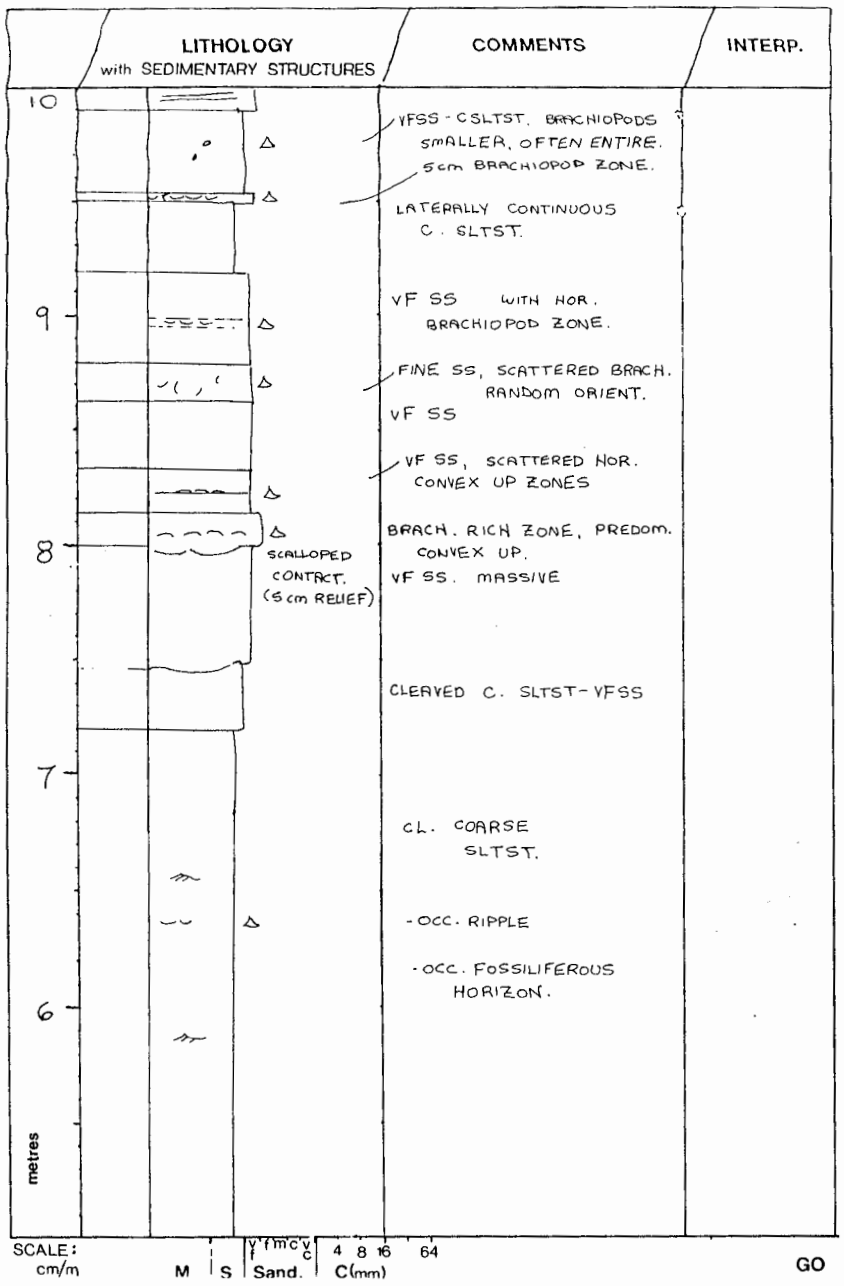
SECTION: U·4 B LOCATION: PEN YR OLE WEN



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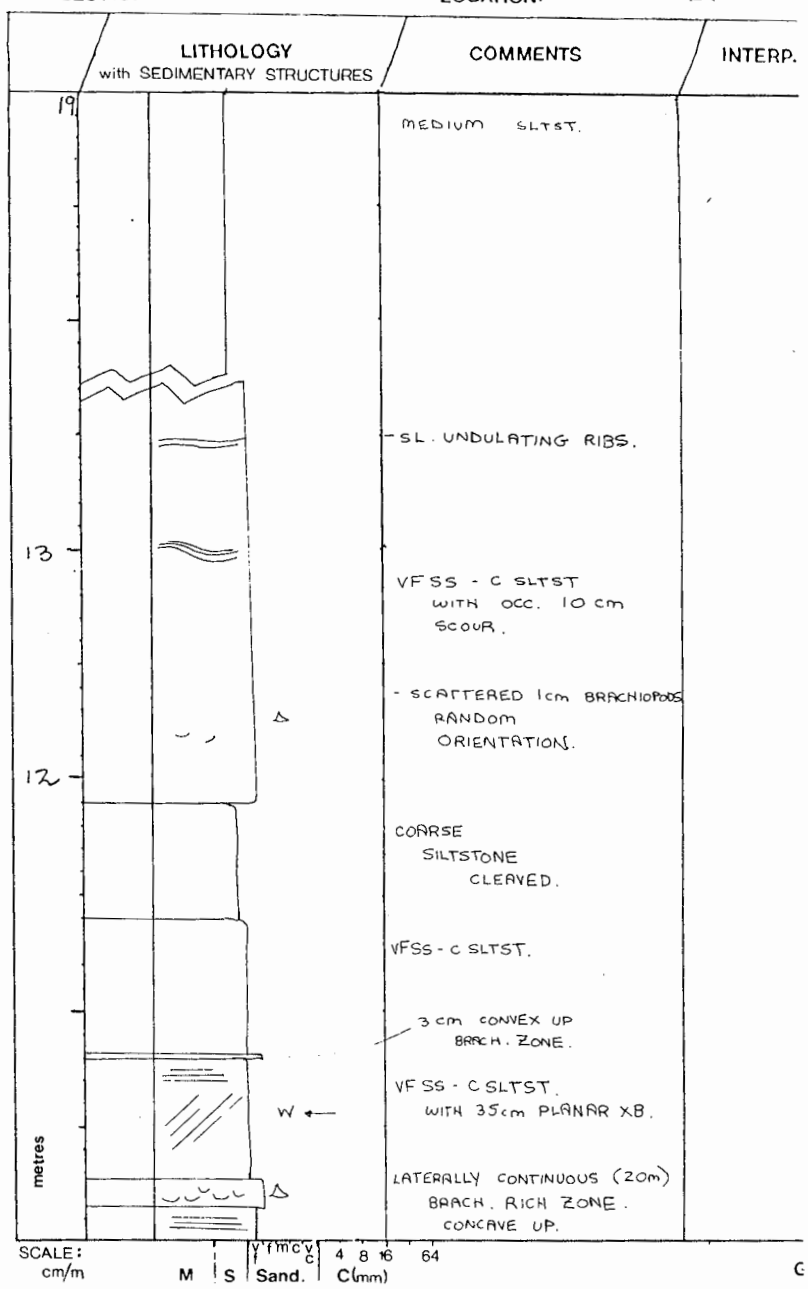
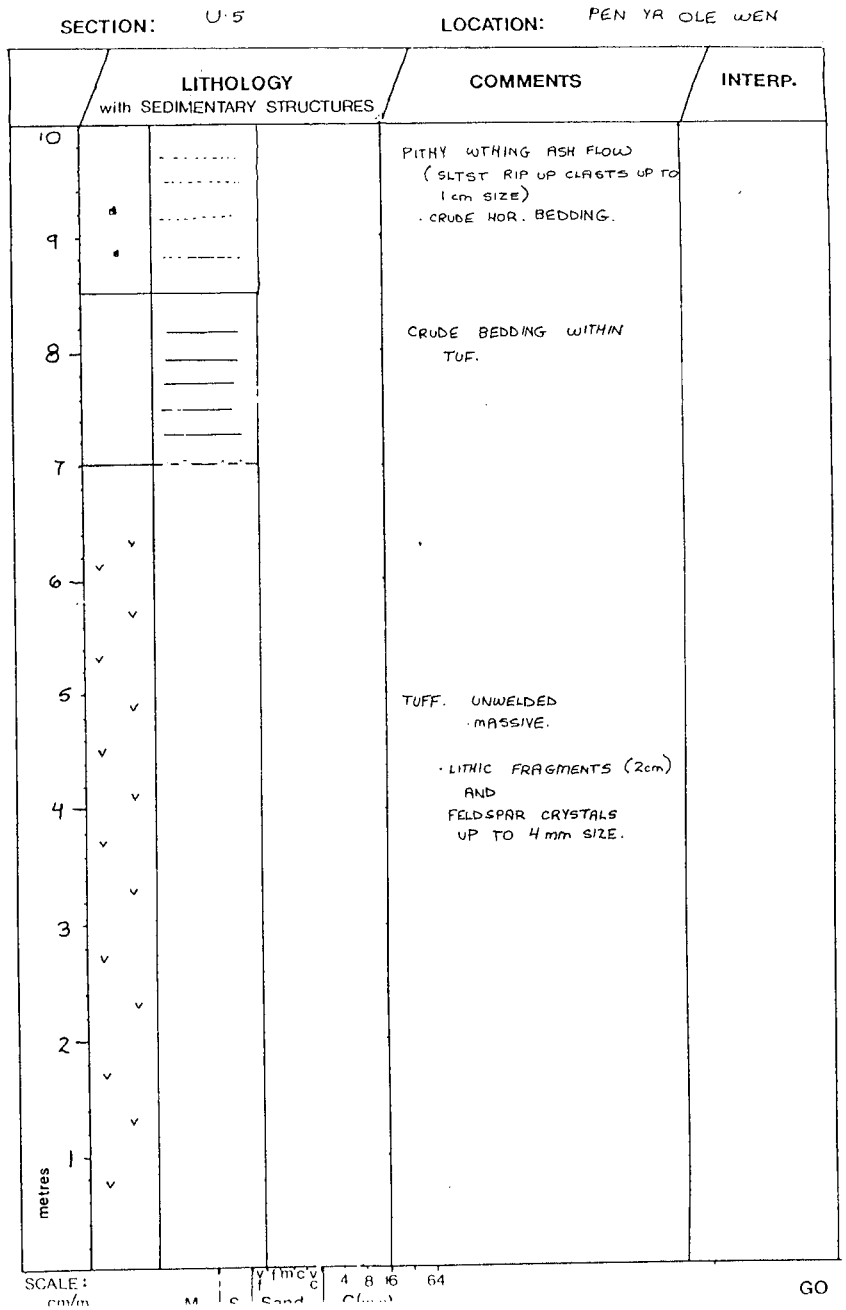


SECTION U5

SECTION U5 LOCATION: Locate Capel Curig Volcanic Fm. in steep crags to NW of Pen yr Ole Wen. Section starts at base of formation and proceeds to SE into sandstone overlying CCVF to footpath between Carnedd Dafydd and Ogwen Cottage.



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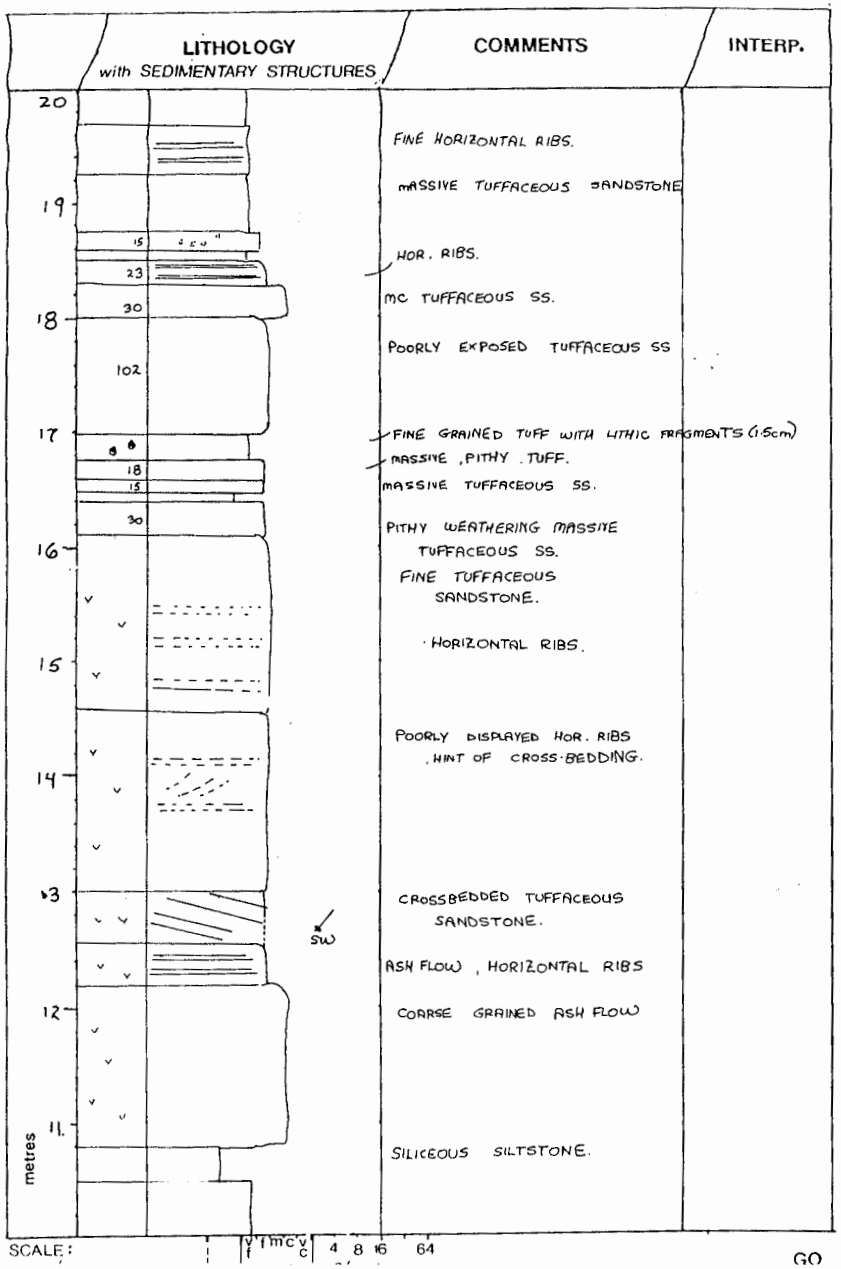

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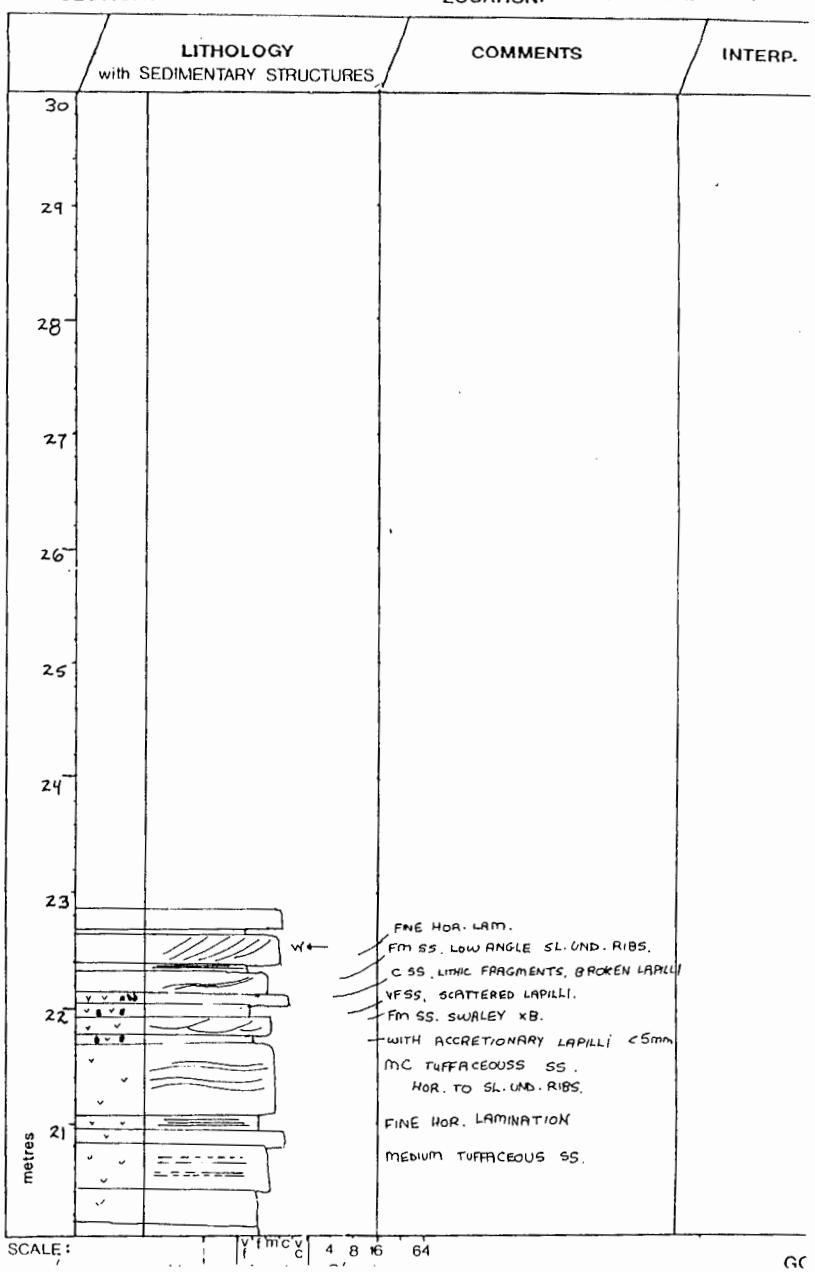
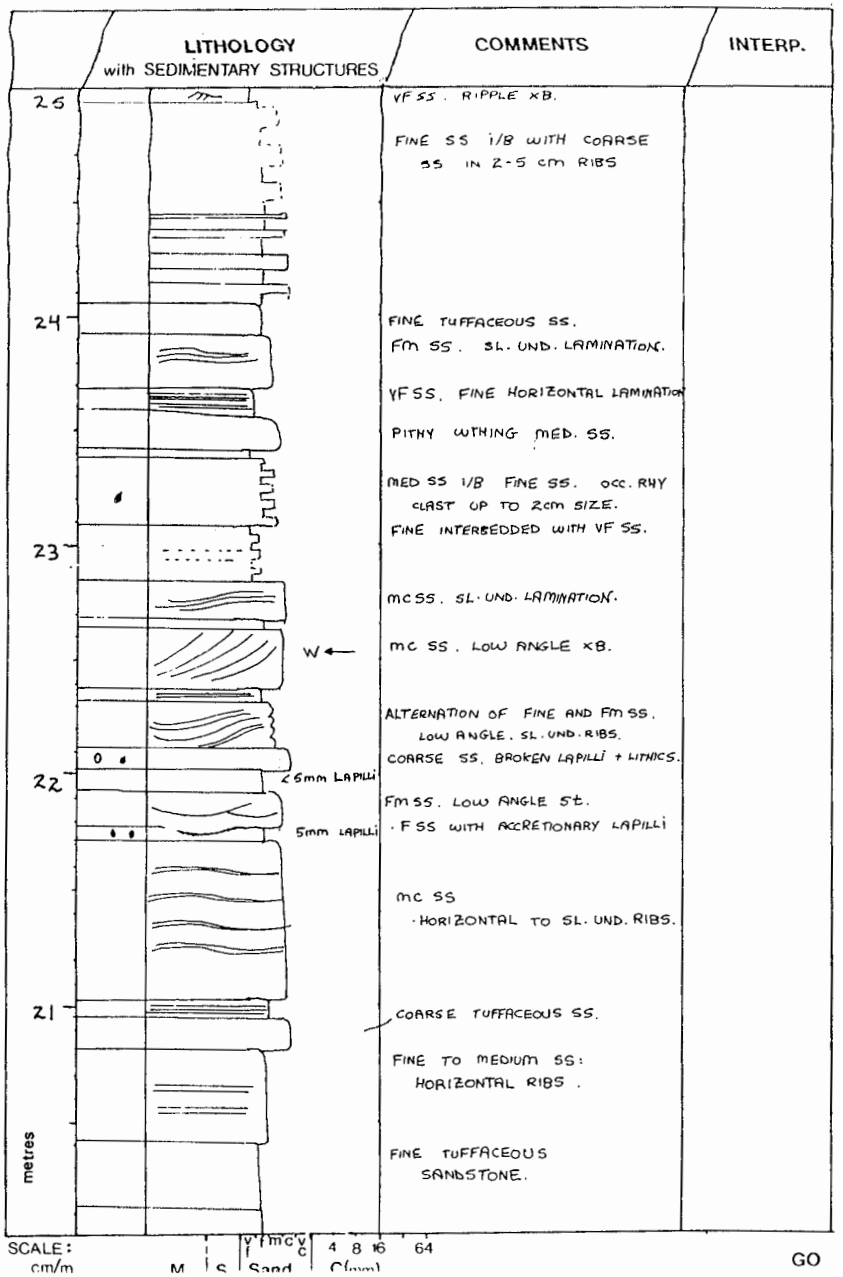


GC

SECTION: U·5 LOCATION: PEN YR OLE WEN



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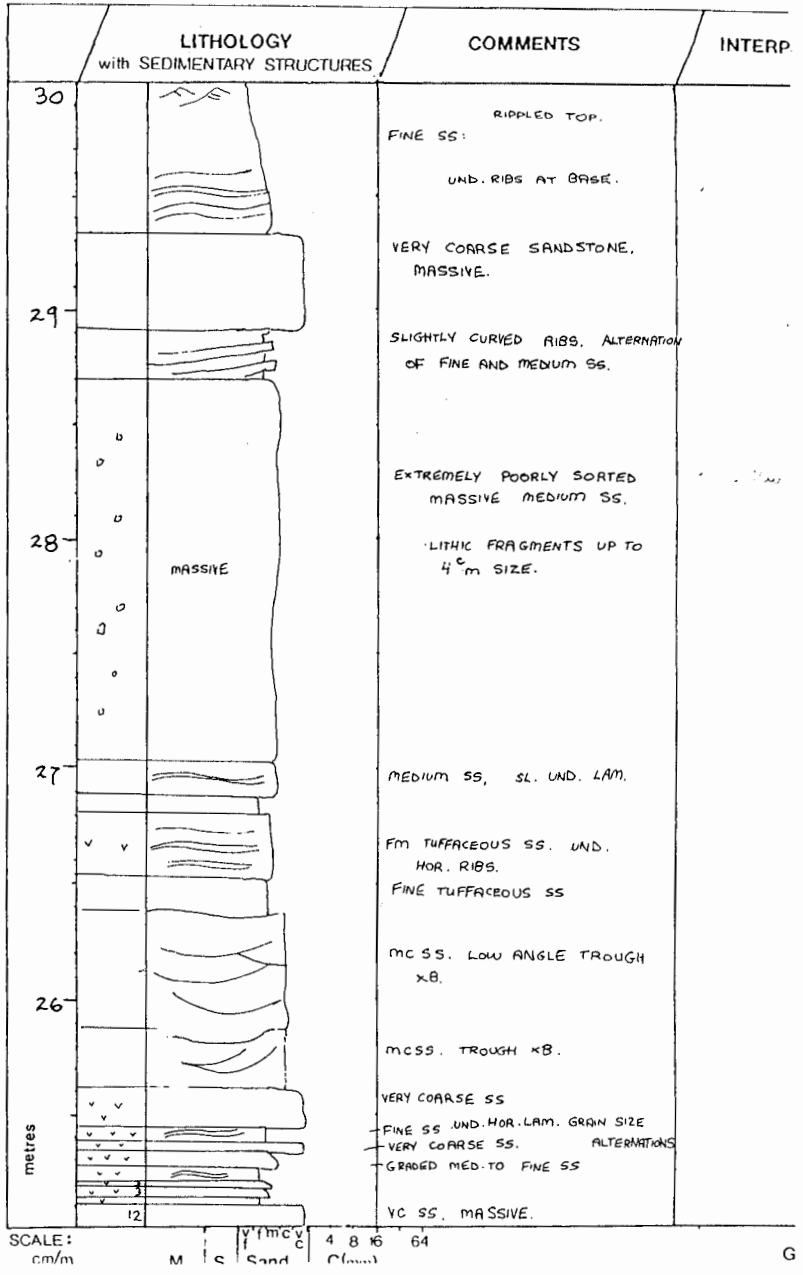

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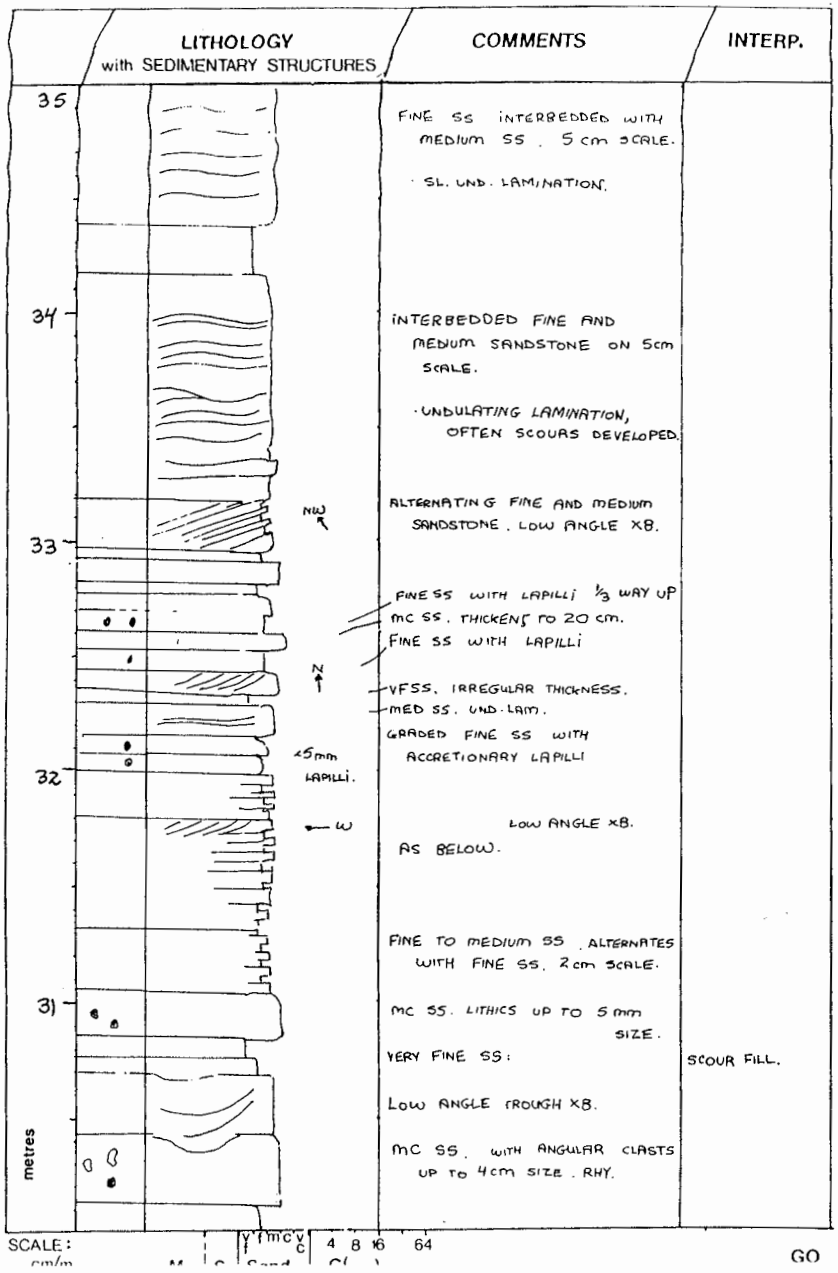

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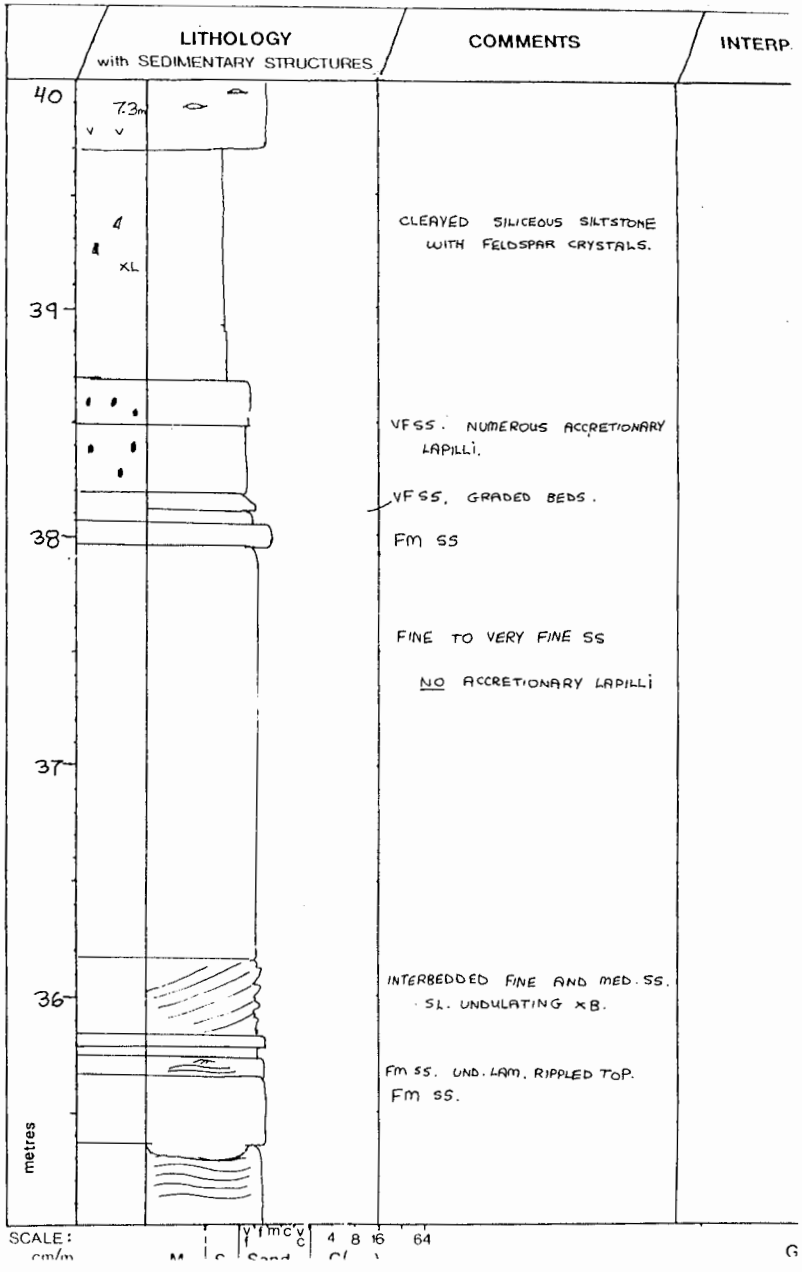

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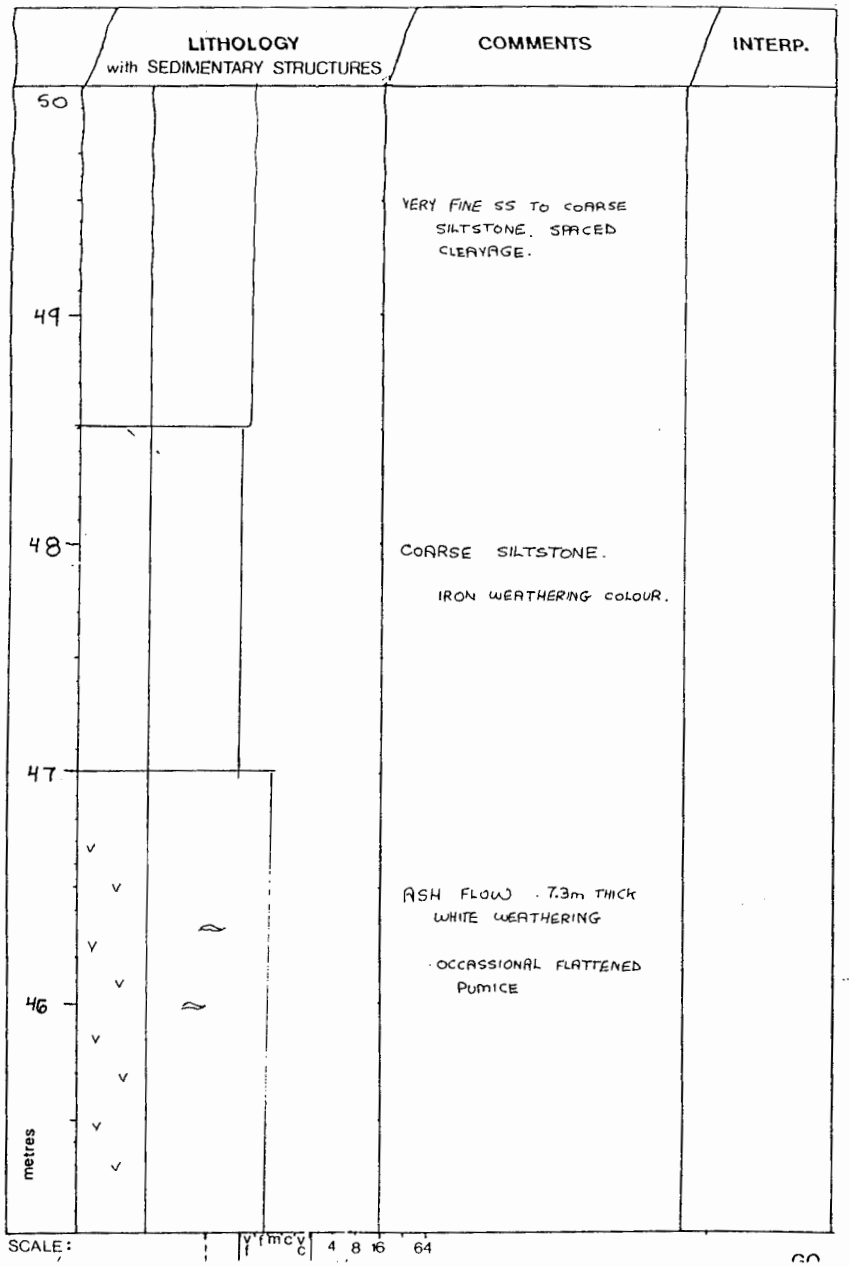

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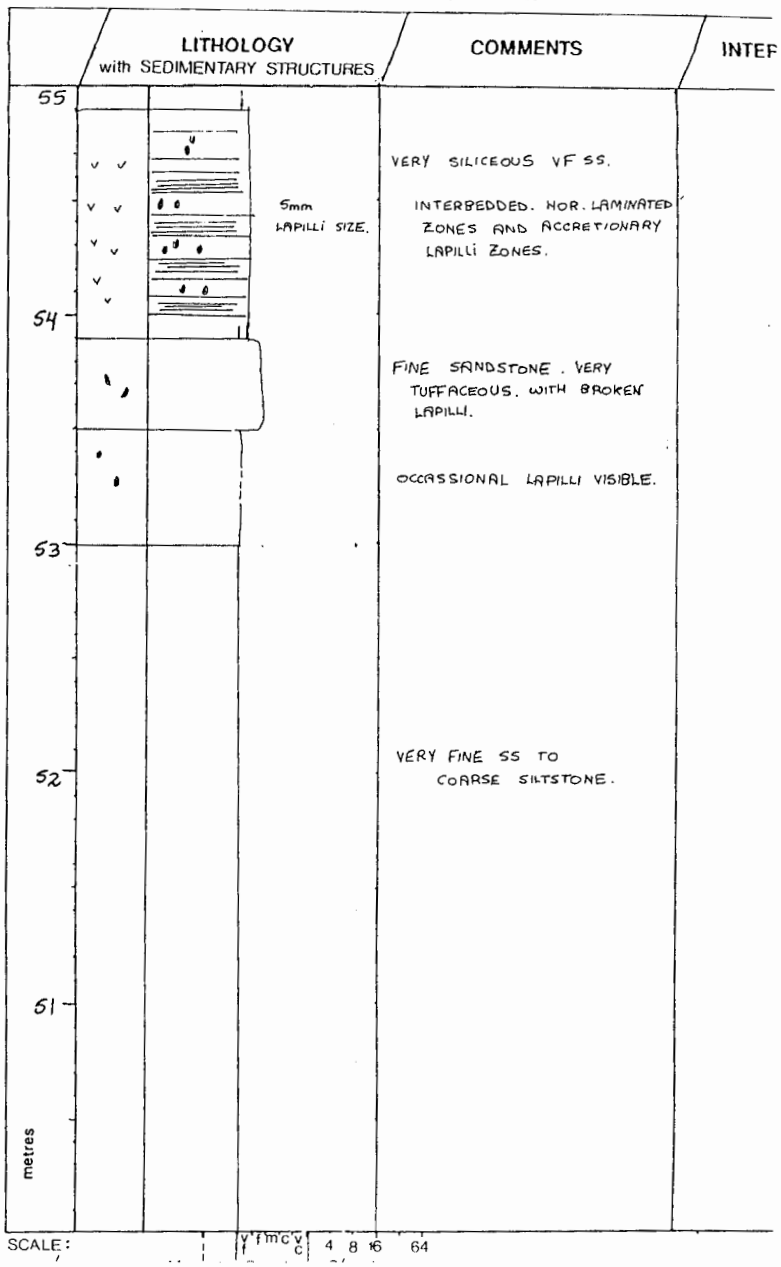
SECTION: U·5 LOCATION: PEN YR OLE WEN



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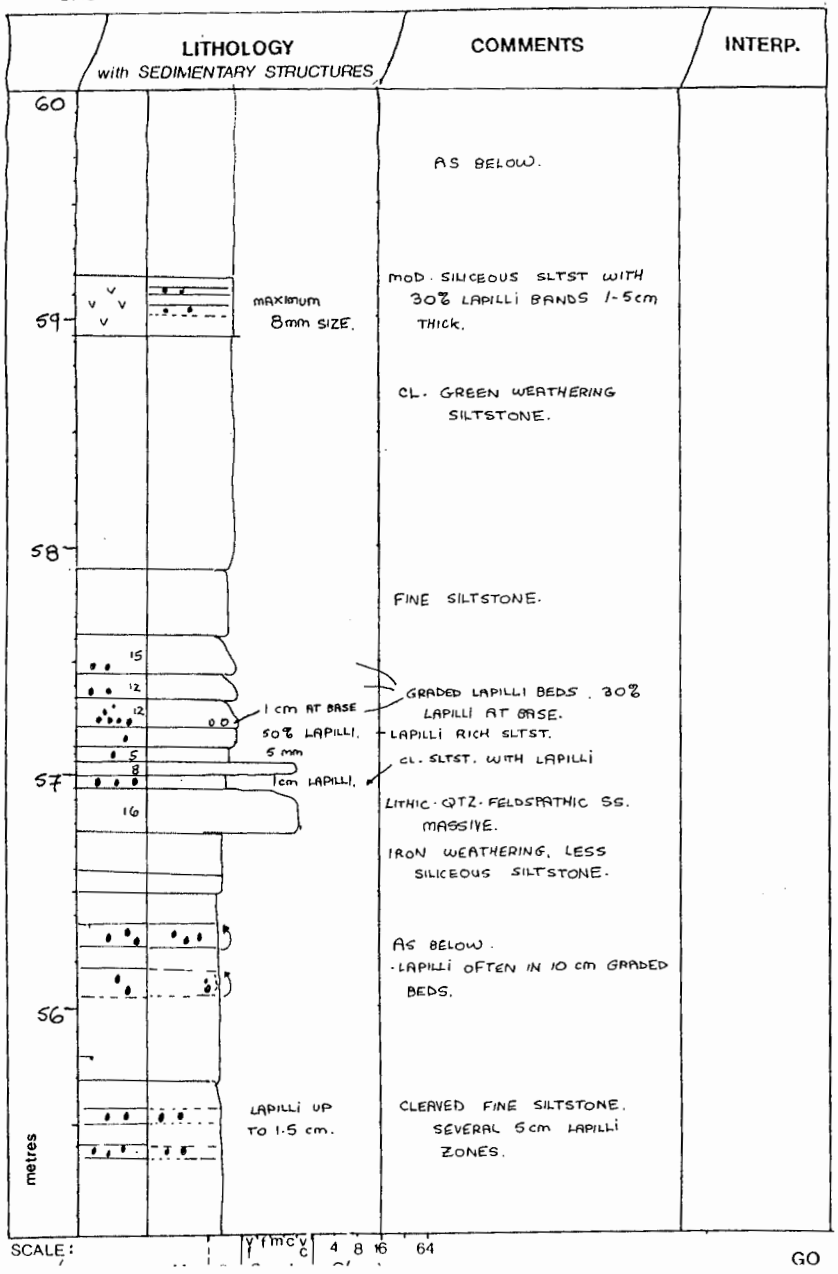

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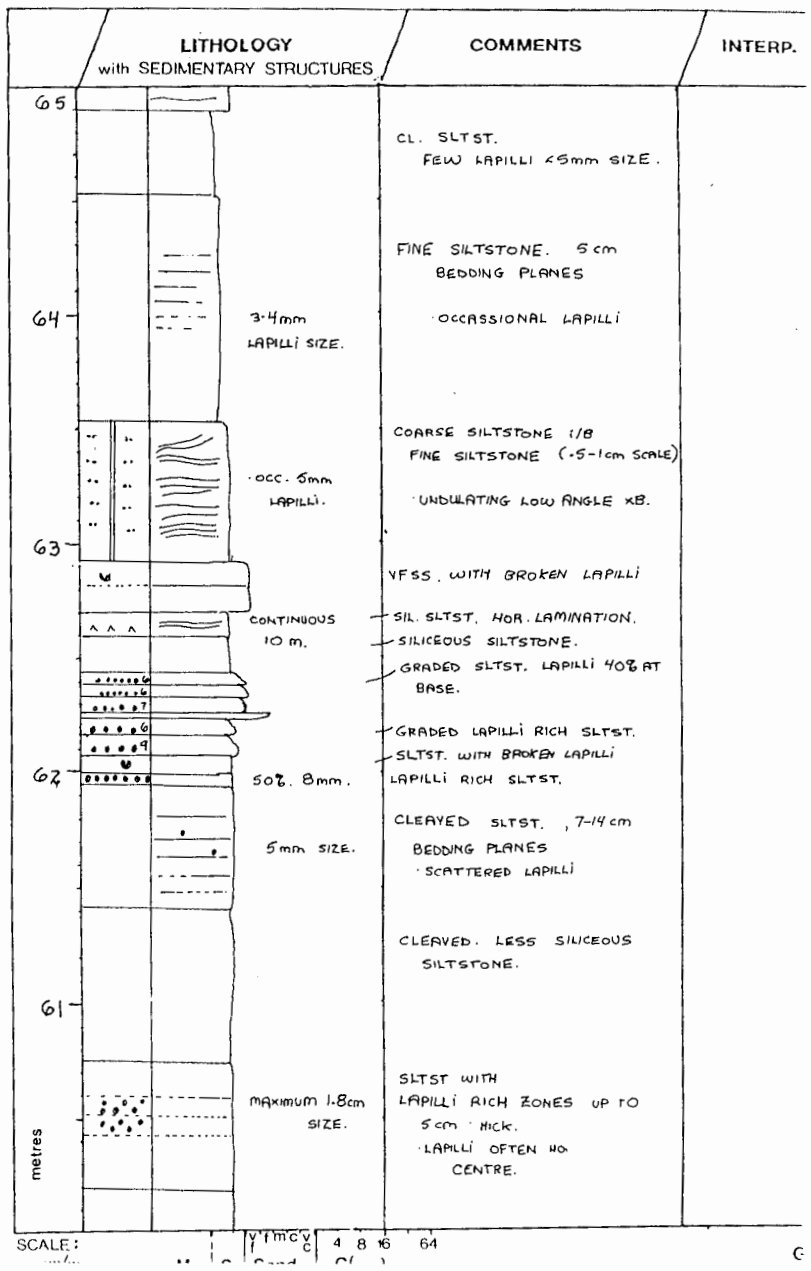

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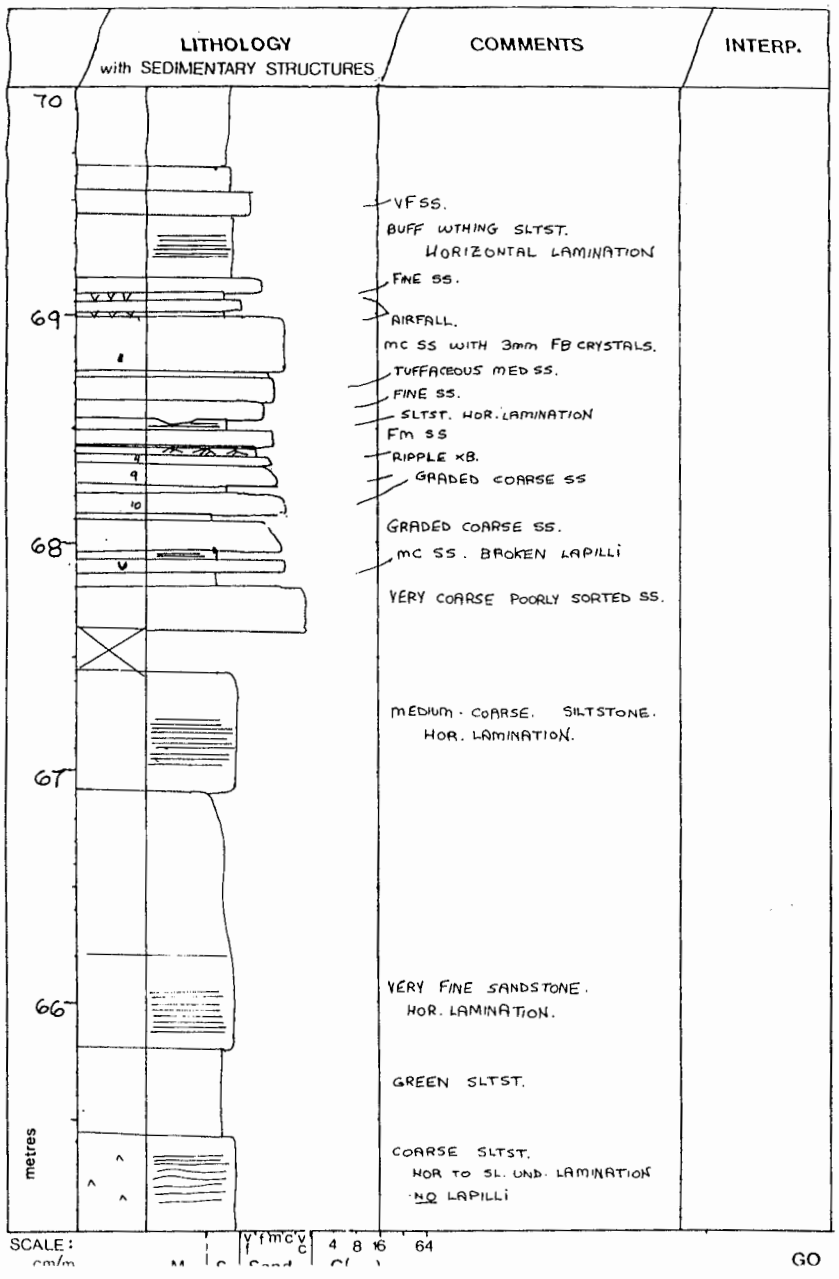

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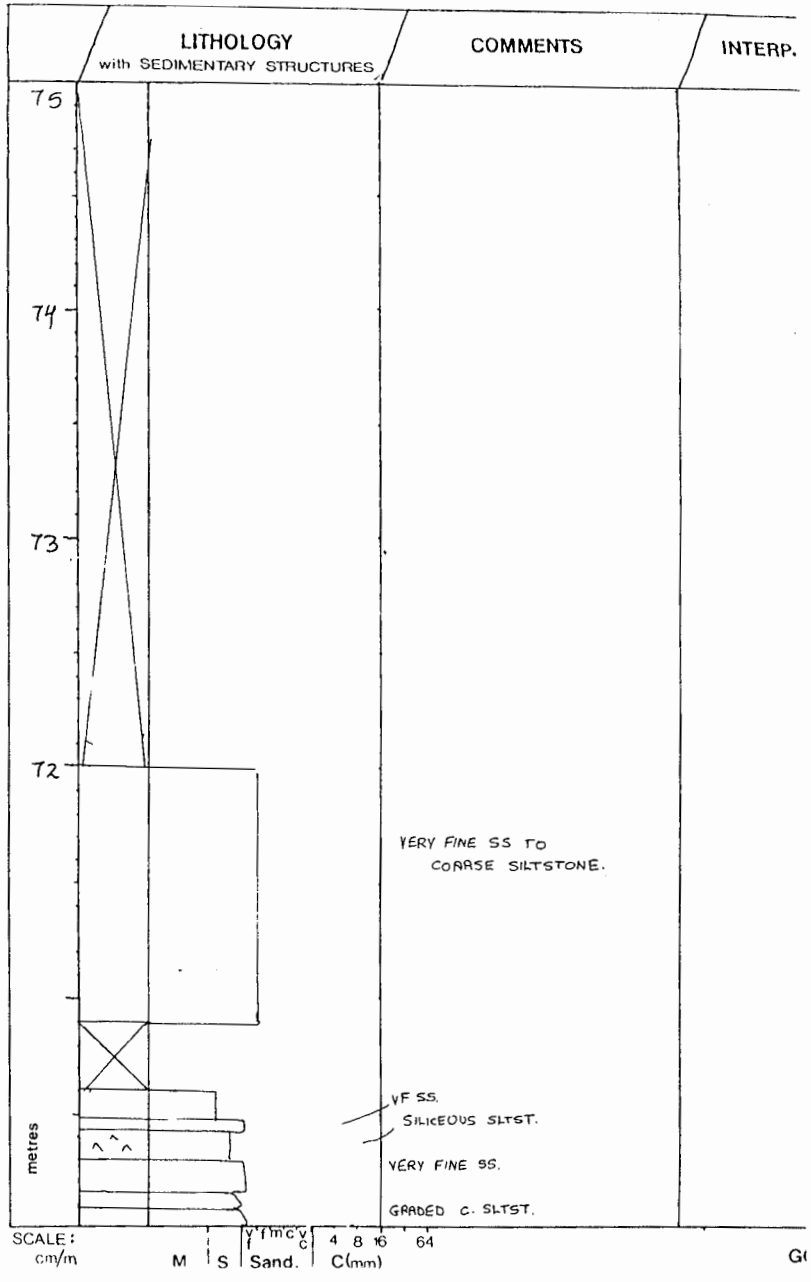

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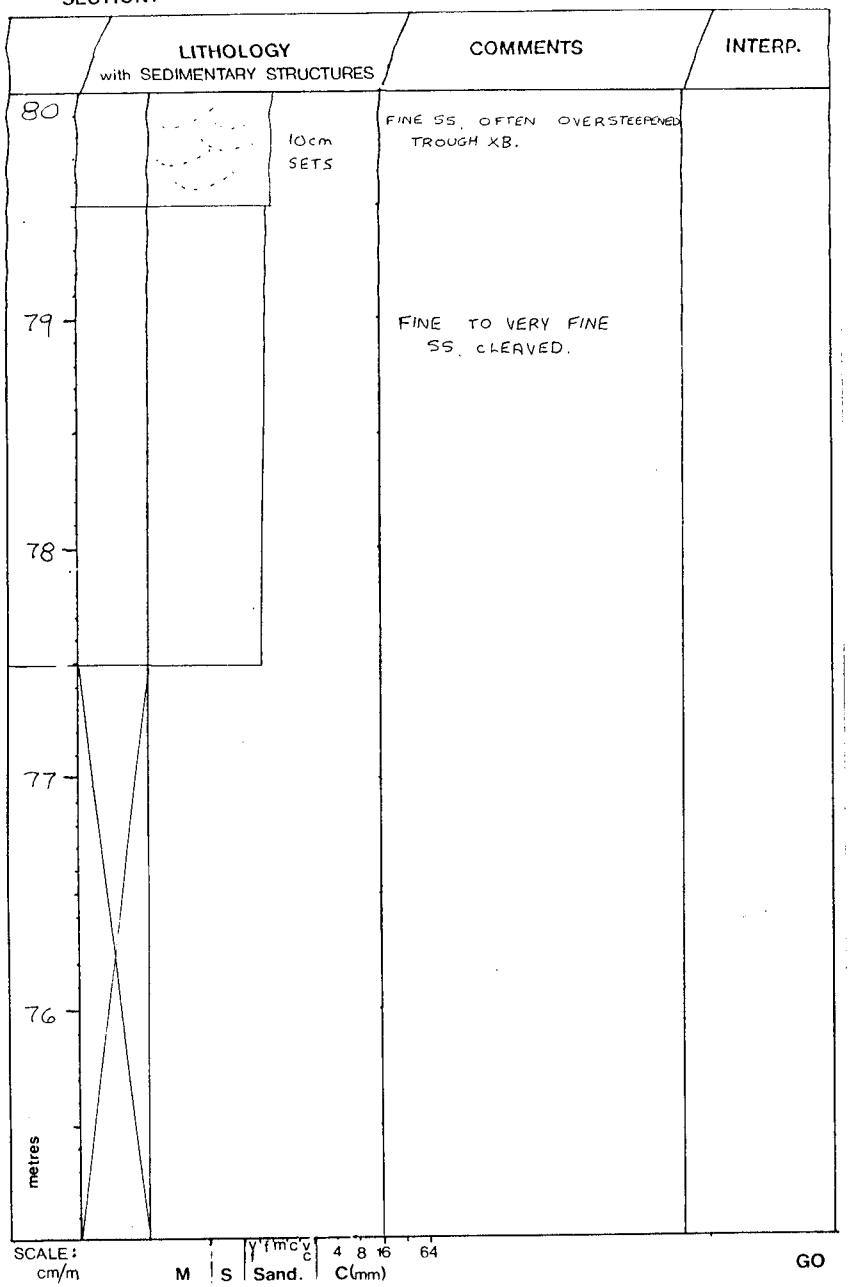
SECTION: U - 5 LOCATION: PEN YR OLE WEN



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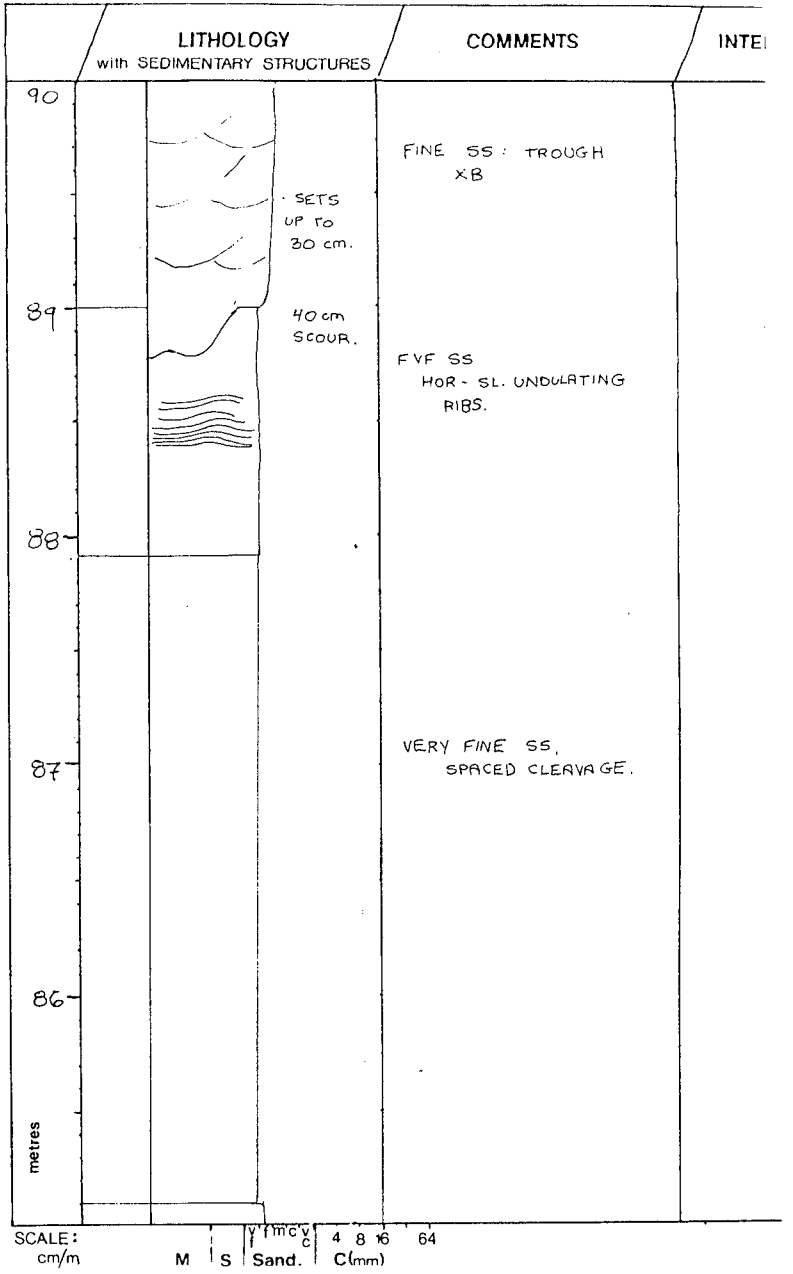

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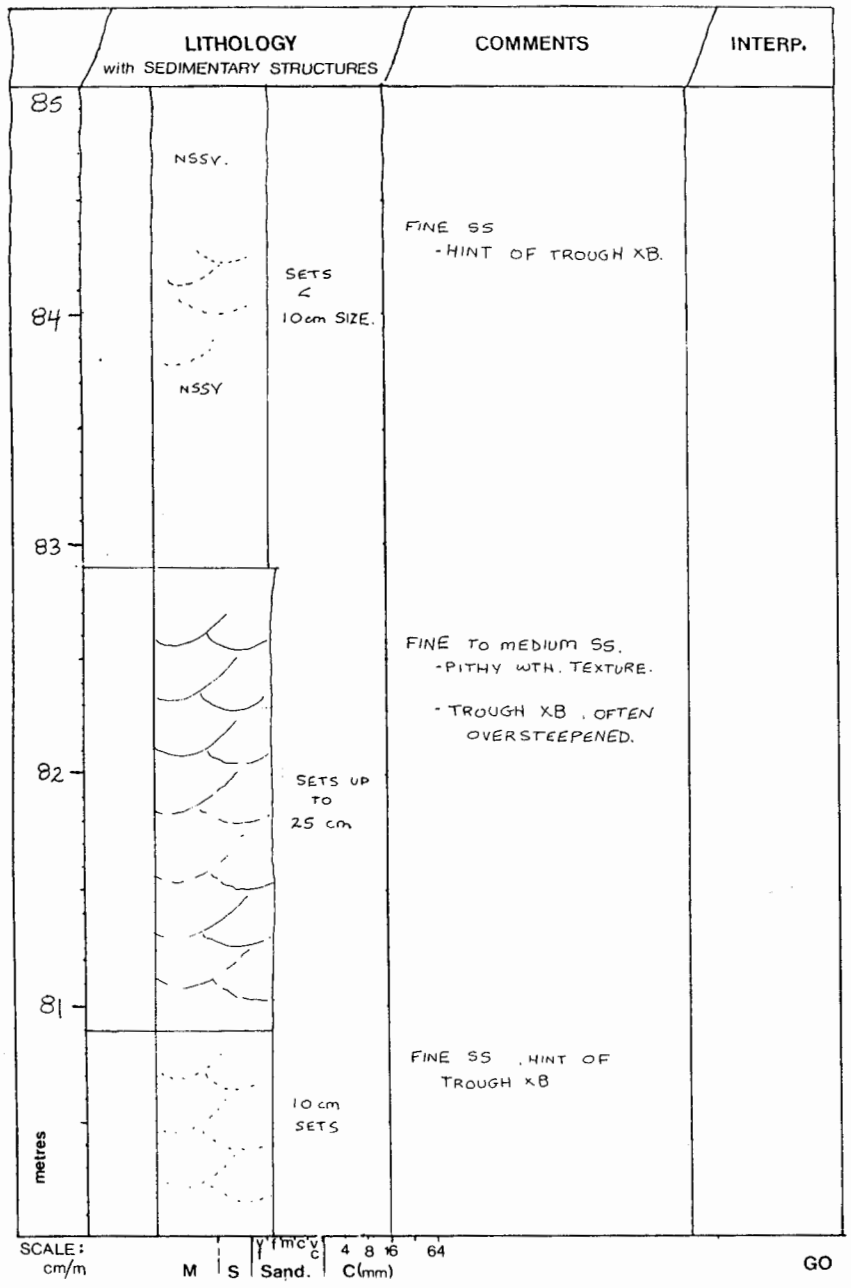

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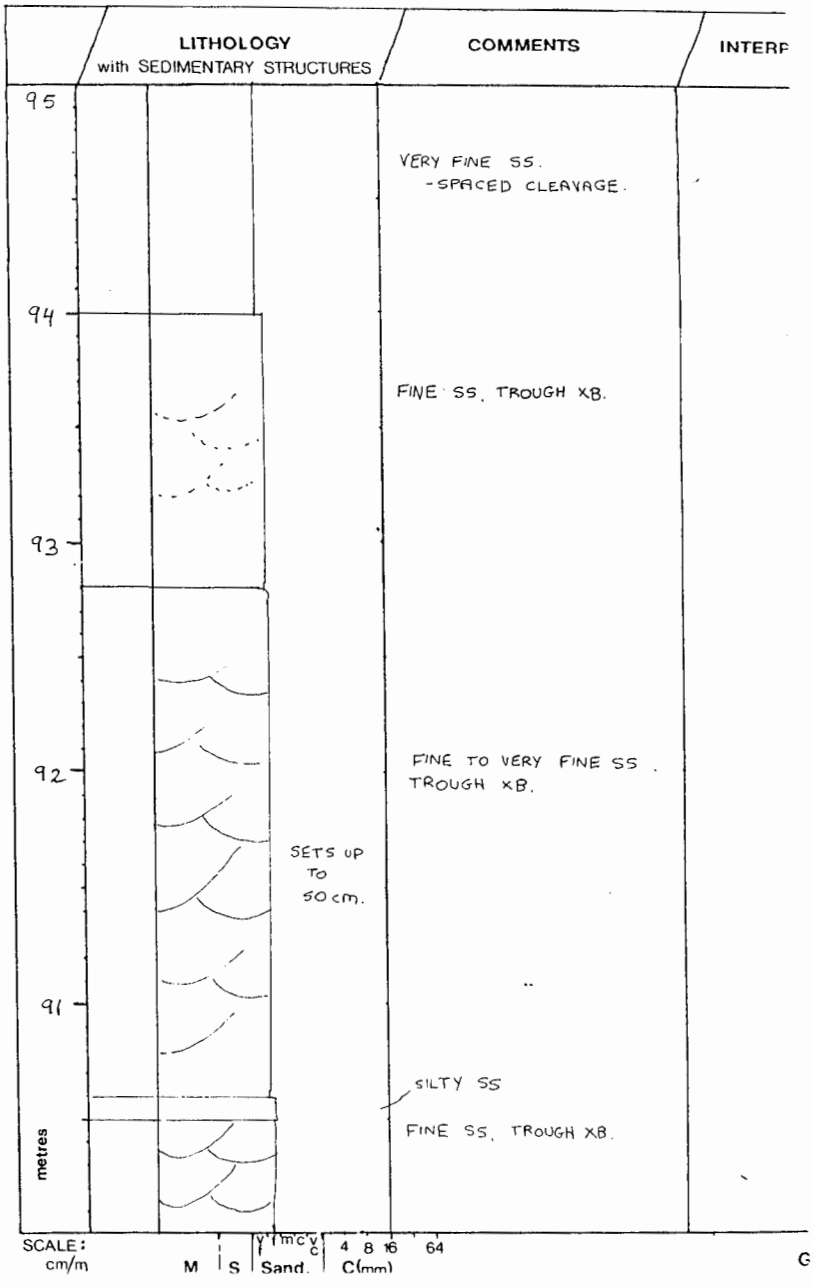

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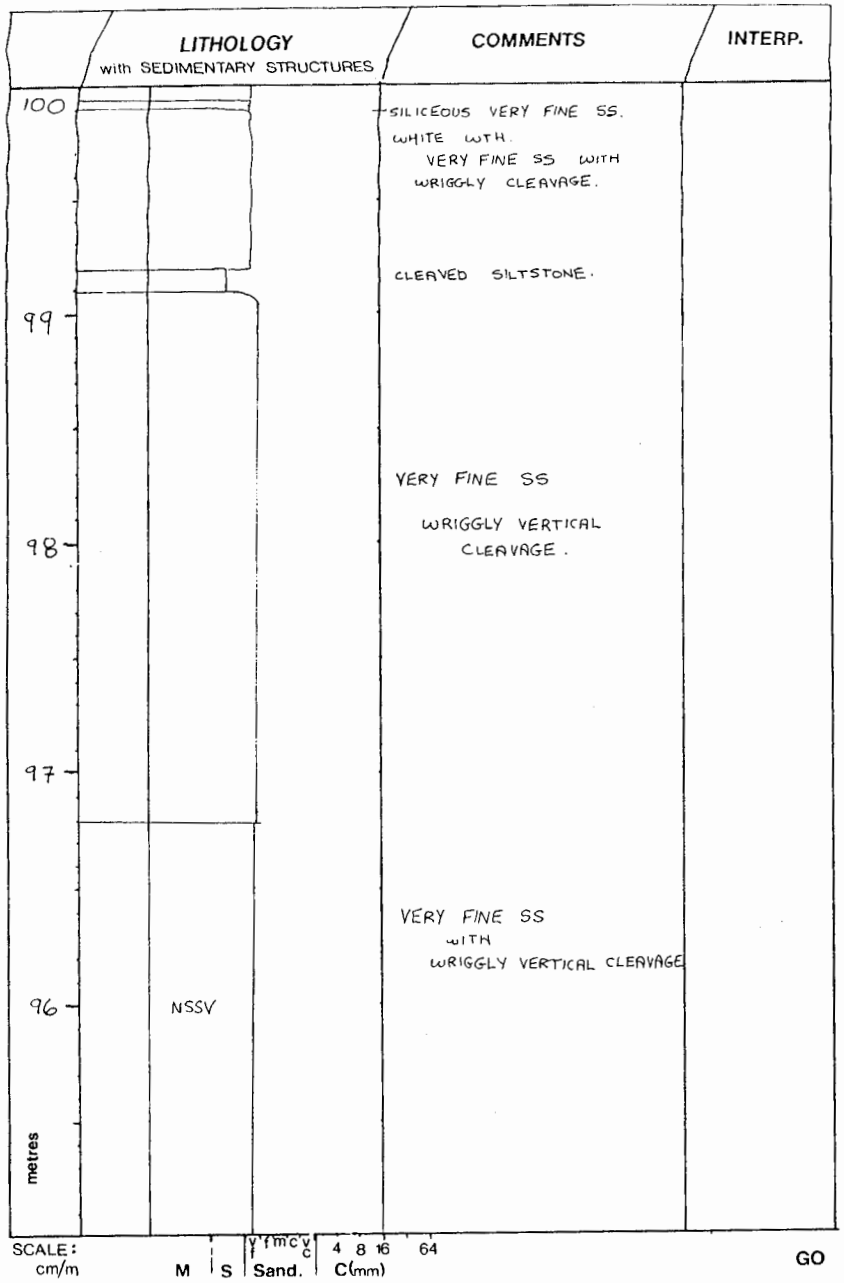

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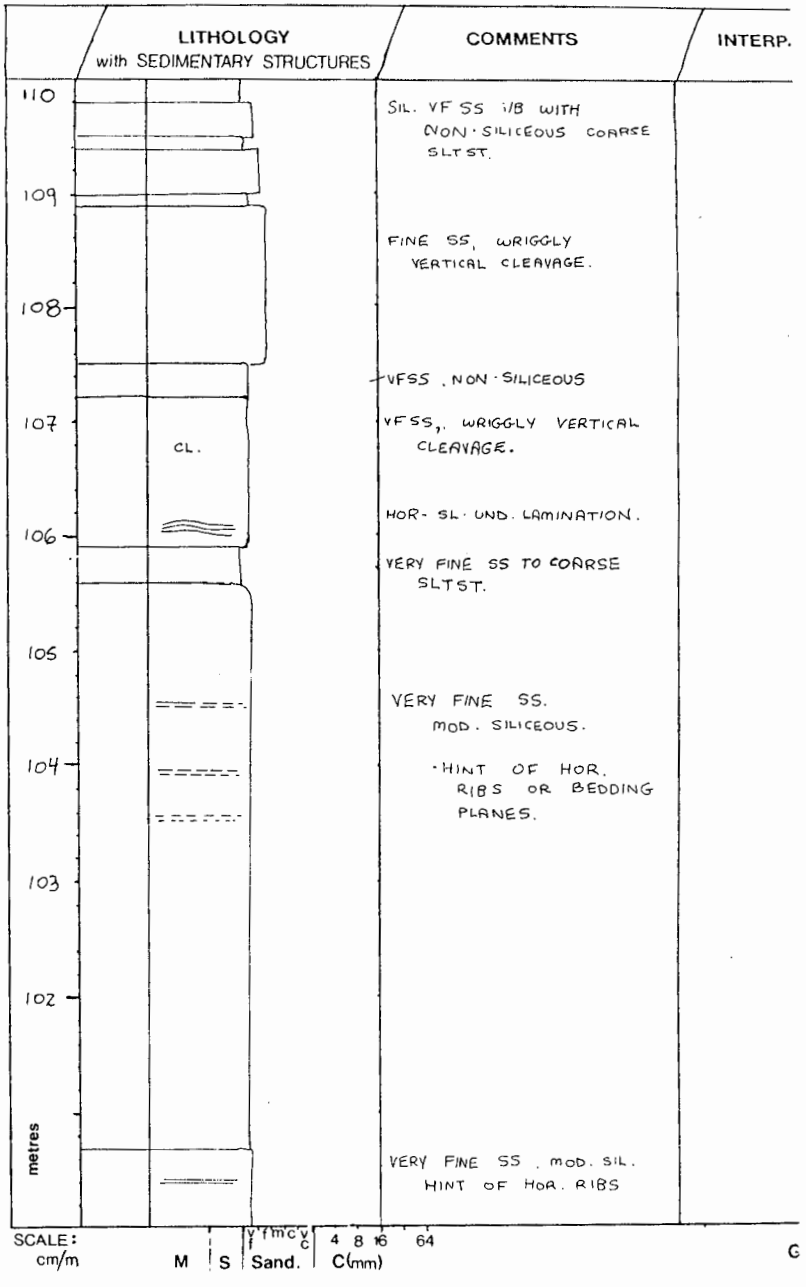

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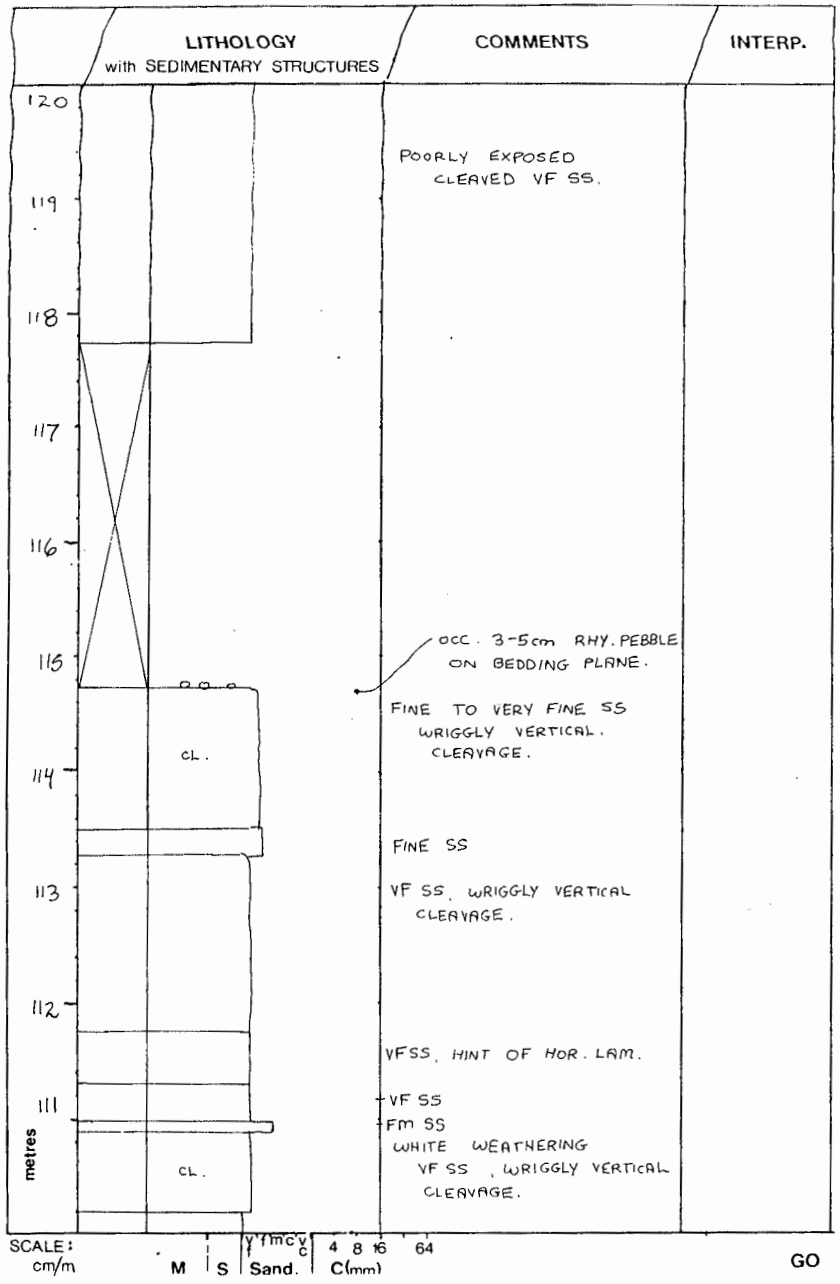

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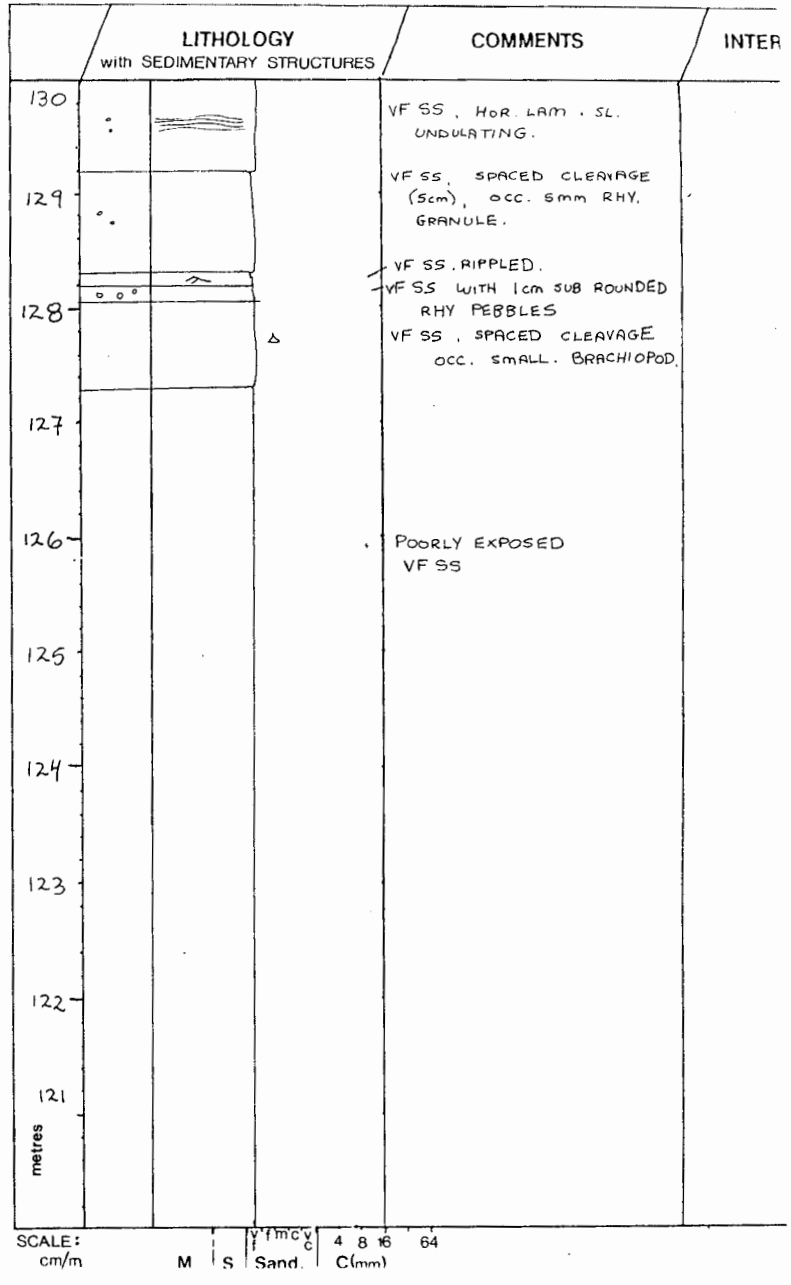

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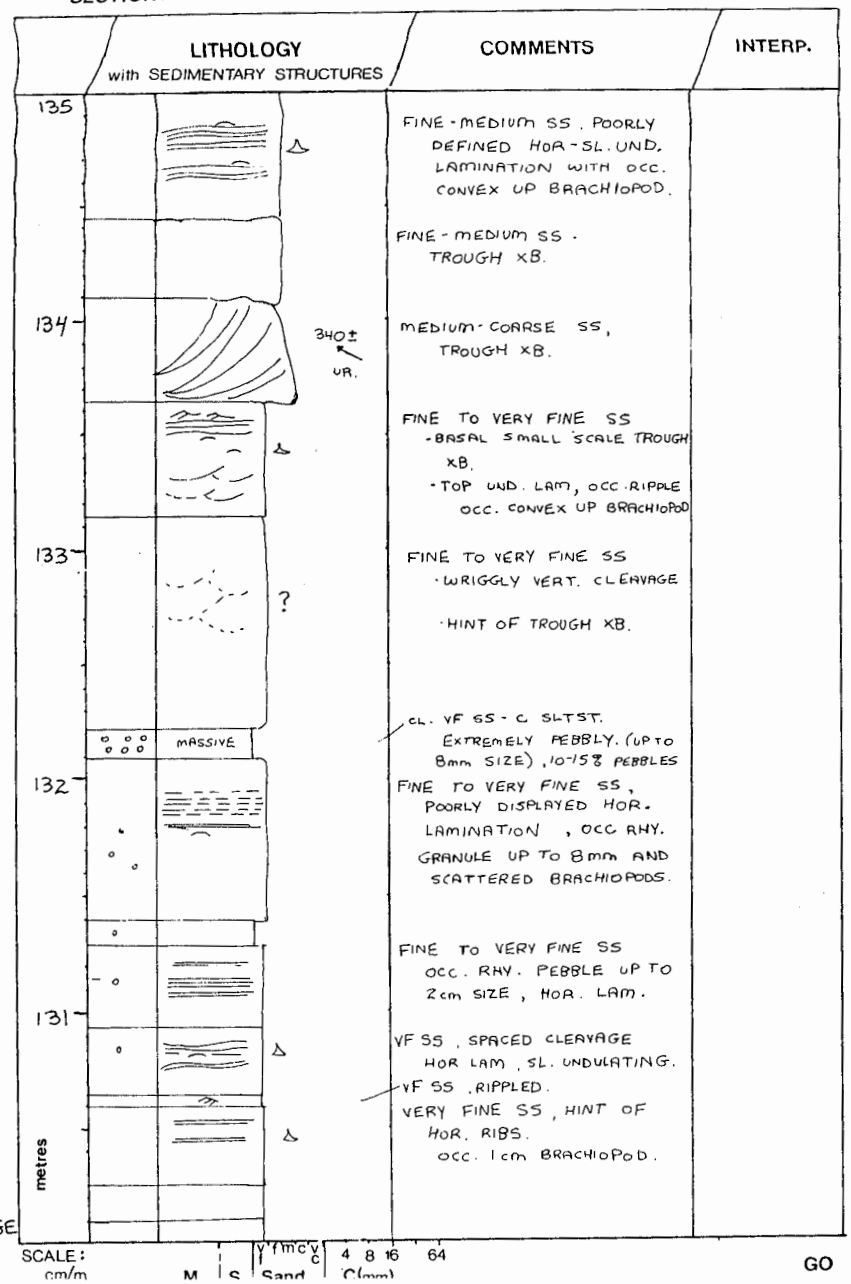

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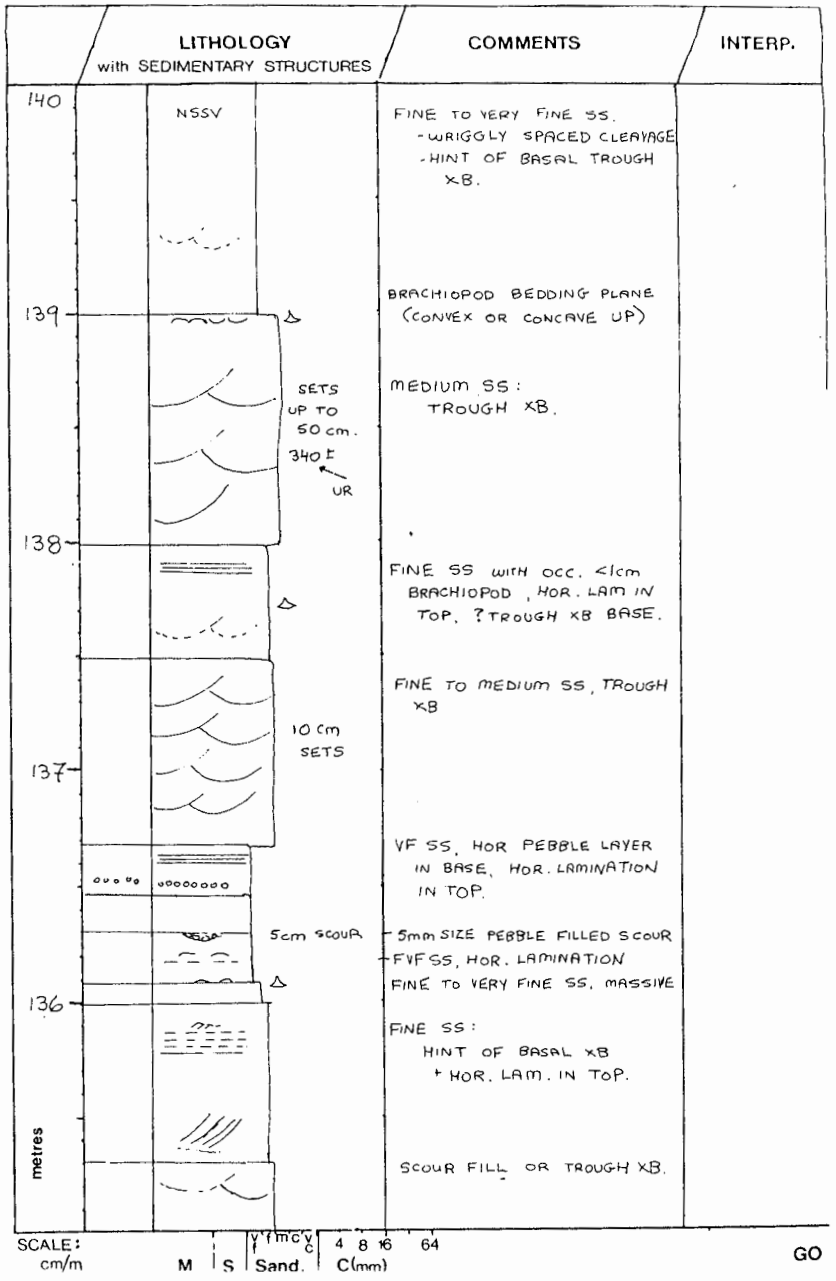

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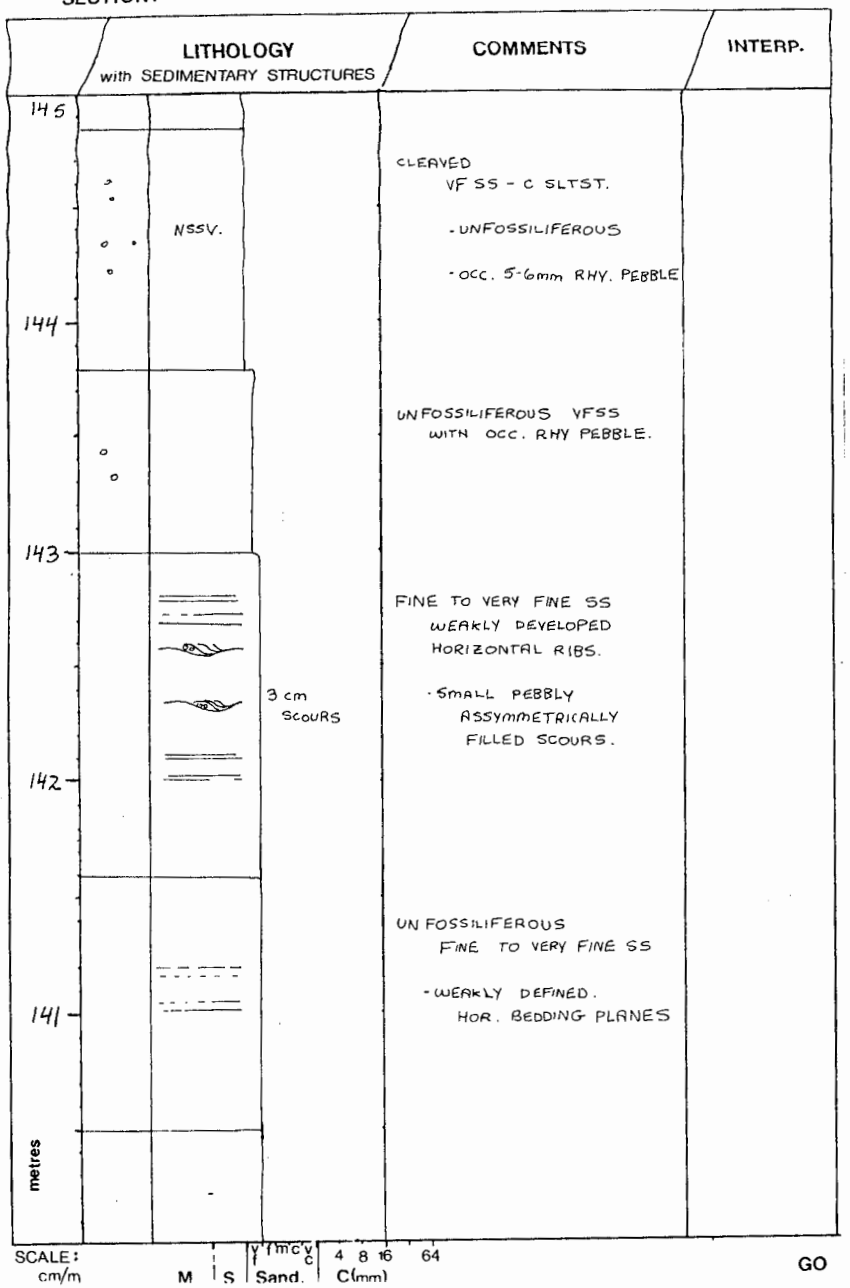

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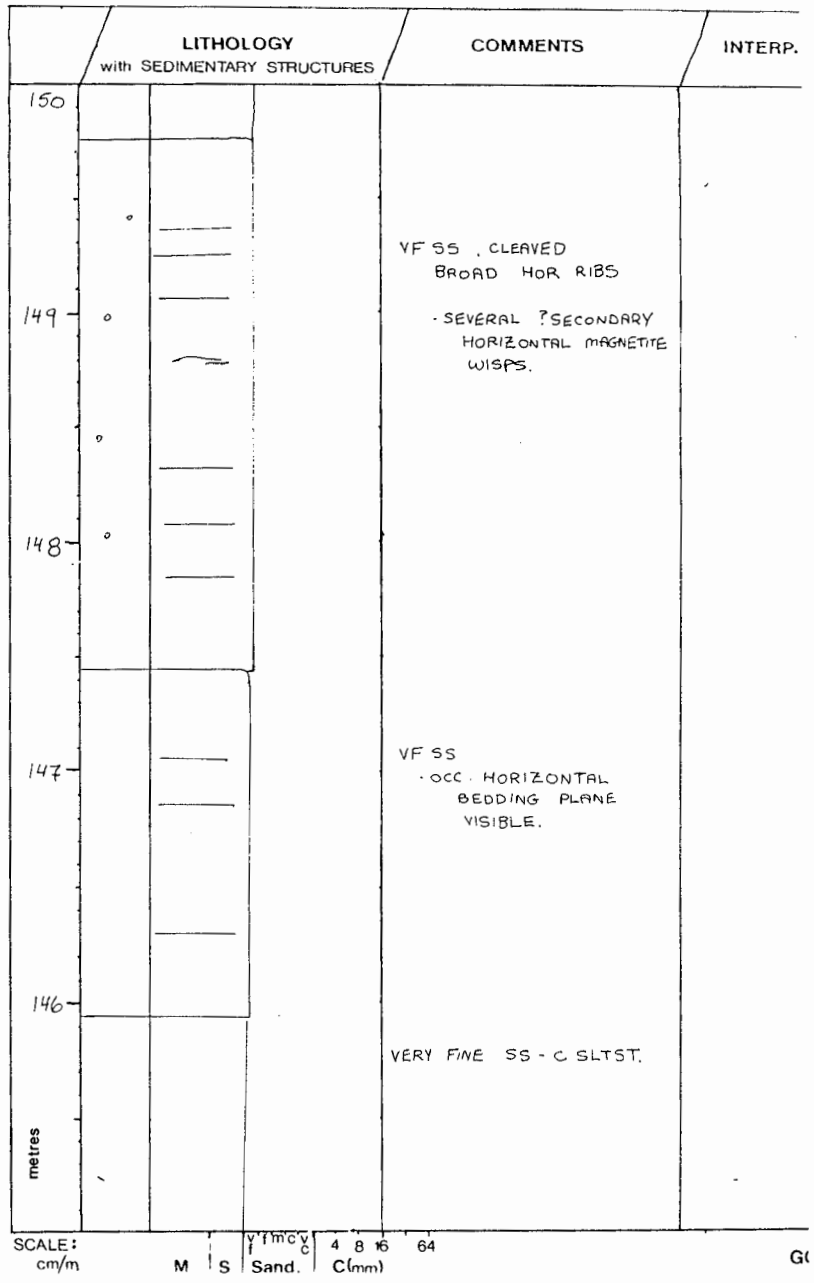
SECTION: U·5 LOCATION: PEN YR OLE WEN.



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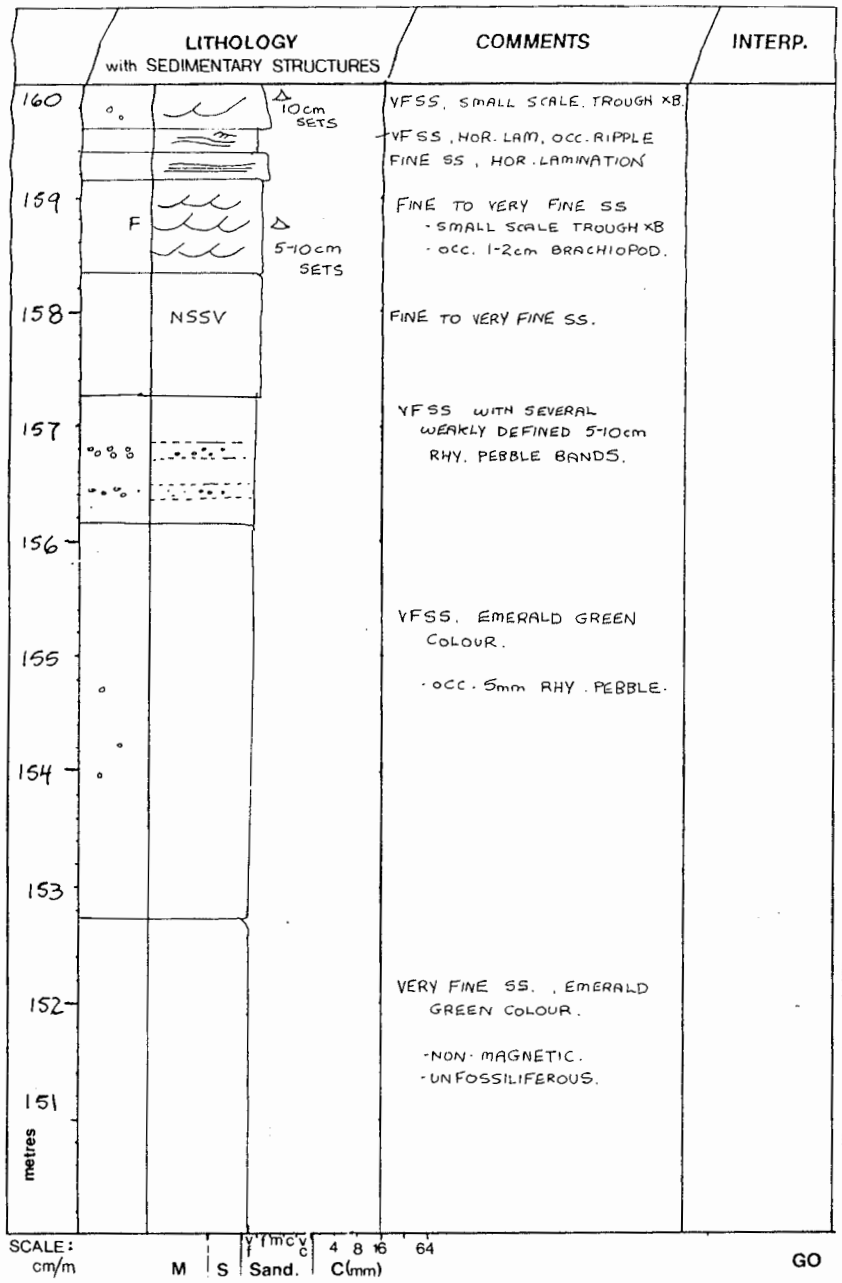
SECTION: U-5 LOCATION: PEN YR OLE WEN



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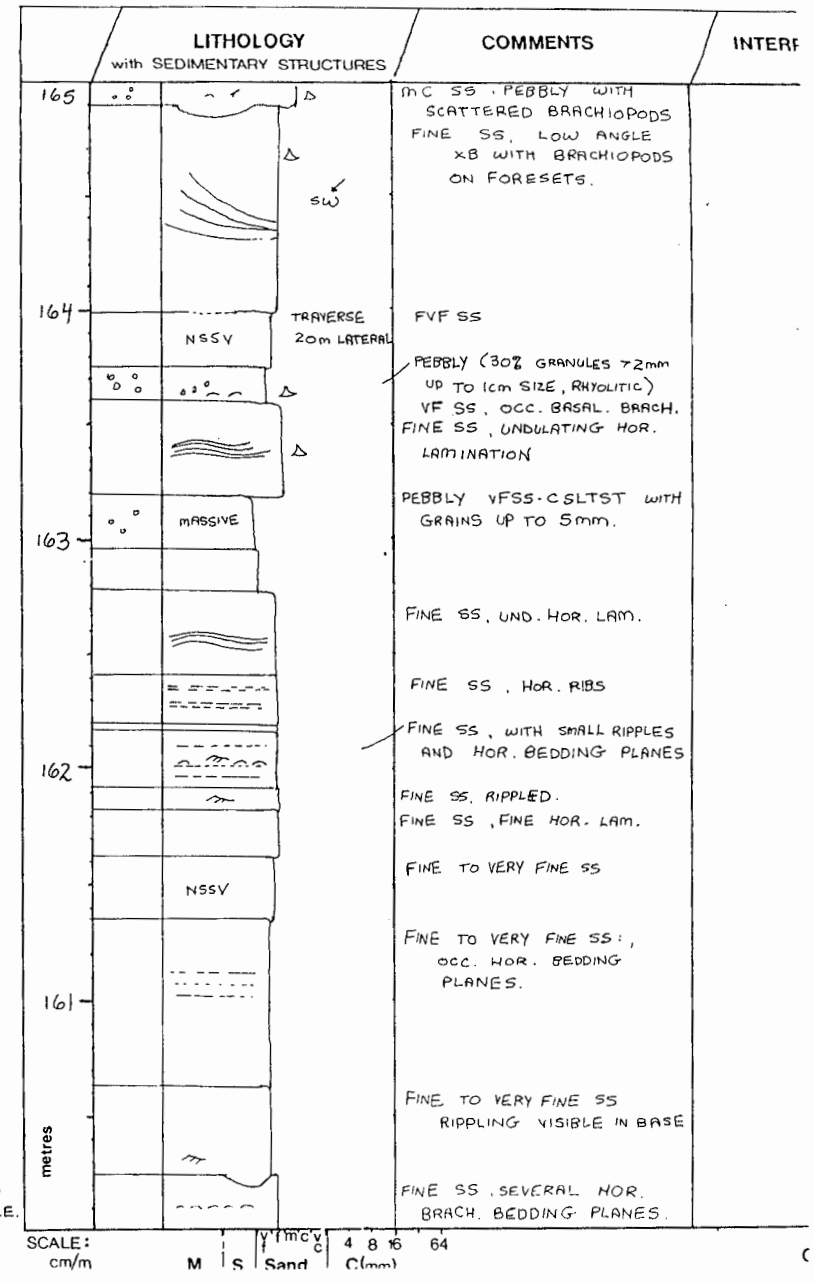

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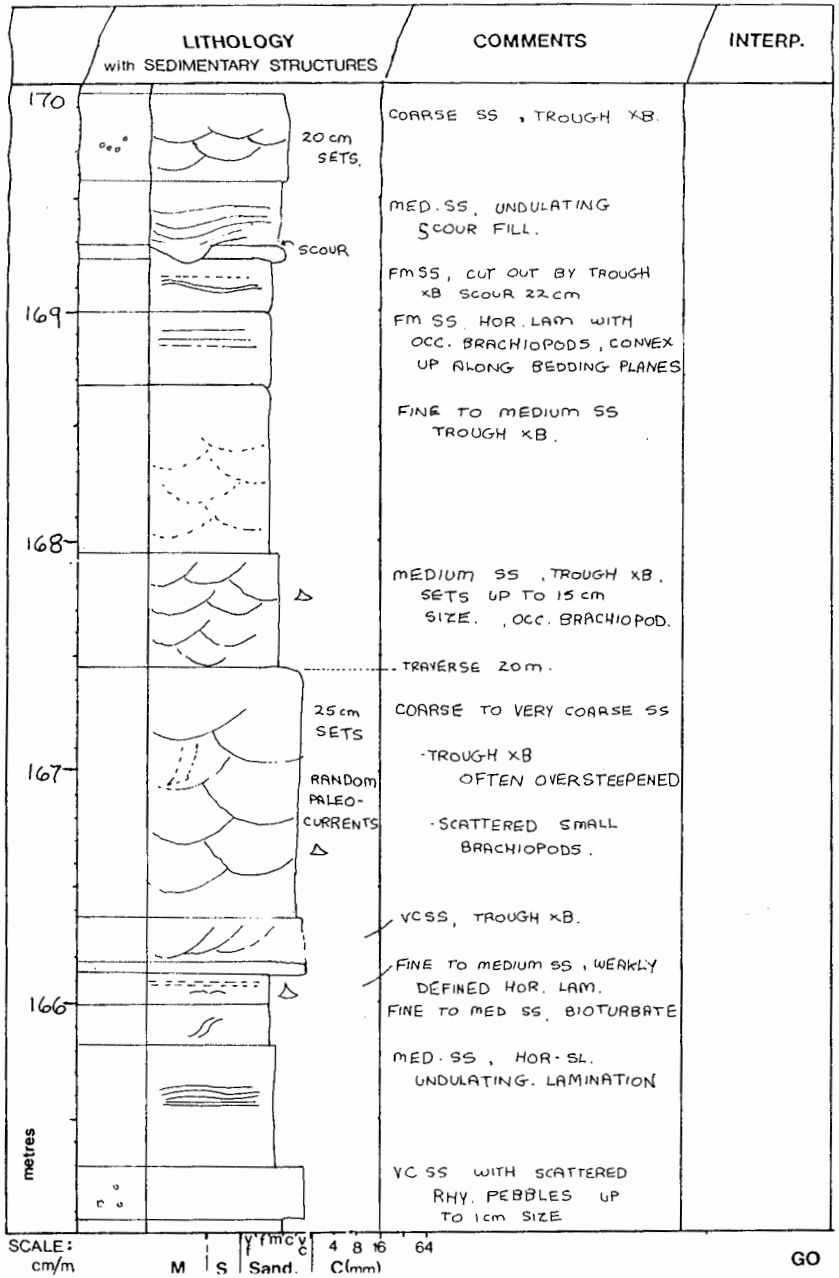

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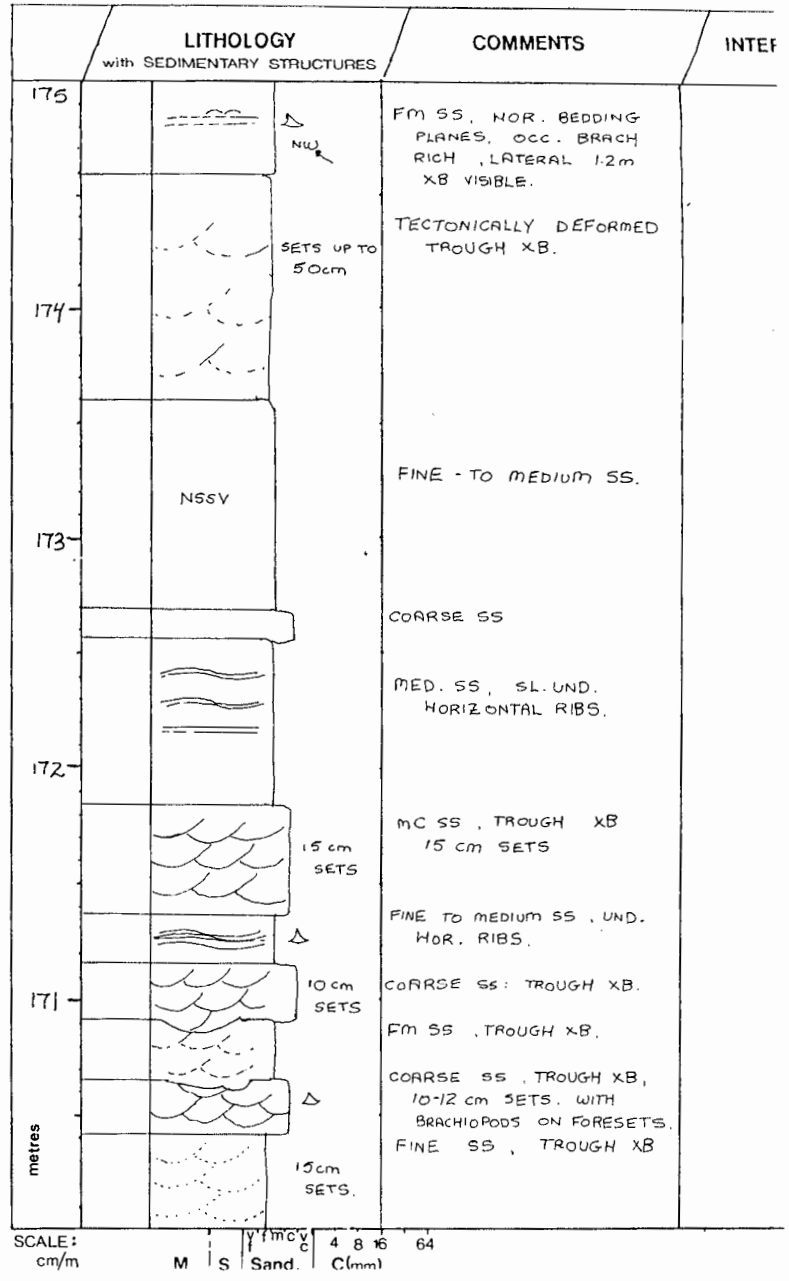

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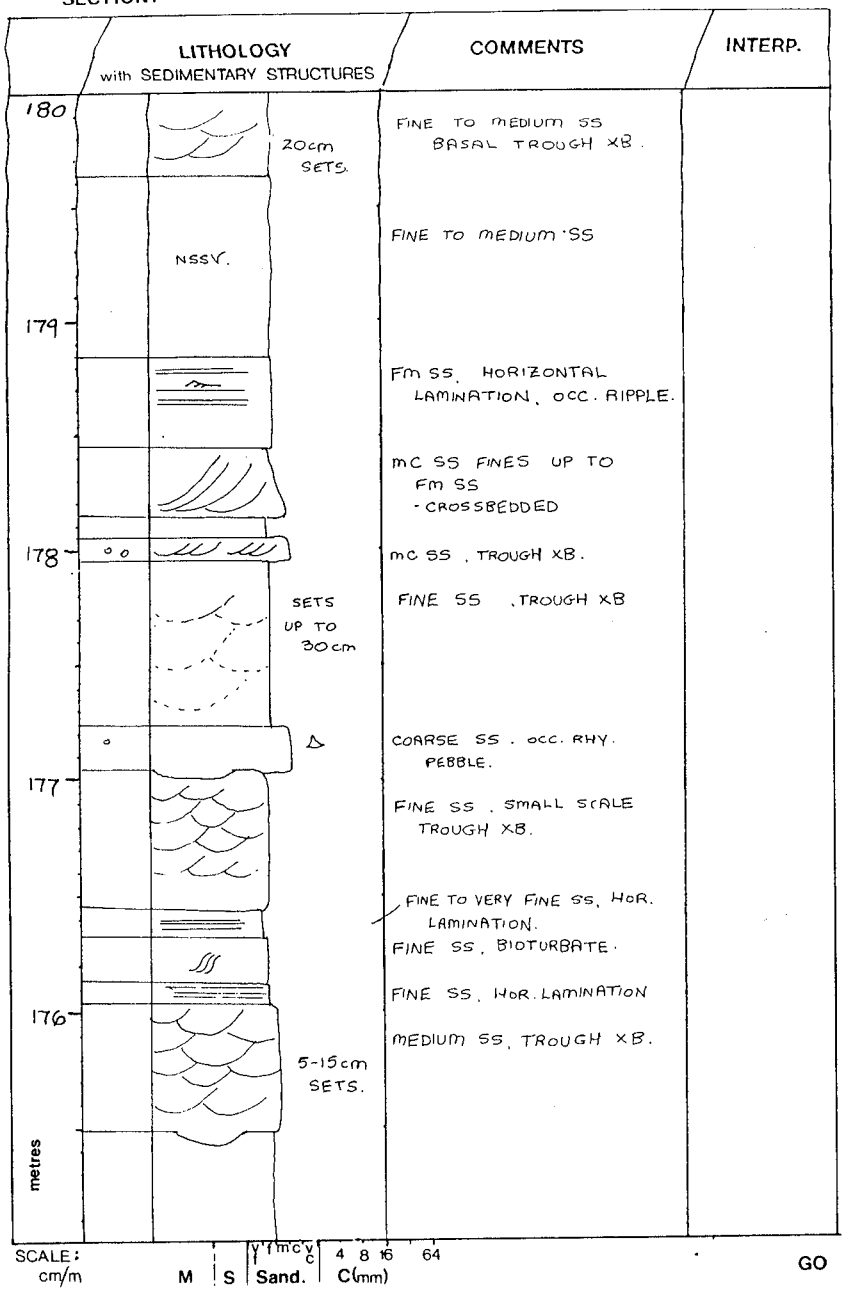

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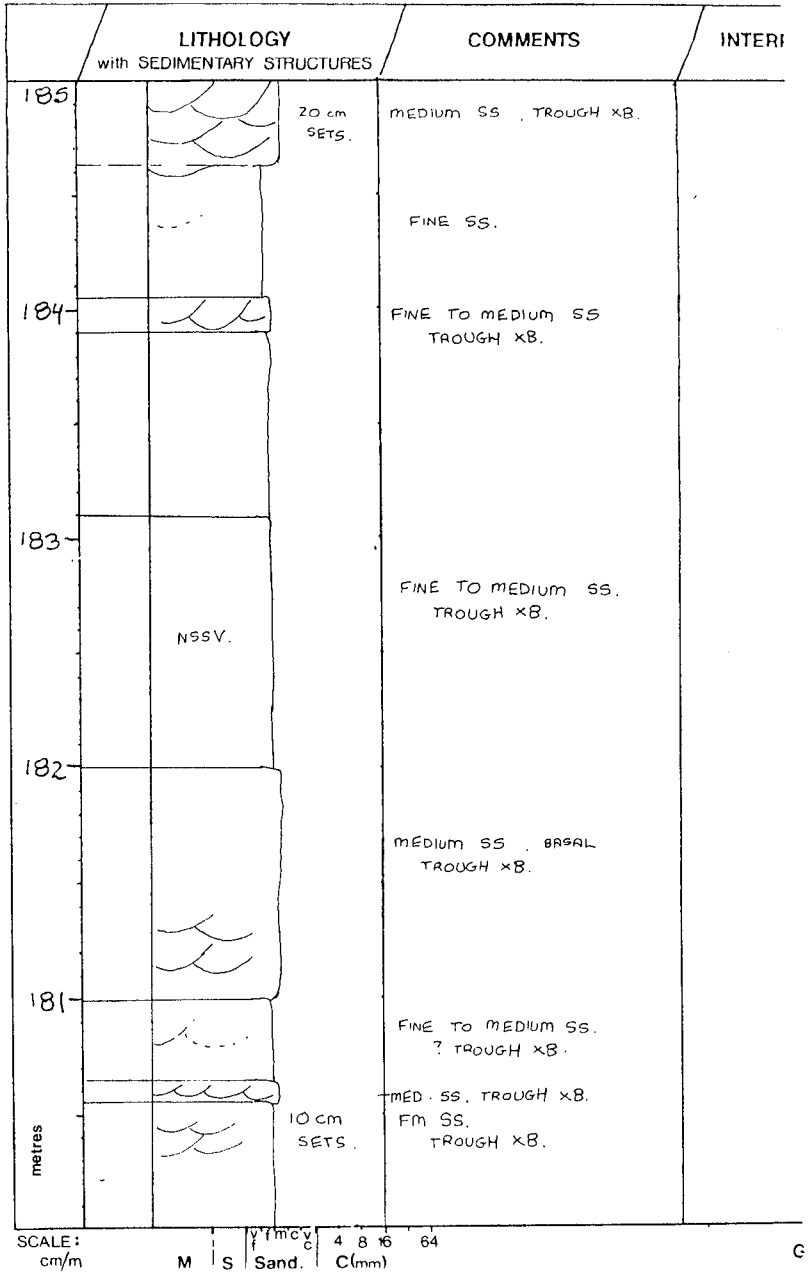

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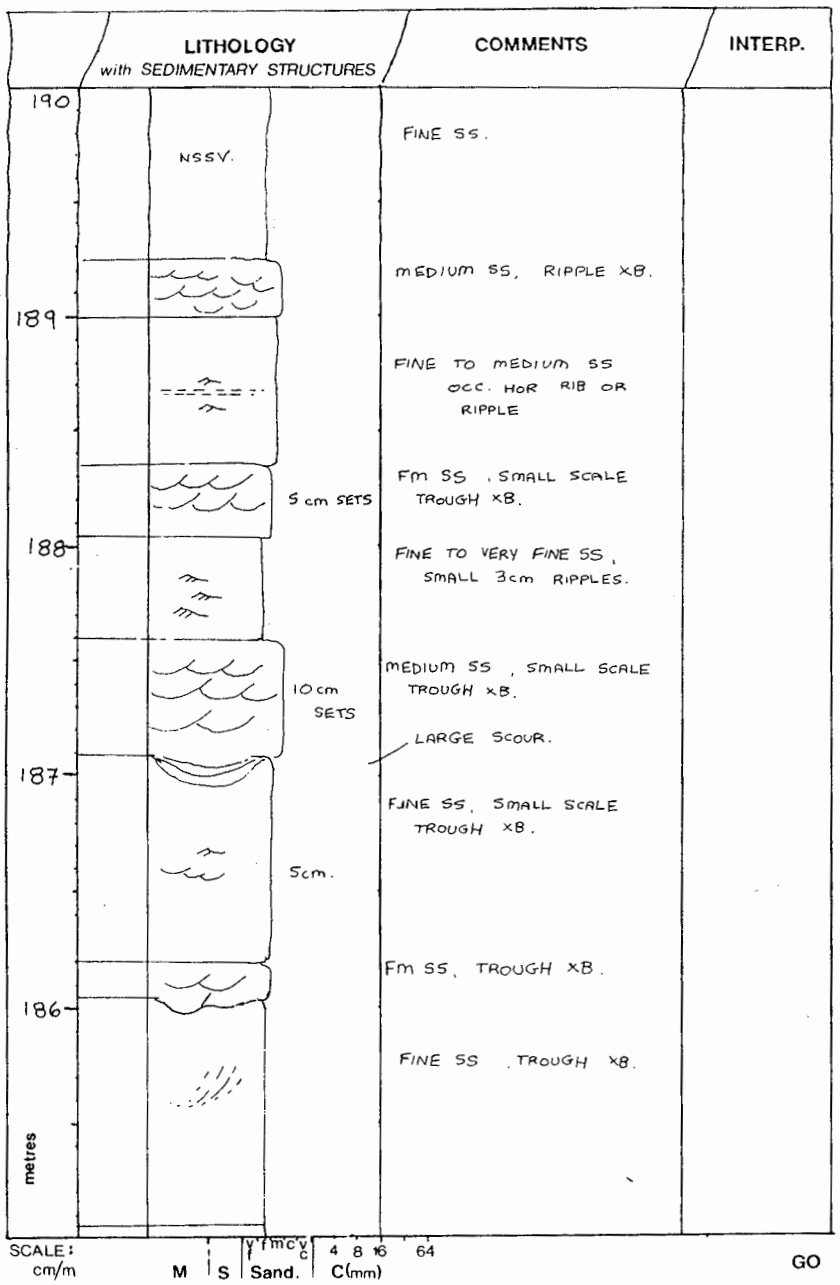

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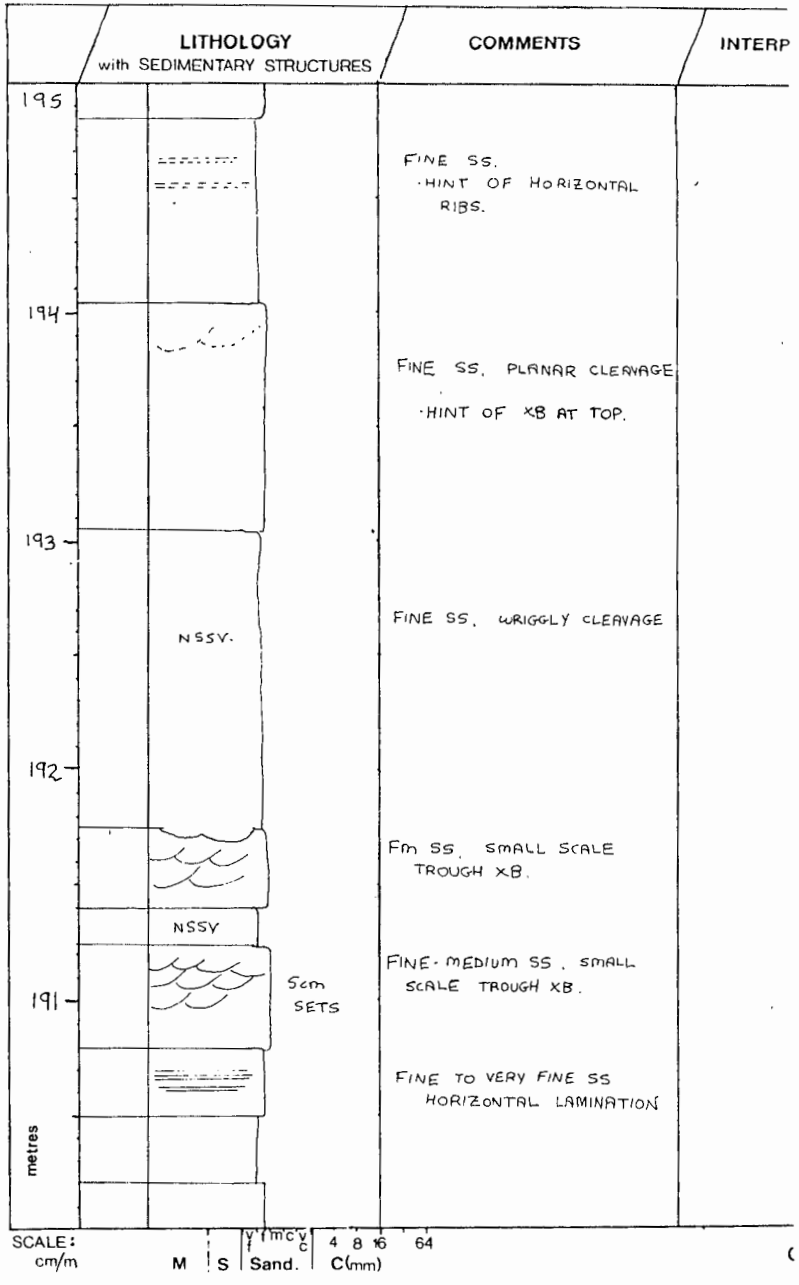

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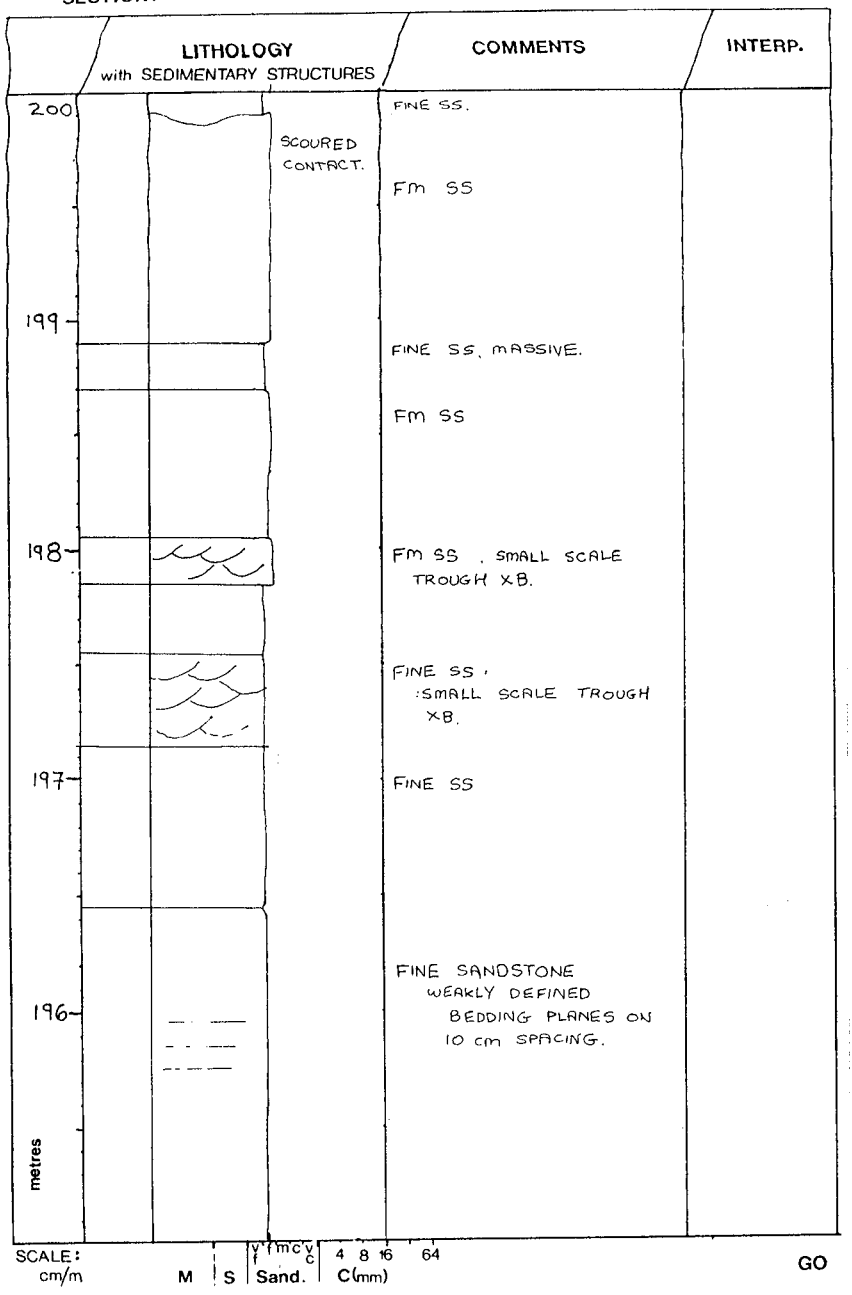

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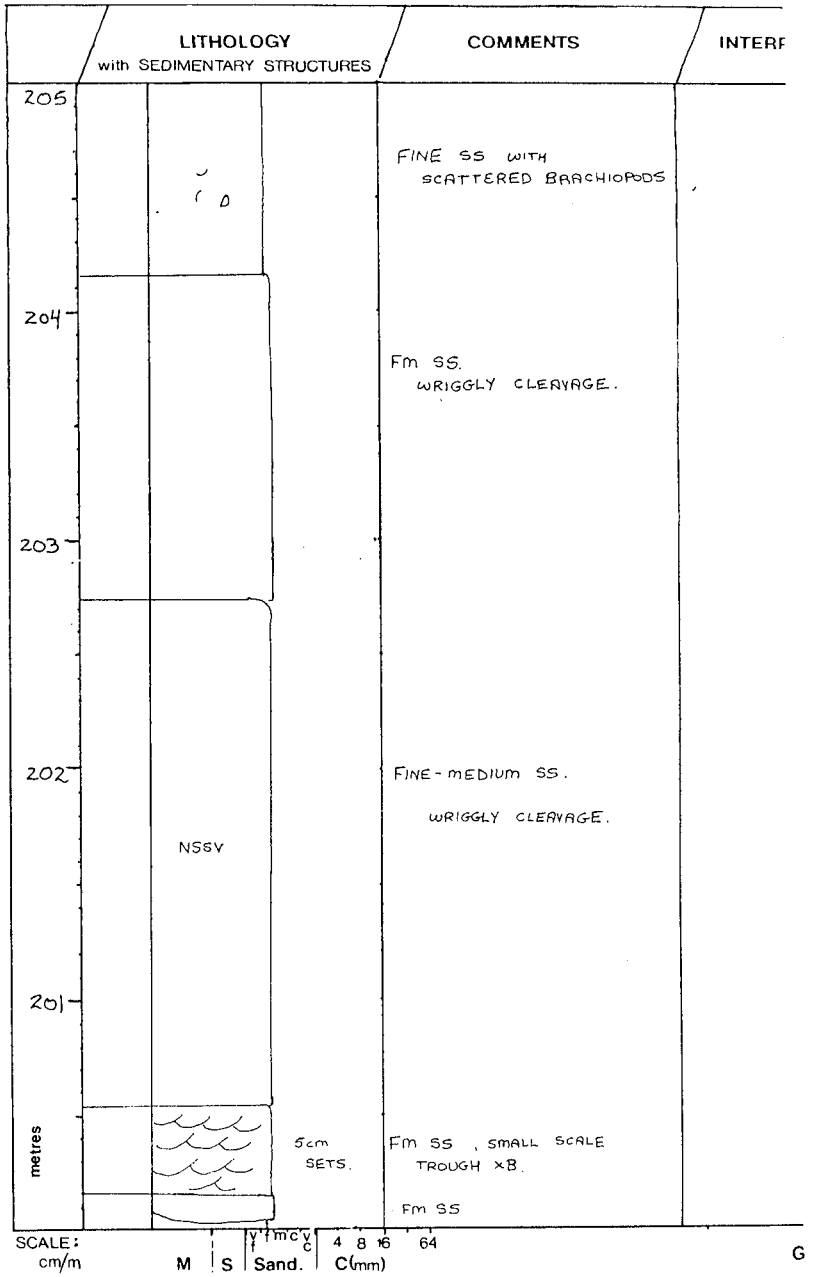

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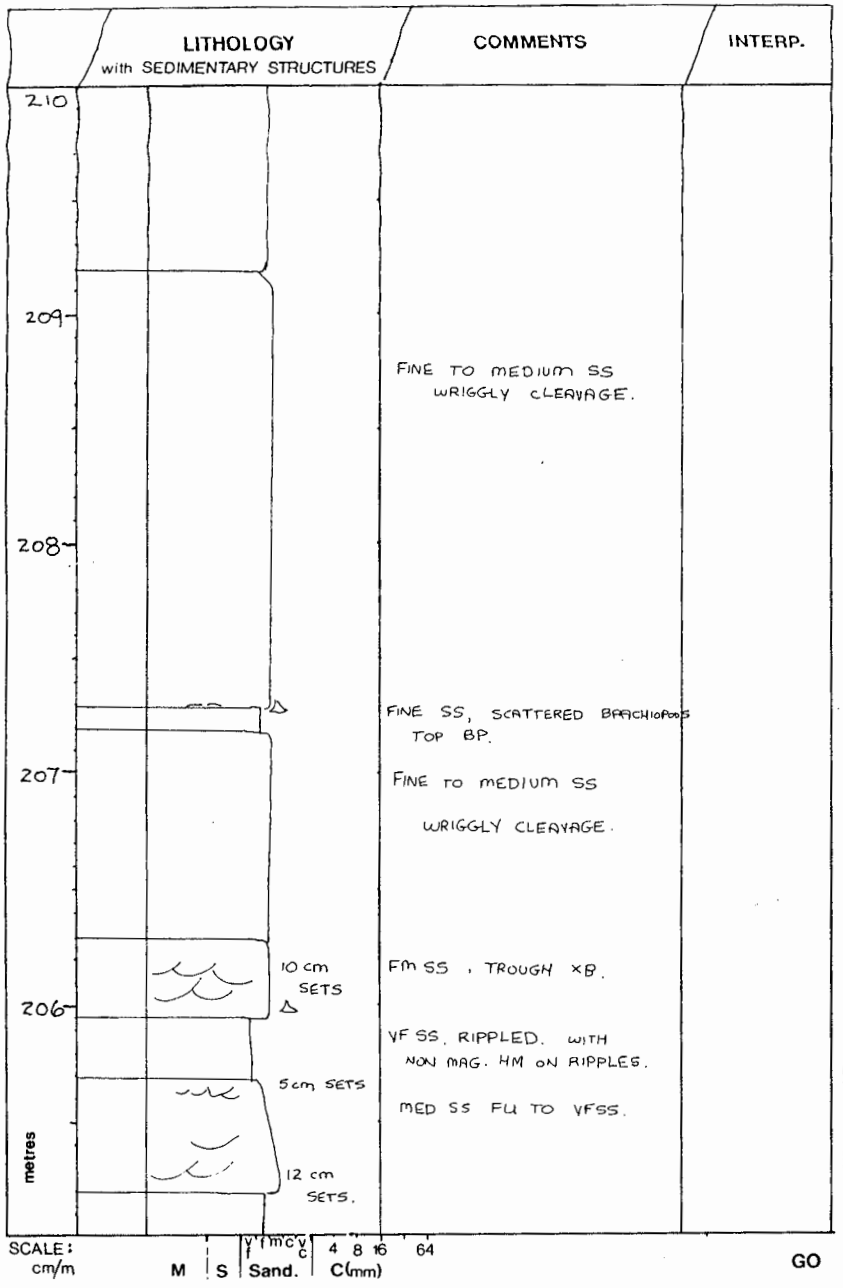

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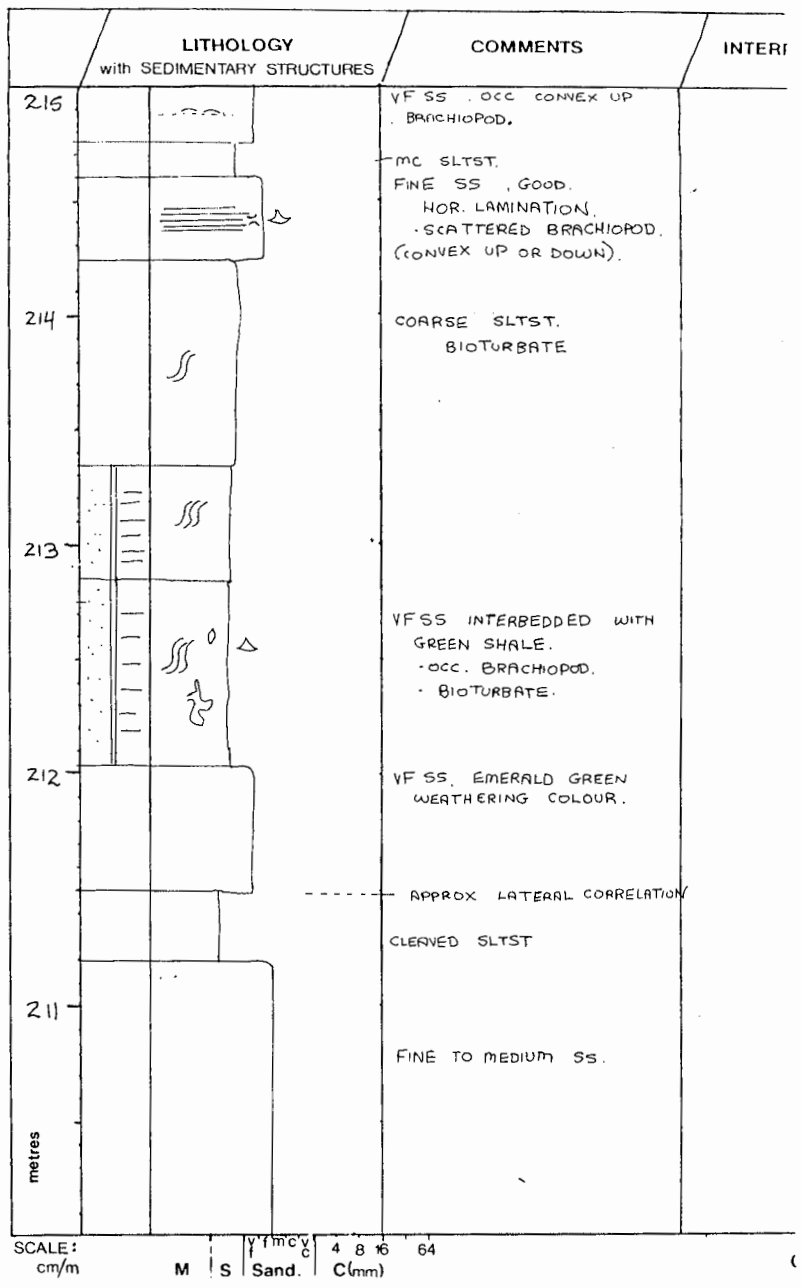

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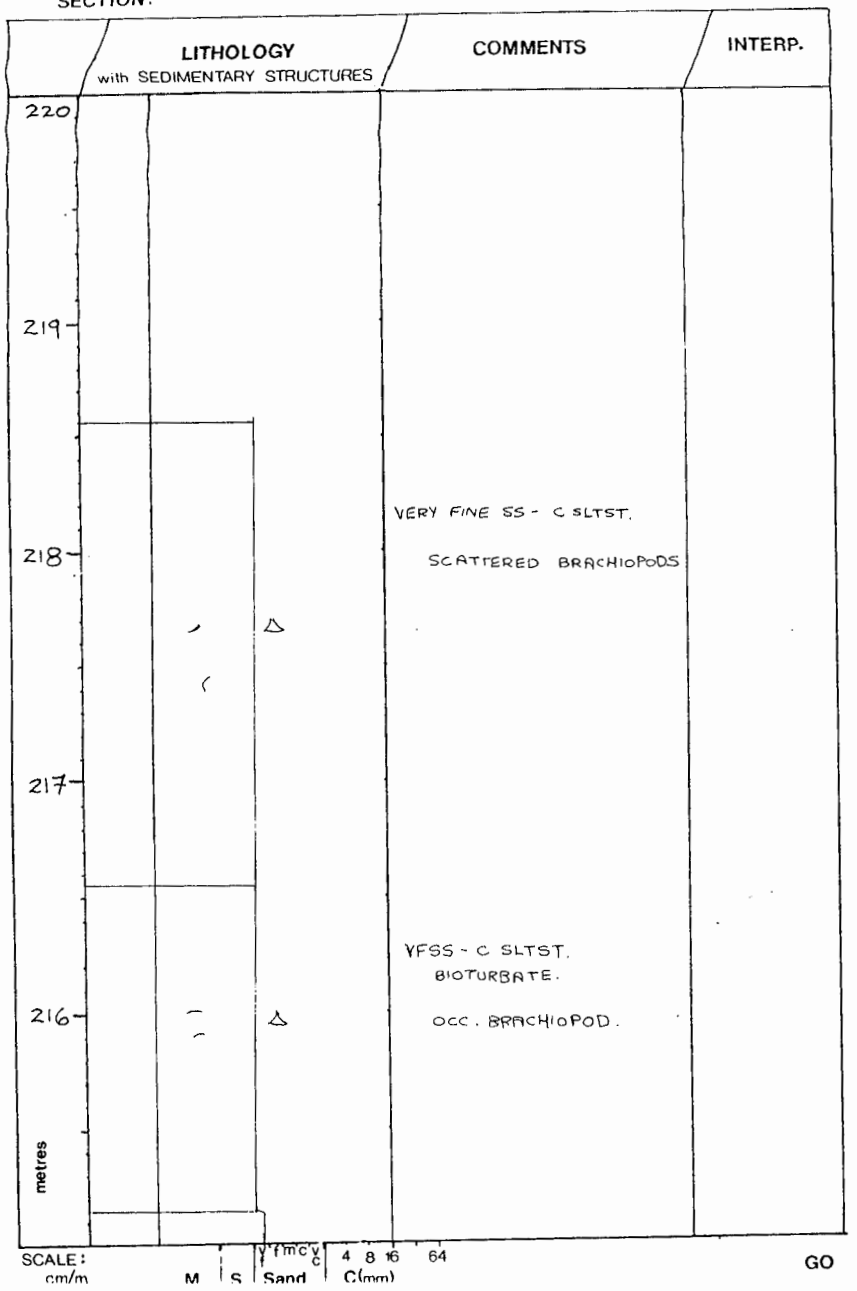
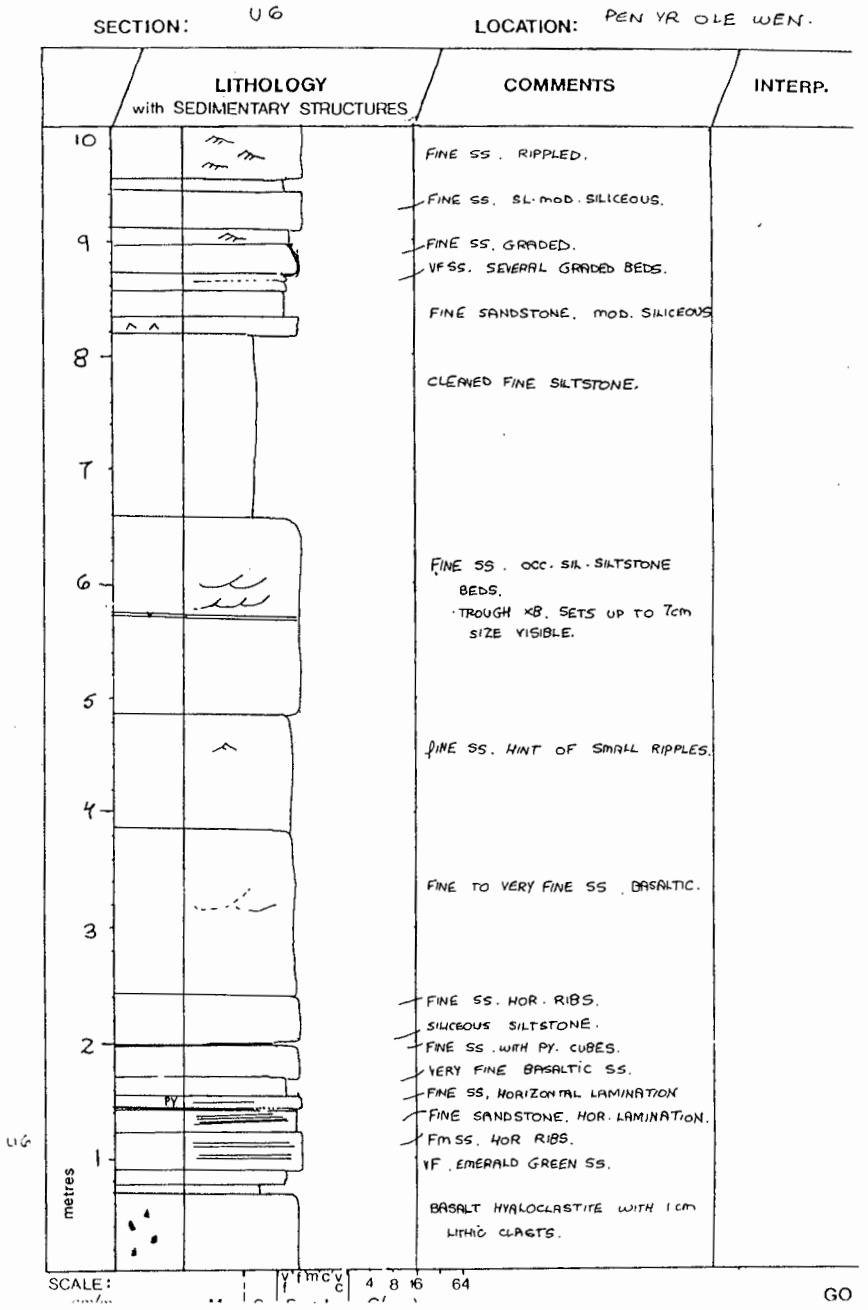
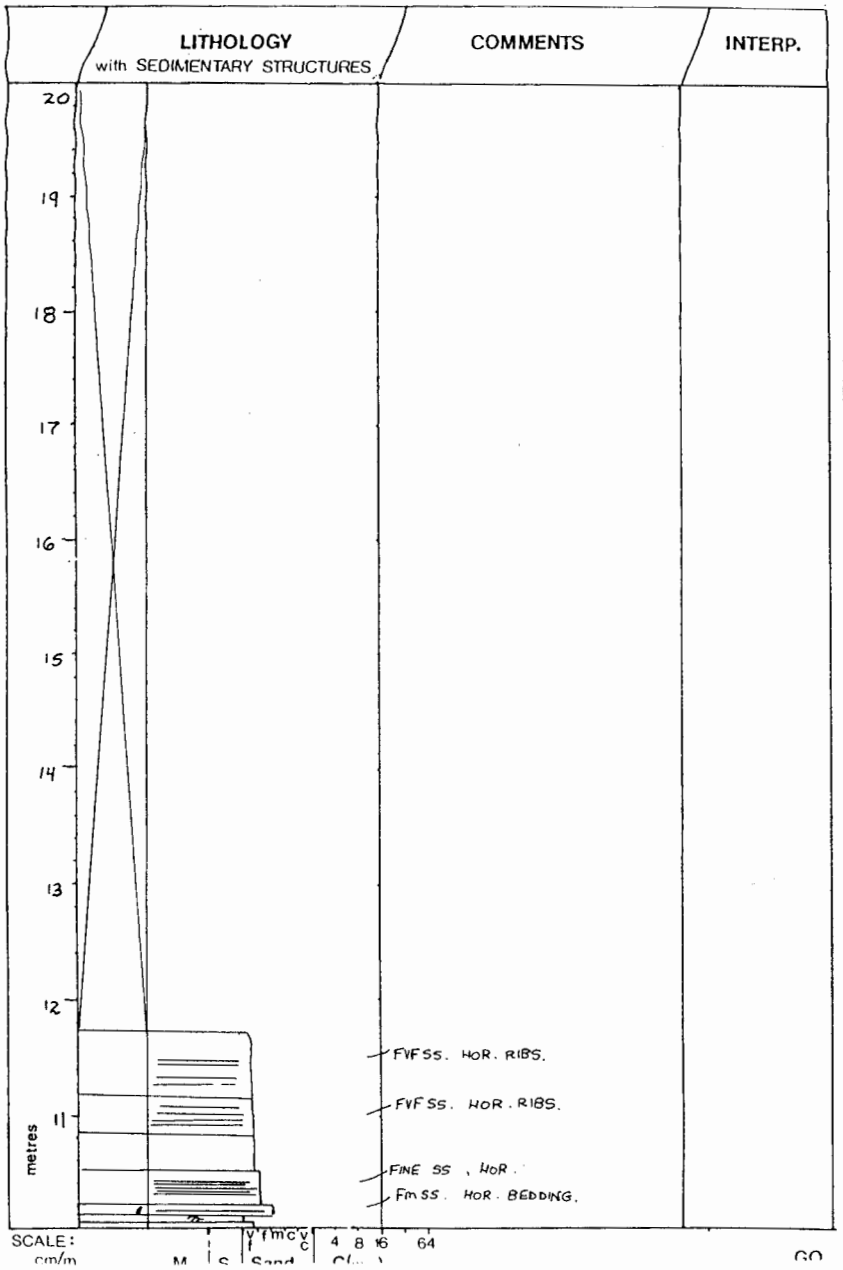


SECTION U6

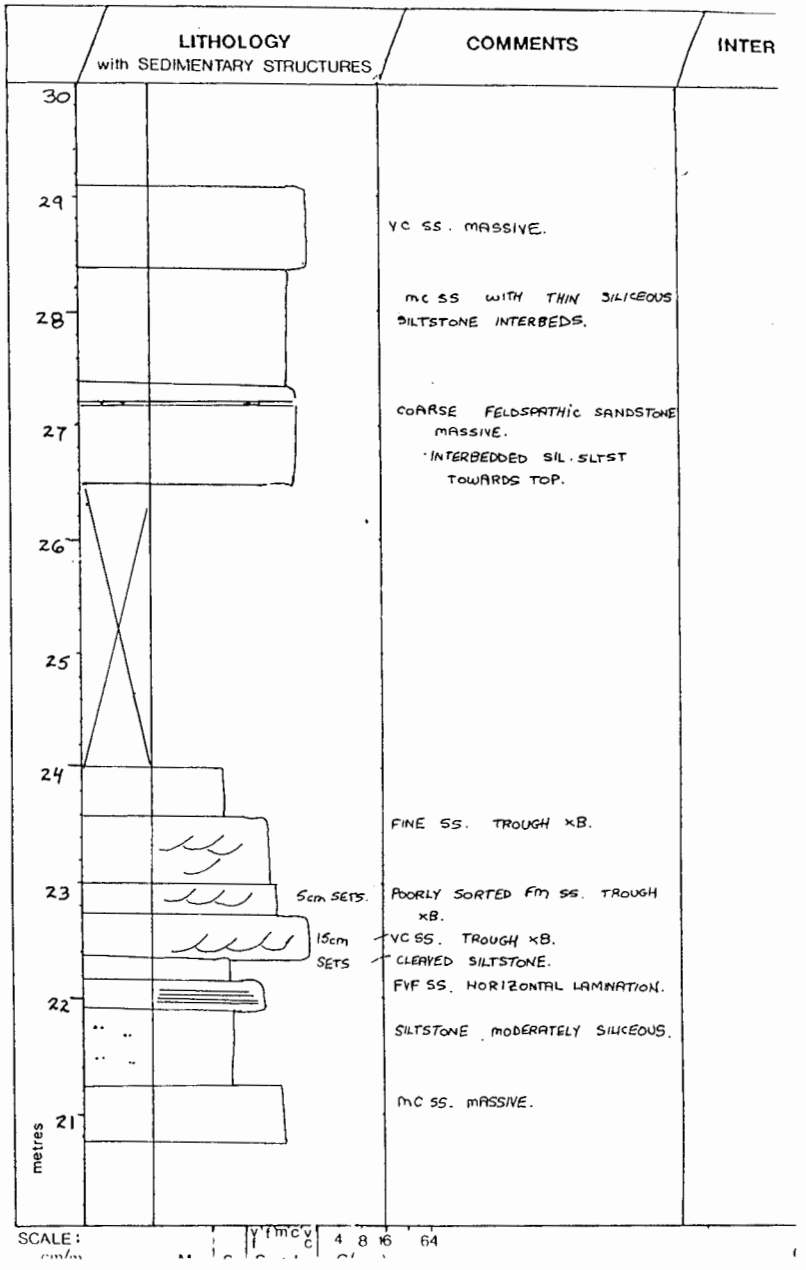
SECTION U6 LOCATION:Stratigraphically beneath section U6 in conglomeratic sandstones beneath CCVF.



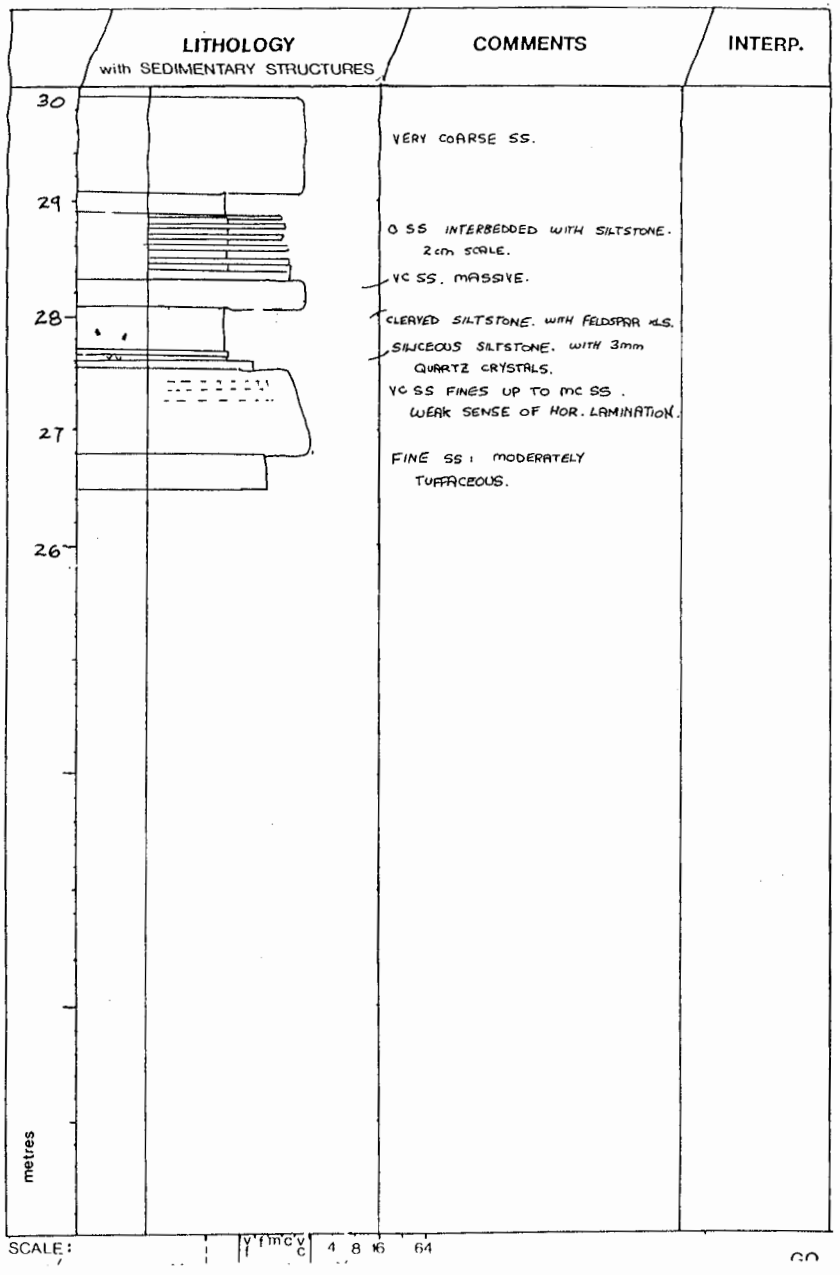
SECTION: U·6 LOCATION: PEN YR OLE WEN



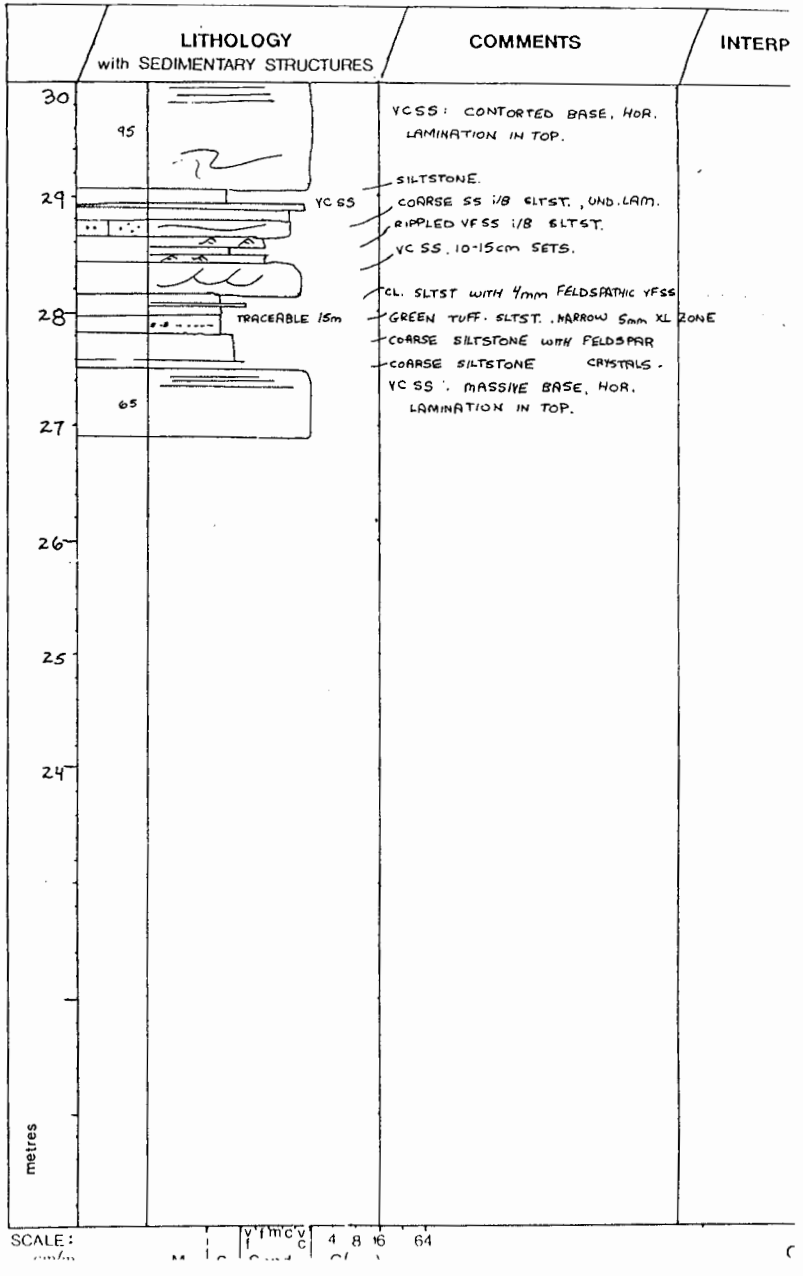
SECTION: U·6A LOCATION: PEN YR OLE WEN



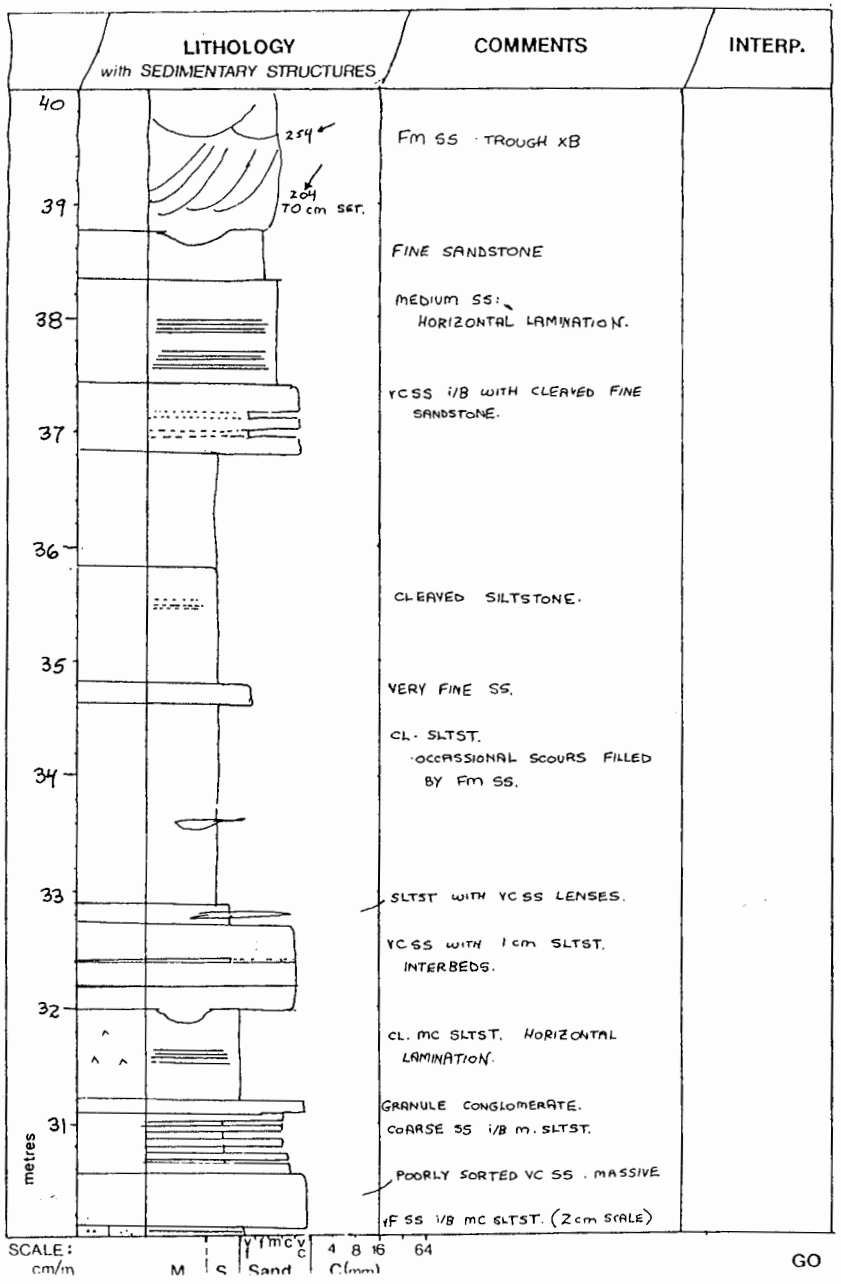
SECTION: UGB LOCATION: PEN YR OLE WEN



SECTION: UGC LOCATION: PEN YR OLE WEN



SECTION: U·GC LOCATION: PEN YR OLE WEN.



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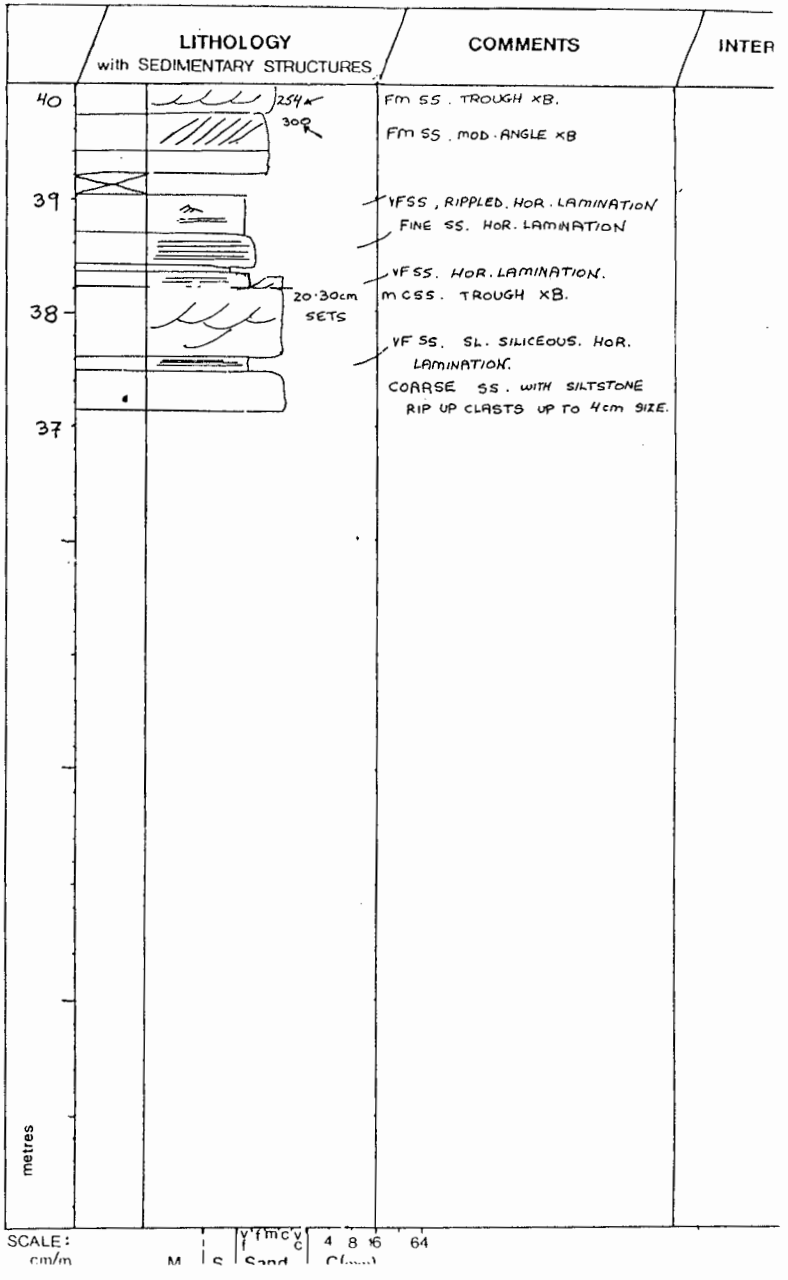
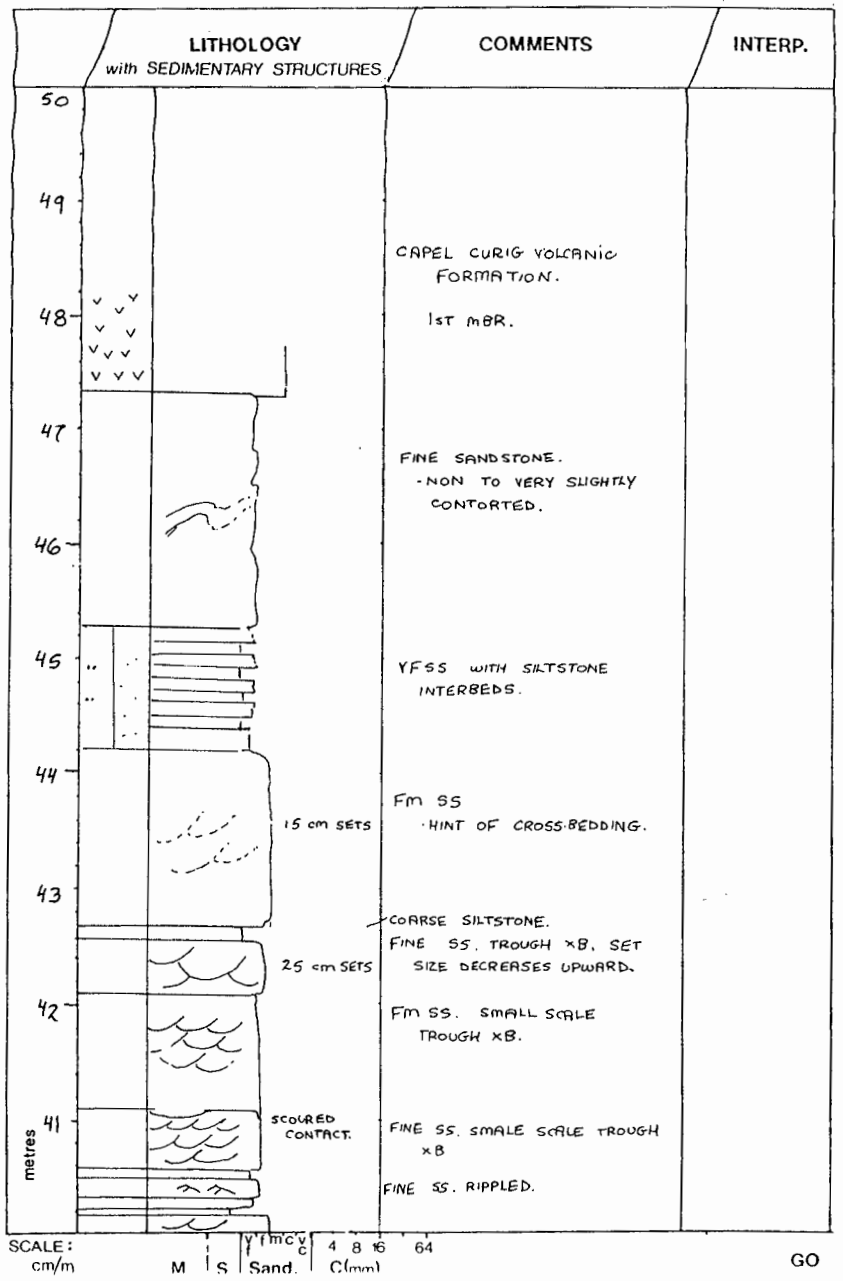
SECTION: U·GD LOCATION: PEN YR OLE WEN

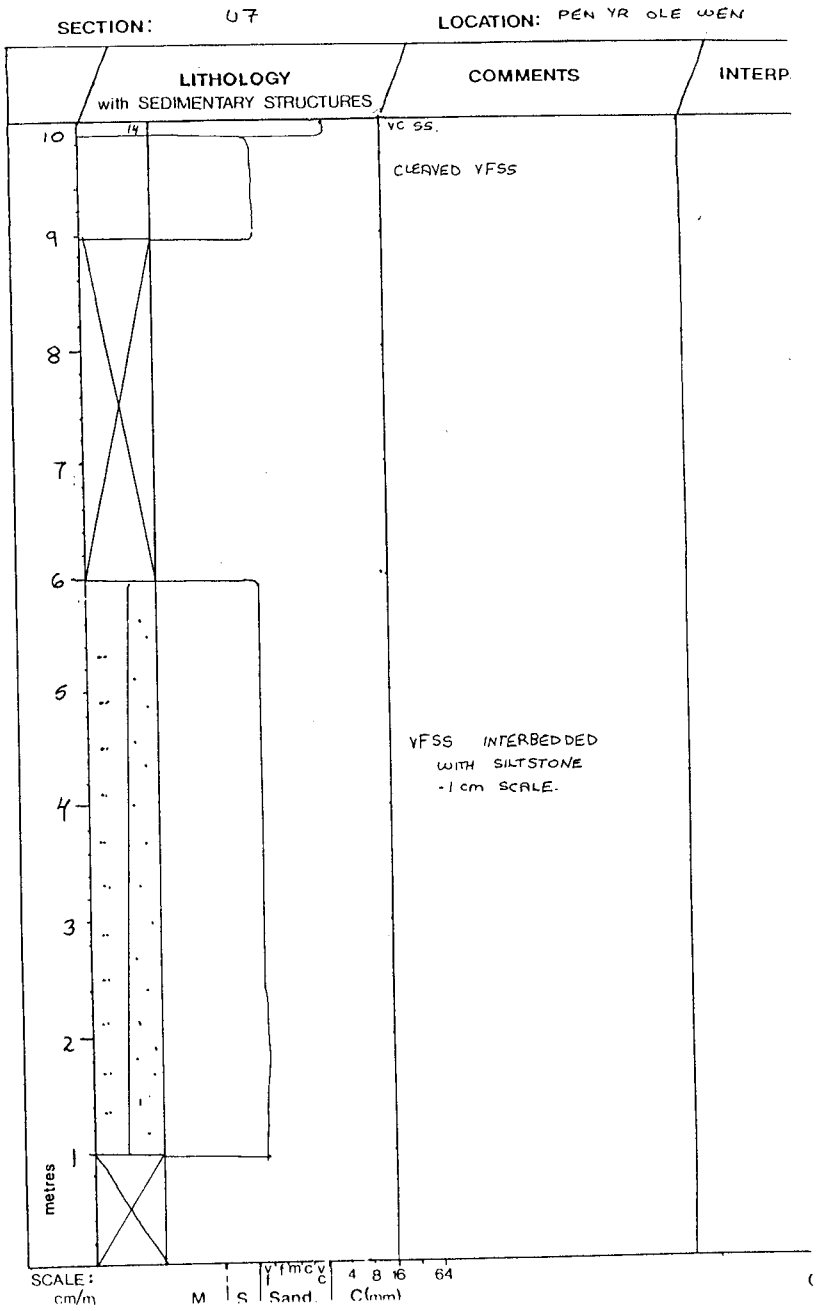


SECTION: U·6D LOCATION: PEN YR OLE WEN

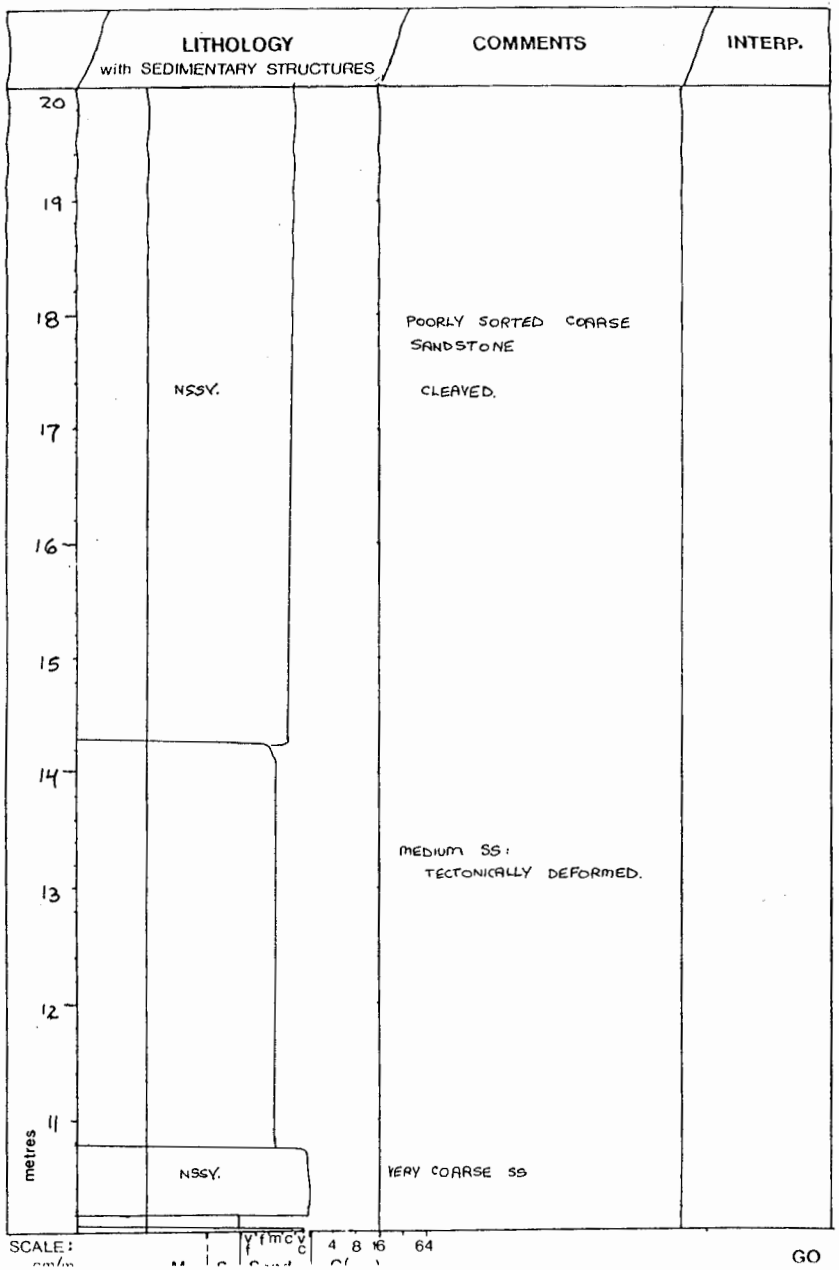


SECTION U7

SECTION U7 LOCATION: Locate Yr Hafod hostel. Section measured through sandstones stratigraphically beneath Capel Curig Volcanic Fm. 200 m to SSW of hostel.



SECTION: U·7 LOCATION: PEN YR OLE WEN



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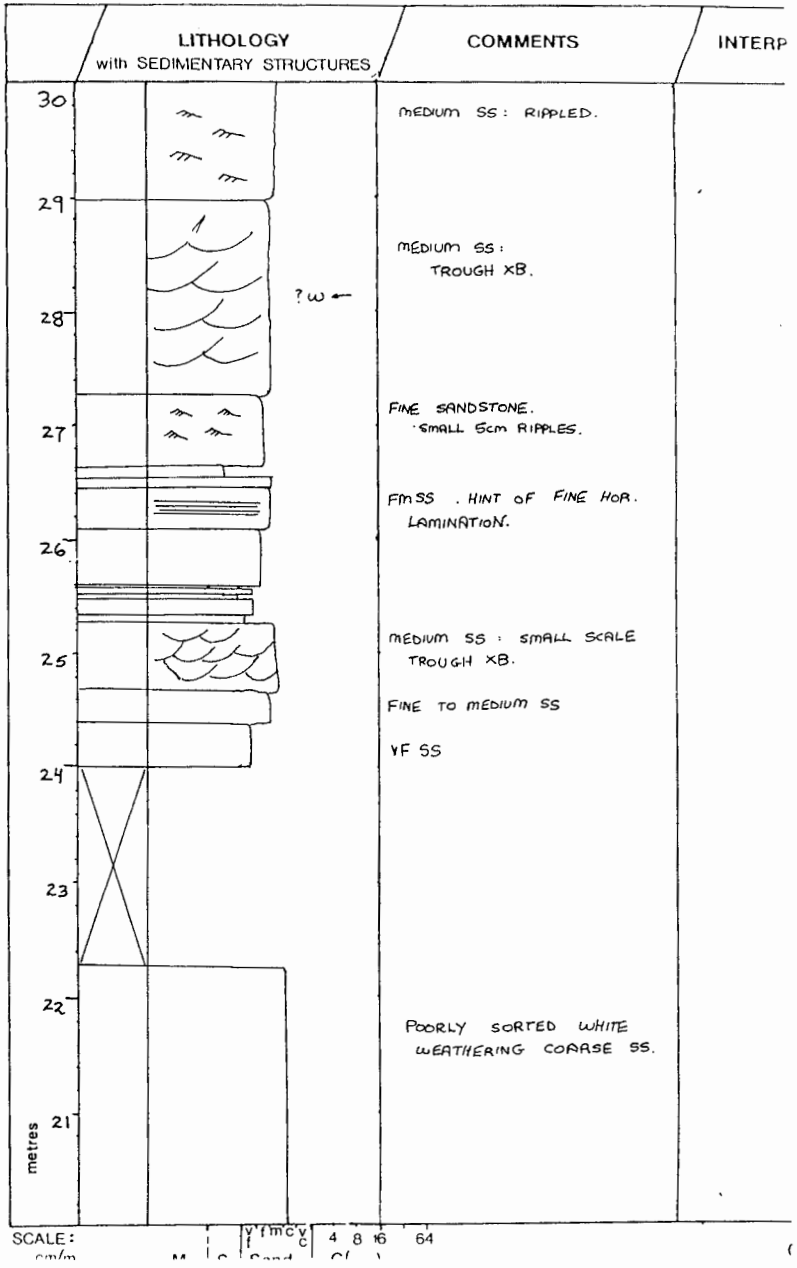
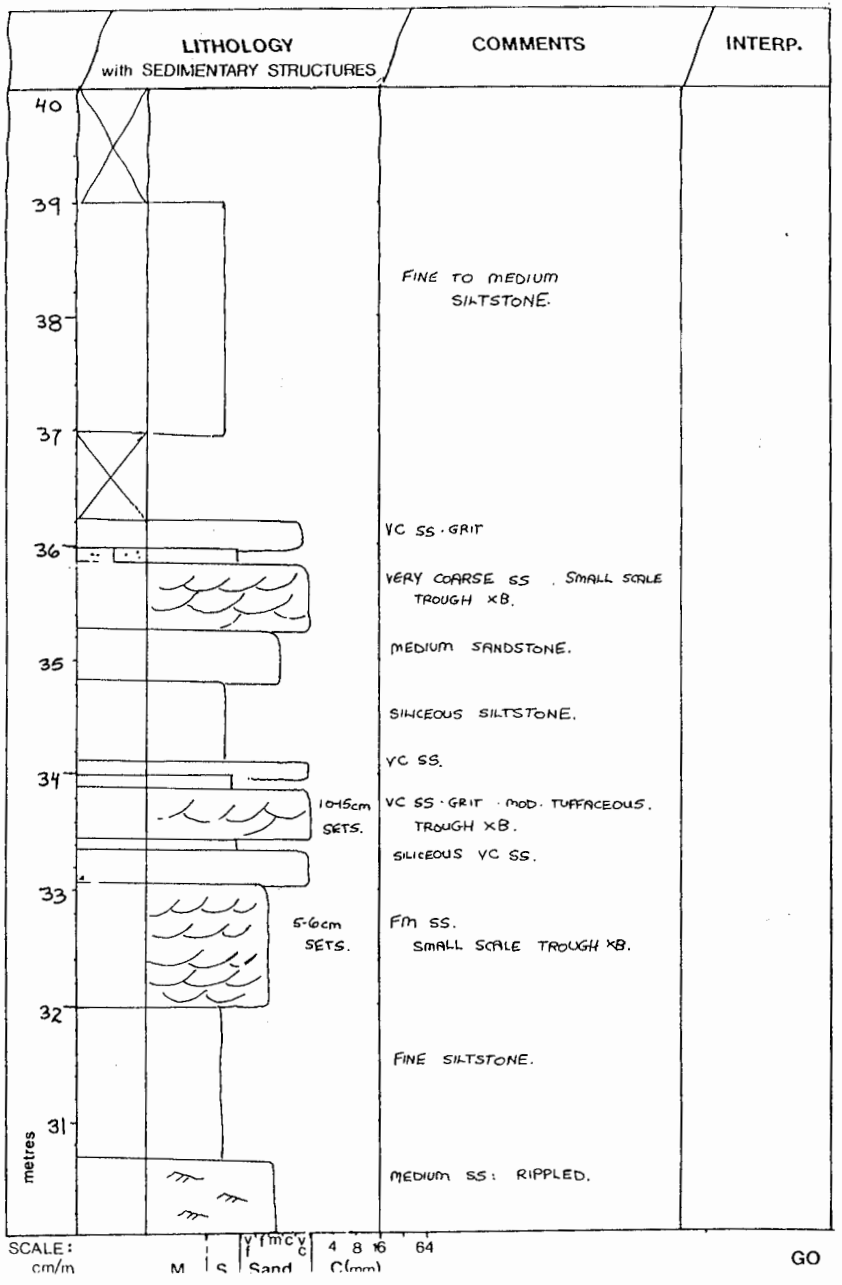
SECTION: U. 7 LOCATION: PEN YR OLE WEN



SECTION: U·7 LOCATION: PEN YR OLE WEN.



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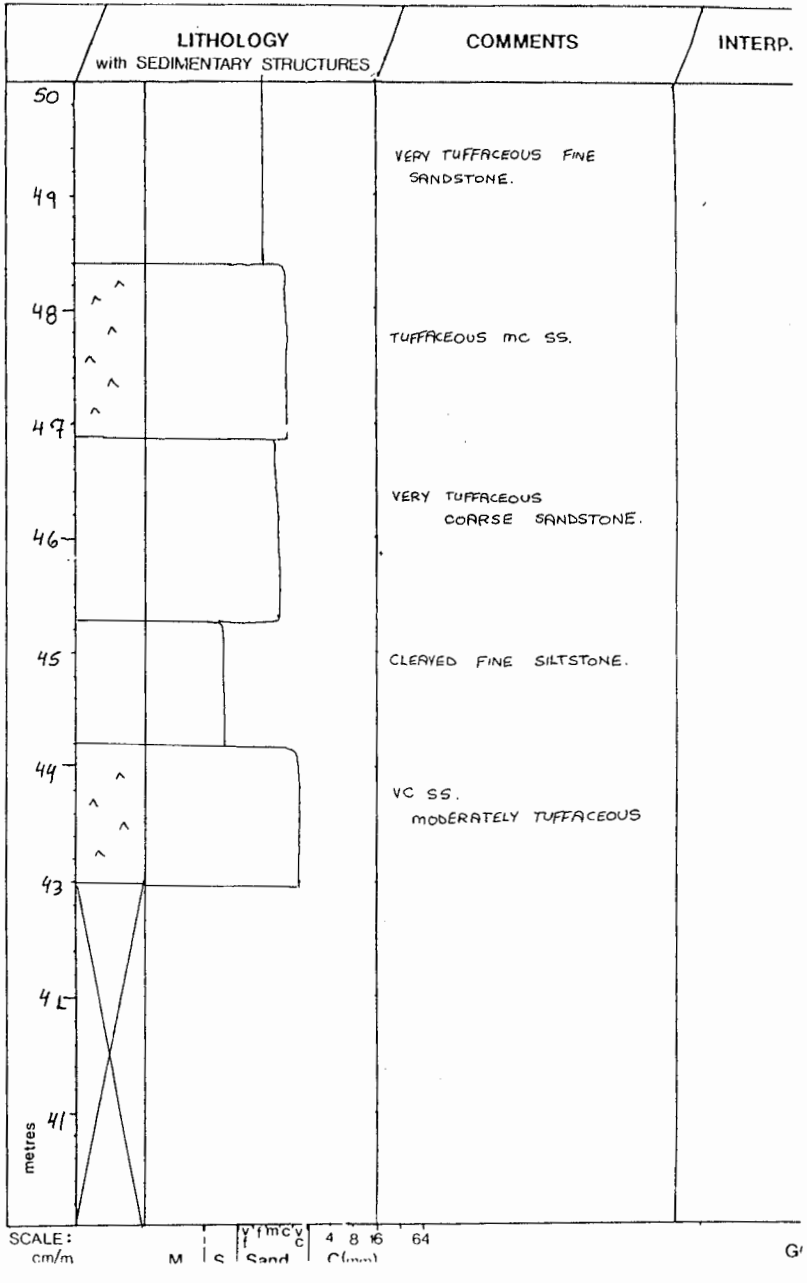

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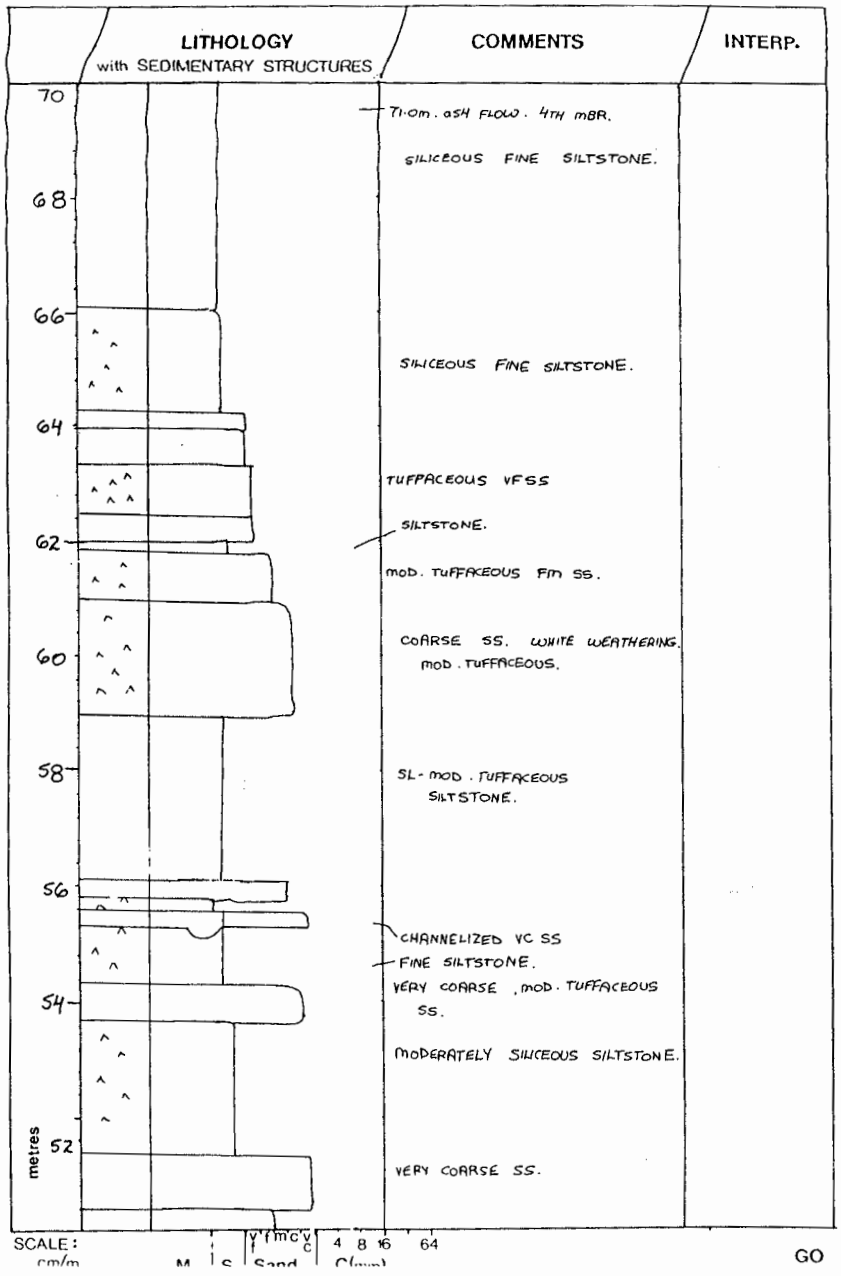
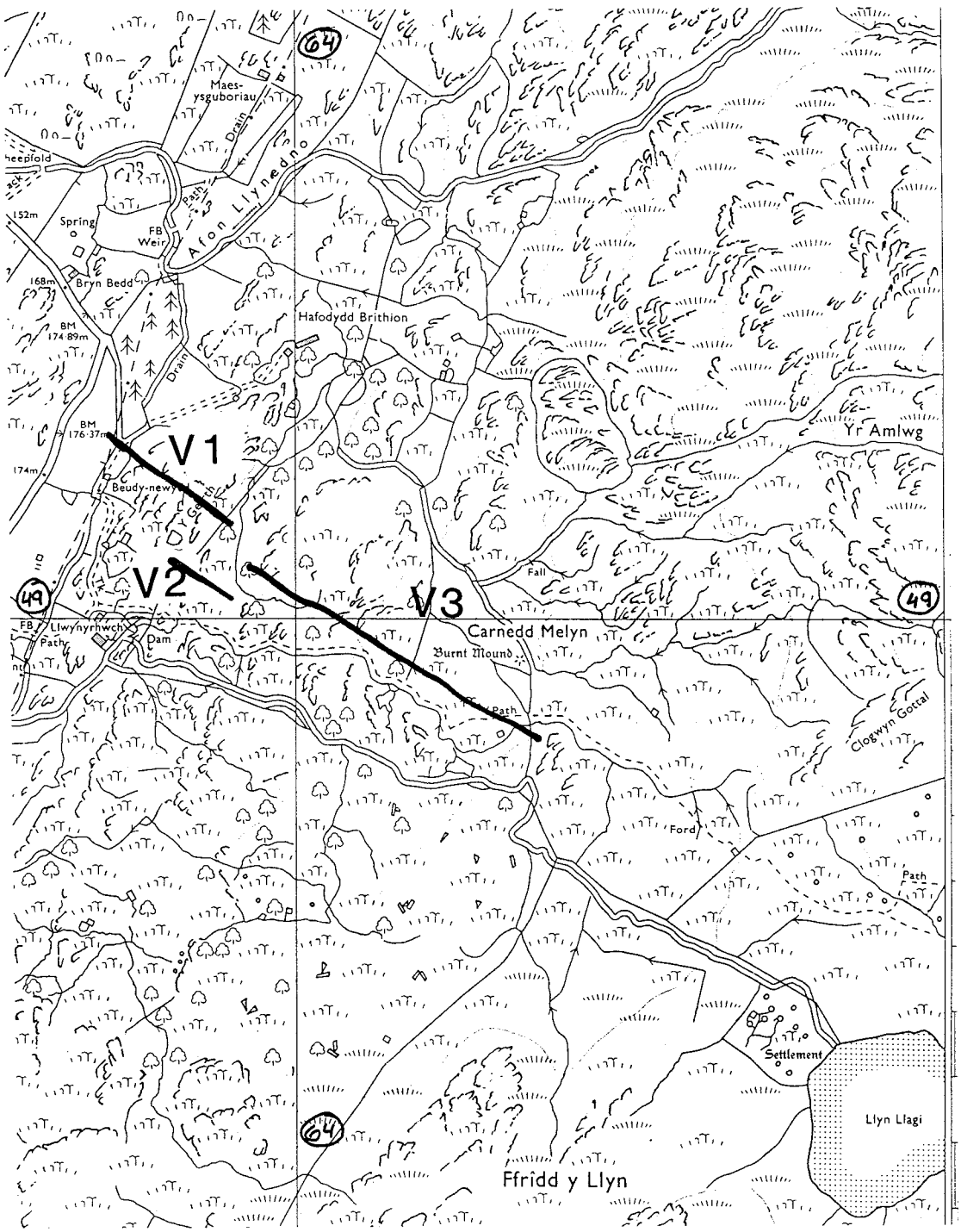
SECTION: U·7 LOCATION: PEN YR OLE WEN

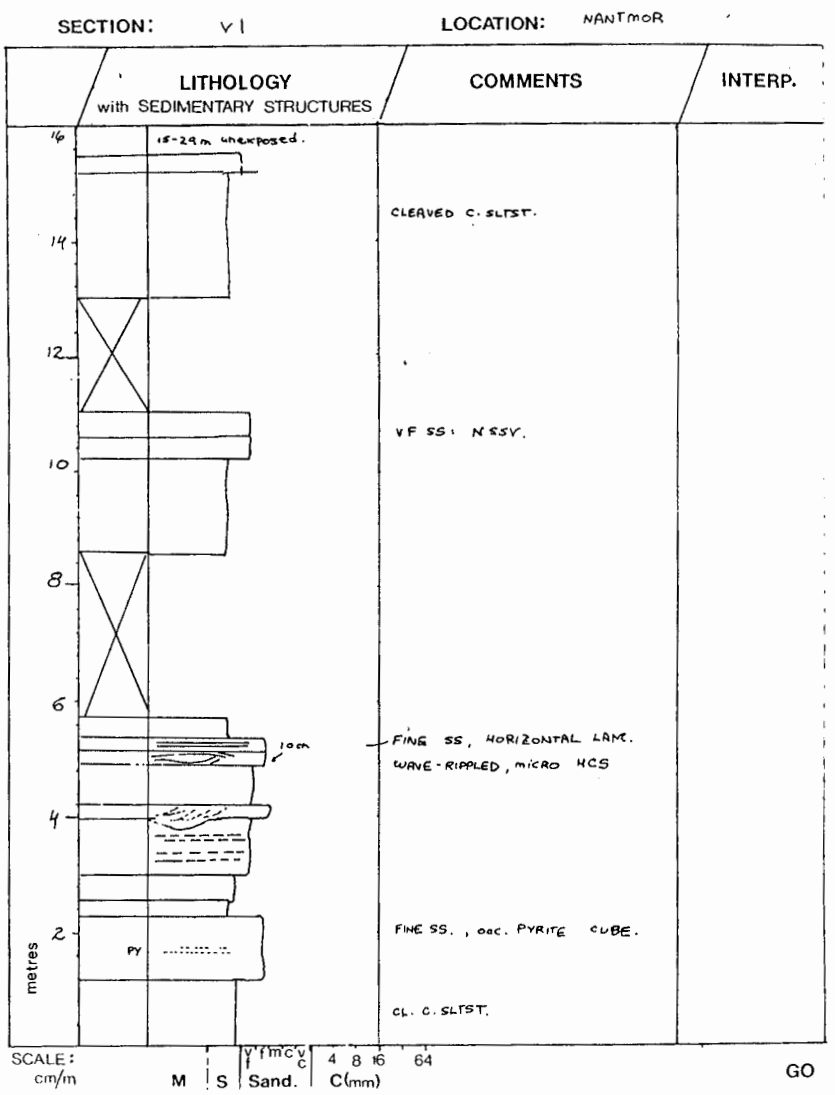


AREA V

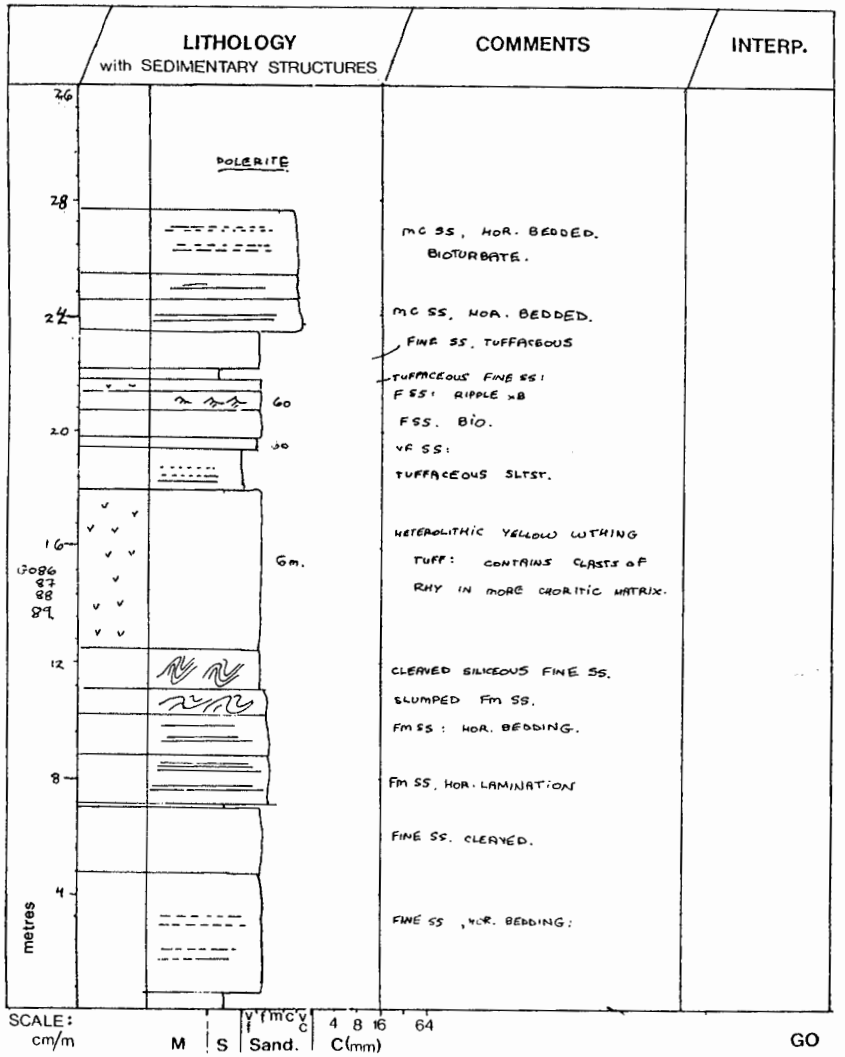
LOCATION MAP.



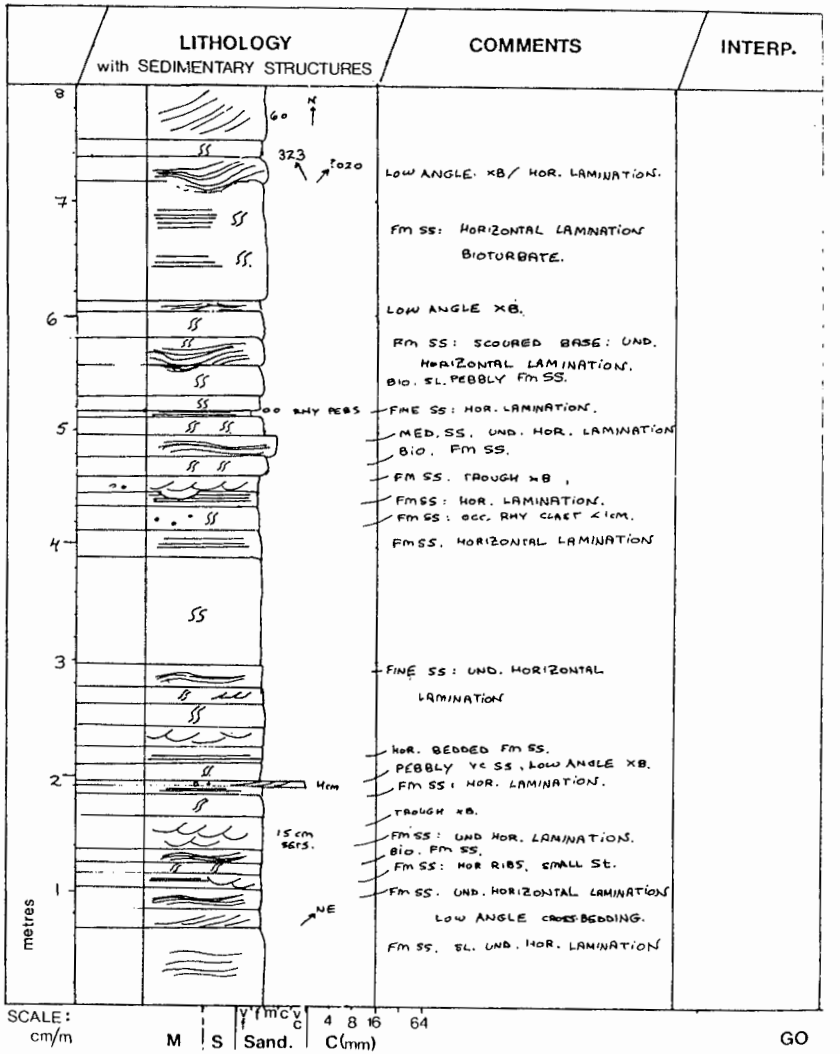
SECTION V1 to V3



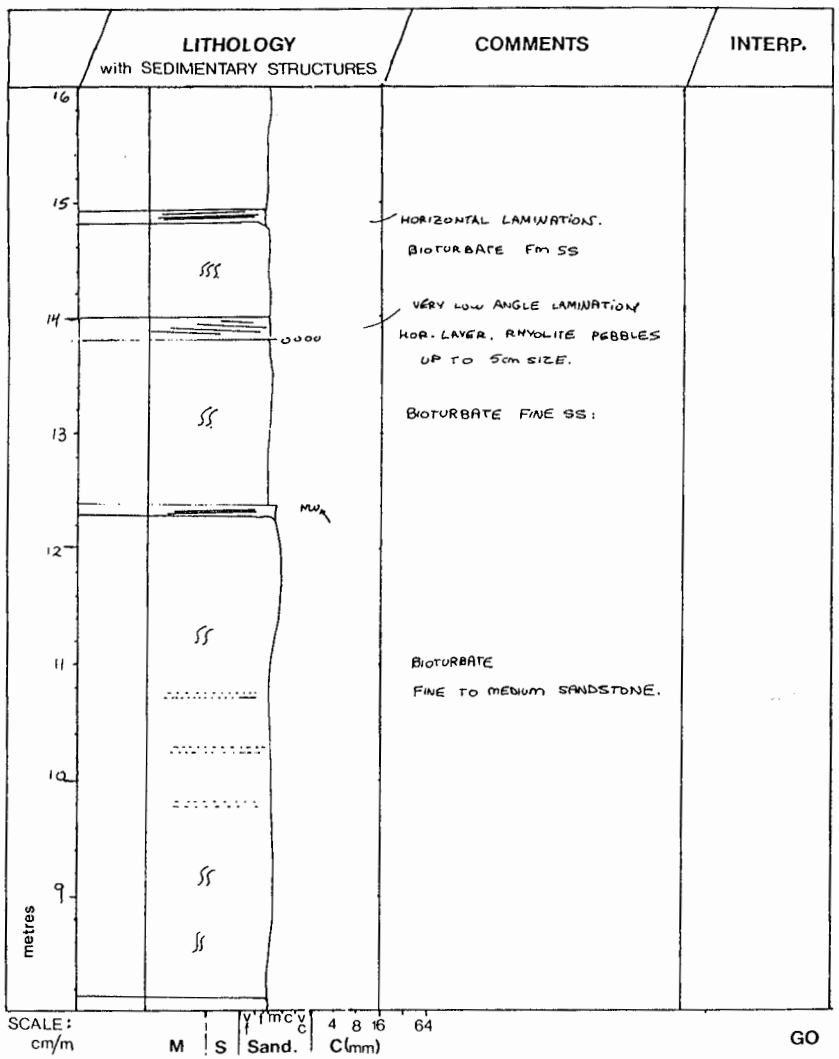
SECTION: V2 LOCATION: NANTMOR.



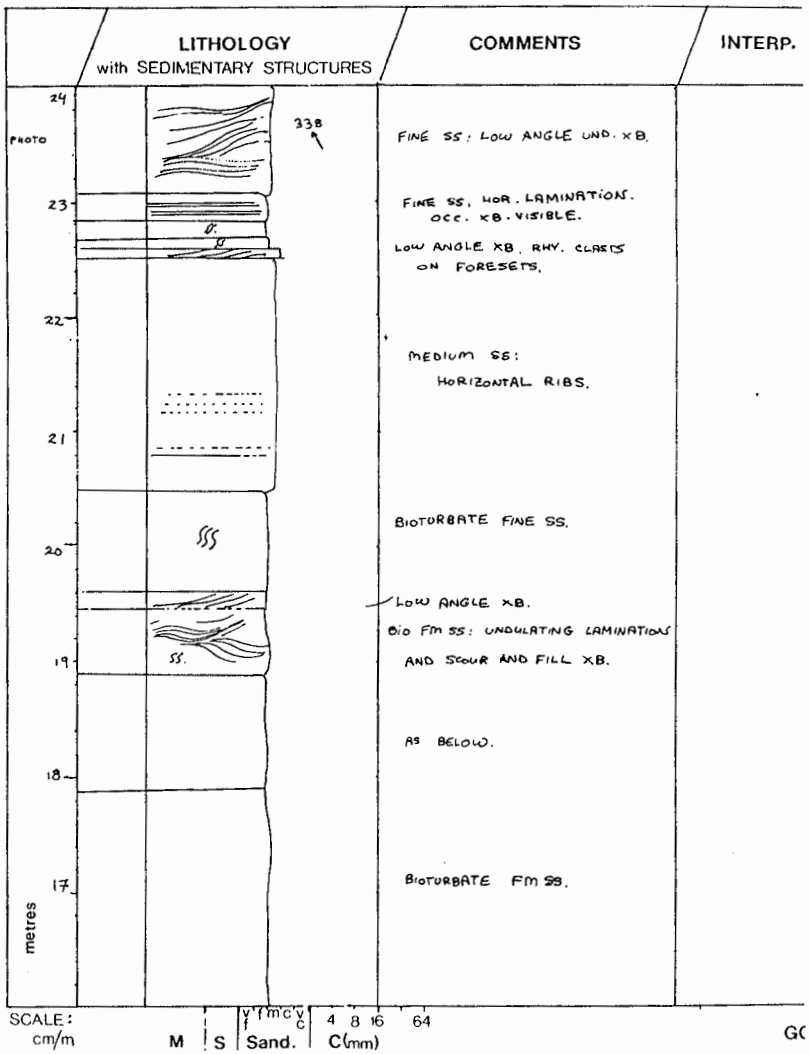
SECTION: V 3/1 LOCATION: NANTMOR:



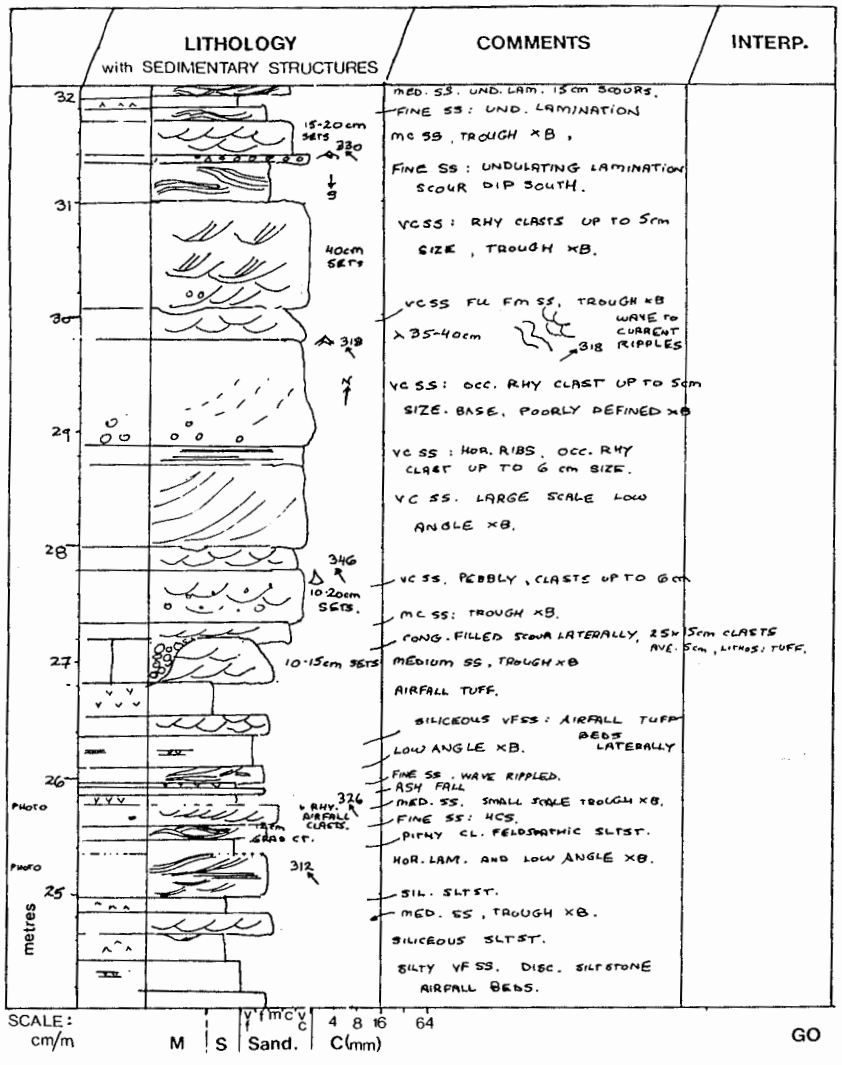
SECTION: V 3/2 LOCATION:



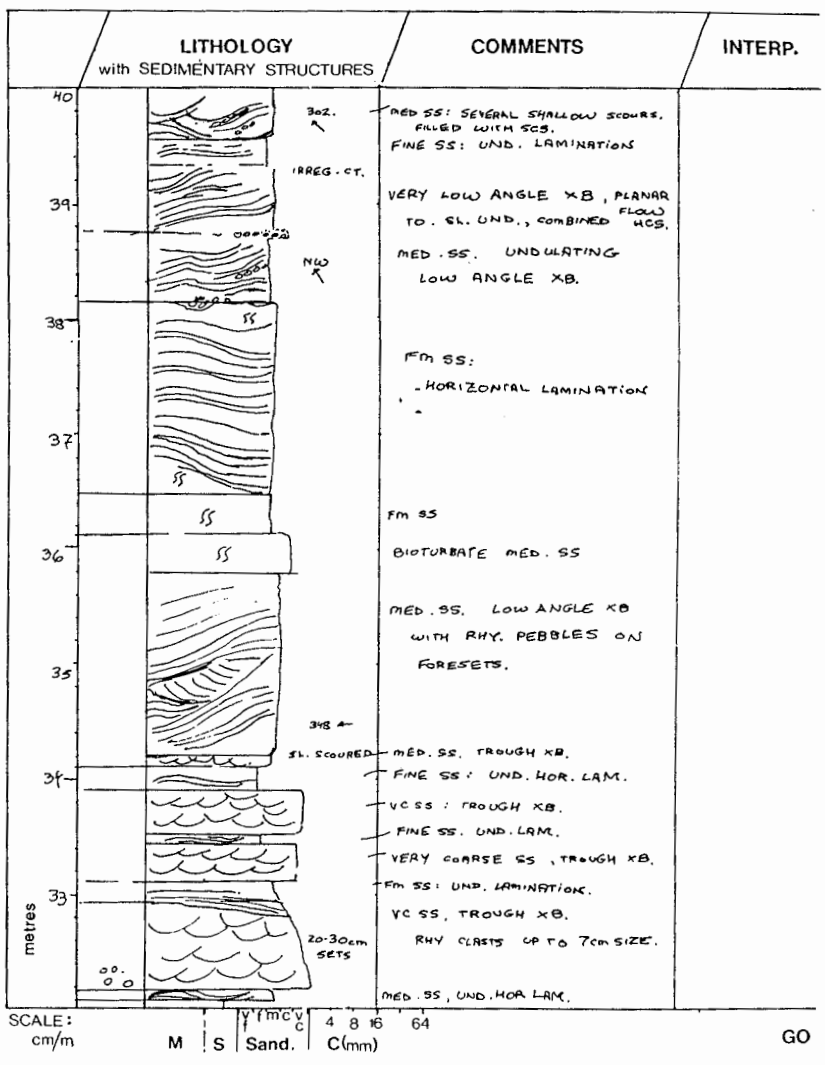
SECTION: V 3/3 LOCATION:



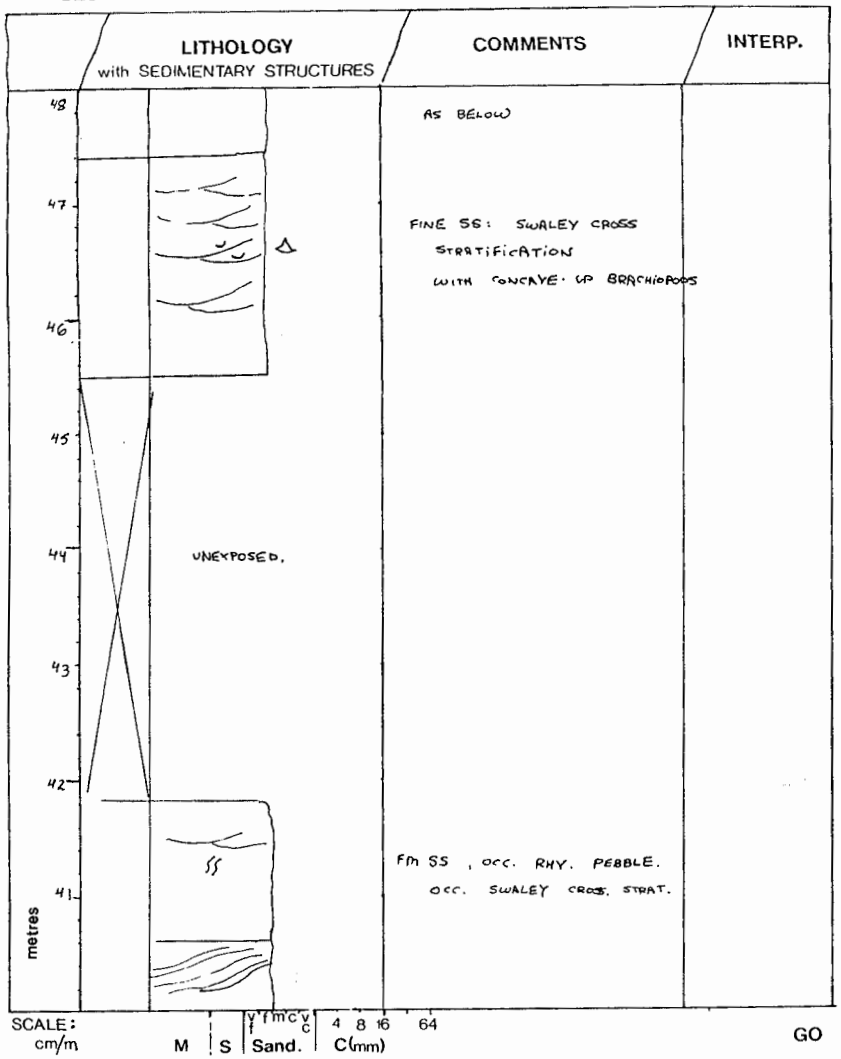
SECTION: V 314 LOCATION:



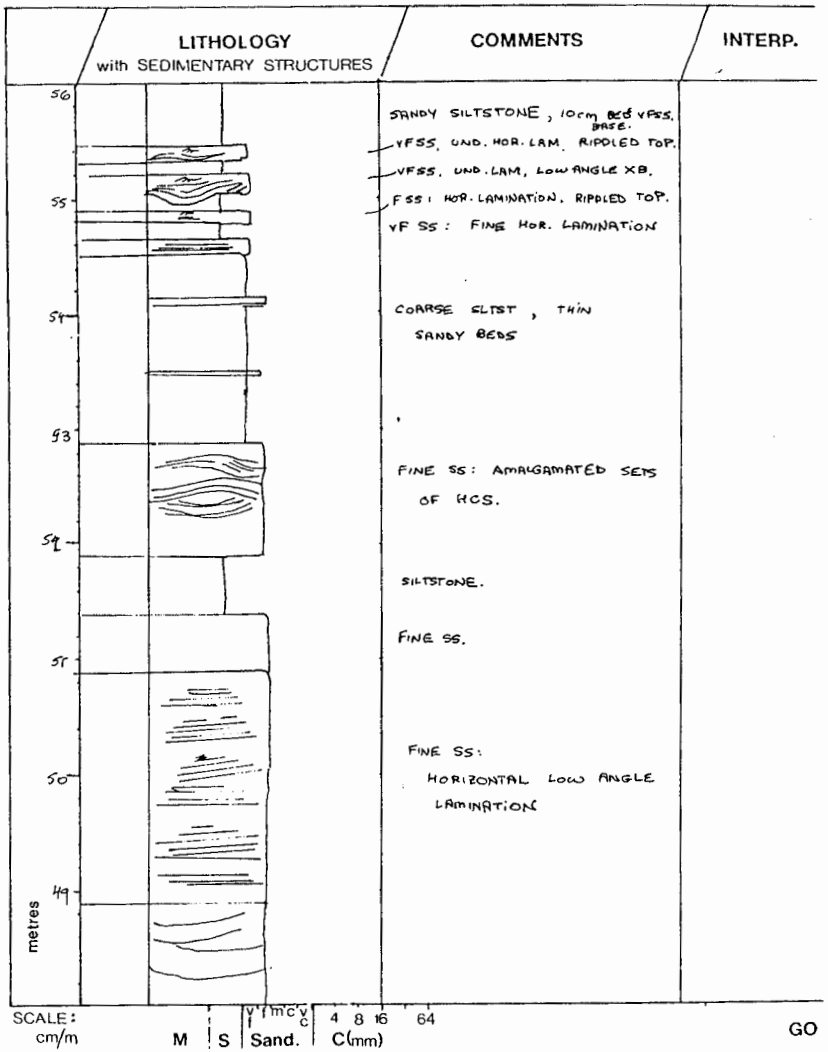
SECTION: V 315 LOCATION: NANTMOR



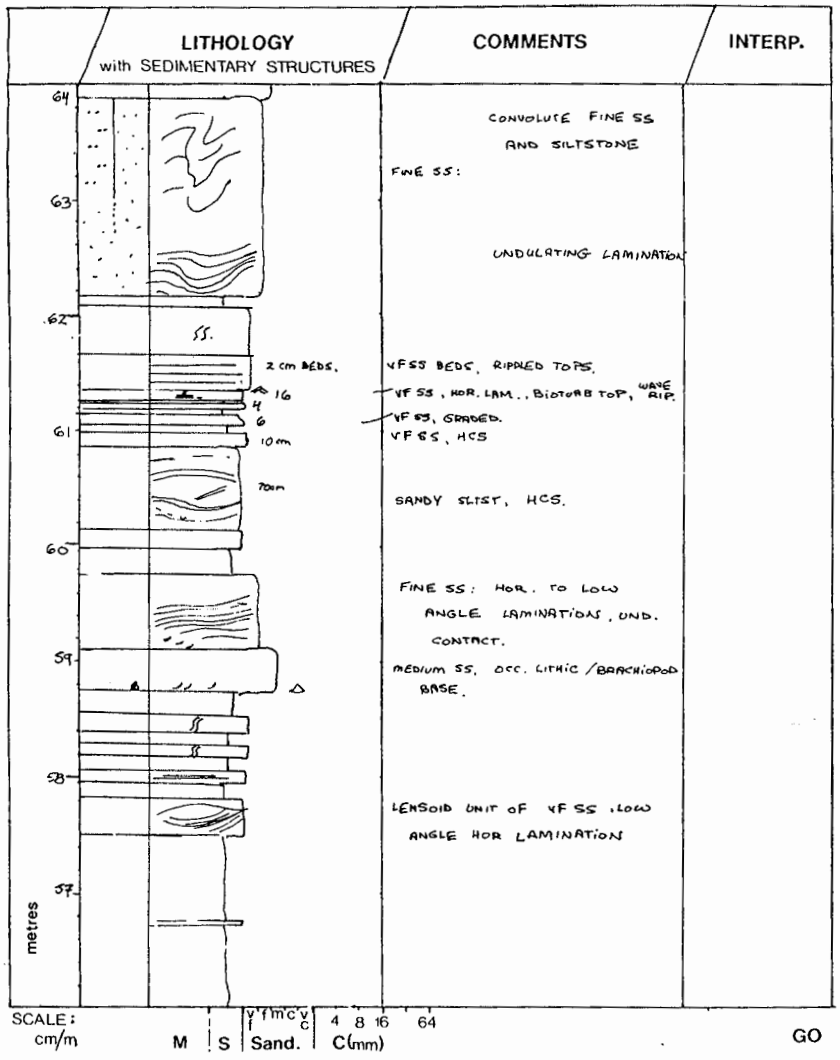
SECTION: V 3/6 LOCATION:



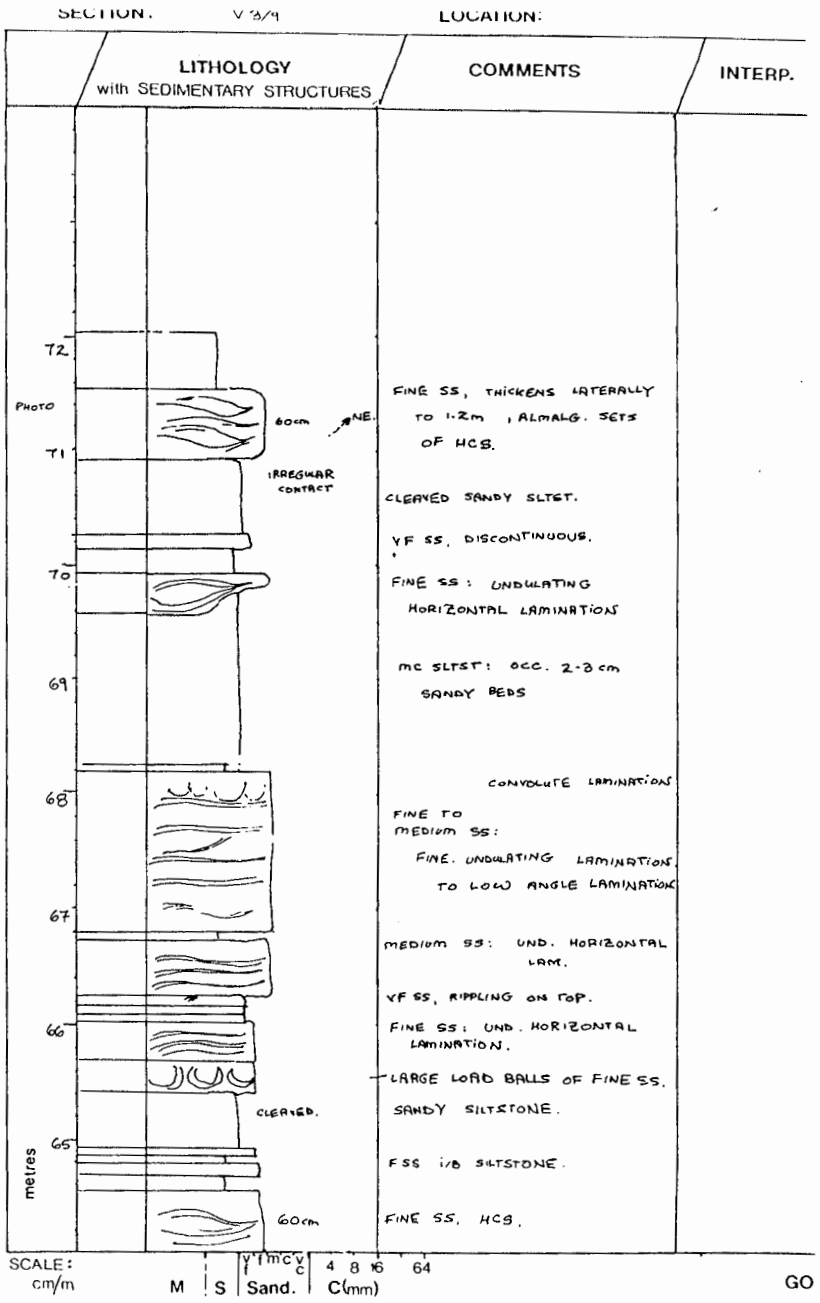
SECTION: V 3/7 LOCATION: NANTMOR



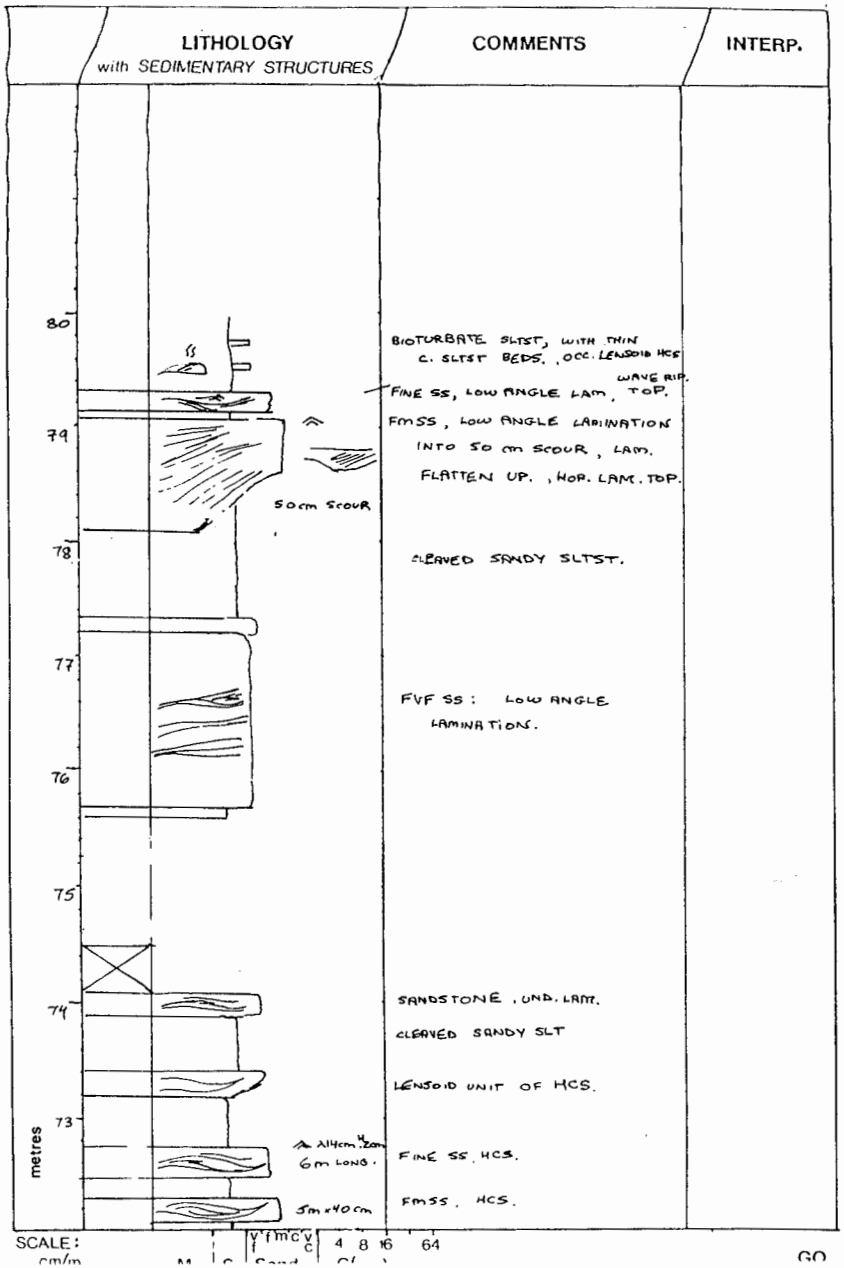
SECTION: V 3/8 LOCATION: NANTMOR



SECTION: V 3/9 LOCATION:



SECTION: V 3/10 LOCATION:



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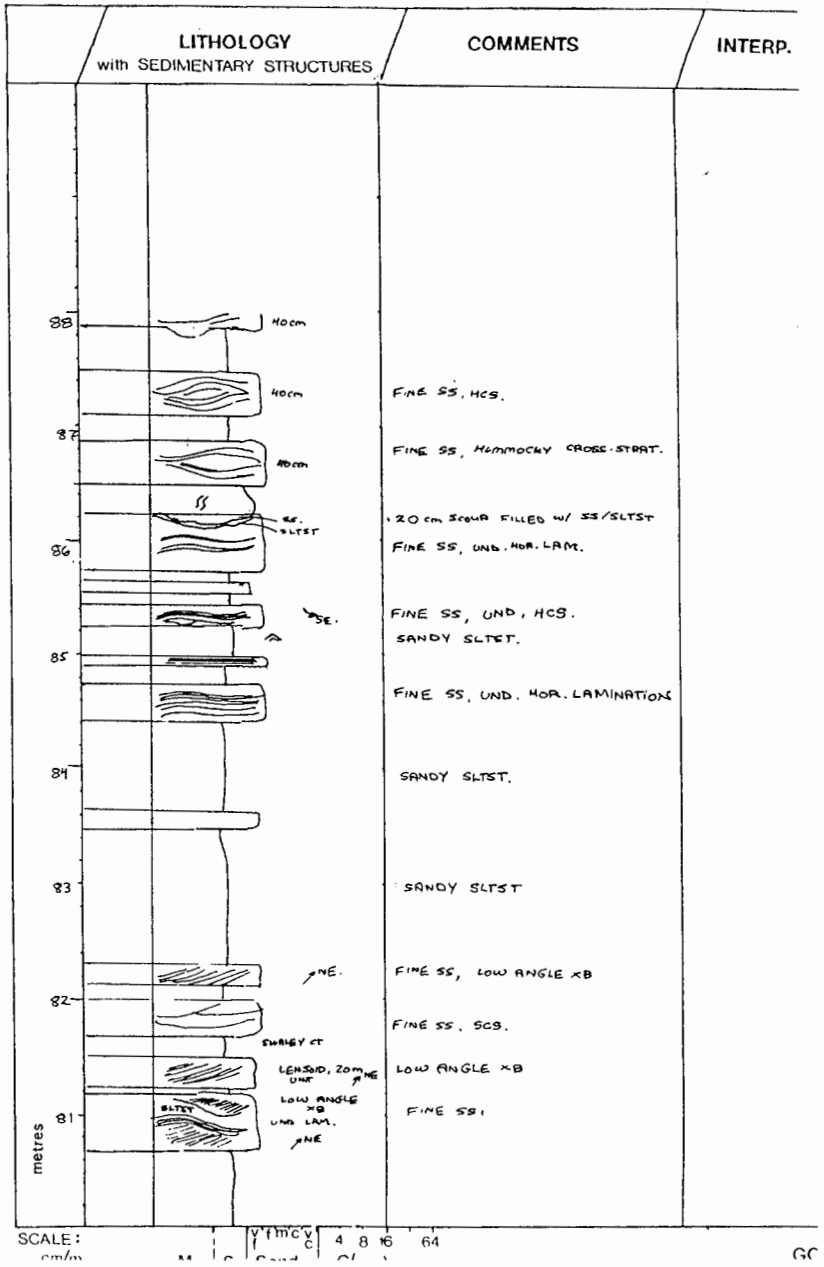
SECTION: V 3/11 LOCATION:



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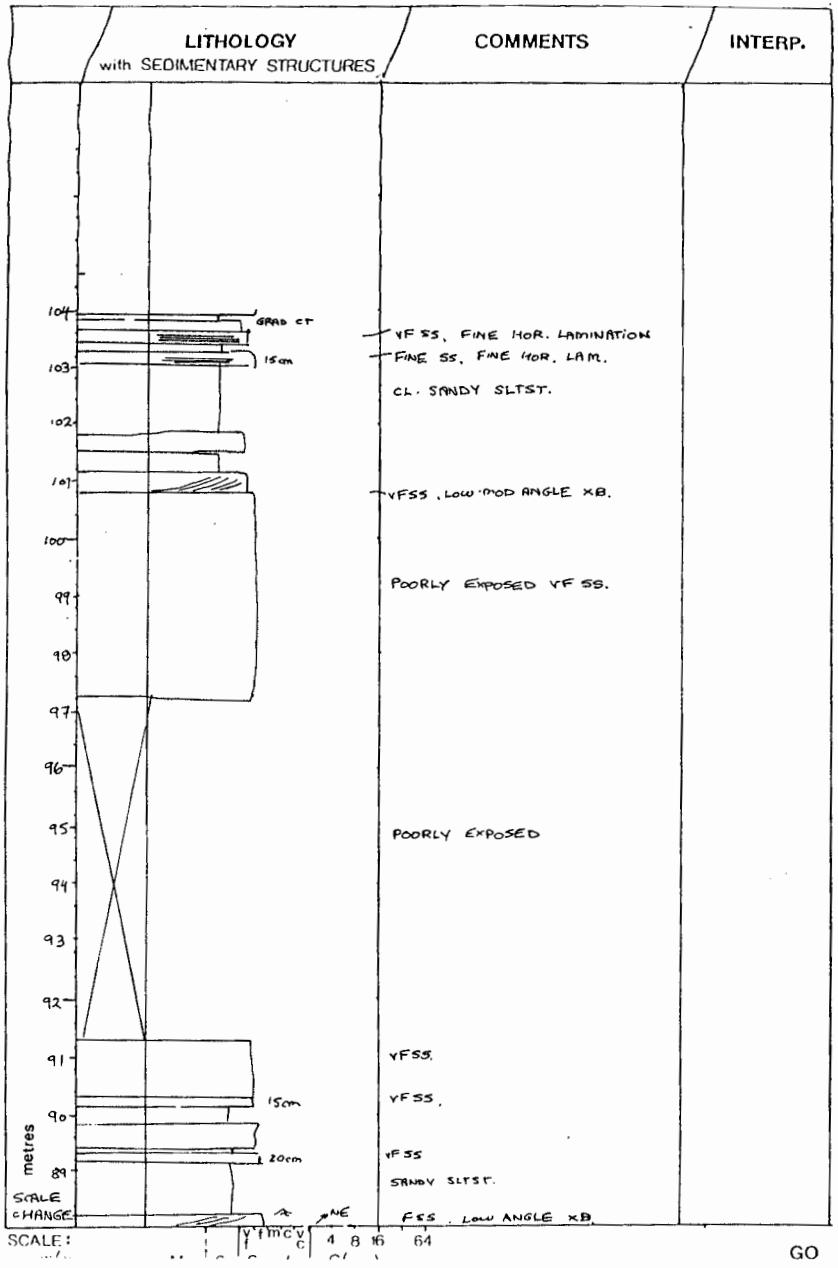
SECTION: V 3/12 LOCATION:



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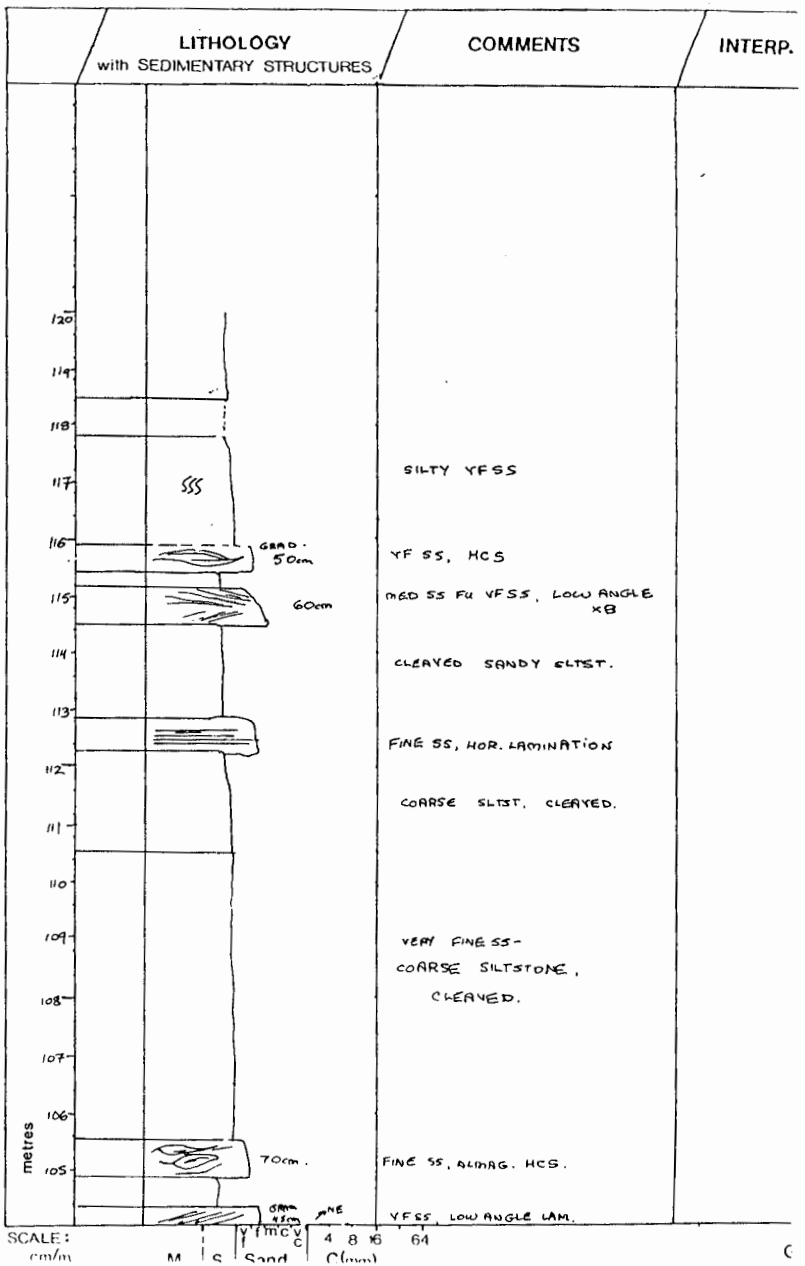
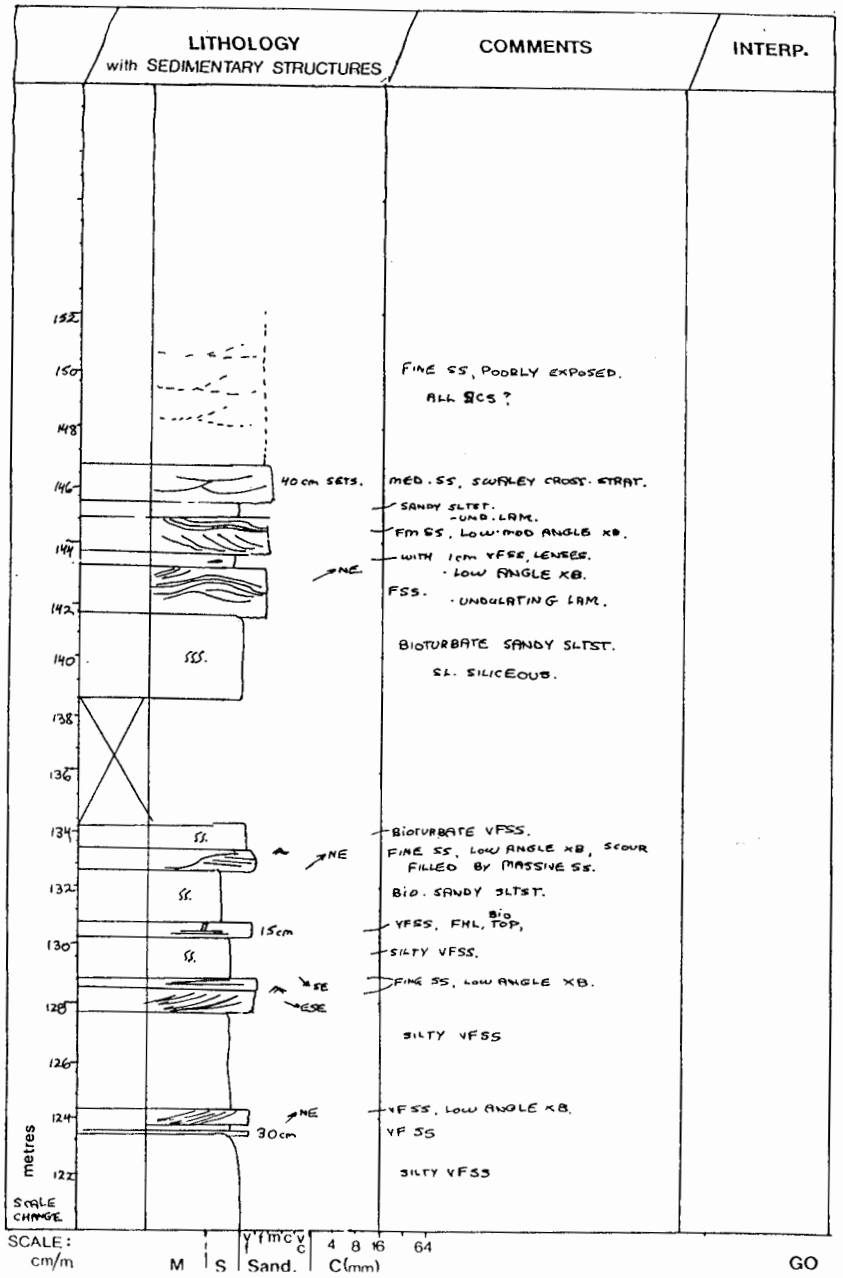
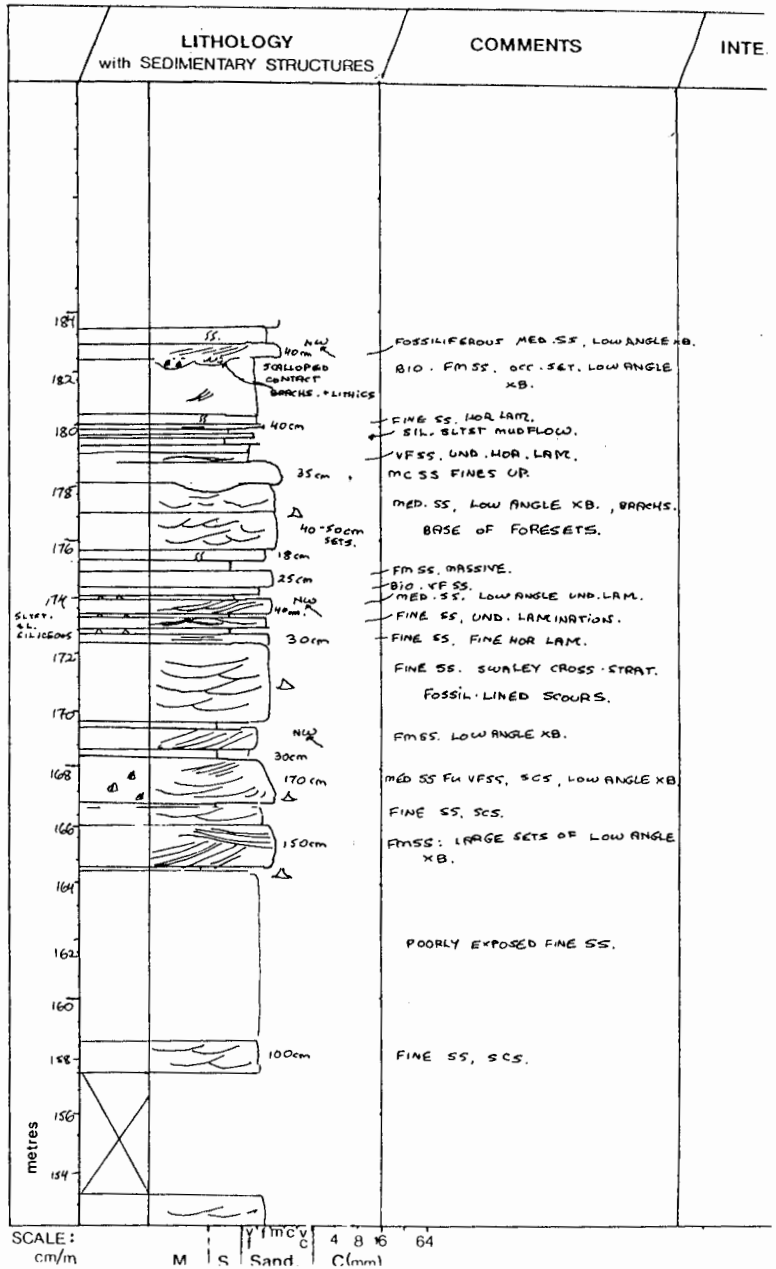
SECTION: V 3/13 LOCATION:



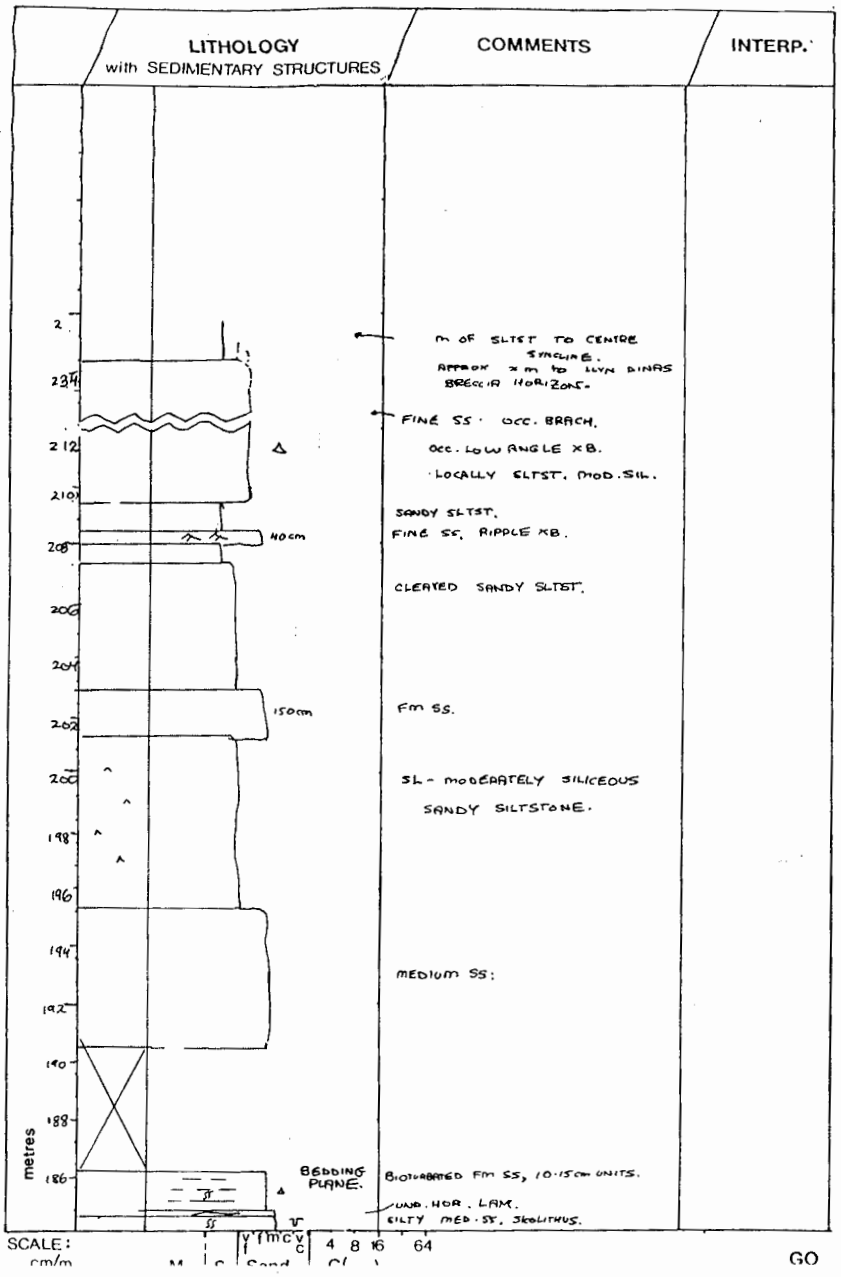
SECTION: V3/14 LOCATION:



SECTION: V 3/15 LOCATION:



SECTION: V 3/16 LOCATION: NANTMOR



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