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Tittel Ground recovery of drill targets from Helicopter geophysics, Pasvik Finnmark, Norway. June 1973				
Forfatter Ø Logn F Hansen J B Gammon		Dato Juni 1973	Bedrift Sulfidmalm A/S	
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Fagområde Geofysikk		Dokument type Rapport	Forekomster	
Råstofftype Malm/metall		Emneord Ni Cu		
Sammendrag Korte profiler for lokalisere helikopterannomalier på bakken forut for borprogrammet senere på sommeren.				

A/S SULFIDMALM
INTER-OFFICE MEMORANDUM

Rj

Date: 2nd July, 1973

To: Falconbridge Nikkelverk A/S ✓
A. M. Clarke, H. T. Berry,

cc: F. Hansen, Sydvaranger, Oslo,
prospekteringssjef Sverdrup,
Sydvaranger, Kirkenes, v. geolog Skordal

From:

Subject: J. B. Gammon

905-23 PASVIK, FINNMARK, REPORT NO. 253/73/23.

Please find attached field results and brief comments on profiles run for ground recovery of helicopter geophysical targets in the pasvik area. Drilling has commenced in the area and is expected to be completed by mid-August.

J. B. Gammon

FOR FALCONBRIDGE NIKKELVERK A/S

A/S SULFIDMALM

PROJECT 905-23

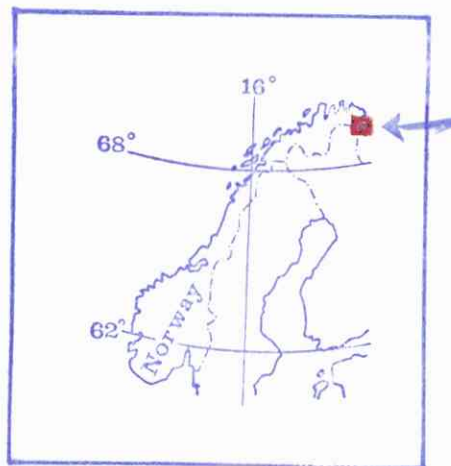
GROUND RECOVERY OF DRILL TARGETS
FROM HELICOPTER GEOPHYSICS.

PASVIK, FINNMARK, NORWAY. JUNE 1973.

Ø. LOGN ·

F. HANSEN

J. B. GAMMON



INTRODUCTION.

For the past decade the Sydvaranger company has been carrying out a programme of exploration in the general Pasvik region of east Finnmark, Norway. Negotiations are currently under way between the Falconbridge organization and Sydvaranger on the continuation of this work on a joint venture basis. Results obtained by Sydvaranger to date have been summarised in Sulfidmalm Report No. 250/73/23 to which the reader is referred.

One of the most encouraging investigations to date has been the helicopter geophysical survey over the presumed extension of the nickel bearing Petsamo Formation into Norway. The area concerned, known as the "Skogfoss Arch" exhibits many interesting magnetic and EM anomalies. Preliminary drilling by Sydvaranger has shown the presence of ultrabasics in this belt.

If a joint venture agreement is satisfactorily negotiated the 1973 field season will consist largely of drilling targets obtained during the helicopter survey. This report presents the results of ground recovery of the planned targets.

METHODS AND PERSONELL.

The work reported on here was initiated by Logn of Sydvaranger using the NGU handheld minimagnetometer and SP measurements. It was completed by Hansen of Sulfidmalm using a McPhar M700 fluxgate magnetometer and Crone RADEM VLF-EM unit. The latter two instruments were left in Pasvik for Sydvaranger's personell to continue with additional measurements.

TARGETS COVERED.

The table below summarises preliminary target evaluation by the two companies' and shows the priorities agreed on at a joint meeting on May 9th in Oslo.

Helicopter profile	Km → N from S base line	EM. Anomaly		magn. anomaly	Priority a/s Sydvaranger	Priority a/s Sulfidmalm	Agreed for 1973 program		
		Real	Imag.				Geophysics	Geochemistry	Diamond drill hole
6.	2.9.	1.	1.	1.	3?	0.			
11.	3.6.	1/2	1/2	1.	3?	0.			
23.	2.8.	1.	1.	1.	2.	0.			
34.	4.9.	0.	0.	1.	0.	2.	2.		
41.	4.36	1.	1.	0.	1.	0.		1.	
44.	3.9.	0.	1.	0.	3?	0			
46.	5.0.	1/2.	1/2.	1.	1.	1.	1.		1.
52.	6.7.	0.	0.	1.	0.	3.	2.		
53.	4.7.	1/2.	1.	1.	2.	0.	1.		
58.	4.7.	1.	1.	0.	2.	0.	2.		
58.	6.1.	0.	0.	1.	2.	2.	1.		
59.	2.1.	1/2.	1.	1.	2.	1.	1.		1.
59.	2.7.	0.	0.	1.	2.	1.	1.		1.
59.	5.5.	0.	1.	0.	3?	3.	3.		
60.	5.2.	0.	0.	1.	1.	1.	1.		1.
61.	3.3.	1/2.	1.	1.	2.	1.	1.		1.
65.	5.3.	0.	0.	1.	0.	2.	3.		
66.	0.6.	1.	1.	1.	0.	1.	1.		2.
67.	4.8.	1.	1/2.	1.	1.	1.	1.		1.
72.	5.2.	1.	1.	1.	1.	1.	1.		1.
81.	1.8.	1/2.	0.	1.	3?	0.	3.		
81.	5.1.	1.	1.	0.	0.	2.	2.		
83.	5.6.	1/2.	1/2.	1.	1.	1.	1.		1.
87.	1.1.	0.	0.	1.	3?	0.			
90.	5.2.	1.	1.	1.	2.	1.	1.		1.
93.	0.8.	1.	1.	1/2.	0.	1.	1.		(3.)
94.	3.5.	1.	1.	1.	2.	1.	1.		1.
94.	1.8.	1.	1.	1.	0	1.	1.		1.
103.	1.2.	1.	1.	1.	1.	0.	1.		1.
103.	3.0.	2	1/2	1/2	1.	0.	1.		1.
109.	4.5.	1/2.	0	1.	3.	0.			
120.	2.1.	1.	1.	1.	3.	0.	2.		2.

The 13 first priority 1973 drill targets shown in the final column of the above table were covered in this work and are discussed in turn below. The profiles measured on the ground are shown on the attached map 1/253/73/23.

TARGET 46/5.1

The attached profile 2/253/73/23 shows Logn's results over the presumed anomaly zone. The expected mag. anomaly shows up clearly at about +140 metres with a flanking minor SP anomaly at about +100 metres. A hole is currently being drilled on this profile from +30 metres at 45° N to a planned depth of 120 metres. The attached map 3/253/73/23 shows the results of additional short mag. profiles run across the main anomaly zone.

TARGET 59/2.1

Hansen ran the profile shown on the attached Figure 4/253/73/23 from the fixed point supposedly located adjacent to the anomaly. A minor mag. anomaly with associated VLF cross over was obtained at 100S. Referring to the original helicopter data he decided to put in a parallel line 150 metres further east. The results of this are shown on the attached Figure 5/253/73/23. A much stronger response for both mag. and VLF was obtained at about 20N on this line. A hole is to be spotted at 50S on this line to be drilled north at 45° to test these anomalies.

TARGET 59/2.7

A profile was run by Logn using the minimag over this target. (Fig. 6/253/73/23). It was later covered by Hansen with the fluxgate and VLF. His results are shown on 7/253/73/23. Reference to the table of targets shows that the object here was an interesting magnetic anomaly with no obvious EM association. Hansen's results have shown a clear VLF anomaly centred around 300N and a rather weak magnetic anomaly around 275N. Additional magnetics will be carried out over this target before a hole is located.

TARGET 60/5.2

This target was covered by Logn, his results are shown in profile form on 8/253/73/23 and the mag. anomalies obtained on two parallel profiles are contoured on map 9/253/73/23. It is planned to test this magnetic anomaly with a hole at 45° located as shown on 9/253/73/23.

TARGET 61/3.3

This target was covered by Hansen whose results are shown on 10/253/73/23. A double mag. anomaly was obtained with peaks centred at 185N and 275N. Two conductors are indicated by the VLF dip angle profile and are confirmed by increased horizontal field strength readings. A hole is planned at 120N to be drilled N along the profile at 45° to a planned depth of 120 metres this should enable us to test both indicated conductors and mag. anomalies. ,

TARGET 67/4.8

This target was covered by two parallel profiles 50 metres apart. Hansen's results are shown on the attached figures 11/253/73/23 and 12/253/73/23. Logns mag. results are shown on 13/253/73/23 for the main profile and contoured on 14/253/73/23. Logn's SP results are shown on 15/253/73/23 for the main profile and in contoured form on 16/253/73/23, which also shows the location of the planned drill hole.

TARGET 72/5.2

Logn's SP and mag. results over this target are shown on the attached figure 17/253/73/23. A hole is planned to test the strong SP anomaly at 50N and the slight mag. high at 125N. According to existing plans it would be collared at 40N and drilled in the direction of the profile at 45°. However Hansen's results (18/253/73/23), while confirming the minor mag. high have given no VLF anomaly at 50N as should be expected. The mag. anomaly being tested here is very close to background level and we have recommended additional measurements in this area.

TARGET 83/5.6

This target was covered with a mag. profile by Logn (19/253/73/23). It was also covered by Hansen (20/253/73/23) who obtained a very strong mag. anomaly at 100N with an indicated conductor around 50N. Field strength measurements were not completed since the Russian sending station (MS) went off the air. A hole is planned along this profile with the collar at 20N to test both the VLF and mag. anomalies.

TARGET 90/5.2

Logn covered this target with a main mag. profile shown on 21/253/73/23. To gain additional information he fanned out supplementary profiles to east and west as shown on 22/253/73/23.

Hansen remeasured profile "C" with the results shown on 23/253/73/23. He obtains a clear mag. anomaly with a strong associated VLF conductor. Unfortunately field strength readings had to be completed using the Bordeaux rather than the Russian transmitter as the latter went off the air. However the readings obtained appear to confirm the anomaly locations.

Bearing all the information in mind it has been decided to collar a hole 20 metres east of the "main profile" and drill a 45° hole to the north to test these anomalies.

TARGET 94/3.5

This target was covered by Logn with SP only. His results are shown on 24/253/73/23, where a very clear anomaly is apparent at about 200N. The profile was extended to 600N to cover the target drilled in an earlier phase of the programme.

Hansen covered the same line with both mag. and VLF (25/253/73/23). He got a very clear signature from the target drilled by the earlier DDH III at around 500N.

The VLF also gives a very strong anomaly at around 210N thus confirming the SP results. There is however no associated magnetic expression. Graphitic schists are exposed nearby which may be the cause of this anomaly. Mineralized boulders have been discovered in this vicinity so we tend to test the conductor with a hole collared at 100N to be drilled to a planned depth of 100 metres at 45°.

TARGET 94/1.8

Hansen covered this target with Mag. and VLF EM measurements. (26/253/73/23). It is planned to test the mag. anomaly with VLF-EM association centred at 30N by a hole collared at 20S and drilled at 45° in the direction of the profile. If this is drilled to the planned depth of 120 metres we should also be able to test the mag and VLF anomalies located between 100N and 150N.

TARGET 103/1.2

This target was covered by Hansen with VLF and mag. (27/253/73/23). It is planned to test the combined mag.-EM anomaly centred on 100E by a hole collared at 40E and drilled at 45° along the profile direction to a planned depth of ca. 100 metres.

TARGET 103/3.0

The target was covered by Hansen with mag. and VLF. The results are shown on 28/253/73/23 from which a broad VLF-EM zone is apparent. However the magnetometer readings do not indicate any very clear anomalies. No hole has been planned for this target pending additional data.

GENERAL COMMENTS.

It has been interesting and gratifying to see the generally good correlation between the two sets of magnetometer readings and the similarity between the VLF and SP data.

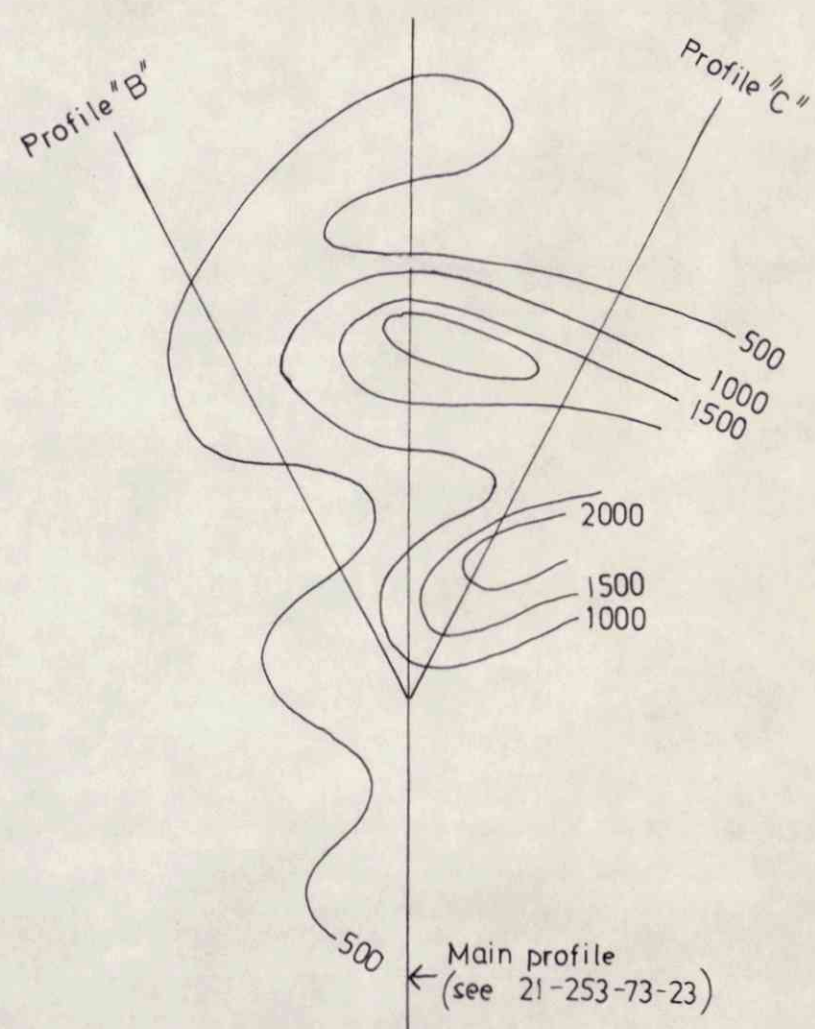
The programme has been very rushed due to an urgent need for data to get the drilling underway. It would be desirable on all of these targets to have additional profiles covering the target areas before final hole location decisions are made. Additional data is particularly urgently needed in target areas 103/3.0, 103/1.2, 67/4.8, 72/5.2 and 59/2.7.

The VLF and Fluxgate instruments will remain in the Pasvik area until about July 9th and it is hoped that Sydvaranger will be able to carry out some of these additional measurements.

— 200

— 100

— 0



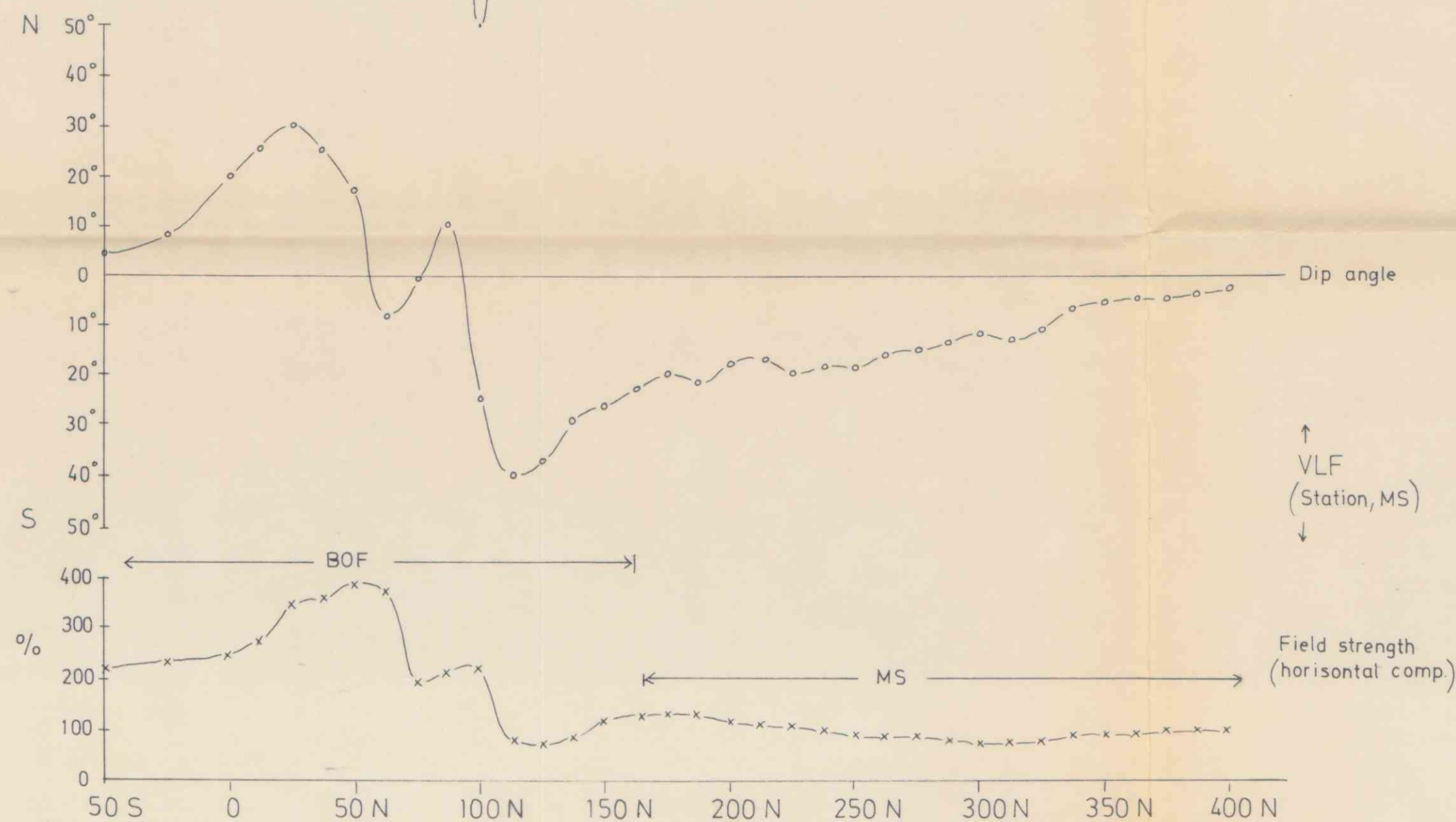
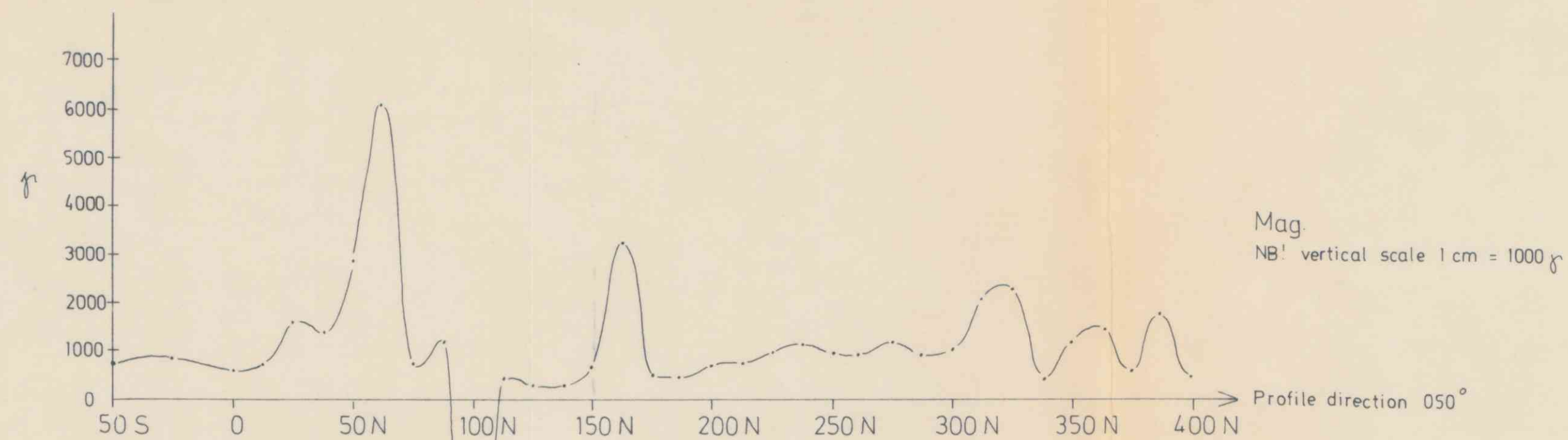
Target 90/5.2
Magnetic anomalies

SCALE 1:2000	OBS. ØL	6-73
	DRAW. ØL	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

1/2 SULFIDMALM

MAP NO.
22-253-73-23

MAP SHEET



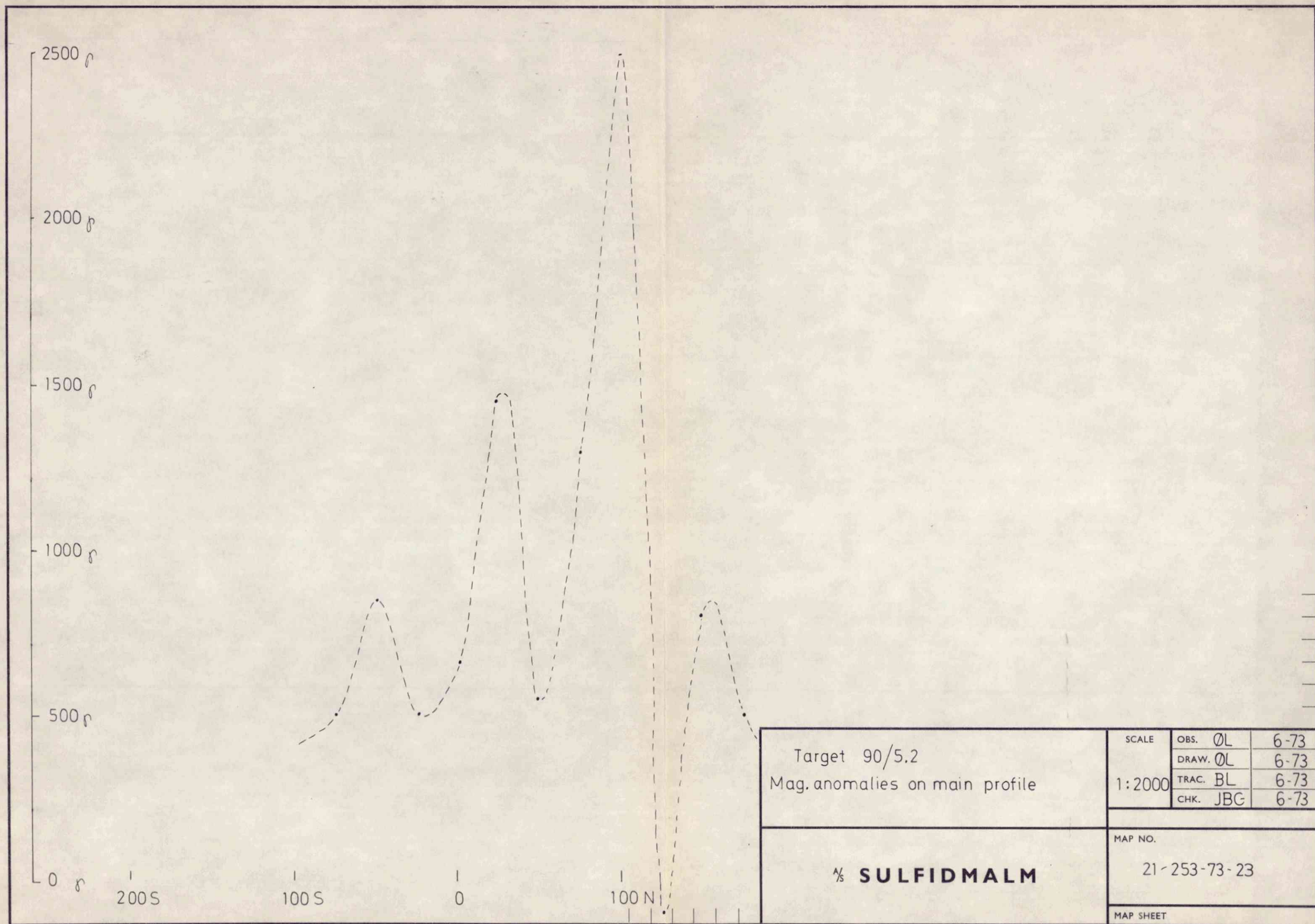
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Magnetic and VLF-EM anomalies

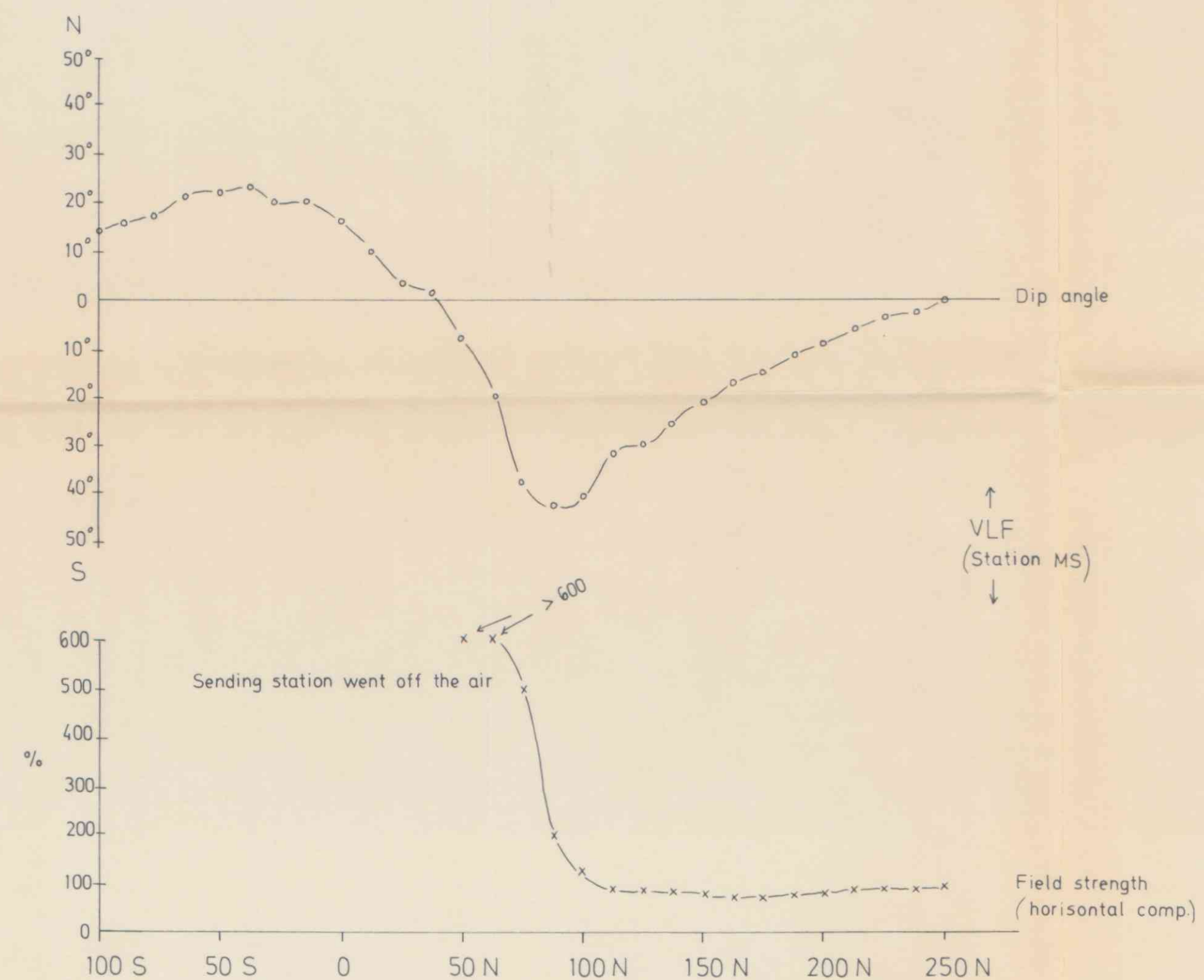
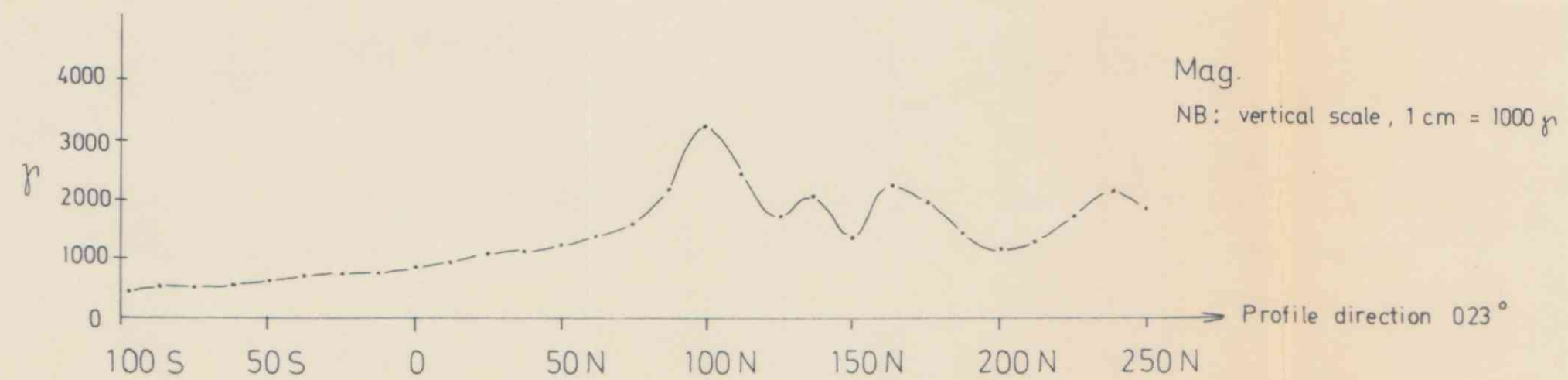
SCALE	OBS. F.H.	6-73
	DRAW. F.H.	6-73
1:2000	TRAC. BL	6-73
	CHK. JBG	6-73

1/2 SULFIDMALM

MAP NO.
23 - 253 - 73 - 23

MAP SHEET





Target 83/5.6
Magnetic and VLF-EM anomalies

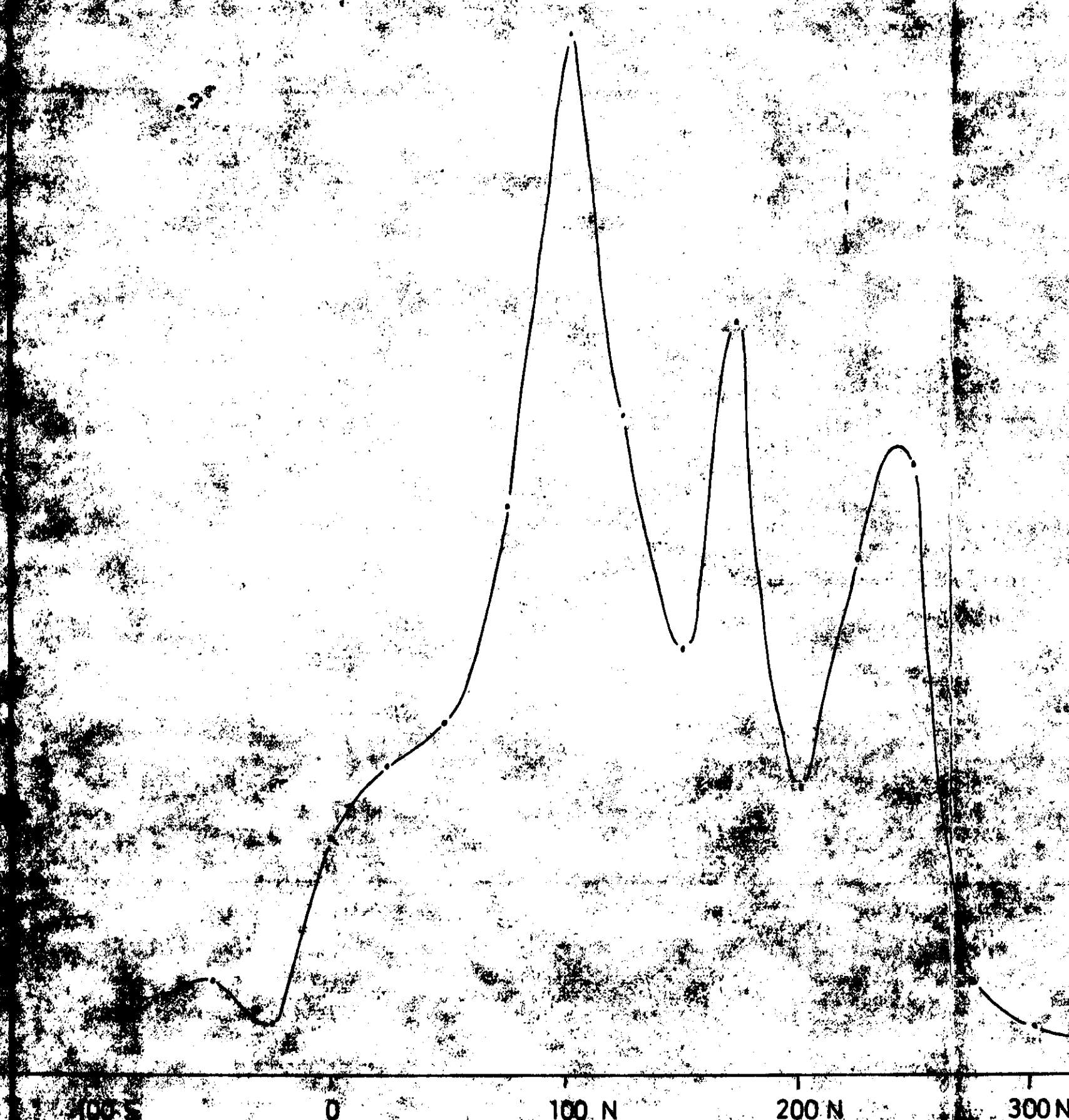
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	DRAW. F.H.	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

1/2 SULFIDMALM

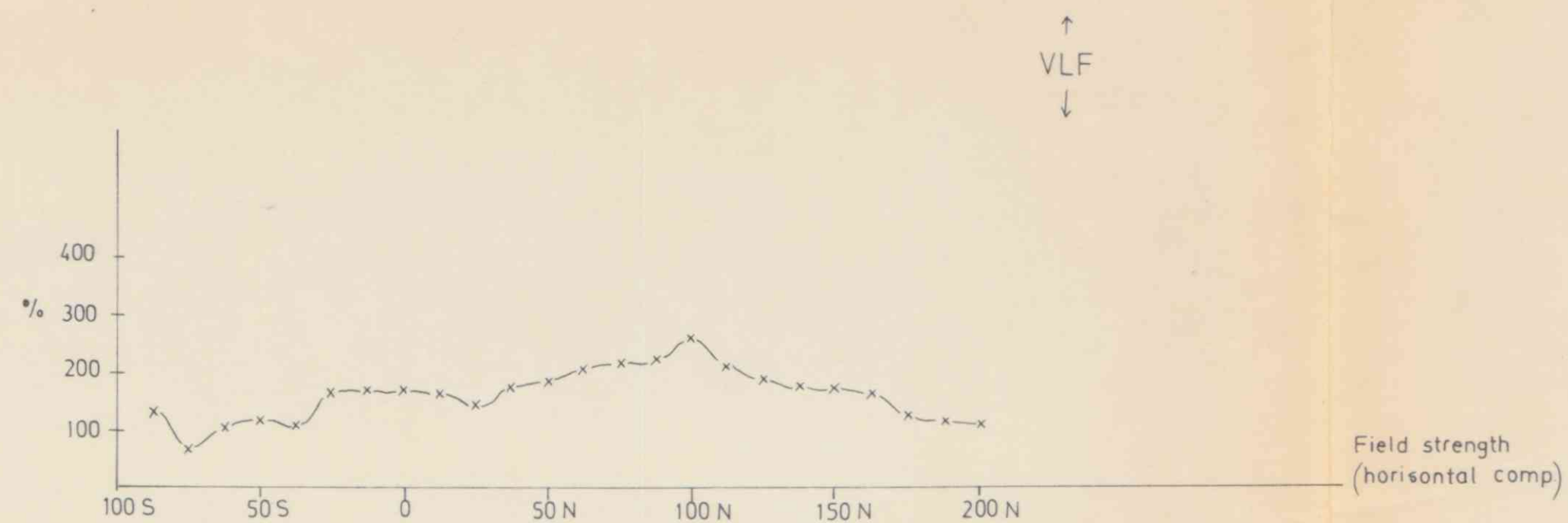
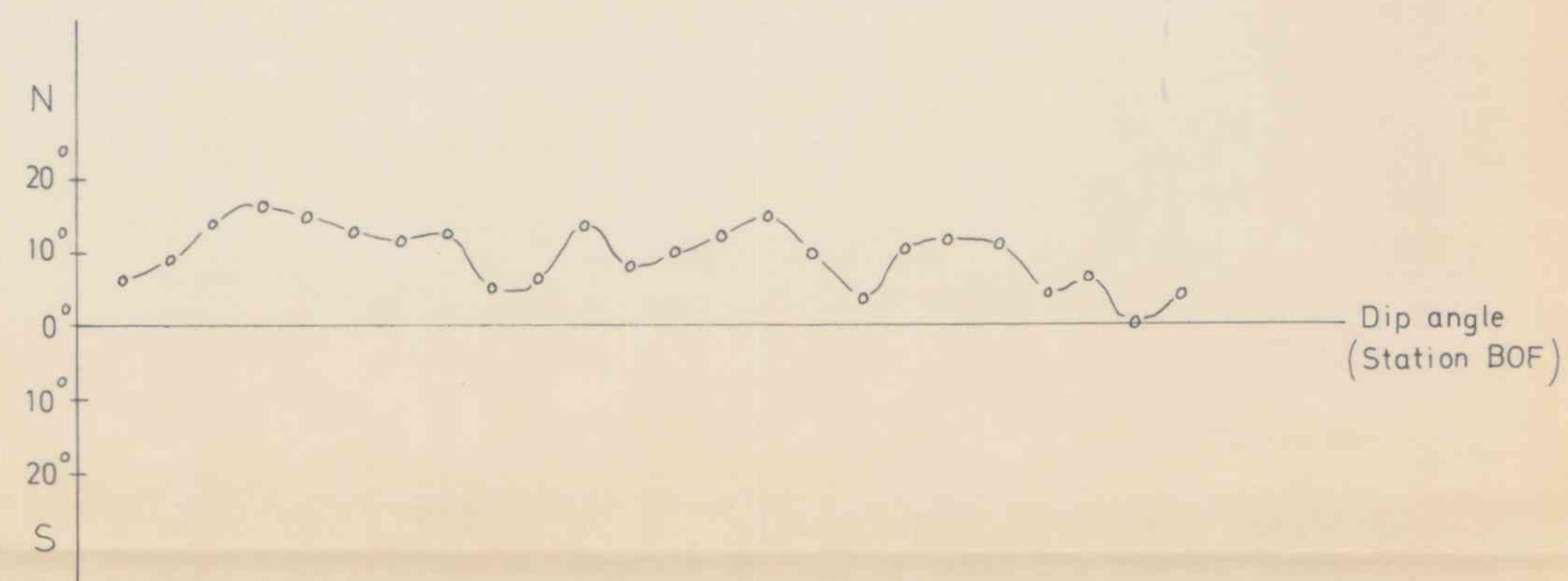
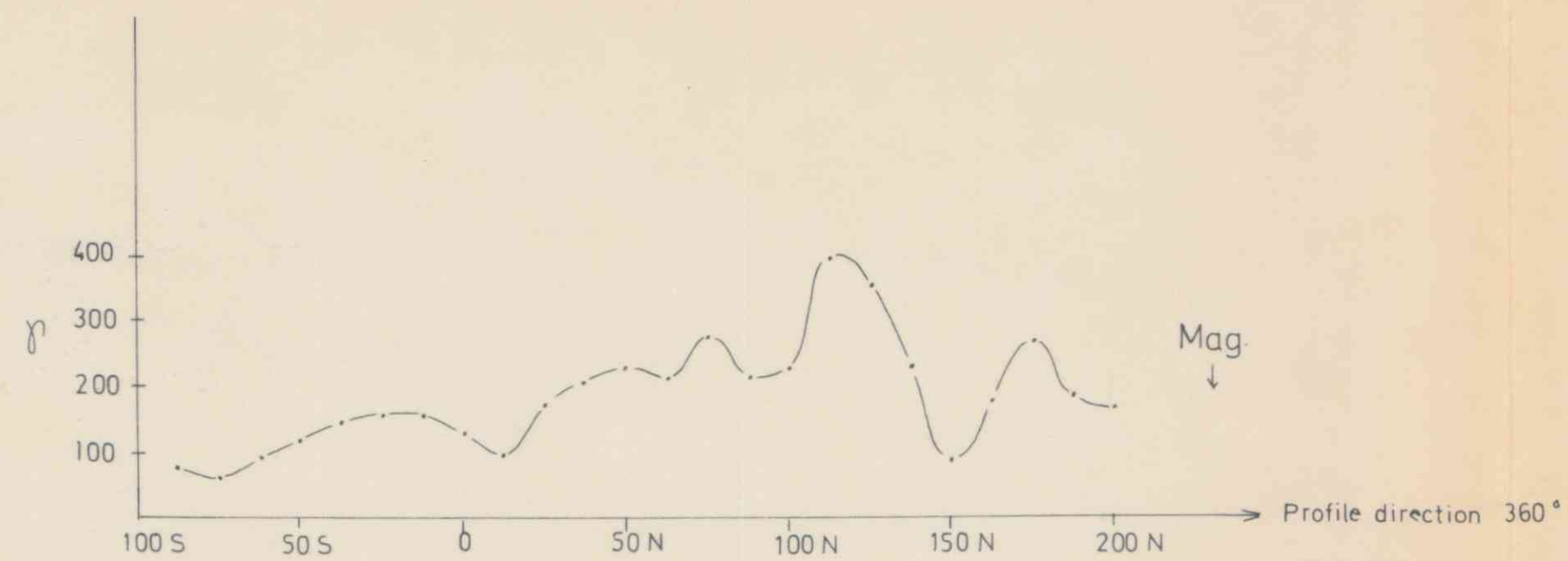
MAP NO.

20-253-73-23

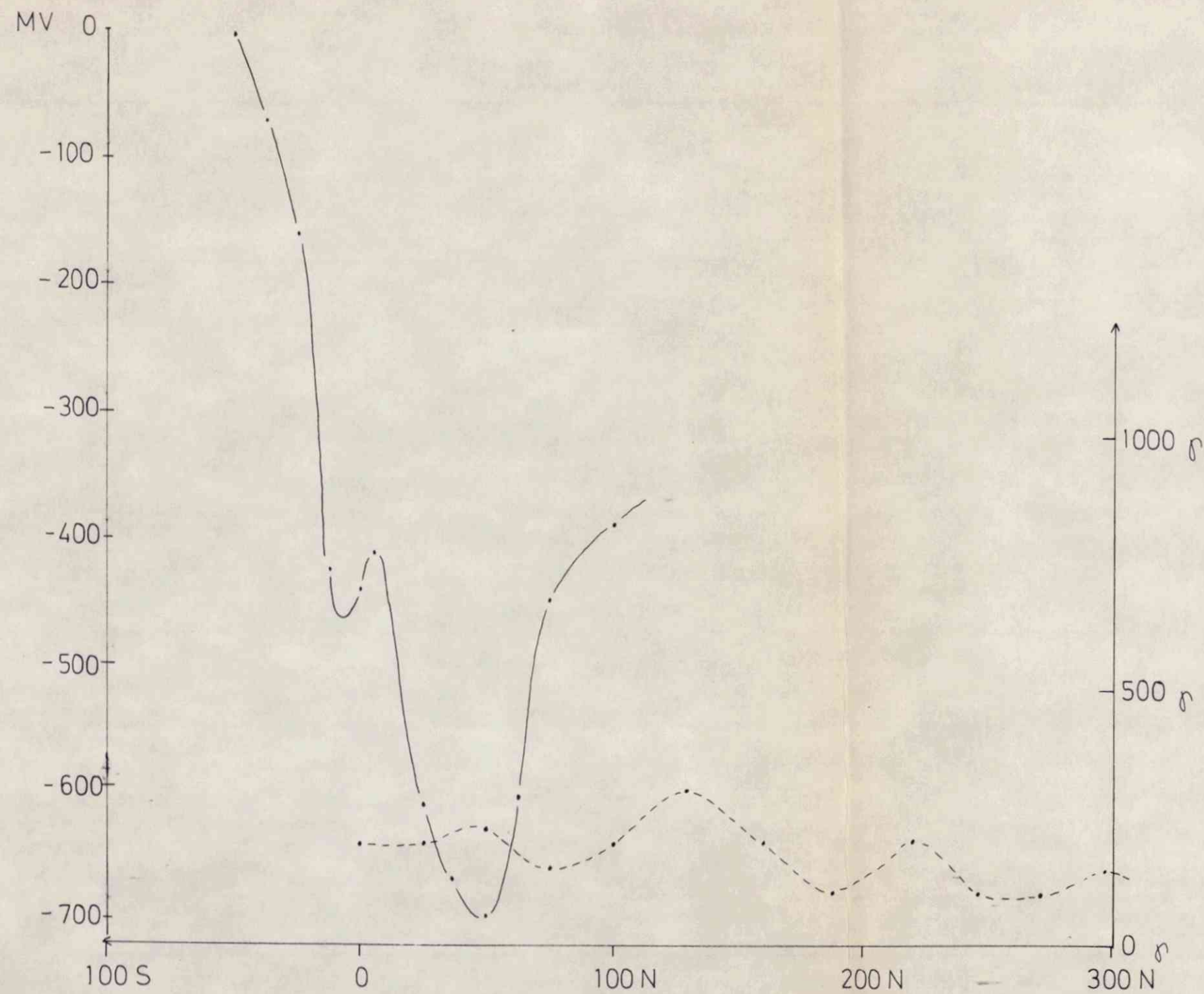
MAP SHEET



Target 83/5.6 Mag. profile	SCALE	ORL	
	1:2000	DRAWN BY	
SULFIDNALM		TRAC. BY	
		CHK. BY	JBG
	19-253-73-23		



Target 72/5.2 Magnetic and VLF-EM anomalies	SCALE	OBS. FiH	6-73
		DRAW. FiH	6-73
	1:2000	TRAC. BL	6-73
		CHK. JBG	6-73
SULFIDMALM	MAP NO.	18-253-73-23	
	MAP SHEET		



KEY :

— SP
 - - - Magn.

Target 72/5.2
 Magnetic and SP anomalies

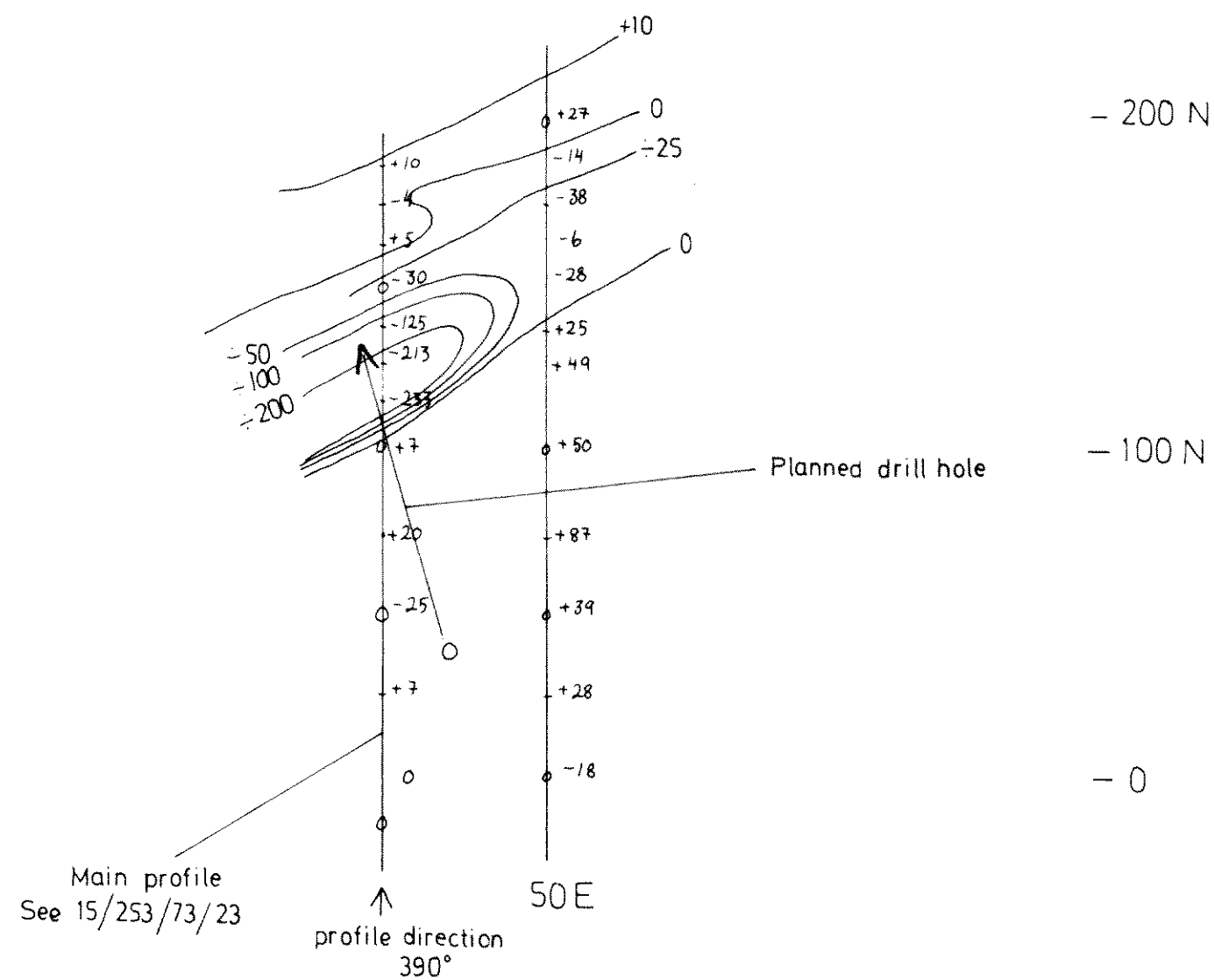
SCALE 1:2000	OBS. ØL	6-73
	DRAW. ØL	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

1/2 **SULFIDMALM**

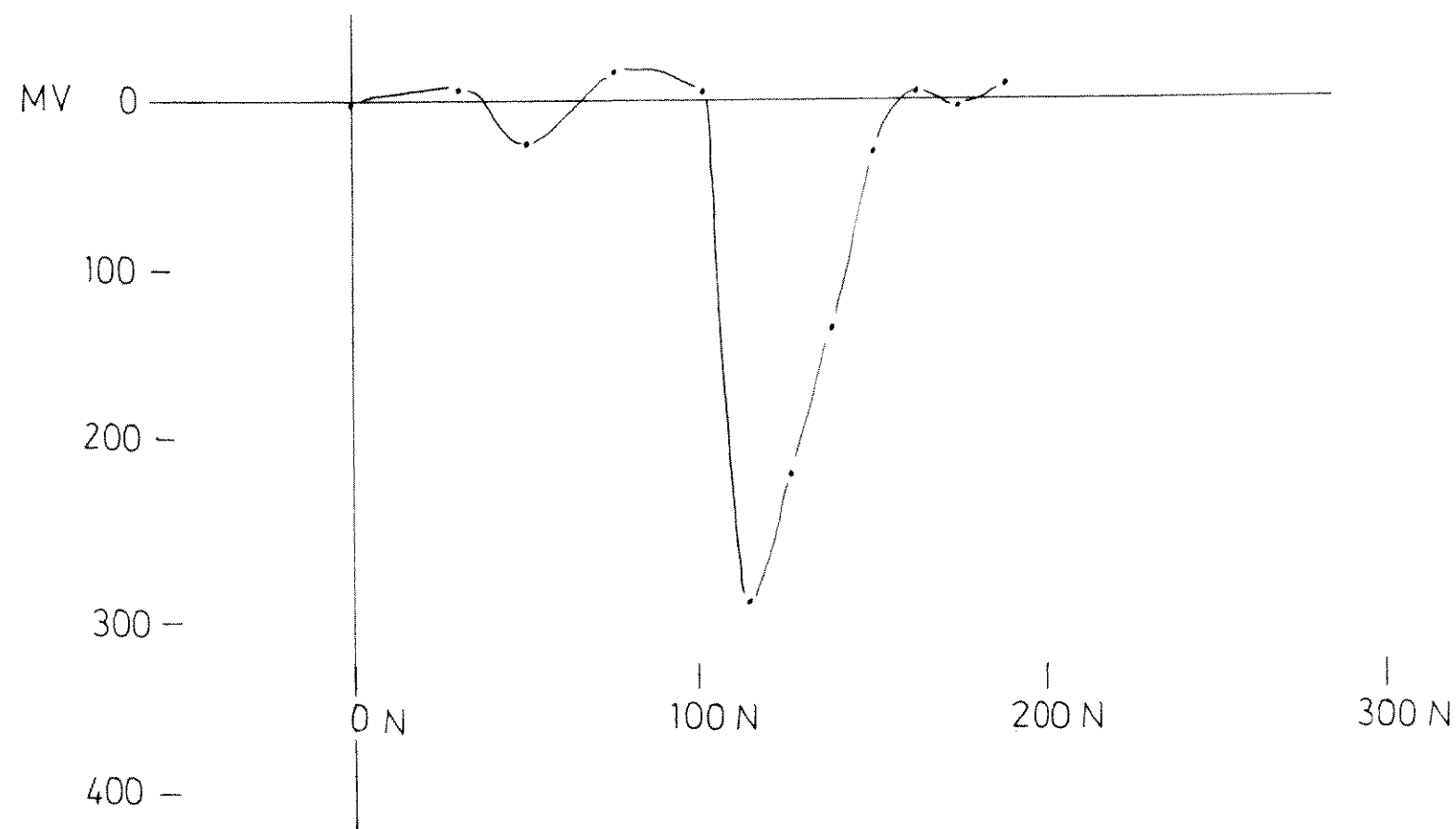
MAP NO.

17 - 253-73-23

MAP SHEET



Target 67/4.8 SP anomalies	SCALE 1:2000	OBS. ØL	6-73
		DRAW. ØL	6-73
		TRAC. BL	6-73
		CHK. JBG	6-73
1/5 SULFIDMALM	MAP NO.		16-253-73-23
	MAP SHEET		



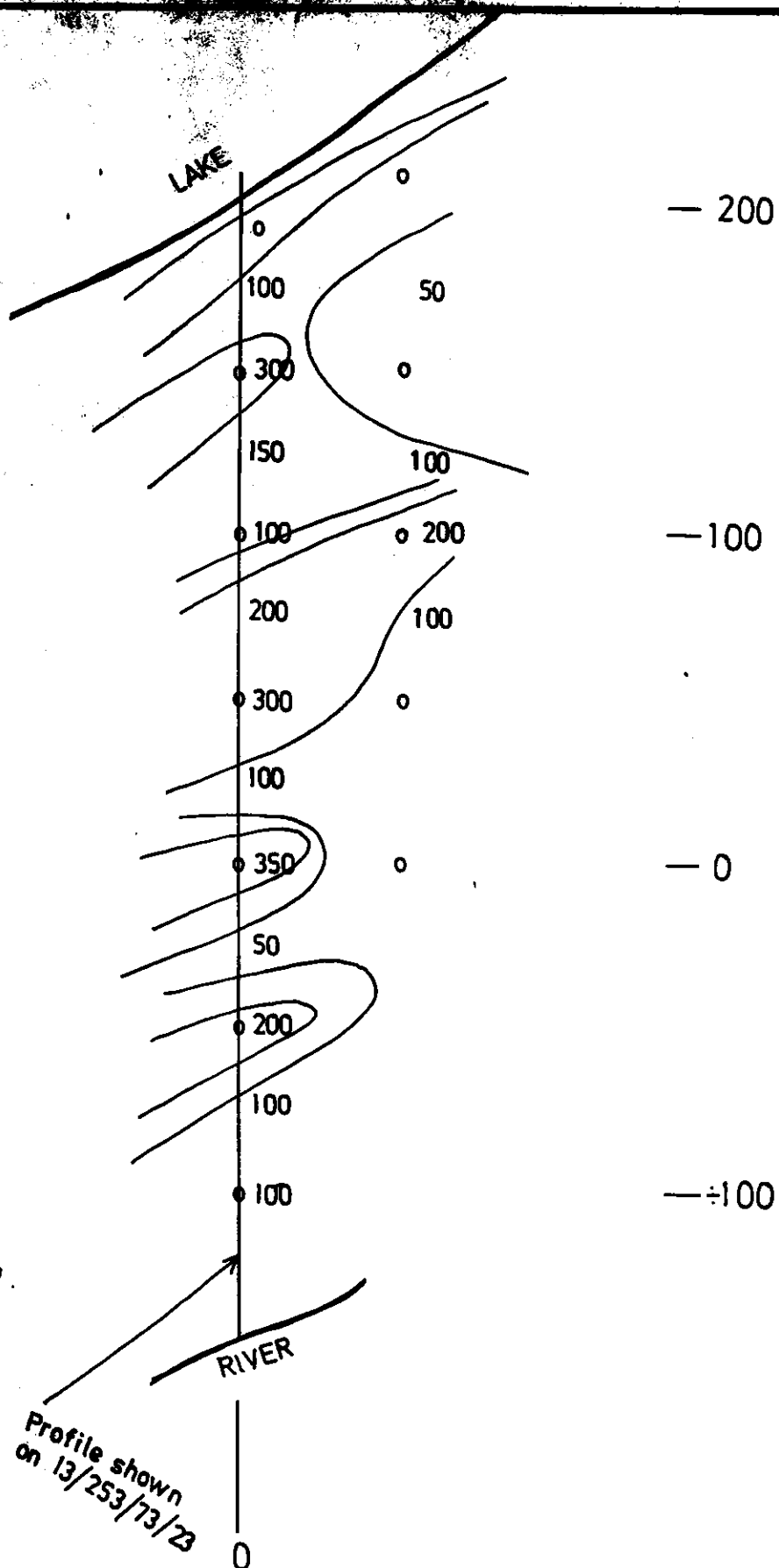
Target 67/4.8
SP anomalies on main profile

SCALE 1:2000	OBS. ØL	6-73
	DRAW. ØL	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

1/8 **SULFIDMALM**

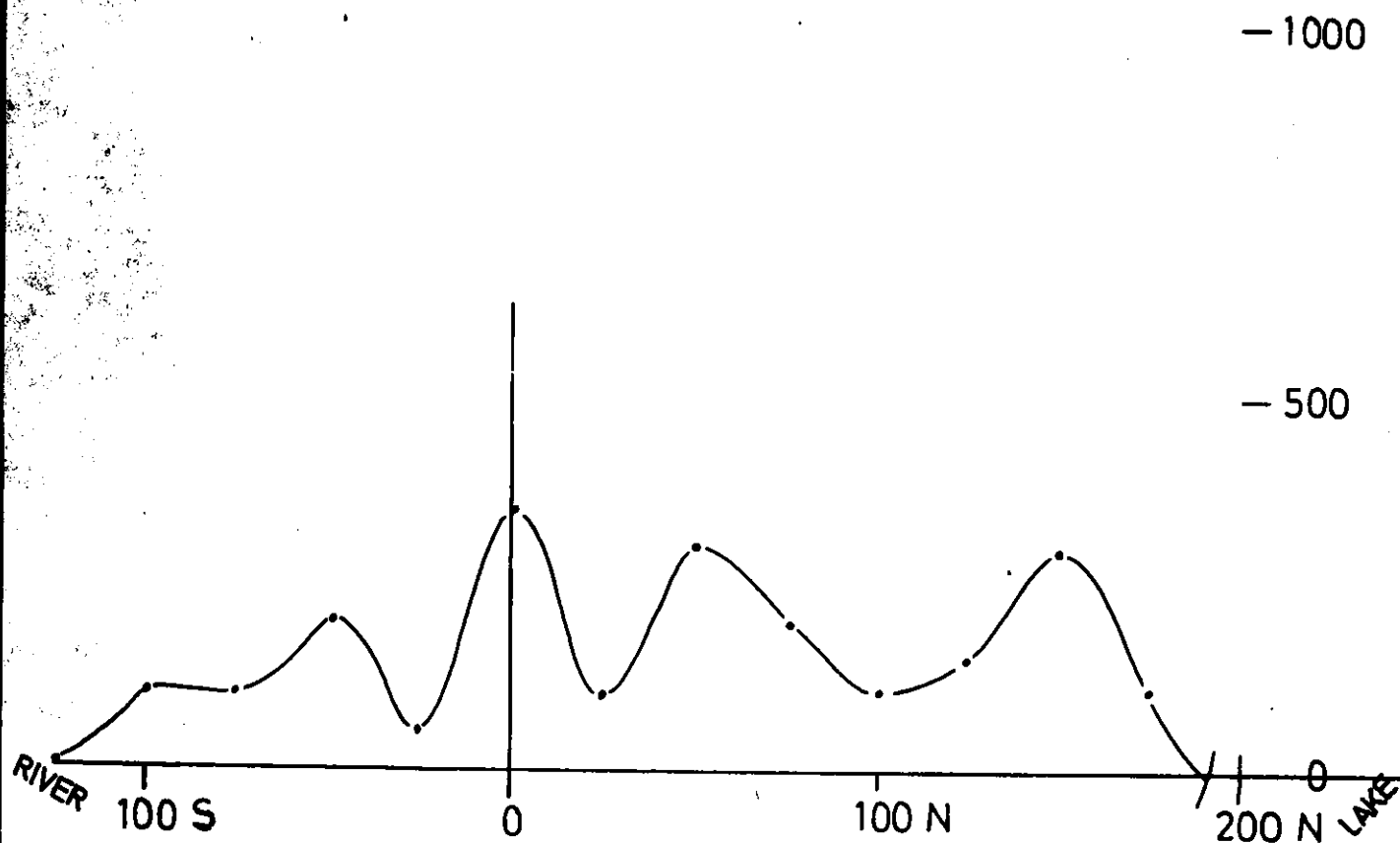
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15-253-73-23

MAP SHEET

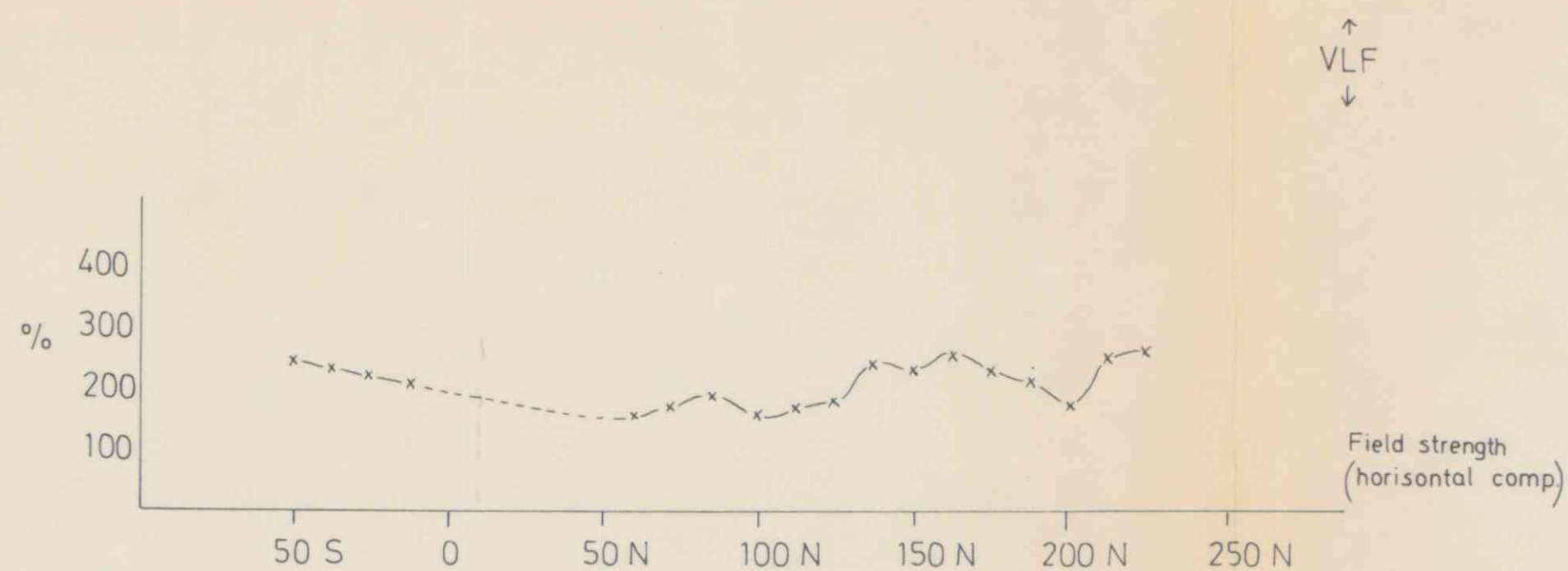
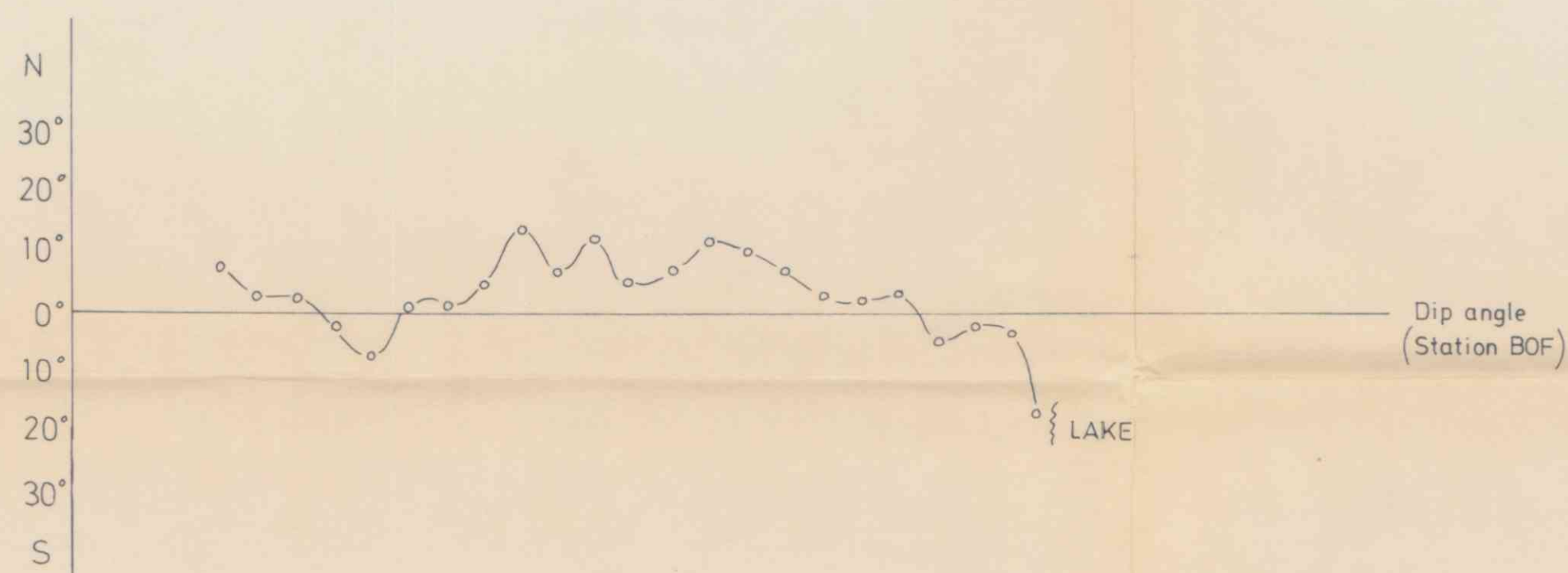
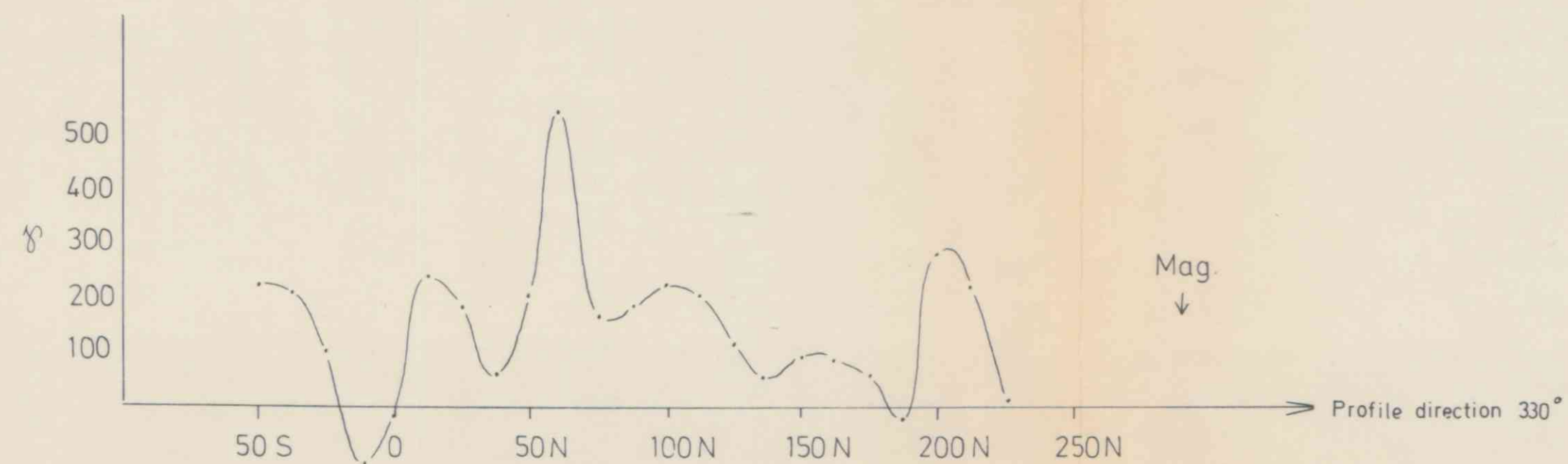


Profile shown
on 13/253/73/23

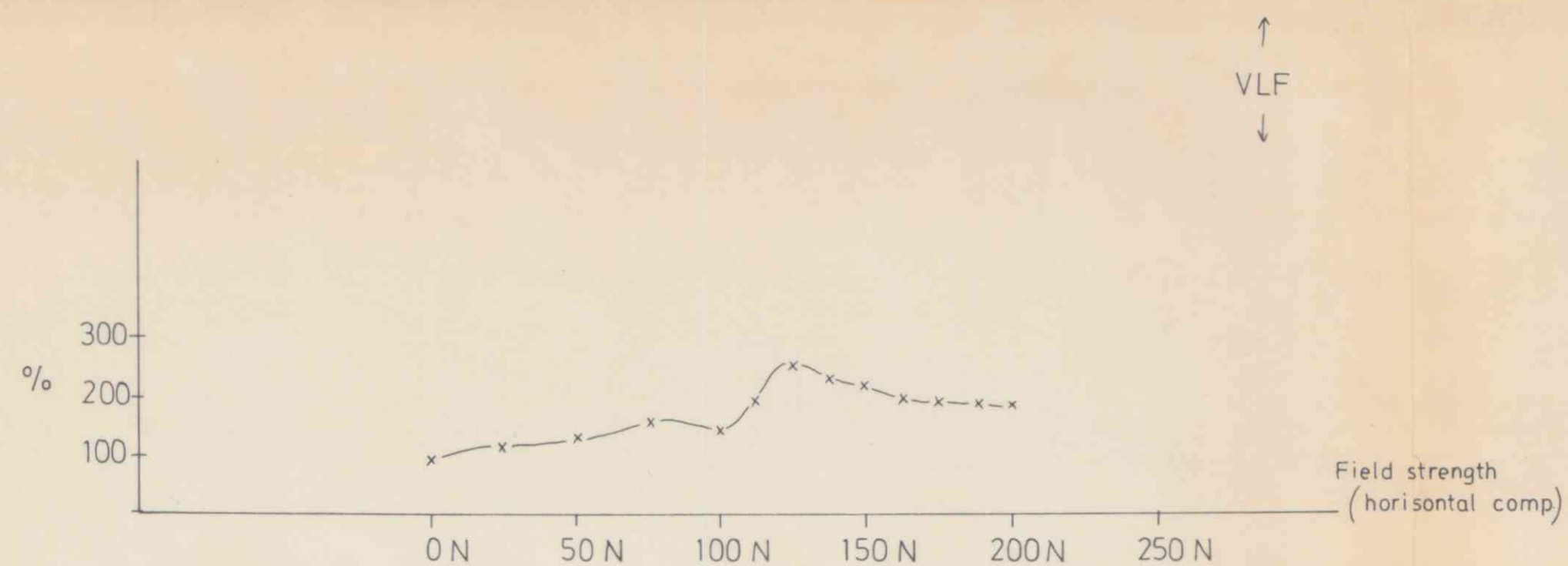
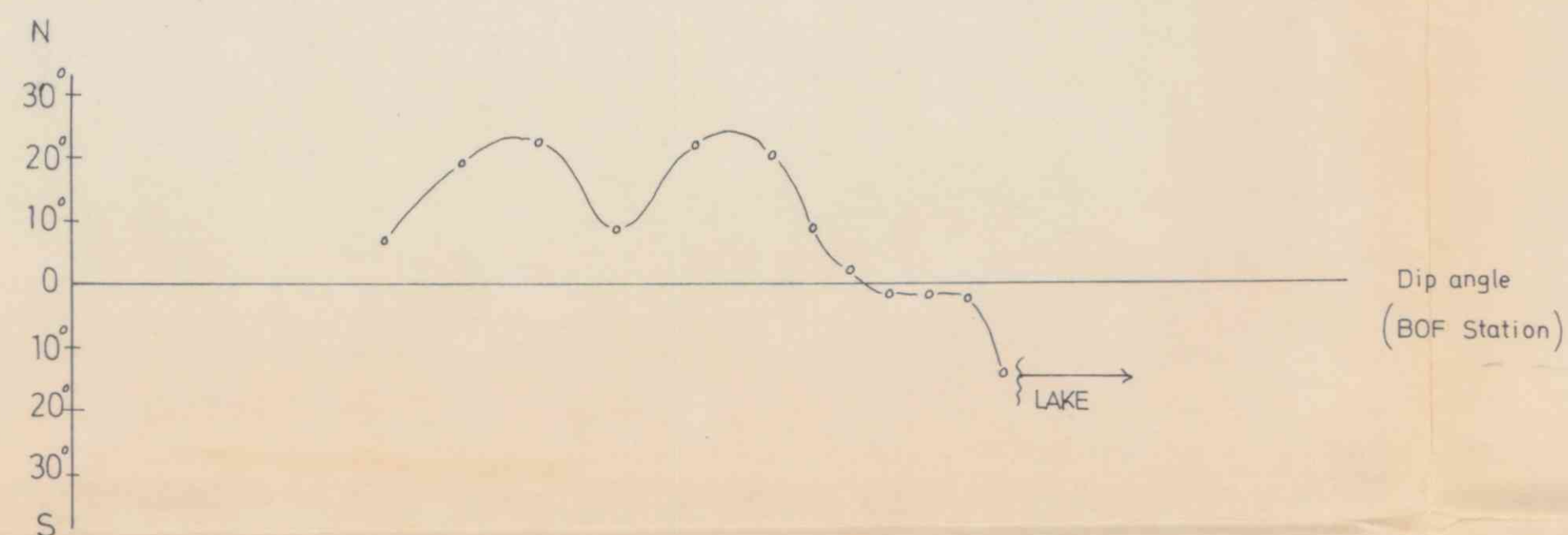
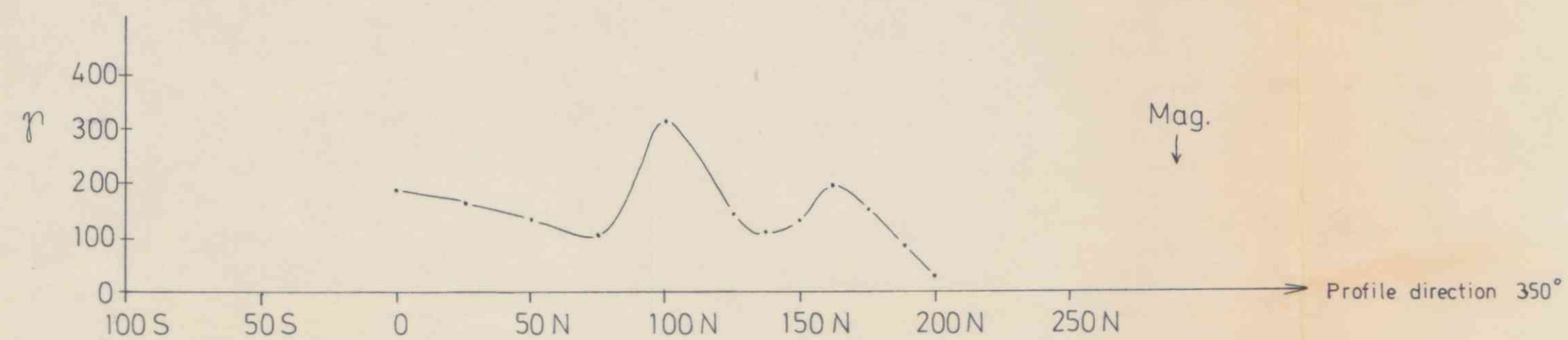
A/S SULFIDMALM			
Target 67/4.8			
Magnetic anomalies			
14/253/73/23			
SCALE	1: 2000	DRAWN	ØL 6-73
DATE	6-73	TRACED	BL 6-73



A/S SULFIDMALM	
Target 67/4.8	
Magnetic anomalies on main profile	
13-253-73-23	
SCALE 1:2000	DRAWN ØL
DATE 6-73	TRACED BL



Target 67/4.8 Magnetic and VLF anomalies on profile 50 E	SCALE 1:2000	OBS. F.H.	6-73
		DRAW. F.H.	6-73
		TRAC. BL	6-73
		CHK. JBG	6-73
SULFIDMALM	MAP NO. 12-253-73-23		
	MAP SHEET		



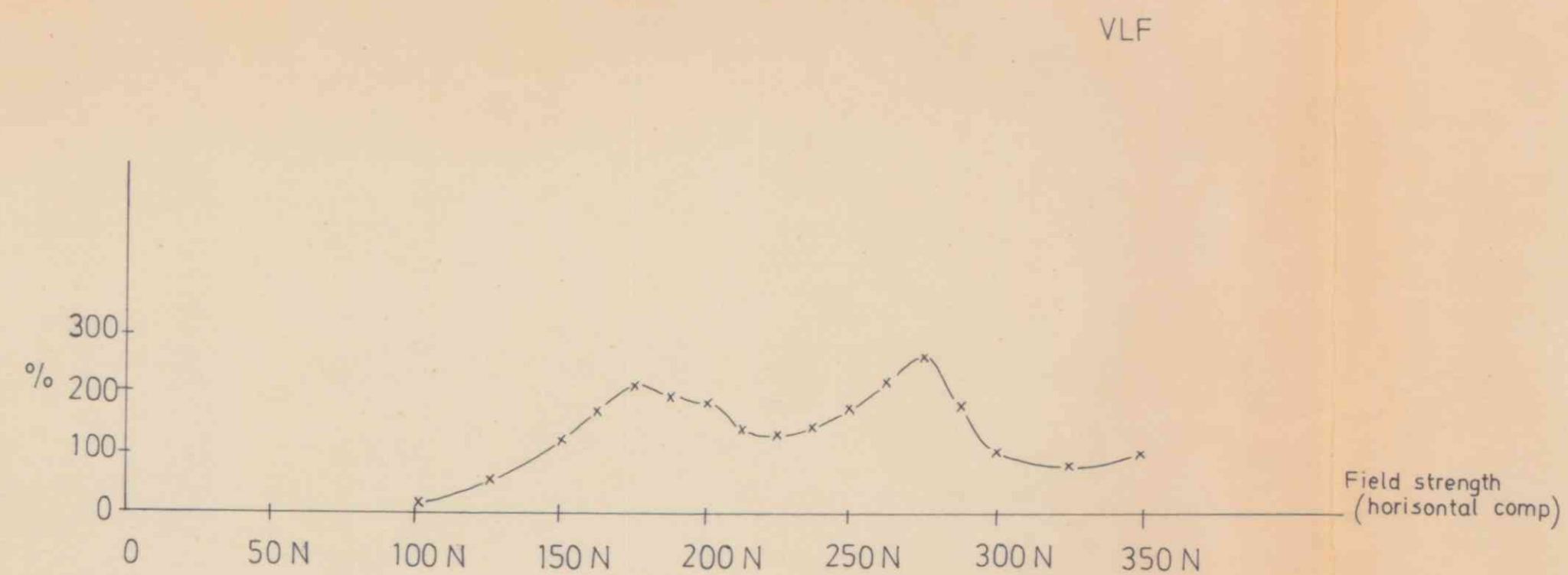
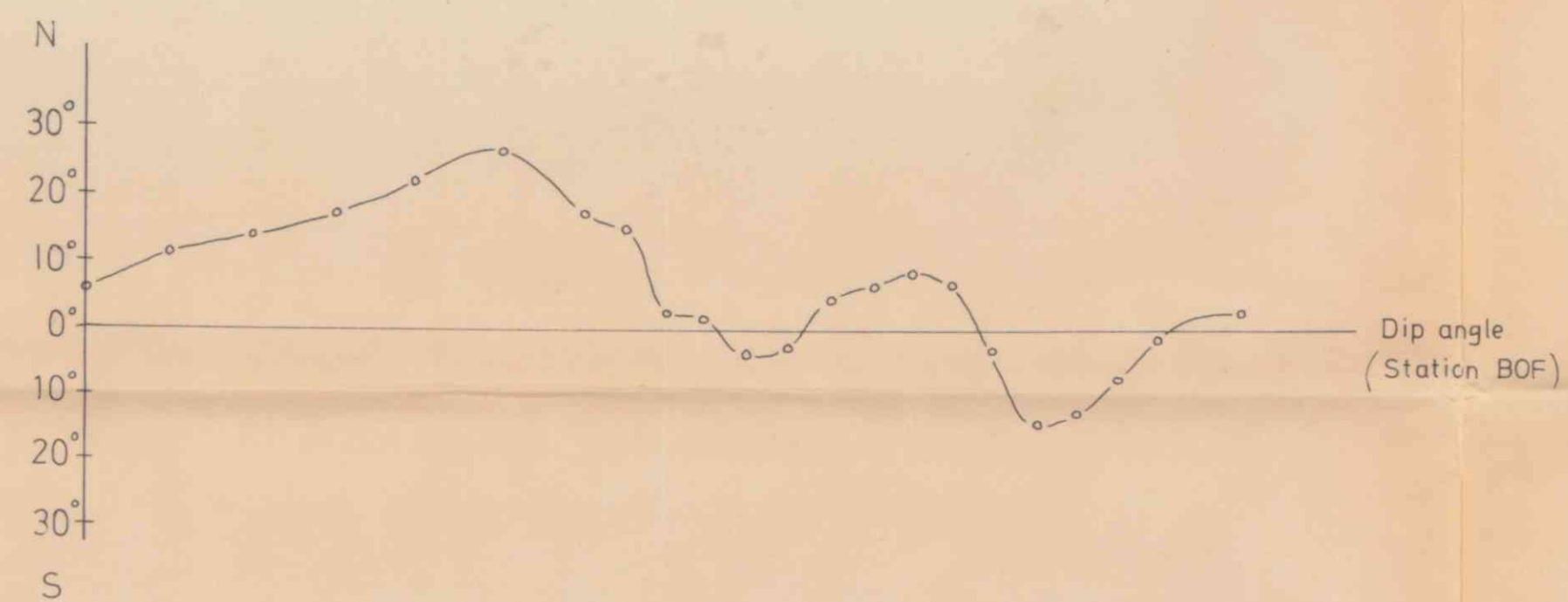
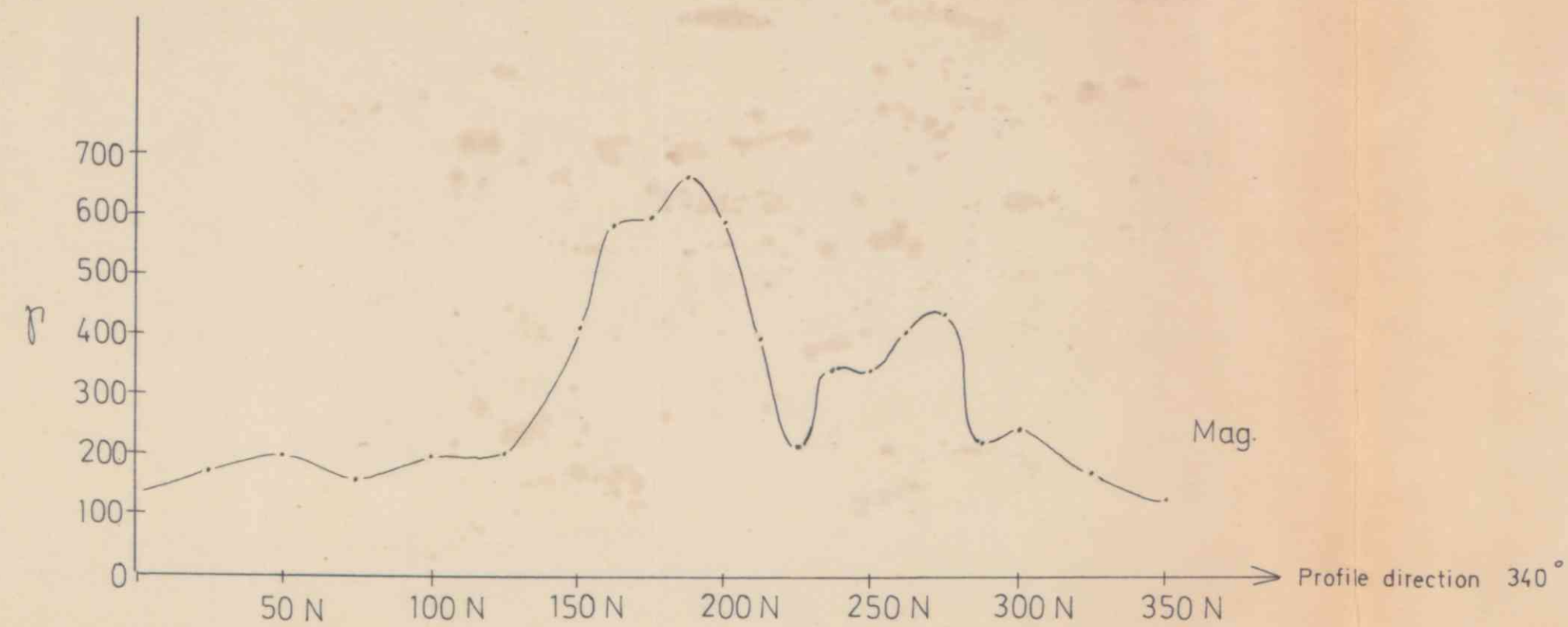
Target 67/4.8
Magnetic and VLF anomalies on main profile

SCALE 1:2000	OBS. F.H.	6-73
	DRAW. F.H.	6-73
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	CHK. JBG	6-73

1/8 SULFIDMALM

MAP NO.
11-253-73-23

MAP SHEET



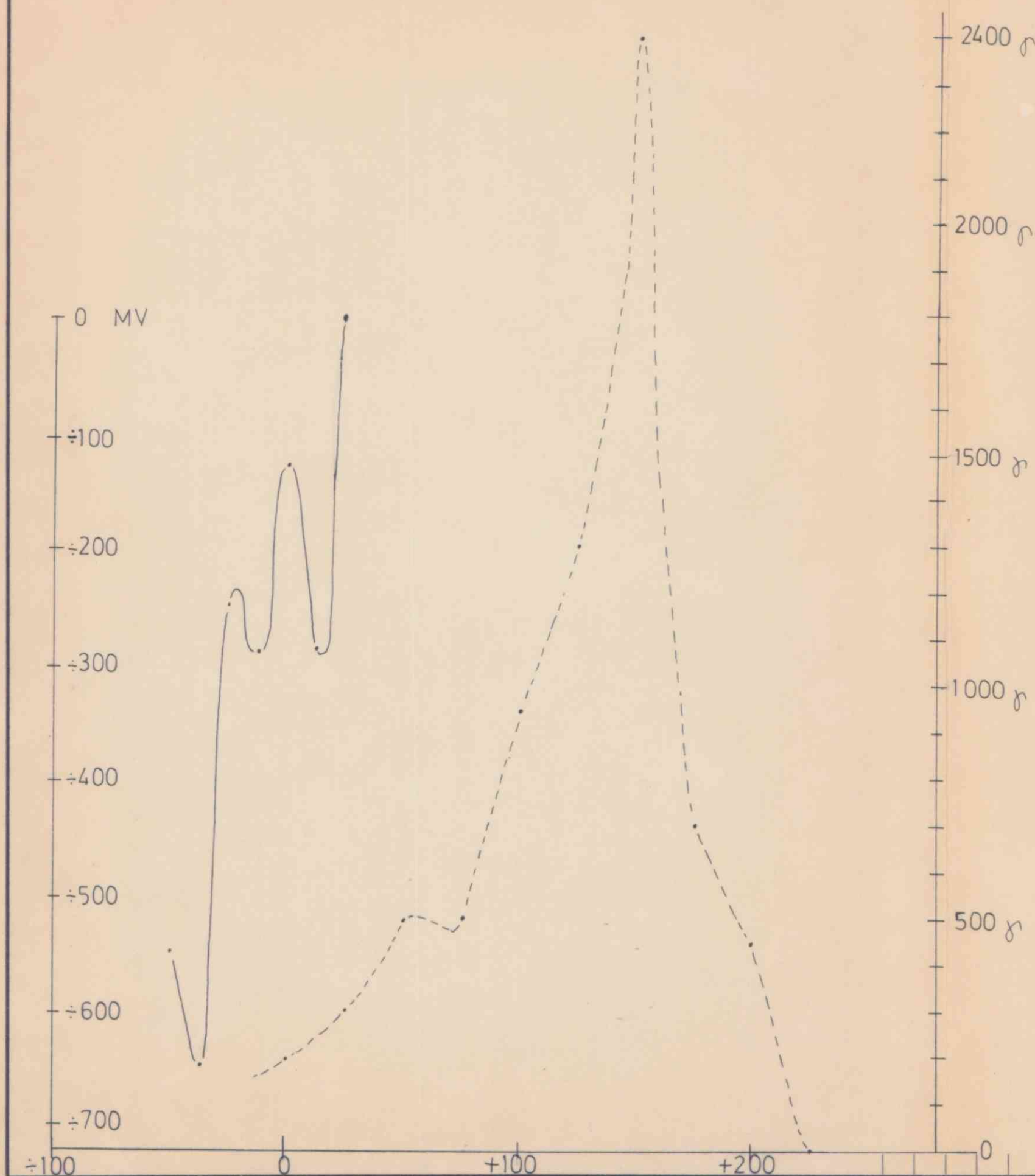
Target 61/3.3
Magnetic and VLF-EM anomalies

SCALE 1:2000	OBS. F.H.	6-73
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	TRAC. BL	6-73
	CHK. JBG	6-73

1/2 SULFIDMALM

MAP NO.
10-253-73-23

MAP SHEET



KEY:

—•— SP
- - -•- - Mag.

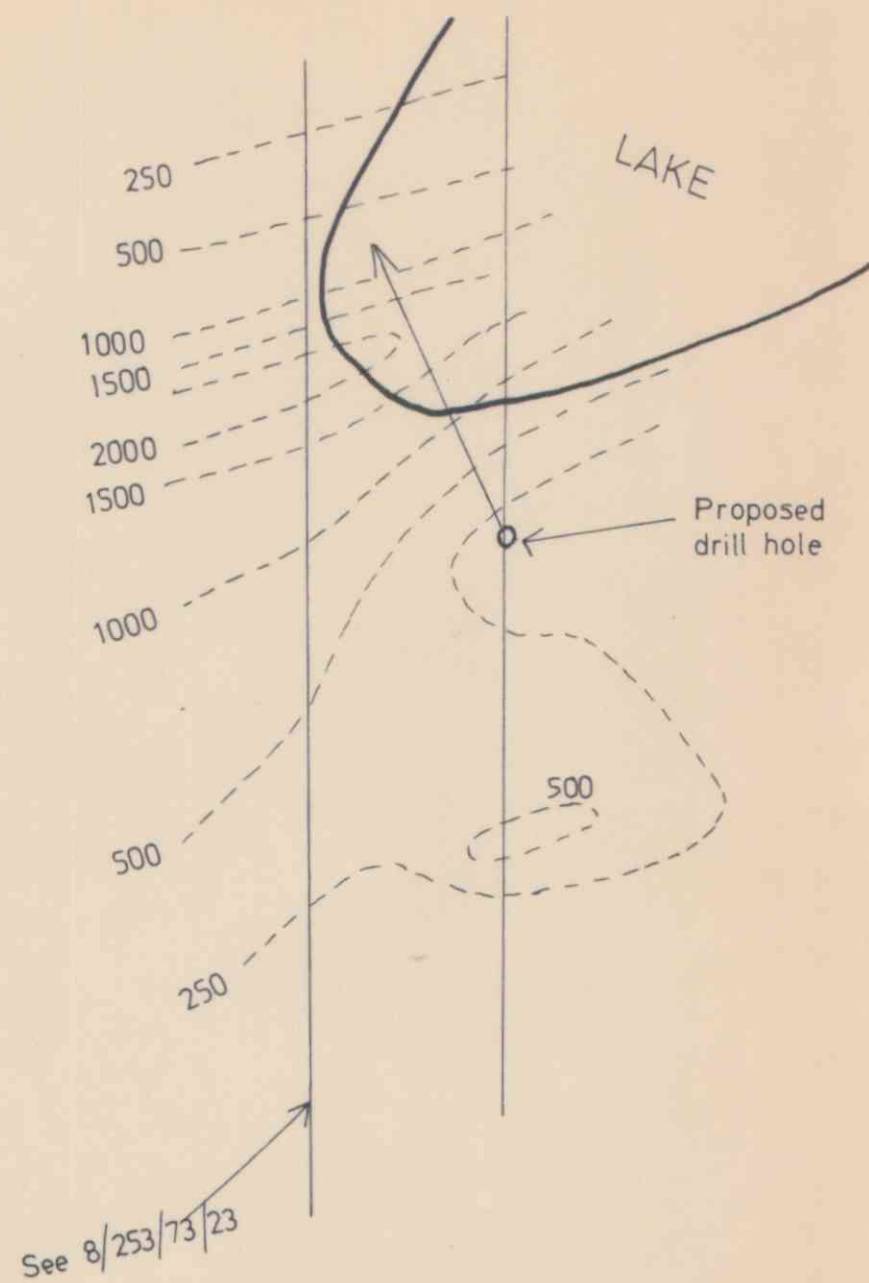
Target 60/5.2
Magnetic and SP anomalies

1/8 **SULFIDMALM**

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	TRAC. BL	6-73
	CHK. JBG	6-73

MAP NO.
8-253-73-23

MAP SHEET



— 200

— 100

— 0

— -100

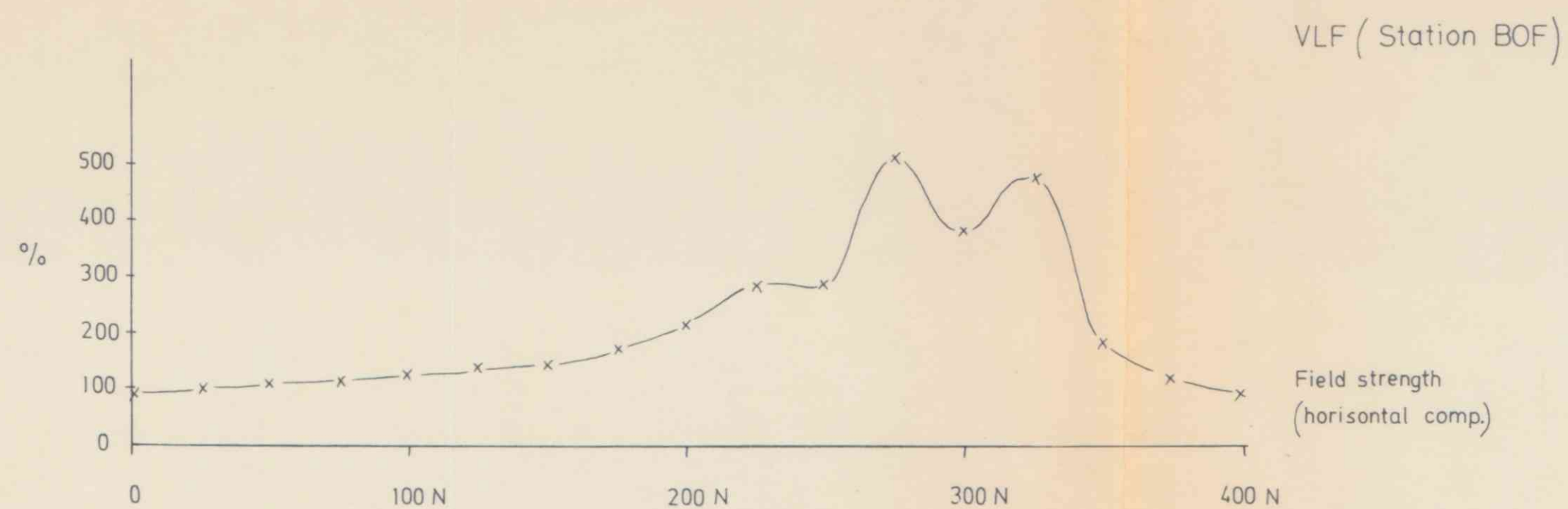
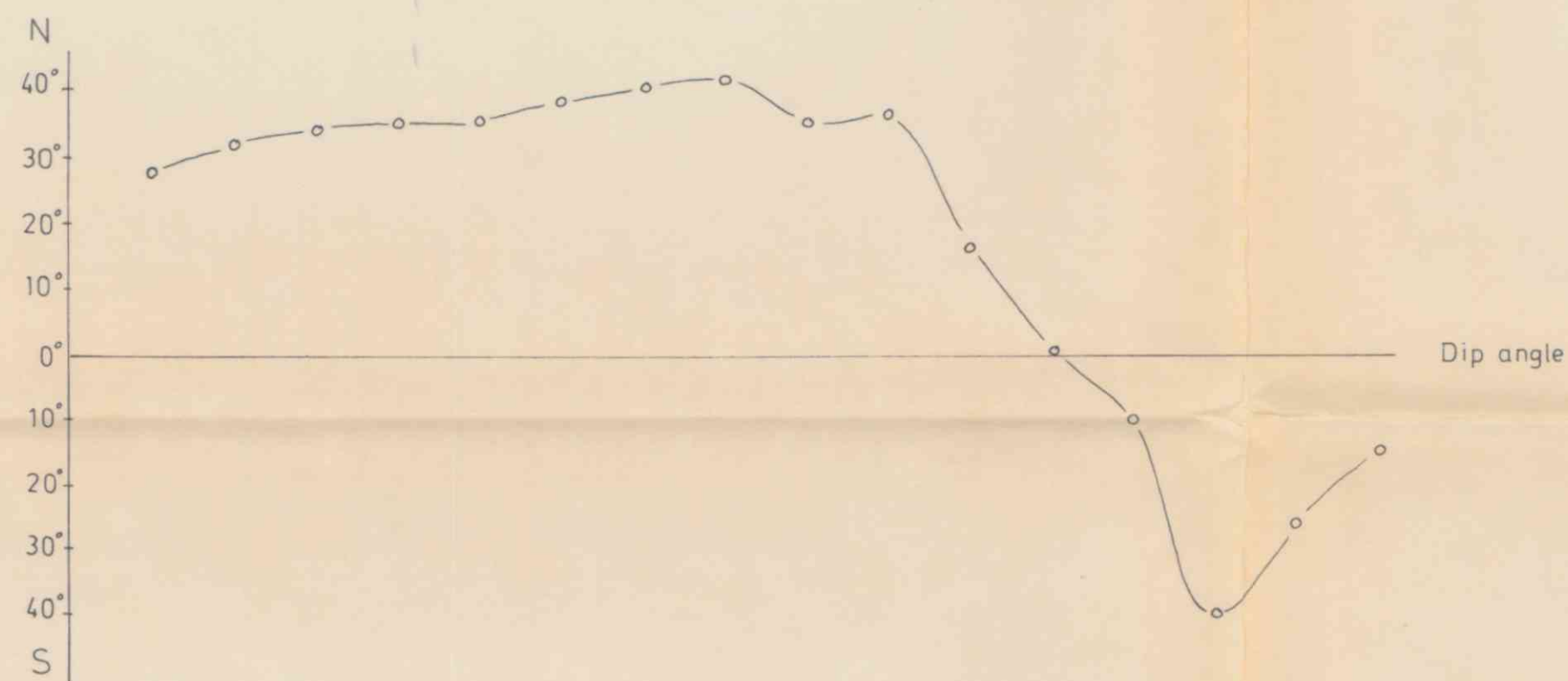
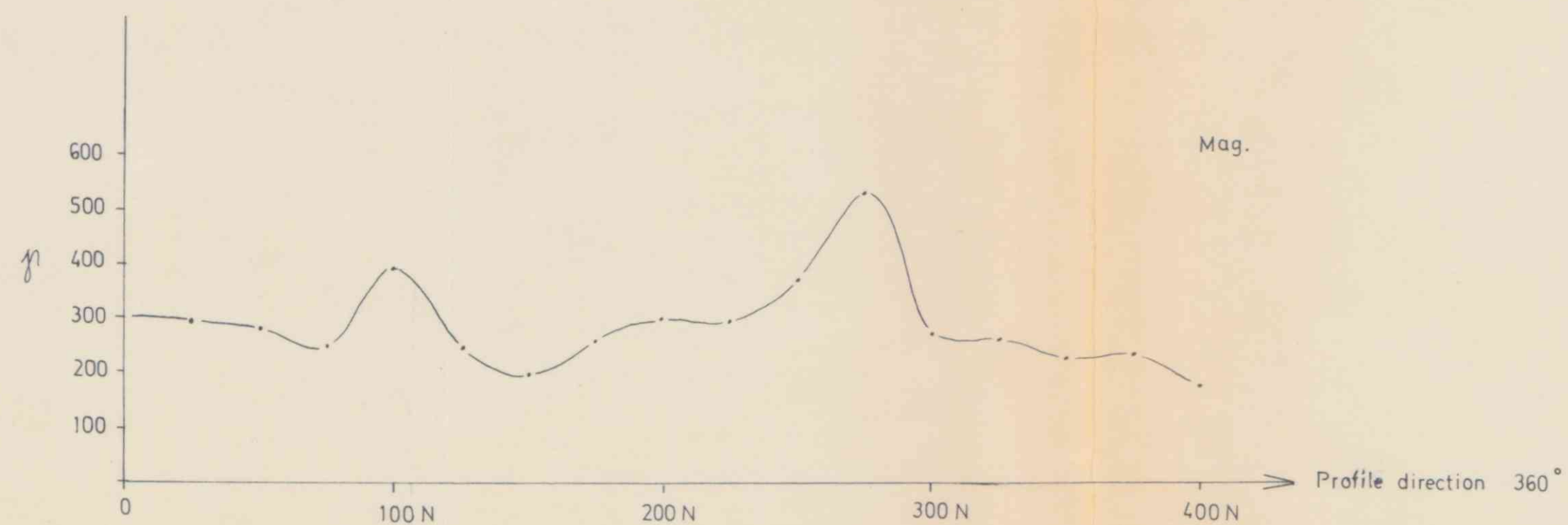
Target 60/5.2
Magnetic anomalies

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	CHK. JBG	6-73

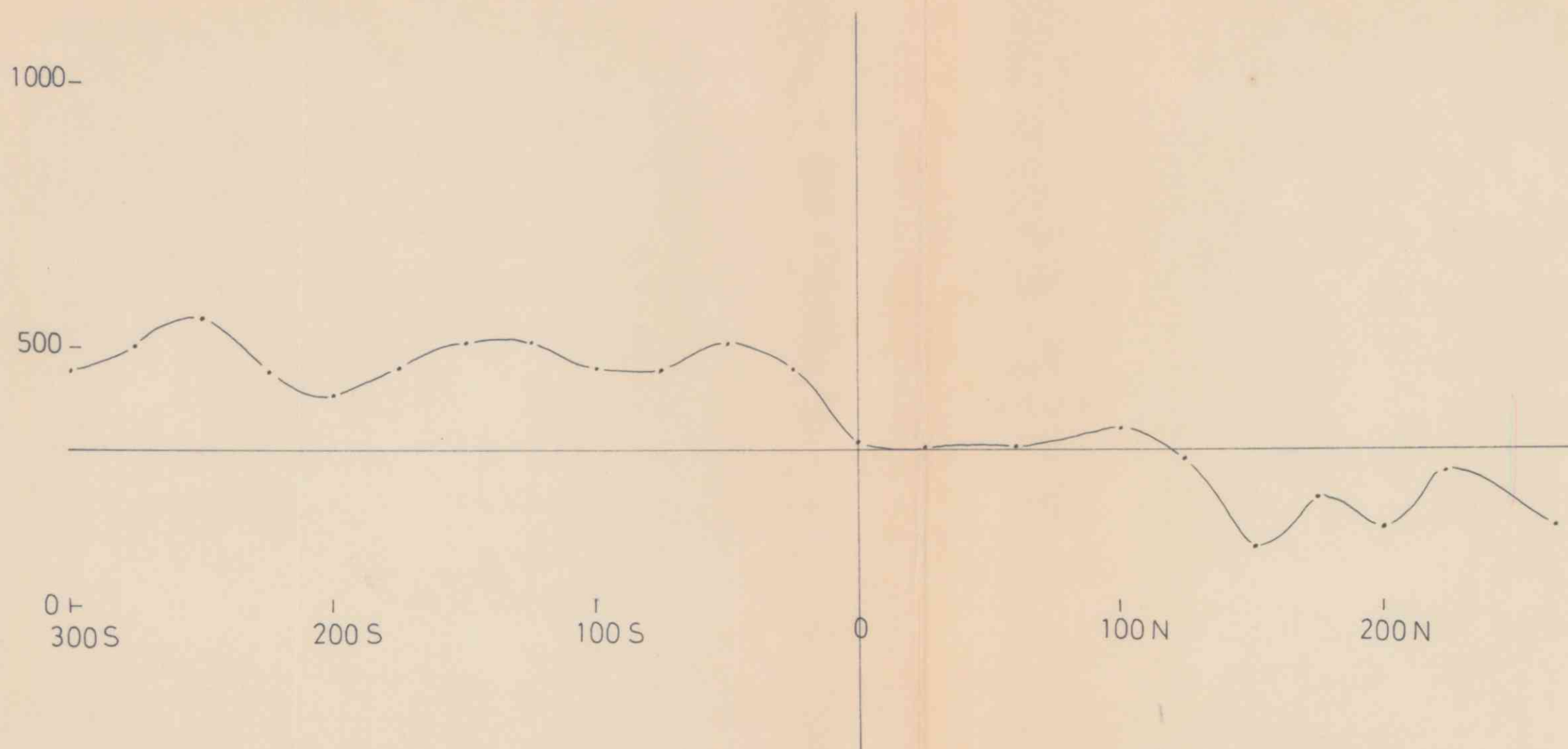
1/8 SULFIDMALM

MAP NO.
9-253-73-23

MAP SHEET



Target 59/2.7 Magnetic and VLF anomalies	SCALE	OBS. F _i H	6-73
		DRAW. F _i H	6-73
		TRAC. BL	6-73
		CHK. JBG	6-73
7-253-73-23	MAP NO.		
	MAP SHEET		



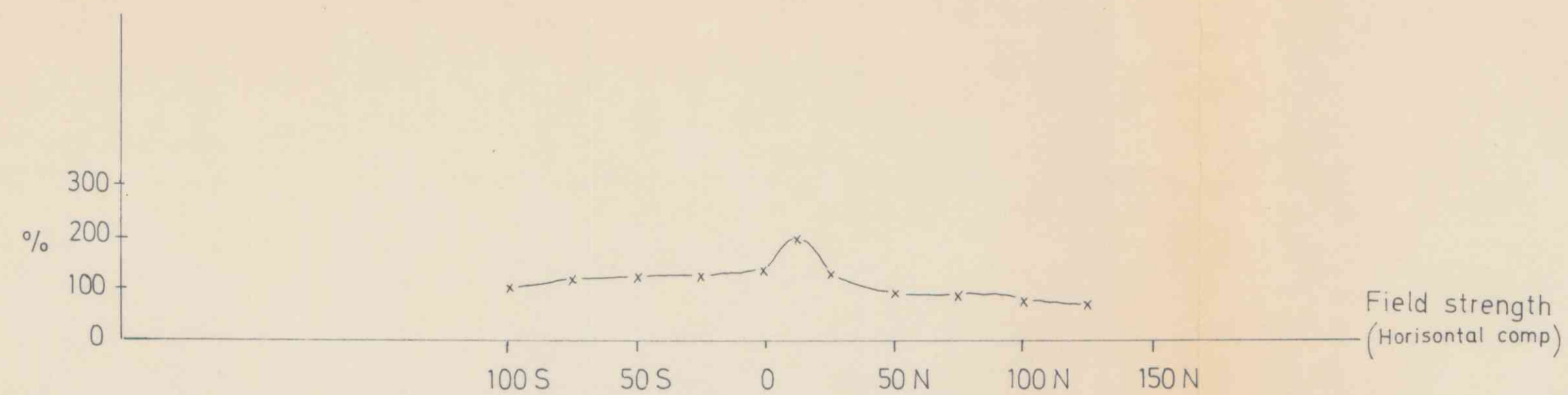
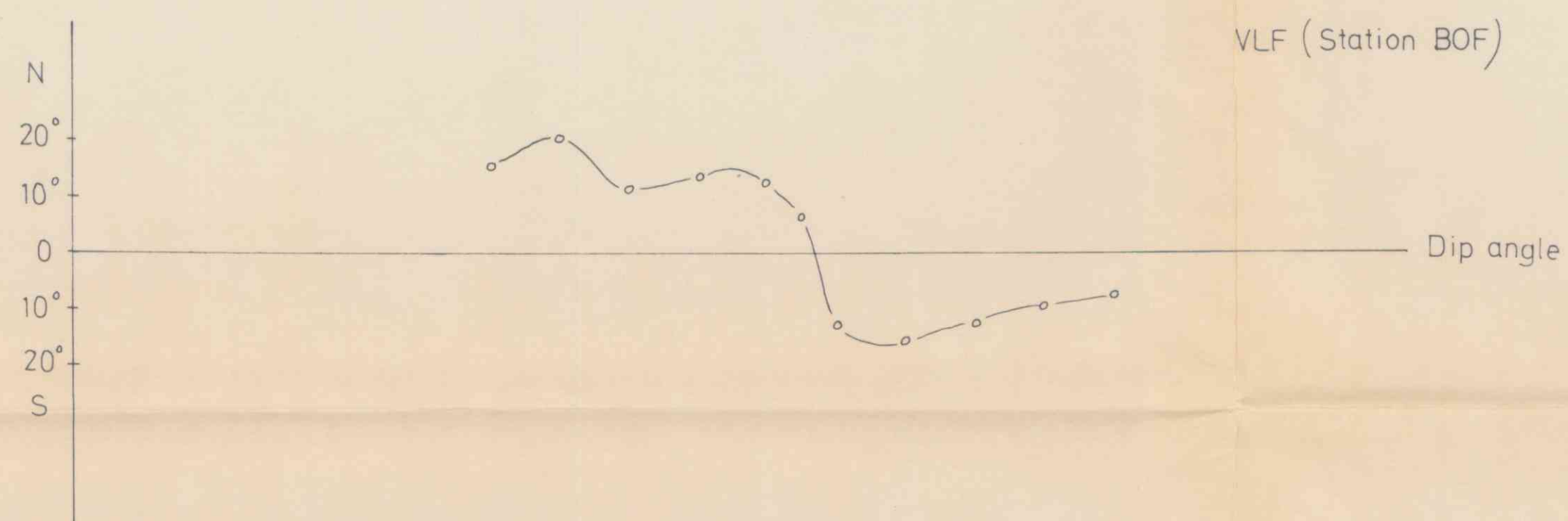
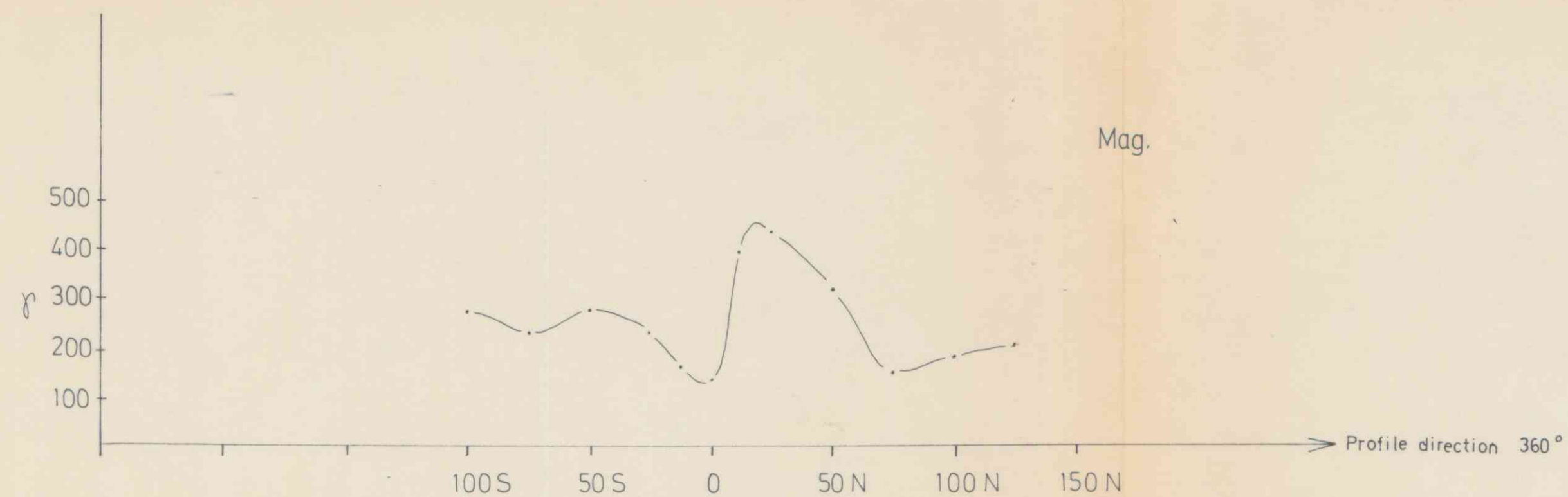
Target 59/2.7
Magnetic anomalies

SCALE 1:2000	OBS. FiH	6-73
	DRAW. FiH	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

1/8 SULFIDMALM

MAP NO.
6-253-73-23

MAP SHEET



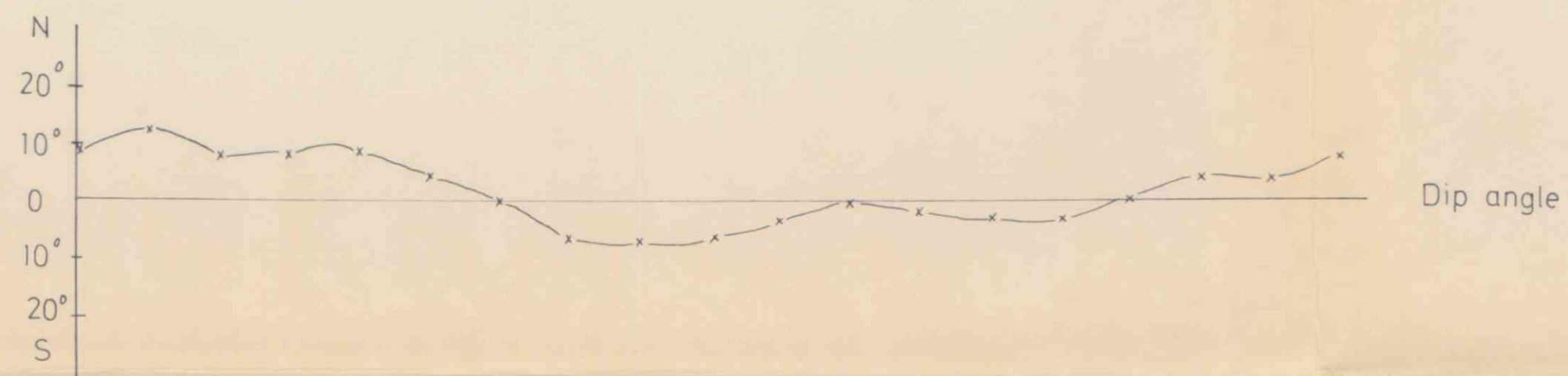
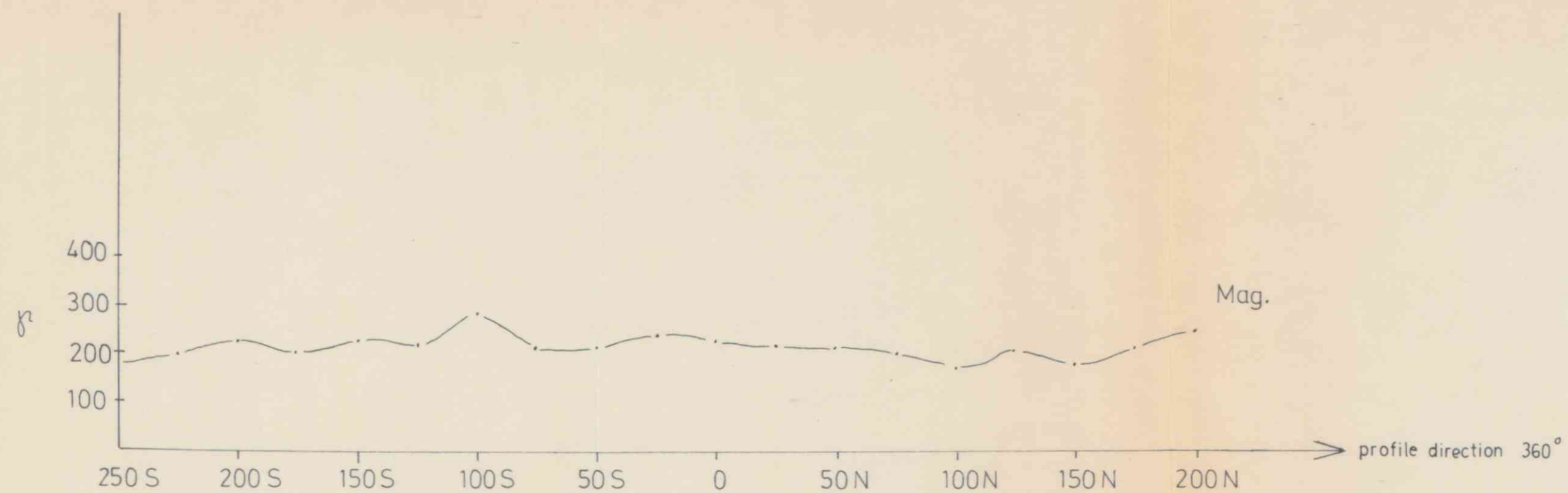
Target 59/2.1
Magnetic and VLF anomalies on
profile 150m east of fixed point.

SCALE 1:2000	OBS. FiH	6-73
	DRAW. FiH	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

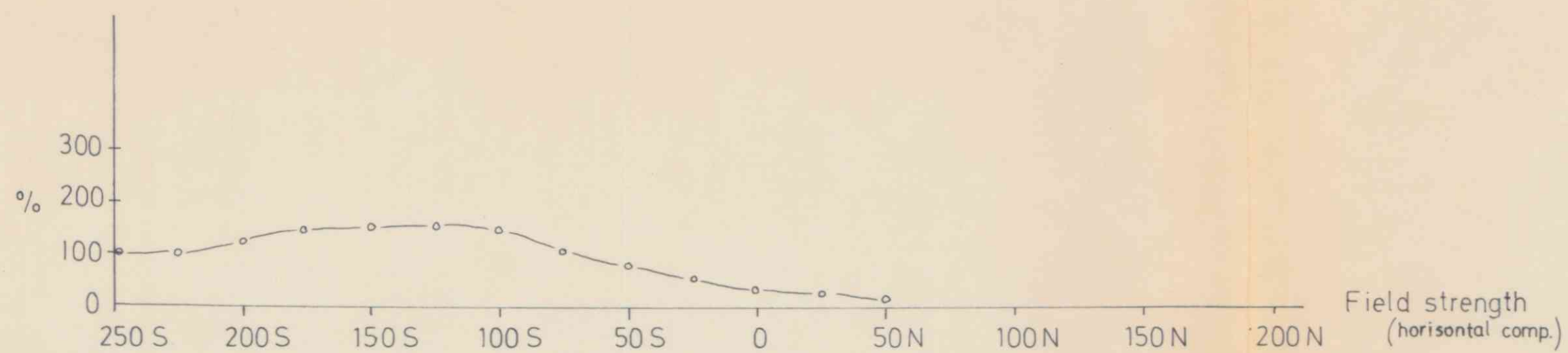
½ SULFIDMALM

MAP NO.
5 - 253 - 73 - 23

MAP SHEET



VLF (Station BOF)



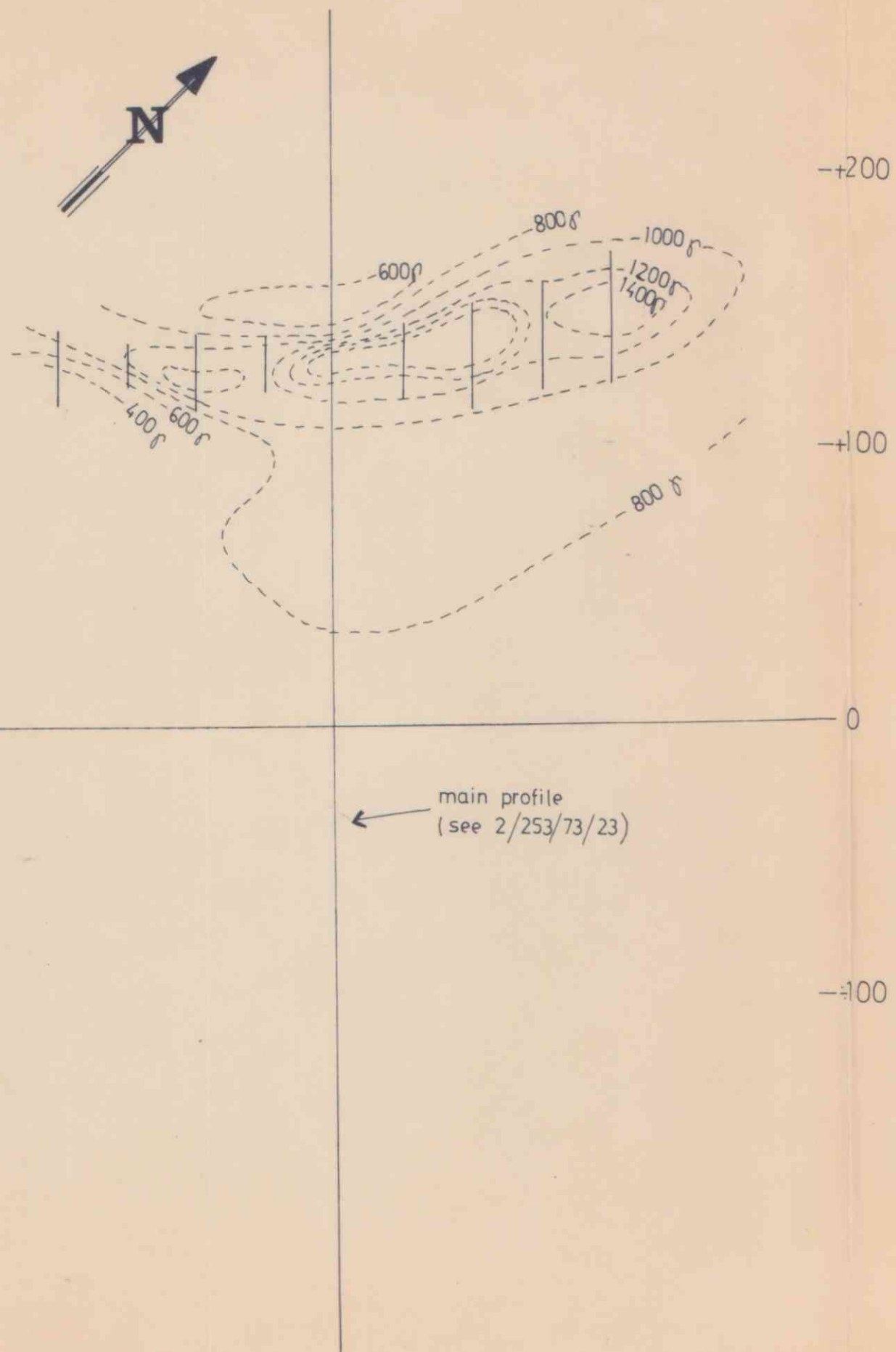
Target 59/2.1
Magnetic and VLF anomalies

SCALE 1:2000	OBS. F.H.	6-73
	DRAW. F.H.	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

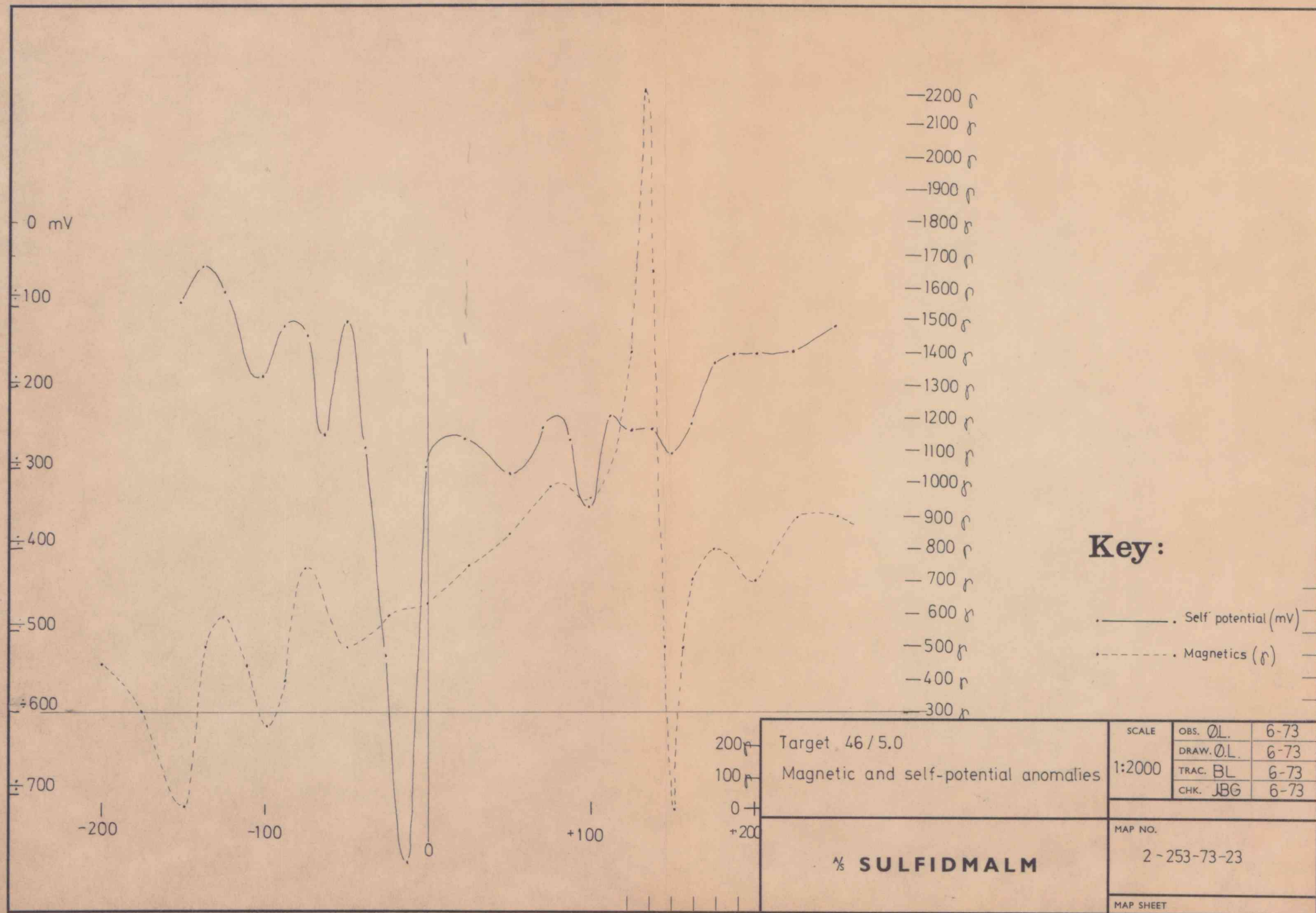
1/8 SULFIDMALM

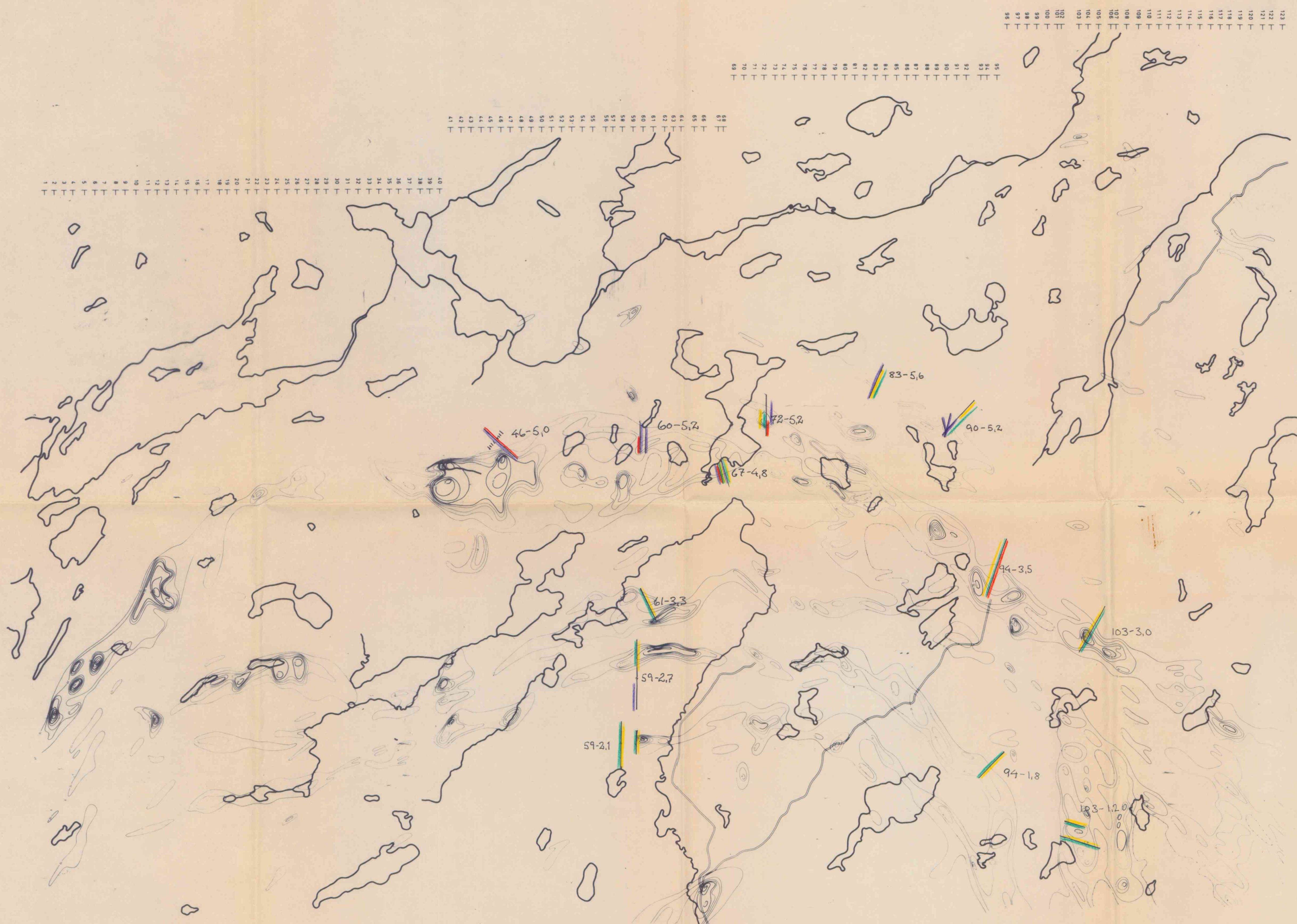
MAP NO.
4/253/73/23

MAP SHEET



Target 46/5.0 Additional magnetic measurements.	SCALE 1:2000	OBS. ØL	6-73
		DRAW. ØL	6-73
		TRAC. BL	6-73
		CHK. JBG	6-73
1/5 SULFIDMALM	MAP NO.		3/253/73/23
	MAP SHEET		

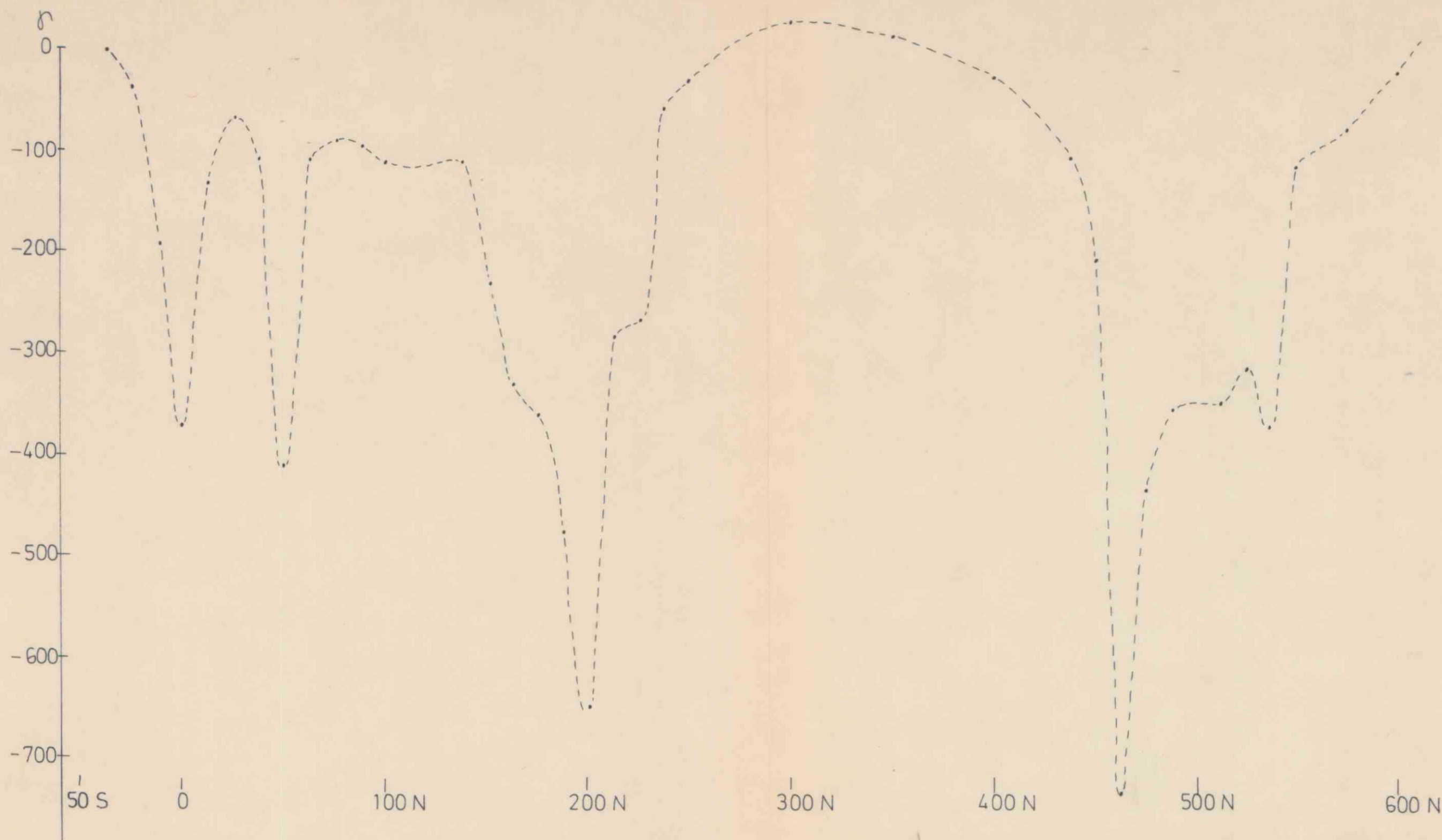




COVERED BY:

- NGU MINIMAG } A/S Sydvaranger
- SP } A/S Sulfidmalm
- Fluxgate mag. }
- RADEM VLF }

PASVIK, FINNMARK Terratest survey, EM-imaginary comp. Showing location of ground recovery profiles	SCALE 1:20 000	OBS. TERRATEST	1969
		DRAW. FCH	1973
		TRAC. BL	1973
		CHK. JBG	1973
% SULFIDMALM	MAP NO. 1-253-73-23		
	MAP SHEET		



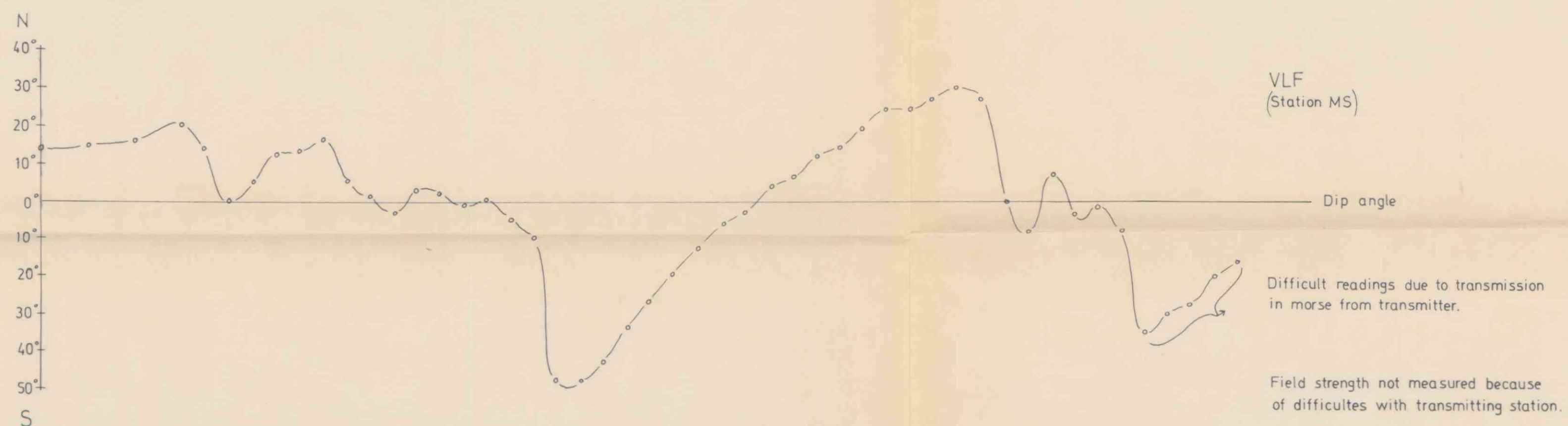
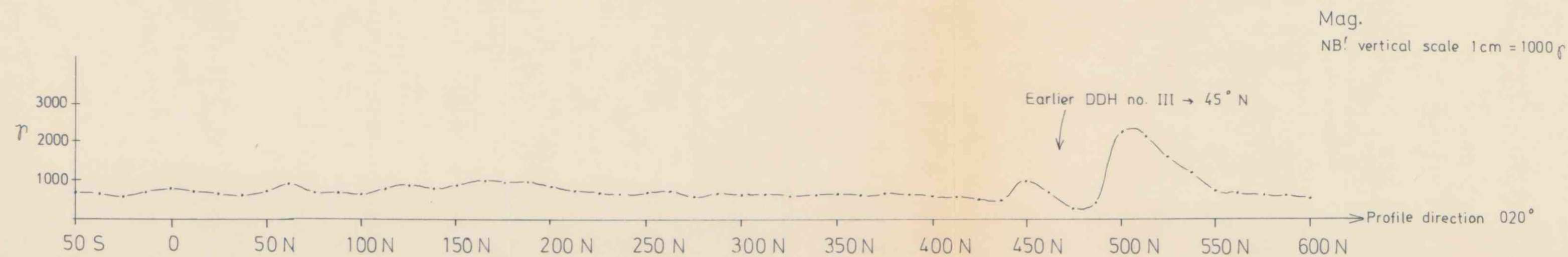
Target 94/3.5
SP anomalies

SCALE 1:2000	OBS. ØL	6-73
	DRAW. ØL	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

1/5 **SULFIDMALM**

MAP NO.
24-253-73-23

MAP SHEET



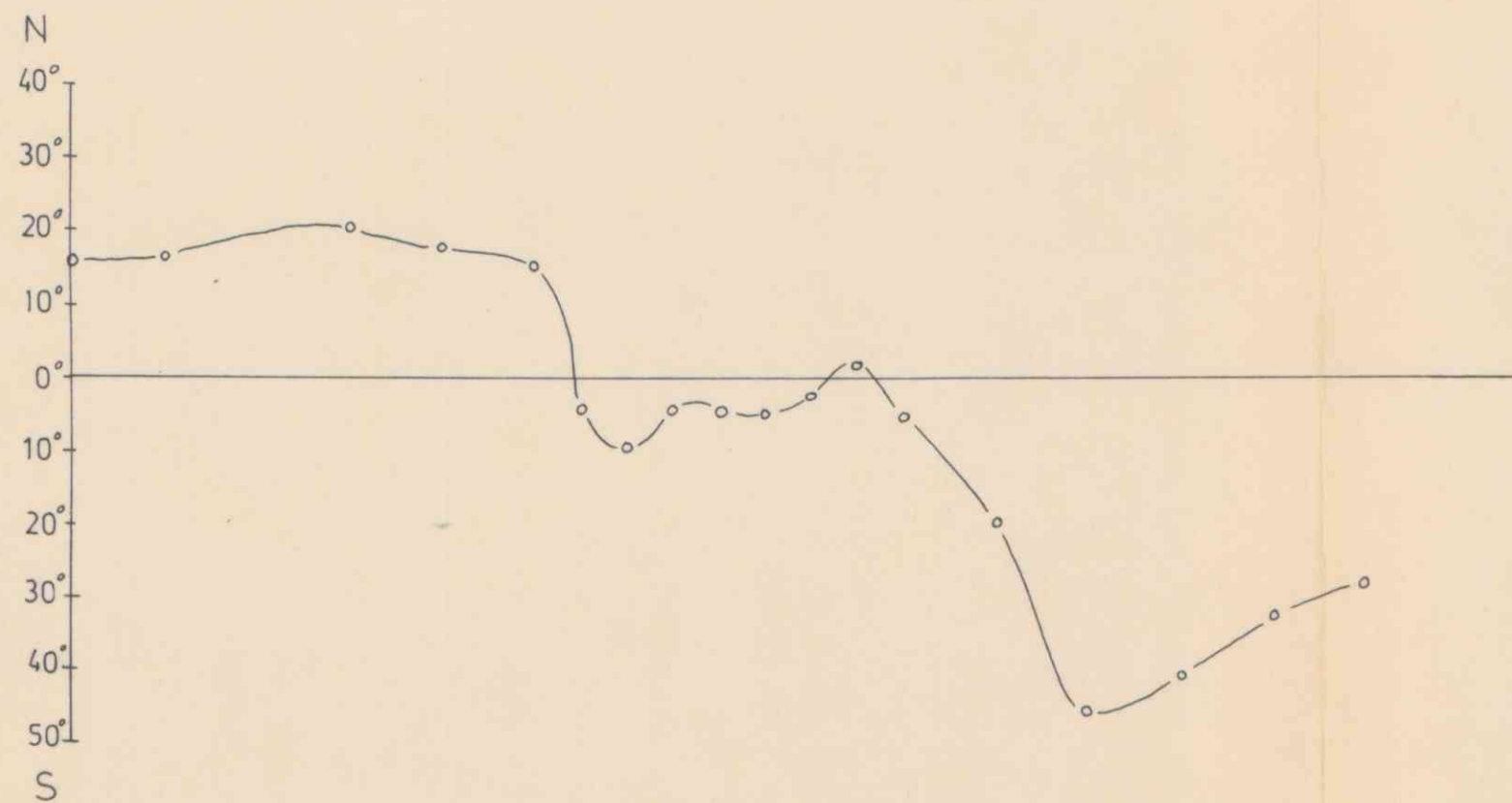
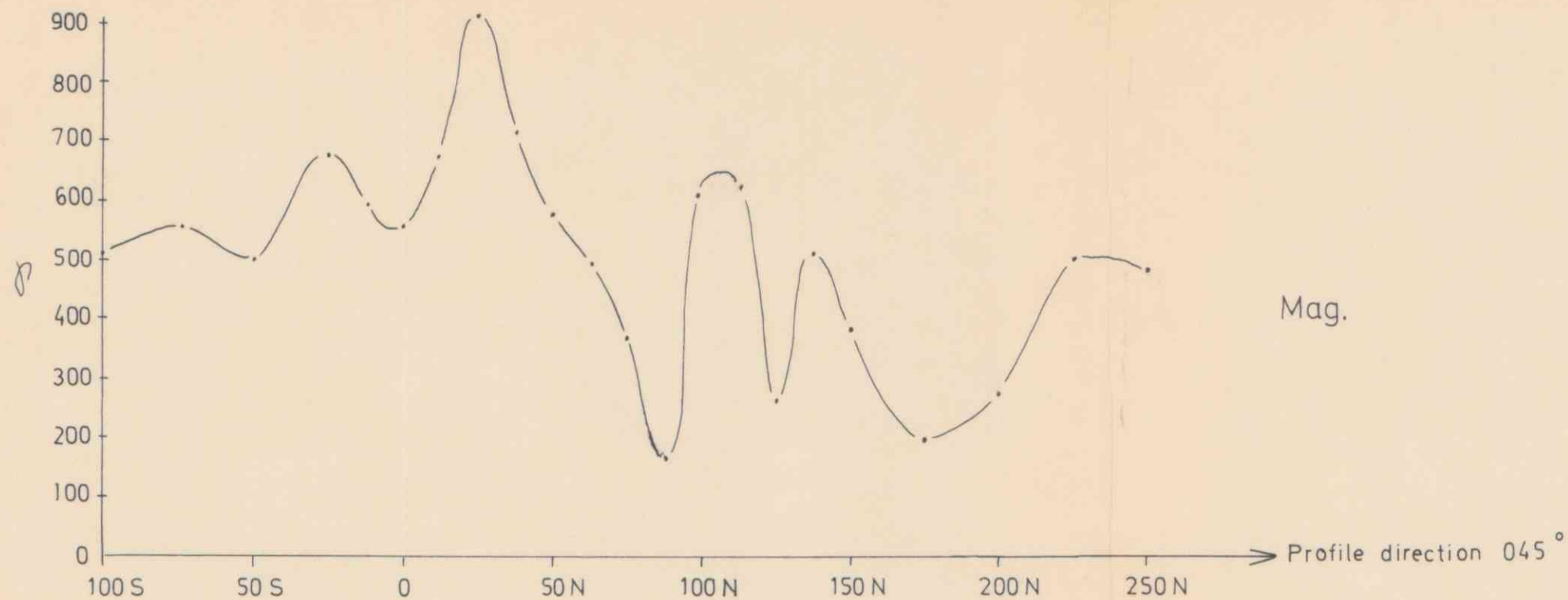
Target 94/3.5
Magnetic and VLF-EM anomalies

SCALE 1:2000	OBS. F&H	6-73
	DRAW. F&H	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

1/2 SULFIDMALM

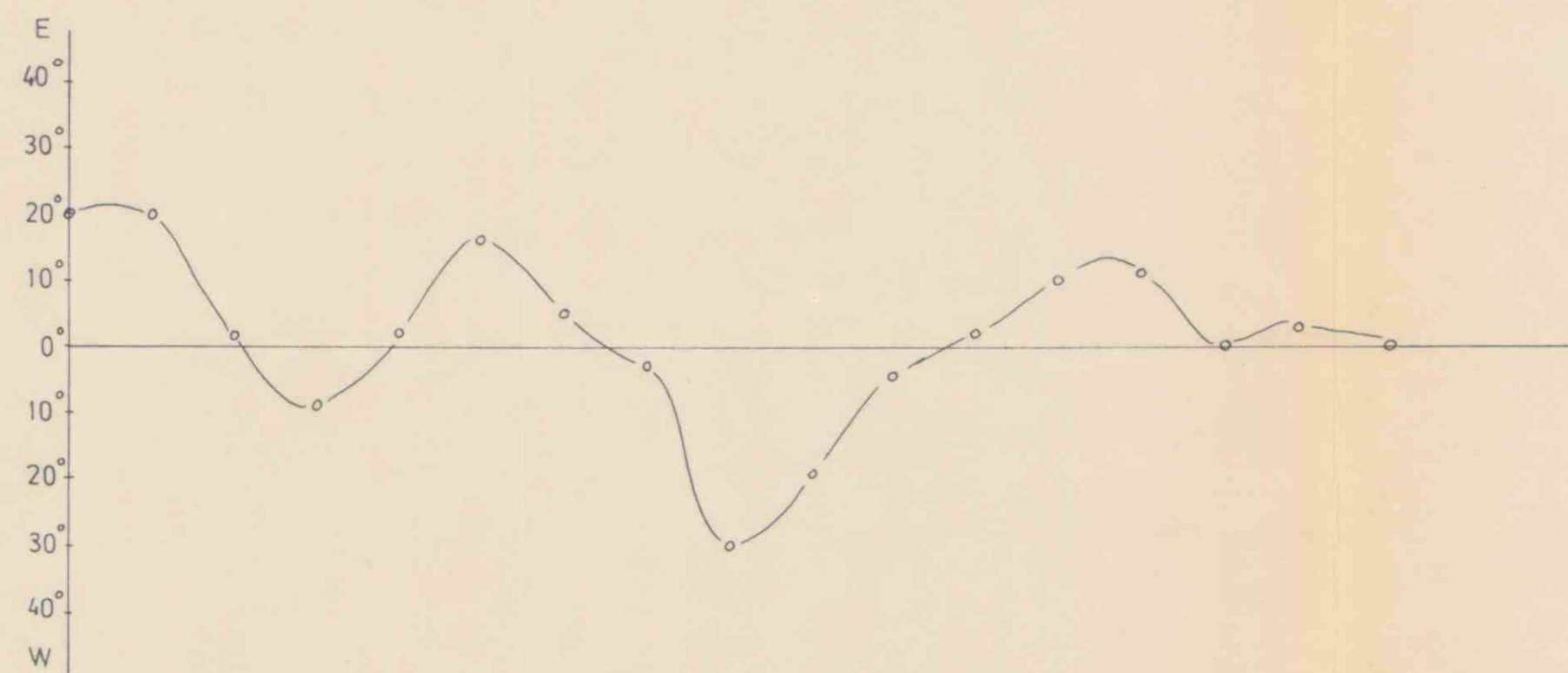
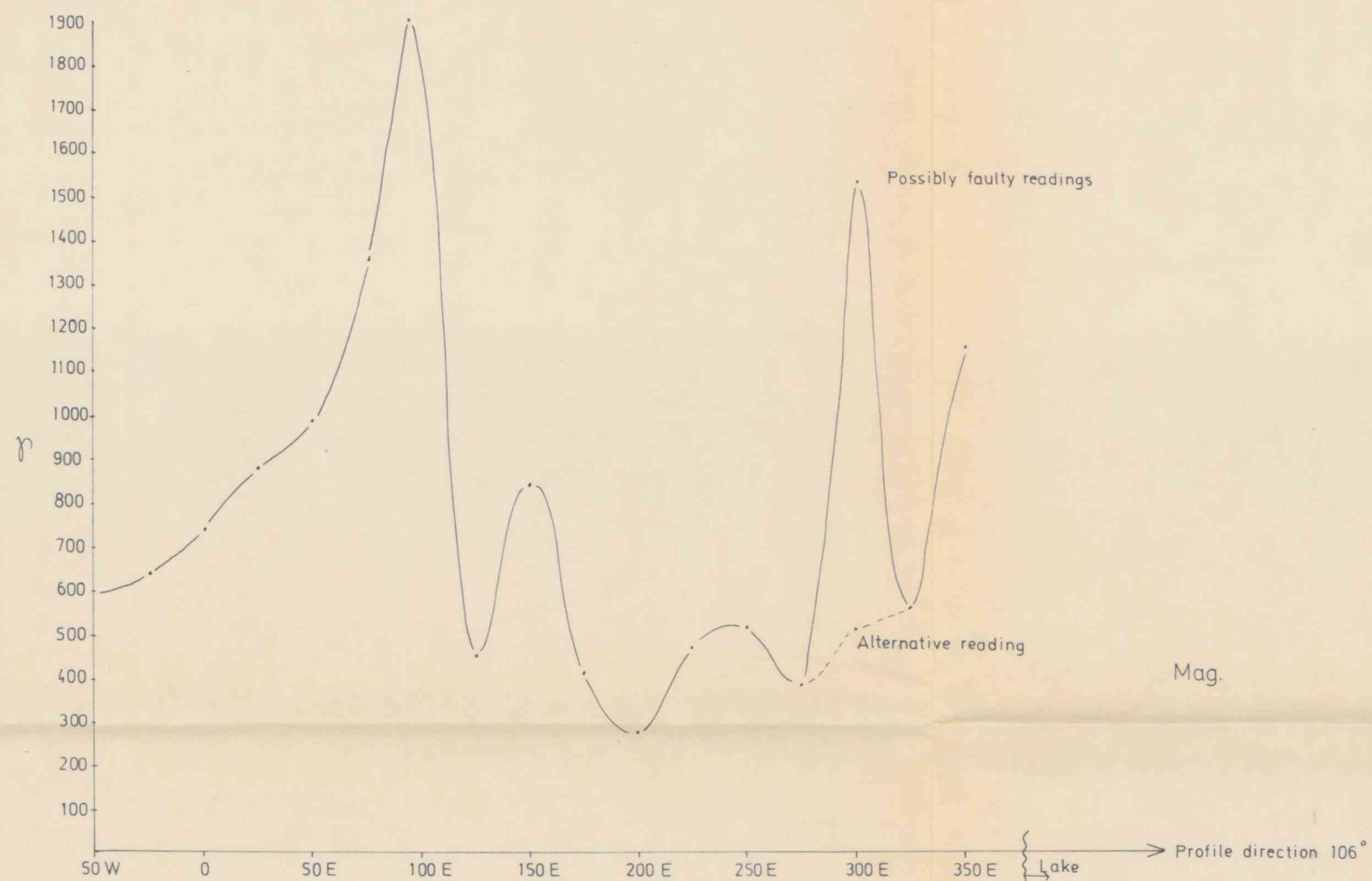
MAP NO.
25-253-73-23

MAP SHEET



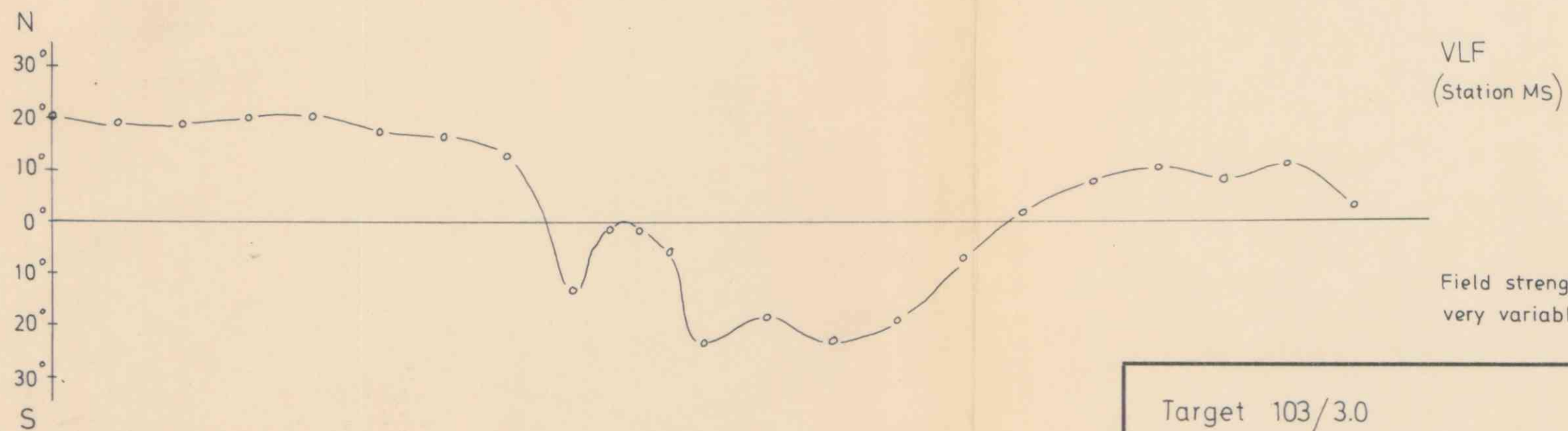
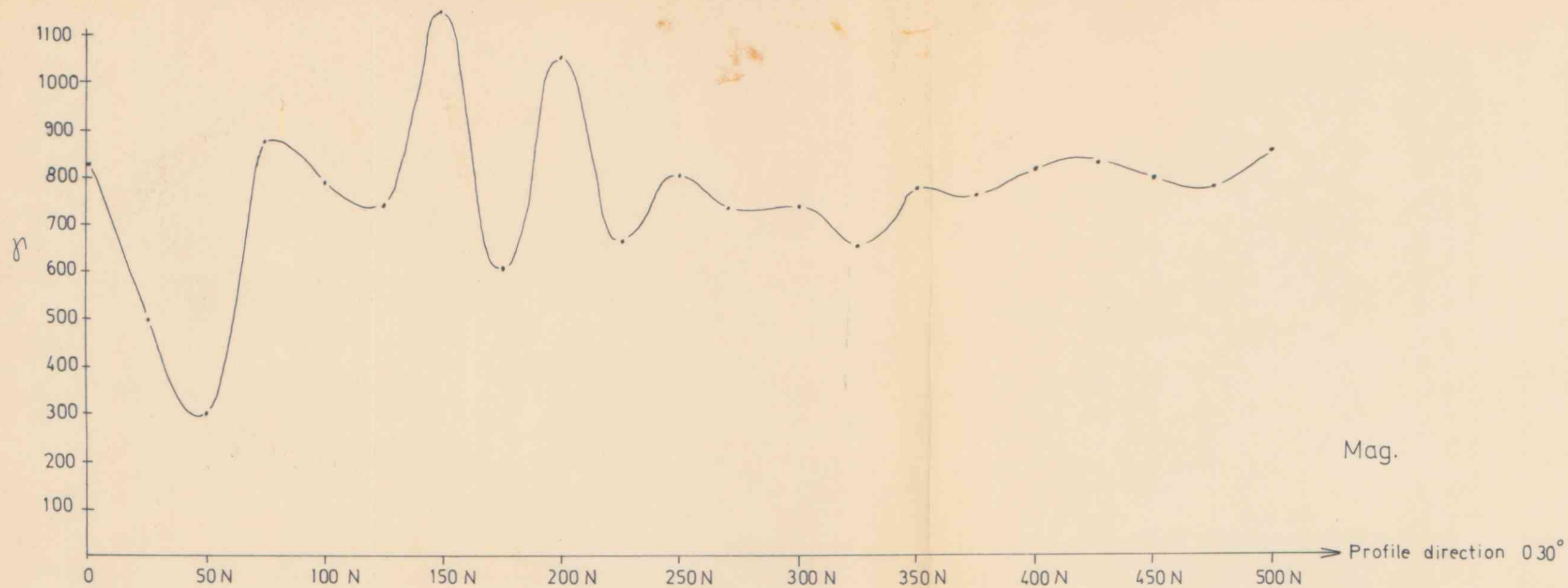
Field strength not measured because
of very variable signal from transmitter

Target 94/1.8 Magnetic and VLF anomalies	SCALE 1:2000	OBS. FiH	6-73
		DRAW. FiH	6-73
		TRAC. BL	6-73
		CHK. JBG	6-73
1/2 SULFIDMALM	MAP NO. 26-253-73-23		
	MAP SHEET		



Field strength data not
measured because of
variable signal from trans-
mitter.

Target 103/1.2 Magnetic and VLF-EM anomalies	SCALE 1:2000	OBS. FcH	6-73
		DRAW. FcH	6-73
		TRAC. BL	6-73
		CHK. JBG	6-73
1/2 SULFIDMALM	MAP NO.		
	27 - 253-73-23		
	MAP SHEET		



Target 103/3.0
Magnetic and VLF-EM anomalies

1/5 **SULFIDMALM**

SCALE 1:2000	OBS. F _i H	6-73
	DRAW. F _i H	6-73
	TRAC. BL	6-73
	CHK. JBG	6-73

MAP NO.
28-253-73-23

MAP SHEET