



Bergvesenet

Postboks 3021, 7002 Trondheim

Rapportarkivet

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Kommer fra ..arkiv Falconbridge	Ekstern rapport nr Sul 403-76-20	Oversendt fra Sulfidmalm A/S	Fortrolig pga	Fortrolig fra dato:
Tittel Note on VLF/EM and magnetic survey, Vakkerlien area, Kvikne.				
Forfatter F Nixon, R Sivertsen, F Hansen, L Nessvoll		Dato mai 1976	Bedrift Sulfidmalm A/S	
Kommune Tynset	Fylke Hedmark	Bergdistrikt Østlandske	1: 50 000 kartblad 16203	1: 250 000 kartblad Røros
Fagområde Geofysikk	Dokument type Rapport	Forekomster Vakkerlien		
Råstofftype Malm/metall	Emneord Cu Ni			
Sammendrag Meget voluminøs rapport fra de vintergeofysiske målingene vårvinteren 1976				

A/S SULFIDMALM
INTER-OFFICE MEMORANDUM

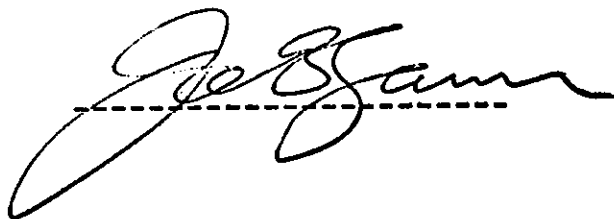
Date: 23rd February, 1977
To: W. D. Harrison
cc: H. T. Berry, R. Jahnsen, E. Wigstøl, F. Nixon
R. Sivertsen
From: J. B. Gammon
Subject:

Report No. 403/76/20 - winter geophysics at Vakkerlien.

(Sent under separate cover)

Please find enclosed a report summarising the geophysical work carried out in the Vakkerlien area during the spring of 1976. Interesting anomalies resulting from this work were detailed during the summer season and will be reported on in due course.

Also included at the end of the report is a map summarising geochemical anomalies in the area north of Vakkerlien based on sampling done during the fall of 1975.

A handwritten signature in cursive script, appearing to read 'J. B. Gammon', is written over a horizontal dashed line.

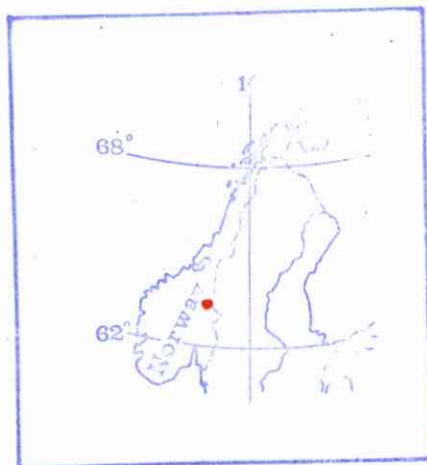
FOR FALCONBRIDGE NIKKELVERK A/S
A/S SULFIDMALM
PROJECT 905-20N

Note on VLF/EM and magnetic
survey, Vakkerlien area, Kvikne
Norway

March - May 1976

by

F. Nixon
R. Sivertsen
F. Hansen
L. Nessvoll



Report No. 403/76/20

INTRODUCTION

During the month of March - May 1976 a total of 163 profile kilometers were chained and measured with VLF, in a grid extended out from the Vakkerlien grid of 1975 and covering interesting geochemical anomalies. The enclosures show the location of the grid.

The VLF measurements were carried out using two instruments of Norwegian manufacture - Paulsen VLF-EM. (It should be noted that at the base line on several lines there is a small discrepancy in values due to a non linear built in calibration difference between instruments).

A limited number of the VLF anomalies obtained were measured with a GEOMETRICS G816 proton magnetometer.

RESULTS

The obtained results are shown in map form on the enclosures.

In general the area measured was geophysically flat, however, several anomalies having a favourable trend i.e parallel to regional lineation were obtained, of these perhaps the most significant is the apparent continuation of the main Vakkerlien anomaly down to 2200S.

This anomaly is also partly co-incident with a magnetic anomaly.

Other anomalies are shown on the summary map. The most interesting of these being located near the west side of Stor-Innsjø approximately 2 km west of the main Vakkerlien zone, also having a coincident mag. anomaly.

Only a few VLF anomalies have been tested with proton magnetometer due to a malfunction in the electronics with our newly purchased proton magnetometer. However, the remaining anomalies will be tested during the summer season.

GEOLOGICAL MAP OF THE TRONDHEIM REGION

GEOLOGISK KART OVER TRONDHEIMSFELTET

1:

COMPILED BY FR. CHR. WOLFF AFTER:
SAMMENTEGNET AV FR. CHR. WOLFF ETTER:

T. BIRKELAND, C.W. CARSTENS, H. CARSTENS, J. CHALOUPEVSKY, G. GRAMMELTVEDT, F. FEDIUK,
M. FIŠERA, S. FOSLIE, J. FÆRDEEN, A. HAUGEN, H. HEIM, P. HOLMSEN, H.J. KISCH, GHR. OFTEDAHL,
J. PEACEY, Z. PELC, D. ROBERTS, I.J. RUI, G. SCHAAR, A. SIEDLECKA, S. SIEDLECKI,
T. STRAND, TH. VOGT, FR. CHR. WOLFF.

LEGEND TEGNFORKLARING

RÖRAGEN BEDS (DEVONIAN)
RÖRAGENFELTET (DEVON)

CONGLOMERATE AND SHALE
KONGLOMERAT OG SKIFER

SLAGÅN GROUP - HORG GROUP (SILURIAN)
SLAGÅNGRUPPEN - HORGGRUPPEN (SILUR)

DARK SHALE AND SANDSTONE
MØRK SKIFER OG SANDSTEIN

KJØLHAUGEN GROUP - RÖRÖS GROUP - UPPER HOVIN GROUP (UPPER ORDOVICIAN)
KJØLHAUGENGRUPPEN - RÖRÖSGRUPPEN - ØYRE HOVINGRUPPEN (ØYRE ORDOVICIUM)

PHYLLITE, METAGRAWACKES, WITH INCREASING AMOUNTS OF BIOTITE,
HORNBLEND AND GARNET TOWARDS THE SOUTHEAST; PARTLY CONGLOMERATIC
FYLLITT, METAGRAVAKKER MED ØKENDE MENGDER AV BIOTITT,
HORNBLENDE OG GRANAT MOT SYDØST, DELVIS KONGLOMERATISK

POLYGENOUS CONGLOMERATE
POLYMILT KONGLOMERAT

SULAMO GROUP - LOWER HOVIN GROUP (MIDDLE ORDOVICIAN)
SULAMOGRUPPEN - ØYRE HOVINGRUPPEN (MIDTRE ORDOVICIUM)

DARK SHALE AND RHYOLITE TUFF IN WEST, GREENSTONE IN EAST
MØRK SKIFER OG RHYOLITT TUFF I VEST, GRØNNSTEIN I ØST

GREY CALCAREOUS SANDSTONE AND GREY TO DARK PHYLLITE
GRÅ KALKHOLDIG SANDSTEIN OG GRÅ TIL MØRK FYLLITT

HÖLONDA, TROMSDALEN, BRENNÅ AND SIMILAR LIMESTONES
HÖLONDA, TROMSDALEN, BRENNÅ OG LIGNENDE KALKSTEINER

VENNA, STOKKVOLA, LILLE FUNDSJØ AND SIMILAR CONGLOMERATES
VENNA, STOKKVOLA, LILLE FUNDSJØ OG LIGNENDE KONGLOMERATER

FUNDSJØ GROUP - STÖREN GROUP (LOWER ORDOVICIAN)
FUNDSJØGRUPPEN - STÖRENGRUPPEN (ØYRE ORDOVICIUM)

GREENSTONES AND QUARTZKERATOPHYRES
GRØNNSTEINER OG KVARTSKERATOPHYRES

GRANODIORITIC GNEISS
GRANODIORITISK GNEISS

SONHATN GROUP - GULA SCHIST GROUP (CAMBRIAN)
SONHATNGRUPPEN - GULASKIFERGRUPPEN (KAMBRIUM)

MICA SCHISTS, OFTEN WITH GARNET
GLIMMERSKIFER, OFTE MED GRANAT

CONGLOMERATES OF THE GUDÅ CONGLOMERATE ZONE
KONGLOMERATER TILHØRENDE GUDÅKONGLOMERATSONEN

LIMESTONE
KALKSTEIN

CALEDONIAN INTRUSIVES
KÆLEDONISKE INTRUSIVER

LARGER BODIES OF TRONDHEMITE
STØRRE LEGEMER AV TRONDHEMITT

LARGER BODIES OF GABBRO
STØRRE LEGEMER AV GABBRO

NORITE
NORITT (ØYRHAUGEN)

SERPENTINITES
SERPENTINER

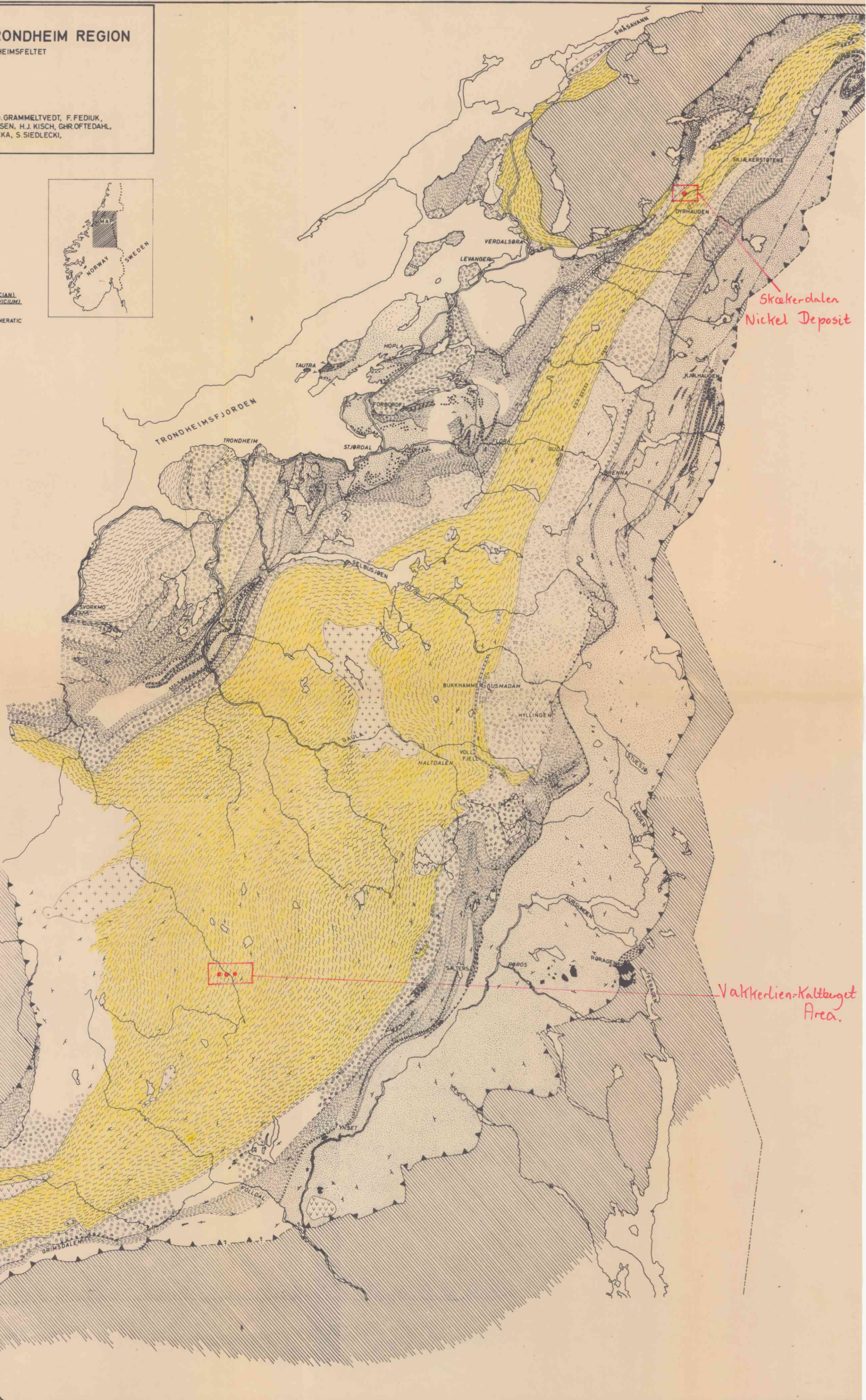
UNDIFFERENTIATED ROCKS BELOW THE TRONDHEIM NAPPE
UDIFFERENSIERTE BERGARTER UNDER TRONDHEIMSEKKET

STRIKE AND DIP
STRØK OG FALL

TRONDHEIM NAPPE THRUST PLANE
TRONDHEIMSEKKEKETS SKYVEPLAN

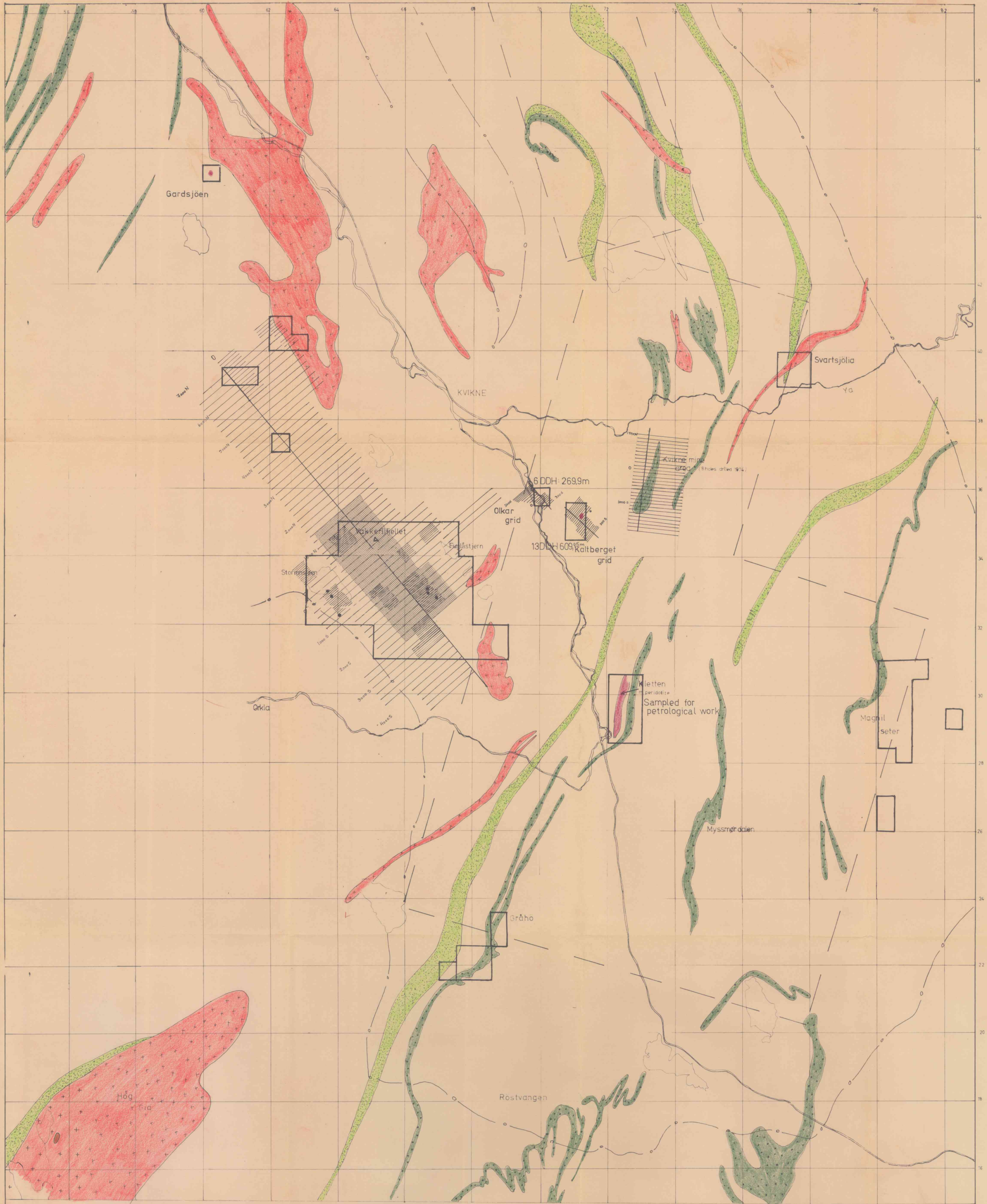
MINOR THRUST PLANES
MINDRE SKYVEPLAN

SUPPOSED THRUST PLANE
ANTATT SKYVEPLAN



Skækerdalen
Nickel Deposit

Valkerlien-Kaltbuget
Area.

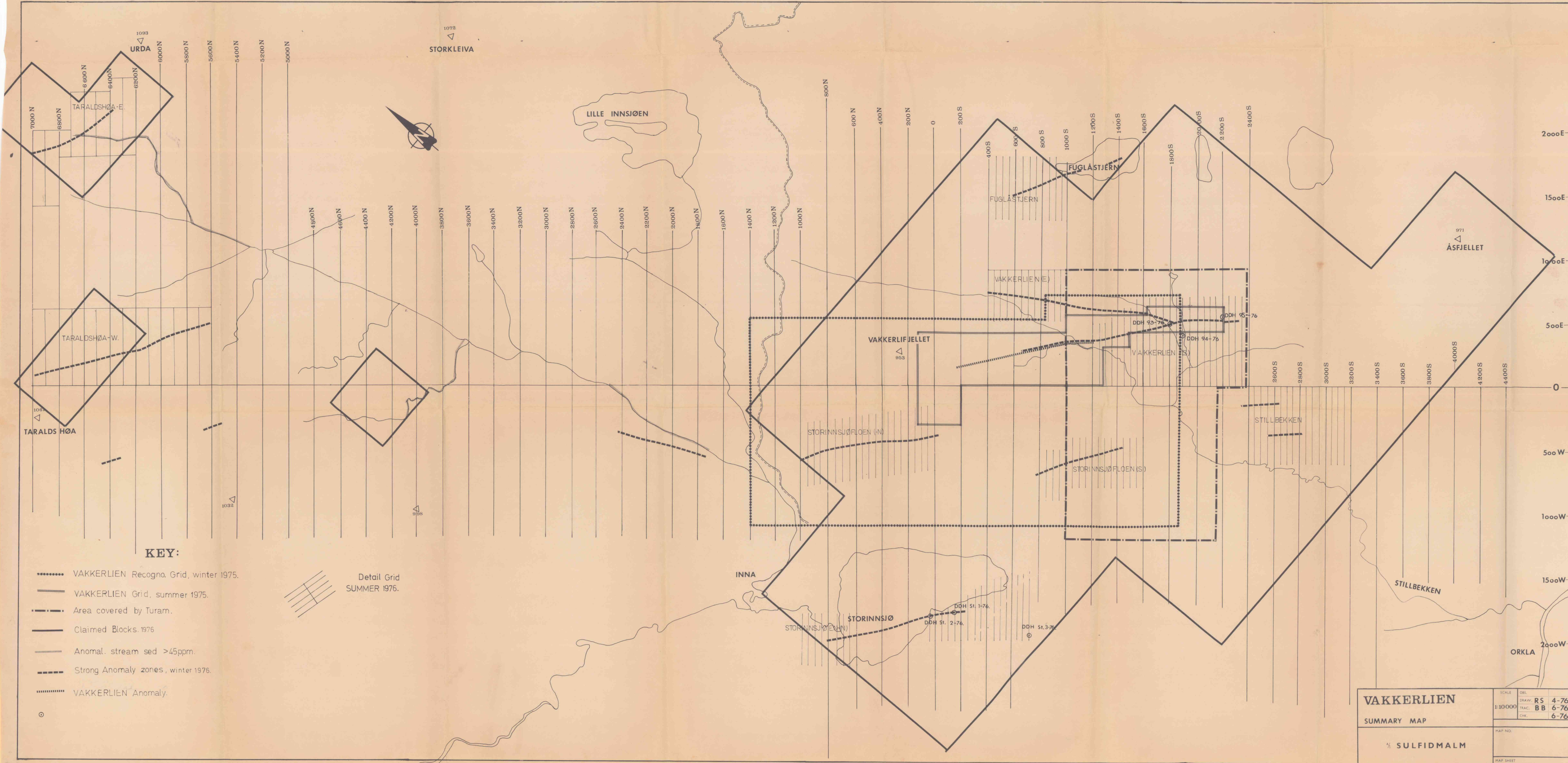


- Greenstone } STOREN GROUP
- Siltstone }
- Greenstone } GULA GROUP
- Graphite schist }
- Schist }
- Ultrabasic }
- Gabbro }
- Acid intrusives }

- Stream sed. sampled area
- Helicopter survey area
- Claim blocks
- Vakkerli grid summer 1975
- Vakkerli grid winter 1976

Detailed geophysical grid summer 1976.

KVİKNE AREA LOCATION AND SUMMARY	SCALE	OBS.	O.N.
	1:50000	DRAW.	R.S.
% SULFIDMALM	TRAC.	R.S.	
	CHK.		
MAP NO.			
MAP SHEET			



VAKKERLIEN

SUMMARY MAP

1/2 SULFIDMALM

SCALE	1:10000	DRAW.	RS	4-76
TRAC.	BB	CHK.	BB	6-76
MAP NO.				
MAP SHEET				

4200w

2600w

1400w

0

1200E

2600E

KEY MAP

7000N

5400N

3800N

2400N

1000N

0

200S

1600S

3000S

4400S

15

15

14

13

12

11

10

9

8

7

6

5

4

3

2

1

B.L.

A.S. Tettliopi, 1000, A.3, E.9 g.l. 10.71, Santrum Trykkeri.

1200 w

1000 w

800 w

600 w

400 w

200 w

0



7000 N

6800 N

6600 N

6400 N

6000 N

5800 N

5600 N

DA°

+20

+10

-10

-20

KEY:

 Real

Reading direction

NAA
Direction to Station

Inst. Paulsen

16.

A'S SULFIDMALM

VAKKERLIEN GRID

VLF-EM survey

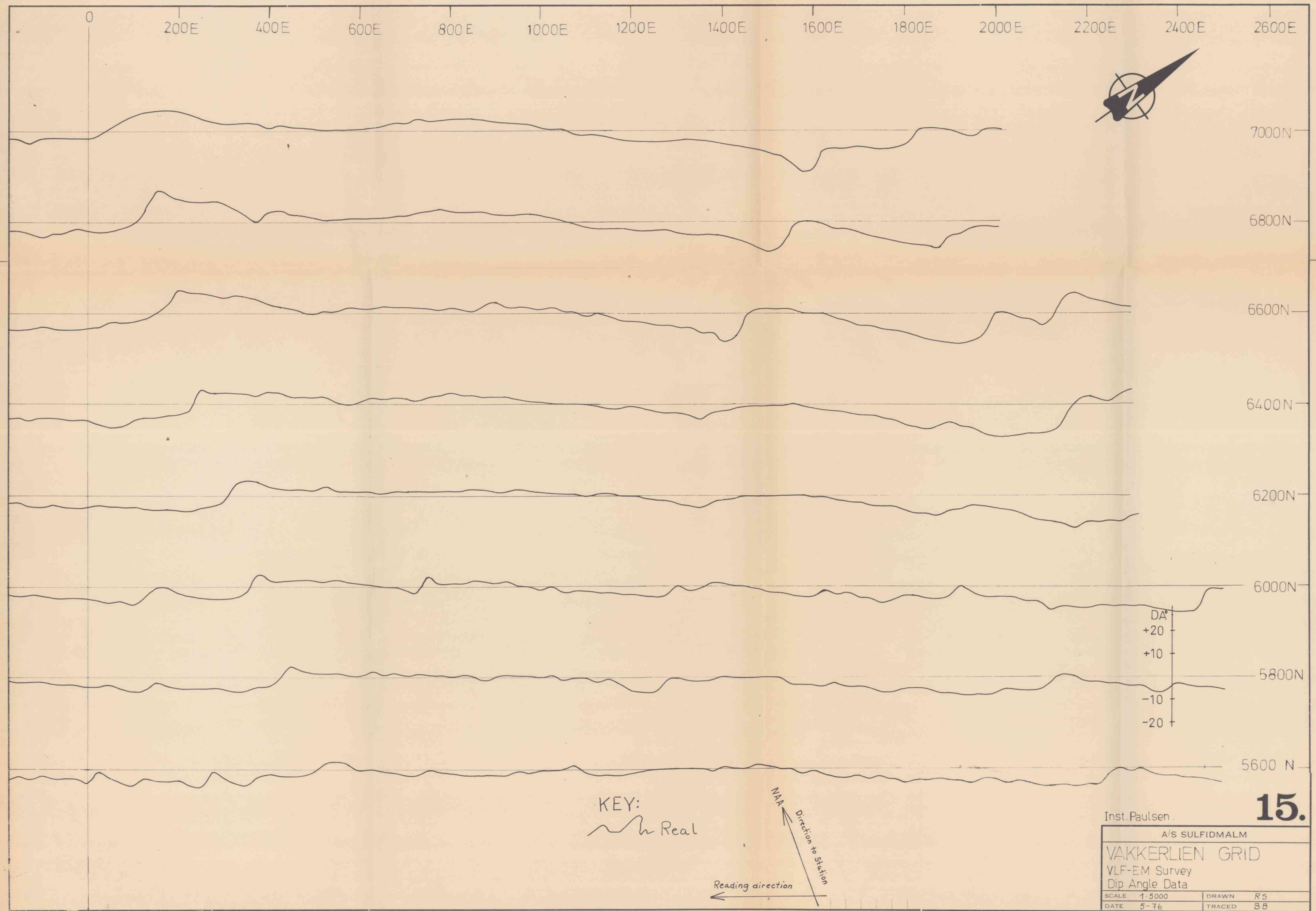
Dip Angle Data

SCALE 1:5000

DRAWN RS

DATE 5-75

TRACED BB



A/S Terrapoli, 1000, A.3, E.9 g/l, 10-71, Sønderum Trykkeri.

1200W

1000W

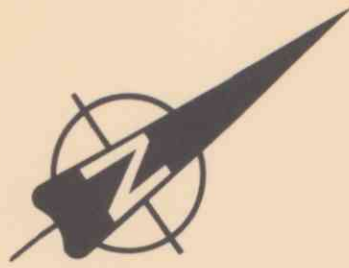
800W

600W

400W

200W

0



5400N

5200N

5000N

4800N

4600N

4400N

4200N

4000N

DA°

+20

+10

-10

-20

KEY:

 Real

NAA

Direction to station

Reading direction

Inst. Paulsen

A/S SULFIDMALM

VAKKERLIEN GRID

VLF-EM Survey

Dip Angle Data

SCALE 1:5000

DRAWN

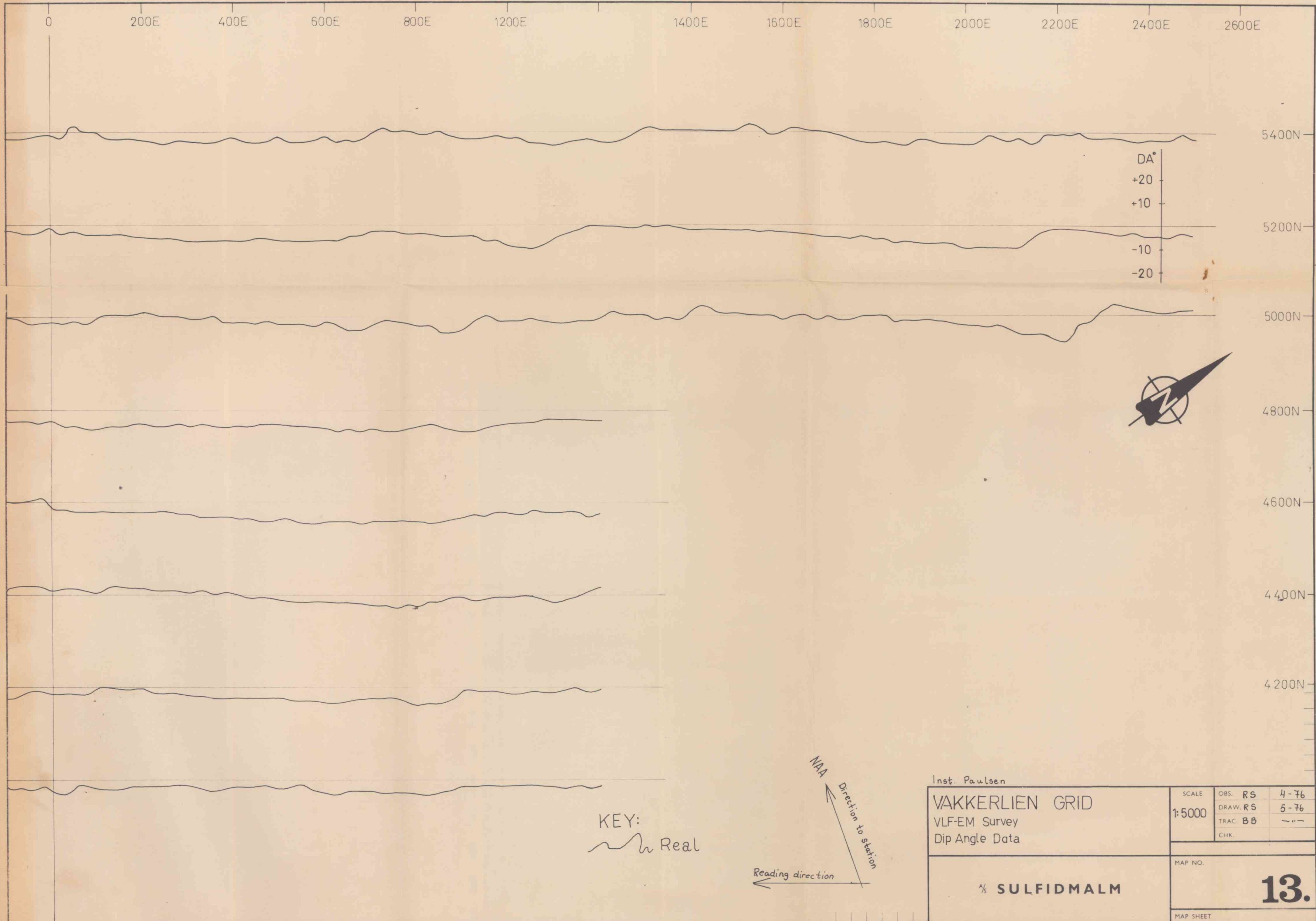
RS

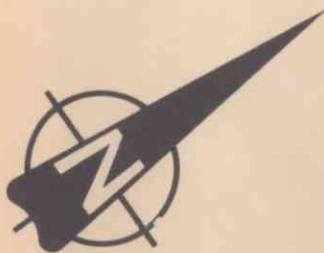
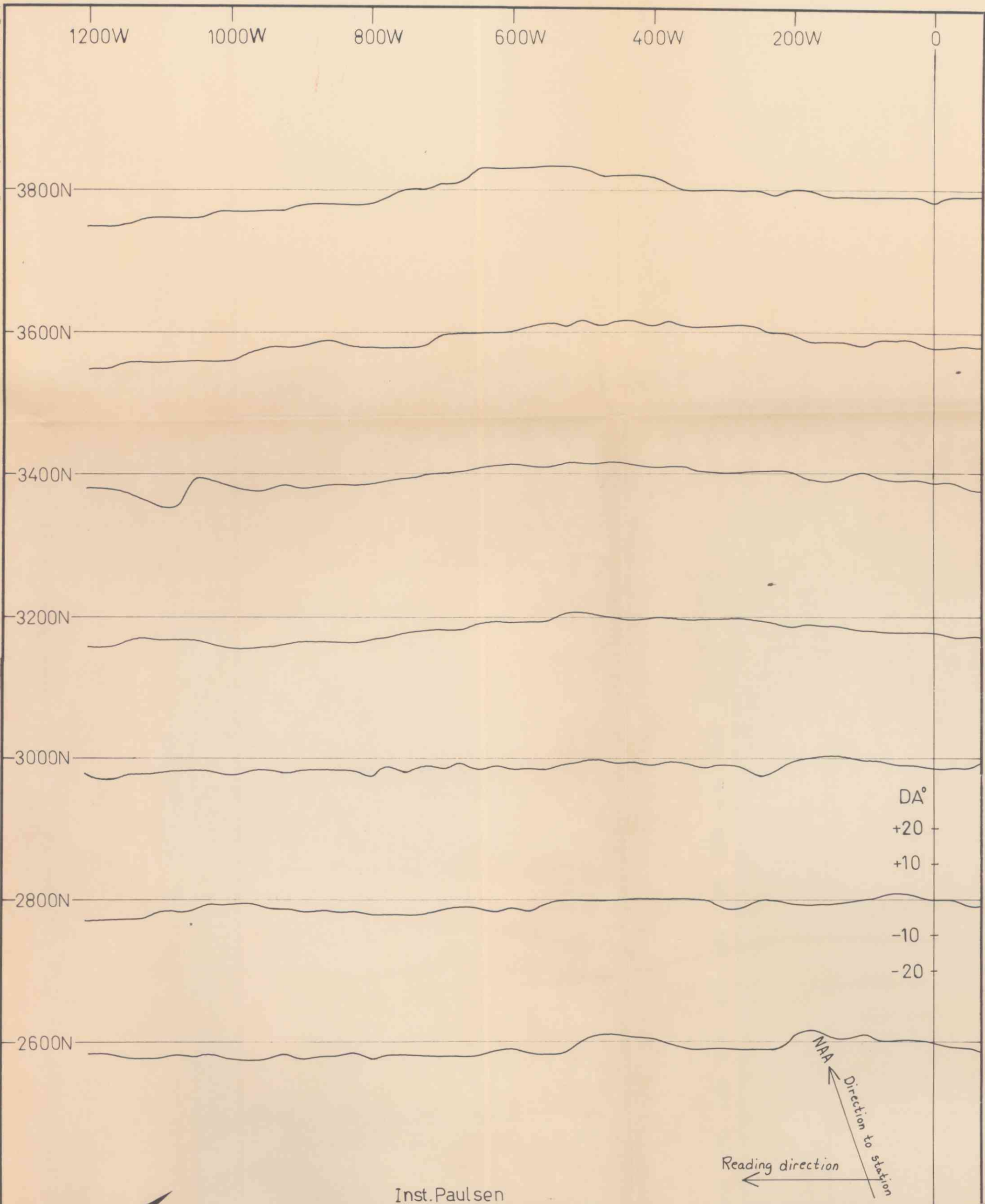
DATE 5-75

TRACED

BB

14.





KEY:
 Real

Inst. Paulsen

VAKKERLIEN GRID

VLF-EM Survey
 Dip-Angle Data

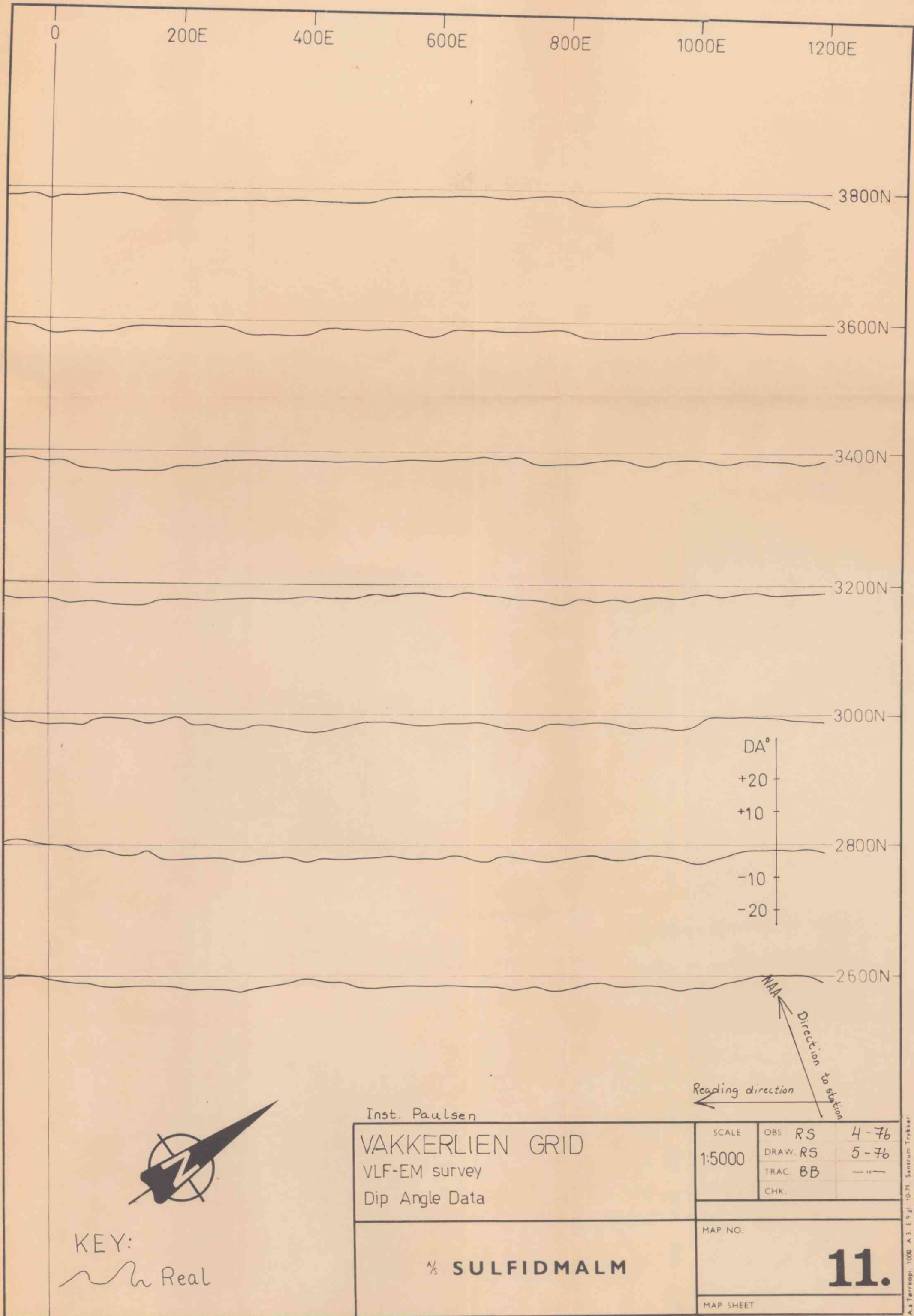
1/2 SULFIDMALM

SCALE 1:5000	OBS.	RS	4-76
	DRAW.	RS	5-76
	TRAC.	BB	—
	CHK.		

MAP NO. -

12.

MAP SHEET



As Terrapoint, 1000, A.3, E.9, 10-71, San Francisco, California

1200W

1000W

800W

600W

400W

200W

0



2400N

2200N

2000N

1800N

1600N

1400N

1200N

DA°
+20
+10
-10
-20

NAA
Direction to station
Reading direction

KEY:

 Real

Inst. Paulsen

VAKKERLIEN GRID

VLF-EM survey

Dip-Angle Data

SCALE
1:5000

OBS. RS
DRAW. RS
TRAC. BB
CHK.

4-76

5-76

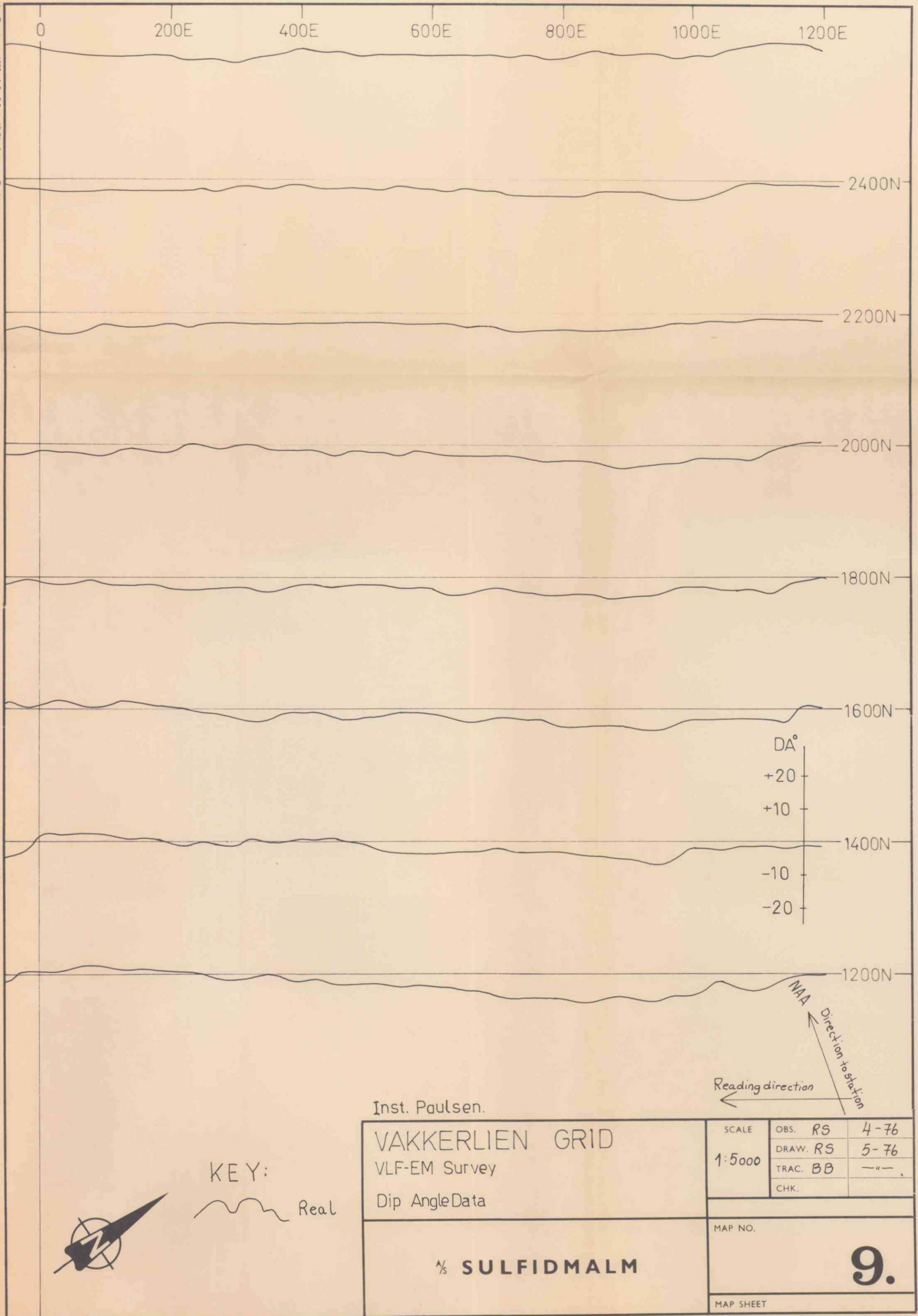
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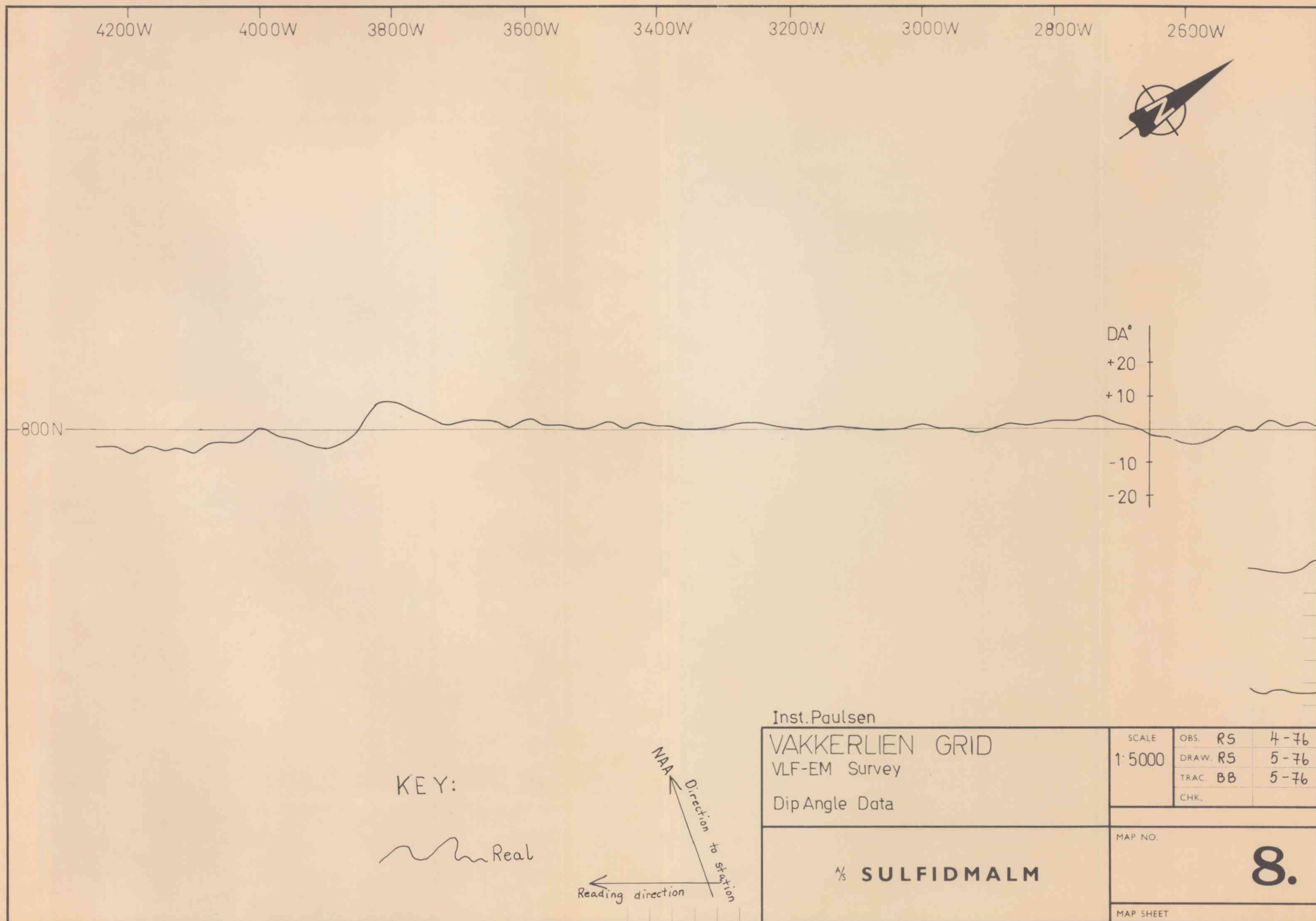
MAP NO.

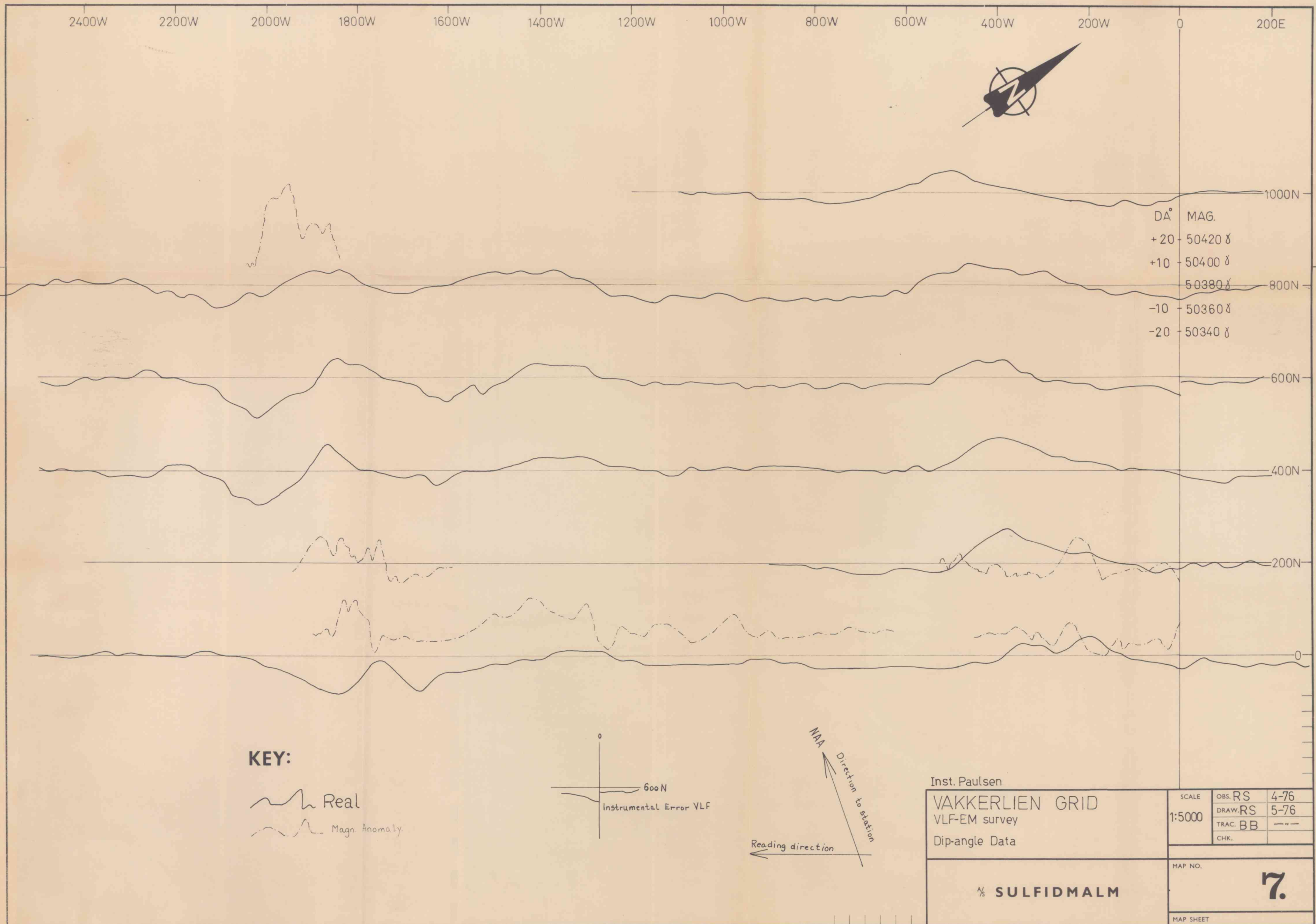
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MAP SHEET

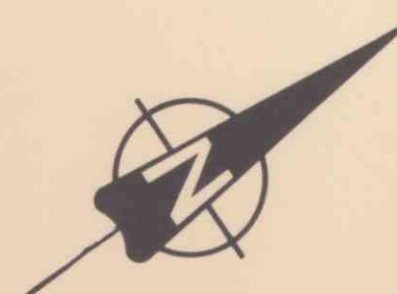
$\frac{1}{2}$ SULFIDMALM







200W 0 200E 400E 600E 800E 1000E 1200E 1400E 1600E 1800E 2000E 2200E 2400E



1000N

800N

600N

400N

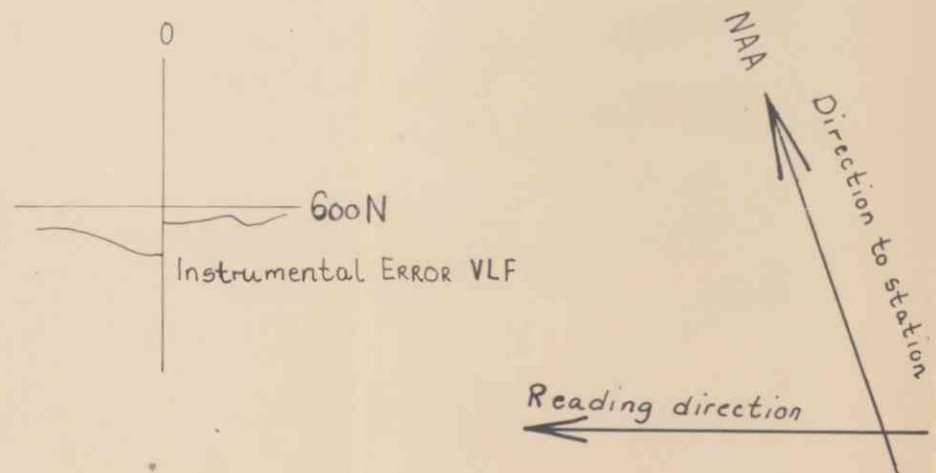
200N

0

DA°
+20
+10
-10
-20

KEY:

 Real



Inst. Paulsen

VAKKERLIEN GRID

VLF-EM survey

Dip-angle Data

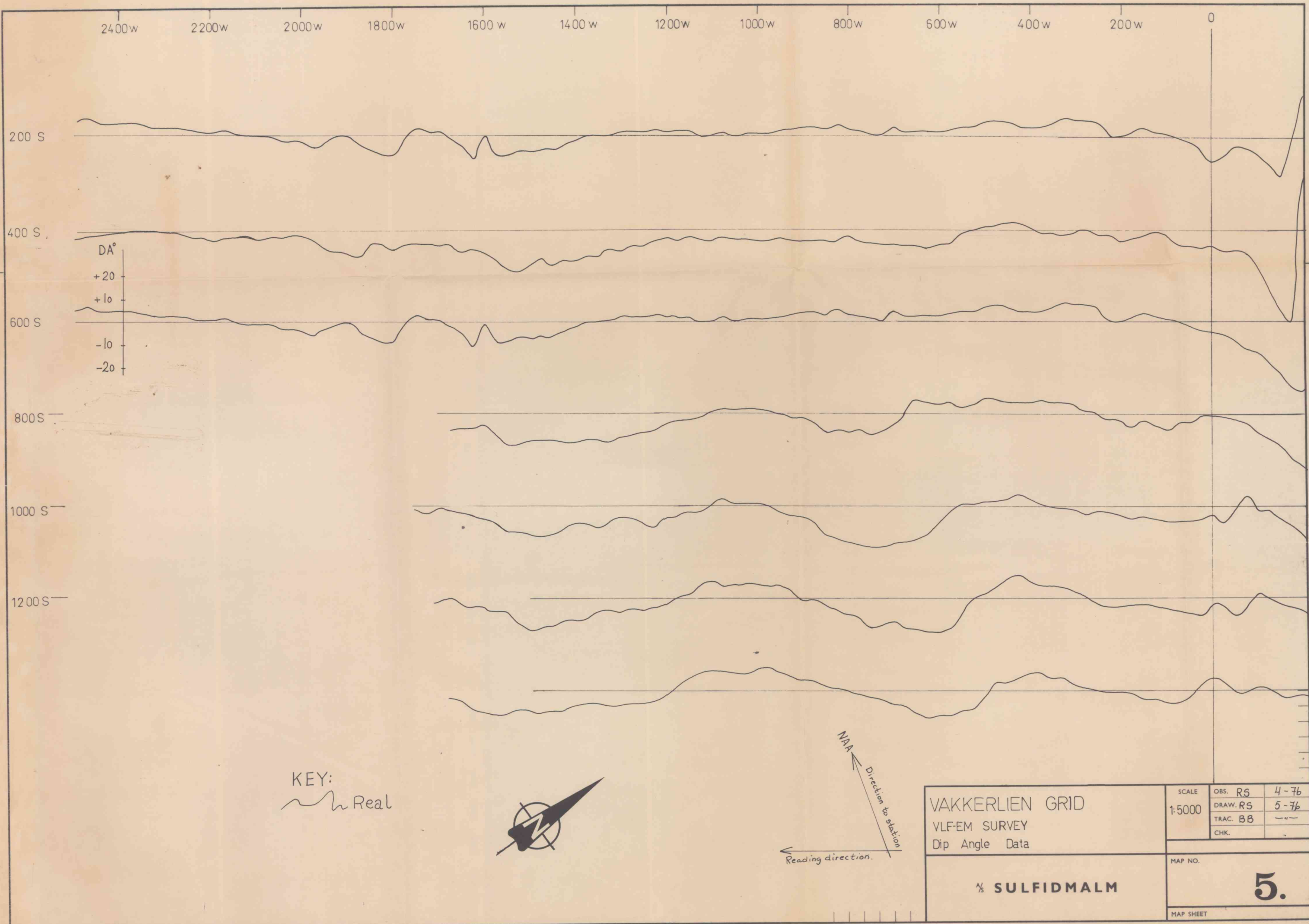
SCALE	OBS. RS	4-76
1:5000	DRAW. RS	5-76
	TRAC. BB	---
	CHK.	

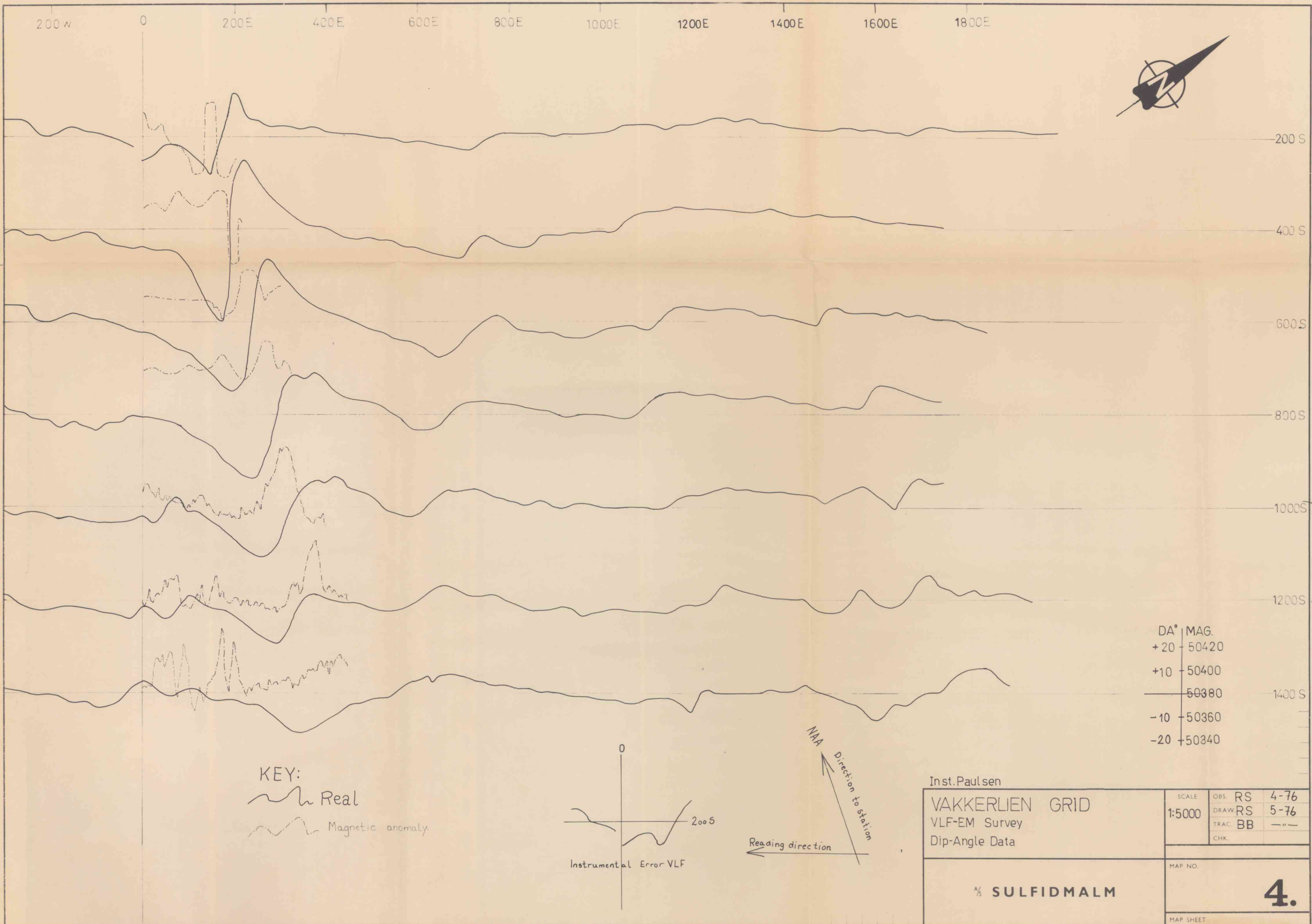
1/2 SULFIDMALM

MAP NO.

6.

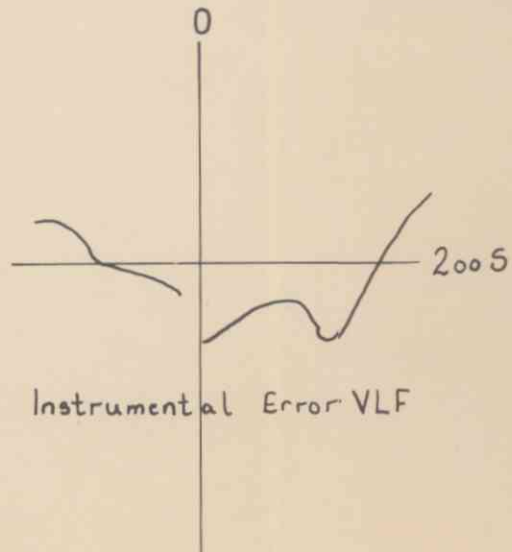
MAP SHEET





DA°	MAG.
+20	50420
+10	50400
—	50380
-10	50360
-20	50340

KEY:
— Real
--- Magnetic anomaly.



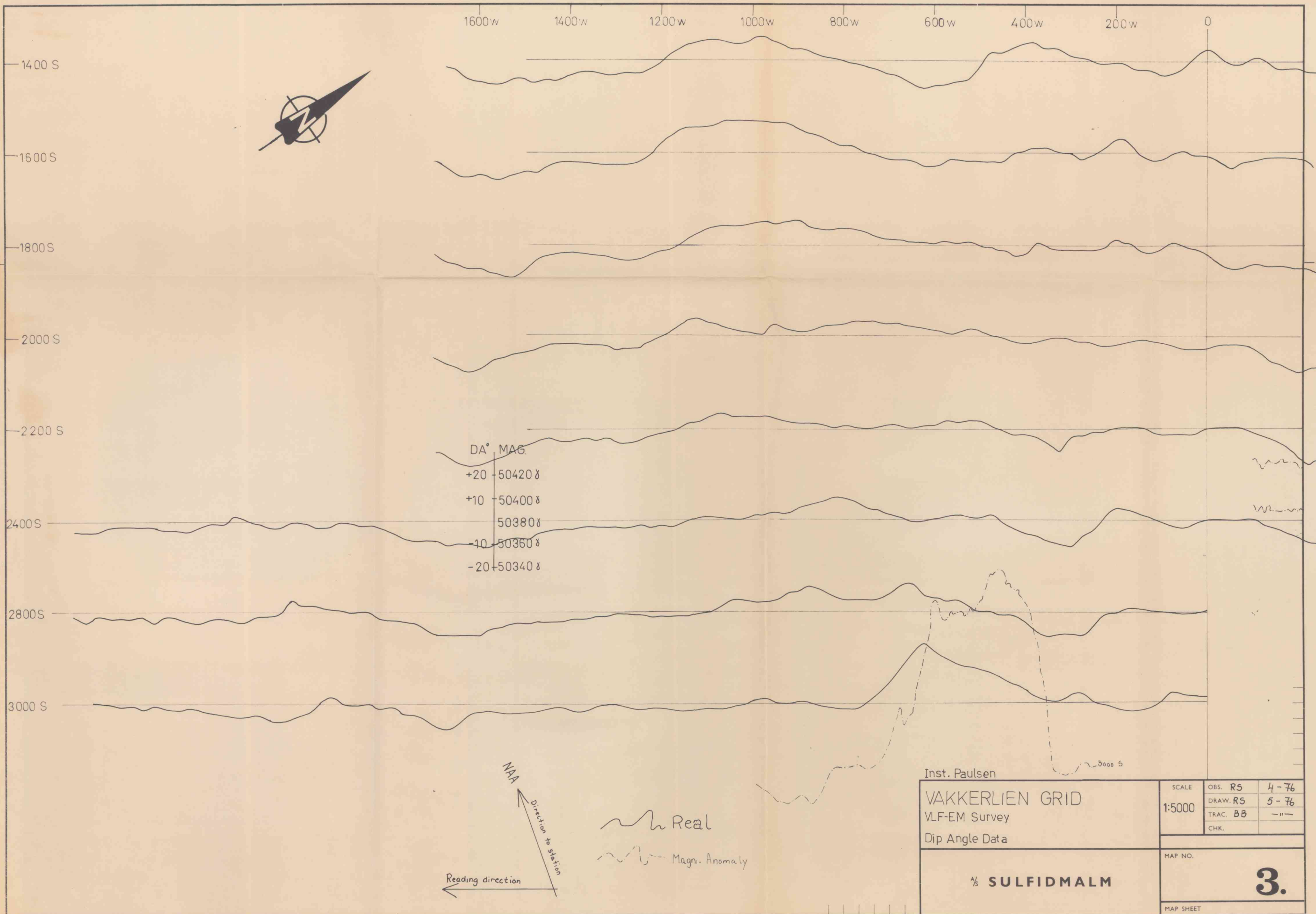
NAA
Direction to station
Reading direction

Inst. Paulsen
VAKKERLIEN GRID
VLF-EM Survey
Dip-Angle Data

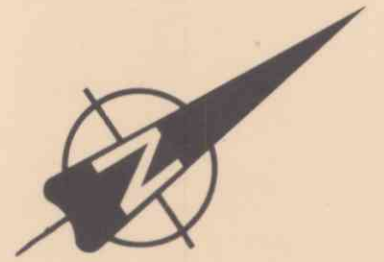
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1:5000	DRAW	RS	5-76
	TRAC.	BB	—
	CHK.		

1/5 SULFIDMALM

MAP NO.	4.
MAP SHEET	



200w 0 200E 400E 600E 800E 1000E 1200E 1400E 1600E 1800E



1600 S

1800 S

2000 S

2200 S

2400 S

DA°	MAG.
+20	50420 X
+10	50400 X
	50380 X
-10	50360 X
-20	50340 X

KEY:

Real

Magnetic Anomaly.

NAA
Direction to station
Reading direction

Inst. Paulsen

VAKKERLIEN GRID
VLF-EM Survey
DIP-ANGLE DATA

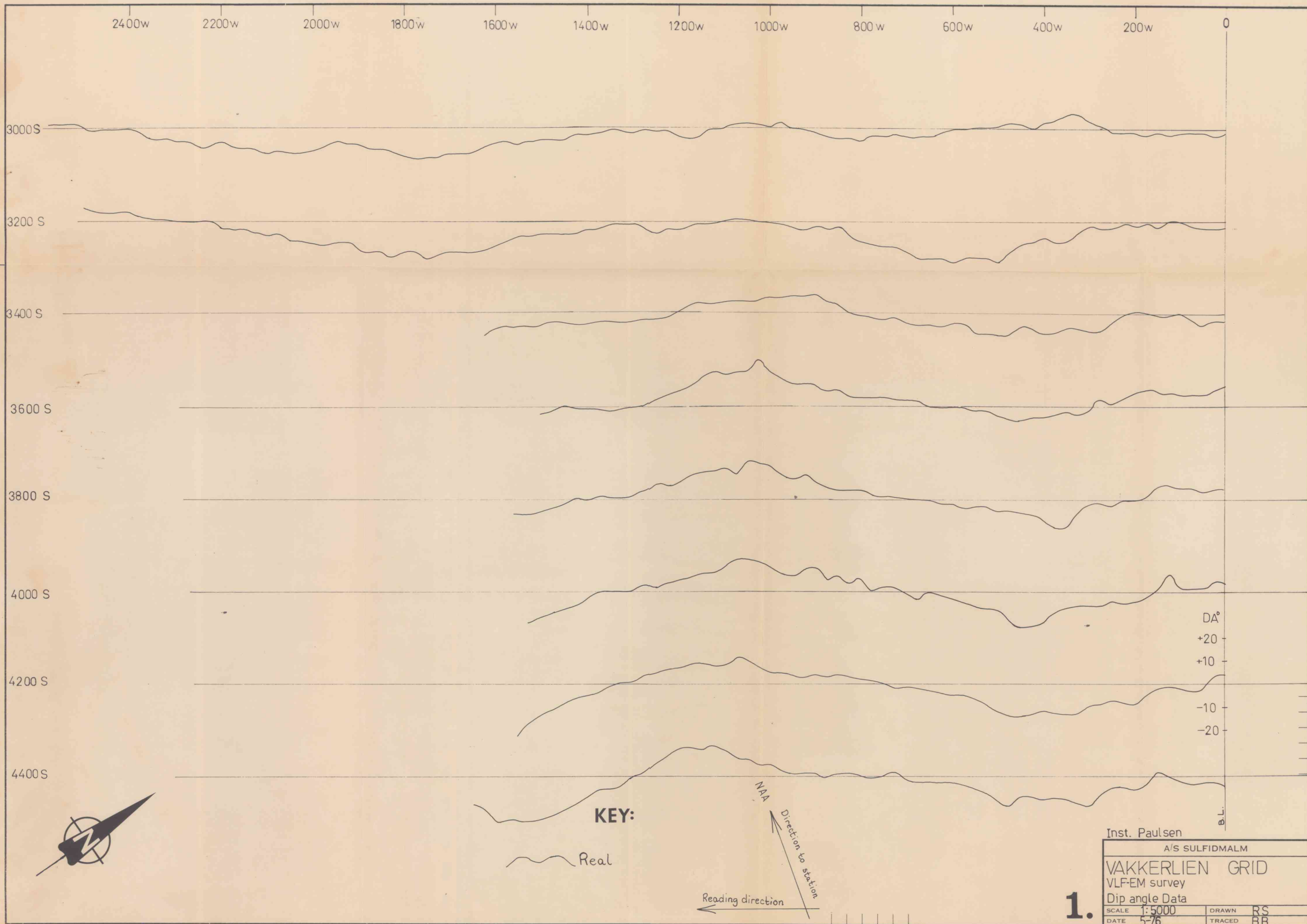
% SULFIDMALM

SCALE	OBS. RS	4-76
1:5000	DRAW. RS	5-76
	TRAC. BB	---
	CHK.	

MAP NO.

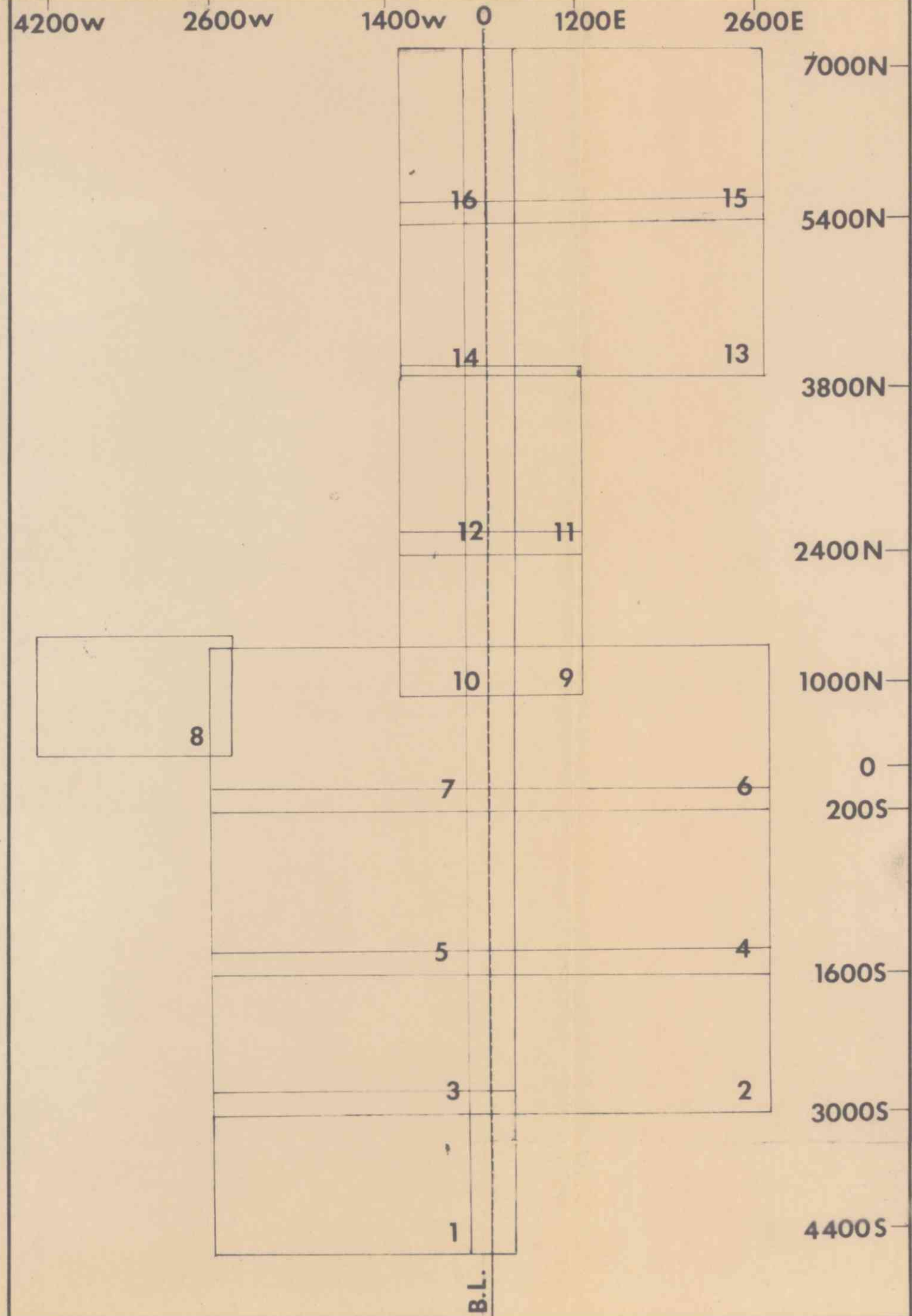
2.

MAP SHEET



KEY:

- ☐ 0 - 6
- ☐ 7 - 10
- ☐ 11 - 15
- ☐ 16 - 20
- ☐ 21 - 30
- ☐ 31 - 40
- ☐ 41 - 50
- ☐ > 50



A/S Torkopi, 1000 A.3, E 9 gL, 10-71, Sandviken Trækeri

1200 w 1000 w 800 w 600 w 400 w 200 w 0



7000 N

6800 N

6600 N

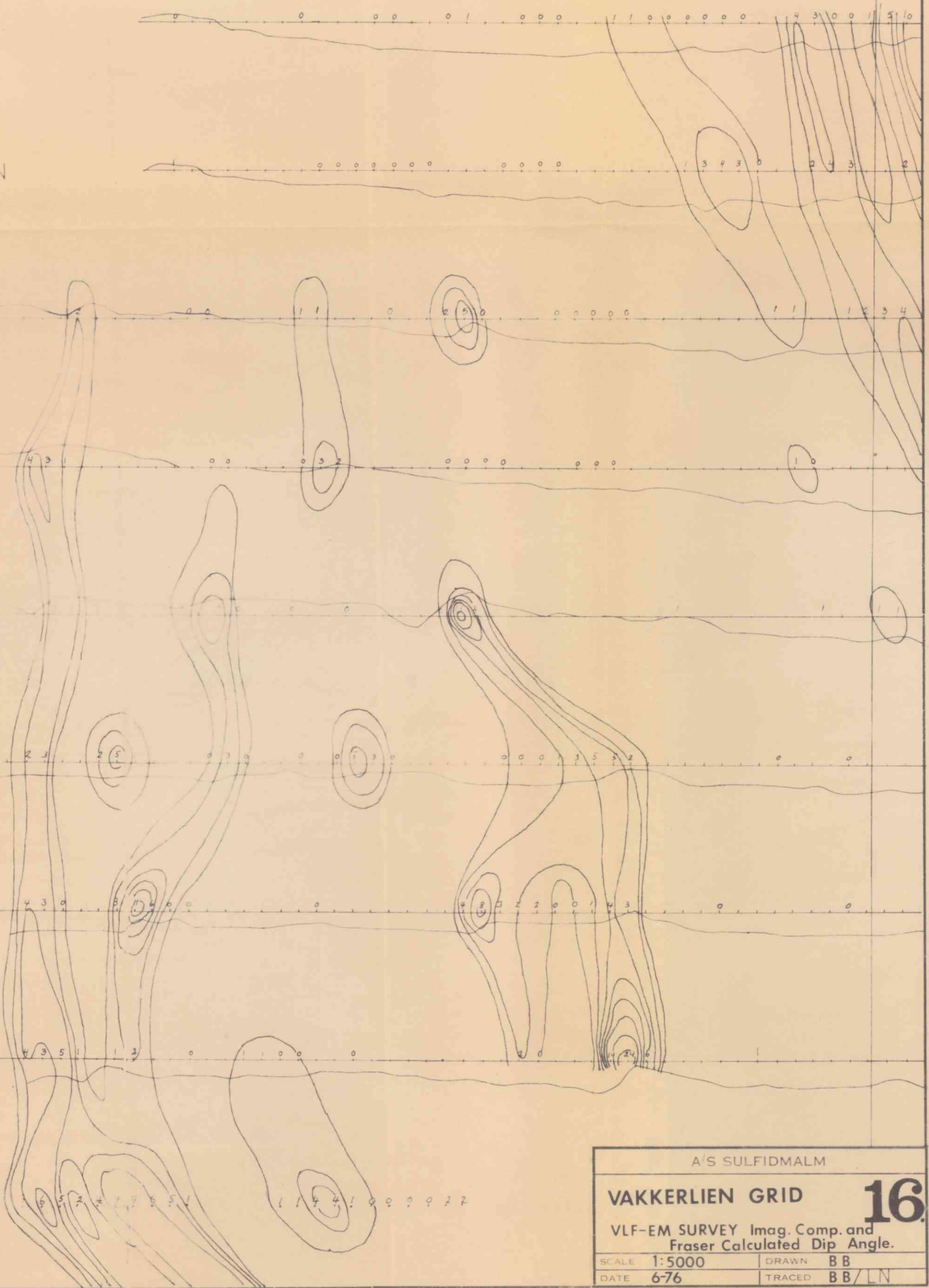
6400 N

6200 N

6000 N

5800 N

5600 N



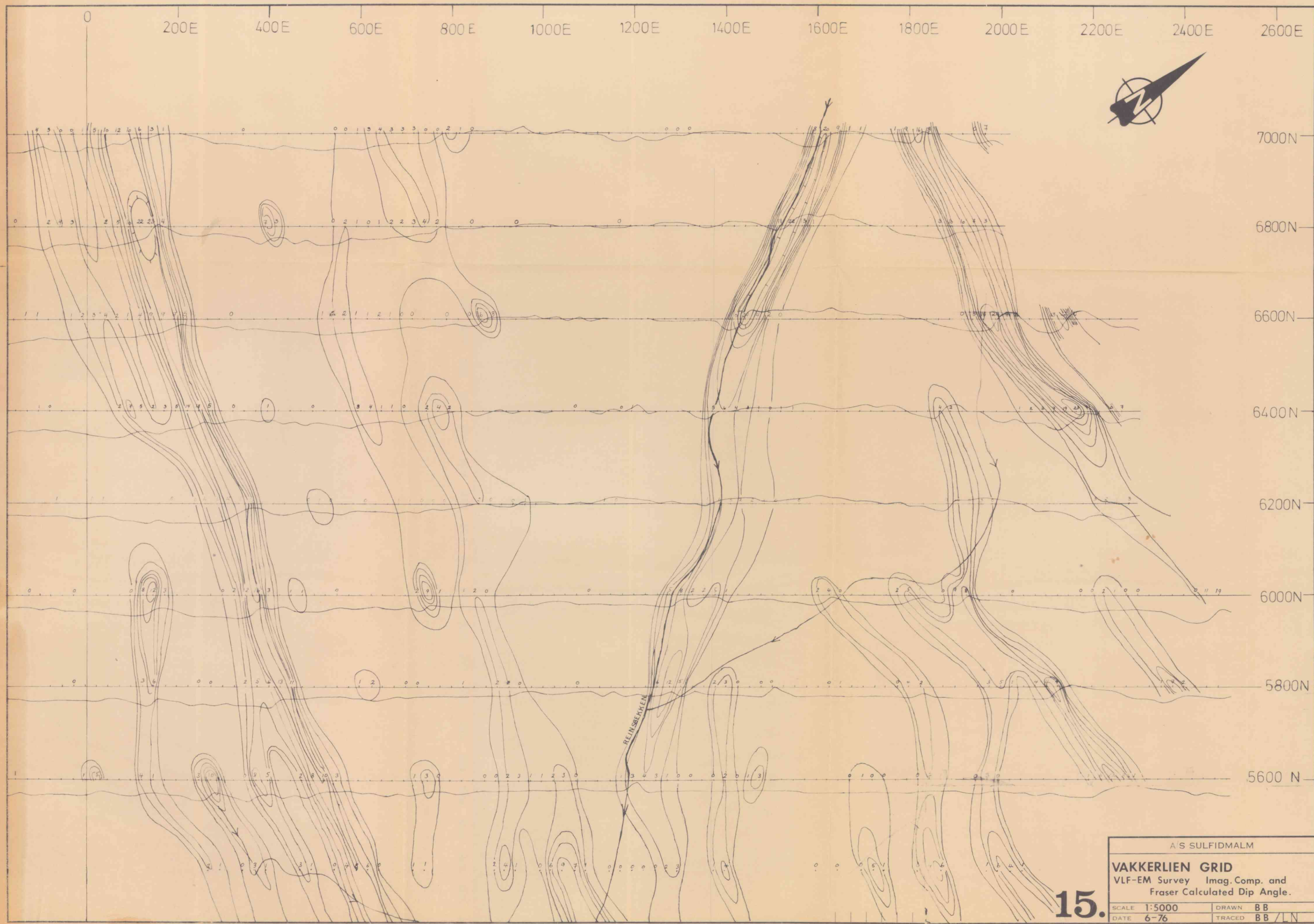
A/S SULFIDMALM

VAKKERLIEN GRID

16

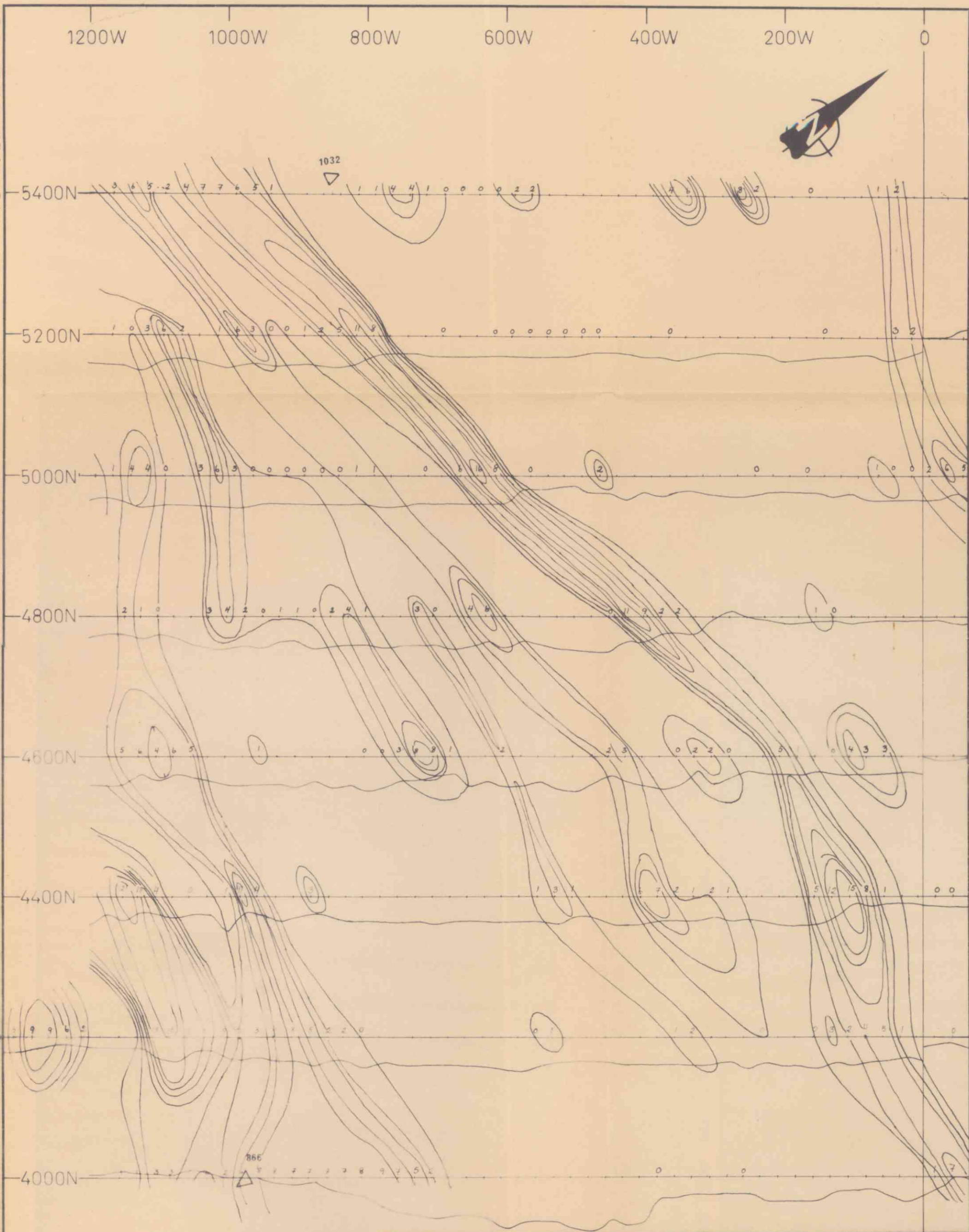
VLF-EM SURVEY Imag. Comp. and Fraser Calculated Dip Angle.

SCALE	1:5000	DRAWN	BB
DATE	6-76	TRACED	BB/LN



A'S SULFIDMALM			
VAKKERLIEN GRID			
VLF-EM Survey Imag. Comp. and Fraser Calculated Dip Angle.			
SCALE	1:5000	DRAWN	BB
DATE	6-76	TRACED	BB / LN

A-5 Terrapin, 1000, A-3, E-9 el. 10-71, Santum Tjerkker.



VAKKERLIEN Grid

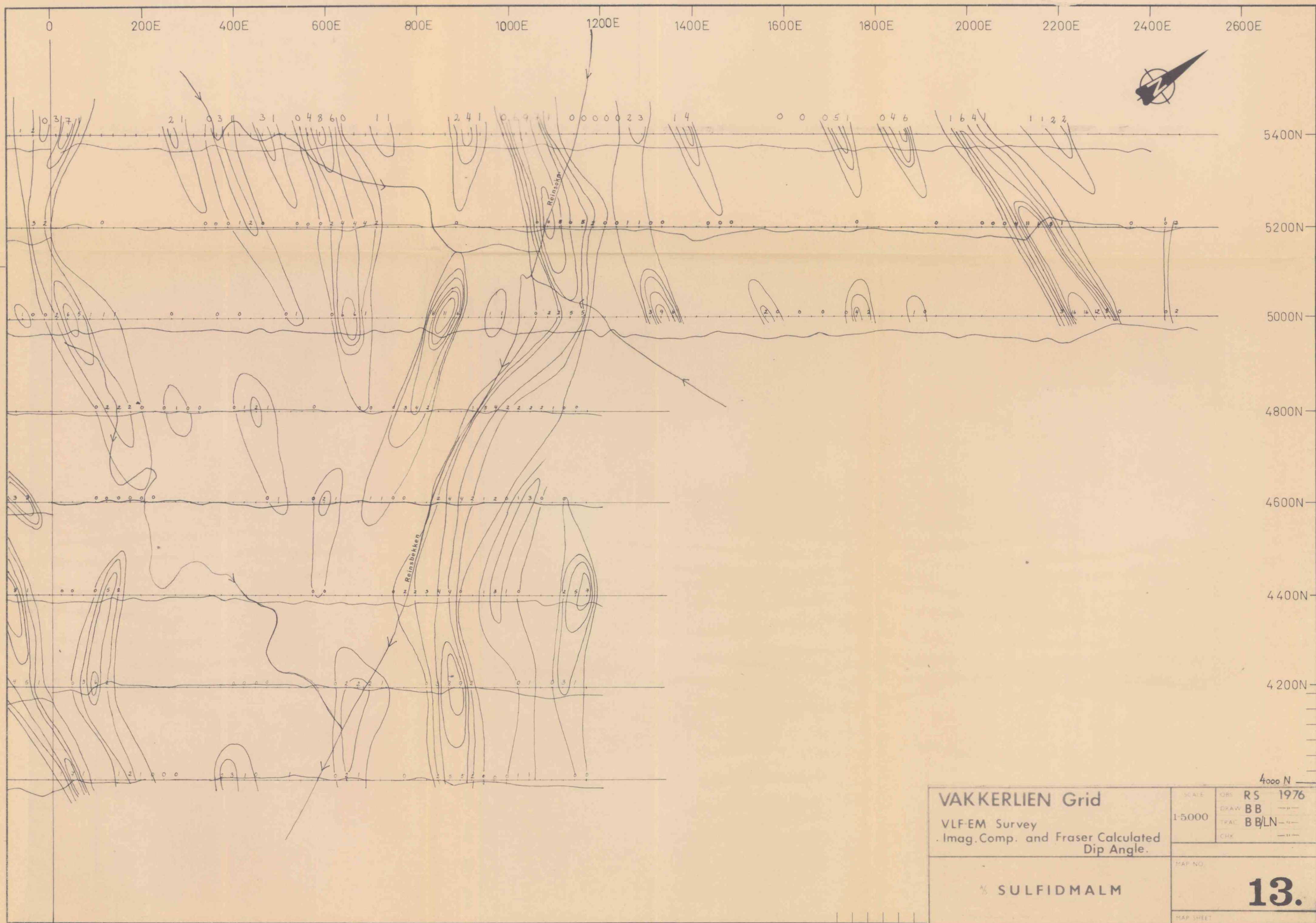
VLF-EM Survey
Imag. Comp. and Fraser Calculated
Dip Angle.

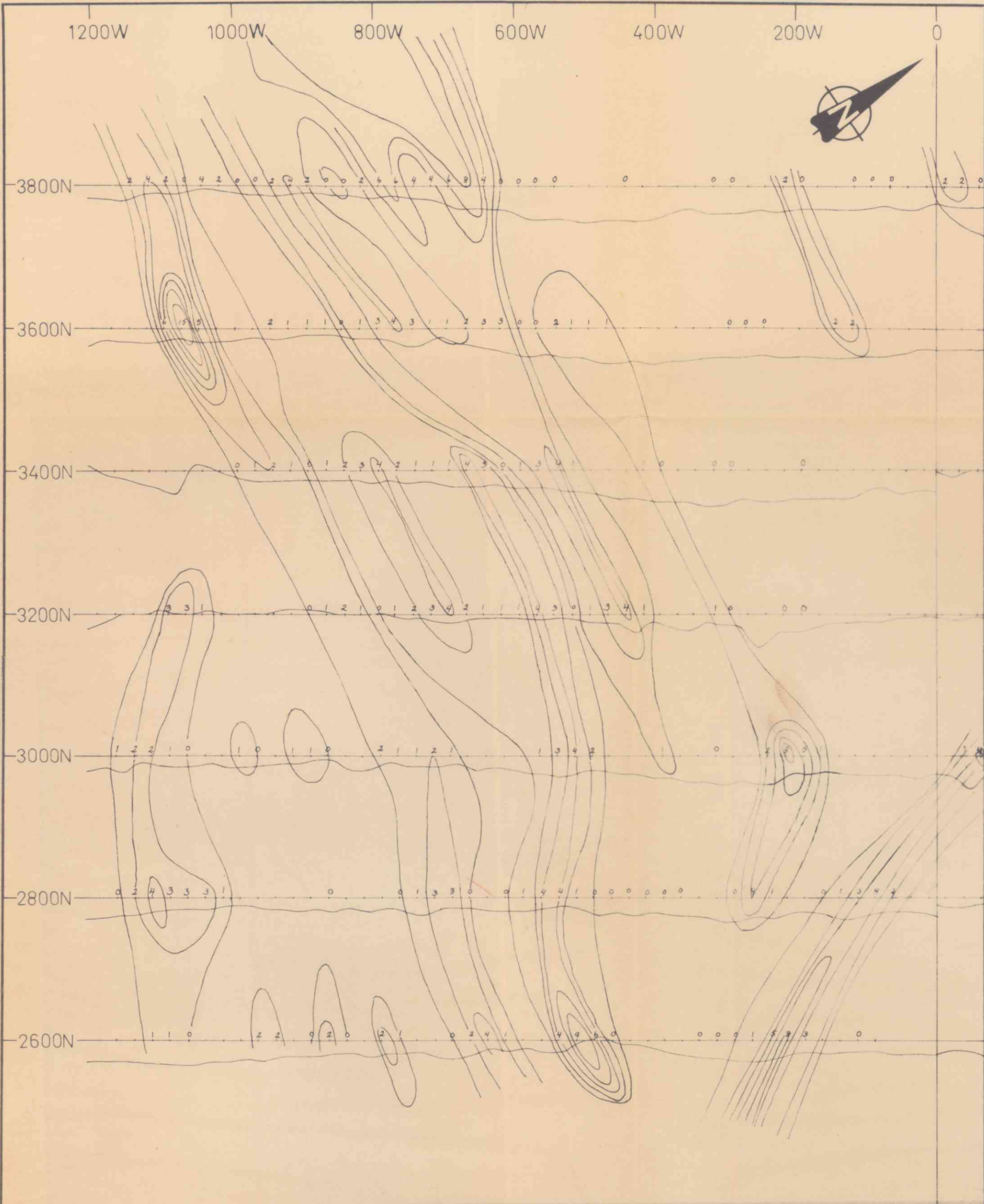
1/2 SULFIDMALM

SCALE	OBS. RS	1976
1-5000	DRAW. BB	—"
	TRAC. BB/LN	—"
	CHK.	—"

MAP NO.

14.





VAKKERLIEN Grid

VLF-EM Survey
 Imag. Comp. and Fraser Calculated
 Dip Angle.

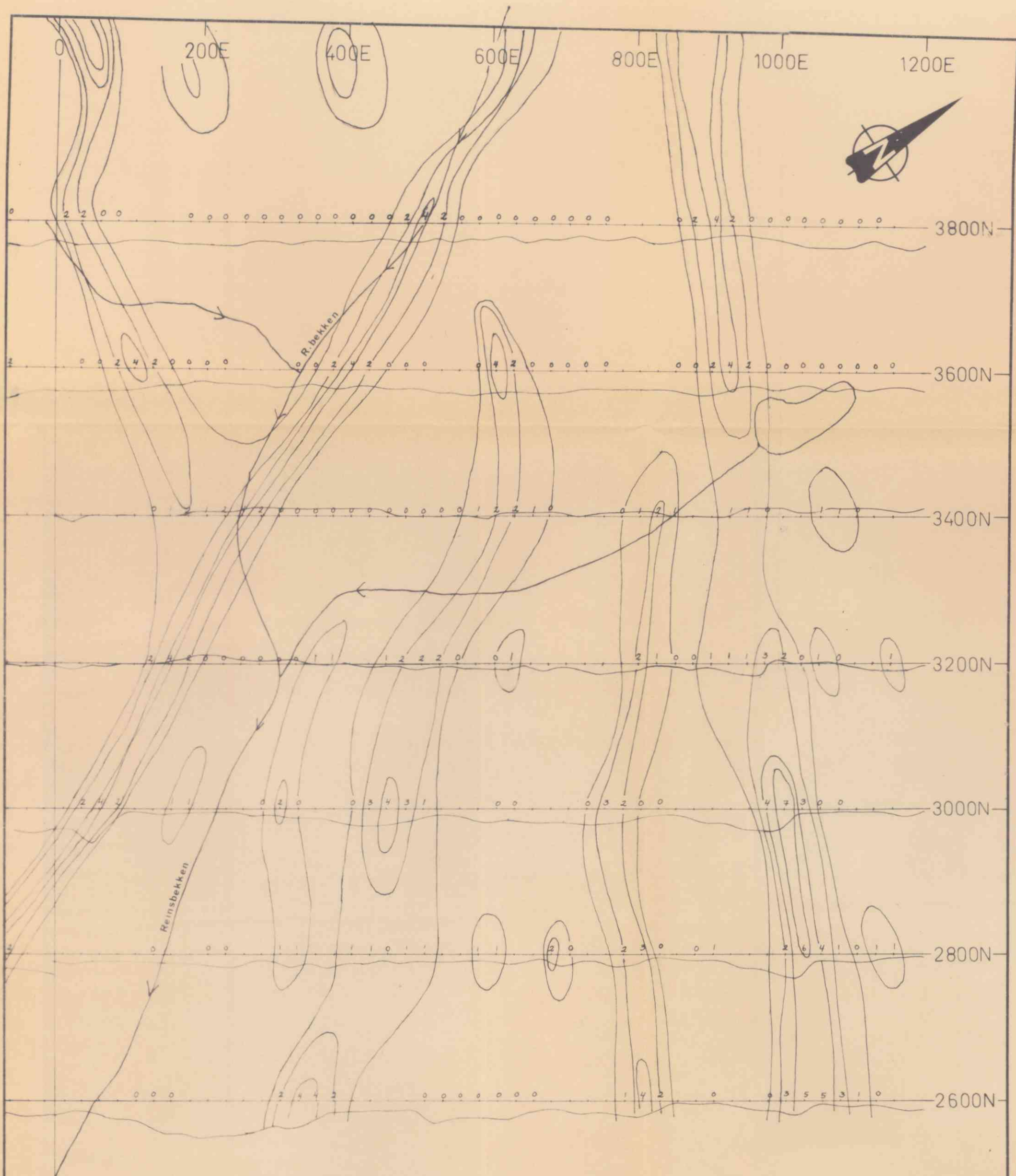
1/3 SULFIDMALM

SCALE	OBS.	RS	1976
1-5,000	DRAW	BB	—"
	TRAC.	BB/LN	—"
	CHK.		—"

MAP NO.

12.

MAP SHEET



VAKKERLIEN Grid

VLF-EM Survey
 Imag. Comp. and Fraser Calculated
 Dip Angle.

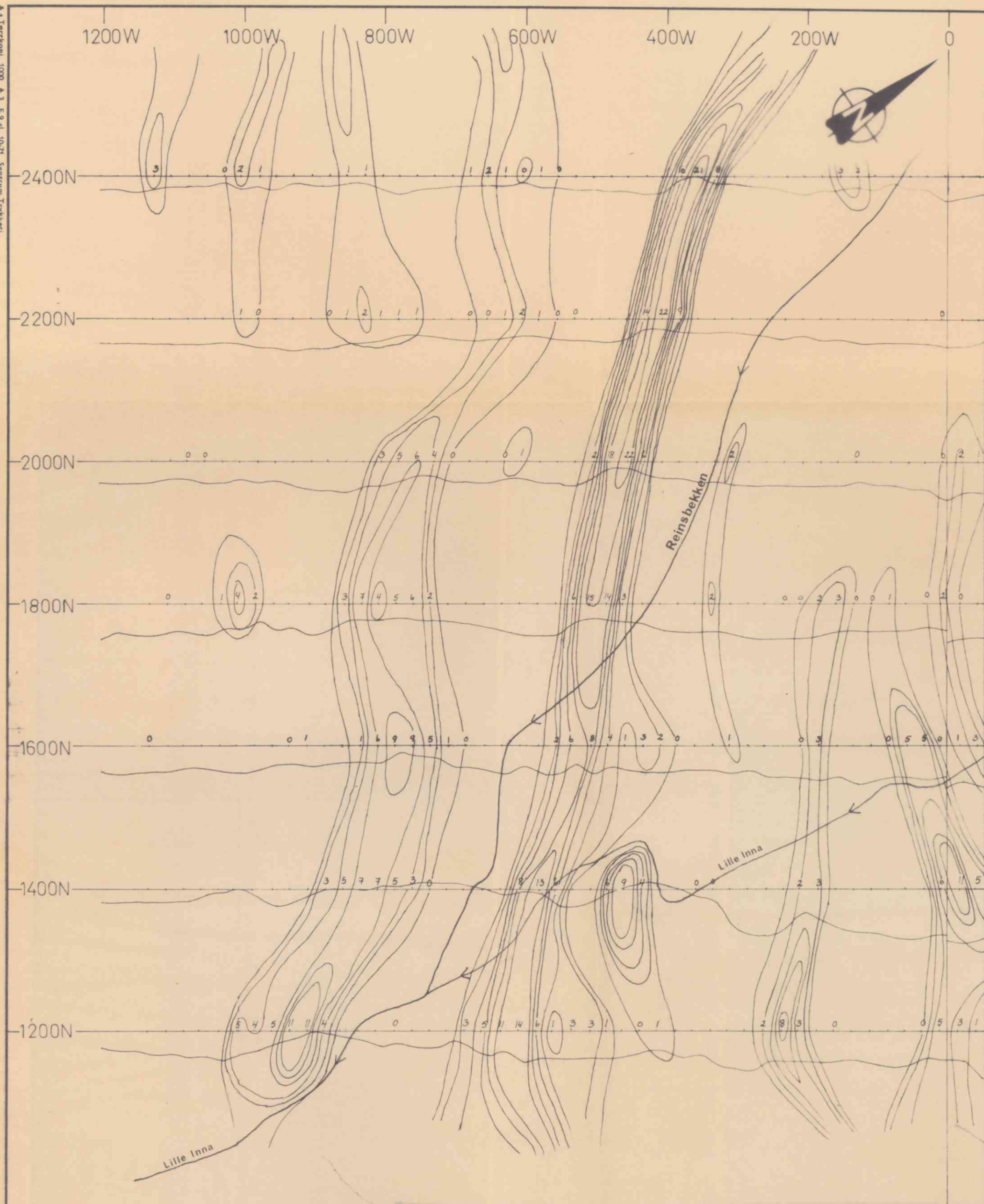
$\frac{1}{2}$ SULFIDMALM

SCALE	OBS. RS	1976
1-5000	DRAW. BB	—
	TRAC. BB/LN	—
	CHK.	—

MAP NO.

11.

MAP SHEET



VAKKERLIEN Grid

VLF-EM Survey
 Imag. Comp. and Fraser Calculated
 Dip Angle.

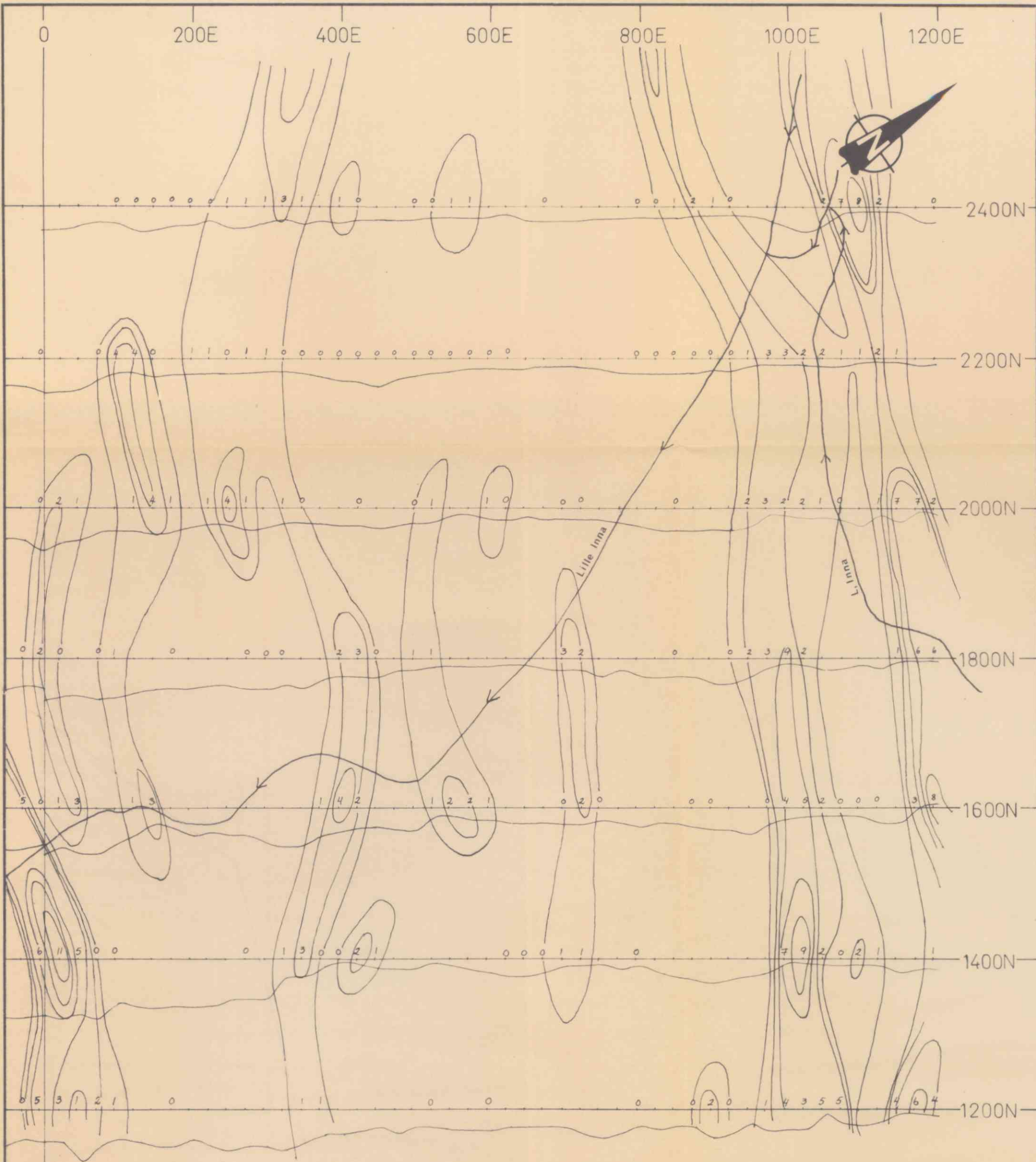
$\frac{1}{2}$ SULFIDMALM

SCALE 1-5000	OBS.	RS	1976
	DRAW.	BB	—
	TRAC.	BB/LN	—
	CHK.		—

MAP NO.

10.

MAP SHEET

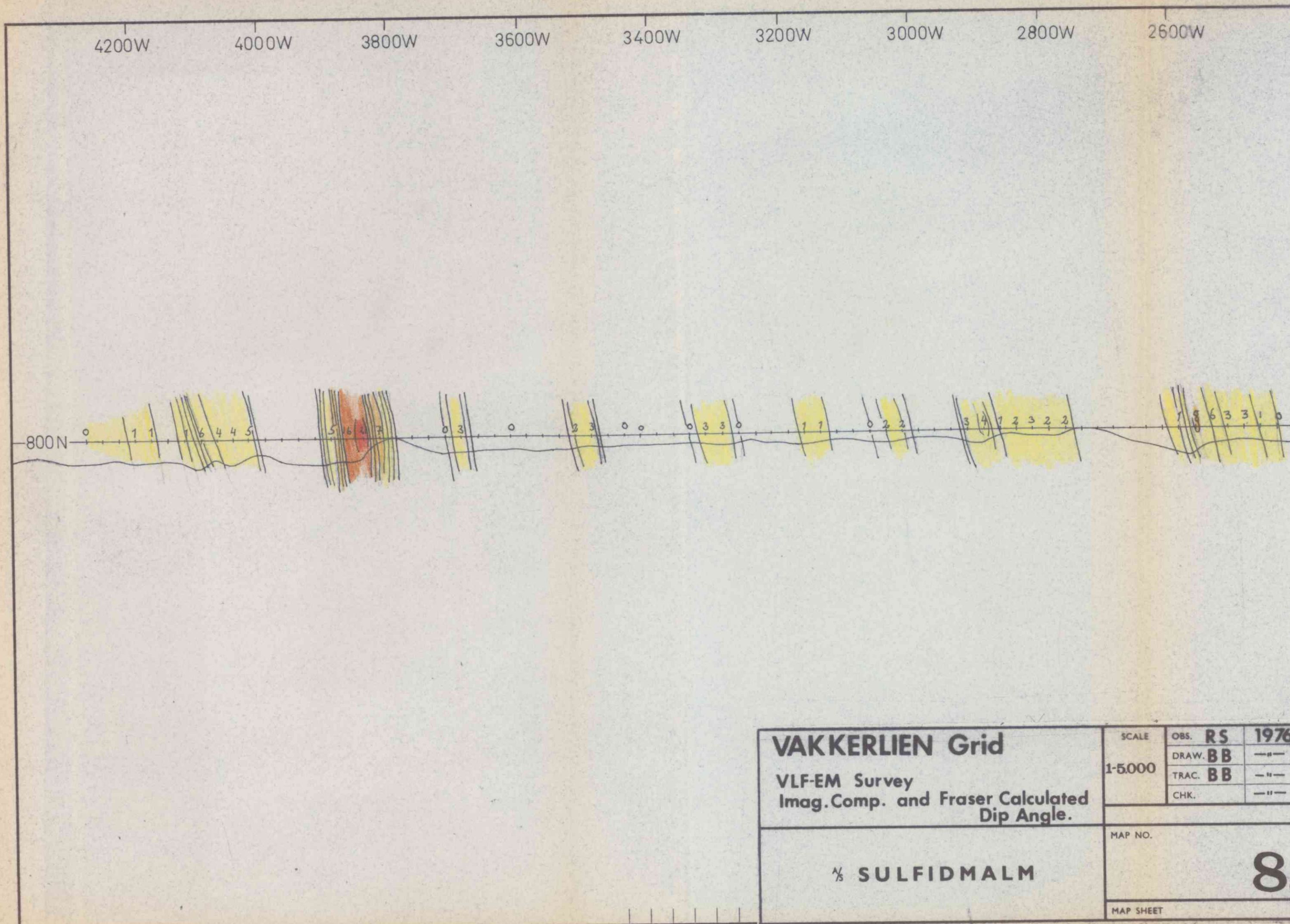


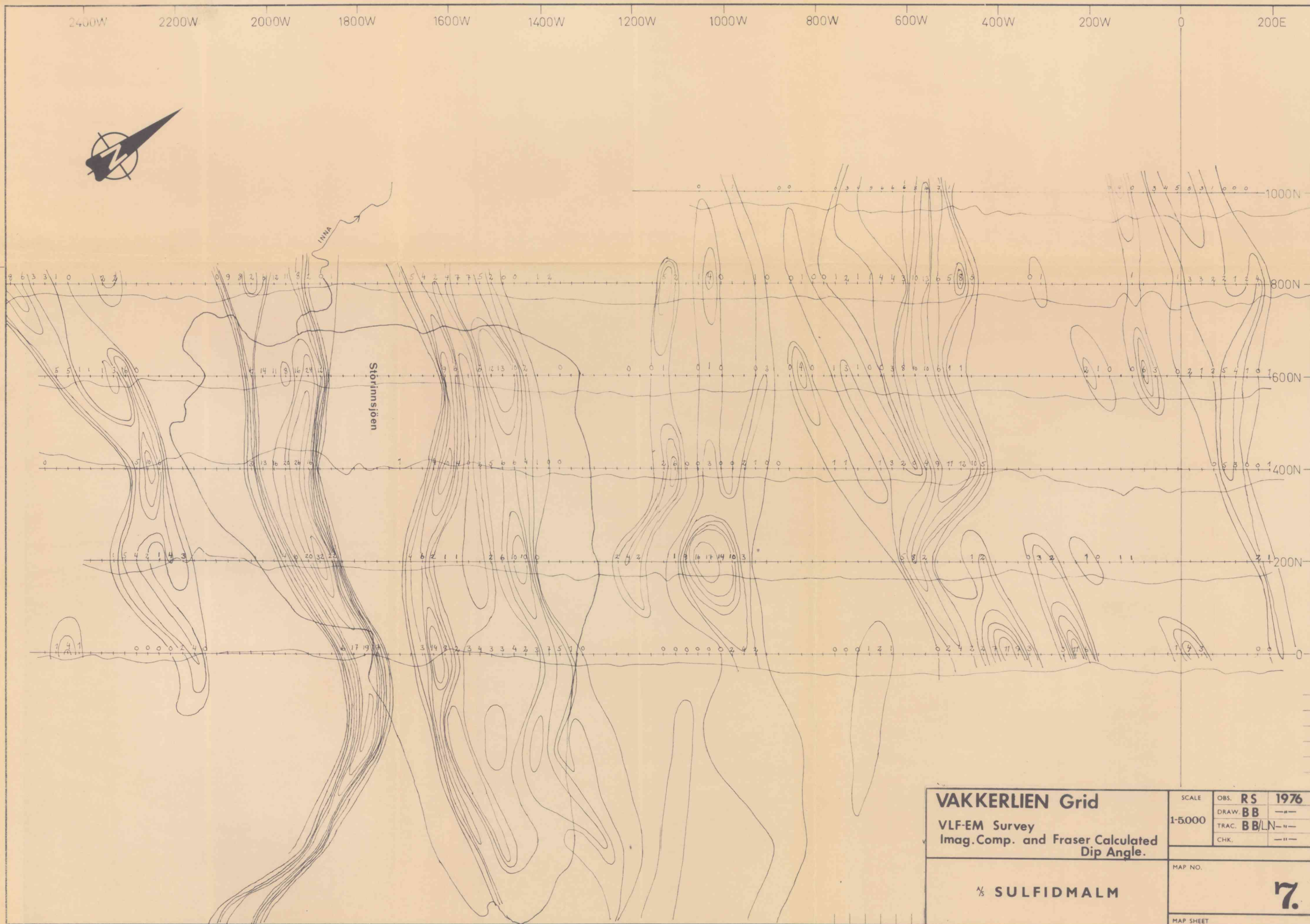
VAKKERLIEN Grid

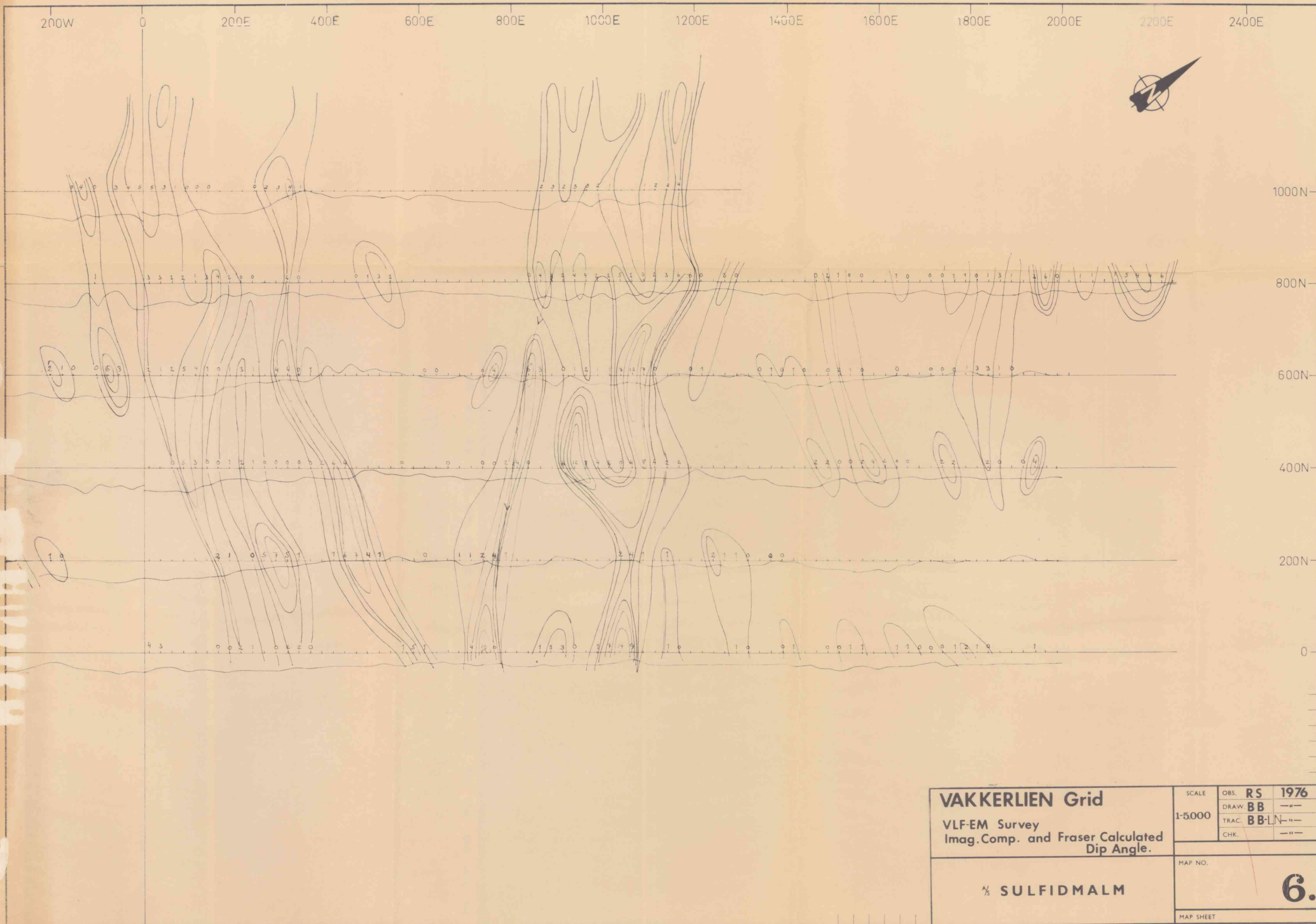
VLF-EM Survey
 Imag. Comp. and Fraser Calculated
 Dip Angle.

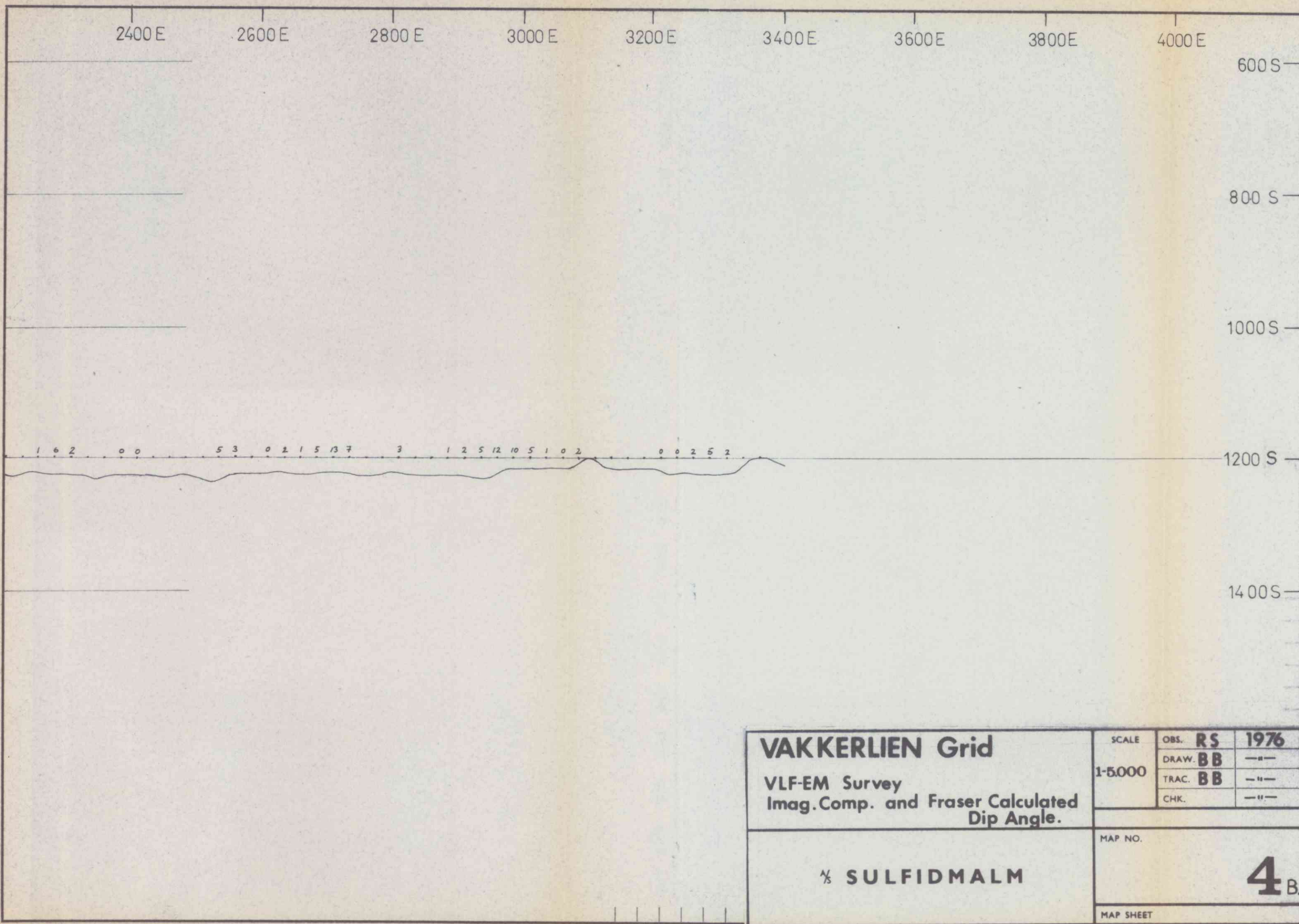
$\frac{1}{5}$ SULFIDMALM

SCALE 1-5000	OBS.	RS	1976
	DRAW.	BB	—
	TRAC.	BB/LN	—
	CHK.		—
MAP NO.			
9.			
MAP SHEET			









VAKKERLIEN Grid VLF-EM Survey Imag.Comp. and Fraser Calculated Dip Angle.	SCALE	OBS. RS	1976
	1-5,000	DRAW. BB	— " —
		TRAC. BB	— " —
		CHK.	— " —
$\frac{1}{2}$ SULFIDMALM	MAP NO.		
	4 B.		
	MAP SHEET		

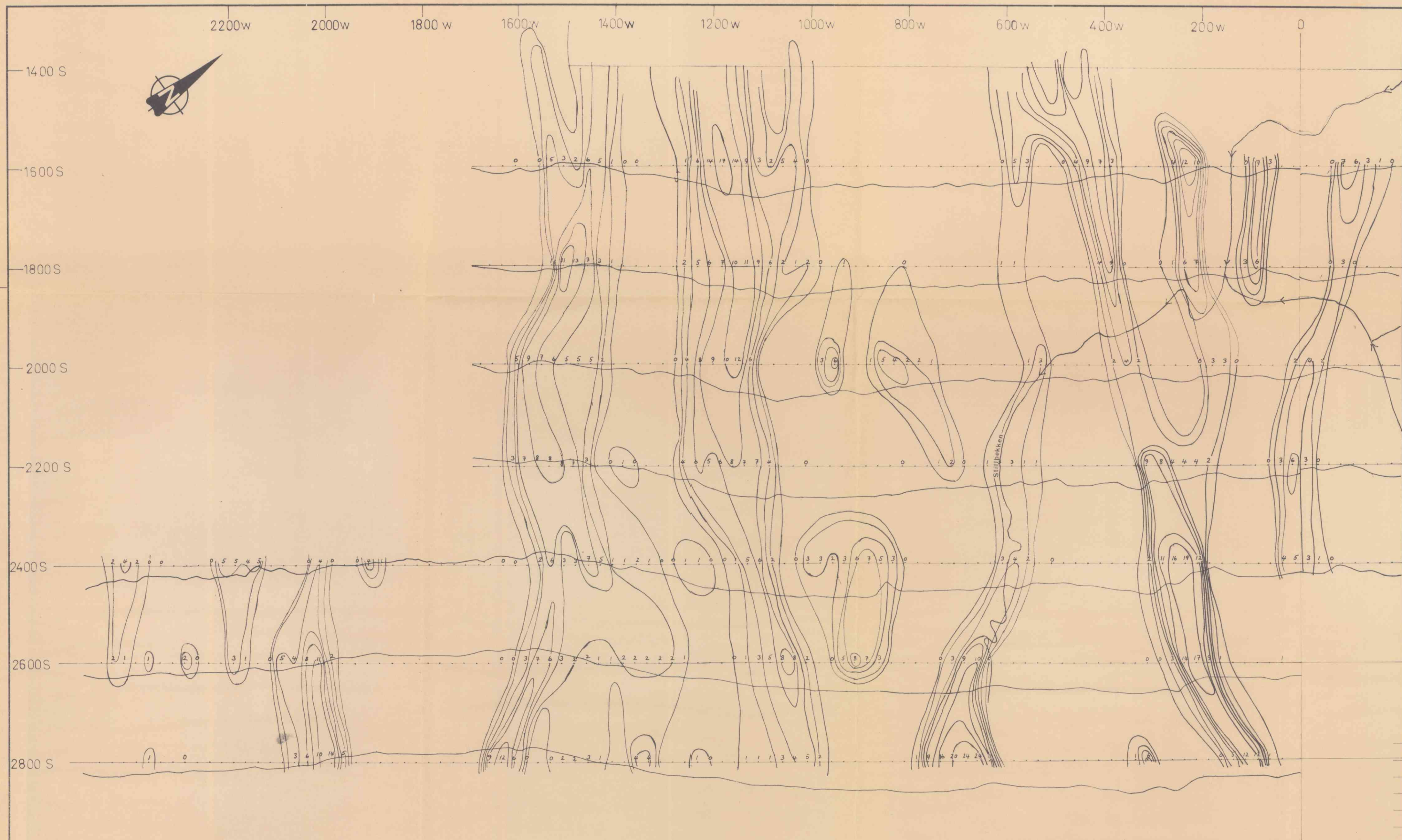


VAKKERLIEN Grid
 VLF-EM Survey
 Imag. Comp. and Fraser Calculated
 Dip Angle.

SCALE	OBS.	RS	1976
1:5,000	DRAW	BB	—
	TRAC.	BB	N—
	CHK.		—

$\frac{1}{2}$ SULFIDMALM

MAP NO.	4
MAP SHEET	A.

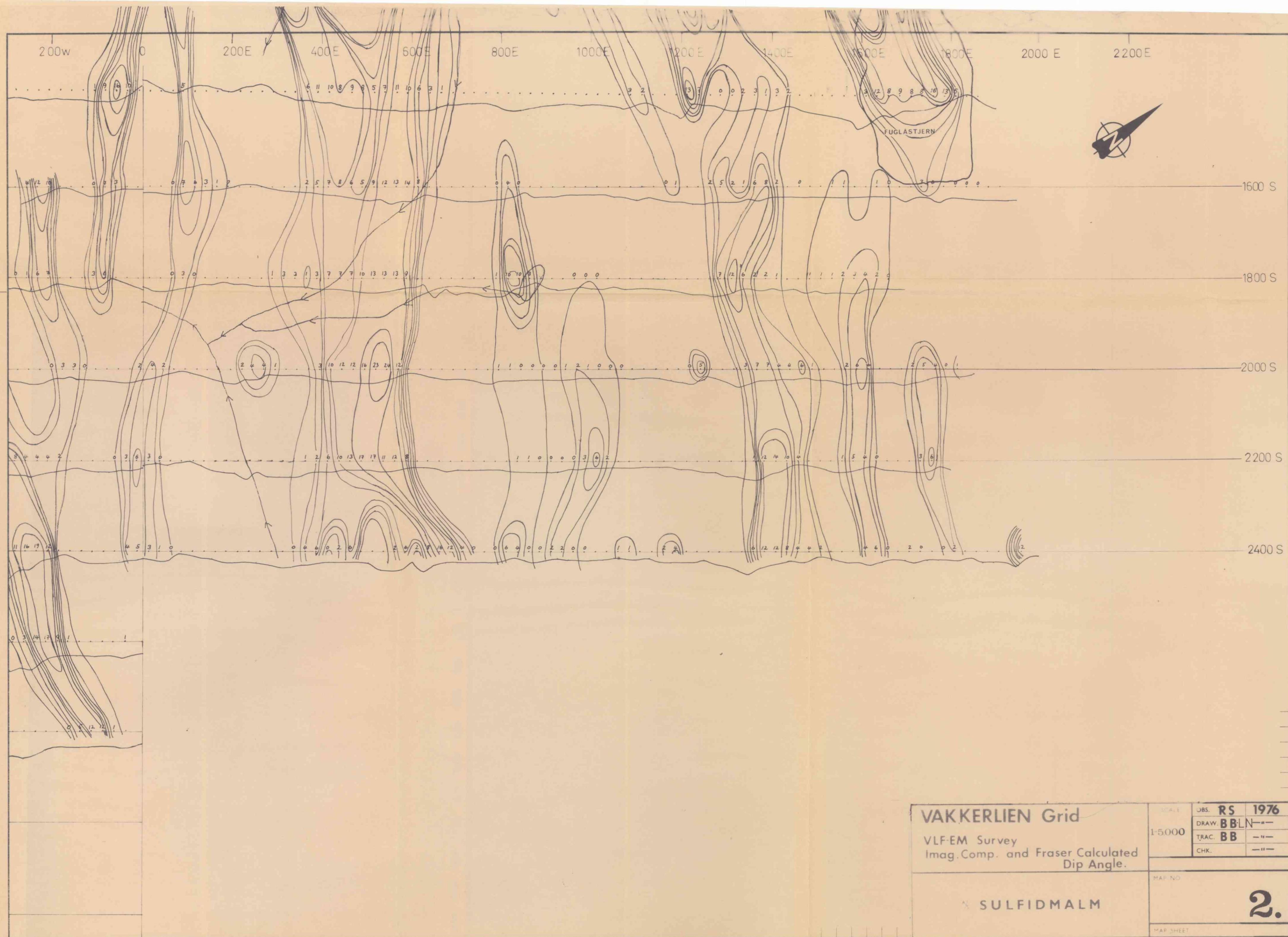


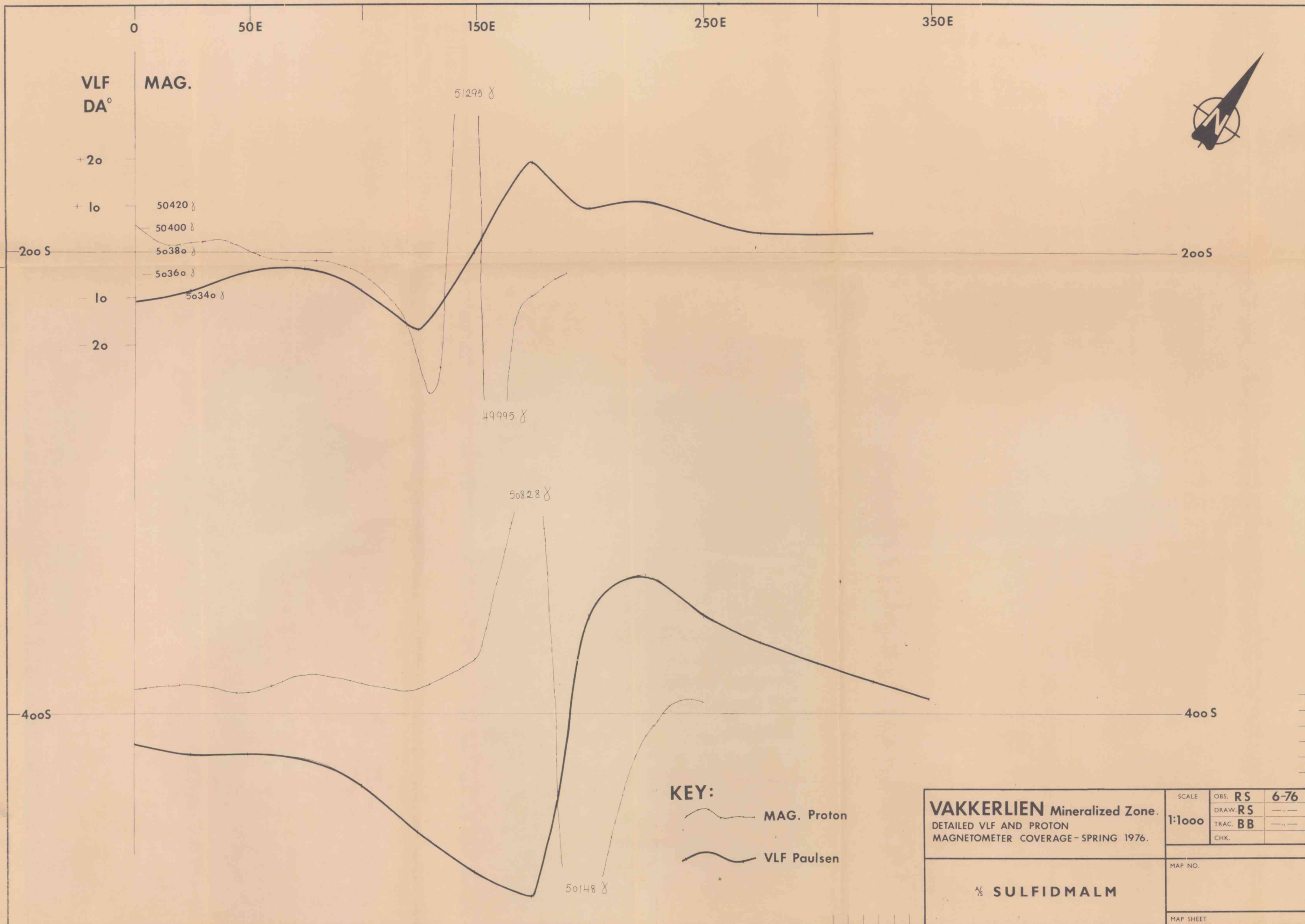
VAKKERLIEN Grid
 VLF-EM Survey
 Imag. Comp. and Fraser Calculated
 Dip Angle.

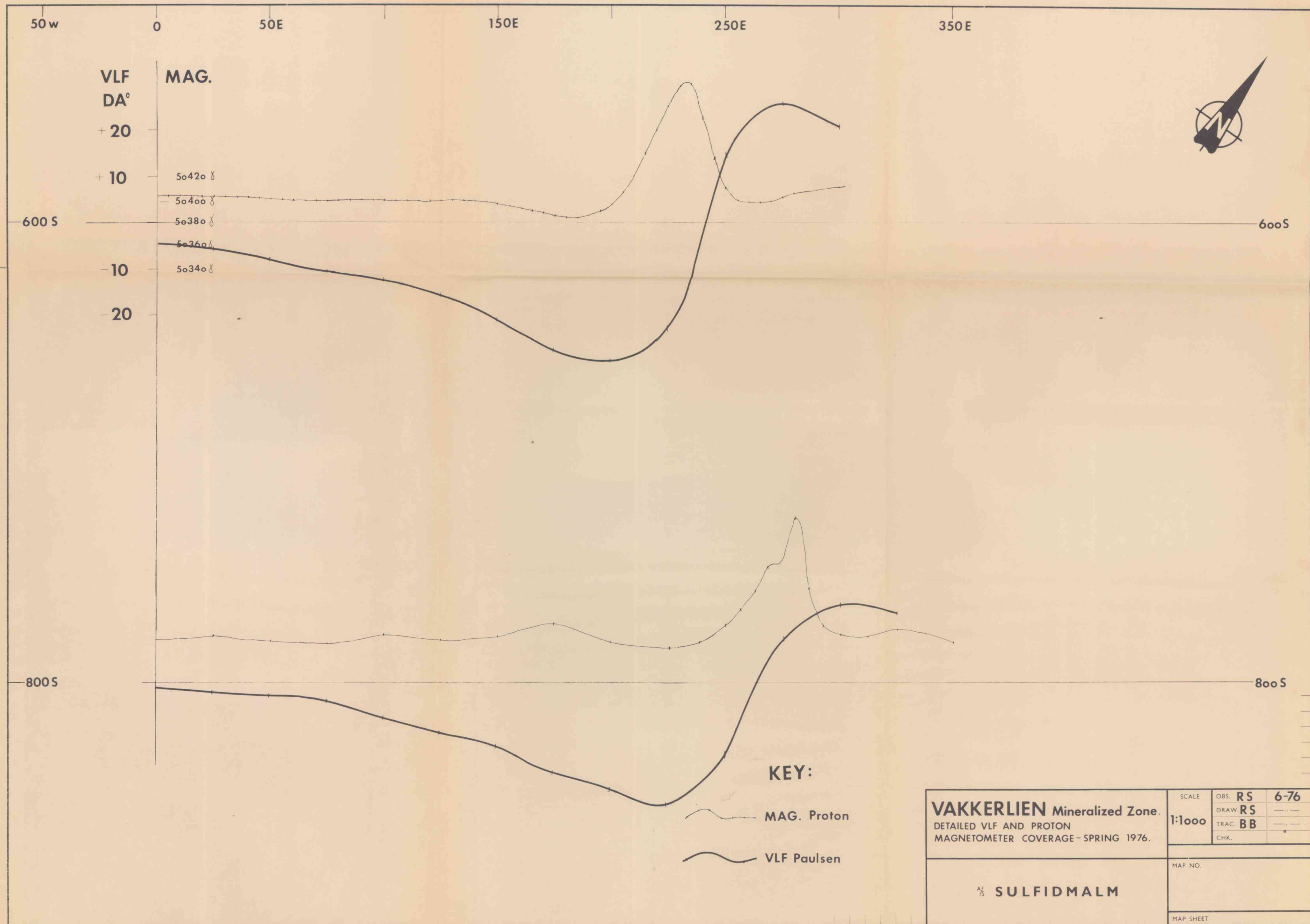
SCALE	OBS.	RS	1976
1:5,000	DRAW.	BB	—
	TRAC.	BB-LN	—
	CHK.	—	—

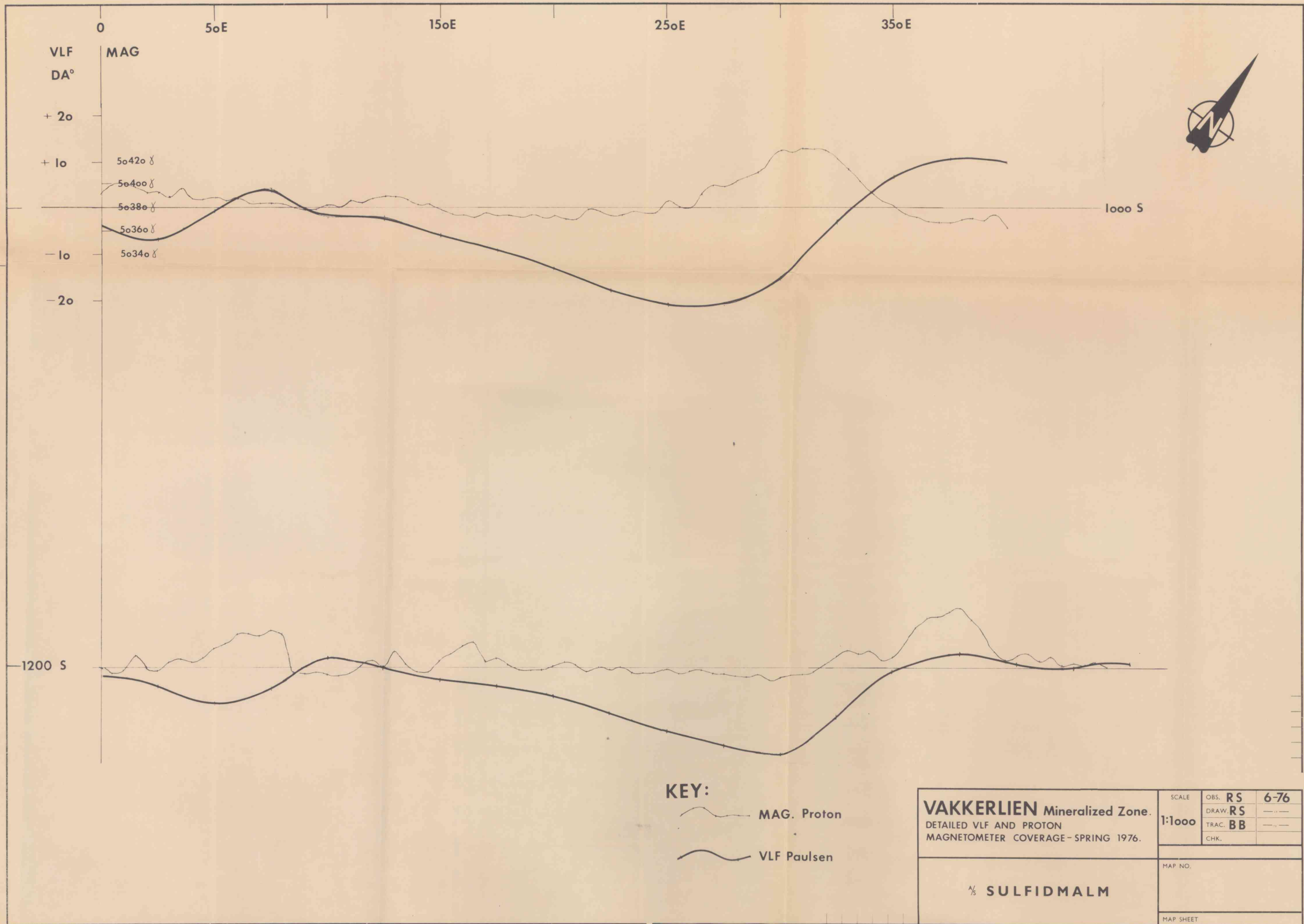
$\frac{1}{5}$ SULFIDMALM

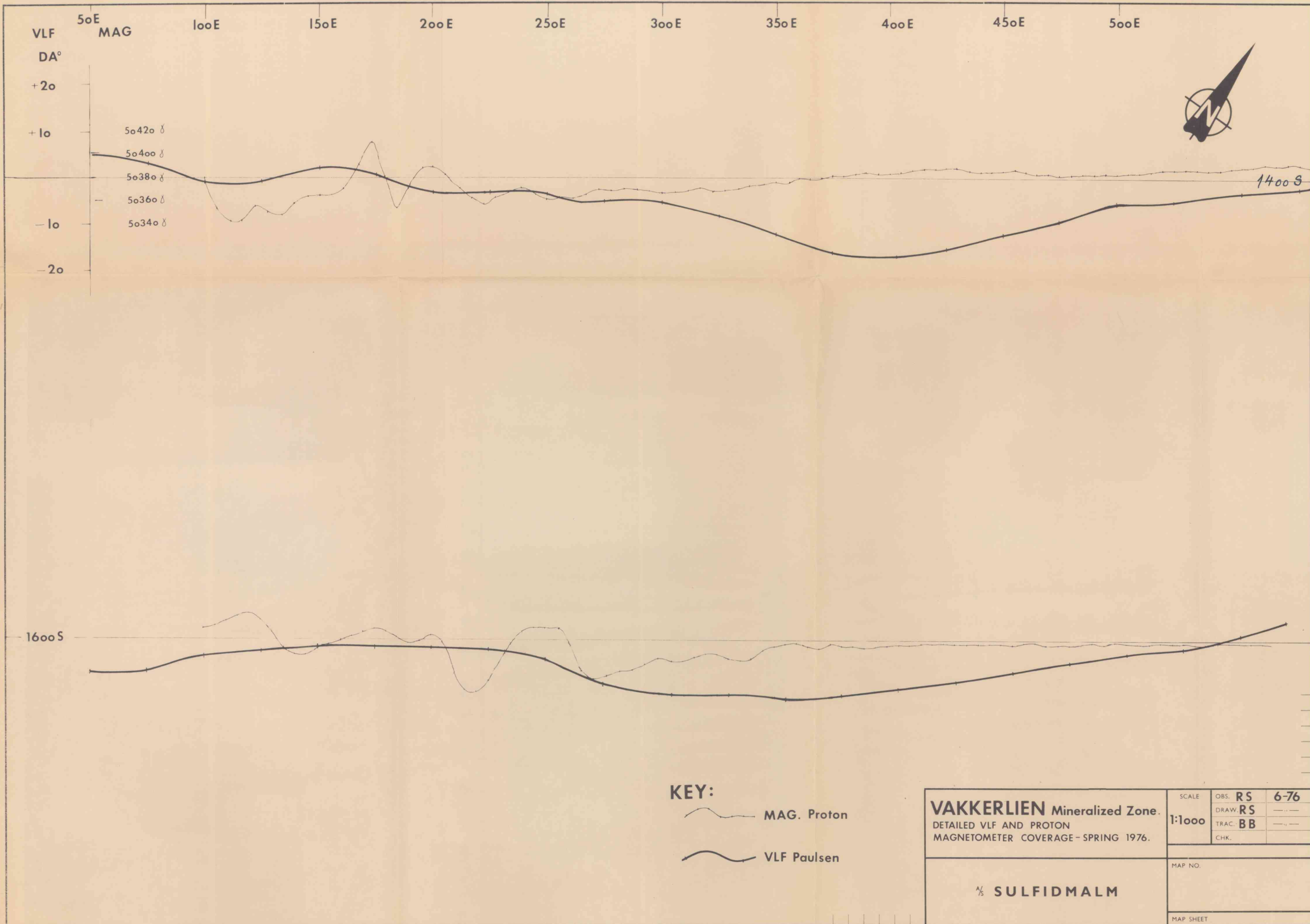
MAP NO.	3.
MAP SHEET	

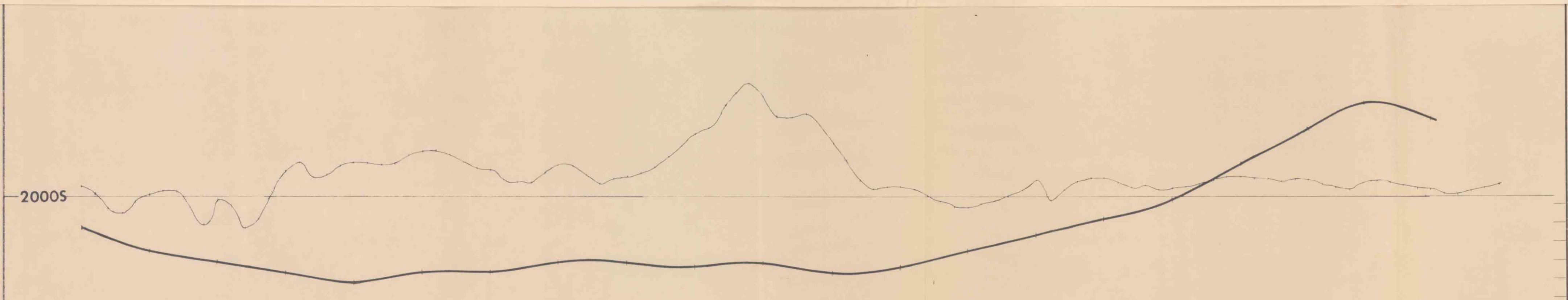
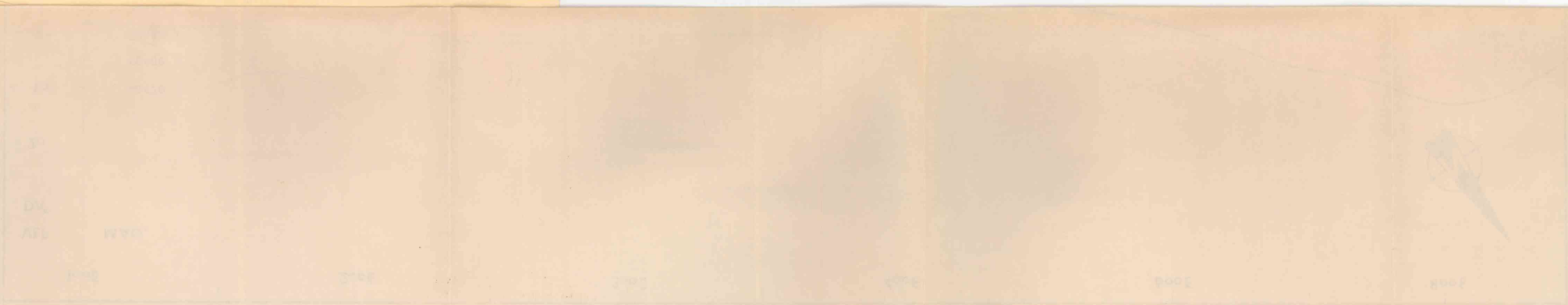












KEY:

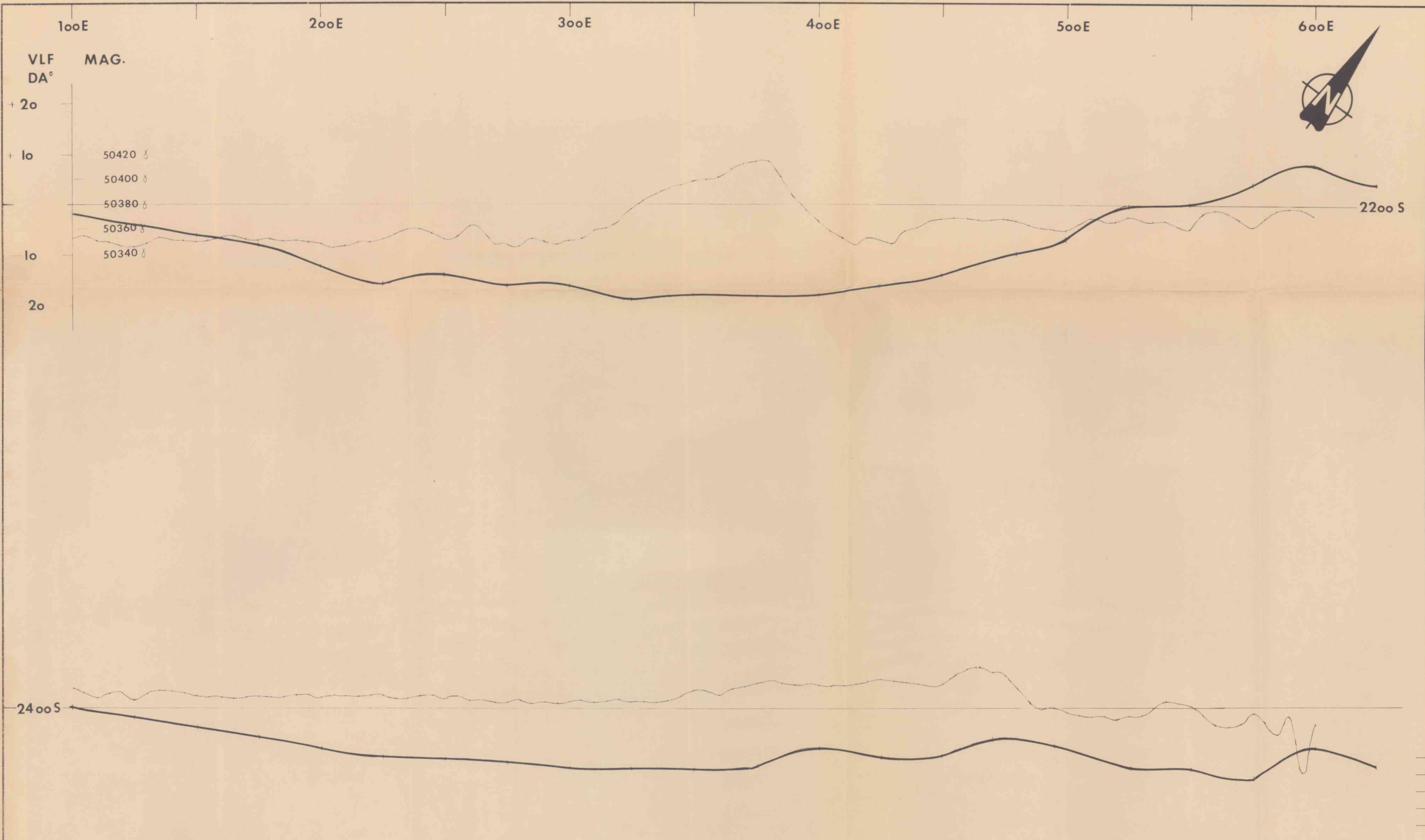
 **MAG. Proton**

 **VLF Paulsen**

VAKKERLIEN Mineralized Zone.
DETAILED VLF AND PROTON
MAGNETOMETER COVERAGE - SPRING 1976.

$\frac{1}{8}$ **SULFIDMALM**

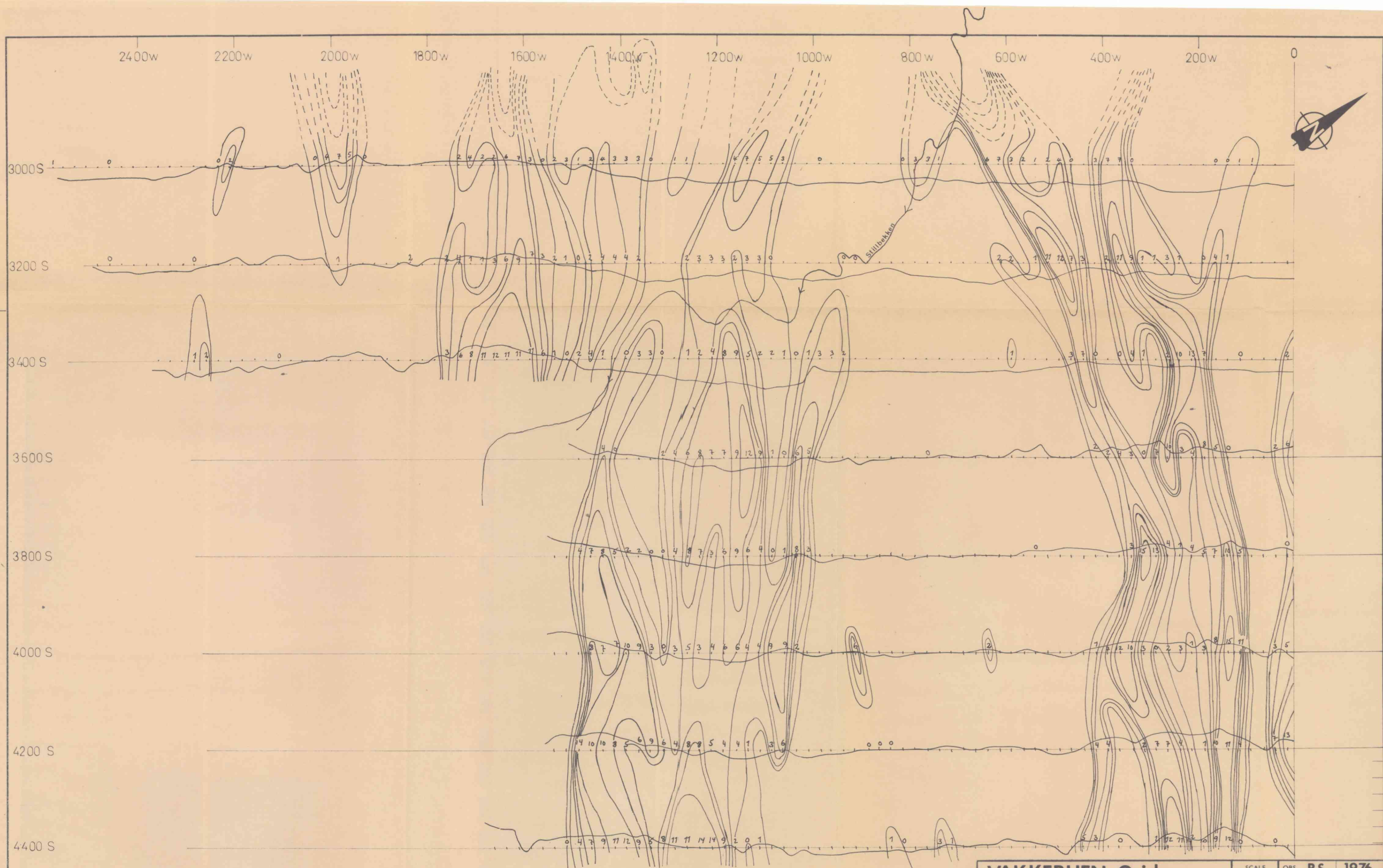
SCALE 1:1000	OBS. RS	6-76
	DRAW. RS	— — —
	TRAC. BB	— — —
	CHK.	
MAP NO.		
MAP SHEET		



KEY:

- MAG. Proton
- VLF Paulsen

VAKKERLIEN Mineralized Zone. DETAILED VLF AND PROTON MAGNETOMETER COVERAGE - SPRING 1976.	SCALE	OBS. RS	6-76
	1:1000	DRAW. RS	
		TRAC. BB	
		CHK.	
1/5 SULFIDMALM		MAP NO.	
		MAP SHEET	



VAKKERLIEN Grid

VLF-EM Survey
 Imag. Comp. and Fraser Calculated
 Dip Angle.

$\frac{1}{5}$ SULFIDMALM

SCALE	OBS. RS	1976
1-5000	DRAW. BB	—
	TRAC. BB-LN	—
	CHK.	—

MAP NO.	1.
MAP SHEET	