

3.3.3 Results of Hydrographic Survey

The results of hydrographic survey were finally compiled as smooth sheets. It should be noted that charted soundings on smooth sheets are placed in such a way that the center of gravity of the set of figures inclusive of decimals coincides with the position referred to.

(1) Confirmation of Wrecks

The charted wrecks identified for detailed investigation and confirmation were located at the following Sub-Areas and Points :

- ① Group Area 1 : Point j, Sub-Area A
- ② Group Area 2 : Point f
- ③ Group Area 3 : Point m, Sub-Area D
- ④ Group Area 4 : Point b, Point c
- ⑤ Group Area 5 : Point h, Point d, Point i, Point e,
Sub-Area E, Sub-Area F, Sub-Area G
- ⑥ Group Area 6 : Sub-Area I

These wrecks are either charted with approximate positions or reported positions and some of them have no information on the least depth (refer to Figures 3-15 to 3-25).

At each survey area and survey point, the sidescan sonar was operated simultaneously with echo sounder to achieve 100 % ensonification. The sidescan was set at 200 meters nominal range during the sounding of the normal 200-meter interval sounding lines. In case where wrecks were detected, the sounding lines were run at closer intervals, and the sidescan sonar switched to 100 meters nominal range to achieve a more detailed investigation.

All the charted wrecks identified for the Study have been investigated. The survey results for nineteen (19) unconfirmed wrecks are summarised in Table 3-9.

The sidescan sonar and echo sounder records of the wrecks confirmed are shown in the attached Appendix 8.

Sub-Area A (Group Area 1)

Scale 1:100,000

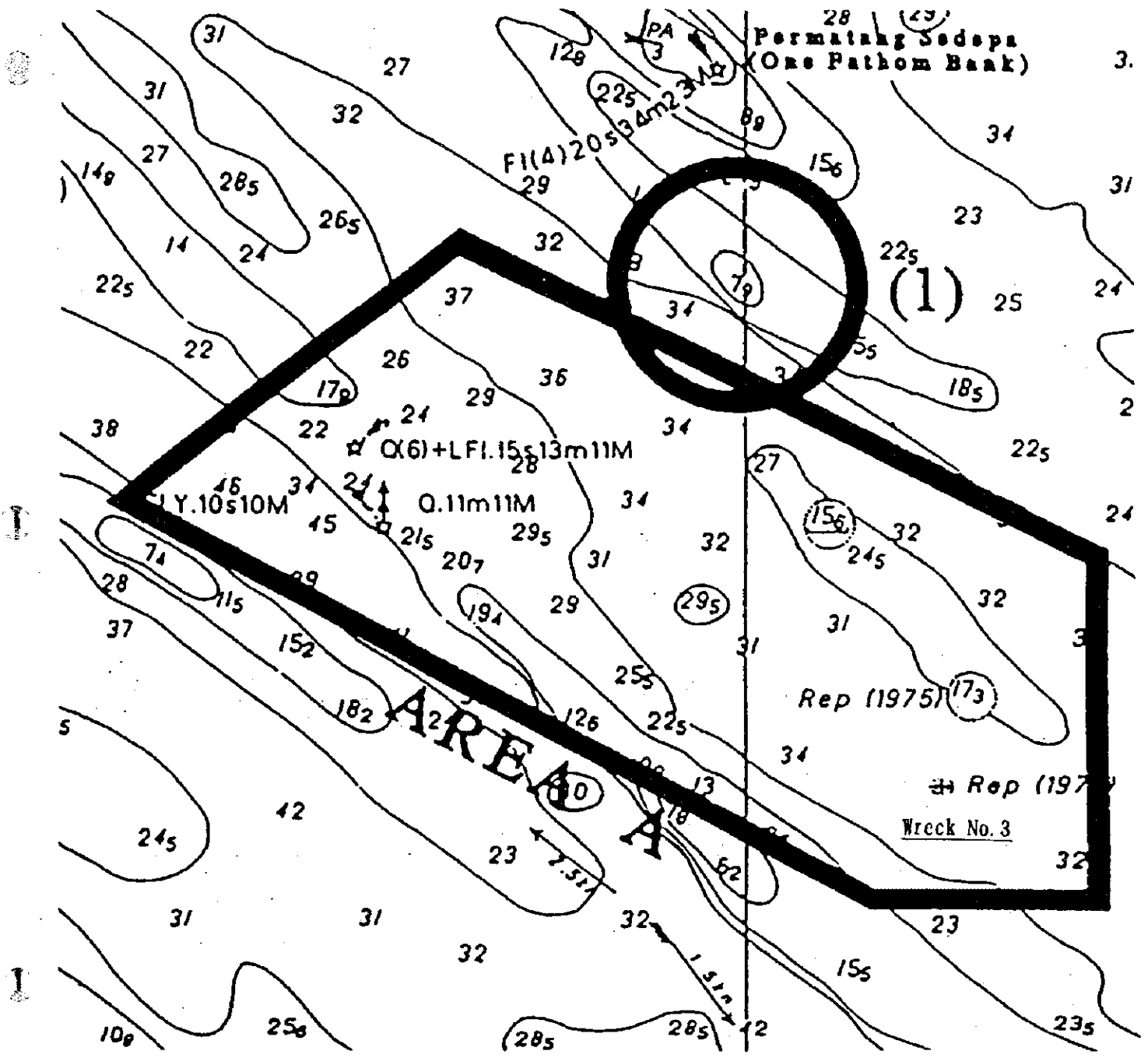


Chart No. MAL 515 (Scale 1:200,000)

Fig. 3-16 Copy of Existing Chart (Sunken Wrecks)

Point m & Sub-Area D (Group Area 3)

Scale 1:100,000

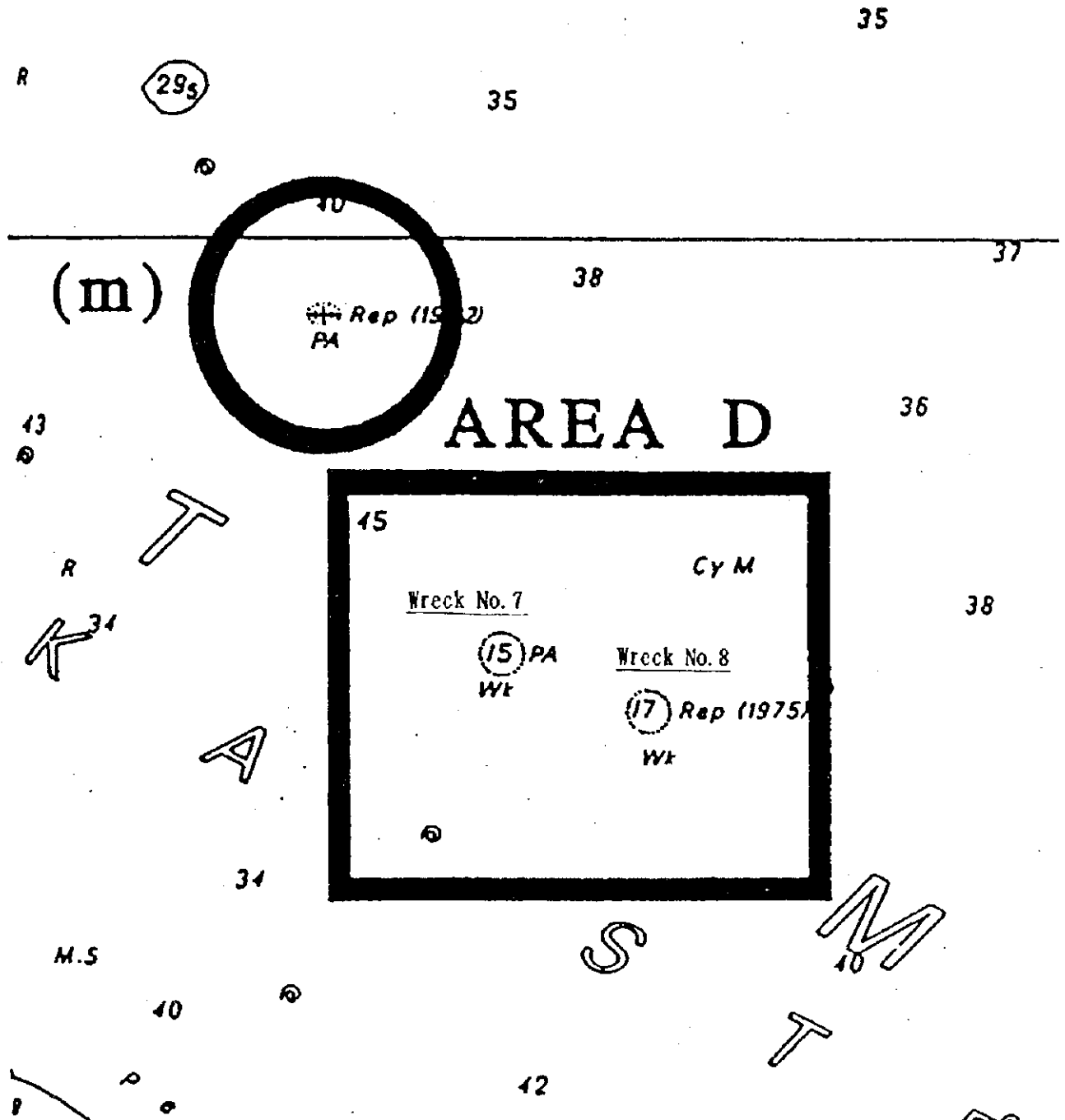


Chart No. MAL 515 (Scale 1:200,000)

Fig. 3-18 Copy of Existing Chart (Sunken Wrecks)

Point b (Group Area 4)

Scale 1:100,000

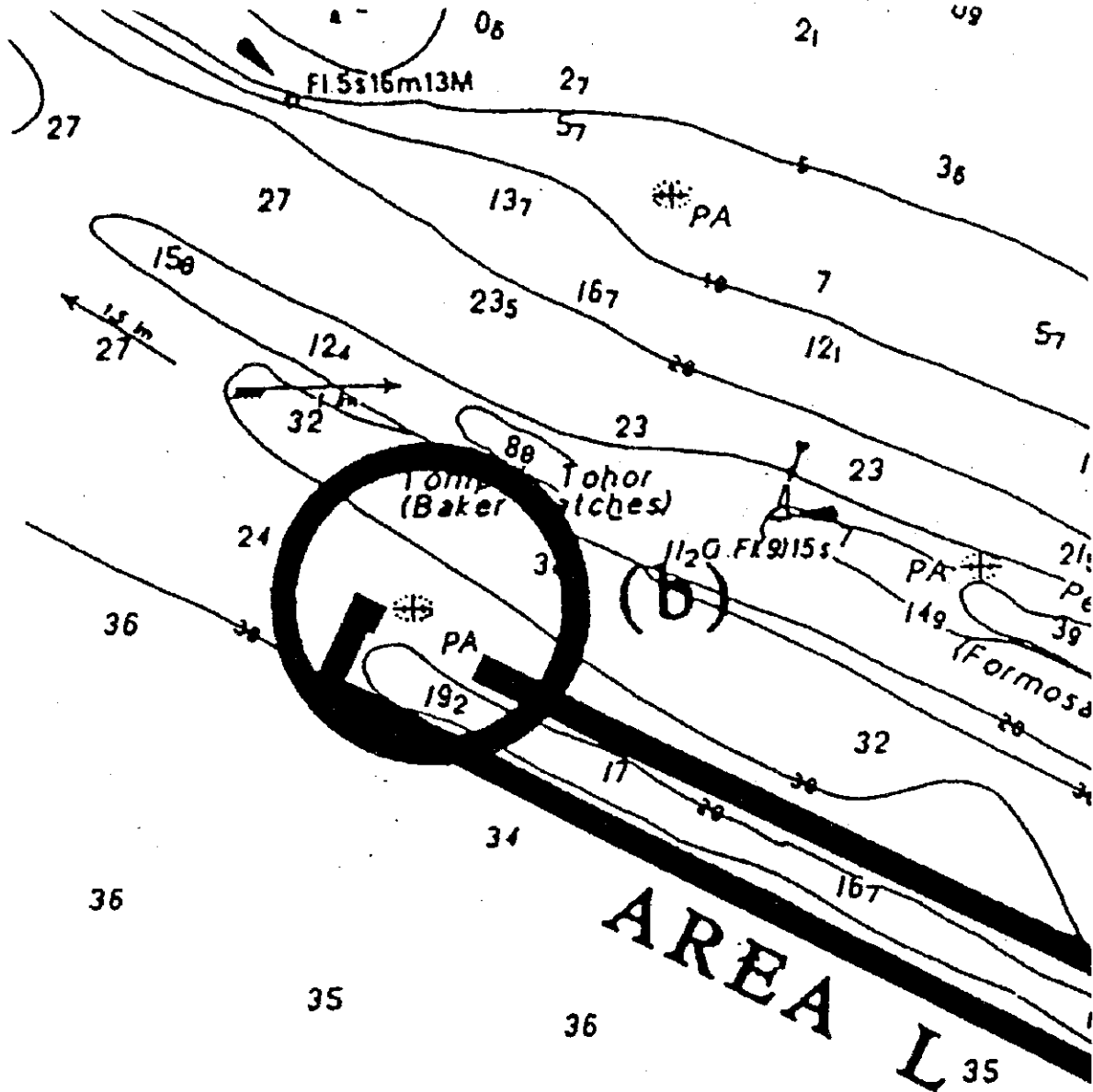


Chart No. MAL 515 (Scale 1:200,000)

Fig. 3-19 Copy of Existing Chart (Sunken Wrecks)

Point c (Group Area 4)

Scale 1:100,000

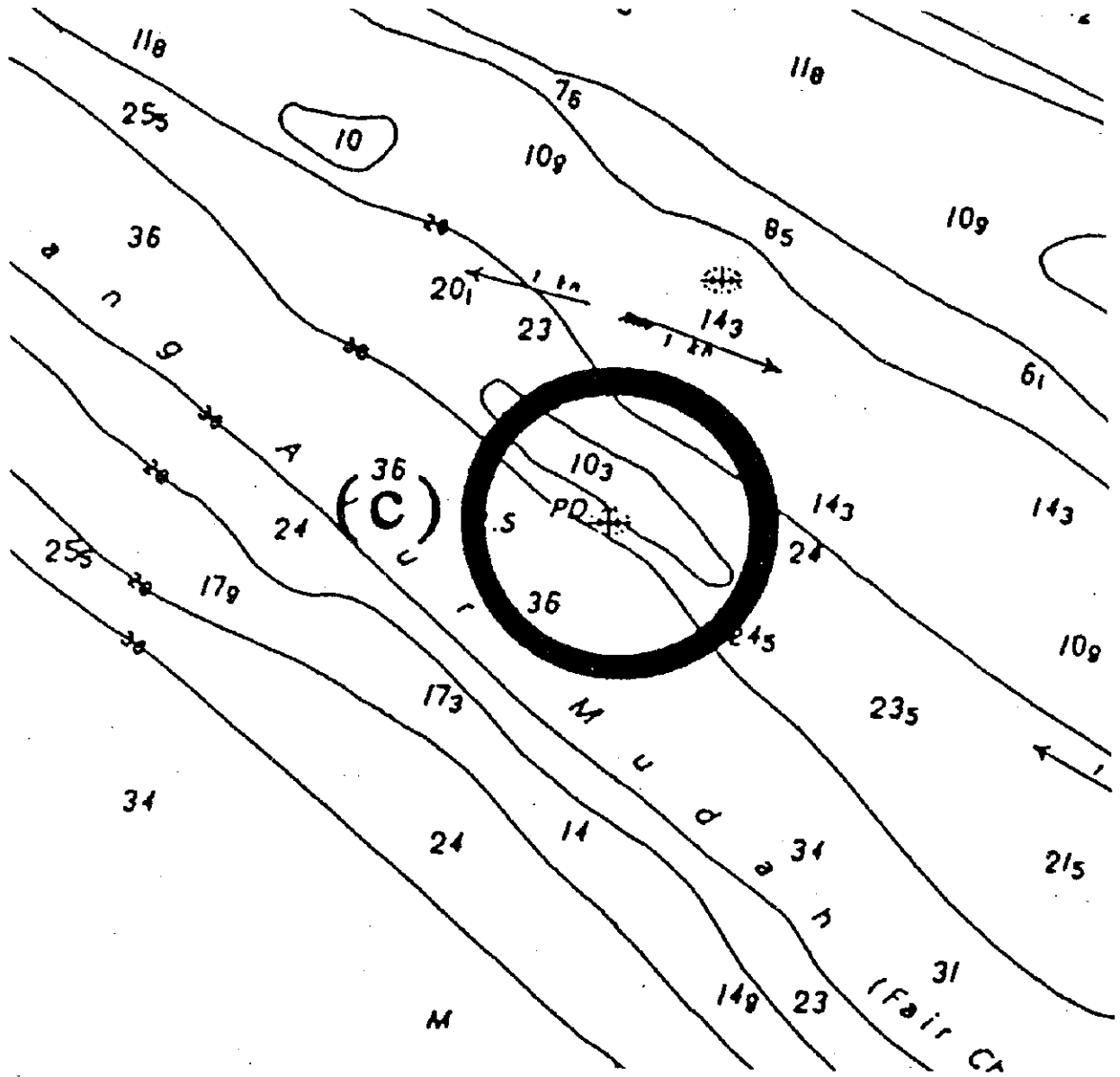


Chart No. MAL 515 (Scale 1:200,000)

Fig. 3-20 Copy of Existing Chart (Sunken Wrecks)

Point h & Sub-Area E (Group Area 5)

Scale 1:100,000

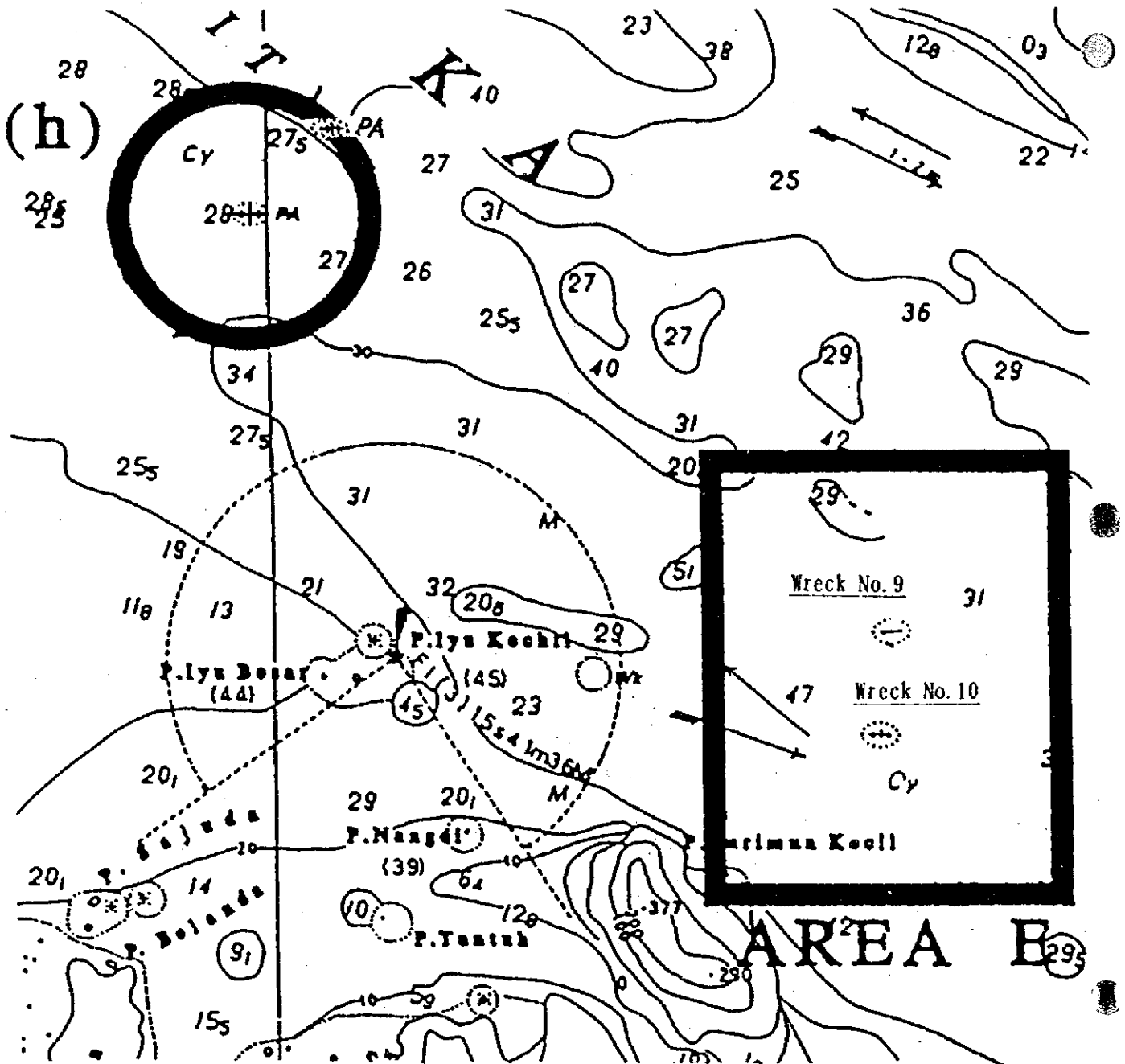


Chart No. MAL 515 (Scale 1:200,000)

Fig. 3-21 Copy of Existing Chart (Sunken Wrecks)

Sub-Area F (Group Area 5)

Scale 1:100,000

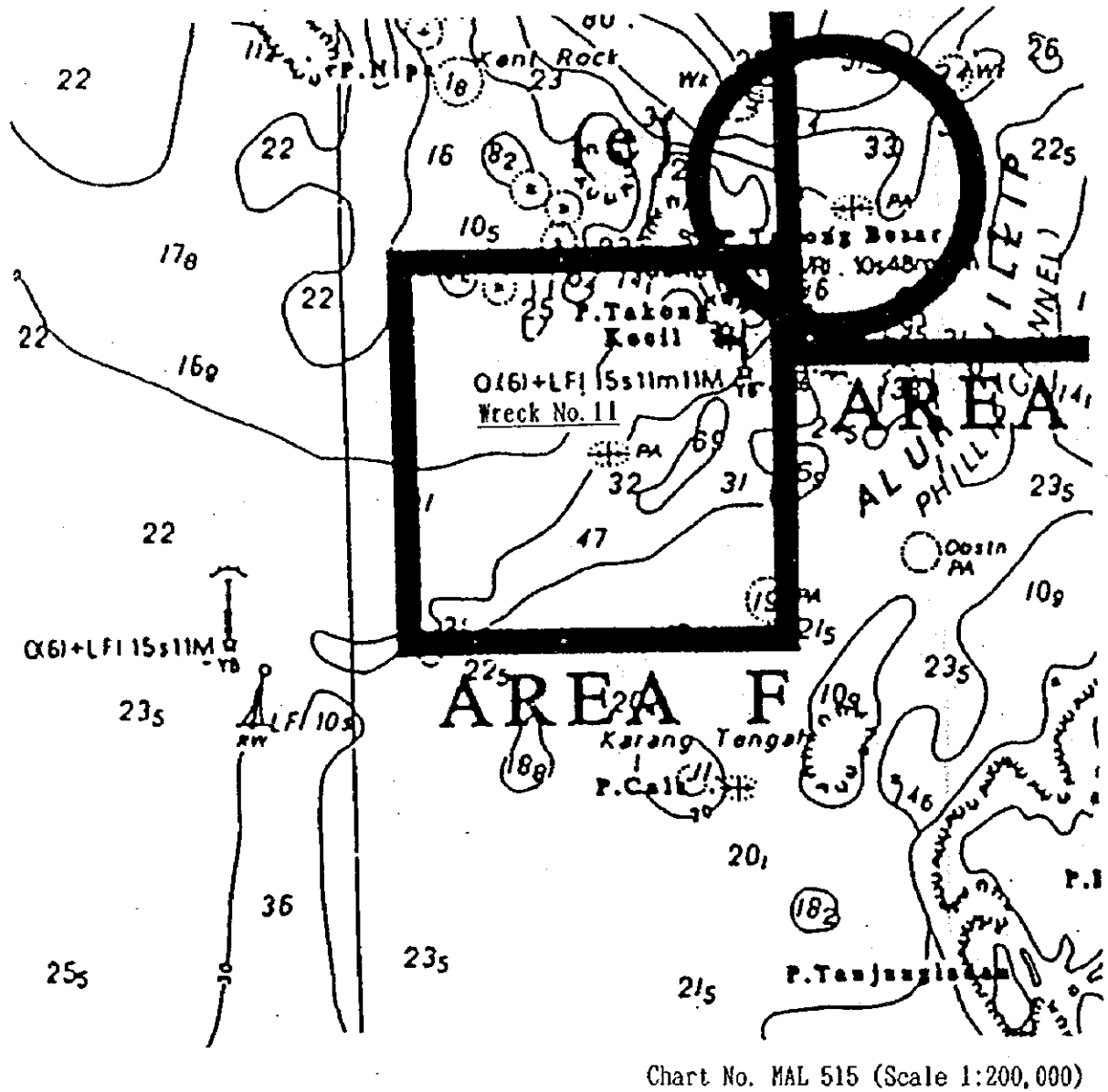


Fig. 3-23 Copy of Existing Chart (Sunken Wrecks)

Sub-Area I (Group Area 6)

Scale 1:100,000

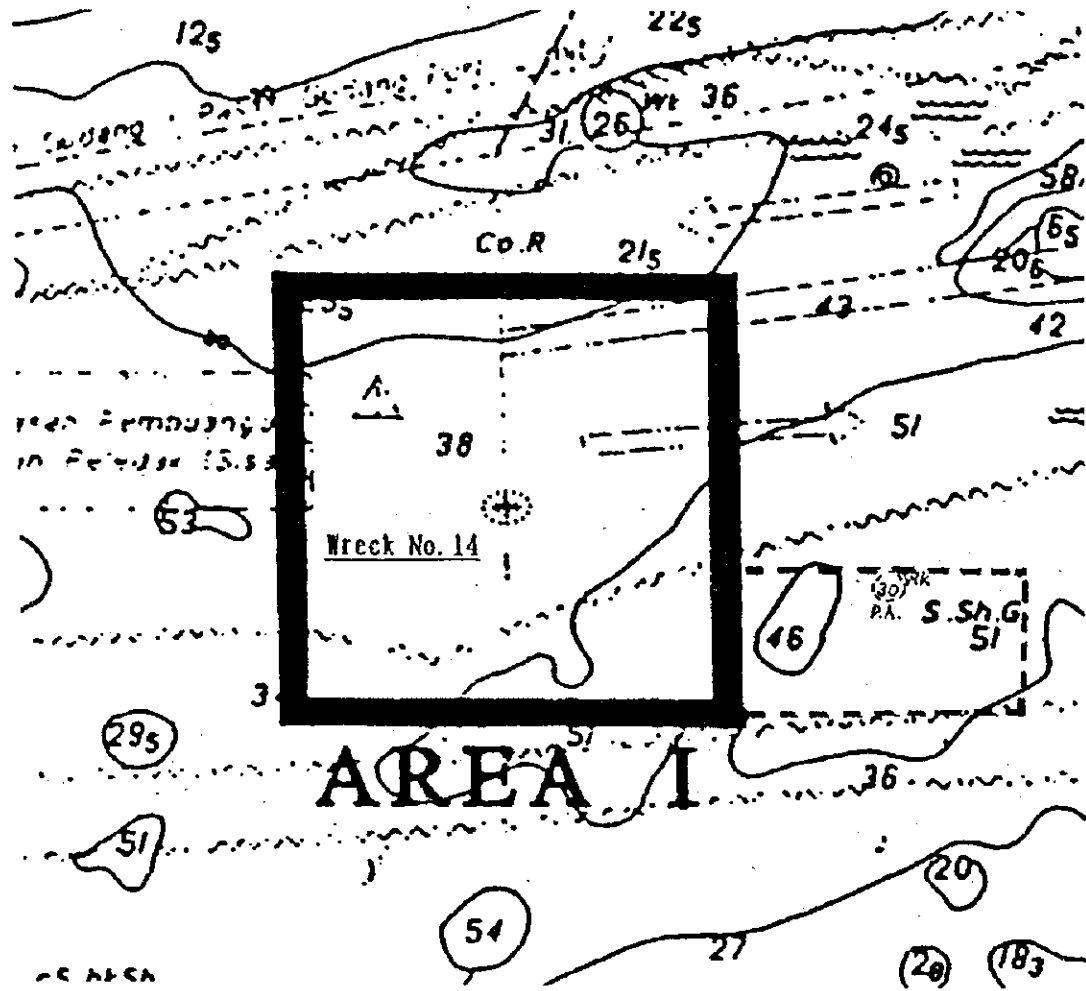


Chart No. MAL 515 (Scale 1:200,000)

Fig. 3-25 Copy of Existing Chart (Sunken Wrecks)

Table 3-9 Findings of Sunken Wrecks

Survey Area	Unconfirmed Information on Existing Charts/List		Confirmed Information (Surveyed Results)		Remarks
	Description on Chart	Position	Position (WGS-84)	Least Depth	
Point j	Wreck (PA)	2° 58' 12" N 100° 49' 30" E	2° 58' 35" N 100° 49' 35" E	23.6 m (4 m)	ADHAS (489 G.T.) 26.01.1980
			2° 57' 35" N 100° 48' 16" E	22.3 m (3 m)	
Sub-Area A	Wreck (Rep) [No. 3]	2° 46' 00" N 101° 02' 06" E	2° 48' 39" N 101° 03' 03" E	27.5 m (5 m)	CAHAYA BARU 10.10.1972
			2° 47' 27" N 100° 57' 01" E	43 m (4 m)	Obstruction
Point f	Wreck (PA)	2° 28' 00" N 101° 35' 24" E	2° 28' 37" N 101° 35' 50" E	44 m (2 m)	Steel Lighter
Point m	Wreck (PA) (Rep)	1° 59' 18" N 102° 12' 24" E	1° 58' 06" N 102° 12' 03" E	45 m (3 m)	JIH SHENG (785 G.T.) 24.11.1992
Sub-Area D	Wreck (PA) 15 m [No. 7]	1° 56' 06" N 102° 14' 06" E	1° 54' 19" N 102° 15' 18" E	40 m (5 m)	OH YANG NO. 57 29.03.1973
	Wreck (Rep) 17 m [No. 8]	1° 55' 30" N 102° 15' 24" E	NOT FOUND		
Point b	Wreck (PA)	1° 46' 24" N 102° 43' 18" E	NOT FOUND		Junk
Point c	Wreck (PD)	1° 34' 00" N 103° 05' 00" E	NOT FOUND		Tronoh (208 G.T.)
Point h	Wreck (PA)	1° 15' 48" N 103° 19' 48" E	1° 15' 53" N 103° 19' 48" E	24.2 m (5 m)	SAMBU INDAH (45 G.T.) 24.07.1988
	Wreck (PA)	1° 16' 30" N 103° 20' 30" E	1° 16' 55" N 103° 21' 02" E	31 m (2 m)	

(to be continued)

Survey Area	Unconfirmed Information on Existing Charts/List		Confirmed Information (Surveyed Results)		Remarks
	Description on Chart	Position	Position (WGS-84)	Least Depth	
Sub-Area E	Wreck (No. 9)	1° 11' 48" N 103° 25' 54" E	1° 11' 06" N 103° 27' 23" E	38 m (4 m)	MV NIAGA 40 (834 G.T.) 07.09.1986
	Wreck (No. 10)	1° 10' 48" N 103° 25' 48" E	NOT FOUND		
Point d	Wreck (PA)	1° 12' 12" N 103° 34' 18" E	1° 12' 45" N 103° 35' 05" E	25.0 m (2-3 m)	MV EKADJAYA (154 G.T.) 08.09.1978
Point i	Wreck (PA)	1° 11' 06" N 103° 33' 00" E	1° 11' 14" N 103° 35' 26" E	28.9 m (5 m)	Tug 06.03.1974
Sub-Area F	Wreck (PA) (No. 11)	1° 05' 12" N 103° 42' 06" E	1° 05' 47" N 103° 41' 54" E	20.4 m (4 m)	21.03.1977
Point e	Wreck (PA)	1° 07' 24" N 103° 44' 12" E	1° 07' 48" N 103° 43' 56" E	43 m (5-6 m)	Tug 14.10.1978
Sub-Area G	Wreck (PA) (No. 12)	1° 07' 36" N 103° 45' 24" E	1° 06' 45" N 103° 44' 31" E	42 m (4-5 m)	MV SINLAUT (71 G.T.) 01.07.1981
Sub-Area I	Wreck (PA) (No. 14)	1° 16' 00" N 104° 15' 00" E	1° 17' 10" N 104° 15' 29" E	35 m (3 m)	Sampan 26.09.1988
	Wreck (PA) 30 m	1° 15' 30" N 104° 17' 48" E	1° 15' 25" N 104° 18' 19" E	29m(mast) 53m(hull) (30 m)	JENSON (726 G.T.) 01.01.1991

- [Note] 1) PA : Position Approximate
 2) Rep : Reported
 3) PD : Position Doubtful
 4) Values in bracket of "Least Depth" column : Heights of Wrecks

The existence of fifteen wrecks within nineteen wrecks were confirmed and four wrecks in Sub-Areas D, E and Points b, c were confirmed of no existence in the reported areas. Other two wrecks or obstructions, whose existences are not reported, were found in Sub-Area A and Point j.

Point j (Group Area 1)

The wreck at Point j (see Figure 3-15) was not found at the charted position. However, one wreck (2° 58' 35" N, 100° 49' 35" E) with least depth of 23.6 meters was found 0.4 nautical miles north of Point j, and another (2° 57' 35" N, 100° 48' 16" E) with least depth of 22.3 meters was found 1.4 nautical miles southwest of Point j (see Figure 3-26).

Sub-Area A (Group Area 1)

The reported wreck (Wreck No. 3) in Sub-Area A (see Figure 3-16) was not found at the charted position. One wreck (2° 48' 39" N, 101° 03' 03" E) with least depth of 27.5 meters was found 2.8 nautical miles north northeast of the charted position and the other obstruction (2° 47' 27" N, 100° 57' 01" E) with least depth of 43 meters was found 5.3 nautical miles west northwest of Wreck No. 3 (see Figure 3-27).

Point f (Group Area 2)

The wreck at Point f (see Figure 3-17) was not found at the charted position. One wreck (2° 28' 37" N, 101° 35' 50" E) with least depth of 44 meters was found 0.8 nautical miles northeast of the charted position (see Figure 3-28).

Point m (Group Area 3)

The reported wreck charted as "PA" at the center of the survey area Point m (see Figure 3-18) was found at 1.2 nautical miles south southwest of the charted position with least depth of 45 meters (see Figure 3-29).

Sub-Area D (Group Area 3)

In Sub-Area D, two wrecks are charted in the survey area (see Figure 3-18). One wreck (Wreck No. 7, 1° 56' 06" N, 102° 14' 06" E) is charted as "PA" with least depth of 15 meters and the other reported wreck (Wreck No. 8, 1° 55' 30" N, 102° 15' 24" E) with least depth of 17 meters.

One wreck (1° 54' 19" N, 102° 15' 18" E) was found 1.1 nautical miles south of the charted position of Wreck No. 8 with least depth of 40 meters (see Figure 3-30).

The survey area was extended both to the east and west, 1.2 kilometers each in this area. Any more wreck, however, was not found in the area concerned.

By the check of the 'History of Wrecks & Obstruction (Notices to Mariners)', the detail of the reported wreck (Wreck No. 8) is not clear. Some Document describes that Wreck No. 8 will be the same wreck with Wreck No. 7.

Point b (Group Area 4)

The wreck charted as "PA" at the center of the survey area Point b (see Fig. 3-19) was not found except the existence of small substances, although rather flat sandy muds are deposited (see Figure 3-31).

Point c (Group Area 4)

The wreck charted as "PD" at the center of Point c (see Figure 3-20) was also not found except the existence of small substances (see Figure 3-32).

Point h (Group Area 5)

The wreck charted as "PA" at the center of the survey area Point h (see Fig. 3-21) was found at the nearest position of its charted one with least depth of 24.2 meters (see Figure 3-33).

An investigation was also carried out to examine the new wreck (1° 16' 30" N, 103° 20' 30" E) reported on January 29, 1996 at the northeast border of the survey area. This wreck was confirmed to be at 0.7 nautical miles northeast of its reported position with least depth of 31 meters (see Figure 3-33).

Sub-Area E (Group Area 5)

In Sub-Area E, two wrecks (Wrecks No. 9 & 10) are charted in the survey area on the Malaysia chart: Chart No. MAL 515 (see Figure 3-21). However, only one wreck is charted on the Singapore charts: Charts No. 201 and 202.

On the other hand, the following descriptions are seen in the 'History of Wrecks & Obstruction' :

(Date)	(Authority)	(Particulars)
12/10/87	DG SEA COMM.	Salvage work to remove the wreck of MV NIAGA XI. Position 1° 11' 35" N, 103° 26' 16" E has been doing.
11/11/87	DG SEA COMM.	The wreck of MV NIAGA XI. Position 1° 11' 35" N, 103° 26' 16" E has been removed.
16/12/87	DG SEA COMM.	Confirming that the wreck of MV NIAGA XI was salvaged.

The results of the detailed investigation in this area shows that one wreck exists near the eastern border of the survey area, 1.6 nautical miles east of the charted position of Wreck No.10, with least depth of 38 meters (see Fig. 34). However, we are not sure whether this found wreck is MV Niaga or not.

Point d (Group Area 5)

The wreck at Point d (see Figure 3-22) was not found at the charted position. One wreck (1° 12' 45" N, 103° 35' 05" E) with least depth of 25.0 meters was found 0.9 nautical mile northeast of Point d (see Figure 3-35).

Point i (Group Area 5)

The wreck at Point i (see Figure 3-22) was not found at the charted position. One wreck (1° 11' 14" N, 103° 35' 26" E) with least depth of 28.9 meters was found 2.4 nautical miles east of Point i (see Figure 3-35).

Sub-Area F (Group Area 5)

The wreck (Wreck No.11) charted as 'PA' in Sub-Area F (see Figure 3-23) was not found at the charted position. One wreck (1° 05' 47" N, 103° 41' 54" E) was found 0.6 nautical miles north northwest of the charted position with least depth of 20.4 meters (see Figure 3-36).

Point e (Group Area 5)

The wreck charted as 'PA' at Point e (see Figure 3-24) was not found at the charted position. One wreck (1° 07' 48" N, 103° 43' 56" E) was found 0.5 nautical miles northwest of the charted position with least depth of 43 meters (see Figure 3-37).

Sub-Area G (Group Area 5)

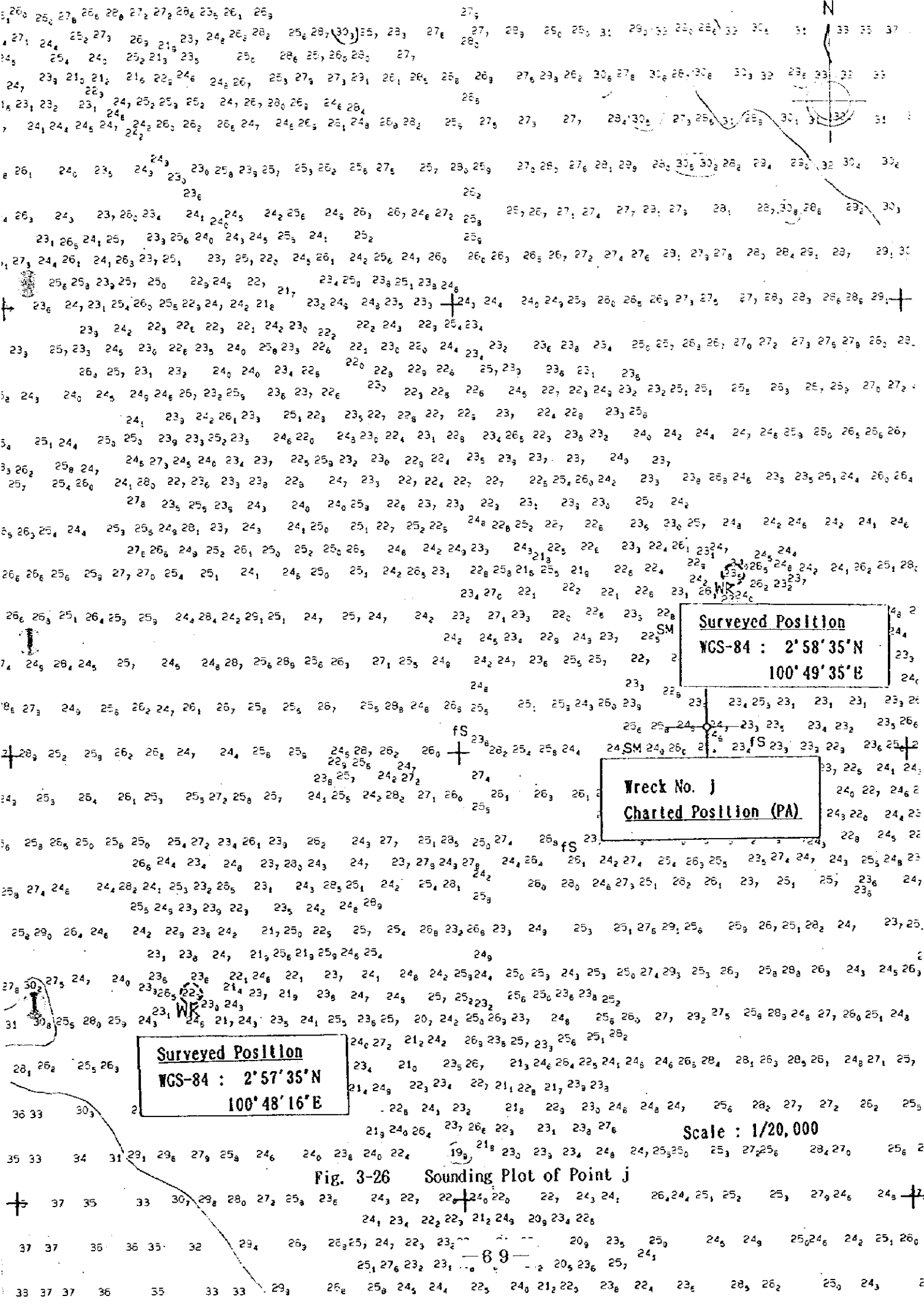
The wreck (Wreck No.12) charted as 'PA' in Sub-Area G (see Figure 3-24) was not found at the charted position. One wreck (1°06'45"N, 103°44'31"E) was found 1.2 nautical miles southwest of Wreck No.12 with least depth of 42 meters (see Figure 3-37).

Sub-Area I (Group Area 6)

In Sub-Area I, Wreck No.14 (see Figure 3-25) at the center of the survey area was found at 1.2 nautical miles northeast of its charted position with least depth of 35 meters (see Figure 3-38).

An investigation was also carried out to examine the wreck charted as 'PA' in the extended area eastward. This wreck was confirmed to be at 0.5 nautical miles east of its charted position with least depth of 29 meters. This depth of 29 meters is thought to be the least depth of the mast and the hull is reckoned to have a least depth of 53 meters. The height of the wreck is 30 meters above the seabed.

N



Surveyed Position
 WGS-84 : 2° 58' 35" N
 100° 49' 35" E

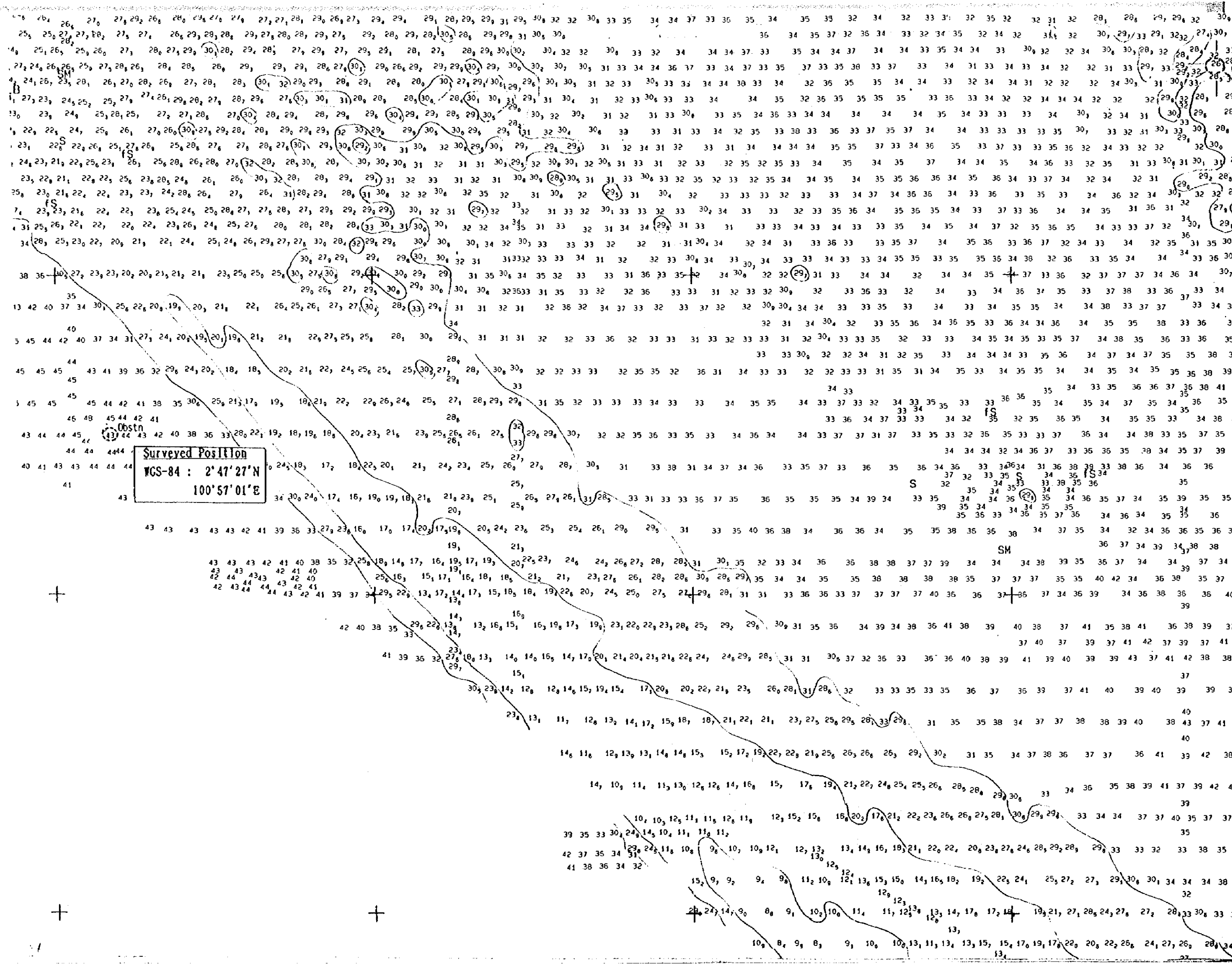
Wreck No. J
Charted Position (PA)

Surveyed Position
 WGS-84 : 2° 57' 35" N
 100° 48' 16" E

Scale : 1/20,000

Fig. 3-26 Sounding Plot of Point j

69



Surveved Position
WGS-84 : 2'47'27"N
100'57'01"E

Obstn

SM

S



13

27



Surveyed Position
WGS-84 : 2°48'39"N
101°03'03"E

Wreck No. 3
Charted Position (Rep)

Fig. 3-27 Sounding Plot of Sub-Area A Scale : 1/20,000

70

Point f

1/20,000

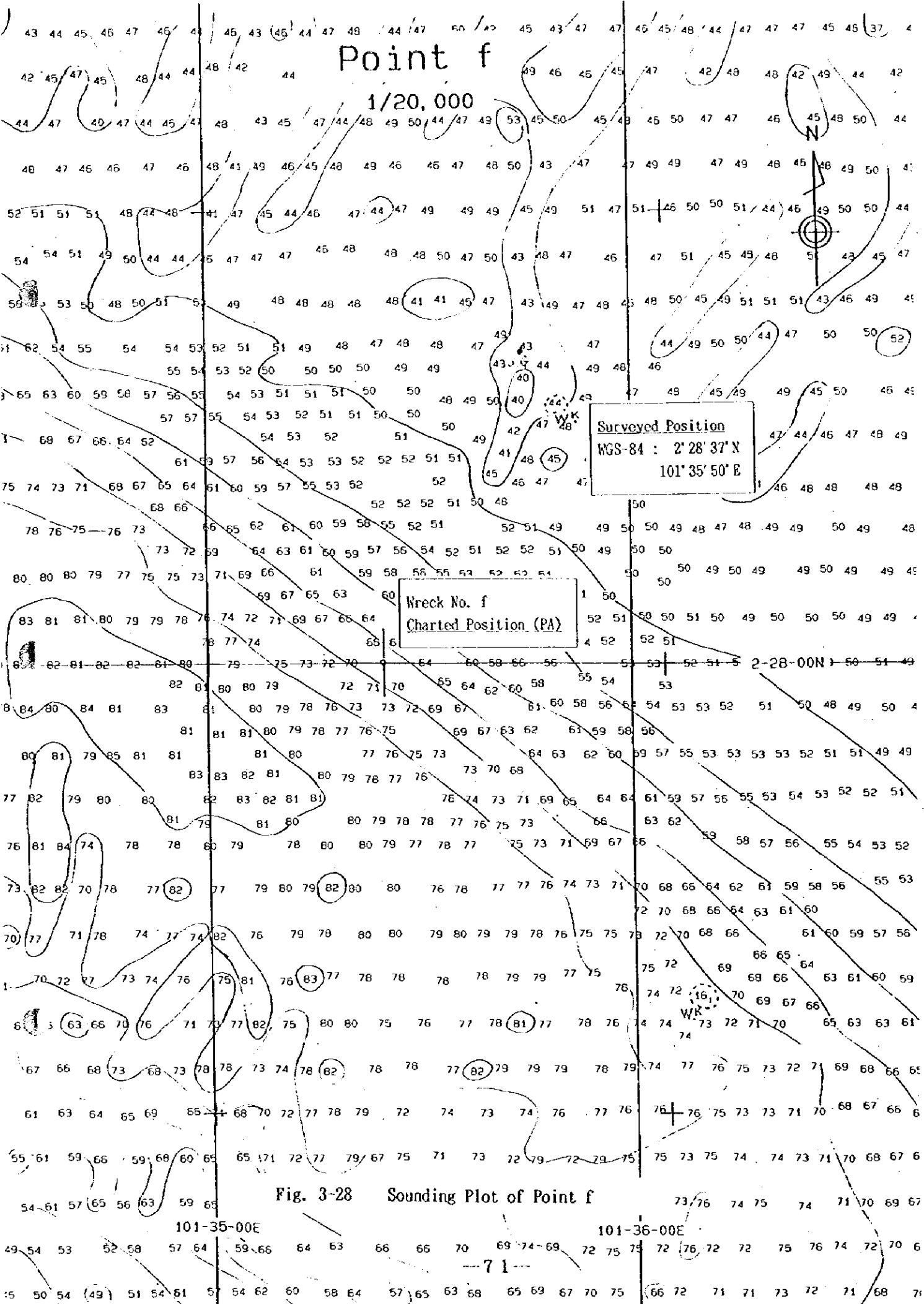
Surveyed Position
WGS-84 : 2°28'37"N
101°35'50"E

Wreck No. f
Charted Position (PA)

Fig. 3-28 Sounding Plot of Point f

101-35-00E

101-36-00E



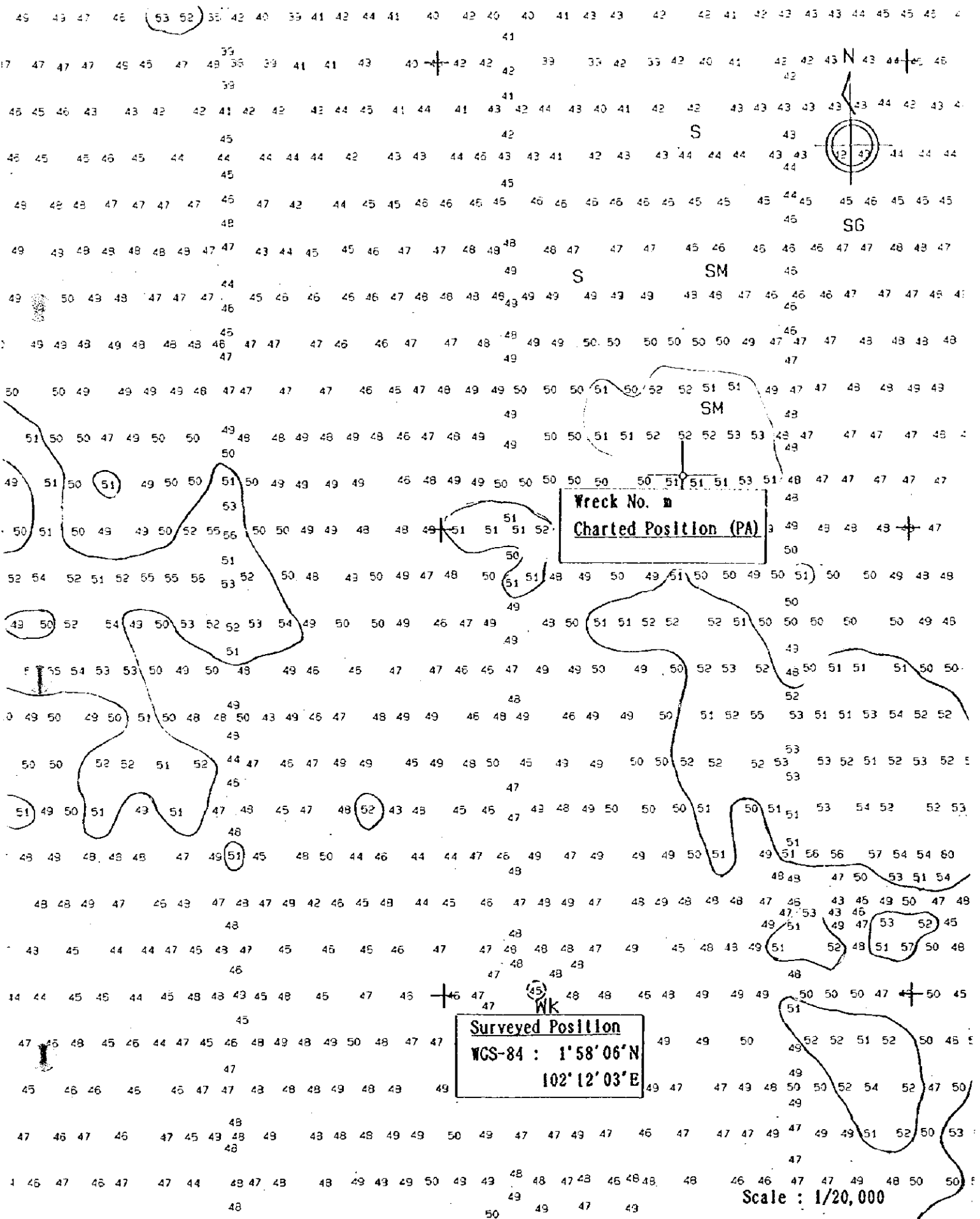
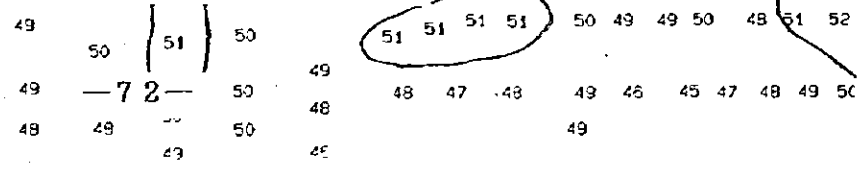


Fig. 3-29 Sounding Plot of Point m



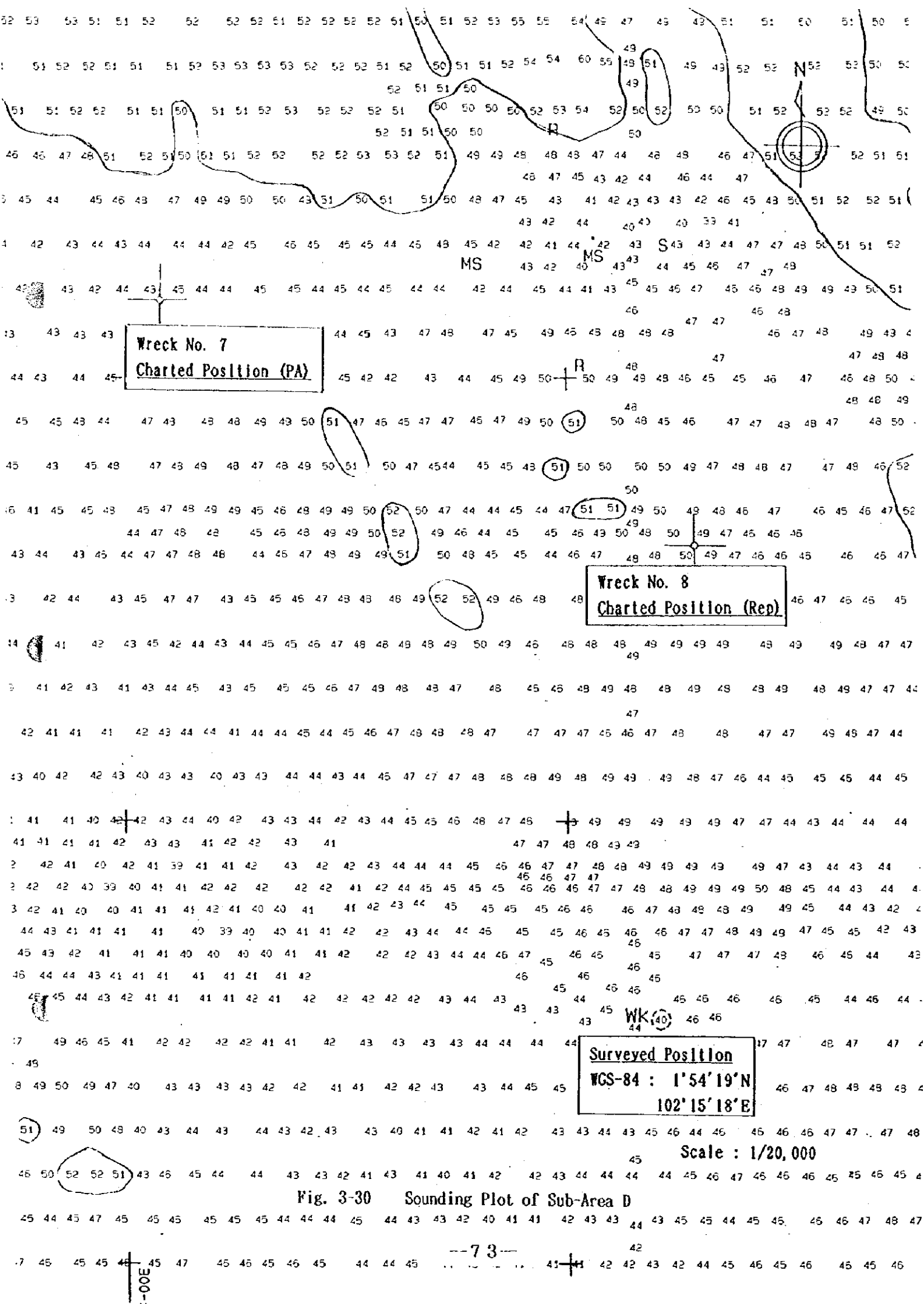


Fig. 3-30 Sounding Plot of Sub-Area D

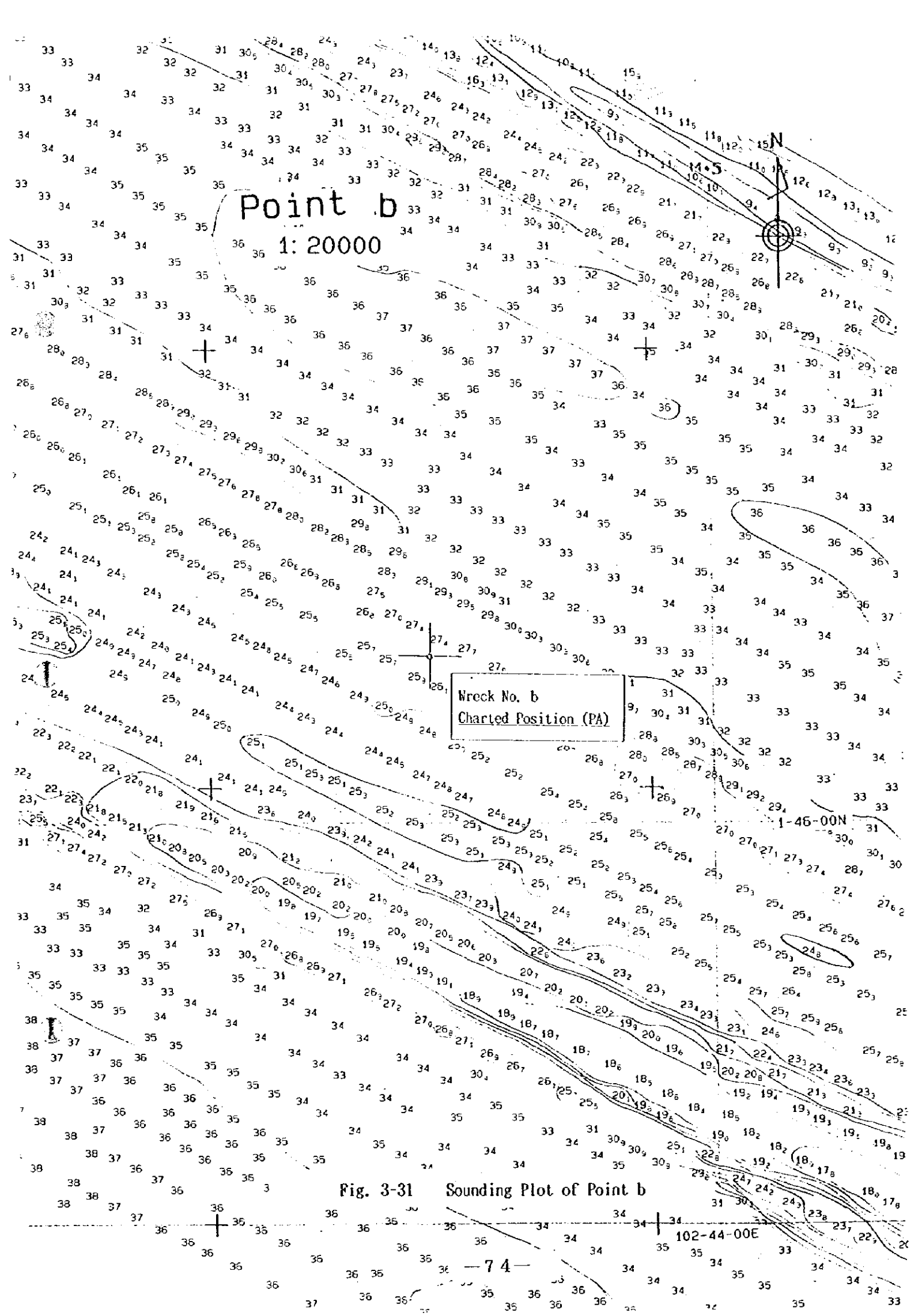
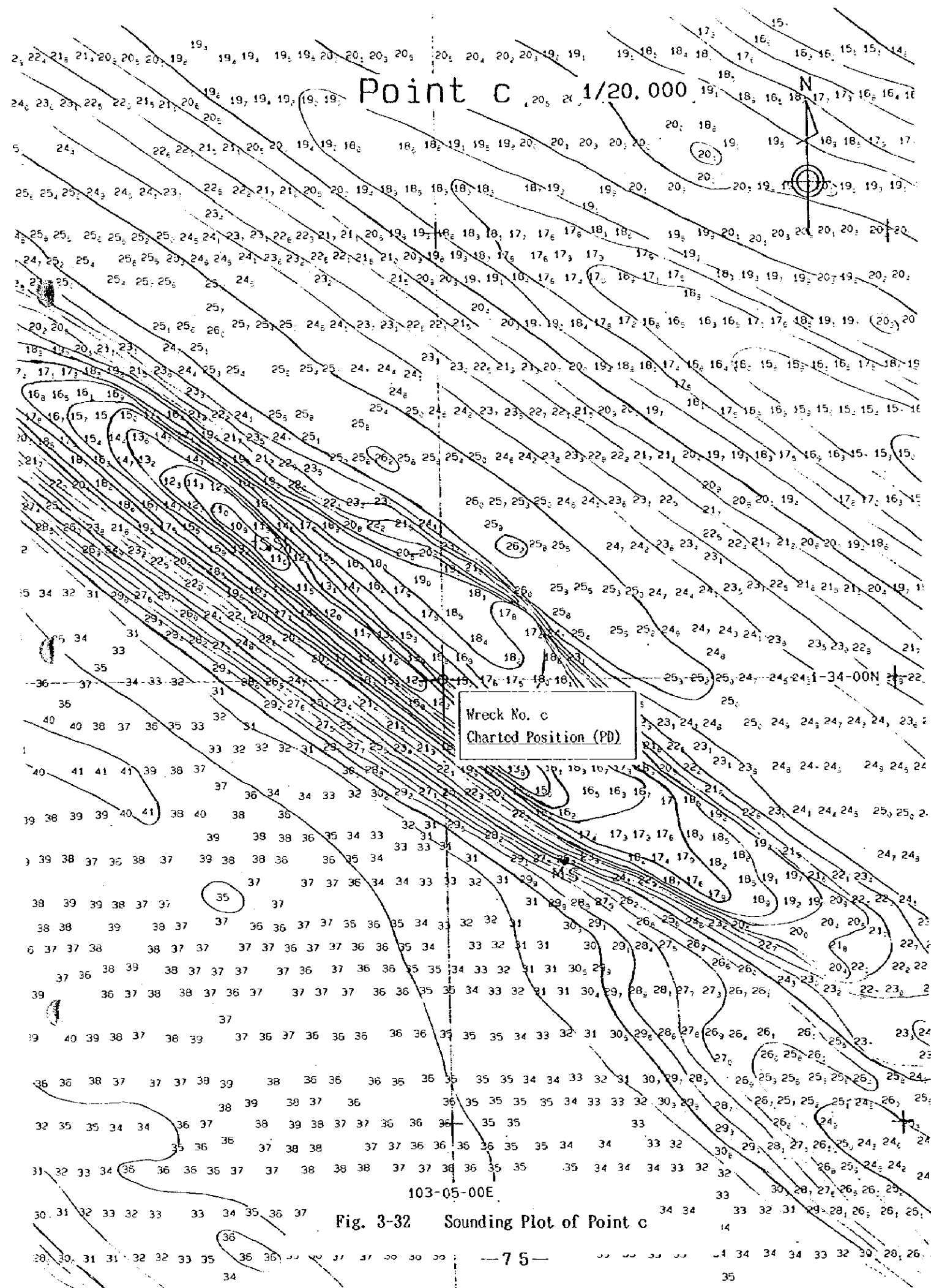


Fig. 3-31 Sounding Plot of Point b



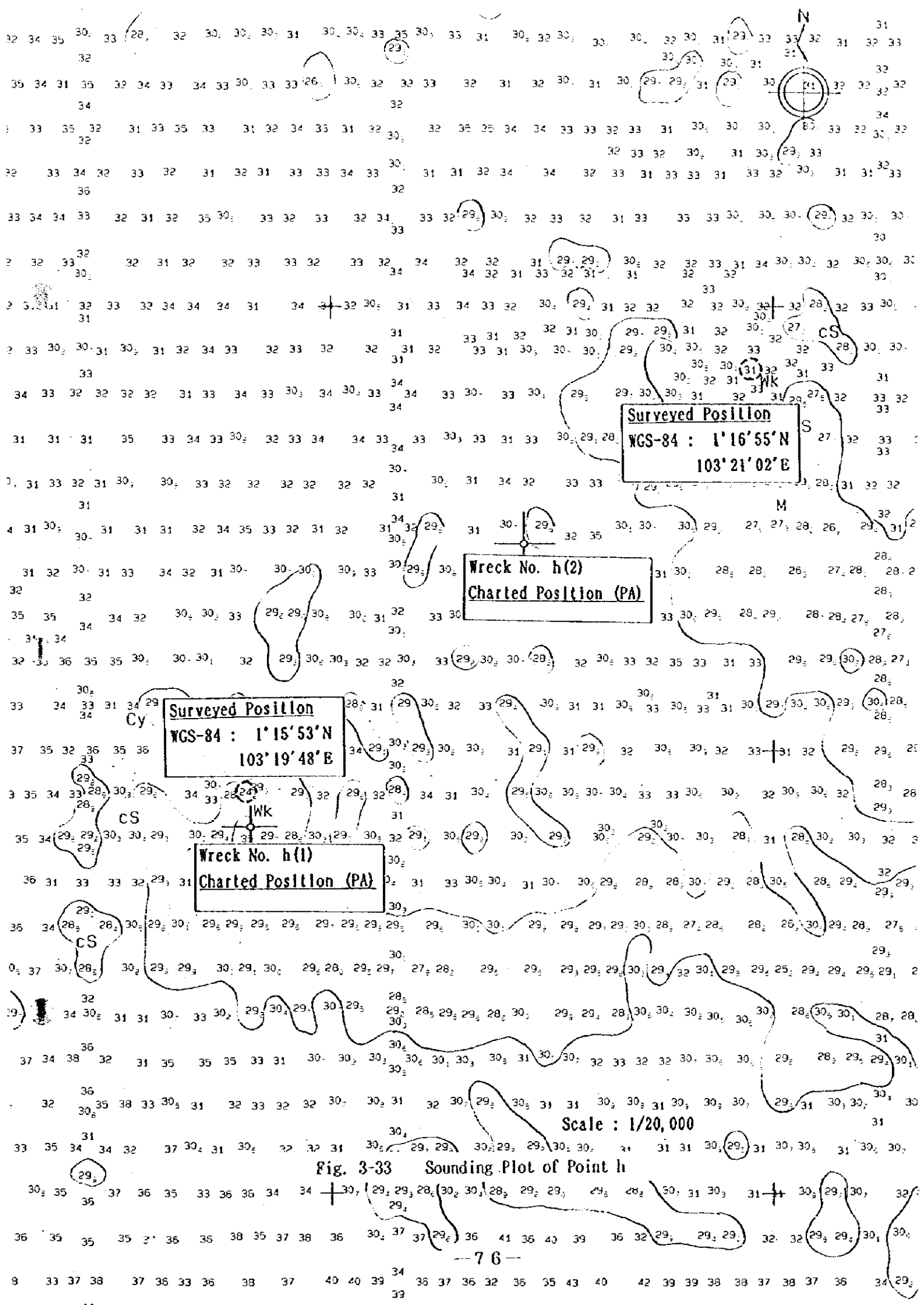
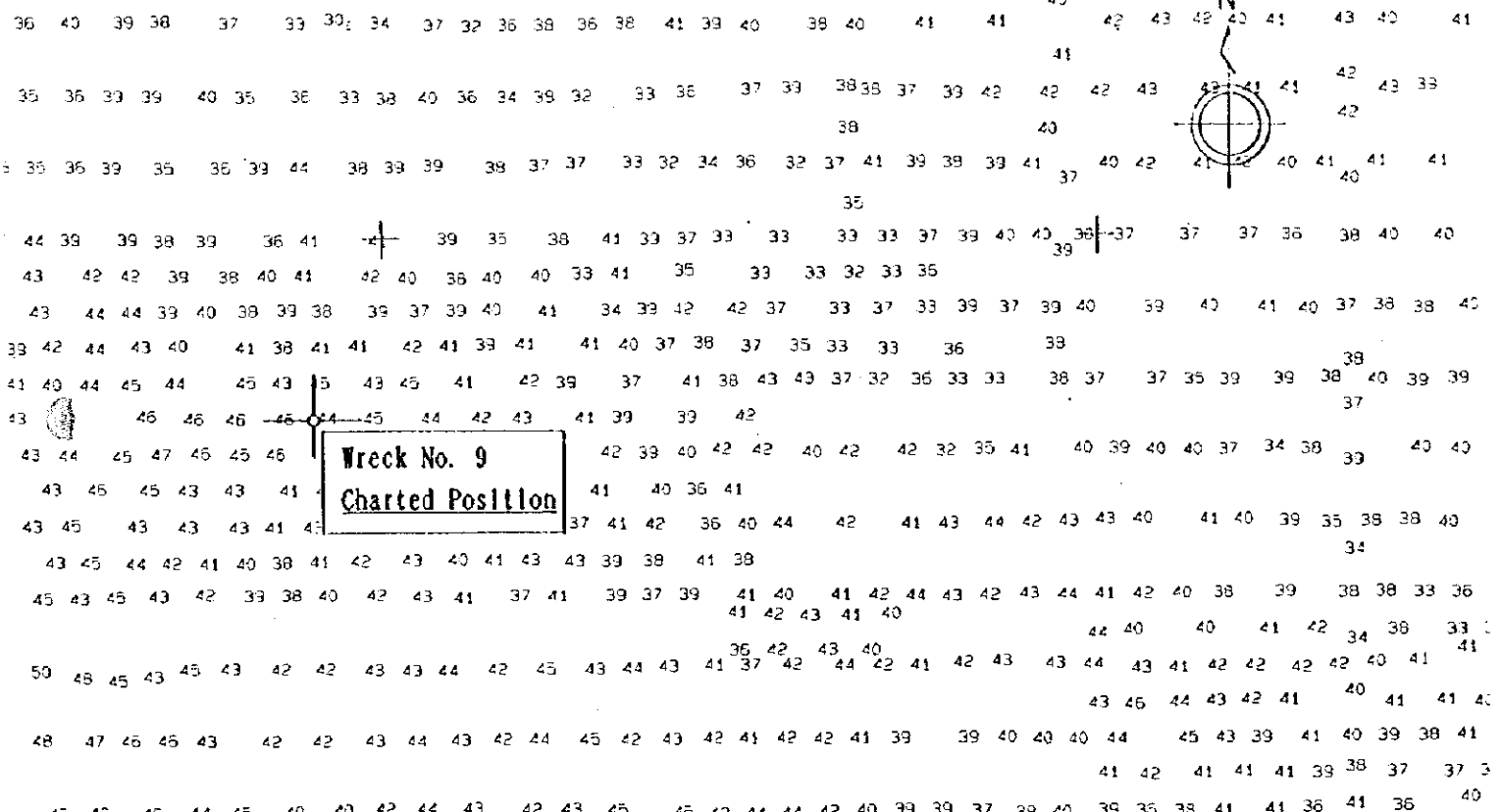


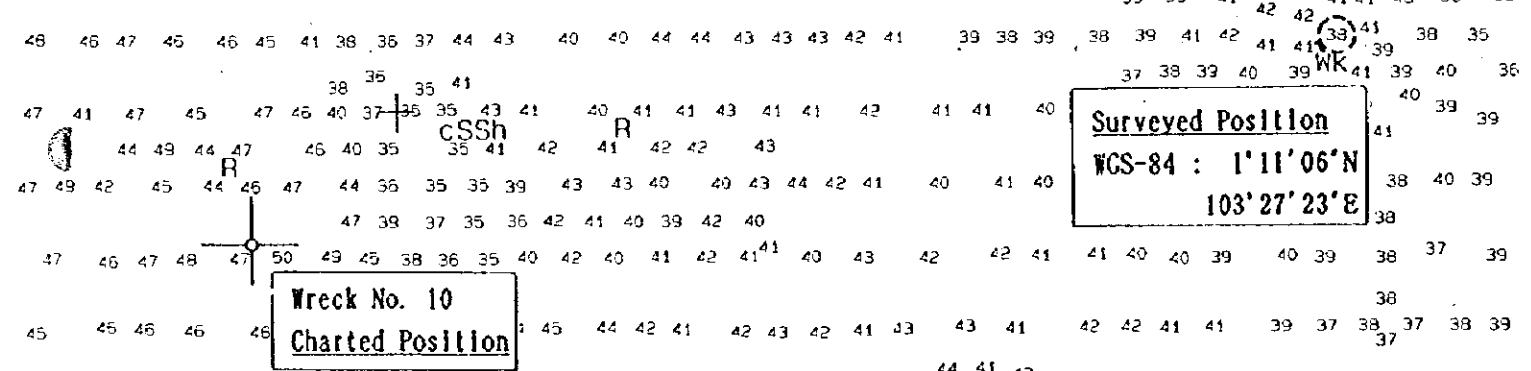
Fig. 3-33 Sounding Plot of Point h

R



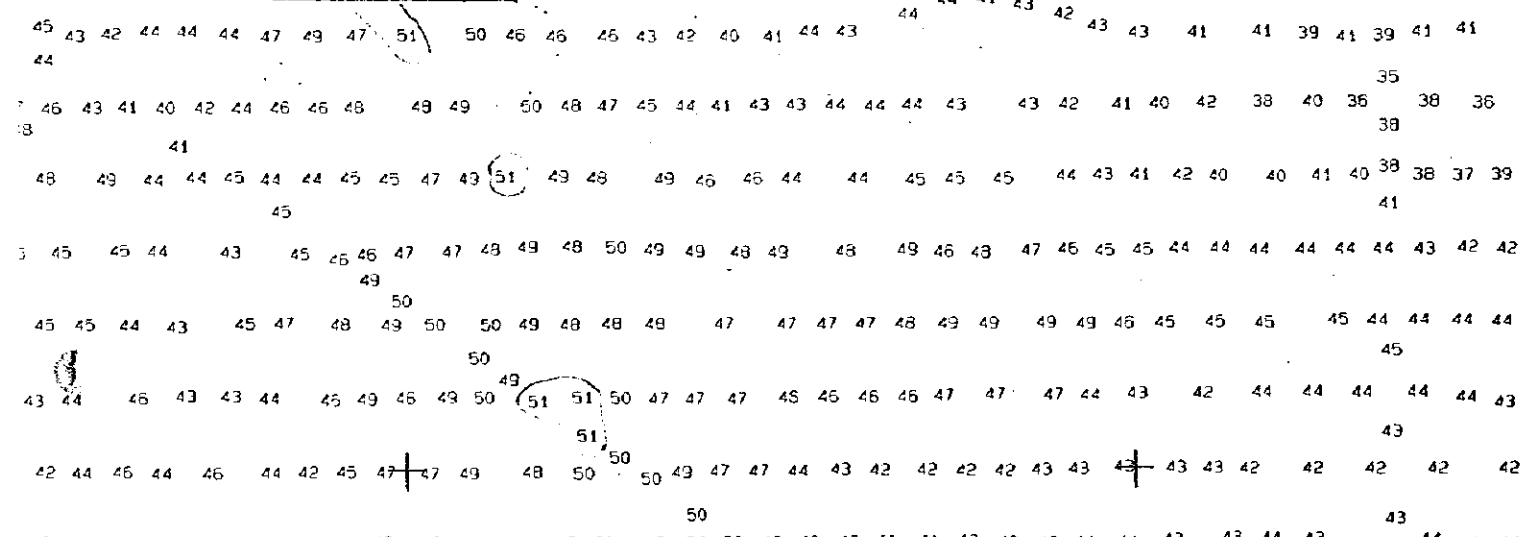
Wreck No. 9
Charted Position

R



Wreck No. 10
Charted Position

Surveyed Position
WGS-84 : 1°11'06"N
103°27'23"E

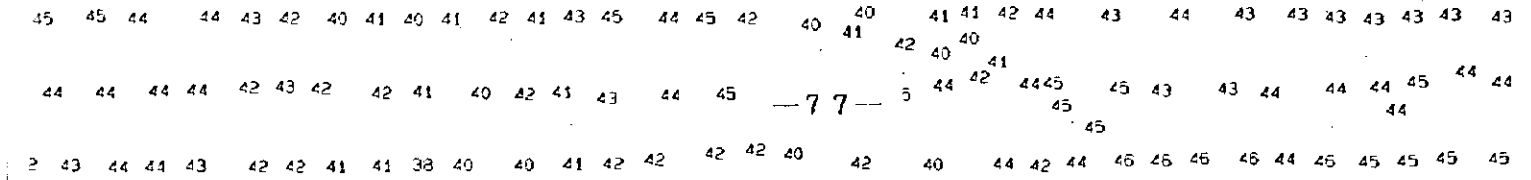


Wreck No. 10
Charted Position

Surveyed Position
WGS-84 : 1°11'06"N
103°27'23"E

Scale : 1/20,000

Fig. 3-34 Sounding Plot of Sub-Area E



Wreck No. 10
Charted Position

Surveyed Position
WGS-84 : 1°11'06"N
103°27'23"E

Scale : 1/20,000

Fig. 3-34 Sounding Plot of Sub-Area E

Surveyed Position
WGS-84 : 1°12'45"N
103°35'05"E

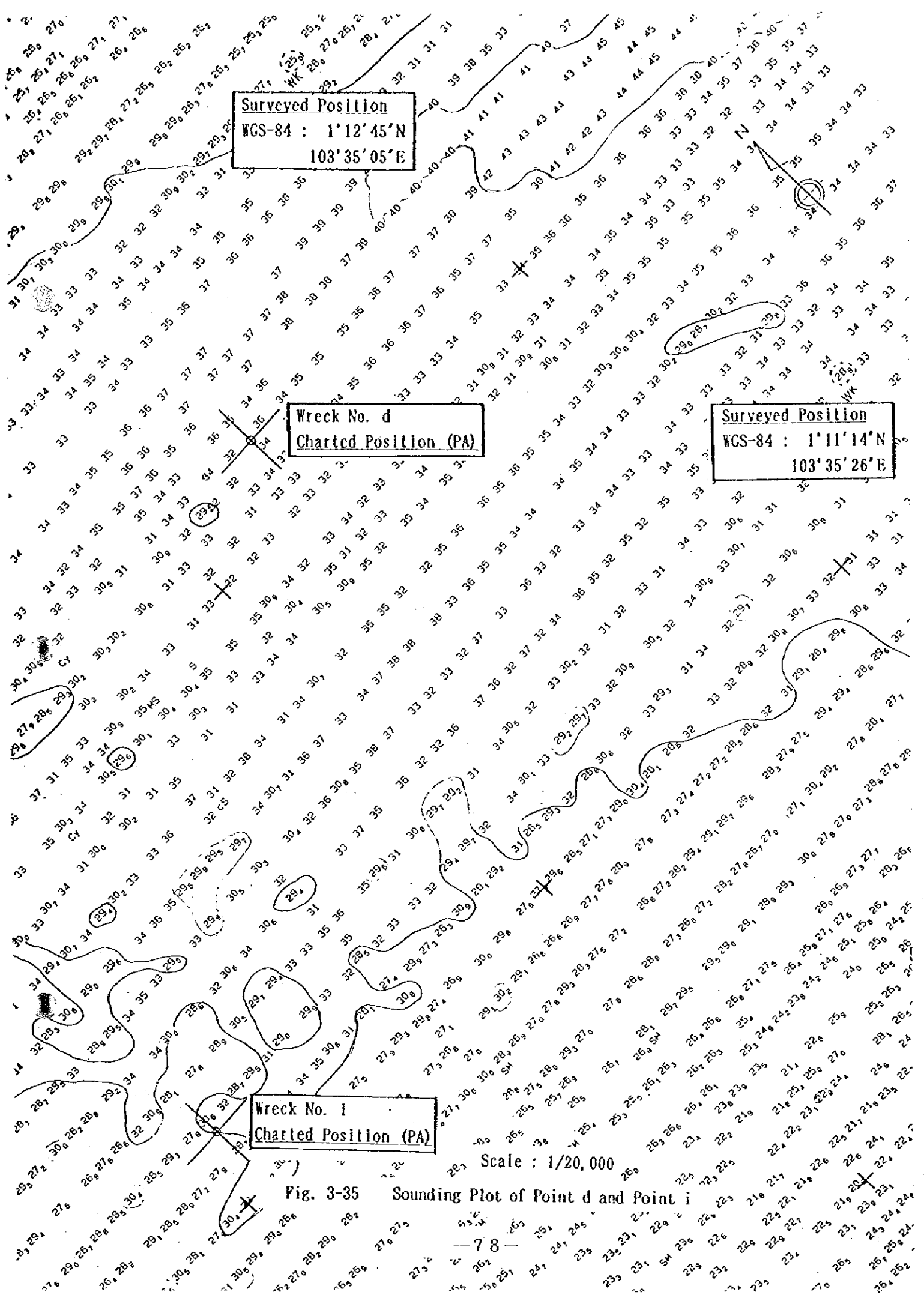
Wreck No. d
Charted Position (PA)

Surveyed Position
WGS-84 : 1°11'14"N
103°35'26"E

Wreck No. i
Charted Position (PA)

Scale : 1/20,000

Fig. 3-35 Sounding Plot of Point d and Point i



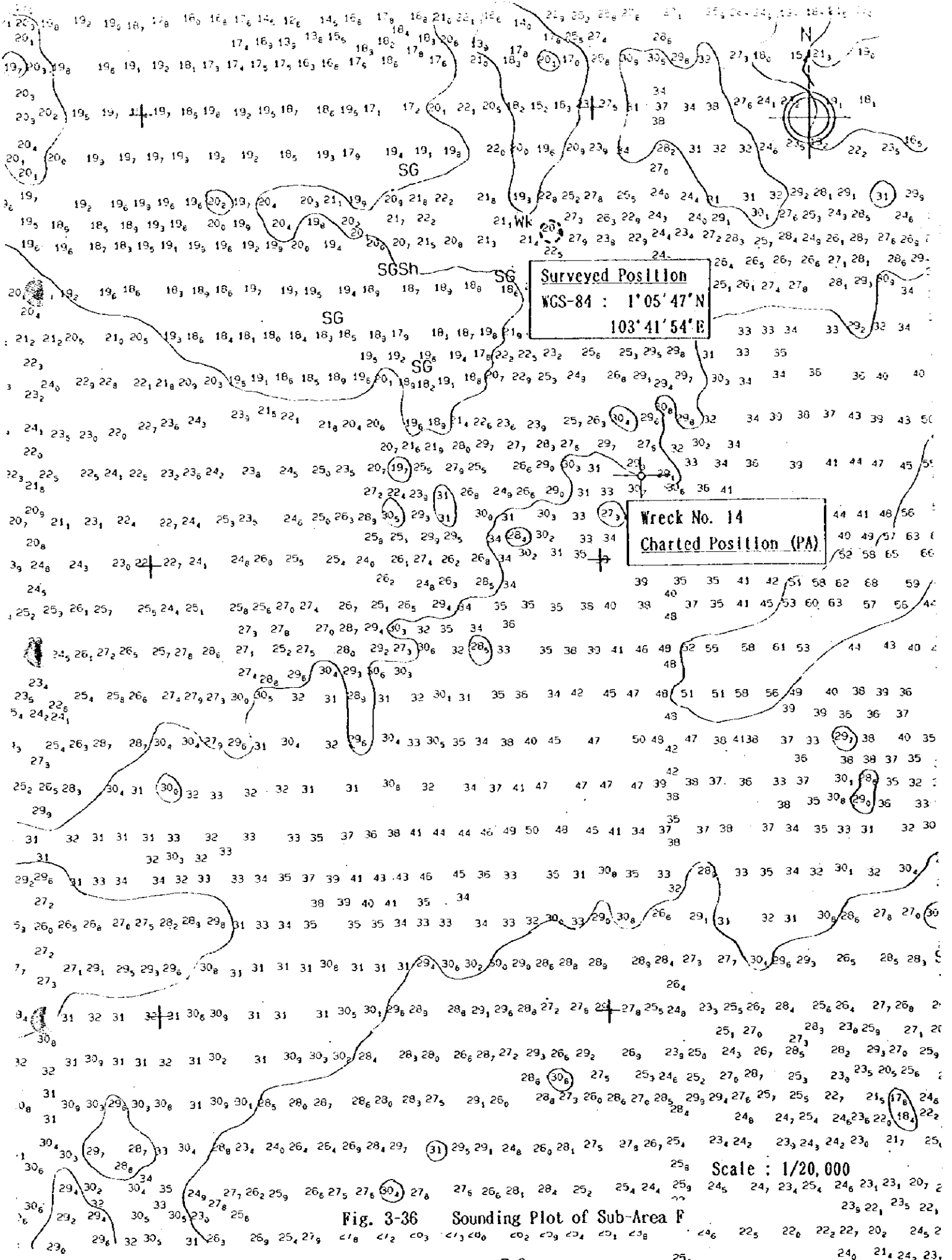


Fig. 3-36 Sounding Plot of Sub-Area F

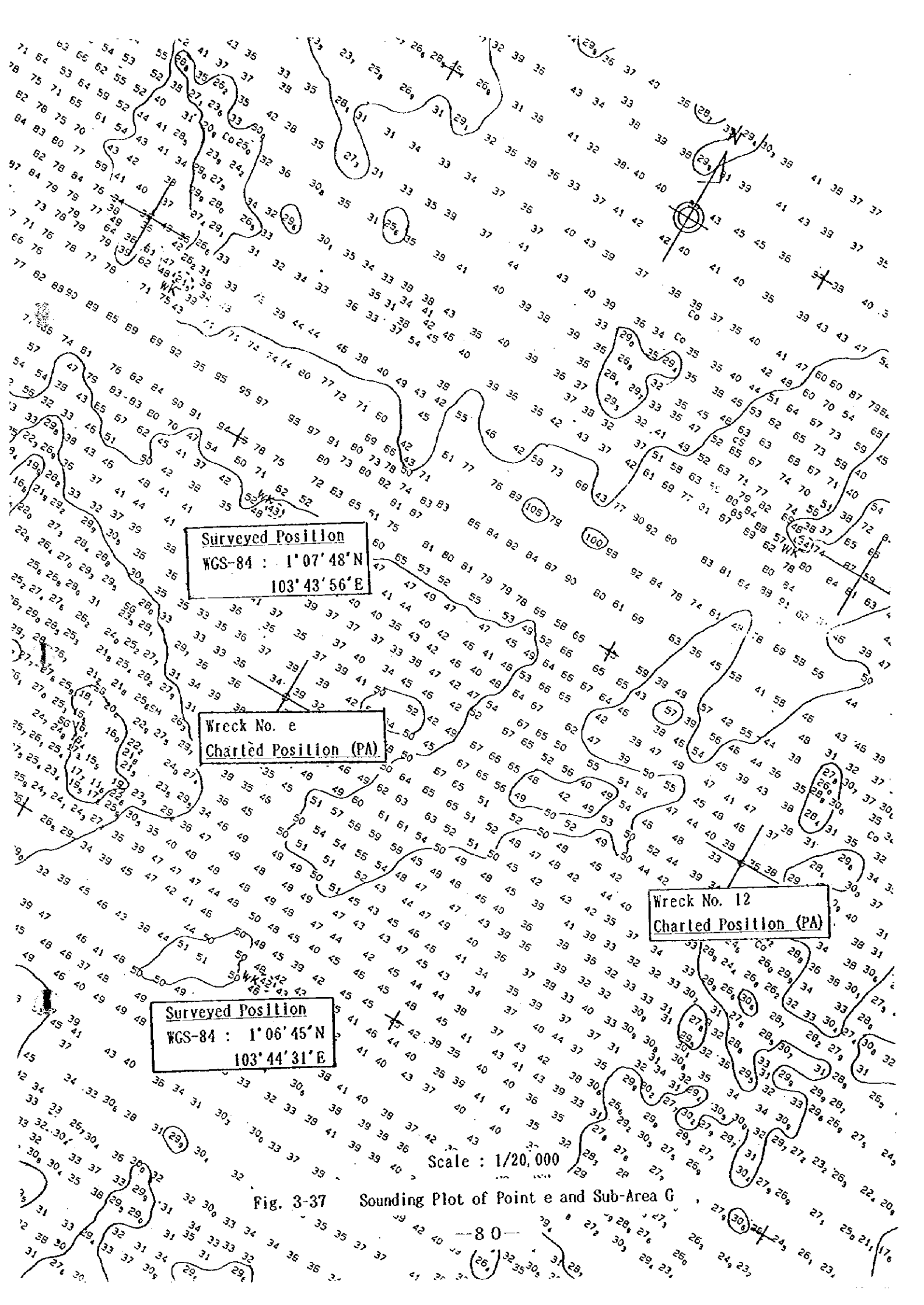
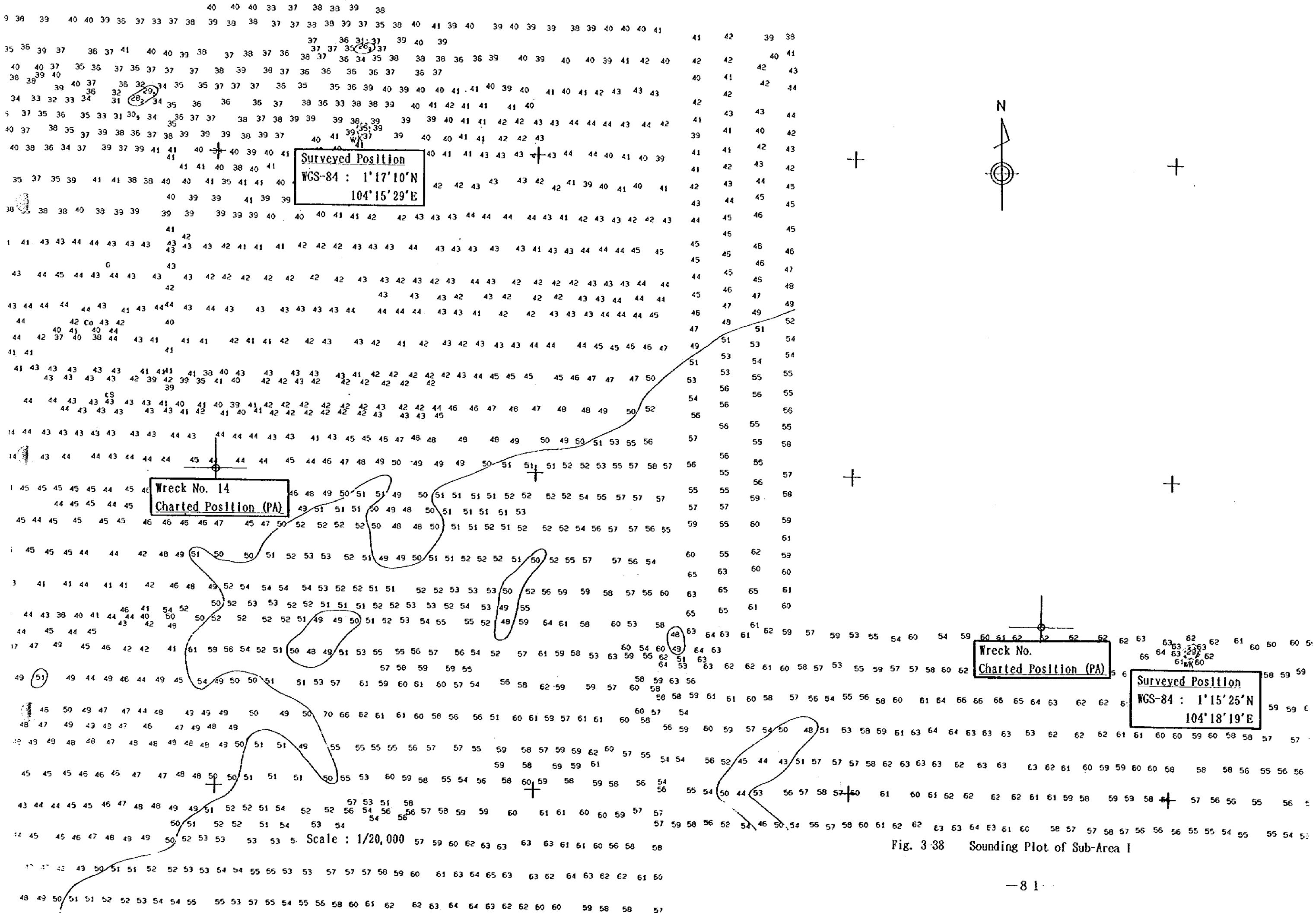


Fig. 3-37

Sounding Plot of Point e and Sub-Area G



Surveied Position
WGS-84 : 1°17'10"N
104°15'29"E

Wreck No. 14
Charted Position (PA)

Wreck No.
Charted Position (PA)

Surveied Position
WGS-84 : 1°15'25"N
104°18'19"E

Scale : 1/20,000

Fig. 3-38 Sounding Plot of Sub-Area I

(2) Verification of the Existence of Wrecks

The charted wrecks identified for detailed investigation and verification of the existence were one wreck located at Sub-Area A (Wreck No.1), which is charted with 15.6 m of cleared depth by wire drag, and four wrecks at Points f, e and Sub-Areas G, H (refer to Figures 3-39 to 3-42).

The results of the verification for the existence of these five wrecks are summarised in Table 3-10.

The sidescan sonar and echo sounder records of the wrecks verified are shown in the attached Appendix 8.

Table 3-10 Findings of Sunken Wrecks
(Verification of the Existence of Wrecks)

Survey Area	Information on Existing Charts		Confirmed Information (Surveyed Results)		Remarks
	Description on Chart	Position	Position (NGS-84)	Least Depth	
Sub-Area A	Wreck 15.6 m, [Wreck No.1]	2° 48' 42" N 101° 00' 48" E	2° 48' 42" N 101° 00' 47" E	26.3 m (11 m)	Coaster 01.1972
Point f	Wreck 40 m	2° 27' 24" N 101° 36' 18" E	2° 27' 12" N 101° 36' 10" E	16.1 m (54 m)	Royal Pacific mast ?
Point e	Wreck 21.5 m	1° 08' 18" N 103° 43' 18" E	1° 08' 11" N 103° 43' 27" E	23.6 m (16 m)	KYORYU MARU (3421 G.T.) 16.06.1973
Sub-Area G	Wreck 34 m	1° 08' 24" N 103° 45' 18" E	1° 08' 24" N 103° 45' 08" E	39 m (14 m)	MV NAIS 1975
Sub-Area H	Wreck 37 m	1° 11' 12" N 103° 50' 06" E	1° 11' 14" N 103° 50' 02" E	38 m (11 m)	TOSA MARU 1977

[Note] Values in bracket of 'Least Depth' column : Heights of Wreck

Point f (Group Area 2)

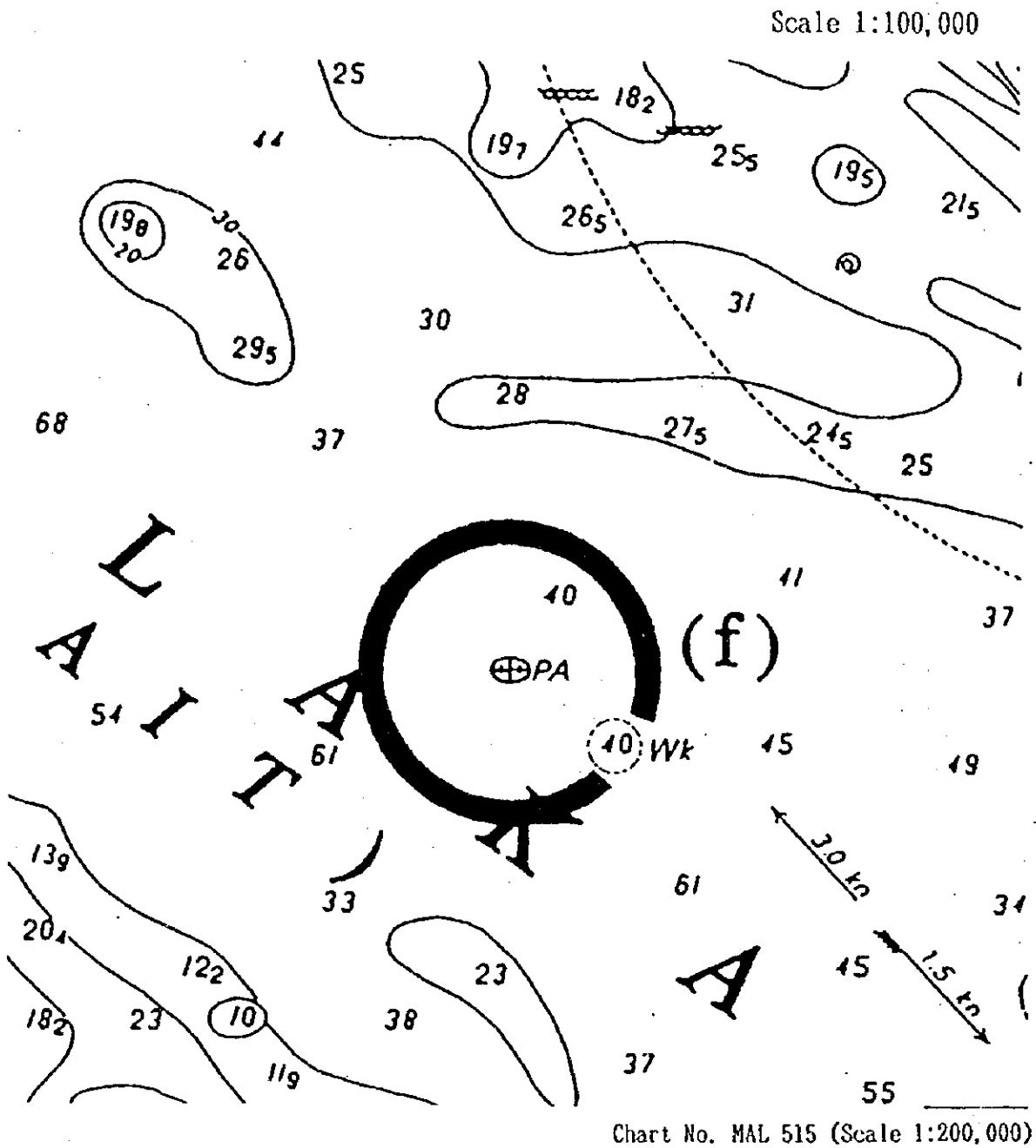


Fig. 3-40 Copy of Existing Chart (Sunken Wrecks)

Point c & Sub-Area G (Group Area 5)

Scale 1:100,000

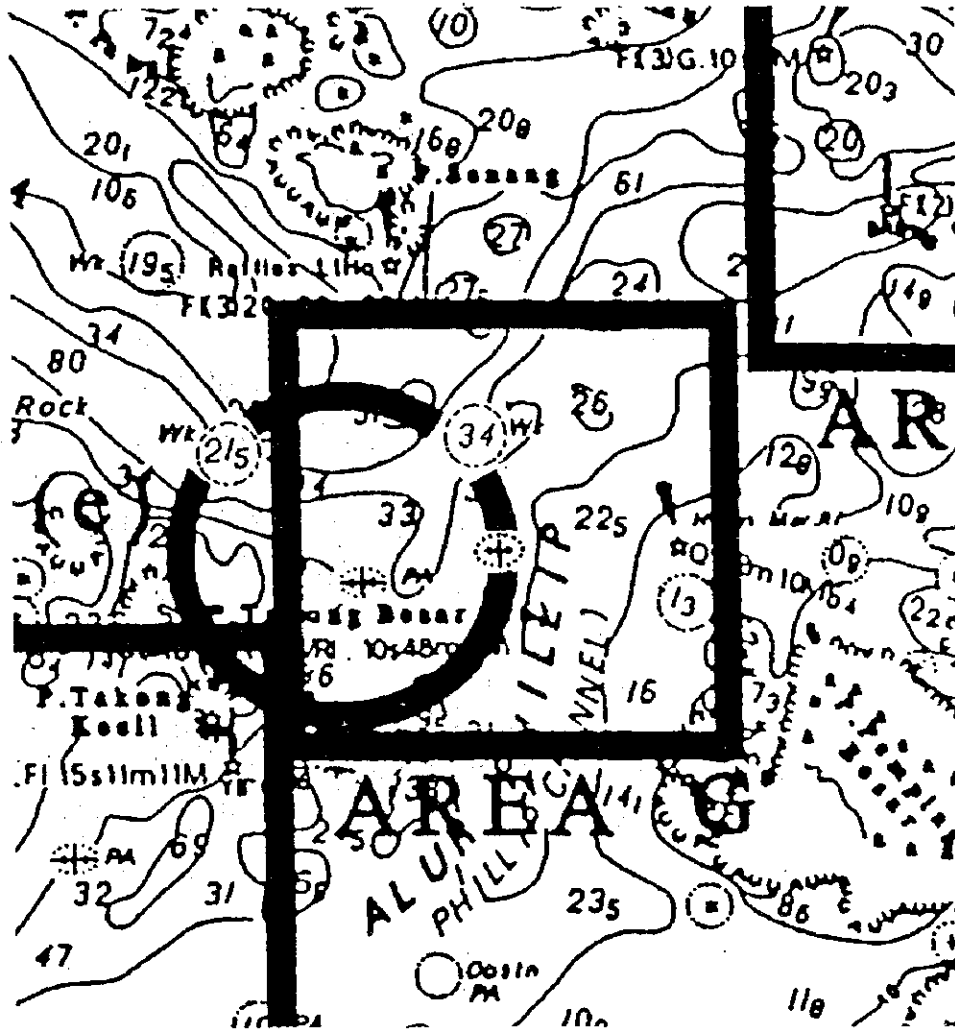


Chart No. 3947

Fig. 3-41 Copy of Existing Chart (Sunken Wrecks)

Sub-Area II (Group Area 5)

Scale 1:100,000

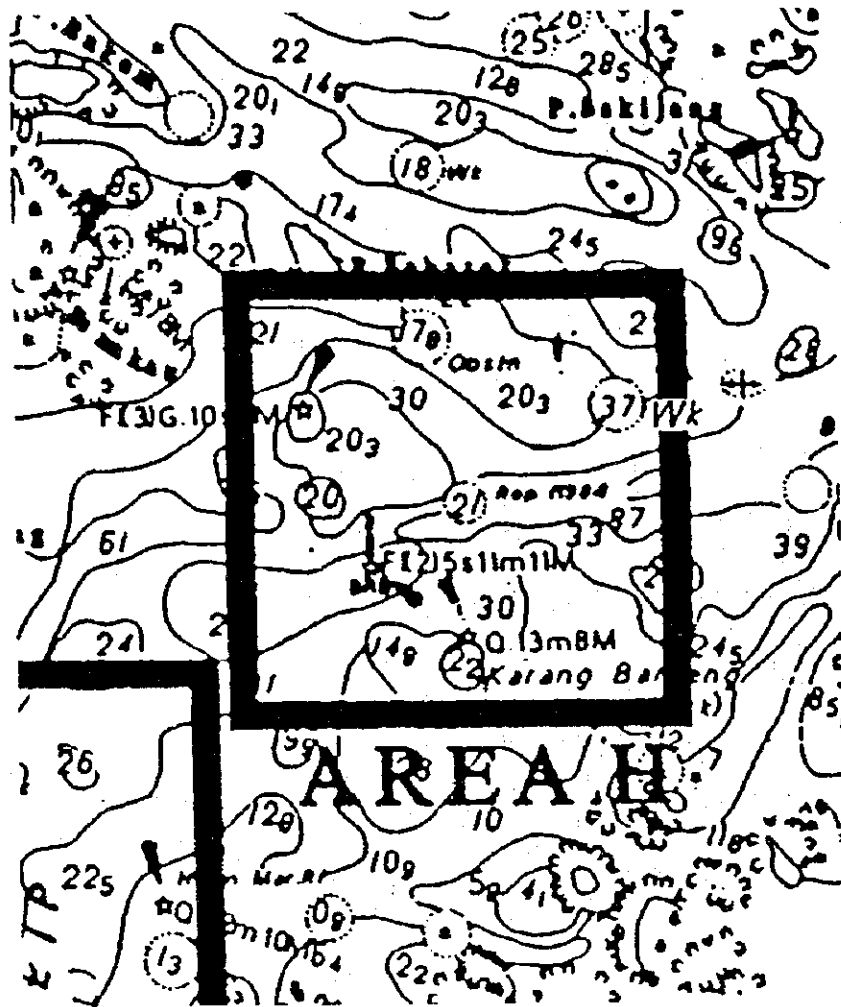


Chart No. MAL 515 (Scale 1:200,000)

Fig. 3-42 Copy of Existing Chart (Sunken Wrecks)

The existences of five wrecks were verified near the charted positions. The least depth of the cleared wreck at Sub-Area A was 26.3 meters and that of the wreck, Royal Pacific, at Point f was 16.1 meters to the charted depth 40 meters.

Sub-Area A (Group Area 1)

In Sub-Area A, the wreck (Wreck No.1) charted with cleared depth by wire drag of 15.6 meters was found to exist very close to its charted position with least depth of 26.3 meters (see Figure 3-43).

Point f (Group Area 2)

One wreck "Royal Pacific" exists at the border of the survey area with confirmed depth of 40 meters (see Figure 3-40). The existence of this wreck was verified near the charted position with least depth of 16.1 meters (see Figure 3-44). Judging from the record of echo sounder, it is thought that the top of wreck's mast was caught as such a shallow depth.

Point e (Group Area 5)

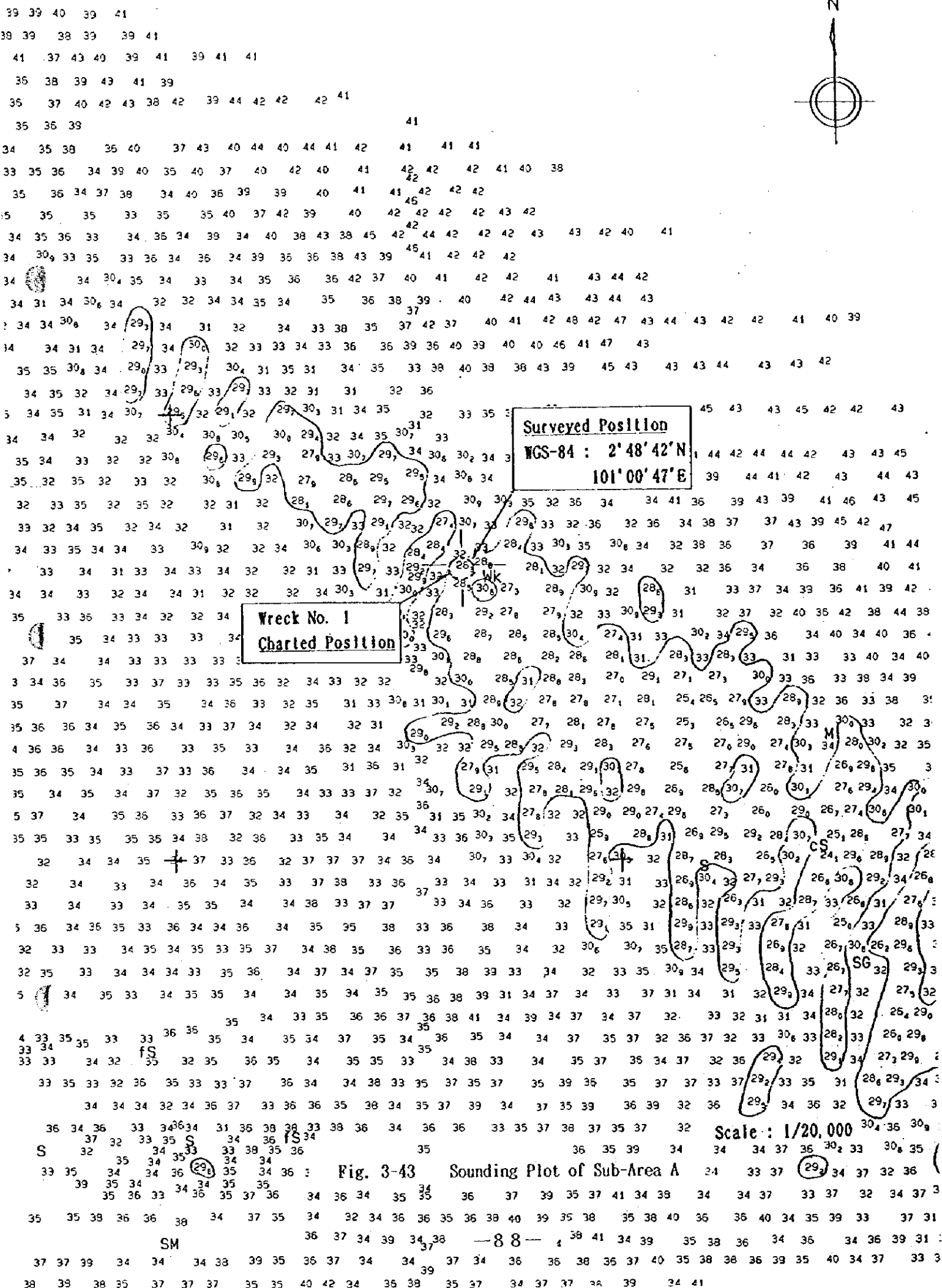
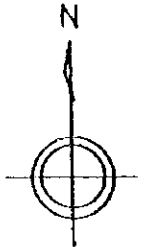
The charted wreck with depth of 21.5 meters at the northwest side border of the survey area was found to be close to its charted position with least depth of 23.6 meters (see Figures 3-41 & 3-45). On the Sounding Plot and Smooth Sheet, existing charted depth of 21.5 meters was adopted as least depth at this point.

Sub-Area G (Group Area 5)

The charted wreck with depth of 34 meters in Sub-Area G was found to be close to its charted position with least depth of 39 meters (see Figures 3-41 & 3-45). On the Sounding Plot and Smooth Sheet, existing charted depth of 34 meters was adopted as least depth at this point.

Sub-Area H (Group Area 5)

In Sub-Area H, the wreck charted with depth of 37 meters at northeast of the survey area was found to exist very close to its charted position with least depth of 38 meters (see Figures 3-42 & 3-46). On the Sounding Plot and Smooth Sheet, existing charted depth of 37 meters was adopted as least depth at this point.



Surveyed Position
 WGS-84 : 2°48'42"N
 101°00'47"E

Wreck No. 1
Charted Position

Scale : 1/20,000

Fig. 3-43 Sounding Plot of Sub-Area A

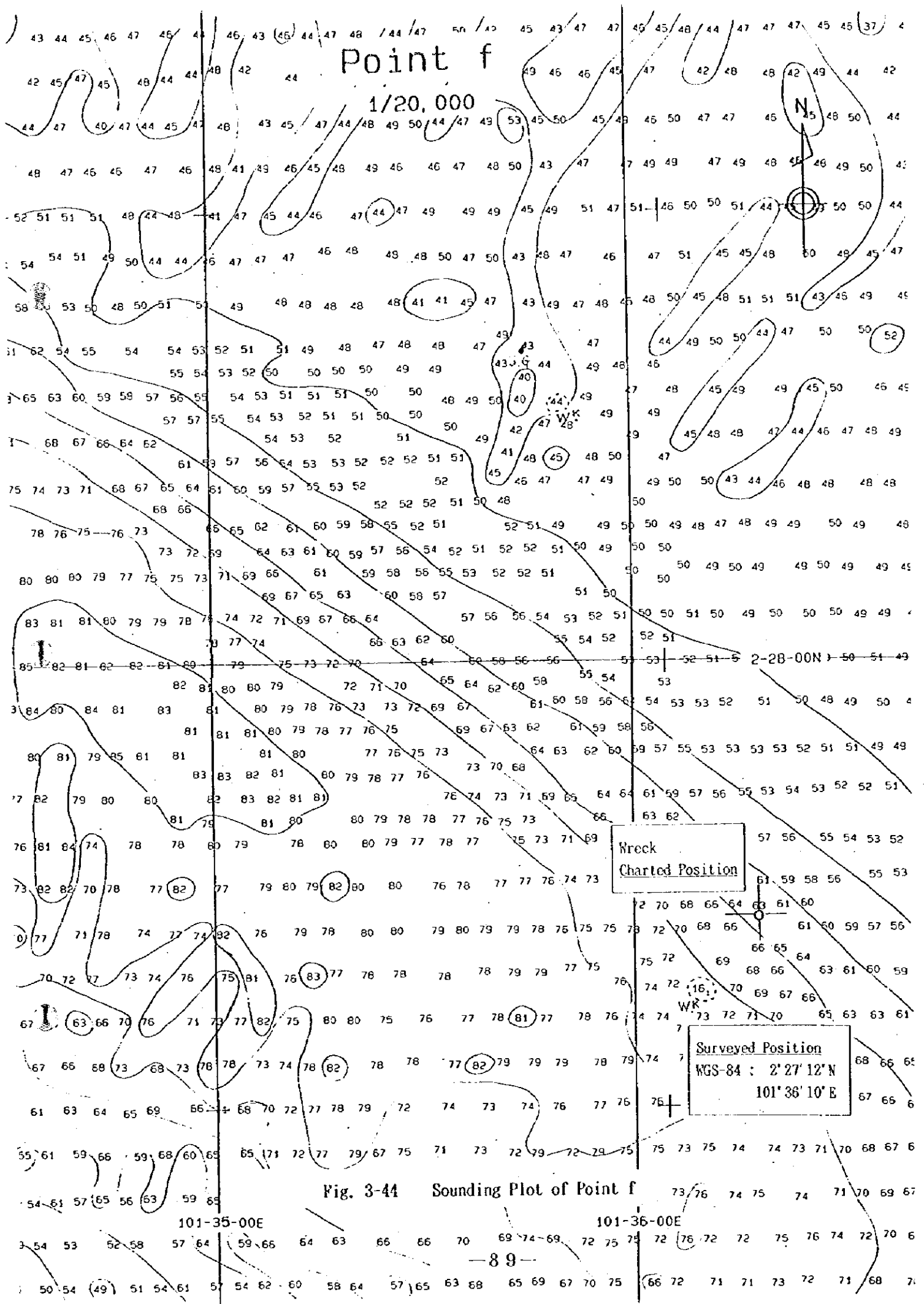
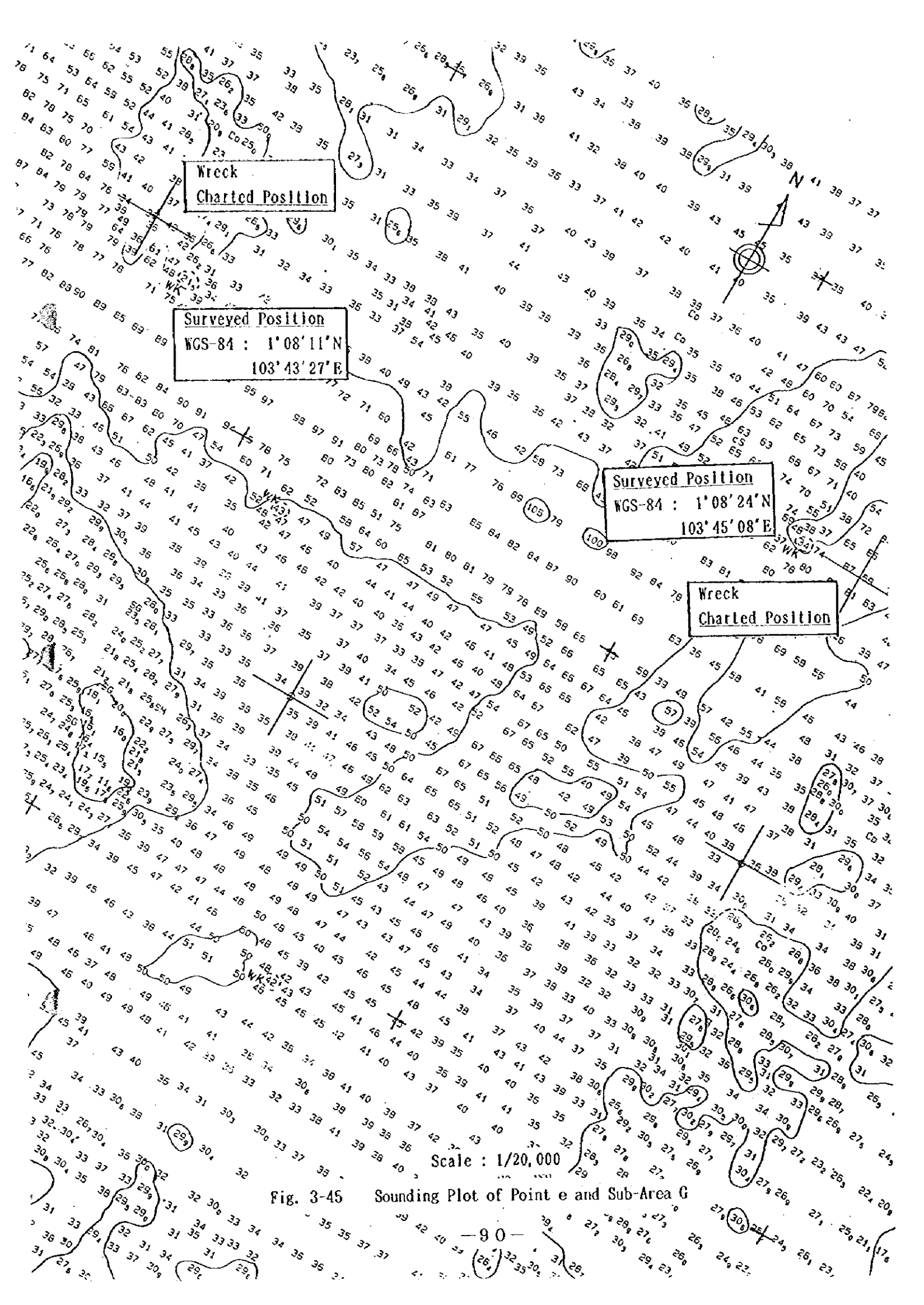
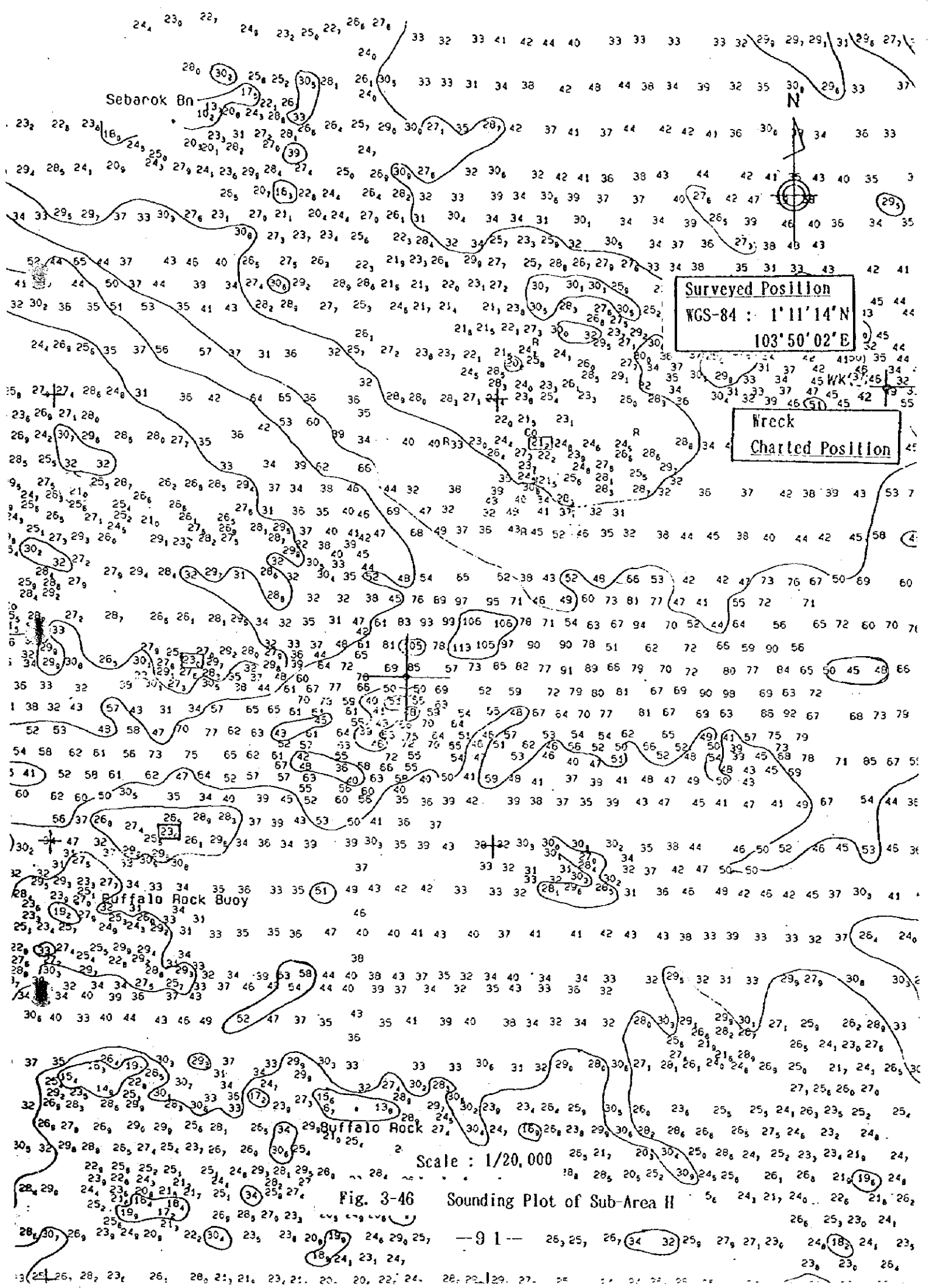


Fig. 3-44 Sounding Plot of Point f





Surveyed Position
WGS-84 : 1°11'14"N
103°50'02"E

Wreck
Charted Position

Scale : 1/20,000

Fig. 3-46 Sounding Plot of Sub-Area H

(3) Depth of Shoals

Five dangerous shoals and nine reported shoals were chosen for detailed investigation in the Study (refer to Figures 3-47 to 3-55). These shoals are located at the following Sub-Areas and Points :

- ① Group Area 1 : Point k, Point l, Sub-Area A
- ② Group Area 2 : Sub-Area B, Sub-Area C, Point g,
Sub-Area J, Sub-Area K
- ③ Group Area 3 : Point a
- ④ Group Area 4 : Sub-Area L
- ⑤ Group Area 5 : Sub-Area H

All the charted shoals identified for the Study have been investigated. The survey results for the shoals are tabulated in Table 3-11.

Point k (Group Area 1)

Scale 1:100,000

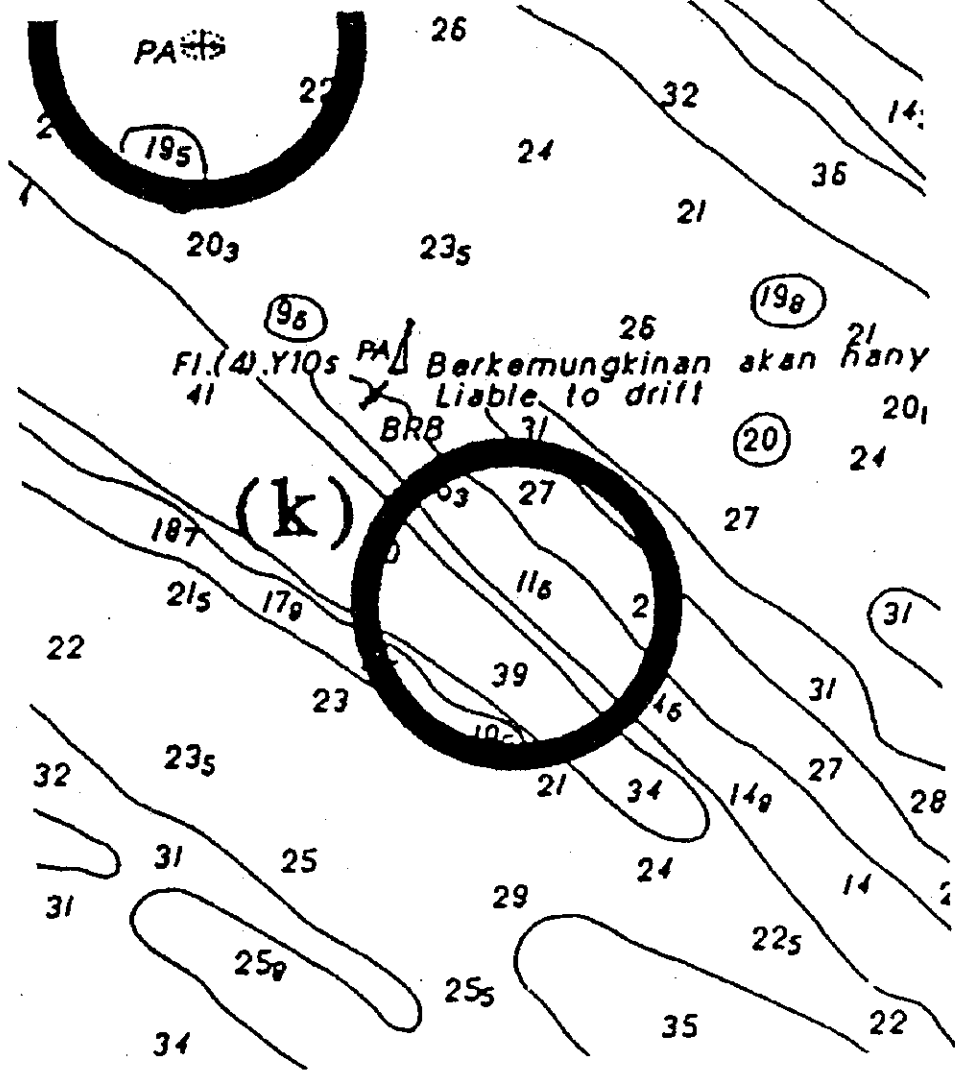


Chart No. MAL 515 (Scale 1:200,000)

Figure 3-47 Copy of Existing Chart

Point 1 & Sub-Area A (Group Area 1)

Scale 1:100,000

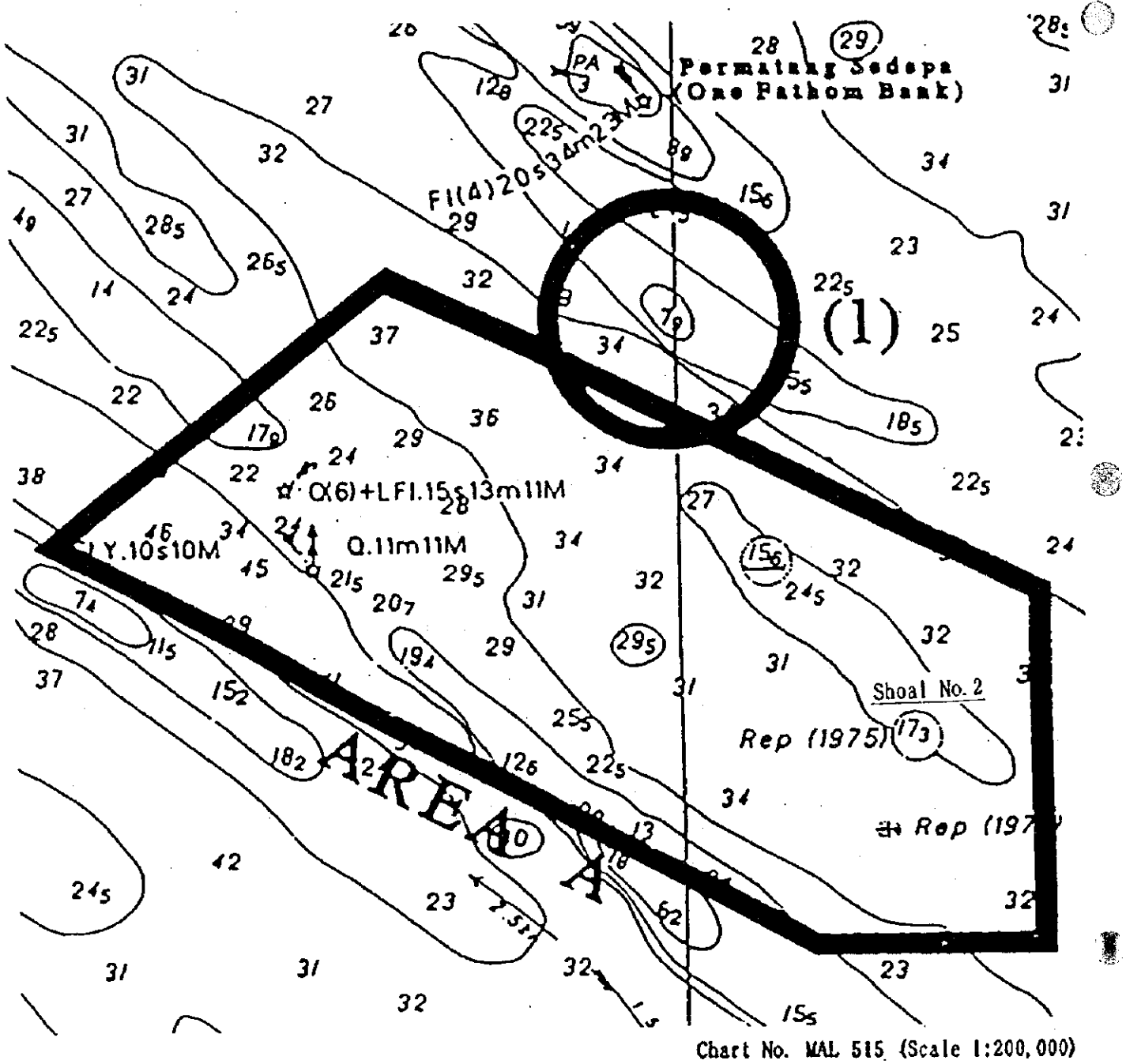


Figure 3-48 Copy of Existing Chart

Sub-Area B (Group Area 2)

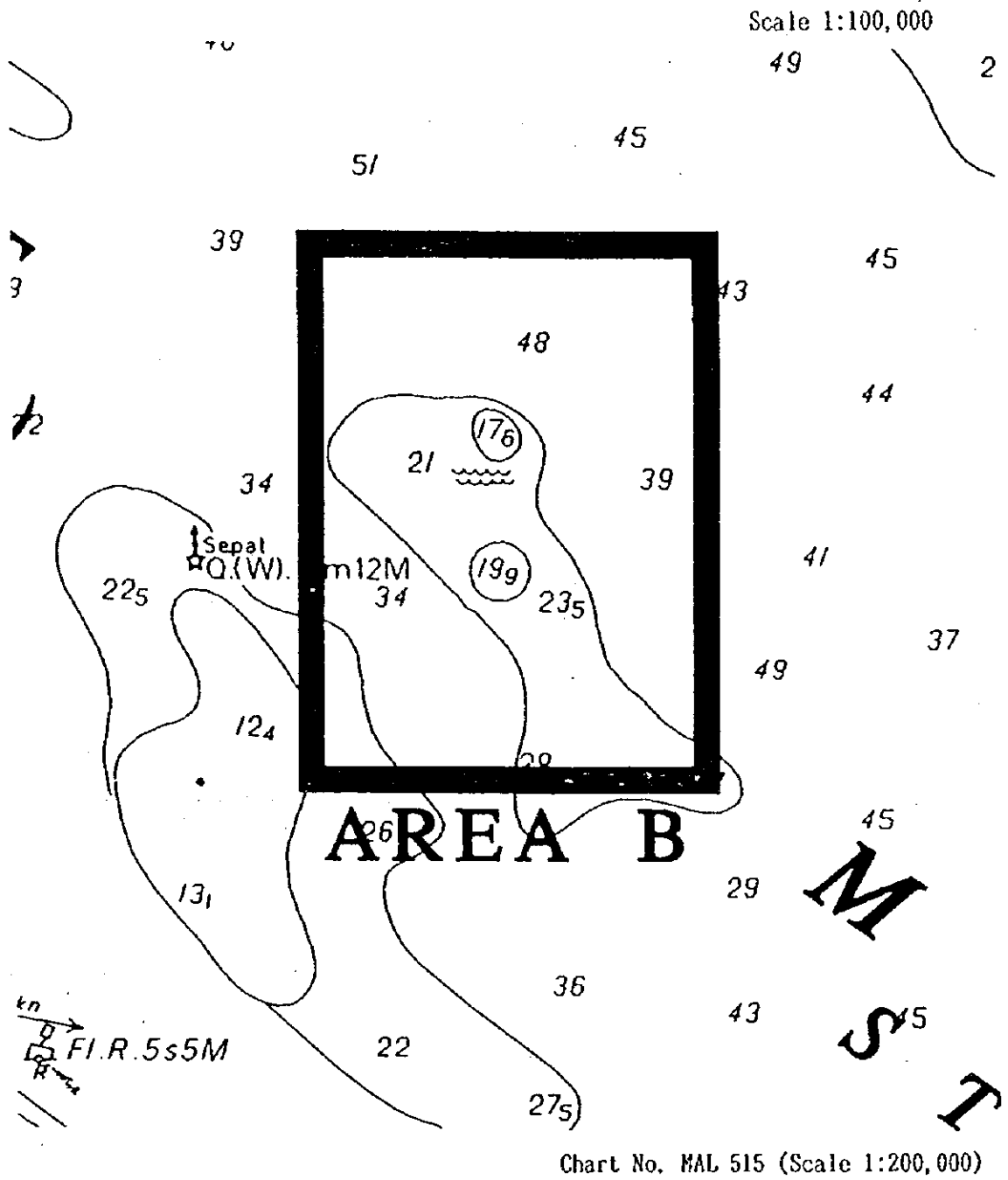


Figure 3-49 Copy of Existing Chart

Sub-Area C (Group Area 2)

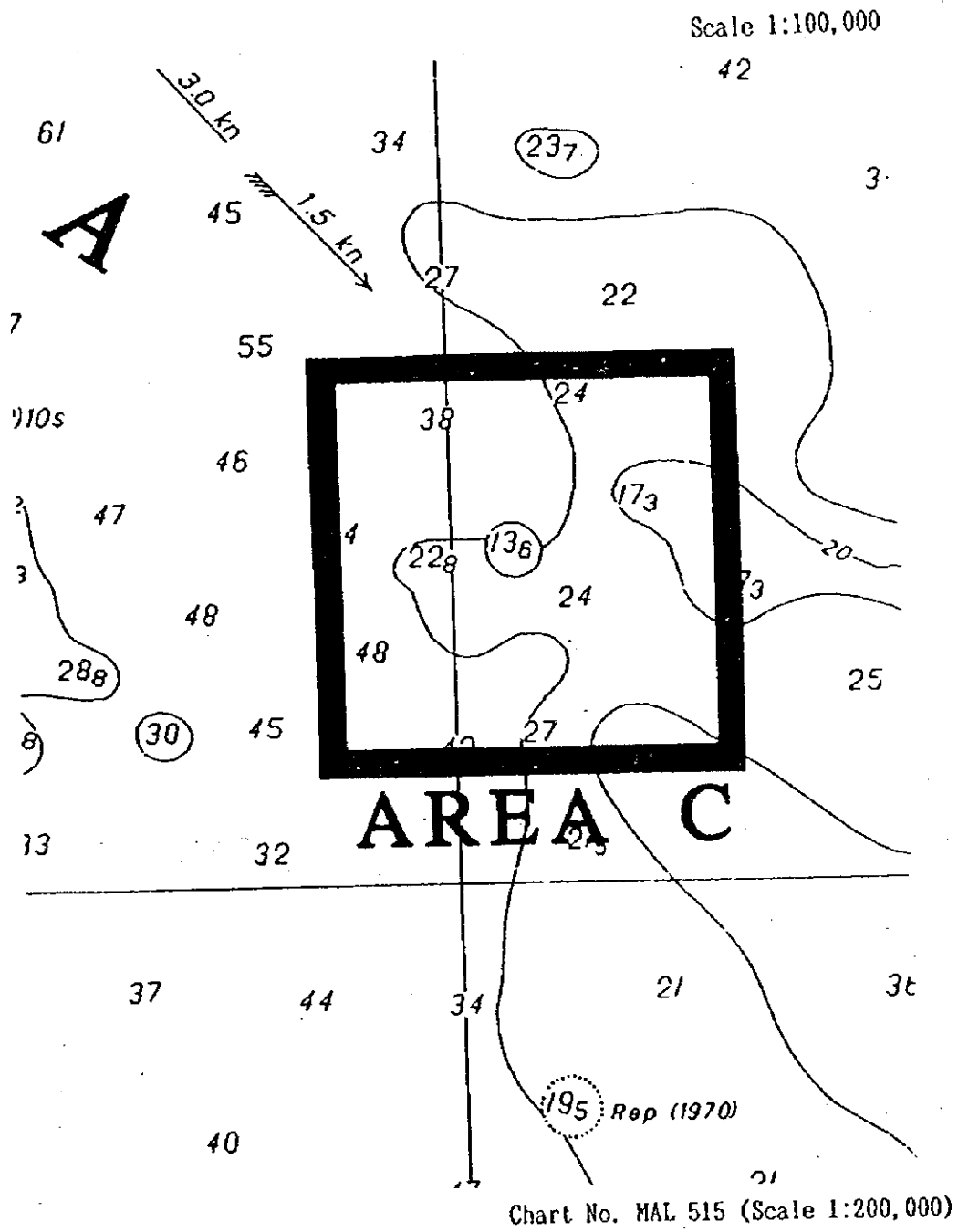


Figure 3-50 Copy of Existing Chart

Point g & Sub-Area J (Group Area 2)

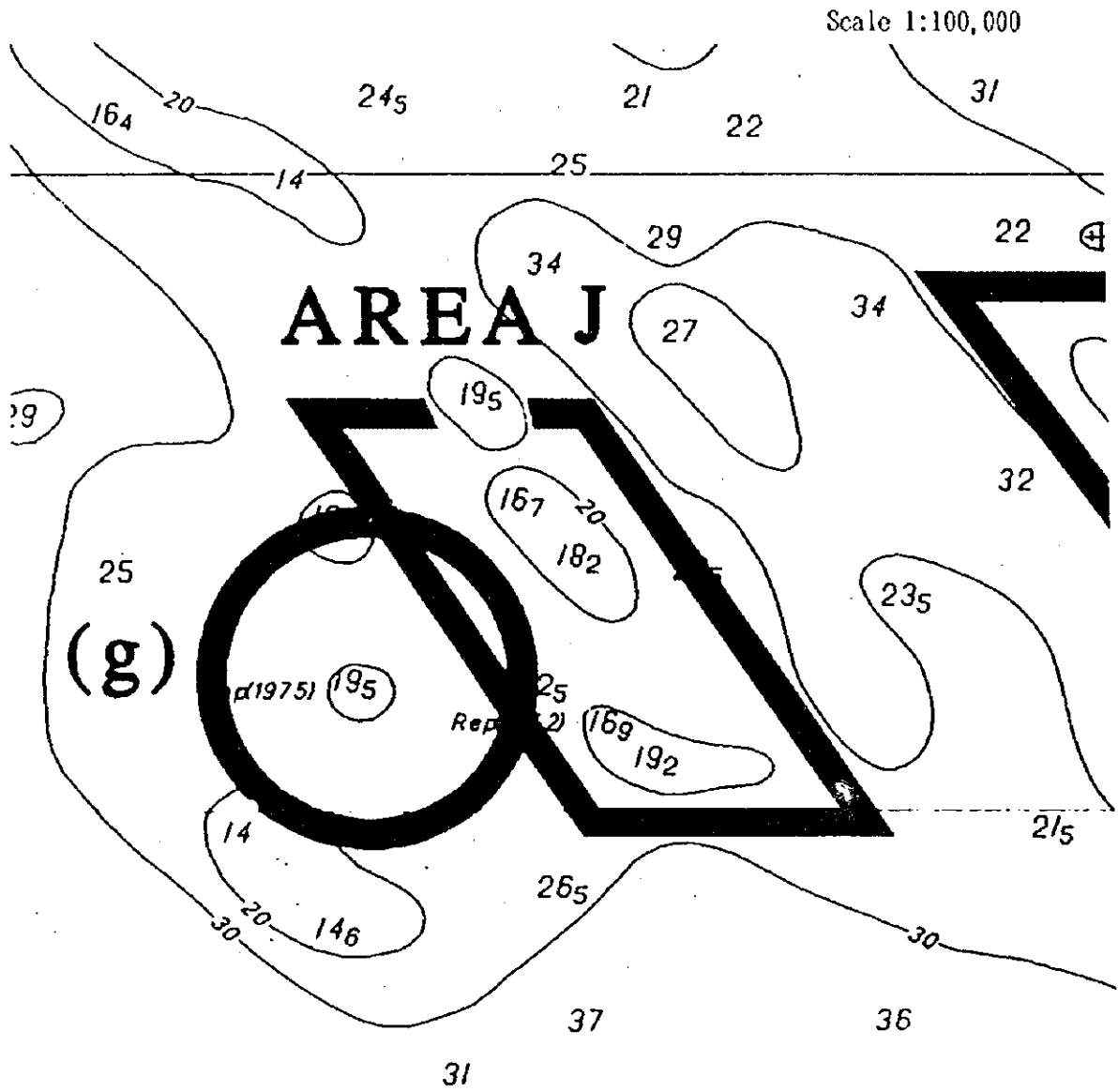


Chart No. MAL 515 (Scale 1:200,000)

Figure 3-51 Copy of Existing Chart

Sub-Area K (Group Area 2)

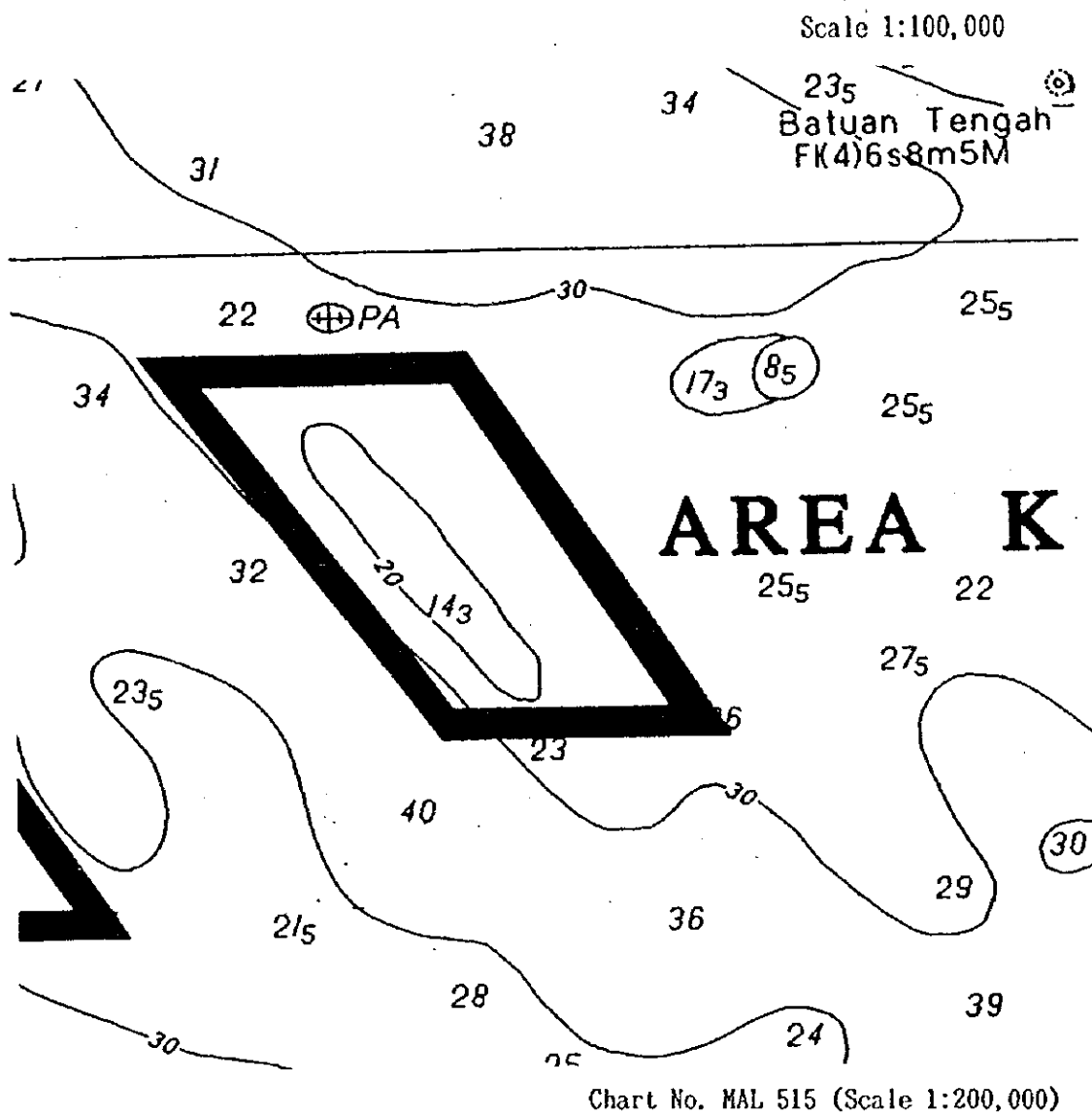


Figure 3-52 Copy of Existing Chart

Point a (Group Area 3)

Scale 1:100,000

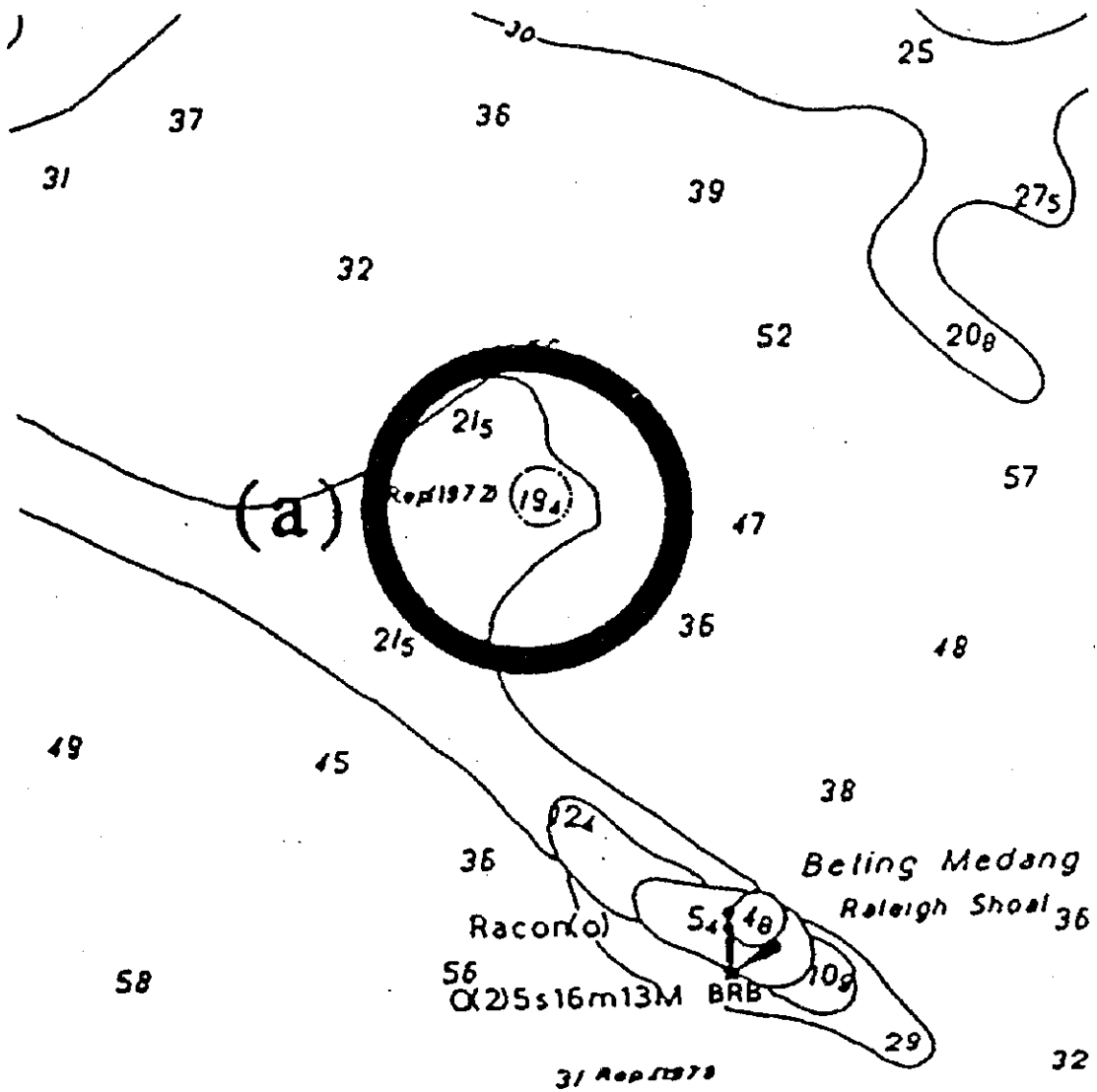


Chart No. MAL 515 (Scale 1:200,000)

Figure 3-53 Copy of Existing Chart

Sub-Area L (Group Area 4)

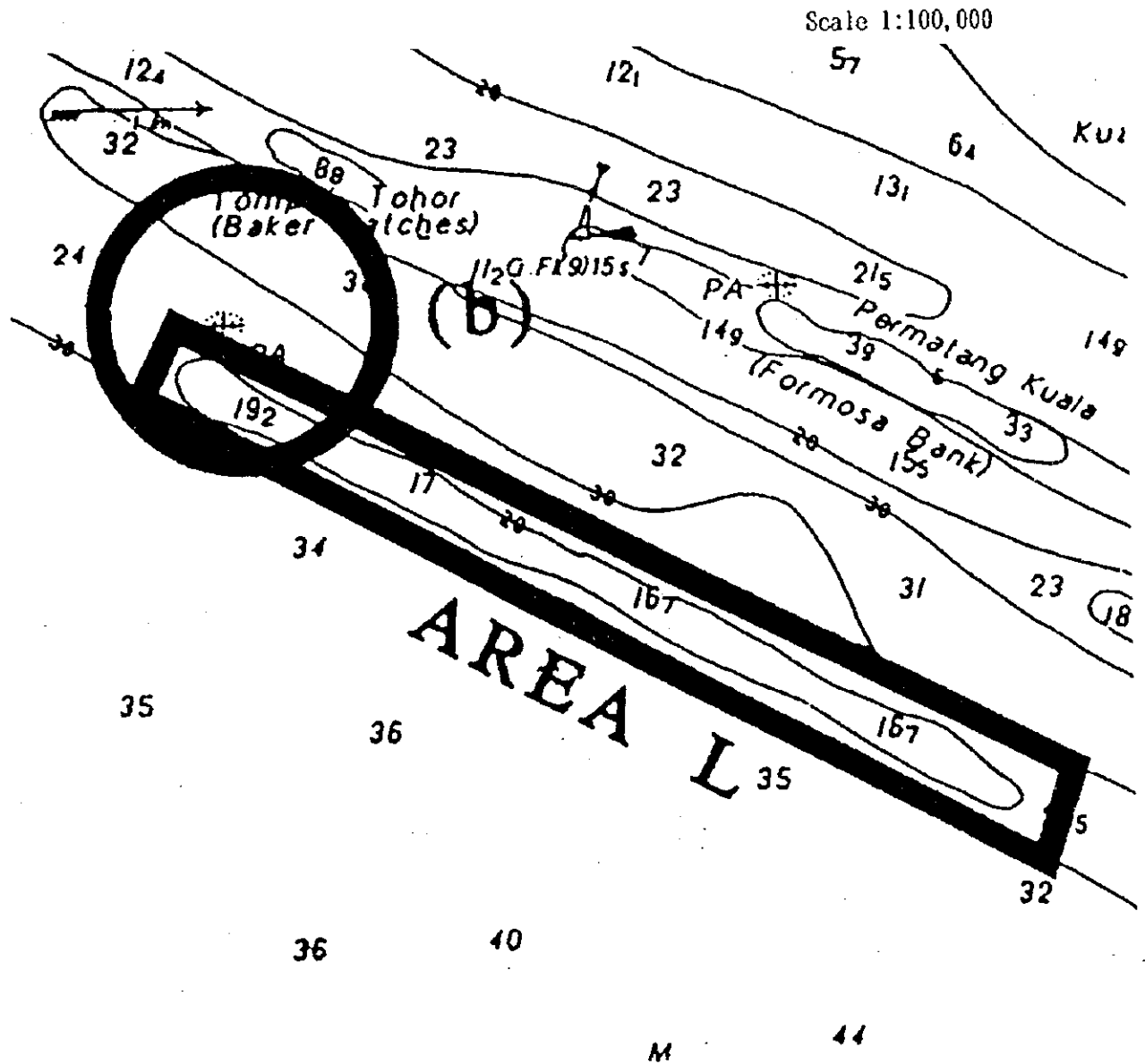


Chart No. MAL 515 (Scale 1:200,000)

Figure 3-51 Copy of Existing Chart

Sub-Area II (Group Area 5)

Scale 1:100,000

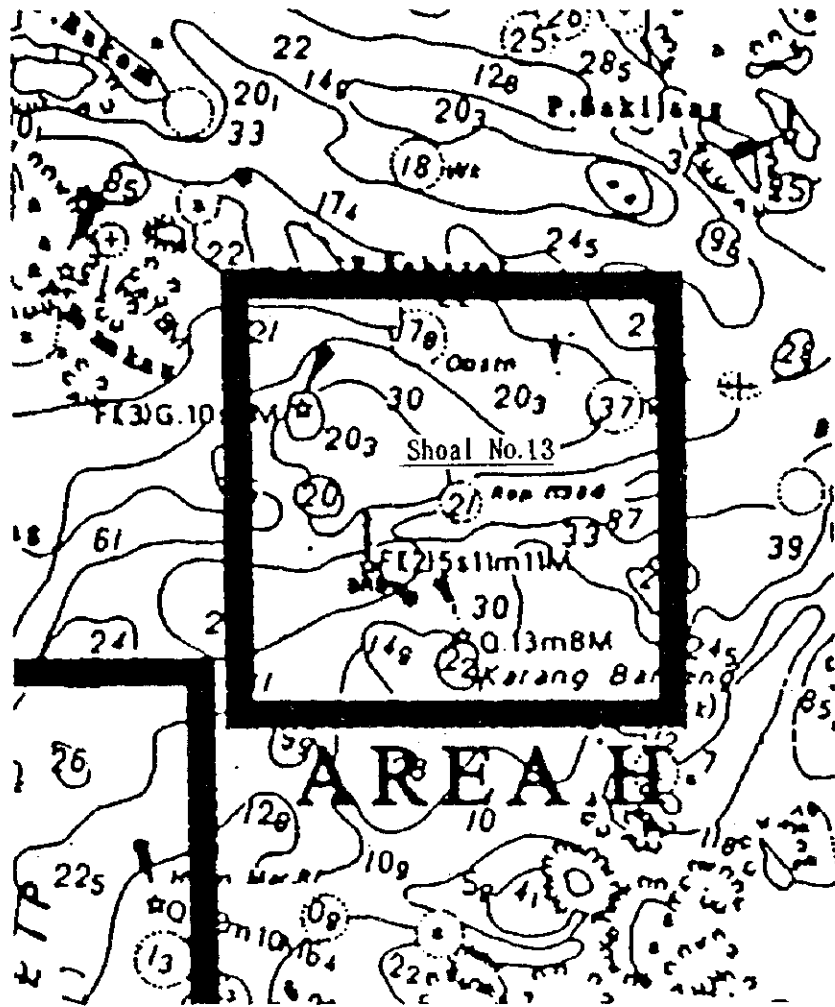


Chart No. MAL 515 (Scale 1:200,000)

Figure 3-55 Copy of Existing Chart

Table 3-11 Findings of Shoals

Survey Area	Information on Charts		Results of Survey		Remarks
	Least Depth	Position (Lat. & Lon.)	Least Depth	Position (WGS-84)	
Point k	11.6 m	2° 53' 54" N 100° 52' 00" E	12.6 m	2° 53' 53" N 100° 51' 58" E	1974 (Joint Survey)
Point l	7.9 m (6.4 [*])	2° 51' 06" N 101° 00' 00" E	8.4 m	02° 51' 09" N 101° 00' 00" E	1967 (Dampier), Amazon Maru Shoal
Sub-Area A	17.3 m (Rep) [No. 2]	2° 47' 00" N 101° 02' 06" E	Not Found		1975
Sub-Area B	17.6 m (Rep)	2° 35' 12" N 101° 25' 54" E	21.9 m	2° 35' 08" N 101° 25' 19" E	
			20.7 m	2° 34' 33" N 101° 25' 23" E	
	19.9 m (Rep)	2° 33' 54" N 101° 26' 00" E	21.1 m	2° 34' 10" N 101° 25' 33" E	
Sub-Area C	13.6 m (Rep)	2° 22' 36" N 101° 40' 36" E	19.7 m	2° 22' 36" N 101° 40' 11" E	
			19.9 m	2° 22' 34" N 101° 41' 01" E	
Point g	19.5 m (Rep)	2° 16' 00" N 101° 47' 42" E	17.9 m	2° 16' 00" N 101° 47' 34" E	
Sub-Area J	19.5 m	2° 18' 12" N 101° 48' 36" E	17.9 m	2° 18' 13" N 101° 48' 37" E	
	16.7 m	2° 17' 24" N 101° 49' 00" E	15.4 m	2° 17' 24" N 101° 49' 12" E	
			16.1 m	2° 16' 30" N 101° 49' 20" E	
	16.9 m (Rep)	2° 15' 36" N 101° 49' 36" E	18.6 m	2° 15' 47" N 101° 49' 29" E	
Sub-Area K	14.3 m	2° 17' 12" N 101° 54' 12" E	13.6 m	2° 18' 06" N 101° 53' 40" E	

(to be continued)

Survey Area	Information on Charts		Results of Survey		Remarks
	Least Depth	Position (Lat. & Lon.)	Least Depth	Position (WGS-84)	
Point a	19.4 m (Rep)	2° 10' 12" N 101° 52' 00" E	20.0 m	2° 10' 19" N 101° 52' 16" E	1972
			18.6 m	2° 10' 51" N 101° 51' 35" E	
			20.4 m	2° 09' 47" N 101° 50' 42" E	
			17.5 m	2° 08' 54" N 101° 50' 36" E	
Sub-Area L	16.7 m	1° 43' 00" N 102° 48' 36" E	16.5 m	1° 42' 52" N 102° 48' 40" E	
Sub-Area H	21 m (Rep) {No. 13}	1° 10' 30" N 103° 48' 54"	Not Found		
			23.0 m	1° 10' 32" N 103° 48' 25" E	
			23.0 m	1° 10' 06" N 103° 48' 22" E	
			21.2 m	1° 11' 04" N 103° 49' 16" E	

[Note] 1) Rep : Reported
 2) (6.4m*) : Depth on the Japanese Chart



The existence of twelve shoals within fourteen shoals was confirmed and two shoals; 17.3 m in Sub-Area A (Shoal No.2) and 21 m in Sub-Area H (Shoal No.13) were confirmed of no existence in the reported areas. Some other dangerous shoals, whose existences are not reported, were found, especially in the area of Point a.

Point k (Group Area 1)

The charted shoal depth of 11.6 meters in Point k was found to be close to its charted position with least depth of 12.6 meters (see Figures 3-47 & 3-56).

Point l (Group Area 1)

The charted shoal depth of 7.9 meters in Point l was found to be close to its charted position with least depth of 8.4 meters (see Figures 3-48 & 3-57).

Sub-Area A (Group Area 1)

The reported dangerous shoal (Shoal No.2), depth of 17.3 meters, in Sub-Area A was not found around the charted position (see Figures 3-48 & 3-58).

Although the seabed topography in this area is undulating, the least depth around the charted position is 24.1 meters.

Sub-Area B (Group Area 2)

Two isolated shoals with depths of 17.6 meters and 19.9 meters are charted in Sub-Area B on the existing chart (see Figure 3-49).

The shoals in this area are situated on the crest of sand waves with depth of 20 to 25 meters, consisting of coarse sands and sands containing granules. The least depth in this area was 20.7 meters and the reported depth 17.6 meters is not existed any more (see Figure 3-59).

Sub-Area C (Group Area 2)

Sub-Area C shows complicated topographic features and the reported shoal, depth of 13.6 meters, is located at the center of the survey area (see Figure 3-50).

The shoals of 19 meters level are scattered over the area. These shoals are on the crest of sand waves consisted of sands containing shells. The reported shoal of 13.6 meters is not existed any longer (see Figure 3-60).

Point g (Group Area 2)

The shoal depth of 19.5 meters is a new shoal reported in 1975 (see Figure 3-51). Sounding plot at Point g shows that least depth is 17.9 meters around the reported position (see Figure 3-61).

Sub-Area J (Group Area 2)

In Sub-Area J, three isolated shoals of 19.5, 16.7 and 16.9 meters are reported (see Figure 3-51).

The topographic features in this area are complicated because of predominant sand waves and many patches less than 19 meters depth were found all over the area. The least depth was 15.4 meters (see Figure 3-62).

Sub-Area K (Group Area 2)

Long and narrow shoal less than 20 meters can be seen in Sub-Area K (see Figure 3-52). This shoal is elongated to the direction of NW to SE and sand waves are found on the shoal with depth of 14 to 18 meters. The least depth was 13.6 meters comparing with reported 14.3 meters (see Figure 3-63).

Point a (Group Area 3)

The reported shoal in Point a was not found at the charted position. Two shoals with least depths of 20.0 and 18.6 meters were found 0.3 nautical miles northeast and 0.8 nautical miles northwest of the charted position, respectively.

The other two shoals with least depths of 20.4 and 17.5 meters were also found 1.4 nautical miles west southwest and 1.9 nautical miles southwest of the charted position, respectively (see Figure 3-64).

Sub-Area L (Group Area 4)

Very long and narrow shoal less than 20 meters can be seen in Sub-Area L and least depth is reported as 16.7 meters (see Figures 3-54).

This shoal is elongated to the direction of NW to SE and characterized with gentle shapes consisting of sandy muds. Any notable patches were not found out in the area (see Figures 3-65).

Sub-Area H (Group Area 5)

The reported dangerous shoal (Shoal No.13) depth of 21 meters was not found at the charted position (see Figure 3-55).

The seabed topography in Sub-Area H was undulating. The depths vary between 20 to 90 meters throughout the area. Shoal patches of less than 25 meters were found in the direction southeast of Sebarok Beacon, and west and southwest of the reported 21-meter shoal. The nature of the seabed comprised mainly rock outcrops and coral reefs.

Three shoal patches with depths between 21 to 23 meters, which were closest to the reported shoal, had been examined. These patches were situated between 0.5 to 0.7 nautical miles from the reported shoal (see Figure 3-66).

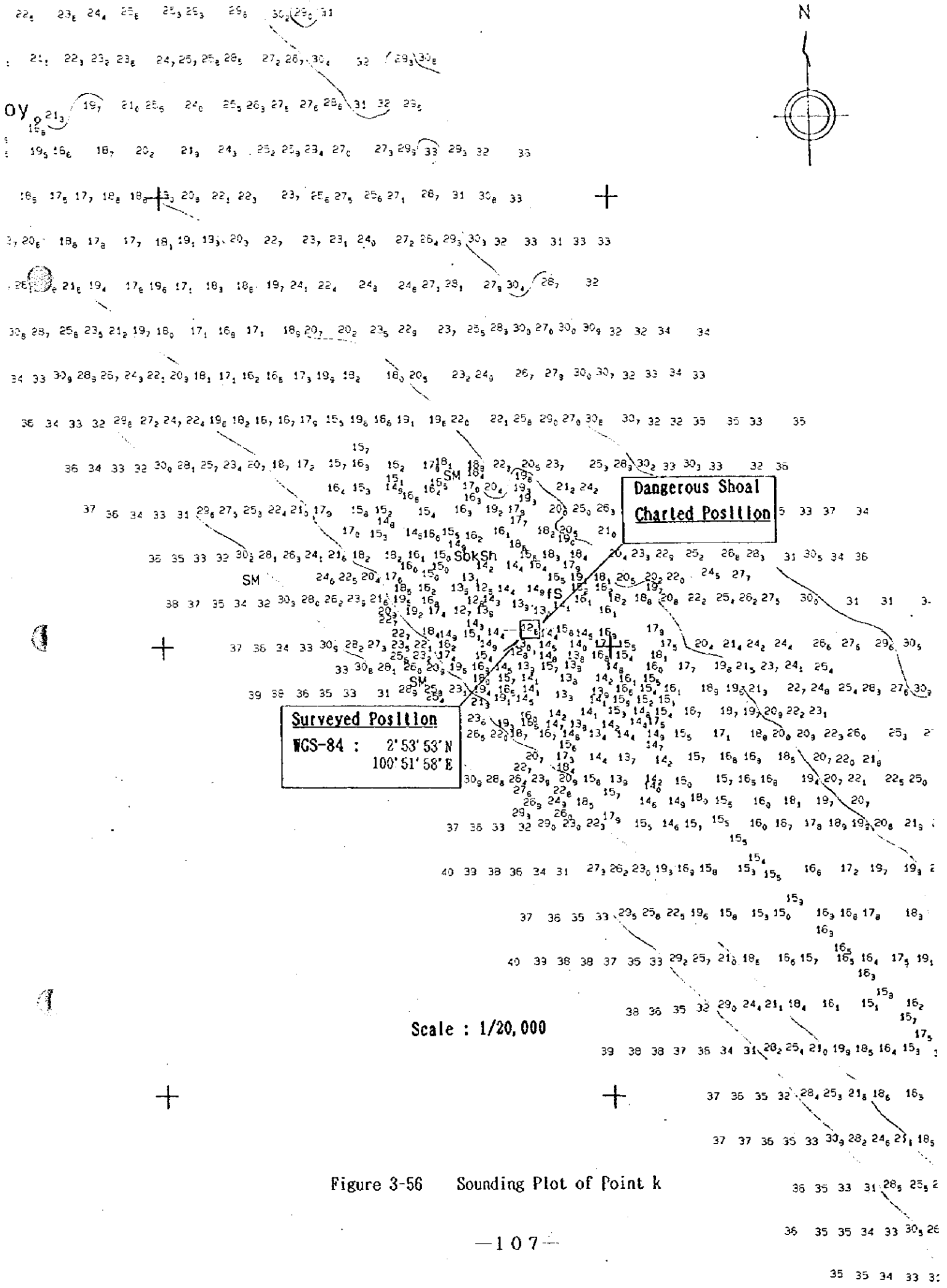
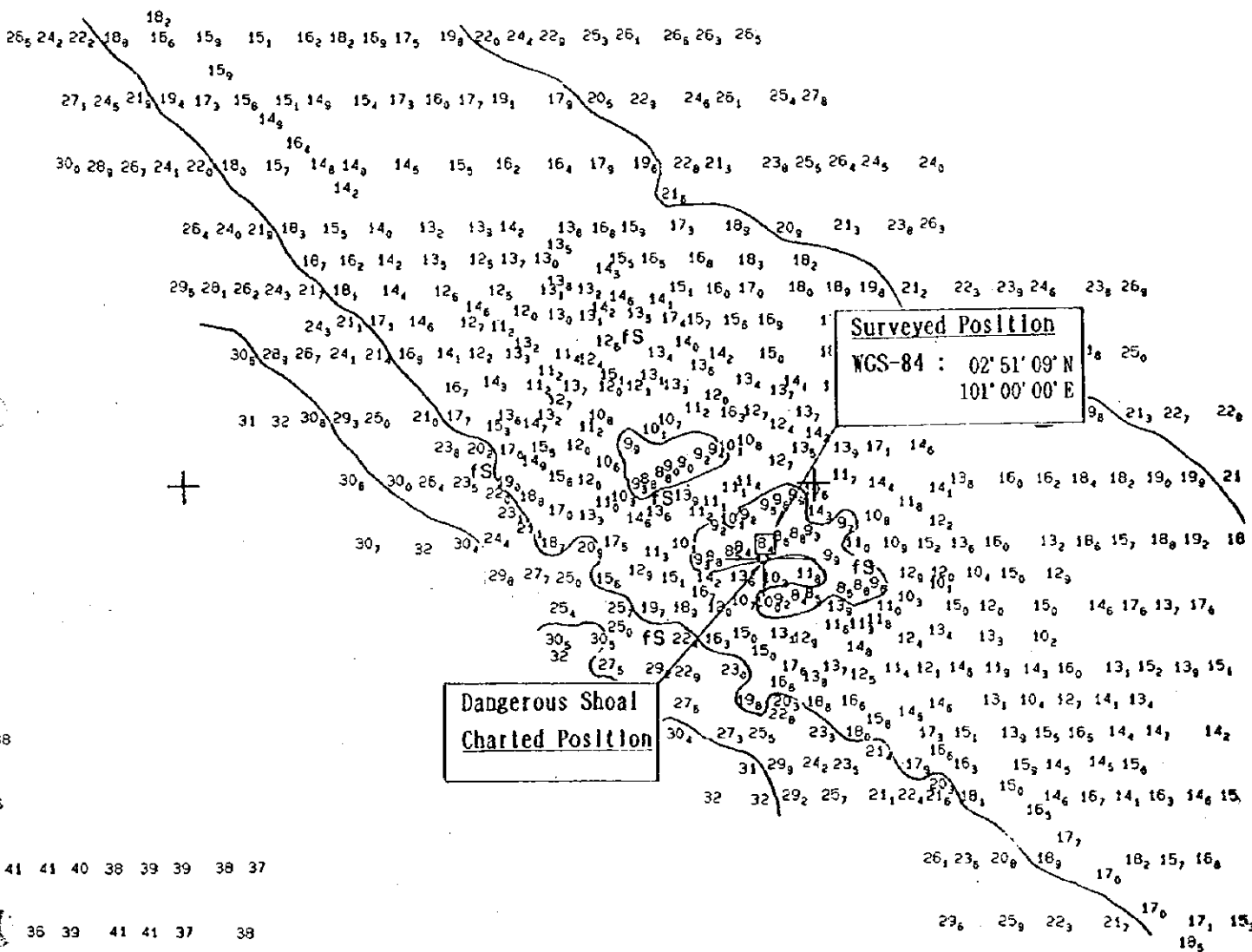
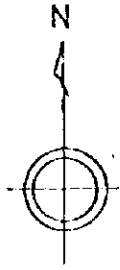


Figure 3-56 Sounding Plot of Point k



Surveyed Position
 WGS-84 : 02° 51' 09" N
 101° 00' 00" E

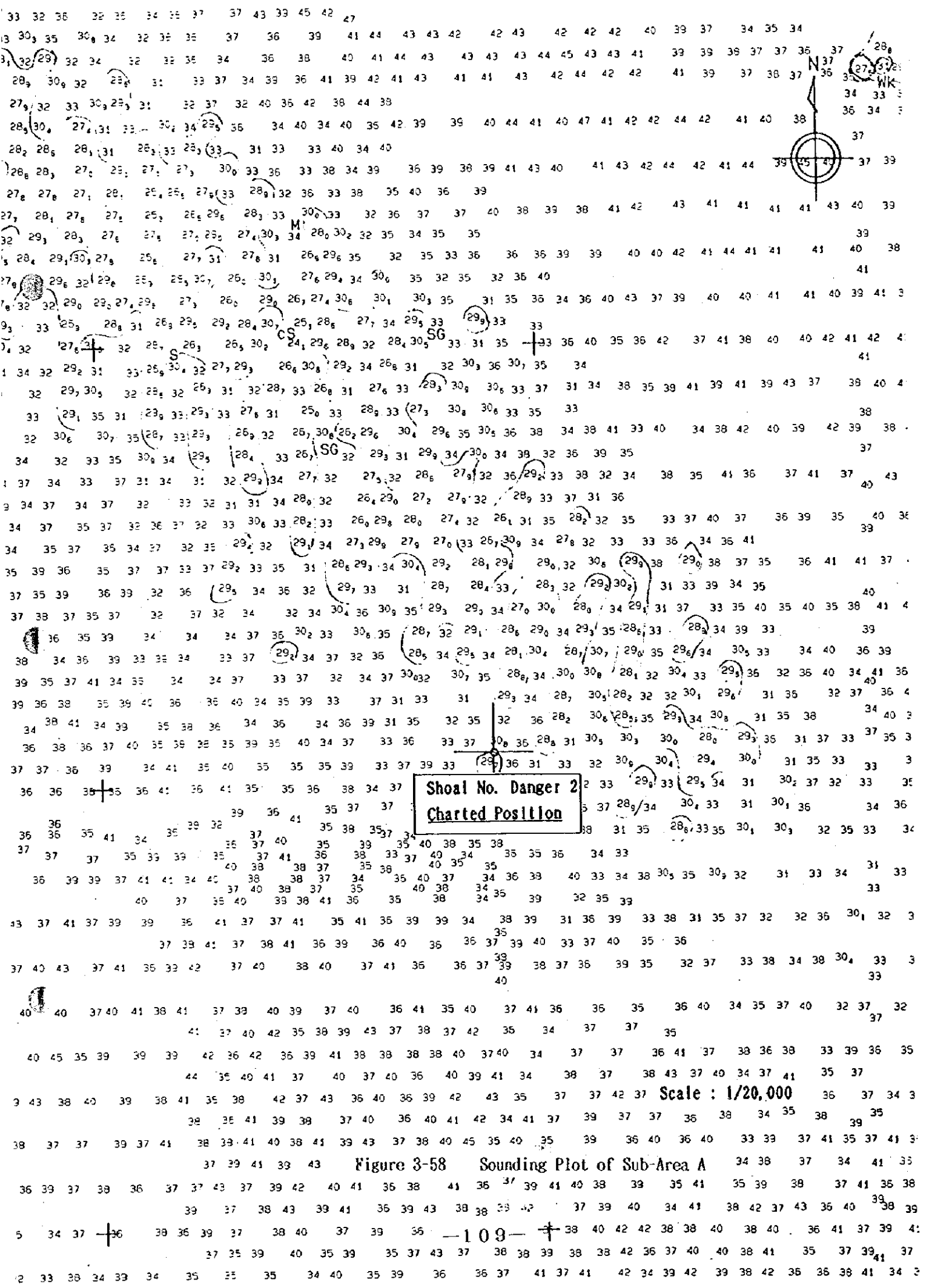
Dangerous Shoal
Charted Position

35 38
 36
 40 41 41 40 38 39 39 38 37
 39 36 39 41 41 37 38
 38 38 37 37 39 37 41 36 37 40 39 40 41 37

Scale : 1/20,000

Figure 3-57 Sounding Plot of Point 1

38 37 37 35 36 36 36 36 37 37 36 35 39 41 38 39 38 39 41
 38 37 34 36 36 36 36 36 36 34 36 36 35 37 35 40 41 37 43 40 39 41 39 41 41
 38 37 36 35 36 35 35 35 34 35 34 36 36 36 37 3 — 108 — 43 41 39
 38 37 37 30 36 35 36 35 35 34 35 36 36 36 36 37 36 37 40 42 43 38 42 39 44 42 42 41
 39 37 36 35 35 35 35 35 34 35 36 36 36 36 37 36 37 40 42 43 38 42 39 44 42 42 41



Shoal No. Danger 2
Charted Position

Scale : 1/20,000

Figure 3-58 Sounding Plot of Sub-Area A

Sub-Area B

1: 20000



Surveyed Position

NGS-84 : 2° 35' 08" N
101° 25' 19" E

Shoal

Charted Position (Rep)

Surveyed Position

NGS-84 : 2° 34' 33" N
101° 25' 23" E

Surveyed Position

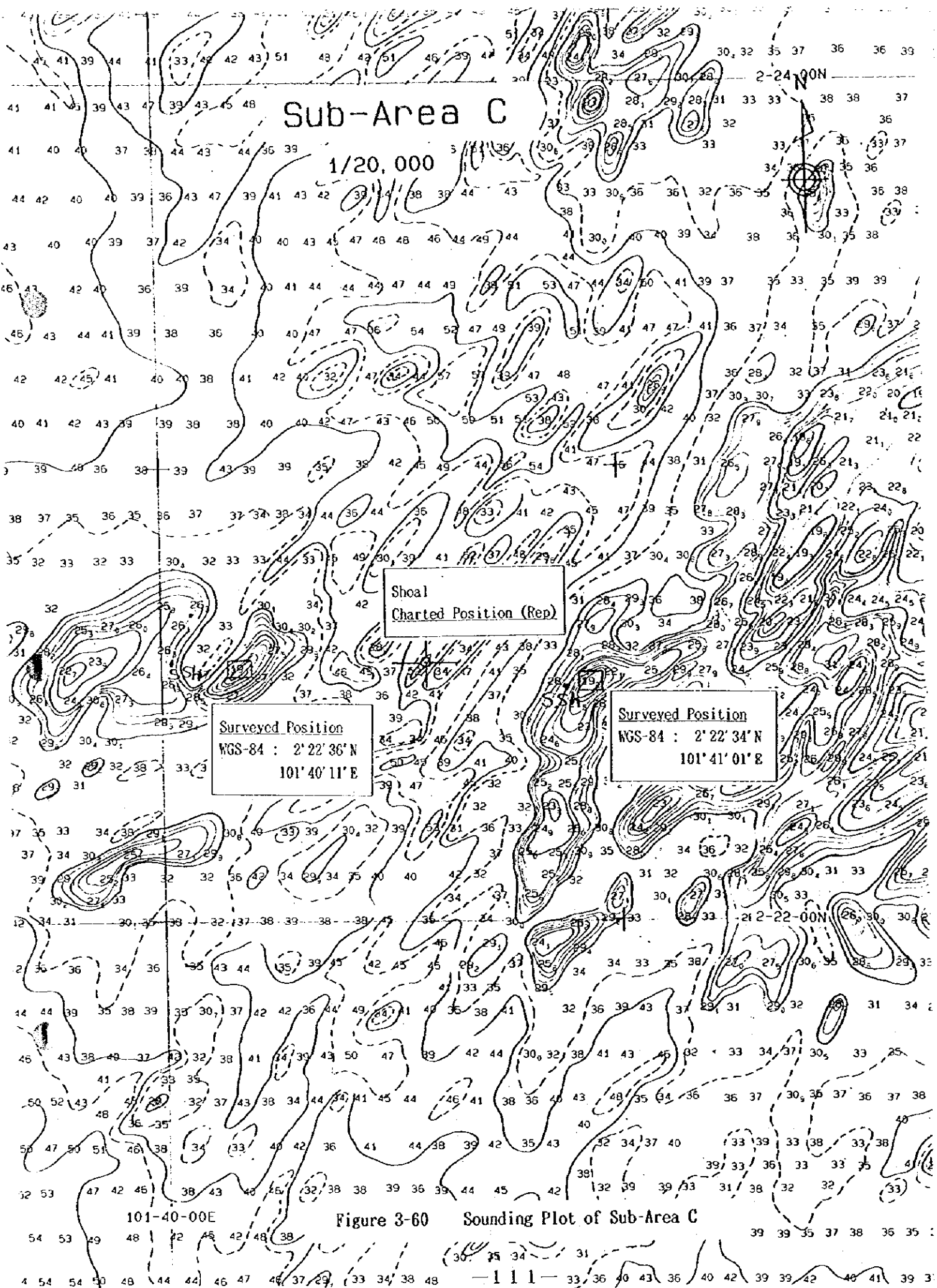
NGS-84 : 2° 34' 10" N
101° 25' 33" E

Shoal

Charted Position (Rep)

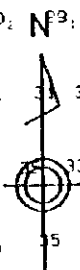
Figure 3-59 Sounding Plot of Sub-Area B

101-26-00E



Point g

1:20000

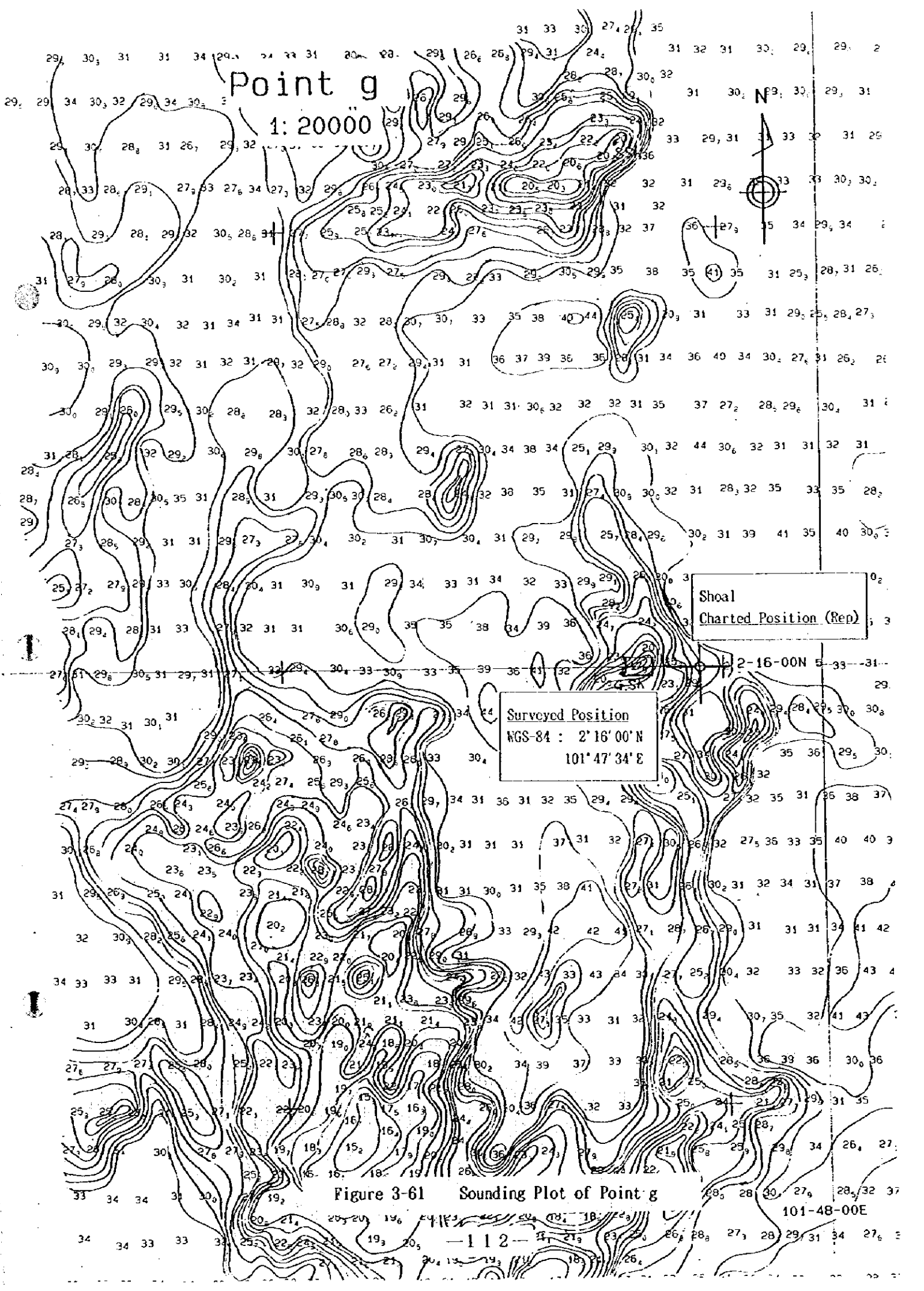


Shoal
Charted Position (Rep)

Surveyed Position
WGS-84 : 2°16'00"N
101°47'34"E

Figure 3-61 Sounding Plot of Point g

101-48-00E



Sub-Area K

1/20,000

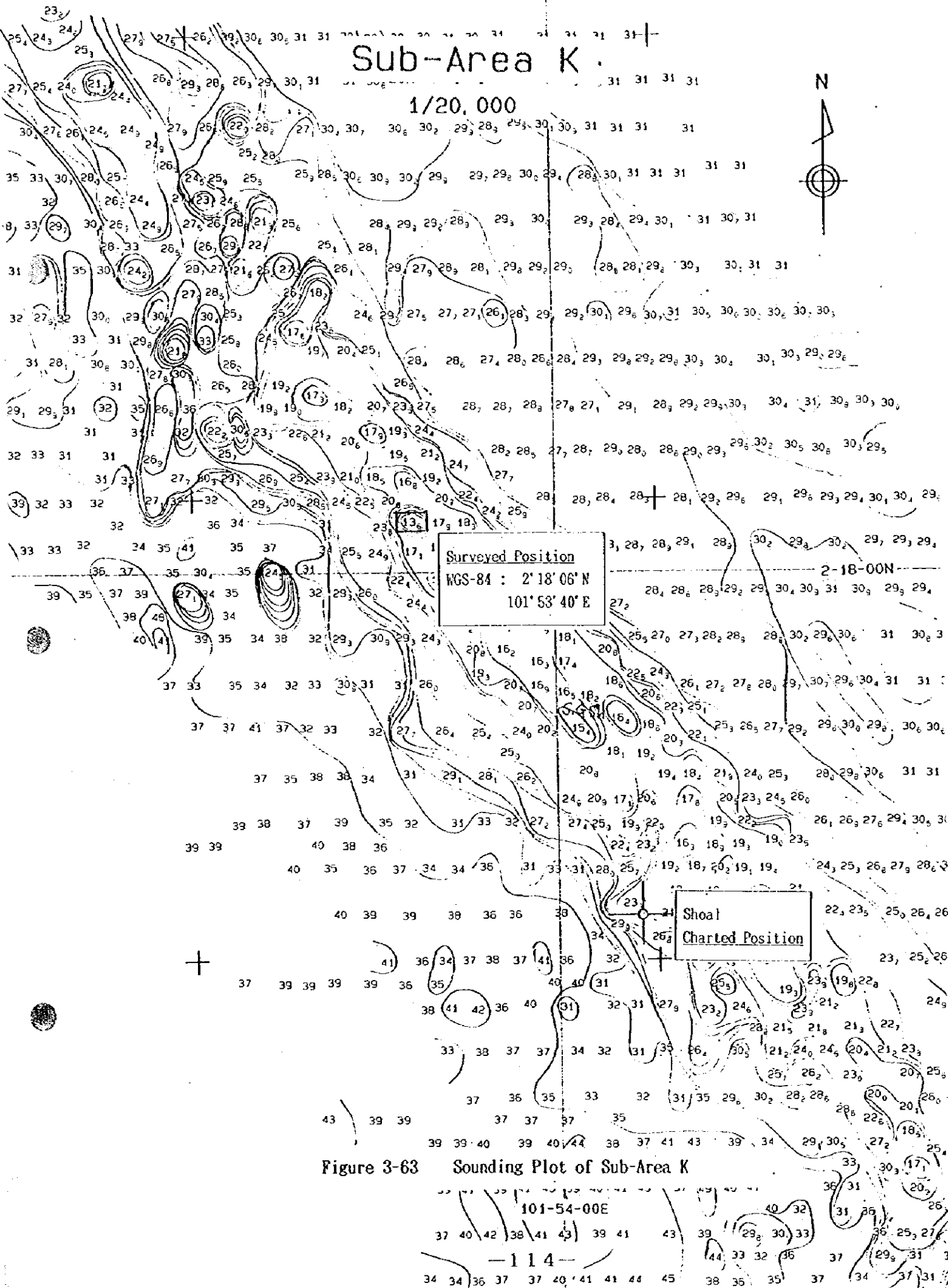


Figure 3-63 Sounding Plot of Sub-Area K

101-54-00E

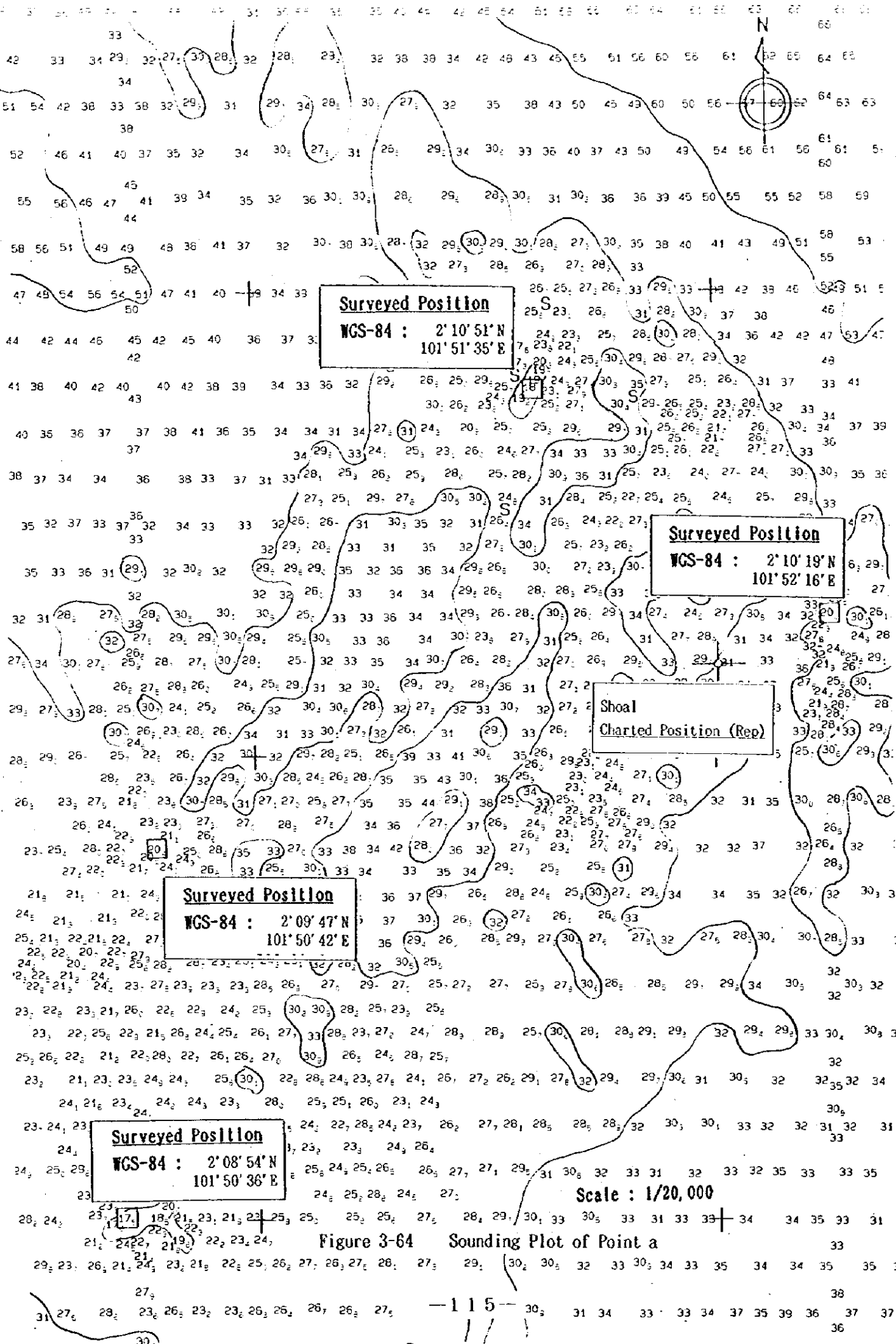


Figure 3-64 Sounding Plot of Point a

Sub-Area L

1/20,000

1-44-00N

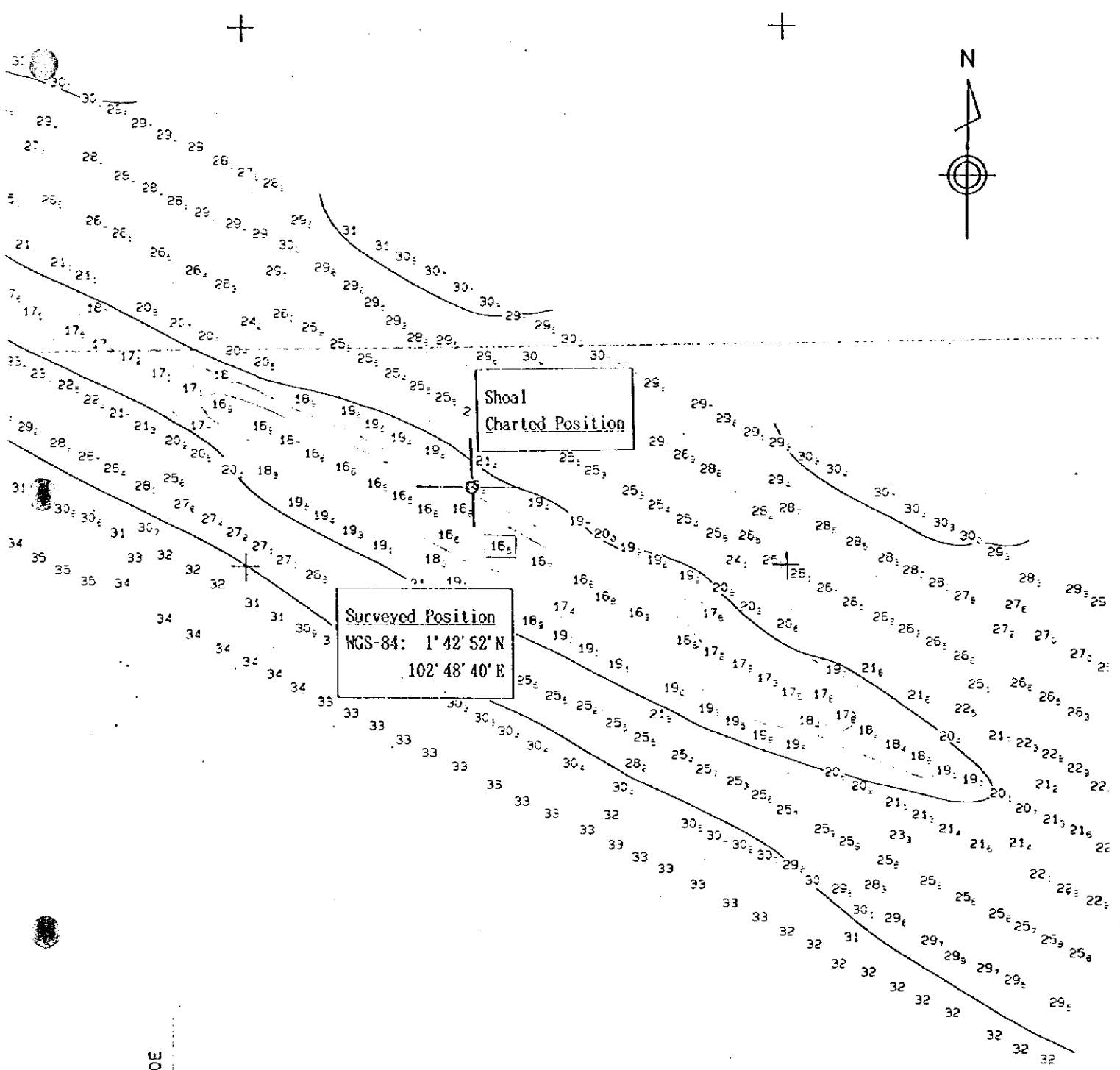
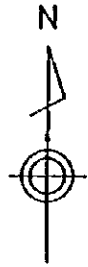
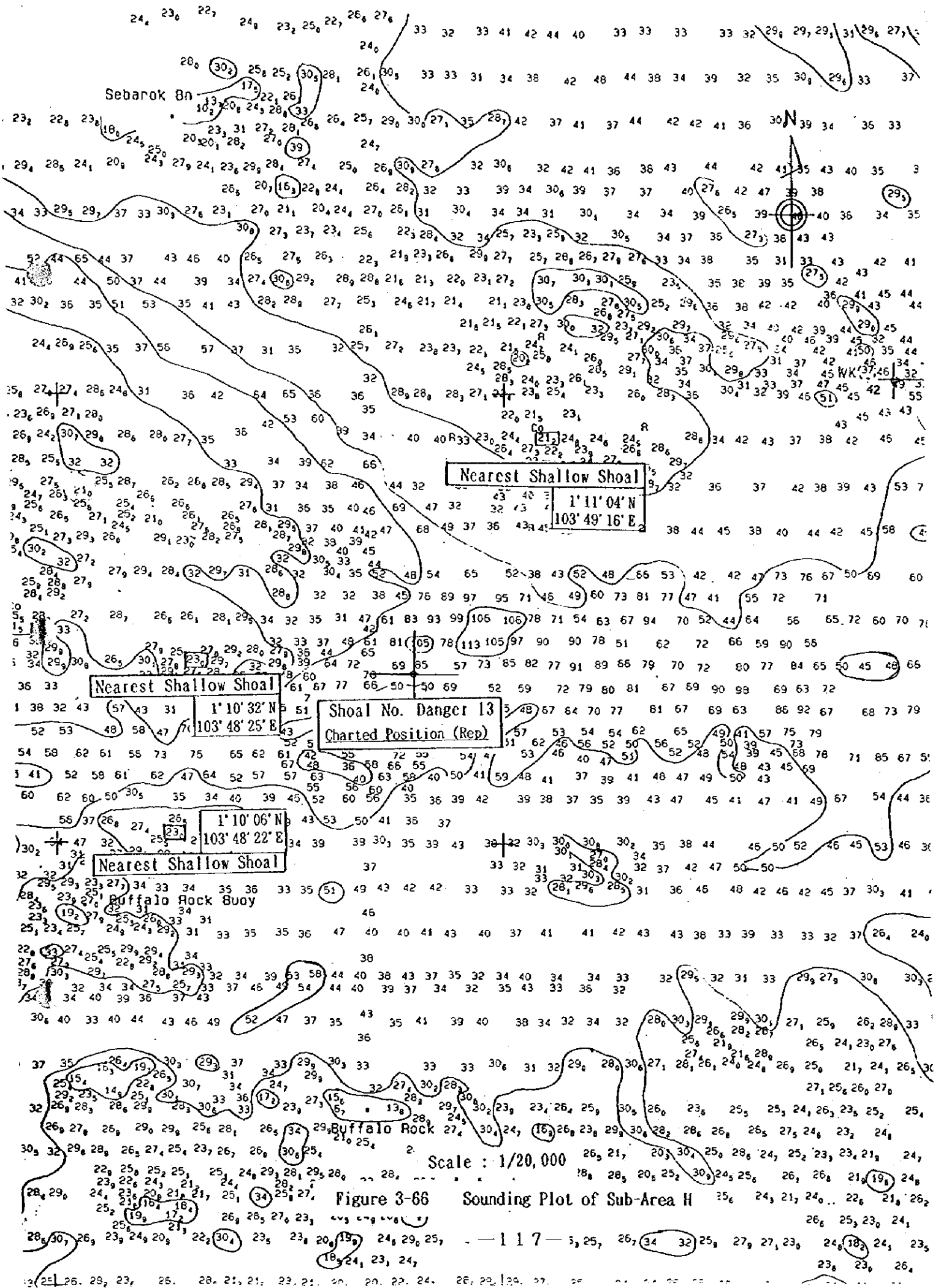


Figure 3-65 Sounding Plot of Sub-Area L



(4) Characteristics of Sand Waves

The purpose of this study was to know the characteristics of sand waves in the Strait of Malacca. For that purpose, a survey area located at the south of One Fathom Bank was chosen.

The survey area was in Sub-Area A having a depth around 30 meters as shown in Figure 3-67. The north and south sides of this area are called "North Sands" and "South Sands", and the survey area is situated at the northwestern part of the South Sands.

The general topography of seabed in the area trends northwest and the channel runs almost along the topography. Tidal currents in this area are northwest to southeast along the topography having a maximum speed of about three knots.

From sounding plots and echo sounder records, the dimension of typical sand waves can be obtained as follows (refer to the attached Appendix 9 for echo sounder records of sand waves) :

	(Height of Sand Wave)	(Wave Length)	(Remarks)
Sub-Area A :	2 ~ 4 meters	70 ~ 180 meters	top of bank
	4 ~ 10 meters	150 ~ 400 meters	foot of bank
Point 1 :	3 ~ 5 meters	100 ~ 170 meters	
Point k :	3 ~ 6 meters	80 ~ 150 meters	

Considering the whole area surveyed, the height of sand waves, peak to trough, is 2 to 10 meters and wave length is 70 to 400 meters. Generally, the height and wave length at the top of bank is smaller than that at the foot of bank.

With respect to the strike of sand waves, wave ridges generally run to the direction of northeast-southwest, which is perpendicular to predominant tidal currents.

Bottom materials of the sand wave area comprised mainly fine sand and sand, and partly coarse sand.

For seasonal and annual variation of sand waves, it is very difficult to interpret the tendency of the variation because of the lack of detailed data.

Only the sounding data, which were obtained during the joint survey in 1974 and by H.M. Surveying Ships Dampier and Hydra in 1967 and 1970, are available for comparison as far as we know. The comparison between surveyed results and existing data shows that big sand wave variation cannot be recognized.

Sand Wave Area

Chart No. MAL 515 (Scale 1:200,000)

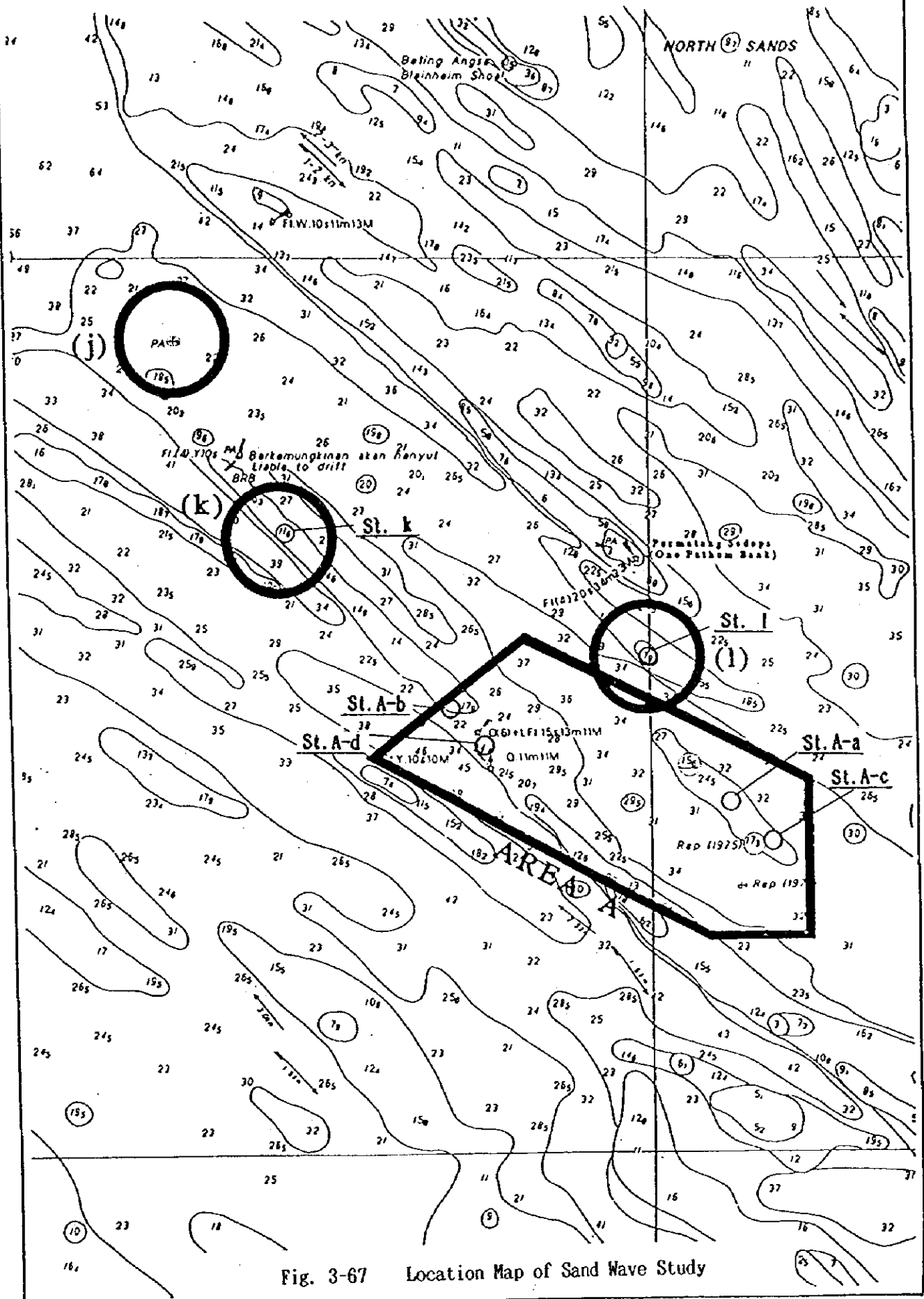


Fig. 3-67 Location Map of Sand Wave Study