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REPORT ON THE SURFICIAL GEOLOGY
OF UPPER CHALEUR BAY
MAPPED USING MS26B ECHOSOUNDER DATA
FROM THE CANADIAN HYDROGRAPHIC SERVICE

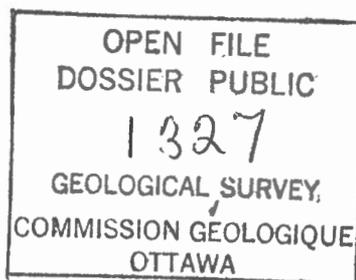
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SUMMARY

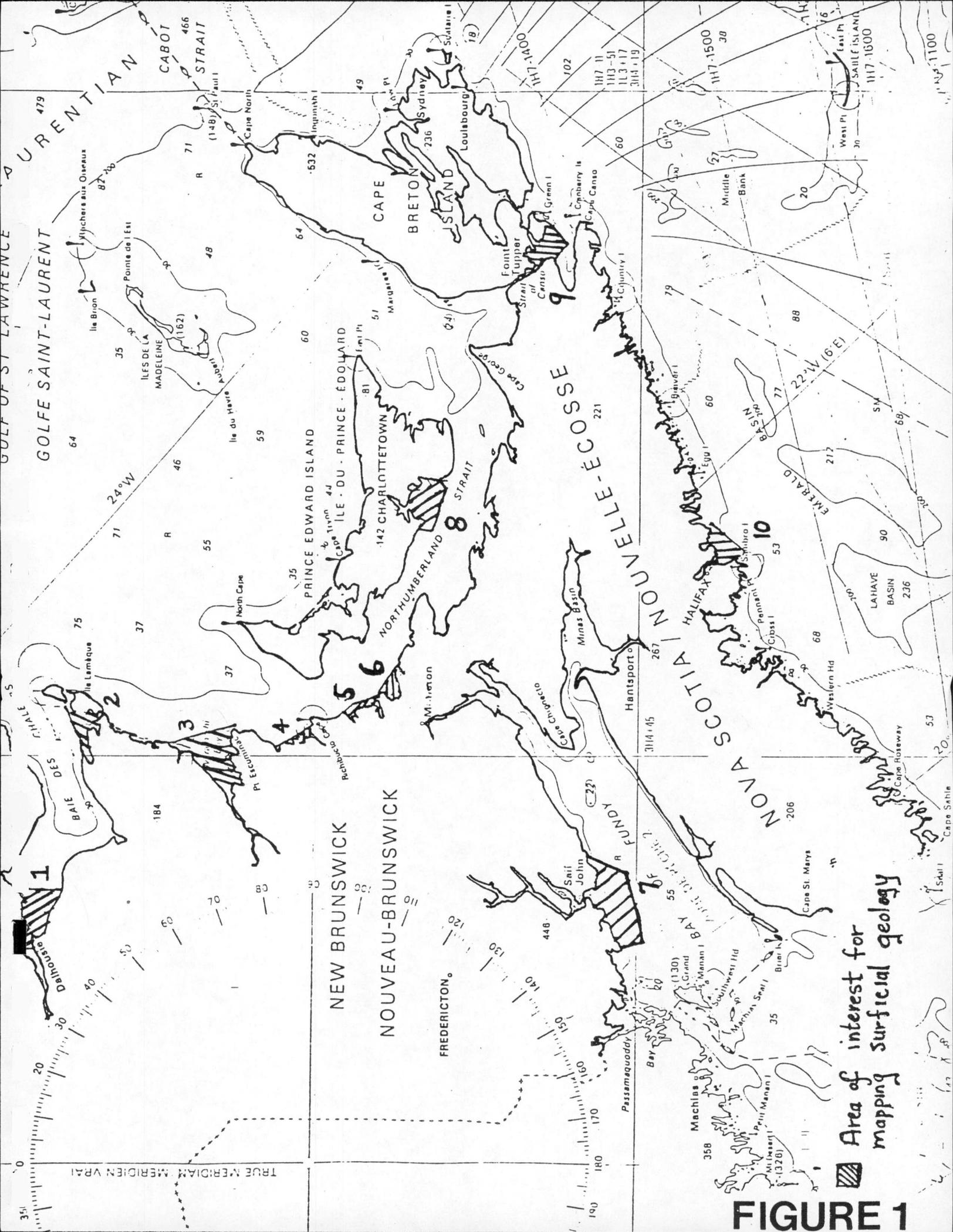
Surficial sediment texture has been mapped in the Upper Bay of Chaleur using MS26B echosounder data collected by the Canadian Hydrographic Service in 1964. Four types of bottom sediment, I, II, IIa and III, interpreted as sandy silt, mud, sandy mud and sand, are distinguished on the basis of reflector characteristics. Sediment is generally distributed with the coarsest material in shallow water and the finer material deposited in deeper areas.

A submerged and partially buried river channel has been traced from the mouth of the Restigouche River eastward to the margin of the map area. Apparent scouring indicates strong bottom currents in the section of channel between profiles E1-E2 and J1-J2. Sediment distribution also indicates stronger bottom currents north of the channel than to the south. Thus, areas favourable for dumping of dredged material would be southwest of the channel, over Type IIa sediment, or in the eastern portion of the map area, over Type II sediment.

SECTION 1

INTRODUCTION

The purpose of this project has been to map surficial sediment texture of inshore areas using existing Canadian Hydrographic Service data. Ten areas of interest were suggested by Don Bezanson and described in the Geomarine proposal. Figure 1 is a page-size sketch of the interest areas and Figures 2-11 show each area in detail. Upper Chaleur Bay, from Belledune to Dalhousie was chosen for mapping, based on priority ratings by the client, and availability of data. The area actually mapped, ~680 sq. km., is larger than Area 1 of the proposal and corresponds to CHS Field Sheet #4042.



Area of interest for mapping surficial geology

FIGURE 1

NOTRE

DAME

MOUNTAINS

-2325

AREA 1

UPPER REACHES OF CHALEUR BAY
TAKEN FROM CHART 4002

-2325

-1275

-1725

-2175

-1525

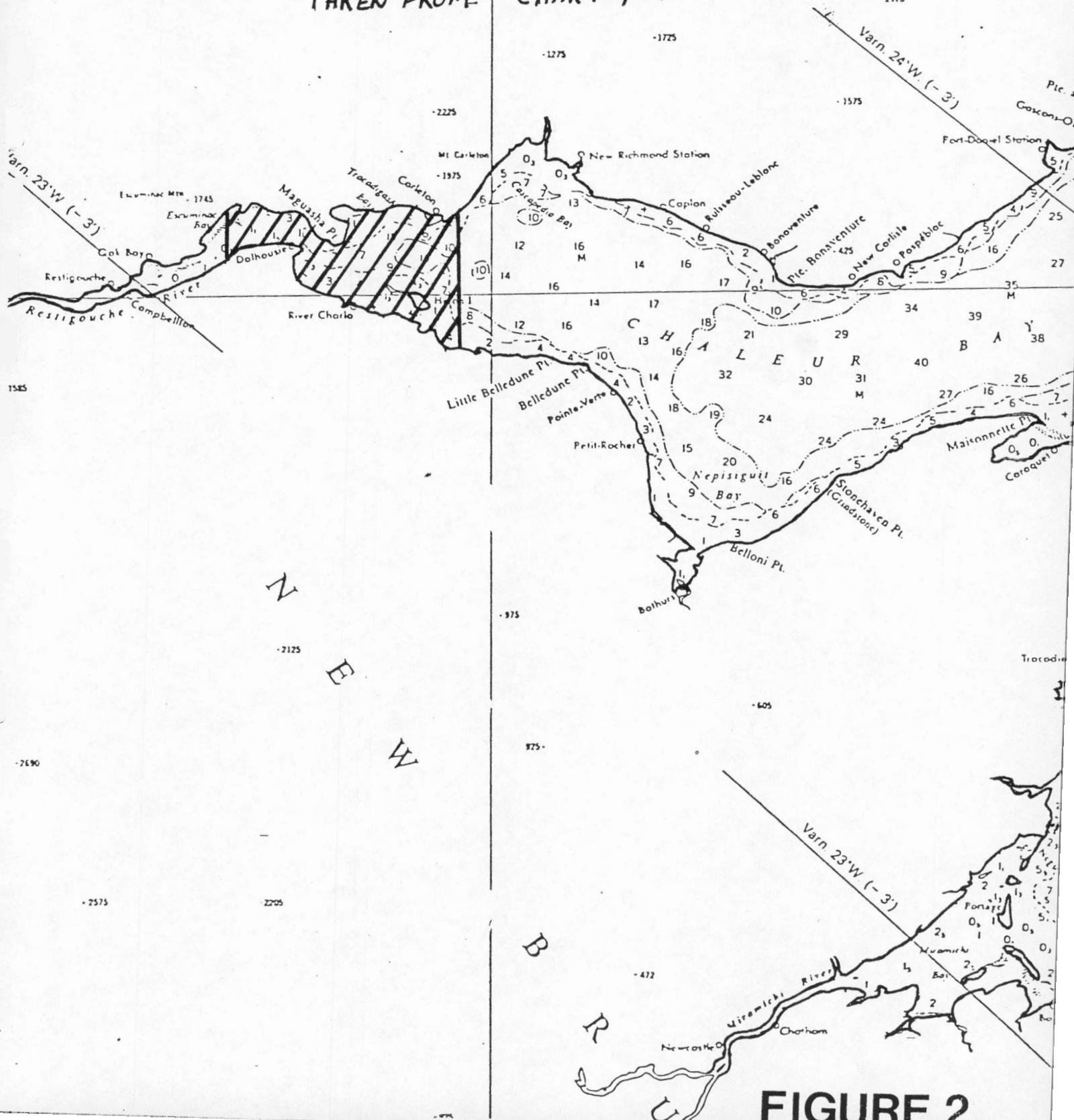


FIGURE 2

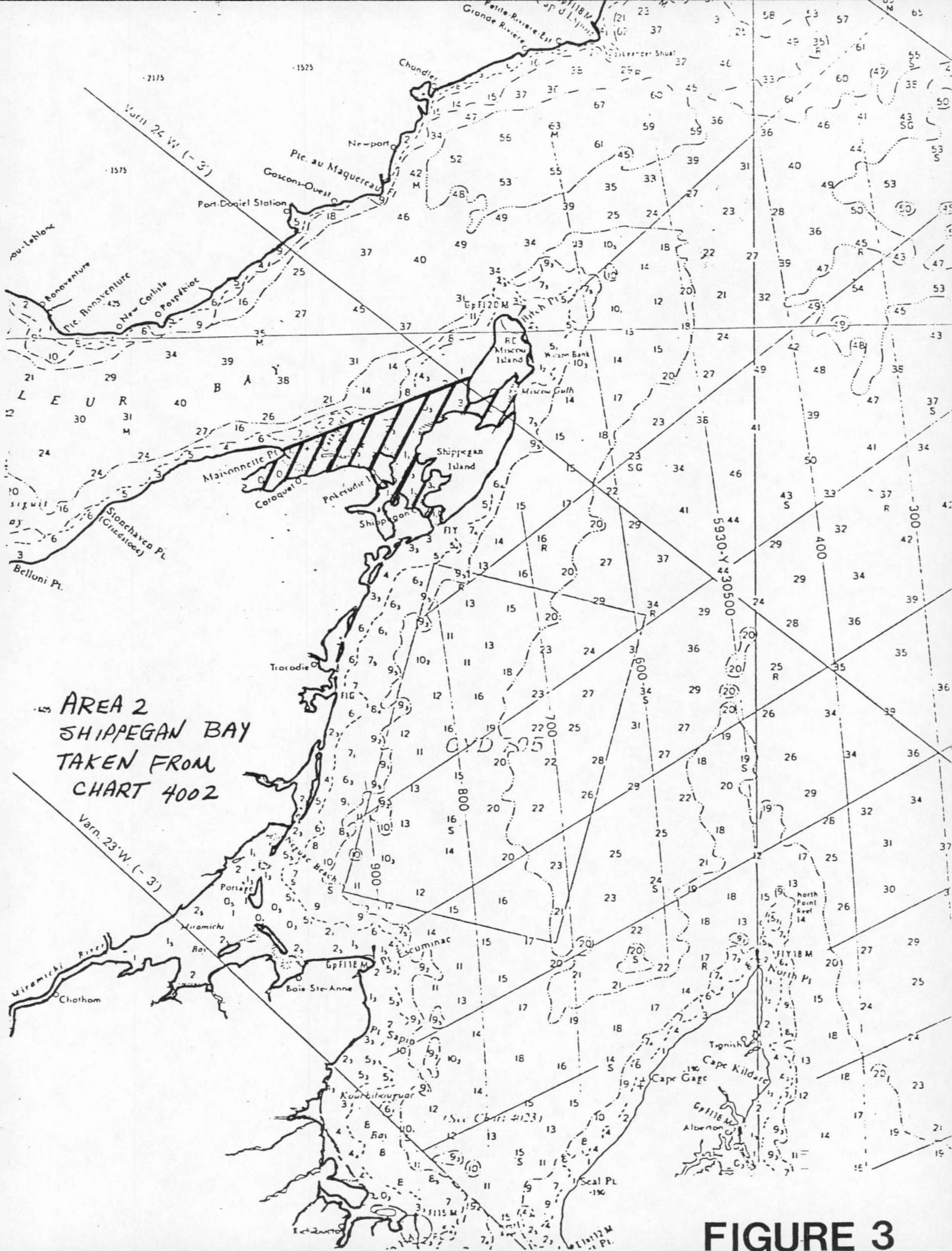


FIGURE 3

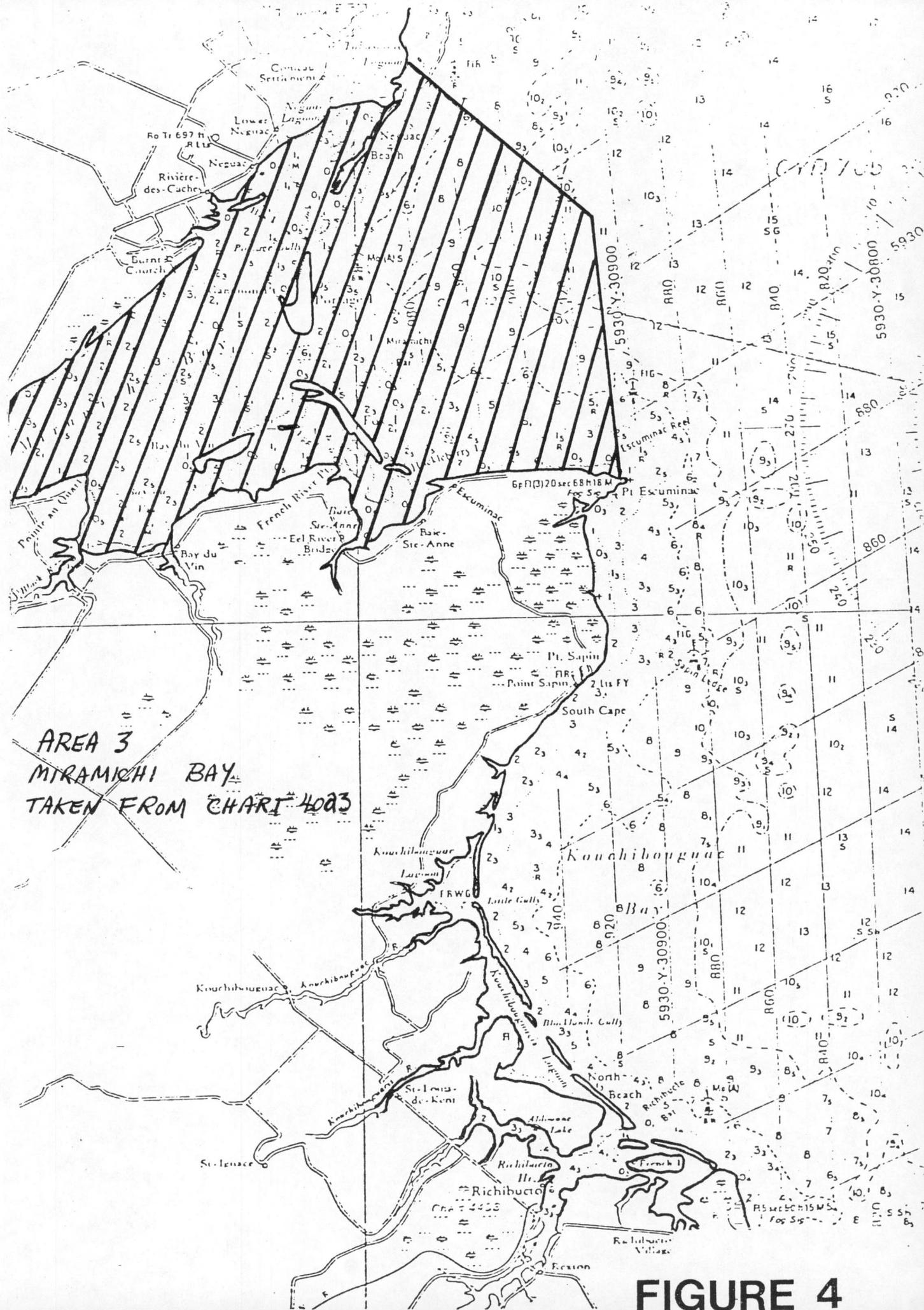
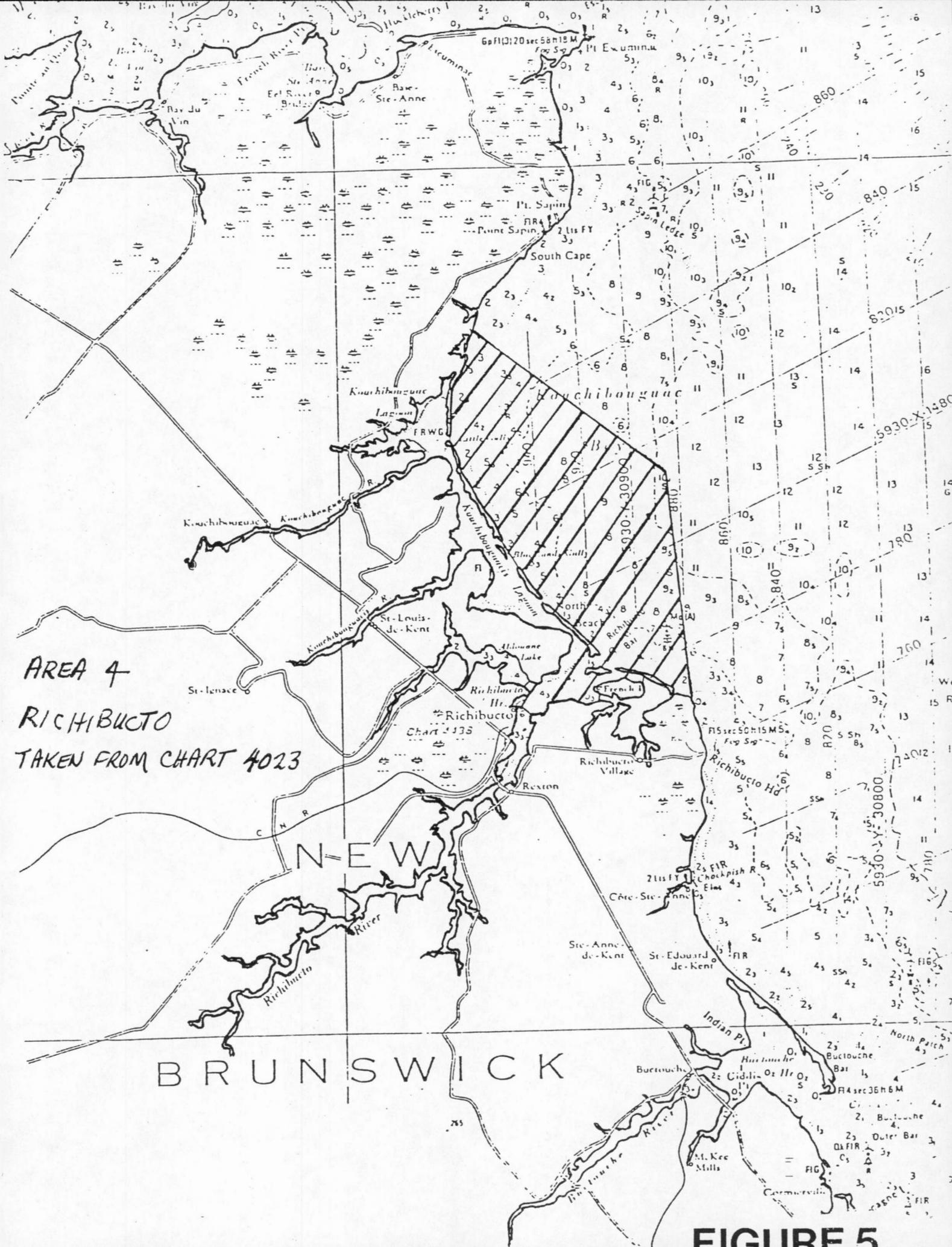


FIGURE 4



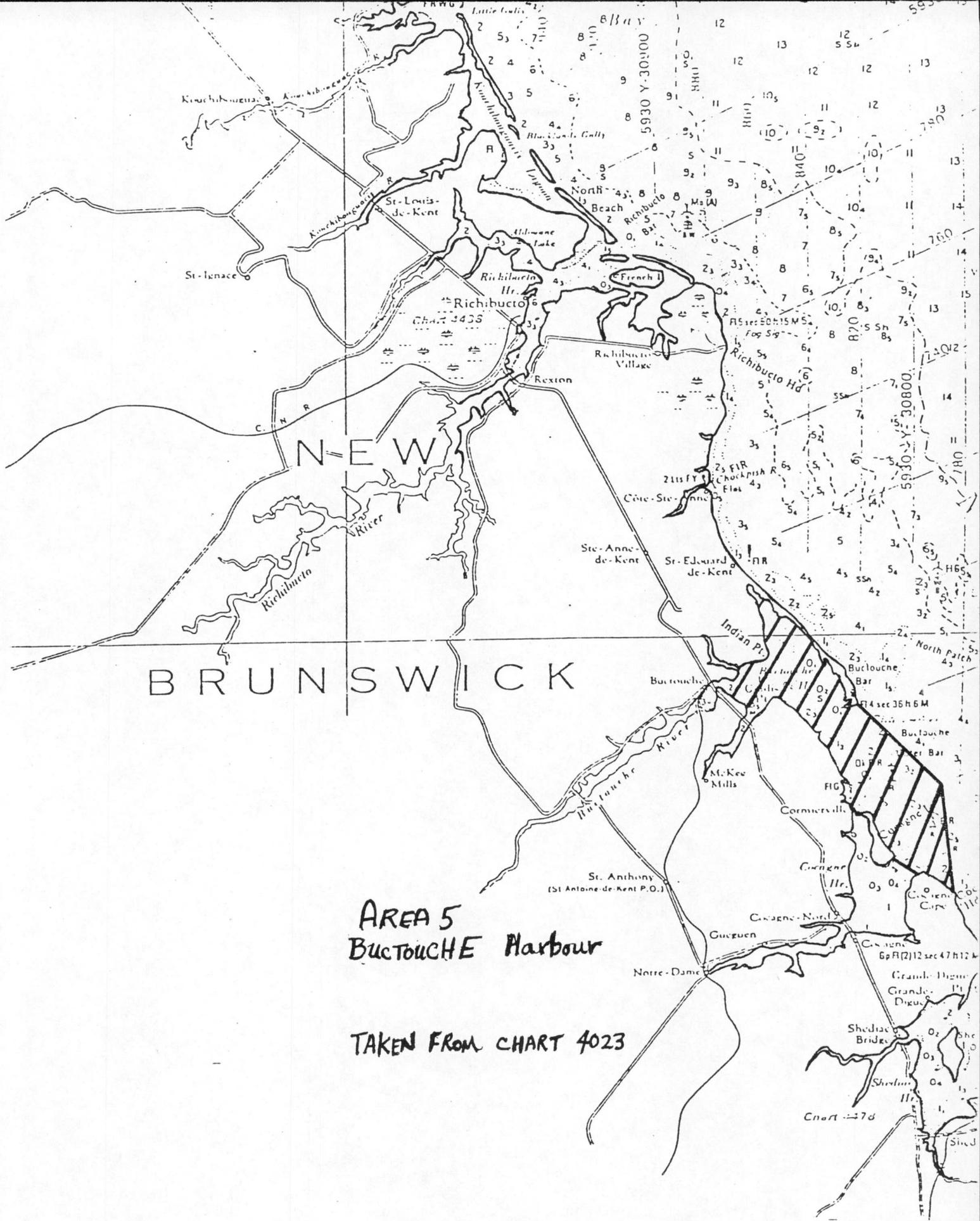
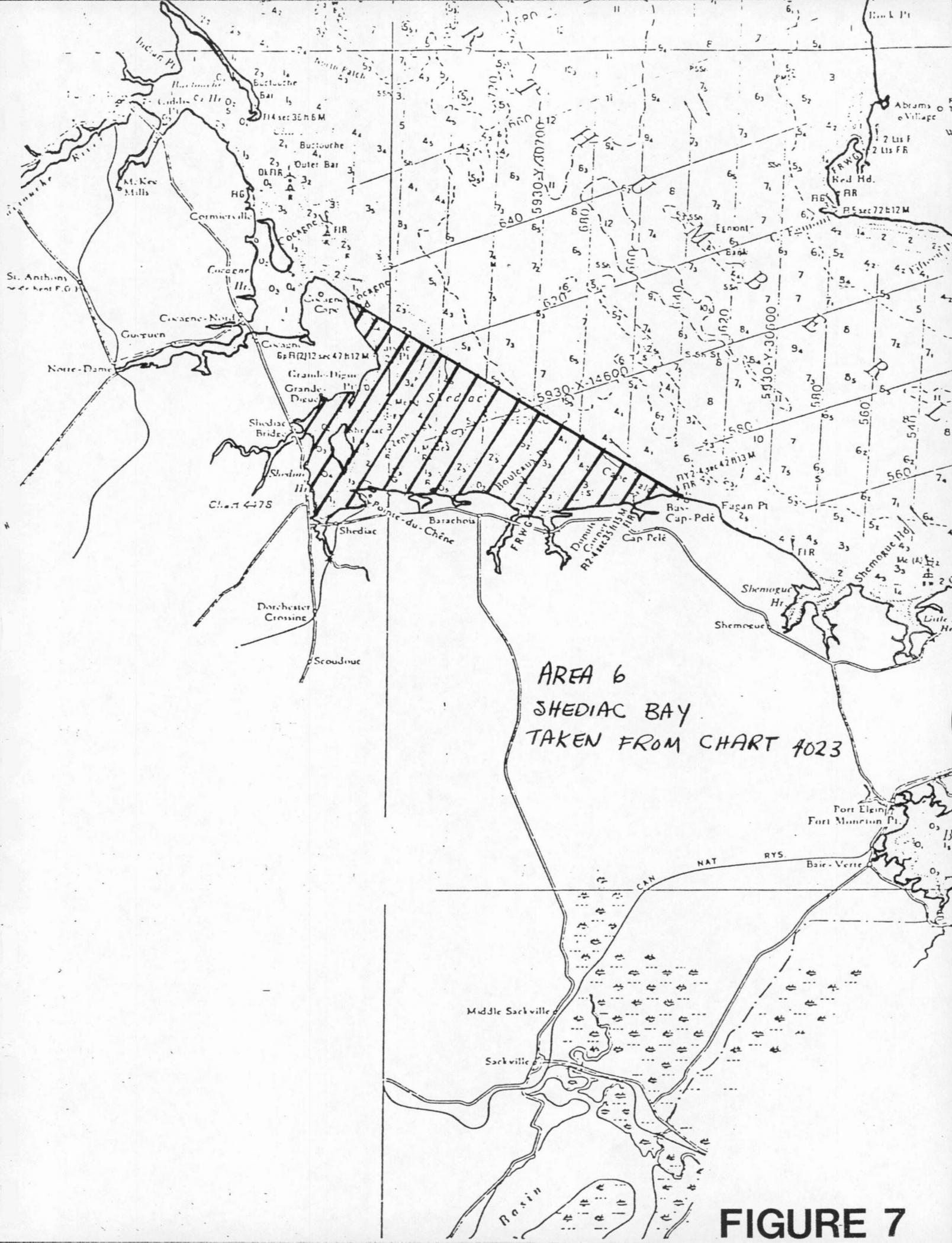


FIGURE 6



AREA 6
 SHEDIAC BAY
 TAKEN FROM CHART 4023

FIGURE 7

NEW-BRUNSWICK

SAINT JOHN Harbour

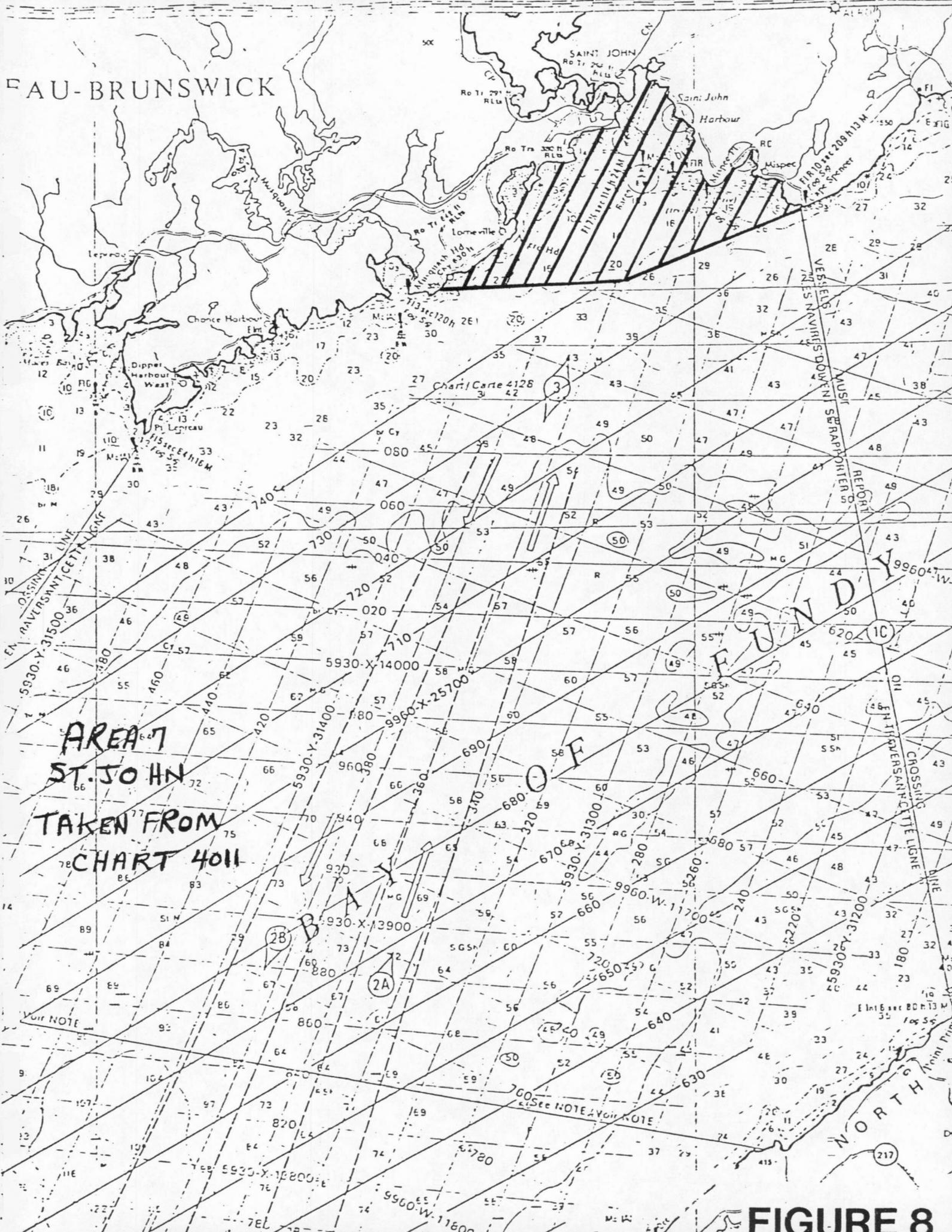


FIGURE 8

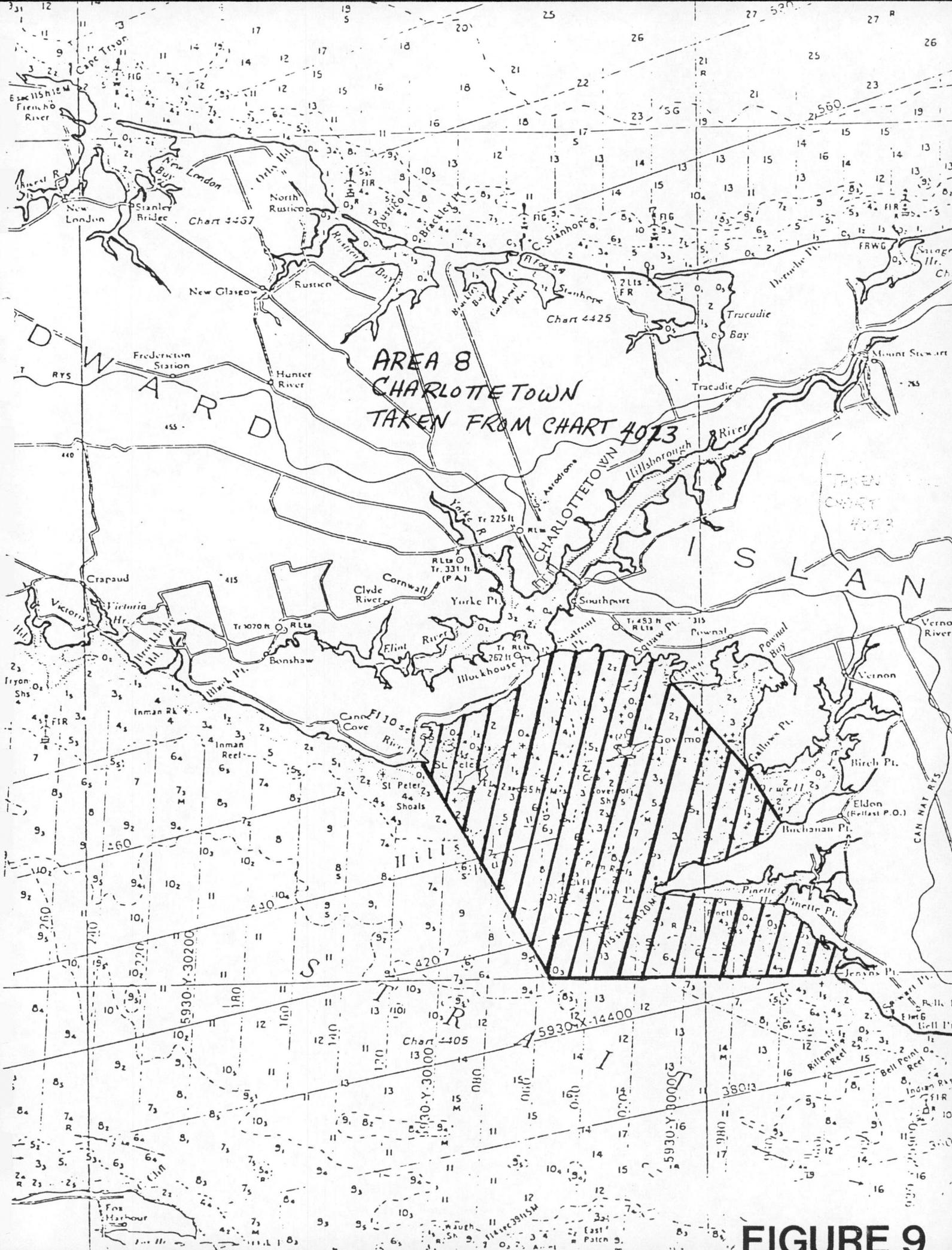
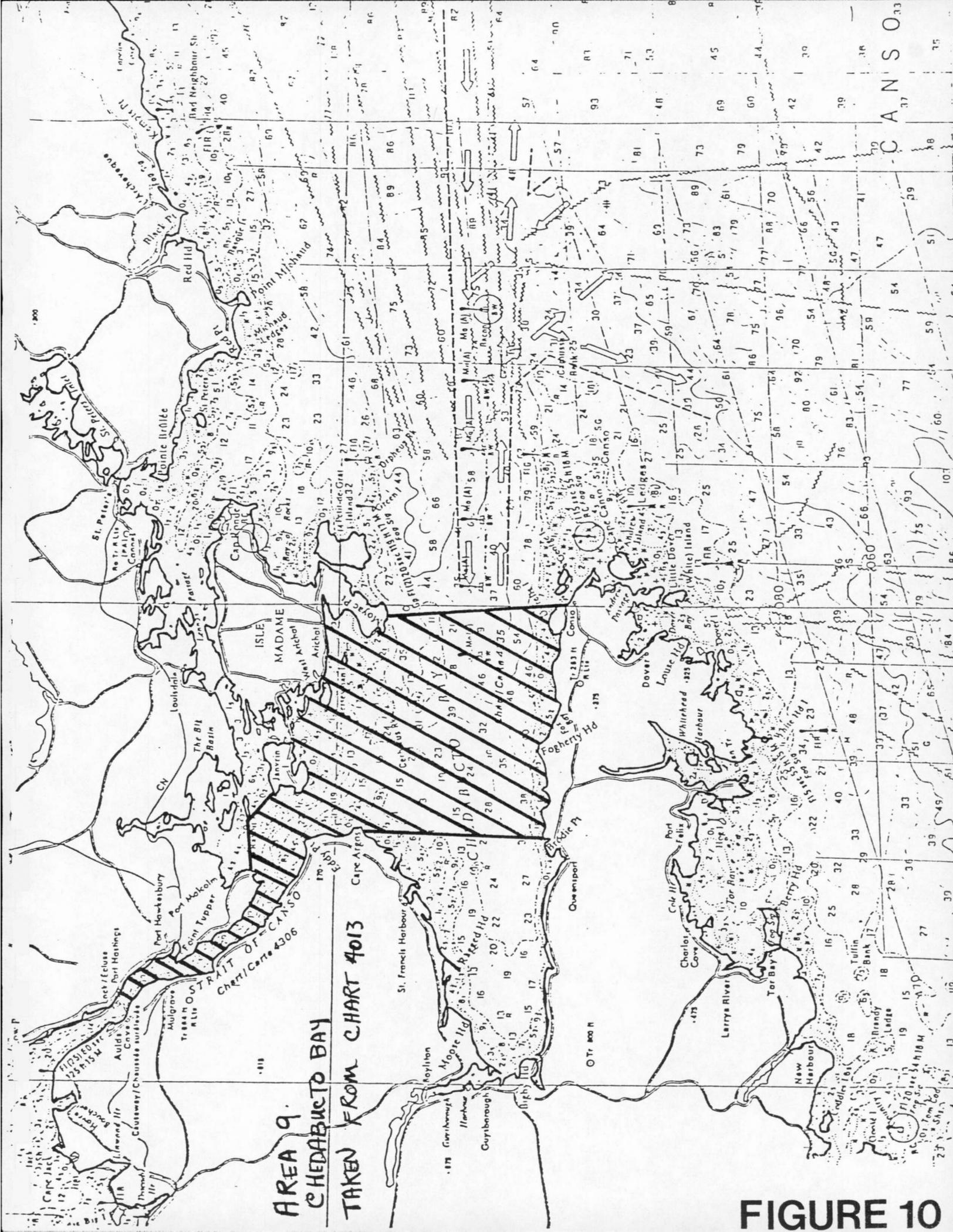


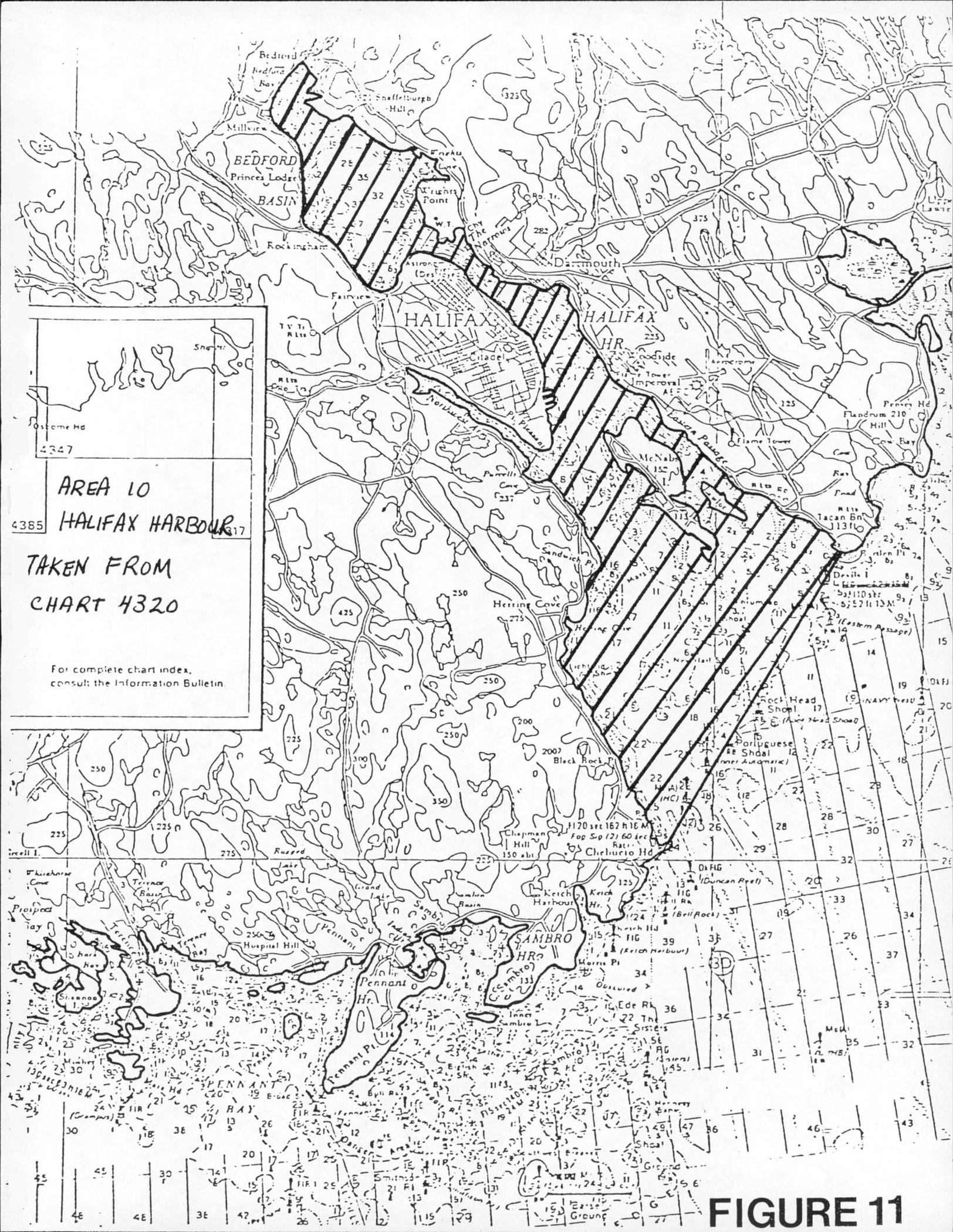
FIGURE 9



AREA 9.
 CHEDABUCTO BAY
 TAKEN FROM CHART 4013

FIGURE 10

CAN SO 33



4385
AREA 10
HALIFAX HARBOUR
 4317
 TAKEN FROM
 CHART 4320
 For complete chart index,
 consult the Information Bulletin.

FIGURE 11

SECTION 2

THE DATA

The data, collected in 1964 by the Canadian Hydrographic Service, is composed of four boatboard track plots and 32 rolls of MS26B profiles. Approximately 1800 line-km. of data, at a line spacing of ~300 metres, provides very detailed coverage of the area. All the available data has been used in compiling the sediment texture map.

Table 1 lists the sounding rolls by date, vessel and fix numbers.

TABLE 1

Echosounder Data from the Map Area Listed by Roll

| <u>Vessel</u> | <u>Date</u> | <u>Fix Numbers</u> |
|---------------|--------------------|--------------------|
| KUNGO | September 19, 1964 | 1-139 |
| KUNGO | September 22, 1964 | 1-180 |
| KUNGO | October 7, 1964 | 1- 27 |
| KUNGO | October 8, 1964 | 1- 27 |
| WIDGEON | September 14, 1964 | 1-155 |
| WIDGEON | September 15, 1964 | 1- 6 |
| WIDGEON | September 17, 1964 | 1-141 |
| WIDGEON | September 18, 1964 | 1- 70 |
| WIDGEON | September 19, 1964 | 1-140 |
| WIDGEON | September 22, 1964 | 1-124 |
| WIDGEON | October 7, 1964 | 1- 50 |
| WIDGEON | October 8, 1964 | 1-147 |
| WIDGEON | October 15, 1964 | 1- 40 |
| METELA | August 31, 1964 | 1- 45 |
| METELA | September 14, 1964 | 1- 98 |
| METELA | September 15, 1964 | 1- 12 |
| METELA | September 17, 1964 | 1-163 |
| METELA | September 18, 1964 | 1- 53 |
| METELA | September 19, 1964 | 1-102 |
| METELA | September 22, 1964 | 1- 82 |
| METELA | October 6, 1964 | 1- 66 |
| METELA | October 7, 1964 | 1- 48 |
| METELA | October 8, 1964 | 1-125 |
| KAPUSKASING | August 27, 1964 | 1-183 |
| KAPUSKASING | August 28, 1964 | 1-136 |
| KAPUSKASING | August 29, 1964 | 1-142 |
| KAPUSKASING | August 30, 1964 | 1- 18 |
| KAPUSKASING | September 2, 1964 | 1- 32 |
| KAPUSKASING | September 10, 1964 | 1-123 |
| KAPUSKASING | September 12, 1964 | 1-131 |
| KAPUSKASING | September 13, 1964 | 1-139 |
| MALARD | September 18, 1964 | 1- 39 |

SECTION 3

INTERPRETATION METHODS

Echosounder data has been used in the past to map surficial sediment texture (L. H. King, 1967). Several parameters must be taken into consideration when interpreting MS26B records:

- (1) the spread of the bottom return in time;
 - (2) the amplitude of the return, or the darkness of the bottom trace;
- and
- (3) the transparency of the sediment to sound (or the degree of sub-bottom penetration).

For example, sand is a hard, non-transparent medium which returns sound with very little penetration or scattering. Thus, pure sand allows no sub-bottom penetration and shows on a sounding record as a thin, dark line.

Conversely, clay, an almost transparent medium, shows a weak line at the bottom, underlain by a light area and allows good penetration to the underlying layers.

Silt tends to scatter acoustic energy and lies between clay and sand in degree of transparency. Thus, silt produces a broad, grey return which may be lighter or darker depending on the amount of clay or sand included. Transparency to sound, in the case of silt, is largely a function of the thickness of the layer and is reduced by the inclusion of sand.

With these concepts in mind, four bottom sediment types were delineated in the Upper Chaleur area, I, II, IIa and III.

Type I has been mapped over areas showing a broad, strong bottom return, usually with no sub-bottom penetration. The sediment is assumed to be predominantly silt with varying amounts of sand and clay. Boundaries with Type IIa are often gradational and the two are probably opposite ends of a sandy-silt to clayey-silt spectrum.

Type IIa sediment allows penetration to depths of 15-20 feet and is characterized by a moderately strong bottom return. The weaker return and higher transparency of Type IIa, as compared to Type I sediment, is indicative of a lower sand content.

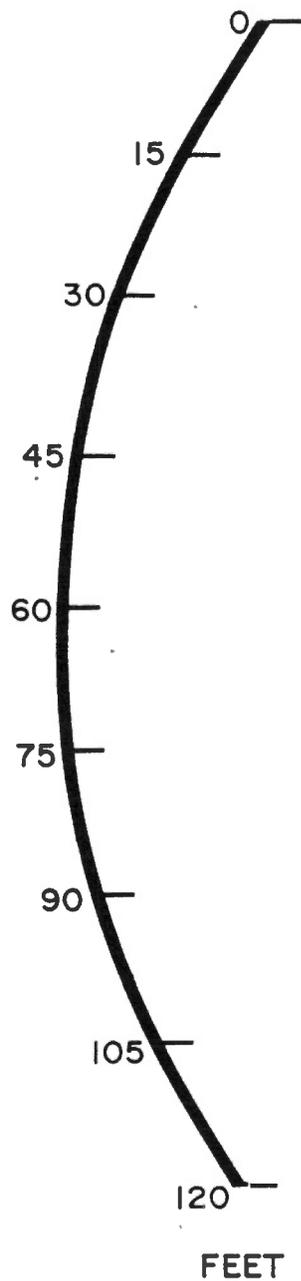
Type II has been mapped over areas showing a weak bottom return with good penetration to underlying layers.

A wide bottom return indicates a fairly high silt content, while the transparency is characteristic of clay-type sediments.

Type III areas are characterized by a very thin bottom return and no penetration. The bottom trace usually appears patchy, probably as a result of scattering due to surface irregularities and/or the presence of gravel. Type III sediments can be tied into observed occurrences of sand and gravel recorded on the field sheets. Table 2 summarizes the classification system. Figure 12 is a depth scale for the profiles.

TABLE 2

| <u>Type</u> | <u>Description of Reflector</u> | <u>Interpretation</u> |
|-------------|---|--|
| I | Broad, strong bottom return usually without penetration to underlying layers | Predominantly silt with lesser amounts of sand and clay (sandy silt) |
| IIa | Moderately strong bottom return with penetration to underlying reflectors | Silt and clay with lesser amounts of sand (sandy mud) |
| II | Weak bottom return with good penetration to underlying reflectors | Silt and clay in sub-equal amounts (mud) |
| III | Narrow bottom return, usually patchy, with no penetration to underlying layers. | Predominantly sand with some gravel and possibly silt (sand) |



DEPTH SCALE (IN FEET) FOR THE MS26B ECHO-SOUNDER PROFILES

FIGURE 12

SECTION 4

RESULTS

The final surficial sediment map and 19 echosounder profiles, listed in Table 3, are included with the report. The map shows the coarsest material, Type III, distributed in the shallower areas around the margins of the bay. The finest sediment, Type II appears at depths greater than ~20 metres, with Types I and IIa arranged between the two extremes. The textural classification often corresponds to stratigraphic boundaries, with Type II overlying Type IIa (see profiles I1-I2 and J1-J2) which, in turn, can be seen on some profiles, overlying Type I sediment (see profiles C1-C2 and D1-D2).

A submerged river channel, indicated by the dashed line, has been traced through the map area and can be seen on many of the profiles. Depth of the channel in exposed sections varies from 20-35 feet, with a width of 750-1000 metres. Infilling with Type II sediment (see Profile L1-L2) has occurred in the deepest areas, while the section of channel closest to the mouth of the Restigouche River shows a sill of Type IIa (Profile C1-C2) sediment, probably river-borne in origin. Compare this to Profiles A1-A2 and B1-B2 which show no infilling of fine sediment.

Between these two sections, the channel is lined with coarser material, mapped as Type I, and appears to be scoured. Profile H1-H2 is a prime example. Sediment distribution generally indicates stronger currents north of the channel, which have laid down coarser material in smaller quantity than that found south of the channel (see Profile J1-J2).

Sediment distribution suggests the strongest bottom currents north of the channel and between lines E1-E2 and J1-J2. Thus, the sill at the mouth of the Restigouche River may be

partially due to incoming currents. The most favourable areas for dumping of dredged materials would be south and west of the channel over a Type IIa bottom or much further east in the areas bottomed by Type II material.

TABLE 3

Listing of Echosounder Profiles

| <u>Vessel</u> | <u>Date</u> | <u>Fix Nos.</u> | <u>Profile</u> |
|---------------|--------------------|-----------------|----------------|
| METELA | October 8, 1964 | 107-114 | A1-A2 |
| WIDGEON | October 8, 1964 | 65- 71 | B1-B2 |
| WIDGEON | October 8, 1964 | 1- 10 | C1-C2 |
| KUNGO | September 19, 1964 | 1- 8 | D1-D2 |
| KUNGO | September 19, 1964 | 39- 47 | E1-E2 |
| KUNGO | September 19, 1964 | 111-119 | F1-F2 |
| KUNGO | October 8, 1964 | 5- 9 | G1-G2 |
| KAPUSKASING | September 10, 1964 | 92-104 | H1-H2 |
| WIDGEON | September 22, 1964 | 1- 9 | I1-I2 |
| KAPUSKASING | September 10, 1964 | 41- 48 | J1-J2 |
| METELA | September 17, 1964 | 17- 24 | K1-K2 |
| KAPUSKASING | August 28, 1964 | 94-105 | L1-L2 |
| KAPUSKASING | August 27, 1964 | 117-130 | M1-M2 |
| KAPUSKASING | September 12, 1964 | 5- 16 | N1-N2 |
| KAPUSKASING | September 12, 1964 | 18- 30 | P1-P2 |
| METELA | August 31, 1964 | 16- 20 | Q1-Q2 |
| WIDGEON | September 14, 1964 | 48- 54 | R1-R2 |
| KAPUSKASING | September 13, 1964 | 68- 79 | S1-S2 |
| KAPUSKASING | September 10, 1964 | 111-120 | T1-T2 |

REFERENCES

- King, L. H., 1967. Use of a Conventional Echosounder and Textural Analyses in Delineating Sedimentary Facies: Scotian Shelf in Canadian Journal of Earth Sciences, Volume 4, No. 4.

A1

Type

A2

I

107

110

115

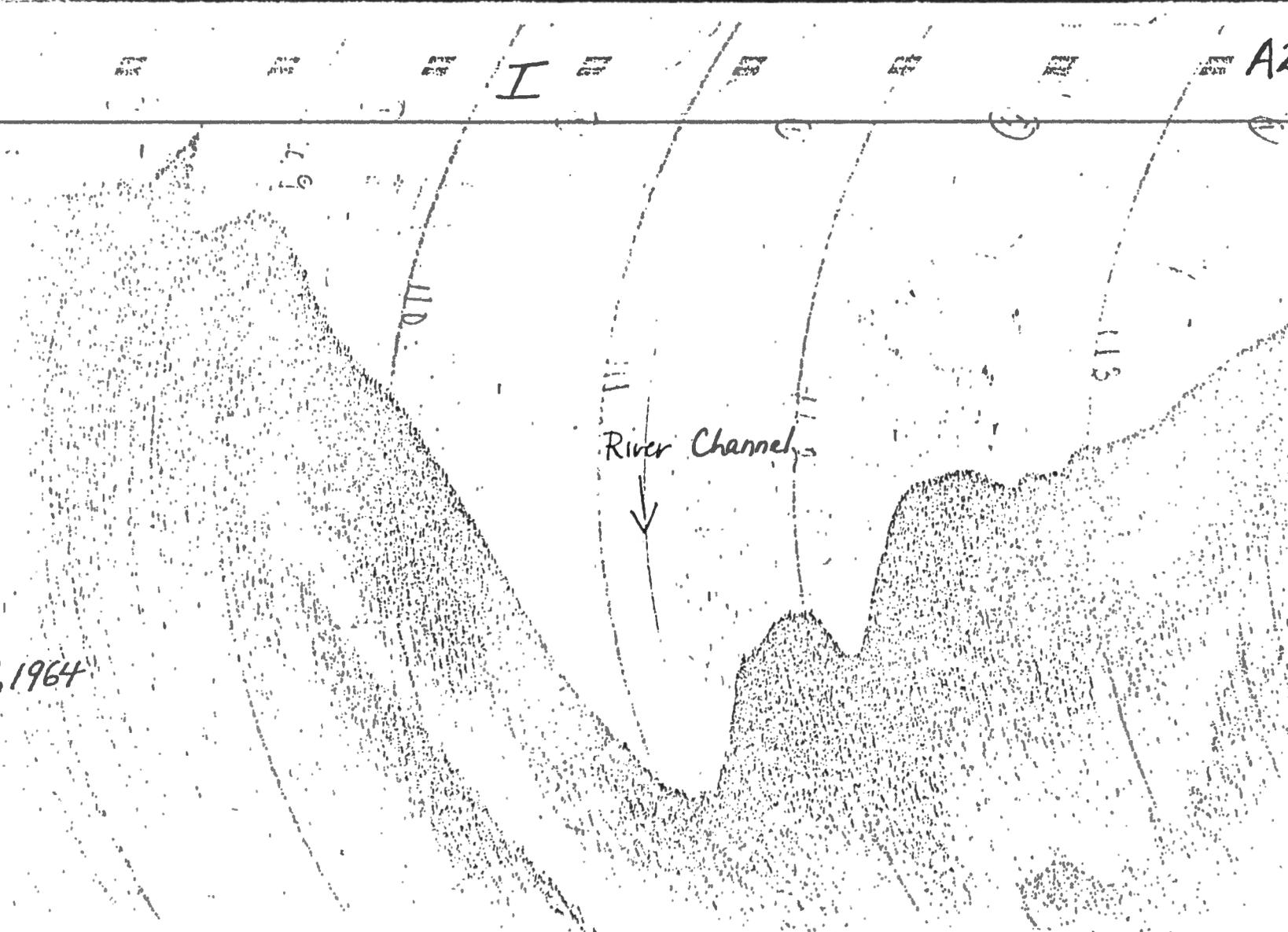
River Channel

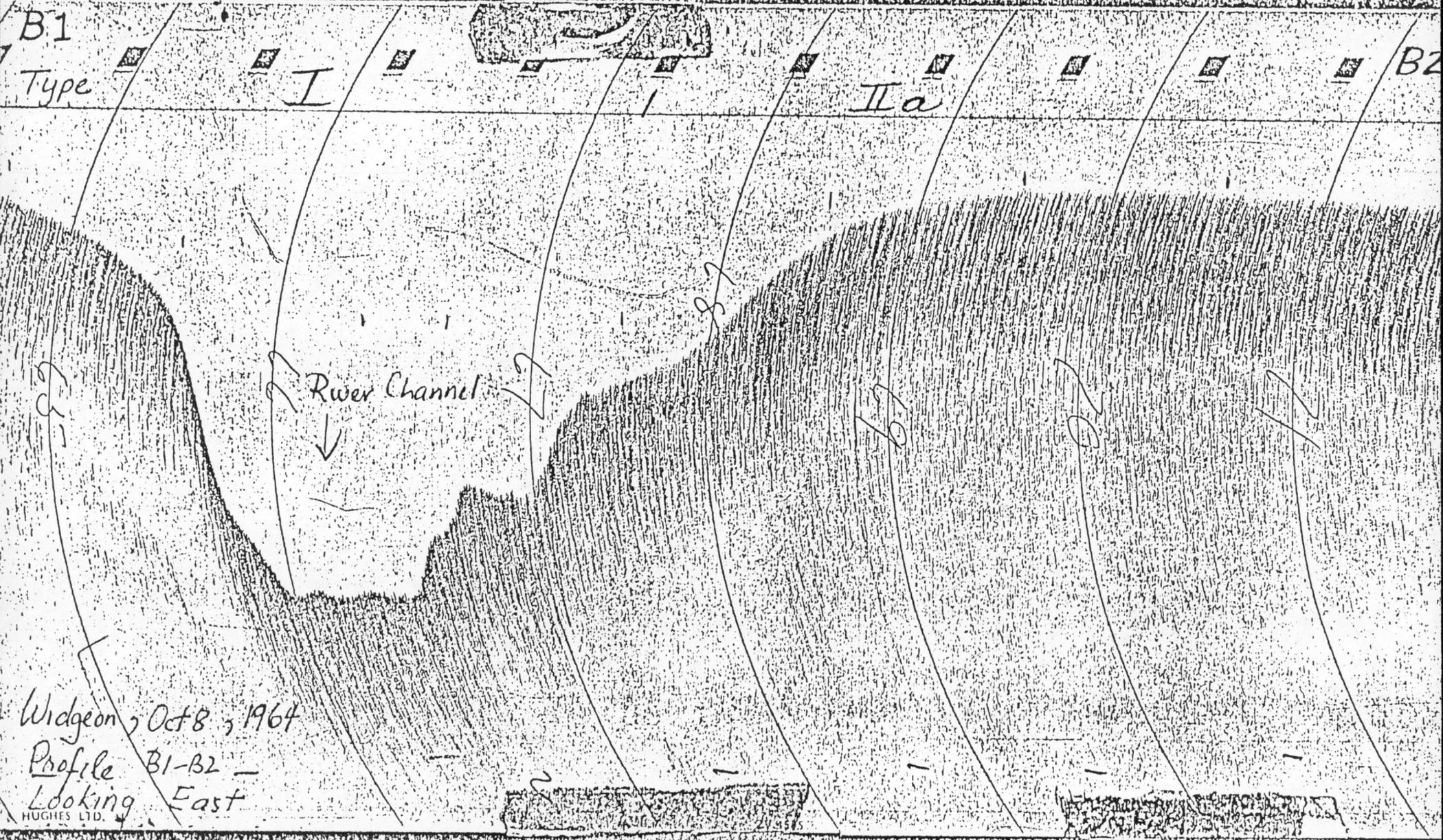


Metela, October 8, 1964

Profile A1-A2

Looking West





Widgeon, Oct 8, 1964
Profile B1-B2 -
Looking East

HUGHES LTD.

Type III I Ia C1 C2

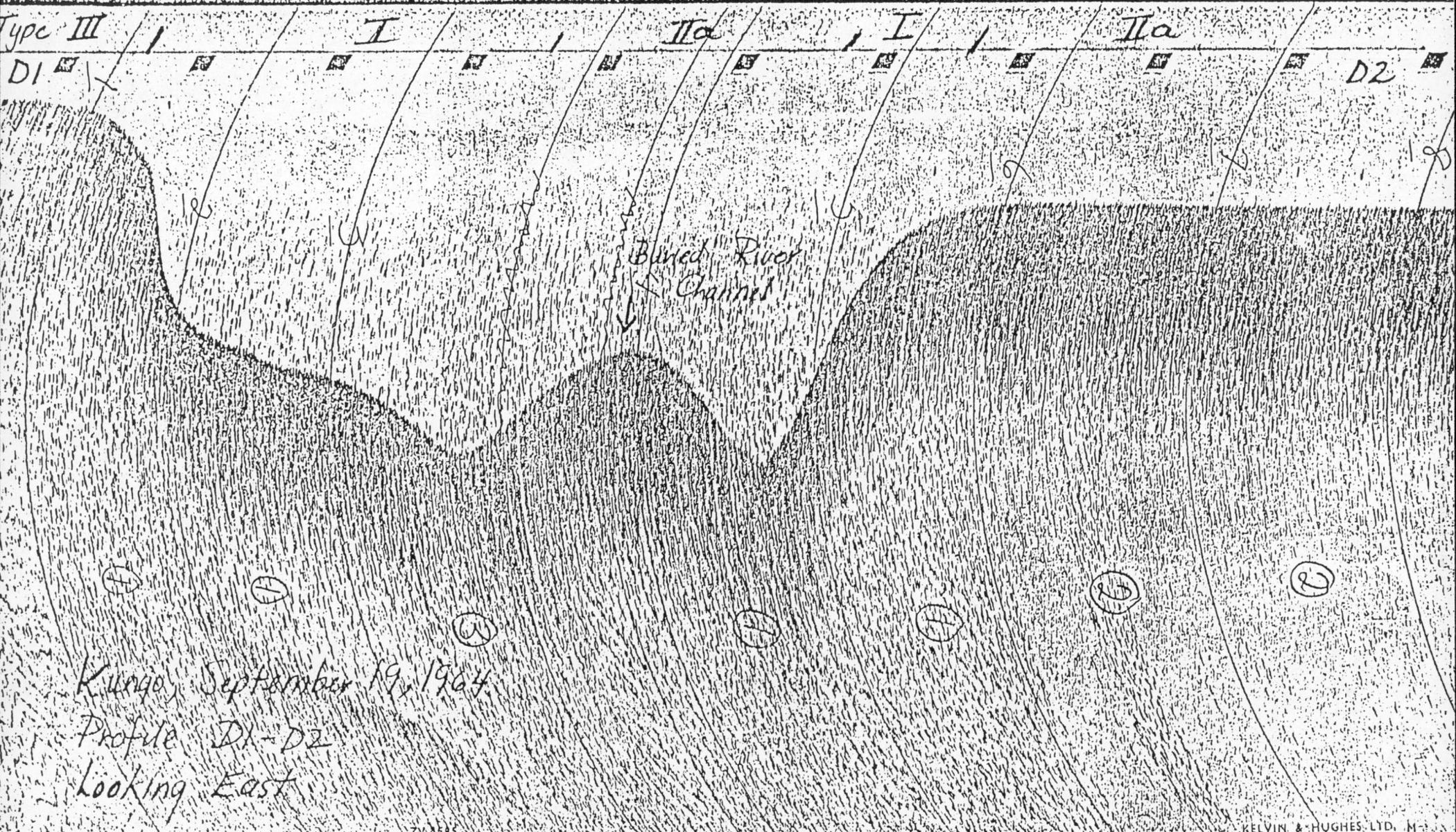
Buried River Channel



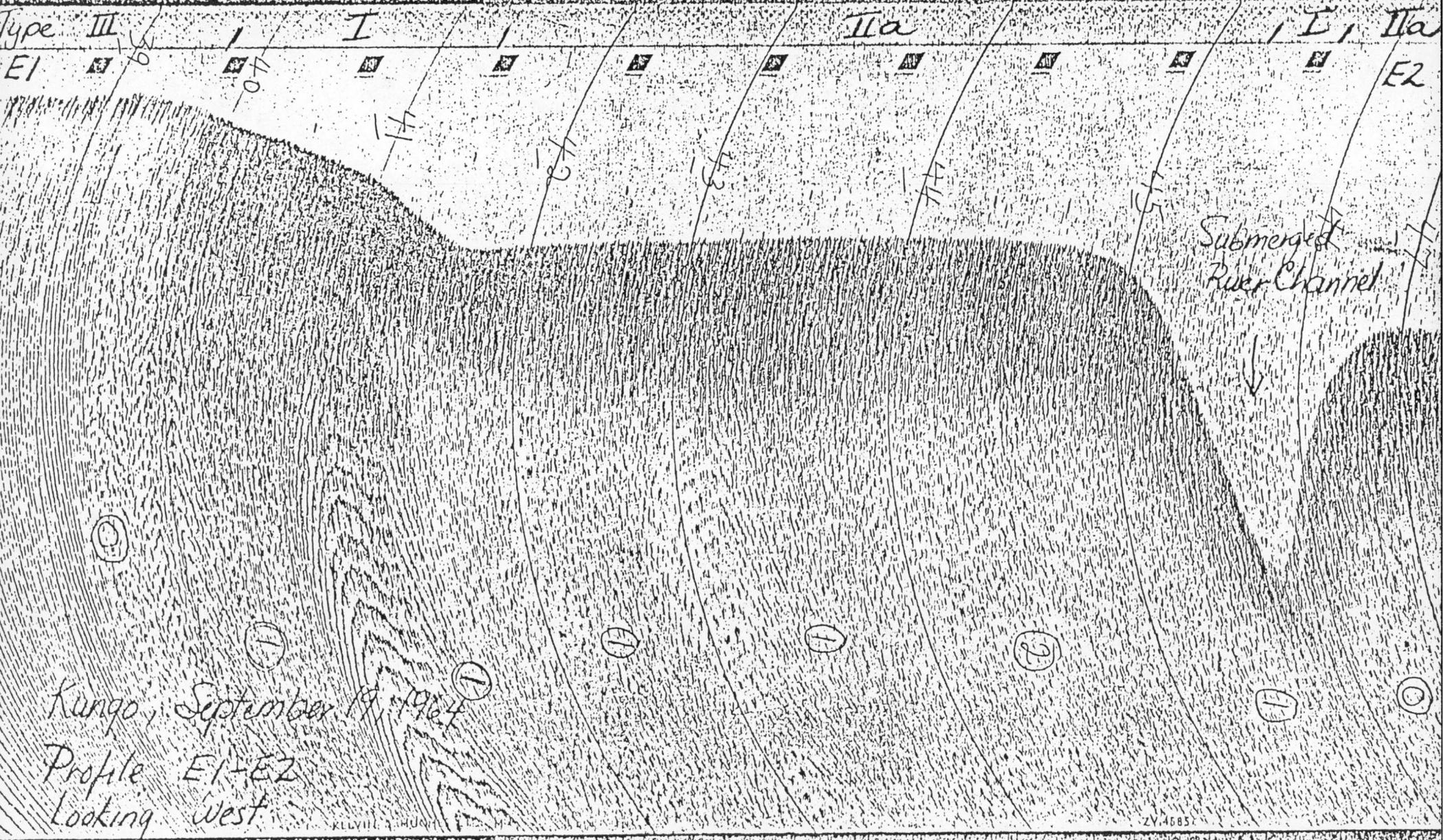
Widgeon, Oct 8, 1964
Profile C1-C2
Looking East

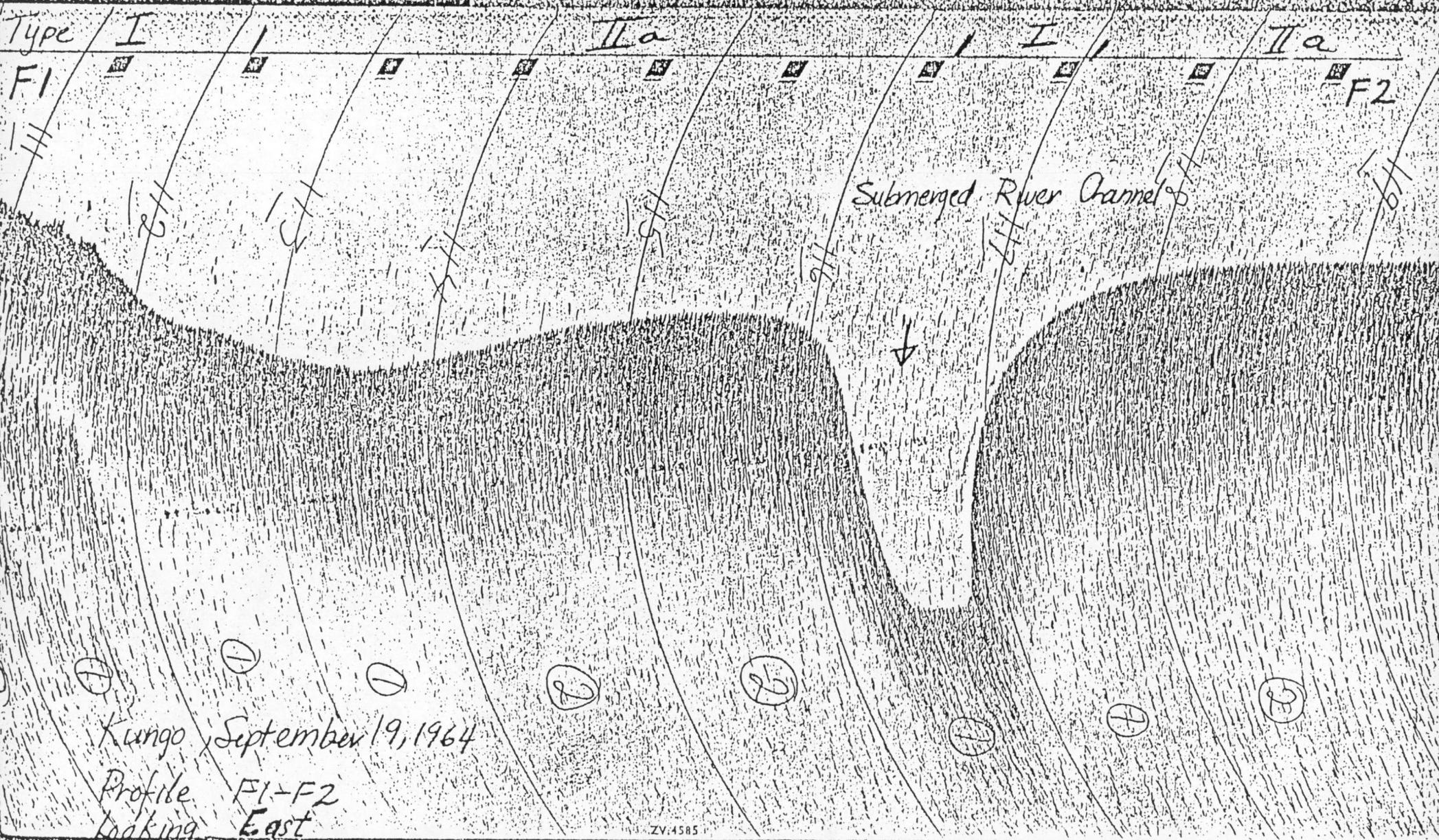
244585

KELVIN &



Kungo, September 19, 1964.
Profile D1-D2
Looking East

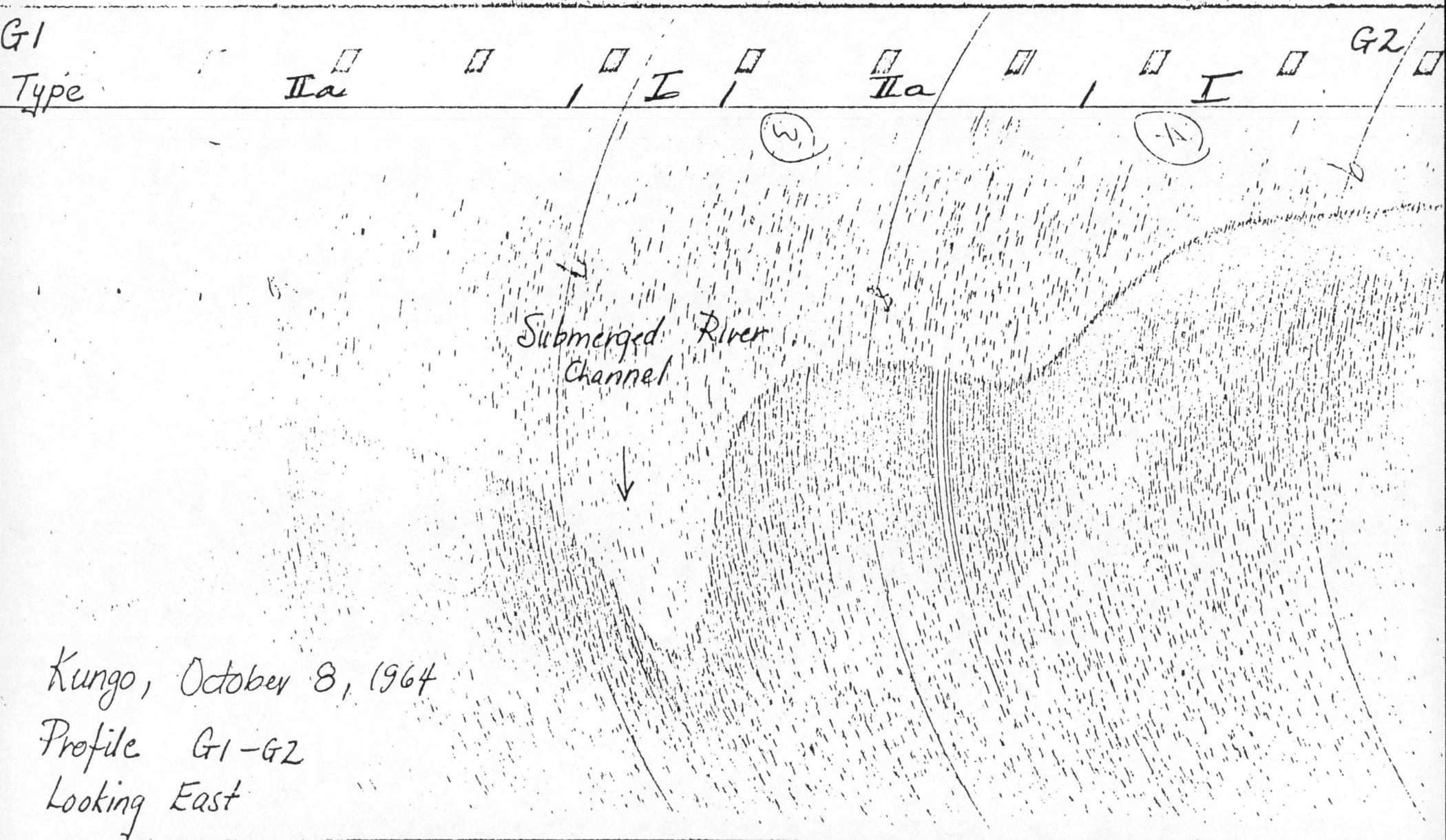


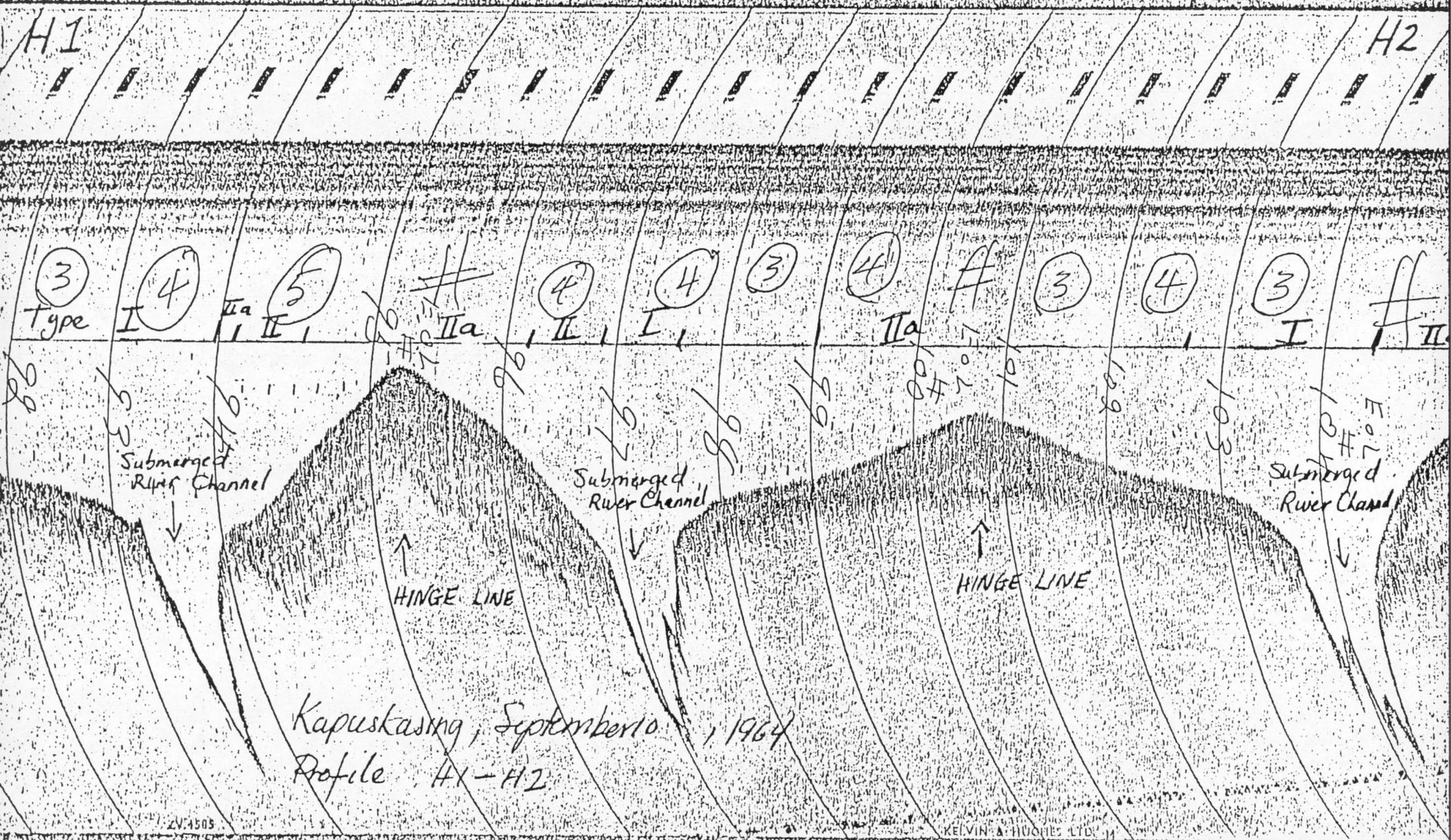


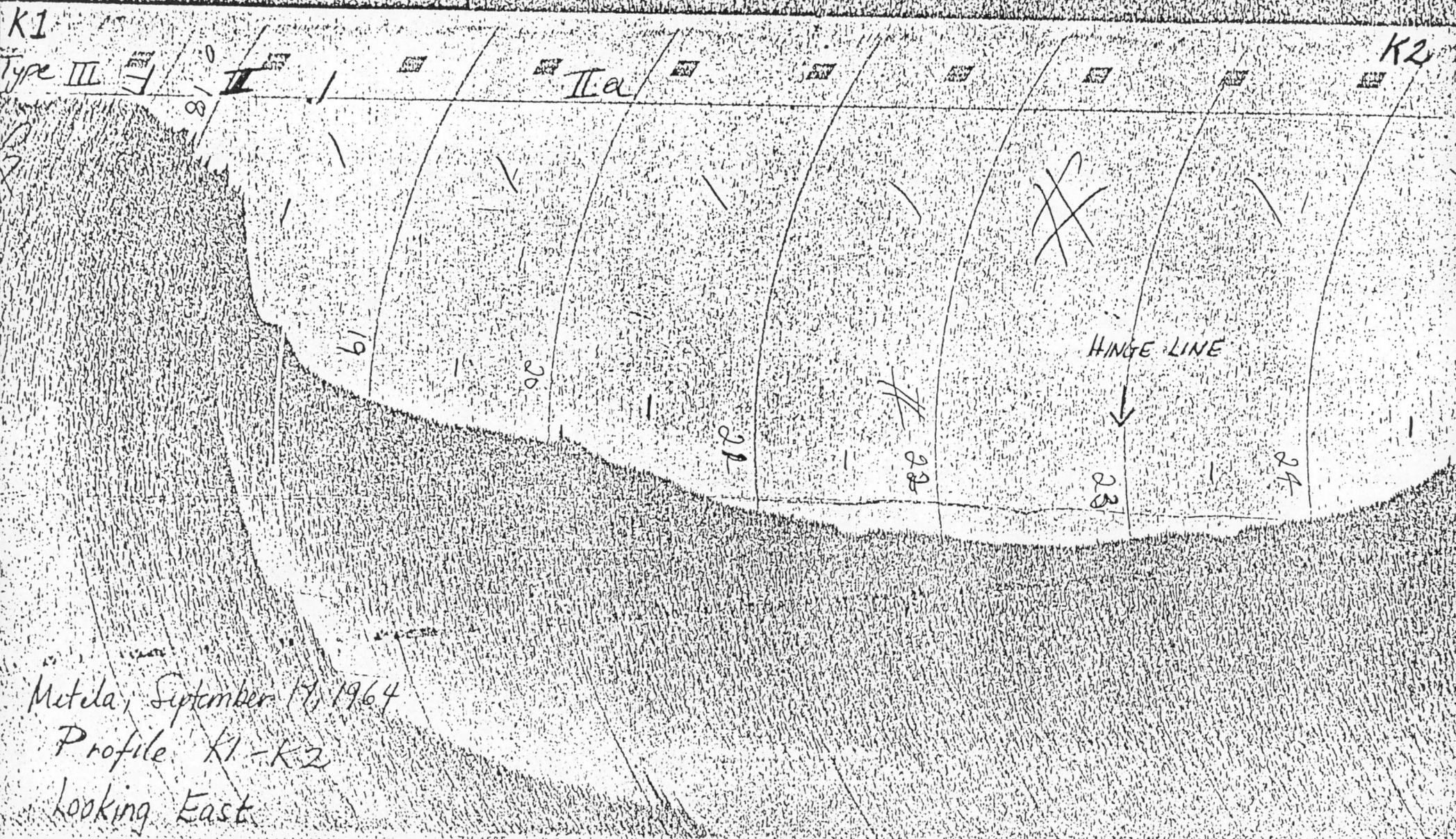
G1
Type IIa I IIa I G2

Submerged River Channel

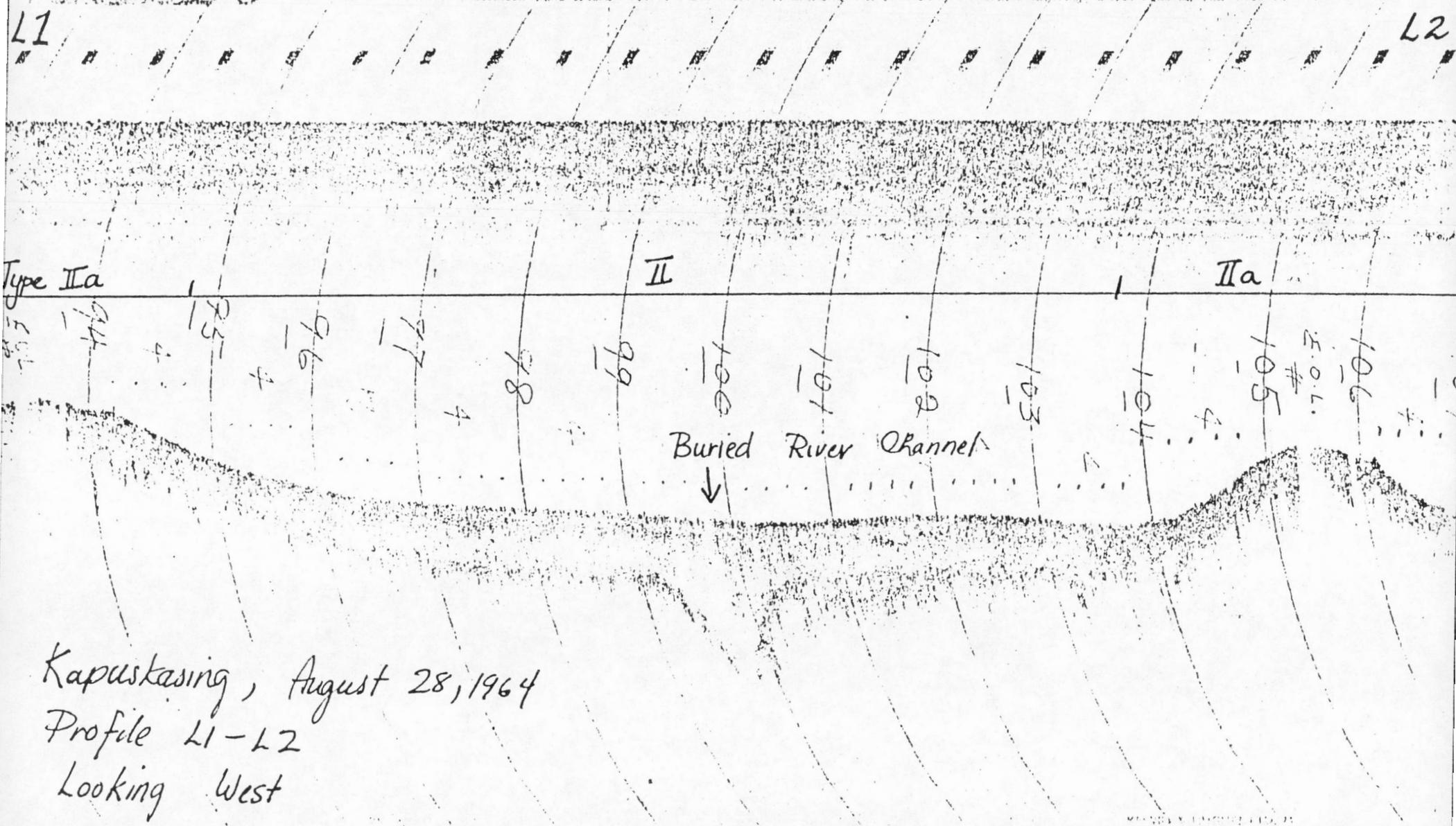
Kungo, October 8, 1964
Profile G1-G2
Looking East







Mitla, September 17, 1964
Profile K1-K2
Looking East



Kapuskasing, August 28, 1964
 Profile L1-L2
 Looking West

M1

M2

Type
IIa

IIa

119

120

121

122

123

124

125

126

127

128

129

130

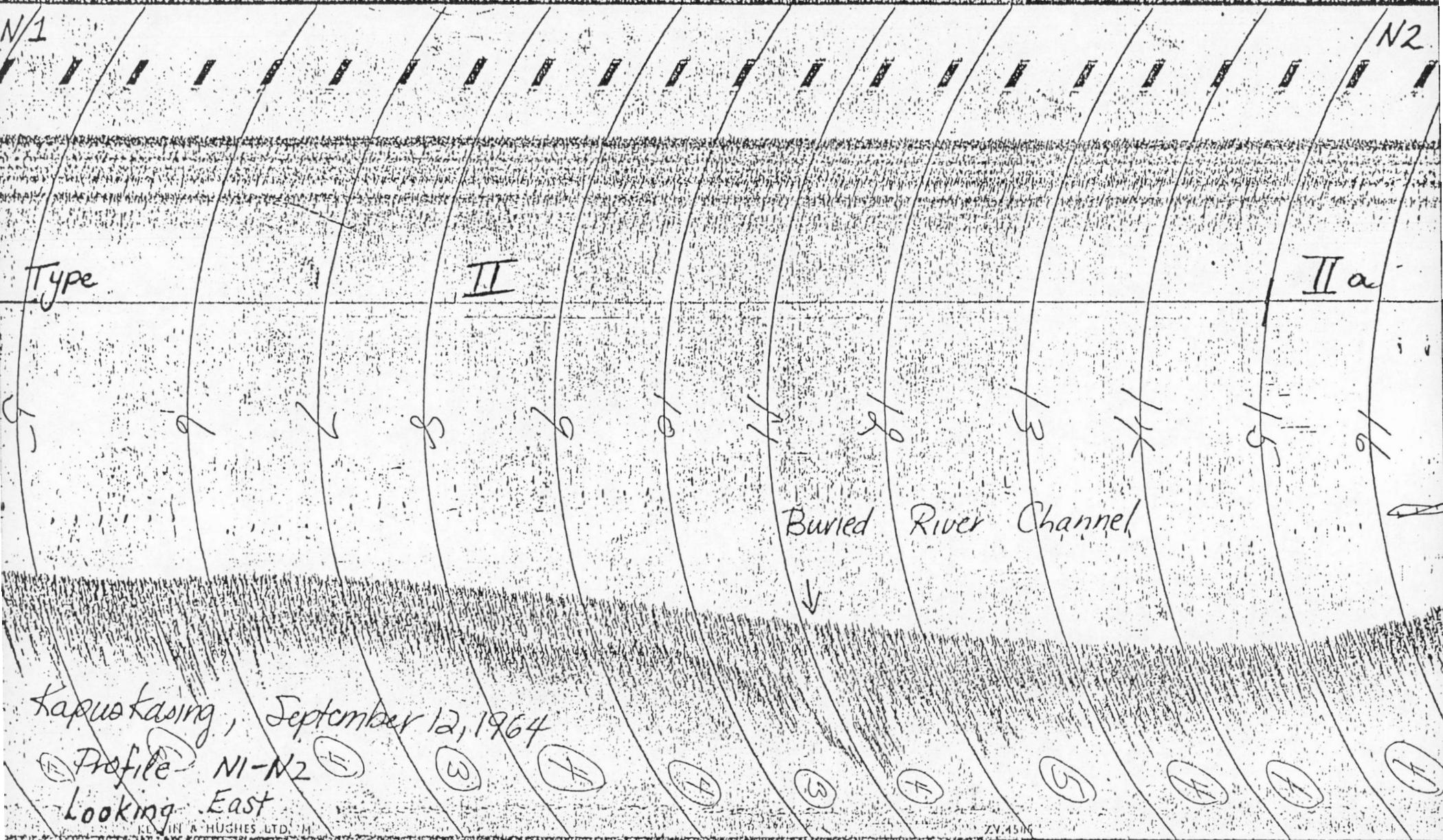
Buried River Channel



Kapuskasing, August 27, 1964

Profile M1-M2

Looking West

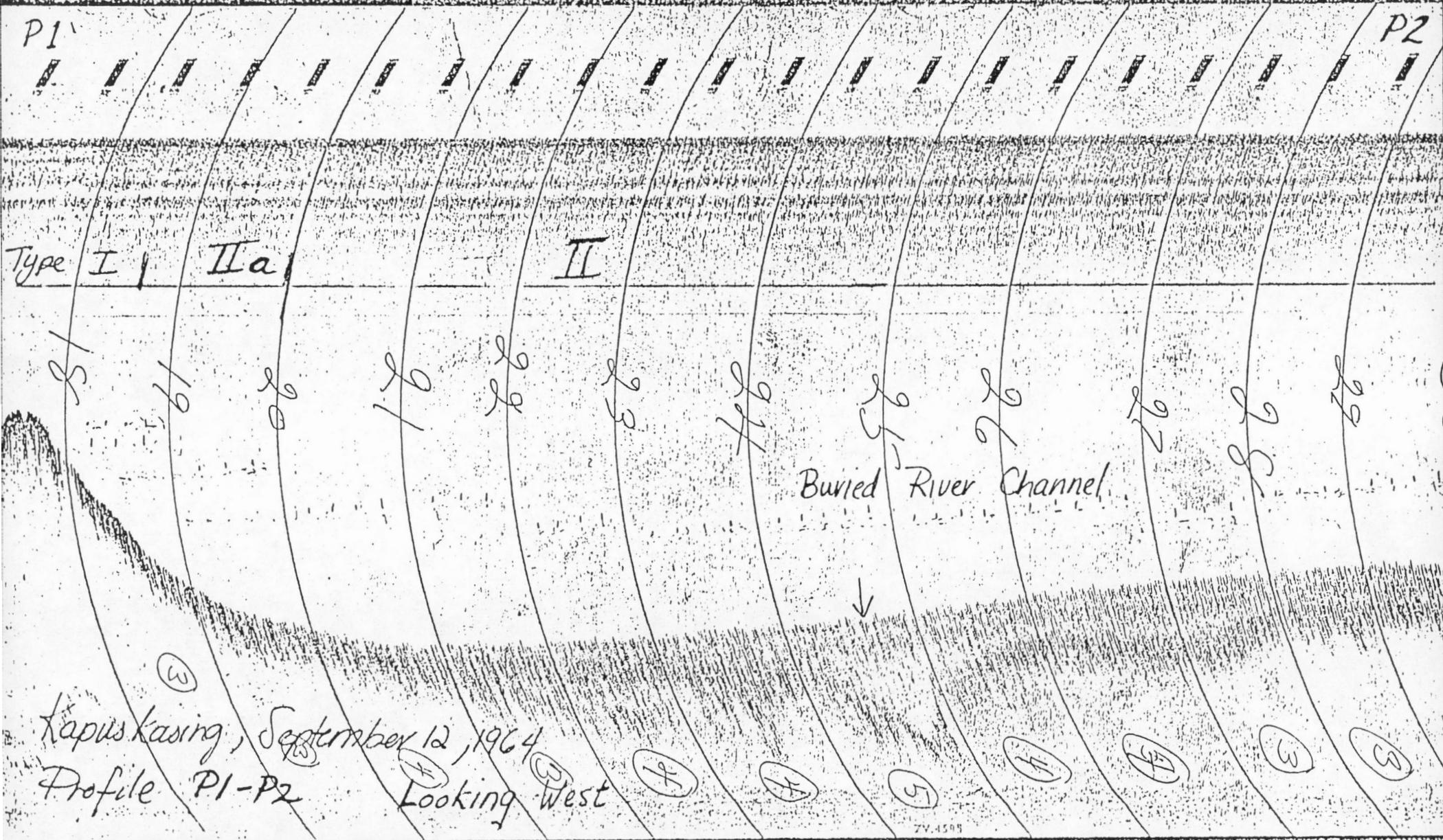


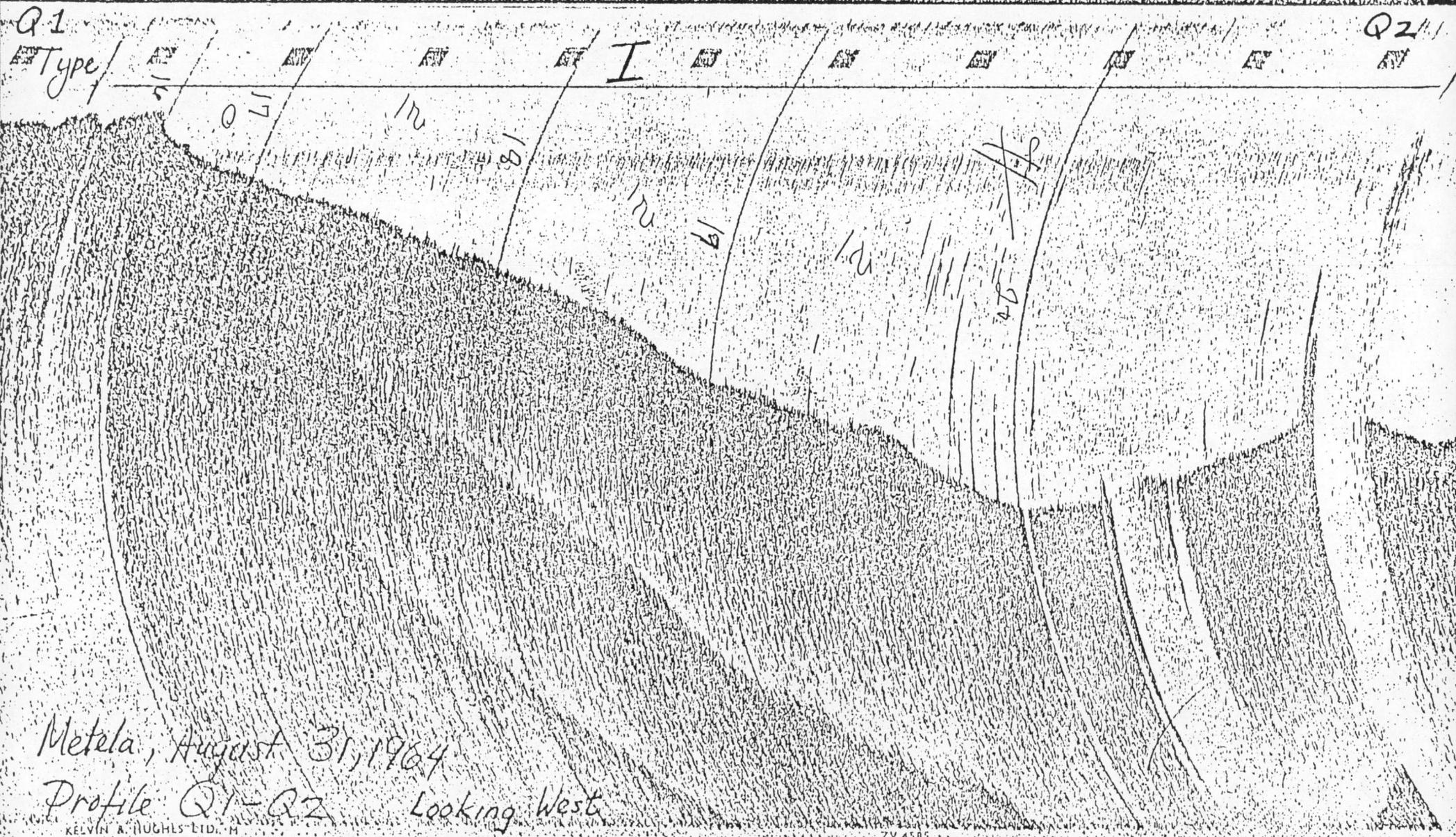
Kapuskasing, September 12, 1964

Profile NI-N2
Looking East

KELVIN & HUGHES LTD. M

ZV.45N



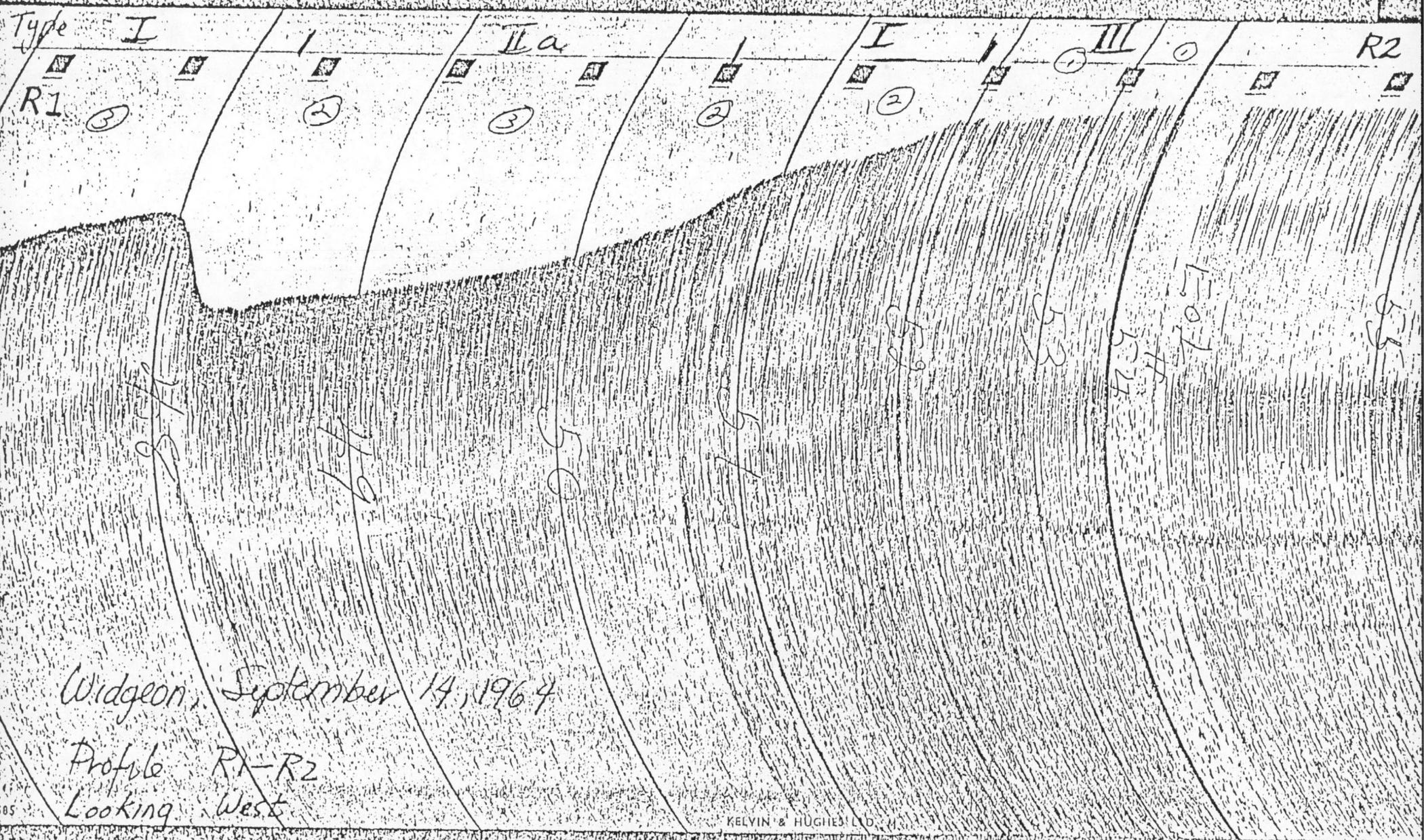


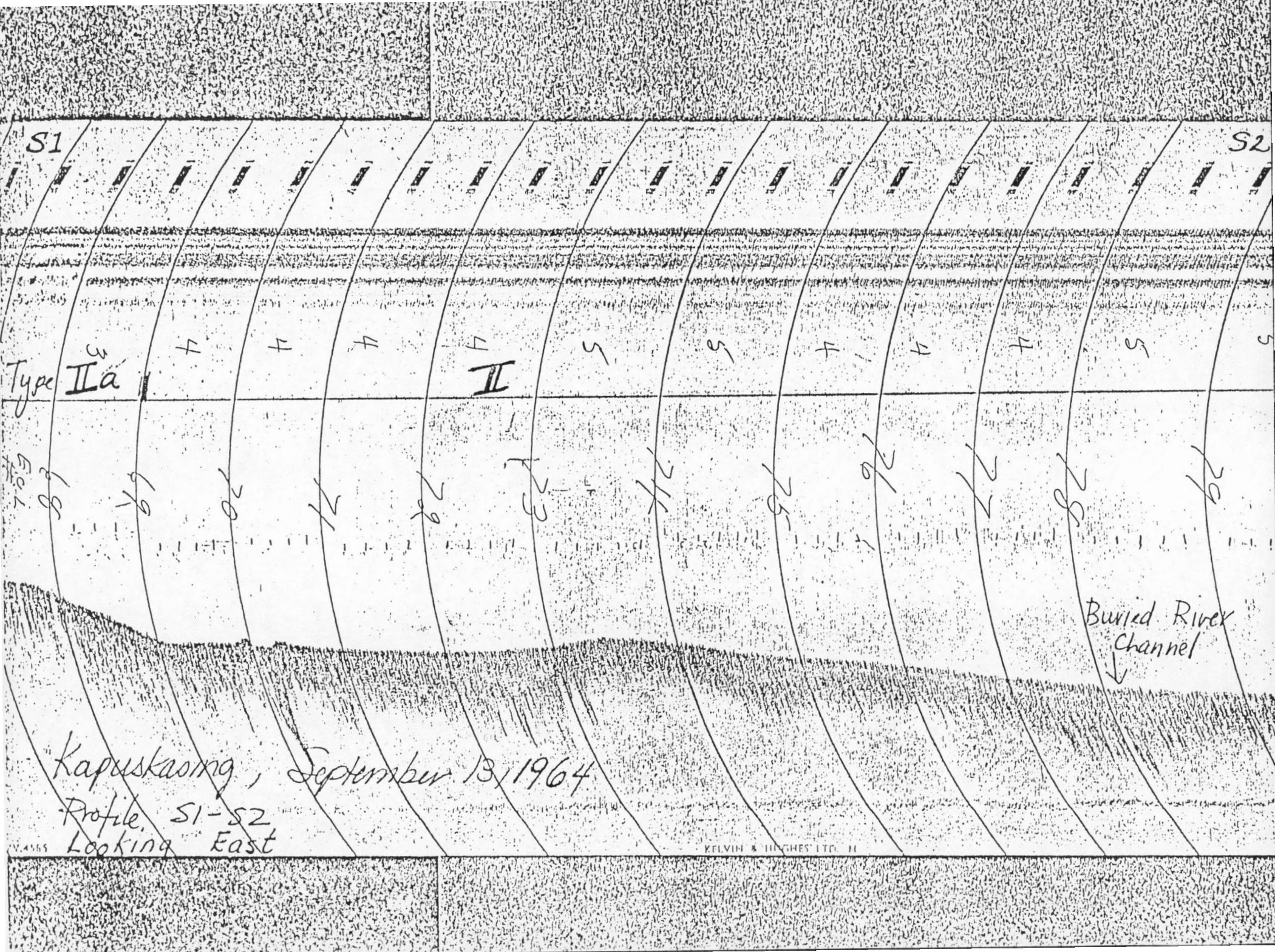
Metela, August 31, 1964

Profile Q1-Q2 Looking West

KELVIN A. HUGHES LTD. M

ZV 4585





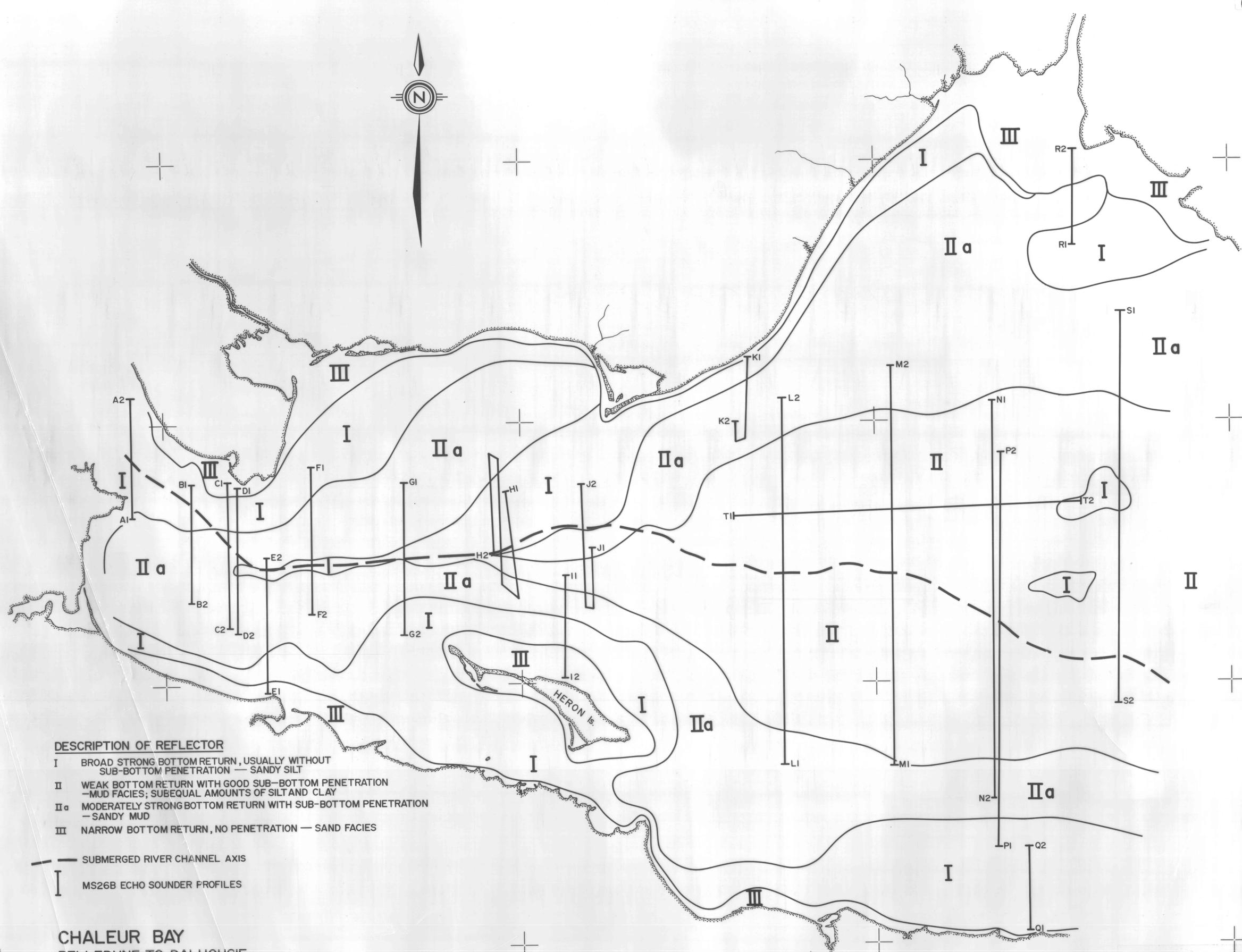
Kapuskasing, September 13, 1964

Profile S1-S2
Looking East

KELVIN & HUGHES LTD. N



48°10'N
48°05'
48°00'
47°55'N



DESCRIPTION OF REFLECTOR

- I BROAD STRONG BOTTOM RETURN, USUALLY WITHOUT SUB-BOTTOM PENETRATION — SANDY SILT
- II WEAK BOTTOM RETURN WITH GOOD SUB-BOTTOM PENETRATION — MUD FACIES; SUBEQUAL AMOUNTS OF SILT AND CLAY
- II_a MODERATELY STRONG BOTTOM RETURN WITH SUB-BOTTOM PENETRATION — SANDY MUD
- III NARROW BOTTOM RETURN, NO PENETRATION — SAND FACIES

- SUBMERGED RIVER CHANNEL AXIS
- I MS26B ECHO SOUNDER PROFILES

CHALEUR BAY
BELLEDUNE TO DALHOUSIE

| | | |
|---------------------------|---------------|---|
| A.O.L./B.I.O. | | |
| CHALEUR BAY | | |
| MAP OF | | |
| SURFICIAL SEDIMENT | | |
| ENCLOSURE: I | DATE: SEPT/81 | SCALE: 1:50,000 |
| PROJECTION: NA | | |
| PROJECT: 81-45 | DWN. BY: FGK | CKD. BY: |
| | | GEOMARINE ASSOCIATES LTD. HALIFAX & ST. JOHN'S CANADA |

