K. U. WEYER:

SALT DISSOLUTION, KARST GEOLOGY, GLACIAL EVENTS AND GROUNDWATER FLOW IN THE PINE POINT REGION, N.W.T.

VOL. 2: FIGURES

National Hydrology Research Institute
Ground Water Division
101 - 4616 Valiant Drive N.W.
Calgary, Alberta
T3A 0X9

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Vol. 1: Text
Vol. 2: Figures
Vol. 3: Tables and Appendices.

List of Figures

Chapter 1

Chapter 2

B. Location of boreholes included in geologic evaluation by computer.

stripes, isotopic balances were calculated from measured $\delta^{34}S$ values and concentrations of sulphate and sulphide ions. In areas without stripes, measured $\delta^{34}S$ values for sulphates only were used, since sulphide data were lacking.

Figure 4-17 Scatter diagrams of $\delta^{34}S$ in SO_4^{2-} versus sulphate concentrations in natural waters south of Great Slave Lake. The numbers 26 and 50 signify 26 or 50 data points not plotted in the area of the number.

A. Using measured distribution of $\delta^{34}S$ in dissolved sulphate.
B. Using corrected $\delta^{34}S$ values, after the isotopic balance and the initial SO_4^{2-} content had been calculated using H_2S values.

Figure 4-18 Population of ^2H isotopes in water samples and comparison ot Cl^- concentration (A) and topographic elevation (B).

Figure 4-19 Occurrence of lighter ^2H values (<-165°/oo; group 2) in surface waters and discharging groundwates. Similar groundwater discharge pattern are indicated as in Figs. 4-8, 4-11, 4-12 and 4-13.

Figure 4-20 Effect of groundwater discharge on chemistry of river waters south of Great Slave Lake, compared with flow volume.

Figure 4-21 $\delta^{34}S$ (SO_4^{2-}) for river waters south of Great Slave Lake. Nyarling River, Little Buffalo River and Salt River are dominated by discharge of deep groundwater.

Chapter 5

Chapter 6

Chapter 7

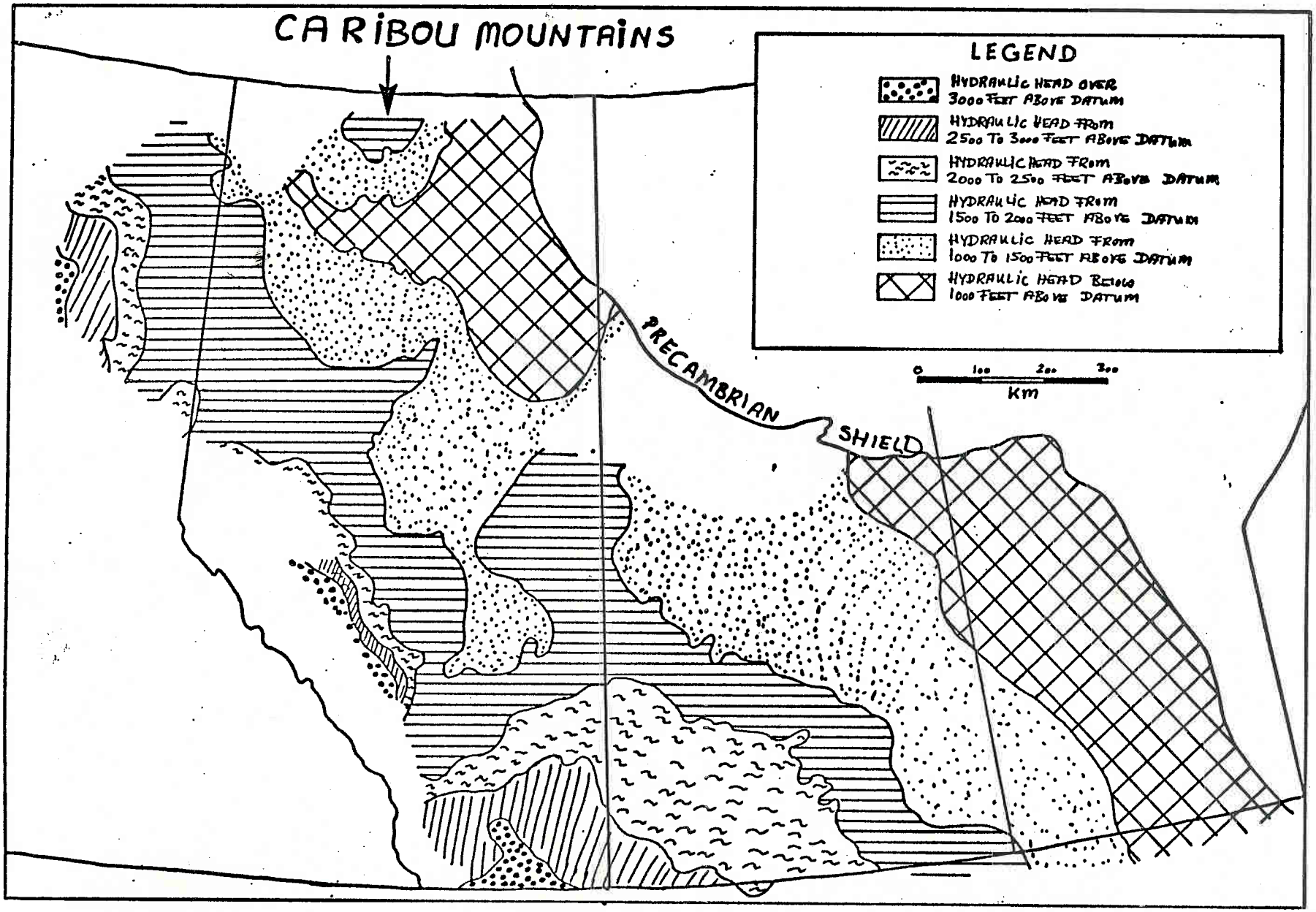

CARIBOU MOUNTAINS
LEGEND
HYDRAULIC HEAD OVER 3000 FEET ABOVE DATUM
HYDRAULIC HEAD FROM 2500 TO 3000 FEET ABOVE DATUM
HYDRAULIC HEAD FROM 2000 TO 2500 FEET ABOVE DATUM
HYDRAULIC HEAD FROM 1500 TO 2000 FEET ABOVE DATUM
HYDRAULIC HEAD FROM 1000 TO 1500 FEET ABOVE DATUM
HYDRAULIC HEAD BELOW 1000 FEET ABOVE DATUM
0 100 200 300
km
PRECAMBRIAN SHIELD

FIG. 1-1

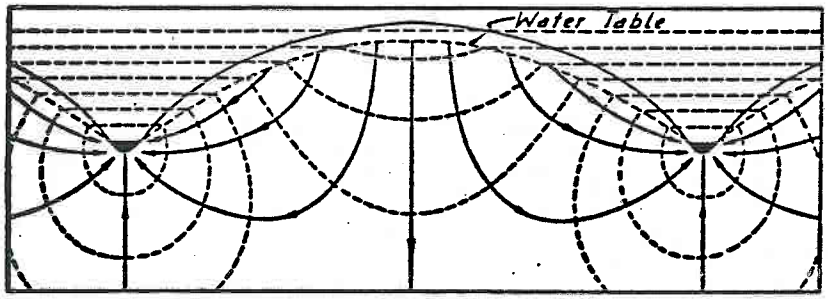


FIG. 2-1

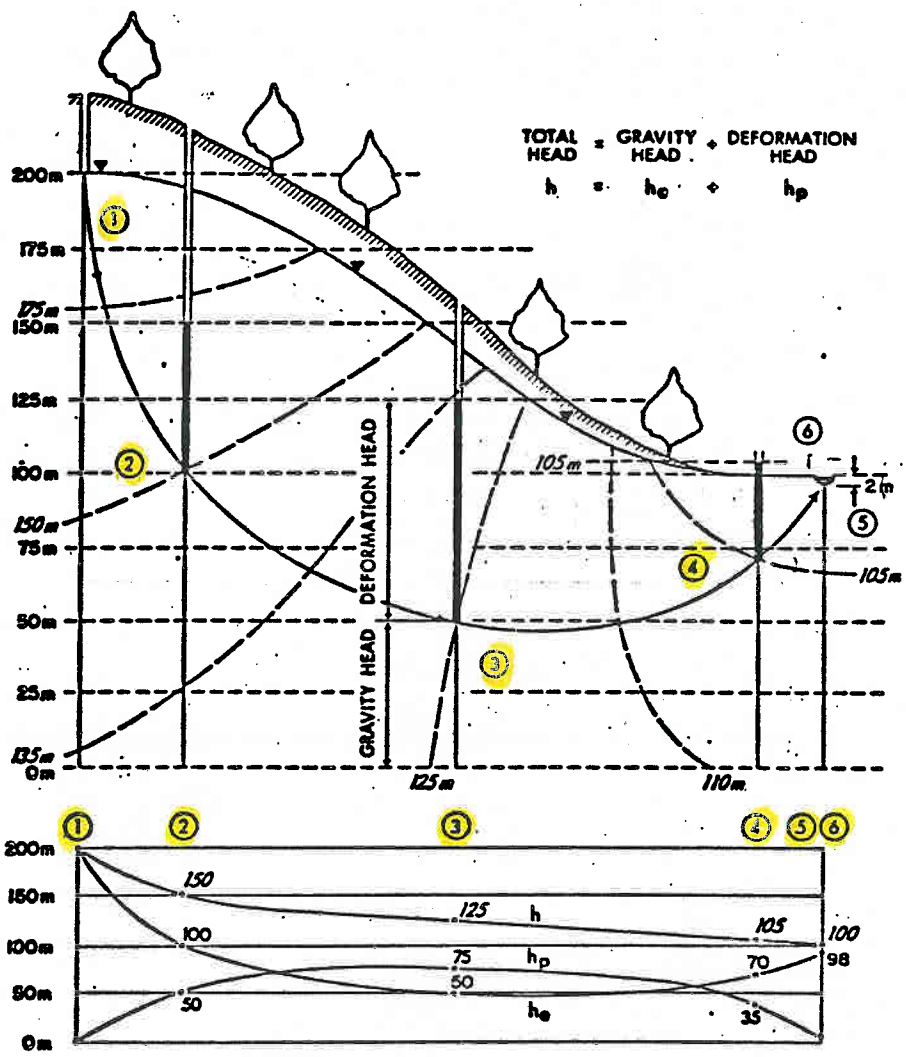

TOTAL HEAD = GRAVITY HEAD + DEFORMATION HEAD
h = hg + hp
200m
175m
150m
125m
100m
75m
50m
25m
0m
DEFORMATION HEAD
GRAVITY HEAD
105m
125m
110m
2m
150
100
50
125
h
105
100
98
75
hp
50
70
hg
35

FIG. 2-2

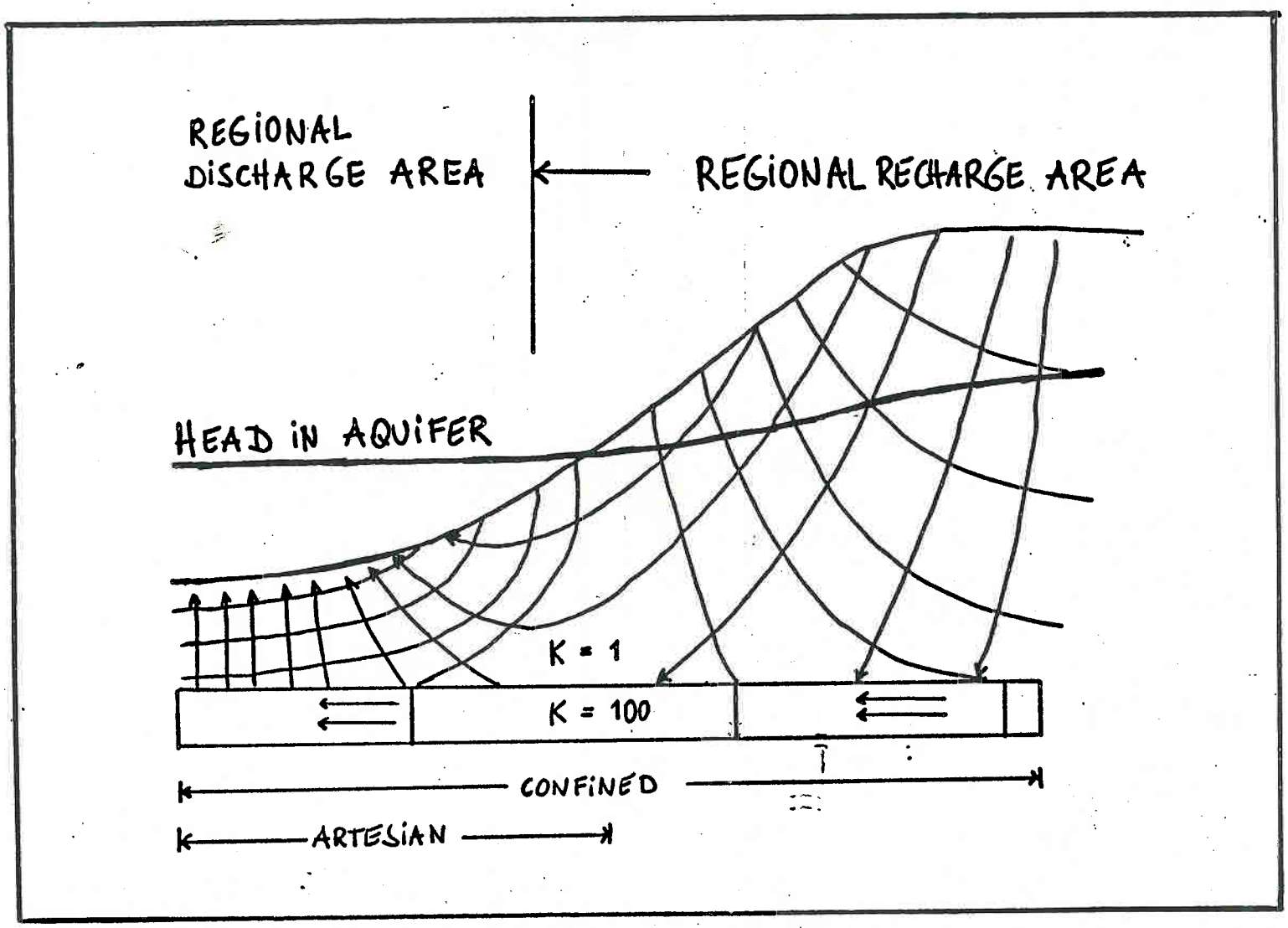

REGIONAL
DISCHARGE AREA
REGIONAL RECHARGE AREA
HEAD IN AQUIFER
K = 1
K = 100
CONFINED
ARTESIAN

FIG. 2-3

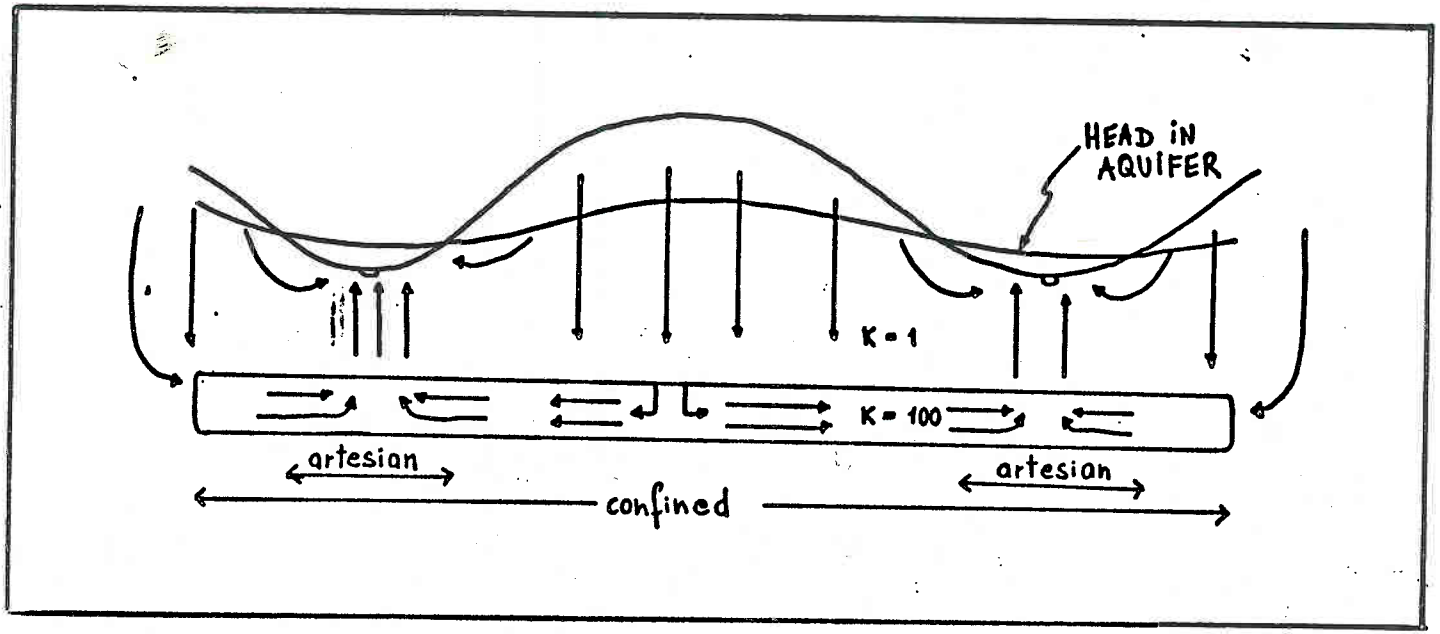


FIG. 2-4

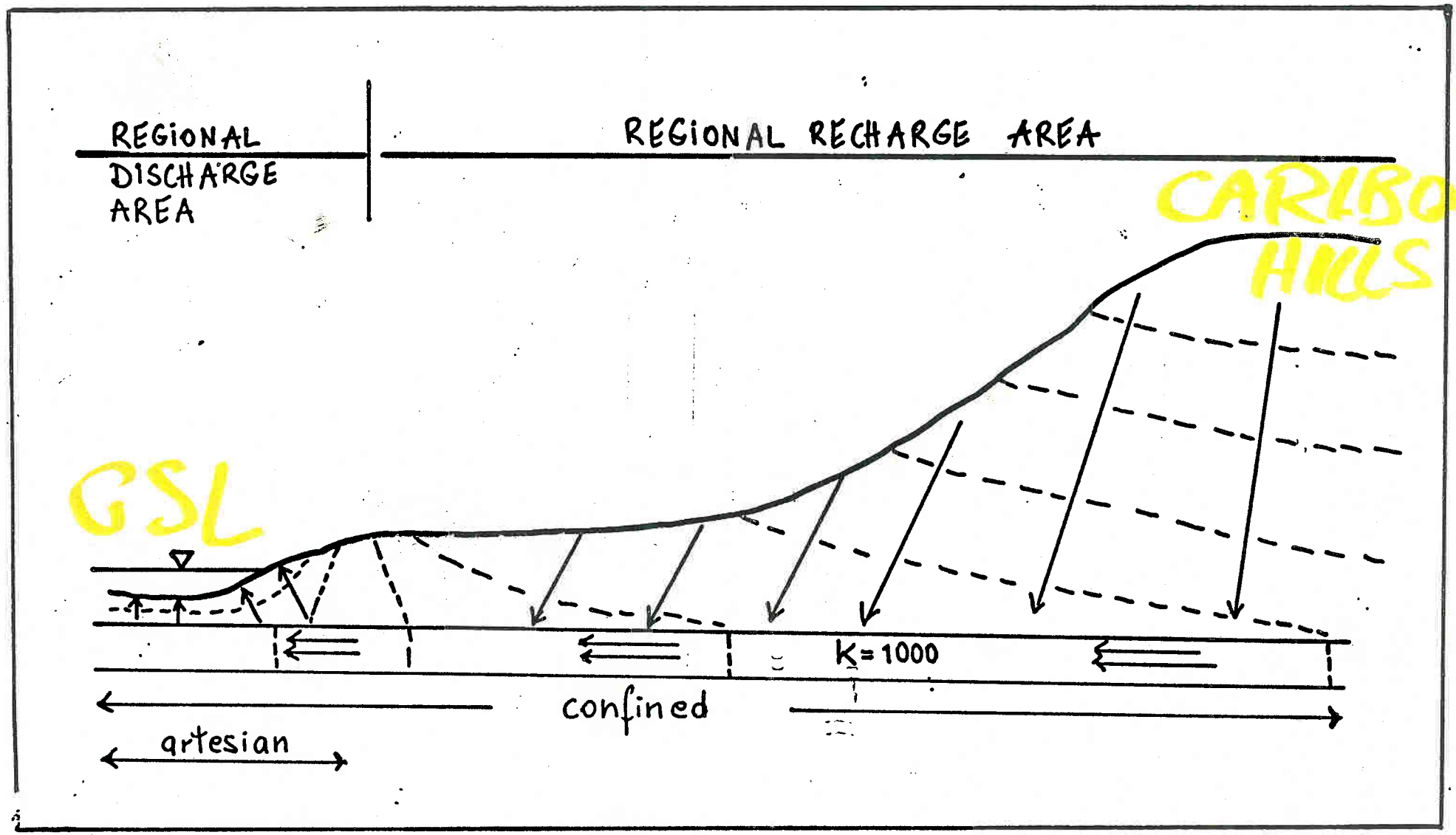

REGIONAL DISCHARGE AREA
REGIONAL RECHARGE AREA
CARIBOU HILLS
GSL
K=1000
confined
artesian

FIG. 2-5

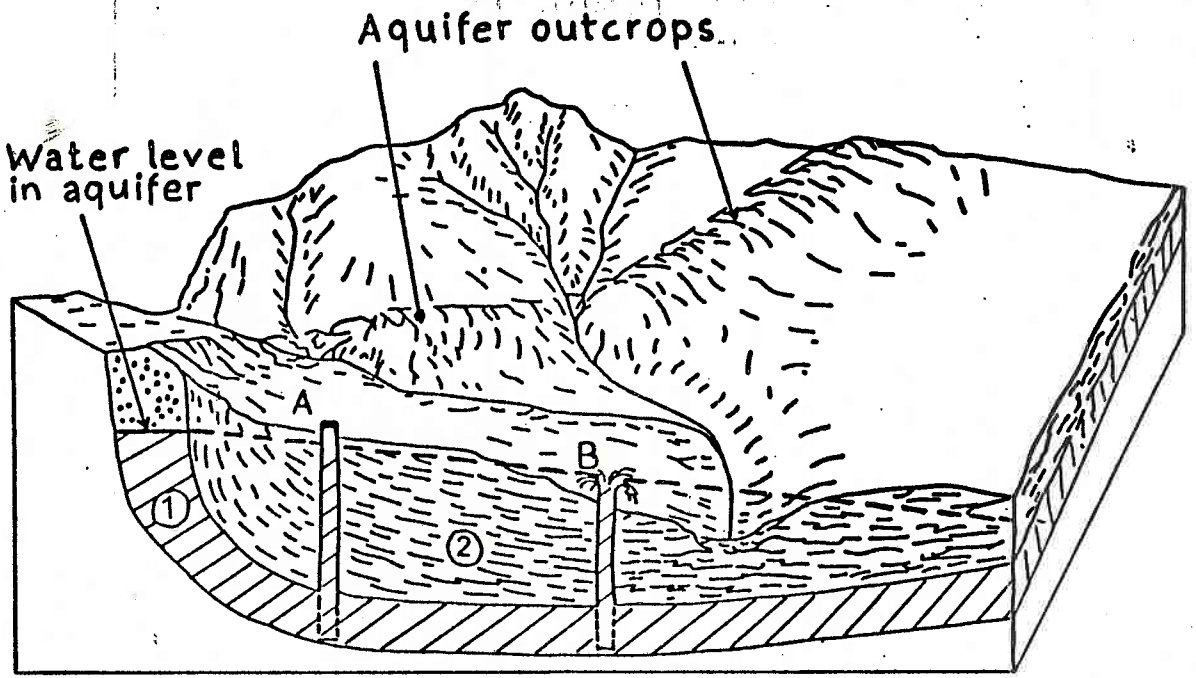


FIG. 2-6

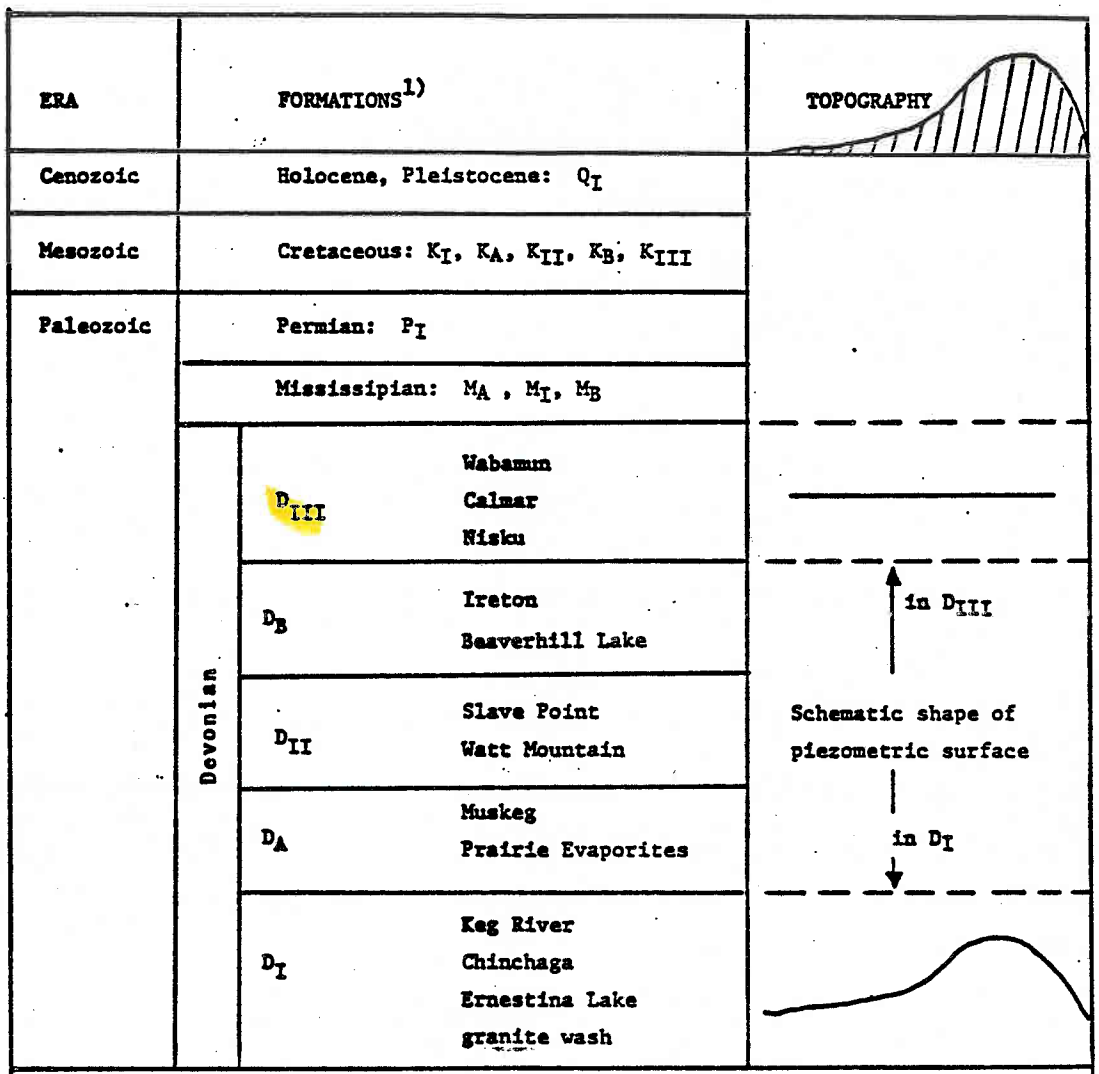
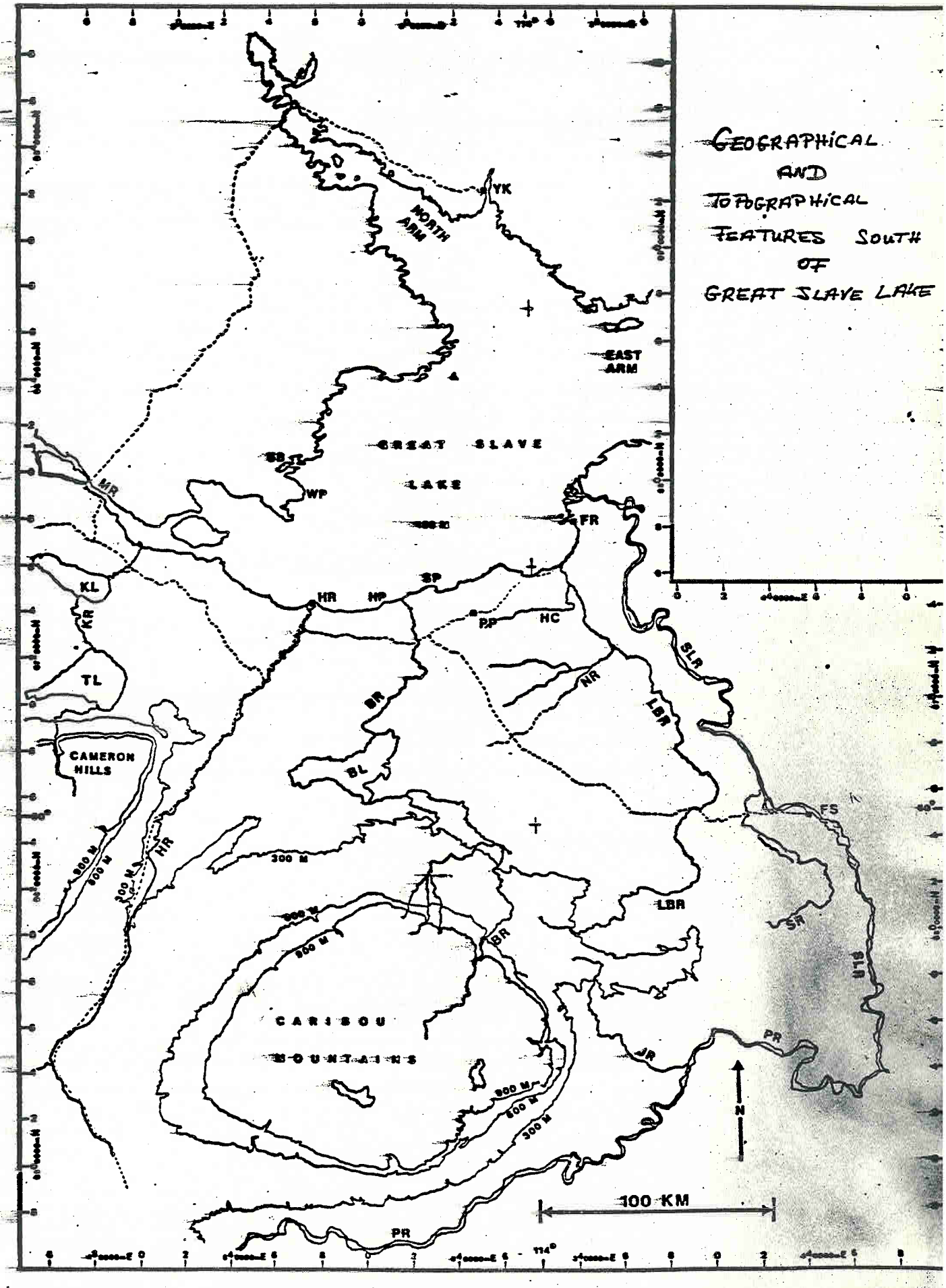

ERA
FORMATIONS 1)
TOPOGRAPHY
Cenozoic
Holocene, Pleistocene: Q_I
Mesozoic
Cretaceous: K_I, K_A, K_{II}, K_B, K_{III}
Paleozoic
Permian: P_I
Mississipian: M_A, M_I, M_B
Devonian
D_{III}
Wabamun
Calmar
Nisku
D_B
Ireton
Beaverhill Lake
D_{II}
Slave Point
Watt Mountain
D_A
Muskeg
Prairie Evaporites
D_I
Keg River
Chinchaga
Ernestina Lake
granite wash
in D_{III}
Schematic shape of piezometric surface
in D_I
Precambrian
1) Roman subscript denotes aquifer; letter subscript denotes aquitard; numbering and lettering from deeper layers upwards.

FIG. 2-7


GEOGRAPHICAL
AND
TOPOGRAPHICAL
FEATURES SOUTH
OF
GREAT SLAVE LAKE
YK
NORTH ARM
EAST ARM
GREAT SLAVE LAKE
SB
TZ
WP
MR
FR
KL
KR
HR
HP
SP
PP
HC
TL
SLR
NR
LBR
BR
BL
CAMERON HILLS
FS
SR
300 M
600 M
CARIBOU MOUNTAINS
JR
PR
N
100 KM

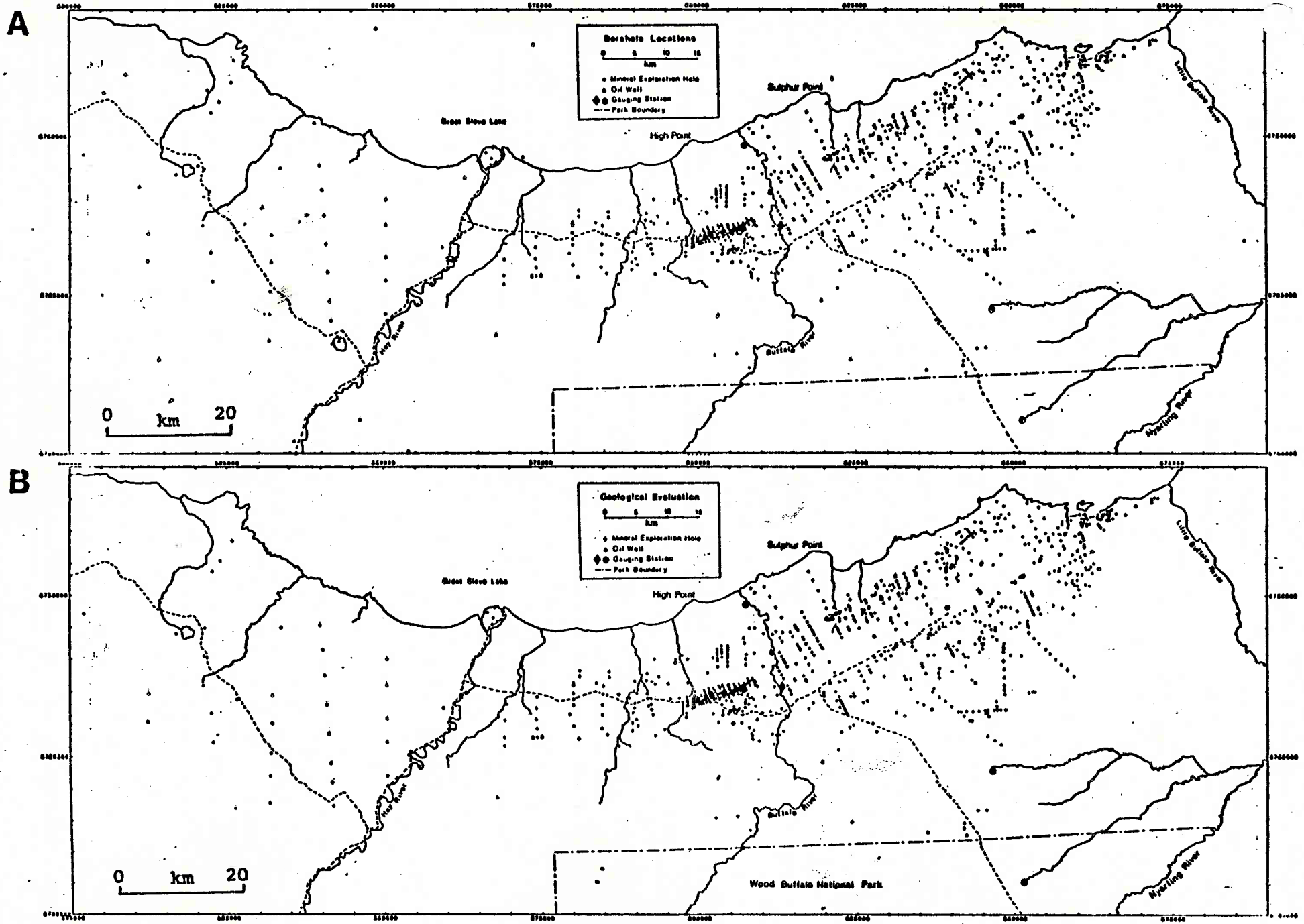

A
Borehole Locations
0 5 10 15
km
Mineral Exploration Hole
Oil Well
Gauging Station
Park Boundary
Great Slave Lake
Sulphur Point
High Point
Little Buffalo River
Hay River
Buffalo River
Nyarling River
0 km 20
B
Geological Evaluation
0 5 10 15
km
Mineral Exploration Hole
Oil Well
Gauging Station
Park Boundary
Great Slave Lake
Sulphur Point
High Point
Little Buffalo River
Hay River
Buffalo River
Nyarling River
Wood Buffalo National Park
0 km 20

FIG. 3-2

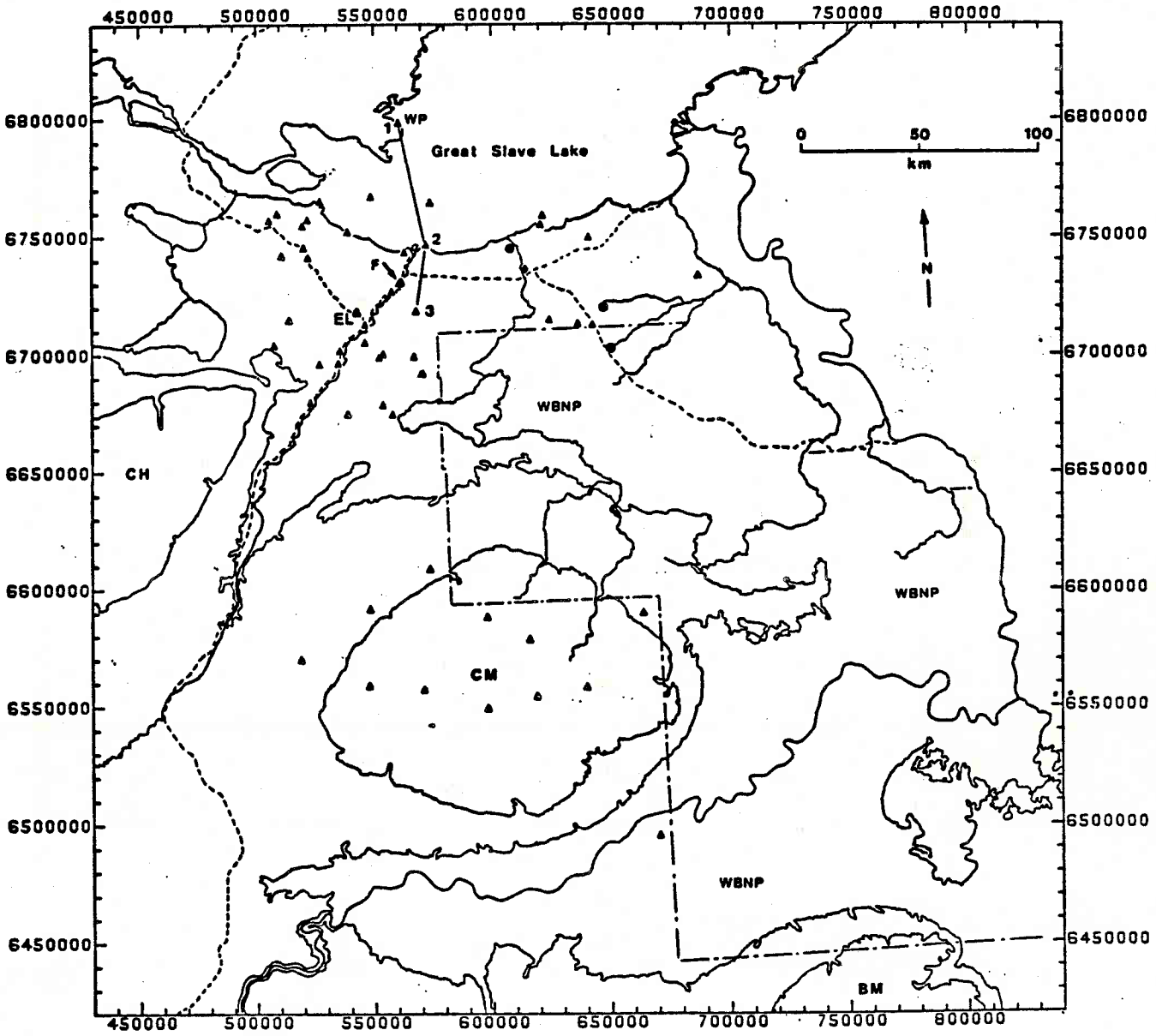

450000
500000
550000
600000
650000
700000
750000
800000
6800000
6750000
6700000
6650000
6600000
6550000
6500000
6450000
WP
1
2
3
Great Slave Lake
0
50
100
km
N
EL
WBNP
CH
CM
BM

FIG. 3-3

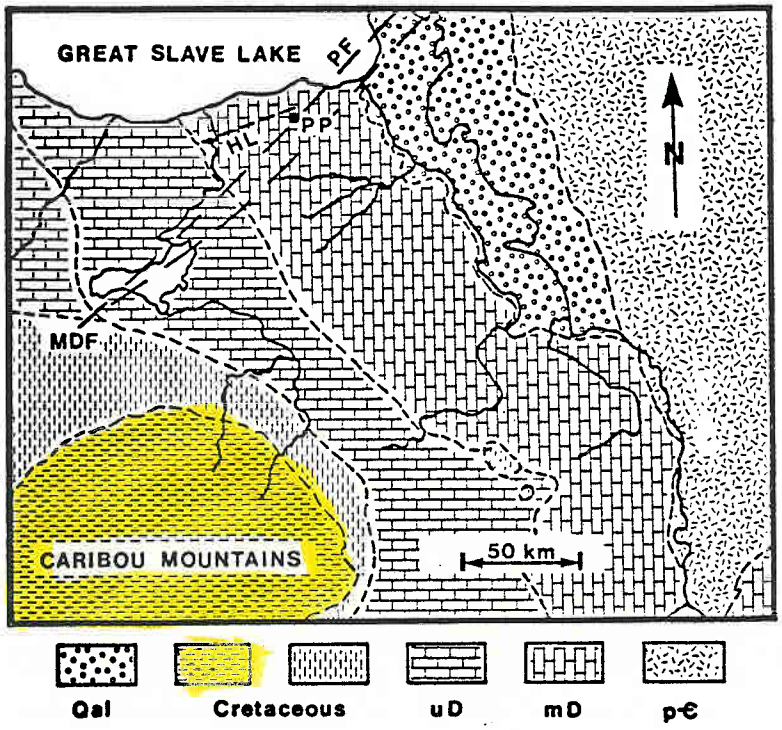

GREAT SLAVE LAKE
PF
PP
HL
MDF
CARIBOU MOUNTAINS
50 km
N
Qal
Cretaceous
uD
mD
p-€

FIG. 3-4

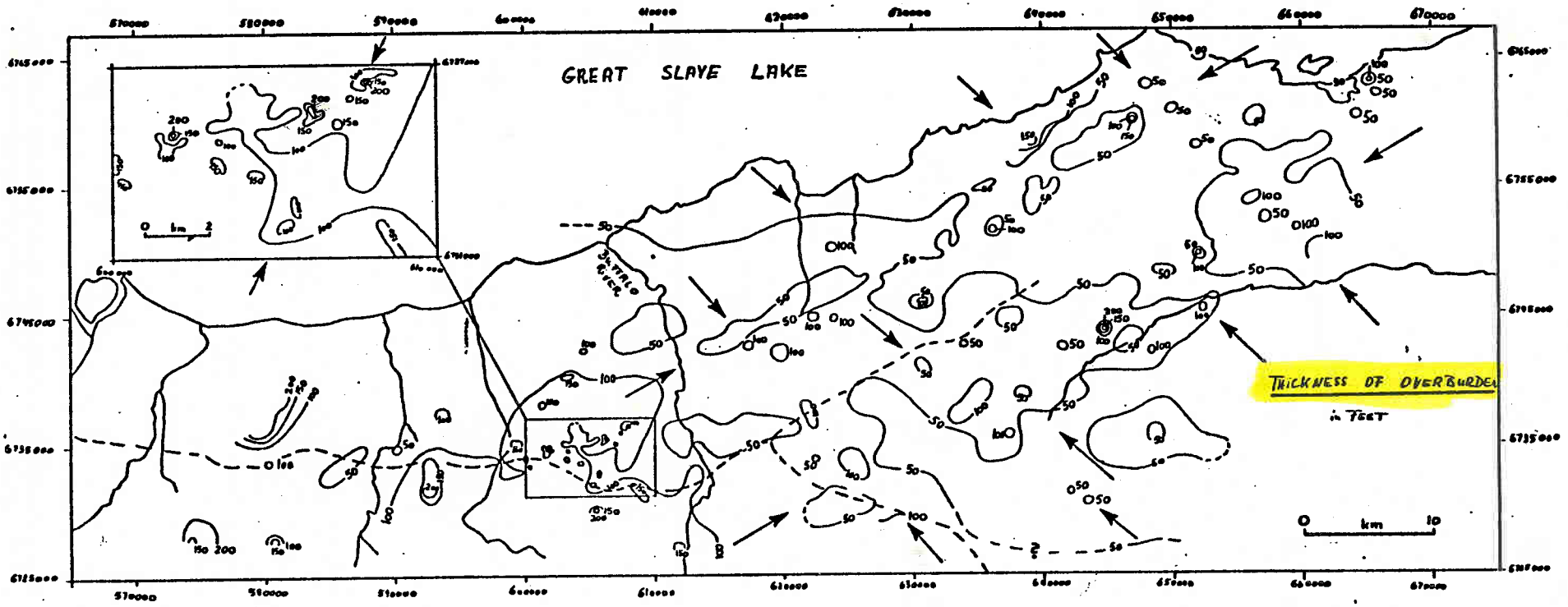

GREAT SLAVE LAKE
THICKNESS OF OVERBURDEN
in FEET
0 km 10
0 km 2

FIG. 3-5

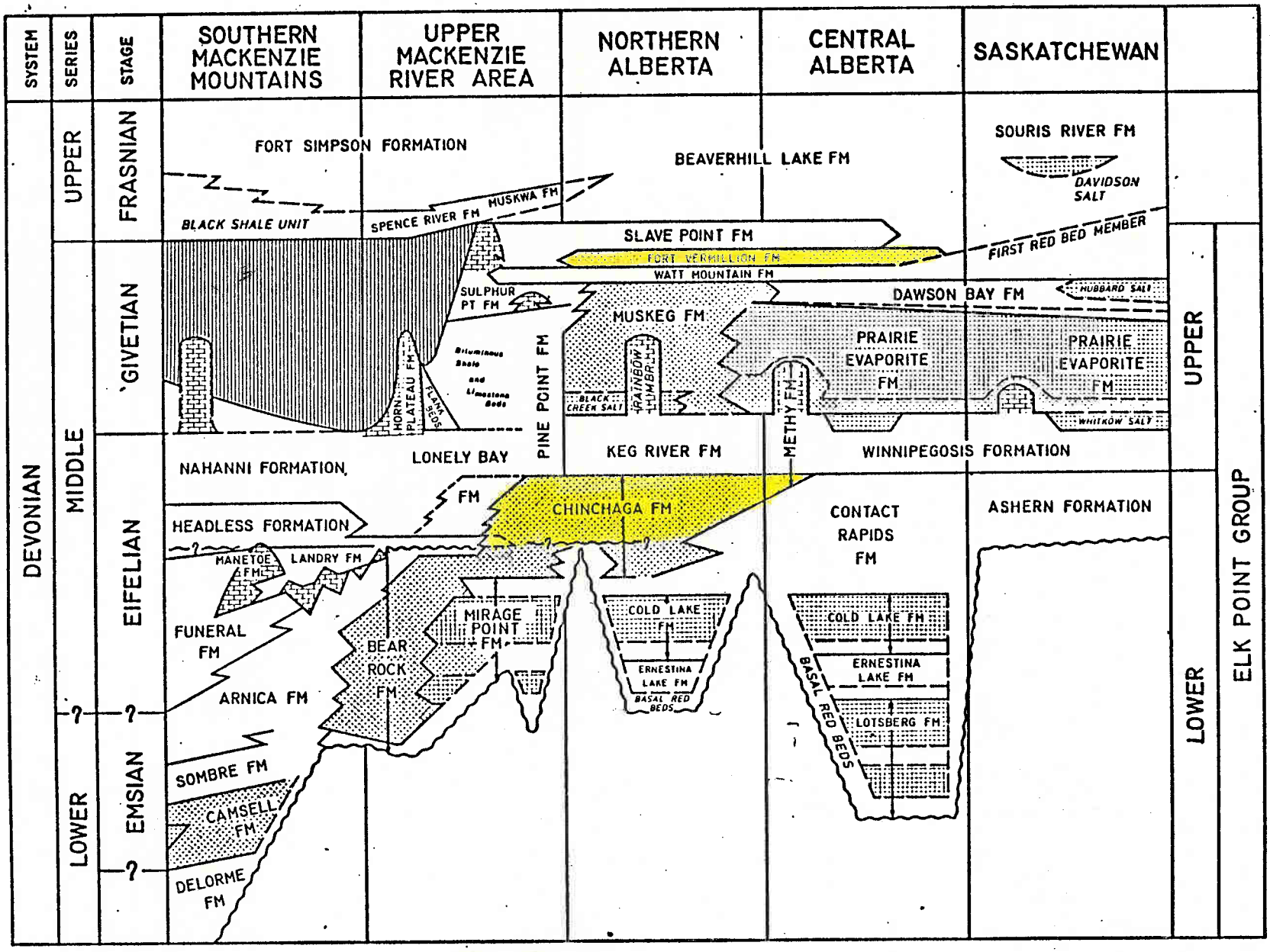

SYSTEM
SERIES
STAGE
SOUTHERN MACKENZIE MOUNTAINS
UPPER MACKENZIE RIVER AREA
NORTHERN ALBERTA
CENTRAL ALBERTA
SASKATCHEWAN
DEVONIAN
UPPER
MIDDLE
LOWER
FRASNIAN
GIVETIAN
EIFELIAN
EMSIAN
FORT SIMPSON FORMATION
BEAVERHILL LAKE FM
SOURIS RIVER FM
DAVIDSON SALT
BLACK SHALE UNIT
SPENCE RIVER FM
MUSKWA FM
SLAVE POINT FM
FORT VERMILLION FM
WATT MOUNTAIN FM
FIRST RED BED MEMBER
SULPHUR PT FM
DAWSON BAY FM
HUBBARD SALT
MUSKEG FM
PRAIRIE EVAPORITE FM
PRAIRIE EVAPORITE FM
HORN PLATEAU FM
Bituminous Shale and Limestone Beds
PINE POINT FM
BLACK CREEK SALT
RAINBOW MBR
METHY FM
WHITKOW SALT
NAHANNI FORMATION
LONELY BAY
KEG RIVER FM
WINNIPEGOSIS FORMATION
UPPER
LOWER
ELK POINT GROUP
FM
CHINCHAGA FM
HEADLESS FORMATION
CONTACT RAPIDS FM
ASHERN FORMATION
MANETOE FM
LANDRY FM
FUNERAL FM
MIRAGE POINT FM
BEAR ROCK FM
COLD LAKE FM
ERNESTINA LAKE FM
BASAL RED BEDS
COLD LAKE FM
ERNESTINA LAKE FM
BASAL RED BEDS
LOTSBERG FM
ARNICA FM
SOMBRE FM
CAMSELL FM
DELORME FM
?
?
?

FIG. 3-6

Fig. 3-7
ALBERTA
CRETACEOUS

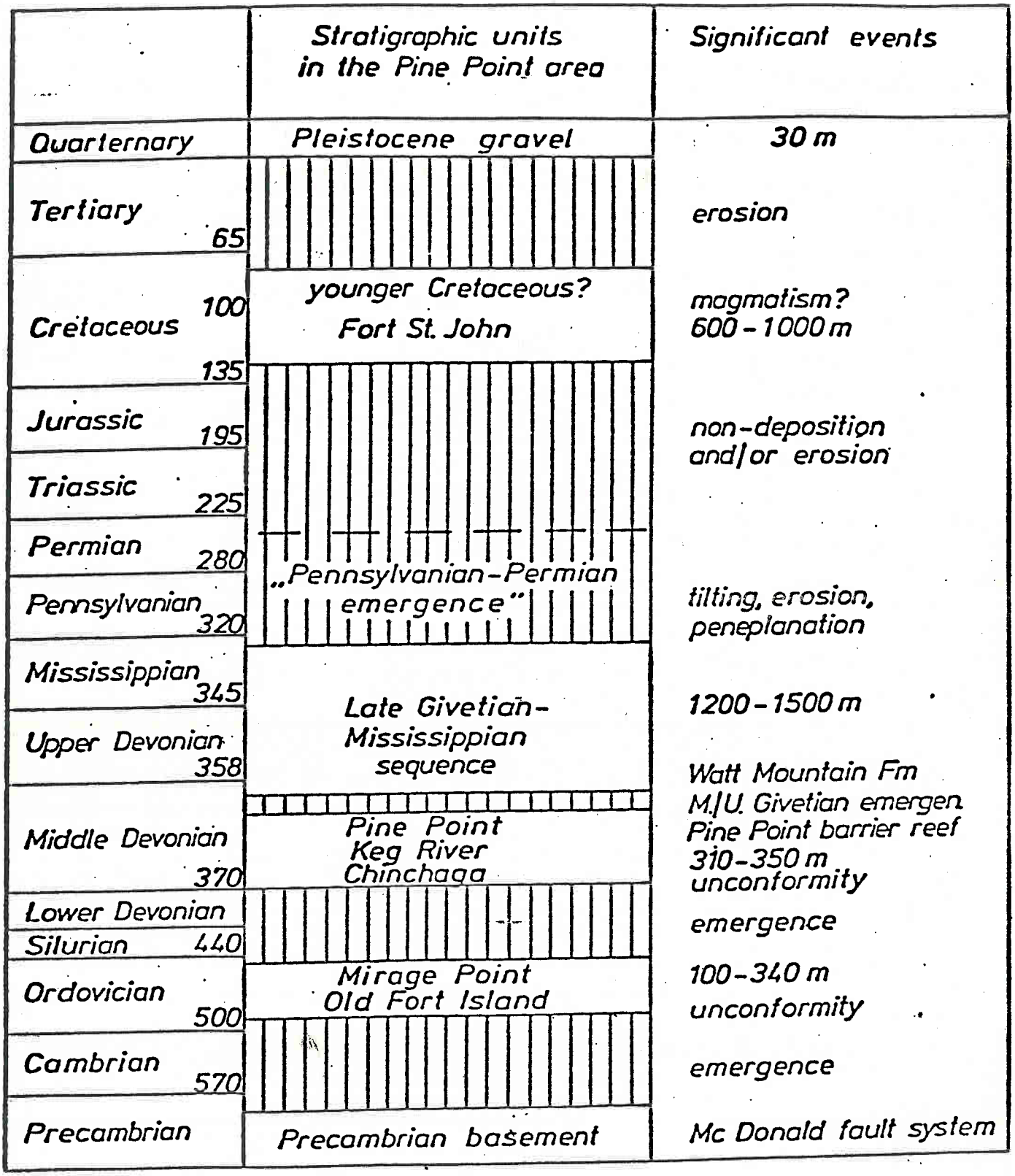
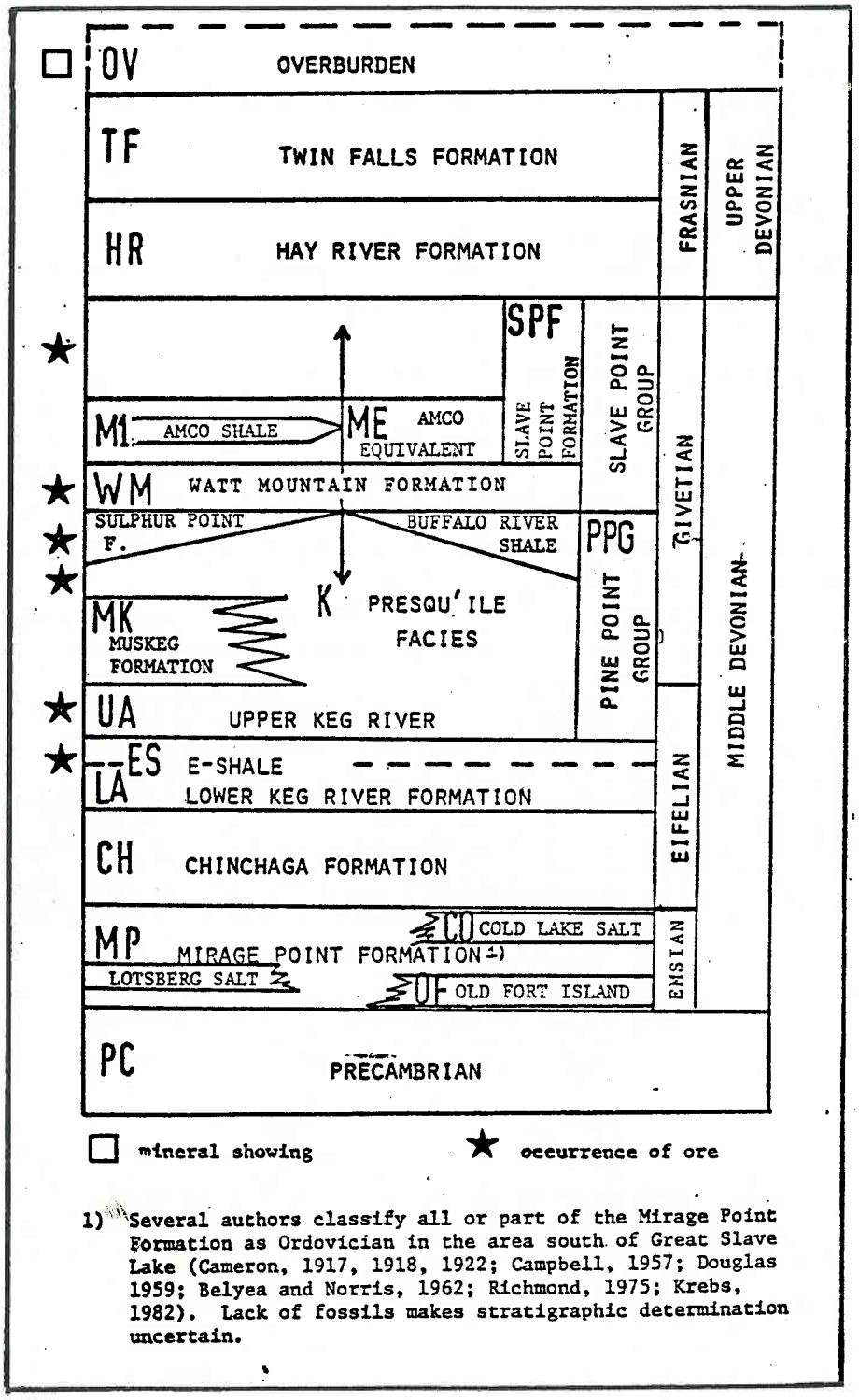

Stratigraphic units in the Pine Point area
Significant events
Quarternary
Pleistocene gravel
30 m
Tertiary
65
erosion
younger Cretaceous?
Cretaceous
100
Fort St. John
magmatism?
600 - 1000 m
135
Jurassic
195
non-deposition and/or erosion
Triassic
225
Permian
280
„Pennsylvanian-Permian emergence"
Pennsylvanian
320
tilting, erosion, peneplanation
Mississippian
345
Late Givetian-Mississippian sequence
1200 - 1500 m
Upper Devonian
358
Watt Mountain Fm
M./U. Givetian emergen.
Pine Point barrier reef
Middle Devonian
Pine Point
Keg River
Chinchaga
310 - 350 m
unconformity
370
Lower Devonian
emergence
Silurian
440
Mirage Point
Old Fort Island
100 - 340 m
Ordovician
unconformity
500
Cambrian
emergence
570
Precambrian
Precambrian basement
Mc Donald fault system

FIG. 3-8



1) Several authors classify all or part of the Mirage Point Formation as Ordovician in the area south of Great Slave Lake (Cameron, 1917, 1918, 1922; Campbell, 1957; Douglas 1959; Belyea and Norris, 1962; Richmond, 1975; Krebs, 1982). Lack of fossils makes stratigraphic determination uncertain.

FIG. 3-9

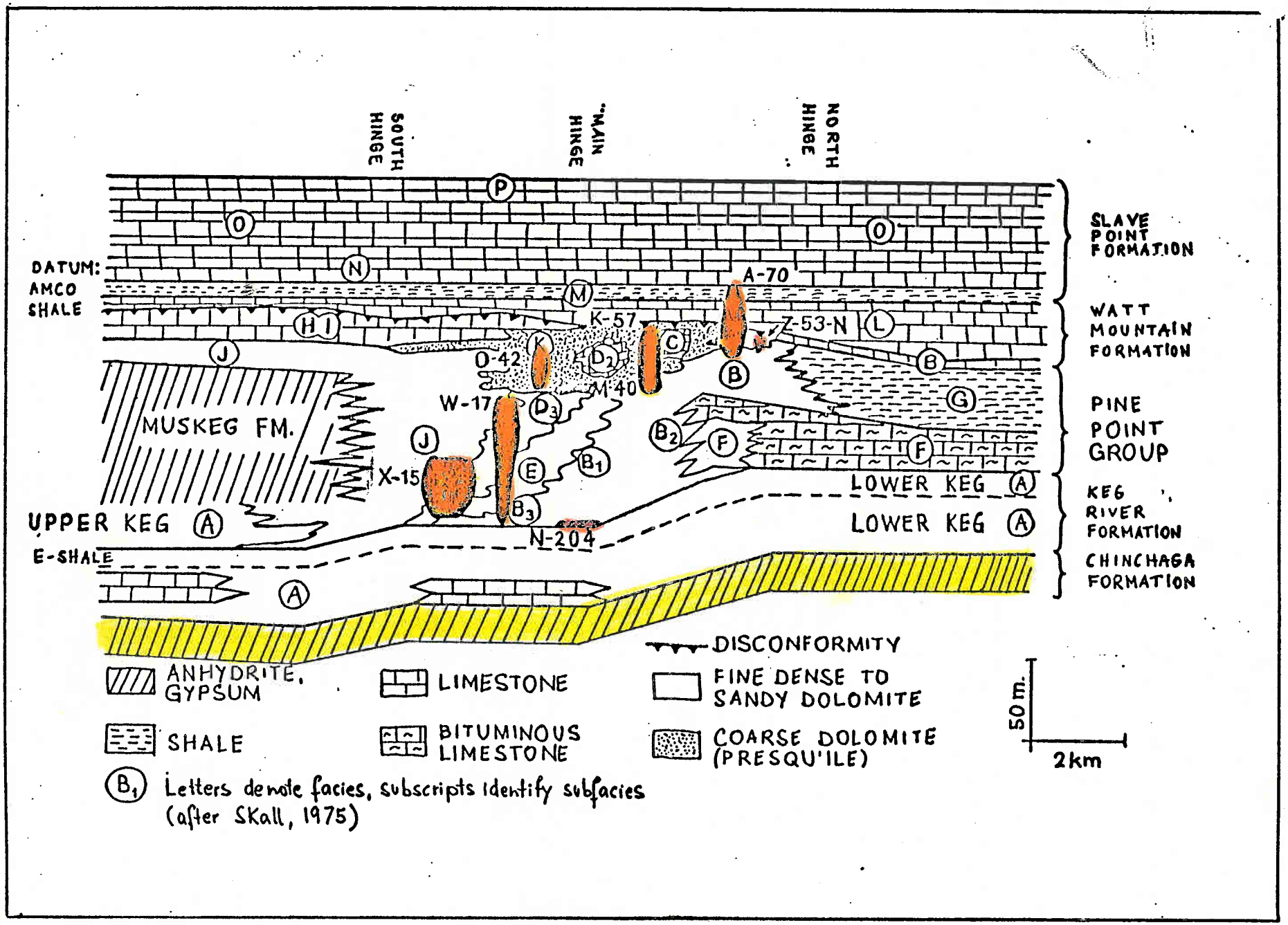

SOUTH HINGE
"MAIN" HINGE
NORTH HINGE
DATUM: AMCO SHALE
SLAVE POINT FORMATION
WATT MOUNTAIN FORMATION
PINE POINT GROUP
KEG RIVER FORMATION
CHINCHAGA FORMATION
MUSKEG FM.
UPPER KEG
LOWER KEG
LOWER KEG
E-SHALE
A-70
K-57
Z-53-N
O-42
M-40
W-17
X-15
N-204
DISCONFORMITY
ANHYDRITE, GYPSUM
LIMESTONE
FINE DENSE TO SANDY DOLOMITE
SHALE
BITUMINOUS LIMESTONE
COARSE DOLOMITE (PRESQU'ILE)
50 m.
2km
Letters denote facies, subscripts identify subfacies (after Skall, 1975)

FIG. 3-10

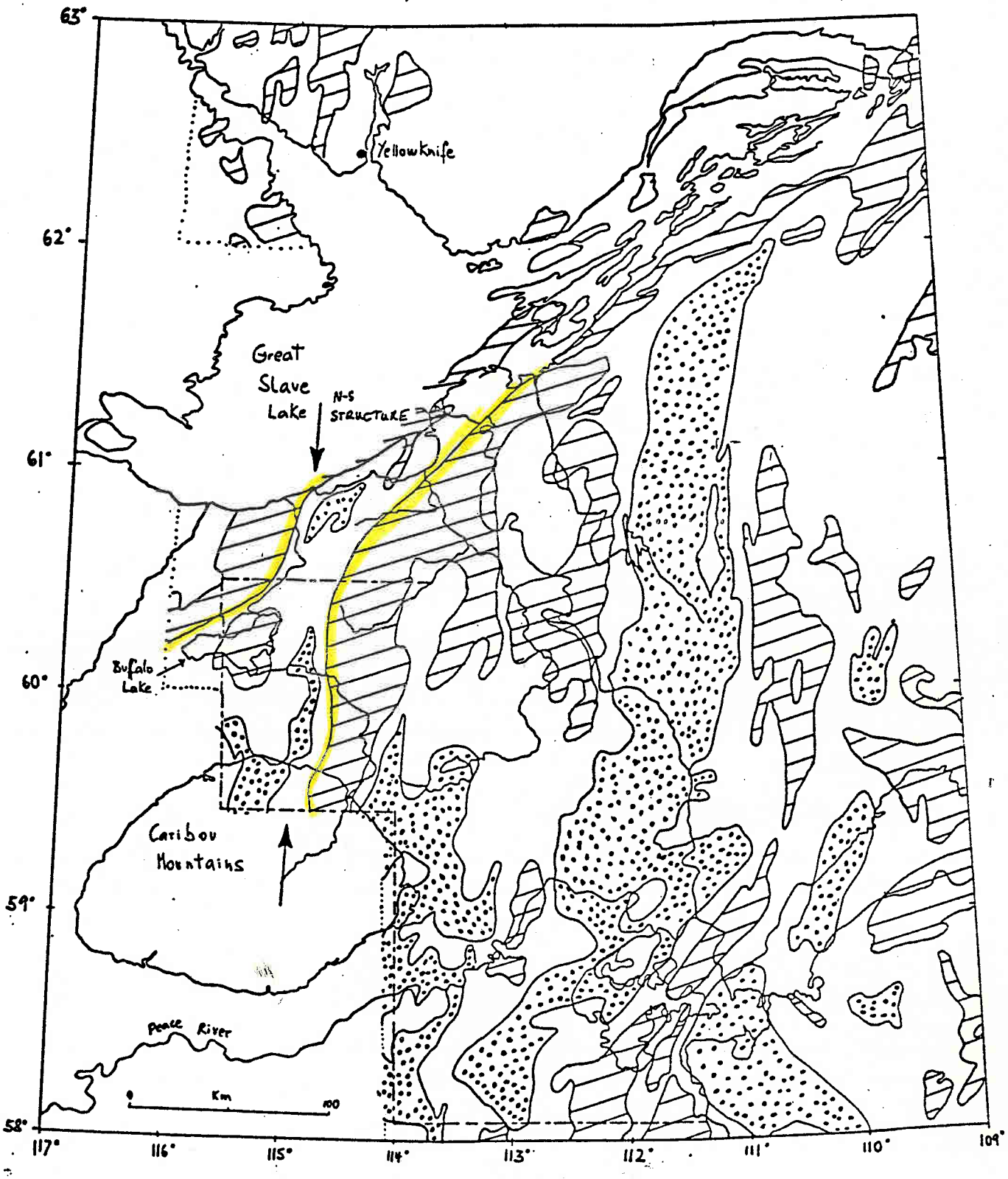

63°
62°
61°
60°
59°
58°
117°
116°
115°
114°
113°
112°
111°
110°
109°
Yellowknife
Great
Slave
Lake
N-S
STRUCTURE
Buffalo
Lake
Caribou
Mountains
Peace River
0
Km
100

FIG. 3-11

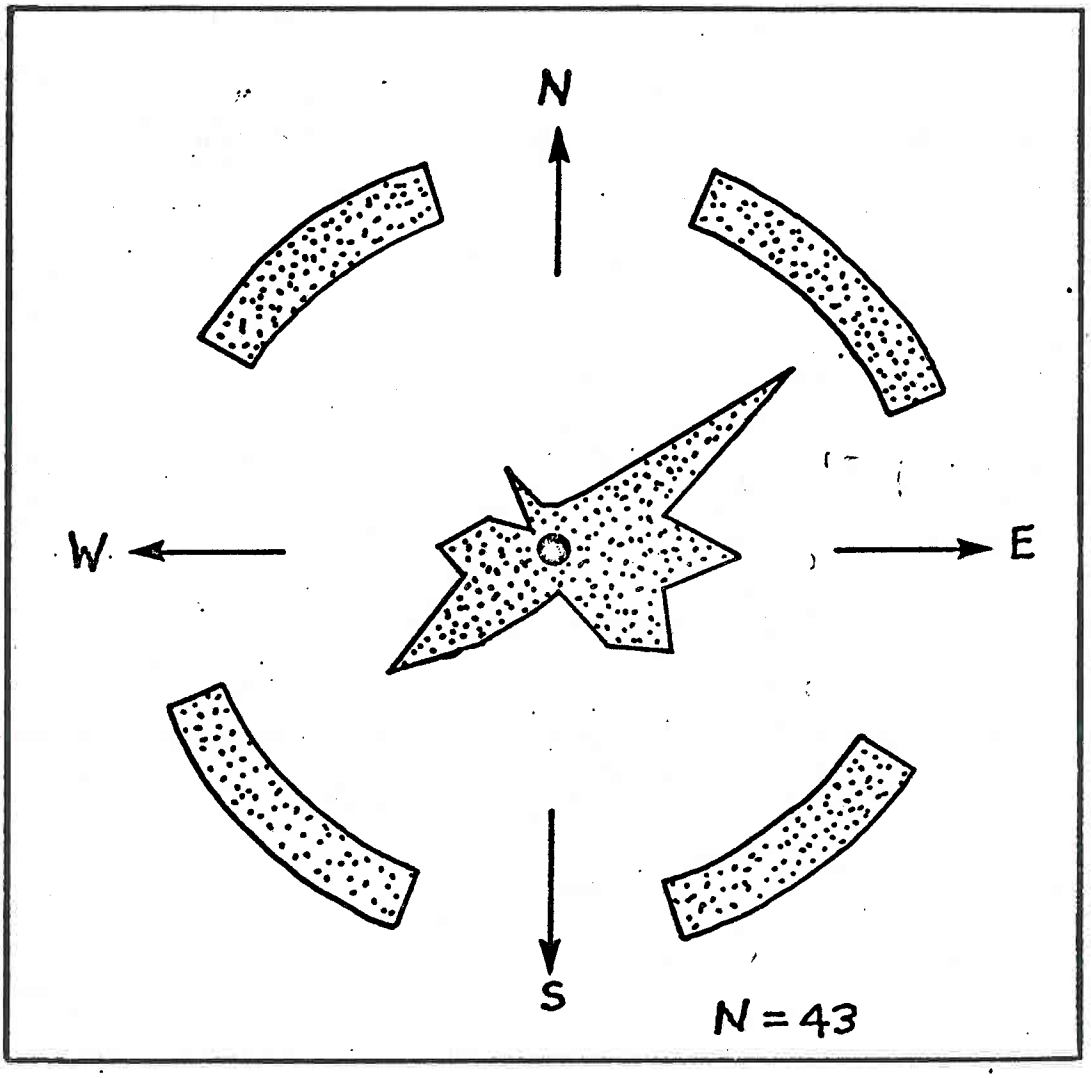


FIG. 3-12

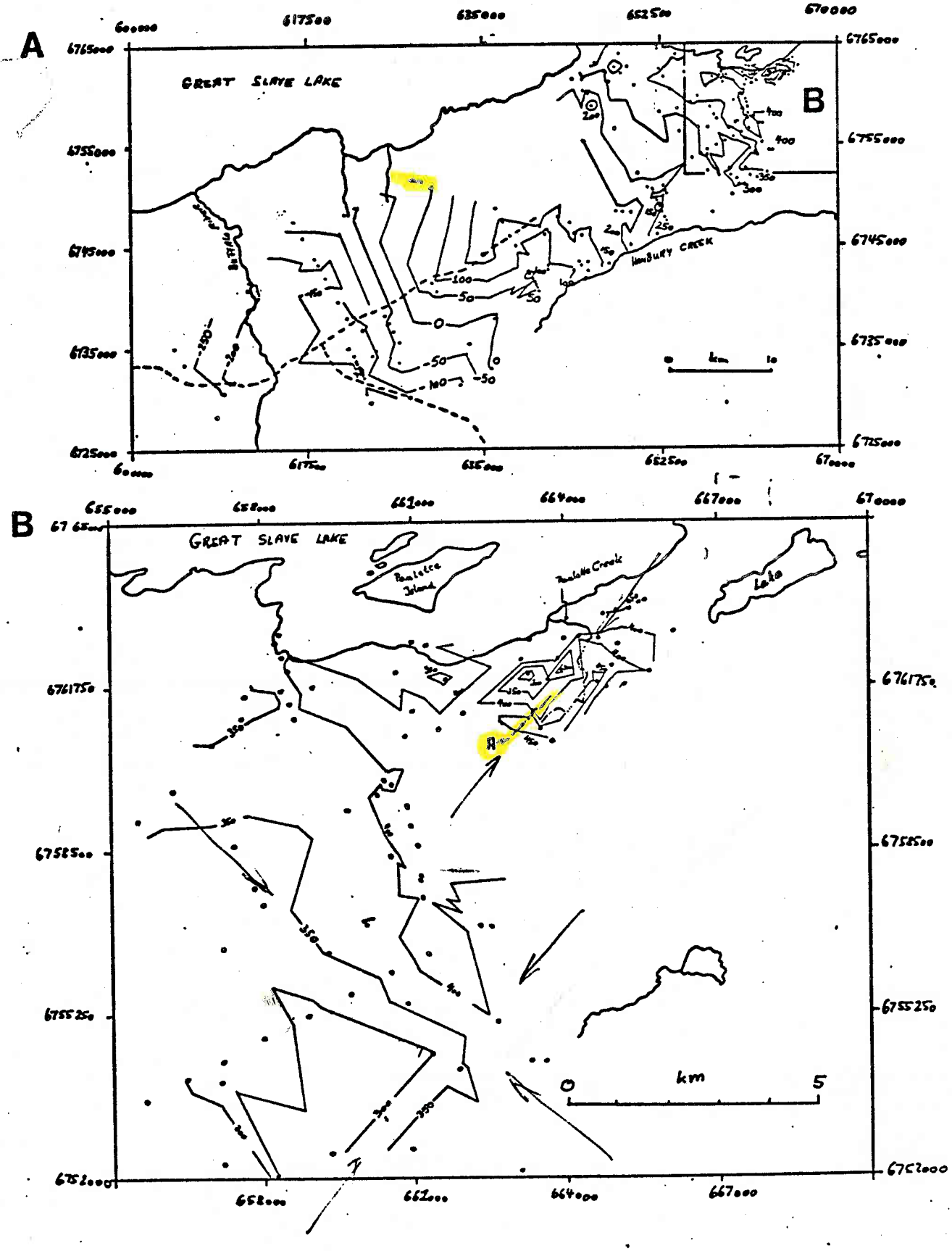
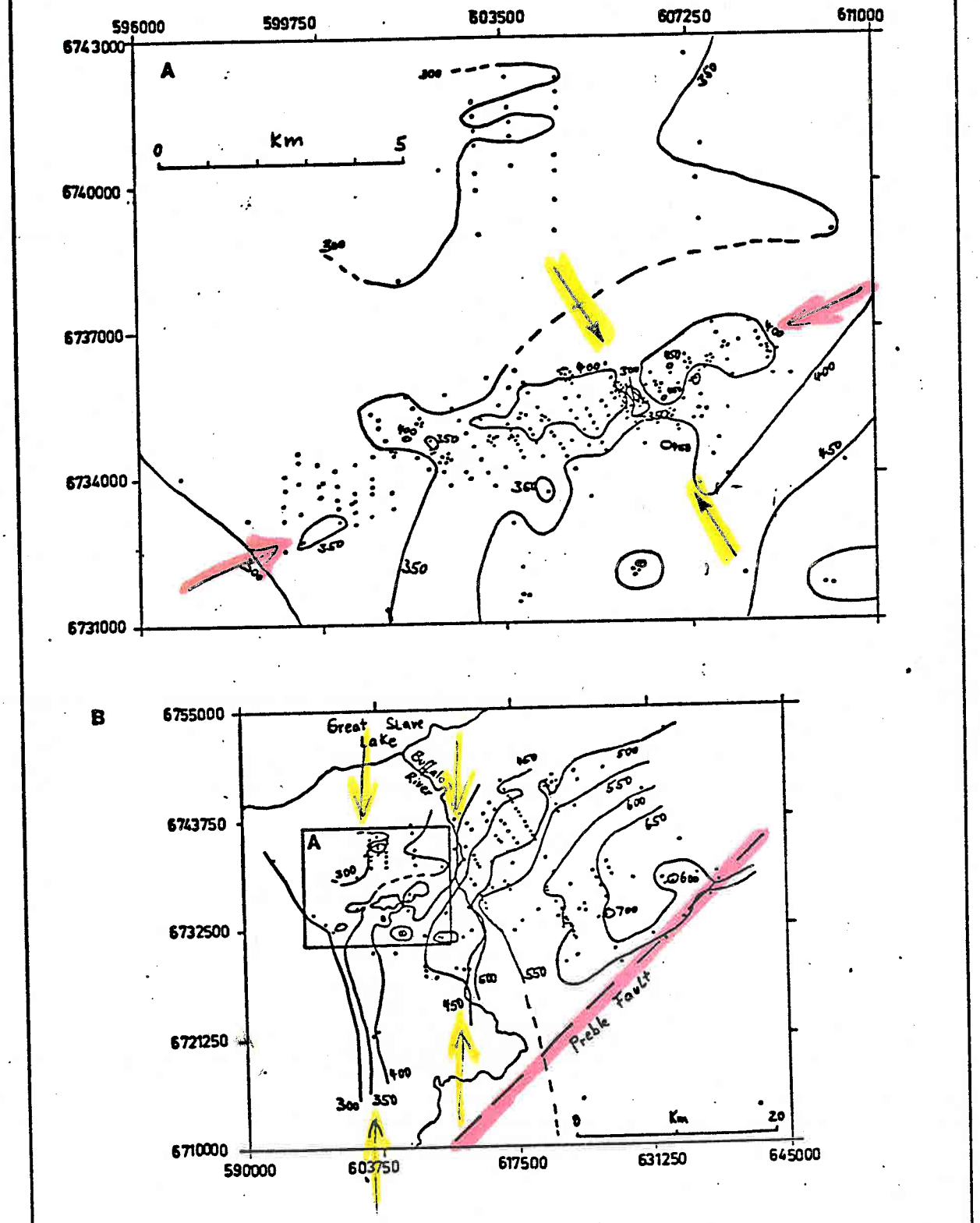

A
GREAT SLAVE LAKE
B
Hanbury Creek
km
10
B
GREAT SLAVE LAKE
Pearlette Island
Pearlette Creek
Lake
A
km
5

FIG. 3-13



Top of Amco Shale [Elevation in feet]

FIG. 3-14

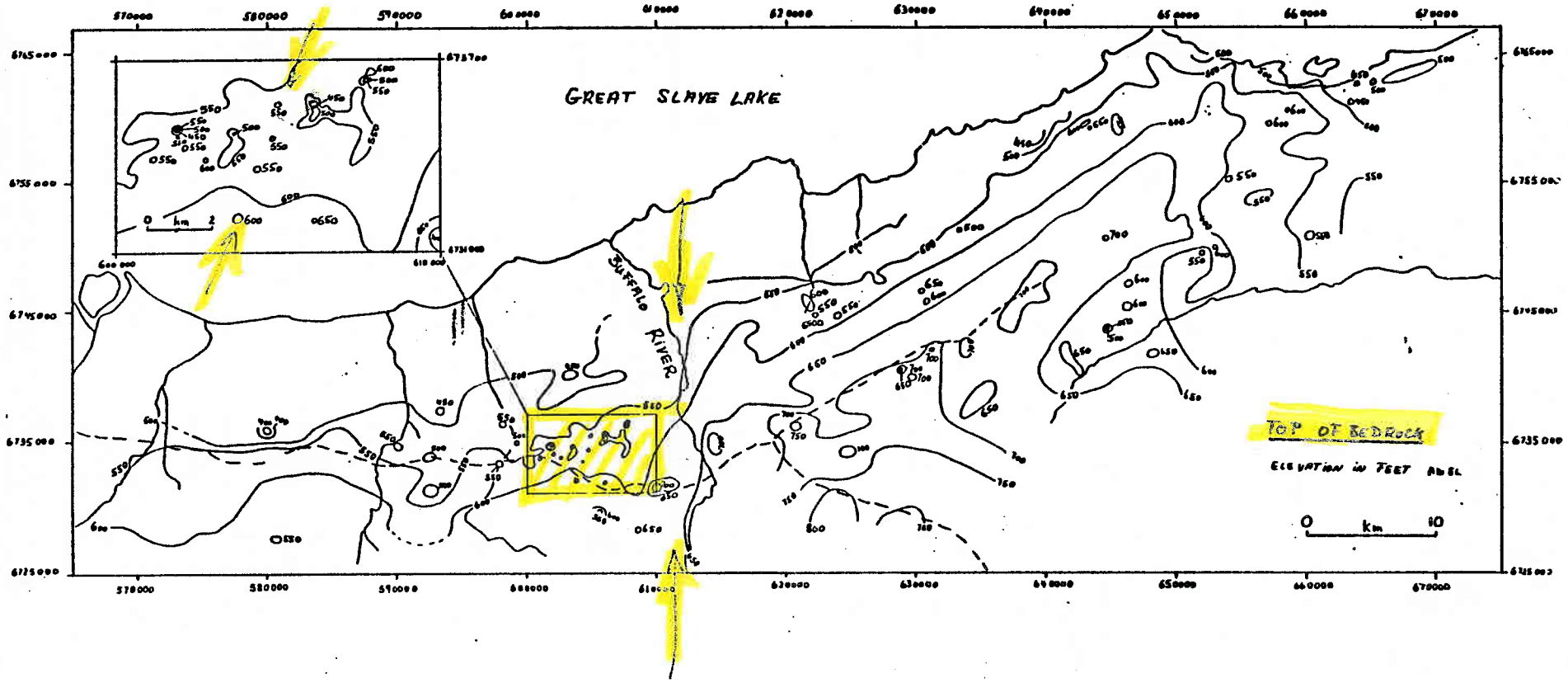

GREAT SLAVE LAKE
BUFFALO RIVER
TOP OF BEDROCK
ELEVATION IN FEET ABSL
0 km 10
0 km 2

FIG. 3-15

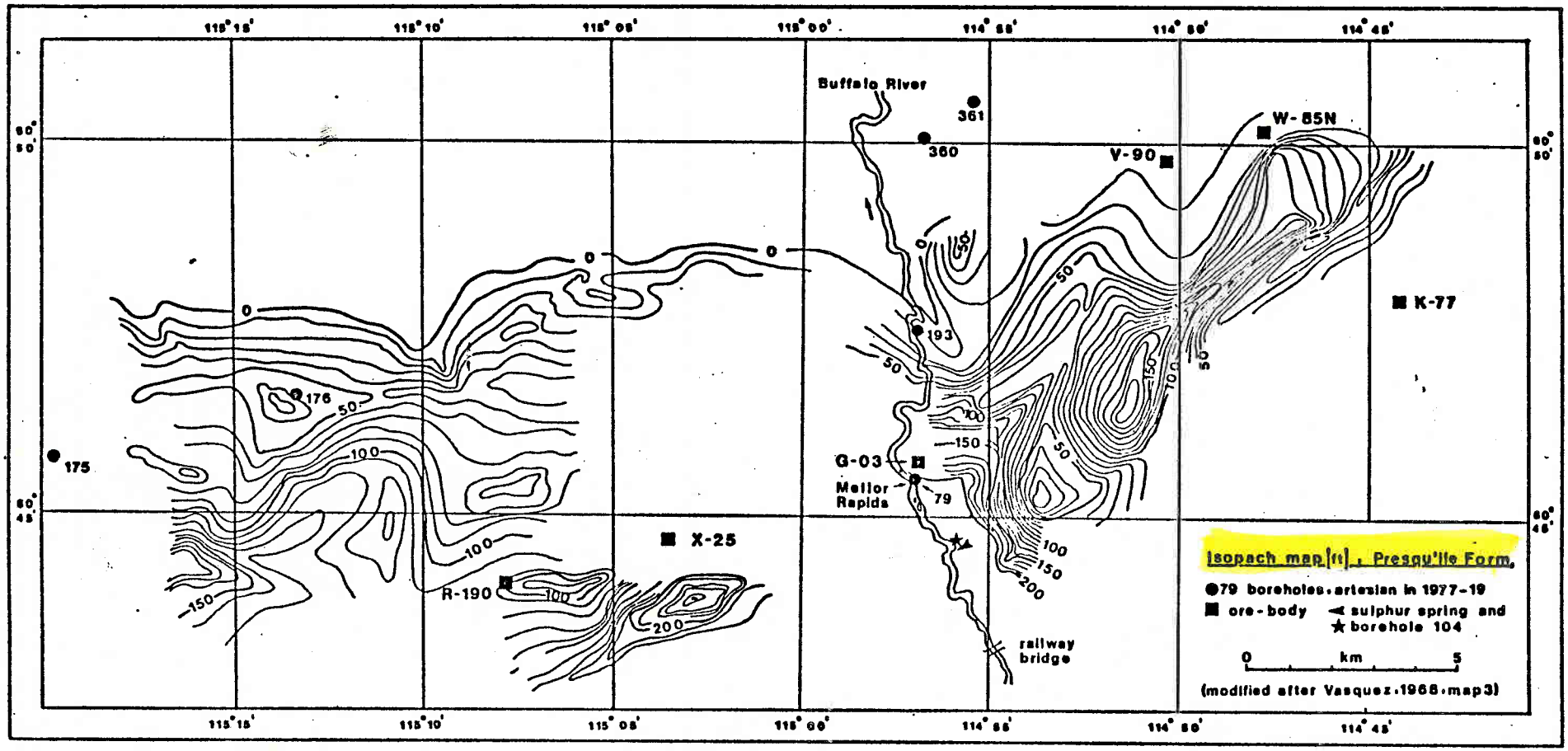
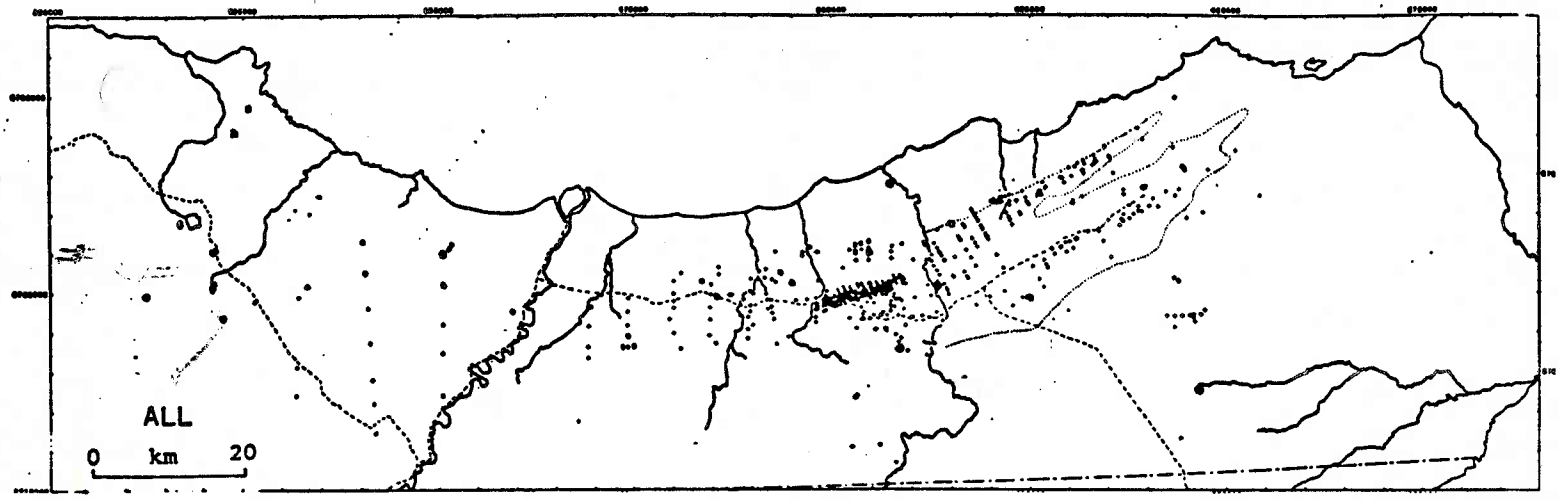
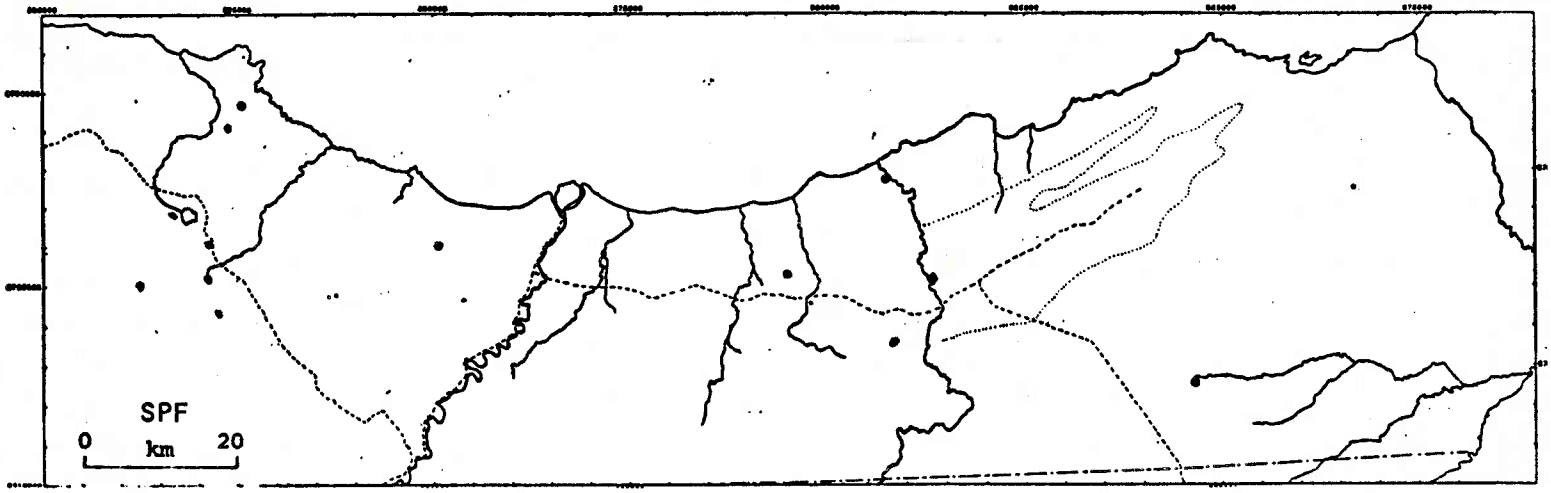
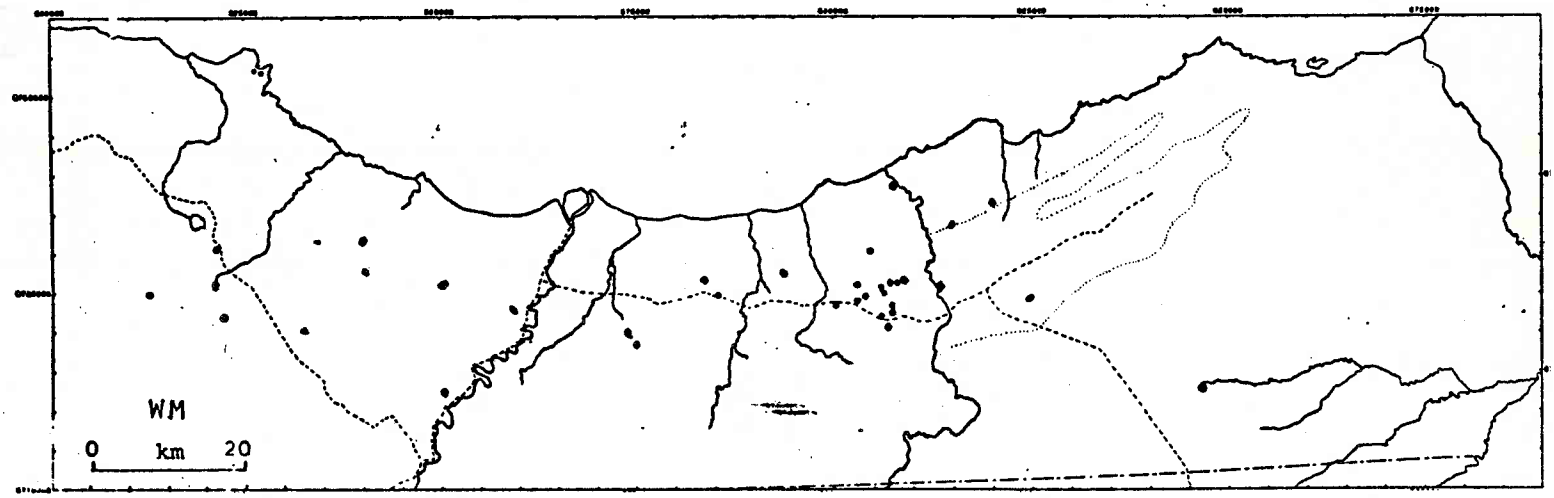
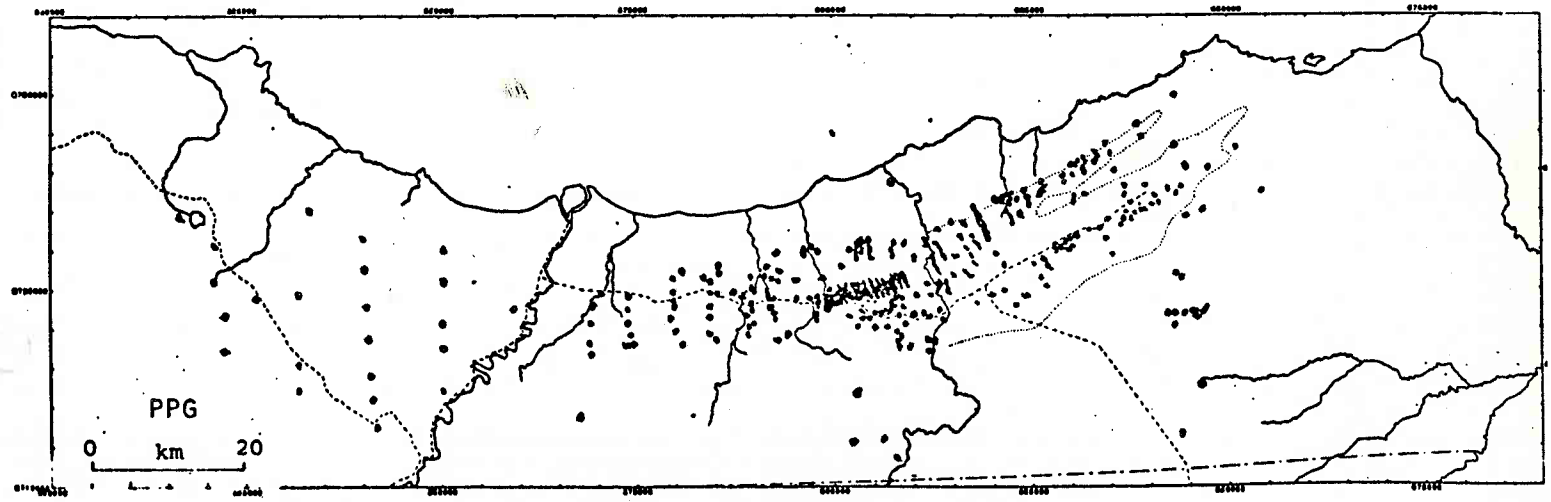

115° 15'
115° 10'
115° 05'
115° 00'
114° 55'
114° 50'
114° 45'
60° 50'
60° 45'
Buffalo River
361
360
W-85N
V-90
K-77
193
176
175
G-03
Mellor Rapids
79
X-25
R-190
railway bridge
0
50
100
150
200
Isopach map (ft), Presqu'ile Form.
●79 boreholes, artesian in 1977-19
■ ore-body
sulphur spring and ★ borehole 104
0 km 5
(modified after Vasquez, 1968, map3)

FIG. 3-16


ALL
0 km 20


SPF
0 km 20


WM
0 km 20


PPG
0 km 20

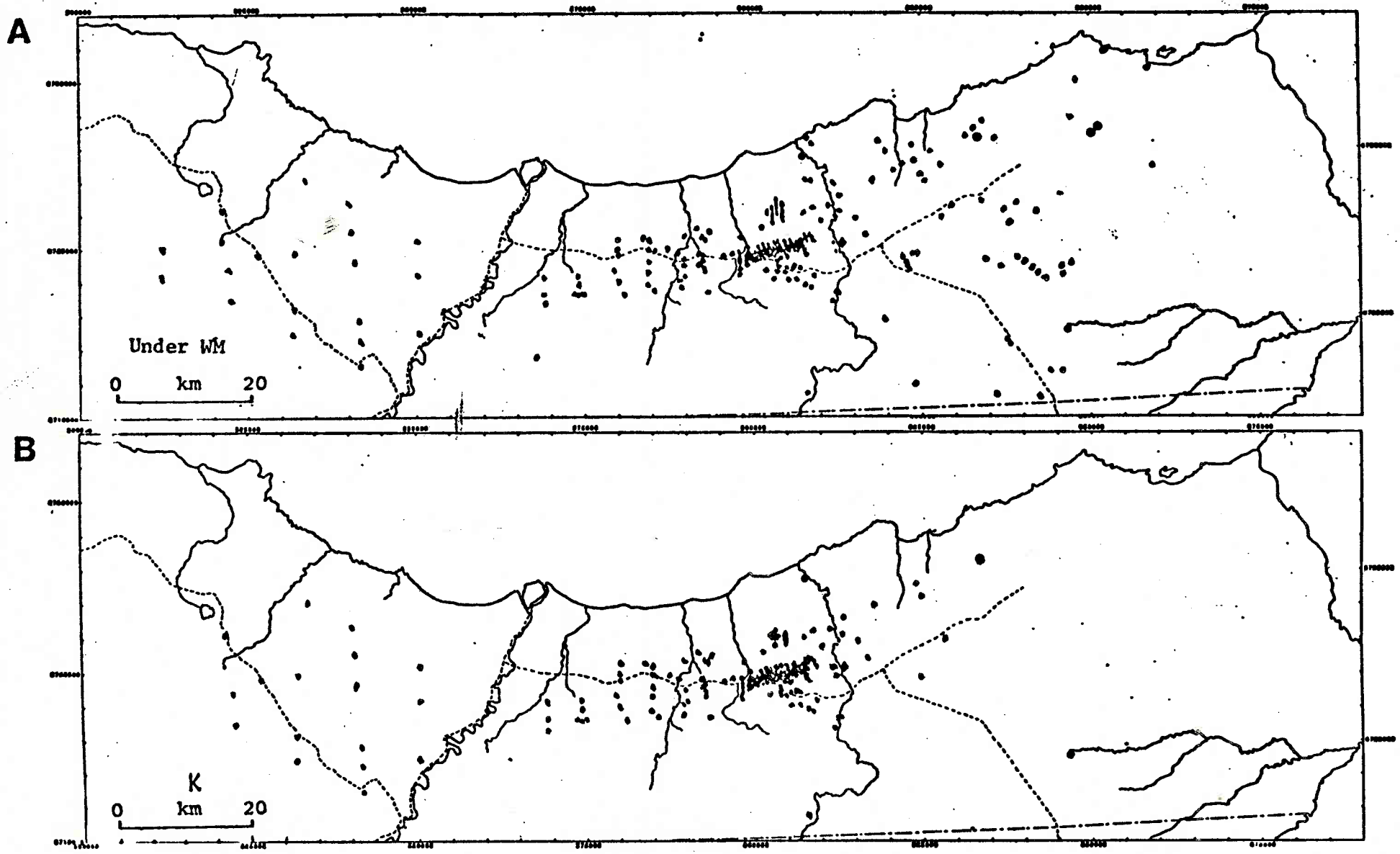


FIG. 3-18

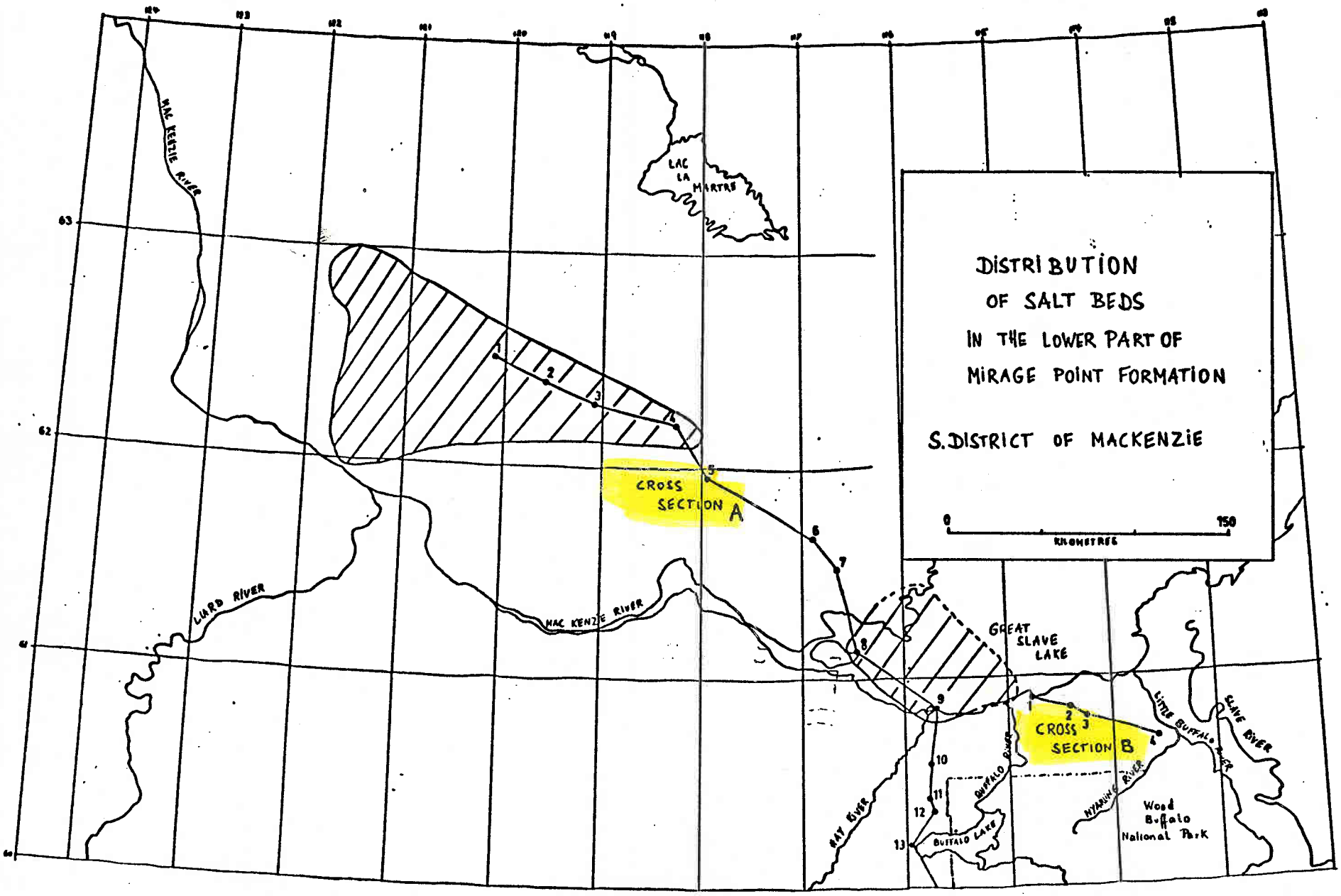

DISTRIBUTION
OF SALT BEDS
IN THE LOWER PART OF
MIRAGE POINT FORMATION
S. DISTRICT OF MACKENZIE
0
150
KILOMETRES
MAC KENZIE RIVER
LAC LA MARTRE
LIARD RIVER
MAC KENZIE RIVER
CROSS SECTION A
CROSS SECTION B
GREAT SLAVE LAKE
LITTLE BUFFALO RIVER
SLAVE RIVER
BUFFALO RIVER
HYARNING RIVER
BUFFALO LAKE
BAT RIVER
Wood Buffalo National Park

FIG. 3-19

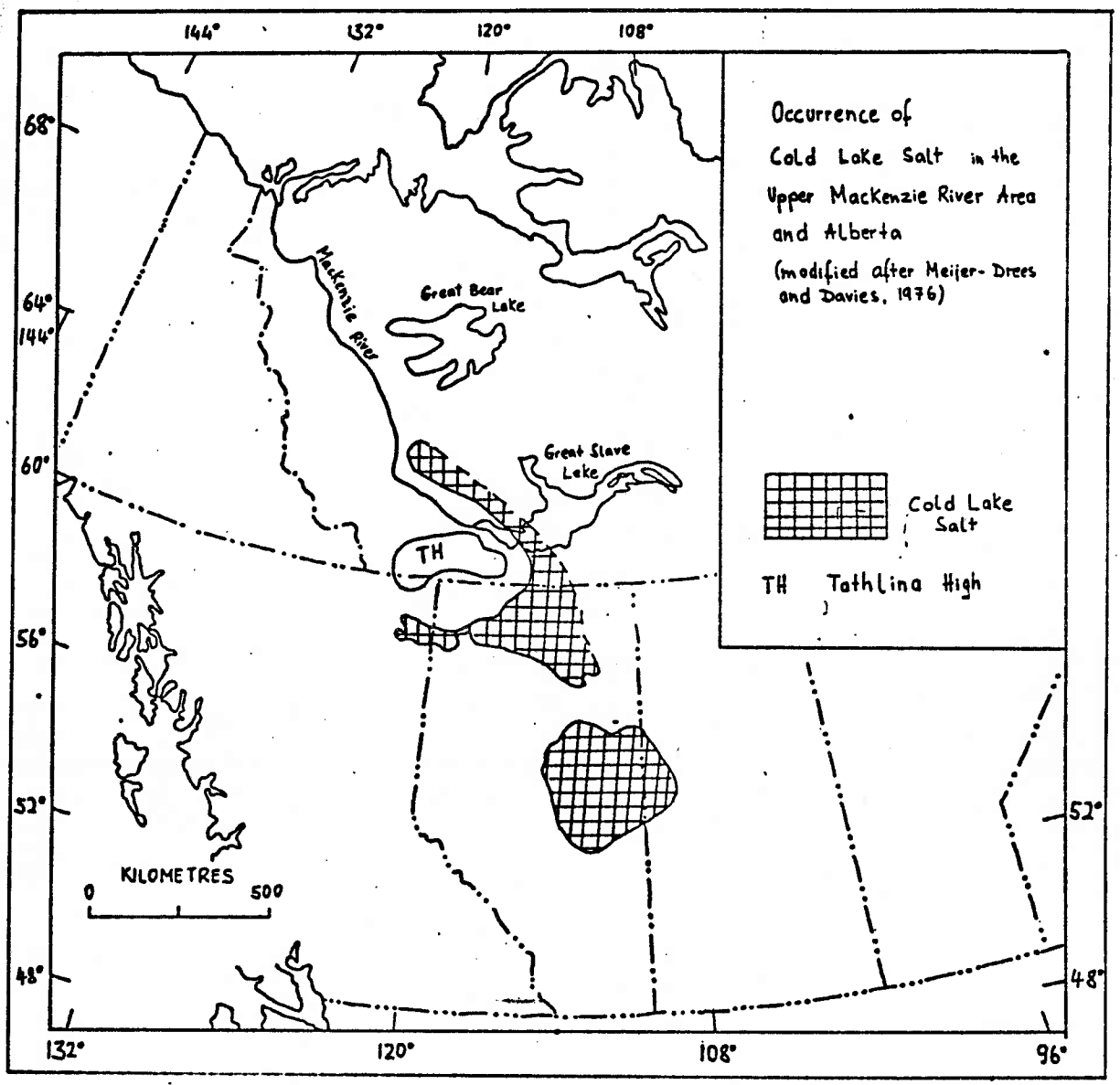

144°
132°
120°
108°
68°
64°
144°
60°
56°
52°
48°
132°
120°
108°
96°
52°
48°
Occurrence of
Cold Lake Salt in the
Upper MacKenzie River Area
and Alberta
(modified after Meijer-Drees
and Davies, 1976)
Cold Lake
Salt
TH Tathlina High
Great Bear
Lake
MacKenzie River
Great Slave
Lake
TH
KILOMETRES
0
500

FIG. 3-20

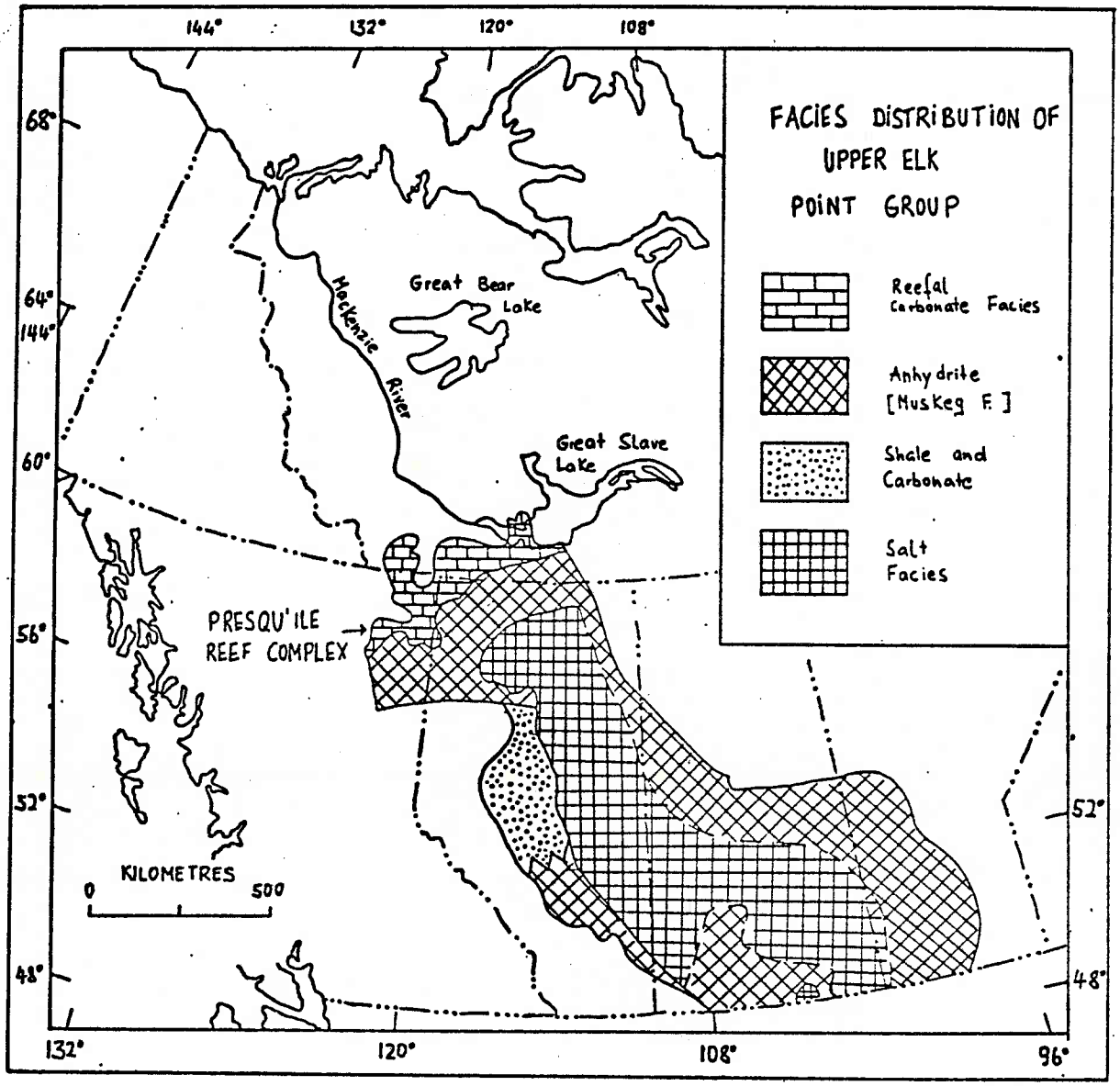

144°
132°
120°
108°
68°
64°
144°
60°
56°
52°
48°
132°
120°
108°
96°
FACIES DISTRIBUTION OF UPPER ELK POINT GROUP
Reefal Carbonate Facies
Anhydrite [Muskeg F.]
Shale and Carbonate
Salt Facies
Great Bear Lake
Mackenzie River
Great Slave Lake
PRESQU'ILE REEF COMPLEX
KILOMETRES
0
500

FIG. 3-21

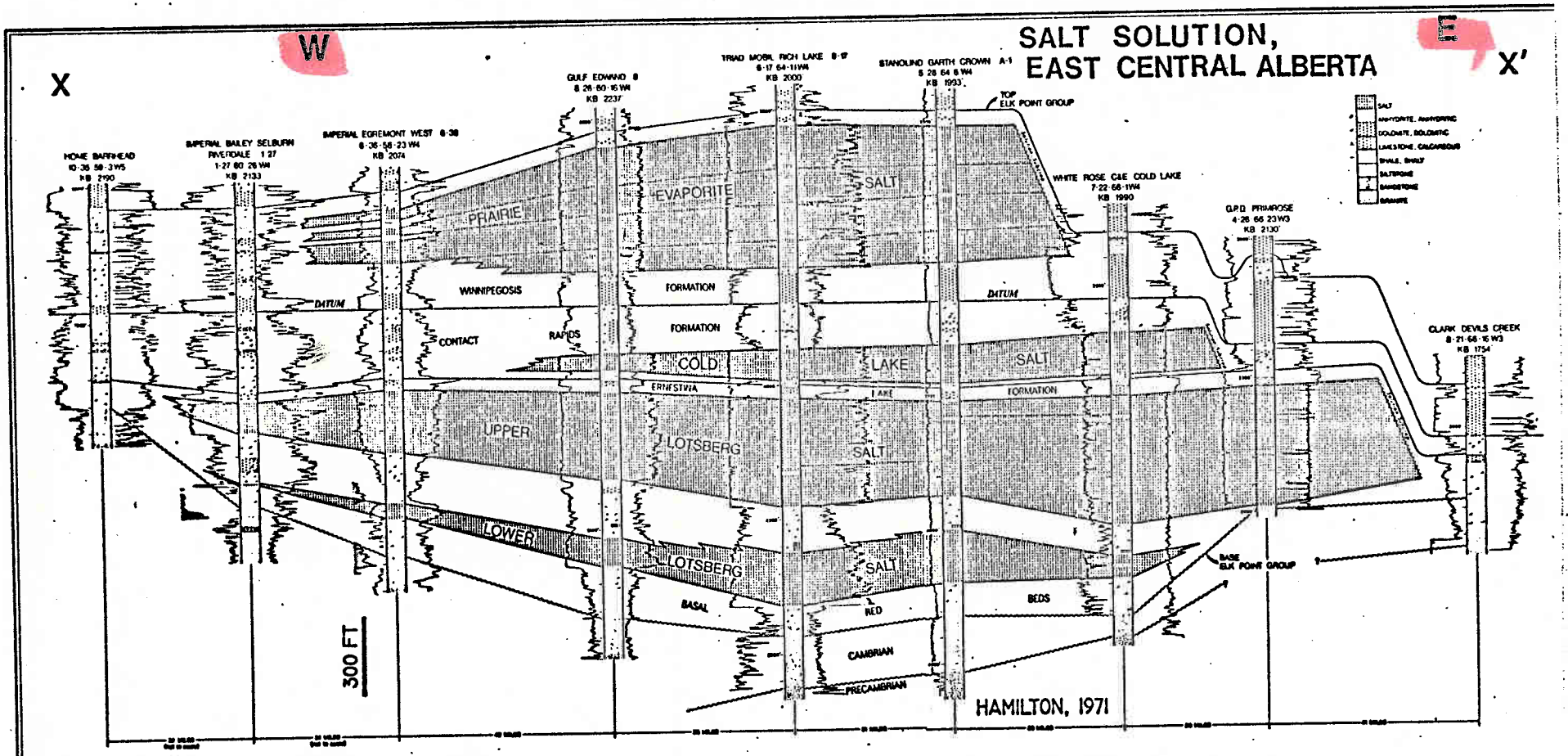

W
E
X
X'
SALT SOLUTION,
EAST CENTRAL ALBERTA
HOME BARNHEAD
10-36-58-3W5
KB 2190
IMPERIAL BAILEY SELBURN
RIVERDALE 1-27
1-27-60-26W4
KB 2133
IMPERIAL EGREMONT WEST 8-36
8-36-58-23W4
KB 2074
GULF EDWARD 8
8-26-60-15W4
KB 2237
TRIAD MOBIL RICH LAKE 8-17
8-17-64-11W4
KB 2000
STANOLIND GARTH CROWN A-1
5-28-64-8W4
KB 1933
TOP
ELK POINT GROUP
WHITE ROSE CAE COLD LAKE
7-22-66-1W4
KB 1990
G.P.D. PRIMROSE
4-26-66-23W3
KB 2130
CLARK DEVILS CREEK
8-21-66-15W3
KB 1754
PRAIRIE
EVAPORITE
SALT
WINNIPEGOSIS
FORMATION
DATUM
CONTACT
RAPIDS
FORMATION
COLD
LAKE
SALT
ERNESTINA
LAKE
FORMATION
UPPER
LOTSBERG
SALT
LOWER
LOTSBERG
SALT
BASAL
RED
BEDS
CAMBRIAN
PRECAMBRIAN
BASE
ELK POINT GROUP
300 FT
HAMILTON, 1971

FIG. 3-22

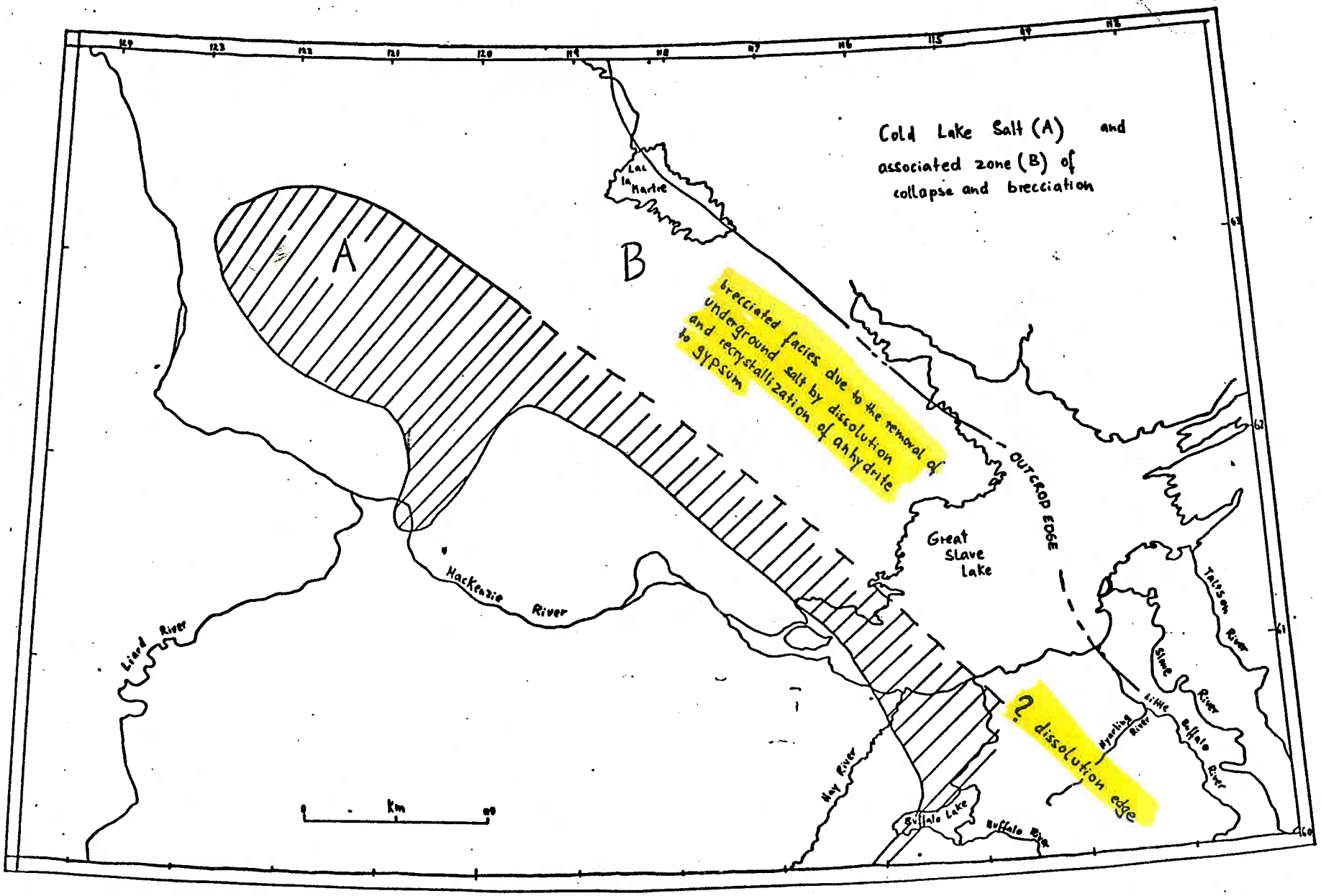

Cold Lake Salt (A) and associated zone (B) of collapse and brecciation
A
B
brecciated facies due to the removal of underground salt by dissolution and recrystallization of anhydrite to gypsum
OUTCROP EDGE
Great Slave Lake
Lac la Martre
Mackenzie River
Liard River
Hay River
Buffalo Lake
Buffalo River
Little Buffalo River
Trout River
Slave River
? dissolution edge
km

FIG. 3-23

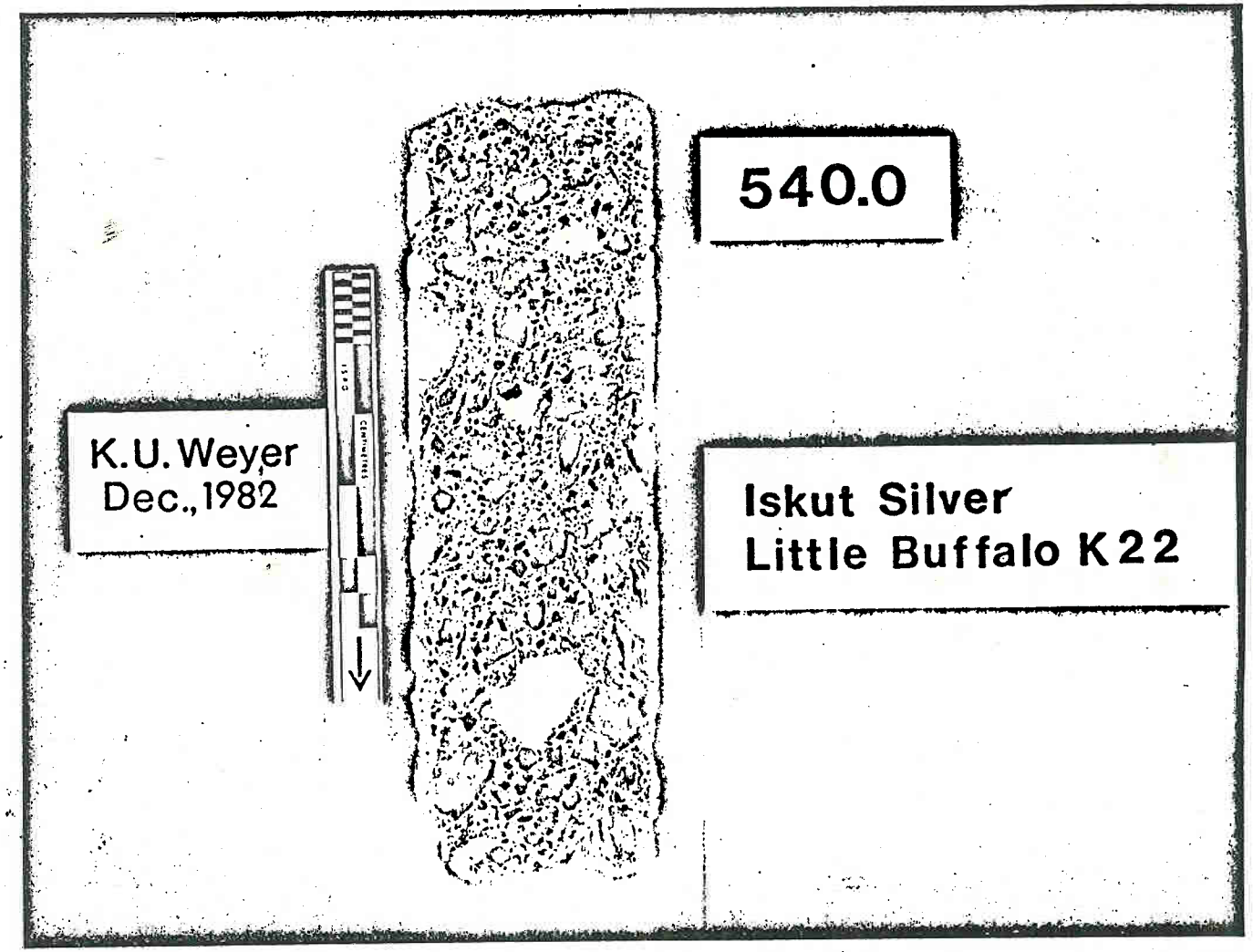
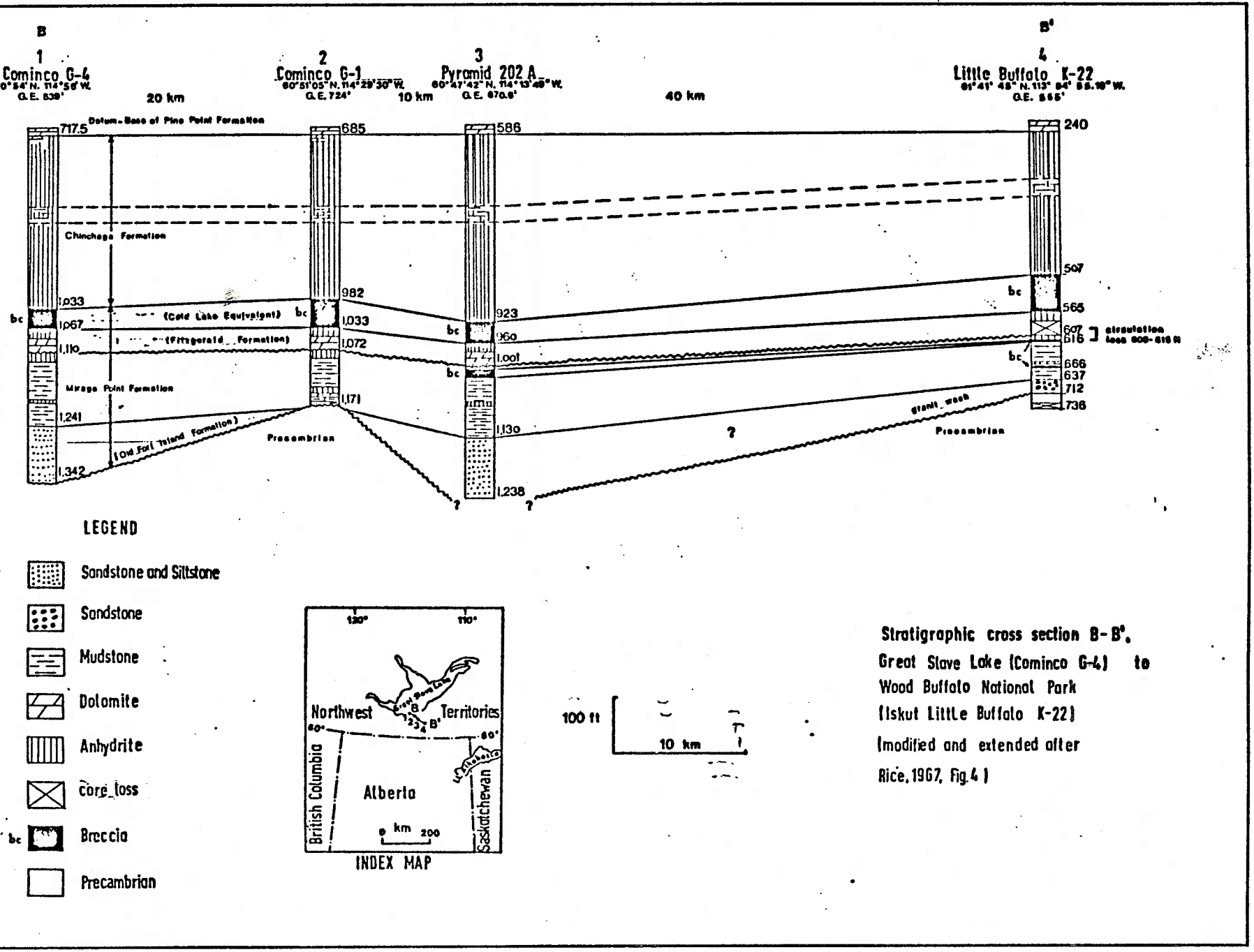


FIG. 3-24



Stratigraphic cross section B-B', Great Slave Lake (Cominco G-4) to Wood Buffalo National Park (Iskut Little Buffalo K-22) (modified and extended after Rice, 1967, Fig. 4)

FIG. 3-25

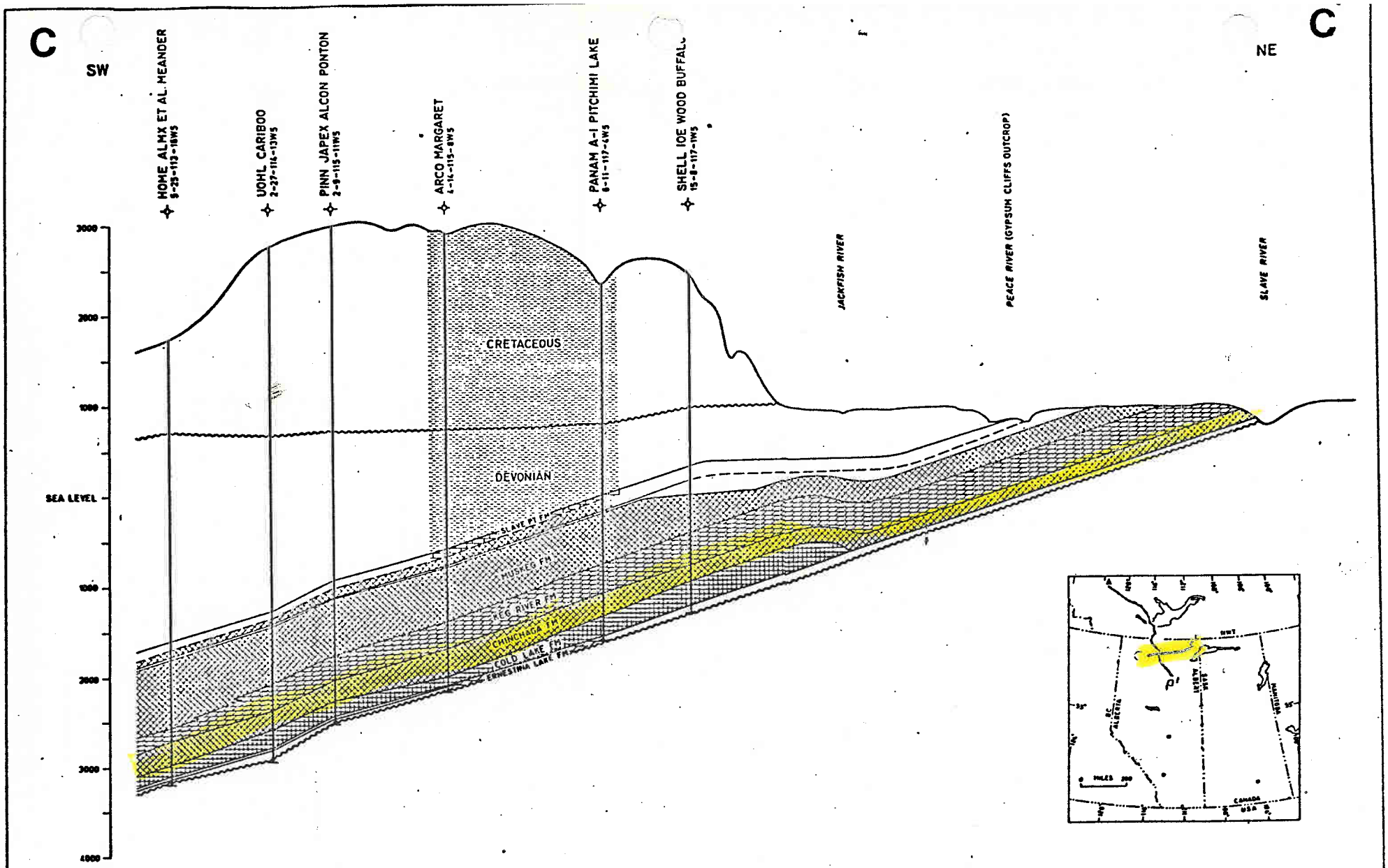

C
SW
C
NE
HOME ALMX ET AL. MEANDER
9-23-113-18W5
UOHL CARIBOO
2-27-114-13W5
PINN JAPEX ALCON PONTON
2-9-115-11W5
ARCO MARGARET
4-14-115-8W5
PANAM A-I PITCHIMI LAKE
8-11-117-4W5
SHELL IOE WOOD BUFFALO
15-8-117-1W5
JACKFISH RIVER
PEACE RIVER (GYPSUM CLIFFS OUTCROP)
SLAVE RIVER
CRETACEOUS
DEVONIAN
SEA LEVEL
3000
2000
1000
SLAVE PT FM
MUSKEG FM
KEG RIVER FM
CHINCHAGA FM
COLD LAKE FM
ERNESTINA LAKE FM
P
P'
ALBERTA
SASK
MANITOBA
CANADA
USA
0 MILES 200

FIG. 3-26

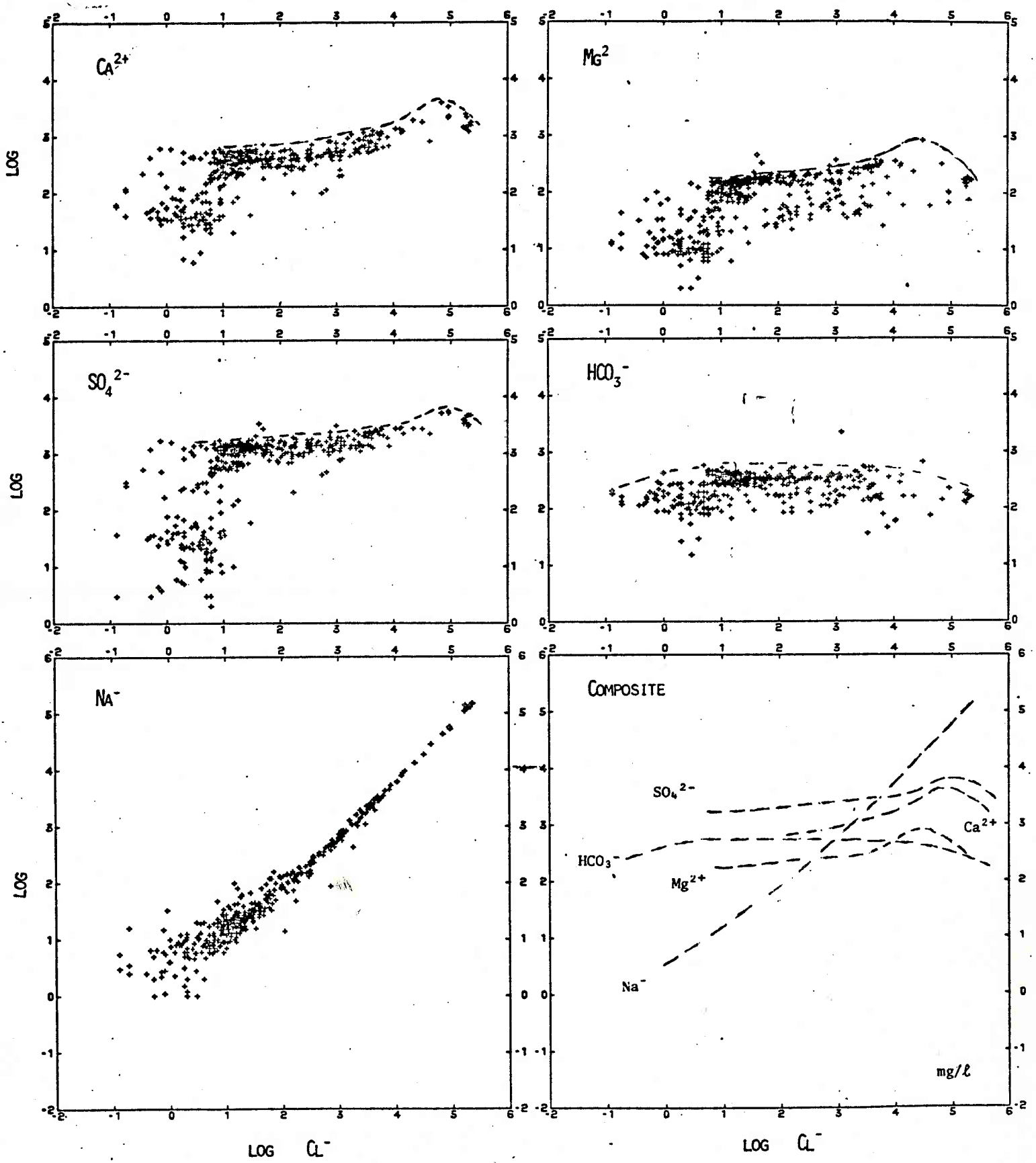

CA^{2+}
Mg^{2}
SO_4^{2-}
HCO_3^-
NA^-
COMPOSITE
SO_4^{2-}
Ca^{2+}
HCO_3^-
Mg^{2+}
Na^-
mg/ℓ
LOG
LOG CL^-

FIG. 3-28

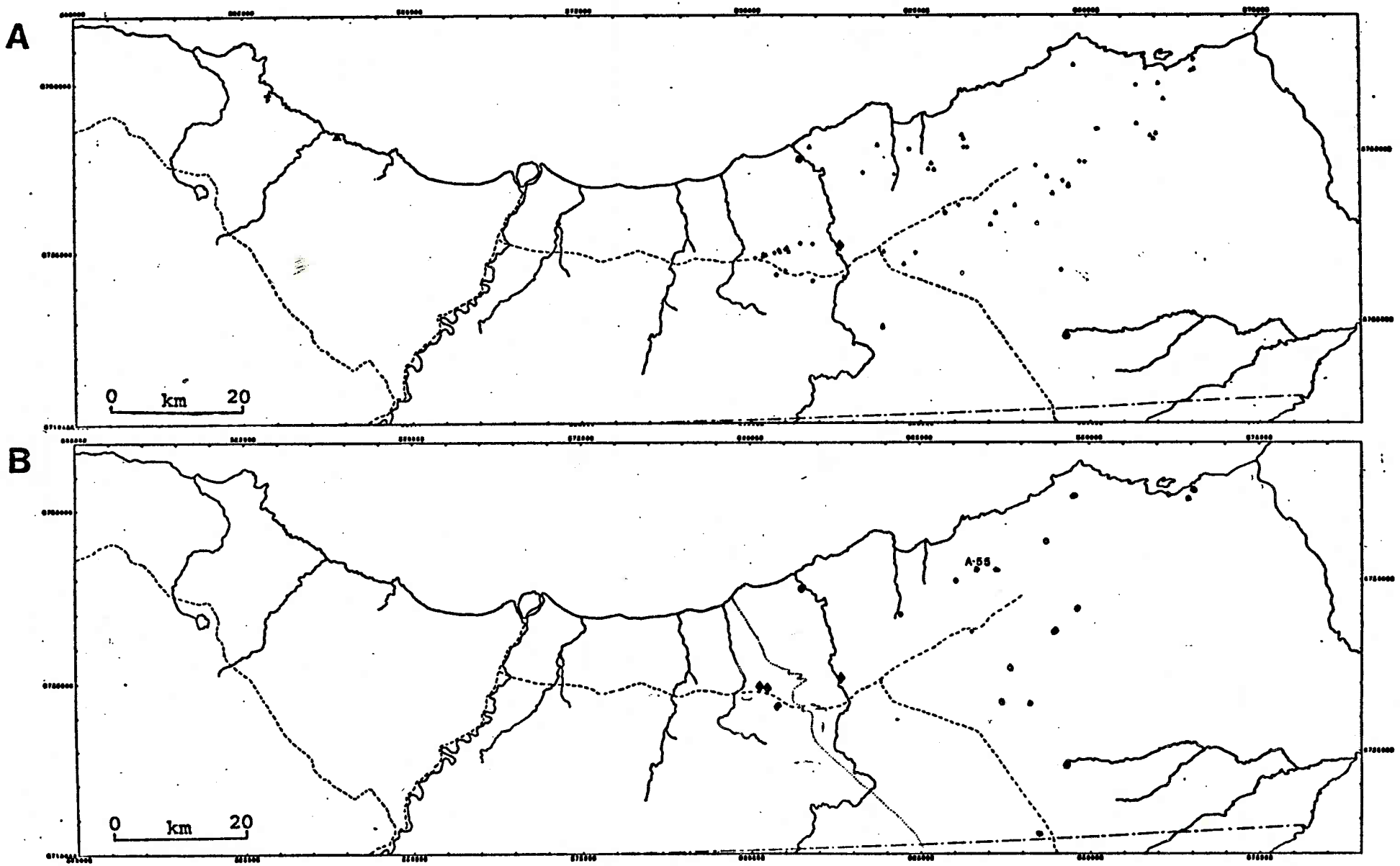


FIG. 3-29

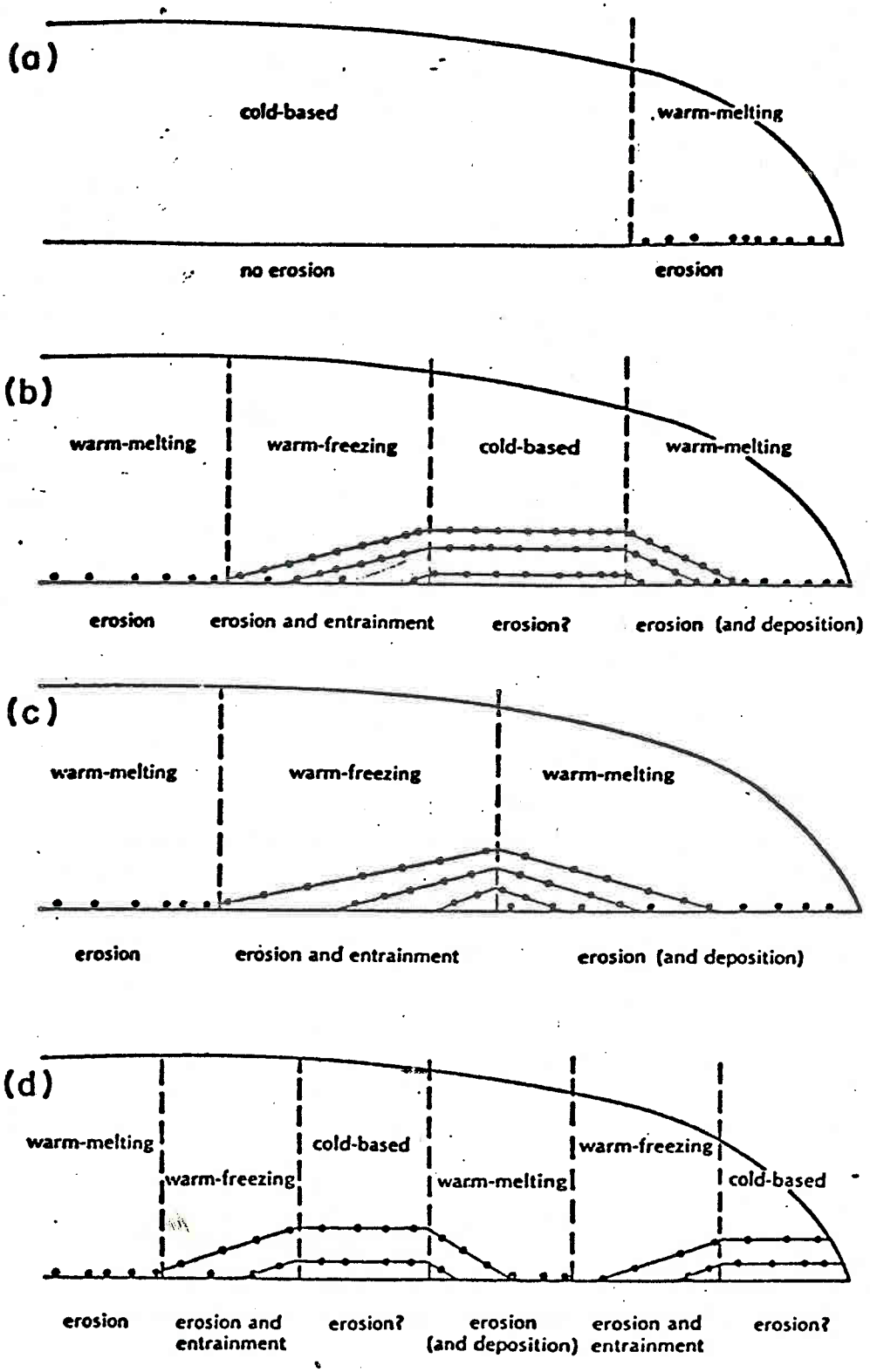

(a)
cold-based
warm-melting
no erosion
erosion
(b)
warm-melting
warm-freezing
cold-based
warm-melting
erosion
erosion and entrainment
erosion?
erosion (and deposition)
(c)
warm-melting
warm-freezing
warm-melting
erosion
erosion and entrainment
erosion (and deposition)
(d)
warm-melting
warm-freezing
cold-based
warm-melting
warm-freezing
cold-based
erosion
erosion and entrainment
erosion?
erosion (and deposition)
erosion and entrainment
erosion?

FIG. 3-30

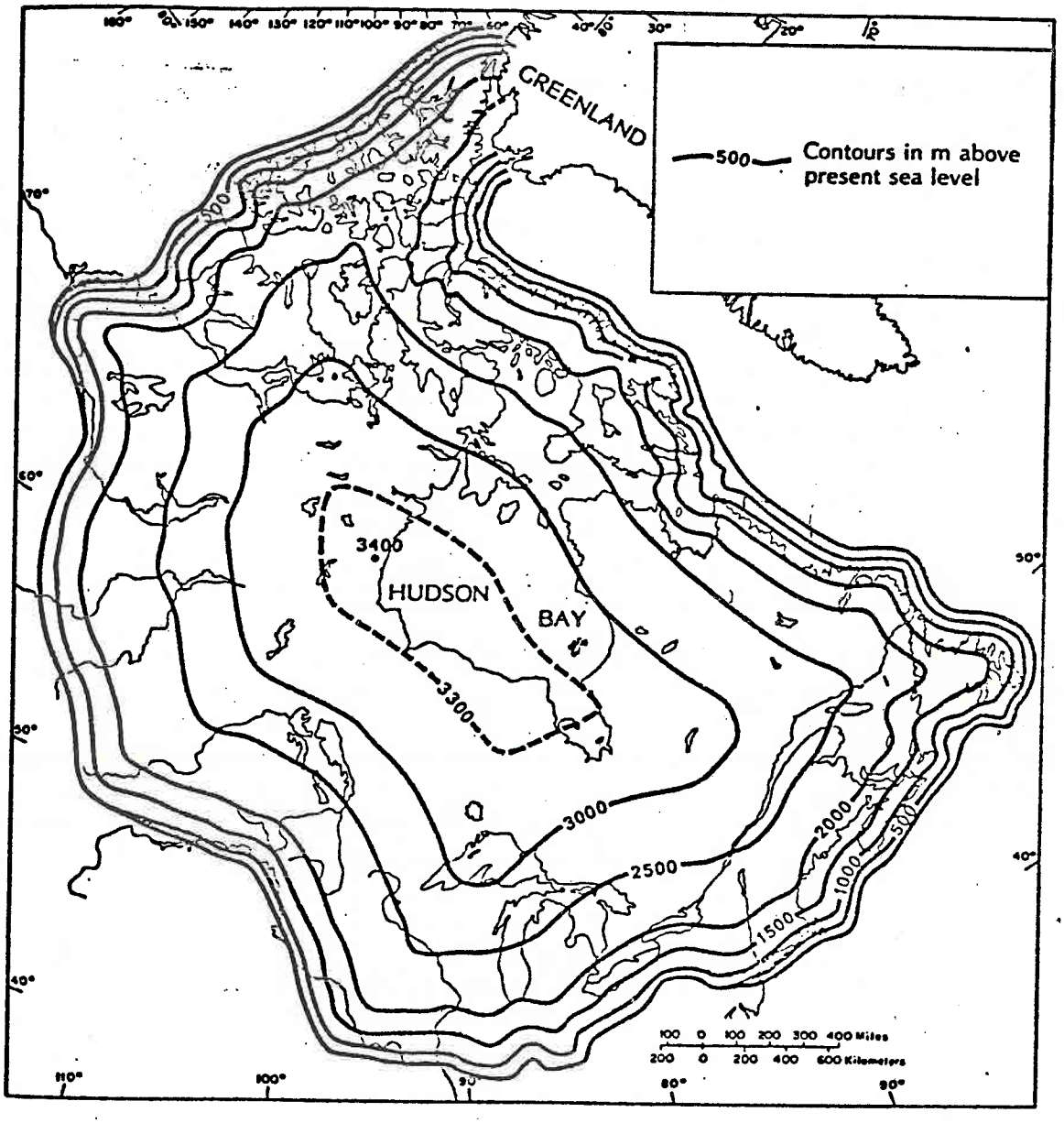

GREENLAND
500
Contours in m above present sea level
3400
HUDSON
BAY
3300
3000
2500
2000
1500
1000
500
100 0 100 200 300 400 Miles
200 0 200 400 600 Kilometers

FIG. 3-31

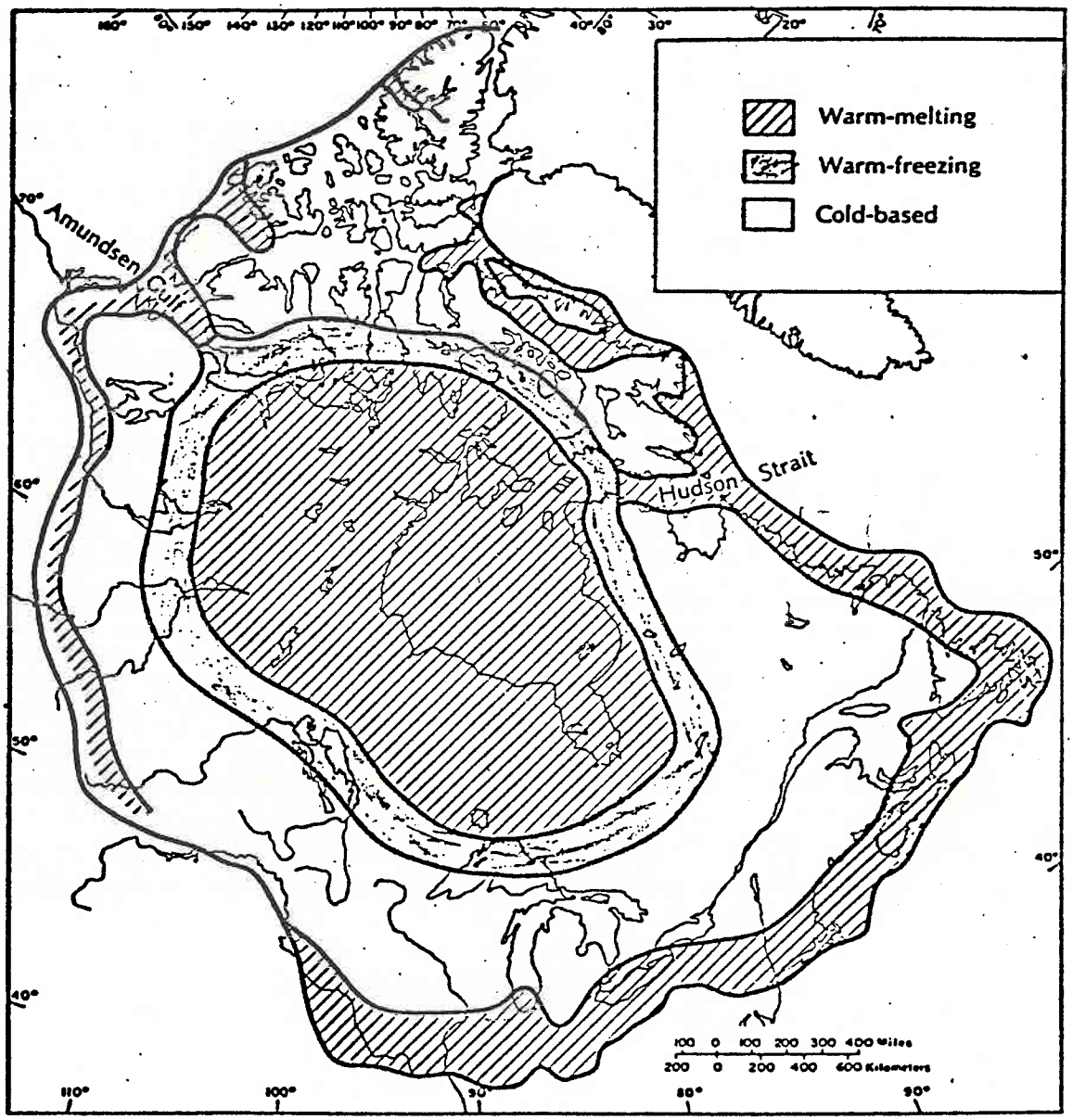

Warm-melting
Warm-freezing
Cold-based
Amundsen Gulf
Hudson Strait
70°
60°
50°
40°
110°
100°
90°
80°
100 0 100 200 300 400 Miles
200 0 200 400 600 Kilometers

FIG. 3-32

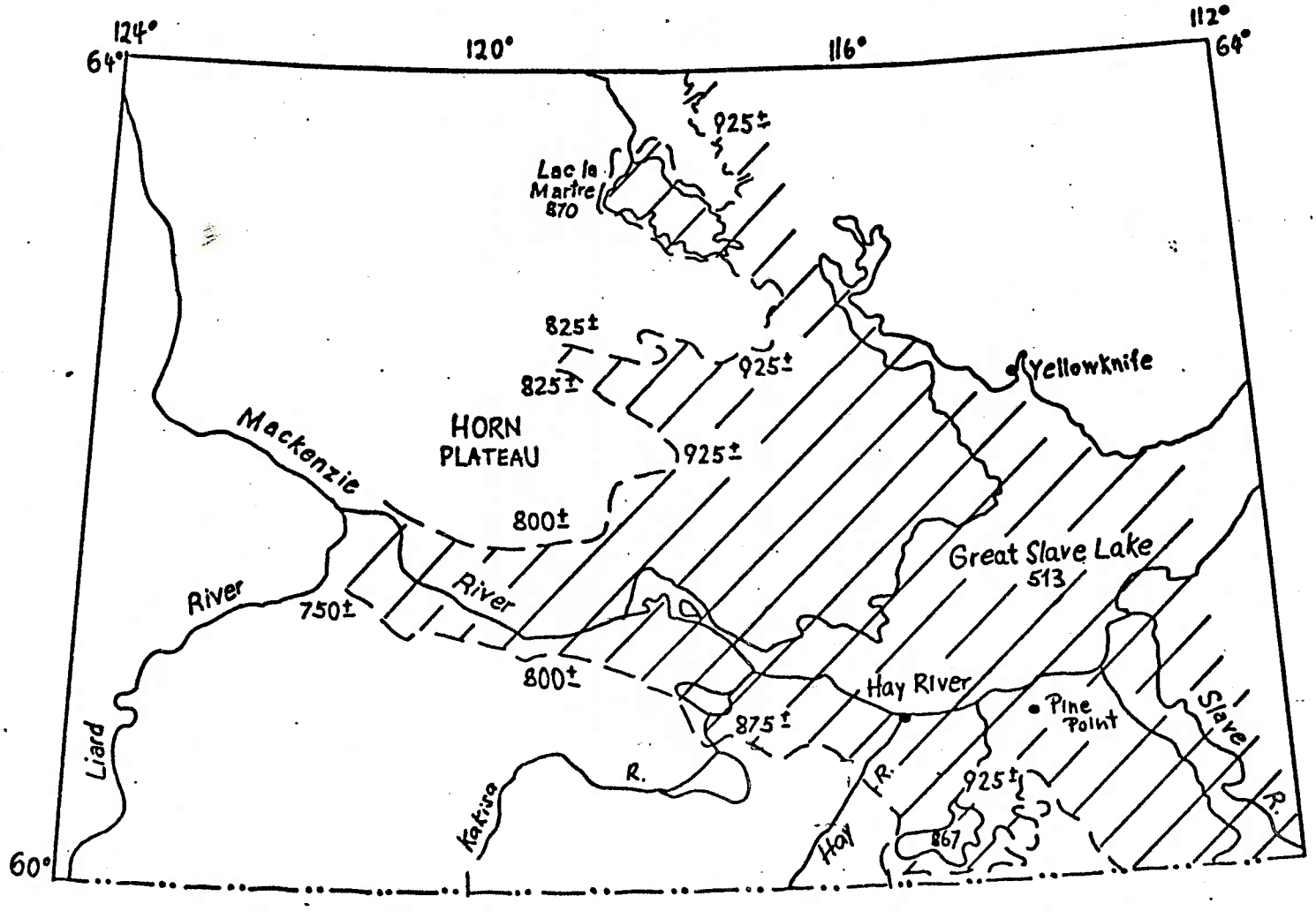

124°
120°
116°
112°
64°
60°
925±
Lac la Martre 870
825±
825±
925±
925±
HORN PLATEAU
Mackenzie River
800±
750±
River
800±
875±
Liard
R.
Kakisa
Hay R.
867
925±
Hay River
Pine Point
Slave R.
Yellowknife
Great Slave Lake 513
Deduced upper limit of submergence (feet above sea-level) ..... 800±
Elevation of topographic features (feet above sea-level) 867
0 50 100 150
Kilometres

FIG. 3-33

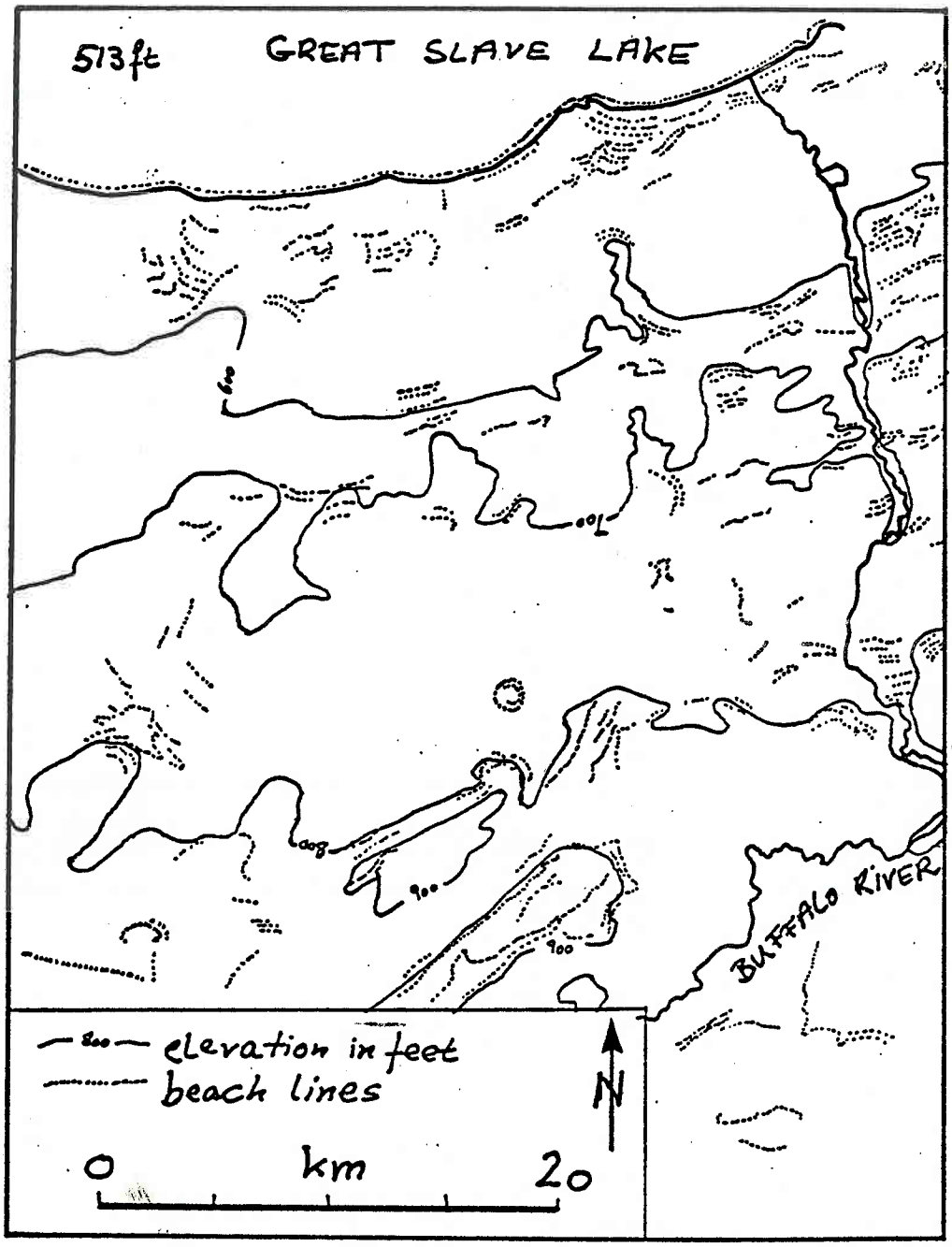
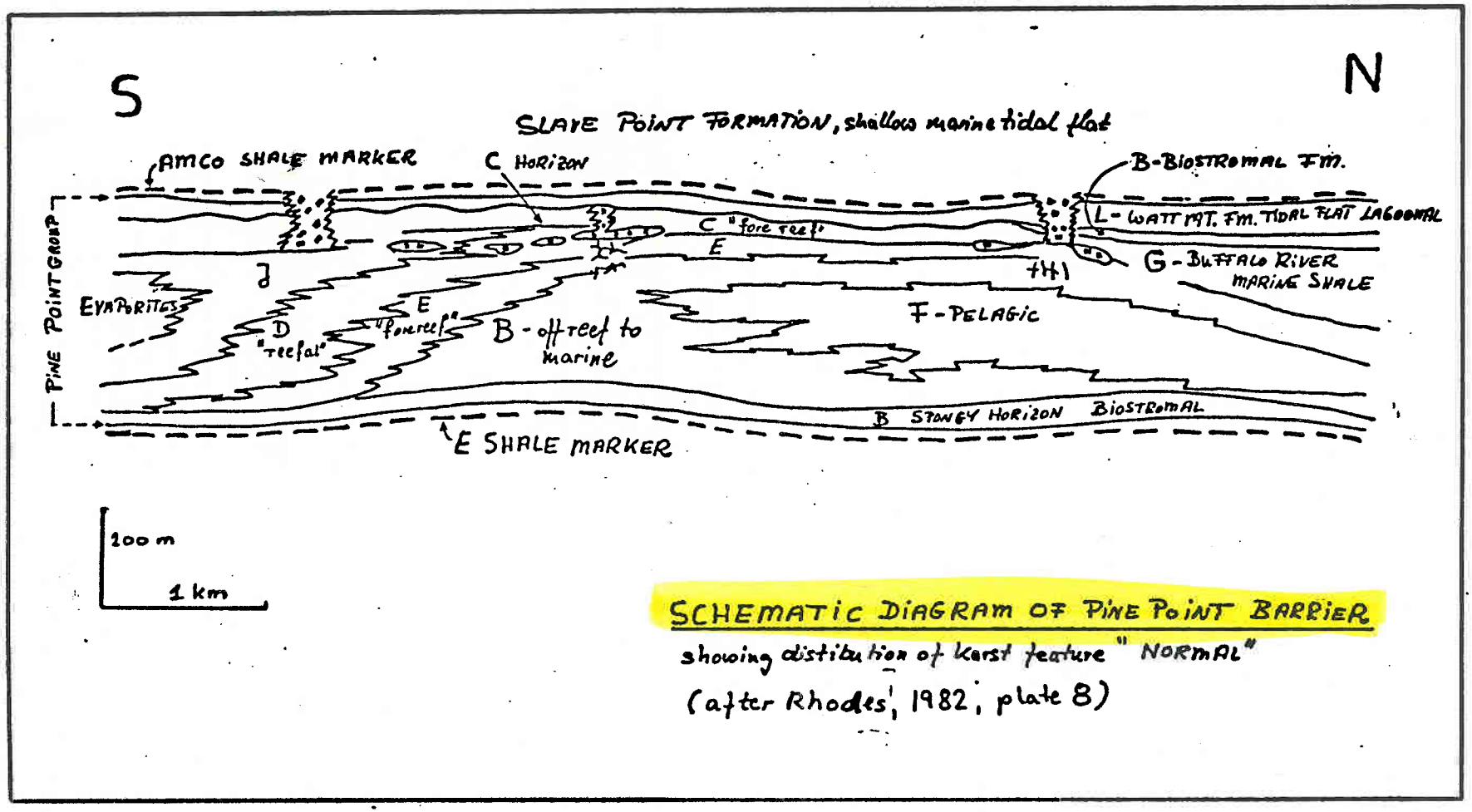

513ft
GREAT SLAVE LAKE
700
800
900
900
BUFFALO RIVER
elevation in feet
beach lines
N
0
km
20

FIG. 3-34

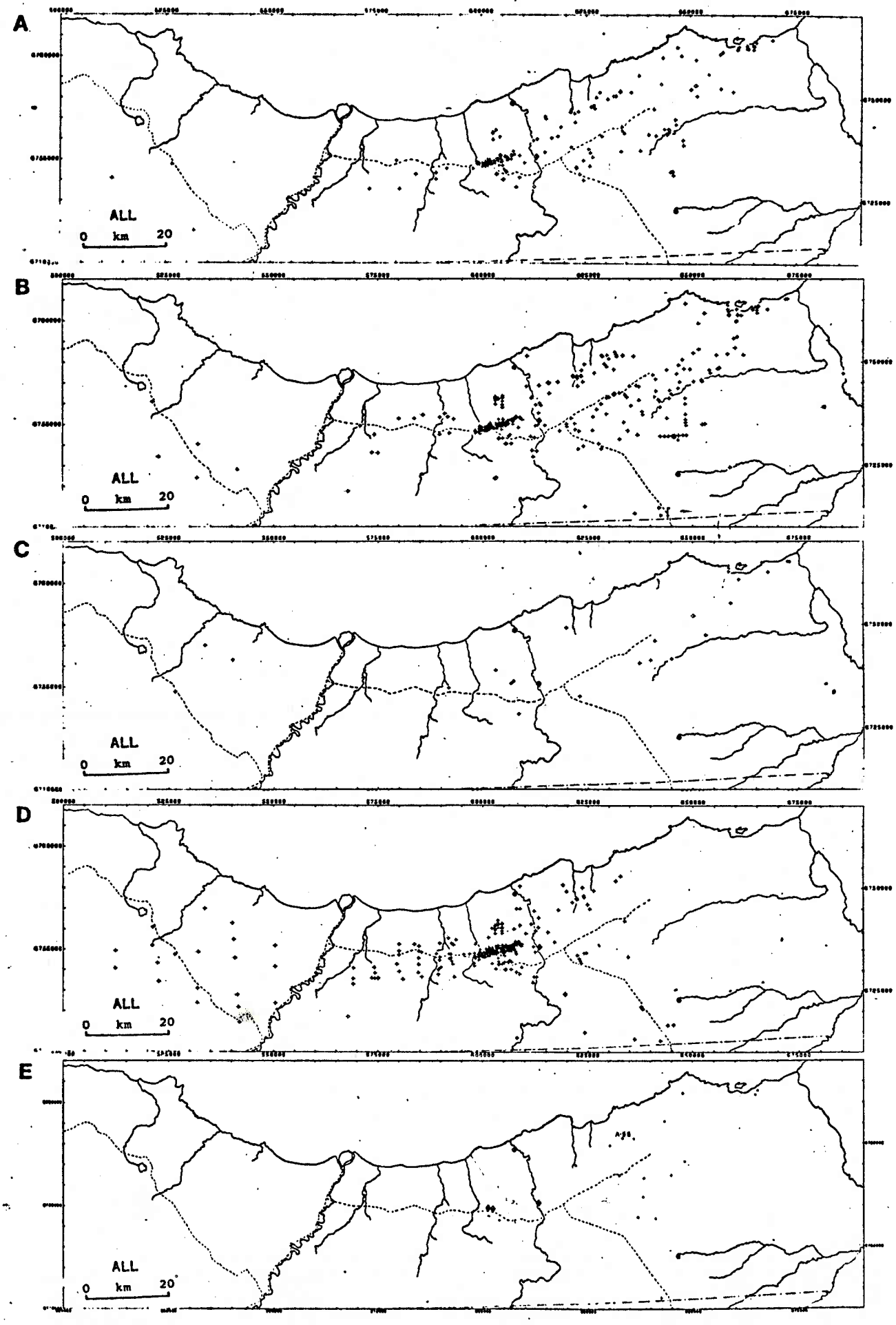


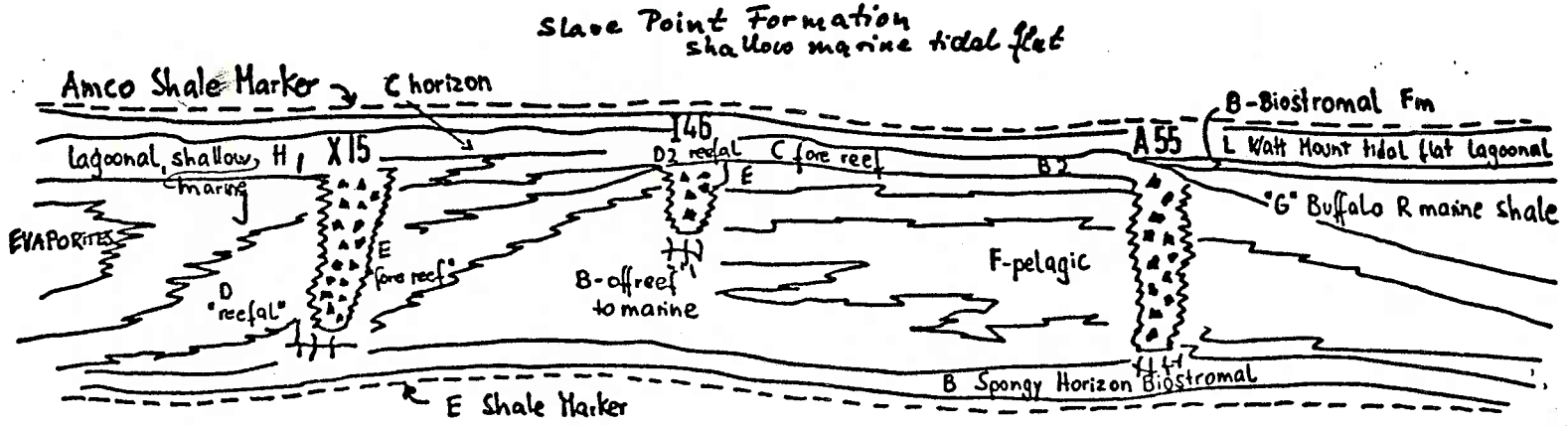
SCHEMATIC DIAGRAM OF PINE POINT BARRIER

showing distribution of karst feature "NORMAL"

(after Rhodes, 1982, plate 8)

FIG. 3-35

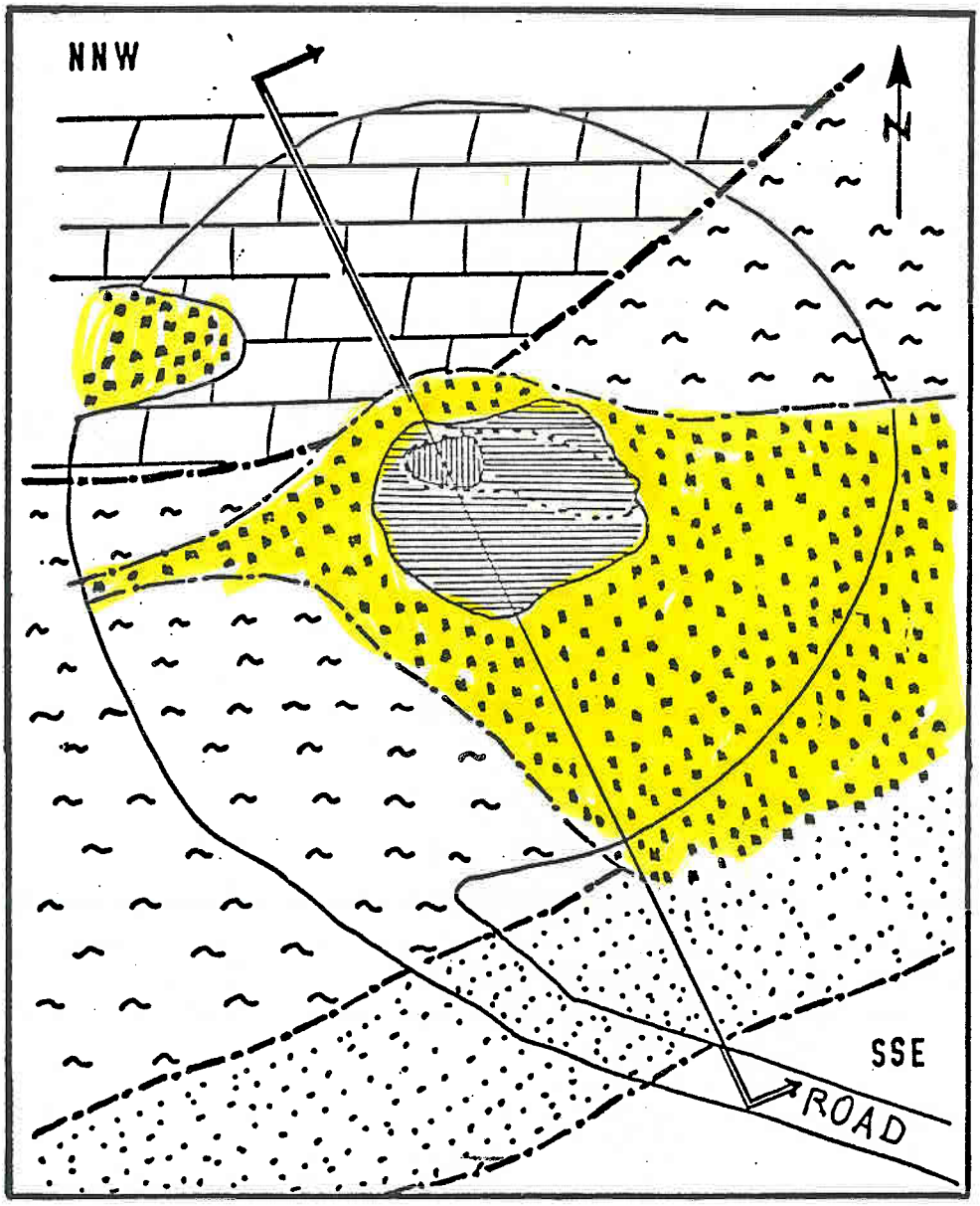

A
ALL
0 km 20
B
ALL
0 km 20
C
ALL
0 km 20
D
ALL
0 km 20
E
ALL
0 km 20



Schematic Diagram of Pine Point Barrier

showing Position of Anomalous Unconsolidated collapse ore bodies
(after Rhodes, 1982, plate 9)

FIG. 3-37

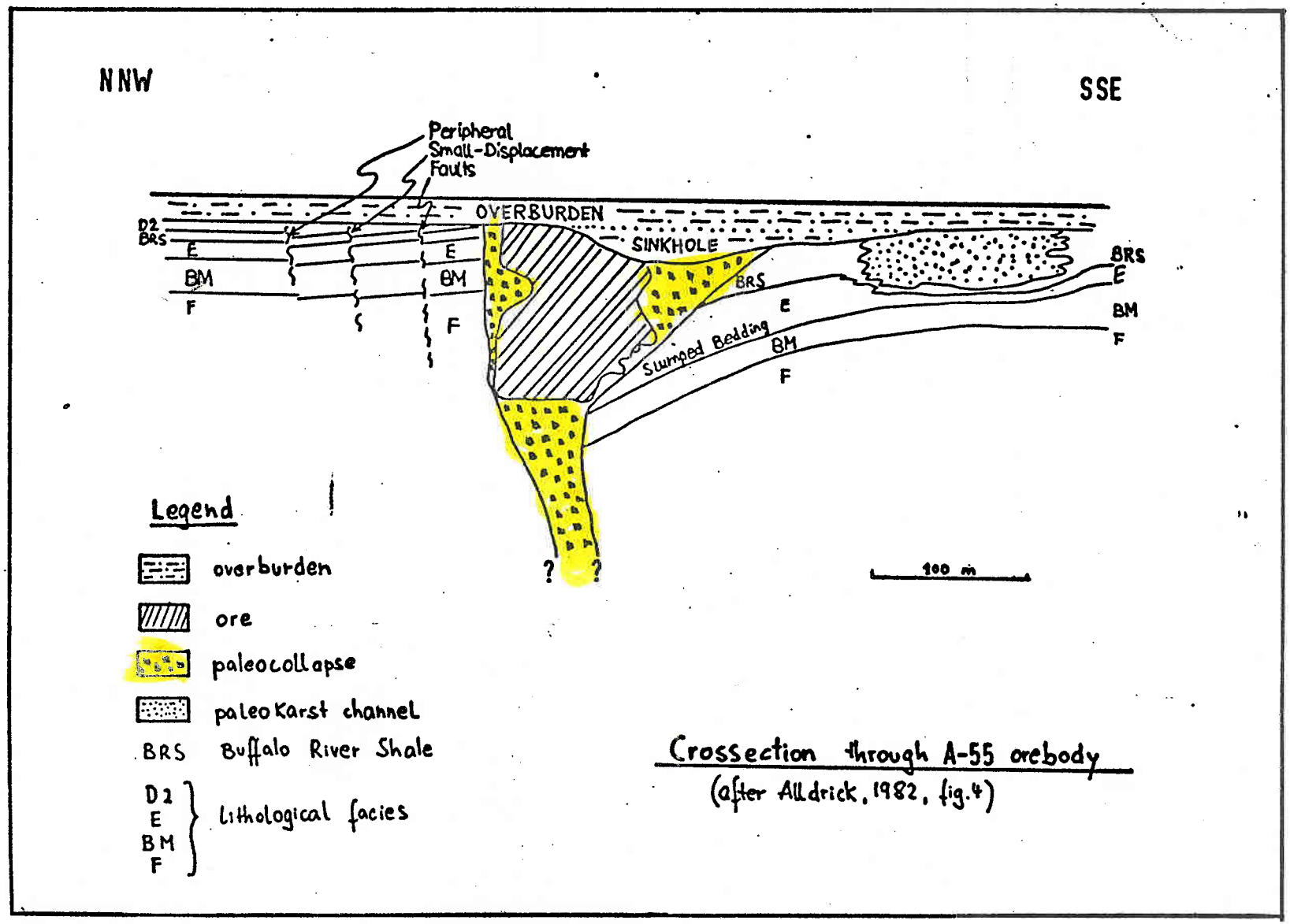


LEGEND

- D2 Facies (Presqu'illzed)
- BRS Facies
- Ore Outline (4th Bench)
- Ore Outline (14th Bench)
- Collapse (Subcrop)
- Paleokarst Channel
- Collapse (14th Bench)

MAJOR GEOLOGICAL FEATURES OF THE A-55 OREBODY (AFTER ALLDRICK, 1982, FIGS. 2+4)

FIG. 3-38



Crossection through A-55 orebody
(after Alldrick, 1982, fig. 4)

FIG. 3-39

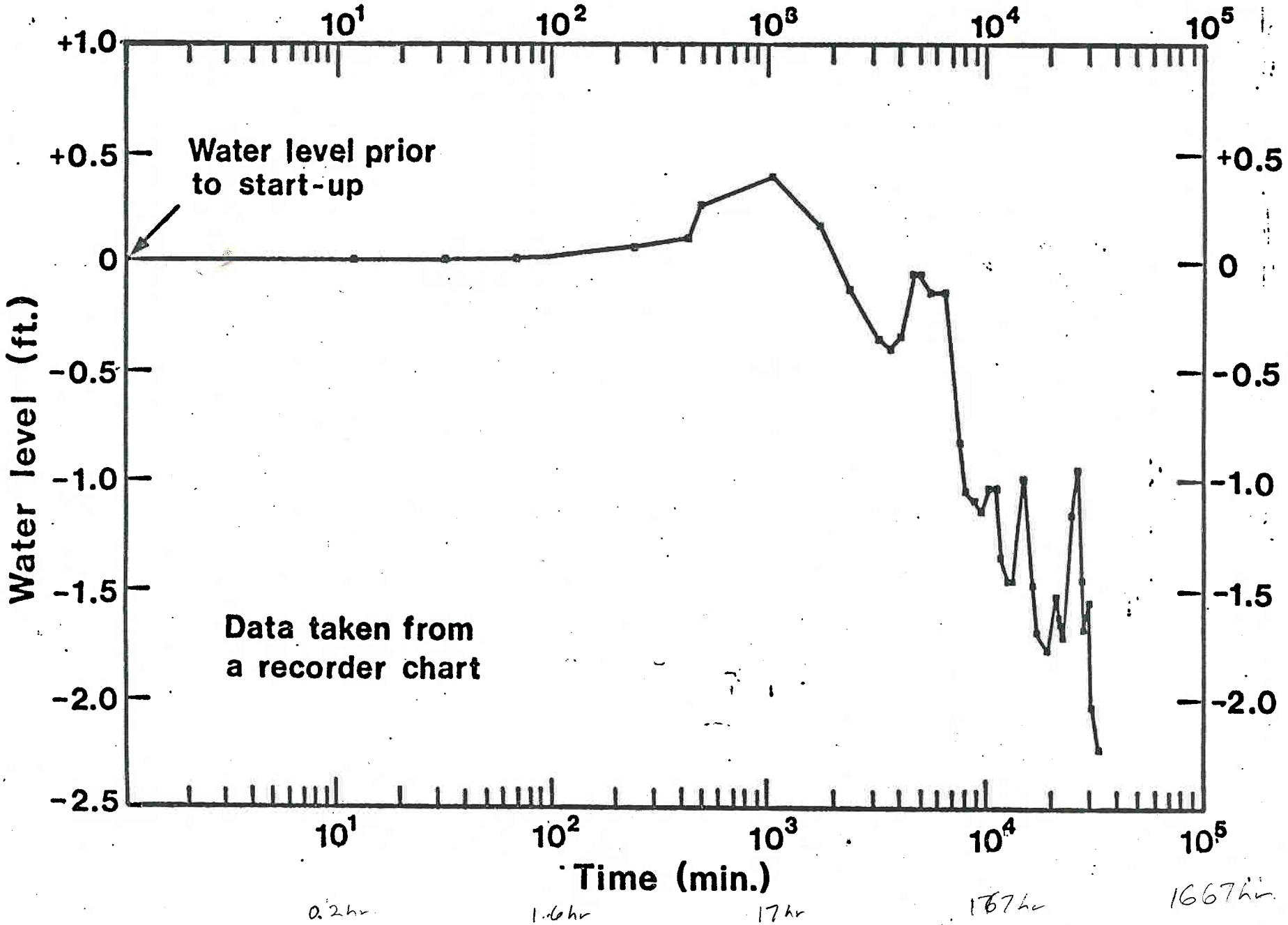
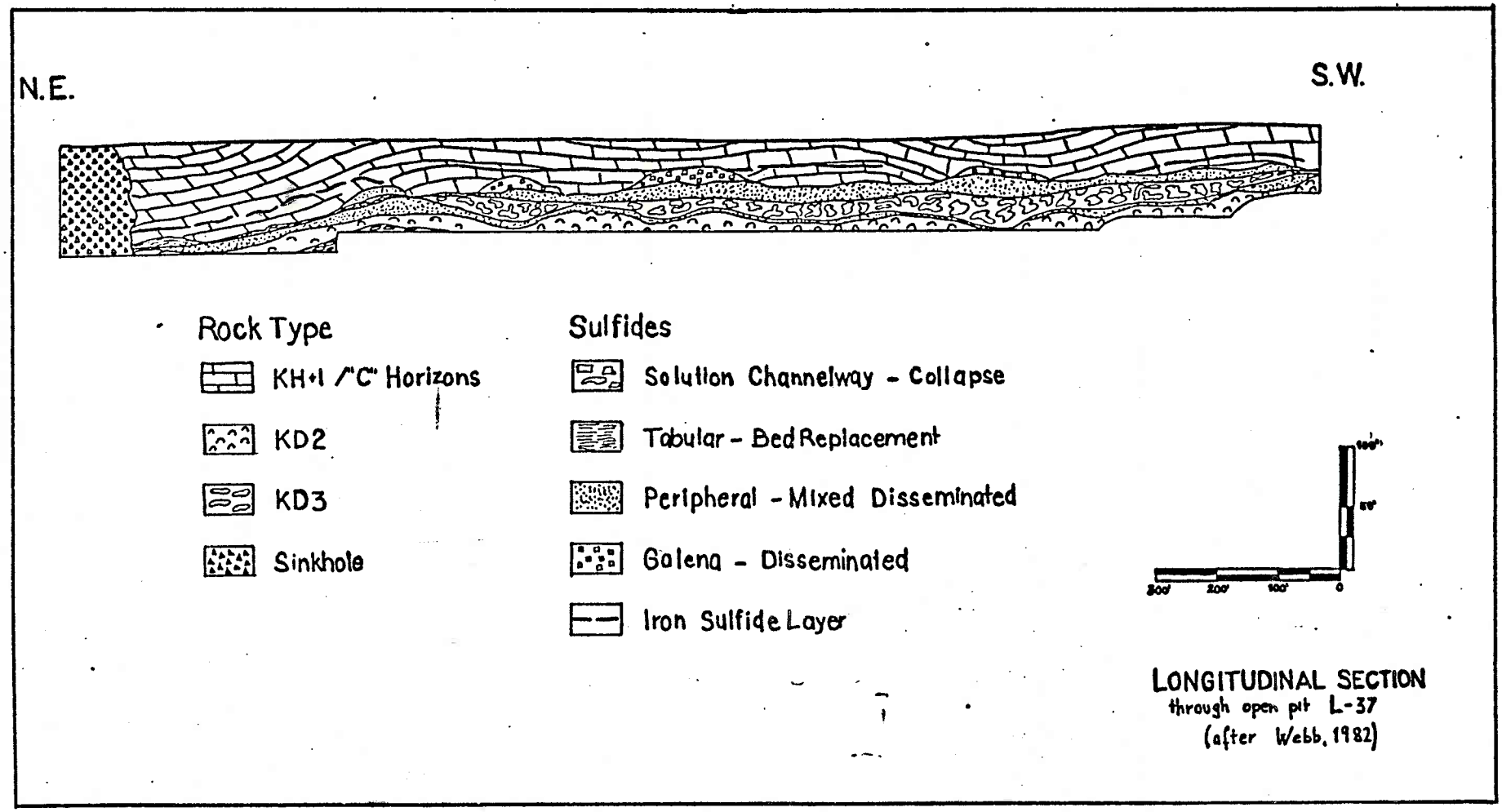

Water level prior to start-up
Data taken from a recorder chart
Water level (ft.)
Time (min.)
+1.0
+0.5
0
-0.5
-1.0
-1.5
-2.0
-2.5
10¹
10²
10³
10⁴
10⁵
0.2hr
1.6hr
17hr
167hr
1667hr

FIG. 3-40



LONGITUDINAL SECTION
through open pit L-37
(after Webb, 1982)

FIG. 3-41

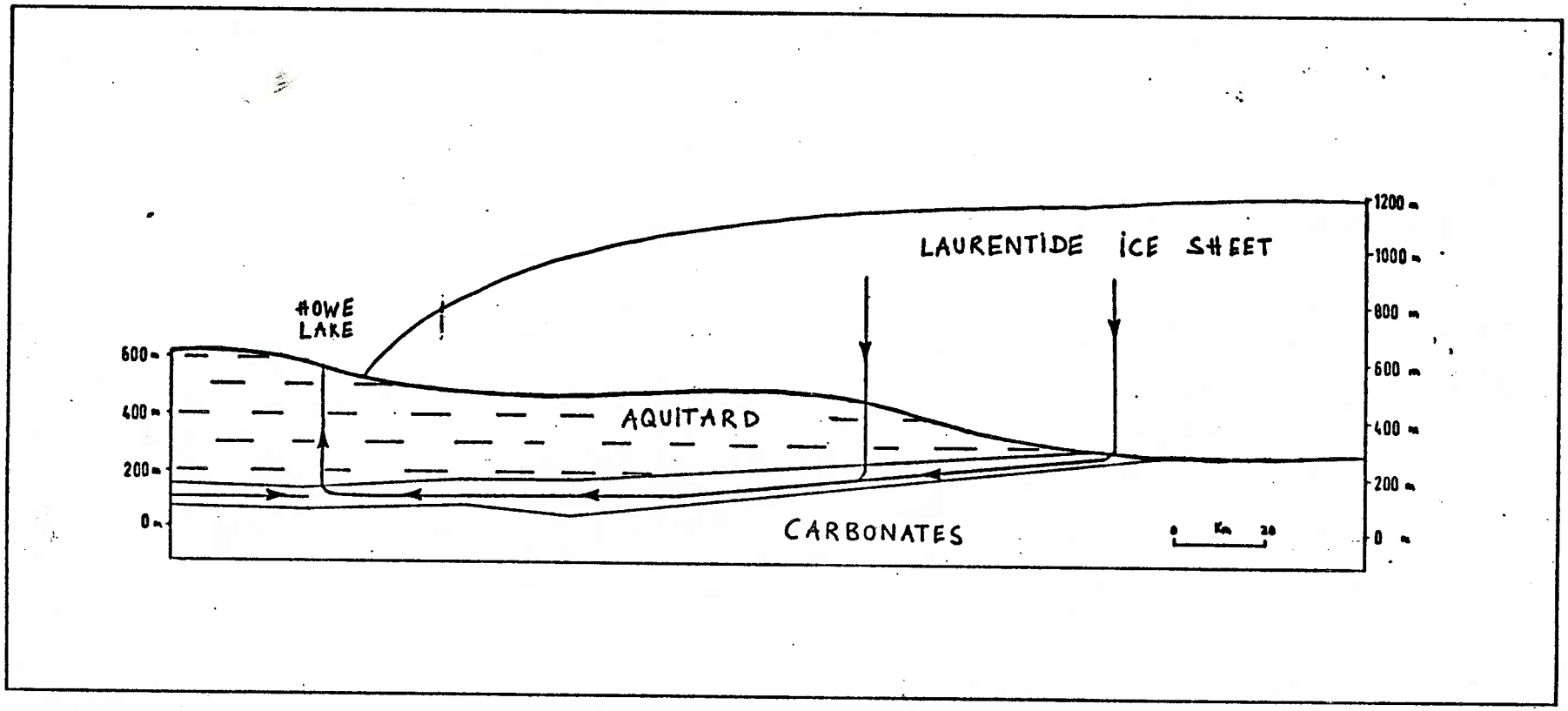
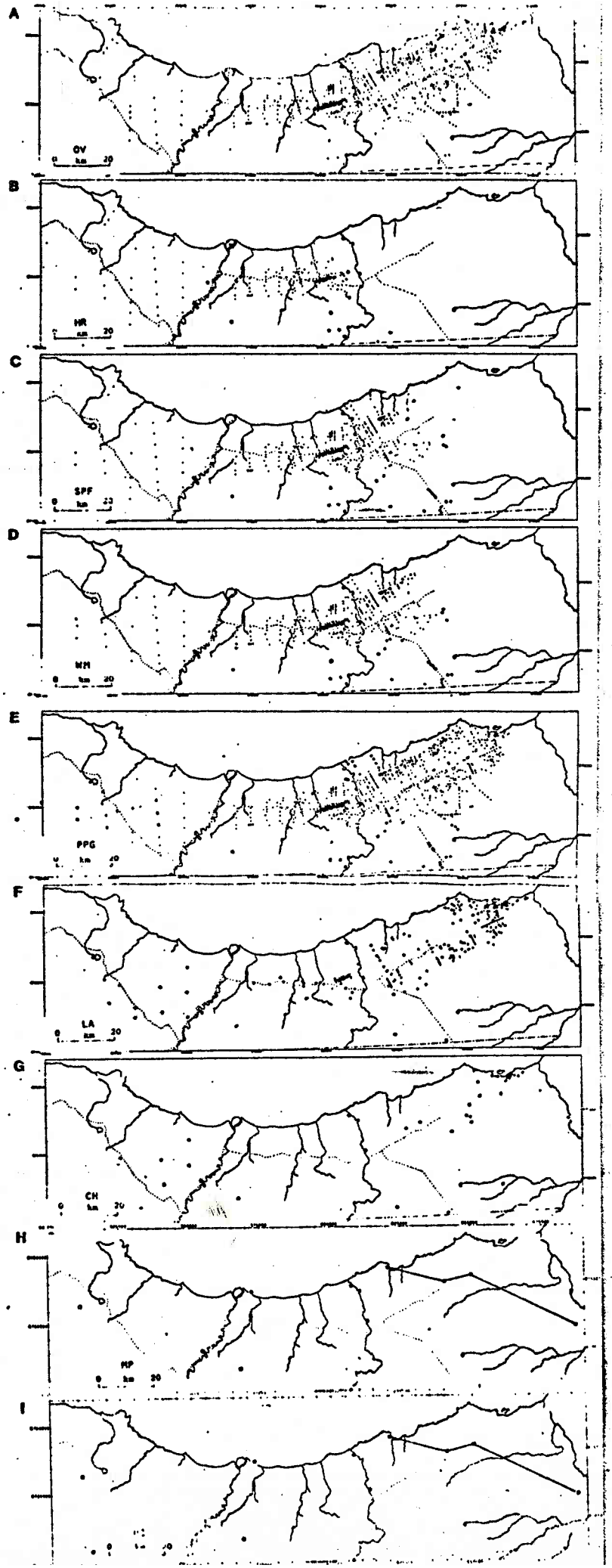
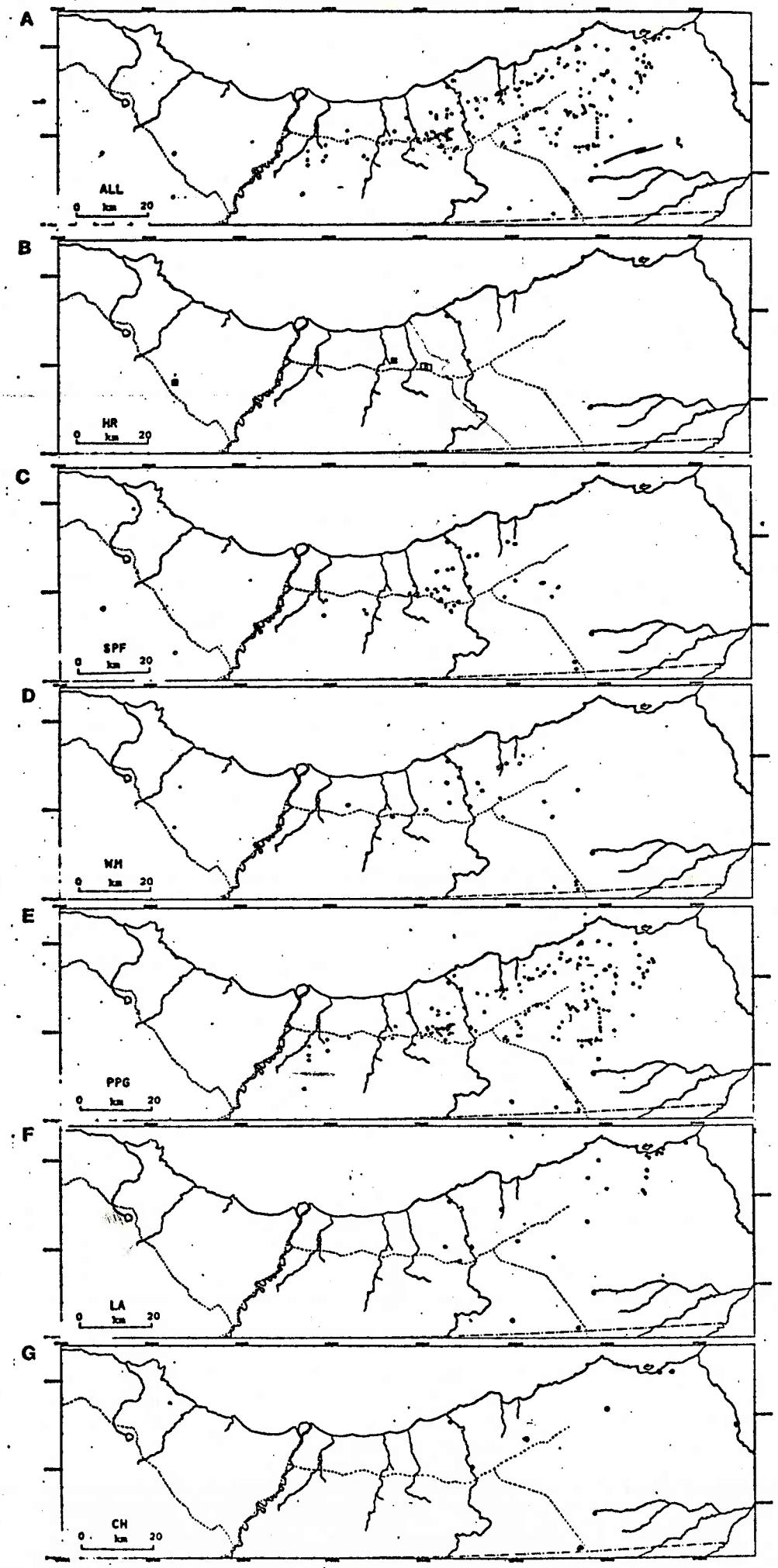

LAURENTIDE ICE SHEET
HOWE LAKE
AQUITARD
CARBONATES
600 m
400 m
200 m
0 m
1200 m
1000 m
800 m
600 m
400 m
200 m
0 m
0 Km 20

FIG. 3-42


A
OV
0 km 20
B
HR
0 km 20
C
SPF
0 km 20
D
MH
0 km 20
E
PPG
0 km 20
F
LA
0 km 20
G
CH
0 km 20
H
MP
0 km 20
I
0 km 20


A
ALL
0 km 20
B
HR
0 km 20
C
SPF
0 km 20
D
WH
0 km 20
E
PPG
0 km 20
F
LA
0 km 20
G
CH
0 km 20

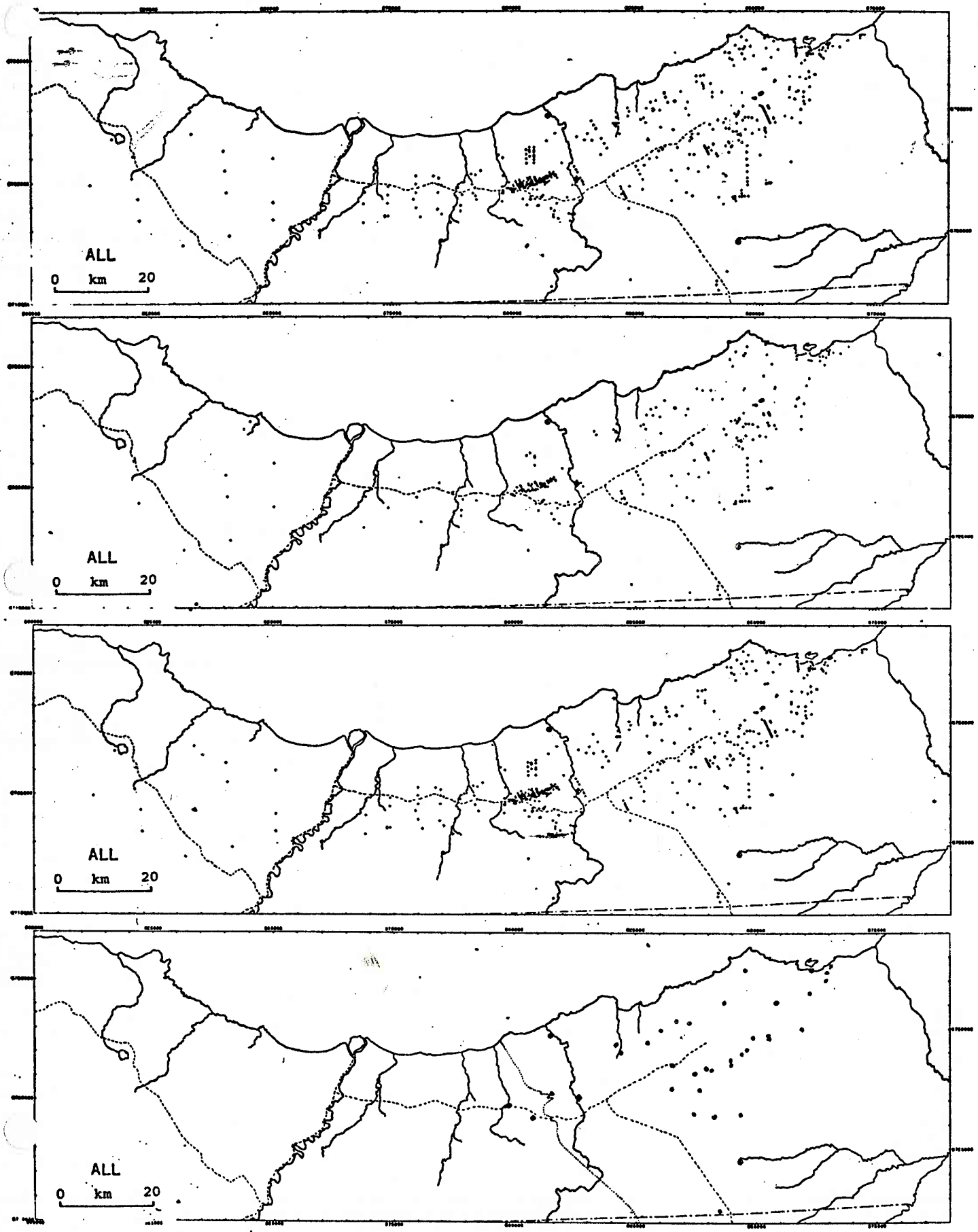
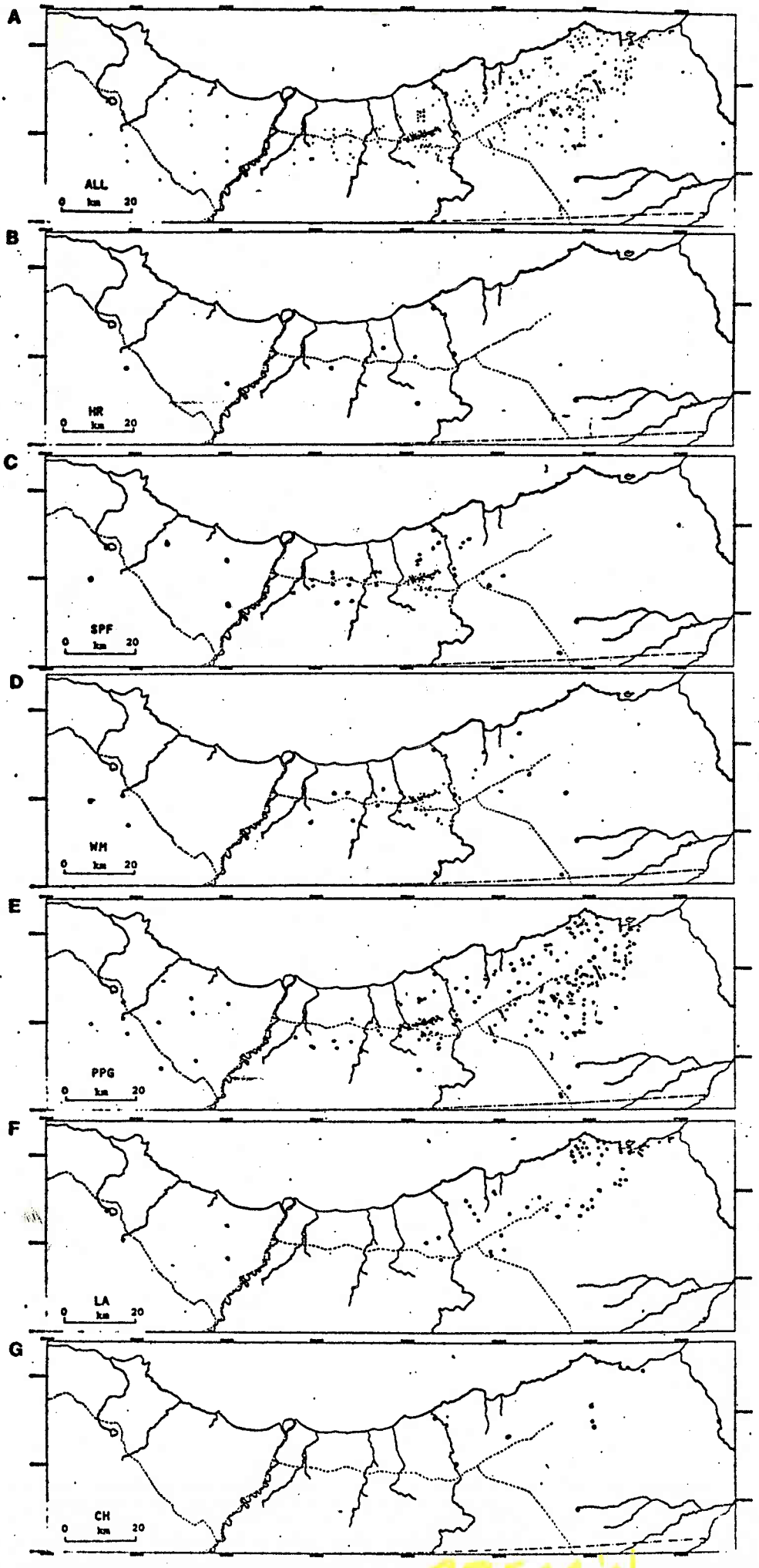
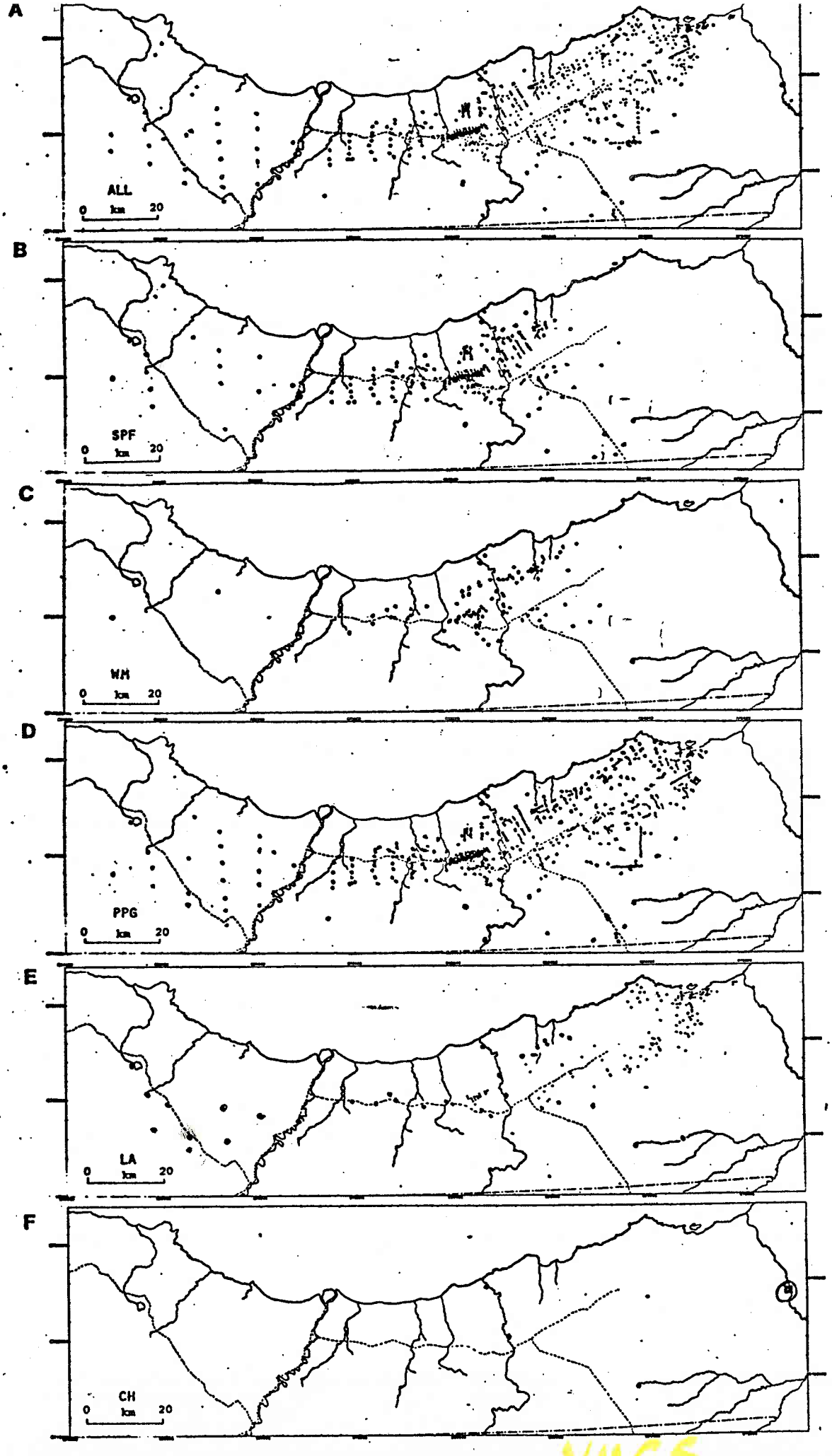


FIG. 3-45


A
ALL
0 km 20
B
HR
0 km 20
C
SPF
0 km 20
D
WH
0 km 20
E
PPG
0 km 20
F
LA
0 km 20
G
CH
0 km 20


A
ALL
0 km 20
B
SPF
0 km 20
C
WH
0 km 20
D
PPG
0 km 20
E
LA
0 km 20
F
CH
0 km 20

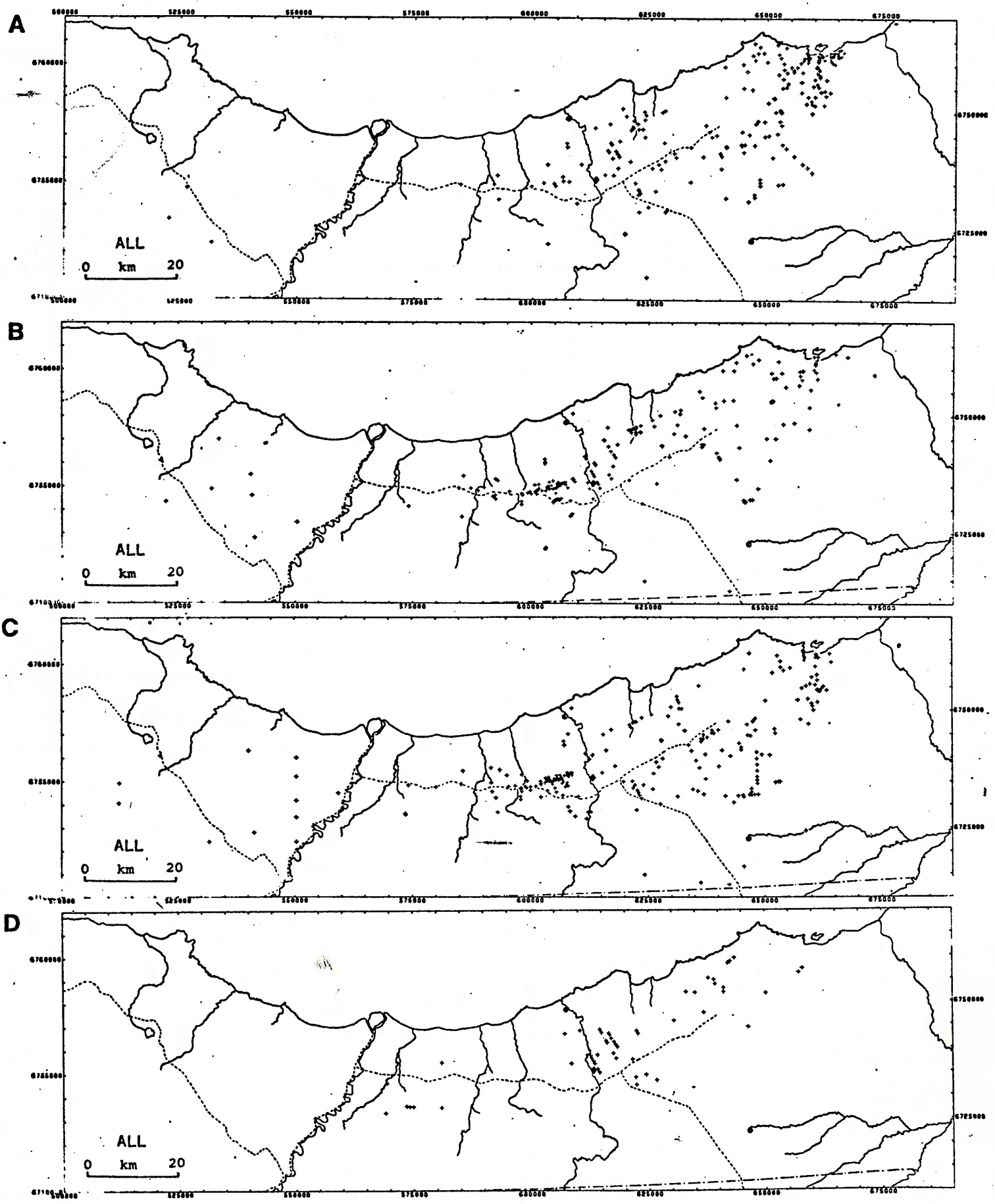
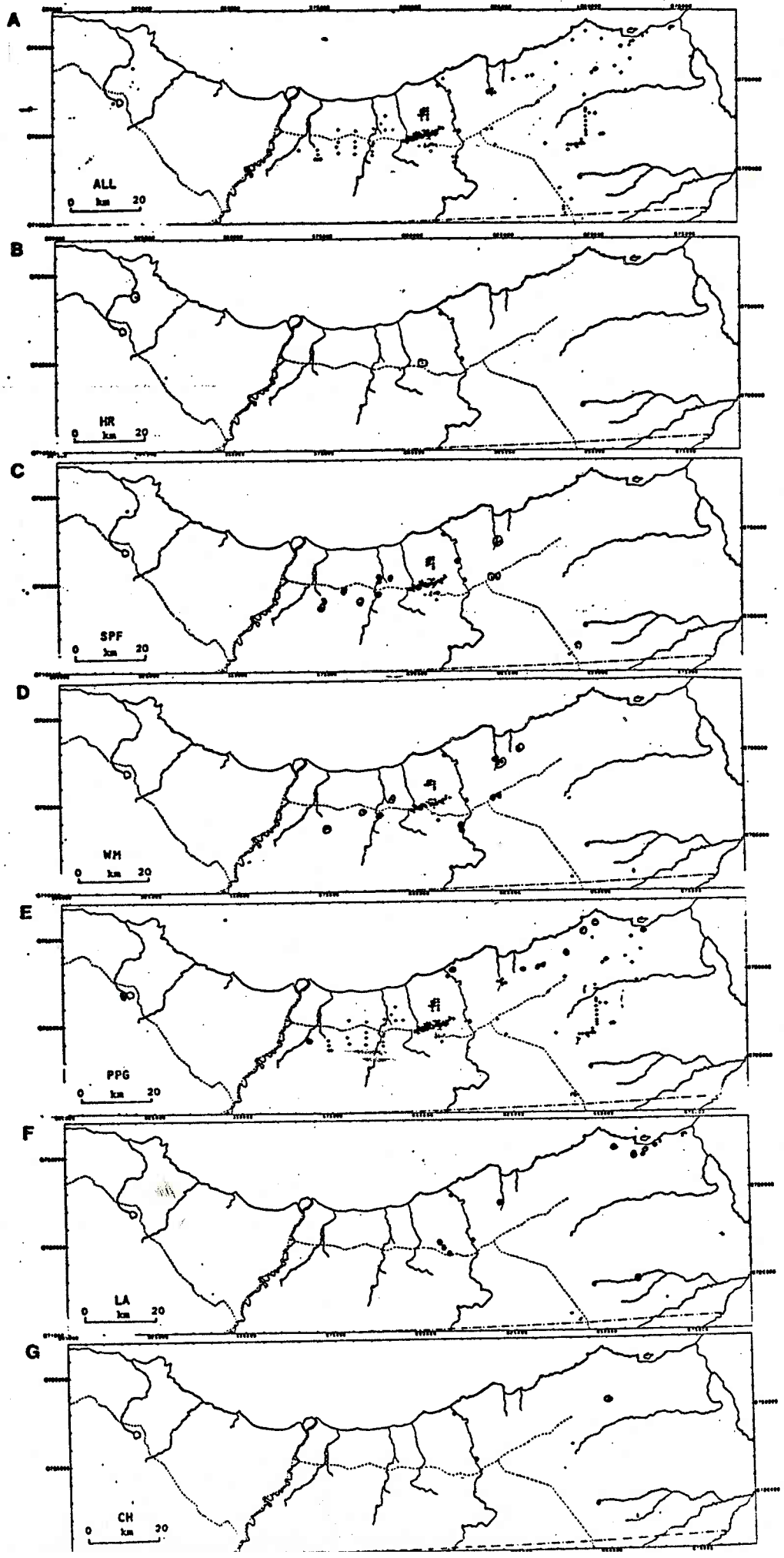


FIG. 3-48


A
ALL
0 km 20
B
HR
0 km 20
C
SPF
0 km 20
D
WM
0 km 20
E
PPG
0 km 20
F
LA
0 km 20
G
CH
0 km 20

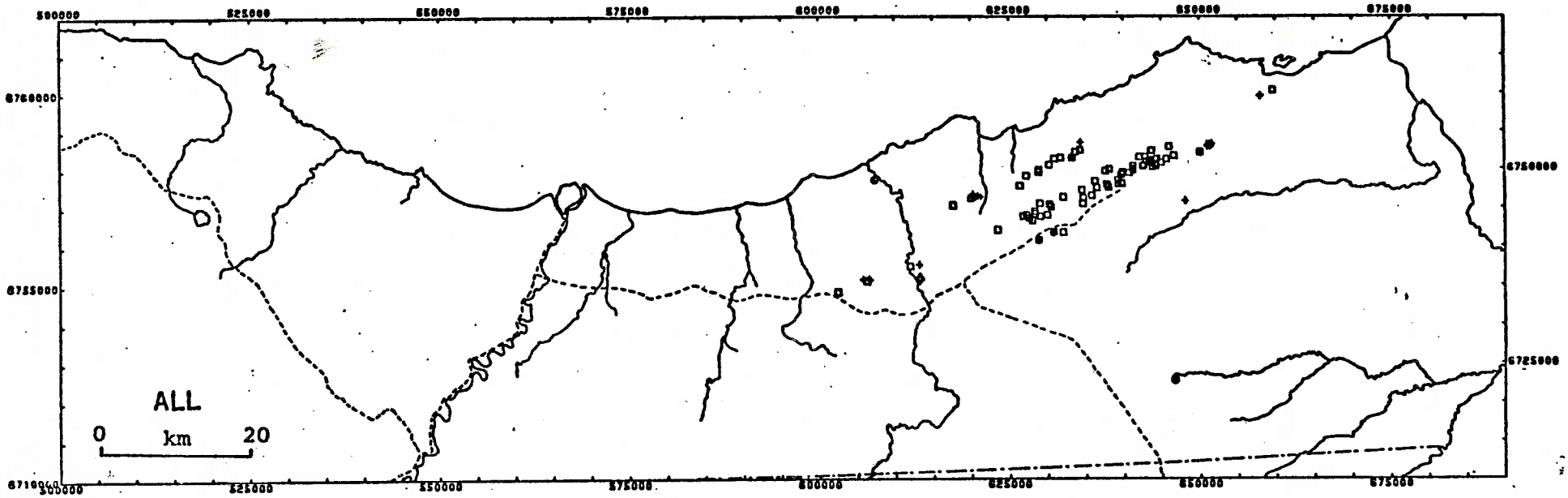
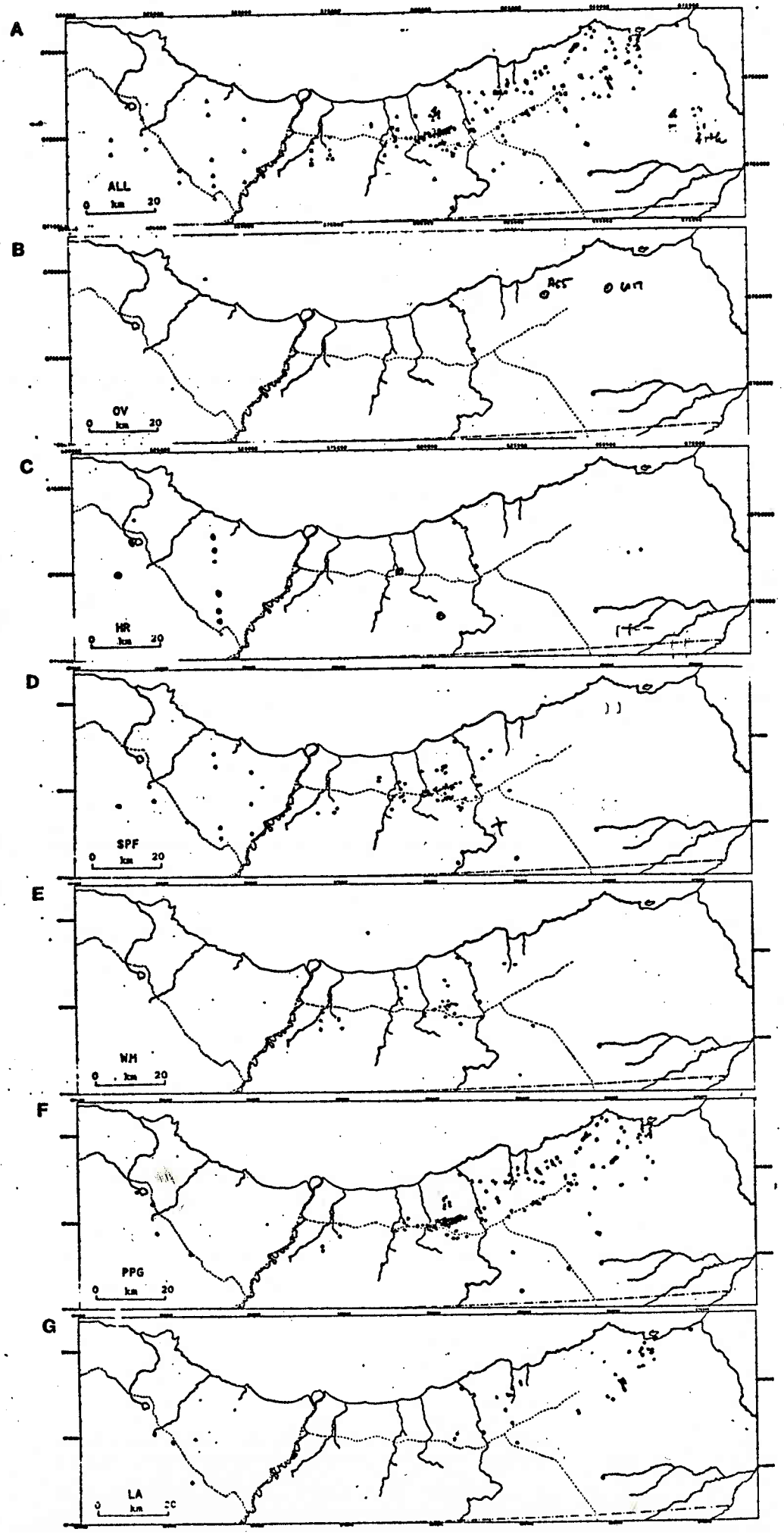
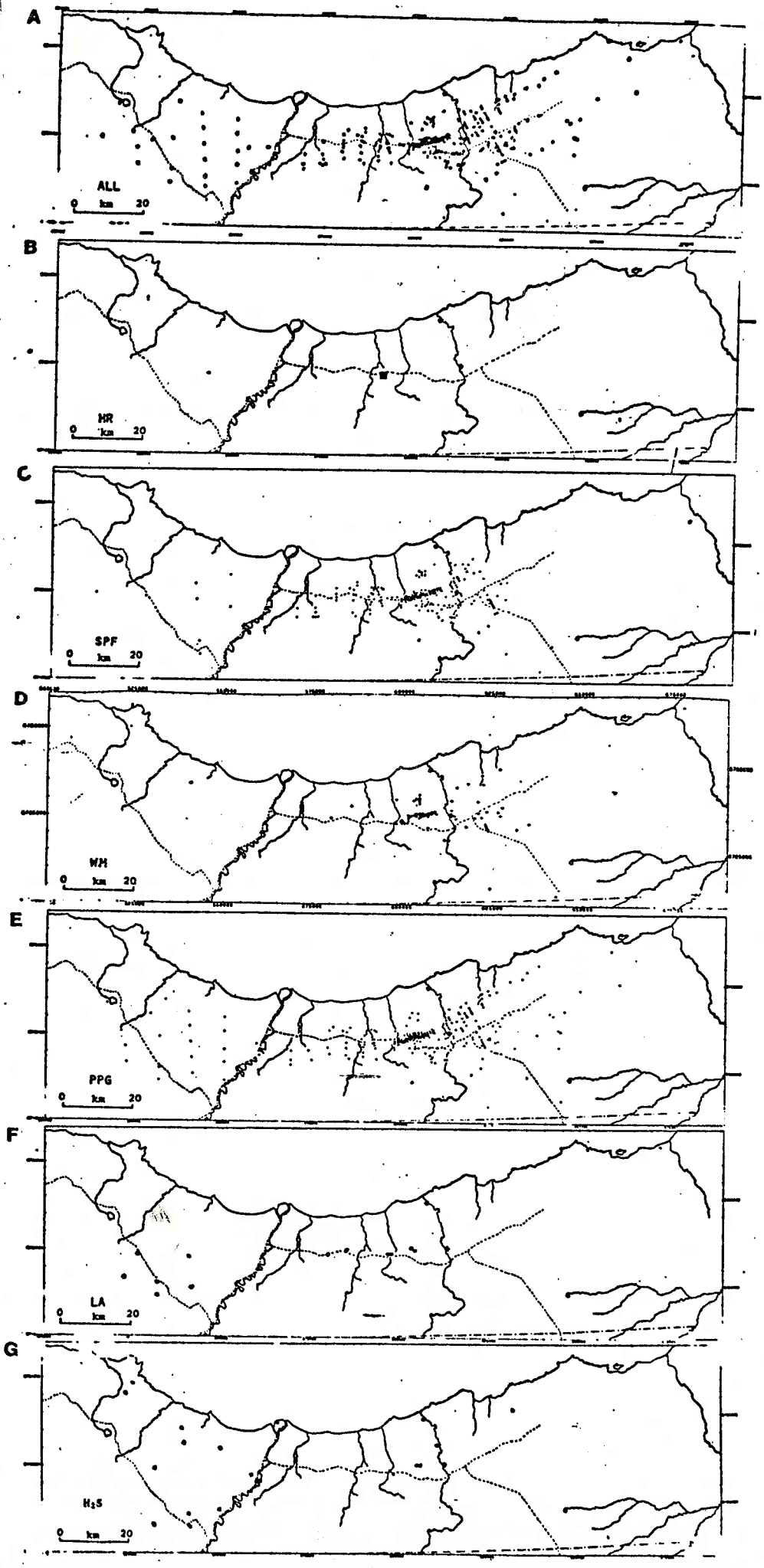
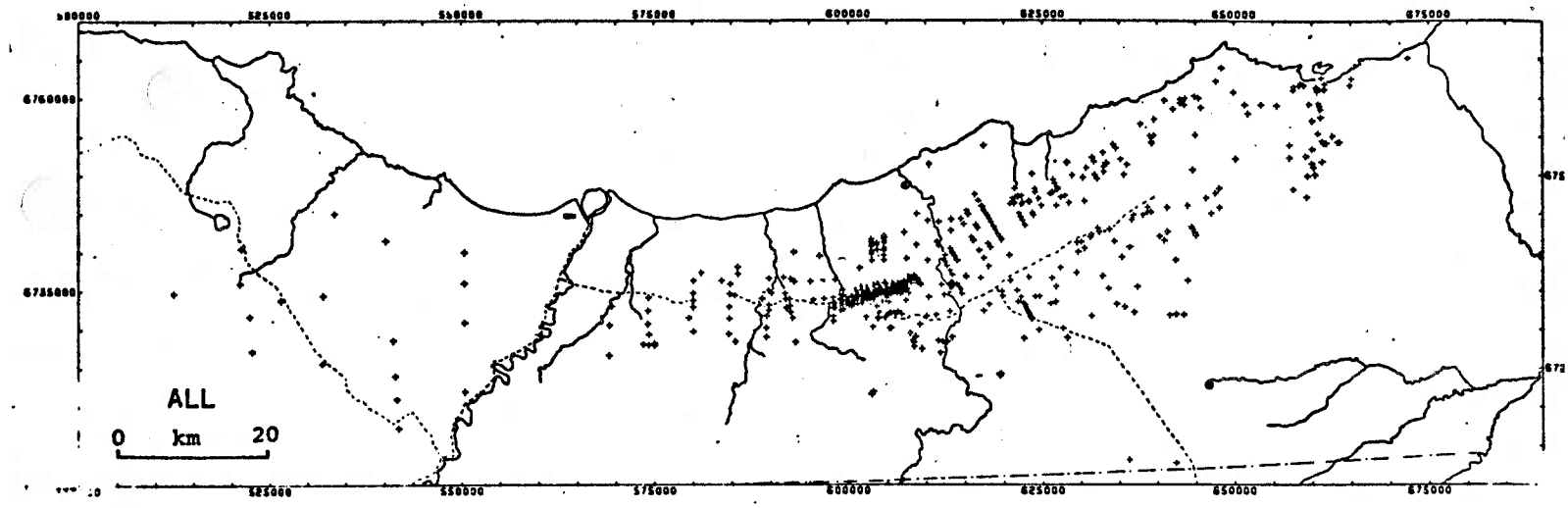
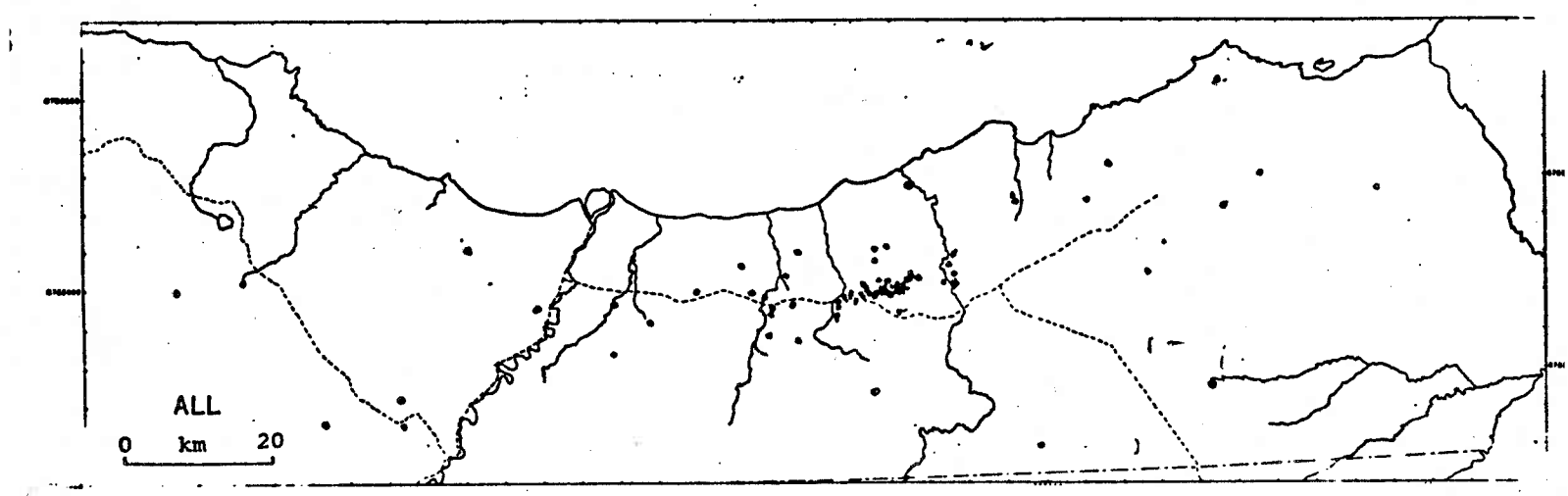

500000
525000
550000
575000
600000
625000
650000
675000
6760000
6750000
6755000
6725000
6710000
ALL
0 km 20

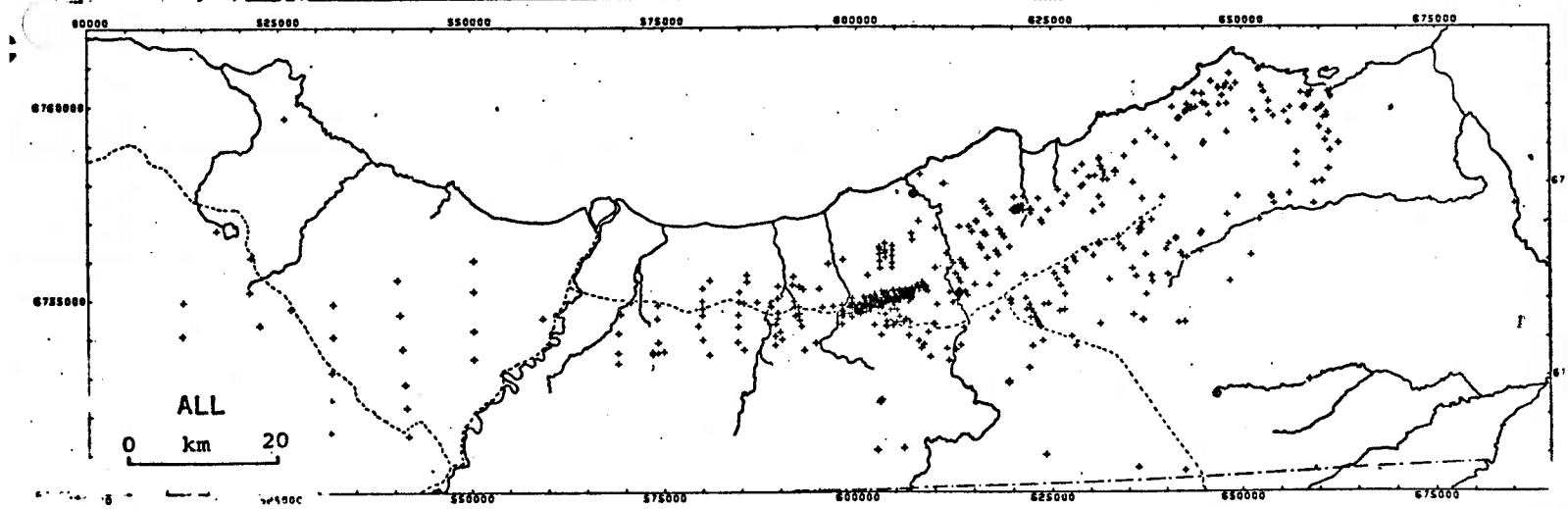
FIG. 3-50

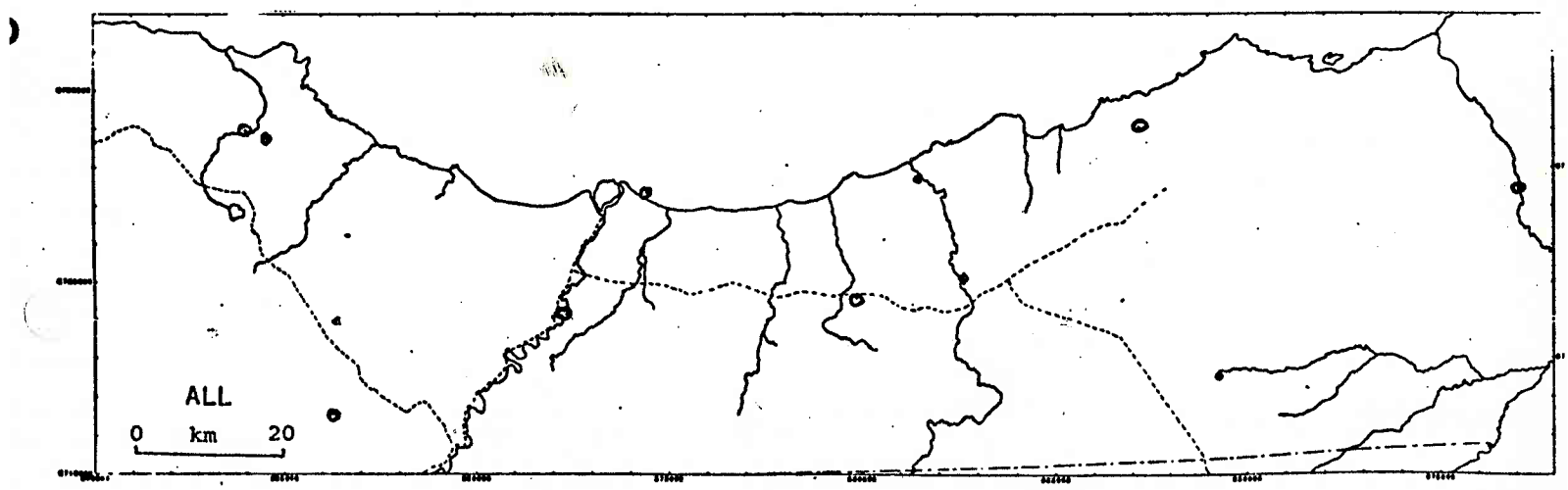

A
ALL
0 km 20
B
OV
0 km 20
C
HR
0 km 20
D
SPF
0 km 20
E
NM
0 km 20
F
PPG
0 km 20
G
LA
0 km

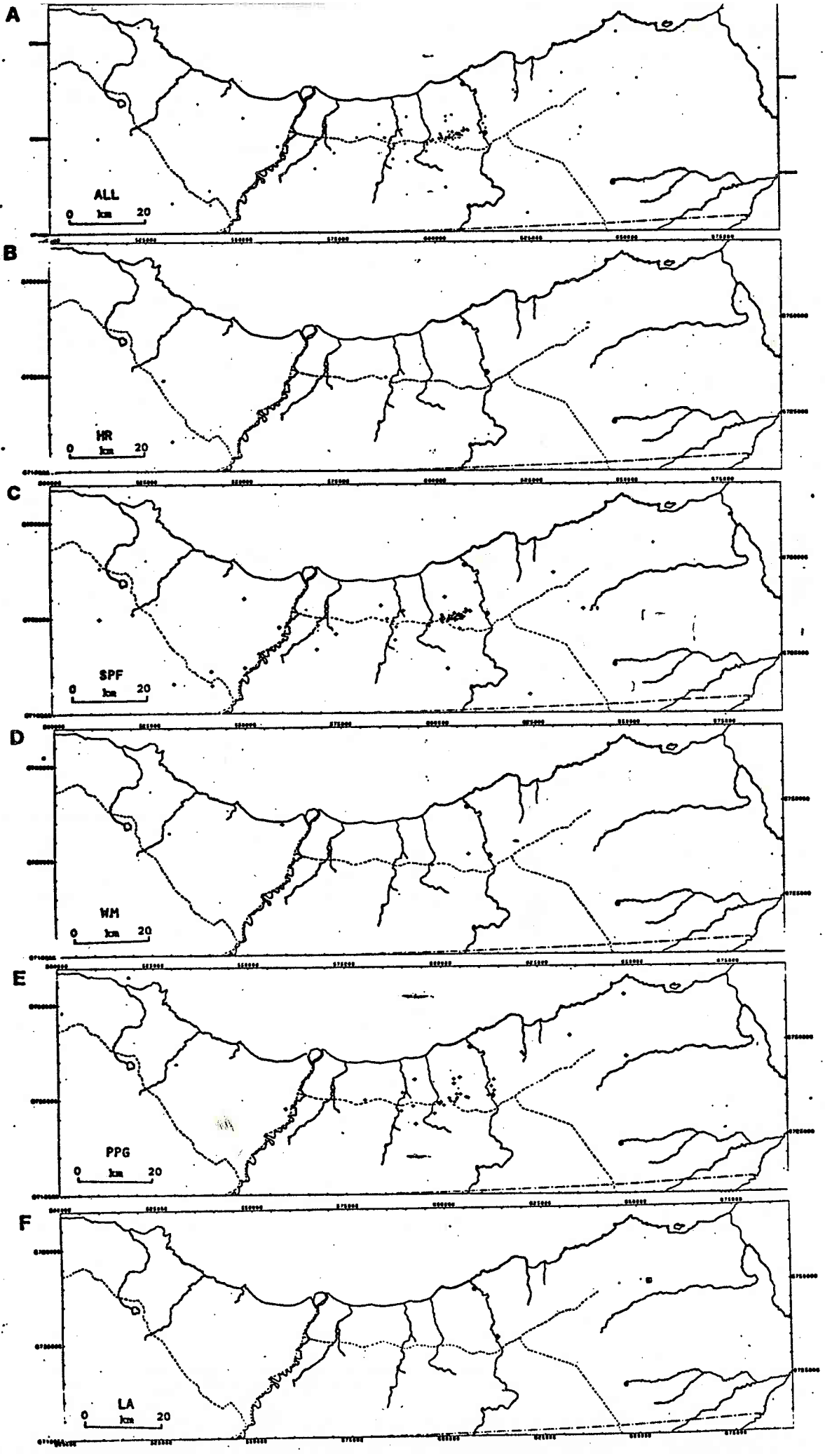

A
ALL
0 km 20
B
HR
0 km 20
C
SPF
0 km 20
D
WH
0 km 20
E
PPG
0 km 20
F
LA
0 km 20
G
H_2S
0 km 20

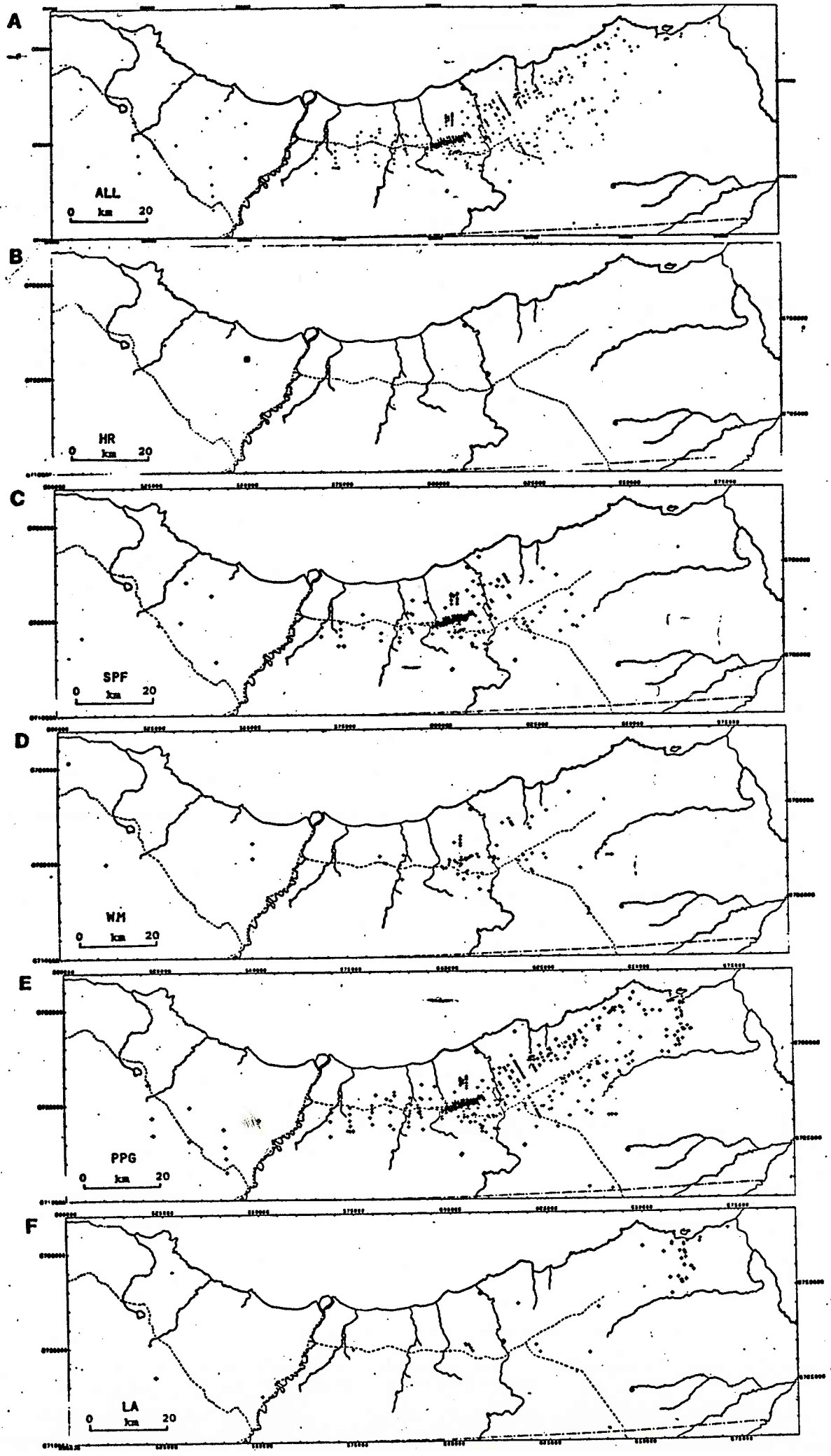

ALL
0 km 20

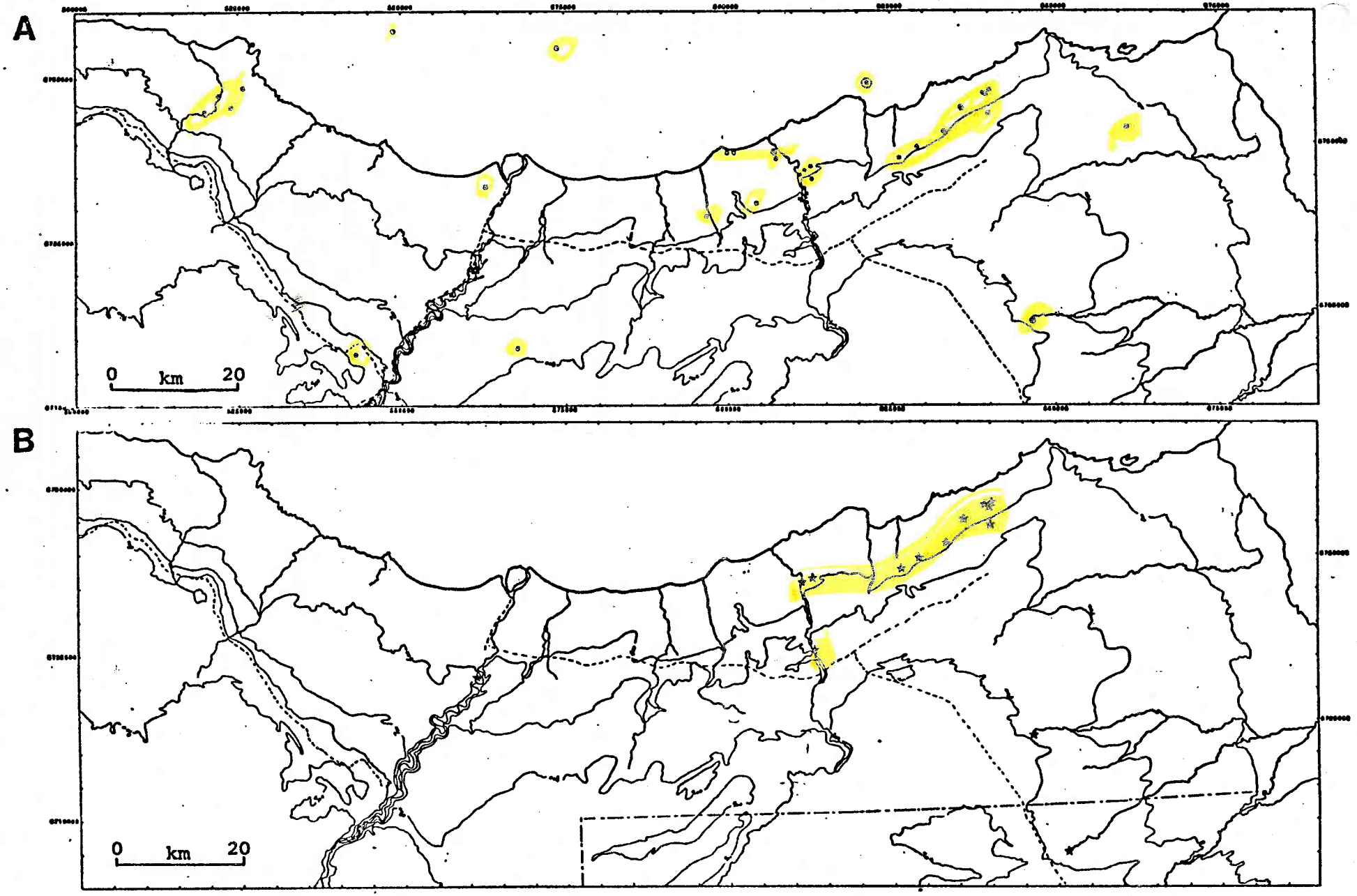

ALL
0 km 20


ALL
0 km 20


ALL
0 km 20


A
ALL
0 km 20
B
HR
0 km 20
C
SPF
0 km 20
D
WM
0 km 20
E
PPG
0 km 20
F
LA
0 km 20


A
ALL
0 km 20
B
HR
0 km 20
C
SPF
0 km 20
D
WM
0 km 20
E
PPG
0 km 20
F
LA
0 km 20



ARTESIAN HOLES

FIG. 4-1

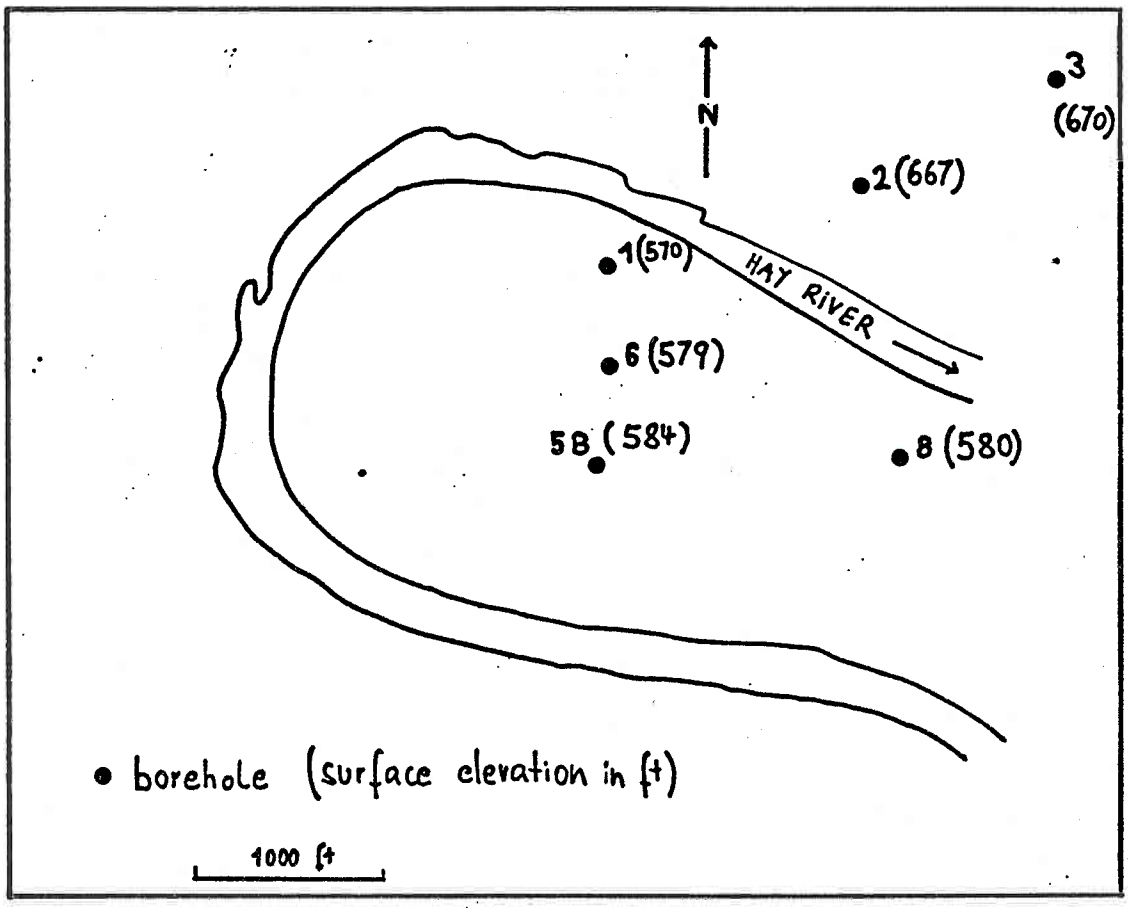

N
3
(670)
2(667)
1(570)
HAY RIVER
6(579)
5B(584)
8(580)
• borehole (surface elevation in ft)
1000 ft

FIG. 4-2

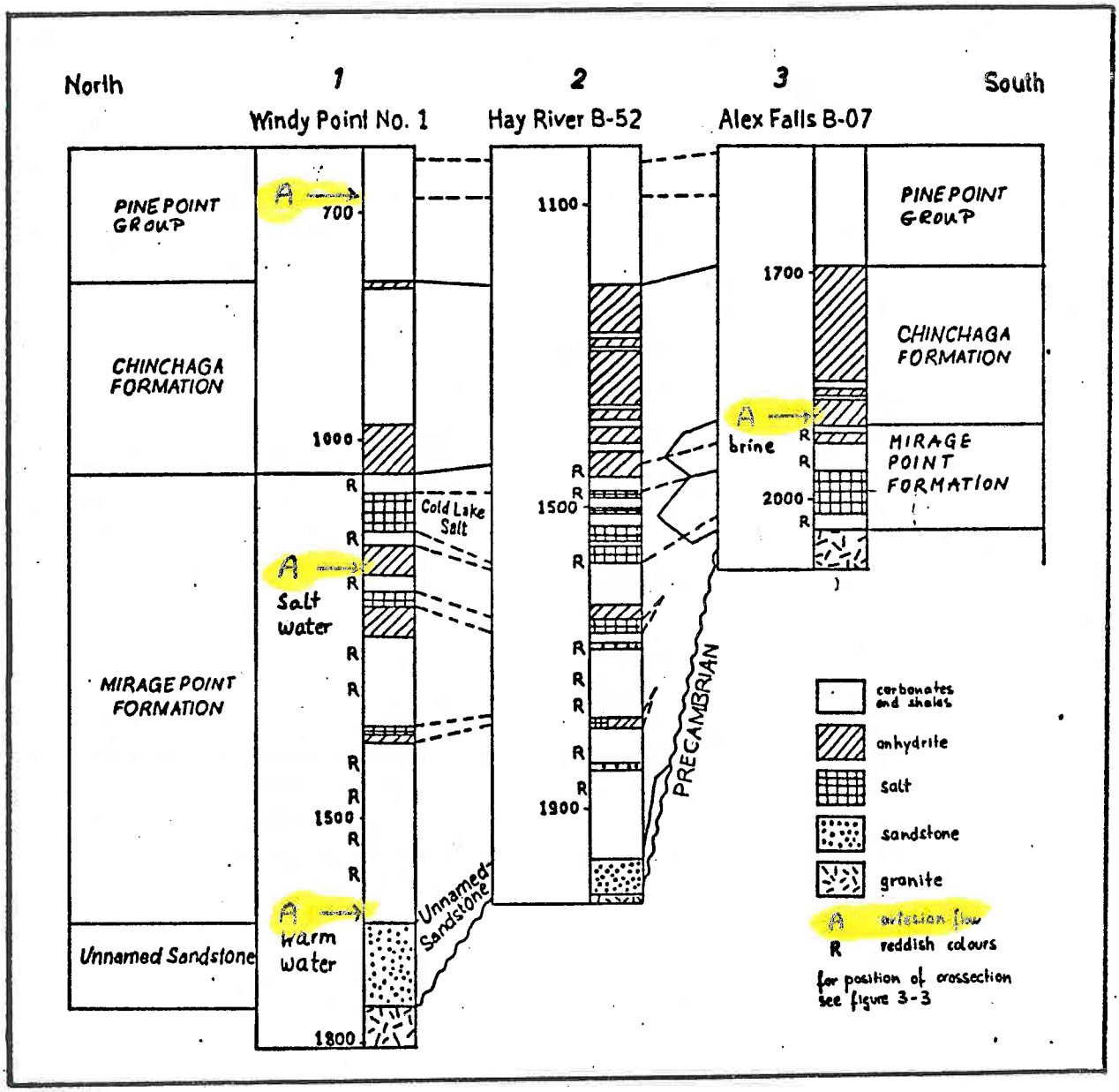

North
1
Windy Point No. 1
2
Hay River B-52
3
Alex Falls B-07
South
PINE POINT GROUP
CHINCHAGA FORMATION
MIRAGE POINT FORMATION
Unnamed Sandstone
PRECAMBRIAN
Cold Lake Salt
Salt water
warm water
brine
Unnamed Sandstone
700
1000
1500
1800
1100
1900
1700
2000
R
carbonates and shales
anhydrite
salt
sandstone
granite
A artesian flow
R reddish colours
for position of crossection see figure 3-3

FIG. 4-3

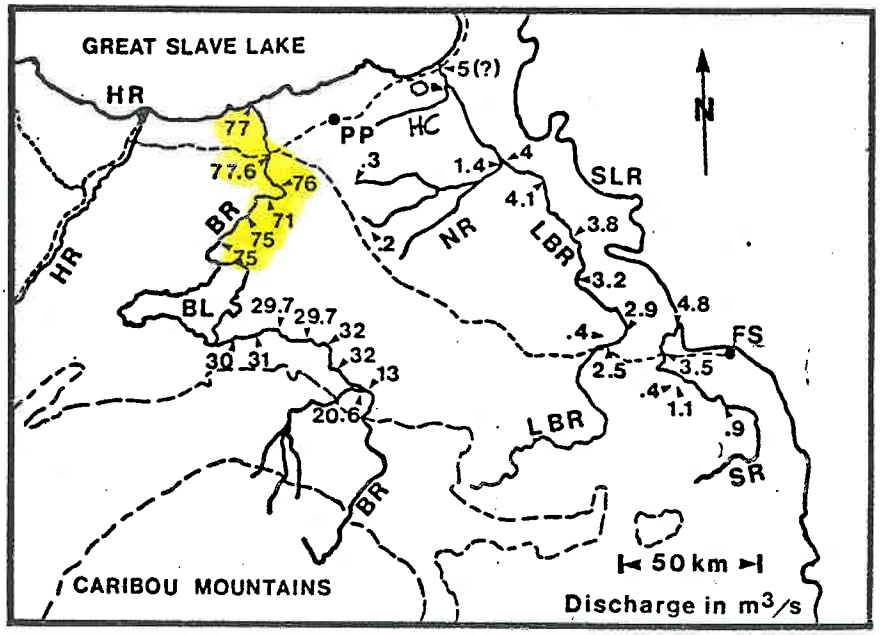

GREAT SLAVE LAKE
HR
77
77.6
76
71
75
75
BR
HR
PP
HC
5(?)
3
1.4
4
4.1
SLR
3.8
NR
LBR
2
3.2
2.9
4.8
.4
FS
2.5
3.5
.4
1.1
.9
SR
LBR
BL
29.7
29.7
32
30
31
32
13
20.6
BR
CARIBOU MOUNTAINS
N
50 km
Discharge in m3/s

FIG. 4-4

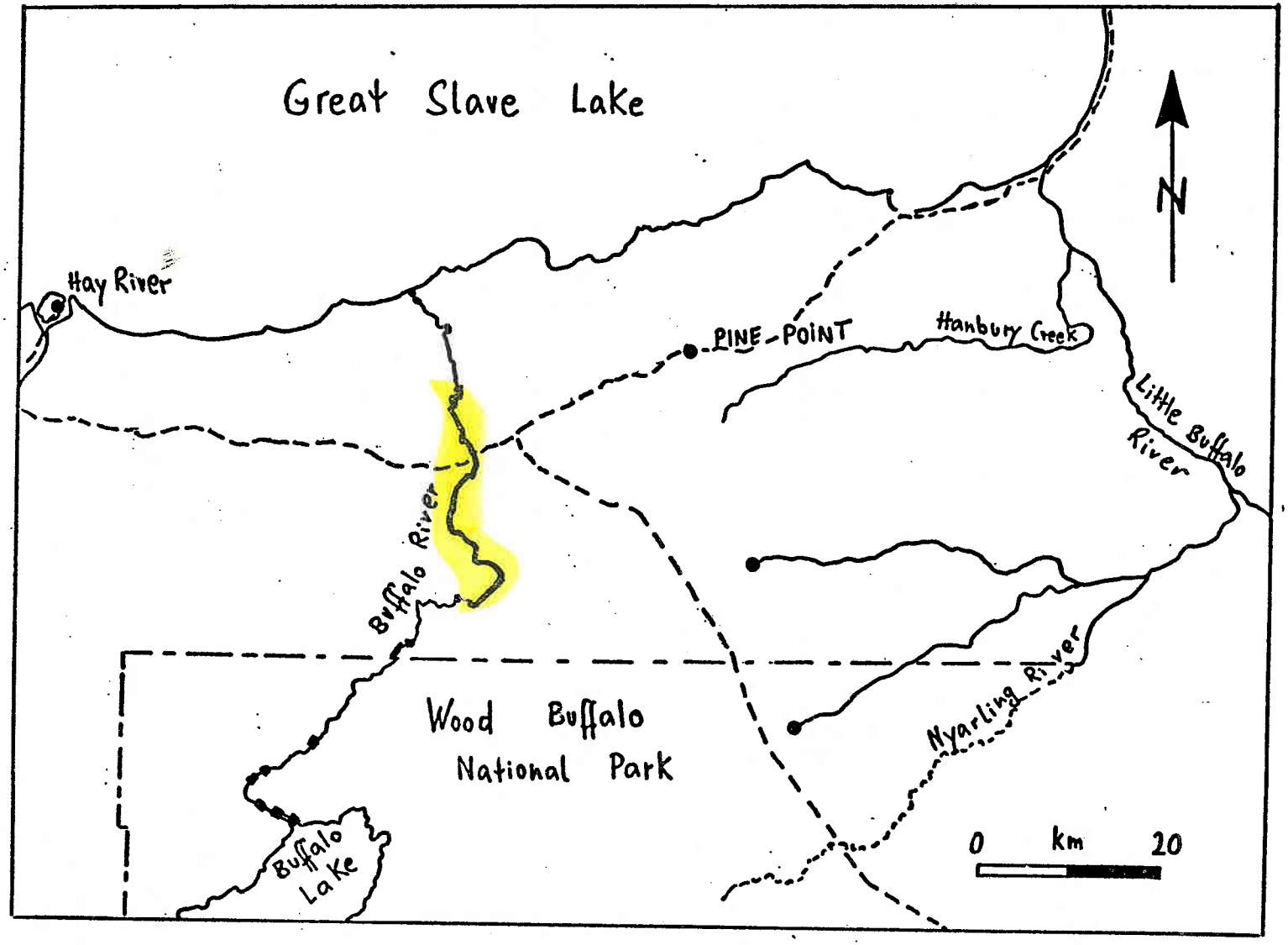
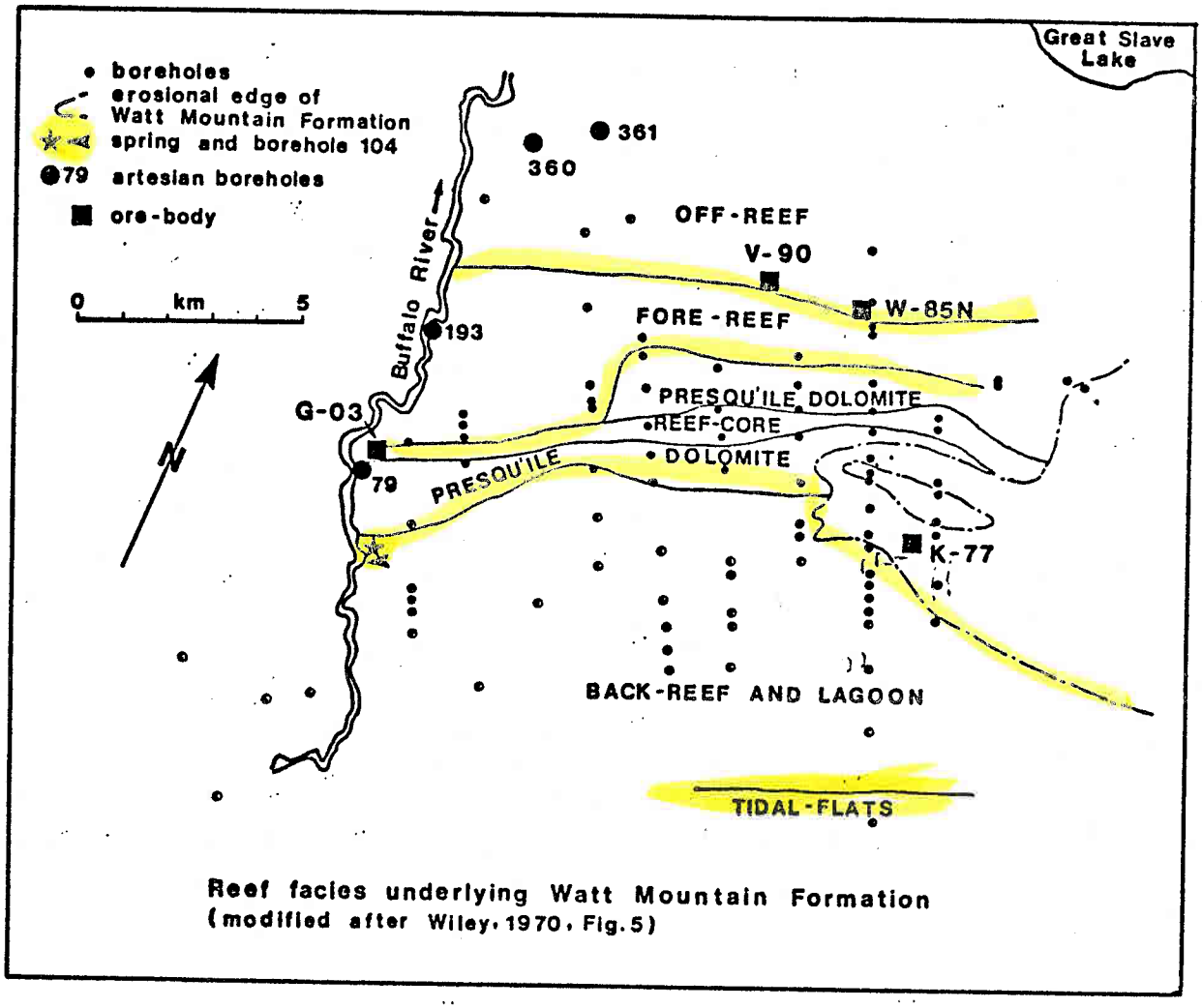

Great Slave Lake
N
Hay River
PINE POINT
Hanbury Creek
Little Buffalo River
Buffalo River
Wood Buffalo National Park
Nyarling River
Buffalo Lake
0 km 20
open water, November 30, 1975

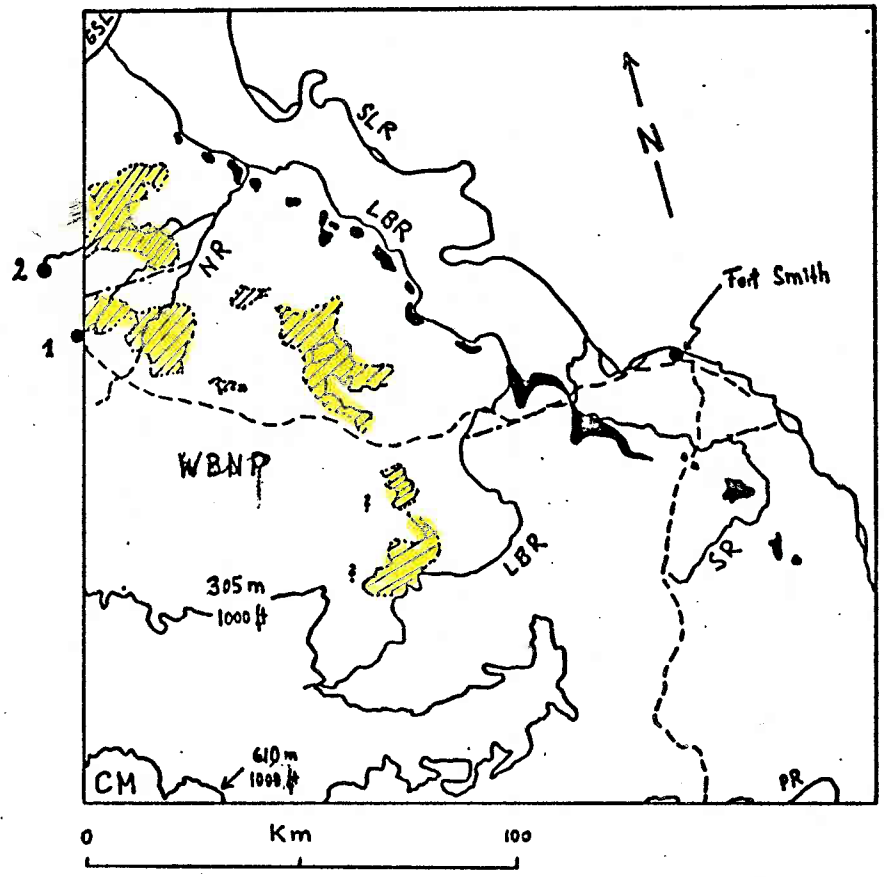
FIG. 4-5



Reef facies underlying Watt Mountain Formation
(modified after Wiley, 1970, Fig. 5)

FIG. 4-6

FIG. 4-7

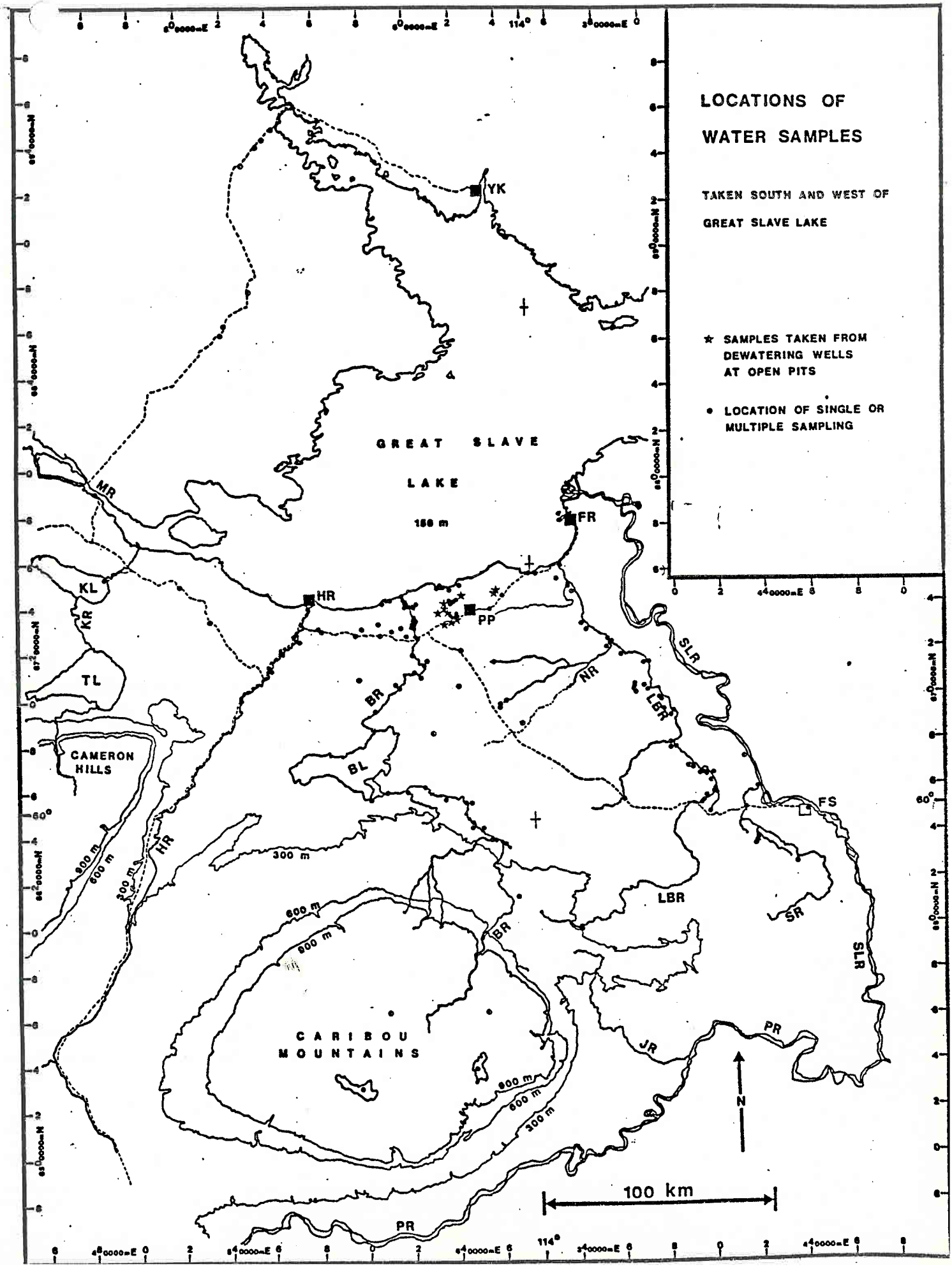


WBNP	Wood Buffalo National Park
SLR	Slave River
PR	Peace River
SR	Salt River
NR	Nyarling River
LBR	Little Buffalo River
CM	Caribou Mountains
GSL	Great Slave Lake
1	Angus Tower Spring
2	Halfway Spring

belt of saline and sulphurous water discharge
belt of sulphurous water discharge
boundary WBNP
road

DISCHARGE BELTS OF SALINE AND SULPHUROUS GROUNDWATER

FIG. 4-8


LOCATIONS OF
WATER SAMPLES
TAKEN SOUTH AND WEST OF
GREAT SLAVE LAKE
★ SAMPLES TAKEN FROM DEWATERING WELLS AT OPEN PITS
• LOCATION OF SINGLE OR MULTIPLE SAMPLING
GREAT SLAVE
LAKE
156 m
YK
FR
HR
PP
MR
KL
KR
TL
CAMERON
HILLS
BR
BL
NR
LBR
SLR
FS
SR
JR
PR
CARIBOU
MOUNTAINS
300 m
600 m
800 m
N
100 km

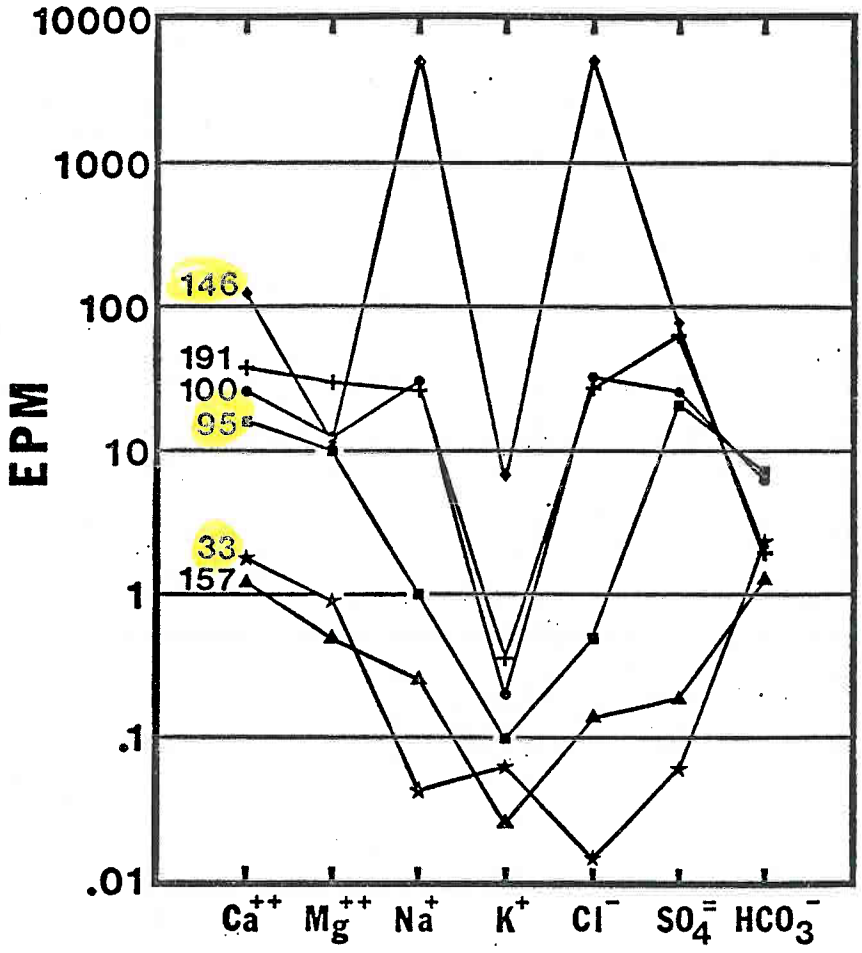

10000
1000
100
10
1
.1
.01
EPM
146
191
100
95
33
157
Ca++
Mg++
Na+
K+
Cl−
SO4=
HCO3−

FIG. 4-10

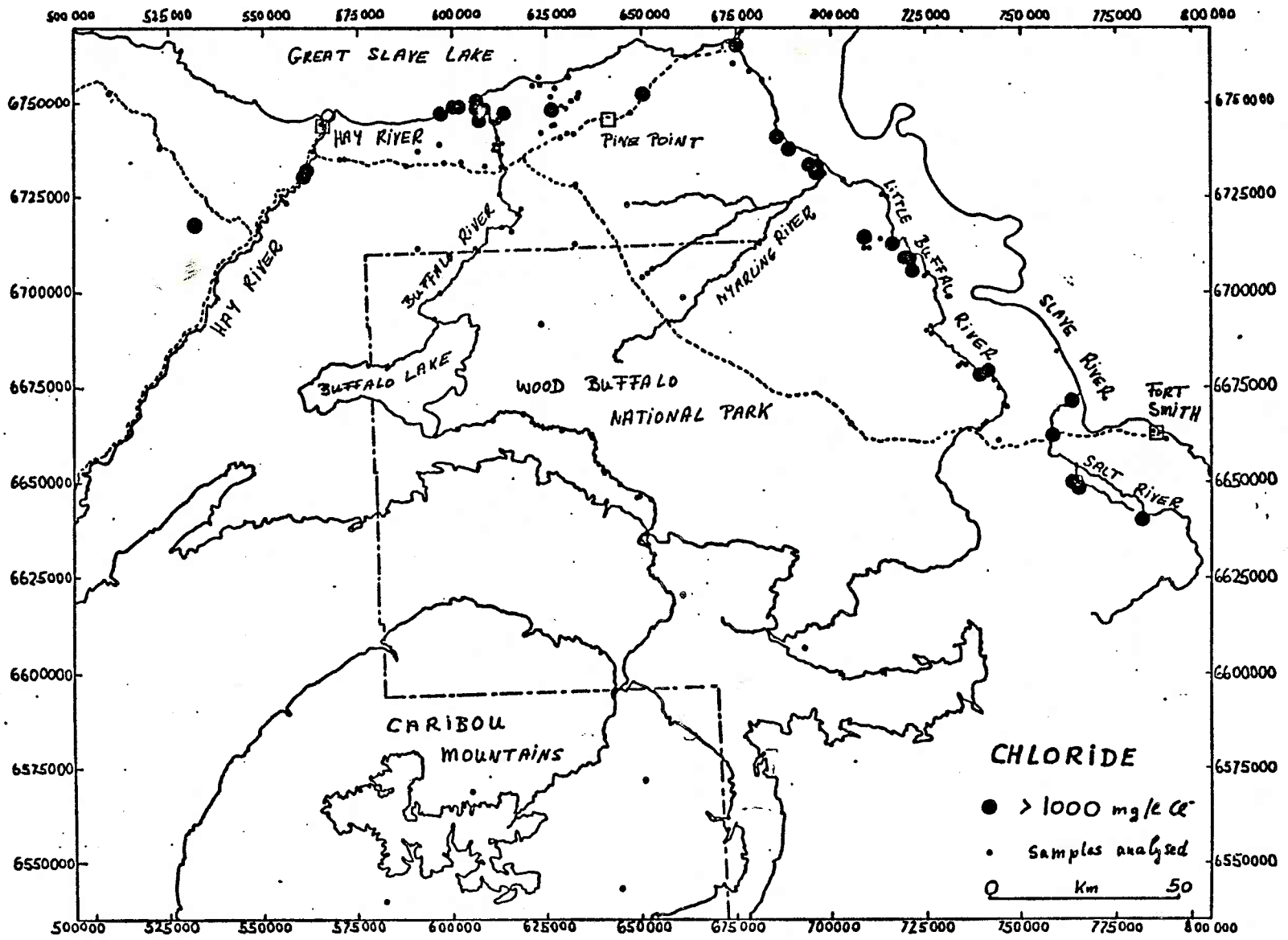

GREAT SLAVE LAKE
HAY RIVER
PINE POINT
BUFFALO RIVER
HAY RIVER
NYARLING RIVER
LITTLE BUFFALO RIVER
SLAVE RIVER
FORT SMITH
SALT RIVER
BUFFALO LAKE
WOOD BUFFALO NATIONAL PARK
CARIBOU MOUNTAINS
CHLORIDE
> 1000 mg/l Cl⁻
Samples analysed
0 Km 50
500 000
525 000
550 000
575 000
600 000
625 000
650 000
675 000
700 000
725 000
750 000
775 000
800 000
6750000
6725000
6700000
6675000
6650000
6625000
6600000
6575000
6550000

FIG. 4-11

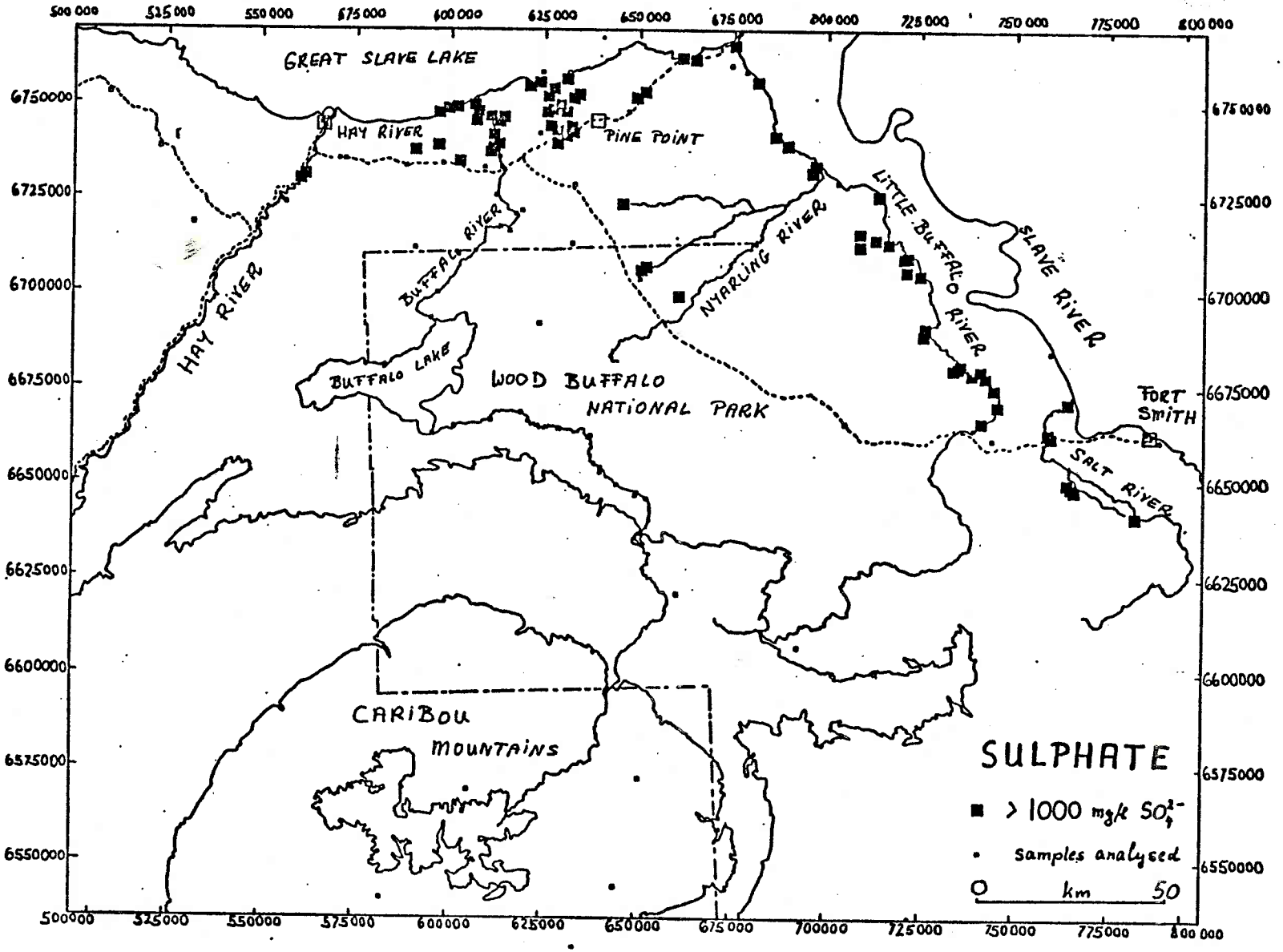

GREAT SLAVE LAKE
HAY RIVER
PINE POINT
BUFFALO RIVER
NYARLING RIVER
LITTLE BUFFALO RIVER
SLAVE RIVER
HAY RIVER
BUFFALO LAKE
WOOD BUFFALO
NATIONAL PARK
FORT SMITH
SALT RIVER
CARIBOU
MOUNTAINS
SULPHATE
> 1000 mg/k SO_4^{2-}
Samples analysed
km 50
500 000
525 000
550 000
575 000
600 000
625 000
650 000
675 000
700 000
725 000
750 000
775 000
800 000
6750000
6725000
6700000
6675000
6650000
6625000
6600000
6575000
6550000

FIG. 4-12

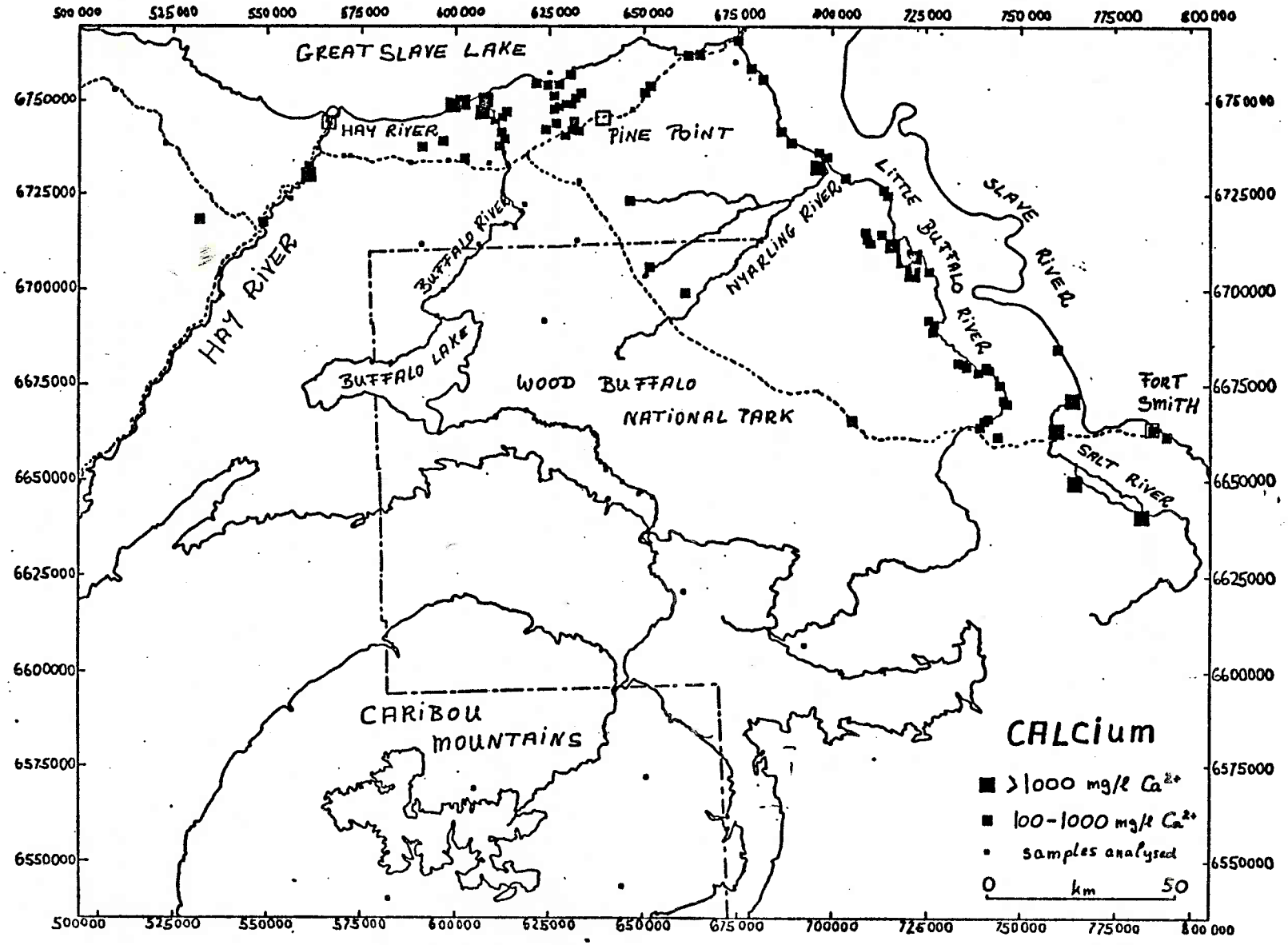

GREAT SLAVE LAKE
HAY RIVER
PINE POINT
BUFFALO RIVER
NYARLING RIVER
LITTLE BUFFALO RIVER
SLAVE RIVER
HAY RIVER
BUFFALO LAKE
WOOD BUFFALO NATIONAL PARK
FORT SMITH
SALT RIVER
CARIBOU MOUNTAINS
CALCium
> 1000 mg/l Ca2+
100-1000 mg/l Ca2+
samples analysed
0 km 50
500 000
525 000
550 000
575 000
600 000
625 000
650 000
675 000
700 000
725 000
750 000
775 000
800 000
6750000
6725000
6700000
6675000
6650000
6625000
6600000
6575000
6550000

FIG. 4-13

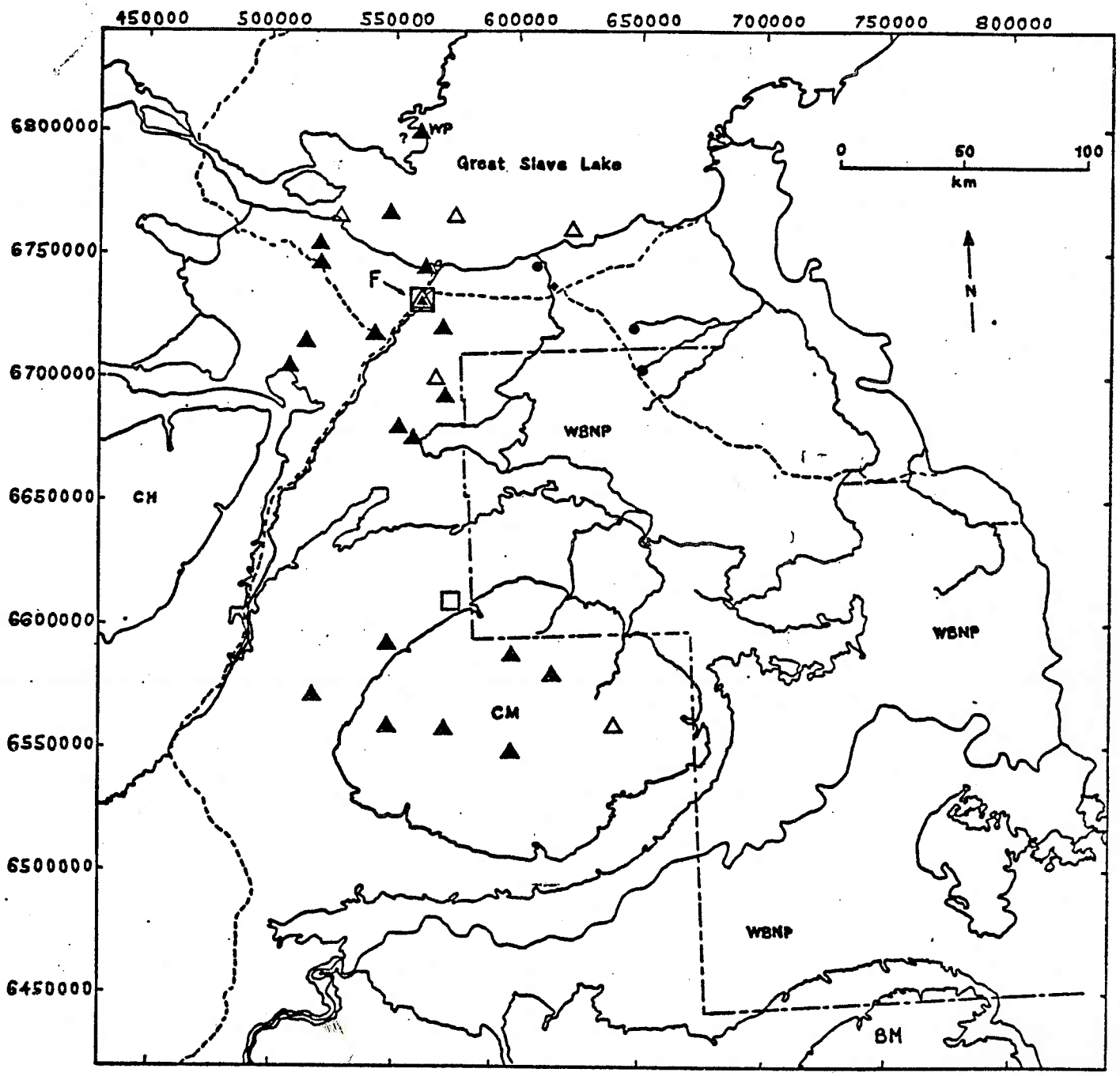
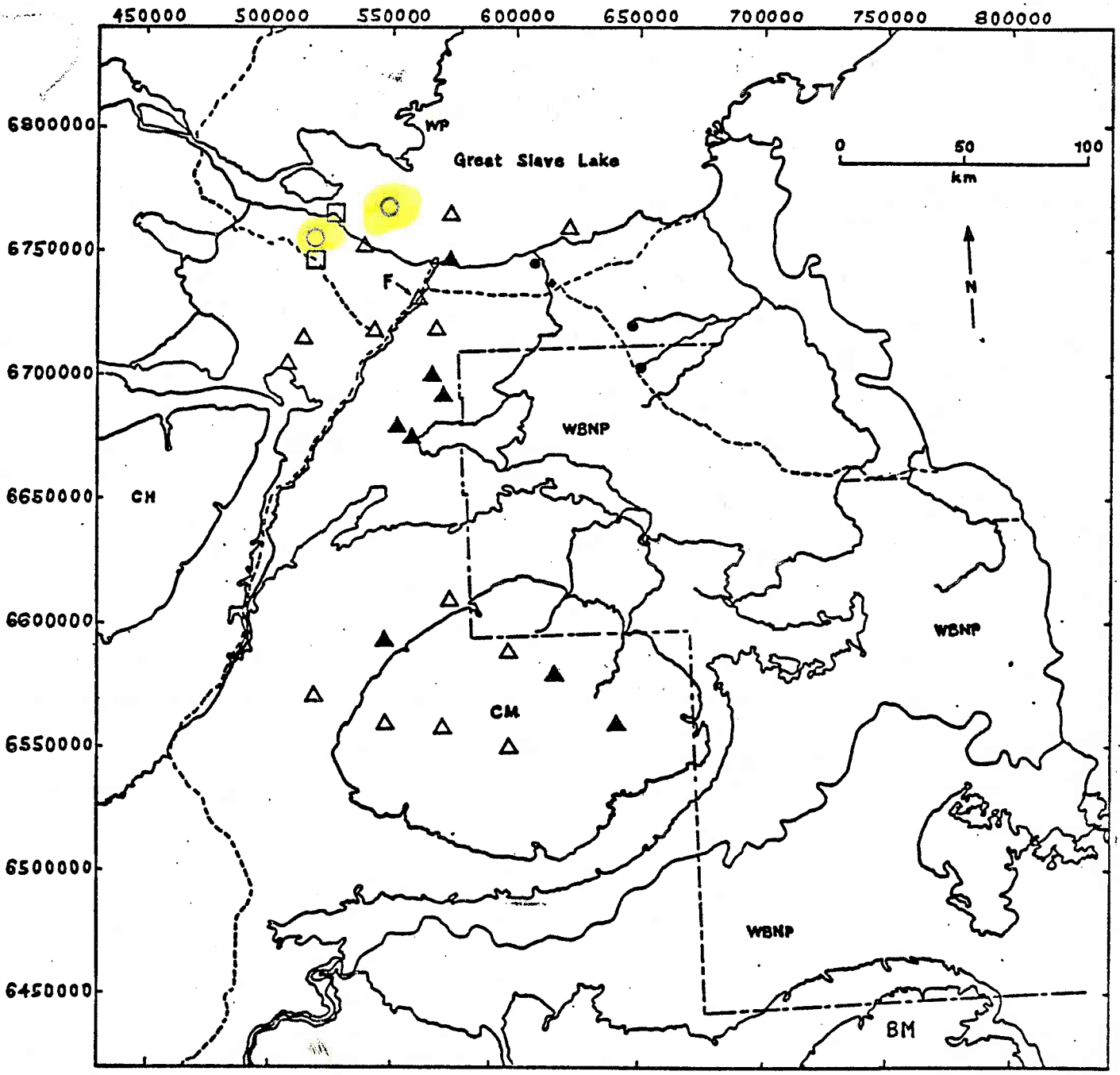

450000
500000
550000
600000
650000
700000
750000
800000
6800000
6750000
6700000
6650000
6600000
6550000
6500000
6450000
WP
Great Slave Lake
0
50
100
km
N
F
WBNP
CH
CM
WBNP
WBNP
BM
Cl
100-999
1000-9999
> 10 000

FIG. 4-14



SO_4

- ○ 10-99
- □ 100-999
- △ 1000-2999
- ▲ > 3000

FIG. 4-15

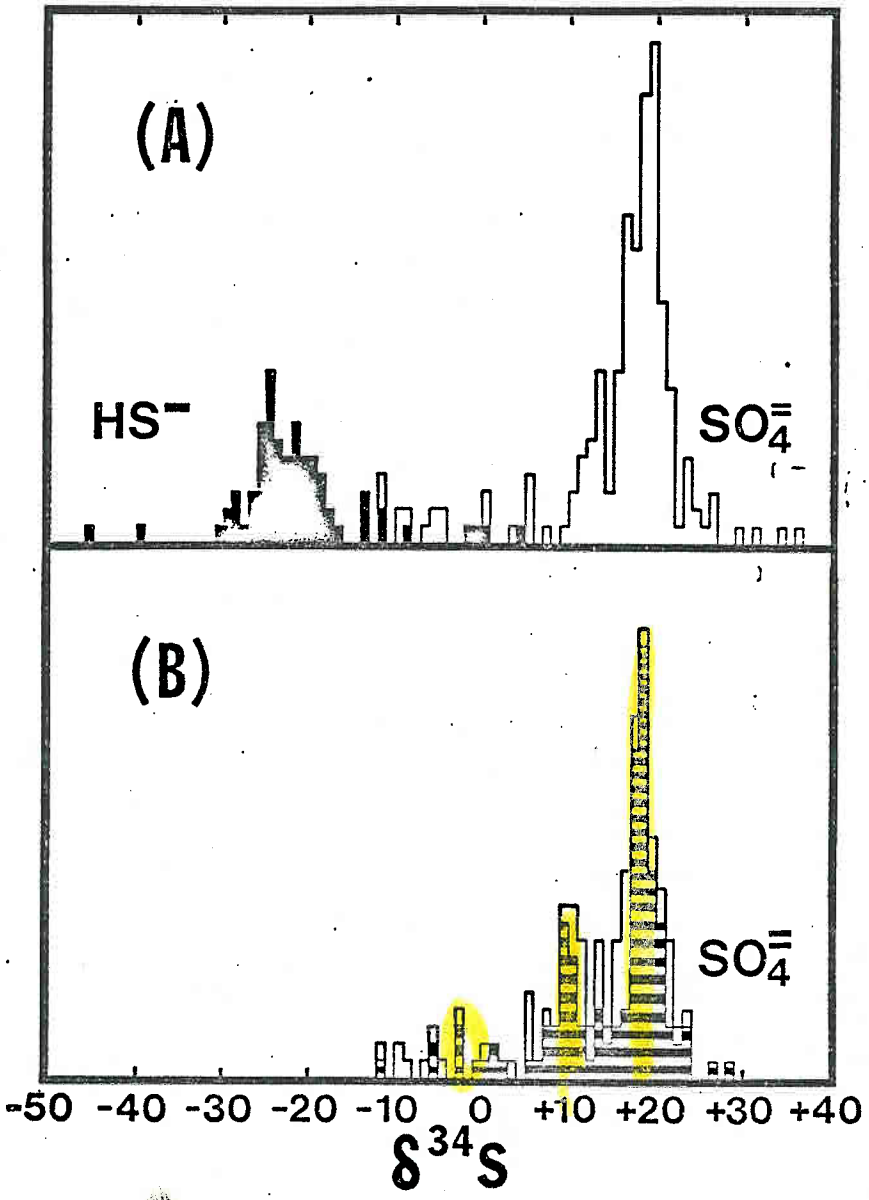


FIG. 4-16

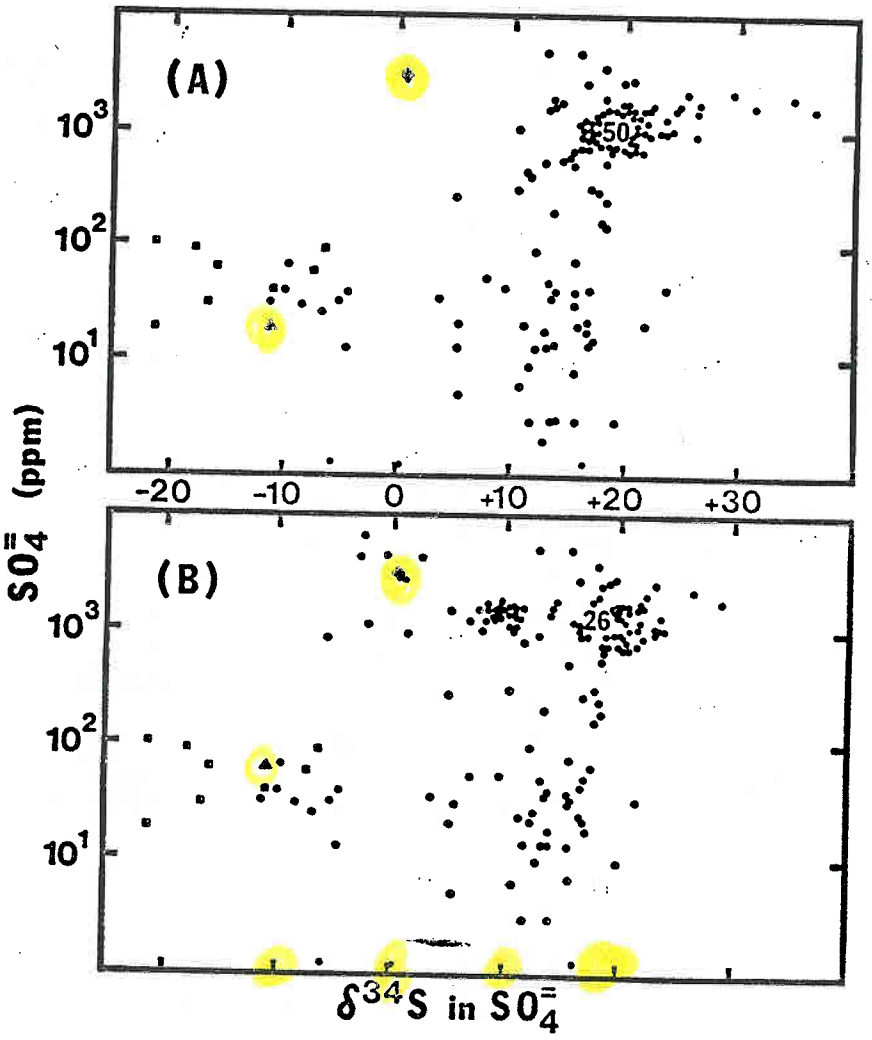


FIG. 4-17

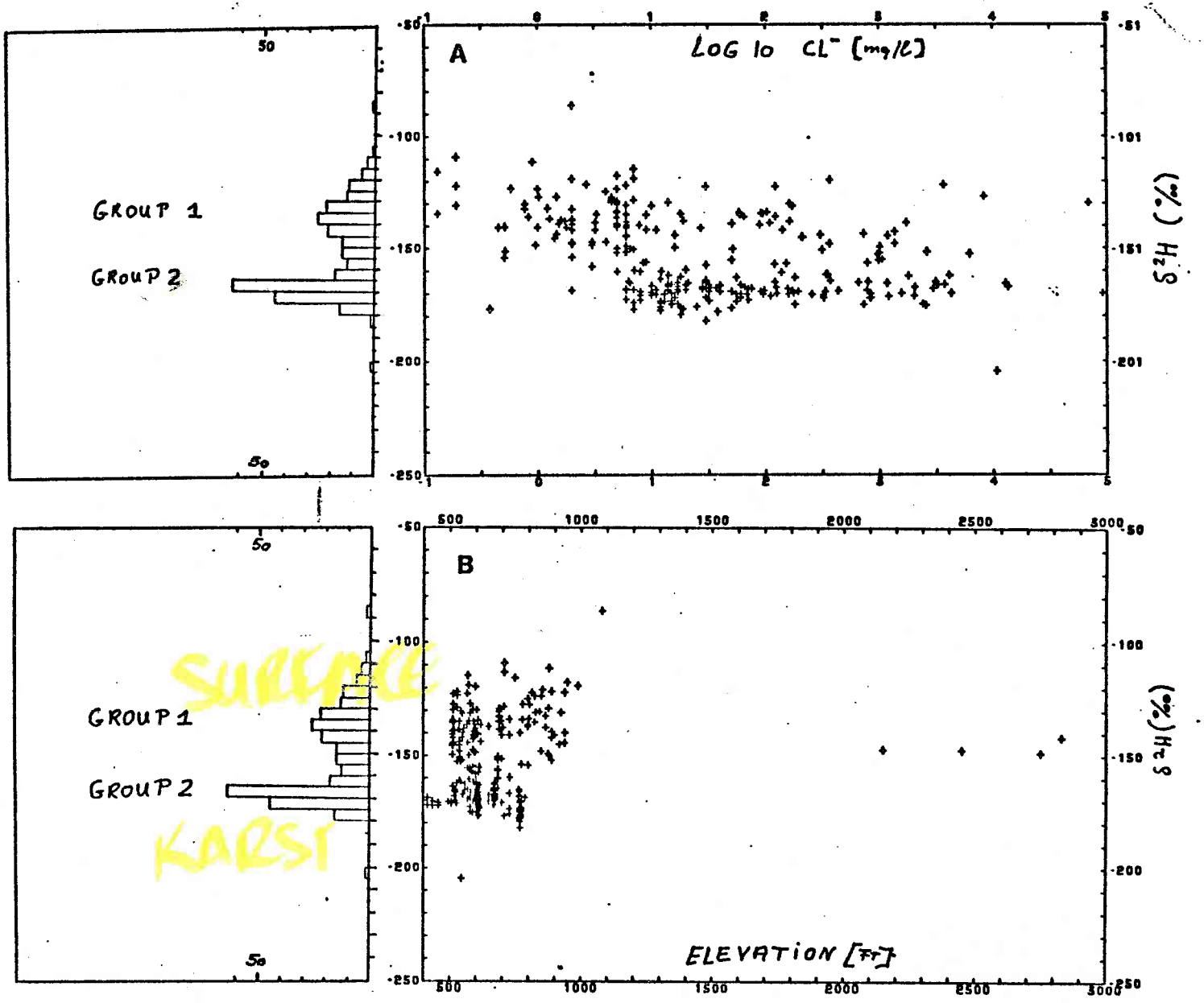

A
LOG 10 CL⁻ [mg/l]
GROUP 1
GROUP 2
50
50
-50
-100
-150
-200
-250
-51
-101
-151
-201
1
0
1
2
3
4
5
H2S (%)
B
500
1000
1500
2000
2500
3000
GROUP 1
GROUP 2
ELEVATION [FT]
SURFACE
KARST

FIG. 4-18

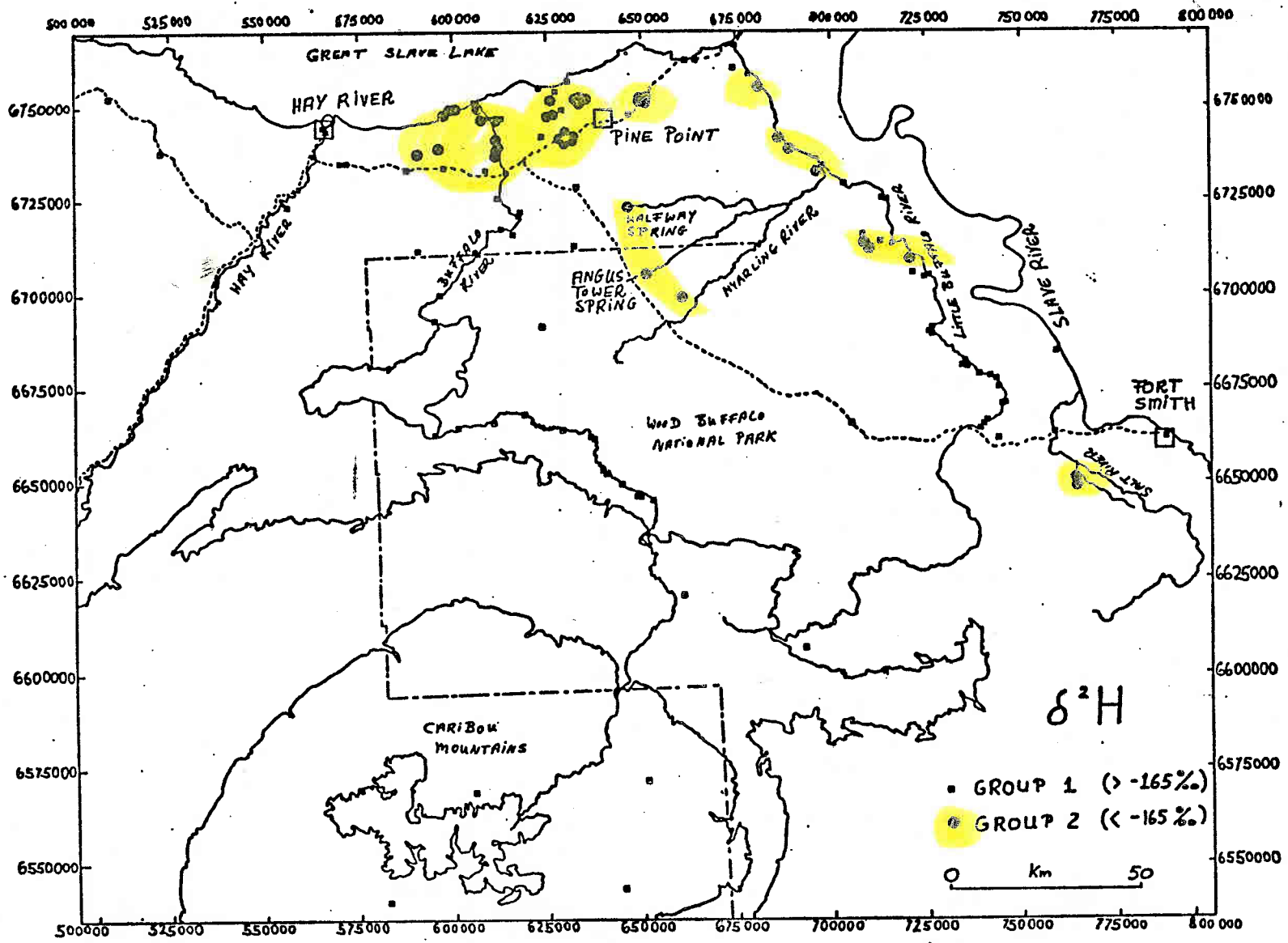
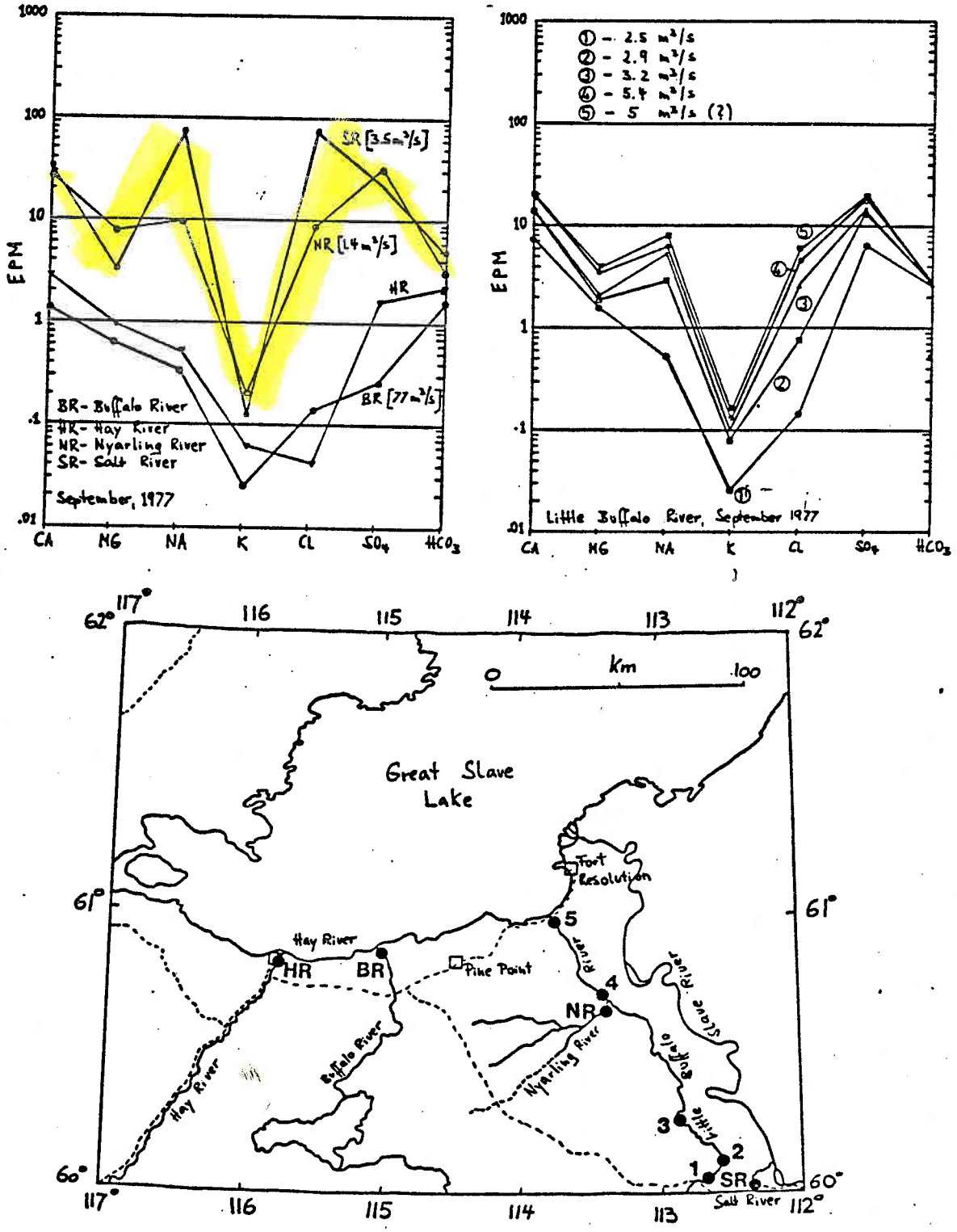

500 000
525 000
550 000
575 000
600 000
625 000
650 000
675 000
700 000
725 000
750 000
775 000
800 000
6750000
6725000
6700000
6675000
6650000
6625000
6600000
6575000
6550000
GREAT SLAVE LAKE
HAY RIVER
PINE POINT
HALFWAY SPRING
ANGUS TOWER SPRING
BUFFALO RIVER
HAY RIVER
NYARLING RIVER
LITTLE BUFFALO RIVER
SLAVE RIVER
FORT SMITH
SMART RIVER
WOOD BUFFALO NATIONAL PARK
CARIBOU MOUNTAINS
δ²H
GROUP 1 (> -165‰)
GROUP 2 (< -165‰)
0 Km 50

FIG. 4-19



CHEMISTRY AND FLOW OF RIVERS, PINE POINT AREA

FIG. 4-20

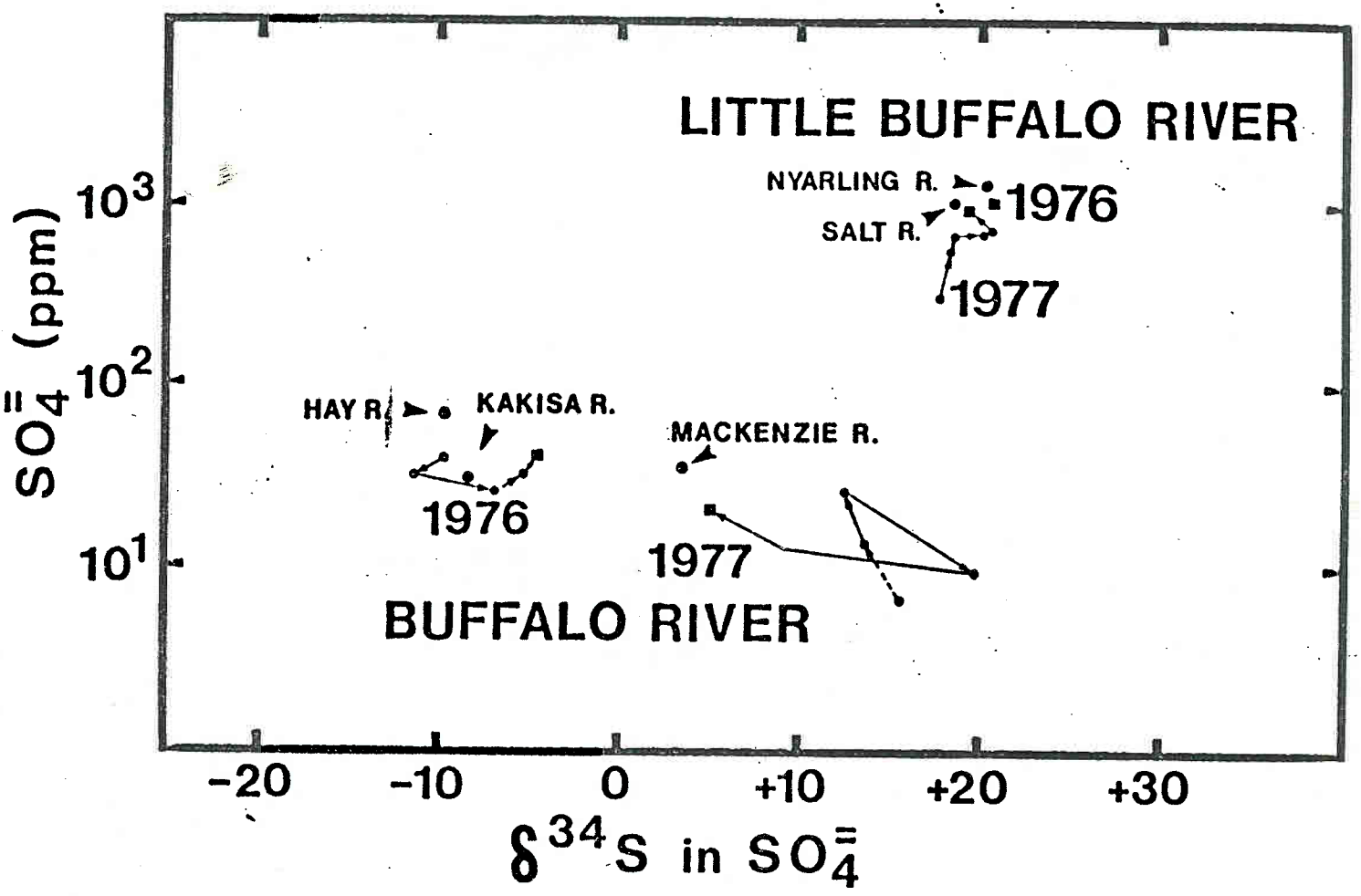

LITTLE BUFFALO RIVER
NYARLING R.
SALT R.
1976
1977
HAY R.
KAKISA R.
1976
MACKENZIE R.
1977
BUFFALO RIVER
$SO_4^{=}$ (ppm)
10^3
10^2
10^1
-20
-10
0
+10
+20
+30
$\delta^{34}S$ in $SO_4^{=}$

FIG. 4-21

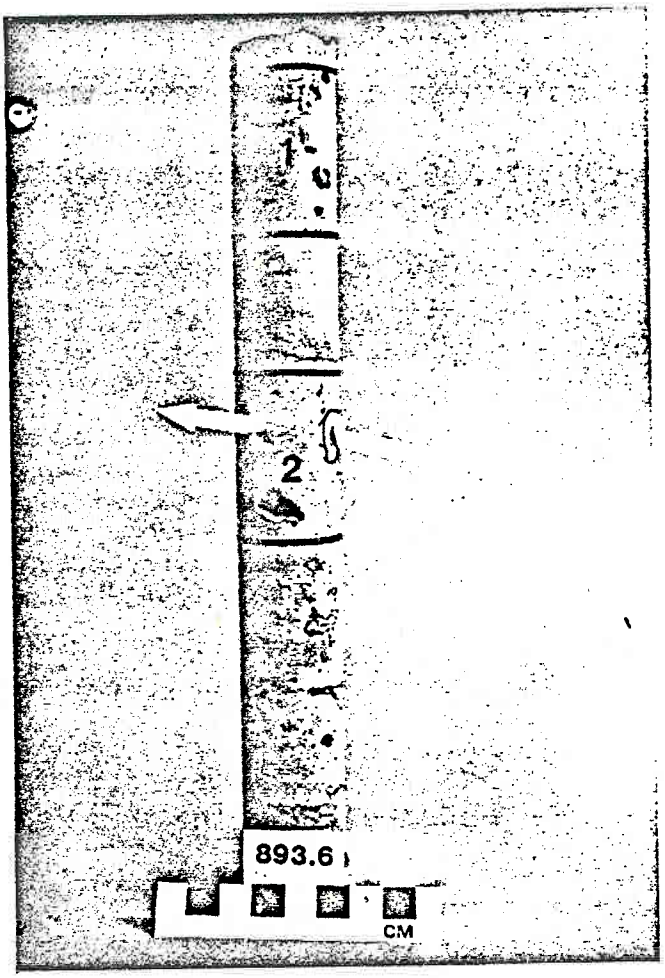


FIG. 4-22 A

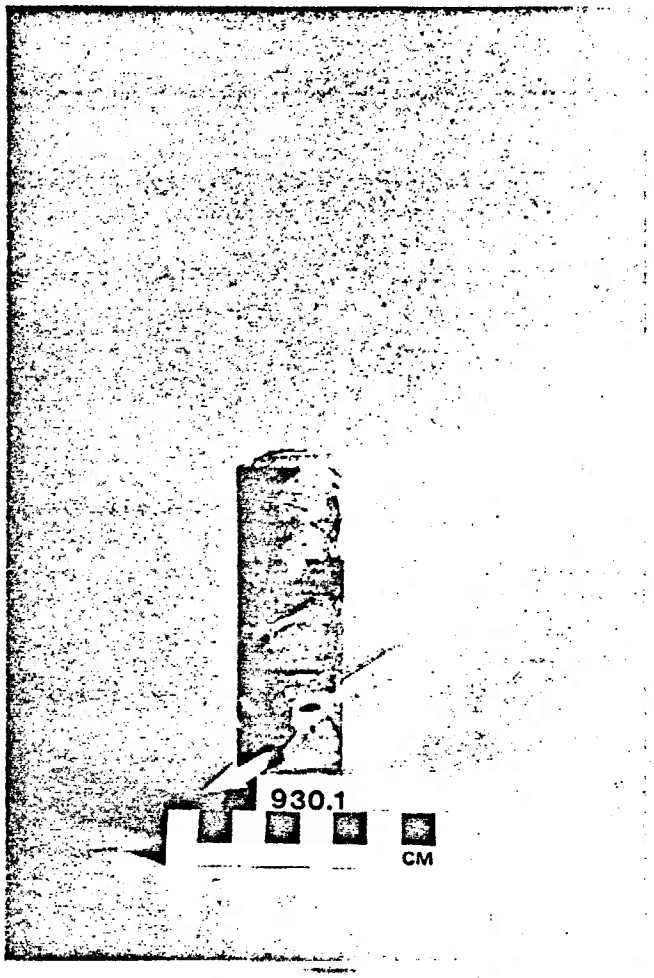


FIG. 4-22 B

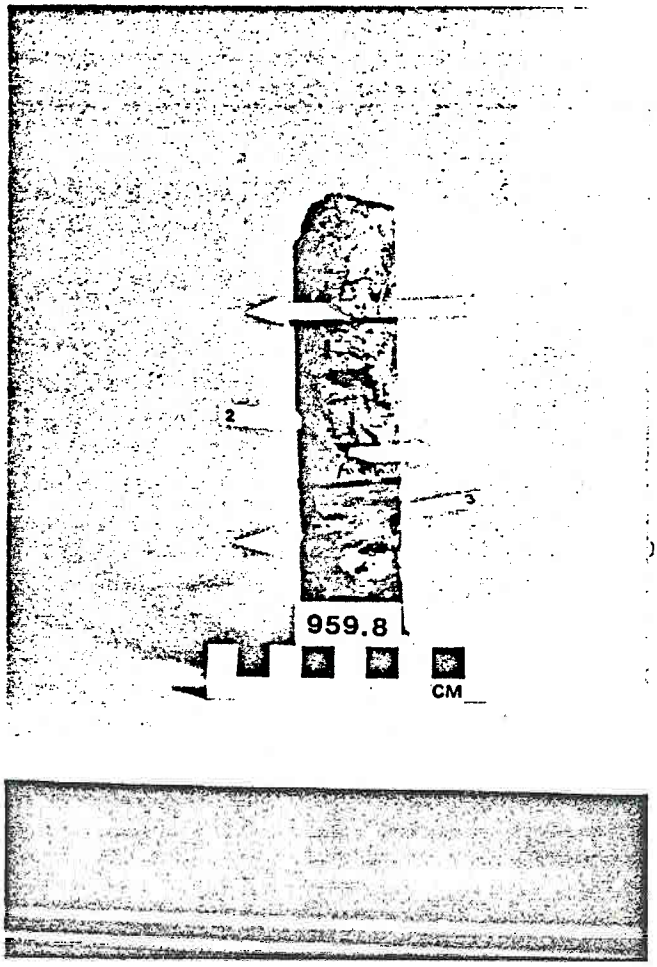


FIG. 4-22 C

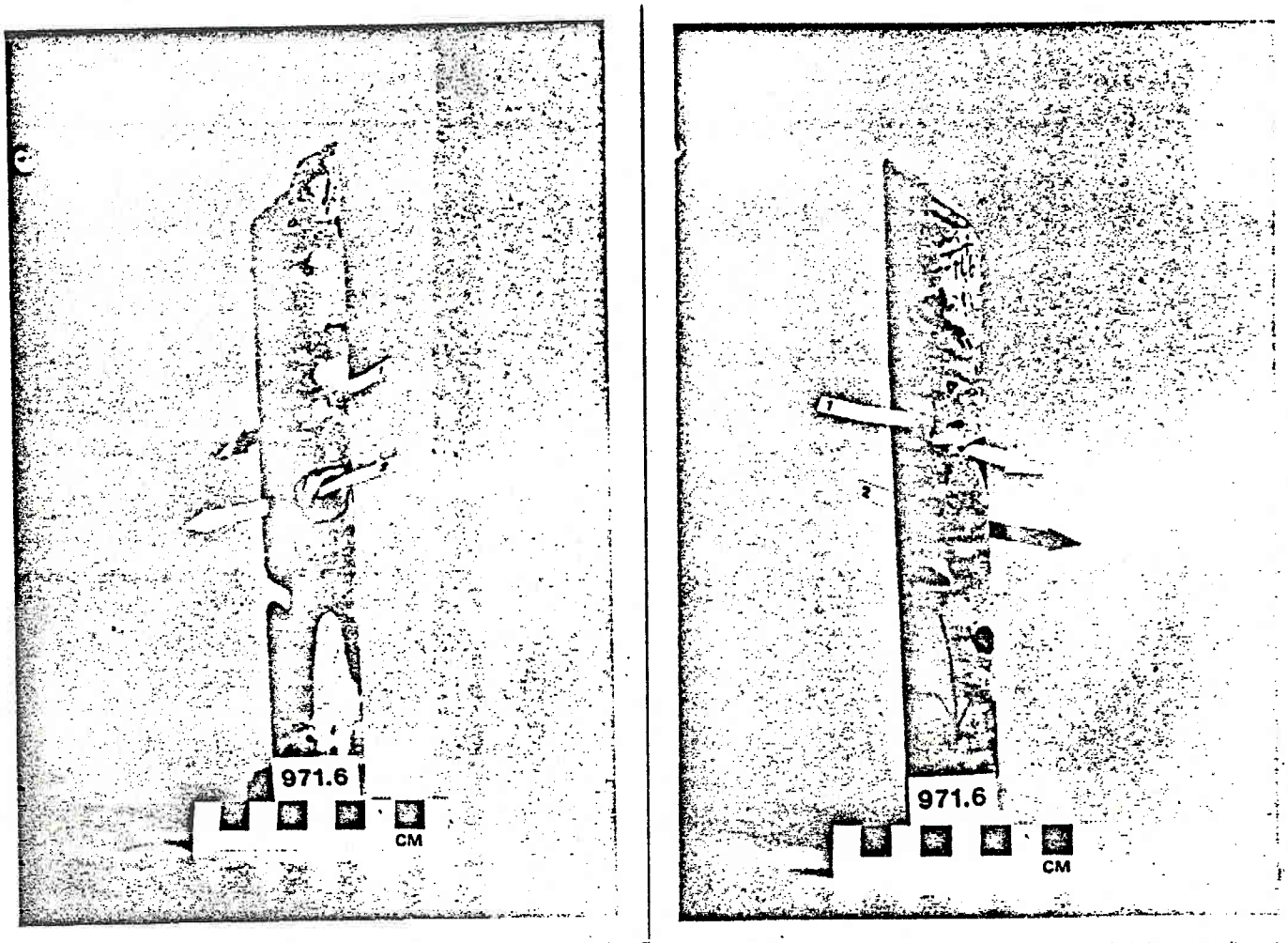


FIG. 4-22 D

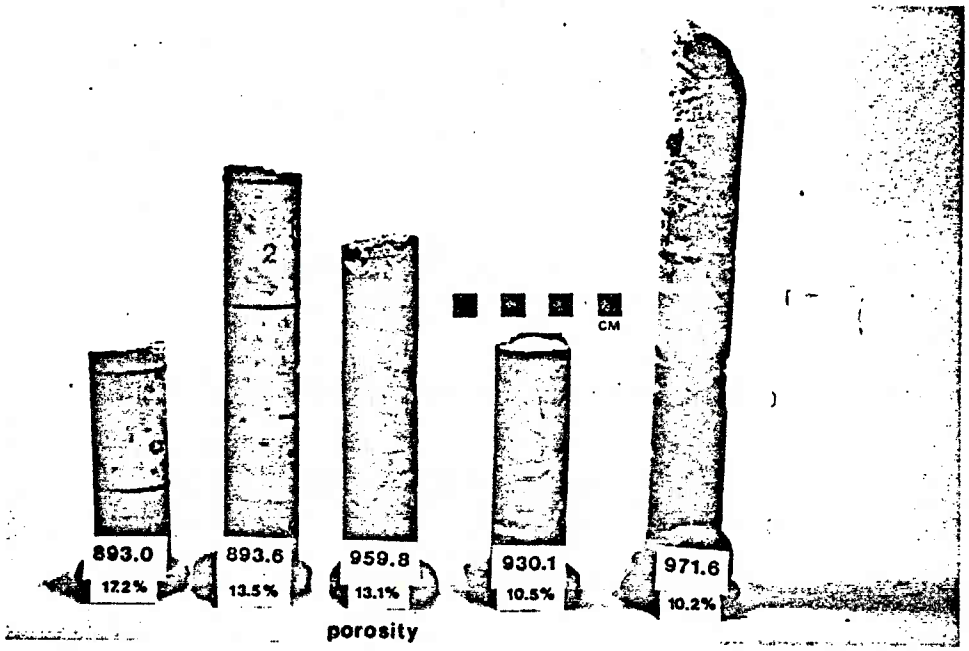
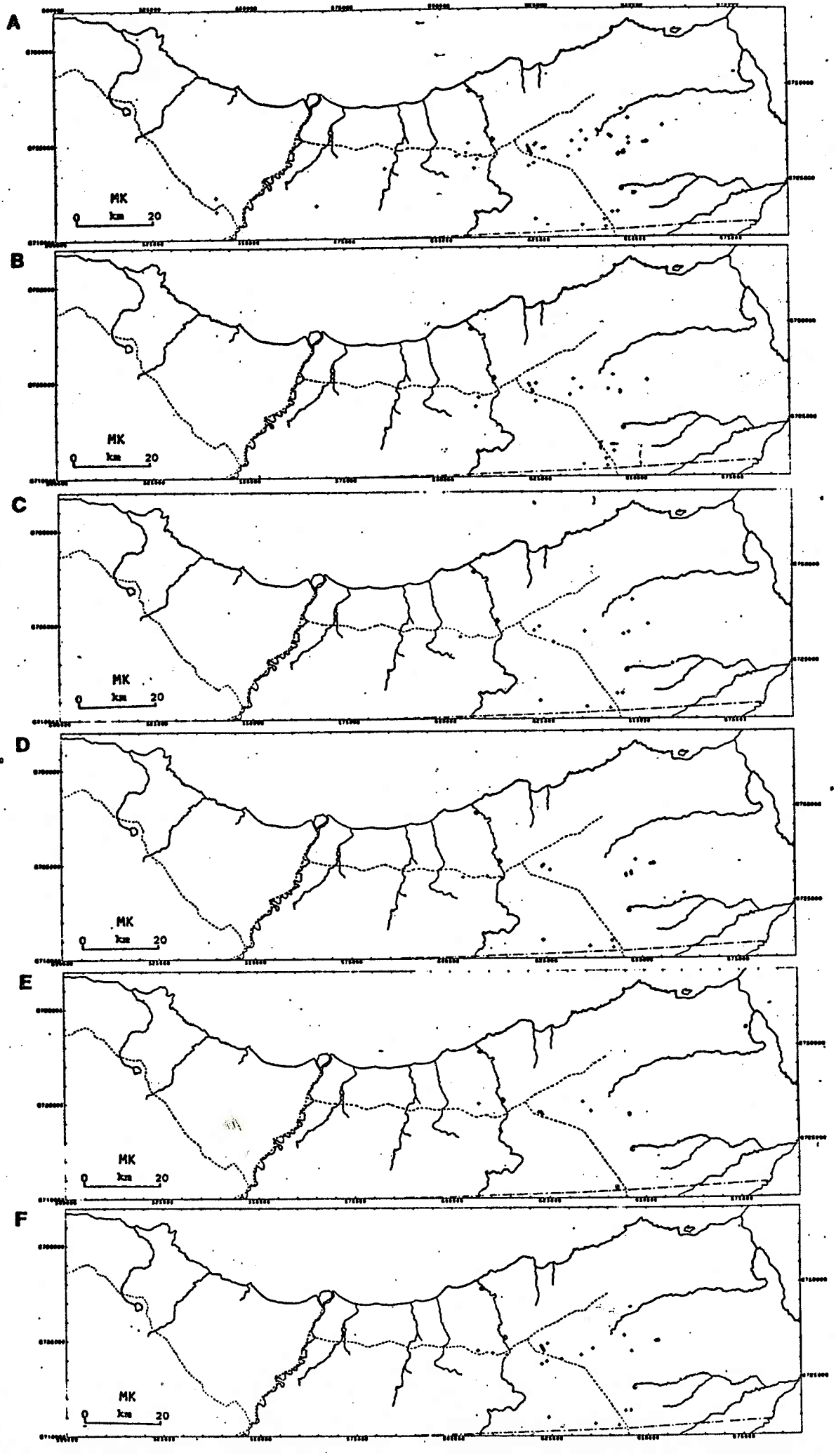


FIG. 4-23


A
MK
0 km 20
B
MK
0 km 20
C
MK
0 km 20
D
MK
0 km 20
E
MK
0 km 20
F
MK
0 km 20

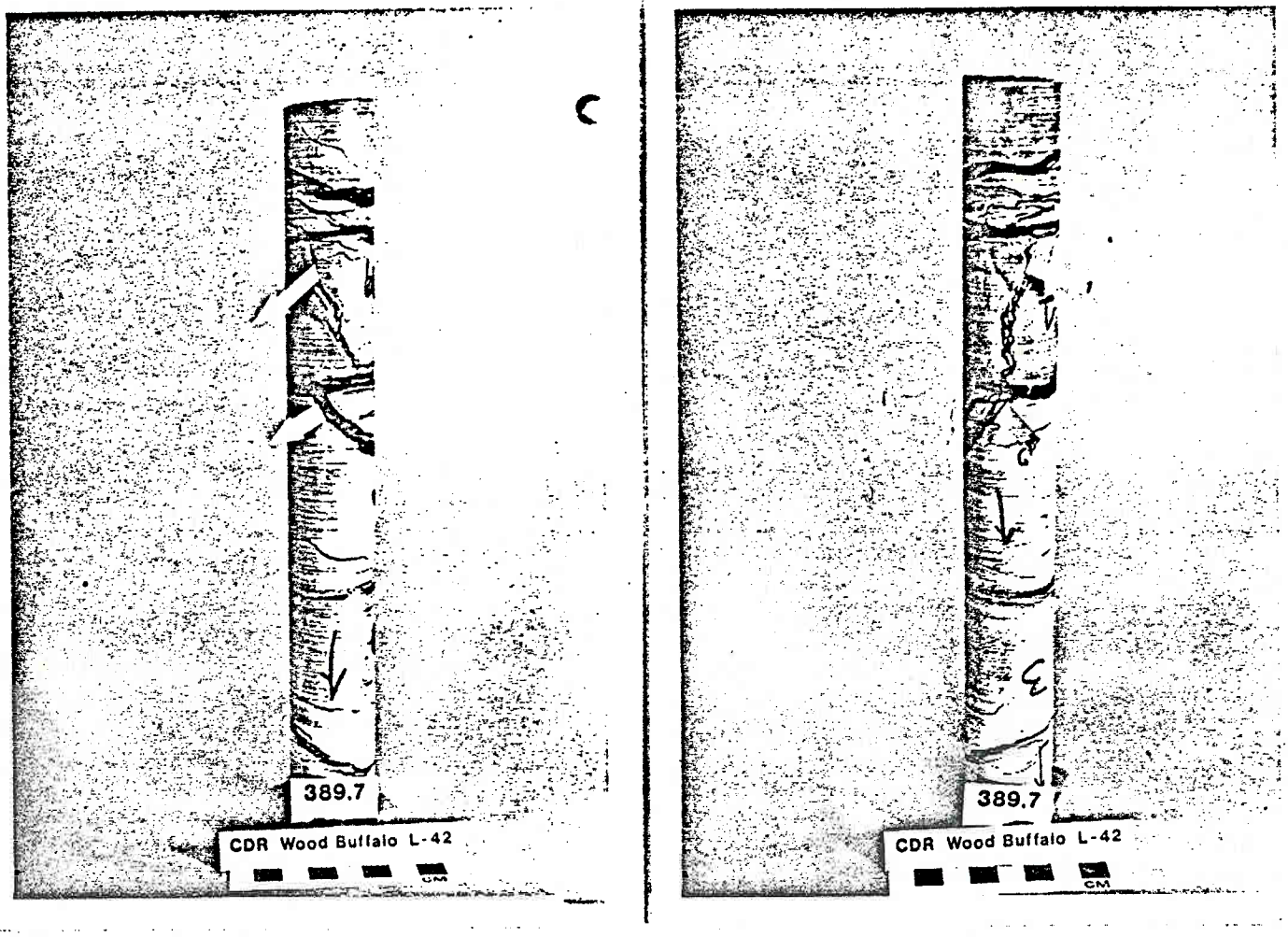
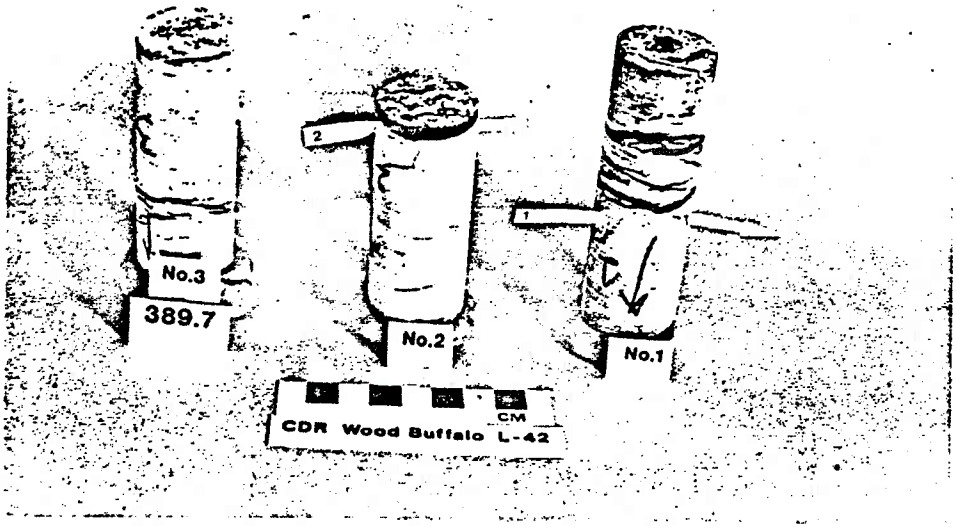


FIG. 4-25


No.3
389.7
2
No.2
1
No.1
CM
CDR Wood Buffalo L-42

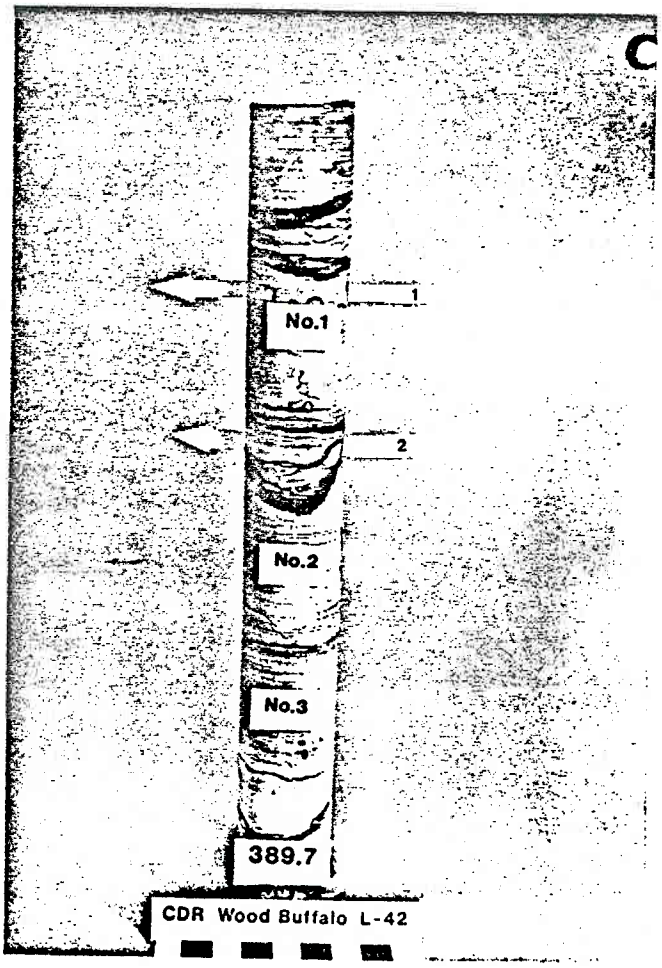

1
No.1
2
No.2
No.3
389.7
CDR Wood Buffalo L-42

FIG. 4-26

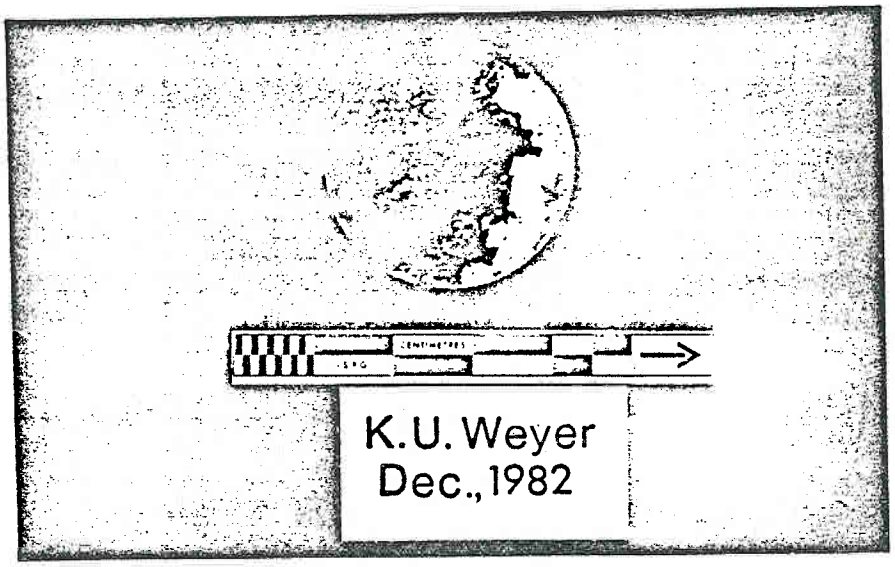


FIG. 4-27

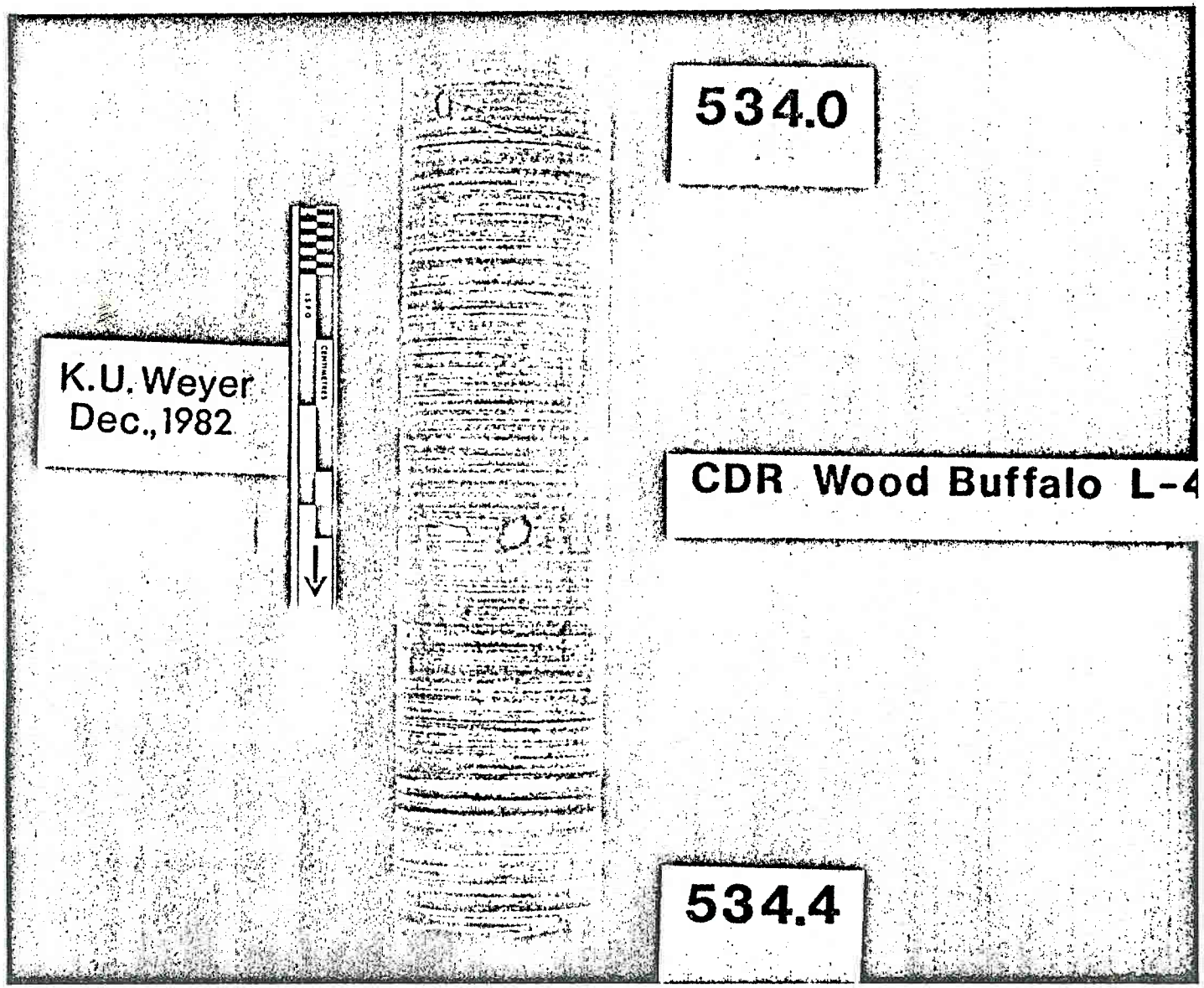


FIG. 4-28

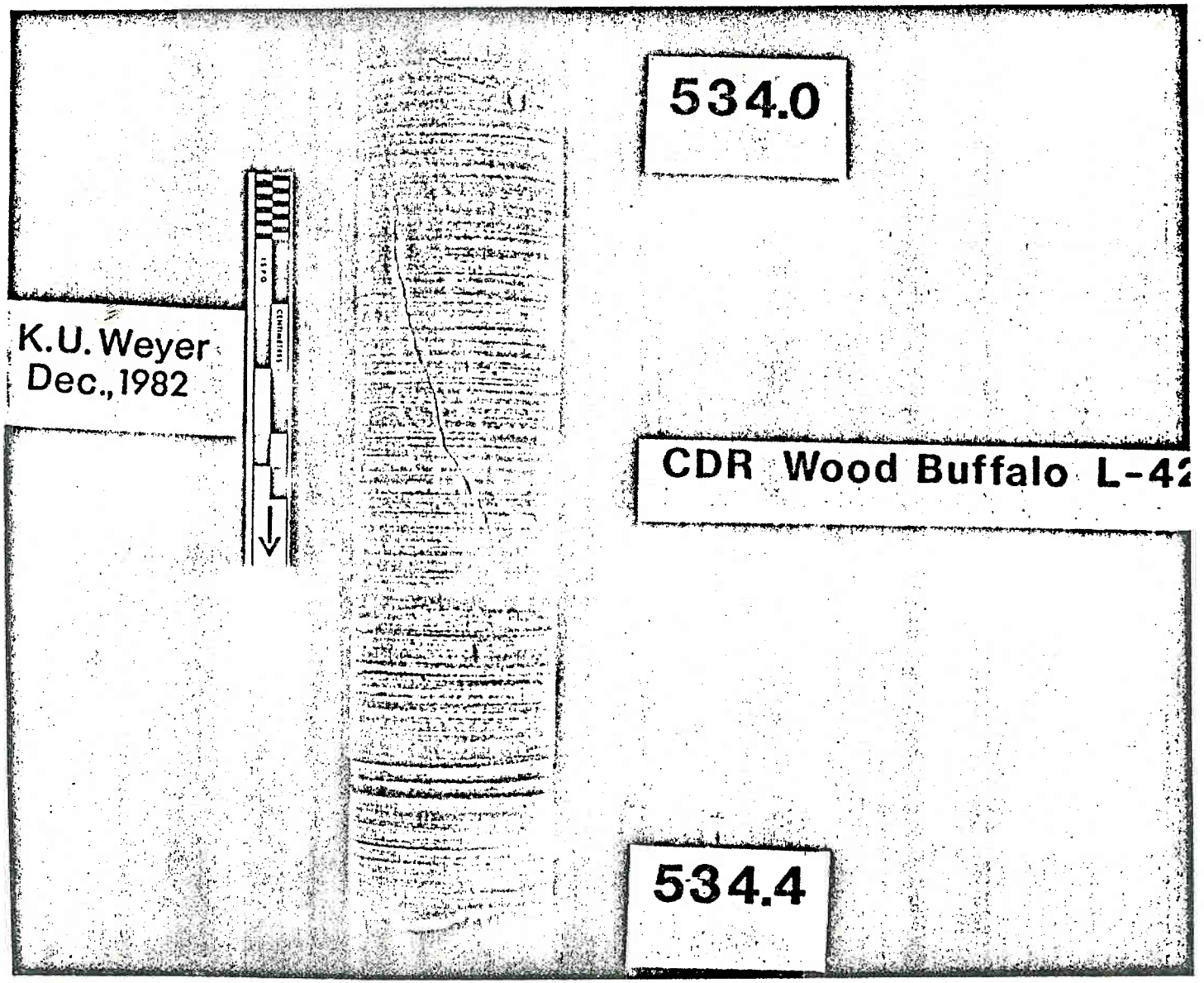


FIG. 4-29

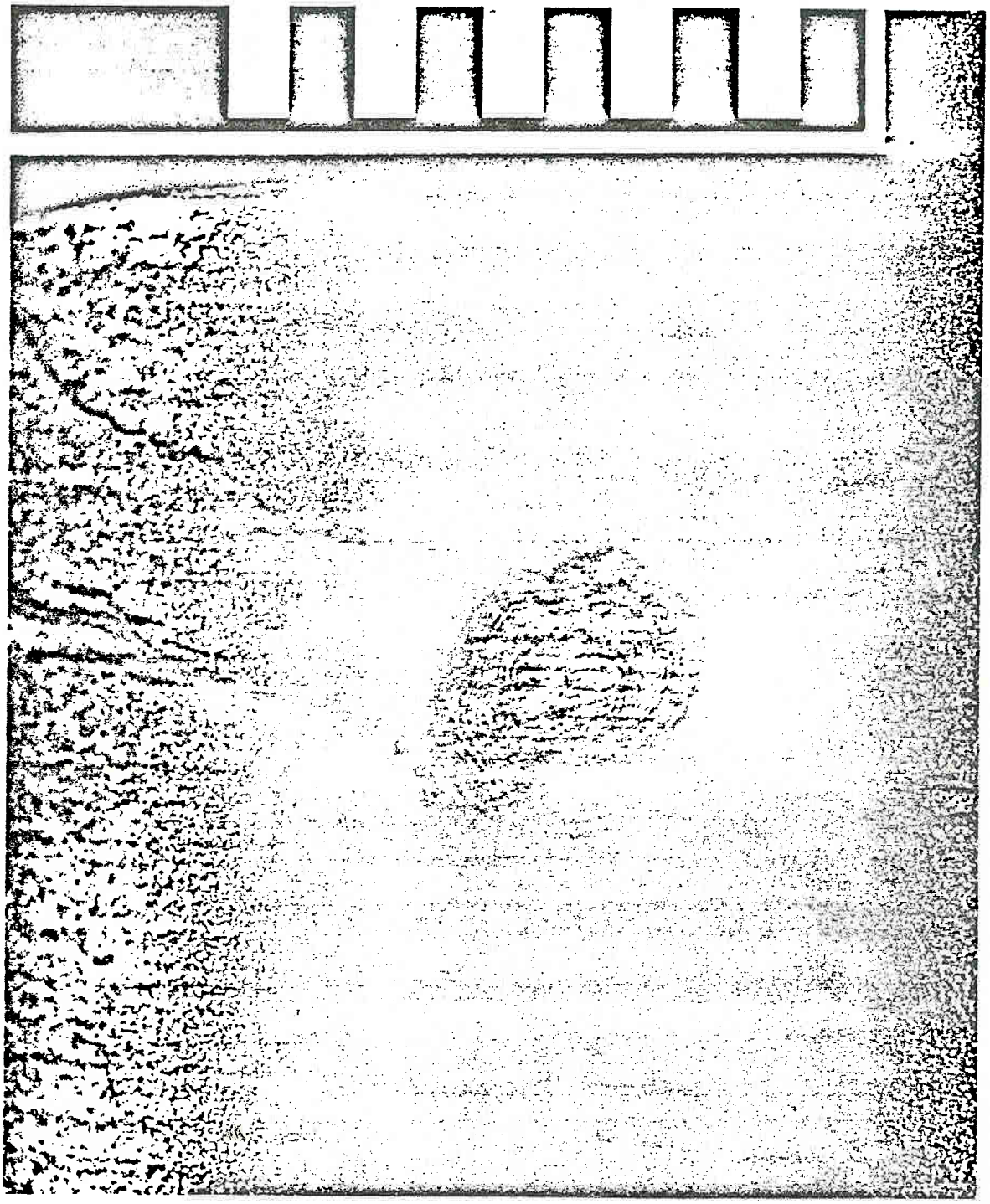


FIG. 4-30