F I G U R E S

FIG.-3.1.1 GEOLOGICAL MAP

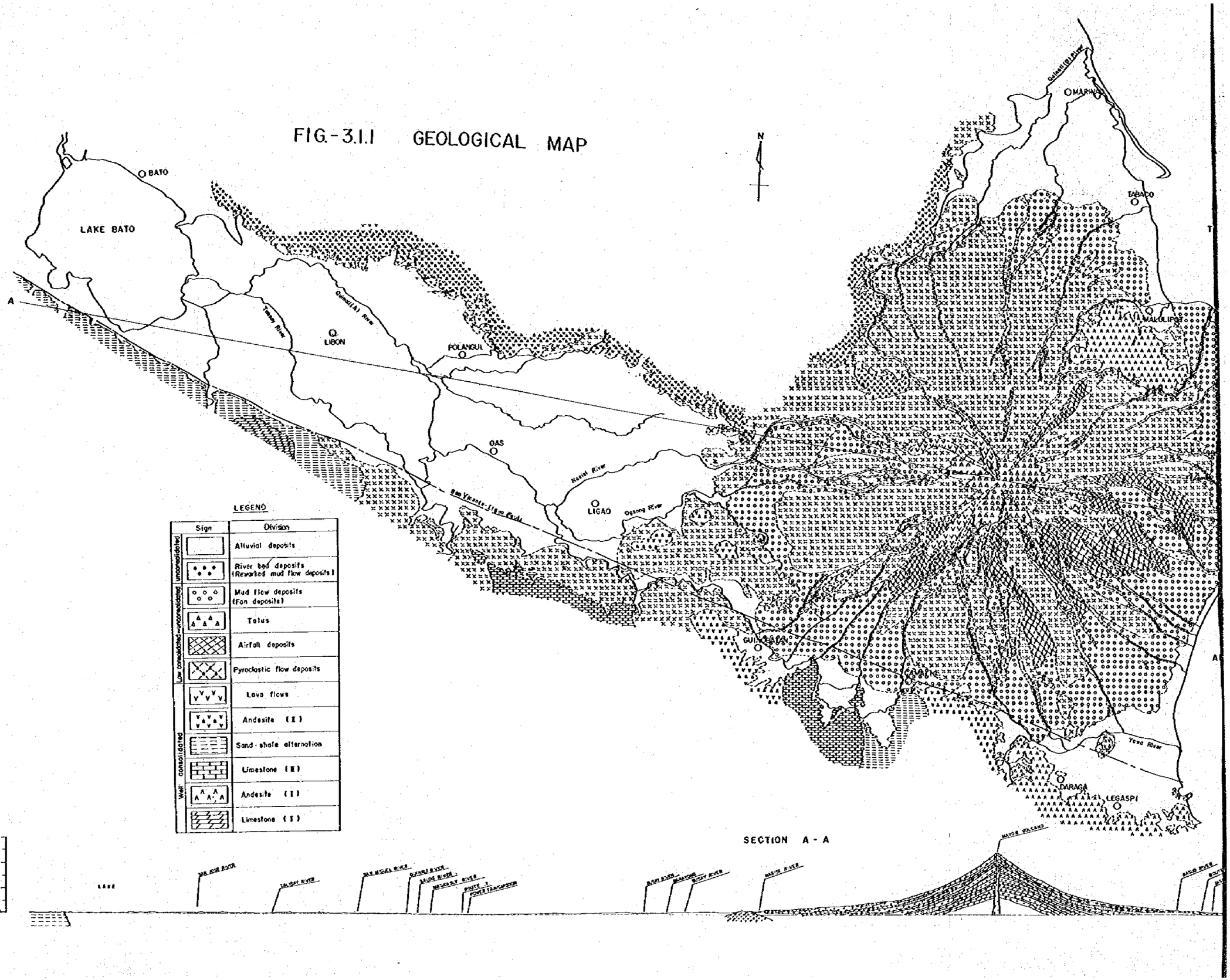
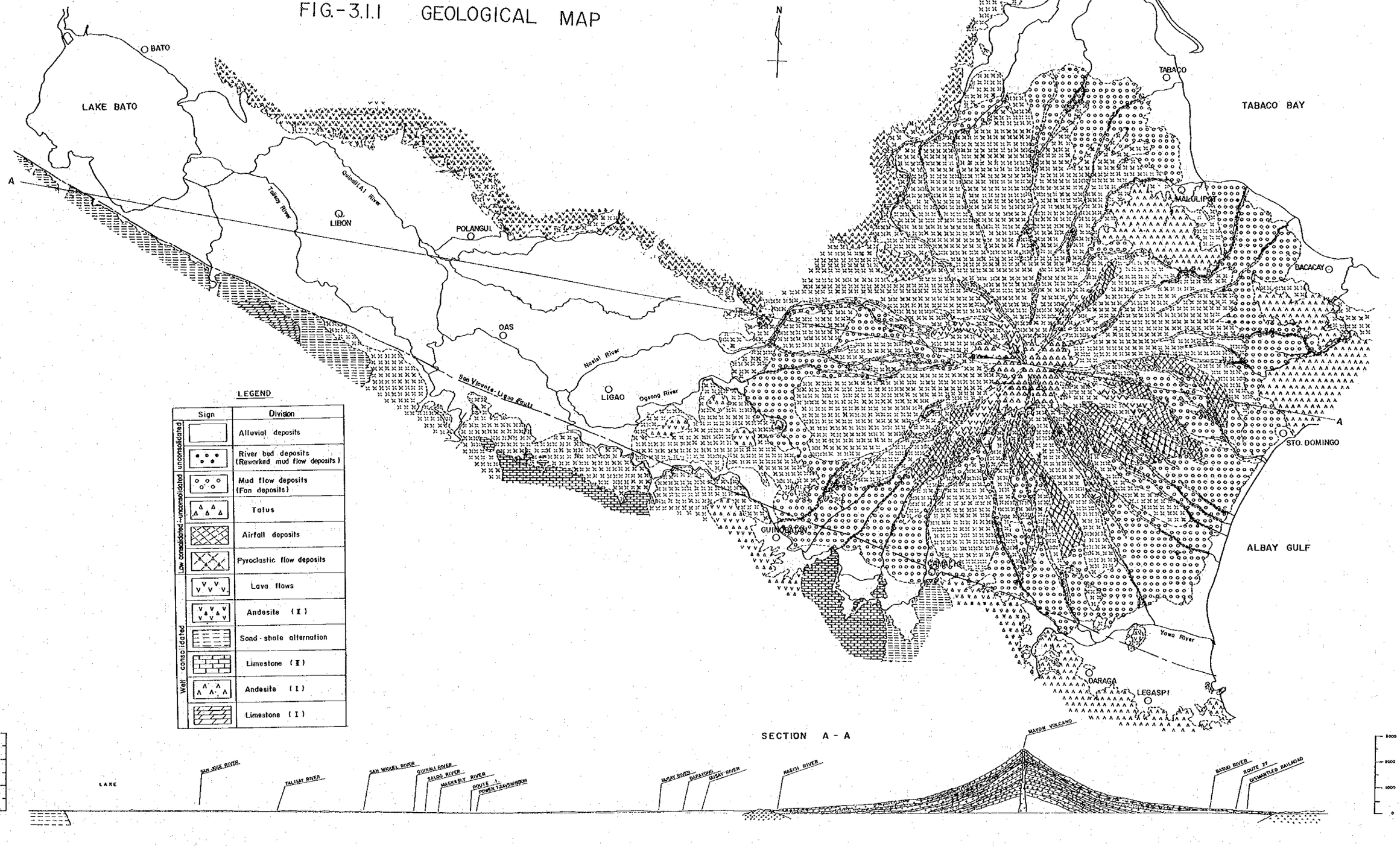


FIG.-3.1.1 GEOLOGICAL MAP

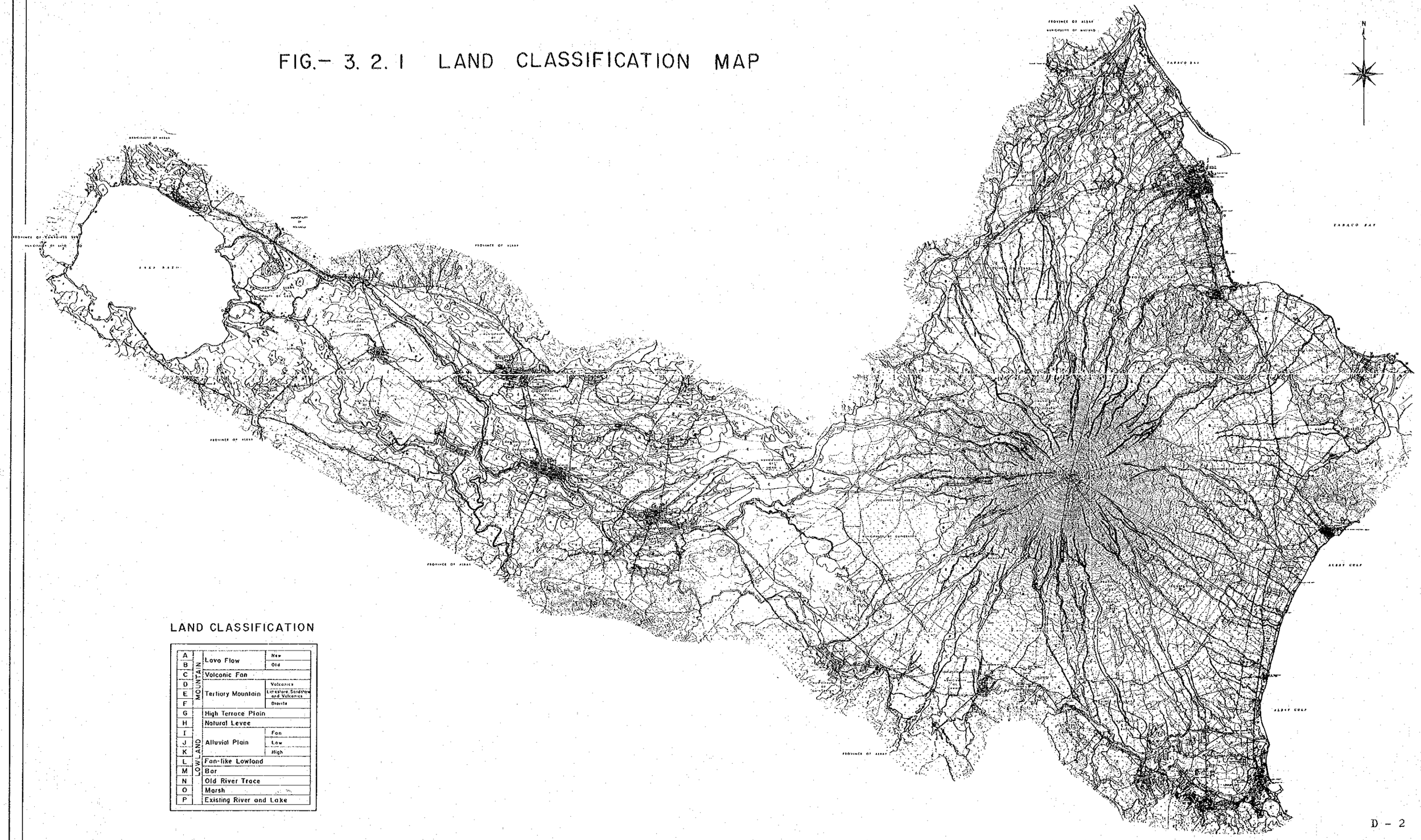


LEGEND

	Sign	Division
Unconsolidated		Alluvial deposits
		River bed deposits (Reworked mud flow deposits)
Low consolidated~unconsolidated		Mud flow deposits (Fan deposits)
		Talus
		Airfall deposits
		Pyroclastic flow deposits
Well consolidated		Lava flows
		Andesite (II)
		Sand-shale alternation
		Limestone (II)
		Andesite (I)
		Limestone (I)

SECTION A - A

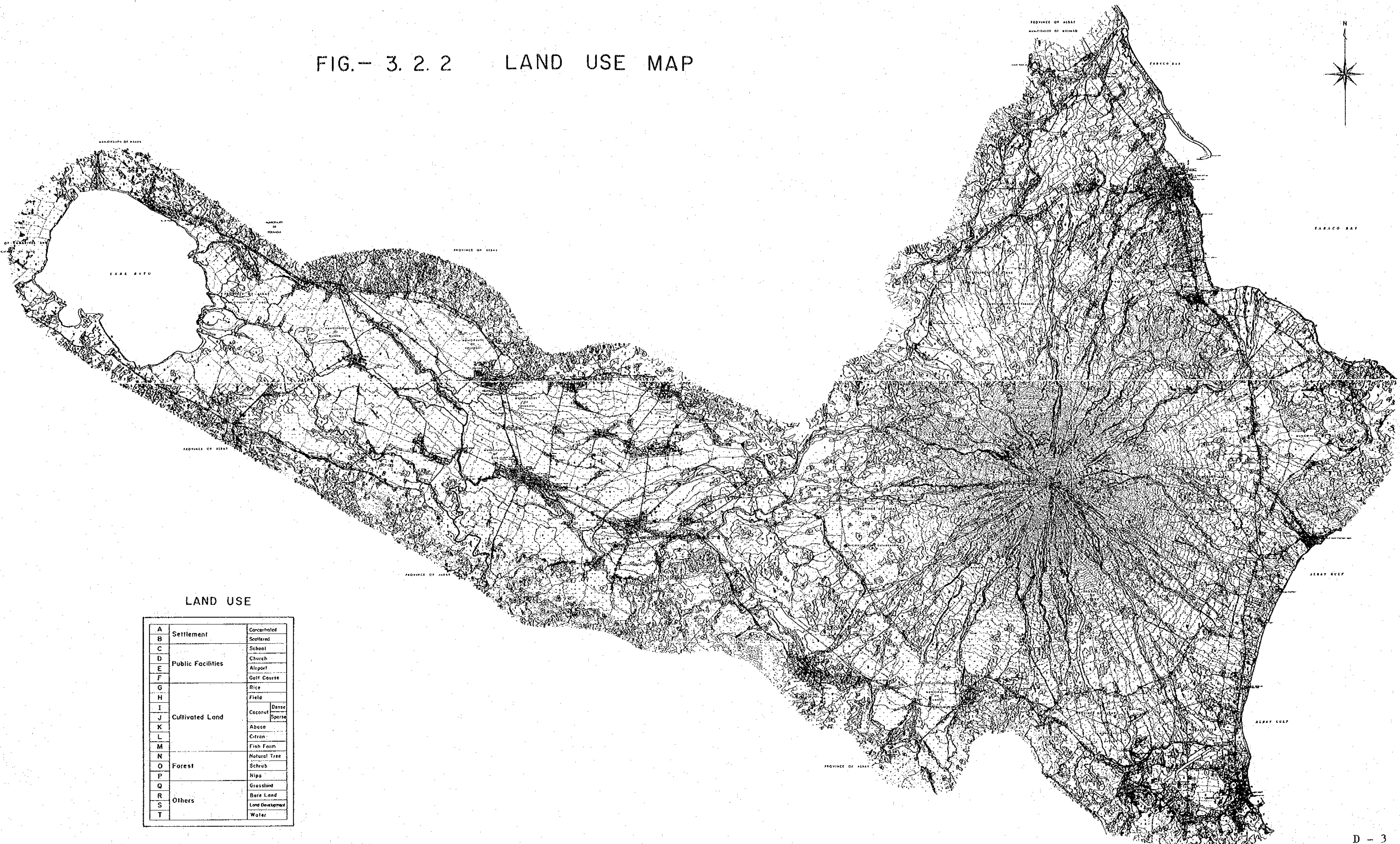
FIG.– 3. 2. 1 LAND CLASSIFICATION MAP



LAND CLASSIFICATION

A	MOUNTAIN	Lava Flow	New
B			Old
C		Volcanic Fan	
D		Tertiary Mountain	Volcanics
E			Limestone, Sandstone and Volcanics
F			Diorite
G	LOWLAND	High Terrace Plain	
H		Natural Levee	
I		Alluvial Plain	Fan
J			Low
K			High
L		Fan-like Lowland	
M		Bar	
N		Old River Trace	
O		Marsh	
P		Existing River and Lake	

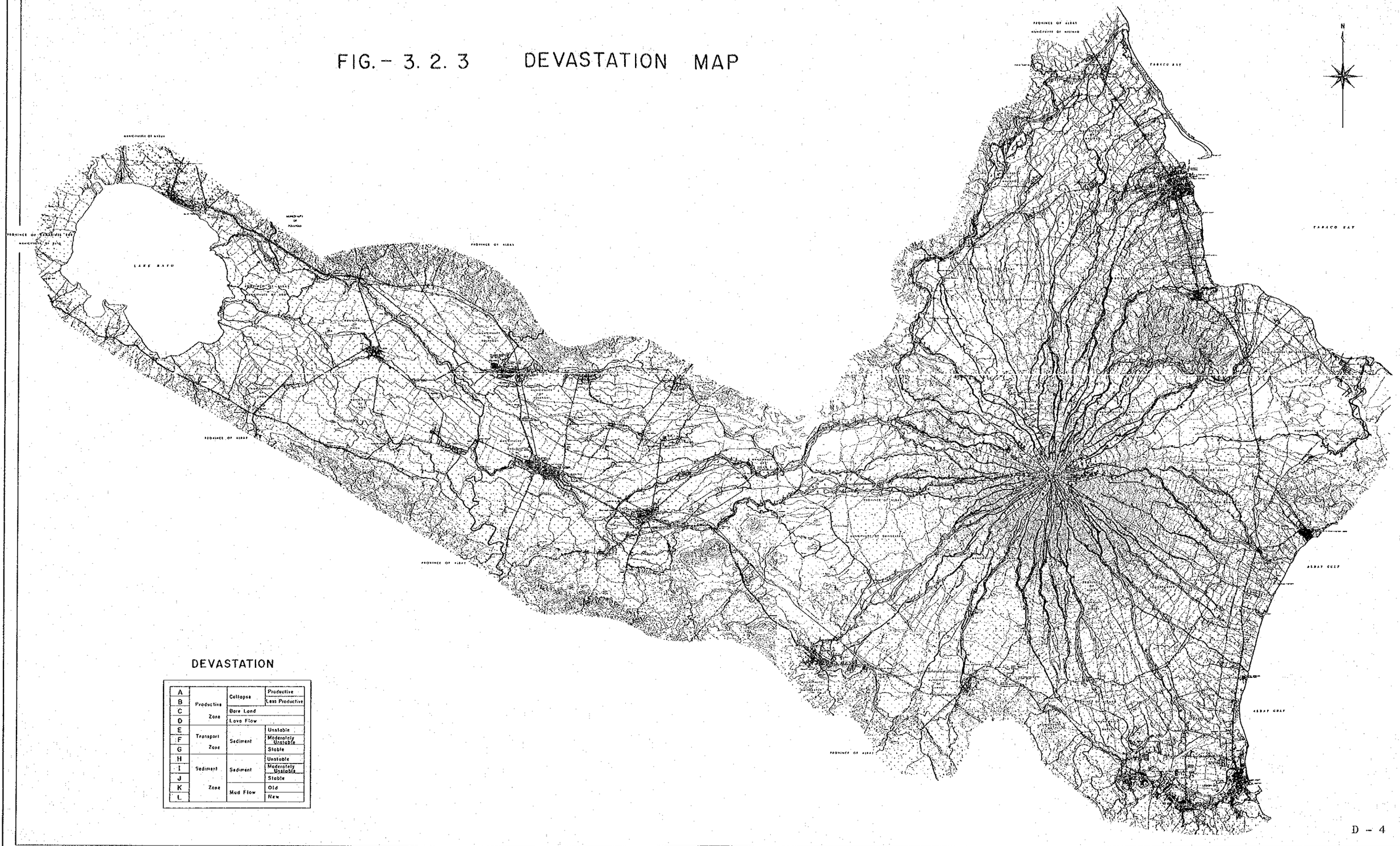
FIG.– 3. 2. 2 LAND USE MAP



LAND USE

A	Settlement	Concentrated
B		Scattered
C	Public Facilities	School
D		Church
E		Airport
F		Golf Course
G	Cultivated Land	Rice
H		Field
I		Coconut – Dense
J		Coconut – Sparse
K		Abaca
L		Citron
M		Fish Farm
N	Forest	Natural Tree
O		Schrub
P		Nipa
Q	Others	Grassland
R		Bare Land
S		Land Development
T		Water

FIG. – 3. 2. 3 DEVASTATION MAP



DEVASTATION

A	Productive Zone	Collapse	Productive
B			Less Productive
C		Bare Land	
D		Lava Flow	
E	Transport Zone	Sediment	Unstable
F			Moderately Unstable
G			Stable
H	Sediment Zone	Sediment	Unstable
I			Moderately Unstable
J			Stable
K		Mud Flow	Old
L			New

FIG. – 3. 2. 4 SLOPE MAP

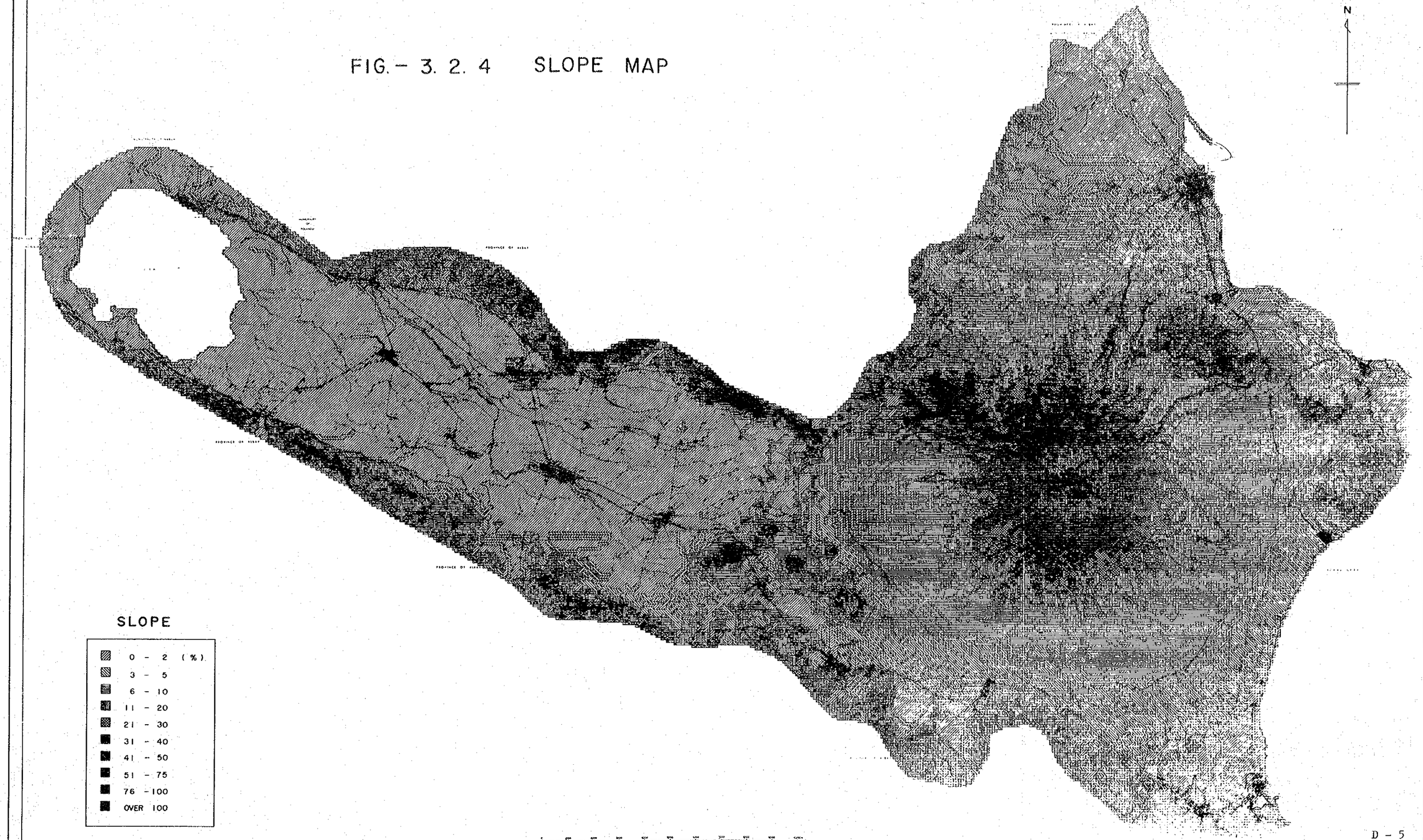


FIG.– 3.2.5 ASPECT MAP

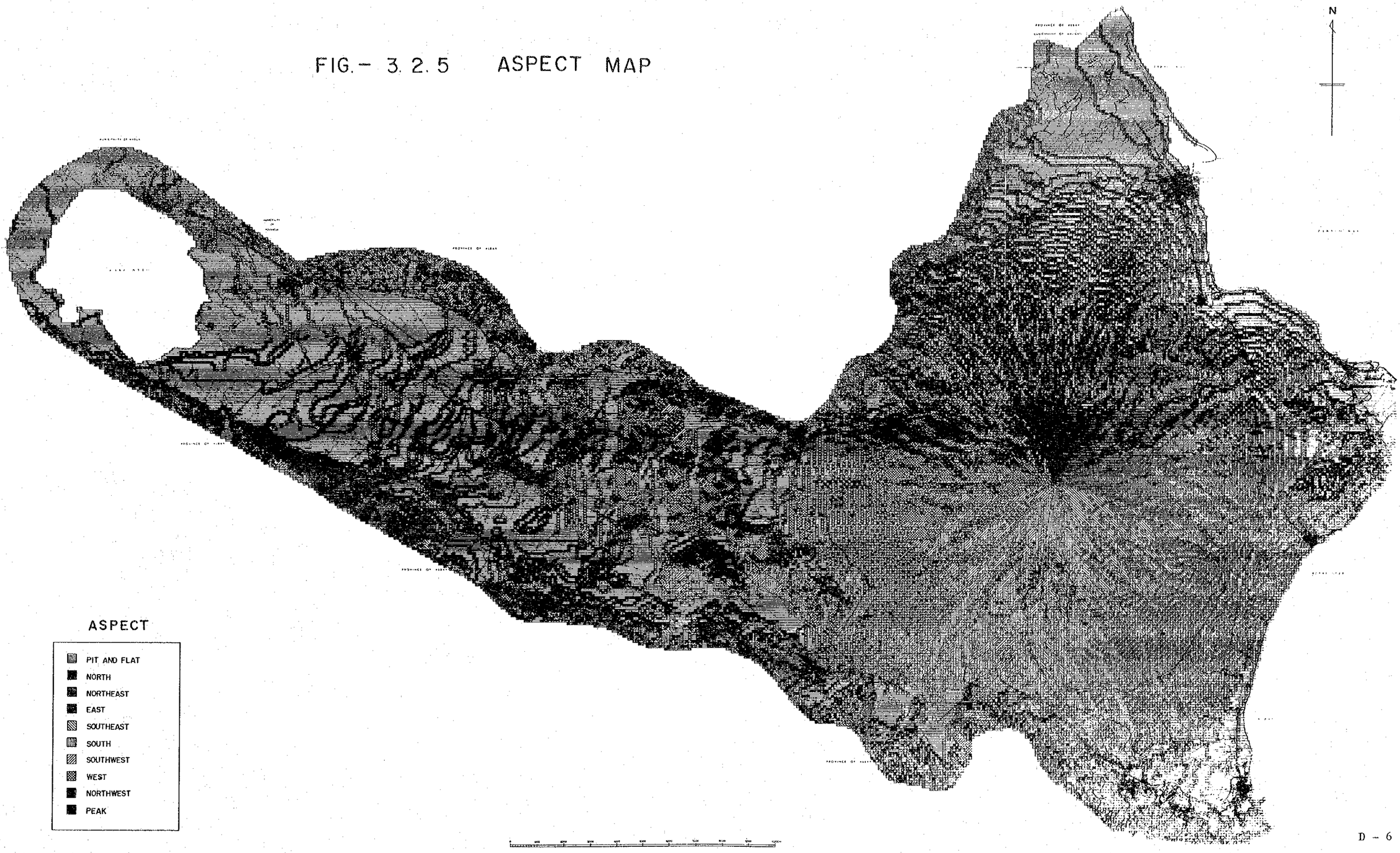


FIG.– 3. 2. 6 RIVER ORDER MAP

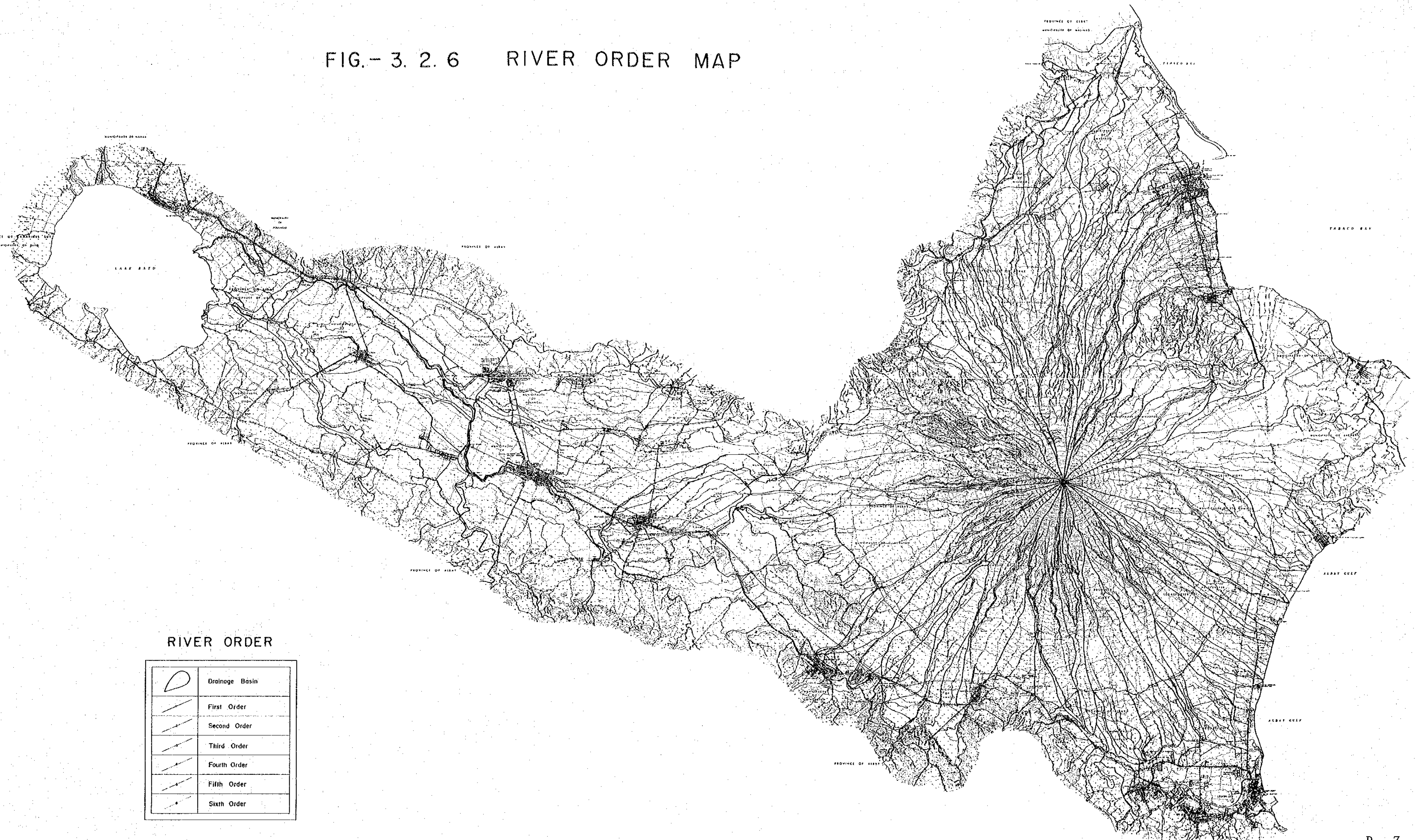
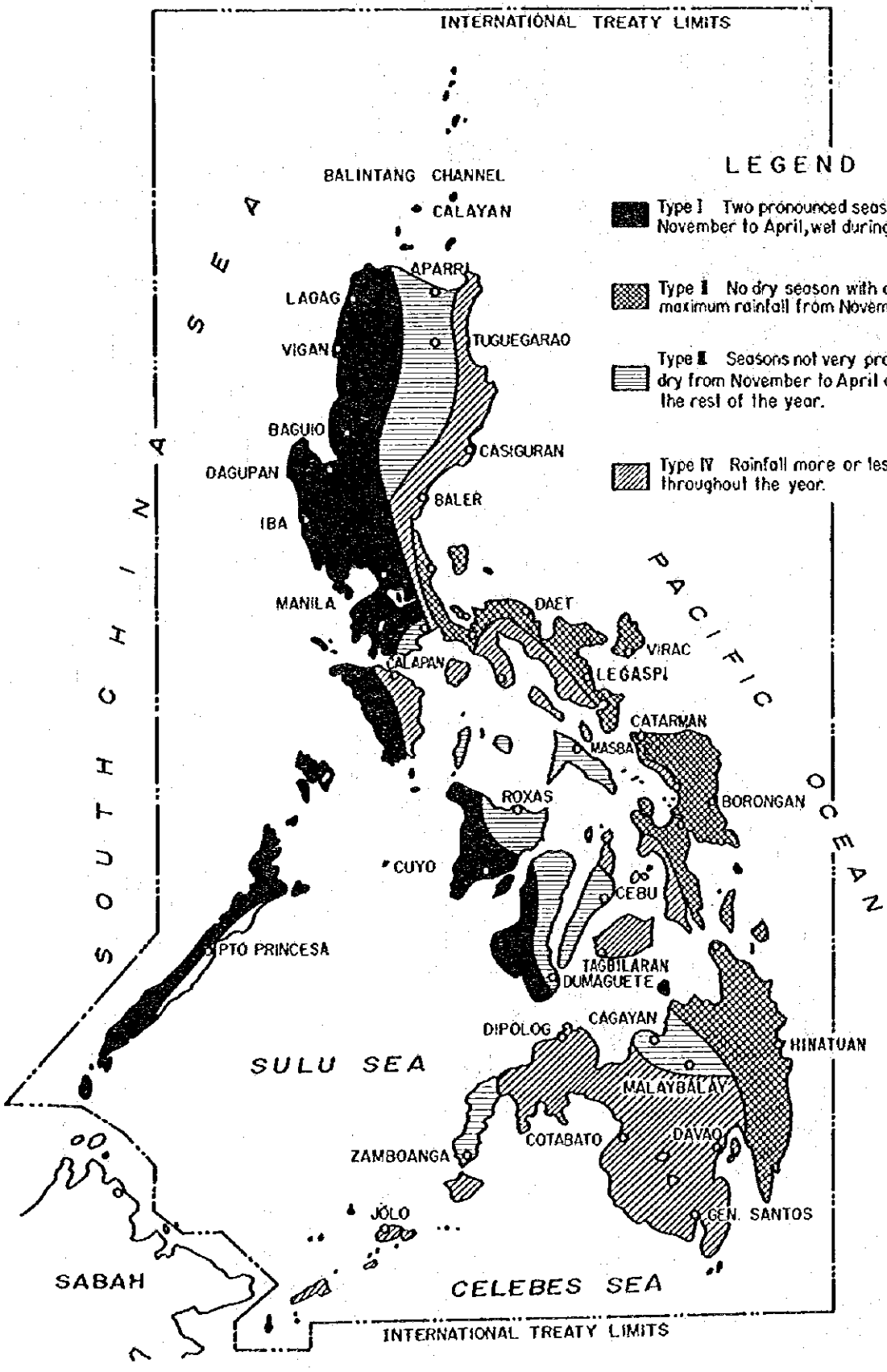


FIG.-3.3.1 CLIMATE MAP OF THE PHILIPPINES



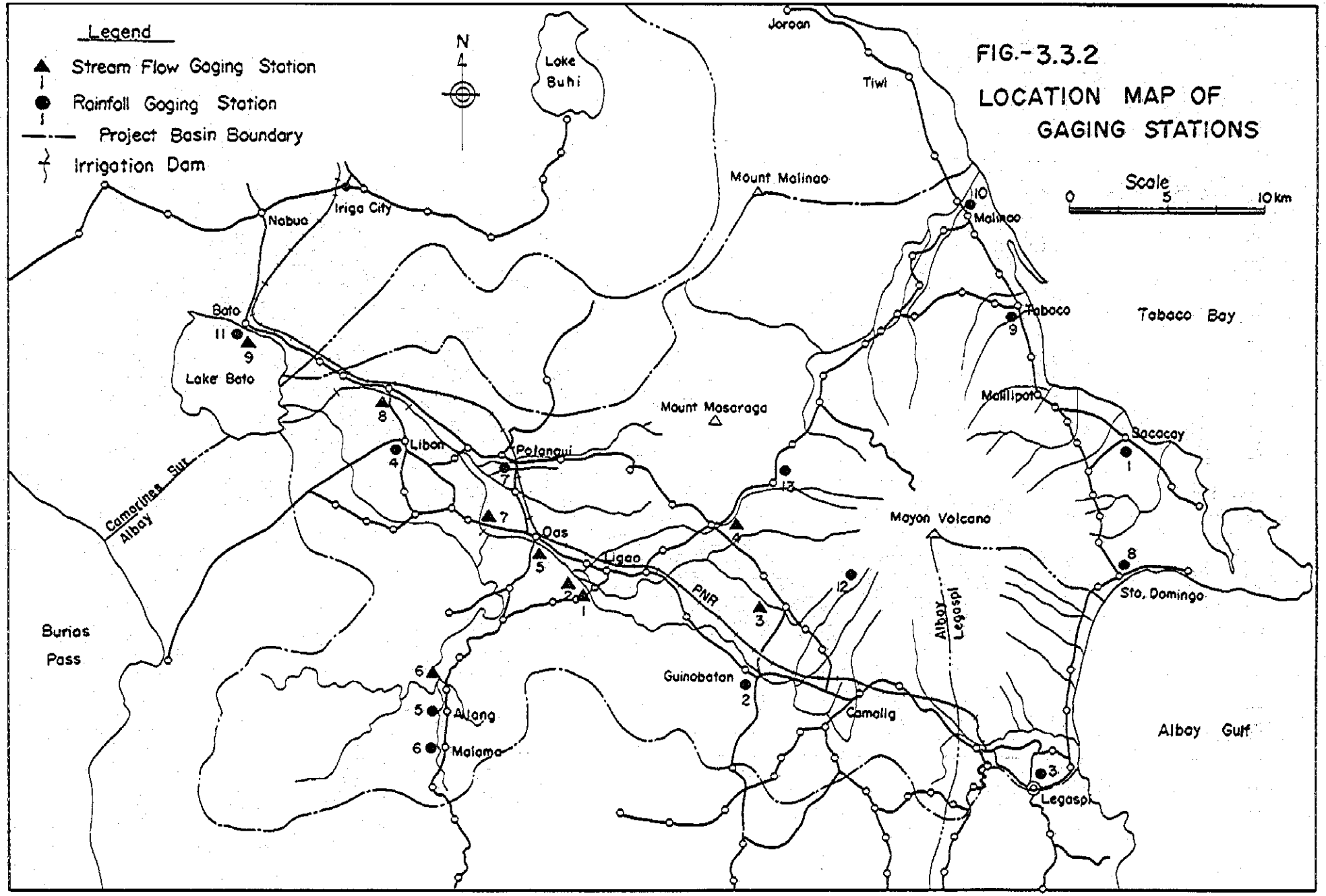

Legend
Stream Flow Gaging Station
Rainfall Gaging Station
Project Basin Boundary
Irrigation Dam
N
FIG.-3.3.2
LOCATION MAP OF
GAGING STATIONS
Scale
0 5 10 km
Joroan
Tiwi
Lake Buhi
Mount Malinao
Malinao
Nabua
Iriga City
Bato
Lake Bato
Tabaco
Tabaco Bay
Malilipot
Mount Masaraga
Libon
Polangui
Camarines Sur
Albay
Oas
Ligao
Mayon Volcano
Sto. Domingo
PNR
Albay Legaspi
Burias Pass
Guinobatan
Camalig
Albay Gulf
Legaspi
Alang
Malama

FIG.-3.5.1 PRESENT CROPPING PATTERN OF RICE,
THE QUINALI (A) RIVER BASIN

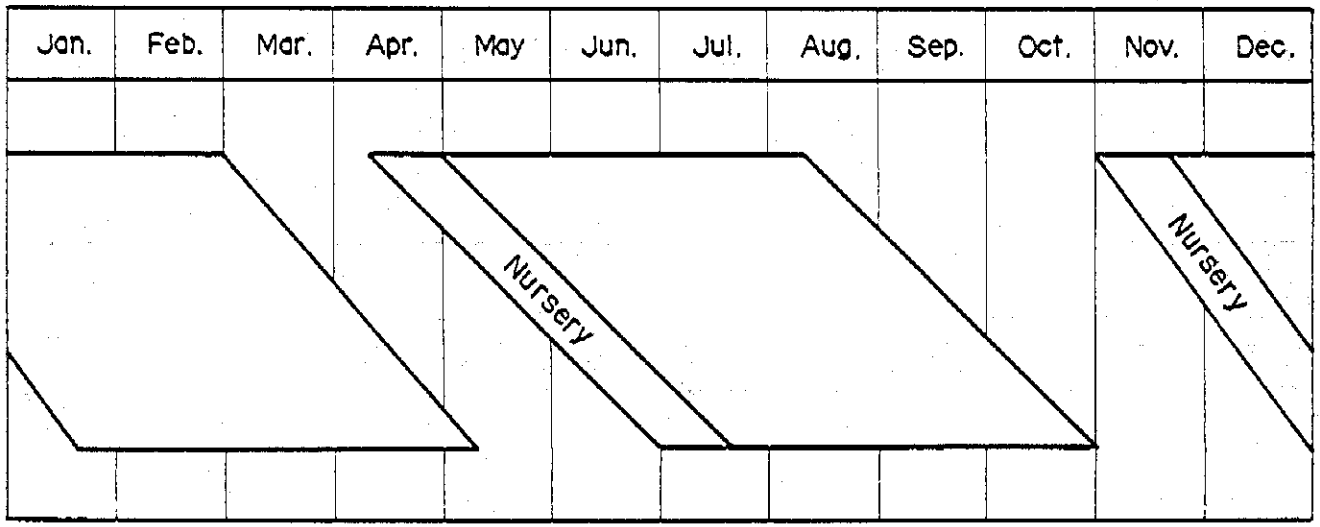


FIG.-3.5.2 PRESENT CROPPING PATTERN OF RICE,
THE QUINALI (B) RIVER BASIN

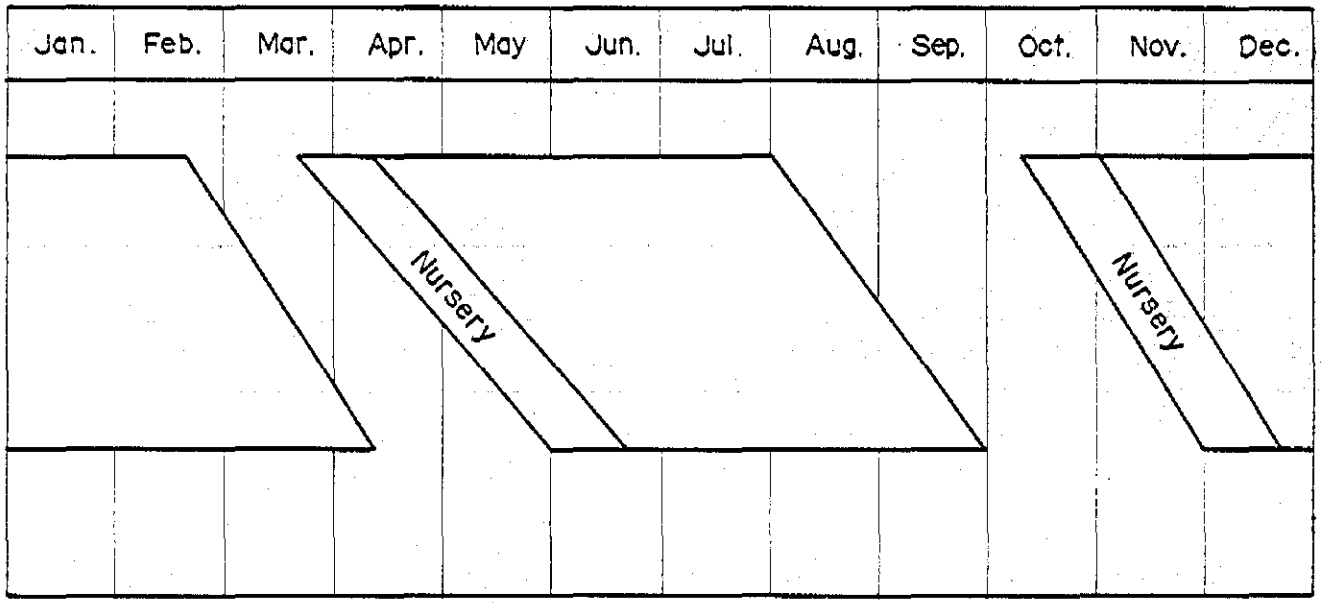
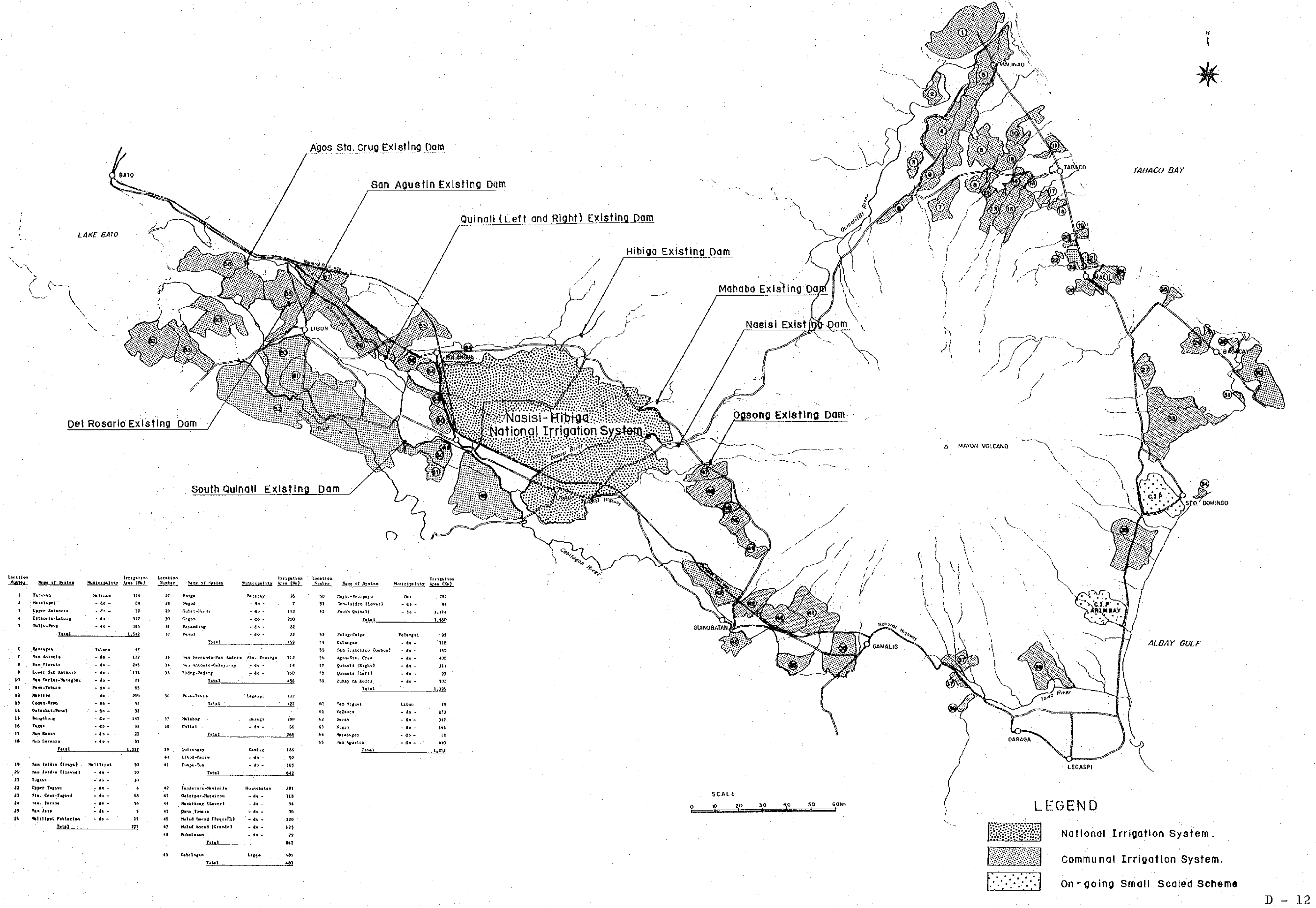
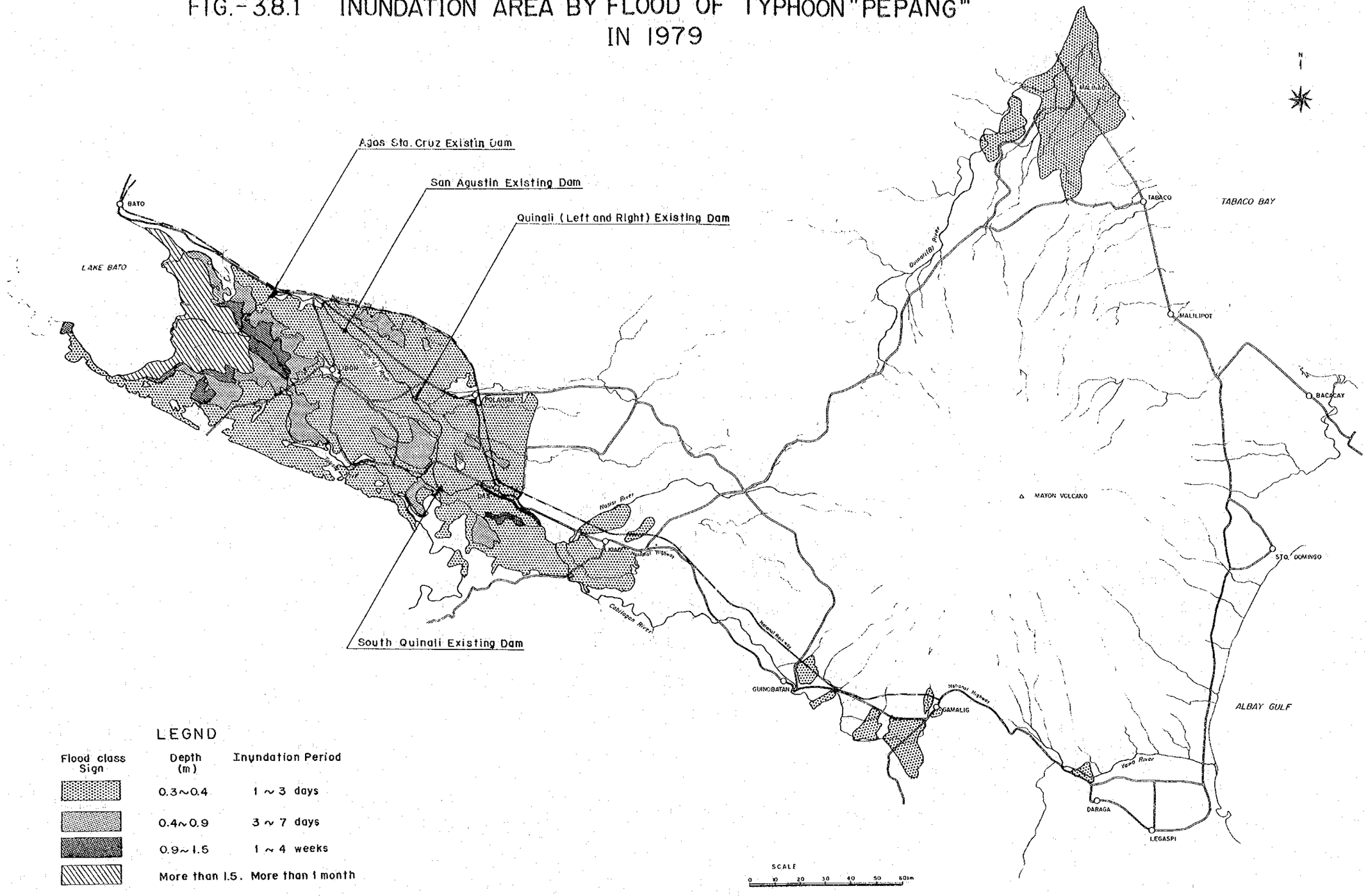


FIG.- 3.6.1 LOCATION MAP OF EXISTING IRRIGATION SYSTEMS



Location Number	Name of System	Municipality	Irrigation Area (Ha)
1	Taravan	Malinao	524
2	Matalipni	- do -	69
3	Upper Estancia	- do -	37
4	Estancia-Labnig	- do -	527
5	Tuliv-Pawa	- do -	385
	Total		1,542
6	Banlagan	Tabaco	44
7	San Antonio	- do -	172
8	San Vicente	- do -	245
9	Lower San Antonio	- do -	153
10	San Carlos-Mataglac	- do -	73
11	Pawa-Tabaco	- do -	65
12	Mapirac	- do -	200
13	Cacum-Vera	- do -	97
14	Guinobat-Panal	- do -	32
15	Bangabong	- do -	147
16	Tagas	- do -	33
17	San Ramon	- do -	21
18	San Lorenzo	- do -	30
	Total		1,317
19	San Isidro (Iraya)	Malilipot	50
20	San Isidro (Llawod)	- do -	10
21	Tagawi	- do -	10
22	Upper Tagawi	- do -	4
23	Sta. Cruz-Tagawi	- do -	68
24	Sta. Teresa	- do -	95
25	San Jose	- do -	5
26	Malilipot Poblacion	- do -	15
	Total		277
27	Bonga	Bacacay	96
28	Ongsod	- do -	7
29	Gubat-Hindi	- do -	112
30	Gogon	- do -	200
31	Bayandong	- do -	22
32	Banuel	- do -	22
	Total		459
33	San Fernando-San Andres	Sto. Domingo	312
34	San Antonio-Calayucay	- do -	14
35	Lidong-Padang	- do -	160
	Total		486
36	Pawa-Banis	Legaspi	122
	Total		122
37	Malabog	Daraga	180
38	Cullat	- do -	86
	Total		266
39	Quirangay	Camalig	185
40	Libod-Bariw	- do -	92
41	Tumpa-Sun	- do -	365
	Total		642
42	Tandarora-Maninila	Guinobatan	281
43	Calzipay-Maquiron	- do -	118
44	Masarawag (Lower)	- do -	34
45	Dona Tomasa	- do -	90
46	Malad Burad (Pequeño)	- do -	120
47	Malad Burad (Grande)	- do -	125
48	Bubulusan	- do -	79
	Total		847
49	Cabilogan	Ligao	480
	Total		480
50	Mayao-Bonipayo	Oas	282
51	San Isidro (Lower)	- do -	94
52	South Quinali	- do -	1,174
	Total		1,550
53	Balog-Culge	Polangui	95
54	Cabangan	- do -	118
55	San Francisco (Gubon)	- do -	280
56	Agos-Sta. Cruz	- do -	400
57	Quinali (Right)	- do -	315
58	Quinali (Left)	- do -	90
59	Buhay na Bodos	- do -	100
	Total		1,396
60	San Miguel	Libon	75
61	Velasco	- do -	170
62	Daran	- do -	347
63	Nogpo	- do -	165
64	Macabugos	- do -	18
65	San Agustin	- do -	430
	Total		1,212

FIG.-3.8.1 INUNDATION AREA BY FLOOD OF TYPHOON "PEPANG" IN 1979



LEGND

Flood class Sign	Depth (m)	Inundation Period
	0.3~0.4	1 ~ 3 days
	0.4~0.9	3 ~ 7 days
	0.9~1.5	1 ~ 4 weeks
	More than 1.5.	More than 1 month

FIG. - 4.1.1 DAILY RAINFALL DEPTH - AREA RELATION AFTER HORTON

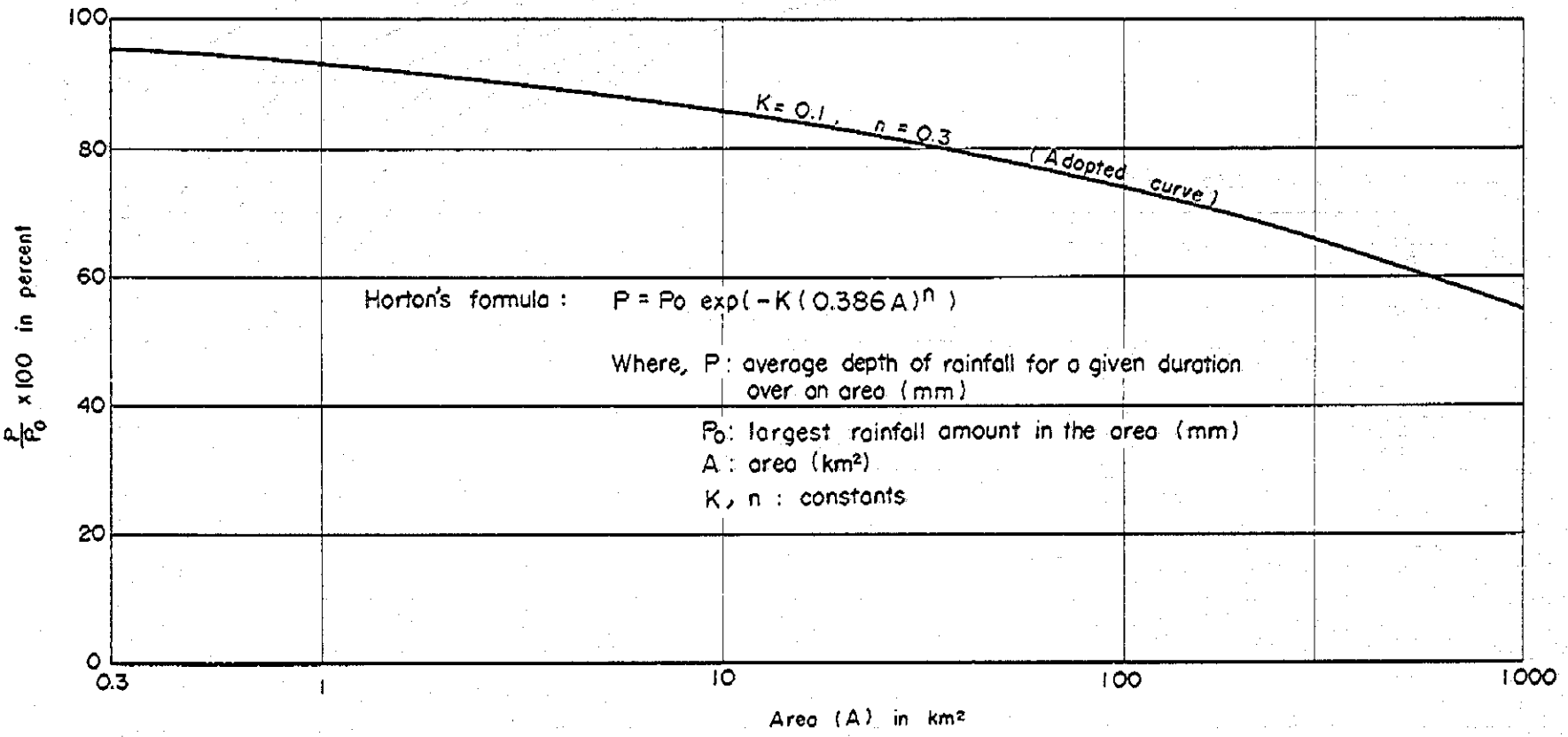
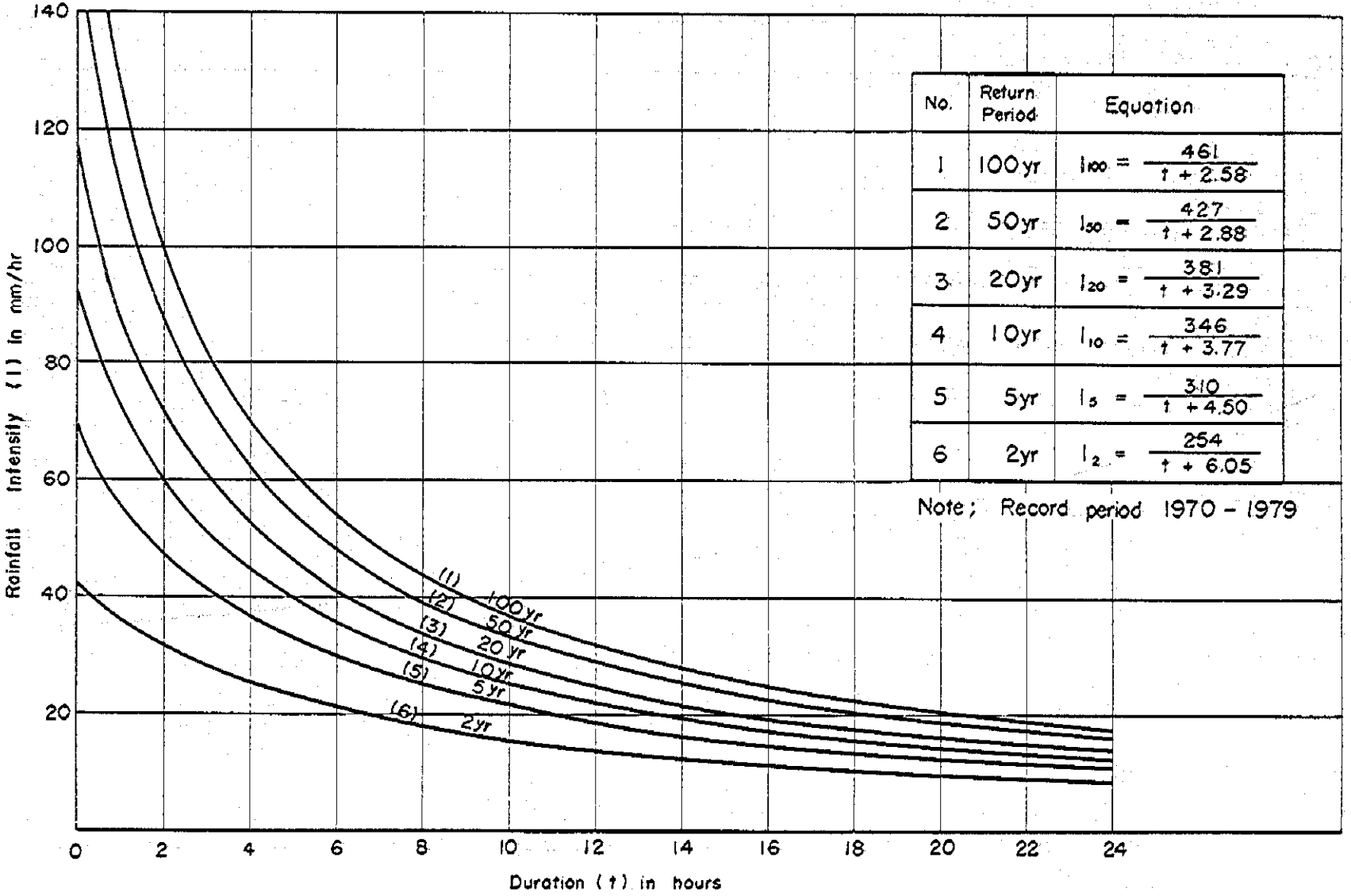


FIG.- 4.1.2 PROBABLE RAINFALL INTENSITY - DURATION CURVES FOR LEGASPI



No.	Return Period	Equation
1	100yr	$I_{100} = \frac{461}{t + 2.58}$
2	50yr	$I_{50} = \frac{427}{t + 2.88}$
3	20yr	$I_{20} = \frac{381}{t + 3.29}$
4	10yr	$I_{10} = \frac{346}{t + 3.77}$
5	5yr	$I_5 = \frac{310}{t + 4.50}$
6	2yr	$I_2 = \frac{254}{t + 6.05}$

Note; Record period 1970 - 1979

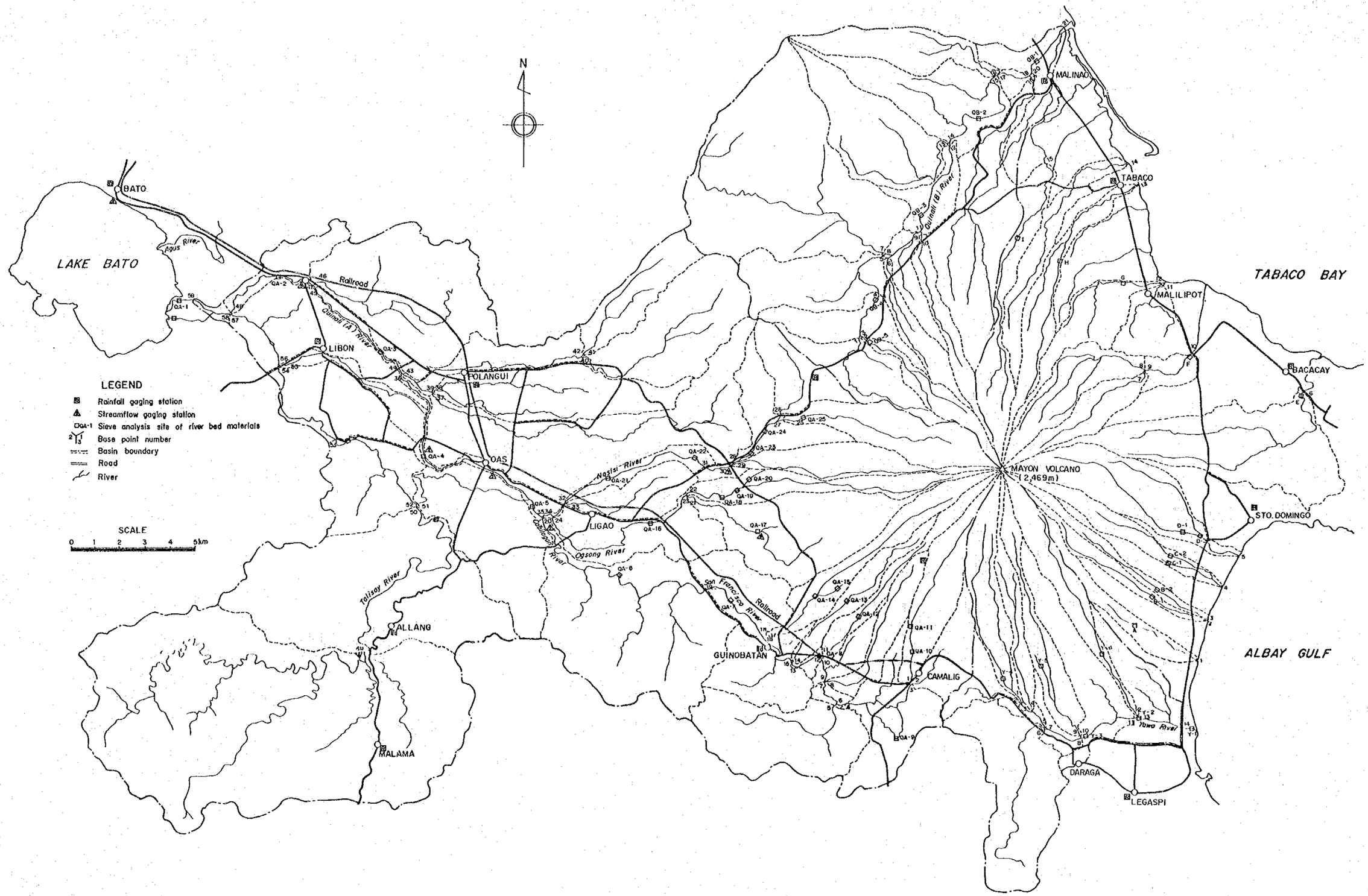


FIG.-4.1.3 BASIN MAP

FIG. - 4.1.4 SPECIFIC FLOOD DISCHARGE DIAGRAM FOR RIVERS IN THE PHILIPPINS