

(5) Bottom Outlet

F - 6

F. - 7

Description	Unit	Quantity	Unit Price			Cost		
			Total	Foreign	Local	Total	Foreign	Local
Common Excavation	m <sup>3</sup>	24,000	60	42	18	1,440,000	1,008,000	432,000
Rock Excavation	m <sup>3</sup>	8,900	130	65	65	1,157,000	578,500	578,500
Tunnel Excavation	m <sup>3</sup>	30,000	580	286	294	17,400,000	8,580,000	8,820,000
Structural Concrete	m <sup>3</sup>	5,700	2,400	704	1,696	13,680,000	4,012,800	9,667,200
Concrete Lining	m <sup>3</sup>	3,100	2,500	733	1,767	7,750,000	2,272,300	5,477,700
Concrete Filling	m <sup>3</sup>	4,800	1,200	472	728	5,760,000	2,265,600	3,494,400
Mortar Injection	m <sup>3</sup>	600	3,000	1,580	1,420	1,800,000	948,000	852,000
Curtain Grouting	m	750	2,500	1,615	885	1,875,000	1,211,250	663,750
Consolidation Grouting	m	2,000	2,500	1,615	885	5,000,000	3,230,000	1,770,000
Shotcrete ( t = 10cm )	m <sup>2</sup>	12,200	260	172	88	3,172,000	2,098,400	1,073,600
Rockbolt ( $\phi$ 25m/m, $\ell$ = 2.0m )	PC	2,800	860	570	290	2,408,000	1,596,000	812,000
Reinforcement	t	230	15,600	13,185	2,415	3,588,000	3,032,550	555,450
Miscellaneous Works	L.S.	1				6,503,000	3,083,340	3,419,660
Sub Total						71,523,000	33,916,740	37,616,260



(9) Tail race

F - 10

(10) Switchyard

F - 11



F-1-(2) BILL OF QUANTITY : MAE LAMA LUANG PROJECT  
INTEGRATED DEVELOPMENT





Mae Lama Luang Integrated Development

Construction Cost

Unit : 10<sup>6</sup>Baht

Item	Total	Currency	
		Foreign	Local
<b>Civil Works</b>			
Diversion & Care of River	227.1	114.0	113.1
Dam	533.3	348.3	185.0
Spillway	422.4	180.5	241.9
Outlet Works	7.4	3.1	4.3
Intake	35.6	15.2	20.4
Headrace and Penstock	55.6	28.0	27.6
Powerhouse	186.6	89.4	97.2
Tail-race	130.1	47.4	82.7
Switchyard	1.7	0.7	1.0
<b>Sub-total</b>	<b>1,599.8</b>	<b>826.6</b>	<b>773.2</b>
<b>Hydraulic Equipment</b>			
Diversion Gate	9.8	7.8	2.0
Spillway Gate	37.4	29.9	7.5
Intake Gate	15.9	12.7	3.2
Screen	5.2	3.6	1.6
Tail-race	6.5	5.2	1.3
Outlet Valve	15.0	11.7	3.3
Penstock	115.6	80.9	34.7
<b>Sub-total</b>	<b>205.4</b>	<b>151.8</b>	<b>53.6</b>



(2) Coffer Dam

F - 15

F - 16

Description	Unit	Quantity	Unit Price			Cost		
			Total	Foreign	Local	Total	Foreign	Local
Common Excavation	m <sup>3</sup>	31,000	60	42	18	1,860,000	1,302,000	558,000
Rock Excavation	m <sup>3</sup>	15,000	130	65	65	1,950,000	975,000	975,000
Tunnel Excavation	m <sup>3</sup>	130,000	580	286	294	75,400,000	37,180,000	38,220,000
Structural Concrete	m <sup>3</sup>	3,400	2,400	704	1,696	8,160,000	2,393,600	5,766,400
Concrete Lining	m <sup>3</sup>	14,100	2,500	733	1,767	35,250,000	10,335,300	24,914,700
Plug Concrete	m <sup>3</sup>	6,200	2,200	645	1,555	13,640,000	3,999,000	9,641,000
Shotcrete ( t = 10 cm )	m <sup>3</sup>	38,000	260	172	88	9,880,000	6,536,000	3,344,000
Rockbolt ( $\phi$ 25m/m, $\ell$ = 3.0 <sup>m</sup> )	PC	8,500	860	570	290	731,000	4,845,000	2,465,000
Reinforcement	t	520	15,600	13,185	2,415	8,112,000	6,856,200	1,255,800
Mortar Injection	m <sup>3</sup>	510	3,000	1,580	1,420	1,530,000	805,800	724,200
Curtain Grouting	m	1,650	2,500	1,615	885	4,125,000	2,664,750	1,460,250
Miscellaneous Works	L.S.	1				16,721,700	7,789,265	8,932,435
Sub Total						183,938,700	85,681,915	98,256,785







F - 20

F - 21



F - 23



**F-1-(3) BILL OF QUANTITY : MAE LAMA LUANG PROJECT  
INDIVIDUAL DEVELOPMENT**



Mae Lama Luang Individual Development

Construction Cost

Unit : 10<sup>6</sup>Baht

Item	Total	Currency	
		Foreign	Local
<b>Civil Works</b>			
Diversion & Care of River	227.1	114.0	113.1
Dam	533.3	348.3	185.0
Spillway	422.4	180.5	241.9
Outlet Works	7.4	3.1	4.3
Intake	29.7	12.7	17.0
Headrace and Penstock	46.0	23.3	22.7
Powerhouse	147.0	70.0	77.0
Tail-race	121.7	43.5	78.2
Switchyard	1.7	0.7	1.0
Sub-total	1,536.3	796.1	740.2
<b>Hydraulic Equipment</b>			
Diversion Gate	9.8	7.8	2.0
Spillway Gate	37.4	29.9	7.5
Intake Gate	13.1	10.5	2.6
Screen	4.3	3.0	1.3
Tail-race	6.5	5.2	1.3
Outlet Valve	15.0	11.7	3.3
Penstock	82.4	57.7	24.7
Sub-total	168.5	125.8	42.7



(1) Main Dam

F. - 26

(2) Coffer Dam

F - 27



F - 29

F - 30

(6) Power Intake

F - 31

(7) Penstock

F - 32

(8) Powerhouse

F - 33



F - 34

(10) Switchyard

F - 35



F-2 UNIT COST OF CIVIL WORKS



Appendix F-2 Unit Cost of Civil Works

Description	Total (₹)	FC (₹)	LC (₹)
Common Excavation			
Excavating	15.3	13.2	2.1
Loading	9.2	8.2	1.0
Hauling	18.0	11.9	6.1
Disposal	9.8	8.8	1.0
Sub-total	52.3	42.1	10.2
Indirection Cost (Overhead, Profit, Tax)	7.7	0	7.7
Total Cost	60.0	42.1	17.9

Description	TOTAL (₹)	FC (₹)	LC (₹)
Rock Excavation			
Blasting	53.9	37.4	16.5
Loading	22.0	11.3	10.7
Hauling	28.3	12.3	16.0
Disposal	8.8	4.0	4.8
Sub-total	113.0	65.0	48.0
Indirection Cost (Overhead, Profit, Tax)	17.0	0	17.0
Total Cost	130.0	65.0	65.0

Description	Total (₹)	FC (₹)	LC (₹)
Embankment Rockfill			
Blasting	24.6	20.7	3.9
Stockpile	7.2	5.9	1.3
Loading	10.3	8.0	2.3
Hauling	41.8	28.4	13.4
Spreading	10.1	8.1	2.0
Compacting	1.6	0.9	0.7
Sub-total	95.6	72.0	23.6
Indirection Cost (Overhead, Profit, Tax)	14.4	0	14.4
Total Cost	110.0	72.0	38.0



Description	Total (₹)	FC (₹)	LC (₹)
Embankment Filter Material			
Excavation	12.6	8.5	4.1
Loading	12.6	8.5	4.1
Hauling	87.5	66.5	21.0
Spreading	12.6	10.3	2.3
Compacting	5.1	4.2	0.9
Sub-total	130.4	98.0	32.4
Indirection Cost (Overhead, Profit, Tax)	19.6	0	19.6
Total Cost	150.0	98.0	52.0

Description	Total (₹)	FC (₹)	LC (₹)
Embankment Impervious Material			
Excavation	63.3	48.0	15.3
Loading	10.4	9.3	1.1
Hauling	34.0	25.1	8.9
Spreading	15.1	11.4	3.7
Compacting	7.6	4.2	3.4
Sub-total	130.4	98.0	32.4
Indirection Cost (Overhead, Profit, Tax)	19.6	0	19.6
Total Cost	150.0	98.0	52.0

Description	Total (₹)	FC (₹)	LC (₹)
Structural Concrete			
Mixing	206.9	159.1	47.8
Transporting	212.1	180.6	31.5
Placing	358.7	174.2	184.5
Formwork	411.4	0	411.4
Aggregate	236.4	190.1	46.3
Cement	661.5	0	661.5
Sub-total	2,087.0	704.0	1,383.0
Indirection Cost (Overhead, Profit, Tax)	313.0	0	313.0
Total Cost	2,400.0	704.0	1,696.0

Description	Total (₹)	FC (₹)	LC (₹)
Mass Concrete			
Mixing	206.9	159.1	47.8
Transporting	212.1	180.6	31.5
Placing	152.4	58.2	94.2
Formwork	205.9	0	205.9
Aggregate	236.4	190.1	46.3
Cement	551.3	0	551.3
Sub-total	1,565.0	588.0	977.0
Indirection Cost (Overhead, Profit, Tax)	235.0	0	235.0
Total Cost	1,800.0	588.0	1,212.0

Description	Total (₪)	FC (₪)	LC (₪)
Concrete Facing			
Mixing	206.9	159.1	47.8
Transporting	212.1	180.6	31.5
Placing	358.7	174.2	184.5
Formwork	498.4	0	498.4
Aggregate	236.4	190.1	46.3
Cement	661.5	0	661.5
Sub-total	2,174.0	704.0	1,470.0
Indirection Cost (Overhead, Profit, Tax)	326.0	0	326.0
Total Cost	2,500.0	704.0	1,796.0

## **APPENDIX—G**

### **ENVIRONMENTAL IMPACT**



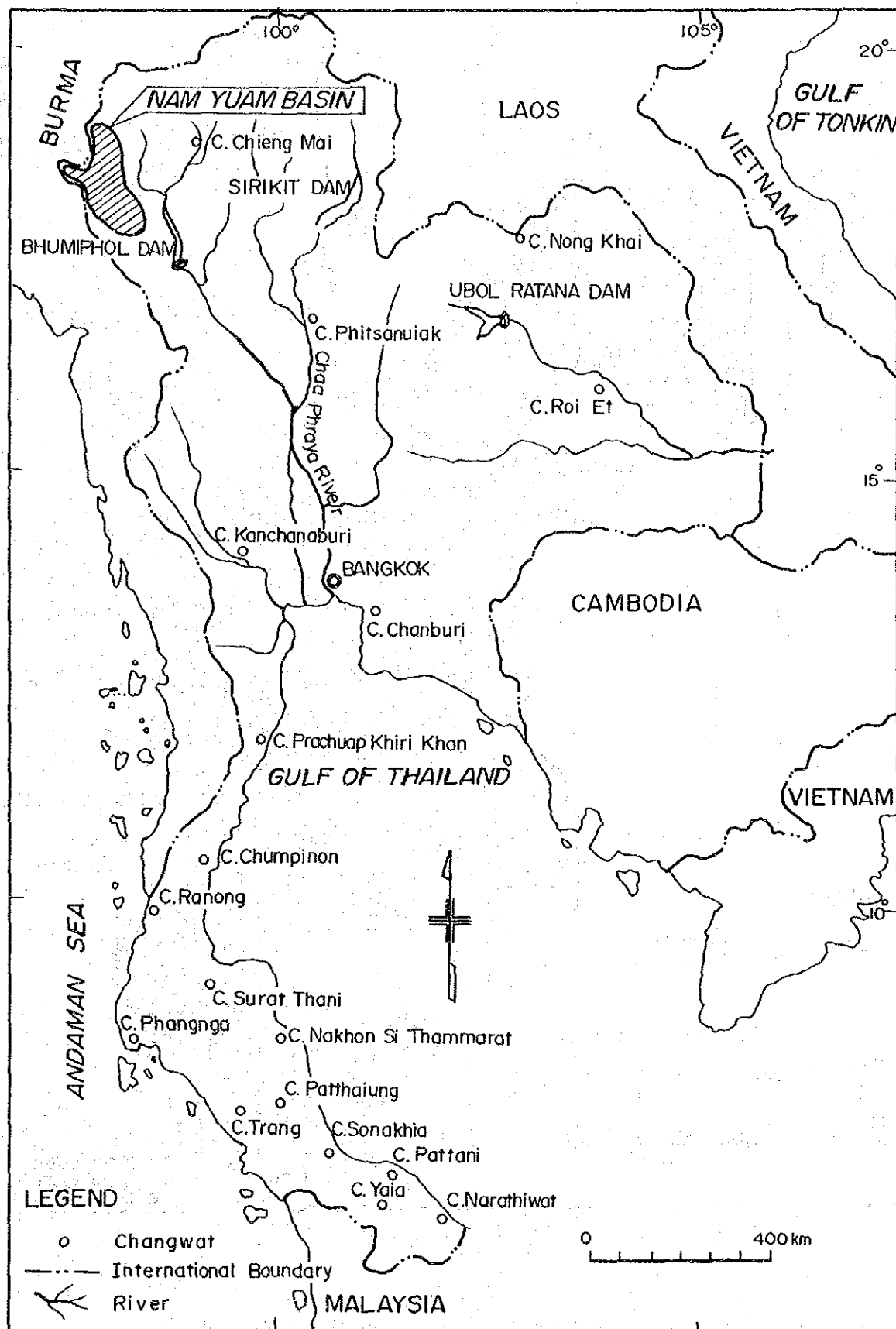


Fig. 1 LOCATION MAP



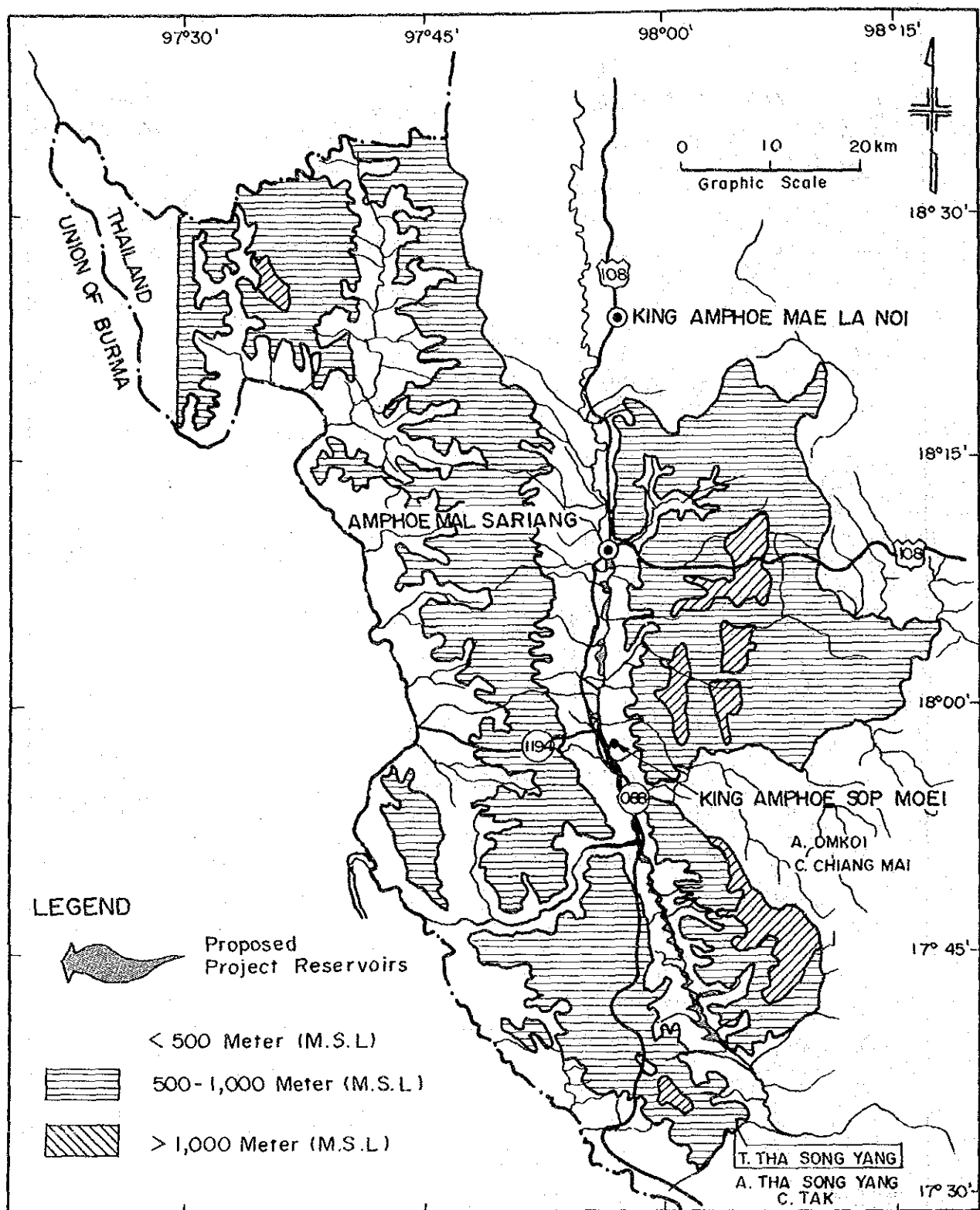


Fig.2 GENERALIZE TOPOGRAPHY IN THE PROJECT VICINITY

Table 1 Climatological Statistics at Mae Sariang Meteorological Station (1951-1980)

Station	MAE SARIANG	Elevation of station above MSL.	212 meters
Index Station	48 325	Height of barometer above MSL.	215 meters
Latitude	18° 10' N	Height of thermometer above ground	1.20 meters
Longitude	97° 56' E	Height of wind vane above ground	11.66 meters
		Height of raingauge	0.52 meters

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
<u>Pressure ( 1,000 or 900)</u>													
Mean	13.81	12.18	9.50	7.60	6.08	5.20	5.34	5.58	7.02	10.19	12.51	13.75	0.09
Ext. Max	22.61	23.92	19.88	18.20	15.16	14.24	14.19	14.19	16.54	19.48	23.98	24.99	24.93
Ext. Min.	4.58	2.75	0.06	98.03	94.95	93.20	93.90	96.38	0.46	4.30	4.48	93.20	
Mean daily range	7.17	7.49	7.46	7.05	5.49	4.22	3.93	4.30	5.28	5.95	6.24	6.74	5.95
<u>Temperature (°C)</u>													
Mean	21.7	23.6	27.6	30.7	29.3	27.2	26.6	26.3	26.0	26.8	25.2	22.4	26.2
Mean Max.	30.8	33.6	36.6	37.9	34.8	37.4	30.4	30.2	31.5	32.5	31.9	30.6	2.7
Mean Min.	13.1	12.9	16.9	22.1	24.0	23.5	23.1	23.0	23.1	22.1	19.2	15.3	19.9
Ext. Max.	36.4	38.8	41.5	44.1	42.7	38.6	35.7	36.4	37.4	36.3	36.4	36.0	44.1
Ext. Min.	3.3	6.2	8.7	13.8	19.2	20.5	20.8	20.6	19.7	13.4	6.5	5.0	3.3
<u>Relative Humidity (%)</u>													
Mean	73.0	65.0	55.0	55.0	71.0	81.0	83.0	85.0	83.0	80.0	77.0	76.0	74.0
Mean Max.	96.2	94.0	89.0	84.4	90.0	94.0	94.5	94.9	95.0	95.0	94.9	95.5	93.0
Mean Min.	43.7	34.2	29.3	33.7	53.2	68.4	71.5	73.3	68.7	62.6	55.5	49.8	53.7
Ext. Min.	17.0	15.0	13.0	16.0	21.0	44.0	49.0	40.0	44.0	32.0	24.0	23.0	13.0
<u>Dew Point (°C)</u>													
Mean	15.6	15.1	16.4	19.5	22.8	23.5	23.3	23.4	23.6	22.9	20.5	17.3	20.3
<u>Evaporation (mm.)</u>													
Mean - Pan						No Observation							
<u>Cloudiness (0 - 8)</u>													
Mean	2.9	1.7	1.5	2.7	5.7	6.9	7.2	7.2	6.4	5.3	4.1	3.6	4.6
<u>Sunshine Duration (hr.)</u>													
Mean						No Observation							
<u>Visibility (km.)</u>													
0700 L.S.T.	1.4	1.7	1.5	3.6	7.9	6.8	6.3	6.1	5.6	4.3	2.4	1.6	4.1
Mean	8.4	6.1	3.3	5.2	10.4	9.2	8.4	8.4	9.5	10.3	10.7	10.0	2.3
<u>Wind (Knots)</u>													
Prevailing wind		S	S	S	S	S	S	S	S	X	X	X	--
Mean wind speed	1.8	2.1	2.9	3.5	3.2	2.5	2.6	2.5	2.2	2.3	2.2	2.0	--
Max. wind speed	33	39 E,Sx	52	50 SSr	60	45	35 S	35 S	30 X	40 x	30	34	60 V
<u>Rainfall (mm.)</u>													
Mean	12.7	5.1	8.1	37.6	170.7	189.5	202.5	253.4	210.9	119.6	23.0	12.2	1,245.3
Mean rainy days	1.3	0.7	1.2	3.4	-16.3	24.1	25.9	26.0	20.9	12.5	3.5	2.0	137.5
Greatest in 24 hr.	49.4	38.9	61.3	62.8	131.0	95.1	57.2	92.8	113.8	96.3	76.7	58.9	131.0
Day/Year	10/75	2/53	13/71	19/77	23/80	6/55	4/64	29/71	3/69	14/60	1/56	23/61	26/80
<u>Number of days with</u>													
xxxx	20.6	24.6	29.5	22.4	2.7	0.2	0.0	0.2	0.4	3.7	7.3	12.4	124.4
Fog	22.0	12.6	5.6	1.4	0.2	0.0	0.4	0.3	0.9	6.3	16.5	22.6	89.3
Hail	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Thunderstorm	0.4	0.3	1.9	6.3	11.9	3.5	2.9	3.5	8.6	9.6	2.4	0.5	52.1
Snowfall	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1



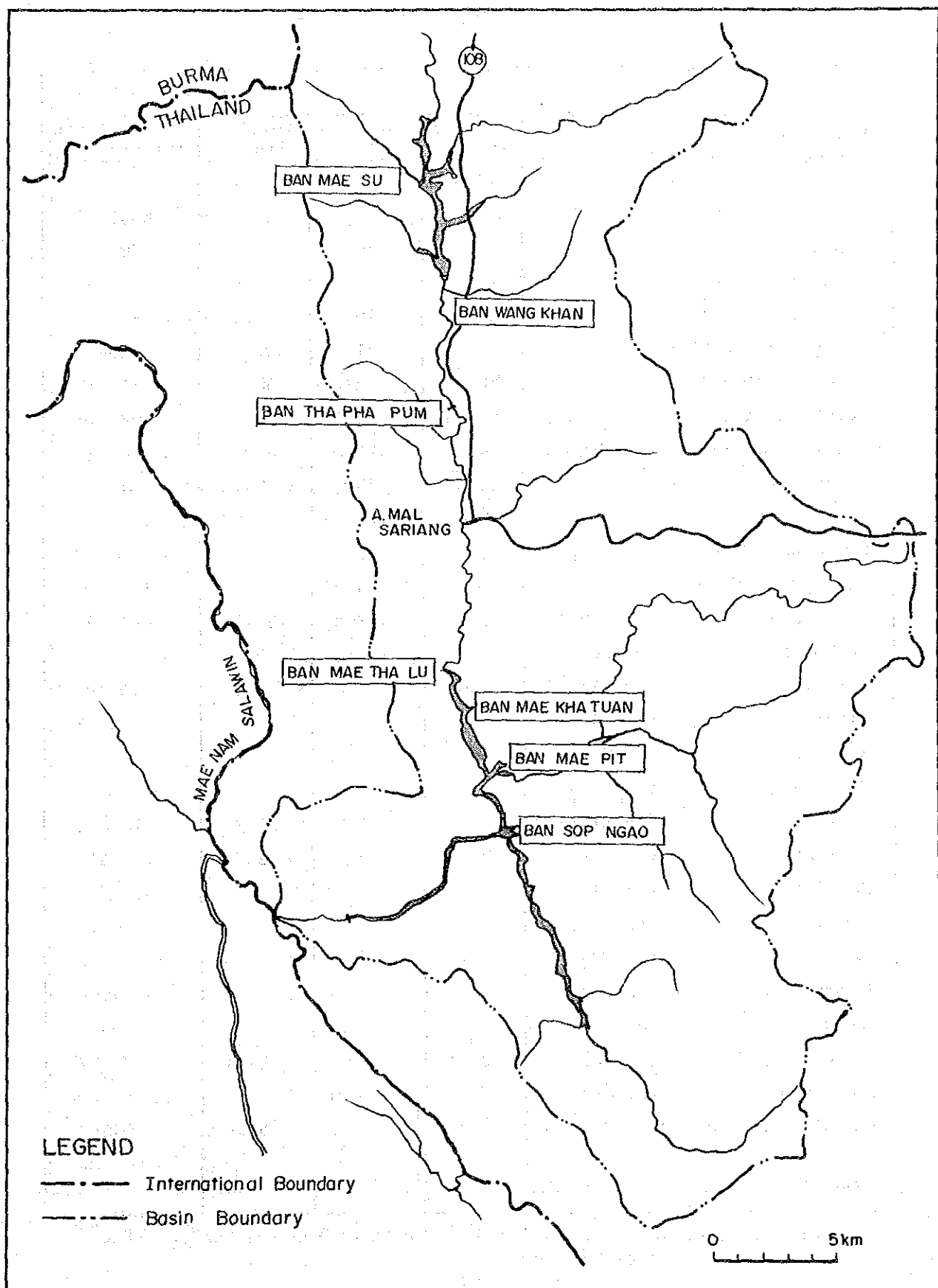


Fig.3 WATER SAMPLING STATIONS

Table 2 Physico - Chemical Properties of Water Samplers  
at 7 Water Sampling Stations

Kind of Sample				
Source	Ban Mae Tha Lu	Ban Mae Rit	Ban Wang Khan	North of Ban Tha Pha Pum
pH	7.5	7.6	7.7	7.0
Conductivity (micromhos/cm)	230	320	220	800*
Depth (cm)	30	50	80	50
Transparency (cm)				
Turbidity (NTU)	15	90	9.0	80
Temperature (°C) Water	33	31	31	32
Total Alkalinity (as CaCO <sub>3</sub> )	98	142*	88	74
Total Hardness (as CaCO <sub>3</sub> )	84	122	76	108
Calcium Hardness (as CaCO <sub>3</sub> )	64	94	64	78
Magnesium Hardness (as CaCO <sub>3</sub> )	20	28	12	30
Total Solids	128.0	1,701.0*	115.0	1,802*
Dissolved Solids	121.0	163.0	--	440
Suspended Solids	7.0	1,535.0*	--	1,362*
Bicarbonate (as HCO <sub>3</sub> )	119.6	173.2	107.4	90.3
Carbonate (as CO <sub>3</sub> )	--	--	--	--
Chloride (as CL)	5.0	3.0	4.0	152*
Nitrate (as N)				
Nitrite (as N)				
Phosphate (as PO <sub>4</sub> )				
Silica (as SiO <sub>2</sub> )	15.9	16.8	20.2	16.0
Sulfate (as SO <sub>4</sub> )	2.95	3.14	2.75	27.54*
Sulfide (as S)				
Ammonia (as N)				
Carbon Dioxide (as CO <sub>2</sub> )				
Chromium (VI) (as Cr)				
Copper (as Cu)				
Iron (as Fe)	0.43	2.3	0.51	3.32*
Manganese (as Mr)				
Oxygen Dissolved (as O)	7.0	6.0 - 6.9	5.5	7.1
Solinity (PPT)				

Remark: Water samplers at Ban Mae Rit, North of Ban Tha Pha Pum show brawn and high turbidity.

Depth, Water temperature and dissolved oxygen were collected during the field survey.

Source: Chemical and Analysis Department

Table 2 (cont')

Kind of Sample			
Source	Ban Mae Ngao	Ban Mae Kha Tuan	Ban Mae Su
pH	8.2	7.5	7.3
Conductivity (micromhos/cm)	215	210	210
Depth (cm)	30	50	50
Transparency (cm)			
Turbidity (NTU)	8.0	38.0	120*
Temperature (°C) Water	31.9	28.5	28
Total Alkalinity (as CaCO <sub>3</sub> )	100	92	88
Total Hardness (as CaCO <sub>3</sub> )	94	84	80
Calcium Hardness (as CaCO <sub>3</sub> )	64	64	64
Magnesium Hardness (as CaCO <sub>3</sub> )	30	20	16
Total Solids	122	221.0	292.5
Dissolved Solids	--	110.0	126.0
Suspended Solids	--	111	166.5
Bicarbonate (as HCO <sub>3</sub> )	107.4	112.2	107.4
Carbonate (as CO <sub>3</sub> )	7.2	--	--
Chloride (as Cl)	5.0	5.0	4.0
Nitrate (as N)			
Nitrite (as N)			
Phosphate (as PO <sub>4</sub> )			
Silica (as SiO <sub>2</sub> )	10.2	23.4	18.3
Sulfate (as SO <sub>4</sub> )	1.77	1.37	4.72
Sulfide (as S)			
Ammonia (as N)			
Carbon Dioxide (as CO <sub>2</sub> )			
Chromium (VI) (as Cr)			
Copper (as Cu)			
Iron (as Fe)	0.38	1.02	2.91
Manganese (as Mr)			
Oxygen Dissolved (as O)	8.2 - 8.9	5.8	5.6
Solinity (PPT)			

Source: Chemical and Analysis Department

Table 3 Forest Area in Mae Hong Son Province  
(Classified by Type of Forest, 1975)

Types of Forest	Plant Names	Area (rai)
1. Deciduous Dipterocarp Forest	<u>Lagerstroemia siamica</u> Gagnep <u>Shorea obtusa</u> Wall <u>Shorea siamensis</u> Miq. <u>Shidora</u> <u>Siamensia Teijsm</u> ex Miq. Family Fagaceae	3,711,636
2. Mixed Deciduous Forest with Teak	<u>Tectona grandis</u> Linn. f. <u>Azalia xylocarpa</u> Roxb. <u>Chukrasia venlutina</u> W. & A. <u>Diospyros mollis</u> Griff <u>Pterocarpus macrocarpus</u> Kurz. Family Lythraceae Family Myristicaceae Family Gramineae	3,541,942
3. Hill Evergreen Forest	<u>Castanopsis acuminatissima</u> Rehd. <u>Castanopsis argentea</u> A. Dc. <u>Quercus poilanei</u> Hick. & A. Camus <u>Eugenia cumini</u> (L.) Druce Family Pinaceae Family Fagaceae Grounding Plant: Fern, Moss, <u>Bromheadia finlaysoniana</u> Reichb. f.	69,126
4. Pine Forest	Family Pinaceae	78,607

Table 3 (con't) Forest Area in Mae Hong Son Province  
(Classified by Type of Forest 1975)

Types of Forest	Plant Names	Area (rai)
5. Dry Evergreen Forest	<u>Dipterocarpus alatus</u> Roxb. <u>Afelia xylocarpa</u> Roxb. Family Lythraceae	1,692
6. Disturbed Deciduous Dipterocarp Forest	--	361,677
7. Mixed Deciduous Forest with Disturbed Teak	--	138,099
8. Mixed Deciduous Forest with Undisturbed Teak	--	24,831
9. Disturbed Hill Evergreen Forest	--	1,538
Total rai	--	7,929,130
Total sq. km.	--	12,686.60

Source: Social Research Institute, Chiang Mai University 1983



Table 4 Freshwater Fauna Quality and Utilization at Amphoe Mae Sariang,  
Mae Hong Song Province (1980 - 1983)

Freshwater Fauna's Name	1980		1981		1982		1983	
	Total Catch (kg)	Sale or Consume (kg)	Total Catch (kg)	Sale or Consume (kg)	Total Catch (kg)	Sale or Consume (kg)	Total Catch (kg)	Sale or Consume (kg)
1. Striped Snake-Head	24,500	22,650	500	500	600	600	350	350
2. <u>Clarias spp.</u>	15,200	14,680	750	750	500	500	250	250
3. Climbing Perch	8,315	8,315	200	200	--	--	--	--
4. <u>Puntius spp.</u>	1,460	1,460	1,000	1,000	500	500	600	600
5. <u>Tilapia spp.</u>	1,250	1,250	--	--	2,000	2,000	800	800
6. <u>Cyprinus spp.</u>	1,830	1,830	2,000	2,000	--	--	700	700
7. Swamp eel	--	--	450	450	700	700	200	200
8. Other Fish	25,400	19,900	3,000	3,000	3,500	3,500	2,500	2,500
9. Shrimp	1,780	1,480	400	400	200	200	150	150
10. Other Freshwater Fauna	2,370	2,220	1,200	1,200	500	500	300	300
Total	82,105	73,535	9,500	9,500	8,500	8,500	5,850	5,850

Source: Mae Sariang, Amphoe Fisheries Office

Remark: Not classified by freshwater fauna's source

Table 5 List of Fish Names in the Salawin River

Scientific Name	Common Name	Year 1945	Year 1981
Family Notopteridae			
1) <u>Notopterus notoptrus</u> (Pallas)	Hang-Pan	-	+
Family Mastacembelidae			
2) <u>Mastacembelus armatus</u> Gunther	Lard	-	+
3) <u>Mastacembelus unicolor</u> Cuvier and Valenciennes	Lard	-	+
Family Anguillidae			
4) <u>Anguilla australis</u> Richardson	Sa-Ngik	-	+
Family Flutidae			
5) <u>Fluta albe</u> (Zuiew)	Yian	-	+
Family Cyprinidae			
6) <u>Danio regina</u> Fowler	Siew	-	+
7) <u>Danio aequipinnatus</u> (Mc Clelland)	Siew	-	+
8) <u>Rasbora myersi</u> Brittan	Siew	-	+
9) <u>Aspidoparia morar</u> (Hamilton)	-	-	+
10) <u>Mystacoleucus argenteus</u> (Day)	Hang-Luane	-	+
11) <u>Hampala macrolepidota</u> van Hasselt	Kasooop	-	+
12) <u>Tor (Folifer) brevifilis</u> <u>brevifillilis</u> (Peters)	Kor-Moer-Nang	-	+
13) <u>Tor tambroides</u> (Bleeker)	-	-	+
14) <u>Tor stracheyi</u> (Day)	Yard	+	-
15) <u>Tor soro</u> (Cuvier and Valenciennes)	Mung	+	+
16) <u>Rohtee alfrediana</u> (Cuvier and Valenciennes)	Kai-Ong	-	+
17) <u>Barilius pulchellus</u> Smith	Kaem	-	+

Table 5 (Cont') List of Fish Names in the Salawin River

Scientific Name	Common Name	Year 1945	Year 1981
18) <u>Barilius guttatus</u> (Day)	Ma-Hung	+	+
19) <u>Puntius stoliczkae</u> (Day)	Mung-Maie	+	+
20) <u>Puntius daruphani</u> Smith	Sa-Pag	-	+
21) <u>Puntius orphoides</u> (Cuvier and Valenciennes)	-	-	+
22) <u>Chagunius chagunio</u> (Hamilton)	Hang-Daeng	+	+
23) <u>Acrossocheilus vittatus</u> Smith	Jad	+	-
24) <u>Acrossocheilus malcomi</u> Smith	Jad	-	+
25) <u>Acrossocheilus deauratus</u> (Cuvier and Valenciennes)	-	-	+
26) <u>Acrossocheilus bantamensis</u> (Rendahl)	-	+	-
27) <u>Scaphiodonichthys burmanicus</u> Vinciguerra	Mum, Kam	+	+
28) <u>Labeo dyocheilus</u> (McClelland)	Va	+	+
29) <u>Labeo calbasu</u> (Hamilton)	-	+	-
30) <u>Labeo behri</u> Fowler	-	-	+
31) <u>Garra fuliginosa</u> Fowler	Mud	-	+
32) <u>Garra</u> sp.	-	-	+
33) <u>Epalzeorhynchus siamensis</u> Smith	Mon	+	-
34) <u>Crossocheilus</u> sp.	Mon	-	+
35) <u>Balitor brucei</u> Gray	-	+	+
36) <u>Homaloptera sexmaculata</u> Fowler	-	-	+
37) <u>Lepidocephalus octocirrhus</u> (Van Hasselt)	Sai	-	+
38) <u>Noemacheilus multifasciatus</u> Day	Bou	+	+
39) <u>Noemacheilus waltoni</u> Fowler	Bou	+	+
40) <u>Noemacheilus sexcauda</u> Fowler	Bou	-	+

Table 5 (Cont') List of Fish Names in the Salawin River

Scientific Name	Common Name	Year 1945	Year 1981
41) <u>Noemacheilus reidi</u> Smith	Bou	+	+
42) <u>Silurichthys leucopodus</u> Fowler	Varn	-	+
43) <u>Ompok bimaculatus</u> (Bloch)	-	-	+
Family Clariidae			
44) <u>Clarias batrachus</u> (Linnaeus)	Duk	-	+
Family Schilbeidae			
45) <u>Eutropiichthys vacha</u> (Hamilton)	-	+	-
Family amblycipitidae			
46) <u>Amblyceps mangois</u> (Hamilton)	Dack	-	+
Family Bagridae			
47) <u>Mystus seenghala</u> Day	Kod Hour Seab	-	+
48) <u>Mystus bleekeri</u> Day	-	-	+
49) <u>Mystus microphthalmus</u> Day	-	-	+
Family Sisoridae			
50) <u>Bagarius yarrelli</u> (Sykes)	Kae	-	+
51) <u>Gagata cenia</u> (Hamilton)	-	+	-
52) <u>Hara hara</u> (Hamilton)	-	-	+
53) <u>Exostoma vincigurrae</u> Ragan	-	-	+
54) <u>Pseudecheneis sulcatus</u> (Mac Clelland)	-	-	+
55) <u>Glyptothorax platypogonoides</u> (Bleeker)	Kong-Kang, Tek-Hin	+	+
56) <u>Glyptothorax trilineatus</u> Blyth	Tek-Hin	-	+
57) <u>Glyptothorax dorsalis</u> Vinciguerra	-	-	+
58) <u>Glyptothorax</u> sp.	-	-	+

Table 5 (Cont') List of Fish Names in the Salawin River

Scientific Name	Common Name	Year 1945	Year 1981
Family Belontiidae			
59) <u>Xenentodon cancella</u> (Hamilton)	Som-Mok	+	+
Family Anabantidae			
60) <u>Trichogaster trichopterus</u> (Pallas)	Slak	+	-
Family Ophicephalidae			
61) <u>Ophicephalus marulius</u> Hamilton	Lim-Hang-Qua	-	+
62) <u>Ophicephalus striatus</u> Bloch	Lim, Kor	-	+
63) <u>Ophicephalus gachua</u> Hamilton	Kang	+	+
Family Centroponidae			
64) <u>Chanda siamensis</u> Fowler	-	-	+
65) <u>Chanda ranga</u> Hamilton	Peir, Wee	+	-
66) Unknown species	Hour-Luam	-	+

Source: Somposh Akatavewat, 1982

Remark: + Fish was found  
 - Fish wasn't found

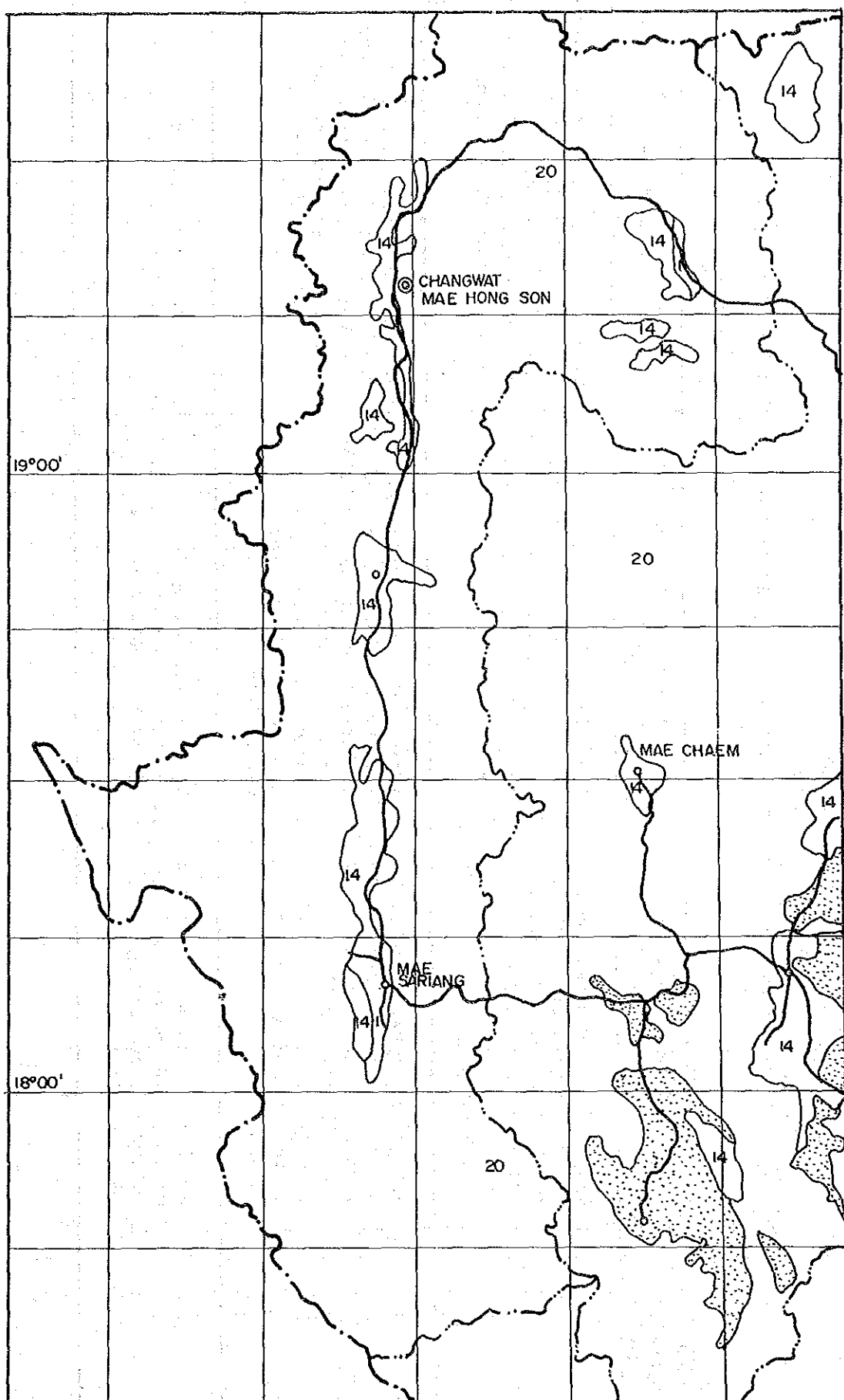


Fig.4 LAND CAPABILITY FOR AGRICULTURE IN MAE HONG SON PROVINCE

Table 6 Soil Characteristics and Land Use in the Area of Mae Hong Son Province

Number Used as Symbols in Figure 4-2	General Soil Characteristics	Recommendations for Land use	Land Management
1.	Deep and well drained, Soil texture varying from silt to sandy loam, Moderate fertility. Normally found in the area of relatively flat or rolling close to the river.	Generally suitable for cultivation of cash crops such as corn, cotton, tobacco, peanut, sugar cane, sorghum and castor bean	Require moderate land management to maintain the land fertility and soil structure. Irrigation may be required for cultivation in the dry season.
14.	Shallow and moderate to well drained. At the depth of 50 cm. from the surface, often found rocky lateritic soil. This type of soil are mainly in the area of moderate to steep slope.	Not suitable for cultivation. This type of land may be better for livestock raising and forest plantation. Specific land management is necessary if the land to be utilized for cultivation.	Advanced and technologies of agricultural practices are very much needed where fertilizer and soil improvement are necessary for cultivate this type of land.
20.	Shallow to deep soil with very well drained and can be found mainly on slope of high hills and mountain.	Not suitable for agricultural practice of any kind. The land should be reserved as forest of watershed area.	There should not be any investment on this type of land.

Table 7 Small Irrigation Project in Amphoe Mae Sariang,  
Mae La Noi and King Amphoe Sop Moel

Project Name	Tambon	Irrigation Area (Rai)	Year Completed
Amphoe Mae Sariang			
1. Huai Kud Weir	Ban Gart	600	1983
2. Maer Ko Weir	Mae Kha Tuan	600	1983
3. Mae Tob Tai Weir	Ban Gart	1,250	1978
4. Mae Pan Weir	Mae Kha Tuan	1,500	1978
5. Mae Tob Klang Weir	Ban Gart	360	1984
6. Mae La Weir	Mae Sariang	800	1989
7. Huai Luang Reservoir	Ban Gart	--	1988
8. Huai Luang Weir	Ban Gart	--	1988
King Amphoe Sop Moel			
1. Mae Suad Weir		1,117	1984
2. Mae Thalu Weir		200	1984
3. Pha Pa Rservoir		1,200	1984
Amphoe Mae La Noi			
1. Chang Moh Weir	Mae La Noi	300	1982
2. Om Pai Weir	Mae La Noi	200	1982
3. Mae Taie Weir	Tha Pa Pum	650	1982
4. Mae La Ngoe Weir	Mae La Noi	600	1982
5. Mae Koh Weir	Tha Pa Pum	500	1983
6. Mae Tho Weir	Mae Tho	185	1983
7. Mae Prang Weir	Mae La Luang	100	1984

Table 8 Mae Sariang Waterwork Requirement and Its Consumers

	Year 1986 (Cu.M.)	Year 1987 (Cu.M.)	Year 1988 (Cu.M.)
Raw Water Demand	366,301	389,507	383,811
Water Production	363,761	386,633	380,361
Number of Household Served	947	1,008	1,104

Source: Data Received from Mae Sariang Waterwork Office  
during Field Investigation August 1989.



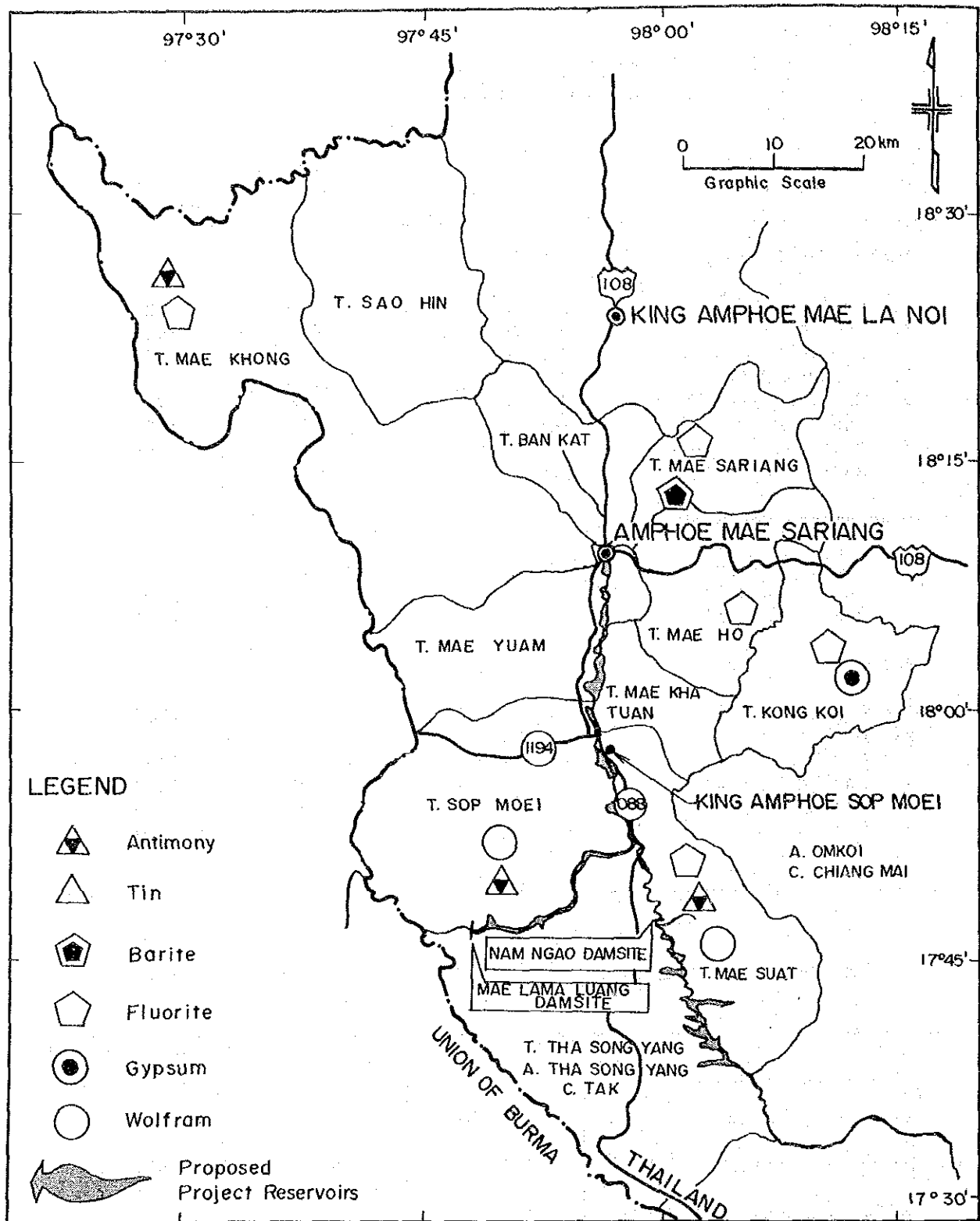


Fig. 5 MINERAL RESOURCES IN PROJECT VINICITY

Table 9 Population Distribution of Amphoe Mae Sariang

Tambon	Moo Ban	Population	Male	Female	House-holds
Mae Sariang	5	9,383	4,789	4,594	1,781
Ban Gart	11	10,868	5,854	5,014	2,011
Mae Kong	10	3,272	1,648	1,624	649
Mae Yuam	11	8,333	3,879	4,454	1,689
Mae Huaa	12	6,316	3,185	3,131	1,063
Soa Hin	6	1,434	723	711	266
Pa Pae	9	5,434	2,751	2,683	882
Total	55	39,606	20,078	19,528	7,459

Source: Brief Report of Mae Sariang 1989

Table 10 Population Distribution of King Amphoe Sop Moei

Tambon	Moo Ban	Population	Male	Female	House-holds
Sop Moei	9	4,098	2,074	2,024	1,247
Mae Kha Tuan	7	4,327	2,134	2,193	1,608
Mae Suad	7	3,898	1,921	1,977	690
Kong Koi	6	3,757	1,911	1,846	1,289
Pa Pong	7	2,885	1,409	1,476	
Mae Sam Lap	9	4,367	2,197	2,170	
Total	45	23,332	11,646	11,686	4,834

Source: Brief Report of King Amphoe Sop Moei 1989

Table 11 Public Services in Mae Sariang and Sop Moei District

<u>Mae Sariang</u>	<u>Sop Moei</u>
Mae Sariang Administrative Office	Sop Moei Administrative Office
Mae Sariang Provincial Court	Rural Development Office
Mae Sariang Regional Forestry	Forestry Office
Mae Sariang District Penitentiary	Animal Husbandary Office
Mae Sariang District Treasury	Lands Office
District Attorney	Education Office
Police Station	Taxation Office
District Custom	Excise Office
Border Patrol Police Unit 337	Military Recruitment Office
Control Unit 35	Post Office
Military Unit 4, 7	Primary School Administration Office
Mobile Unit for Development No. 27	Agricultural Office
Unit 36	Police Station
Immigration Check Point	Public Health Office
Nam Yuam Irrigation Project	Co-operation Office
EGAT Field Office	Community Hospital
Community Hospital	Sop Moei Secondary School
Malaria Control Unit No. 11	Malaria Control Unit
Public Health Office	Forest Protection Unit
Co-operation Office	Special Task Force Unit No. 32
Mae Sariang Electric Work	
Post Office	
Meteorological Station	
Animal Husbandary Office	
Rural Development Office	
Agricultural Office	
Excise Office	
Revenue Office	
Forestry Office	
Lands Office	
Military Recruitment Office	
Education Office	
Primary School Administration Office	
Provincial Lands Office	
Mae Sariang Water Work	
Center for Hill Tribe Development and Welfare	
Krung Thai Bank Ltd.	
The Government Saving Bank	

Table 12 Number of Hospital and Public Health Offices (1988)

Health Relate Facilities	Amphoe Mae Sariang	King Amphoe Sop Moei
District Hospital	1	1
District Health Office	1	1
Health Service Center	6	4
Midwifery	2	1
Maralia Control Unit	1	1

Source: Brief Report on Public Health of Sop Moei Sub-District 1988  
Brief Report on Public Health of Amphoe Mae Sariang 1989

Table 13 Number of Health Personal

Health Personal	Amphoe Mae Sariang	King Amphoe Sop Moei
Physician	3	1
Nurse	13	4
Nurse Aid	21	8
Health Officer	9	3
Midwife	4	4
Health Volunteer	8	5
Health Communicator	13	13

Source: Brief Report on Public Health of King Amphoe Sop Moei 1988  
Brief Report on Public Health of Amphoe Mae Sariang 1989

Table 14 Health Records of Local and Endemic Diseases  
of Amphoe Mae Sariang

Diseases	Number of Patient		
	Year 1987	Year 1988	Oct. 88 - Jun. 89
1. Infectious and Parasitic Diseases	6,935	6,316	2,863
2. Neoplasm	194	290	468
3. Endocrine, Nutritional and Metabolic Diseases	1,348	1,155	1,412
4. Diseases of the Blood and Blood-forming Organs	429	550	291
5. Mental Disorders	1,051	1,329	1,465
6. Diseases of the Nervous System and Sense Organs	2,121	2,681	1,172
7. Diseases of Circulatory System	1,552	2,249	1,185
8. Diseases of the Respiratory System	13,819	11,906	9,684
9. Diseases of the Digestive System	6,704	12,975	4,503
10. Diseases of the Genitourinary System	1,826	1,744	1,281
11. Complications of Pregnancy Childbirth and the Puerperium	461	733	58
12. Diseases of the Skin and Subcutaneous Tissue	3,774	4,843	2,853
13. Diseases of the Musculoskeletal System and Connective Tissue	2,292	2,766	1,382
14. Congenital Anomalies	33	23	--
15. Certain Causes of Perinatal Morbidity and Mortality	37	49	23
16. Symptoms and Illdefined Conditions	12,351	11,292	8,210
17. Accidents, Poisonings and Violence	2,634	2,919	1,736
18. Others	11,371	8,024	7,863

Source: Brief Report on Public Health of Amphoe Mae Sariang 1989

Table 15 Health Records of Local and Endemic Diseases  
of King Amphoe Sop Moei

Diseases	Number of Patient		
	Year 1986	Year 1987	Year 1988
1. Diarrhosa	10	101	95
2. Symthoms and Ill-defined Condition	63	114	28
3. Measles	--	1	37
4. Conjunctivitis	7	5	17
5. Tneumonia	11	16	8
6. Influenza	3	1	5
7. Malaria	19	219	389
8. Tuberculosis	1	1	1
9. Hepatitis	1	1	1
10. Shigellosis	6	2	6
11. Chicken Pox	--	--	1
12. Nephritis	1	--	--
13. Encephalitis	1	--	--
14. Haemorrhagic Fever	1	--	--

Source: Brief Report on Public Health of King Amphoe Sop Moei 1989

Table 16 Classification of Existing Local Tourism Resource in Mae Hong Son Province

Amphoe	Tourism Resource		
	National Attraction	Architectural Attraction	Cultural Attraction
Amphoe Muang	Pha Sour Waterfall Pra Cave Park Pha Pong Hot Spring Pe Man cave Huai Kan Waterfall	Wat Phra Non Wat Hua Wiang Wat Jong Kum Wat Jong Krang Wihara Wat Pong Toa U	Miew Village Na Pa Pag Ruk Kiew Ordination
Amphoe Pai	Moa Peng Waterfall Mae Nam Pai, Floating Lum Nam Pai Sanctuary	Wat Krang Wat Nam Hu	
Amphoe Kun Yuam	Mae Surin Waterfall National Park	Wat toa prai Ban Muang Pon Ancient	
Amphoe Mae La Noi	Mae Hu Cave Dao Dung Waterfall	Wat Mae La Noi	Thai Yai Local Performance Art
Amphoe Mae Sariang	Huai Som Pu Plant Garden Salawin Sanctuary Mae Nam Salawin, Floating	Wat Kittiwong Wat Uttayalom	Mae Hong Son Hilltribe Development and Welfare Center

Source: The Tourism Authority of Thailand, 1983

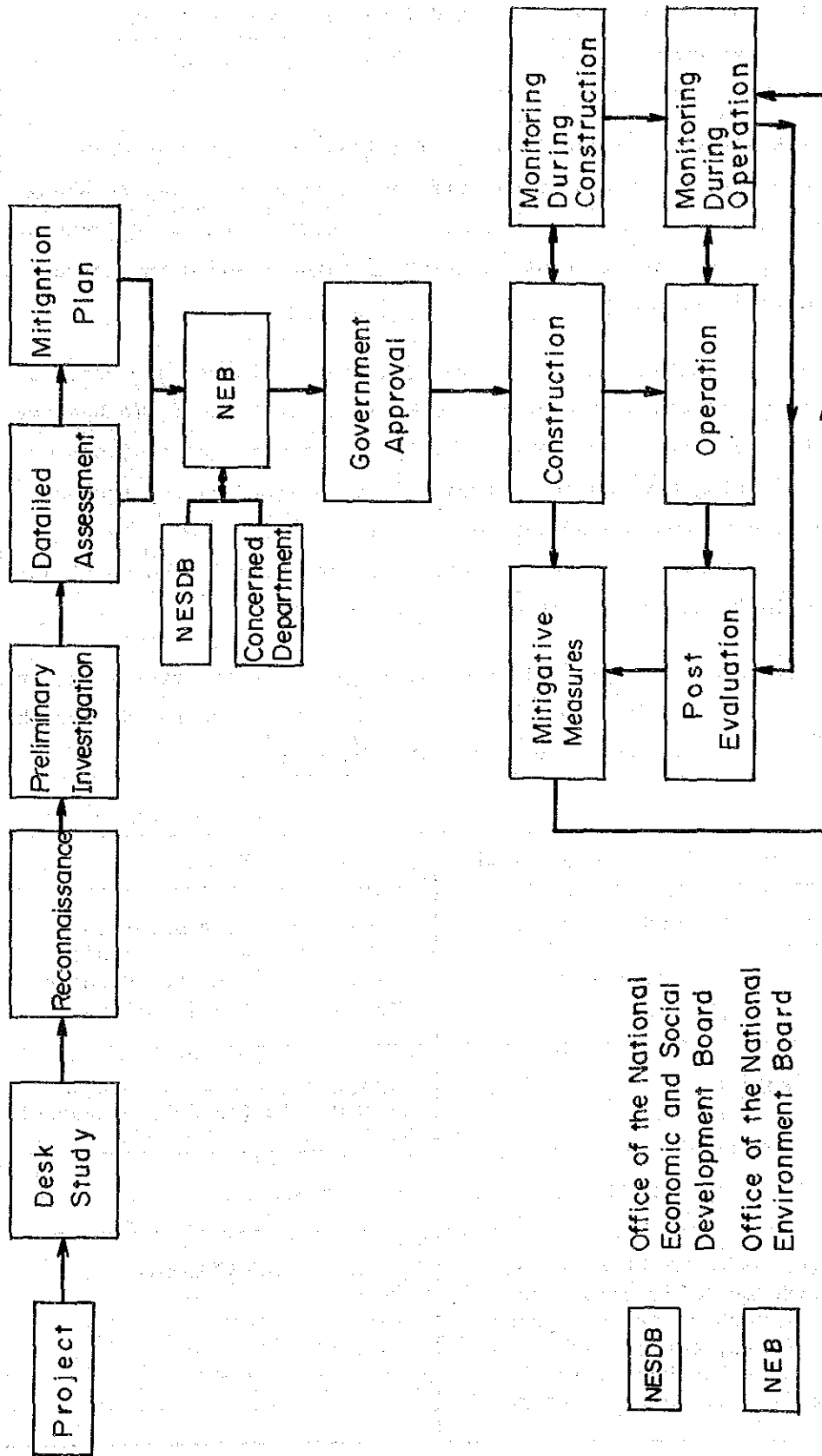


Fig.6 ENVIRONMENTAL PROCEDURE



G-23 Proclamation for Types and Sizes of Project Required  
Environmental Impact Assessment

The National Environment Board (NEB) of Thailand is now implementing "selective projects" approach in identifying environmental impact along with mitigation measures and monitoring programs for certain projects or activities to ensure efficient utilization of natural and human resources in the economic development.

Section 17 of the National Environmental Quality Act (NEQA) of 1975, as amended in 1978, provides a power to the Ministry of Science, Technology and Energy to issue proclamation for the types and sizes of projects or activities requiring Environmental Impact Assessment (EIA) reports and measures for the prevention of and remedy for the adverse effects on environmental quality. The first proclamation has been issued on 14 July 1981 which stipulates in essence as in table below:

Table: Notification of Types and Sizes of Projects or Activities Requiring EIA Reports and Measures for the Prevention of and Remedy for the Adverse Effects on the Environmental Quality.

Items	Types of Projects or Activities	Sizes
1	Dam or Reservoir	storage volume greater than 100,000,000 cubic meters or storage surface area greater than 15 square kilometers
2	Irrigation	irrigated area greater than 80,000 rai (12,800 hectares).
3	Commercial Airport	all sizes
4	Hotel or Resort Facilities environmentally sensitive areas such as areas adjacent to rivers, coastal areas, lakes or beaches or in the vicinity of national parks	greater than 80 rooms

Items	Types of Projects or Activities	Sizes
5	Mass Transit System and Expressway as defined by the Announcement of the Revolutionary Party No. 290, 24 November B. E. 2515	all sizes
6	Mining as defined by the Mineral Act No. 1 B.E. 2510, No. 2 B.E. 2516 and No. 3 B.E. 2522	all sizes
7	Industrial Estate as defined by the Industrial Estate Authority of Thailand Act, B.E. 2522	all sizes
8	Commercial Port and Harbour	with capacity for vessels of greater than 500 ton-gross.
9	Thermal Power Plant	capacity greater than 10 MW.
10	Industries	
	(1) Petrochemical Industry	greater than 100 tons/day of raw materials required in production processes of oil refinery and/or natural gas separation.
	(2) Oil Refinery	all sizes
	(3) Natural Gas Separation of processing	all sizes
	(4) Chlor-alkaline Industry requiring NaCl as raw material for production of NaOH, Na <sub>2</sub> CO <sub>3</sub> , HCl, Cl <sub>2</sub> , NaOCl and Bleaching Powder	production capacity of each or combined product greater than 100 tons/day

Items	Types of Projects or Activities	Sizes
10	(5) Iron and/or Steel Industry	requiring from ore and/or scrap iron as raw materials for production greater than 100 tons/day or using furnaces with combined capacity greater than 5 tons/batch.
	(6) Cement Industry	all sizes
	(7) Smelting Industry other than Iron and Steel	production capacity greater than 50 tons/day.
	(8) Pulp Industry	production capacity greater than 50 tons/day.







