Ngao Project

(5) Bottom Outlet

311,000 120,750 358,950 499,800 48,500 266,500 1,017,600 1,325,250 3,948,450 Local 659,250 422,400 549,750 129,000 266,500 486,200 113,400 Foreign Cost 440,000 780,000 986,000 162,000 533,000 1,875,000 1,440,000 Total 2,415 1,696 1,555 18 65 294 Local 1,767 13,185 Unit Price Foreign 645 42 733 704 Ω Ω 286 15,600 2,400 2,500 2,200 130 280 Tota? 60 20 900 200 1,700 2,700 4,100 750 Quantity Unit Ë E ŝ £ °≘ 33 Descripcion Structual Concrete Common Excavation Tunnel Excavation Concrete Lining Rock Excavation Reinforcement Plug Concrete

Miscellameous Works L.S. 1 621,600 262,65 Sub Total 6,837,600 2,889,15						
Sub Total 6,837,600 6,837,600 6,837,600	Miscellaneous Works	L.S.	~		 621,600	2
	Sub Total				6,837,600	2,8

(6) Power Intake

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Document	L.	1		Unit Price			Cost	
וארוטון והפאר	5	קמשנורו נא	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	m 3	22,000	09	42	18	1,320,000	924,000	396,000
Rock Excavation	m3	7,100	130	65	65	923,000	461,500	461,500
Structual Concrete	E	3,700	2,400	704	1,696	8,880,000	2,604,800	6,275,200
Mass Concrete	E	4,700	1,800	288	1,212	8,460,000	2,763,600	5,696,400
Reinforcement	t)	230	15,600	13,185	2,415	3,588,000	3,032,550	555,450
Connecting Bridge	1.5.	1				2,200,000	1,320,000	880,000
Miscellaneous Works	L.S.	T				2,537,100	1,110,645	1,426,455
Sub Total	-:					27,908,100	12,217,095	15,691,005
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(7) Penstock

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pesci ipcion	, 0111.c	daguer ey	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	⊞3	24,000	09	42	18	1,440,000	1,008,000	432,000
Rock Excavation	- E	8,900	130	65	92	1,157,000	578,500	578,500
Tunnel Excavation	EM3	30,000	280	286	294	17,400,000	8,580,000	8,820,000
Structual Concrete	£	5,700	2,400	704	1,696	13,680,000	4,012,800	9,667,200
Concrete Lining	£ #	3,100	2,500	733	1,767	7,750,000	2,272,300	5,477,700
Concrete Filling	e E	4,800	1,200	472	728	5,760,000	2,265,600	3,494,400
Mortar Injection	£ ₩	009	3,000	1,580	1,420	1,800,000	948,000	852,000
Curtain Grouting	E	750	2,500	1,615	885	1,875,000	1,211,250	663,750
Consolidation Grouting	8	2,000	2,500	1,615	885	5,000,000	3,230,000	1,770,000
Shotcrete ($t = 10^{cm}$)	± 5 ± 5 ± 5 ± 5 ± 5 ± 5 ± 5 ± 5 ± 5 ± 5	12,200	260	172	88	3,172,000	2,098,400	1,073,600
Rockbolt (ϕ 25m/m, ℓ = 2.0")	ည	2,800	098	570	290	2,408,000	1,596,000	812,000
Reinforcement	ىد	230	15,600	13,185	2,415	3,588,000	3,032,550	555,450
Miscellaneous Works	L.S.	-				6,503,000	3,083,340	3,419,660
Sub Total						71,523,000	33,916,740	37,616,260
					*. *.			
			:					

(8) Powerhouse

Ngao Project

Dooring	- + 	Q.:-		Unit Price			Cost	
ואויאליו ואפשט	ء 5	למוורו רא	Total	Foreign	Locai	Total	Foreign	Local
Common Excavation	£	37,000	9	42	18	2,220,000	1,554,000	000*999
Rock Excavation	B 3	43,000	130	65	65	5,590,000	2,795,000	2,795,000
Backfill	2	16,000	96	09	30	1,440,000	000,096	480,000
Structual Concrete	£	6,800	2,400	704	1,696	16,320,000	4,787,200	11,532,800
Mass Concrete	E E	14,500	1,800	588	1,212	26,100,000	8,526,000	17,574,000
Reinforcement	ų	730	15,600	13,185	2,415	11,388,000	9,625,050	1,762,950
Pavement Works	. 2 E	9,600	009	180	420	5,760,000	1,728,000	4,032,000
Architectural Works	L.S.					24,600,000	14,750,000	9,840,000
Miscellaneous Works	L.S.	1				9,341,800	4,473,525	4,868,275
Sub Total						102,759,800	49, 208, 775	53, 551, 025
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Ngao Project

(9) Tailrace

	+: 5	- + - + C		Unit Price			Cost	
יייין יייים	3	לתמווכו כל	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	E	102,000	60	42	18	6,120,000	4,284,000	1,836,000
Rock Excavation	£	15,000	130	65	65	1,950,000	975,000	975,000
Embankment	m ³	55,000	150	86	25	8,250,000	5,390,000	2,860,000
Structual Concrete	m3	3,700	2,400	704	1,696	8,880,000	2,604,800	6,275,200
Mass Concrete	m ³	17,400	1,800	588	1,212	31,320,000	10,231,200	21,088,800
Reinforcement	دو	290	15,600	13,185	2,415	4,524,000	3,823,650	700,350
Miscellaneous Works	L.S.					6,104,400	2,730,865	3,373,535
Sub Total						67,148,400	30,039,515	37,108,885
				23 41 41 44				
	-							} ====================================

Ngao Project

(10) Switchyard

December 2 and 2 a	4:-11	1.1		Unit Price			Cost	
מפוסלו והפסח	ر 1000	dualitity	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	. E	350	09	42	18	21,000	14,700	6,300
Structual Concrete	m ₃	200	2,400	704	1,696	1,200,000	352,000	848,000
Reinforcement	دد	20	15,600	13,185	2,415	312,000	263,700	48,300
Miscellaneous Works	L.S.					153,300	63,040	90,260
Sub Total			-			1,686,300	693,440	992,860
								. ,

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

Mae Lama Luang Integrated Development

Construction Cost

Unit: 106Baht

	Item	Tota1	Curr	ency
	I cem	local	Foreign	Local
Civi	1 Works			
: -	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
	Sub-tota1	1,599.8	826.6	773.2
Hyd	raulic Equipment			
	Diversion Gate	9.8	7.8	2.0
•	Spillway Gate	37.4	29.9	7.5
	Intake Gate	15.9	12.7	3.2
1. 4.	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
	Sub-total1	205.4	151.8	53.6

Mae Lama Luang Project

(1) Main Dam

	4 7 9			Unit Price			Cost	
pescripcion	3 7 7	קחמוונורא	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	m3	494,000	60	42	18	29,640,000	20,748,000	8,892,000
Rock Excavation	. m ³	72,000	130	65	65	9,360,000	4,680,000	4,680,000
Tunnel Excavation	m3	800	580	286	464	464,000	228,800	235,200
Embankment Rockfill .	m3	2,704,000	110	72	38	297,440,000	194,688,000	102,752,000
Embankment Filter Material	Em.	377,000	150	98	52	56,550,000	36,946,000	19,604,000
Embankment Impervious Material	. W	446,000	150	98	25	000,006,99	43,708,000	23,192,000
Concrete Lining	.⊞	200	2,500	733	1,767	500,000	145,600	353,400
Curtain Grouting	Œ	4,500	2,500	1,615	885	11,250,000	7,267,500	3,982,500
Blanket Grouting	E	5,100	2,500	1,615	885	12,750,000	8,236,500	4,513,500
Miscellaneous Works	L.S.	H		·		48,485,400	31,664,940	16,820,460
Sub Total						533,339,400	348,314,340	185,025,060
	." (7	10 m				
			e e e					
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Mae Lama Luang Project

(2) Coffer Dam

				Unit Prica			Cost	
Descripcion	Cuit	Quantity	Total	Eoroíon	Lengt	Total	Foreign	[200]
Common Excavation	(H3	78,000	09	42	18	4,680,000	3,276,000	1,404,000
Rock Excavation	E	5,800	130	65	65	754,000	377,000	377,000
Embankment Rockfill	th Est	243,000	110	72	38	26,730,000	17,496,000	9,234,000
Embankment Impervious Material	E E	47,000	150	88	52	7,050,000	4,606,000	2,444,000
Miscellaneous Works	L.S.	4-4				3,921,400	2,575,500	1,345,900
Sub Total						43,135,400	28,330,500	14,804,900
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Mae Lama Luang Project

(3) Spillway

	1 1			Unit Price			Cost	
uescripcion	1 IUO	quantity	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	■3	580,000	09	42	18	34,800,000	24,360,000	10,440,000
Rock Excavation	£	63,000	130	92	65	8,190,000	4,095,000	4,095,000
Backfill	П	38,000	06	09	30	3,420,000	2,280,000	1,140,000
Structual Concrete	£	8,900	2,400	704	1,696	21,360,000	6,265,600	15,094,400
Mass Concrete	. E	78,200	1,800	588	1,212	140,760,000	45,981,600	94,778,400
Backfilling Concrete	E III	124,000	1,200	472	728	148,800,000	58,528,000	90,272,000
Reinforcenent	ىد	1,710	15,600	13,185	2,415	26,676,000	22,546,350	4,129,650
Miscellaneous Works	L.S.	-				38,400,600	16,405,655	21,994,945
Sub Total						422,406,500	180,462,205	241,944,395
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Mae Lama Luang Project

(4) Diversion Work

724,200 975,000 2,465,000 38,220,000 5,766,400 24,914,700 9,641,000 3,344,000 8,932,435 558,000 1,255,800 1,460,250 98,256,785 Local 975,000 805,800 85,681,915 37,180,000 2,393,600 10,335,300 3,999,000 6,536,000 4,845,000 6,856,200 2,664,750 7,789,265 1,302,000 Foreign 1,950,000 75,400,000 8,160,000 35,250,000 13,640,000 9,880,000 731,000 8,112,000 1,530,000 4,125,000 183,938,700 1,860,000 16,721,700 Total 1,555 2,415 18 65 294 1,696 88 290 1,420 885 1,767 Local Unit Price Foreign 1,615 13,185 42 65 704 733 645 172 570 1,580 286 15,600 3,000 2,200 9 130 580 2,400 2,500 260 860 2,500 Total 31,000 15,000 130,000 14,100 38,000 510 3,400 6,200 8,500 520 1,650 Quantity Unit L.S. 33 8 £ 2 € € Ę. Ē e E ىچ ≘ $\ell = 3.0^{m}$ Shotcrete ($t = 10 c^m$) Descripcion Sub Total Miscellaneous Works Rockbolt (\$25m/m, Structual Concrete Tunnel Excavation Common Excavation Curtain Grouting Mortor Injection Concrete Lining Rock Excavation Reinforcement Plug Concrete

Mae Lama Luang Project

(5) Bottom Outlet

	11-11	+ + +		Unit Price			Cost	
nescripcion	onic	quarierey	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	£	3,000	09	42	18	180,000	126,000	54,000
Rock Excavation	E E	2,700	130	65	65	351,000	175,500	175,500
Tunnel Excavation	e E	1,200	280	286	294	000,969	343,200	352,800
Structual Concrete	E E	800	2,400	704	1,696	1,920,000	563,200	1,356,800
Concrete Lining	8 E	750	2,500	733	1,767	1,875,000	549,750	1,325,250
Plug Concrete	_E =	350	2,200	645	1,555	770,000	225,750	544,250
Reinforcement	ų	09	15,600	13,185	2,415	936,000	791,100	144,900
Miscellaneous Works	L.S.	1				672,800	277,450	395,350
Sub Total						7,400,800	3,051,950	4,348,850
		: -						

(6) Power Intake

Mae Lama Luang Project

	11.24	1		Unit Price			Cost	
Descripcion	מנונר	Quality ty	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	m3	16,000	09	42	18	960,000	672,000	288,000
Rock Excavation	33	15,000	130	65	65	1,950,000	975,000	975,000
Structual Concrete	£.	4,900	2,400	704	1,696	11,760,000	3,449,600	8,310,400
Mass Concrete	£	6100	1800	588	1,212	10,980,000	3,586,800	7,393,200
Reinforcement	4	300	15,600	13,185	2,415	4,680,000	3,955,500	724,500
Connecting Bridge						2,000,000	1,200,000	800,000
Miscellaneous Works	L.S.	-				3,233,000	1,383,890	1,849,110
Sub Total						35,563,000	15,222,790	20,340,210
				:		200 miles		
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(7) Penstock

Mae Lama Luang Project

	1	4 9 4 9 4 9 6 9 6		Unit Price			Cost	
pescripcion	100	(transits)	Total	Foreign	Local	Total	Foreign	Local
Tunnel Excavation	m ₃	35,000	580	586	294	20,300,000	10,010,000	10,290,000
Concrete Lining	E	3,000	2,500	733	1,767	7,500,000	2,199,000	5,301,000
Concrete Filling	E 3	6,000	1,200	472	728	7,200,000	2,832,000	4,368,000
Mortor Injection	£	570	3,000	1,580	1,420	1,710,000	900,600	809,400
Curtain Grouting	E	750	2,500	1,615	885	1,875,000	1,211,250	663,750
Consolidation Grouting	E	1,400	2,500	1,615	885	3,500,000	2,261,000	1,239,000
Shotcrete	III 2	13,000	260	172	88	3,380,000	2,236,000	1,144,000
Rockbolt	J.	2,900	980	570	290	2,494,000	1,653,000	841,000
Reinforcement	ىد	165	15,600	13,185	2,415	2,574,000	2,175,525	398,475
Miscellaneous Works	L.S.	LT .				5,053,300	2,547,800	2,505,500
Sub Total						55,586,300	28,026,175	27,560,125
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Mae Lama Luang Project

(8) Powerhouse

	45-11			Unit Price			Cost	
pescr ipcion	UNITE	quant 1 ty	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	E _{III} 3	44,000	09	42	18	2,640,000	1,848,000	792,000
Rock Excavation	E	116,000	130	65	65	15,080,000	7,540,000	7,540,000
Backfill	£	18,000	06	09	30	1,620,000	1,080,000	540,000
Structual Concrete	£	12,700	2,400	704	1,696	30,480,000	8,940,800	21,539,200
Mass Concrete	E	28,700	1,800	588	1,212	51,660,000	16,875,600	34,784,400
Reinforcement	ų	1,350	15,600	13,185	2,415	21,060,000	17,799,750	3,260,250
Pavement Works	■2	5,700	009	180	420	3,420,000	1,026,000	2,394,000
Architectural Works	1.5.	ન				43,665,000	26,199,000	17,456,000
Miscellaneous Works	L.S.	. -!				16,962,500	8,130,915	8,831,585
Sub Total						186,587,500	89,440,065	97,147,435
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(9) Tailrace

Mae Lama Luang Project

	+ · · · · · · · · · · · · · · · · · · ·	45.4%		Unit Price			Cost	megafin ver
מפאר ואכיים	OIII C	qualiting	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	£ ≣	83,000	09	42	18	4,980,000	3,486,000	1,494,000
Rock Excavation	£.	23,000	130	65	65	2,990,000	1,495,000	1,495,000
Embankment	E E	29,000	150	86	52	8,850,000	5,782,000	3,068,000
Structual Concrete	E	8,500	2,400	704	1,696	20,400,000	5,984,000	14,416,000
Mass Concrete	£ ■	39, 400	1,800	450	1,350	70,920,000	17,730,000	53,190,000
Reinforcement	ىد	650	15,600	13,185	2,415	10,140,000	8,570,250	1,569,750
Miscellaneous Works	L.S.	1				11,828,000	4,304,725	7,523,275
Sub Total						130,108,000	47,351,975	82,756,025
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Mae Lama Luang Project

(10) Switchyard

				Unit Price			Cost	
Descripcion	Unit	Quantity	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	E E	350	09	42	18	21,000	14,700	6,300
Structual Concrete	8≅	200	2,400	704	1,696	1,200,000	352,000	848,000
Reinforcement	ب	20	15,600	13,185	2,415	312,000	263,700	48,300
Miscellaneous Works	L.S.	T ,				153,300	63,040	90,260
Sub Total						1,686,300	693,440	992,860
		,					·	
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F-1-(3) BILL OF QUANTITY: MAE LAMA LUANG PROJECT INDIVIDUAL DEVELOPMENT

Mae Lama Luang Individual Development

Construction Cost

Unit: 10°Baht

Thomas Th	Total	Curr	ency
Item	IOLAI	Foreign	Local
		<u> </u>	
Civil Works			
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
		ļ	
Hydraulic Equipment		!	£ .
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-total1	168.5	125.8	42.7
			

Mae Lama Luang Project

(1) Main Dam

				Unit Price			Cost	
מפיטלו ישפרט	าเนก	Quantity	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	E ##	494,000	9	42	18	29,640,000	20,748,000	8,892,000
Rock Excavation	£	72,000	130	65	65	9,360,000	4,680,000	4,680,000
Tunnel Excavation	E E	800	580	286	464	464,000	228,800	235,200
Embankment Rockfill	£ 55	2,704,000	110	72	38	297,440,000	194,688,000	102,752,000
Embankment Filter Material	£	377,000	150	98	52	56,550,000	36,946,000	19,604,000
Embankment Impervious Material	E	446,000	150	86	52	66,900,000	43,708,000	23,192,000
Concrete Lining	£ €	200	2,500	733	1,767	500,000	146,600	353,400
Curtain Grouting	f E.	4,500	2,500	1,615	885	11,250,000	7,267,500	3,982,500
Blanket Grouting	Œ	5,100	2,500	1,615	885	12,750,000	8,236,500	4,513,500
Miscellaneous Works	L.S.					48,485,400	31,664,940	16,820,460
Sub Total						533,339,400	348,314,340	185,025,060
					1.2			
						·		

Mae Lama Luang Project

(2) Coffer Dam

				Ilmit Dring			100	
Descripcion	Unit	Ouantity		3110	}		2600	
			Total	Foreign	Local	Total	Foreign	Local
Common Excayation	E E	78,000	. 09	42	18	4,680,000	3,276,000	1,404,000
Rock Excavation	£	5,800	130	92	65	754,000	377,000	377,000
Embankment Rockfill	. E	243,000	110	72	38	26,730,000	17,496,000	9,234,000
Embankment Impervious Material	E W	47,000	150	86	52	7,050,000	4,606,000	2,444,000
Miscellaneous Works	L.S.	1		_		3,921,400	2, 575, 500	1,345,900
Sub Total						43,135,400	28,330,500	14,804,900
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Mae Lama Luang Project

(3) Spillway

				Inst Daige			100	
Descripcion	unit	Quantity	- [מווו ביין ירם			300	
	}	facaciones	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	E E	580,000	09	42	18	34,800,000	24,360,000	10,440,000
Rock Excavation	E E	63,000	130	65	65	8,190,000	4,095,000	4,095,000
Backfill	B 3	38,000	06	09	30	3,420,000	2,280,000	1,140,000
Structual Concrete	£ E	8,900	2,400	704	1,696	21,360,000	6,265,600	15,094,400
Mass Concrete	E E	78,200	1,800	588	1,212	140,760,000	45,981,600	94,778,400
Backfilling Concrete	Æ	124,000	1,200	472	728	148,800,000	58,528,000	90,272,000
Reinforcenent	ىد	1,710	15,600	13,185	2,415	26,676,000	22,546,350	4,129,650
Miscellaneous Works	L.S.	1				38,500,600	16,405,655	21,994,945
Sub Total						422,406,600	189,462,205	241,944,395
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		,						
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Mae Lama Luang Project

(4) Diversion Work

				Unit Price			Cost	
Descripcion	r Bit	Quantity	To+01			Total	3500	
			Scal	roreign	LOCAL	10101	roreign	Local
Common Excavation	m3	31,000	09	42	138	1,860,000	1,302,000	558,000
Rock Excavation	m3	15,000	130	65	65	1,950,000	975,000	975,000
Tunnel Excavation	E E	130,000	580	286	294	75,400,000	37,180,000	38,220,000
Structual Concrete	£ E	3,400	2,400	704	1,696	8,160,000	2,393,600	5,766,400
Concrete Lining	E 121	14,100	2,500	733	1,767	35,250,000	10,335,300	24,914,700
Plug Concrete	E JUL	6,200	2,200	645	1,555	13,640,000	3,999,000	9,641,000
Shotcrete ($t = 10^{cm}$)	E MR	38,000	092	172	88	9,880,000	6,536,000	3,344,000
Rockbolt (ϕ 25m/m, ℓ = 3.0")	Dd.	8,500	098	570	290	731,000	4,845,000	2,465,000
Reinforcement	-	520	15,600	13,185	2,415	8,112,000	6,856,200	1,255,800
Mortor Injection	£ ₽	510	3,000	1,580	1,420	1,530,000	805,800	724,200
Curtain Grouting	ш	1,650	2,500	1,615	885	4,125,000	2,664,750	1,460,255
Miscellaneous Works	L.S.					16,721,700	7,789,265	8,932,435
Sub Total						183,938,700	85,681,915	98, 256, 785
								,
		¥.						

Mae Lama Luang Project

(5) Bottom Outlet

				Unit Drice			Cost	
Descripcion	Sait.	Quantity		3 1 1 3 115	1			1
			lotal	Foreign	Local	lotal	Foreign	Local
Common Excavation	E	3,000	09	42	18	180,000	126,000	54,000
Rock Excavation	£	2,700	130	65	65	351,000	175,500	175,500
Tunnel Excavation	£	1,200	580	286	294	969	343,200	352,800
Structual Concrete	E	800	2,400	704	1,696	1,920	563,200	1,356,800
Concrete Lining	B 3	750	2,500	733	1,767	1,875	549,750	1,325,250
Plug Concrete	£	350	2,200	645	1,555	770,000	225,750	544,250
Reinforcement	در	09	15,600	13,185	2,415	936,000	791,100	144,900
Miscellaneous Works	L.S.	-1				672,800	277,450	395,350
Sub Total						7,400,800	3,051,950	4,348,850
							-	
			: : : : :					
				: 1				
				1				

(6) Power Intake

Mae Lama Luang Project (Turbine & Generator: 2 units)

Description Unit Quantity Total Foreign Foreign Common Excavation m³ 14,000 60 42 18 840,000 Rock Excavation m³ 13,000 130 65 65 1,690,000 Structual Concrete m³ 4,100 2,400 704 1,696 9,840,000 Mass Concrete m³ 5,000 1800 586 1,212 9,000,000 Reinforcement t 2,30 15,600 13,185 2,415 3,588,000 Commerching Bridge L.S. 1 2,000,000 Miscellaneous Works L.S. 1 2,695,000 Miscellaneous Fortai 2,695,000 29,633,800 29,633,800					Ilnit Drice			100	
1023 FOTERIGN LOCAL m3	Descripcion	Unit	Quantity					1602	
m³ 14,000 60 42 18 m³ 13,000 130 65 65 1, m³ 4,100 2,400 704 1,696 9, t 230 15,600 13,185 2,415 3, L.S. 1 230 2,415 3, 2, 1 230 2,415 3, 2, 2, 2, 3, 3, 4,000 1800 588 1,212 9, 2, 3, 3, 4,000 1800 588 1,212 9, 2, 2, 3,000 18,000 18,000 1,696 9, 3,000 18,000 1,696 9, 4,000 18,000 18,000 1,696 9, 4,000 18,000 18,000 1,696 9, 4,000 18,0				lotal	iJ.	Locai	101a1	roreign	Locai
m³ 4,100 130 65 65 65 m³ 4,100 2,400 704 1,696 1,212 t 230 15,600 13,185 2,415 1.S. 1	Common Excavation	e E	14,000	09	42	18	840,000	588,000	252,000
m³ 4,100 2,400 704 1,696 m³ 5,000 1800 588 1,212 L.S. 1 L.S. 1 23 15,600 13,185 2,415 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Rock Excavation	33	13,000	130	65	65	1,690,000	845,000	845,000
t 230 15,600 13,185 2,415 L.S. 1	Structual Concrete	ا	4,100	2,400	704	1,696	9,840,000	2,886,400	6,953,600
t 230 15,600 13,185 2,415 L.S. 1 L.S. 2 1 1 1 1 1 1 1 1 1 1 1 1 1	Mass Concrete	£	2,000	1800	588	1,212	9,000,000	2,940,000	6,060,000
L.S. 1 L.S. 1 1 1 1 1 1 1 1 1 1 1 1 1	Reinforcement	د ب	230	15,600	13,185	2,415	3,588,000	3,032,550	555, 450
7	Connecting Bridge	L.S.	Ţ				2,000,000	1,200,000	800,000
	Miscellaneous Works	L.S.	T	:			2,695,000	1,149,195	1,546,605
	Sub Total						29,653,800	12,641,145	17,012,655
				. '					
								:"	
			-		:				

(7) Penstock

Mae Lama Luang Project (Turbine & Generator: 2 units)

				Unit Price			Cost	
nescripcion	3 (5)	quantity	Total	Foreign	Local	Total	Foreign	Local
Tunnel Excavation	£ 183	27,000	580	286	294	15,660,000	7,722,000	7,938,000
Concrete Lining	£	2,700	2,500	733	1,767	6,750,000	1,979,100	4,770,900
Concrete Filling	E E	4,500	1,200	472	728	5,400,000	2,124,000	3,276,000
Mortor Injection	#II3	530	3,000	1,580	1,420	1,590,000	837,400	752,600
Curtain Grouting	E	750	2,500	1,615	885	1,875,000	1,211,250	663,750
Consolidation Grouting	æ	1,400	2,500	1,615	885	3,500,000	2,261,000	1,239,000
Shotcrete	Th 2	11,000	260	172	888	2,860,000	1,892,000	968,000
Rockbolt	2	2,400	860	570	290	2,064,000	1,368,000	696,000
Reinforcement	ىد	135	15,600	13,185	2,415	2,106,000	1,779,975	326,025
Miscellaneous Works	L.S.	 1				4,180,500	2,117,500	2,063,000
Sub Total						45,985,500	23,292,225	22,693,275
		: .						

(8) Powerhouse

Mae Lama Luang Project (Turbine & Generator : 2 units)

				Unit Price			Cost	
Descripcion	Calt	Quantity	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	£ W	34,000	09	42	18	2,040,000	1,428,000	612,000
Rock Excavation	e E	83,000	130	65	65	10,790,000	5,395,000	5,395,000
Backfill	e E	17,000	06	09	30	1,530,000	1,020,000	510,000
Structual Concrete	. E	10,200	2,400	704	1,696	24,480,000	7,180,800	17,299,200
Mass Concrete	£ ##	22,900	1,800	588	1,212	41,220,000	13,465,200	27,754,800
Reinforcement	ىپ	1,060	15,600	13,185	2,415	16,536,000	13,976,100	2,559,900
Pavement Works	IN 2	5,300	009	180	420	3,180,000	954,000	2,226,000
Architectural Works	L.S.					33,825,000	20,295,000	13,530,000
Miscellaneous Works	1.5.	1				13,360,100	6,371,410	6,988,690
Sub Total				7		146,961,100	70,085,510	76,875,590
		- '	. 19 					
					.			
	2							

Mae Lama Luang Project

(9) Tailrace

				Unit Price			Cost	
ספארי ואר וטוו	חווה	Quantity	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	£#3	63,000	09	42	18	3,780,000	2,646,000	1,134,000
Rock Excavation	£ E	15,000	130	65	65	1,950,000	975,000	975,000
Embankment	E E	59,000	150	86	52	8,850,000	5,782,000	3,068,000
Structual Concrete	E E	7,000	2,400	704	1,696	16,800,000	4,928,000	11,872,000
Mass Concrete	E	39,000	1,800	450	1,350	70,200,000	17,550,000	52,650,000
Reinforcement	ىد	580	15,600	13,185	2,415	9,048,000	7,647,300	1,400,700
Miscellaneous Works	L.S.	•1				11,062,800	3,952,800	7,110,000
Sub Total						121,690,800	43,481,100	78,209,700
		ĵ.						
						* .		
		V .						

(10) Switchyard

Mae Lama Luang Project

							1	
Descrincion	+	Oughtito	- [Unit Price	.		1507	
	}	f	Total	Foreign	Local	Total	Foreign	Local
Common Excavation	E = 3	350	09	42	18	21,000	14,700	6,300
Structual Concrete	E ##	200	2,400	704	1,696	1,200,000	352,000	848,000
Reinforcement	4.4	20	15,600	13,185	12,415	312,000	263,700	48,300
Miscellaneous Works	L.S.					153,300	63,040	90,260
Sub Total						1,686,300	693,440	992,860
				,			: `	
								· · · · · · · · · · · · · · · · · · ·

(11) Hydraulic Equipment

Project
Luang
Lama
age 9

	45.71			Unit Price			Cost	
מבין ומכוסו	2110	ממעורו בא	Total	Foreign	Local	Total	Foreign	Local
Diversion Gate (10m $ imes$ 10m)	ديد	184	53,000			9,752	7,802	1,950
Spillway Gate (12m $ imes$ 14.5m)	ديد	440	85,000			37,400	29,920	7,480
Intake Gate (Roller Gate)	دډ	155	85,000			13,175	10,540	2,635
Screen	ند	86	50,000			4,300	3,010	1,290
Tailrace Gate	+2	9/	85,000			6,460	5,170	1,290
Outlet								
Conduit Pipe ($D = 1.5m$)	ىد	14	53,000			742	520	222
Screen	נו	46	50,000			2,300	1,610	069
Jet flow Gate	L.S.					6,300	5,040	1,260
High Presure Gate	L.S.					5,600	4,480	1,120
Penstock	+	2,180	53,000			82,680	57,960	24,720
Sub Total						168,709	126,052	42,657
					:			
							i i	

F-2 UNIT COST OF CIVIL WORKS

Appendix F-2 Unit Cost of Civil Works

Description	Total (B)	FC (B)	LC (B)
	- T		
Common Excavation			
Excavating	15.3	13.2	2.1
Loading	9.2	8.2	1.0
			-
Hauling	18.0	11.9	6.1
Disposal	8.6	80	1.0
Sub-total	52.3	42.1	10.2
		ngi ggya Marika I	
Indirection Cost (Overhead, Profit, Tax)	7 · 7	0	7.7
Total Cost	0.09	42.1	17.9
		\$ 	

Description	Total (B)	(A) DA	TC (\$)
Rock Excavation			
Blasting	53.9	37.4	16.5
Loading	22.0	11.3	10.7
Hauling	28.3	12.3	16.0
Disposal	& &	4.0	8.
Sub-total	113.0	65.0	48.0
Indirection Cost (Overhead, Profit, Tax)	17.0	0	17.0
Total Cost	130.0	0,59	65.0

Description	Total (B)	FC (B)	TC (\$)
Embankment Rockfill			
Blasting	24.6	20.7	3.9
Stockpile	7.2	6.5	1.3
Loading	10.3	8.0	2.3
Hauling	41.8	28.4	13.4
Spreading	10.1	8° I	2.0
Compacting	1.6	6.0	0.7
Sub-total	92.6	72.0	23.6
Indirection Cost (Overhead, Profit, Tax)	14.4	0	14.4
Total Cost	110.0	72.0	38.0

Embankment Filter Material 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 (B)	FC (\$)	LC (\$)	
12.6 8.5 12.6 8.5 87.5 66.5 12.6 10.3 12.6 10.3 130.4 98.0 150.0 98.0		Ì			
12.6 8.5 12.6 8.5 12.6 8.5 12.6 10.3 12.6 10.3 130.4 98.0 150.0 98.0	Embankment Filter Material		,	Manage and the second	
12.6 8.5 87.5 66.5 12.6 10.3 5.1 4.2 5.1 4.2 130.4 98.0 150.0 98.0	Excavation	12.6	8 2	4.1	
87.5 66.5 12.6 10.3 5.1 4.2 130.4 98.0 19.6 0	Loading	12.6	ω	4.1	
12.6 10.3 5.1 4.2 130.4 98.0 1 Cost (Overhead, Profit, Tax) 19.6 0 150.0 98.0	Hauling	87.5	66.5	21.0	
5.1 4.2 130.4 98.0 19.6 0	Spreading	12.6	10.3	2.3	
130.4 98.0 1 Cost (Overhead, Profit, Tax) 19.6 0 150.0 98.0	Compacting	5.1	4.2	6 0	
Cost (Overhead, Profit, Tax)	Sub-total	130.4	0.86	32.4	
150.0		19.6	0	19.6	
	Total Cost	150.0	0.86	52.0	
					 -

Description	Total (B)	FC (B)	LC (B)
Embankment Impervious Material			
Excavation	63.3	48.0	15.3
Loading	10.4	e. 6	
Hauling	34.0	25.1	φ.
Spreading	15.1	11.4	3.7
Compacting	7.6	4.2	3.4
Sub-total	130.4	0.86	32.4
Indirection Cost (Overhead, Profit, Tax)	19.6	0	19.6
Total Cost	150.0	98.0	52.0

	Total (B)	FC (B)	LC (\$)	
Structural Concrete	:			
Mixing	206.9	1.651	47.8	<u> </u>
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 (B)	FC (B)	IC (B)
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	0.776
Indirection Cost (Overhead, Profit, Tax)	235.0	0	235.0
Total Cost	1,800.0	588.0	1,212.0

Description	Total (B)	FC (B)	TC (\$)
	1		
Concrete Facing			
Mixing	206.9	159.1	47.8
Transporting	212.1	180.6	31.5
Placing	358.7	174.2	184.5
Formwork	7*867	0	488.4
Aggregate	236.4	190•1	76.3
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

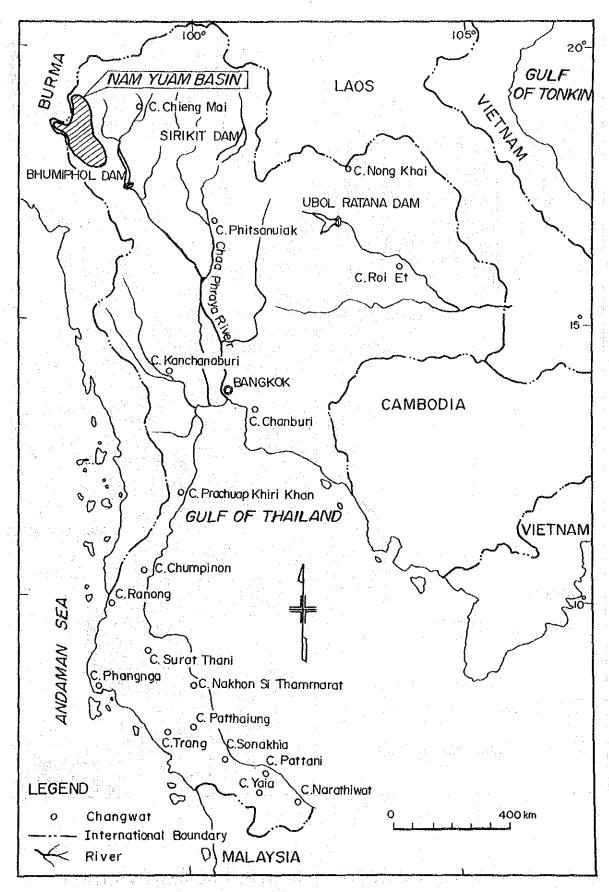


Fig. 1 LOCATION MAP

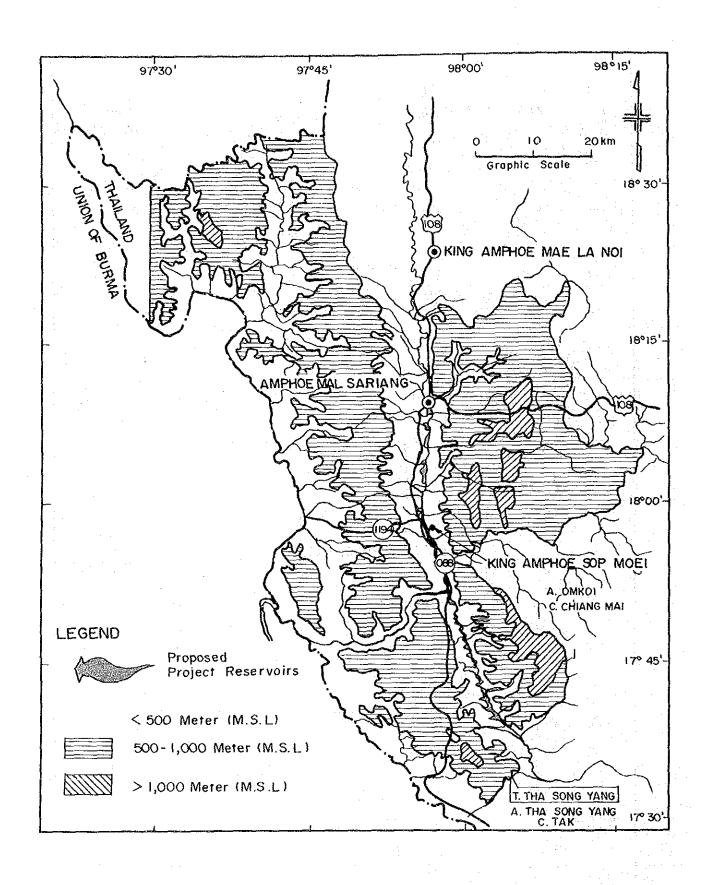


Fig. 2 GENERALIZE TOPOGRAPHY IN THE PROJECT VICINITY

Station MAE SARIANG Index Station 48 325 Latitude 18° 10' N Longitude 97° 56' E

Elevation of station above MSL.
Height of barometer above MSL.
Height of thermometer above ground
Height of wind vane above ground
Height of raingauge

212 meters 215 meters 1.20 meters 11.66 meters 0.52 meters

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Pressure (1,000 or 900) Mean Ext. Max Ext. Min. Mean daily range	13.81 22.61 4.58 7.17	12.18 23.92 2.75 7.49	9.50 19.88 0.06 7.46	7.60 18.20 98.03 7.05	6.08 15.16 94.95 5.49	5.20 14.24 93.20 4.22	5.34 14.19 93.90 3.93	5.58 14.19 96.38 4.30	7.02 16.54 0.46 5.28	10.19 19.48 4.30 5.95	12.51 23.98 4.48 6.24	13.75 24.99 93.20 6.74	0.09 24.93 5.95
Temperature (°C) Mean Mean Max. Mean Min. Ext. Max. Ext. Min.	21.7 30.8 13.1 36.4 3.3	23.6 33.6 12.9 38.8 6.2	27.6 36.6 16.9 41.5 8.7	30.7 37.9 22.1 44.1 13.8	29.3 34.8 24.0 42.7 19.2	27.2 37.4 23.5 38.6 20.5	26.6 30.4 23.1 35.7 20.8	26.3 30.2 23.0 36.4 20.6	26.0 31.5 23.1 37.4 19.7	26.8 32.5 22.1 36.3 13.4	25.2 31.9 19.2 36.4 6.5	22.4 30.6 15.3 36.0 5.0	26. 2 2. 7 19. 9 44. 1 3. 3
Relative Humidity (%) Mean Mean Max. Mean Min. Ext. Min.	73.0 96.2 43.7 17.0	65.0 94.0 34.2 15.0	55.0 89.0 29.3 13.0	55.0 84.4 33.7 16.0	71.0 90.0 53.2 21.0	81.0 94.0 68.4 44.0	83.0 94.5 71.5 49.0	85.0 94.9 73.3 40.0	83.0 95.0 68.7 44.0	80.0 95.0 62.6 32.0	77.0 94.9 55.5 24.0	76.0 95.5 49.8 23.0	74.0 93.0 53.7 13.0
Dew Point (°C) Mean Evaporation (mm.) Mean - Pan	15.6	15.1	16.4	19.5	22.8	23.5 No Obs	23.3 ervation	23.4	23.6	22.9	20.5	17.3	20.3
Cloudiness (0 - 8) Mean Sunshine Duration (hr.) Mean	2.9	1.7	1.5	2.7	5.7	6.9 No Obs	7.2	7.2	6.4	5.3	4.1	3.6	4.6
Visibility (km.) 0700 L.S.T. Mean	1.4	1.7	1.5 3.3	3.6 5.2	7.9 10.4	6.8 9.2	6.3 8.4	6.1 8.4	5.6 9.5	4.3 10.3	2.4	1.6 10.0	4.1 2.3
Wind (Knots) Prevailing wind Mean wind speed Max. wind speed	1.8	S 2.1 39 E,Sx	S 2.9 52	\$ 3.5 50 SSr	s 3.2 60	8 2.5 45	s 2.6 35 S	S 2.5 35 S	S 2.2 30 X	X 2.3 40 x	X 2.2 30	X 2.0 34	 60 V
Rainfall (mm.) Mean Mean rainy days Greatest in 24 hr. Day/Year	12.7 1.3 49.4 10/75	5.1 0.7 38.9 2/53	8.1 1.2 61.3 13/71	37.6 3.4 62.8 19/77	170.7 -16.3 131.0 23/80	189.5 24.1 95.1 6/55	202.5 25.9 57.2 4/64	253.4 26.0 92.8 29/71	210.9 20.9 113.8 3/69	119.6 12.5 96.3 14/60	23.0 3.5 76.7 1/56	12.2 2.0 58.9 23/61	1,245.3 137.5 131.0 26/80
Number of days with xxxx Fog Hail Thunderstorm Snowfall	20.6 22.0 0.0 0.4 0.0	24.6 12.6 0.0 0.3 0.0	29.5 5.6 0.1 1.9 0.0	22.4 1.4 0.1 6.3 0.1	2.7 0.2 0.0 11.9 0.0	0.2 0.0 0.0 3.5 0.0	0.0 0.4 0.0 2.9 0.0	0.2 0.3 0.0 3.5 0.0	0.4 0.9 0.0 8.6 0.0	3.7 6.3 0.0 9.6 0.0	7.3 16.5 0.0 2.4 0.0	12.4 22.6 0.0 0.5 0.0	124.4 89.3 0.3 52.1 0.1

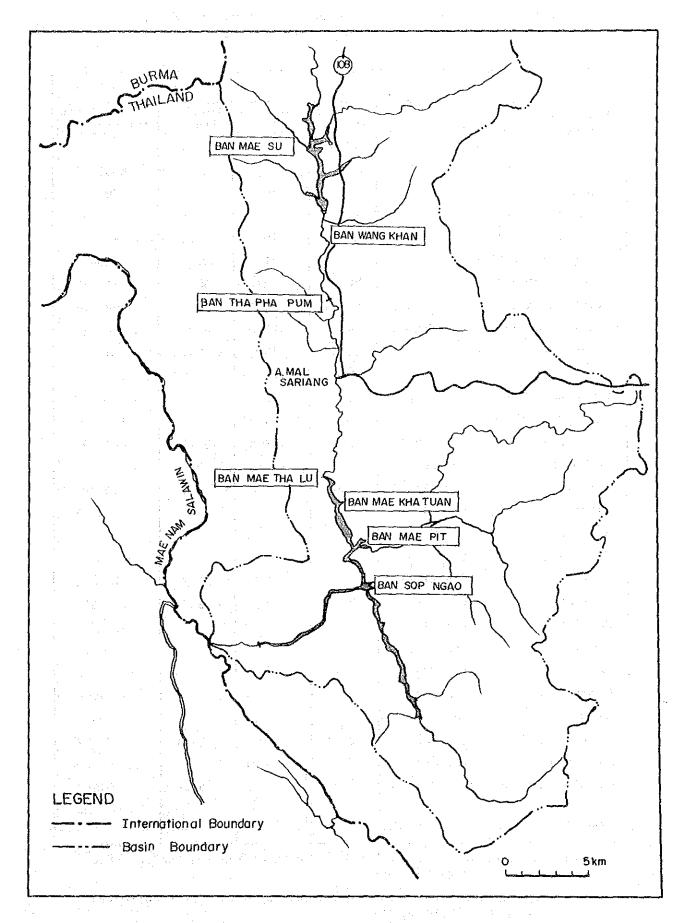


Fig. 3 WATER SAMPLING STATIONS

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
płi	<u>خفینی میں بیون نے برپ پر سی سے ب</u>	7.5	7.6	7.7	7.0
Conductivity (micro	omhos/cm)	230	320	220	800*
Depth (cm)		30	50	80	50
Transparency (cm)					
Turbidity (NTU)		15	90	9.0	- 80
Temperature (°C) Wa	ater	33	31	31	32
Total Alkalinity	(as CaCO3)	98	142*	88	74
Total Hardness	(as CaCO3)	84	122	76	108
Calcium Hardness	(as CaCO3)	64	94	64	78
Magnesium Hardness	(as CaCO3)	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 HCO3)	119.6	173.2	107.4	90.3
Carbonate	(as CO ₃)		,	:	
Chloride	(as CL)	5.0	3.0	4.0	152*
Nitrate	(as N)				
Nitrite	(as N)	}		·	[
Phosphate	(as PO ₄)				
Silica	(as SiO ₂)	15.9	16.8	20.2	16.0
Sulfate	(as SO ₄)	2.95	3.14	2.75	27.54*
Sulfide	(as S)				
Ammonia	(as N)				
Carbon Dioxide	(as CO ₂)				
Chromium (VI)	(as Cr)				
Copper	(as Cu)			ř	
Iron	(as Fe)	0.43	2.3	0.51	3.32*
Manganese	(as Mr)		: :		
Oxygen Dissolved	(as 0)	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
pН	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 CaCO3)	100	92	88
Total Hardness (as CaCO3)	94	84	80
Calcium Hardness (as CaCO3)	64	64	64
Magnesium Hardness (as CaCO3)	30	20	16
Total Solids	122	221.0	292.5
Dissolved Solids		110.0	126.0
Suspended Solids		111	166.5
Bicarbonate (as HCO3)	107.4	112.2	107.4
Carbonate (as CO ₃)	7.2		
Chloride (as CL)	5.0	5.0	4.0
Nitrate (as N)			·
Nitrite (as N)			
Phosphate (as PO ₄)			
Silica (as SiO ₂)	10.2	23.4	18.3
Sulfate (as SO ₄)	1.77	1.37	4.72
Sulfide (as S)			
Ammonia (as N)			
Carbon Dioxide (as CO ₂)			
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)		en e	

Source: Chemical and Analysis Department

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

	lassified by Type of Forest, 1975)	
Types of Forest	Plant Names	Area (rai)
1. Diciduous Dipterocarp Forest	Lagerstroemia siamica Gagnep Shorea obtusa Wall Shorea siamensia Miq.	3,711,636
	Shidora Siamensia Teijsm ex Miq. Family Fagaceae	
2. Mixed Deciduous Forest with Teak	Tectona grandis Linn. f. Afzelia xylocarpa Roxb. Chukrasia venlutina W. & A. Diospyros mollis Griff Pterocarpus macrocarpus Kurz. Family Lythraceae Family Myristicaceae Family Gramineae	3,541,942
3. Hill Evergreen Forest	Castanopsis acuminatisima Rehd. Castanopsis argentea A. Dc. Quercus poilanei Hick. & A. Camus Eugenia cumini (L.) Druce Family Pinaceae Family Fagaceae Grounding Plant: Fern, Moss, Bromheadia finlaysoniana 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	Dipterocarpus alatus Roxb. Afelia xylocarpa Roxb. Family Lythraccae	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)

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

Source: Mae Sriang, 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) Notopterus notoptrus (Pallas)	Hang-Pan	_	+
Family Mastacembelidae			
2) Mastacembelus armatus Gunther	Lard	_	+
3) Mastacembelus unicolor Cuvier and Valencennes	Lard	<u>-</u>	**************************************
Family Anguillidae	"		
4) Anguilla australis Richardson	Sa-Ngik	- .	+
Family Flutidae			
5) <u>Fluta albe</u> (Zuiew)	Yian	•• •••	+
Family Cyprinidae			
6) <u>Danio regina</u> Fowler	Siew	_	+
7) Danio aeguipinnatus (Mc Clelland)	Siew	-	
8) <u>Rasbora myersi</u> Brittan	Siew	· -	+
9) <u>Aspidoparia morar</u> (Hamilton)		-	+
10) Mystacoleucus argenteus (Day)	Hang-Luane		+
11) <u>Hampala macrolepidota</u> van <u>Hasselt</u>	Kasoop		+
12) Tor (Folifer) brevifilis brevifillis (Peters)	Kor-Moer-Nang	_	+
13) <u>Tor tambroides</u> (Bleeker)		, s t <u>L</u> et, s	+
14) <u>Tor stracheyi</u> (Day)	Yard	+	.
15) <u>Tor soro</u> (Cuvier and Valenciennes)	Mung	• + • • •	+
16) Rohtee alfrediana (Cuvier and Valenciennes)	Kai-Ong	- -	+
17) Barilius pulchellus Smith	Kaem	<u>.</u> 	+

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

Scientific Name	Common Name	Year 1945	Year 1981
18) Barilius guttatus (Day)	Ma-Hung	+	. ••••••••••••••••••••••••••••••••••••
19) <u>Puntius stoliczkae</u> (Day)	Mung-Maie	+	+
20) <u>Puntius</u> <u>daruphani</u> Smith	Sa-Pag	-	+
21) Puntius orphoides (Cuvier and Valenciennes)			+
22) Chagunius chagunio (Hamilton)	Hang-Daeng	+	+
23) Acrossocheilus vittatus Smith	Jad	+	- 1
24) Acrossocheilus malcomi Smith	Jad	:	+
25) Acrossocheilus deauratus (Cuvier and Valenciennes)		-	+ .i
26) Acrossocheilus bantamensis (Rendahl)	-	+	-
27) <u>Scaphiodonichthys</u> <u>burmanicus</u> <u>Vinciguerra</u>	Mum, Kam	+	+
28) Labeo dyocheilus (Mcclelland)	Va	+	+
29) <u>Labao calbasu</u> (Hamilton)		+	-
30) <u>Labeo behri</u> Fowler	: -	-	+
31) <u>Garra fuliginosa</u> Fowler	Mud	- ,,	+
32) <u>Garra</u> sp.	-	-	+
33) Epalzeorhynchos siamensis Smith	Mon	+	-
34) <u>Crossocheilus</u> sp.	Mon	-	+
35) <u>Balitory brucei Gray</u>	- .	+ .	+
36) <u>Homaloptera</u> <u>sexmaculata</u> <u>Fowler</u>	•••		+
37) <u>Lepidocephalus octocirrhus</u> (Van Hasselt)	Sai		og a toyaa
38) Noemacheilus multifasciatus Day	Bou	+ , , , , ,	. +
39) Noemacheilus waltoni Fowler	Bou	2]	+
40) Noemacheilus sexcauda Fowler	Bou		1, 1

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

Scientific Name	Common Name	Year 1945	Year 1981
41) Noemacheilus reidi Smith	Bou	+	+
42) Silurichthys leucopodus Fowler	Varn	→	
43) Ompok bimculatus (Bloch)			.+- :
Family Clariidae			
44) Clarias batrachus (Linnaeus)	Duk		+
Family Schiibeidae		· !	
45) Eutropiichthys vacha (Hamilton)		+	_
Family amblycipitidae			
46) Amblyceps mangols (Hamilton)	Dack	- -	+
Family Bagridae			
47) <u>Mystus</u> <u>seenghala</u> Day	Kod Hour Seab	•	4
48) <u>Mystus</u> <u>bleekeri</u> Day			+
49) Mystus microphthalmus Day	-		+
Family Sisoridae	justina i dise		
50) <u>Bagarius yarrellie</u> (Sykes)	Kae		+
51) <u>Gagata cenia</u> (Hamilton)	-	+	
52) <u>Hara hara</u> (Hamilton)	-		+
53) Exostoma vincigurrae Ragan			+
54) Pseudecheneis sulcatus	,		
(Mac Clelland)		_	+
55) Glyptothorax platypogonoides (Bleeker)	Kong-Kang, Tek-Hin	+	+
56) Glytothorax trilineatus Blyth	Tek-Hin	-	+
57) Glyptothorax dorsalis Vinciguerra		_	+
58) Glyptothorax sp.			+

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

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

Source: Somposh Akatavewat, 1982

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

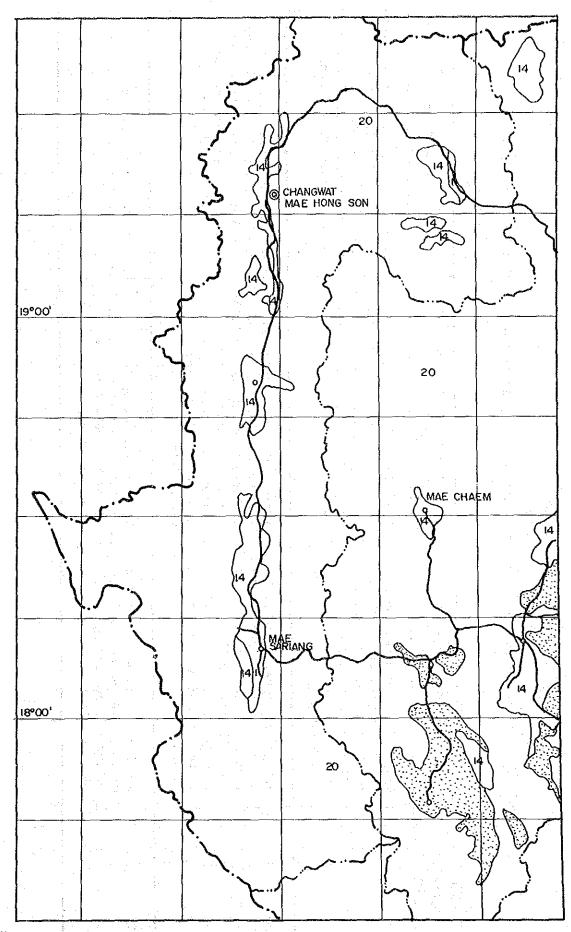


Fig. 4 LAND CAPABILITY FOR AGRICULTURE IN MAE HONG SON PROVINCE

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

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

Project Name	Tambon	Irrigation Area (Rai)	Year Completed
Amphoe Mae Sarlang		•	
1. Hual 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 Moei			
1. Mae Suad Weir		1,117	1984
2. Mae Thalu Weir	•	200	1984
 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.

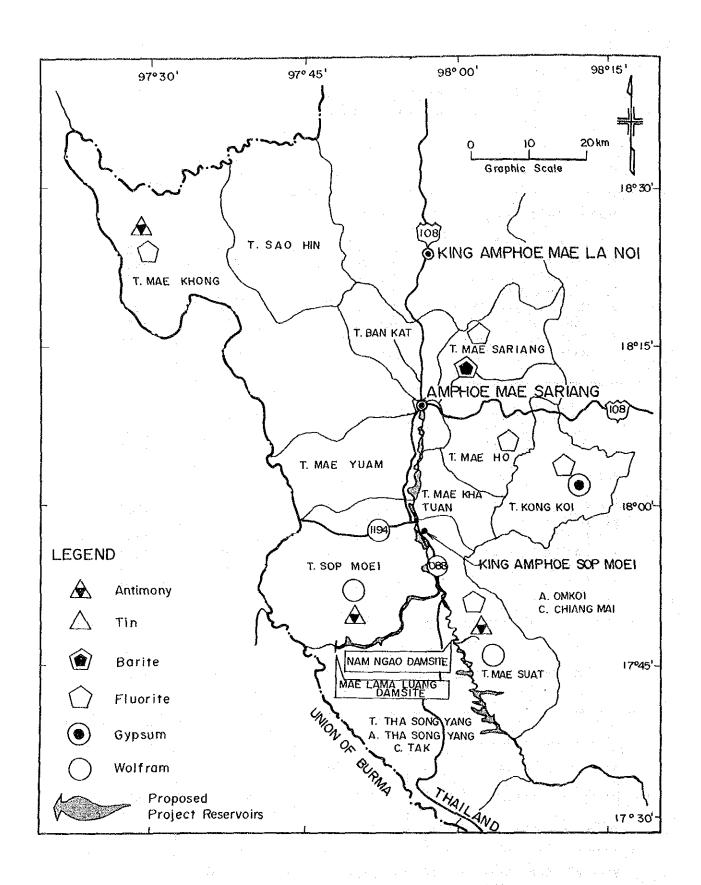


Fig. 5 MINERAL RESOURCES IN PROJECT VINICITY

Table 9 Population Distribution of Amphoe Mae Sariang

				ing the second s	
Tambon	Moo Ban	Population	Male	Female	House holds
				1 1 1 1	
Mae Sarlang	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

Mae Sarlang

Mae Sariang Administrative Office

Mae Sariang Provincial Court

Mae Sariang Regional Forestry

Mae Sariang District Penitentiary

Mae Sariang District Treasury

District Attorney

Police Station

District Custom

Border Patrol Police Unit 337

Control Unit 35

Military Unit 4, 7

Mobile Unit for Development No. 27

Unit 36

Immigation Check Point

Nam Yuam Irrigation Project

EGAT Field Office

Community Hospital

Malaria Control Unit No. 11

Public Health Office

Co-operation Office

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

Sop Moei

Sop Moei Administrative Office

Rural Development Office

Forestry Office

Animal Husbandary Office

Lands Office

Education Office

Taxation Office

Excise Office

Military Recruitment Office

Post Office

Primary School Administration Office

Agricultural Office

Police Station

Public Health Office

Co-operation Office

Community Hospital

Sop Moel Secondary School

Malaria Control Unit

Forest Protection Unit

Special Task Force Unit No. 32

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

Health Relate Facilities	Amphoe Mae Sariang	King Amphoe Sop Moei
District Hospital	<u>I</u>	1
District Health Office	1	1
Health Service Center	6	4
Midwifery	2	1
Maralia Control Unit	1	of the second

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	Ampho	e Mae	Sariang	King	Amphoe Sop	Moei
Physician		3			1.	
Nurse		13			4	
Nurse Aid		21			8	
Health Officer		. 9			3	1
Midwife	5 - 2 2 1	4		4, 5	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 Sarlang

	و المراقب المر	Number of Patient			
	Diseases	Year 1987	Year 1988	Oct. 88 - Jun. 89	
1.	Infectiuas and Parasitic Diseases	6,935	6,316	2,863	
2.	Neoplasm	194	290	468	
3.	Endrocrine, 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 Raspiratory 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 Musculosketal System and Connective Tissue	2,292	2,766	1,382	
14.	Congenital Anomalies	33	23		
15.	Certain Causes of Perinatal Morbidity and Mortaliry	37	49	23	
16.	Symtoms 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	Nu	mber of Patien	t
		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

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

Source: The Tourism Authority of Thailand, 1983

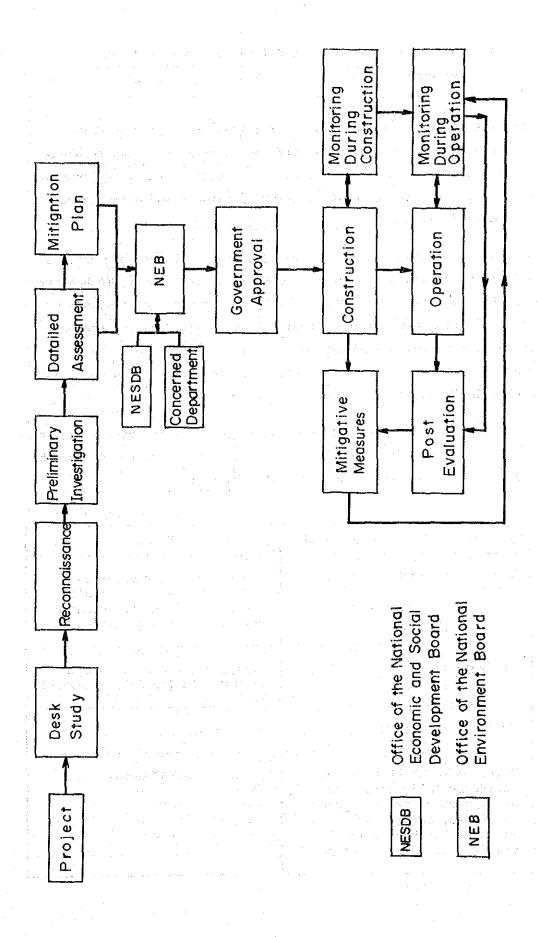


Fig. 6 ENVIRONMENTAL PROCEDURE

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 an 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 rais (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 ₂ CO ₃ , HCl, CL ₂ , 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 are and/or scrap iron as raw materials for production greater than 100 tons/day or using furnaces with combined capacity greater 5 tons/batch.
i	(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.

