6. DESIGN

6.1 District Road

6.1.1 Design Policy

Because the district road network has a primary function to connect sub-districts to a district centre or the National Route as well as to contribute to the farmers' daily and economic activities throughout the year, it should be of all weather type. In addition, economical construction and elimination of any environmental problem should also be taken into consideration in the design of the road rehabilitation. Therefore, attention is paid to the design so as to minimize earth work volume, using the existing road alignment as much as possible.

Drainage facilities such as river crossing and side drains are indispensable to maintain the rainy season traffic. The road in Xai model area crosses the Nam Mao river, and the one in Hun model area crosses the Nam Kham and Nam Ngat rivers. They have 0.1 to 0.4 m^3/sec of mean flow in the dry season and 50 to 700 m^3/sec of flood flow with 40-year return period. Taking into account these river conditions, causeway type of river crossing (Irish type) will be applied for its economical construction.

6.1.2 Design Standard

The following standard will be applied for the design of district road rehabilitation :

- Design speed	:	25 km/hour
- Carriage way	:	3.5 m
- Gravel pavement width	:	3.5 m
- Shoulder width	:	1.25 m x both sides
- Side drain width	:	0.5 m
- Maximum gradient	:	10% up to 200 m
- Minimum radius	:	12 m
- Daily traffic volume	:	less than 50

The river crossing will consist of concrete slab bridge with a span of 7 m and stone masonry type of short access roads. The crossings on the Nam Mao, Nam Kham and Nam Ngat will have five spans, two spans and one span, respectively. The height of the concrete slab bridge will be about 1.5 m above the river bed so that floods with annual frequency can pass through at no more than 50 cm of water depth on the bridge surface.

Cross drains will be constructed according to the topographical requirement. Most of cross drains will be pipe culvert with a diameter of 400 mm to 600 mm, and concrete protection walls will be provided at both sides. For large crosses where two sets of 600-mm pipe culvert or more are required, concrete box culvert will be constructed.

Typical cross section of proposed district road is shown in Fig. FE-4, and the number of crossing structures is summarized below.

Item	Unit	Xai model area (H. Khoum to Nale)	Hun model area (Hun to Somphon)
Road Length	km	1.9	7.5
Causeway	Nos.	1	2
Cross drain			
- Concrete pipe (400x1)	Nos.	1	6
- Concrete pipe (600x1)	Nos.	2	18
- Concrete pipe (600x2)	Nos.	1	4
- Box culvert	Nos.	3	5

6.2 Rural Water Supply System

6.2.1 Design

(1) Water Requirement

In order to determine the total daily water consumption, the following design assumption is made based on the similar type of rural water supply systems constructed by UNDP, UNICEF and Quaker service :

- Daily water consumption : 45 lit/day/capita
- Design population : Year 2000 with 2.9% of growth rate
- Daily demand pattern :

Time period	Allocation of Demand
6:00 - 8:00 (2 hours)	30% of total daily demand
8:00 - 16:00 (8 hours)	40% of total daily demand
16:00 - 18:00 (2 hours)	30% of total daily demand
18:00 - 6:00 (12 hours)	Negligible

Based on the above assumption, total daily water demands for proposed three (3) water supply systems will be 73 m^3 for Xai, 105 m^3 for Beng and 133 m^3 for Hun scheme, requiring 0.84 lit/sec, 1.20 lit/sec and 1.53 lit/sec of flows, respectively, as shown below.

Item	Xai	Beng	Hun
Nos. of Village	3	4	5
Total Population	1,173	1,743	2,172
Design Population	1,600	2,300	2,900
Daily Demnd (m3)	73	105	133
Demand Flow (lit/s)	0.84	1.20	1.53

(2) Hydraulic Design

The following Hazen-Willams formula is used for hydraulic design of pipe line system :

$$h = 10.666 * L * C^{(-1.85)} * D^{(-4.87)} * Q^{(1.85)}$$

Where,

h = Head loss (m)
L = Pipe Length (m)
C = Coefficient (100 = GI Pipe, 130 = HDP Pipe)
D = Diameter (m)
Q = Quantity of Flow (m^3/s)
GI = Galvanized Iron
HDP = High Density Polyethylene

Other design assumption applied is as follows :

- Design requirement of tap : 10 families/tap
- Tap stand discharge : 0.23 lit/sec.
- Pressure rating of pipes : HDP Pipe = 6 kg/cm^2
  GI Pipe = 25 kg/cm^2
- Velocity limits in pipes : Max. 3.0 m/s
  Min. 0.7 m/s
- Head loss in fitting : Negligible
- Residual head
  Tap stand : Max. 6 m
  (> 6 m = diffuser)
  Min. 3 m
  Discharge into tank : Max. 8 m
  Min. 5 m

Details of the hydraulic design of each system thus made are shown in Tables FE-5, FE-6 and FE-7.

6.2.2 Distribution System

(1) Xai Scheme

Available water source will be the Houay Khoum river with 6.7 lit/sec of flow discharge observed in November 1992 and will be sufficient for the proposed water supply system covering three (3) villages which will require 0.84 lit/sec of discharge for 1,600 of design population. The elevation at intake site is 481.16 m above sea level. On the other hand, the three villages are located at an elevation between 291.06 m and 308.14 m. Therefore, the difference in elevation between the site and villages could provide the hydraulic head enough for supplying water under the gravity flow condition.

Two (2) reservoir tanks will be required : one in B. Houay Khoum village and the other in B. Nasao village. The tanks will be conncetd with the intake facility by trunk pipe lines with a total length of 4.9 km. A sand filter tank will be constructed at about 100 m upstream from the reservoir tank No.1 to protect the pipes from sediment in the rainy season.

Three (3) distribution lines for each village will start from the reservoirs, one is from the reservoir No.1 to B. Houay Khoum and the other two are from the reservoir No.2 to B. Nasao and B. Nale, respectively, with 3.5 km in total length. The number of stand taps for each village is determined at 12 taps for B. Houay Khoum, 7 taps for B. Nasao and 7 taps for B. Nale, based on the beneficiary population.

The water supply distribution system of Xai scheme is illustrated in Fig. FE-5.

(2) Beng Scheme

Available water source will be the Houay Lai river with 2.9 lit/sec of discharge observed in November 1992 and will be sufficient for the proposed water supply system for four (4) villages which will require 1.20 lit/sec of discharge with 2,300 of design population. The elevation at intake site is 392.01 m, and the four villages are located at an elevation between 308.87 m and 321.85 m. This could provide sufficient hydraulic head for the scheme with gravity flow.

Two (2) reservoir tank will be required : one in B. Nalai village and the other in B. Pandua, and will be connected with the intake facility by trunk pipe lines with 4.2 km in total length. A sand filter tank will be constructed at about 500 m upstream from the reservoir tank No.1 to protect the pipes from sediment during the rainy season.

Four (4) distribution lines for each village will start from the reservoirs: two are from the reservoir No.1 to B. Nalai and B. Gnjo, and the other two are from the reservoir No.2 to B. Pandua and B. Phokeo, respectively, with a total length of 5.6 km. The number of stand tap for each village is determined at 11 taps for B. Gnjo, 7 taps for B. Nalai, 8 taps for B. Pandua and 9 taps for B. Phokeo, based on the number of family.

The water supply distribution system of Beng scheme is shown in Fig. FE-6.

(3) Hun Scheme

Available water source will be the Houay Phon river with a discharge of 5.7 lit/sec observed in November 1992 and will have sufficient flow for the proposed water supply system for five (5) villages, which will require 1.53 lit/sec of discharge for 2,900 of design population. The elevation at intake site is 453.28 m, and the five villages are between 313.55 m and 345.48 m in elevation. Therefore, this scheme could supply enough water by gravity.

Three (3) reservoir tanks will be required, each for B. Somphon village, B. Nakham-nua and B. Na, and will be connected with the intake facility by trunk pipe lines with 7.3 km in total length. A sand filter tank will also be constructedat about 2.0 km upstream from the reservoir tank No.1 to avoid sediment in the pipes during the rainy season.

Five (5) distribution lines for each village will start from the reservoirs : one is from the reservoir No.1 to B. Somphon ; two are from the reservoir No.2 to B. Nakham-nua and B. Nakham-tai ; and the remaining two are from the reservoir No.3 to B. Na and B. Mai, respectively, with a total length of 4.3 km. The number of stand taps for each village is determined at 13 taps

for B. Somphon, 6 taps for B. Nakham-nua, 8 taps for B. Nakham-tai, 13 taps for B. Na and 6 taps for B. Mai, based on the numbers of family.

The water supply distribution system of Hun scheme is shown in Fig. FE-7.

6.3 PRIMARY SCHOOL

It is proposed that the design of primary school will follow an existing Thaohom primary school in B. Gnjo village, Beng district newly constructed in 1992. Such a Thaohom school has four (4) class rooms, which consists of galvanized iron sheet roof and brick masonry moltar wall on the concrete floor. However, slate sheet is recommended for the roofing of proposed primary school instead of galvanized iron sheet to provide more comfortable condition for the pupils especially in the hot season. One room, 7 m in length and 6 m in width, will have a floor space of 42 m^2 which is enough to accommodate 45 pupils of the standard. Each room will be equipped with the required number of desks, chairs and blackboard. The rooms will be linked each other with a corridor at the front side. Although the required number of rooms vary according to the number of pupil, it will be two to four rooms in a school on an average. Only the Thaohom Khet 1 in Beng model area will require 10 rooms in total for five school houses, each with two rooms. The plan of primary school in each model area will be as follows :

Model Area	Xay	Beng	Hun
Nos. of School	5	3	4
Nos. of Room	15	14	10

Table

Table FE-1 Feature of Water Usage

Model Scheme	Village	Popu-lation	Nos.of Family	Nos.of Well	Nos.of Tap	Water Source for Drinking	Washing/ Bathing	Remark
Xai								
1	B.Nalao	894	135	-	92 ,2)	Tap	Tap	
2	B.Nami	230	38	-	15 ,2)	Tap/N.Mao	N.Mao	
3	B.Nakhang	100	17	-	-	H.Puk	H.Puk	
4	B.Nasao	337	57	-	-	H.Sa/N.Mao	H.Sa/N.Mao	Water is not clean, upstreams inhabitants
5	B.Nale	356	58	1	-	Well/N.Hin	N.Hin	Well dries up in dry season, N.Hin is not clean
6	B.Houaykhoum	480	97	1	-	Well/H.Khoum	H.Khoum/N.Mao	
Beng								
1	B.Phokeo	477	74	1	-	Well/Canal	Canal/N.Beng	Drying up in dry season, 1 Km to N.Beng
2	B.Bengkham	393	79	-	3 ,3)	Canal/N.Beng	Canal/N.Beng	
3	B.Nahouay	340	57	-	2 ,3)	N.Hao	Tap/N.Hao	
4	B.Benglouang	502	93	3	9 ,3)	Well/N.Hao	Tap/N.Hao	
5	B.Houayla	406	59	2	5 ,3)	Well/H.Klee	Tap/Well	
6	B.Thakat	332	84	1	7 ,3)	Well	Tap/N.Beng	Drying up in dry season, 300-400 m to N.Beng
7	B.Pangdua 1)	365	62	-	-	N.Beng	N.Beng	No clean streams available, 300-400 m to N.Beng
8	B.Nalai 1)	363	52	-	-	H.Lai	H.Lai	
9	B.Gnjo 1)	538	91	1	-	Well	N.Beng	Well dries up in dry season, 200-300 m to N.Beng
Hun								
1	B.Somphon	641	126	-	-	N.Kham	N.Kham	200-300 m to N.Kham, upstreams inhabitants
2	B.Nakham-nua	261	50	-	-	N.Kham	N.Kham	50-200 m to N.Kham, upstreams inhabitants
3	B.Nakham-tai	351	60	-	-	N.Kham	N.Kham	100-200 m to N.Kham, upstreams inhabitants
4	B.Somxai	872	176	-	8 ,4)	Tap	N.Ngat	50-100 m to N.Ngat
5	B.Na	657	118	-	-	N.Ngat	N.Ngat	50-200 m to N.Ngat, upstreams inhabitants
6	B.Mai	262	54	1	-	Well	N.Kham	100-200 m to N.Kham, upstreams inhabitants

Note : 1) Out of the model scheme area in Beng district, but included because of water source availability
2) Taps of Nam papa urban water supply system in Xai town
3) Taps of rural water supply system in Beng town
4) Taps of rural water supply system in Hun town

Table FE-2 Proposed Plan of Water Supply

Item		Model Scheme		
		Xai	Beng	Hun
1. Objective Village (Population/Nos.of Family)	(1)	B.Nasao (337/57)	B.Phokeo (477/74)	B.Somphon (641/126)
	(2)	B.Nale (356/58)	B.Pangdua (365/62)	B.Nakham-nua (261/50)
	(3)	B.Houaykhoum (480/97)	B.Nalai (363/52)	B.Nakham-tai (351/60)
	(4)	-	B.Gnjo (538/91)	B.Na (657/118)
	(5)	-	-	B.Mai (262/54)
2. Total Population		1,173	1,743	2,172
3. Design Population*		1,600	2,300	2,900
4. Water Source		Houay Khoum	Houay Lai	Houay Phon
5. Discharge (Observation Date)		6.7 l/s (16/Nov./92)	2.9 l/s (02/Nov./92)	5.7 l/s (10/Nov./92)
6. Nos.of Tap**		B.Nasao (7) B.Nale (7) B.Houaykhoum (12)	B.Phokeo (9) B.Pangdua (8) B.Nalai (7) B.Gnjo (11)	B.Somphon (13) B.Nakham-nua (6) B.Nakham-tai (8) B.Na (13) B.Mai (6)
(Total)		(26)	(35)	(46)
7. Lengh of Main Pipe (Water Source to Village)		3.1 Km	2.4 Km	4.4 Km
8. Length of Distribution Line		4.5 Km	4.2 Km	3.7 Km

Note: * Predicted population in Year 2000 with 2.9 % of increase rate
** 10 families/tap, design requirement

Table FE-3 Primary School and Village Community House

District	Village	Popu-lation	Nos.of Family	Nos.of Pupil of Primary School by Class I	II	III	IV	V	Nos.of Teacher	School House	Community House	Remark
Xai	1 B.Nalao	894	135	86	30	-	-	-	2	X*	O*	Class III-V to Thaohom Khet 1
	2 B.Nami	230	38	24	8	-	-	-	1	O	X	Class III-V to Thaohom Khet 1
	3 B.Nakhang	100	17	20	0	-	-	-	0	O	X	Class III-V to Thaohom Khet 1
	4 B.Nasao	337	57	28	12	-	-	-	1	O	O	Class III-V to Thaohom Khet 4
	5 B.Nale	356	58	-	-	-	-	-	-	X	O	Class I-V to Thaohom Khet 4
	6 B.Houaykhoum	480	97	49	22	-	-	-	2	O	X	Class III-V to Thaohom Khet 5
	7 Thaohom Khet 1	-	-	-	-	64	58	33	4	O	X	**
	8 Thaohom Khet 4	-	-	40	22	19	17	16	4	O	X	***
Sub-total		2397	402	247	94	83	75	49	14			
Beng	1 B.Phokeo	477	74	33	31	-	-	-	1	X	O	Class III-V to Thaohom Khet 1
	2 B.Bengkham	393	79	42	-	-	-	-	1	X	O	Class II-V to Thaohom Khet 1
	3 B.Nahouay	340	57	55	-	-	-	-	1	O	O	Class II-V to Thaohom Khet 1
	4 B.Benglouang	502	93	59	-	-	-	-	1	X	O	Class II-V to Thaohom Khet 1
	5 B.Houayla	406	59	24	-	-	-	-	1	O	X	Class II-V to Thaohom Khet 1
	6 B.Thakat	332	84	47	-	-	-	-	1	X	O	Class II-V to Thaohom Khet 1
	7 Thaohom Khet 1	-	-	-	110	101	78	40	6	O	X	****
Sub-total		2450	446	260	141	101	78	40	12			
Hun	1 B.Somphon	641	126	26	11	-	-	-	1	X	O	Class III-V to Thaohom Khet 2
	2 B.Nakham-nua	261	50	17	10	-	-	-	1	O	O	Class III-V to Thaohom Khet 2
	3 B.Nakham-tai	351	60	25	13	-	-	-	1	O	O	Class III-V to Thaohom Khet 2
	4 B.Somxai	872	176	25	17	-	-	-	1	X	O	Class III-V to Thaohom Khet 2
	5 B.Na	657	118	18	21	-	-	-	2	X	O	Class III-V to Thaohom Khet 2
	6 B.Mai	262	54	21	0	-	-	-	1	O	X	Class III-V to Thaohom Khet 2
	7 Thaohom Khet 2	-	-	-	-	48	15	17	3	O	X	*****
Sub-total		3044	584	132	72	48	15	17	10			
Total		7891	1432	639	307	232	168	106	36			

Source: Data obtain from both provincialand district offices

Note : * O = exist, X = not exist

** Primary school having Class III-V in B.Cheng, covering 5 villages (B.Nalao, B.Nami, B.Nakhang, B.Dongxai, B.Cheng)

*** Primary school having Class I-V in B.Nale, covering 4 villages (B.Nale, B.Nasao, B.Houaydu, B.Nasengkham)

**** Primary school having Class II-V in B.Benglouang, coverig 11 villages (B.Phokeo, B.Bengkham, B.Nahouay, B.Benglouang, B.Houayla, B.Thakat, B.Khonkam, B.Namhao, B.Nagiou, B.Namdo, B.Phousing)

***** Primary school having Class III-V in B.Somxai, covering 9 villages (B.somphon, B.Nakham-nua, B.Nakham-tai, B.Somxai, B.Na, B.Mai, B.Namlian, B.Khokharan, B.Mokoron)

Table FE-4 Proposed Plan of Primary School

District		Village	Nos.of Pupil of Primary School by Class					Nos.of Room	Remark
			I	II	III	IV	V		
Xai									
	1	B.Nalao*	116	38	-	-	-	3	
	2	B.Nasao	28	12	-	-	-	2	
	3	B.Houaykhoum	49	22	-	-	-	2	
	4	Thaohom Khet 1	-	-	64	58	33	4	B. Cheng
	5	Thaohom Khet 4	40	22	19	17	16	4	B.Nale
Beng									
	1	B.Phokeo	33	31	-	-	-	2	
	2	B.Thakat	47	-	-	-	-	2	
	3	Thaohom Khet 1**	180	110	101	78	40	10	B.Benglouang
Hun									
	1	B.Somphon	26	11	-	-	-	2	
	2	B.Nakham-nua*** + B.Nakham-tai	42	23	-	-	-	2	
	3	B.Na + B.Mai****	39	21	-	-	-	2	
	4	Thaohom Khet 2****	25	17	48	15	17	4	B.Somxai

Total : 12 Places with 39 rooms

Note:
* : Pupil of Class I and II in B. Nami are instructed and supposed to join B Nalao.
** : Class I in B. Bengkham, B. Nahouay, B. Benglouang and B. Houayla are supposed to join Thaohom Khet 1 in B. Benglouang
*** : Total number of population in B. Nakhana-nua and B. Nakhana-tai, and a school house is proposed to be established between the two villages
**** : Total number of pupil in the Na and B. Mai, and a school house is proposed to be established between the two villages
***** : Clas I and II in B. Somxai is proposed to join Thaohom khert 2 in B, Somxai

Table FE-5 Pipeline Hydraulics in Xai Scheme

	Reach		Flow	Pipe	Pipe	Frictional	Head	HGL(*)	EL. of	HGL(*)	Residual	
	Station I	Station II	(lps)	Length (m)	Size (mm)	Factor (%)	Loss (m)	St.I (m)	St.II (m)	St.II (m)	Head of S.II (m)	Remark
(1) Trunk Pipe Line (H.Khoum, Xai)												
	Intake	*	1	150	1.5"	4	5	481	-	476	-	GI Pipe
	*	HP-1	1	53	1.0"	26	14	476	457	462	6	GI Pipe
	HP-1	*	1	0	50	1	0	462	-	462	-	
	*	HP-2	1	855	32	5	44	462	390	419	29	
	HP-2	*	1	0	1.5"	4	0	419	-	419	-	GI Pipe
	*	HP-3	1	61	1.0"	26	16	419	385	403	18	GI Pipe
	HP-3	*	1	0	50	1	0	419	-	419	-	
	*	HP-4	1	373	32	5	19	419	363	400	37	
	HP-4	*	1	45	2"	1	0	363	-	363	-	GI Pipe
	*	HP-5	1	0	1.5"	4	0	363	361	363	2	GI Pipe
	HP-5	*	1	200	50	1	1	361	-	360	-	
	*	HP-6	1	164	32	5	8	360	338	351	13	
	HP-6	*	1	48	1.5"	4	2	351	-	349	-	GI Pipe
	*	HP-7	1	0	1.0"	26	0	349	335	349	15	GI Pipe
	HP-7	*	1	125	50	1	1	349	-	349	-	
	*	F.Tank	1	215	32	5	11	349	331	338	7	
	F.Tank	*	1	111	50	1	1	331	-	330	-	
	*	R.Tank-1	1	0	32	5	0	330	323	330	7	
	R.Tank-1	*	0	1,860	50	0	4	323	-	319	-	
		HP-1	0	0	32	2	0	319	291	319	28	
	HP-1	*	0	150	1.5"	1	2	319	-	317	-	GI Pipe
	*	HP-2	0	0	1.0"	9	0	317	289	317	28	GI Pipe
	HP-2	*	0	300	50	1	2	317	-	315	-	
	*	R.Tank-2	0	0	32	2	0	315	308	315	7	
(2) Distribu (2) Distribution Line (B.Houaykhoum)												
Line-1	R.Tank-1	*	3	120	90	0	0	323	-	323	-	
	*	T-1	3	120	63	2	2	323	305	321	16	
	T-1	*	2	20	63	1	0	321	-	320	-	
	*	T-2	2	0	50	4	0	320	304	320	17	
	T-2	*	2	20	63	1	0	320	-	320	-	
	*	T-3	2	0	50	3	0	320	302	320	18	
	T-3	*	2	20	63	1	0	320	-	320	-	
	*	T-4	2	0	50	2	0	320	304	320	16	
	T-4	*	1	20	63	0	0	320	-	320	-	
	*	Tap-7	1	0	50	1	0	320	304	320	16	Diffuser
	Tap-7	*	1	20	63	0	0	320	-	320	-	
	*	T-5	1	0	50	1	0	320	305	320	15	
	T-5	*	1	20	50	1	0	320	-	320	-	
	*	Tap-9	1	0	32	6	0	320	305	320	14	Diffuser
	Tap-9	*	1	50	50	0	0	320	-	319	-	
	*	T-6	1	210	32	4	7	319	299	312	13	
	T-6	*	0	20	50	0	0	312	-	312	-	
	*	Tap-11	0	80	32	2	1	312	304	311	7	Diffuser
	Tap-11	*	0	40	32	0	0	311	-	310	-	
	*	Tap-12	0	20	20	5	1	310	308	310	1	
Line-2	T-1	*	0	0	32	2	0	321	-	321	-	
	*	Tap-1	0	20	20	17	3	321	306	317	11	Diffuser
	Tap-1	*	0	0	32	0	0	317	-	317	-	
	*	Tap-2	0	50	20	5	2	317	309	315	6	Diffuser
Line-3	T-2	*	0	0	32	0	0	320	-	320	-	
	*	Tap-3	0	20	20	5	1	320	304	319	16	Diffuser
Line-4	T-3	*	0	0	32	2	0	320	-	320	-	
	*	Tap-4	0	10	20	17	2	320	302	318	16	Diffuser
	Tap-4	*	0	0	32	2	0	318	-	318	-	
	*	Tap-5	0	40	20	17	7	318	302	312	10	Diffuser
Line-5	T-4	*	0	0	32	2	0	320	-	320	-	
	*	Tap-6	0	30	20	17	5	320	303	315	12	Diffuser
Line-6	T-5	*	0	0	32	2	0	320	-	320	-	
	*	Tap-8	0	30	20	17	5	320	304	315	11	Diffuser
Line-7	T-6	*	0	35	32	2	1	312	-	311	-	
	*	Tap-10	0	15	20	17	2	311	304	309	5	
(3) Distribution Line (B.Nasao)												
Line-1	R.Tank-2	*	2	0	63	1	0	308	-	308	-	
	*	Tap-1	2	315	50	2	6	308	292	302	10	Diffuser
	Tap-1	*	1	25	50	1	0	302	-	302	-	
	*	T-1	1	0	32	13	0	302	293	302	9	
	T-1	*	1	0	50	1	0	302	-	302	-	
	*	Tap-4	1	25	32	6	2	302	293	300	7	Diffuser
	Tap-4	*	1	0	50	0	0	300	-	300	-	
	*	T-2	1	25	32	4	1	300	293	299	6	
	T-2	*	0	0	32	0	0	299	-	299	-	
	*	Tap-7	0	25	20	5	1	299	293	298	5	
Line-2	T-1	*	0	0	32	0	0	302	-	302	-	
	*	Tap-2	0	30	20	5	1	302	292	300	8	Diffuser
Line-3	T-1	*	0	0	32	0	0	302	-	302	-	
	*	Tap-3	0	30	20	5	1	302	293	300	7	Diffuser
Line-4	T-2	*	0	0	32	0	0	299	-	299	-	
	*	Tap-5	0	30	20	5	1	299	293	298	5	Diffuser
Line-5	T-2	*	0	0	32	0	0	299	-	299	-	
	*	Tap-6	0	30	20	5	1	299	293	298	5	
(4) Distribution Line (B.Nale)												
Line-1	R.Tank-2	*	2	1,680	63	1	11	308	-	297	-	
	*	Tap-1	2	70	50	2	1	297	291	296	5	
	Tap-1	*	1	20	50	1	0	296	-	296	-	
	*	T-1	1	10	32	13	1	296	290	294	4	
	T-1	*	1	10	50	1	0	294	-	294	-	
	*	Tap-3	1	10	32	6	1	294	289	294	5	
	Tap-3	*	1	10	50	0	0	294	-	294	-	
	*	T-2	1	0	32	4	0	294	289	294	5	
	T-2	*	0	15	32	0	0	294	-	294	-	
	*	Tap-5	0	15	20	5	1	294	288	293	5	
	Tap-5	*	0	20	32	0	0	293	-	293	-	
	*	T-3	0	10	20	5	0	293	288	292	5	
	T-3	*	0	40	32	0	0	292	-	292	-	
	*	Tap-7	0	10	20	5	0	292	287	292	5	
Line-2	T-1	*	0	15	32	0	0	294	-	294	-	
	*	Tap-2	0	5	20	5	0	294	289	294	5	
Line-3	T-2	*	0	5	32	0	0	294	-	294	-	
	*	Tap-4	0	15	20	5	1	294	288	293	5	
Line-4	T-3	*	0	17	32	0	0	292	-	292	-	
	*	Tap-6	0	3	20	5	0	292	287	292	5	

Table FE-6 Pipeline Hydraulics in Beng Scheme

		Reach		Flow	Pipe	Pipe	Frictional	Head	HGL(*)	El. of	HGL(*)	Residual	
		Station I	Station II	(lps)	Length	Size	Factor	Loss	St.I	St.II	St.II	Head of	Remark
					(m)	(mm)	(%)	(m)	(m)	(m)	(m)	St.II (m)	
(1) Trunk Pipe Line (H.Lal, Beng)		Intake	"	1	184	3.0"	0	0	392	-	392	-	GI Pipe
		"	HP-1	1	0	2.0"	2	0	392	390	392	2	GI Pipe
		HP-1	"	1	168	63	0	1	392	-	391	-	
		"	HP-2	1	0	50	1	0	391	386	391	5	
		HP-2	"	1	1,300	50	1	15	391	-	376	-	
		"	P.Tank	1	130	32	10	13	376	356	364	8	
		P.Tank	"	1	0	50	1	0	356	-	356	-	
		"	HP-3	1	265	32	10	26	376	315	350	35	
		HP-3	"	1	0	3.0"	0	0	350	-	350	-	GI Pipe
		"	HP-4	1	27	2.0"	2	0	350	315	350	34	GI Pipe
		HP-4	"	1	100	63	0	0	350	-	349	-	
		"	R.Tank-1	1	146	50	1	2	349	340	348	8	
		R.Tank-1	"	1	900	50	0	3	340	-	337	-	
			HP-1	1	0	32	3	0	337	314	337	23	
		HP-1	"	1	1,200	50	0	3	337	-	334	-	
		"	R.Tank-2	1	0	32	3	0	334	327	334	7	
(2) Distribution Line (B.Gnjo)	Line-1	R.Tank-1	"	3	300	90	0	1	340	-	339	-	
		"	Tap-1	3	880	63	1	13	339	322	326	5	
		Tap-1	"	2	50	90	0	0	326	-	326	-	
		"	T-1	2	0	63	1	0	326	322	326	5	
		T-1	"	2	50	90	0	0	326	-	326	-	
		"	Tap-4	2	0	63	1	0	326	322	326	5	
		Tap-4	"	2	50	63	1	0	326	-	326	-	
		"	T-2	2	0	50	2	0	326	322	326	4	
		T-2	"	1	50	63	0	0	326	-	326	-	
		"	Tap-7	1	0	50	1	0	326	322	326	4	
		Tap-7	"	1	50	63	0	0	326	-	326	-	
		"	T-3	1	0	50	1	0	326	322	326	4	
		T-3	"	0	50	50	0	0	326	-	326	-	
		"	Tap-10	0	0	32	2	0	326	322	326	4	
		Tap-10	"	0	50	32	0	0	326	-	325	-	
		"	Tap-11	0	0	20	5	0	325	322	325	4	
	Line-2	T-1	"	0	30	32	0	0	326	-	326	-	
		"	Tap-2	0	0	20	5	0	326	322	326	5	
	Line-3	T-1	"	0	30	32	0	0	326	-	326	-	
		"	Tap-3	0	0	20	5	0	326	322	326	5	
	Line-4	T-2	"	0	30	32	0	0	326	-	326	-	
		"	Tap-5	0	0	20	5	0	326	322	326	4	
	Line-5	T-2	"	0	30	32	0	0	326	-	326	-	
		"	Tap-6	0	0	20	5	0	326	322	326	4	
	Line-6	T-3	"	0	30	32	0	0	326	-	326	-	
		"	Tap-8	0	0	20	5	0	326	322	326	4	
	Line-7	T-3	"	0	30	32	0	0	326	-	326	-	
		"	Tap-9	0	0	20	5	0	326	322	326	4	
(3) Distribution Line (B.Nalal)	Line-1	R.Tank-1	"	2	424	50	2	8	340	-	332	-	
		"	Tap-1	2	76	32	17	13	332	314	319	5	
		Tap-1	"	1	20	50	1	0	319	-	319	-	
		"	T-1	1	0	32	13	0	319	314	319	5	
		T-1	"	1	30	50	1	0	319	-	318	-	
		"	Tap-4	1	0	32	6	0	318	314	318	4	
		Tap-4	"	1	40	50	0	0	318	-	318	-	
		"	T-2	1	0	32	4	0	318	314	318	4	
		T-2	"	0	30	32	0	0	318	-	318	-	
		"	Tap-7	0	0	20	5	0	318	313	318	4	
	Line-2	T-1	"	0	30	50	0	0	319	-	319	-	
		"	Tap-2	0	0	32	2	0	319	314	319	4	
		Tap-2	"	0	30	32	0	0	319	-	318	-	
		"	Tap-3	0	0	20	5	0	318	314	318	4	
	Line-3	T-2	"	0	30	32	0	0	318	-	318	-	
		"	Tap-5	0	0	20	5	0	318	313	318	4	
	Line-4	T-2	"	0	30	32	0	0	318	-	318	-	
		"	Tap-6	0	0	20	5	0	318	314	318	4	
(4) Distribution Line (B.Pandra)	Line-1	R.Tank-2	"	2	50	63	1	0	327	-	327	-	
		"	T-1	2	360	50	2	9	327	313	318	5	
		T-1	"	2	10	63	1	0	318	-	318	-	
		"	T-2	2	10	50	2	0	318	312	317	5	
		T-2	"	1	10	63	0	0	317	-	317	-	
		"	T-3	1	20	50	1	0	317	312	317	5	
		T-3	"	1	10	63	0	0	317	-	317	-	
		"	T-4	1	10	50	1	0	317	312	317	5	
		T-4	"	1	10	63	0	0	317	-	317	-	
		"	T-5	1	20	50	1	0	317	311	317	6	
		T-5	"	1	10	50	0	0	317	-	317	-	
		"	T-6	1	10	32	4	0	317	311	316	6	
		T-6	"	0	10	50	0	0	316	-	316	-	
		"	T-7	0	20	32	2	0	316	310	316	6	
		T-7	"	0	23	32	0	0	316	-	316	-	
		"	Tap-8	0	17	20	5	1	316	310	315	5	
	Line-2	T-1	"	0	20	32	0	0	318	-	318	-	
		"	Tap-1	0	0	20	5	0	318	313	318	5	
	Line-3	T-2	"	0	15	32	0	0	317	-	317	-	
		"	Tap-2	0	5	20	5	0	317	312	317	5	
	Line-4	T-3	"	0	20	32	0	0	317	-	317	-	
		"	Tap-3	0	0	20	5	0	317	312	317	5	
	Line-5	T-4	"	0	5	32	0	0	317	-	317	-	
		"	Tap-4	0	15	20	5	1	317	311	316	5	
	Line-6	T-5	"	0	10	32	0	0	317	-	317	-	
		"	Tap-5	0	10	20	5	0	317	311	316	5	
	Line-7	T-6	"	0	0	32	0	0	316	-	316	-	
		"	Tap-6	0	20	20	5	1	316	311	316	5	
	Line-8	T-7	"	0	10	32	0	0	316	-	316	-	
		"	Tap-7	0	10	20	5	0	316	311	316	5	
(5) Distribution Line (B.Phokro)	Line-1	R.Tank-2	"	2	700	90	0	1	327	-	326	-	
		"	Tap-1	2	1,100	63	1	11	326	309	315	6	Diffuser
		Tap-1	"	2	60	63	1	0	315	-	314	-	
		"	T-1	2	0	50	2	0	314	309	314	5	
		T-1	"	2	40	63	1	0	314	-	314	-	
		"	Tap-3	2	0	50	2	0	314	309	314	5	Diffuser
		Tap-3	"	1	100	63	0	0	314	-	314	-	
		"	Tap-4	1	0	50	1	0	314	309	314	5	
		Tap-4	"	1	60	63	0	0	314	-	313	-	
		"	T-2	1	0	50	1	0	313	309	313	5	
		T-2	"	1	40	50	1	0	313	-	313	-	
		"	Tap-6	1	0	32	6	0	313	308	313	5	
		Tap-6	"	1	100	50	0	0	313	-	313	-	
		"	Tap-7	1	0	32	4	0	313	308	313	4	
		Tap-7	"	0	60	50	0	0	313	-	313	-	
		"	T-3	0	0	32	2	0	313	308	313	4	
		T-3	"	0	60	32	0	0	313	-	312	-	
		"	Tap-9	0	0	20	5	0	312	308	312	4	
Line-2	Line-2	T-1	"	0	10	32	0	0	314	-	314	-	
		"	Tap-2	0	20	20	5	1	314	309	313	5	
Line-3	Line-3	T-2	"	0	30	32	0	0	313	-	313	-	
		"	Tap-5	0	0	20	5	0	313	308	313	5	
Line-4	Line-4	T-3	"	0	30	32	0	0	313	-	312	-	
		"	Tap-8	0	0	20	5	0	312	308	312	4	

Table FE-7 Pipeline Hydraulics in Hun Scheme

		Reach		Flow	Pipe	Pipe	Frictional	Head	HGL(*)	El. of	HGL(*)	Residual	
		Station I	Station II	(lps)	Length (m)	Size (mm)	Factor (%)	Loss (m)	St.I (m)	St.II (m)	St.II (m)	Head of St.II (m)	Remark
(1) Trunk Pipe Line (H.Phon, Hun)		Intake	*	2	60	3"	0	0	453	-	453	-	GI Pipe
		*	HP-1	2	483	63	1	3	453	445	450	5	
		HP-1	*	3	1,100	50	3	19	450	-	431	-	
		*	HP-2	2	46	32	15	7	431	419	424	5	
		HP-2	*	2	80	63	1	0	424	-	423	-	
		*	HP-3	2	43	50	2	1	423	418	423	5	
		HP-3	*	2	140	50	2	2	423	-	421	-	
		*	Fil.Tank	2	219	32	15	34	421	379	387	8	
		Fil.Tank	*	2	1,800	63	1	10	379	-	369	-	
		*	R.Tank-1	2	229	50	2	4	369	357	365	7	B.Somphon
		R.Tank-1	*	1	1,100	63	0	3	357	-	354	-	
		*	R.Tank-2	1	400	50	1	4	354	343	351	8	B.Nakham noi
		R.Tank-2	*	1	1,320	50	0	5	343	-	337	-	
		*	R.Tank-3	1	80	32	3	3	337	327	335	8	B.Na
(2) Distribution Line (B.Somphon)		R.Tank-1	*	3	0	90	0	0	357	-	357	-	
		*	Tap-1	3	200	63	2	4	357	348	354	6	
		Tap-1	*	3	0	90	0	0	354	-	354	-	
		*	T-1	3	50	63	2	1	354	347	353	6	
		T-1	*	2	10	63	1	0	353	-	353	-	
		*	Tap-4	2	30	50	4	1	353	347	351	5	
		Tap-4	*	2	10	63	1	0	351	-	351	-	
		*	T-2	2	0	50	3	0	351	347	351	5	
		T-2	*	1	30	63	0	0	351	-	351	-	
		*	Tap-8	1	10	50	1	0	351	346	351	5	
		Tap-8	*	1	0	63	0	0	351	-	351	-	
		*	T-3	1	10	50	1	0	351	346	351	5	
		T-3	*	0	20	50	0	0	351	-	351	-	
		*	T4(Tap12)	0	30	32	2	1	351	345	350	5	
		T4(Tap12)	*	0	50	32	0	0	350	-	350	-	
		*	Tap 13	0	0	20	5	0	350	346	350	5	
	Line-2	T-1	*	0	25	32	0	0	353	-	353	-	
		*	Tap 3	0	25	20	5	1	353	347	351	5	
	Line-3	T-2	*	0	50	32	0	0	351	-	351	-	
		*	Tap-5	0	0	20	5	0	351	347	351	5	
	Line-4	T-2	*	0	25	50	0	0	351	-	351	-	
		*	Tap 6	0	0	32	2	0	351	346	351	5	
		Tap 6	*	0	20	32	0	0	351	-	351	-	
		*	Tap-7	0	5	20	5	0	351	346	351	5	
	Line-5	T-3	*	0	50	32	0	0	351	-	351	-	
		*	Tap 9	0	0	20	5	0	351	347	351	4	
	Line 6	T-3	*	0	10	50	0	0	351	-	351	-	
		*	Tap-10	0	15	32	2	0	351	346	351	5	
		Tap 10	*	0	20	32	0	0	351	-	351	-	
		*	Tap 11	0	5	20	5	0	351	345	350	5	
(3) Distribution Line (B.Nakham noa)		R.Tank-2	*	1	180	50	1	3	343	-	340	-	
		*	T-1	1	20	32	13	3	340	332	338	6	
		T-1	*	1	10	50	1	0	338	-	337	-	
		*	T3(Tap-2)	1	40	32	9	4	337	329	334	5	
		T3(Tap-2)	*	1	0	50	0	0	334	-	334	-	
		*	T5(Tap 4)	1	50	32	4	2	334	326	332	6	Diffuser
		T5(Tap-4)	*	0	10	32	0	0	332	-	332	-	
		*	Tap 6	0	40	20	5	2	332	326	330	5	
	Line-2	T-1	*	0	4	32	0	0	338	-	338	-	
		*	Tap-1	0	45	20	5	2	338	331	335	5	
	Line-3	T3(Tap-2)	*	0	50	32	0	0	334	-	334	-	
		*	Tap-3	0	0	20	5	0	334	330	334	4	
	Line 4	T5(Tap-4)	*	0	35	32	0	0	332	-	332	-	
		*	Tap-5	0	15	20	5	1	332	326	331	5	
(4) Distribution Line (B.Nakham tai)	Line-1	R.Tank-2	*	2	125	63	1	1	343	-	342	-	
		*	T-1	2	425	50	2	10	342	326	331	6	
		T-1	*	1	15	50	1	0	331	-	331	-	
		*	T-2	1	10	32	9	1	331	325	330	5	
		T-2	*	1	10	50	1	0	330	-	330	-	
		*	T5(Tap-5)	1	15	32	6	1	330	324	329	5	Diffuser
		T5(Tap 5)	*	0	10	50	0	0	329	-	329	-	
		*	T-4	0	20	32	2	0	329	323	329	6	
		T-4	*	0	0	32	0	0	329	-	329	-	
		*	Tap-8	0	20	20	5	1	329	322	328	6	Diffuser
	Line-2	T-3	*	0	50	32	0	0	331	-	331	-	
		*	Tap-2	0	0	20	5	0	331	326	331	5	
		Tap-2	*	0	40	32	0	0	330	-	330	-	
		*	Tap 3	0	0	20	5	0	331	327	331	4	
	Line-3	T-2	*	0	50	32	0	0	330	-	330	-	
		*	Tap-4	0	0	20	5	0	330	325	330	5	
	Line-4	T-3	*	0	50	32	0	0	329	-	329	-	
		*	Tap-6	0	0	20	5	0	329	325	329	4	
	Line-5	T-4	*	0	50	32	0	0	329	-	329	-	
		*	Tap-7	0	20	20	5	1	329	323	328	5	
(5) Distribution Line (B.Na)	Line-1	R.Tank-3	*	3	250	63	2	5	330	-	325	-	
		*	T-1	3	0	50	6	0	325	314	325	12	
		T-1	*	3	50	63	2	1	325	-	324	-	
		*	Tap-2	3	0	50	5	0	324	314	324	10	Diffuser
		Tap-2	*	3	50	63	1	1	324	-	324	-	
		*	T-2	3	0	50	4	0	324	315	324	8	
		T-2	*	2	50	63	1	1	324	-	323	-	
		*	Tap-5	2	0	50	3	0	323	317	323	6	Diffuser
		Tap-5	*	2	50	63	1	0	323	-	323	-	
		*	T-3	2	0	50	2	0	323	317	323	6	
		T-3	*	1	50	63	0	0	323	-	322	-	
		*	Tap 8	1	0	50	1	0	322	318	322	5	
		Tap 8	*	1	50	63	0	0	322	-	322	-	
		*	T 4	1	0	50	1	0	322	318	322	4	
		T-4	*	1	50	63	0	0	322	-	322	-	
		*	Tap-11	1	0	50	0	0	322	318	322	4	
		Tap 11	*	0	50	50	0	0	322	-	322	-	
		*	T-5	0	0	32	2	0	322	318	322	5	
		T-5	*	0	50	32	0	0	322	-	322	-	
		*	Tap-12	0	0	20	5	0	322	319	322	3	
	Line-2	T-1	*	0	0	32	0	0	325	-	325	-	
		*	Tap-1	0	50	20	5	2	324	313	322	9	Diffuser
	Line-3	T-2	*	0	0	32	0	0	324	-	324	-	
		*	Tap 3	0	50	20	5	2	324	314	322	8	Diffuser
	Line-4	T-2	*	0	0	32	0	0	324	-	324	-	
		*	Tap-4	0	50	20	5	2	324	314	322	8	Diffuser
	Line 5	T-3	*	0	50	32	0	0	323	-	322	-	
		*	Tap-6	0	20	20	5	1	323	317	321	5	
	Line-6	T-3	*	0	25	32	0	0	323	-	322	-	
	*	*	Tap-7	0	25	20	5	1	322	316	321	5	
	Line-7	T-4	*	0	50	32	0	0	322	-	322	-	
		*	Tap 9	0	0	20	5	0	322	318	322	4	
	Line 8	T-4	*	0	35	32	0	0	322	-	322	-	
	*	*	Tap 10	0	15	20	5	1	322	317	321	5	
	Line 9	T-5	*	0	50	32	0	0	322	-	322	-	
		*	Tap-13	0	20	20	5	1	322	317	321	4	
(6) Distribution Line (B.Mai)	Line-1	R.Tank-3	*	1	150	63	0	1	330	-	329	-	
		*	Tap-1	1	710	50	1	10	329	314	319	5	
		Tap-1	*	1	40	63	0	0	319	-	319	-	
		*	T-1	1	0	50	1	0	319	314	319	5	
		T-1	*	1	35	50	0	0	319	-	319	-	
		*	Tap-4	1	5	32	4	0	319	314	319	5	
		Tap 4	*	0	25	50	0	0	319	-	318	-	
		*	T-2	0	5	32	2	0	318	314	318	5	
		T-2	*	0	0	50	0	0	318	-	318	-	
		*	Tap-5	0	25	32	2	0	318	313	318	5	
	Line-2	T-1	*	0	15	32	0	0	319	-	319	-	
		*	Tap 2	0	10	20	5	0	319	314	318	5	
	Line-3	T-1	*	0	20	32	0	0	319	-	319	-	
		*	Tap-3	0	5	20	5	0	319	314	319	5	
	Line-4	T-2	*	0	15	32	0	0	318	-	318	-	
		*	Tap 6	0	10	20	5	0	318	313	318	5	

Figure

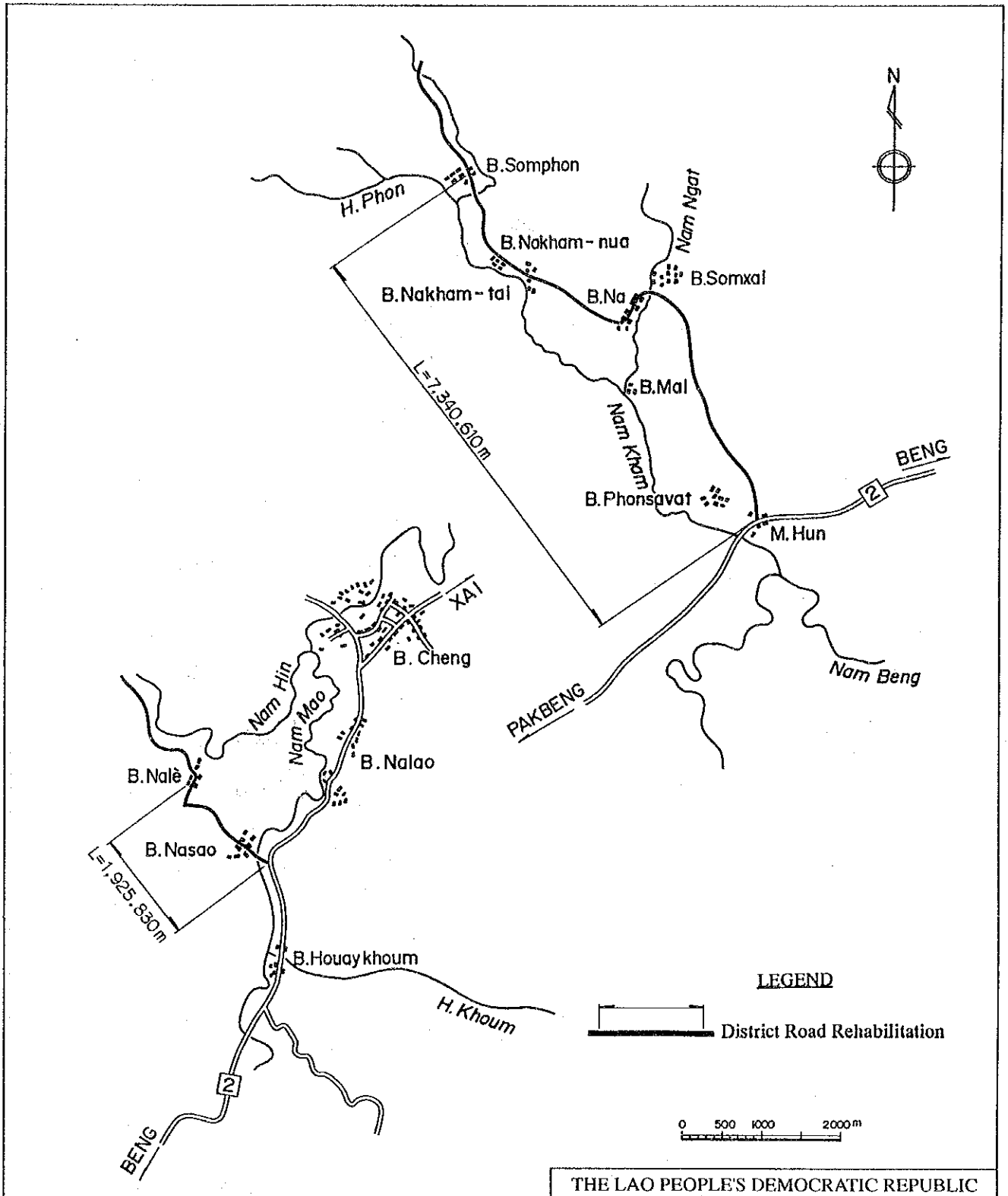

Fig. FE-1 Proposed Plan of District Road Rehabilitation

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF AGRICULTURE AND FORESTRY
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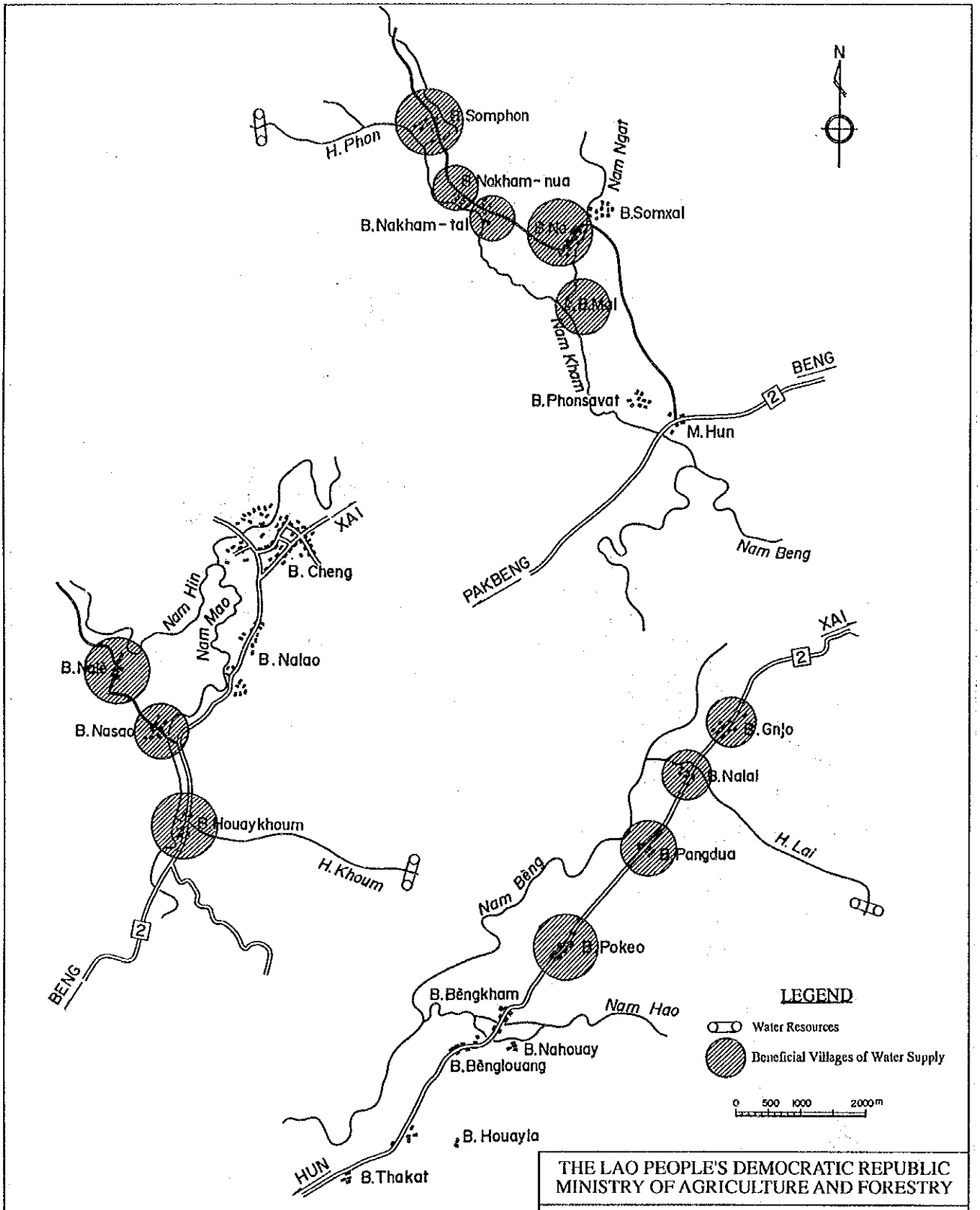

Fig. FE-2 Proposed Plan of Water Suppoy System

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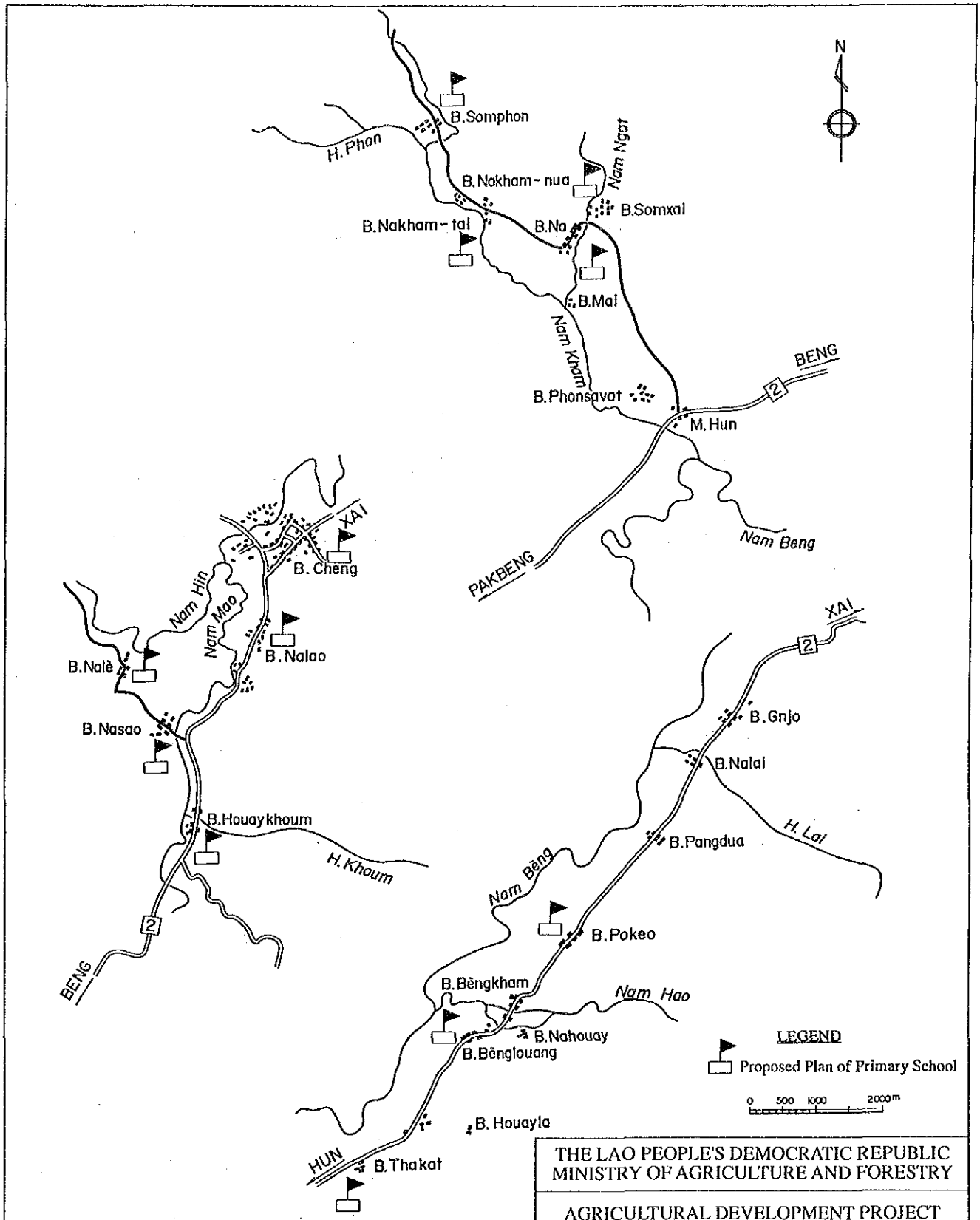

Fig. FE-3 Proposed Plan of Primary School

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF AGRICULTURE AND FORESTRY
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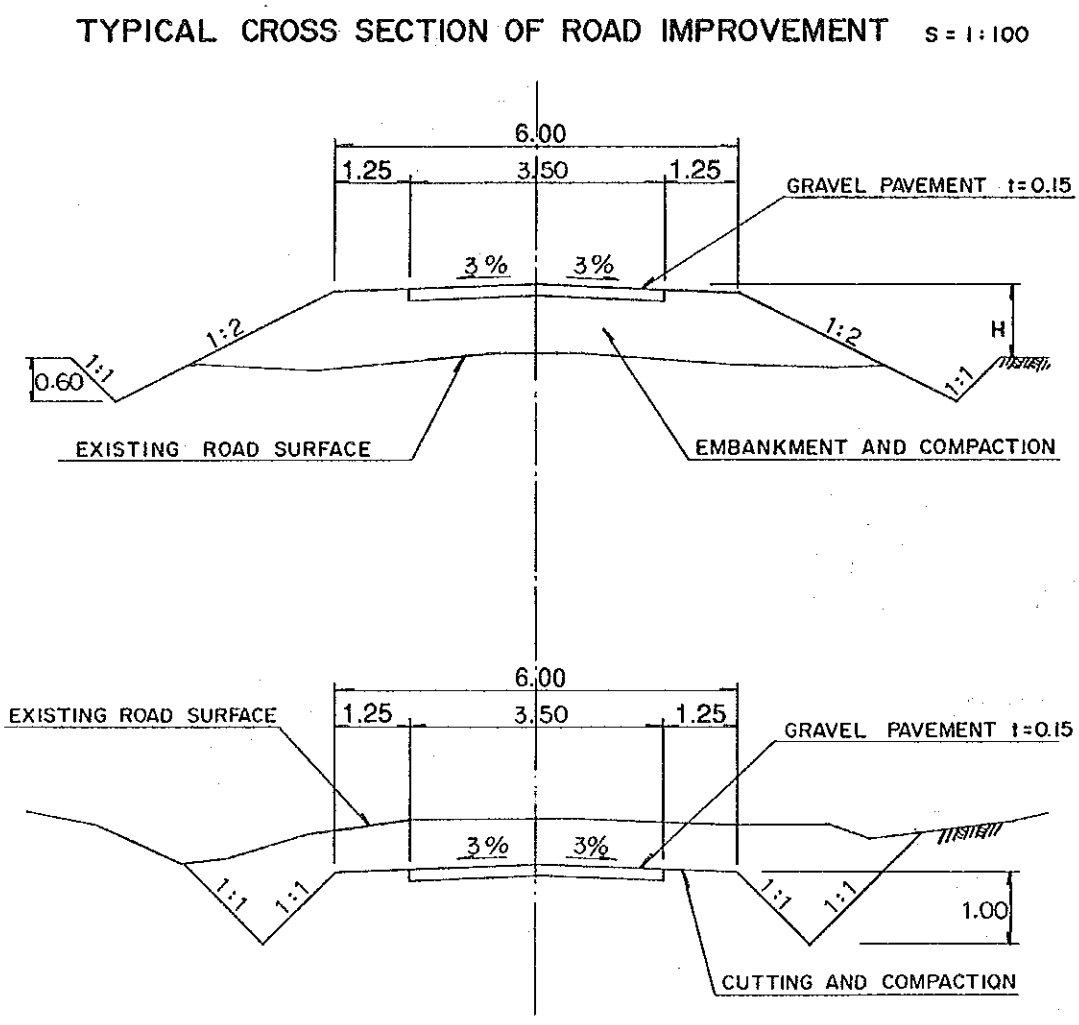

Fig. FE-4 Typical Cross Section

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF AGRICULTURE AND FORESTRY
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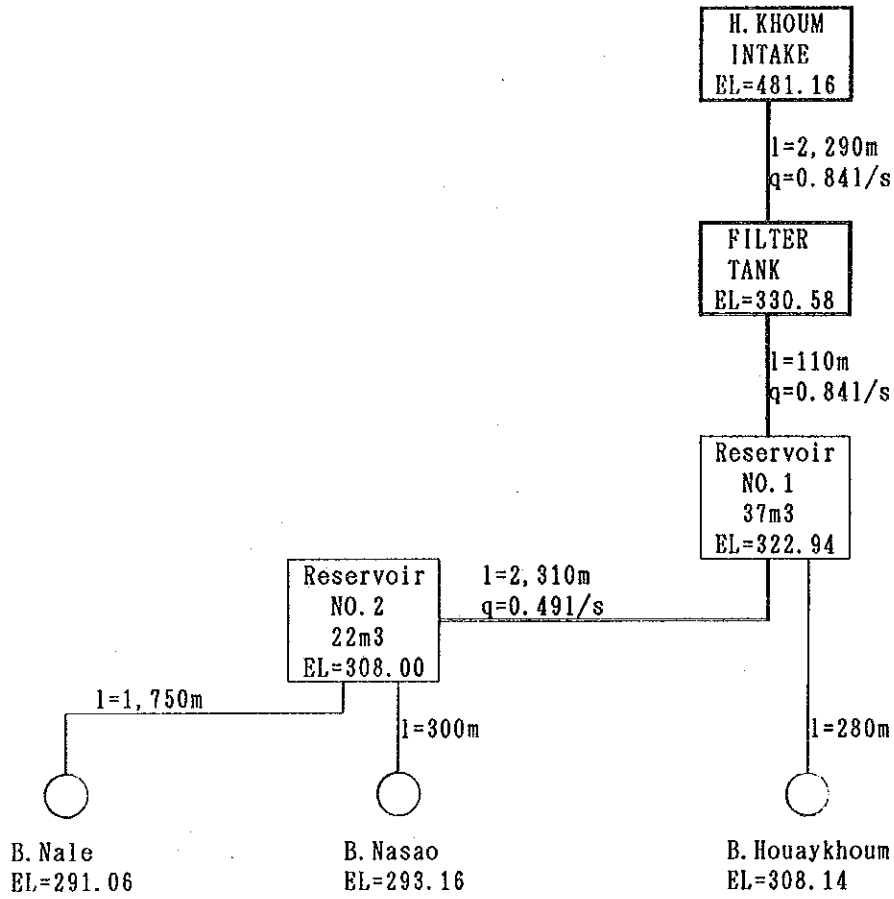

XAI

	B. Nale	B. Nasao	B. Houay khoum	Total
Population	356	337	480	1173
Design Population	486	460	654	1600
Tap	7	7	12	26
Required Amount(m3/day)	22	21	30	73
Capacity of Reservoir(m3)	-	22	37	-

Fig. FE-5 Distribution Line in Xai Scheme

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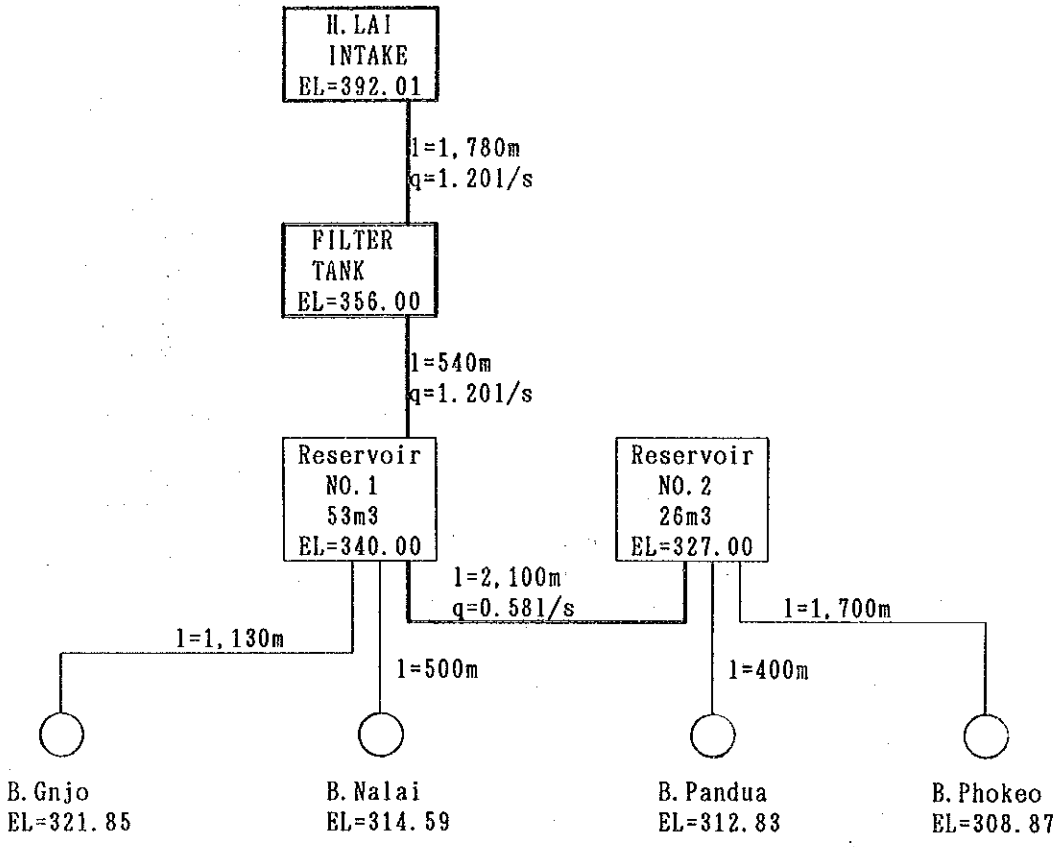

BENG

	B. Gnjo	B. Nalai	B. Pandua	B. Phokeo	Total
Population	538	363	365	477	1743
Design Population	711	478	481	630	2300
Tap	11	7	8	9	35
Required Amount(m3/day)	32	22	22	29	105
Capacity of Reservoir(m3)	-	53	26	-	-

Fig. FE-6 Distribution Line in Beng Scheme

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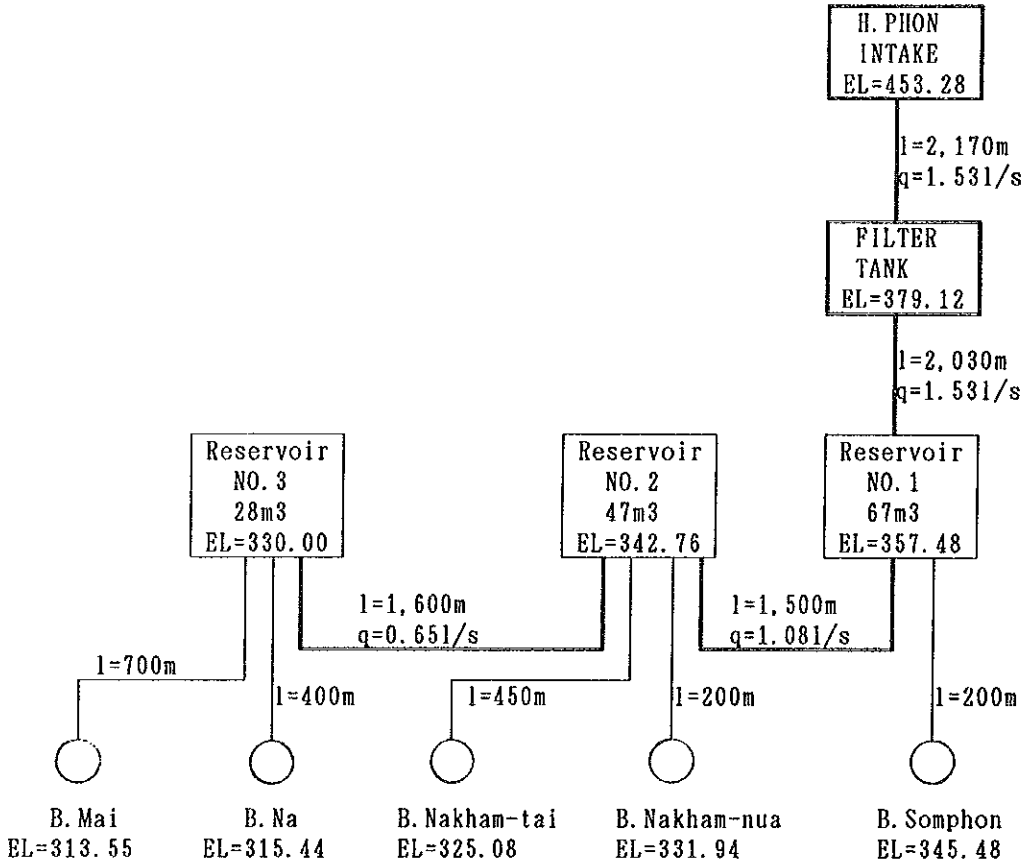

HUN

	B. Mai	B. Na	B. Nakham-tai	B. Nakham-nua	B. Somphon	Total
Population	262	657	351	261	641	2172
Design Population	348	878	470	348	856	2900
Tap	6	13	8	6	13	46
Required Amount(m3/day)	16	40	22	16	39	133
Capacity of Reservoir(m3)	-	28	-	47	67	-

Fig. FE-7 Distribution Line in Hun Scheme

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
MINISTRY OF AGRICULTURE AND FORESTRY

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IN OUDOMXAY PROVINCE

NIPPON KOEI CO., LTD.
CONSTRUCTION PROJECT CONSULTANTS, INC.

ANNEX-FF
CONSTRUCTION PLAN AND COST ESTIMATE

ANNEX - FF CONSTRUCTION PLAN AND COST ESTIMATE

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1. INTRODUCTION

This ANNEX presents all the results of feasibility study level estimation of the construction works and the cost for implementation of the Model Areas Scheme. The civil and building works implemented under the Model Areas Scheme are composed of five work items as follows:

(1) Irrigation and drainage
(2) Social infrastructures
(3) Agricultural station
(4) Extension office
(5) Rice bank

2. CONSTRUCTION PLAN

2.1 Construction Works

2.1.1 Irrigation and Drainage

Major construction work items for irrigation and drainage development are weir, main irrigation canal, secondary irrigation canal, drainage canal and river improvement as shown below for each model area:

Model area	Weir (nos.)	Main canal (km)	Secondary canal (km)	Drainage canal (km)	River improvement (km)
Xai	1	6.9	12.9	7.0	-
Beng	1	9.4	13.9	6.3	0.9
Hun	2	5.7	13.4	9.2	-

The weirs are of concrete one with slide gate of scouring sluice and will need the diversion works during construction that will be mainly carried out in the dry season. Main irrigation canals and secondary irrigation canals will be constructed mainly by bulldozer, backhoe and tire roller. Masonry lining will be provided to main irrigation canals. Work quantities and quarry sites for each model area are shown in Table FF-1 and Fig. FF-1, respectively.

2.1.2 Social Infrastructures

The works implemented under the Model Areas Scheme on social infrastructure are of 1) rehabilitation of existing district roads, 2) establishment of new rural water supply systems and 3) rehabilitation and new construction of primary schools.

(1) District Road

The district roads of 1.9 km from Nasao village to Nale village in Xai area and 7.5 km from Hun center to Somphon village in Hun area will be improved to all-weather type with three river crossing structures of causeway type. Causeways should be constructed in the dry season when the rivers will almost be dried up. The improvement works will be carried out mainly by bulldozer, motor grader and road roller. Work quantities required to the road improvement are presented in Table FF-2.

(2) Rural Water Supply

Three rural water supply systems, one in each district, will be newly established. The main facilities to be constructed are as follows and work quantities for each model area are presented in Table FF-3.

Area	Intake (nos.)	Reservoir Tank (nos.)	Filter Tank (nos.)	Tap Stand (nos.)	Trunk Pipe Line (m)	Distribution Pipe Line (m)
Xai	1	2	1	26	4,910	3,515
Beng	1	2	1	35	4,178	5,600
Hun	1	3	1	46	7,300	4,320

(3) Primary School

Twelve primary schools will be constructed under the model areas scheme. Out of twelve schools, ten are the rehabilitation of existing building and two in Hun area will be newly established. The schools are of one-story made of brick masonry with mortar finishing, concrete floor and slate sheet roofing. The work quantities are presented in Table FF-4 and numbers of schools that will be constructed are as below:

Model area	Xai	Beng	Hun
Nos. of schools	5	3	4

2.1.3 Agricultural Station

An agricultural station with trial farms will be constructed in Xai area. It is composed of main office, building of research and trials, workshop, quarters and trial farms of 15 ha. The construction works related to the agricultural station are as follows:

Item	Unit	Quantity
1. Main office		
- Main office	m^2	650
- Storage	m^2	200
- Garage	m^2	200
2. Research and trial building		
- Laboratory	m^2	650
- Working room	m^2	105
- Storage	m^2	100
3. Workshop		
- Workshop	m^2	300
- Garage for farm machinery	m^2	200
4. Quarters		
- Residence for staff with family	m^2	140 x 6 = 840
- Dormitory for bachelor staff	m^2	425
- Dormitory for trainee	m^2	560
5. Trial farms		
- Trial farm for lowland rice	ha	5
- Trial farm for upland crops	ha	10

2.1.4 Extension Office

The offices for extension services will be constructed in Beng and Hun areas. Hun extension office will be used for branch office of implementation during construction of the Model Areas Scheme. The buildings are of one-story made of brick masonry with mortar finishing, concrete floor and slate sheet roofing. The size of buildings for each extension office is as follows:

Area	Office (m^2)	Garage (m^2)	Quarters (m^2)
Beng	208	54	-
Hun	208	54	140 x 2

2.1.5 Rice Bank

Rice banks will be established one for each district. The building works required for the rice bank are office, storage, mill house for rice and sesame. Beside the building, drying yard and garage will be constructed. The buildings are of one-story made of brick masonry with mortar finishing, concrete floor and slate sheet roofing. The size of buildings for each rice bank is as follows:

Building	Size (m^2)
Office	104
Storage	200
Mill house for rice	50
Sesame separator room	50
Drying yard	200
Garage	54

2.2 Construction Schedule

The construction schedule of the Scheme is prepared on the following conditions:

(1) All the construction works will be executed by contractor(s) selected through international bidding.

(2) Mechanized construction methods will be employed in major construction works.

(3) Competent foreign consultant(s) will be engaged in detailed design, preparation of tender documents, technical guidance for prequalification and tendering, and supervision of the construction works.

(4) Annual workable days for the construction works are estimated at 278 days excluding suspension days due to rainfall, national holidays and Sundays as shown in Table FF-5.

Orderly implementation of the Model Areas Scheme is essential for obtaining the benefit as early as possible. In this view and also taking into account the scale of the Scheme, it is proposed to implement the Scheme in two phases. The construction works related to Xai district will be mainly implemented in Phase-1 and the works related to Beng and Hun district will be implemented in Phase-2. Proposed construction schedule of the Scheme is presented in Fig. FF-2. Major construction works to be implemented in each phase are tabulated as follows:

Work Items	Phase-1	Phase-2
1. Irrigation and Drainage		
- Xai area	X	
- Beng area		X
- Hun area		X
2. Social Infrastructure		
(1) District road		
B.Nasao to B.Nale (Xai)	X	
Hun center to B.Somphon (Hun)		X
(2) Rural water supply system		
Houay Khoum system (Xai)	X	
Houay Lai system (Beng)		X
Houay Phon system (Hun)		X
(3) Primary school		
Xai area	X	
Beng area		X
Hun area		X
3. Agricultural Station	X	
4. Extension Office		
(1) Beng extension office	X	
(2) Hun extension office	X	
5. Rice Bank		
(1) Xai rice bank	X	
(2) Beng rice bank		X
(3) Hun rice bank		X

2.3 Organization for Implementation

For implementation of the Scheme, it is proposed to establish an execution organization tentatively called "the Project Office" under the MAF. The proposed organization chart for implementation of the Scheme is presented in Fig. FF-3.

Main functions of the Project Office will be as follows:

(1) Design and construction supervision of the works such as irrigation facilities, buildings, road and water supply line

(2) Accounting and administrative management of the construction works as well as office operation

The Project Office will be constructed in the center of the Xai town and one site office with staff quaters will be constructed in the center of the Hun town to facilitate the implementation of the construction works in Hun and Beng area.

For successful implementation of the Scheme, close cooperation among the ministries, departments, agencies and institutes concerned at the national and provincial level will be essential. The Project Coordination Committee is proposed to be organized under the MAF with it's leadership. The committee coordinate among the concerned authorities and make recommendations and assistance to the Project Office for smooth and successful implementation of the Scheme.

2.4 Operation and Maintenance

After completion of the construction works, all the facilities will be handed over to the province for actual operation. The construction works will be implemented in two phases which will function independently. After completion of the construction works of Phase-1, which consists of the construction works of irrigation and drainage works of Xai area, social infrastructures of Xai area, agricultural station, Xai rice bank and extension offices, operation and maintenance (O&M) works for completed facilities will be commenced. Therfore, it is proposed to organize the O&M section in the organization of the agricultural station.

3. COST ESTIMATE

3.1 Conditions of cost Estimate

The costs for implementation of the project are estimated based on the preliminary design of the facilities and the following assumptions:

(1) The exchange rate used for the cost estimate is US$1 = Kip 715 = Yen 125 as of December, 1992.
(2) The construction works will be carried out by contractor(s) selected through international bidding.
(3) The construction materials, construction machinery and equipment to be imported from abroad will be exempted from taxes.
(4) Physical contingency is taken as 5% of direct cost.
(5) Price contingency is estimated based on a annual increase rate of 2% and 5% for foreign currency portion and local currency portion, respectively.

Prices of basic materials and labor wages and unit cost for major work items are presented in Table FF-6 and Table FF-7, respectively.

3.2 Cost Estimate

The total construction cost for the project is estimated at US$15.54 million consisting of US$5.27 million of local currency portion and US$10.27 million of foreign currency portion as summarized in Table FF-8. The breakdown of the direct costs is expressed below:

3.2.1 Irrigation and Drainage

The direct construction cost of irrigation and drainage development is estimated at US$ 5.9 million in total. The direct costs for each model area are as follows and the details are presented in Table FF-9.

Unit : US$ 1,000

Area	Foreign currency	Local currency	Total
Xai	1,498	858	2,356
Beng	1,298	730	2,028
Hun	970	573	1,543
Total	3,766	2,161	5,927

3.2.2 Social Infrastructure

Total direct construction cost for social infrastructures is estimated at US$1.4 million. The direct construction costs of district road, rural water supply and primary school are estimated as shown in Table FF-10, Table FF-11 and Table FF-12, respectively, and are summarized as below:

Unit: US$ 1,000

Item	Unit	Quantity	Foreign Currency	Local Currency	Total Cost
(1) District Road					
1 B. Houay Khoum to B. Nale	km	1.93	102	49	151
2 Hun to B. Somphon	km	7.54	314	120	434
(Sub-total)		9.47	416	169	585
(2) Water Supply System					
1 Xai (Houay Khoum)	system	1	102	21	123
2 Beng (Houay Lai)	system	1	124	25	149
3 Hum (Houay Phon)	system	1	145	32	177
(Sub-total)		3	371	78	449
(3) Primary School					
1 Xai	room	15	63	94	157
2 Beng	room	14	59	87	146
3 Hun	room	10	42	62	104
(Sub-total)			164	243	407
(Total)					1,441

3.2.3 Agricultural Station

The direct construction costs for building works such as office, laboratory, workshop and quarters and trial farms of 15 ha are estimated at US$1,158,100 and US$75,000, respectively. The details are presented in Table FF-13.

3.2.4 Extension Office

The total construction cost of two extension offices is estimated at US$229,000 and the details are presented in Table FF-14.

3.2.5 Rice Bank

The total construction cost of three rice banks is estimated at US$287,000 and the details are shown in Table FF-15.

3.2.6 Equipment

The total cost for equipment of the agricultural station, O&M, rice bank, extension office and meteorological instruments is estimated at US$1.56 million. The details are presented in Table FF-16 and FF-17.

3.3 Annual Disbursement Schedule

The annual disbursement schedule is worked out according to the construction schedule as shown in Table FF-18.

3.4 Operation and Maintenance Cost

The annual O&M cost of irrigation and drainage facilities, district road and rural water supply system which constructed by the Scheme is estimated at US$176,600 as shown in Table FF-19. The personnel expense of O&M stage is presented in Table FF-20.

3.5 Replacement Cost

Some of the facilities, especially mechanical and metal facilities have a shorter life than civil works and have to be replaced periodically. The useful life and cost of replacement of such facilities are listed in Table FF-21.

Table

Table FF-1 Work Quantity of Major Civil Works for Irrigation and Drainage

Item	Clearing (m2)	Striping (m3)	Excavation (m3)	Embankment (m3)	Backfill (m3)	Gravel Pavement (m3)	Riprap (m3)	Canal Lining (m3)	Reinforced Concrete (m3)	Plain Concrete (m3)	Reinforcement Bar (ton)	Form (m2)
I. Xai Model Area	21,800	18,950	56,470	179,570	4,990	4,410	1,720	7,780	4,300	380	170	5,180
1. Weir (Nam Mao)	5,300	0	15,100	200	2,890	0	1,540	0	3,600	40	125	2,570
2. Main Irrigation Canals	16,500	9,980	13,480	120,950	950	3,610	0	7,780	230	220	15	1,000
3. Secondary Irrigation Canals	0	8,970	2,830	58,420	730	800	0	0	250	60	15	1,210
4. Drainage Canals	0	0	25,060	0	420	0	180	0	220	60	15	400
II. Beng Model Area	21,000	24,990	64,410	224,880	2,510	5,960	490	10,660	1,520	270	80	3,600
1. Weir (Nam Hao)	5,000	110	3,880	620	520	0	370	0	700	10	25	680
2. Main Irrigation Canals	16,000	12,980	12,410	139,870	840	4,910	0	10,660	410	150	25	1,390
3. Secondary Irrigation Canals	0	9,400	8,130	64,890	840	1,050	0	0	270	70	20	1,240
4. Drainage Canals	0	0	19,290	0	310	0	120	0	140	40	10	290
5. River Improvement	0	2,500	20,700	19,500	0	0	0	0	0	0	0	0
III. Hun Model Area	21,400	17,360	38,790	118,040	2,690	3,940	720	6,260	2,450	300	125	4,350
1. Weir (Nam Ngat No.1)	2,400	90	2,130	450	320	0	250	0	550	20	25	640
2. Weir (Nam Kham No.1)	0	250	3,020	3,600	240	0	350	0	920	20	35	1,030
3. Main Irrigation Canals	19,000	7,010	6,820	47,840	520	2,990	0	6,260	190	120	15	650
4. Secondary Irrigation Canals	0	10,010	3,590	66,150	1,090	950	0	0	420	100	25	1,480
5. Drainage Canals	0	0	23,230	0	520	0	120	0	370	40	25	550
Total	64,200	61,300	159,670	522,490	10,190	14,310	2,930	24,700	8,270	950	375	13,130

Table FF-2 Work Quantity for District Road Rehabilitation

	Work Items	Unit	District Road (Xai) B.Houay Khoum to B.Nale	District Road (Hun) Hun to B. Somphon
(I) Earth Works				
1	Stripping	m3	14,488	58,431
2	Excavation	m3	1,132	4,789
3	Embankment	m3	2,928	36,128
4	Gravel Pavement	m3	929	3,749
(II) Structures				
(II)-1	Causeway			
1	Concrete (1:2:4)	m3	281	304
2	Concrete (1:3:6)	m3	15	13
3	Reinfocing Bar	ton	17	8
4	Stripping	m3	1,116	1,603
5	Excavation	m3	337	312
6	Cobble	m3	30	26
7	Backfill	m3	215	114
8	Embankment	m3	1,944	2,671
9	Stone Pitching	m3	162	211
10	Form	m2	408	344
11	Curing	m2	1,607	2,463
(II)-2	Cross Drain			
1	Concrete Pipe (D=400mm)	m	10	60
2	Concrete Pipe (D=600mm x 1)	m	20	180
3	Concrete Pipe (D=600mm x 2)	m	20	80
4	Concrete (1:2:4)	m3	58	86
5	Concrete (1:3:6)	m3	9	12
6	Reinforcing Bar	ton	4	5
7	Excavation	m3	295	529
8	Cobble	m3	18	24
9	Backfill	m3	129	323
10	Form	m2	226	369
11	Curing	m2	226	369

Table FF-3 (1/3) Work Quantity for Water Supply System (H.Khoum: Xai area)

No.	Material (Works)	Unit	Intake	R.Tank	F.Tank	Tap Stand	Trunk P.Line	Distri. P.Line	T. Q'ty w/Cont.
			1 no.	2 nos.	1 no.	26 nos.	4,910 m	3,515 m	
1	HDP Pipe								
	90 mm	m	0	0	0	0	0	120	132
	63 mm	m	0	30	15	0	0	1,900	2,140
	50 mm	m	0	0	0	0	2,596	540	3,450
	32 mm	m	0	0	0	0	1,807	547	2,589
	20 mm	m	0	0	0	0	0	408	449
2	GI Pipe								
	3"	m	10	10	5	0	0	0	28
	2"	m	10	20	10	0	45	0	94
	1 1/2"	m	0	0	0	0	348	0	383
	1"	m	0	0	0	0	114	0	125
	1/2"	m	0	0	0	0	0	0	0
3	HDP Equal Tee (63,50,32.20mm)	ea.	0	0	0	0	0	23	25
4	HDP Reducer (63x50x32x20mm)	ea.	0	0	0	0	3	26	32
5	GI Socket (3,2,1.2,1,0.5")	ea.	2	4	2	0	85	0	102
6	GI Elbow (3,2,1.2,1,0.5")	ea.	2	4	2	42	5	5	66
7	GI Equal Tee (3,2,1.2,1,0.5")	ea.	0	4	2	0	0	0	7
8	Brass Union (3x90mm-1.5x20mm)	ea.	0	2	2	26	8	0	42
9	Gate Valve (3"-1.5")	ea.	1	8	8	0	3	0	22
10	Glove Valve (2"-1")	ea.	1	1	0	0	0	0	2
11	Brass tap 1 1/2"	ea.	0	0	0	26	0	0	29
12	Diffuser	ea.	0	0	0	15	0	0	17
13	Concrete(1:2:4)	m3	5.0	28.8	16.8	21.1	0	0	79
14	Reinforcing Bar (12mm)	ton	0.3	1.7	1.0	1.3	0	0	5
15	Concrete(1:3:6)	m3	1.0	9.6	6.0	17.6	0	0	38
16	Sand	m3	0.0	0.0	20.0	0.0	0	0	22
17	Gravel Filling	m3	0.0	9.6	6.0	0.0	0	0	17
18	Timber Work	m3	0.0	3.2	2.0	0.0	0	0	6
19	GI Sheet	m2	0.0	48.0	30.0	0.0	0	0	86
20	Form	m2	10.0	192.0	108.0	70.0	0	0	418
21	Curing	m2	10.0	192.0	108.0	70.0	0	0	418
22	Excavation for Access Road	m3	0.0	0.0	0.0	0.0	11,048	7,909	20,852
23	Excavation for Plumbing	m3	3.5	11.5	7.2	21.1	0	0	48
24	Backfill for Plumbling	m3	0.7	2.3	1.4	4.2	0	0	9
25	Plumbling	m	20.0	60.0	30.0	0.0	4,910	3,515	9,389

Table FF-3 (2/3) Work Quantity for Water Supply System (H.Lai : Beng area)

No.	Material (Works)	Unit	Intake	R.Tank	F.Tank	Tap Stand	Trunk P.Line	Distri. P.Line	T. Q'ty w/Cont.
			1 no.	2 nos.	1 no.	35 nos.	4,178 m	5,600 m	
1	HDP Pipe								
	90 mm	m	0	0	0	0	0	1,100	1,210
	63 mm	m	0	30	15	0	26	2,480	2,806
	50 mm	m	0	0	0	0	3,546	1,234	5,258
	32 mm	m	0	0	0	0	395	689	1,192
	20 mm	m	0	0	0	0	0	97	107
2	GI Pipe								
	3"	m	10	10	5	0	184	0	230
	2"	m	10	20	10	0	27	0	74
	1 1/2"	m	0	0	0	0	0	0	0
	1"	m	0	0	0	0	0	0	0
	1/2"	m	0	0	0	0	0	0	0
3	HDP Equal Tee (63,50,32.20mm)	ea.	0	0	0	0	0	31	34
4	HDP Reducer (63x50x32x20mm)	ea.	0	0	0	0	2	30	35
5	GI Socket (3,2,1.2,1,0.5")	ea.	2	4	2	0	85	0	102
6	GI Elbow (3,2,1.2,1,0.5")	ea.	2	4	2	58	5	5	84
7	GI Equal Tee (3,2,1.2,1,0.5")	ea.	0	4	2	0	0	0	7
8	Brass Union (3x90mm-1.5x20mm)	ea.	0	2	2	35	3	0	46
9	Gate Valve (3"-1.5")	ea.	1	8	8	0	3	0	22
10	Glove Valve (2"-1")	ea.	1	1	0	0	0	0	2
11	Brass tap 1 1/2"	ea.	0	0	0	35	0	0	39
12	Diffuser	ea.	0	0	0	2	0	0	2
13	Concrete(1:2:4)	m3	5.0	36.3	22.2	28.4	0	0	101
14	Reinforcing Bar (12mm)	ton	0.3	2.2	1.3	1.7	0	0	6
15	Concrete(1:3:6)	m3	1.0	13.5	9.0	23.6	0	0	52
16	Sand	m3	0.0	0.0	30.0	0.0	0	0	33
17	Gravel Filling	m3	0.0	13.5	9.0	0.0	0	0	25
18	Timber Work	m3	0.0	4.5	3.0	0.0	0	0	8
19	GI Sheet	m2	0.0	67.5	45.0	0.0	0	0	124
20	Form	m2	10.0	228.0	132.0	94.0	0	0	510
21	Curing	m2	10.0	228.0	132.0	94.0	0	0	510
22	Excavation for Access Road	m3	0.0	0.0	0.0	0.0	9,401	12,600	24,201
23	Excavation for Plumbing	m3	3.5	16.2	10.8	21.1	0	0	57
24	Backfill for Plumbling	m3	0.7	3.3	2.2	5.7	0	0	13
25	Plumbling	m	20.0	60.0	30.0	0.0	4,178	5,600	10,877

Table FF-3 (3/3) Work Quantity for Water Supply System (H.Phon : Hun area)

No.	Material (Works)	Unit	Intake	R.Tank	F.Tank	Tap Stand	Trunk P.Line	Distri. P.Line	T. Q'ty w/Cont.
			1 no.	3 nos.	1 no.	46 nos.	7,300 m	4,320 m	
1	HDP Pipe								
	90 mm	m	0	0	0	0	0	0	0
	63 mm	m	0	45	15	0	3,463	1,215	5,212
	50 mm	m	0	0	0	0	3,432	1,575	5,508
	32 mm	m	0	0	0	0	345	1,099	1,588
	20 mm	m	0	0	0	0	0	431	474
2	GI Pipe								
	3"	m	10	15	5	0	60	0	99
	2"	m	10	30	10	0	0	0	55
	1 1/2"	m	0	0	0	0	0	0	0
	1"	m	0	0	0	0	0	0	0
	1/2"	m	0	0	0	0	0	0	0
3	HDP Equal Tee (63,50,32.20mm)	ea.	0	0	0	0	0	38	42
4	HDP Reducer (63x50x32x20mm)	ea.	0	0	0	0	9	37	51
5	GI Socket (3,2,1.2,1,0.5")	ea.	2	6	2	0	10	0	22
6	GI Elbow (3,2,1.2,1,0.5")	ea.	2	6	2	73	5	5	102
7	GI Equal Tee (3,2,1.2,1,0.5")	ea.	0	6	2	0	0	0	9
8	Brass Union (3x90mm-1.5x20mm)	ea.	0	4	2	46	3	0	61
9	Gate Valve (3"-1.5")	ea.	1	8	8	0	5	0	24
10	Glove Valve (2"-1")	ea.	1	1	0	0	0	0	2
11	Brass tap 1 1/2"	ea.	0	0	0	46	0	0	51
12	Diffuser	ea.	0	0	0	8	0	0	9
13	Concrete(1:2:4)	m3	5.0	54.0	20.7	37.3	0	0	129
14	Reinforcing Bar (12mm)	ton	0.3	3.2	1.2	2.2	0	0	8
15	Concrete(1:3:6)	m3	1.0	19.8	8.1	31.1	0	0	66
16	Sand	m3	0.0	0.0	27.0	0.0	0	0	30
17	Gravel Filling	m3	0.0	19.8	8.1	0.0	0	0	31
18	Timber Work	m3	0.0	6.6	2.7	0.0	0	0	10
19	GI Sheet	m2	0.0	99.0	40.5	0.0	0	0	153
20	Form	m2	10.0	360.0	144.0	124.0	0	0	702
21	Curing	m2	10.0	360.0	144.0	124.0	0	0	702
22	Excavation for Access Road	m3	0.0	0.0	0.0	0.0	16,425	9,720	28,760
23	Excavation for Plumbing	m3	3.5	26.6	12.6	37.3	0	0	88
24	Backfill for Plumbling	m3	0.7	5.3	2.5	7.5	0	0	18
25	Plumbling	m	20.0	90.0	30.0	0.0	7,300	4,320	12,936

Table FF-4 Work Quantity for Primary School

	Item	Unit	Xai	Beng	Hun	Total
1	School House (Floor size)	m^2	630	588	420	1,638
	- Nos of School House	Nos.	5	3	4	12
	- Nos. of Room	Nos.	15	14	10	39
2	Desk/Chair for Pupil	set	270	252	180	702
3	Desk/Chair for Teacher	set	15	14	10	39

Table FF-5 Estimation of Workable Days in 1992

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
(1) Days	31	29	31	30	31	30	31	31	30	31	30	31	366
(2) Rainfall days													
10 - 30 mm	0	2	0	1	2	6	7	7	5	0	0	0	30
30 - 50 mm	0	0	0	0	1	0	2	0	1	0	0	0	4
more than 50 mm	0	0	0	0	1	1	0	1	0	0	0	0	3
(3) Suspension days	0	1	0	0.5	4	5	5.5	5.5	3.5	0	0	0	25
(4) Sundays	4	4	5	4	5	4	4	5	4	4	5	4	52
(5) Holidays	2	0	1	5	1	1	0	0	0	0	0	1	11
(6) Total (3 - 5)	6	5	6	9.5	10	10	9.5	10.5	7.5	4	5	5	88
(7) Workable days	25	24	25	20.5	21	20	21.5	20.5	22.5	27	25	26	278

Note:

1. Suspention days are estimated as follows:
   - 10 - 30 mm : 0.5 day
   - 30 - 50 mm : 1 day
   - more than 50 mm 2 days

2. National holidays in 1992 are as follows:
   - 01/Jan. : New year
   - 02/Jan. : Army's day
   - 08/Mar. : Women's day
   - 22/Mar. : Party's day
   - 13 - 15/Apr. : Lao new year
   - 01/May : Labor's day
   - 01/Jun. : Children's day and National planting day
   - 02/Dec. : National day

Table FF-6 Prices of Basic Materials and Labor Wages

Item	Unit	Unit Price (Kips)
A. Material		
1. Gravel	m3	6,500
2. Sand	m3	4,200
3. Masonry Stone	m3	5,200
4. Brick	no.	30
5. Cement	ton	80,000
6. Timber for form	m3	130,000
7. Reinforcement bar	ton	480,000
B. Fuel		
1. Gasoline	lit.	300
2. Diesel	lit.	280
3. Engine oil	lit.	1,200
C. Labor		
1. Foreman	Man-day	3,000
2. Heavy equipment operator	Man-day	5,000
3. Common equipment operator	Man-day	3,500
4. Carpenter	Man-day	3,500
5. Bar bender	Man-day	3,500
6. Mason	Man-day	3,000
7. Mechanican	Man-day	3,500
8. Electrician	Man-day	3,500
9. Plumber	Man-day	3,500
10. Skilled labour	Man-day	3,500
11. Common labour	Man-day	1,000

Table FF-7 Unit Cost for Major Work Items

Work Item	Unit	Unit Rate F/C (Kips)	Unit Rate L/C (Kips)	Unit Rate Total (Kips)	Equivalent US Dollars (US$)
A. Clearing					
1. Weir	m2	176	8	184	0.3
2. Main Irrigation Canal	m2	176	8	184	0.3
3. Related structure	m2	176	8	184	0.3
B. Stripping					
1. Weir	m3	660	14	674	0.9
2. Main Irrigation Canal	m3	660	14	674	0.9
3. Secondary Irrigation Canal	m3	660	14	674	0.9
4. Related structure	m3	660	14	674	0.9
C. Excavation					
1. Weir					
- Common Excavation	m3	867	45	912	1.3
- Boulder Excavation	m3	2,005	89	2,094	2.9
2. Main Irrigation Canal	m3	867	45	912	1.3
3. Secondary Irrigation Canal	m3	867	45	912	1.3
4. Drainage Canal	m3	867	45	912	1.3
5. River Improvement	m3	867	45	912	1.3
6. Related structure	m3	867	45	912	1.3
D. Embankment					
1. Weir	m3	3,175	253	3,428	4.8
2. Main Irrigation Canal					
- Embankment with Excavated Material	m3	1,415	40	1,455	2.0
- Embankment with Borrowed Material	m3	1,485	55	1,540	2.2
3. Secondary Irrigation Canal	m3	942	59	1,001	1.4
4. Drainage Canal	m3	942	59	1,001	1.4
5. River Improvement	m3	3,175	253	3,428	4.8
6. Related structure	m3	942	59	1,001	1.4
E. Backfilling					
1. Weir	m3	819	124	943	1.3
2. Related structure	m3	819	124	943	1.3
F. Concrete Works					
1. Concrete					
- Reinforced concrete	m3	52,399	18,707	71,106	99.4
- Plain concrete	m3	38,609	18,843	57,452	80.4
2. Form for concrete	m2	555	10,131	10,686	14.9
3. Rainforcement bar	ton	720,219	44,402	764,621	1,069.4
G. Gravel Pavement	m3	764	9,861	10,625	14.9
H. Other Works					
1. Canal Lining					
- Wet stone masonry	m3	47,846	38,712	86,558	121.1
- Gravel Filling	m3	214	14,780	14,994	21.0
2. Precast Concrete Pipe					
- Dia. 300 mm (L = 1.0 m)	m	1,307	14,337	15,644	21.9
- Dia. 400 mm (L = 1.0 m)	m	12,997	19,148	32,145	45.0
- Dia. 600 mm (L = 1.0 m)	m	14,816	27,310	42,126	58.9
- Dia. 800 mm (L = 1.0 m)	m	22,366	41,864	64,230	89.8
- Dia. 1,000 mm (L = 1.0 m)	m	28,974	51,290	80,264	112.3
3. Slide gate					
- Slide gate for Sluiceway	set	7,431,313	62,442	7,493,755	10,480.8
- Slide gate for Intake	set	2,307,670	36,608	2,344,278	3,278.7
- Slide gate for Related Structure	set	32,847	7,465	40,312	56.4
4. Stop Log	m3	336	220,480	220,816	308.8
5. Riprap					
- River Bed	m3	109,028	121,171	230,199	322.0
- Others	m3	2,571	21,803	24,374	34.1

Table FF-8 Construction Cost of Model Areas Scheme

(1,000 US$)

Items	Phase-1			Phase-2			Total		
	FC	LC	Total	FC	LC	Total	FC	LC	Total
1. Preparatory Works	271	163	435	306	171	477	578	334	912
2. Irrigation and Drainage									
(1) Xai area	1,498	858	2,356			0	1,498	858	2,356
(2) Beng area			0	1,298	730	2,028	1,298	730	2,028
(3) Hun area			0	970	573	1,543	970	573	1,543
3. Social Infrastructures									
(1) District Road									
- B.Nasao to B.Nale (Xai)	102	49	151			0	102	49	151
- Hun center to B.Somphon (Hun)			0	314	120	434	314	120	434
(2) Water Supply System									
- Houay Khoum system (Xai)	102	21	123			0	102	21	123
- Houay Lai system (Beng)			0	124	25	149	124	25	149
- Houay Phon system (Hun)			0	145	32	177	145	32	177
(3) Primary School									
- Xai area	63	94	157				63	94	157
- Beng area				59	87	146	59	87	146
- Hun area				42	62	104	42	62	104
4. Agricultural Station	754	479	1,233				754	479	1,233
5. Extension Office									
(1) Beng extension office	43	28	71				43	28	71
(2) Hun extension office	96	62	158				96	62	158
6. Rice Bank									
(1) Xai rice bank	56	40	96				56	40	96
(2) Beng rice bank				56	40	96	56	40	96
(3) Hun rice bank				56	40	96	56	40	96
Total (1 - 6)	2,985	1,794	4,780	3,370	1,880	5,250	6,356	3,674	10,030
7. Equipments	1,559	0	1,559			0	1,559	0	1,559
Total (1 - 7)	4,544	1,794	6,339	3,370	1,880	5,250	7,915	3,674	11,589
9. Administration Cost (2%)	0	127	127	0	105	105	0	232	232
10. Engineering Services (8%)	507	0	507	420	0	420	927	0	927
11. Physical Contingency (5%)	253	96	349	190	99	289	442	195	637
12. Price Contingency	292	336	628	692	831	1,523	984	1,167	2,151
Total (1 - 12)	5,596	2,353	7,949	4,672	2,915	7,587	10,268	5,268	15,536

Table FF-9 (1/3) Direct Construction Cost for Irrigation and Drainage System of Xai Model Area

(Exchange Rate : US$ 1 = Kips 715 = J.Yen 125)

I. Xai Area (378 ha)

Work Item		Unit	Quantity	Unit Rate F.C. (Kips)	Unit Rate L.C. (Kips)	Amount F.C. (1,000 Kips)	Amount L.C. (1,000 Kips)	Total (1,000 Kips)	Equivalent US Dollars (1,000 US$)
1. Weir (Nam Mao)						459,419	259,915	719,334	1,006.2
- Clearing & grubbing		m2	5,300	176	8	933	42	975	1.4
- Stripping		m3	0	660	14	0	0	0	0.0
- Excavation-A	(Common)	m3	12,300	867	45	10,664	554	11,218	15.7
- Excavation-B	(Boulder)	m3	2,800	2,005	89	5,614	249	5,863	8.2
- Embankment-D	(Borrow. material)	m3	200	3,175	253	635	51	686	1.0
- Backfill for Structure		m3	2,890	819	124	2,367	358	2,725	3.8
- Concrete-A	(Reinforced)	m3	3,600	52,399	18,706	188,636	67,342	255,978	358.0
- Concrete-B	(Plain)	m3	40	38,608	18,843	1,544	754	2,298	3.2
- Form for Concrete		m2	2,570	555	10,131	1,426	26,037	27,463	38.4
- Reinforcement Bar		ton	125	720,219	44,402	90,027	5,550	95,577	133.7
- Riprap-A	(River bed)	m3	1,260	109,028	121,171	137,375	152,675	290,050	405.7
- Riprap-B	(Weir Side Slope)	m3	280	2,571	21,803	720	6,105	6,825	9.5
- Slide Gate for Sluiceway		nos.	2	7,431,313	62,442	14,863	125	14,988	21.0
- Slide Gate for Intake		nos.	2	2,307,670	36,608	4,615	73	4,688	6.6
2. Main Irrigation Canals						472,751	304,007	776,758	1,086.3
- Clearing & grubbing		m2	16,500	176	8	2,904	132	3,036	4.2
- Stripping		m3	9,980	660	14	6,587	140	6,727	9.4
- Excavation-A	(Common)	m3	11,810	867	45	10,239	531	10,770	15.1
- Embankment-B	(Ex. material)	m3	36,290	1,415	40	51,350	1,452	52,802	73.8
- Embankment-C	(Borrow. material)	m3	84,670	1,485	55	125,735	4,657	130,392	182.4
- Wet Stone Masonry	(Canal Lining)	m3	4,890	47,847	38,712	233,972	189,302	423,274	592.0
- Gravel Filling	(Canal Lining)	m3	2,890	214	14,780	618	42,714	43,332	60.6
- Road metalling	(Gravel Pavement)	m3	3,610	764	9,861	2,758	35,598	38,356	53.6
- Structures		nos.	45	-	-	38,588	29,481	68,069	95.2
3. Secondary Irrigation Canals						92,115	32,502	124,617	174.3
- Stripping		m3	8,970	660	14	5,920	126	6,046	8.5
- Excavation-A	(Common)	m3	1,520	867	45	1,318	68	1,386	1.9
- Embankment-A		m3	58,420	942	60	55,032	3,505	58,537	81.9
- Road metalling	(Gravel Pavement)	m3	800	764	9,861	611	7,889	8,500	11.9
- Structures		nos.	106	-	-	29,234	20,914	50,148	70.1
4. Drainage Canals						46,978	17,363	64,341	90.0
- Excavation-A	(Common)	m3	23,940	867	45	20,756	1,077	21,833	30.5
- Structures		nos.	35	-	-	26,222	16,286	42,508	59.5
Grand Total						1,071,263	613,787	1,685,050	2,356.8
Grand Total per ha						2,834	1,624	4,458	6.2

Notes : F.C. : Foreign Currency Portion
L.C. : Local Currency Portion

Table FF-9 (2/3) Direct Construction Cost for Irrigation and Drainage System of Beng Model Area

(Exchange Rate : US$ 1 = Kips 715 = J.Yen 125)

II. Beng Area (338 ha)

Work Item		Unit	Quantity	Unit Rate F.C. (Kips)	Unit Rate L.C. (Kips)	Amount F.C. (1,000 Kips)	Amount L.C. (1,000 Kips)	Total (1,000 Kips)	Equivalent US Dollars (1,000 US$)
1. Weir (Nam Hao)						106,852	60,727	167,579	234.4
- Clearing & grubbing		m2	5,000	176	8	880	40	920	1.3
- Stripping		m3	110	660	14	73	2	75	0.1
- Excavation-A	(Common)	m3	3,000	867	45	2,601	135	2,736	3.8
- Excavation-B	(Boulder)	m3	880	2,005	89	1,764	78	1,842	2.6
- Embankment-D	(Borrow. material)	m3	620	3,175	253	1,969	157	2,126	3.0
- Backfill for Structure		m3	520	819	124	426	64	490	0.7
- Concrete-A	(Reinforced)	m3	700	52,399	18,706	36,679	13,094	49,773	69.6
- Concrete-B	(Plain)	m3	10	38,608	18,843	386	188	574	0.8
- Form for Concrete		m2	680	555	10,131	377	6,889	7,266	10.2
- Reinforcement Bar		ton	25	720,219	44,402	18,005	1,110	19,115	26.7
- Riprap-A	(River bed)	m3	310	109,028	121,171	33,799	37,563	71,362	99.8
- Riprap-B	(Weir Side Slope)	m3	60	2,571	21,803	154	1,308	1,462	2.0
- Slide Gate for Sluiceway		nos.	1	7,431,313	62,442	7,431	62	7,493	10.5
- Slide Gate for Intake		nos.	1	2,307,670	36,608	2,308	37	2,345	3.3
2. Main Irrigation Canals						600,981	405,507	1,006,488	1,407.6
- Clearing & grubbing		m2	16,000	176	8	2,816	128	2,944	4.1
- Stripping		m3	12,980	660	14	8,567	182	8,749	12.2
- Excavation		m3	10,660	867	45	9,242	480	9,722	13.6
- Embankment-B	(Ex. material)	m3	41,960	1,415	40	59,373	1,678	61,051	85.4
- Embankment-C	(Borrow. material)	m3	97,910	1,485	55	145,396	5,385	150,781	210.9
- Wet Stone Masonry	(Canal Lining)	m3	6,700	47,847	38,712	320,575	259,370	579,945	811.1
- Gravel Filling	(Canal Lining)	m3	3,960	214	14,780	847	58,529	59,376	83.0
- Road metalling	(Gravel Pavement)	m3	4,910	764	9,861	3,751	48,418	52,169	73.0
- Structures		nos.	58	-	-	50,414	31,337	81,751	114.3
3. Secondary Irrigation Canals						106,023	37,623	143,646	200.9
- Stripping		m3	9,400	660	14	6,204	132	6,336	8.9
- Excavation-A	(Common)	m3	6,620	867	45	5,740	298	6,038	8.4
- Embankment-A		m3	64,890	942	60	61,126	3,893	65,019	90.9
- Road metalling	(Gravel Pavement)	m3	1,050	764	9,861	802	10,354	11,156	15.6
- Structures		nos.	102	-	-	32,151	22,946	55,097	77.1
4. Drainage Canals						32,751	12,027	44,778	62.6
- Excavation-A	(Common)	m3	18,520	867	45	16,057	833	16,890	23.6
- Structures		nos.	22	-	-	16,694	11,194	27,888	39.0
5. River Improvement						81,510	5,901	87,411	122.3
- Stripping		m3	2,500	660	14	1,650	35	1,685	2.4
- Excavation-A	(Common)	m3	20,700	867	45	17,947	932	18,879	26.4
- Embankment-D	(Borrow. material)	m3	19,500	3,175	253	61,913	4,934	66,847	93.5
Grand Total						928,117	521,785	1,449,902	2,027.8
Grand Total per ha						2,746	1,544	4,290	6.0

Notes : F.C. : Foreign Currency Portion
L.C. : Local Currency Portion

Table FF-9 (3/3) Direct Construction Cost for Irrigation and Drainage System of Hun Model Area

(Exchange Rate : US$ 1 = Kips 715 = J.Yen 125)

III. Hun Area (323 ha)

Work Item		Unit	Quantity	Unit Rate F.C. (Kips)	Unit Rate L.C. (Kips)	Amount F.C. (1,000 Kips)	Amount L.C. (1,000 Kips)	Total (1,000 Kips)	Equivalent US Dollars (1,000 US$)
1. Weirs						214,880	110,441	325,321	455.0
(Nam Ngat No.1)						(84,213)	(43,974)	(128,187)	179.4
- Clearing & grubbing		m2	2,400	176	8	422	19	441	0.6
- Stripping		m3	90	660	14	59	1	60	0.1
- Excavation-A	(Common)	m3	1,630	867	45	1,413	73	1,486	2.1
- Excavation-B	(Boulder)	m3	500	2,005	89	1,003	45	1,048	1.5
- Embankment-D	(Borrow. material)	m3	450	3,175	253	1,429	114	1,543	2.2
- Backfill for Structure		m3	320	819	124	262	40	302	0.4
- Concrete-A	(Reinforced)	m3	550	52,399	18,706	28,819	10,288	39,107	54.7
- Concrete-B	(Plain)	m3	20	38,608	18,843	772	377	1,149	1.6
- Form for Concrete		m2	640	555	10,131	355	6,484	6,839	9.6
- Reinforcement Bar		ton	25	720,219	44,402	18,005	1,110	19,115	26.7
- Riprap-A	(River bed)	m3	200	109,028	121,171	21,806	24,234	46,040	64.4
- Riprap-B	(Weir Side Slope)	m3	50	2,571	21,803	129	1,090	1,219	1.7
- Slide Gate for Sluiceway		nos.	1	7,431,313	62,442	7,431	62	7,493	10.5
- Slide Gate for Intake		nos.	1	2,307,670	36,608	2,308	37	2,345	3.3
(Nam Kham No.1)						(130,667)	(66,467)	(197,134)	275.6
- Clearing & grubbing		m2	0	176	8	0	0	0	0.0
- Stripping		m3	250	660	14	165	4	169	0.2
- Excavation-A	(Common)	m3	2,120	867	45	1,838	95	1,933	2.7
- Excavation-B	(Boulder)	m3	900	2,005	89	1,805	80	1,885	2.6
- Embankment-D	(Borrow. material)	m3	3,600	3,175	253	11,430	911	12,341	17.3
- Backfill for Structure		m3	240	819	124	197	30	227	0.3
- Concrete-A	(Reinforcement)	m3	920	52,399	18,706	48,207	17,210	65,417	91.5
- Concrete-B	(Plain)	m3	20	38,608	18,843	772	377	1,149	1.6
- Form for Concrete		m2	1,030	555	10,131	572	10,435	11,007	15.4
- Reinforcement Bar		ton	35	720,219	44,402	25,208	1,554	26,762	37.4
- Riprap-A	(River bed)	m3	280	109,028	121,171	30,528	33,928	64,456	90.1
- Riprap-B	(Weir Side Slope)	m3	80	2,571	21,803	206	1,744	1,950	2.7
- Slide Gate for Sluiceway		nos.	1	7,431,313	62,442	7,431	62	7,493	10.5
- Slide Gate for Intake		nos.	1	2,307,670	36,608	2,308	37	2,345	3.3
2. Main Irrigation Canals						299,689	235,740	535,429	748.8
- Clearing & grubbing		m2	19,000	176	8	3,344	152	3,496	4.9
- Stripping		m3	7,010	660	14	4,627	98	4,725	6.6
- Excavation-A	(Common)	m3	5,840	867	45	5,063	263	5,326	7.4
- Embankment-B	(Ex. material)	m3	14,360	1,415	40	20,319	574	20,893	29.2
- Embankment-C	(Borrow. material)	m3	33,490	1,485	55	49,733	1,842	51,575	72.1
- Wet Stone Masonry	(Canal Lining)	m3	3,930	47,847	38,712	188,039	152,138	340,177	475.8
- Gravel Filling	(Canal Lining)	m3	2,340	214	14,780	501	34,585	35,086	49.1
- Road metalling	(Gravel Pavement)	m3	2,990	764	9,861	2,284	29,484	31,768	44.4
- Structures		nos.	33	-	-	25,779	16,604	42,383	59.3
3. Secondary Irrigation Canals						120,556	44,346	164,902	230.6
- Stripping		m3	10,010	660	14	6,607	140	6,747	9.4
- Excavation-A	(Common)	m3	1,490	867	45	1,292	67	1,359	1.9
- Embankment-A		m3	66,150	942	60	62,313	3,969	66,282	92.7
- Road metalling	(Gravel Pavement)	m3	950	764	9,861	726	9,368	10,094	14.1
- Structures		nos.	123	-	-	49,618	30,802	80,420	112.5
4. Drainage Canals						58,086	18,826	76,912	107.6
- Excavation-A	(Common)	m3	21,800	867	45	18,901	981	19,882	27.8
- Structures		nos.	55	-	-	39,185	17,845	57,030	79.8
Grand Total						693,211	409,353	1,102,564	1,542.0
Grand Total per ha						2,146	1,267	3,414	4.8

Notes : F.C. : Foreign Currency Portion
L.C. : Local Currency Portion

Table FF-10 (1/2) Estimated Cost for District Road Rehabilitation

(B.Houay Khoum to B.Nale, Xay)

Unit : (US$)

	Work Items	Unit	Q'ty	Unit Price		Cost		Total Cost
				Foreign Currency	Local Currency	Foreign Currency	Local Currency	
(I) Earth Works								
1	Stripping	m3	14,488	0.92	0.02	13,328.96	289.76	13,619
2	Excavation	m3	1,132	2.80	0.12	3,169.60	135.84	3,305
3	Embankment	m3	2,928	4.44	0.35	13,000.32	1,024.80	14,025
4	Gravel Pavement	m3	929	1.07	13.79	994.03	12,810.91	13,805
(II) Structures								
Causeway								
1	Concrete (1:2:4)	m3	281	73.29	26.16	20,594.49	7,350.96	27,945
2	Concrete (1:3:6)	m3	15	53.99	26.35	809.85	395.25	1,205
3	Reinfocing Bar	ton	17	1,007.30	62.10	16,983.08	1,047.01	18,030
4	Stripping	m3	1,116	0.92	0.02	1,026.72	22.32	1,049
5	Excavation	m3	337	2.80	0.12	943.60	40.44	984
6	Gravel Filling	m3	30	0.30	20.67	9.00	620.10	629
7	Backfill	m3	215	1.15	0.17	247.25	36.55	284
8	Embankment	m3	1,944	4.44	0.35	8,631.36	680.40	9,312
9	Wet Stone Masonry	m3	162	66.92	54.14	10,841.04	8,770.68	19,612
10	Fonn	m2	408	0.31	14.94	126.48	6,095.52	6,222
11	Curing	m2	1,607	0.53	0.65	851.71	1,044.55	1,896
Cross Drain								
1	Concrete Pipe (D=400mm)	m	10	14.92	36.46	149.20	364.60	514
2	Concrete Pipe (D=600mm x 1)	m	20	26.95	56.53	539.00	1,130.60	1,670
3	Concrete Pipe (D=600mm x 2)	m	20	21.16	53.17	423.20	1,063.40	1,487
4	Concrete (1:2:4)	m3	58	73.29	26.16	4,280.14	1,527.74	5,808
5	Concrete (1:3:6)	m3	9	54.00	26.35	467.64	228.19	696
6	Reinforcing Bar	ton	4	1,007.30	62.10	3,525.55	217.35	3,743
7	Excavation	m3	295	2.80	0.12	826.81	35.43	862
8	Wet Stone Masonry	m3	18	0.30	20.67	5.37	369.99	375
9	Backfill	m3	129	1.15	0.17	147.83	21.85	170
10	Form	m2	226	0.31	14.94	70.20	3,383.01	3,453
11	Curing	m2	226	0.53	0.65	120.01	147.19	267
	Total					102,112	48,854	150,967

Table FF-10 (2/2) Estimated Cost for District Road Rehabilitation

(Hun town to B.Somphon, Hun)

Unit : (US$

	Work Items	Unit	Q'ty	Unit Price		Cost		Total Cost
				Foreign Currency	Local Currency	Foreign Currency	Local Currency	
(I) Earth Works								
1	Stripping	m3	58,431	0.92	0.02	53,756.52	1,168.62	54,925
2	Excavation	m3	4,789	2.80	0.12	13,409.20	574.68	13,984
3	Embankment	m3	36,128	4.44	0.35	160,408.32	12,644.80	173,053
4	Gravel Pavement	m3	3,749	1.07	13.79	4,011.43	51,698.71	55,710
(II) Structures								
Causeway								
1	Concrete (1:2:4)	m3	304	73.29	26.16	22,280.16	7,952.64	30,233
2	Concrete (1:3:6)	m3	13	53.99	26.35	712.67	347.82	1,060
3	Reinfocing Bar	ton	8	1,007.30	62.10	7,977.82	491.83	8,470
4	Stripping	m3	1,603	0.92	0.02	1,474.94	32.06	1,507
5	Excavation	m3	312	2.80	0.12	873.60	37.44	911
6	Gravel Filling	m3	26	0.30	20.67	7.92	545.69	554
7	Backfill	m3	114	1.15	0.17	131.10	19.38	150
8	Embankment	m3	2,671	4.44	0.35	11,859.24	934.85	12,794
9	Wet Stone Masonry	m3	211	66.92	54.14	14,093.35	11,401.88	25,495
10	Form	m2	344	0.31	14.94	106.64	5,139.36	5,246
11	Curing	m2	2,463	0.53	0.65	1,305.39	1,600.95	2,906
Cross Drain								
1	Concrete Pipe (D=400mm)	m	60	14.92	36.46	895.20	2,187.60	3,083
2	Concrete Pipe (D=600mm x 1)	m	180	26.95	56.53	4,851.00	10,175.40	15,026
3	Concrete Pipe (D=600mm x 2)	m	80	21.16	53.17	1,692.80	4,253.60	5,946
4	Concrete (1:2:4)	m3	86	73.29	26.16	6,311.00	2,252.64	8,564
5	Concrete (1:3:6)	m3	12	54.00	26.35	659.88	322.00	982
6	Reinforcing Bar	ton	5	1,007.30	62.10	5,207.74	321.06	5,529
7	Excavation	m3	529	2.80	0.12	1,481.20	63.48	1,545
8	Wet Stone Masonry	m3	24	0.30	20.67	7.20	496.08	503
9	Backfill	m3	323	1.15	0.17	371.80	54.96	427
10	Form	m2	369	0.31	14.94	114.53	5,519.58	5,634
11	Curing	m2	369	0.53	0.65	195.81	240.14	436
	Total					314,196	120,477	434,674

Table FF-11 (1/3) Estimated Cost for Water Supply System (Houay Khoum, Xay)

Unit : (US$)

Material Works	Unit	Q'ty	Unit Price		Cost		
			Foreign Currency	Local Currency	Foreign Currency	Local Currency	Total Cost
(I) Pipe Line							
1 HDP Pipe							
90 mm	m	132	5.17	0.57	683	76	758
63 mm	m	2,140	2.54	0.28	5,435	604	6,039
50 mm	m	3,450	1.62	0.18	5,595	622	6,217
32 mm	m	2,589	0.72	0.08	1,862	207	2,069
20 mm	m	449	0.46	0.05	206	23	229
2 GI Pipe							
3"	m	28	7.64	0.85	214	24	238
2"	m	94	4.50	0.50	423	47	470
1 1/2"	m	383	3.38	0.38	1,293	144	1,436
1"	m	125	2.24	0.25	280	31	311
1/2"	m	0	1.22	0.14	0	0	0
3 HDP Equal Tee	ea.	25	8.48	0.94	212	24	236
4 HDP Reducer	ea.	32	10.80	1.20	346	38	384
5 GI Socket	ea.	102	2.03	0.23	207	23	230
6 GI Elbow	ea.	66	1.88	0.21	124	14	138
7 GI Equal Tee	ea.	7	2.43	0.27	17	2	19
8 Brass Union	ea.	42	10.13	1.13	425	47	473
9 Gate Valve	ea.	22	27.00	3.00	594	66	660
10 Glove Valve	ea.	2	27.00	3.00	54	6	60
11 Brass Tap	ea.	29	6.94	0.77	201	22	224
12 Diffuser	ea.	17	135.00	15.00	2,295	255	2,550
(II) Reservoir. etc.							
1 Concrete(1:2:4)	m3	79	73.29	26.16	5,790	2,067	7,857
2 Reinfocing Bar(12mm)	ton	5	1007.30	62.10	5,037	311	5,347
3 Concrete(1:3:6)	m3	38	54.00	26.35	2,052	1,001	3,053
4 Sand	m3	22	0.00	5.87	0	129	129
5 Gravel Filling	m3	17	0.30	20.67	5	351	356
6 Timber Work	m3	6	0.00	218.18	0	1,309	1,309
7 GI Sheet	m2	86	4.25	0.47	365	41	406
8 Form	m2	418	0.31	14.94	130	6,245	6,375
9 Curing	m2	418	0.53	0.65	222	272	493
(III) Plumbing							
1 Excavation for access road	m3	18,956	2.80	0.12	53,078	2,275	55,352
2 Excavation for plumbing	m3	5,898	1.21	0.06	7,136	354	7,490
3 Backfill for plumbing	m3	5,308	1.15	0.17	6,104	902	7,006
4 Plumbing	m	8,425	0.21	0.35	1,769	2,949	4,718
(Total)					102,151	20,479	122,630

Table FF-11 (2/3) Estimated Cost for Water Supply System (Houay Lai, Beng)

Unit : (US$)

Material Works	Unit	Q'ty	Unit Price		Cost		
			Foreign Currency	Local Currency	Foreign Currency	Local Currency	Total Cost
(I) Pipe Line							
1 HDP Pipe							
90 mm	m	1,210	5.17	0.57	6,257	695	6,953
63 mm	m	2,806	2.54	0.28	7,127	792	7,919
50 mm	m	5,258	1.62	0.18	8,527	947	9,475
32 mm	m	1,192	0.72	0.08	857	95	952
20 mm	m	107	0.46	0.05	49	5	55
2 GI Pipe							
3"	m	230	7.64	0.85	1,758	195	1,953
2"	m	74	4.50	0.50	333	37	370
1 1/2"	m	0	3.38	0.38	0	0	0
1"	m	0	2.24	0.25	0	0	0
1/2"	m	0	1.22	0.14	0	0	0
3 HDP Equal Tee	ea.	34	8.48	0.94	288	32	320
4 HDP Reducer	ea.	35	10.80	1.20	378	42	420
5 GI Socket	ea.	102	2.03	0.23	207	23	230
6 GI Elbow	ea.	84	1.88	0.21	158	18	175
7 GI Equal Tee	ea.	7	2.43	0.27	17	2	19
8 Brass Union	ea.	42	10.13	1.13	425	47	473
9 Gate Valve	ea.	22	27.00	3.00	594	66	660
10 Glove Valve	ea.	2	27.00	3.00	54	6	60
11 Brass Tap	ea.	39	6.94	0.77	271	30	301
12 Diffuser	ea.	2	135.00	15.00	270	30	300
(II) Reservoir. etc.							
1 Concrete(1:2:4)	m3	101	73.29	26.16	7,402	2,642	10,044
2 Reinforcing Bar(12mm)	ton	6	1007.30	62.10	6,044	373	6,416
3 Concrete(1:3:6)	m3	52	54.00	26.35	2,808	1,370	4,178
4 Sand	m3	33	0.00	5.87	0	194	194
5 Gravel Filling	m3	25	0.30	20.67	8	517	524
6 Timber Work	m3	8	0.00	218.18	0	1,745	1,745
7 GI Sheet	m2	124	4.25	0.47	527	59	585
8 Form	m2	510	0.31	14.94	158	7,619	7,778
9 Curing	m2	510	0.53	0.65	270	332	602
(III) Plumbing							
1 Excavation for access road	m3	22,001	2.80	0.12	61,601	2,640	64,241
2 Excavation for plumbing	m3	6,845	1.21	0.06	8,282	411	8,693
3 Backfill for plumbing	m3	6,160	1.15	0.17	7,084	1,047	8,131
4 Plumbing	m	9,778	0.21	0.35	2,053	3,422	5,476
		(Total)			123,807	25,434	149,241

Table FF-11 (3/3) Estimated Cost for Water Supply System (Houay Phon, Hun)

Unit : (US$)

Material Works	Unit	Q'ty	Unit Price		Cost		
			Foreign Currency	Local Currency	Foreign Currency	Local Currency	Total
(I) Pipe Line							
1 HDP Pipe							
90 mm	m	0	5.17	0.57	0	0	0
63 mm	m	5,212	2.54	0.28	13,237	1,471	14,708
50 mm	m	5,508	1.62	0.18	8,933	993	9,925
32 mm	m	1,588	0.72	0.08	1,142	127	1,269
20 mm	m	474	0.46	0.05	218	24	242
2 GI Pipe							
3"	m	99	7.64	0.85	757	84	841
2"	m	55	4.50	0.50	247	27	275
1 1/2"	m	0	3.38	0.38	0	0	0
1"	m	0	2.24	0.25	0	0	0
1/2"	m	0	1.22	0.14	0	0	0
3 HDP Equal Tee	ea.	42	8.48	0.94	356	40	396
4 HDP Reducer	ea.	51	10.80	1.20	551	61	612
5 GI Socket	ea.	22	2.03	0.23	45	5	50
6 GI Elbow	ea.	102	1.88	0.21	191	21	213
7 GI Equal Tee	ea.	9	2.43	0.27	22	2	24
8 Brass Union	ea.	61	10.13	1.13	618	69	686
9 Gate Valve	ea.	24	27.00	3.00	648	72	720
10 Glove Valve	ea.	2	27.00	3.00	54	6	60
11 Brass Tap	ea.	51	6.94	0.77	354	39	393
12 Diffuser	ea.	9	135.00	15.00	1,215	135	1,350
(II) Reservoir. etc.							
1 Concrete(1:2:4)	m3	129	73.29	26.16	9,454	3,375	12,829
2 Reinforcing Bar(12mm)	ton	8	1007.30	62.10	8,058	497	8,555
3 Concrete(1:3:6)	m3	66	54.00	26.35	3,564	1,739	5,303
4 Sand	m3	30	0.00	5.87	0	176	176
5 Gravel Filling	m3	31	0.30	20.67	9	641	650
6 Timber Work	m3	10	0.00	218.18	0	2,182	2,182
7 GI Sheet	m2	153	4.25	0.47	650	72	722
8 Form	m2	702	0.31	14.94	218	10,488	10,706
9 Curing	m2	702	0.53	0.65	372	456	828
(III) Plumbing							
1 Excavation for access road	m3	26,145	2.80	0.12	73,206	3,137	76,343
2 Excavation for plumbing	m3	8,134	1.21	0.06	9,842	488	10,330
3 Backfill for plumbing	m3	7,321	1.15	0.17	8,419	1,245	9,663
4 Plumbing	m	11,620	0.21	0.35	2,440	4,067	6,507
		(Total)			144,820	31,739	176,558

Table FF-12 Estimated Cost for Primary School

Unit: US$

	Model Area (District)	Unit	Q'ty	Unit Price		Cost		
				Foreign	Local	Foreign	Local	Total
1	Xay							
	Floor (School House)	m2	630	100	130	63,000	81,900	144,900
	Desk/Chair for Pupil	set	270	0	40	0	10,800	10,800
	Desk/Chair for Teacher	set	15	0	60	0	900	900
	(Sub-total)					63,000	93,600	156,600
2	Beng							
	Floor (School House)	m2	588	100	130	58,800	76,440	135,240
	Desk/Chair for Pupil	set	252	0	40	0	10,080	10,080
	Desk/Chair for Teacher	set	14	0	60	0	840	840
	(Sub-total)					58,800	87,360	146,160
3	Hun							
	Floor (School House)	m2	420	100	130	42,000	54,600	96,600
	Desk/Chair for Pupil	set	180	0	40	0	7,200	7,200
	Desk/Chair for Teacher	set	10	0	60	0	600	600
	(Sub-total)					42,000	62,400	104,400
	Total					163,800	243,360	407,160

Table FF-13 Direct Construction Cost of Agricultural Station

Item	Unit	Quantity	Unit Cost		Construction Cost		
			Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Total (US$)
(1) Building Work *							
1. Main Building							
- Office	m2	650	190	120	123,500	78,000	201,500
- Storage	m2	200	60	40	12,000	8,000	20,000
- Garage	m2	200	60	40	12,000	8,000	20,000
2. Research and Trial Building	m2	885	190	120	168,150	106,200	274,350
3. Quaters	m2	1,825	190	120	346,750	219,000	565,750
4. Workshop	m2	300	60	40	18,000	12,000	30,000
5. Office/Storage at Trial Farm	m2	150	190	120	28,500	18,000	46,500
Sub-total		4,210			708,900	449,200	1,158,100
(2) Trial Farm with Irrigation Facilities							
1. Paddy Field	ha	5	3,000	2,000	15,000	10,000	25,000
2. Upland Crop for hilly Area	ha	10	3,000	2,000	30,000	20,000	50,000
Sub-total					45,000	30,000	75,000
Total					753,900	479,200	1,233,100
						= Yen	154,137,500

Note: US$ 1.0 = Yen 125

*: Project implementation office will be extended to Agricultural Station

Table FF-14 Direct Construction Cost of Extension Office

Item	Unit	Quantity	Unit Cost		Construction Cost		
			Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Total (US$)
(1) Beng Extension Office							
1. Office and Storage	m2	208	190	120	39,520	24,960	64,480
2. Garage	m2	54	60	40	3,240	2,160	5,400
3. Furnitures	LS					1,000	1,000
Sub-total		262			42,760	28,120	70,880
(2) Hun Extension Office *							
1. Office and Storage	m2	208	190	120	39,520	24,960	64,480
2. Garage	m2	54	60	40	3,240	2,160	5,400
3. Quaters (140 m2 x 2)	m2	280	190	120	53,200	33,600	86,800
4. Furnitures	LS					1,000	1,000
Sub-total		542			95,960	61,720	157,680
Total					138,720	89,840	228,560
						= Yen	28,570,000

Note: US$ 1.0 = Yen 125

*: Project implementation office(Hun Branch) will be extended to Extension Office

Table FF-15 Direct Construction Cost of Rice Bank

Item	Unit	Quantity	Unit Cost		Construction Cost		
			Foreign (US$)	Local (US$)	Foreign (US$)	Local (US$)	Total (US$)
(1) Xai Rice Bank							
1. Office	m2	104	190	120	19,760	12,480	32,240
2. Storage	m2	200	60	40	12,000	8,000	20,000
3. Drying Yard	m2	200	10	20	2,000	4,000	6,000
4. Building for Rice Mill	m2	50	190	120	9,500	6,000	15,500
5. Building for Sesame Separator	m2	50	190	120	9,500	6,000	15,500
6. Garage	m2	54	60	40	3,240	2,160	5,400
7. Furnitures	LS					1,000	1,000
Sub-total		658			56,000	39,640	95,640
(2) Beng Rice Bank							
1. Office	m2	104	190	120	19,760	12,480	32,240
2. Storage	m2	200	60	40	12,000	8,000	20,000
3. Drying Yard	m2	200	10	20	2,000	4,000	6,000
4. Building for Rice Mill	m2	50	190	120	9,500	6,000	15,500
5. Building for Sesame Separator	m2	50	190	120	9,500	6,000	15,500
6. Garage	m2	54	60	40	3,240	2,160	5,400
7. Furnitures	LS					1,000	1,000
Sub-total		658			56,000	39,640	95,640
(3) Hun Rice Bank							
1. Office	m2	104	190	120	19,760	12,480	32,240
2. Storage	m2	200	60	40	12,000	8,000	20,000
3. Drying Yard	m2	200	10	20	2,000	4,000	6,000
4. Building for Rice Mill	m2	50	190	120	9,500	6,000	15,500
5. Building for Sesame Separator	m2	50	190	120	9,500	6,000	15,500
6. Garage	m2	54	60	40	3,240	2,160	5,400
7. Furnitures	LS					1,000	1,000
Sub-total		658			56,000	39,640	95,640
Total					168,000	118,920	286,920
						= Yen	35,865,000

Note: US$ 1.0 = Yen 125

Table FF-16 (1/2) Cost of Equipment

Item	Description	Quantity	Unit Price Yen 1,000	Cost Yen 1,000	Equivalent US$ 1,000
1. Agricultural Station					
(1) Vehicles					
Pickup Truck		2	2,000	4,000	32.0
Jeep		2	2,000	4,000	32.0
Minibus		2	2,000	4,000	32.0
Motor cycle		5	150	750	6.0
(2) Workshop Equipment		LS		3,000	24.0
(3) Research & Trial Equipment					
Rice Mill		1	6,800	6,800	54.4
Laboratory Equipment		LS		7,000	56.0
Farm Machinery		LS		20,000	160.0
(4) Training Equipment					
Audio Visual Aids		LS		2,000	16.0
Training Materials		LS		1,000	8.0
(5) Survey & Design Equipment		LS		4,000	32.0
(6) Office Equipment					
Office Equipment (Copy machine, etc.)		LS		1,000	8.0
Radio System		3	1,800	5,400	43.2
Generator		1	2,000	2,000	16.0
Total				64,950	519.6
2. O/M Equipment					
Bulldozer	6 t	1	6,300	6,300	50.4
Backhoe	0.2 m3	1	6,300	6,300	50.4
Motor Grader	2.8 m blade	1	8,800	8,800	70.4
Trailer Truck	15 t	1	10,400	10,400	83.2
Dump Truck	6 t	2	5,700	11,400	91.2
Truck Crane	4 t, Crane 2 t	1	4,700	4,700	37.6
Wheel loader	1.4 t	1	10,700	10,700	85.6
Portable Generator	3.7 kW	2	60	120	1.0
Pickup truck		3	2,000	6,000	48.0
Submersible pump	80 mm, 15 m	2	150	300	2.4
Spare parts	20 % of above	LS		13,000	104.0
Total				78,020	624.2

Table FF-16 (2/2) Cost of Equipment

Item	Description	Quantity	Unit Price 1000 Yen	Cost 1000 Yen	Equivalent US$ 1,000
3. Equipment for Rice Bank					
Rice Mill		3	6,800	20,400	163.2
Sesame Separator		3	4,400	13,200	105.6
Spare Parts	10 % of above	LS		3,360	26.9
Others (Balance, moisture meter, etc.)		3	200	600	4.8
Total				37,560	300.5
4. Equipment for Extension Office					
Motor cycle	2 nos. x 3	6	150	900	7.2
Generator	1 no. x 2	2	600	1,200	9.6
Copy Machine	1 no. x 2	2	500	1,000	8.0
Slide projector	1 no. x 2	2	100	200	1.6
Sprayer	10 nos. x 3	30	50	1,500	12.0
Total				4,800	38.4
4. Meteorological Instruments					
(1) Xai Meteo Station					
Rainfall Recorder		1	500	500	4.0
Evaporation Pan	Class A-Pan	1	375	375	3.0
Wind Vane & Anemometer		1	1,250	1,250	10.0
(2) Beng Meteo Station (New)					
Instrument Shelter		1	200	200	1.6
Thermometer		1	10	10	0.1
Max. & Min. Thermometer		1	65	65	0.5
Psychrometer		1	70	70	0.6
Sunshine Recorder		1	380	380	3.0
Rainfall Recorder		1	500	500	4.0
Evaporation Pan	Class A-Pan	1	375	375	3.0
Wind Vane & Anemometer		1	1,250	1,250	10.0
(3) Rainfall Station					
Rainfall Recorder		9	500	4,500	36.0
(4) Staff-gage		5	10	50	0.4
(5) Ink, Recording chart, etc.	10 % of above	LS		663	5.3
Total				9,525	76.2
Grand Total				194,855	1,558.8

Table FF-17 Cost of Farm Machinery for Agricultural Station

Items	Unit Price	VLM	WGHT	QTY	Total VLM	Total WGHT	Cost
	(Yen1,000)	(m3)	(t)		(m3)	(t)	(Yen1,000)
1 Wheel tractor	2,605	8.42	2.42	2	16.84	4.84	5,210
2 Disc plow	406	1.89	0.51	2	3.78	1.02	812
3 Disc harrow	368	1.62	0.49	2	3.24	0.98	736
4 Chizel plough	270	0.86	0.15	1	0.86	0.15	270
5 Rotary tiller	605	2.97	0.55	2	5.94	1.1	1,210
6 Drum rotor	584	1.75	0.98	2	3.5	1.96	1,168
7 Subsoiler	213	0.4	0.45	1	0.4	0.45	213
8 Swamp wheel	125	1.21	0.1	2	2.42	0.2	250
9 Rear grader	203	1.08	0.42	1	1.08	0.42	203
10 Ridger	183	0.81	0.18	1	0.81	0.18	183
11 Trailer	643	4.05	0.98	1	4.05	0.98	643
12 Rotary slasher	554	13.5	0.08	1	13.5	0.08	554
13 Mower	831	4.32	0.61	1	4.32	0.61	831
Sub-total					60.74	12.97	12,283
1 Hand tractor	501	2.54	0.47	5	12.7	2.35	2,505
2 Swamp wheel	26	0.21	0.04	3	0.63	0.12	78
3 Ridger	16	0.13	0.02	3	0.39	0.06	48
4 Trailer	156	1.3	0.25	3	3.9	0.75	468
Sub-total					17.62	3.28	3,099
1 Power sprayer	302	1.48	0.21	2	2.96	0.42	604
2 Knapsack type	333	0.78	0.16	3	2.34	0.48	999
3 Wheel weeder	47	0.24	0.03	10	2.4	0.3	470
Sub-total					7.7	1.2	2,073
1 Thresher	316	1.75	0.29	3	0.508	0.87	948
2 Treadlethresher	71	0.67	0.13	10	0.087	1.3	710
3 Brush cutter	50	0.22	0.01	3	0.002	0.03	150
Sub-total					0.597	2.2	1,808
TOTAL					86.66	19.65	19,263
Say							20,000

Table FF-18 Annual Disbursement Schedule of Construction Cost

(Unit : US$ 1,000)

Items	Total Cost			1995		1996		1997		1998	
	FC	LC	Total	FC	LC	FC	LC	FC	LC	FC	LC
1. Preparatory Works	578	334	912	0	0	271	163	306	171	0	0
2. Irrigation and Drainage											
(1) Xai area	1,498	858	2,356	0	0	449	257	1,049	601	0	0
(2) Beng area	1,298	730	2,028	0	0	0	0	389	219	909	511
(3) Hun area	970	573	1,543	0	0	0	0	291	172	679	401
3. Social Infrastructures											
(1) District road											
- B.Nasao to B.Nale (Xai)	102	49	151	0	0	31	15	71	34	0	0
- Hun center to B.Somphon (Hun)	314	120	434	0	0	0	0	94	36	220	84
(2) Rural water supply											
- Houay Khoum system (Xai)	102	21	123	0	0	31	6	71	15	0	0
- Houay Lai system (Beng)	124	25	149	0	0	0	0	37	8	87	18
- Houay Phon system (Hun)	145	32	177	0	0	0	0	44	10	102	22
(3) Primary school											
- Xai area	63	94	157	0	0	19	28	44	66	0	0
- Beng area	59	87	146	0	0	0	0	18	26	41	61
- Hun area	42	62	104	0	0	0	0	13	19	29	43
4. Agricultural Station	754	479	1,233	0	0	226	144	528	335	0	0
5. Extension Office											
(1) Beng extension office	43	28	71	0	0	13	8	30	20	0	0
(2) Hun extension office	96	62	158	0	0	29	19	67	43	0	0
6. Rice Bank											
(1) Xai rice bank	56	40	96	0	0	17	12	39	28	0	0
(2) Beng rice bank	56	40	96	0	0	0	0	17	12	39	28
(3) Hun rice bank	56	40	96	0	0	0	0	17	12	39	28
Sub-total (1 - 6)	6,356	3,674	10,030	0	0	1,086	652	3,125	1,825	2,145	1,196
7. Equipment	1,559	0	1,559					1,559	0		
8. Administration cost	0	232	232	0	23	0	81	0	81	0	46
9. Engineering Services	927	0	927	93	0	324	0	324	0	185	0
Sub-total (1 - 9)	8,842	3,906	12,748	93	23	1,410	734	5,009	1,906	2,330	1,243
10. Physical Contingency	442	195	637	5	1	71	37	250	95	117	62
Sub-total (1 - 10)	9,284	4,101	13,385	97	24	1,481	770	5,259	2,002	2,447	1,305
11. Price Contingency	984	1,167	2,151	6	4	122	166	547	553	309	444
Total (1 - 11)	10,268	5,268	15,536	103	28	1,603	936	5,807	2,555	2,755	1,749

Note: Price contingency is estimated based on the annual increase rate of 2 % and 5 % for foreign currency portion and local currency portion, respectively.
FC : Foreign currency portion, LC : Local currency portion

Table FF-19 Annual Operation and Maintenance Cost
(Irrigation and Drainage, District Road, Rural Water Supply)

Items	Annual Cost (US$)	Remarks
1. Salary and Wage		
(1) Staff salary	12,900	see Table FF-20
(2) Labor wage	500	240m/m x US$2.0
2. Office Expense	600	2% of staff salary
3. Operation Cost		
(1) POL for O&M equipment	3,700	800 lit./month x US$ 0.39
(2) POL for vehicles	4,000	800 lit./month x US$ 0.42
4. Maintenance Cost		
(1) Irrigation & Drainage facility	118,500	2% of direct construction cost
(2) District Road	11,300	2% of direct construction cost
(3) Rural Water Supply System	9,000	2% of direct construction cost
5. Miscellaneous	16,100	10% of above total
Total	176,600	

Table FF-20 Salary for Staff at O&M Stage
(Irrigation and Drainage, District Road, Rural Water Supply)

Staffs	Required Number	Montyly Salary (Kips)	Annual Salary (Kips)
1. Administration			
(1) General manager	1	24,000	576,000
(2) Section chief	1	16,000	384,000
(3) Claerk *	1	30,000	720,000
(4) Accountant *	1	30,000	720,000
(5) Typist *	1	35,000	840,000
(6) Driver *	3	50,000	1,200,000
(7) Office boy *	2	35,000	840,000
2. Operation and Maintenance			
(1) Section chief	1	16,000	384,000
(2) Chief mechanic *	1	30,000	720,000
(3) Assistant mechanic	1	25,000	600,000
(4) Operator *	3	18,000	432,000
(5) Fieldman	2	15,000	360,000
3. Study, Planning and Monitoring			
(1) Section chief	1	16,000	384,000
(2) Irrigation engineer	1	15,000	360,000
(3) Civil engineer	1	15,000	360,000
(4) Surveyor	2	15,000	360,000
Total	23		9,240,000
		=US$	12,923

Source: * State Irrigation Company of Oudomxay Province

Table FF-21 Replacement Cost and Useful Life

Items	Useful Life (years)	Replacement Cost (US$ 1,000)
1. Irrigation and Drainage		
Gates of weirs and spillways	25	105
Gates of Turnout	10	2
2. O&M equipment	8	624
3. Farm machinery	8	160

Figure

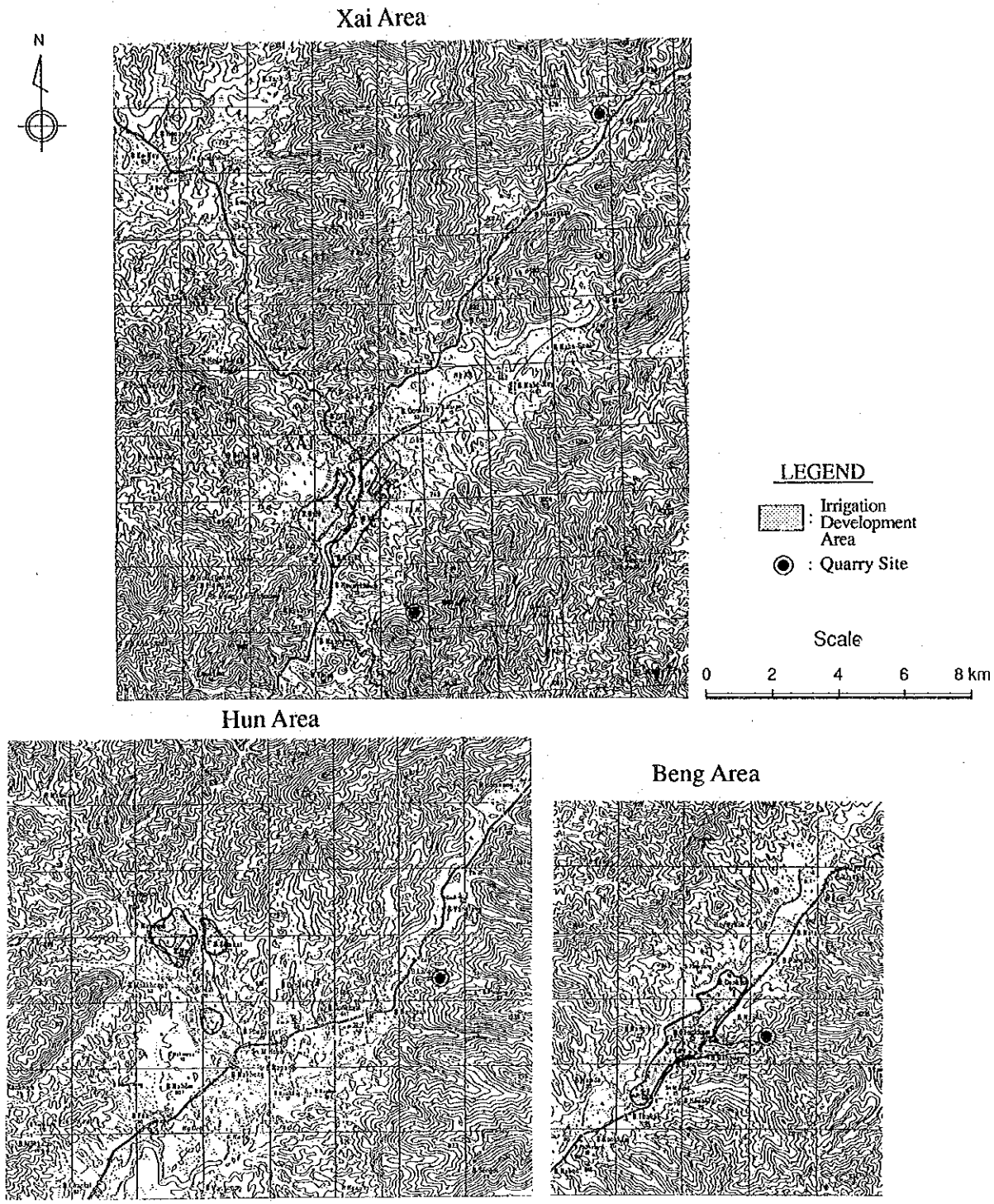


Fig. FF-1 Location of Quarry Sites

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF AGRICULTURE AND FORESTRY
AGRICULTURAL DEVELOPMENT PROJECT TO CONTROL SLASH AND BURN CULTIVATION IN OUDOMXAY PROVINCE
NIPPON KOEI CO., LTD. CONSTRUCTION PROJECT CONSULTANTS, INC.

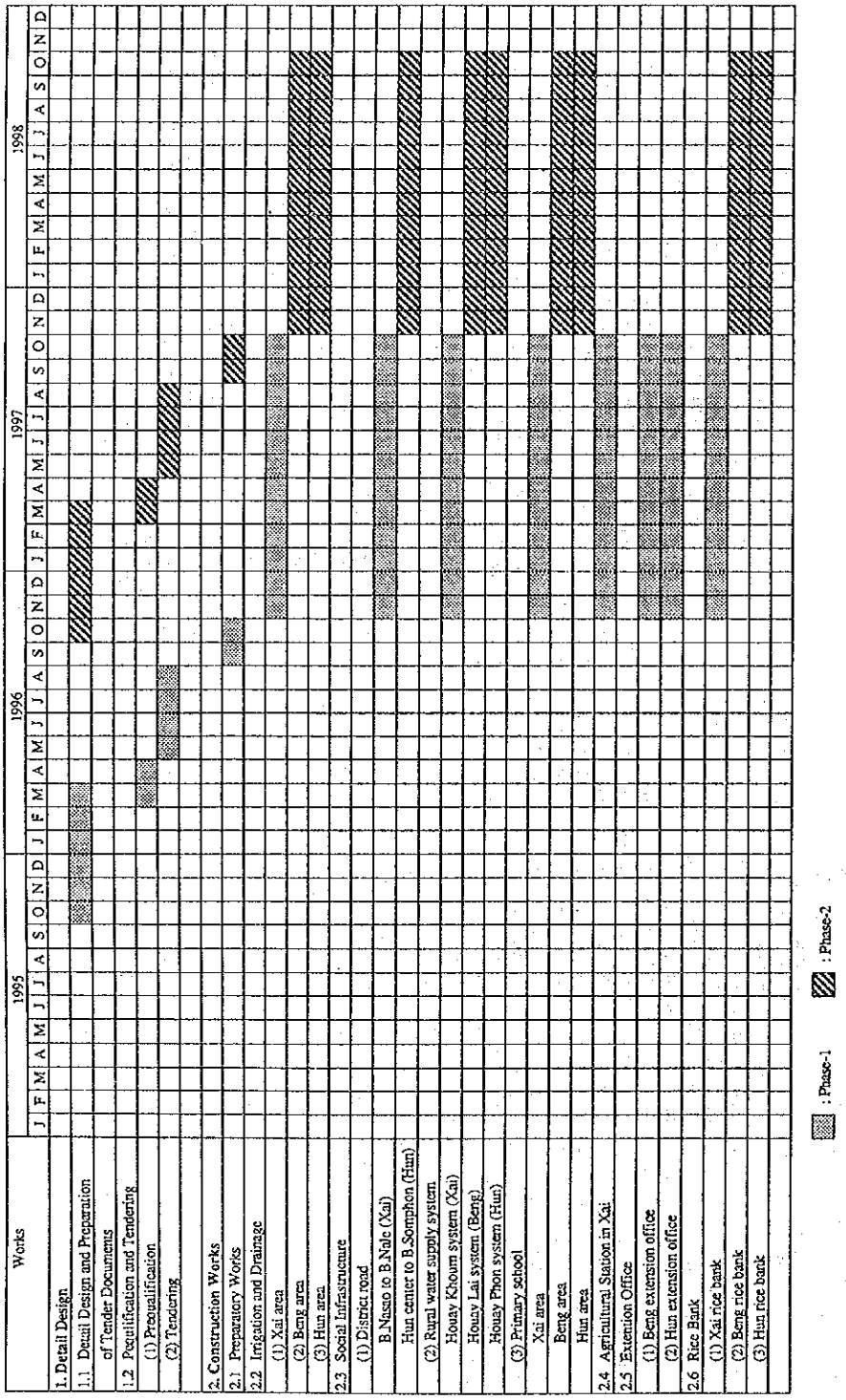
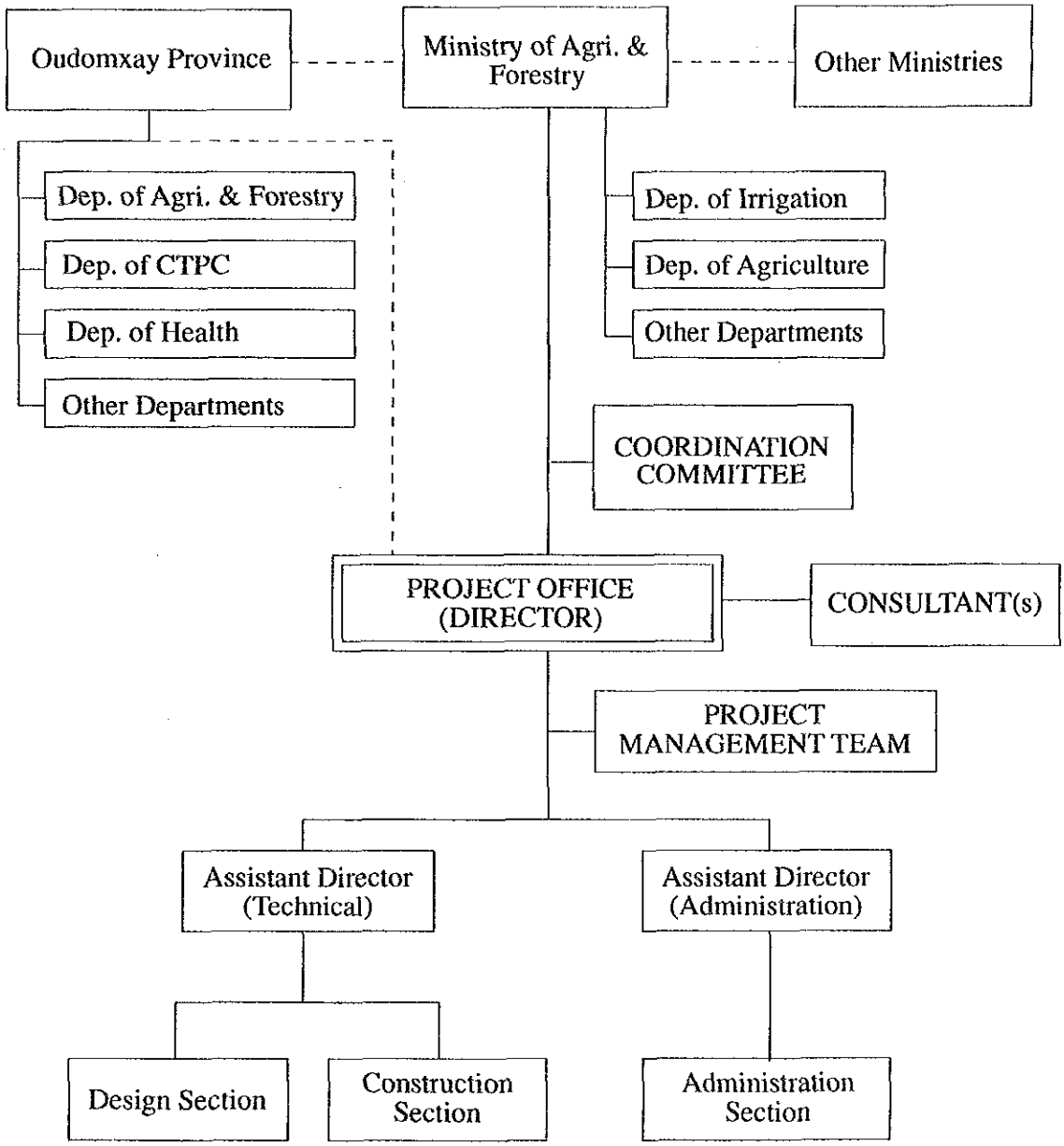


Fig. FF-2 Proposed Construction Schedule of Model Areas Scheme

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC MINISTRY OF AGRICULTURE AND FORESTRY
AGRICULTURAL DEVELOPMENT PROJECT TO CONTROL SLASH AND BURN CULTIVATION IN OUDOMXAY PROVINCE
NIPPON KOEI CO., LTD. CONSTRUCTION PROJECT CONSULTANTS, INC.



Note: - - - means coordination line

Fig. FF-3 Proposed Organization for Implementation of Model Areas Scheme

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC
MINISTRY OF AGRICULTURE AND FORESTRY

AGRICULTURAL DEVELOPMENT PROJECT
TO CONTROL SLASH AND BURN CULTIVATION
IN OUDOMXAY PROVINCE

NIPPON KOEI CO., LTD.
CONSTRUCTION PROJECT CONSULTANTS, INC.

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