

## **ANNEX-H**

# **Agricultural/Rural Infrastructure**

# Agricultural / Rural Infrastructure

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H-1-1-(1) : Existing Infrastructure Condition of District in Study Area Province Borikhamxai (1/2)

Item	District	Thapabath	Borikhan	Paksan	Pakkading	Grand total
<b>A. General</b>	<b>Unit</b>					
(1) Administrative area	Km2	1,212	1,803	654	2,410	6,079
(2) Number of villages	nos.	32	50	75	57	214
(3) Population	ps.	19,424	16,625	34,693	31,440	102,182
(4) Land use						
a) Rainfed Paddy field	ha	3,850	1,384	6,789	5,568	17,591
b) Irrigated Paddy field	ha	544	115	1,200	734	2,593
(5) Irrigation facility (total of four below)						
a) Pump station with electric motor power	nos.	18	48	35	47	148
b) Pump station with diesel power	nos.	12	3	27	0	42
c) Weir	nos.	3	0	1	15	19
d) Reservoir (Dam)	nos.	0	44	7	32	83
		3	1	0	0	4
(6) Area of field, irrigated under irrigation facility above						
a) area of field, irrigated during wet season	ha	3,010	1,241	5,900	2,184	12,335
b) area of field, irrigated during dry season	ha	1,490	341	2,284	961	5,076
(7) Water supply for people (dry season)	%					0
a) % of villages using improved water sources	%					0
b) % of villages relying on traditional sources	%					0
(8) Water supply for people (wet season)	%					0
a) % of villages using improved water sources	%					0
b) % of villages relying on traditional sources	%					0
(9) Education						
a) No. of classrooms for primary education	nos.					0
b) No. of classrooms for secondary education	nos.					0
c) % of villages with a complete elementary school	%					0
d) % of villages with lower secondary school	%					0
(10) Health						
a) No. of a permanent health center (Hospital)	nos.	1	1	1	1	4
b) No. of a health post	nos.	3	2	4	3	12
c) % of villages with a permanent health center	%					0
(11) % of villages with a common source of electricity	%					0
(12) Marketing						
a) No. of mills	nos.	3	60	62	53	178
b) % of villages with a rice mill	%					0
c) No. of market	nos.					0
(13) Port, along the Mekong River with an immigration office						
a) Name of the city or the village		B.Pakthoay-Noy	(no port)	Paksan	Pakkading	1
b) No. of port for both people and cargo (trucking)	nos.	0	0	1	0	1
c) No. of port for only people	nos.	1	0	0	1	2
d) Name of the river, a tributary of the Mekong River		mouth of Nam Thoay		no river	Nam Kading	0
e) Classification of access road to a port from national road No.13		rural road		province road	rural road	0
f) Length of access road above	Km	0.5		3	0.5	4
g) Condition of access road above		no good		good	good	

Source : Data offered from Borikhamxay Province Office, DCTPC.

Data offered from DAFSO and PAFSO .

The length of road was about presumed from data above and road map .

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**H-1-1-(2) : Existing Infrastructure Condition of District in Study Area Province Borikhamxai (2/2)**

Item	District	Thapabath	Borikhan	Paksan	Pakkading	Grand total
<b>B. Existing Road Condition</b>						
(1) Length of road (total length of three type of road as below )	Unit					
a) Length of national road with pavement	Km	103	75	137	173	488
b) Length of province road	Km	65	0	50	110	225
c) Length of rural road	Km	29	5	37	33	84
(2) Length of all year round road (total length of three type of road as below)	Km	78	70	114	159	351
a) Length of national road with pavement	Km	65	0	50	110	225
b) Length of province road	Km	9	0	33	27	69
c) Length of rural road	Km	4	0	31	22	57
(3) Length of dry season only road (total length of three type of road as below)	Km	25	75	23	14	137
a) Length of national road with pavement	Km	0	0	0	0	0
b) Length of province road	Km	0	5	4	6	15
c) Length of rural road	Km	25	70	19	8	122
(4) Trafficability for all year round (average of each classification of road)	%	76	0	83	92	72
a) % of whole length of national road with pavement	%	100	100	100	100	100
b) % of whole length of province road	%	100	0	89	82	82
c) % of whole length of rural road	%	14	0	62	73	32
(5) Untrafficability of dry season only road (average of each classification of road)	%	24	100	17	8	28
a) % of whole length of national road with pavement	%	0	0	0	0	0
b) % of whole length of province road	%	0	100	11	18	18
c) % of whole length of rural road	%	86	100	38	27	68
(6) Road access	%					
a) % of villages with all year round road	%					0
b) % of villages with dry season only road	%					0
c) % of villages with no road	%					0
(7) Bridges (total of three)	nos.					0
a) Number of bridges of national road with pavement	nos.					0
b) Number of bridges of province road	nos.					0
c) Number of bridges of rural road	nos.					0
(8) Average distance to road for villages without all year round road access	Km					0
(9) Transport services						
a) % of villages with all year round transport services	%					0
b) % of villages with dry season only transport services	%					0
c) % of villages with no transport services	%					0
(10) Travel time						
a) Average travel time to district center (dry season)	min					0
b) Average travel time to district center (wet season)	min					0
c) Average travel time to 1st market	min					0
<b>C. Access Problem and Priority for Existing Road</b>						
(1) % of villages with the rural road access problem as the main access problem	unit					0
(2) % of villages with improving rural road access as the first access priority	%					0

Source : Data offered from Borikhamxay Province Office, DCTPC.

Data offered from DAFSO and PAFSO.

The length of road was about presumed from data above and road map.

Blank : no exact data

**H-1-2-1) : Existing Infrastructure Condition of District in Study Area** Province Khammouan (1/2)

Item	District	Hinboun	Thakhek	Nongbok	Xebangfai	Grand total
<b>A. General</b>	<b>Unit</b>					
(1) Administrative area	Km2	3,011	918	321	966	5,216
(2) Number of villages	nos.	166	139	72	49	426
(3) Population	ps.	53,829	70,364	38,949	21,142	184,284
(4) Land use						
a) Rainfed Paddy field	ha	8,264	6,950	10,275	4,058	29,547
b) Irrigated Paddy field	ha	593	756	1,303	595	3,247
(5) Irrigation facility (total of four below)	nos.	52	28	28	22	130
a) Pump station with electric motor power	nos.	20	17	21	5	63
b) Pump station with diesel power	nos.	29	9	0	13	51
c) Weir	nos.	3	1	7	4	15
d) Reservoir (Dam)	nos.	0	1	0	0	1
(6) Area of field, irrigated under irrigation facility above						
a) area of field, irrigated during wet season	ha	2,880	665	4,200	1,655	9,400
b) area of field, irrigated during dry season	ha	1,490	822	1,430	583	4,325
(7) Water supply for people (dry season)	%	29	84		58	57
a) % of villages using improved water sources	%	100	84		57	80
b) % of villages relying on traditional sources	%	29	84		57	57
(8) Water supply for people (wet season)	%	100	84		100	95
a) % of villages using improved water sources	%	29	84		57	57
b) % of villages relying on traditional sources	%	100	84		100	95
(9) Education						
a) No. of classrooms for primary education	nos.	318	405		41	764
b) No. of classrooms for secondary education	nos.	10	12			22
c) % of villages with a complete elementary school	%	25	30		35	30
d) % of villages with lower secondary school	%	59	91		65	72
(10) Health						
a) No. of a permanent health center (Hospital)	nos.	1	2	1	1	5
b) No. of a health post	nos.	15	162	20	15	212
c) % of villages with a permanent health center	%	54	43		96	64
(11) % of villages with a common source of electricity	%	22	47		16	28
(12) Marketing						
a) No. of mills	nos.	340				682
b) % of villages with a rice mill	%	78	84	211	131	62
c) No. of market	nos.				25	0
(13) Port, along the Mekong River with an immigration office						
a) Name of the city or the village	nos.	B.Pak-Hinboun-Tai	Thakhek	B.Pakxebangfai	(no port)	1
b) No. of port for both people and cargo (trucking)	nos.	0	1	0	0	1
c) No. of port for only people	nos.	1	0	1	0	2
d) Name of the river, a tributary of the Mekong River		mouth of Hinboun river	no river	Xe-Bangfai		
e) Classification of access road to a port from national road No.13		province road	national road No.12	province road through Nongbok		
f) Length of access road above	Km	9	2	18		29
g) Condition of access road above		wide, but no good	very good	no good		

Source: District Accessibility Profile, and Road Network Analysis in Khammouane Province, Integrated Rural Accessibility Planning in LAO P.D.R. (IRAP), MCTPC/UNDP/ILO (in 1998 and 1999)  
Data offered from Khammouane Province Office, DCTPC.

Data offered from DAFSO anFAFSO.  
Blank : no exact data

H-1-2-(2) : Existing Infrastructure Condition of District in Study Area Province Khammouan (2/2)

Item	District	Hinboun	Thakhek	Nongbok	Xebangfai	Grand total
<b>B. Existing Road Condition</b>						
(1) Length of road (total length of three type of road as below)	Unit					
a) Length of national road with pavement	Km	570	270	147	222	1,209
b) Length of province road	Km	95	65	0	25	185
c) Length of rural road	Km	383	181	75	17	205
(2) Length of all year round road (total length of three type of road as below)	Km	230	133	66	48	477
a) Length of national road with pavement	Km	95	65	0	25	185
b) Length of province road	Km	92	24	60	3	179
c) Length of rural road	Km	43	44	6	20	113
(3) Length of dry season only road (total length of three type of road as below)	Km	340	137	81	174	732
a) Length of national road with pavement	Km	0	0	0	0	0
b) Length of province road	Km	0	0	12	14	26
c) Length of rural road	Km	340	137	69	160	706
(4) Trafficability for all year round (average of each classification of road)	%	40	49	45	22	39
a) % of whole length of national road with pavement	%	100	100	---	100	100
b) % of whole length of province road	%	100	100	83	18	87
c) % of whole length of rural road	%	11	24	8	11	14
(5) Untrafficability of dry season only road (average of each classification of road)	%	60	51	55	78	61
a) % of whole length of national road with pavement	%	0	0	---	0	0
b) % of whole length of province road	%	0	0	17	82	13
c) % of whole length of rural road	%	89	76	92	89	86
(6) Road access						
a) % of villages with all year round road	%	35	60	60	41	49
b) % of villages with dry season only road	%	59	39	30	41	42
c) % of villages with no road	%	6	1	10	18	9
(7) Bridges (total of three)	nos.	39	20	26	26	111
a) Number of bridges of national road with pavement	nos.	11	11	0	8	30
b) Number of bridges of province road	nos.	19	4	3	1	27
c) Number of bridges of rural road	nos.	9	5	23	17	54
(8) Average distance to road for villages without all year round road access	Km	40	49	45	22	39
(9) Transport services						
a) % of villages with all year round transport services	%	67	67	60	67	65
b) % of villages with dry season only transport services	%	27	30	30	19	27
c) % of villages with no transport services	%	6	3	10	27	12
(10) Travel time						
a) Average travel time to district center (dry season)	min	172	54		207	108
b) Average travel time to district center (wet season)	min	213	69		219	125
c) Average travel time to 1st market	min	172	56		195	106
<b>C. Access Problem and Priority for Existing Road</b>						
(1) % of villages with the rural road access problem as the main access problem	%	64	18		76	40
(2) % of villages with improving rural road access as the first access priority	%	12	18		43	18

Source: District Accessibility Profile, and Road Network Analysis in Khammouane Province, Integrated Rural Accessibility Planning in LAO P.D.R. (IRAP), MCTPC/UNDP/ILO (in 1998 and 1999)  
Data offered from Khammouane Province Office, DCTPC.

Data offered from DAFSO and PAFSO.

Blank : no exact data, under examination

Existing Infrastructure Condition of District in Study Area, Province Khammouan

H-1-3-(1) : Existing Infrastructure Condition of District in Study Area Province Savannakhet ( 1/2 )

Item	District	Xaibourly	Khanthabouly	Xayphouthong	Songkhone	Grand total
<b>A. General</b>	<b>Unit</b>					
(1) Administrative area	Km <sup>2</sup>	1,110	521	512	1,373	3,516
(2) Number of villages	nos.	89	94	48	165	396
(3) Population	ps.	45,025	93,927	31,704	81,475	252,131
(4) Land use						
a) Rainfed Paddy field	ha	7,214	5,515	8,045	18,617	39,391
b) Irrigated Paddy field	ha	4,066	399	43	1,743	6,251
(5) Irrigation facility (total of four below)	nos.	24	11	8	34	77
a) Pump station with electric motor power	nos.	23	6	5	16	50
b) Pump station with diesel power	nos.	1	0	0	9	10
c) Weir	nos.	0	3	1	7	11
d) Reservoir (Dam)	nos.	0	2	2	2	6
(6) Area of field, irrigated under irrigation facility above	ha	6,040	1,160	1,872	6,600	15,672
a) area of field, irrigated during wet season	ha	4,377	662	628	3,379	9,046
b) area of field, irrigated during dry season						
(7) Water supply for people (dry season)	%	17	51	29	24	30
a) % of villages using improved water sources	%	34	12	15	11	18
b) % of villages relying on traditional sources						
(8) Water supply for people (wet season)	%	17	51	15	21	26
a) % of villages using improved water sources	%	34	12	15	11	18
b) % of villages relying on traditional sources						
(9) Education						
a) No. of classrooms for primary education	nos.	312	545	203	545	1,605
b) No. of classrooms for secondary education	nos.	43	165	44	69	321
c) % of villages with a complete elementary school	%	49	46	62	31	47
d) % of villages with lower secondary school	%	10	20	21	12	16
(10) Health						
a) No. of a permanent health center (Hospital)	nos.	1	2	1	1	5
b) No. of a health post	nos.	10	11	5	10	36
c) % of villages with a permanent health center	%	13	16	10	10	12
(11) % of villages with a common source of electricity	%	31	72	44	5	38
(12) Marketing						
a) No. of mills	nos.	90	207	189	206	602
b) % of villages with a rice mill	%		68	90	84	83
c) No. of market	nos.					0
(13) Port along the Mekong River with an immigration office						
a) Name of the city or the village	nos.	(now no use) B.kengka Bao	(two offices for people/cargo) Savannakhet	(no port)	B.Thadua-Gnai	2
b) No. of port for both people and cargo (trucking)	nos.	1	1	0	0	1
c) No. of port for only people	nos.	(port for army) no river	no river	0	no river	1
d) Name of the river, a tributary of the Mekong River		rural road	national road No.9	28	province road	
e) Classification of access road to a port from national road No.13		22	very good		22	
f) Length of access road above	Km	wide, but no good			wide, but no good	72
g) Condition of access road above						

Blank : no exact data , under examination

H-1-3-(2) : Existing Road Condition of District in Study Area

Province Savannakhet

(2/2)

Item	District	Xaibourly	Khanthabouly	Xayphouthong	Songkhone	Grand total
<b>B. Existing Road Condition</b>						
(1) Length of road (total length of three type of road as below )	Unit					
a) Length of national road with pavement	Km	338				338
b) Length of province road	Km	49				49
c) Length of rural road	Km	161				161
(2) Length of all year round road (total length of three type of road as below)	Km	128				128
a) Length of national road with pavement	Km	148				148
b) Length of province road	Km	49				49
c) Length of rural road	Km	55				55
(3) Length of dry season only road (total length of three type of road as below)	Km	44				44
a) Length of national road with pavement	Km	190				190
b) Length of province road	Km	0				0
c) Length of rural road	Km	106				106
(4) Trafficability for all year round (average of each classification of road)	%	84				84
a) % of whole length of national road with pavement	%	44				44
b) % of whole length of province road	%	100				100
c) % of whole length of rural road	%	34				34
(5) Untrafficability of dry season only road (average of each classification of road)	%	34				34
a) % of whole length of national road with pavement	%	56				56
b) % of whole length of province road	%	0				0
c) % of whole length of rural road	%	66				66
(6) Road access	%	66				66
a) % of villages with all year round road	%	44				44
b) % of villages with dry season only road	%	53				53
c) % of villages with no road	%	3				3
(7) Bridges (total of three)	nos.	12				12
a) Number of bridges of national road with pavement	nos.	3				3
b) Number of bridges of province road	nos.	3				3
c) Number of bridges of rural road	nos.	6				6
(8) Average distance to road for villages without all year round road access	Km	15				15
(9) Transport services						
a) % of villages with all year round transport services	%	87				87
b) % of villages with dry season only transport services	%	9				9
c) % of villages with no transport services	%	4				4
(10) Travel time						
a) Average travel time to district center (dry season)	min	125				125
b) Average travel time to district center (wet season)	min	140				140
c) Average travel time to 1st market	min	104				104
<b>C. Access Problem and Priority for Existing Road</b>						
(1) % of villages with the rural road access problem as the main access problem	%	30				30
(2) % of villages with improving rural road access as the first access priority	%	29				29

Source: District Accessibility Profile, and Road Network Analysis in Savannakhet Province, Integrated Rural Accessibility Planning in LAO P.D.R. (IRAP), MCTPC/UNDP/ILO (1998)

Data offered from Savannakhet Province Office, DCTPC.

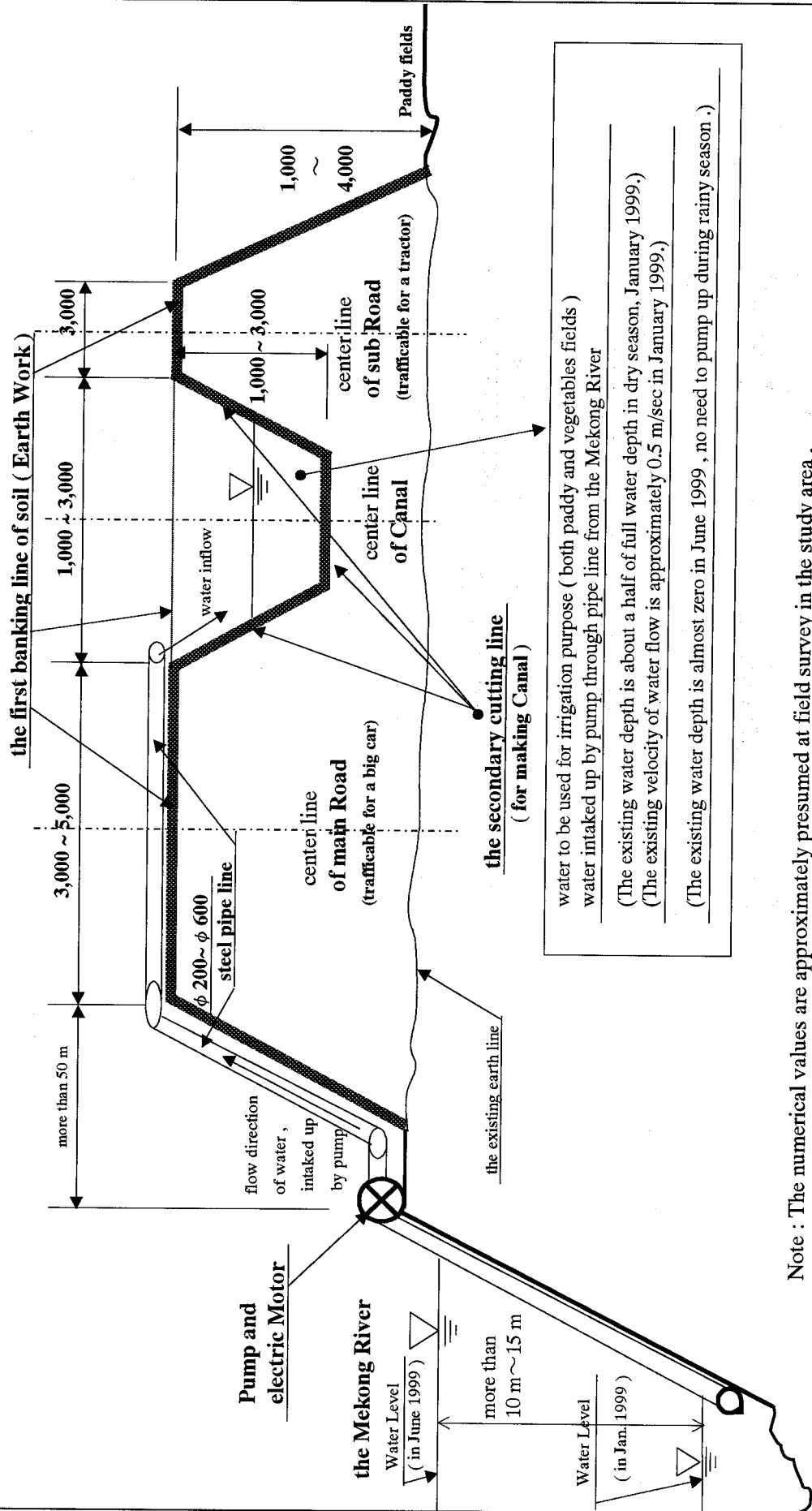
Data offered from DAFSO and PAFSO.

Blank : no exact data



## H-2. : General Profile of Irrigation Facility : Pump, Canal, and Road for operation and maintenance

( no scale ) ( Unit : mm )

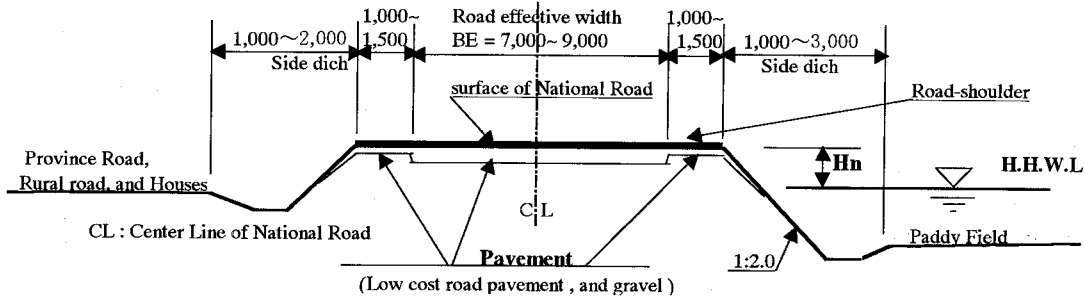


Note : The numerical values are approximately presumed at field survey in the study area , on both the end of January (dry season) and the middle of June (rainy season) in 1999 .

General Profile of Irrigation Facility ; Pump, Canal and Road for operation and maintenance

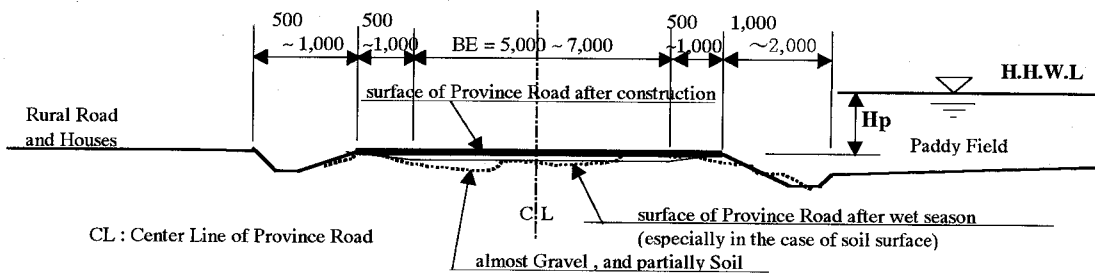
### H-3. Standard Cross Sectional Plan of Roads : National, Province & Rural Road (no scale) (unit of numerical values : mm)

#### (A) Standard Cross Sectional Plan of National Road (trafficable all year round)



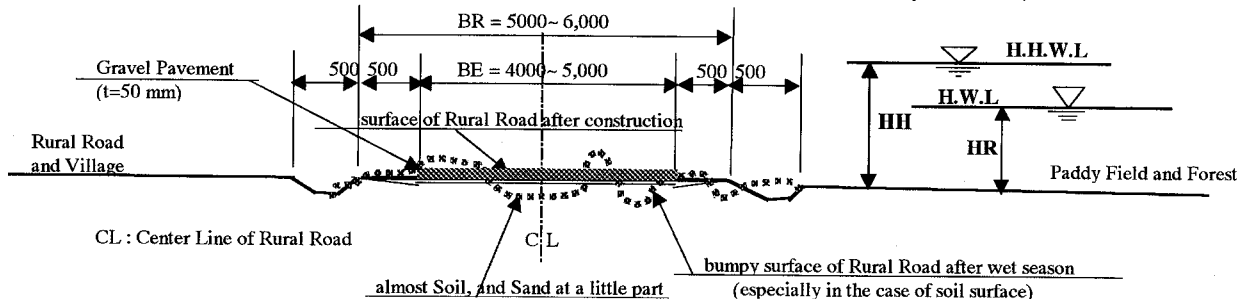
Pavement : Low-cost road pavement for route No.13, but for the others almost gravel of no good trafficability particularly in wet season .  
 Guard-rail : at the road-shoulder , where road-surface is about more than 2 m high apart from the earth .  
 Side ditch, water way : almost made of soil , at a little place made from concrete .  
 Bridge : made from concrete and of steel, but steel one is very old and dangerous to cross over for a big truck because of over load .  
 $H_n$  :  $H_n < (-) 1.50$  at a bridge ,  $H_n < (-) 1.00$  m at the other place except a bridge , then road surface is higher than H.H.W.L .  
 $H_n$  ( m ) : difference between surface of National Road and H.H.W.L  
 H.H.W.L : the highest water level of the biggest flood occurred in 1995 & 1996 for the past 30 years .

#### (B) Standard Cross Sectional Plan of Province Road (trafficable all year round , and in dry season only)



Pavement : a) in the case of gravel trafficable all year round , but no good trafficability in wet season , and  
 b) in the case of soil trafficable in dry season only .  
 Bridge : made from concrete and of steel, but steel one is very old and dangerous to cross over for a big truck because of over load .  
 $H_p$  :  $H_p > 2.00$  m ~ 3.00 m  
 $H_p$  ( m ) : difference between surface of Province Road and H.H.W.L  
 H.H.W.L : the highest water level of the biggest flood occurred in 1995 & 1996 for the past 30 years .

#### (C) Standard Cross Sectional Plan of Rural Road (trafficable in dry season only, and a little trafficable all year round)

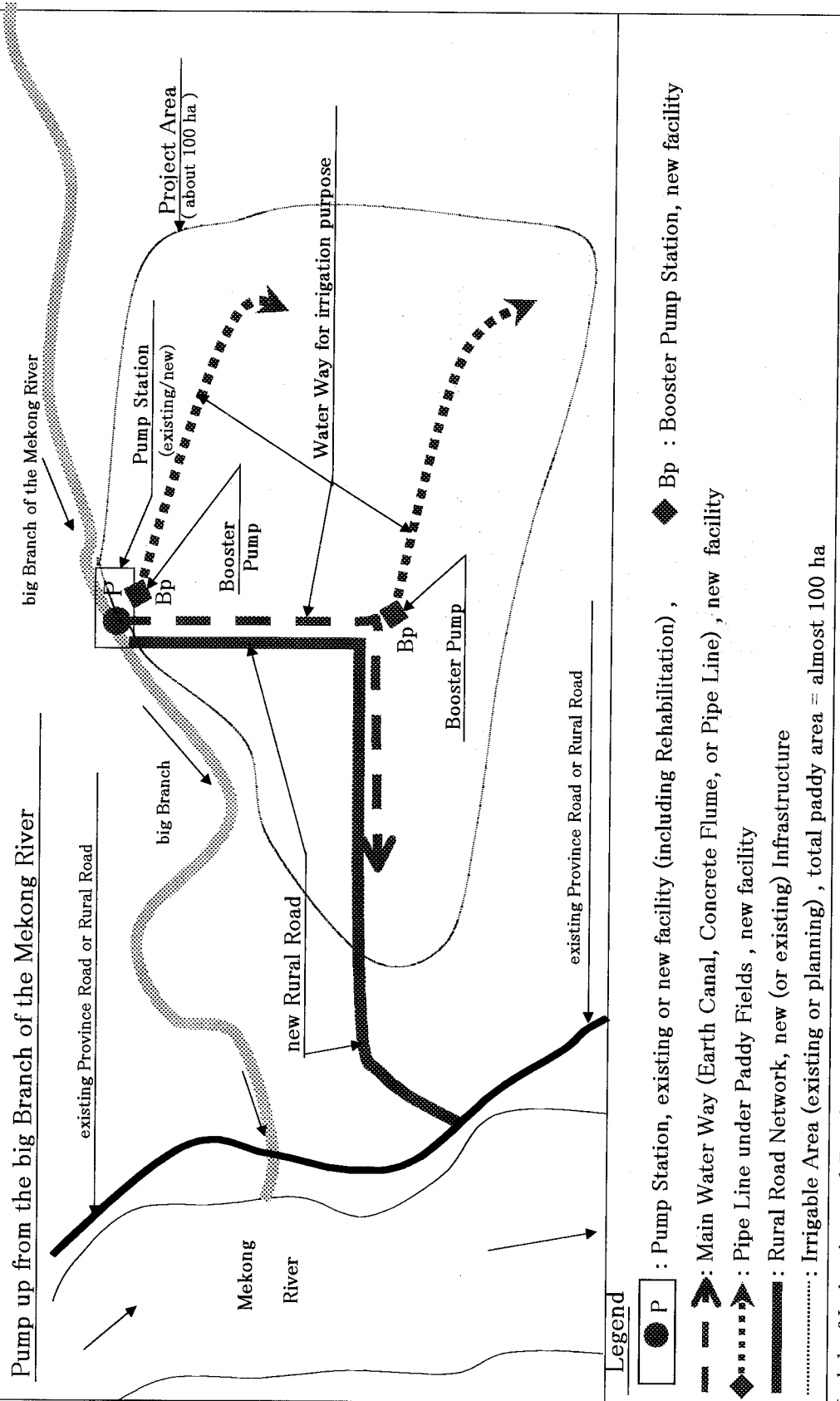


Pavement : a) for most of road soil of untrafficability in wet season .  
 b) trafficable in dry season only, and a little trafficable all year round  
 Bridge : made of both steel and several logs, very old and dangerous , and no bridge ( going on the river bed ) .  
 $HH$  :  $HH > H_p$  ,  $HH$  is more than  $H_p$  ( 2.00 m ~ 3.00 m ) .  $HR = 0.50 \sim 1.00$  m  
 $HR$  ( m ) : difference between surface of Rural Road and H.W.L  
 $HH$  ( m ) : difference between surface of Rural Road and H.H.W.L ,  
 H.W.L : the annualy highest water level every year .  
 H.H.W.L : the highest water level of the biggest flood occurred in 1995 & 1996 for the past 30 years .

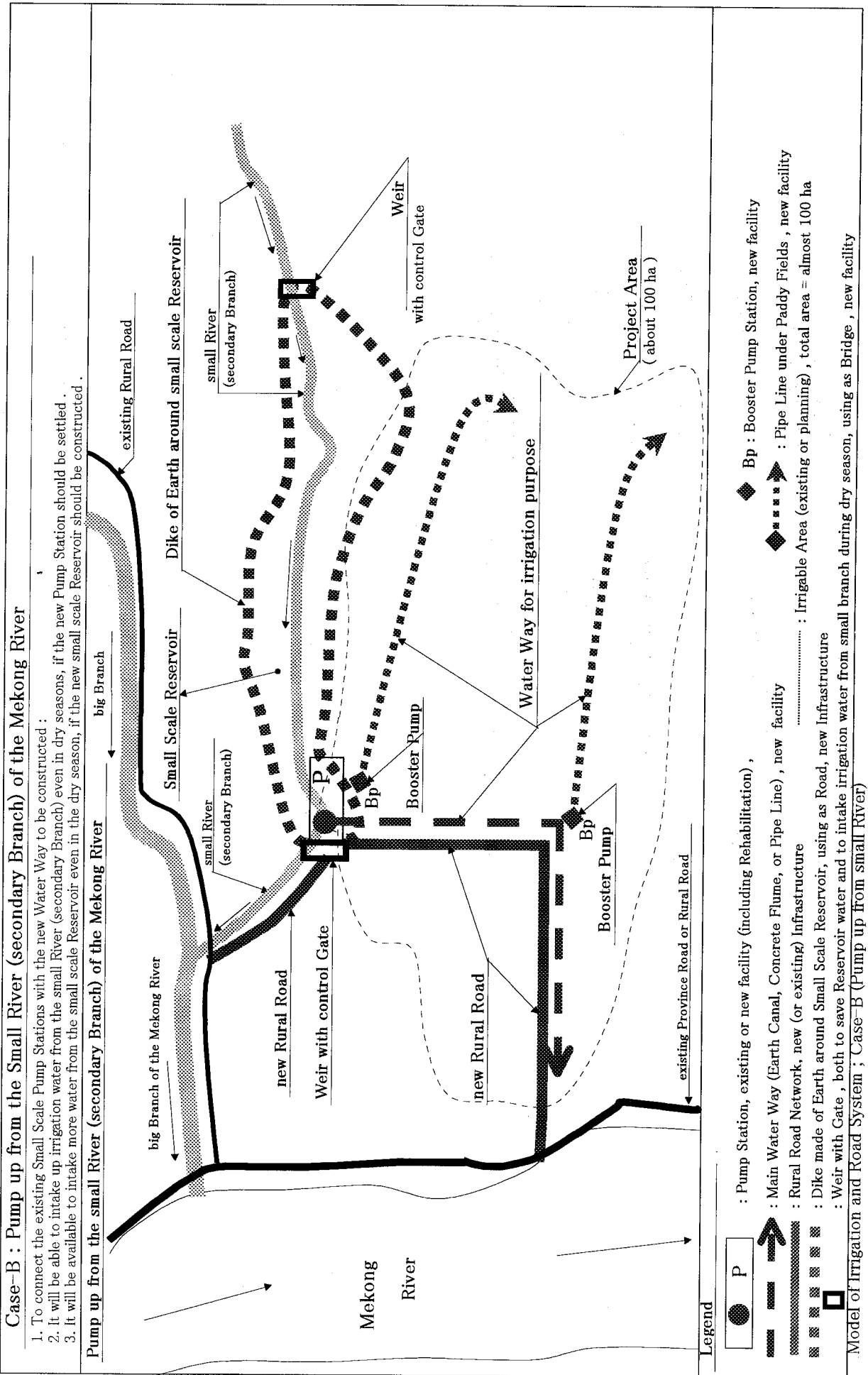
Note : The numerical values are about presumed when field survey in Jan. , June , Nov. and Dec. 1999 .

### H-4-1. Model of Irrigation and Road System ; Case-A (Pump up from big Branch) Case-A : Pump up from the Big Branch of the Mekong River

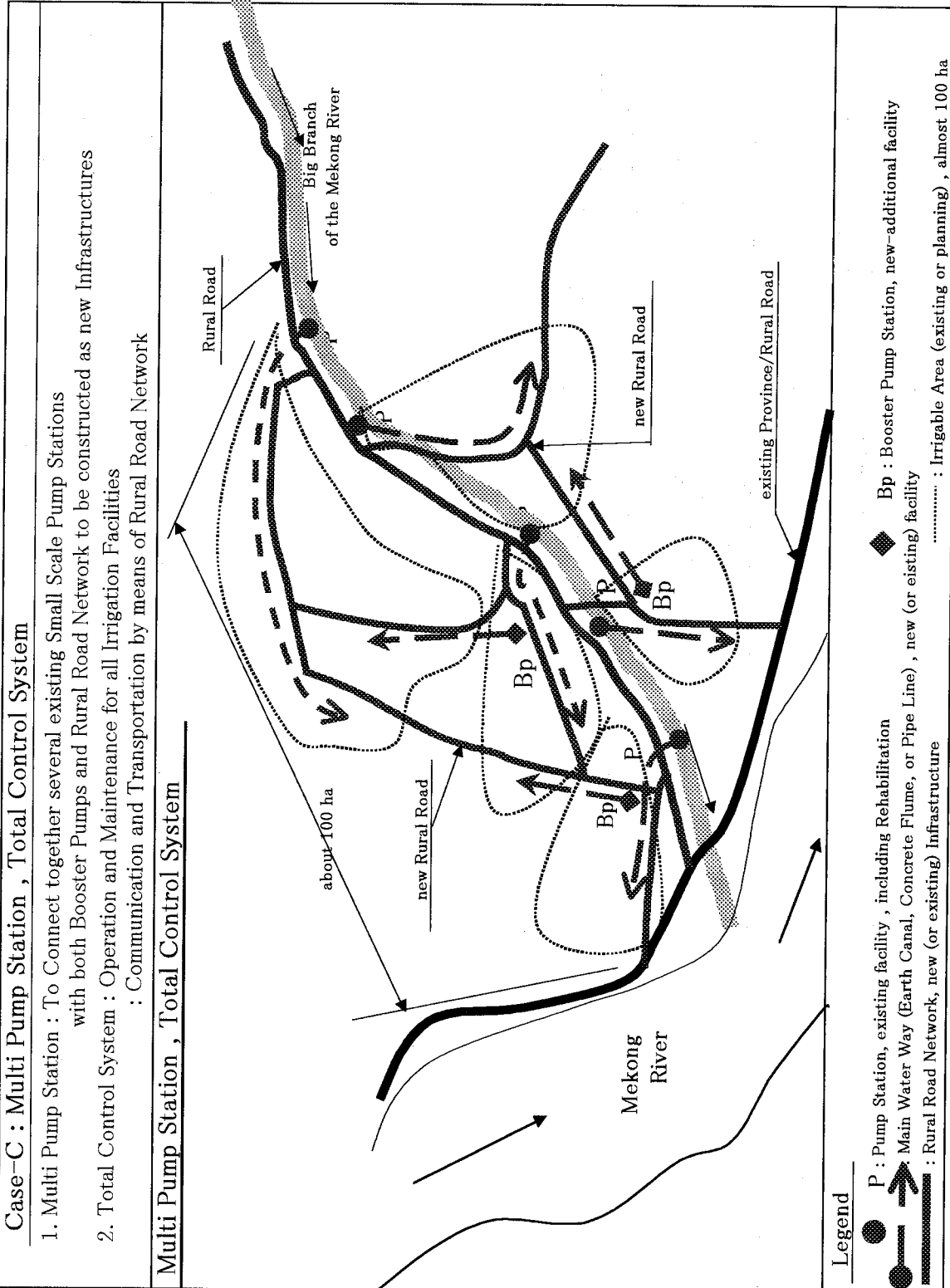
1. To connect the existing Small Scale Pump Stations with the new Water Way to be constructed :
2. It will be available to intake up much water from the big Branch , if the new Pump Station should be settled .



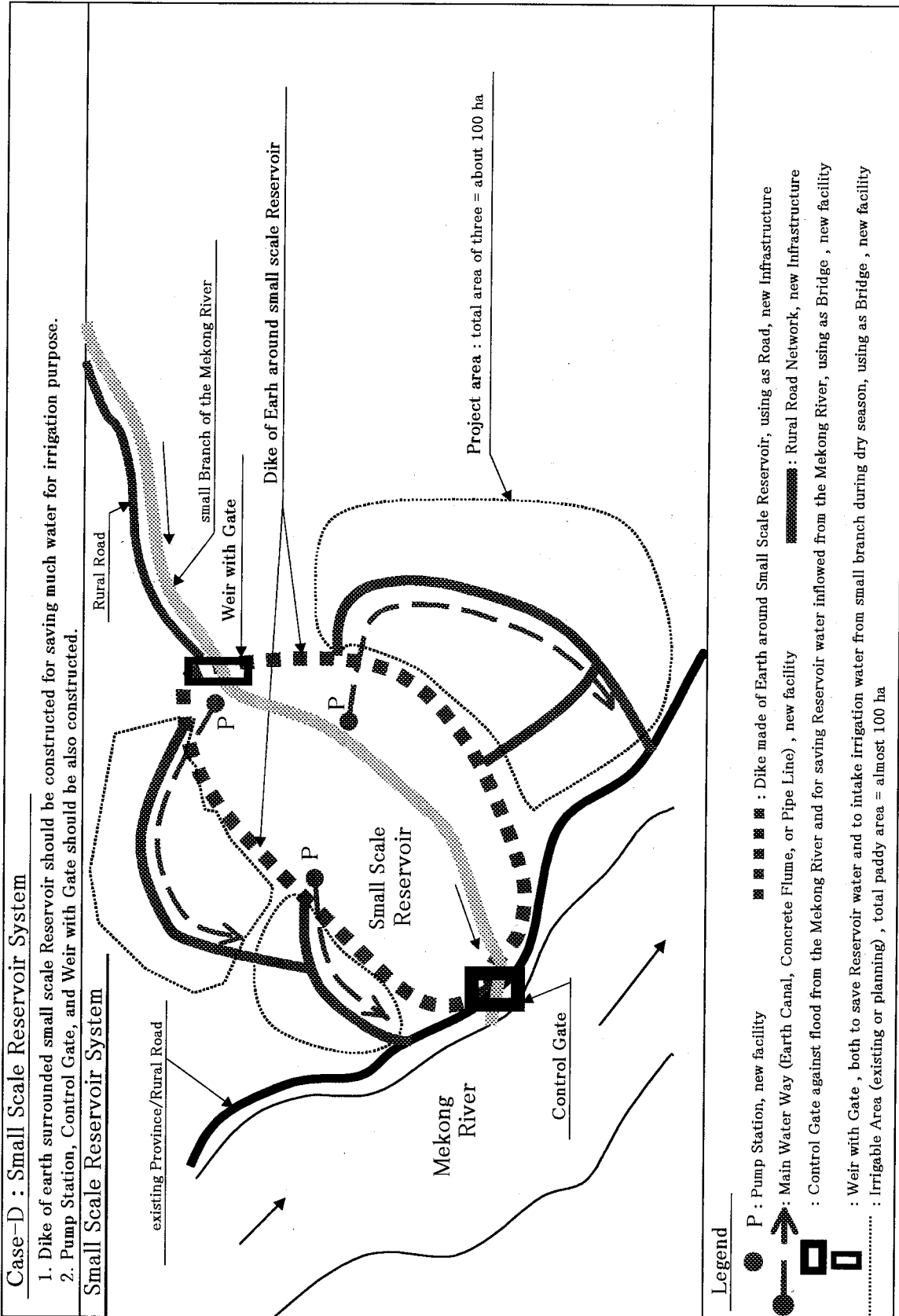
## H-4-2. Model of Irrigation and Road System ; Case-B (Pump up from small River)



### H-4-3. Model of Irrigation and Road System ; Case-C (Multi Pump Station)



## H-4-4. Model of Irrigation and Road System ; Case-D (Small Scale Reservoir)



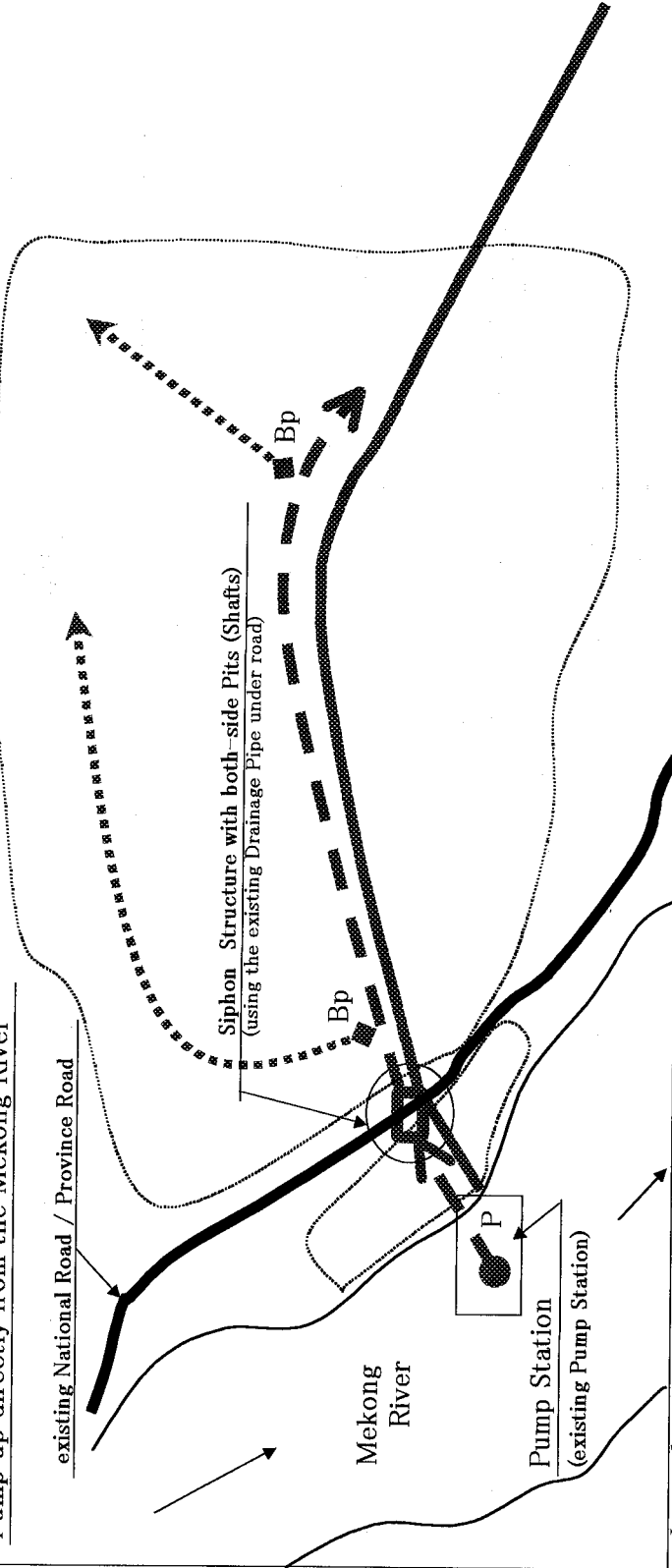
Model of Irrigation and Road System ; Case-D (Small Scale Reservoir)

### H-4-5. Model of Irrigation and Road System ; Case-E (Pump up from Mekong River)



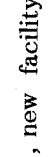




#### Case-E : Pump up directly from the Mekong River

1. To connect the existing Small Scale Pump Stations with the new Water Way to be constructed :
2. Some problems will occur for the Mekong Committee , if the new Pump Station should be settled .

#### Pump up directly from the Mekong River

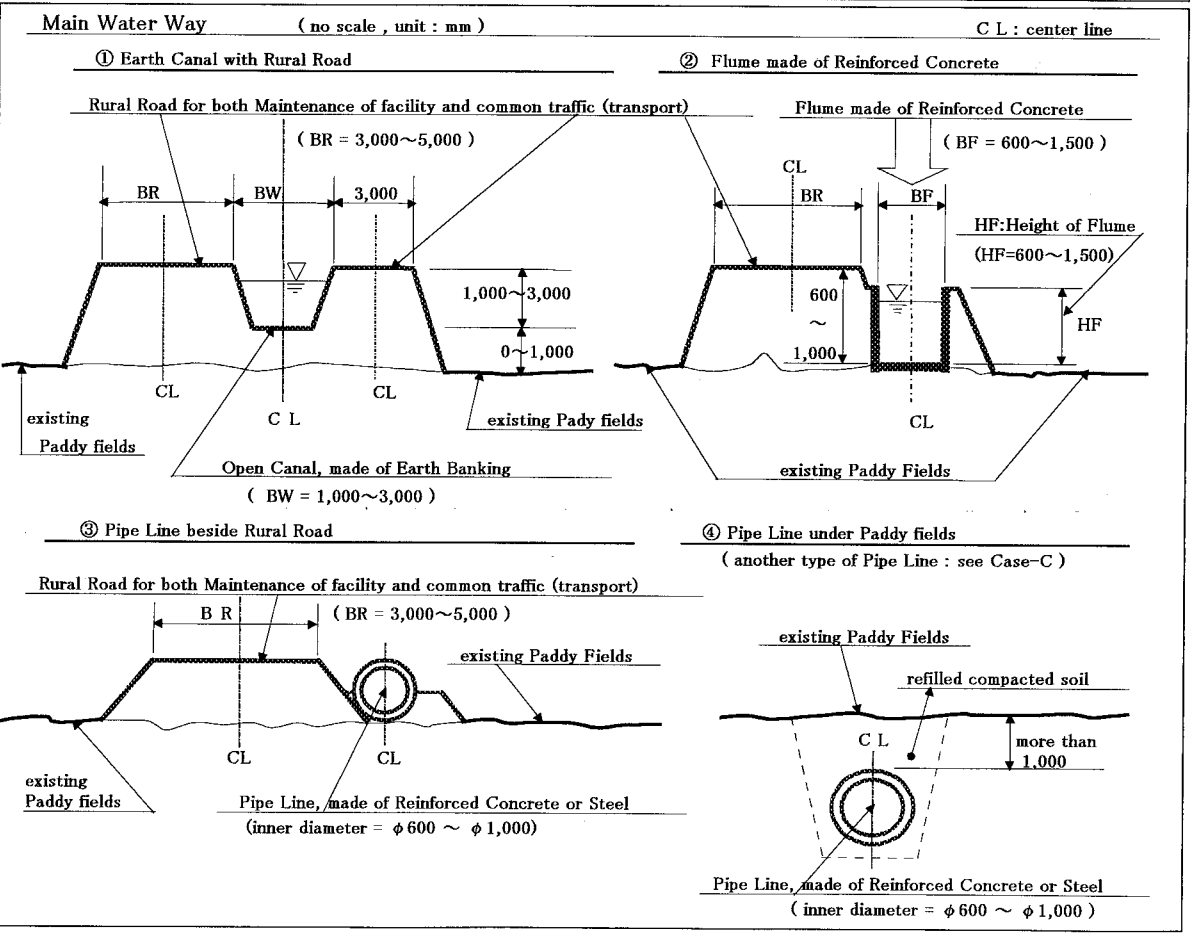
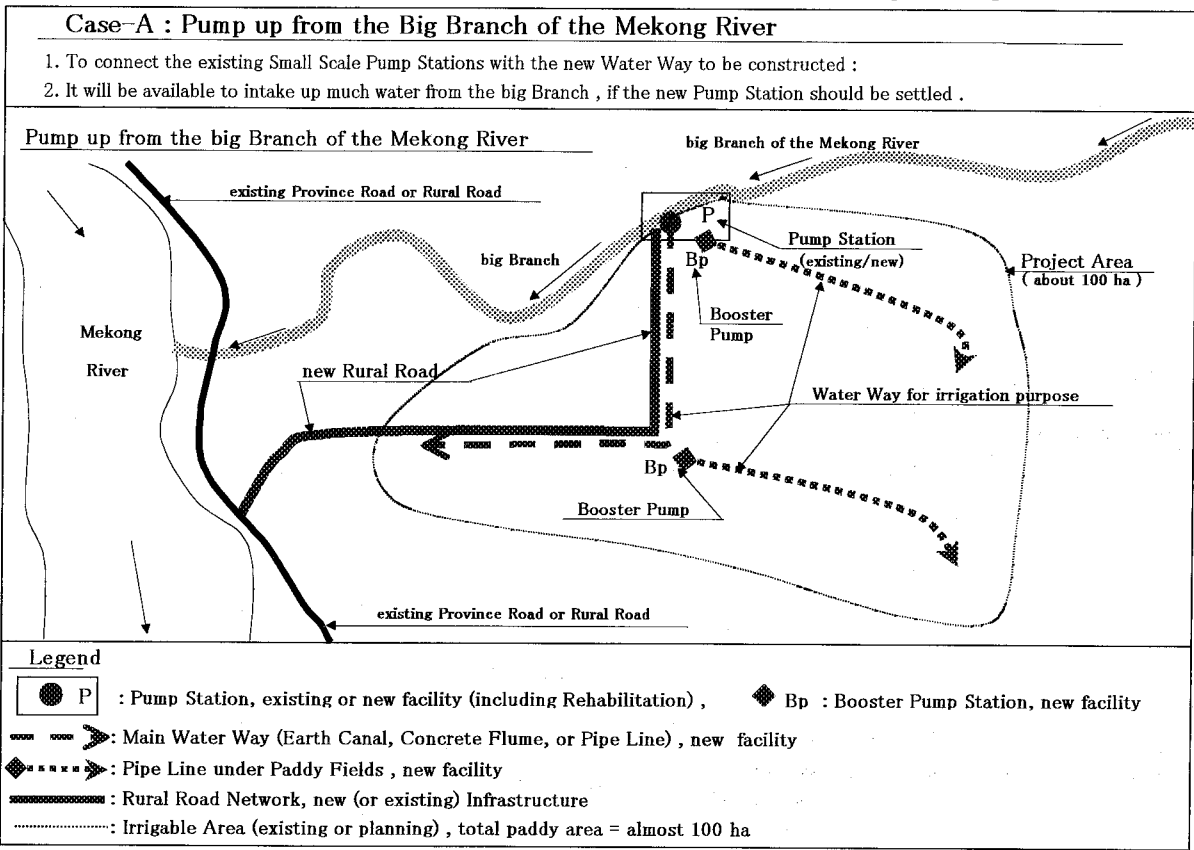


#### Legend

-  : Pump Station, existing facility (including Rehabilitation) ,
-  Bp : Booster Pump Station, new facility
-  Main Water Way (Earth Canal, Concrete Flume, or Pipe Line) , new facility
-  : Pipe Line under Paddy Fields, new facility
-  : Rural Road Network, new (or existing) Infrastructure
-  : Irrigable Area (existing or planning) , total paddy area = almost 100 ha
-  : Siphon Structure with both-side Pits (Shafts)

Model of Irrigation and Road System ; Case-E (Pump up from Mekong River)

H-5-1. Model, Plan & Design for Irrigation and Road System ; Case-A (Pump up from big Branch)

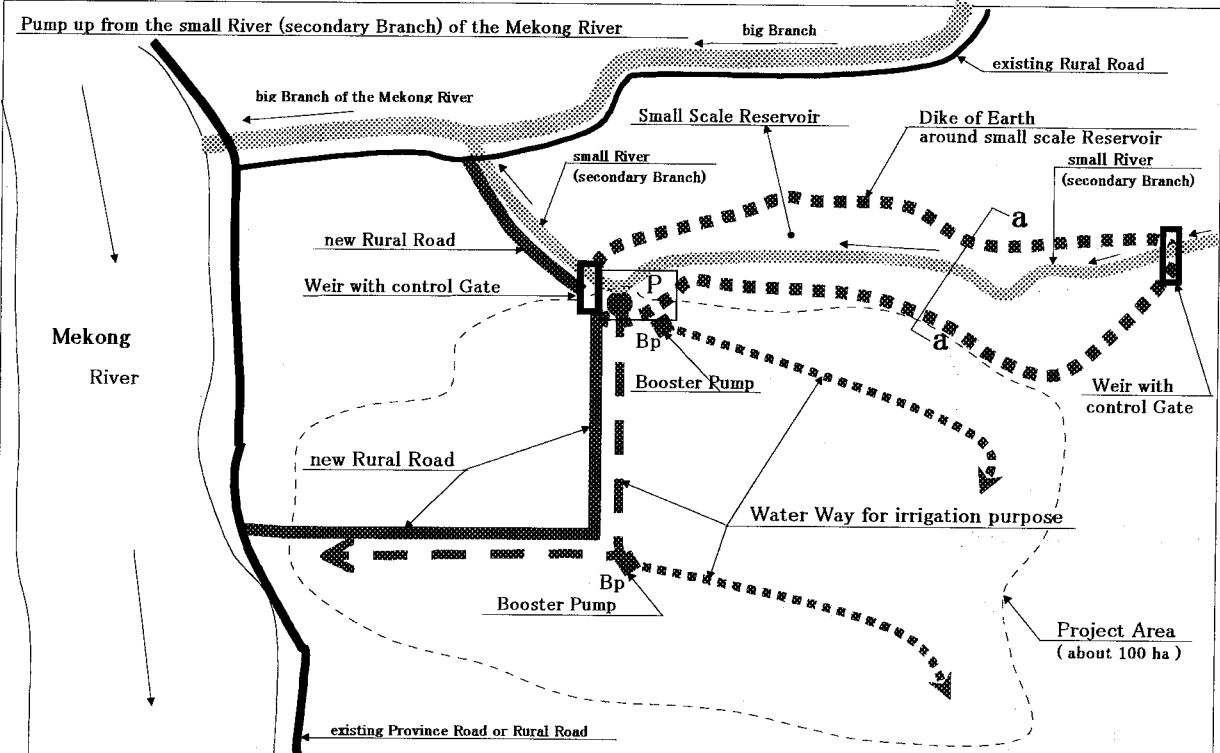




H-5-2. Model, Plan & Design for Irrigation and Road System ; Case-B (Pump up from small River)

Case-B : Pump up from the Small River (secondary Branch) of the Mekong River

1. To connect the existing Small Scale Pump Stations with the new Water Way to be constructed :
2. It will be able to intake up irrigation water from the small River (secondary Branch) even in dry seasons, if the new Pump Station should be constructed .
3. It will be available to intake more water from the small scale Reservoir even in the dry season, if the new small scale Reservoir should be settled .

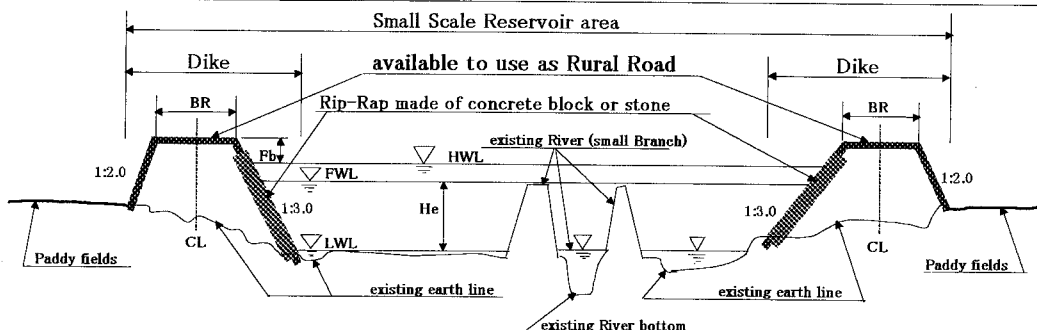


Legend

- : Pump Station, existing or new facility (including Rehabilitation) ,
- : Booster Pump Station, new facility
- : Main Water Way (Earth Canal, Concrete Flume, or Pipe Line), new facility
- : Pipe Line under Paddy Fields, new facility
- : Rural Road Network, new (or existing) Infrastructure
- : Irrigable Area (existing or planning) , total paddy area = almost 100 ha
- : Dike made of Earth around Small Scale Reservoir, using as Road, new Infrastructure
- : Weir with Gate, both to save Reservoir water and to intake irrigation water from small branch during dry season, using as Bridge, new facility

Main Water Way : the same Drawings as Case-A , Case-C , and Case-E

Dike and Reservoir Profile : a-a Cross-Section (no scale) CL : center line



Notes:

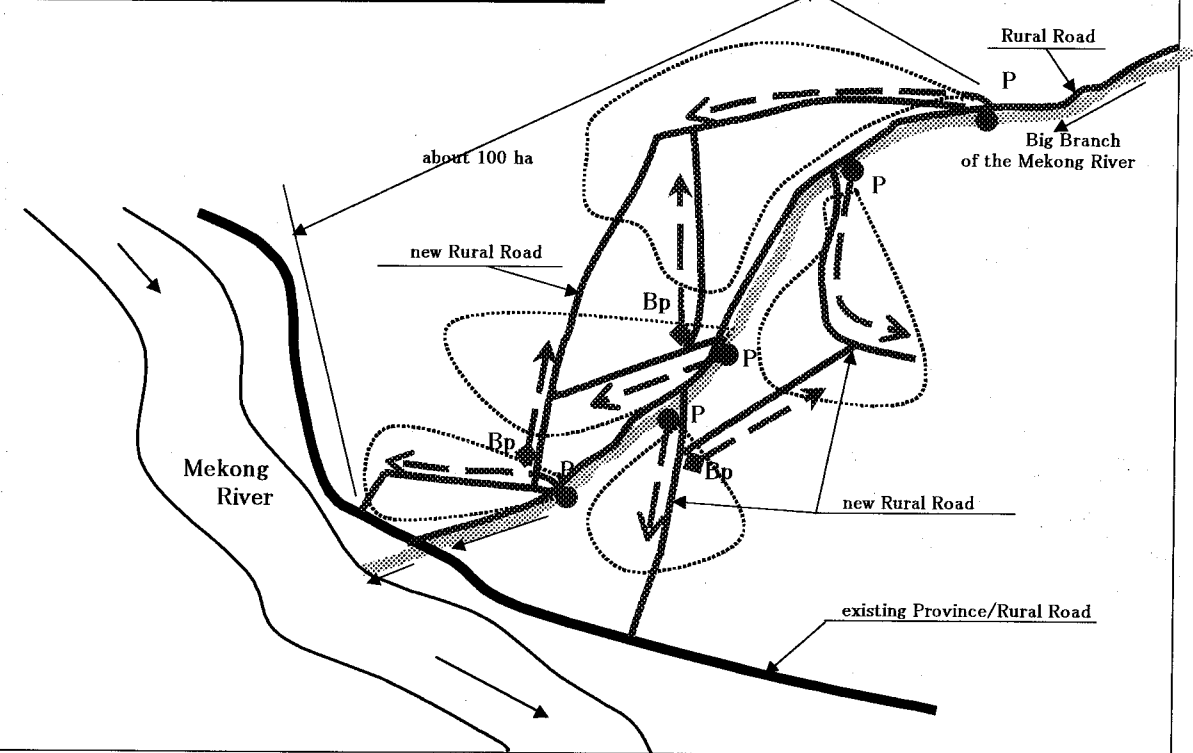
- The Dike made of earth should be compacted up to  $\gamma = 1.65 \text{ ton/m}^3$  .
- The top of the Dike should be used as Rural Road ( BR=5.0 m ) , , Fb : free board (more than 0.5 m) ,
- He : Effective Water Depth (2.0m ~), available for Irrigation , Ve : Effective Storage Volume , expected more than 1,000,000 m<sup>3</sup>
- HWL : High Water Level , LWL : Low Water (or Dead Water) Level , FWL : Full Water Level

H-5-3. Model, Plan & Design for Irrigation and Road System ; Case-C (Multi Pump Station)

**Case-C : Multi Pump Station , Total Control System**

1. Multi Pump Station : To Connect together several existing Small Scale Pump Stations with both Booster Pumps and Rural Road Network to be constructed as new Infrastructures
2. Total Control System : Operation and Maintenance for all Irrigation Facilities : Communication and Transportation by means of Rural Road Network

**Multi Pump Station , Total Control System**



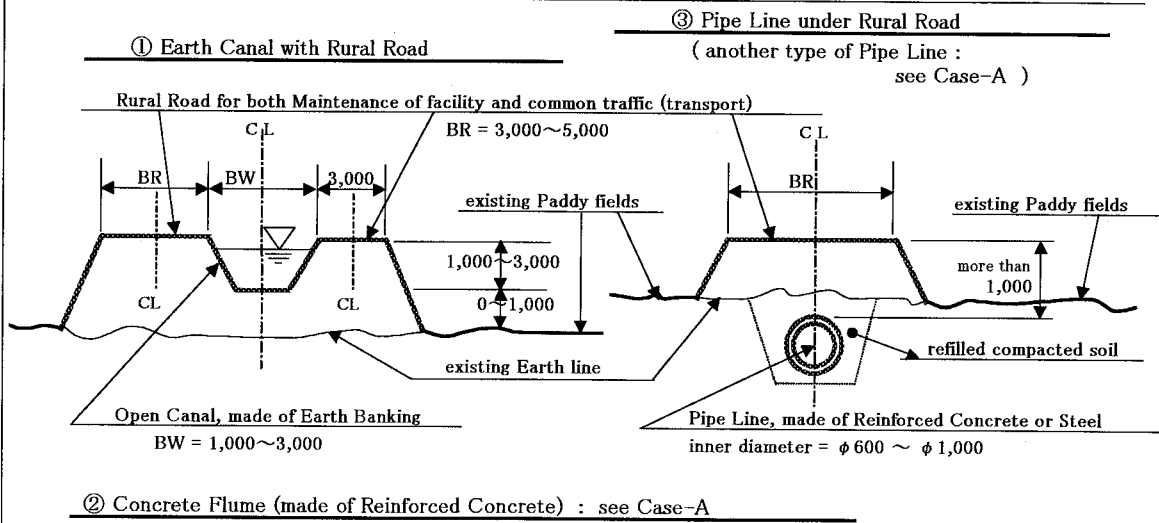
**Legend**

- P : Pump Station, existing facility , including Rehabilitation
- ◆ Bp : Booster Pump Station, new-additional facility
- ➔ Main Water Way (Earth Canal, Concrete Flume, or Pipe Line) , new (or existing) facility
- Rural Road Network, new (or existing) Infrastructure
- ⋯ Irrigable Area (existing or planning) , total paddy area = almost 100 ha

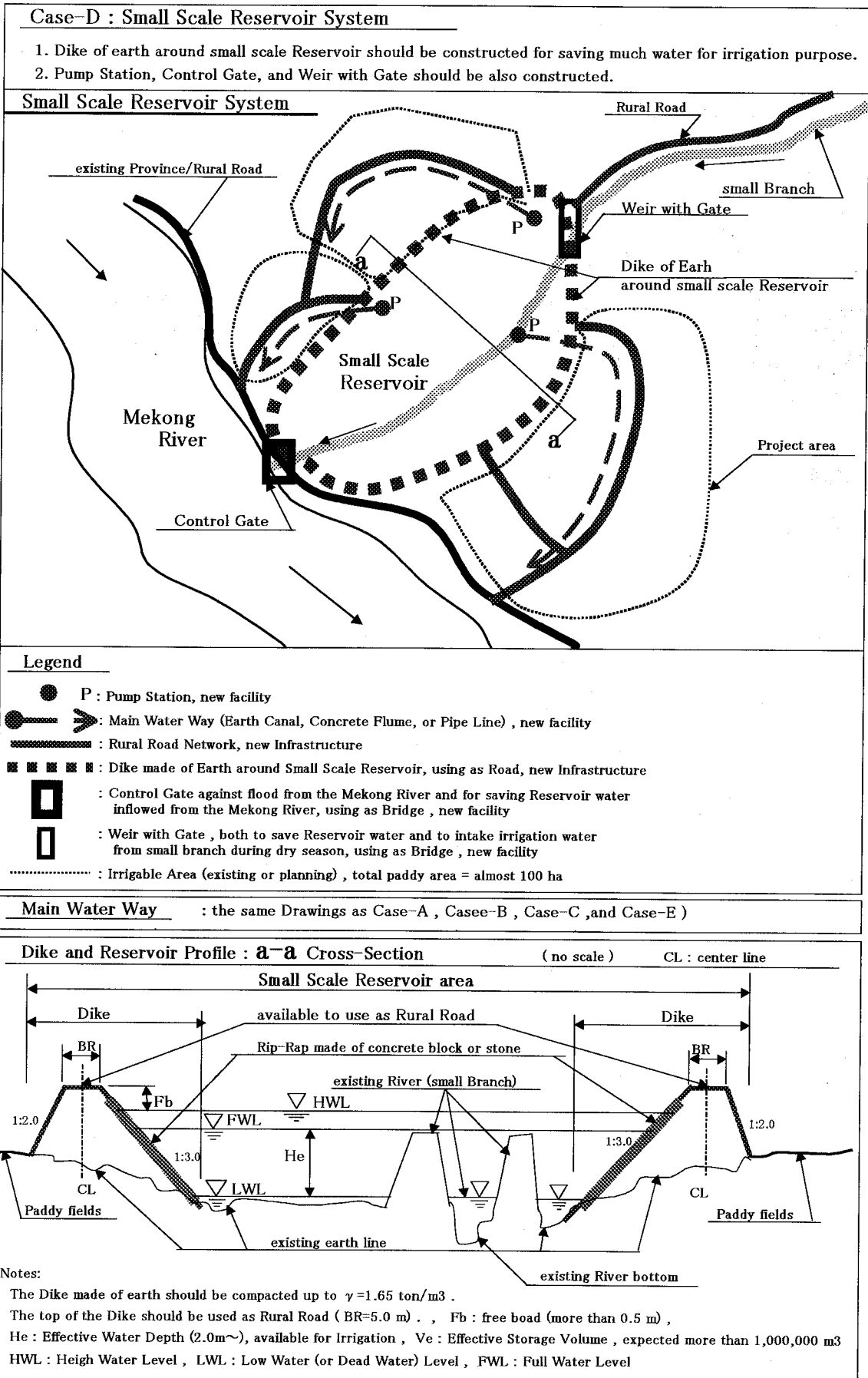
**Main Water Way**

( no scale , unit : mm )

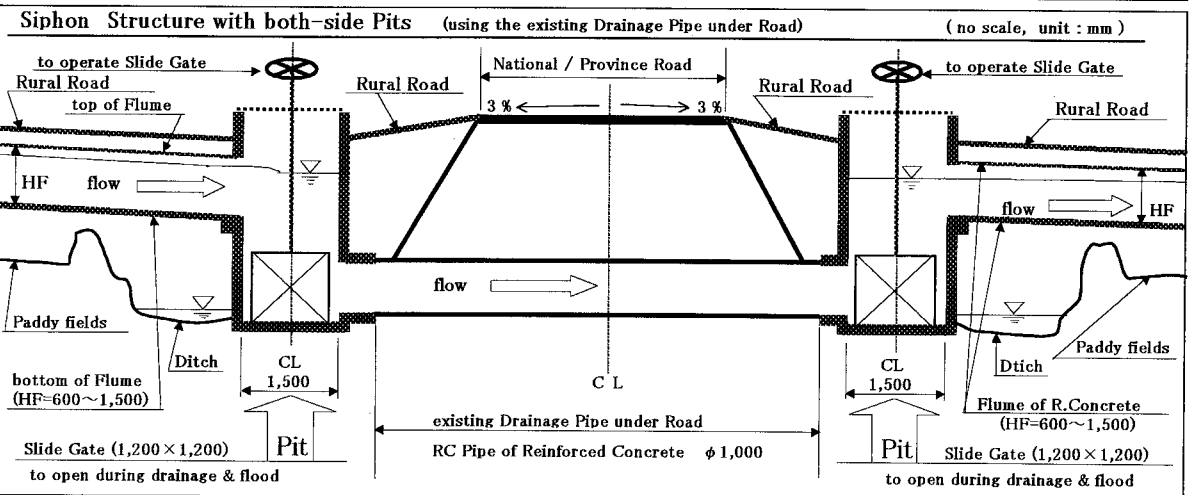
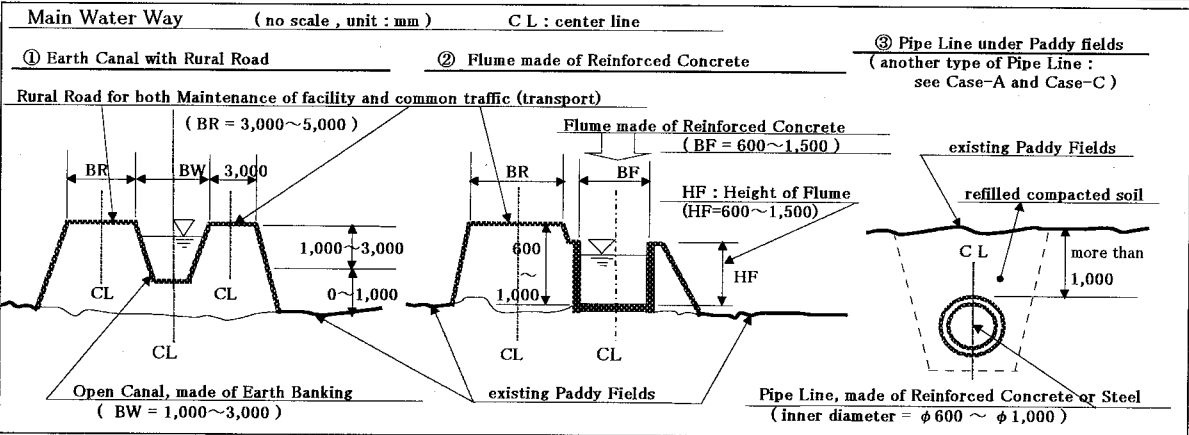
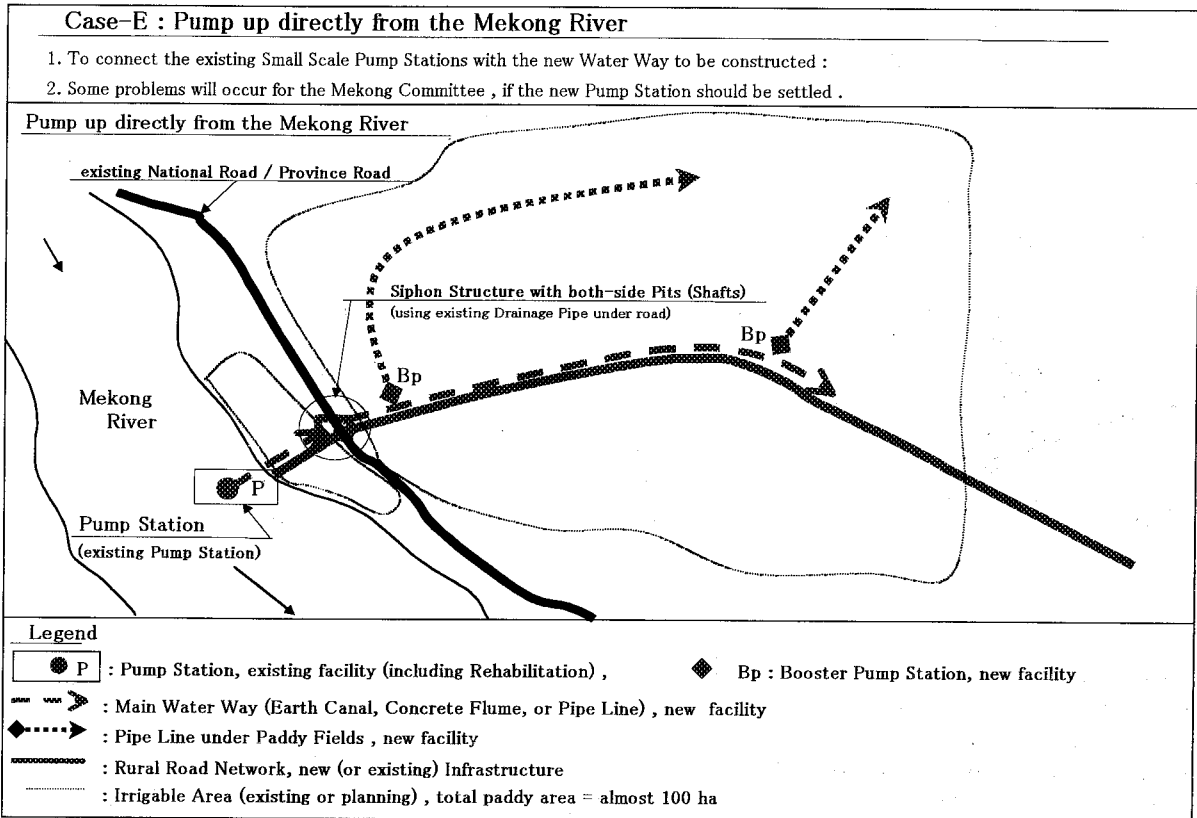
C L : center line



H-5-4. Model, Plan & Design for Irrigation and Road System ; Case-D (Small Scale Reservoir)



H-5-5. Model, Plan & Design for Irrigation and Road System ; Case-E (Pump up from Mekong River)

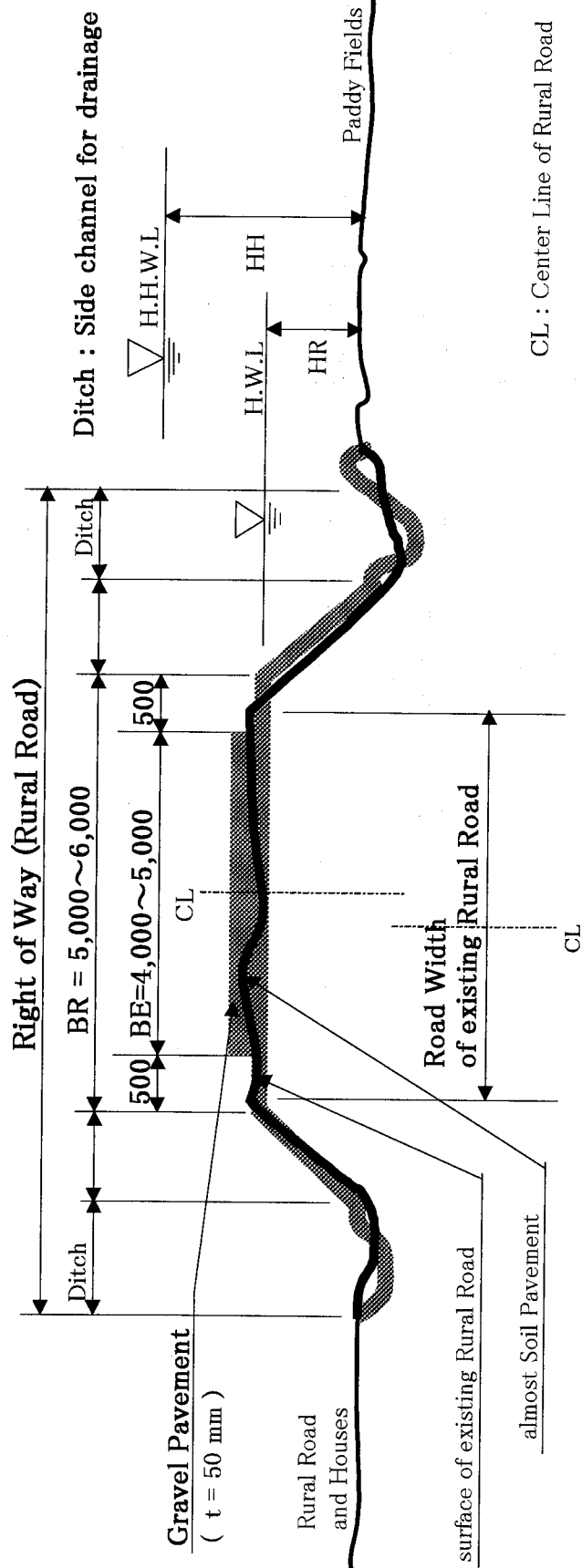


## H-6-1. Improvement Method of Rural Road ; Case-1 (only Gravel Pavement)

Improvement Method of Rural Road ( Case-1 ) ( no scale ) ( unit : mm )

### Case-1 : to arrange and construct Gravel Pavement of Rural Road

1. To arrange the existing Rural Road ( surface, pavement, slope gradient, and ditch )
2. To construct Gravel Pavement ( thickness :  $t = 50$  mm )
3. Total Road Width = BR ; Effective Road Width = BE ; Road Shoulder Width = 500 mm



CL : Center Line of Rural Road

H.W.L. : the high water level of the flood occurred in every wet season . (  $0.50 \text{ m} < \text{HR} < 1.00 \text{ m}$  )

H.H.W.L. : the highest water level of the biggest flood occurred in 1995 & 1996 for the past 30 years . (  $\text{HH} > 2.00 \text{ m} \sim 3.00 \text{ m}$  )

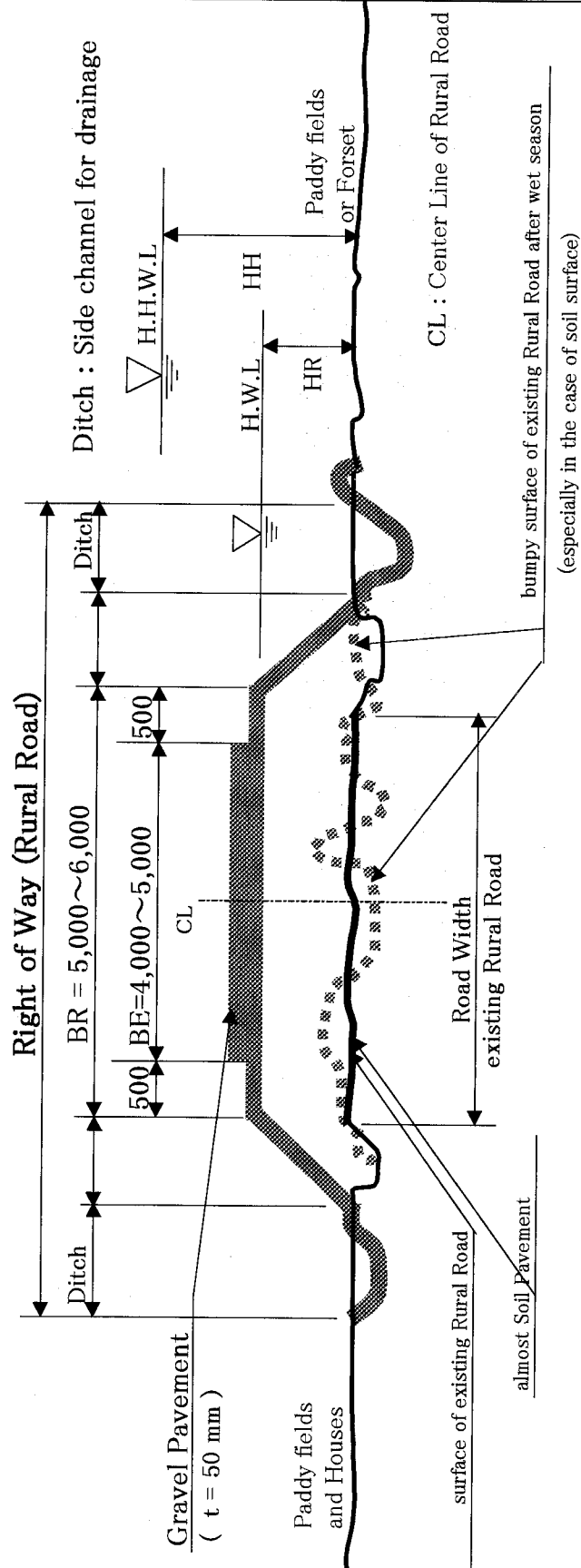
Improvement Method of Rural Road ; Case-1 (only Gravel Pavement)

## H-6-2. Improvement Method of Rural Road ; Case-2 (to heighten)

**Improvement Method of Rural Road ( Case-2)** ( no scale ) ( unit : mm )

### Case-2 : to heighten the surface of Rural Road

1. To heighten the existing surface of Rural Road up to H.W.L
2. To construct Gravel Pavement ( thickness :  $t = 50$  mm )
3. Total Road Width = BR ; Effective Road Width = BE ; Road Shoulder Width = 500 mm



H.W.L : the high water level of the flood occurred in every wet season . (  $0.50 \text{ m} < \text{HR} < 1.00 \text{ m}$  )

H.H.W.L : the highest water level of the biggest flood occurred in 1995 & 1996 for the past 30 years . (  $\text{HH} > 2.00 \text{ m} \sim 3.00 \text{ m}$  )

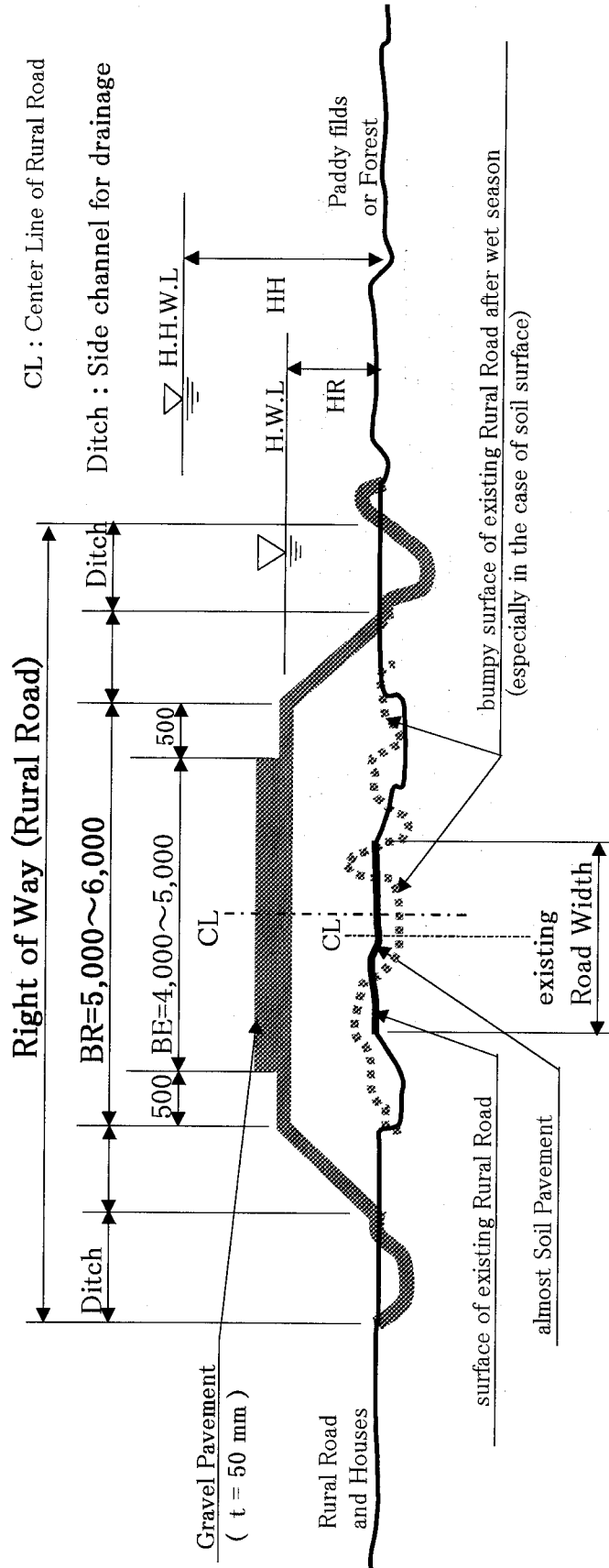
**Improvement Method of Rural Road ; Case-2 (to heighten)**

### H-6-3. Improvement Method of Rural Road ; Case-3 (to extend and heighten)

#### Improvement Method of Rural Road ( Case-3) ( no scale ) ( unit : mm )

##### Case-3 : to extend the width and to heighten the surface of Rural Road

1. To extend the existing width up to the adequate width as the standard Rural Road
2. To heighten the existing surface of Rural Road up to H.W.L
3. To construct Gravel Pavement ( thickness :  $t = 50$  mm )
4. Total Road Width = BR ; Effective Road Width = BE ; Road Shoulder Width = 500 mm



H.W.L : the high water level of the flood occurred in every wet season . (  $0.50 \text{ m} < \text{HR} < 1.00 \text{ m}$  )

H.H.W.L : the highest water level of the biggest flood occurred in 1995 & 1996 for the past 30 years . (  $\text{HH} > 2.00 \text{ m} \sim 3.00 \text{ m}$  )

Improvement Method of Rural Road ; Case-3 (to extend and heighten)