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No. 02

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

ROAD DEVELOPMENT STUDY IN THE CENTRAL REGION

MASTER PLAN STUDY

FINAL REPORT
ROUTE REPORT
(VOLUME I-3)

MARCH 1989
JAPAN INTERNATIONAL COOPERATION AGENCY

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PROJECT ROUTE

Project No.	Changwat	Division	Route No.	Origin - Destination	Page
(1)	SELECTED PROJECTS BASED ON SOCIO-ECONOMIC REQUIREMENT & ROAD CONNECTION (I M PROJECTS)				
IM-1	Nakhon Phathum	Bangkok	PWD	A.Bang Len (J.R.3035) - B.Bang Noi Nai (J.R.3422)	1-1/1-8
IM-2	Kanchanaburi	Bangkok	3306	B.Nong Pru (J.R.3086) - A.Lao Khwan	2-1/2-9
IM-3	Suphan Buri	Bangkok	PWD/ ARD	B.Nong Ei Pang (J.R.3230) - A.Sam Chuk (J.R.3039)	3-1/3-9
IM-4	Uthai Thani	Lop Buri	3282	B.Thong Lang (J.R.3282) - A.Lan Sak (J.R.3438)	4-1/4-9
IM-5	Uthai Thani Nakhon Sawan	Lop Buri	3438/PWD /ARD	A.Lan Sak (J.R.3438) - B. Kao Chonkhon (J.R.1072)	5-1/5-10
IM-6	Nakhon Sawan	Lop Buri	PWD	B.Thap Krit Klang (J.R.225) - B.Phanom Rok (J.R.1119)	6-1/6-5
IM-7	Lop Buri	Lop Buri	2321	K.A.Khok Charoen (J.R.21) - B.Nai Samakki (J.R.2219)	7-1/7-7
IM-8	Lop Buri	Lop Buri	2247	B.Khao Noi (J.R.2256) - B.Chang Ko Nok (J.R.205)	8-1/8-8
IM-9	Lop Buri	Lop Buri	PWD	B.Dilang (J.R.21) - B.Wang Phloeng (J.R.205)	9-1/9-8
IM-10	Lop Buri Ang Thong	Lop Buri	3196	B.Reng Sung (J.R.3267) - C.Lop Buri (J.R.311)	10-1/10-9
IM-11	Sing Buri Ang Thong	Bangkok	RID	B.Chana Soot (J.R.3251) - A.Pho Thong (J.R.3064)	11-1/11-9
IM-12	Ang Thong Ayutthaya	Bangkok	RID	A.Pho Thong (J.R.3064) - A.Sena (J.R.3263)	12-1/12-9
IM-13	Ayutthaya	Bangkok	PWD	A.Bang Pa-in (J.R.308) - C.Ayutthaya (J.R.3059)	13-1/13-8
IM-14	Ayutthaya Phathum Thani	Bangkok	RURAL	A.Wang Noi (J.R.1, J.R.309) - A.Thanyaburi (J.R.305)	14-1/14-8
IM-15	Phathum Thani Bangkok	Bangkok	RURAL	B.Klong Luang (J.R.305) - A.Min Buri (J.R.304)	15-1/15-8
IM-16	Phathum Thani Nakhon Nayok	Bangkok	3312	A.Lam Luk Ka (J.R.3312) - B.Khlong 16	16-1/16-8
IM-17	Bangkok Samut Prakarn Chachoengsao	Chachoengsao	PWD	A.Lat Krabang - B.Khlong Tha Thua (J.R.314)	17-1/17-8
IM-18	Nakhon Nayok	Bangkok	RID/307	C.Nakhong Nayok - A.Ban Sang (J.R.3347)	18-1/18-8
IM-19	Prachin Buri	Chachoengsao	RURAL	A.Sa Kaeo (J.R.33) - DOH Const. Office (Waterfall)	19-1/19-8
IM-20	Chanthaburi	Chachoengsao	3249/ RURAL	B.Khleng Takhian (J.R.3249) - J.R.3322 B.Chan Khrem	20-1/20-10
IM-21	Chon Buri Rayong	Chachoengsao	3245	B.Nong Chang (J.R.344) - J.R.3138	21-1/21-8
IM-22	Bangkok Chachoengsao	Chachoengsao	RURAL	A.Nong Chok (J.R.3120) - A.Bang Nam Prieo (J.R.3124)	22-1/22-8
IM-23	Ayutthaya	Bangkok	3267	J.R.32 - J.R.3022	23-1/23-8
(2)	SELECTED PROJECTS BASED ON ROAD CONGESTION (ML PROJECTS)				
ML-1	Chon Buri	Chachoengsao	3	Chon Buri Bypass (STA.0+000 - STA.13+823)	24-1/24-8
ML-2	Chon Buri	Chachoengsao	3	Pattaya - A.Sattahip (STA.147+775) (STA.175+049)	25-1/25-8
ML-3	Chon Buri Rayong	Chachoengsao	3	A.Sattahip - C.Rayong (STA.175+049) (STA.221+000)	26-1/26-9
ML-4	Rayong Chanthaburi	Chachoengsao	3/316	A.Klaeng - C.Chanthaburi (STA.269+119 - STA.324+309)	27-1/27-10
ML-5	Chon Buri	Chachoengsao	New Route	Chon Buri - Pattaya New Highway (includ.Access Road to Laem Chabang)	28-1/28-7
ML-6	Ratchaburi	Prachuap Khirikan	4	C.Ratchaburi (J.R.3208) - J.R.35	29-1/29-8
ML-7	Bangkok Chachoengsao	Chachoengsao	304	A.Min Buri (J.R.3101) - C.Chachoengsao (J.R.314)	30-1/30-9
ML-8	Nonthaburi	Bangkok	340	B.Bang Muang - A.Lat Lom Khaew (J.R.3035)	31-1/31-8

REPORT FORMAT

This volume comprises thirty one dividual route reports, each of which contains the following:

- SUMMARY

1. **GENERAL**

2. **TRAFFIC** (Forecast Method)

   - Base Traffic Volume
   - Traffic Growth Rates
   - Induced Traffic Ratios
   - Future Traffic Volumes

3. **BENEFITS**

   - Road Conditions
   - VOC Savings
   - Time Savings
   - Total Benefits

4. **ENGINEERING**

   - Summary of Inventory
   - Construction Quantities and Costs

5. **ECONOMIC EVALUATION**

   - Cost and Benefit Statement

6, **DEVELOPMENT AND SOCIAL IMPACTS**

- ROUTE MAP
- TYPICAL CROSS SECTION
- ROAD INVENTORY SHEET

PROJECT IM - 1

Changwat : Nakhon Phathum

A. Bang Len - B. Bang Noi Nai

Length : 18.80 km

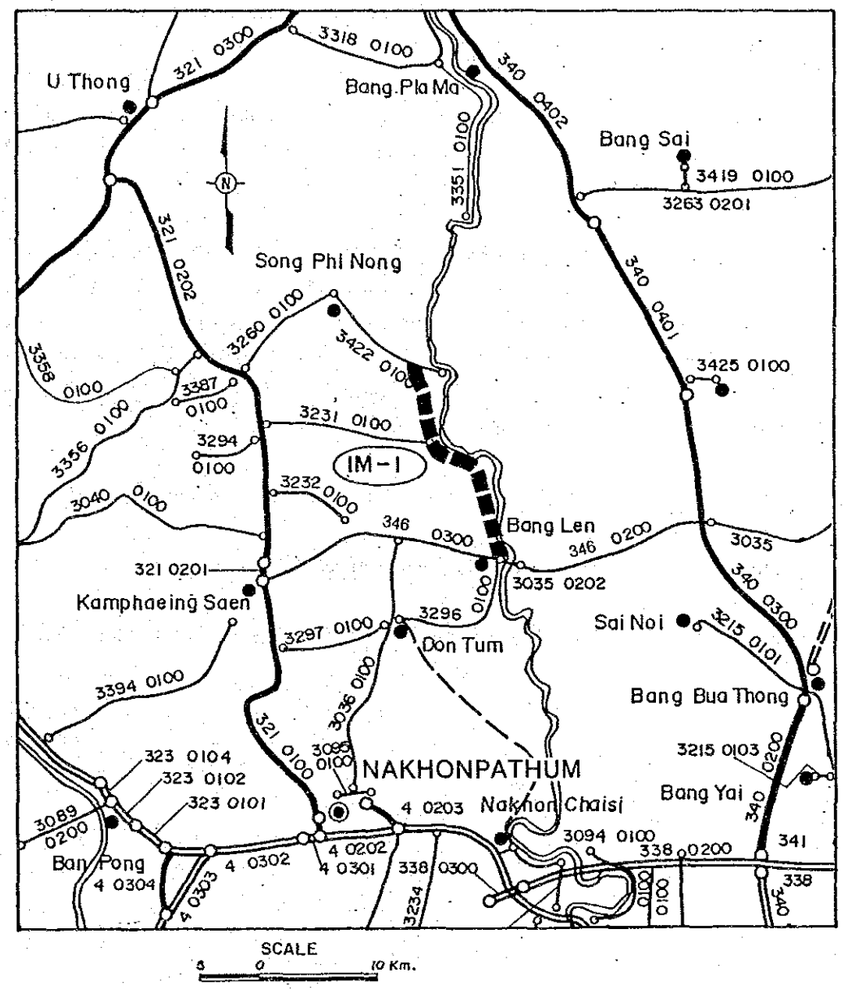
SUMMARY

PROJECT IM-1

Item	Description
Changwat	Nakhon Pathum
Origin	A. Bang Len (J.R.3035)
Destination	B. Bang Noi Nai (J.R.3422)
Length	
Total	18.8 km
Improvement Section	18.8 km
DOH Road	-
Others	PWD 18.8 km
New Construction Section	-
Surface Type and Condition	SBST Poor 1.0 km & S/A Poor 17.8 km
Terrain	Flat
Traffic (ADT)	
Existing	300
2000	754
2008	1,080
Existing Standard	*
Proposed Standard	F3
Construction Cost	
Financial	13,617 Thousand Baht
Economic	11,327 Thousand Baht
IRR	26.6 %
B/C	2.08

* PWD plans to carry out pavement construction work for a 5 m wide carriageway with a roadbed width of 8 m.

LOCATION OF PROJECT ROUTE



LEGEND :

- PROJECT ROUTE
- DIVIDED HIGHWAYS
- NATIONAL HIGHWAYS
- PROVINCIAL HIGHWAYS
- PROVINCIAL HIGHWAYS (Unpaved)
- CHANGWAT, AMPHOE

1. GENERAL

The proposed route lies entirely in Changwat Nakhon Pathom.

It originates in Amphoe Bang Len at the junction with Route 3035, runs northward paralleling the winding Tha Chin River and ends at the junction with Route 3422 in Ban Bang Noi Nai. Its total length is 18.8 km.

The road is currently under the responsibility of the Public Works Department. PWD plans to pave this road in 1989 with a pavement width of 5 m and 1.5 m wide shoulders. Further improvement should involve widening to F3 standards.

The terrain is flat. Land alongside is well cultivated with paddy and sugarcane, and occasionally beans and chili. The existing road is of laterite, except for a short section at Km 14 where it joins Route 3231. Horizontal alignment at some points is poor. Many sugarmills, rice mills and alchohol plants dot both sides of the road. Ban Bang Luang, located at the junction with Route 3221, about two-thirds along the route, is a relatively large village and has a small bus terminal. Most passengers take buses to visit Amphoe Bang Len.

The surface condition of the short SBST section and the remaining laterite sections is poor.

There are nine concrete bridges, of which three are narrow.

Upon completion, the improved road will act as a connector to Routes 3035, 3231 and 3422.

2. TRAFFIC (Growth Rate Method)

Base Traffic Volume

Route	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-1	PWD	1986	150	38	32	13	180	12	25	300

Traffic Growth Rate

Route	Period	MC	PC	LB	HB	LT	MT	HT	ADT
IM-1	- 1993	5.02	6.52	5.70	5.74	4.52	4.51	4.52	5.02
	1994 - 2000	4.56	5.79	5.10	5.05	4.11	4.11	4.11	4.56
	2001 - 2008	4.63	5.80	5.10	5.08	4.15	4.17	4.15	4.63

Induced Traffic Ratio

Route	PC	LB	HB	LT	MT	HT
IM-1	1.36	1.38	1.22	1.37	1.00	1.00

Future Traffic Volume

Route	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-1	PWD	1993	278	80	65	23	335	16	34	553
		2000	278	118	92	33	445	21	45	754
		2008	547	186	138	49	616	29	62	1080

3. BENEFITS

ROAD CONDITIONS

	LENGTH (KM)	ROAD CLASS	GRADIENTS	CURVE	NO. OF NARROW BRIDGE	NO. OF WOODEN BRIDGE
WITHOUT PROJECT	18.80	PAVED FAIR	FAIR	FAIR	0	0
WITH PROJECT	18.80	PAVED F3	FAIR	FAIR	0	0

VOC SAVINGS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	257.	532.	321.	258.	1393.	153.	578.	3492.
2008	370.	839.	481.	383.	1928.	211.	796.	5008.

TIME SAVINGS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	103.	187.	345.	475.	427.	23.	50.	1611.
2008	149.	294.	517.	704.	591.	32.	69.	2356.

TOTAL BENEFITS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	360.	719.	666.	733.	1820.	176.	628.	5103.
2008	519.	1133.	997.	1087.	2520.	243.	865.	7364.

4. ENGINEERING

SUMMARY OF ROAD INVENTORY

(PROJECT IM-1)

Item	Description
Changwat	Nakhon Pathum
Origin	A. Bang Len (J.R.3035)
Destination	B. Bang Noi Nai (J.R.3422)
Length	
Total	18.8 km
Improvement Section	18.8 km
DOH Road	-
Others	PWD 18.8 km
New Construction Section	-
Terrain	Flat
Alignment (Hori./Vert.)	Good ~ Poor / Good
Formation Width	6.80 m ~ 9.40 m
Embankment Section	
Length	18.8 km
Height	1.50 m ~ 2.50 m
Cut Section	
Length	-
Depth	-
Surface Type and Condition	
SBST or DBST	Poor 1.0 km
Soil Aggregate	Poor 17.8 km
Earth	-
Box Culvert	-
Bridge	
Permanent Bridge	6 sites 85.8 m
Narrow Concrete Bridge	3 sites 37.0 m
Wooden Bridge	-
Overflow Section	-
Right of way	12.0 m ~ 26.6 m

CONSTRUCTION QUANTITIES AND COSTS
(Project IM-1 Length = 18.8 km)

Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost %	Economic Cost 1000 Baht	Residual Value %	Residual Value 1000 Baht
EARTHWORK					83		90	
Clearing & Grubbing	ha	9,500	4	38				
Earth Excavation	m3	16	-	0				
Embankment (Side Borrow)	m3	40	74,700	2,988				
Embankment (Borrow Pit)	m3	100	-	0				
Sub Total				3,026		2,512		2,261
PAVEMENT					83		50	
Subbase (Selected Material)	m3	180	5,600	1,008				
Subbase (Soil Aggregate)	m3	220	7,500	1,650				
Base (Soil Aggregate)	m3	350	5,600	1,960				
Shoulder (Soil Aggregate)	m3	250	5,600	1,400				
Asphaltic Prime/Tack Coat	m2	12	37,400	449				
DBST	m2	40	18,700	748				
AC Surfacing	m2	190	-	0				
Sub Total				7,215		5,988		2,994
STRUCTURES					83		50	
RC Pipe Culvert (D 1.00 Equivalent)	m	1,800	154	277				
RC Box Culvert (2 x 2.4 x 2.4 Equivalent)	m	20,000	-	0				
RC Bridge (W=7.0 L=10.0 Equivalent)	m	60,000	-	0				
Sub Total				277		230		115
INTERCHANGE/INTERSECTION	nos.	5,000,000	-	0	83	0	50	0
Total (a)				10,518		8,730		5,370
Miscellaneous Work ((a) x 7%)	ls			736	83	611	0	0
CONTRACT AMOUNT (b)				11,254		9,341		5,370
PHYSICAL CONTINGENCIES ((b) x 10%) (c)	ls			1,125		934		537
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)	ls			1,238	85	1,052	0	0
LAND ACQUISITION					100		100	
Highly Developed Land	ha	-	-	0				
Less Developed Land	ha	-	-	0				
Sub Total (e)	ls			0		0		0
PROJECT COST ((b) + (c) + (d) + (e))				13,617		11,327		5,907
AVERAGE COST PER KM				724				

5. ECONOMIC EVALUATION

COST AND BENEFIT STATEMENT

(1000 BAHT)

	COST	BENEFITS			DISCOUNTED(12%)	
YEAR	CONST. COST	VOC SAVING	TIME SAVING	TOTAL	COST	BENEFIT
1991	0			0	0	0
1992	2,265			0	2,841	0
1993	9,062			0	10,149	0
1994		2,692	1,220	3,912	0	3,493
1995		2,825	1,285	4,110	0	3,276
1996		2,959	1,350	4,309	0	3,067
1997		3,092	1,415	4,507	0	2,864
1998		3,225	1,480	4,705	0	2,670
1999		3,359	1,546	4,905	0	2,485
2000		3,492	1,611	5,103	0	2,308
2001	10,142	3,682	1,704	5,386	4,588	2,175
2002		3,871	1,797	5,668	0	2,044
2003		4,061	1,890	5,951	0	1,916
2004		4,250	1,984	6,234	0	1,792
2005		4,439	2,077	6,516	0	1,672
2006		4,629	2,170	6,799	0	1,558
2007		4,818	2,263	7,081	0	1,449
2008	(5,907)	5,008	2,356	7,364	(1,209)	1,345
TOTAL	15,562	56,400	26,148	82,550	16,369	34,114

NET PRESENT VALUE :	17,745
BENEFIT COST RATIO :	2.08
INTERNAL RATE OF RETURN :	26.6%

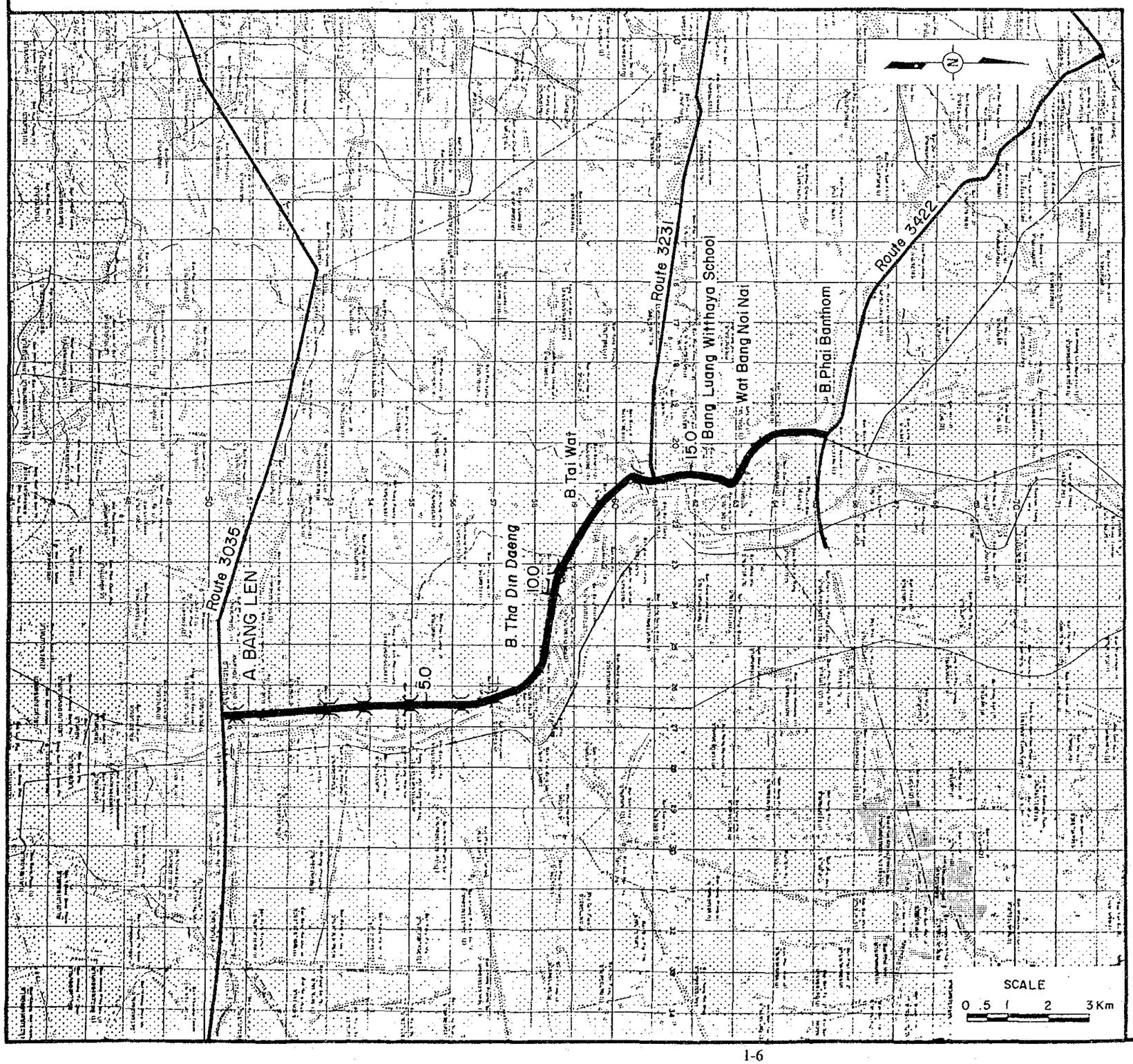
6. DEVELOPMENT AND SOCIAL IMPACTS

The area is already served by frequent bus service on the existing road. Social impacts may not be large. Sugarcane growers and transporters will benefit from a faster and less expensive road.

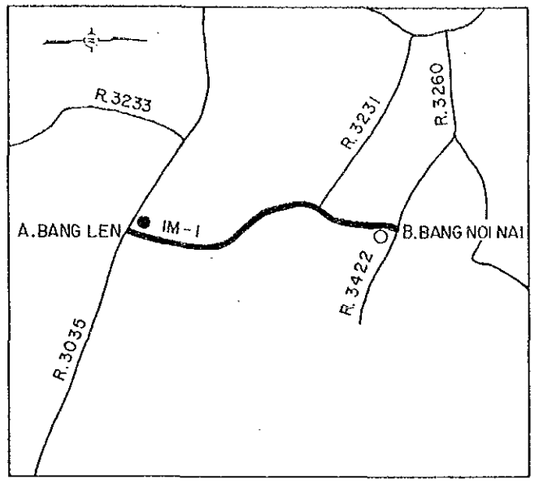
PROJECT NO. IM - 1

A. BANG LEN - B. BANG NOI NAI
C. NAKHON PHATHUM

L = 18.80 KM.



LOCATION MAP



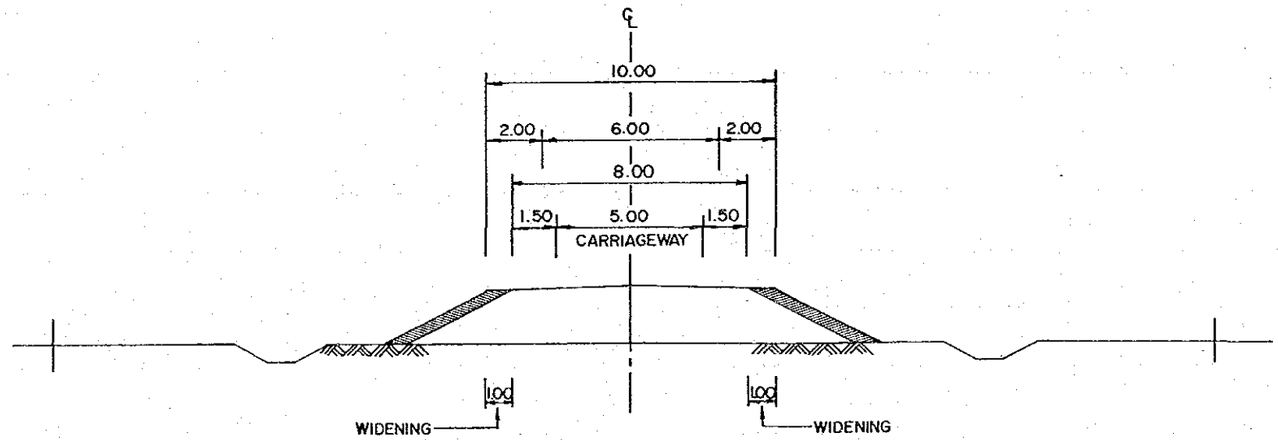
BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	0.1	-	C-8.00 x 35.00
2	2.7	-	C-7.00 x 10.50
3	3.5	-	C-7.00 x 10.50
4	4.8	-	C-7.00 x 10.00
5	5.8	-	C-7.00 x 10.00
6	6.6	-	C-7.00 x 10.00
7	10.0	-	C-7.00 x 7.50
8	10.5	-	C-7.00 x 9.50
9	13.8	-	C-7.00 x 20.00

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE

TYPICAL CROSS SECTION



PROVINCIAL HIGHWAY
WIDENING SECTION (PWD 5/8 → CLASS F3)

ROAD INVENTORY

PROJECT NO. IM-1

ROUTE NO. RURAL BANG LEN (J.R. 3035) – BANG LUANG – BANG NOI NAI (J.R. 3422)

C. NAKHON PHATHUM

L = 18.8 km

Item	Entries along route (left to right)
STATION (Km)	0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 18+800, 20, 22, 24, 26, 28, 30
VILLAGE – Name of Village	A. BANG LEN; B.BANG SAI PA; B.THONG LANG; B.SOM KLING; B.KHLONG JEK; B. HIN MOON; B.BANG LUANG; Rt. 3231; B.BANG NOI NAI
TERRAIN	Flat
CROSS SECTION – Formation Width (m)	9.40; 7.00; 6.80; 7.60
CROSS SECTION – Embankment Height (m)	2.00; 1.50; 2.00; 2.50
CROSS SECTION – Cutting Depth (m)	
SURFACE – Type/Length (km)	Laterite; SBST; Laterite
SURFACE – Condition	Poor
FLOODING – Overflow Length (km)/Height (m)	No
LAND USE – Left	Sugar Cane; Sugar Cane and Paddy; Paddy, Bean, Chilly
LAND USE – Right	Paddy; Sugar Cane; Paddy, Bean, Chilly
BOX CULVERT & BRIDGE – Station (km)	0+100; 2+740; 3+542; 4+785; 5+800; 6+600; 10+000; 10+500; 13+775
BOX CULVERT & BRIDGE – Dimension (m): Bridge – Conc. or wooden – Width – (Sidewalk) – Length; Box – Width – Height – Length	C-Br. 7.90(0.75)x35.00; C-Br. 7.10(0.75)x10.30; C-Br. 7.00(0.75)x10.20; C-Br. 6.90(0.75)x10.10; C-Br. 7.00(0.75)x10.10; C-Br. 6.90(0.75)x10.10; C-Br. 4.90(0.70)x7.40; C-Br. 4.90(0.70)x9.50; C-Br. 3.90x20.10
RIGHT OF WAY (m) (Left/Right)	27.00 (13.50/13.50); 12.00 (6.00/6.00); 15.00 (7.50/7.50)
ALIGNMENT – Horizontal	Good; Fair; Poor; Fair; Poor; Fair
ALIGNMENT – Vertical	Good
ROUTE NO., AGENCIES	PWD

PROJECT IM - 2

Changwat : Kanchanaburi

B. Nong Pru - A. Lao Khwan

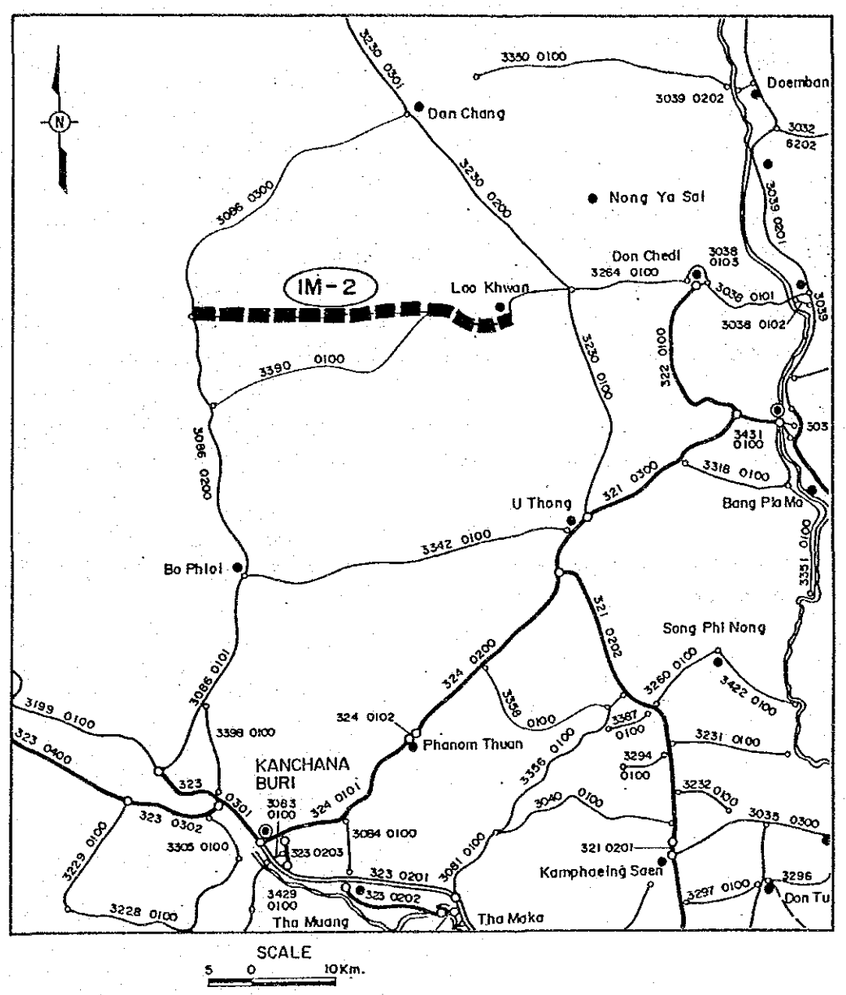
Length : 36.00 km

SUMMARY

PROJECT IM-2

Item	Description
Changwat	Kanchanaburi
Origin	B. Nong Pru (J.R.3086)
Destination	A. Lao Khwan
Length	
Total	36.0 km
Improvement Section	36.0 km
DOH Road	No. 3306 36.0 km
Others	-
New Construction Section	-
Surface Type and Condition	SBST Fair 3.0 km S/A Poor 33.0 km
Terrain	Rolling/Flat
Traffic (ADT)	
Existing	385
2000	959
2008	1,332
Existing Standard	Laterite, Substandard
Proposed Standard	F3
Construction Cost	
Financial	86,408 Thousand Baht
Economic	71,876 Thousand Baht
IRR	27.0 %
B/C	2.62

LOCATION OF PROJECT ROUTE



LEGEND :

- PROJECT ROUTE
- DIVIDED HIGHWAYS
- NATIONAL HIGHWAYS
- PROVINCIAL HIGHWAYS
- PROVINCIAL HIGHWAYS (Unpaved)
- CHANGWAT, AMPHOE

1. GENERAL

The proposed route lies entirely in Changwat Kanchanaburi.

It originates at the junction with Route 3086 in Ban Nong Pru, runs eastward and ends in Amphoe Lao Khwan. Its total length is 36 km.

The terrain is rolling except for the last 4 km approach to Amphoe Lao Khwan. SBST is applied for a length of 3 km from Km 2+700 where two adjoining Bans form a relatively dense cluster of farmhouses. The remaining parts are of laterite. Seven Bans are located along the road, excluding both ends, all of them relatively small. The dominant crop along the road is sugarcane, followed by cassava. Some paddies and pineapples are also grown. During the peak sugar harvesting season, traffic is heavy with overloaded sugarcane trucks, which can make only 20 km per hour because of the poor road surface, which in turn is a result of their own making. There are no bridges but two box culverts of 10 m in width.

The condition of the SBST section was fair, at least at the time of the Study Team's inspection. However, the condition of the laterite sections, which are the majority, is poor.

Upon completion, the road will not only provide better transport facility to area residents but also become a major approach channel to Amphoe Lao Khwan for the people in the area west of the Amphoe.

2. TRAFFIC (Growth Rate Method)

Base Traffic Volume

Route	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-2	3306-0100	1986	264	1	6	3	250	124	1	385

Traffic Growth Rate

Route	Period	MC	PC	LB	HB	LT	MT	HT	ADT
IM-2	- 1993	5.09	6.49	5.65	5.74	4.52	4.52	4.92	5.09
	1994 - 2000	4.64	5.80	5.20	5.05	4.12	4.12	3.66	4.64
	2001 - 2008	4.71	5.81	5.00	5.02	4.15	4.16	4.19	4.71

Induced Traffic Ratio

Route	PC	LB	HB	LT	MT	HT
IM-2	1.53	1.57	1.32	1.55	1.00	1.00

Future Traffic Volume

Route	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-2	3306-0100	1993	513	3	14	5	529	169	1	721
		2000	513	5	20	8	701	224	1	959
		2008	1020	8	30	12	971	310	1	1332

3. BENEFITS

ROAD CONDITIONS

	LENGTH (KM)	ROAD CLASS	GRADIENTS	CURVE	NO. OF NARROW BRIDGE	NO. OF WOODEN BRIDGE
WITHOUT PROJECT	36.00	LATERITE FAIR	POOR	FAIR	0	0
WITH PROJECT	36.00	PAVED F3	FAIR	FAIR	0	0

VOC SAVINGS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	4708.	137.	461.	433.	15771.	11809.	82.	33401.
2008	6809.	222.	684.	649.	21844.	16343.	82.	46634.

TIME SAVINGS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	362.	14.	137.	212.	1225.	476.	2.	2428.
2008	523.	23.	204.	318.	1697.	659.	2.	3425.

TOTAL BENEFITS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	5069.	151.	598.	645.	16996.	12285.	84.	35829.
2008	7331.	245.	888.	968.	23541.	17001.	84.	50059.

4. ENGINEERING

SUMMARY OF ROAD INVENTORY

(PROJECT IM-2)

Item	Description
Changwat	Kanchanaburi
Origin	B. Nong Pru (J.R.3086)
Destination	A. Lao Khwan
Length	
Total	36.0 km
Improvement Section	36.0 km
DOH Road	No. 3306 36.0 km
Others	-
New Construction Section	-
Terrain	Rolling/Flat
Alignment (Hori./Vert.)	Fair/Poor
Formation Width	5.0 m ~ 7.0 m
Embankment Section	
Length	36.0 km
Height	0.5 m ~ 1.0 m
Cut Section	
Length	-
Depth	-
Surface Type and Condition	
SBST or DBST	Fair 3.0 km
Soil Aggregate	Poor 33.0 km
Earth	-
Box Culvert	2 units 20.0 m
Bridge	
Permanent Bridge	-
Narrow Concrete Bridge	-
Wooden Bridge	-
Overflow Section	-
Right of way	35.0 m ~ 38.0 m

CONSTRUCTION QUANTITIES AND COSTS
(Project IM-2 Length = 36.0 km)

Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost %	Economic Cost 1000 Baht	Residual Value %	Residual Value 1000 Baht
EARTHWORK					83		90	
Clearing & Grubbing	ha	9,500	13	124				
Earth Excavation	m3	16	-	0				
Embankment (Side Borrow)	m3	40	223,200	8,928				
Embankment (Borrow Pit)	m3	100	-	0				
Sub Total				9,052		7,513		6,762
PAVEMENT					83		50	
Subbase (Selected Material)	m3	180	59,400	10,692				
Subbase (Soil Aggregate)	m3	220	72,000	15,840				
Base (Soil Aggregate)	m3	350	37,800	13,230				
Shoulder (Soil Aggregate)	m3	250	16,200	4,050				
Asphaltic Prime/Tack Coat	m2	12	252,000	3,024				
DBST	m2	40	216,000	8,640				
AC Surfacing	m2	190	-	0				
Sub Total				55,476		46,045		23,023
STRUCTURES					83		50	
RC Pipe Culvert (D 1.00 Equivalent)	m	1,800	1,162	2,092				
RC Box Culvert (2 x 2.4 x 2.4 Equivalent)	m	20,000	6	120				
RC Bridge (W=7.0 L=10.0 Equivalent)	m	60,000	-	0				
Sub Total				2,212		1,836		918
INTERCHANGE/INTERSECTION	nos.	5,000,000	-	0	83	0	50	0
Total (a)				66,740		55,394		30,703
Miscellaneous Work ((a) x 7%)	1s			4,672	83	3,878	0	0
CONTRACT AMOUNT (b)				71,412		59,272		30,703
PHYSICAL CONTINGENCIES ((b) x 10%) (c)	1s			7,141		5,927		3,070
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)	1s			7,855	85	6,677	0	0
LAND ACQUISITION					100		100	
Highly Developed Land	ha	-	-	0				
Less Developed Land	ha	-	-	0				
Sub Total (e)	1s			0		0		0
PROJECT COST ((b) + (c) + (d) + (e))				86,408		71,876		33,773
AVERAGE COST PER KM				2,400				

5. ECONOMIC EVALUATION

COST AND BENEFIT STATEMENT

(1000 BAHT)

	COST	BENEFITS			DISCOUNTED(12%)	
YEAR	CONST. COST	VOC SAVING	TIME SAVING	TOTAL	COST	BENEFIT
1991	14,375			0	20,196	0
1992	35,938			0	45,081	0
1993	21,563			0	24,151	0
1994		26,202	1,881	28,083	0	25,074
1995		27,402	1,972	29,374	0	23,417
1996		28,602	2,063	30,665	0	21,827
1997		29,801	2,154	31,955	0	20,308
1998		31,001	2,245	33,246	0	18,865
1999		32,201	2,337	34,538	0	17,498
2000		33,401	2,428	35,829	0	16,207
2001	19,542	35,055	2,553	37,608	8,840	15,189
2002		36,709	2,677	39,386	0	14,203
2003		38,363	2,802	41,165	0	13,254
2004		40,017	2,926	42,943	0	12,345
2005		41,671	3,051	44,722	0	11,479
2006		43,326	3,176	46,502	0	10,657
2007		44,980	3,300	48,280	0	9,879
2008	(33,773)	46,634	3,425	50,059	(6,911)	9,146
TOTAL	57,645	535,365	38,989	574,355	91,357	239,348

NET PRESENT VALUE :	147,991
BENEFIT COST RATIO :	2.62
INTERNAL RATE OF RETURN :	27.0%

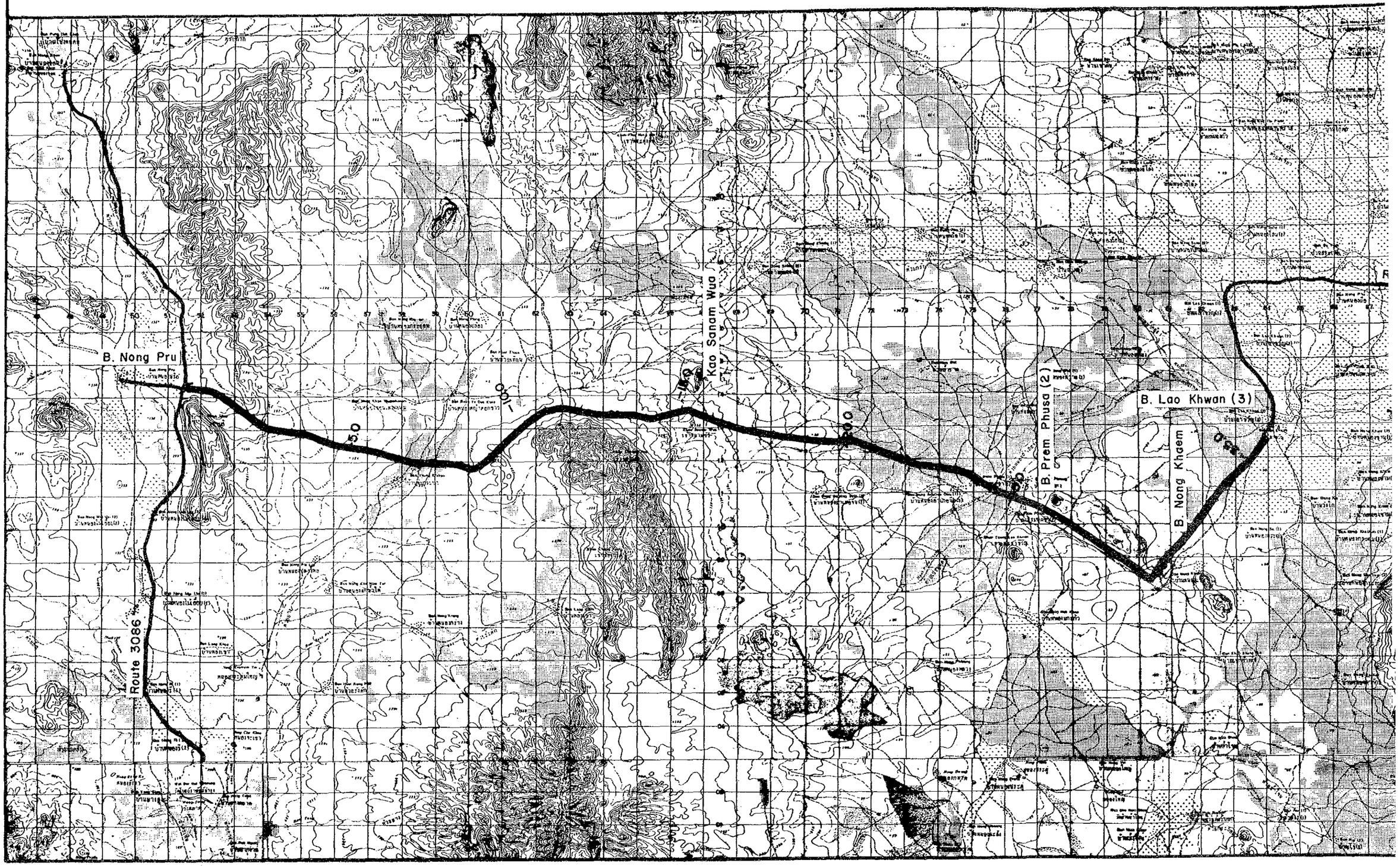
6. DEVELOPMENT AND SOCIAL IMPACTS

It is doubtful that the improved road will bring about an increase in agricultural production as all land is already cultivated. However, sugarcane growers and transporters will benefit from a faster and less expensive road.

PROJECT NO. IM - 2

B. NONG PRU – A. LAO KHWAN
C. KANCHANABURI

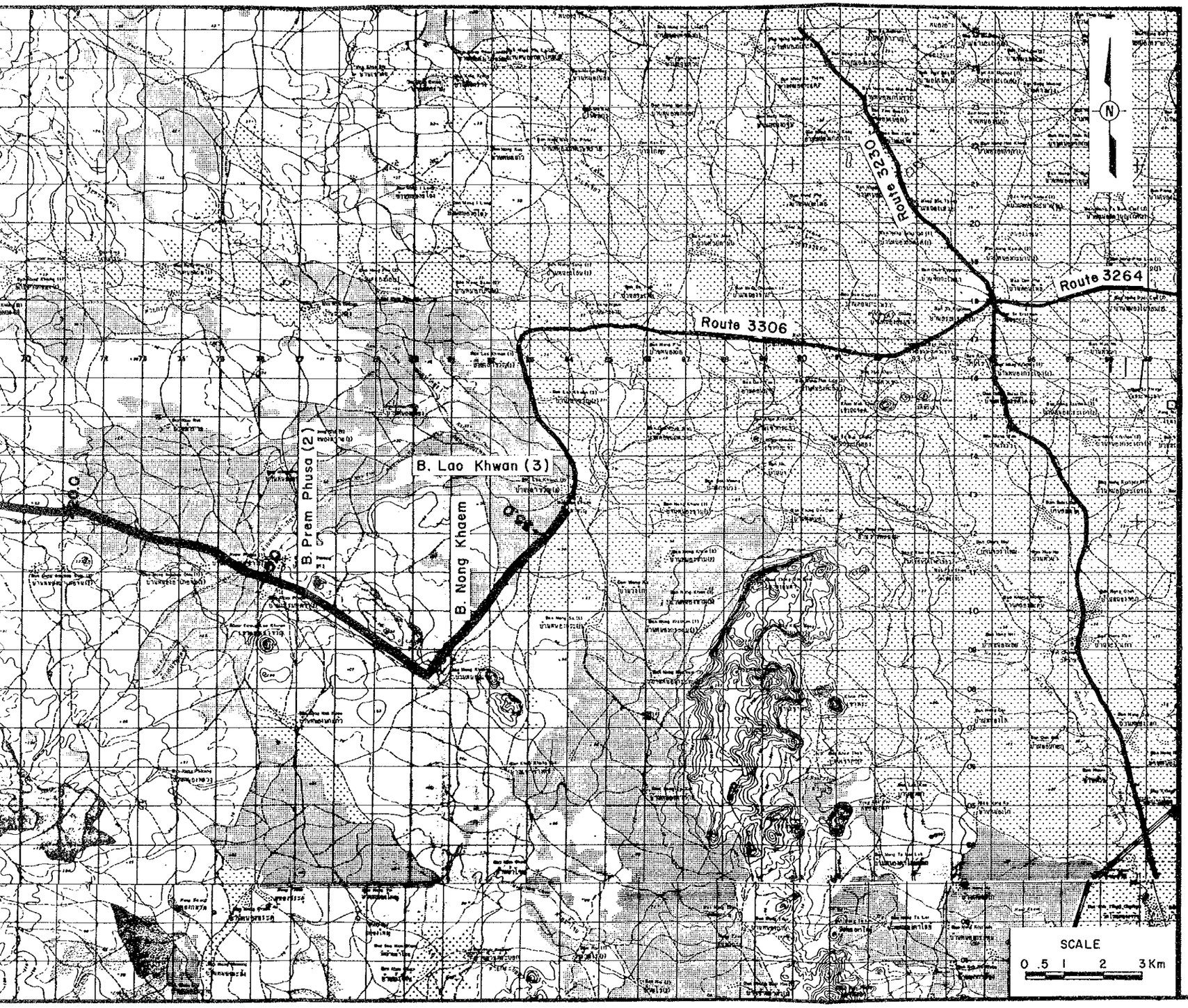
L = 36.00 KM.



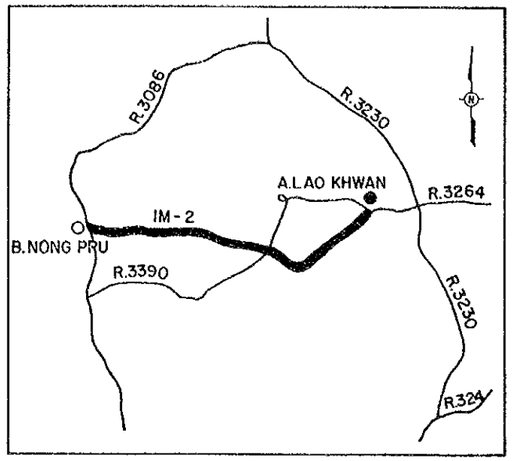
B. NONG PRU – A. LAO KHWAN

C. KANCHANABURI

L = 36.00 KM.



LOCATION MAP



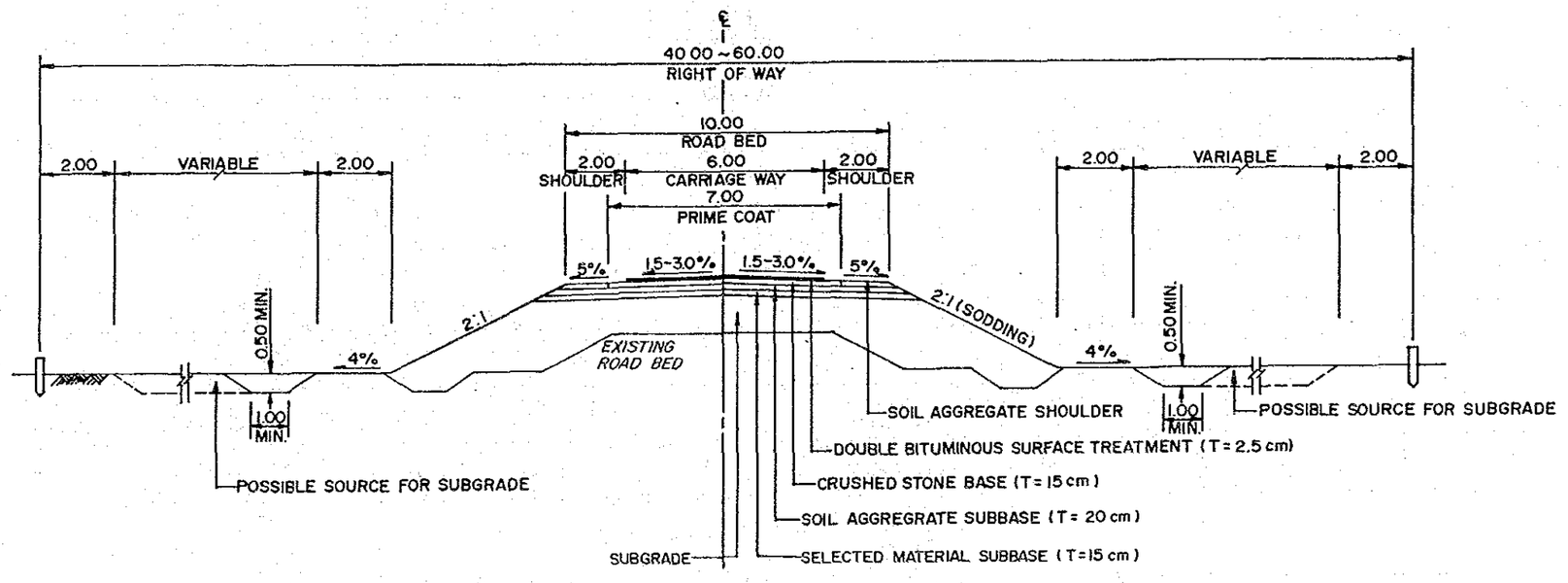
BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE

TYPICAL CROSS SECTION



PROVINCIAL HIGHWAY (CLASS F3)

ROAD INVENTORY (1/2)

ROUTE NO. 3306 NONG PRU (J.R. 3086) – LAO KHWAN (J.R. 3230)

C. KANCHANABURI

L = 36.0 km

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
VILLAGE	Name of Village	B. NONG PRU		B.NONG KANAK	B.NONG PLA LAI			B.TUNG KRA BAM		B.NONG SA NO	B. SI KAK			B. NONG AM – PHOE JEEN			
TERRAIN							Rolling										
CROSS SECTION	Formation Width (m)	6.40	6.30		6.80		4.90		5.80			6.40			7.00		
	Embankment Height (m)	0.50	3.00	0.50		1.00	0.50		1.00		0.10			1.00	1.50	1.00	
	Cutting Depth (m)																
SURFACE	Type/Length (km)		Laterite/4.7		SBST/3.0					Laterite							
	Condition	Poor			Fair					Poor				V.Poor		Poor	
FLOODING	Overflow Length (km)/Height (m)								No								
LAND USE	Left	Sugar Cane	Pine Apple			Sugar Cane			Cassava	Eucalyptus		Cassava		Sugar Cane	Paddy	Cassava	
	Right	Sugar Cane	Pine Apple			Sugar Cane			Cassava	Eucalyptus		Cassava		Sugar Cane	Paddy	Cassava	
BOX CULVERT & BRIDGE	Station (km)					8+800		13+600									
	Dimension (m) Box – Width – Height – Length					C–Box 2.7x3.3x3x100		C–Box 3.0x3.2x3x100									
RIGHT OF WAY (m) (Left/Right)		34.0 (17.0/17.0)								38.0 (19.0/19.0)							
ALIGNMENT	Horizontal						Fair					Poor			Good		
	Vertical	Fair					Poor				Fair		Poor	Fair		Poor	
ROUTE NO., AGENCIES								DOH ROUTE 3306									

PROJECT NO. IM-2

ROAD INVENTORY (2/2)

ROUTE NO. 3306 NONG PRU (J.R. 3086) – LAO KHWAN (J.R. 3230)

C. KANCHANABURI

L = 36.0 km

STATION (Km)		30 – 32 – 34 – 36 – 38 – 40 – 42 – 44 – 46 – 48 – 50 – 52 – 54 – 56 – 58 – 60	
VILLAGE Name of Village		B.KHAO WANG	B. LAO KWAN
TERRAIN		Rolling	Flat
CROSS SECTION	Formation Width (m)	5.40	6.10
	Embankment Height (m)	1.00	
	Cutting Depth (m)		
SURFACE	Type/Length (km)	Laterite	
	Condition	Poor	
FLOODING	Overflow Length (km)/Height (m)		
LAND USE	Left	Paddy	Sugar Cane
	Right	Paddy	Sugar Cane
BOX CULVERT & BRIDGE	Station (km)		
	Dimension (m) Bridge - Conc.or Wooden - Width - (Sidewalk) - Length		
RIGHT OF WAY (m) (Left/Right)		38.0 (19.0/19.0)	
ALIGNMENT	Horizontal	Fair	
	Vertical	Poor	Good
ROUTE NO., AGENCIES		DOH Route No. 3306	

PROJECT IM - 3

Changwat : Suphan Buri

B. Nong Ei Pang - A. Sam Chuk

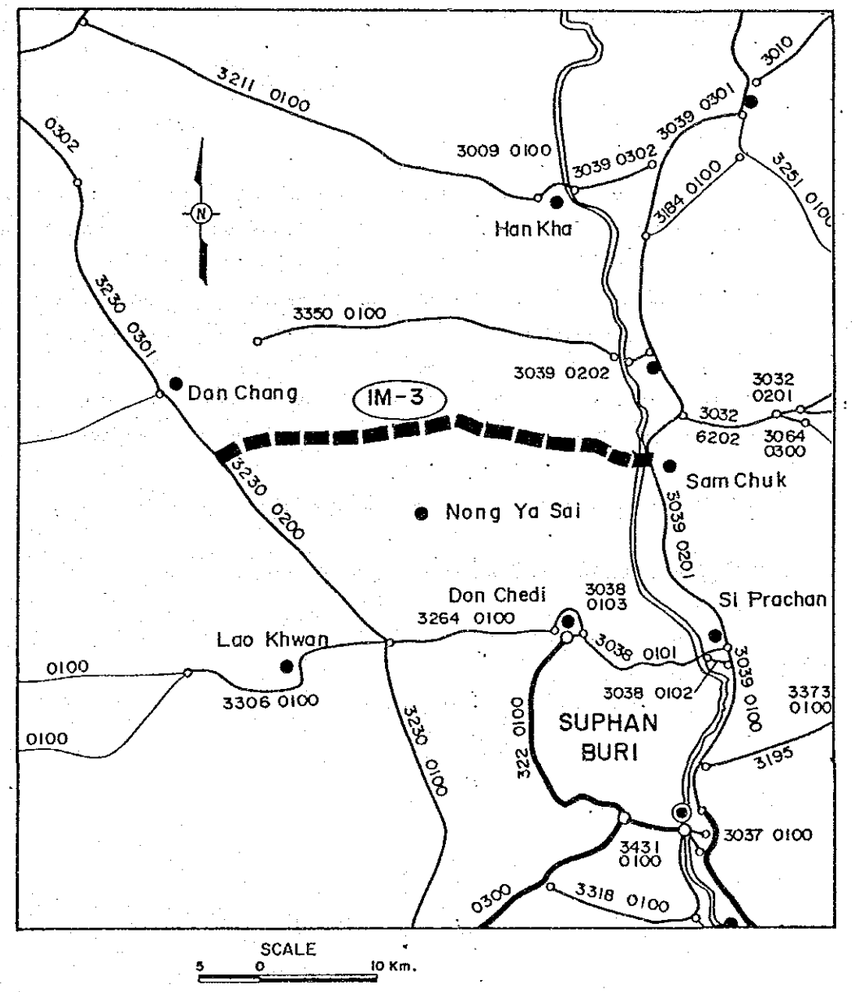
Length : 33.60 km

SUMMARY

PROJECT IM-3

Item	Description
Changwat	Suphan Buri
Origin	B. Nong Ei Pang (J.R.3230)
Destination	A. Sam Chuk (J.R.3039)
Length	
Total	33.6 km
Improvement Section	33.6 km
DOH Road	-
Others	PWD 12 km, ARD 21.6 km
New Construction Section	-
Surface Type and Condition	SBST Fair 15.0 km S/A Poor 18.1 km
Terrain	Flat
Traffic (ADT)	
Existing	170
2000	364
2008	522
Existing Standard	Laterite, Substandard
Proposed Standard	F4
Construction Cost	
Financial	79,643 Thousand Baht
Economic	66,249 Thousand Baht
IRR	10.7 %
B/C	0.90

LOCATION OF PROJECT ROUTE



1. GENERAL

The proposed route lies in Changwat Suphanburi.

It originates at the junction with Route 3230 in Ban Nong Ei Pang and runs eastward to end at the junction with Route 3039 in Amphoc Sam Chuk. Its total length is 33.6 km.

The first 12 km section is under PWD's responsibility and the remaining section under ARD at present.

The first 13 km section up to Ban Nong Yai Sai is of laterite surface and carries little traffic. In the remaining 21 km stretch, laterite surface and SBST surface alternate with the total length of the latter being 15.5 km. In the latter section, villages are more frequent and larger in size than in the former section and traffic is higher. Land along the road is cultivated with paddy for its entire length, except in the first 10 km section where tobacco and sugarcane are also grown.

The surface condition of the section under PWD is poor, while that of the section under ARD is generally fair except for the last 3.6 km section whose condition is poor.

There are three narrow concrete bridges, and a section 1.5 km in length is prone to overflow.

Upon completion, this road will serve a large area north of Suphanburi.

2. TRAFFIC (Growth Rate Method)

Base Traffic Volume

Route	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-3	PWD	1988	370	13	13	0	114	13	21	174
	ARD	1987	140	0	60	0	47	30	28	165
	Average	-	255	7	37	0	81	22	25	170

Traffic Growth Rate

Route	Period	MC	PC	LB	HB	LT	MT	HT	ADT
IM-3	- 1993	3.19	6.50	5.96	5.78	1.29	4.50	4.38	3.19
	1994 - 2000	4.90	5.79	5.00	5.03	5.17	4.15	4.20	4.90
	2001 - 2008	4.62	5.83	4.97	5.09	4.47	4.13	4.19	4.62

Induced Traffic Ratio

Route	PC	LB	HB	LT	MT	HT
IM-3	1.34	1.36	1.21	1.35	1.00	1.00

Future Traffic Volume

Route	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-3	PWD	1993	614	27	26	0	187	16	26	282
		2000	614	41	37	0	266	21	35	400
		2008	1237	63	54	0	378	29	49	573
	ARD	1993	188	0	100	0	60	39	36	235
		2000	188	0	141	0	86	52	48	327
		2008	379	0	209	0	122	72	67	470
	Average	1993	401	14	63	0	124	28	31	259
		2000	562	21	89	0	176	37	42	364
		2008	808	32	132	0	250	51	58	522

3. BENEFITS

ROAD CONDITIONS

	LENGTH (KM)	ROAD CLASS	GRADIENTS	CURVE	NO. OF NARROW BRIDGE	NO. OF WOODEN BRIDGE
WITHOUT PROJECT	33.60	LATERITE FAIR	GOOD	FAIR	3	0
WITH PROJECT	33.60	PAVED F4	GOOD	FAIR	0	0

VOC SAVINGS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	2459.	397.	1417.	0.	2738.	1062.	1818.	9890.
2008	3532.	612.	2090.	0.	3890.	1469.	2541.	14135.

TIME SAVINGS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	272.	55.	625.	0.	297.	72.	82.	1404.
2008	391.	86.	921.	0.	422.	100.	115.	2035.

TOTAL BENEFITS

(1000 BAHT/YEAR)

YEAR	MC	PC	LB	HB	LT	MT	HT	TOTAL
2000	2731.	452.	2041.	0.	3035.	1134.	1900.	11294.
2008	3923.	698.	3011.	0.	4312.	1570.	2656.	16169.

4. ENGINEERING

SUMMARY OF ROAD INVENTORY

(PROJECT IM-3)

Item	Description
Changwat	Suphan Buri
Origin	B. Nong Ei Pang (J.R.3230)
Destination	A. Sam Chuk (J.R.3039)
Length	
Total	33.6 km
Improvement Section	33.6 km
DOH Road	-
Others	PWD 12 km, ARD 21.6 km
New Construction Section	-
Terrain	Flat
Alignment (Hori./Vert.)	Fair/Poor
Formation Width	5.0 m ~ 6.0 m
Embankment Section	
Length	33.6 km
Height	0.50 m ~ 1.0 m
Cut Section	-
Length	-
Depth	-
Surface Type and Condition	
SBST or DBST	Fair 15.5 km
Soil Aggregate	Poor 18.1 km
Earth	-
Box Culvert	-
Bridge	
Permanent Bridge	-
Narrow Concrete Bridge	3 sites 51.3 m
Wooden Bridge	-
Overflow Section	1 place 1.5 km
Right of way	18.0 m ~ 30.0 m

CONSTRUCTION QUANTITIES AND COSTS
(Project IM-3 Length = 33.6 km)

Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost %	Economic Cost 1000 Baht	Residual Value %	Residual Value 1000 Baht
EARTHWORK					83		90	
Clearing & Grubbing	ha	9,500	11	105				
Earth Excavation	m3	16	-	0				
Embankment (Side Borrow)	m3	40	223,600	8,944				
Embankment (Borrow Pit)	m3	100	-	0				
Sub Total				9,049		7,511		6,760
PAVEMENT					83		50	
Subbase (Selected Material)	m3	180	45,300	8,154				
Subbase (Soil Aggregate)	m3	220	60,400	13,288				
Base (Soil Aggregate)	m3	350	32,900	11,515				
Shoulder (Soil Aggregate)	m3	250	12,700	3,175				
Asphaltic Prime/Tack Coat	m2	12	217,900	2,615				
DBST	m2	40	184,400	7,376				
AC Surfacing	m2	190	-	0				
Sub Total				46,123		38,282		19,141
STRUCTURES					83		50	
RC Pipe Culvert (D 1.00 Equivalent)	m	1,800	1,157	2,083				
RC Box Culvert (2 x 2.4 x 2.4 Equivalent)	m	20,000	-	0				
RC Bridge (W=7.0 L=10.0 Equivalent)	m	60,000	71	4,260				
Sub Total				6,343		5,265		2,633
INTERCHANGE/INTERSECTION	nos.	5,000,000	-	0	83	0	50	0
Total (a)				61,515		51,058		28,534
Miscellaneous Work ((a) x 7%)	ls			4,306	83	3,574	0	0
CONTRACT AMOUNT (b)				65,821		54,632		28,534
PHYSICAL CONTINGENCIES ((b) x 10%) (c)	ls			6,582		5,463		2,853
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)	ls			7,240	85	6,154	0	0
LAND ACQUISITION					100		100	
Highly Developed Land	ha	-	-	0				
Less Developed Land	ha	-	-	0				
Sub Total (e)	ls			0		0		0
PROJECT COST ((b) + (c) + (d) + (e))				79,643		66,249		31,387
AVERAGE COST PER KM				2,370				

5. ECONOMIC EVALUATION

COST AND BENEFIT STATEMENT

(1000 BAHT)

	COST	BENEFITS			DISCOUNTED(12%)	
YEAR	CONST. COST	VOC SAVING	TIME SAVING	TOTAL	COST	BENEFIT
1991	13,250			0	18,615	0
1992	33,125			0	41,552	0
1993	19,875			0	22,260	0
1994		7,499	1,056	8,555	0	7,638
1995		7,897	1,114	9,011	0	7,184
1996		8,296	1,172	9,468	0	6,739
1997		8,694	1,230	9,924	0	6,307
1998		9,093	1,288	10,381	0	5,890
1999		9,492	1,346	10,838	0	5,491
2000		9,890	1,404	11,294	0	5,109
2001	16,710	10,421	1,482	11,903	7,559	4,807
2002		10,951	1,561	12,512	0	4,512
2003		11,482	1,640	13,122	0	4,225
2004		12,012	1,719	13,731	0	3,947
2005		12,543	1,798	14,341	0	3,681
2006		13,074	1,877	14,951	0	3,426
2007		13,604	1,956	15,560	0	3,184
2008	(31,387)	14,135	2,035	16,170	(6,422)	2,954
TOTAL	51,573	159,082	22,675	181,761	83,564	75,094

NET PRESENT VALUE :	(8,470)
BENEFIT COST RATIO :	0.90
INTERNAL RATE OF RETURN :	10.7%

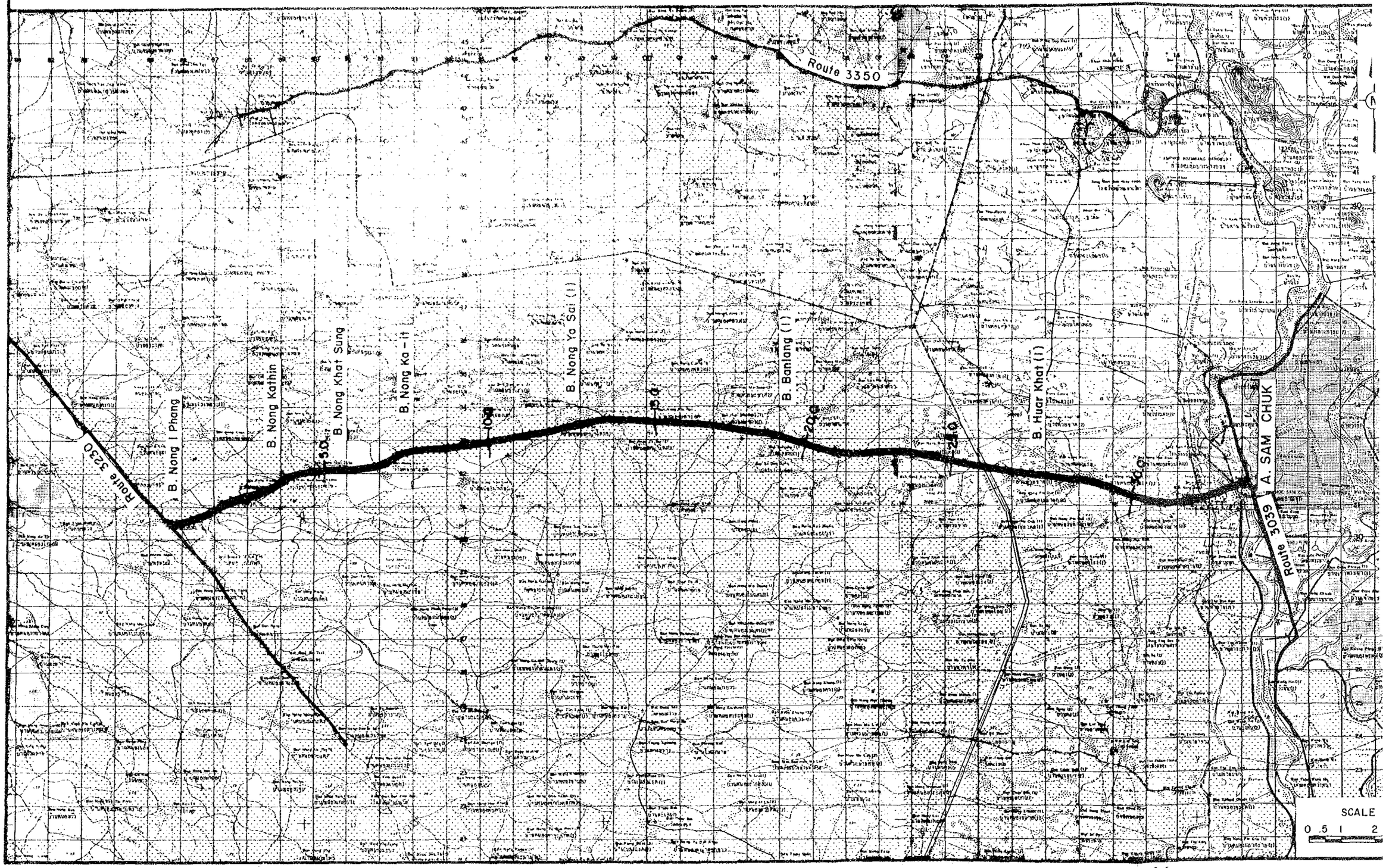
6. DEVELOPMENT AND SOCIAL IMPACTS

The road runs in the middle of a large flat area with villages densely distributed. Farmers particularly in the middle part of the road would benefit from the improvement by better accessibility to Amphoe Sam Chuk and Muang Suphanburi. The project would bring about gradual changes in their activity patterns.

PROJECT NO. IM – 3

B. NONG EI PANG – A. SAM CHUK
C. SUPHANBURI

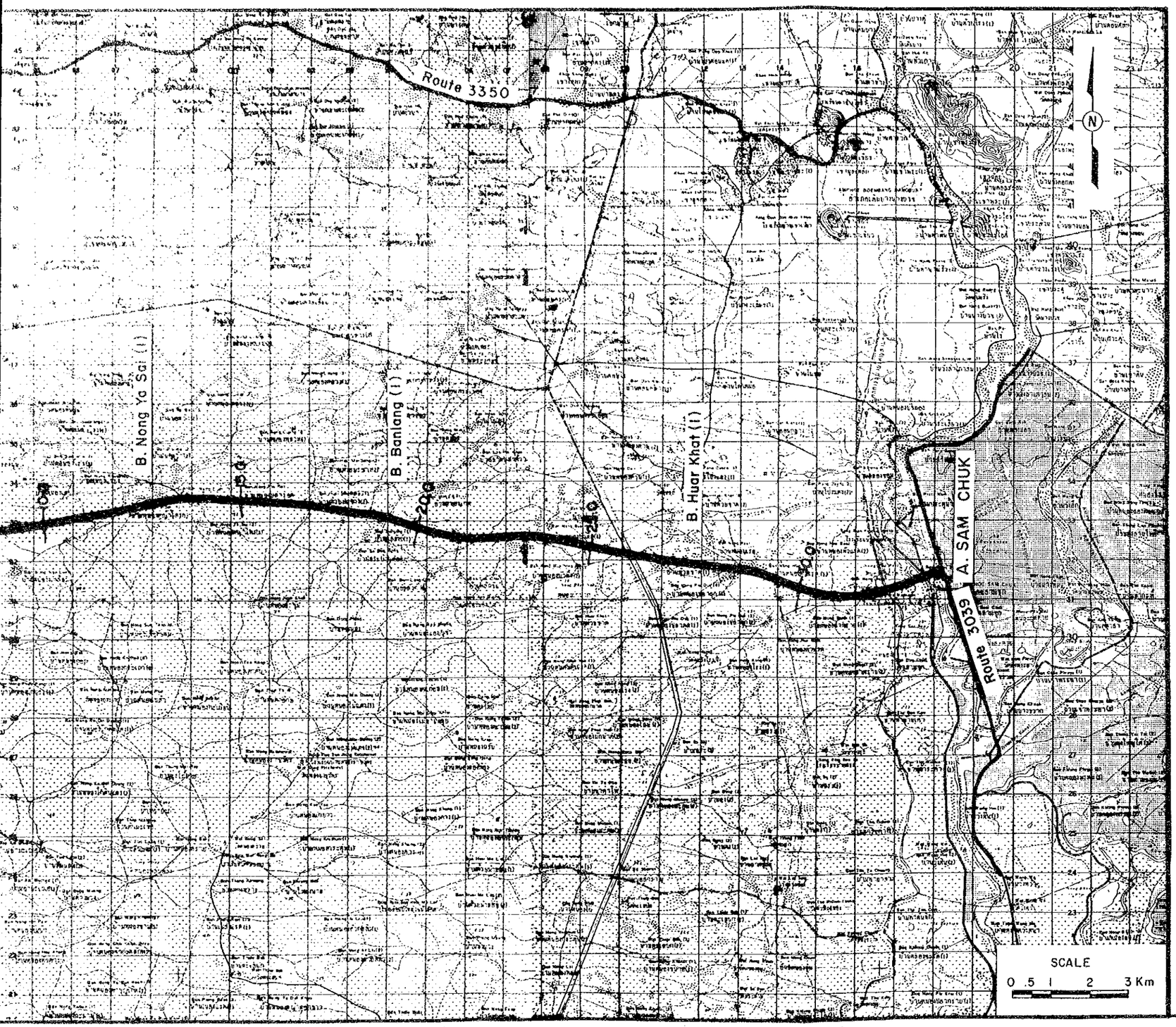
L = 33.60 KM.



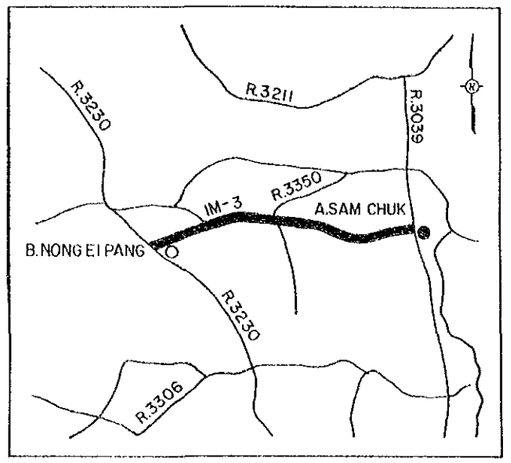
NO. IM - 3

B. NONG EI PANG — A. SAM CHUK
C. SUPHANBURI

L = 33.60 KM.



LOCATION MAP



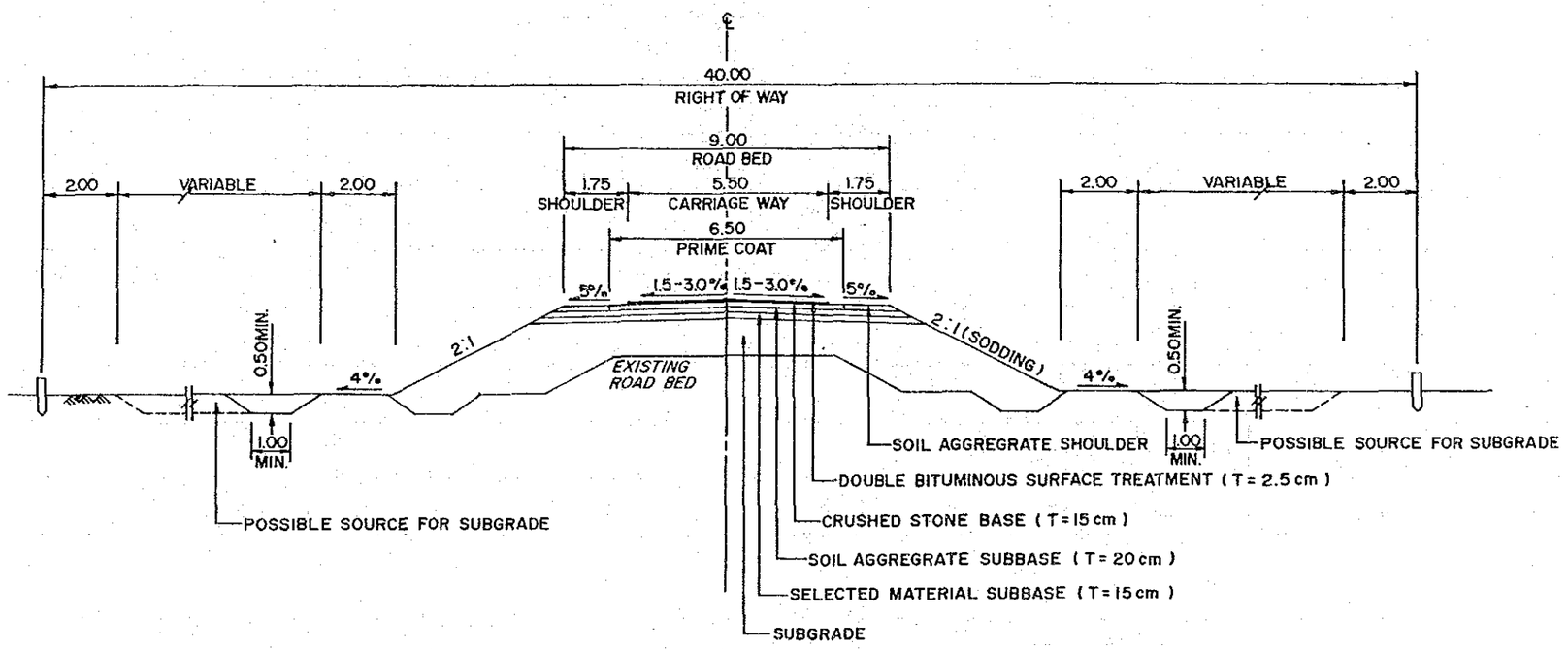
BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	26.0	C-7.00x30.20	C-3.60x30.20
2	29.5	C-7.00x21.10	C-4.00x21.10
3	33.6	C-7.00x20.00	C-4.00x20.00

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE

TYPICAL CROSS SECTION



PROVINCIAL HIGHWAY (CLASS F4)

PROJECT NO. IM-3

ROAD INVENTORY (1/2)

ROUTE NO. RURAL NONG EI PANG (J.R. 3230) – NONG YA SAI – A. SAM CHUK (J.R. 3039)

C. SUPHAN BURI

L = 33.6 km

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
VILLAGE	Name of Village	B.NONG EI PANG		B.NONG KRA TIN		B.NONG KRA IT		B.DONG PLA DANG, KING AMPHOE NONG YA SAI			B. BALLANG	B. LAK CHAI		B. SONG, B. NONG PAI	B, DON YAO	B.NONG PAK NAK	
TERRAIN									Flat								
CROSS SECTION	Formation Width (m)			5.70			6.50	5.00		5.70		6.00			5.00		
CROSS SECTION	Embankment Height (m)			1.00				0.50			1.00			0.50		0.10	0.50
CROSS SECTION	Cutting Depth (m)																
SURFACE	Type/Length (km)				Laterite/12.9					SBST/7.0		Lat. 1.2	* 0.3, Lat. 1.6	* 0.8, Lat. 1.7	* 1.5	Lat. 0.7, *	
SURFACE	Condition				Poor							Fair					
FLOODING	Overflow Length (km)/Height (m)															Flood	
LAND USE	Left		Paddy	Tobacco		Sugar Cane					Paddy						
LAND USE	Right		Paddy	Tobacco		Sugar Cane					Paddy						
BOX CULVERT & BRIDGE	Station (km)														26+000		29+500
BOX CULVERT & BRIDGE	Dimension (m) Bridge – Conc. or Wooden – Width – (Sidewalk) – Length														C-Br. 3.60x30.20		C-Br. 4.00(0.85)x21.10
RIGHT OF WAY (m) (Left/Right)				18.00		30.00		18.00		20.00			18.00			25.00	
ALIGNMENT	Horizontal				Fair					Poor				Fair			
ALIGNMENT	Vertical							Good									
ROUTE NO., AGENCIES					PWD								ARD				

* = SBST

ROAD INVENTORY (2/2)

PROJECT NO. IM-3 | **ROUTE NO. RURAL NONG EI PANG (J.R. 3230) – NONG YA SAI – A. SAM CHUK (J.R. 3039)** | **L = 33.6 km**

C. SUPHAN BURI

STATION (Km)		30	32	33+600	34	36	38	40	42	44	46	48	50	52	54	56	58	60
VILLAGE Name of Village			B.NONG LAMOR	B. TANON KAD														
TERRAIN			Flat															
CROSS SECTION	Formation Width (m)		4.90															
	Embankment Height (m)		1.00															
	Cutting Depth (m)																	
SURFACE	Type/Length (km)		SBST															
	Condition		Poor															
FLOODING	Overflow Length (km)/Height (m)																	
LAND USE	Left		Paddy															
	Right		Paddy															
BOX CULVERT & BRIDGE	Station (km)			33+600														
	Dimension (m) Bridge - Conc. or Wooden - Width - (Sidewalk) - Length			C-Br. 4.00 x 20.0														
RIGHT OF WAY (m) (Left/Right)			25.00															
ALIGNMENT	Horizontal		Fair															
	Vertical		Good															
ROUTE NO., AGENCIES			ARD															