PROPOSED ROUTE NO. IM - 29

Changwat : Buri Ram / Surin

A. Prakhon Chai (J R.24) - A. Krasang

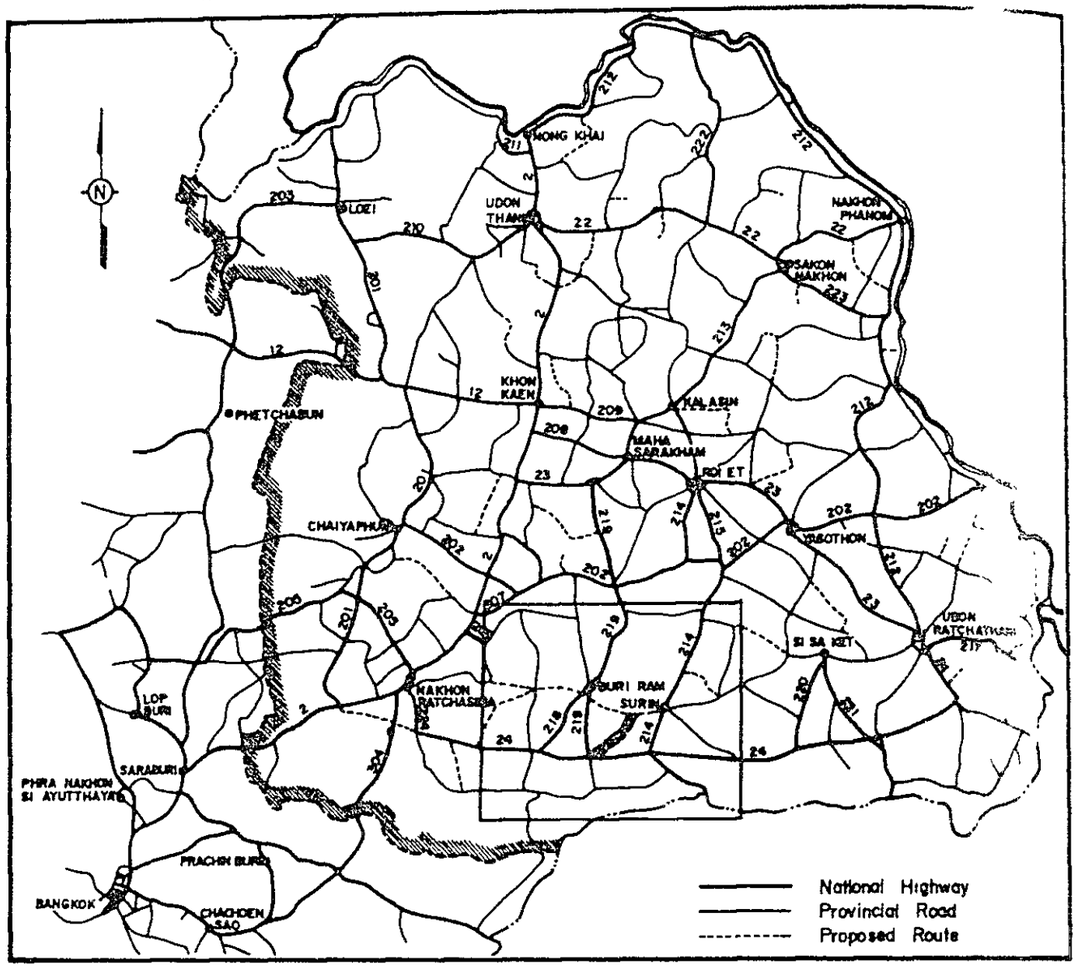
Length : 48.0 KM.

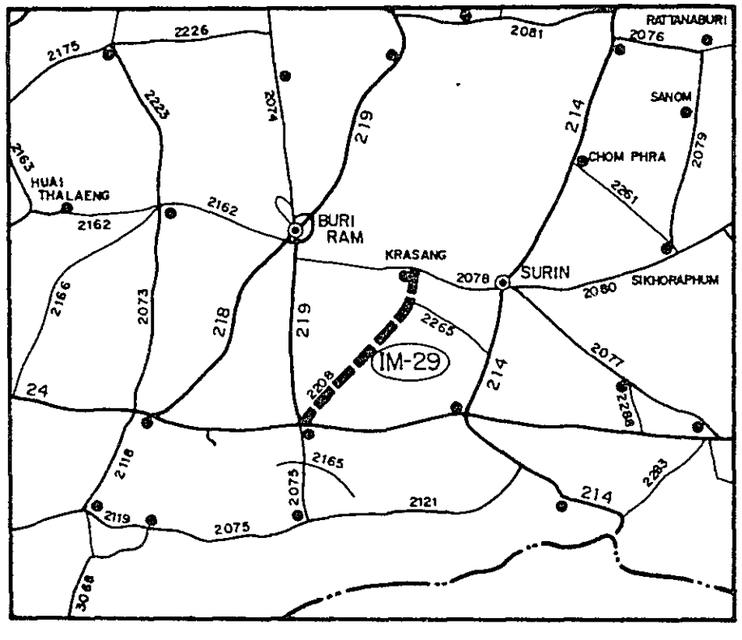
SUMMARY

PROPOSED ROUTE IM-29

Item	Description
Changwat	Buri Ram/Surin
Origin	A. Prakhon Chai (J.R.24)
Destination	A. Krasang
Length	
Total	48.0 km
Improvement Section	48.0 km
DOH Road	R.2208 36.0 km
ARD Road	12.0 km
Others	0 km
New Alignment Section	0 km
Surface Type and Condition	Soil Aggregate, Good
Terrain	Flat
Influence Area	
Area	360 km^2
Population (1982)	59,800
Principal Crops	Paddy
Traffic (ADT)	
Existing	185
1993	772
2001	1,063
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	95,474 . 10^3 ฿
Economic	86,323 . 10^3 ฿
IRR	11.5 %
B/C	0.96
Recommendation	For further consideration

LOCATION OF PROPOSED ROUTE





1. 概　　要

1.1　計画路線の概要

本路線はBuri RamおよびSurin の両県にまたがる。ルートは，Praphon Chaiの県道24号線と 219号線とが交差する所を起点とし，北東に走りChan Dum村，Khok kamin村，Phat村を経て，Krasang 郡で終る。その総延長は48.0kmである。（Figure 29.5.2参照）

沿道の地形は，ほぼ平坦である。影響圏内には，いくつかの村があり，その総人口は，59,800人である。沿道には，医療センターが１ヶ所，病院が２ヶ所あり教育施設としては中学校が２ヶ所ある。

本路線は農業的に開発の進んだ地域における２つの幹線道路国道24号線と県道2078号線を結ぶ重要な道路網の形成を目途に計画されたものである。

1.2　現道の状況

計画路線に利用した現道の状況はTable　29.1.1に要約し，その詳細はTable　29.1.2のインベントリー調査の結果に示した。

2．交通

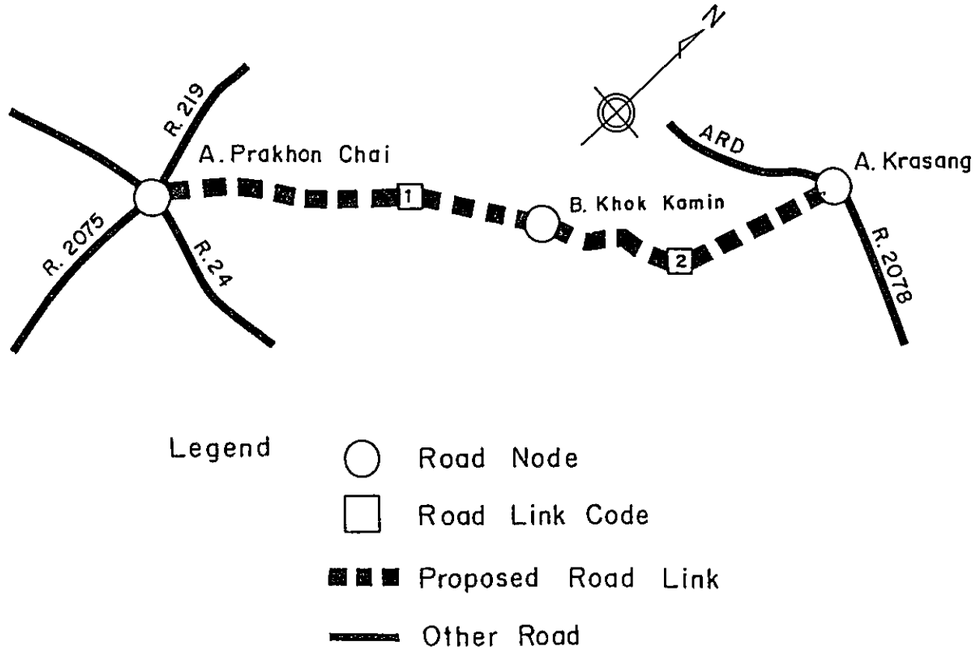
2.1　予測手法

計画対象路線に関し道路改良後の転換交通はほとんど無視し得るので，交通量予測には「伸び率方式」を適用することとした。

2.2　基準年交通量

道路リンク別車種別の基準年交通量は，ＤＯＨ交通量調査結果および本調査で実施したマニュアルカウンティングのデータを基として次のように推定した。

Proposed Road Link



Traffic Volume in Base Year

Source (base year)	Link No	Vehicle Type									
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T	ADT
DOH (1981)	1 1/	28	35	28	35	23	6	18	15	10	198
	2	n.a.									
Manual Counts (1982)	1	n.a.									
	2	-	46	-	57	-	5	10	39	10	167
Estimated	1	28	35	28	35	23	6	18	15	10	198
	2	-	46	-	57	-	5	10	39	10	167

Note: 1/ Route 2208 Section 0100 Station Km 6+500

2.3 交通需要

計画路線上の旅客交通需要（トリップ／日）および貨物交通需要（トン／日）は，先に求めた基準年の交通量に路側インタビューによって得られる平均乗車人員もしくは平均貨物積載量をかけることによって推定した。推定結果は以下のとおりである。

PASSENGER MOVEMENT (1982)

PROPOSED ROAD LINK	TRIPS PER DAY
1	2234
2	1349

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	89	46	136
2	119	62	181

2.4 交通需要の将来伸び率

1981－1987，1987－1993，1993－2001の各期間における旅客および貨物の交通需要の将来伸び率は，メインレポートの7.3.3の1）で述べた予測式に従って求めた。予測の前提および得られた将来伸び率は以下の通りである。

GROWTH RATE OF PASSENGER MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981 - 1987	1987 - 1993	1993 - 2001
PER CAPITA INCOME	4.2	4.5	4.7
TRANS. PRICE INCREASE	4.5	4.5	4.5
POPULATION	1.8	1.6	1.4
PASSENGER MOVEMENT	5.8	6.0	6.0

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981 - 1987	1987 - 1993	1993 - 2001
NON-AGRI.	7.5	7.7	7.8
AGRICULTURE	0.2	0.2	0.2
FREIGHT	5.0	5.1	5.2

2.5 誘発および開発交通量

メインレポートの7.3.3の3）で述べた方式を基に誘発および開発交通量の通常交通量に対する比率を求めた。

RATE OF INDUCED AND DEVELOPED TRAFFIC

(%)

ITEM	YEAR		
	1987	1993	2001
INDUCED	15.0	15.0	15.0
DEVELOPED	0.0	5.6	5.6

2 6 将来交通量

1) 車種構成

計画路線上の旅客・貨物に関する将来交通需要を，以下の車種構成比によって車種別交通量に変換した。

TRAFFIC COMPOSITION

(UNIT : %)

LINK NO.	YEAR	PASSENGER					FREIGHT			
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T
1	1982	18.8	23.5	18.8	23.5	15.4	12.2	36.7	30.6	20.4
	1987	16.3	26.0	19.4	24.1	14.2	13.7	30.5	31.9	23.9
	1993	13.9	28.4	20.0	24.8	12.9	15.1	24.3	33.2	27.4
	2001	10.6	31.7	20.8	25.7	11.2	17.0	16.0	35.0	32.0
2	1982	0.0	44.7	0.0	55.3	0.0	7.8	15.6	60.9	15.6
	1987	2.9	41.7	5.3	47.2	2.8	10.2	15.7	54.1	19.9
	1993	6.5	38.2	11.6	37.5	6.2	13.1	15.8	45.9	25.1
	2001	11.2	33.5	20.0	24.6	10.8	17.0	16.0	35.0	32.0

2) 将来ＡＤＴ

計画路線上のリンク加重平均将来交通量は以下に示すとおりであり，またその道路リンク別交通タイプ別の詳細はTable 29.2.1 に示す。

AVERAGE FUTURE TRAFFIC ON PROPOSED ROUTE

YEAR	TYPE OF VEHICLE								ADT	M/C	TOTAL
	P/C	L/B	M/B	H/B	P/P&T	4/T	6/T	10/T			
1987	24	30	63	21	71	17	32	16	274	307	582
1993	35	52	87	33	108	20	38	25	398	374	772
2001	52	100	123	54	179	21	45	42	616	447	1063

3. 農業開発

3.1. 現況

影響圏の農耕地の殆どが，水田であり，畑地には，ケナフ，キャッサバ，落花生及び豆類が栽培されている。圏内の主として中央部に，水田及び畑地の未開発可耕地が残っている。

圏内の土地利用及び土地適応性の状況はTable 29.3.1 とFigure 29.3.1 に示し，また，Buri RamとSurin 両県地域の代表的作物暦は，Figure 29.3.2 のとおりである。

3.2. 開発予測

影響圏内の将来の農業開発状況を，With ProjectとWithout Project の双方について予測した。予測した作付面積，単位当り収量及び生産量はTable 29.3.2.のとおりである。代表的作物の農家庭先価格と農業生産費とは，各県の資料及び現地調査の結果を参考にしてTable 29.3.3.のように見積った。

上記のごとく各作物ごとに予測された生産量と庭先価格により，生産価値を計算し，これから農業生産費及び別途見積られた開墾費を差引き，純生産価値（N.P.V ）をTable 29.3.4.のように算出した。

このN.P.V のWith Projectの場合と，Without Project の場合の差が，この道路の開発便益である。

4. 走行費の節減

本報告書，第１巻，第７章で述べた概念と基礎データにもとづき関連する各道路リンクの走行費（以下＂ＶＯＣ＂という）をWith ProjectとWithout Project の両ケースについて計算した。

各リンクにおけるＶＯＣのコスト増に影響を与える道路状況は以下に示すとおりである。

Road Condition

Link		Without Project				With Project			
No.	Terrain	Length (Km)	Road Class /1	Nos. of Wooden Bridge	Nos. of Narrow C.Bridge	Length (Km)	Road Class /1		Nos. of Wooden Narrow Bridge
1	Flat	28.4	2B	7	0	28.4	1 (F4)		0
2	Flat	19.6	2B	0	4	19.6			0

/1 Road 1 : Paved Road

Road 2A : Laterite Road with good surface condition and alignment

Road 2B : Laterite Road with good surface condition but poor alignment

Road 3 : Laterite Road with poor surface condition and alignment

Road 4 : Earth Road

ＶＯＣ節減は，With Projectの全リンクのＶＯＣとWithout Project の際のＶＯＣとの差で，当道路におけるＶＯＣの節減は次に示すとおりである。

Vehicle Operating Cost Saving

(Unit: 1,000 Baht)

Road Class	1987	1993	2001
1 (F4)	7,979	11,687	19,254

5. エンジニアリング

5.1 予備設計

予備設計は，次に示す設計規準を基本に行った。

Design Standard : F4 (feasible)

Geometric Design : AASHTO (Rural Highways)

Typical Cross Section : as shown in Figure 29.5.1

Minimum height of Embankment

- Ordinary Section : 1.0m
- Approach of Bridge in Flat Area : 2.0m
- Flood Section : 0.7m (above flood level)

Pavement Structure

In case of F4 Standard

DBST		:	2.5cm
Crushed Stone Base	CBR≥80%	:	15.0cm
Soil Aggregate Subbase	CBR≥20%	:	15.0cm
Selected Material	CBR≥6%	:	20.0cm

Pipe Culvert

- Standard Size : ø100cm
- Standard Interval
  - Paddy Area : 200 m
  - Others : 500 m

Box Culvert

- Standard Size : 2.4m x 2.4m
- Location : as required

Bridge

Standard Type (width 7.0m)

Short Span Bridge : RC - Slab

Long Span Bridge : PC - Girder

Location : as shown in Bridge List in Figure 29.5.2.

ルートの線形は，Figure 29.5.2に示す。

5.2 工事数量および建設費

予備設計により工事数量と建設費は，各工種ごとに単価を付してTable 29.5.1に示す。

道路規格F4の建設費を財務費用および経済費用に分けて集計すると，下表に示すとおりとなる。

F_4 Standard (DBST) L = 48.0 km

Financial Cost 95,474 . 10^3₱

Economic Cost 86,323 . 10^3₱

6 経済評価

年次別経済費用と便益及び評価結果はTable 29.6.1に示す通りである。

このルートはF4規格でフィージブルである。

7. 社会インパクト

社会インパクトを示すデータ及び評価結果はTable 29.7.1に示す通りである。

Table 29.1.1 SUMMARY OF ROAD INVENTORY

Item	Description			
Origin	A. Prakhon Chai (J.R. 24)			
Destination	A. Krasang			
Length				
Total			48.0	km
Improvement Section			48.0	km
DOH Road	R. 2208		36.0	km
ARD Road			12.0	km
Others			0	km
New Alignment Section			0	km
Terrain	Flat			
Alignment (Hori./Vert.)	Fair / Fair			
Formation Width	6.0 m - 7.0 m, 6.5 m (Weighted average)			
Embankment Section				
Length			48.0	km
Height	0.3 m - 2.0 m			
Cut Section				
Length			0	km
Depth	m - m			
Surface Type and Condition				
SBST or DBST			1.0	km
Soil Aggregate	Good		47.0	km
Earth			0	km
Pipe Culvert	86	each		
Box Culvert	0	each	0	m
Bridge				
Permanent Bridge	0	each	0	m
Narrow Concrete Bridge	4	each	102.0	m (4m)
Wooden Bridge	7	each	125.1	m
Overflow Section	0	place	0	km

Table 29.1.2 ROAD INVENTORY (1)

PROPOSED ROUTE NO. IM-29 ROUTE NO. 2208 ARD 2265 2078 A. PRAKHON CHAI (J.R. 24) ~ A. KRASANG BURI RAM/SURIN L = 48.0 Km.

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30													
VILLAGE - Name - Household (H) - Population (P)		A. PRAKHON CHAI	B. PRAKHON CHAI H = 200 P = 1000	B. PALAT H = 250 P = 1250	B. CHAN DUM H = 300 P = 1500	B. SA DAO H = 370 P = 1850	B. PHLAP PHLA H = 35 P = 175	B. LAM DENG H = 150 P = 755	B. KHOK KAMPEN H = 400 P = 2000																					
TERRAIN		Flat																												
CROSS SECTION	Formation Width (m)	7.00	6.00														6.50													
	Embankment Height (m)	0.20	1.20	0.60	0.50	1.00	0.30	0.50	0.70	1.00	0.50	1.00	2.00	1.00	0.50	0.30	1.50	2.00												
	Cutting Depth (m)																													
PAVEMENT	Type/Length	Laterite									DT	Laterite																		
	Condition	Good																												
FLOODING	Overflow Length(Km)/Height(m)																													
LAND USE	Left	Paddy																												
	Right	Paddy																												
PIPE CULVERT	Total Number	86 Pipes																												
BOX CULVERT & BRIDGE	Station (Km)	3.2	4.1	5.5	8.5	9.6	20.8	21.8	29.2	29.6																				
	Dimension	W-Br. 4.30 x 21.30	W-Br. 4.20 x 11.30	W-Br. 4.20 x 20.00	W-Br. 4.20 x 12.00	W-Br. 4.30 x 25.10	W-Br. 4.20 x 25.20	W-Br. 5.40 x 10.20	C-Br. 4.50 x 36.00	C-Br. 5.60 x 32.00																				
RIGHT OF WAY (m)		12.0																												
ALIGNMENT	Horizontal	Fair																												
	Vertical	Fair																												
ROUTE NO., AGENCIES		DOH 2208																												
		ARD																												

ROAD INVENTORY (2)

ROUTE NO. IM-29 ROUTE NO. 2208 ARD 2265 2078

A. PRAKHON CHAI (J.R. 24) ∿ A. KRASANG (Cont'd)

BURI RAM/ SURIN

L = 48.0 Km.

STATION (Km)		30		32		34		36		38		40		42		44		46		48		50		52		54		56		58		60
VILLAGE - Name - Household (H) - Population (P)				B. PA YAO H = 30 P = 150		B. BUA THANON H = 230 P = 1150				B. KRATHUM H = 26 P = 130		B. KANUNG H = 197 P = 1040		B. PHET H = 65 P = 325		B. SAMRONG H = 150 P = 750		B. RAKA H = 75 P = 375		B. NONG PLAILAI		A. KRASANG								
TERRAIN		Flat																												
CROSS SECTION	Formation Width (m)	6.50		7.00		6.50				7.00				6.50		6.00		7.50		8.50										
	Embankment Height (m)	1.00		0.60		1.50	0.60	1.00		0.50	1.00	0.40	1.00	0.50		0.30														
	Cutting Depth (m)																													
PAVEMENT	Type/Length	Laterite																												
	Condition	Good																												
FLOODING	Overflow Length(Km)/Height(m)																													
LAND USE	Left	Paddy																												
	Right	Paddy																												
PIPE CULVERT	Total Number																													
BOX CULVERT & BRIDGE	Station (Km)										37.1		37.2																	
	Dimension										C-Br. 4.50 x 12.00		C-Br. 4.50 x 22.00																	
RIGHT OF WAY (m)		12.0		15.0						10.0		30.0																		
ALIGNMENT	Horizontal	Fair																												
	Vertical	Fair																												
ROUTE NO., AGENCIES		ARD										DOH 2265						DOH 2078												

Table 29.2.1 TRAFFIC VOLUME ON ROUTE IM - 29

YEAR		1987			1993			2001		
LINK		1	2	AVR.	1	2	AVR.	1	2	AVR.
P/C	N+D	33	4	21	40	12	29	50	33	43
	I	5	1	3	6	2	4	8	5	6
	DV	0	0	0	3	1	2	3	2	3
	TOTAL	38	5	24	49	15	35	61	40	52
L/B	N+D	39	7	26	58	22	43	99	59	82
	I	6	1	4	9	3	6	15	9	12
	DV	0	0	0	4	1	3	6	4	5
	TOTAL	45	8	30	70	26	52	120	72	100
M/B	N+D	49	64	55	72	71	71	121	73	101
	I	7	10	8	11	11	11	18	11	15
	DV	0	0	0	5	5	5	8	5	7
	TOTAL	56	73	63	87	86	87	147	88	123
H/B	N+D	29	4	18	37	12	27	53	32	44
	I	4	1	3	6	2	4	8	5	7
	DV	0	0	0	2	1	2	3	2	3
	TOTAL	33	4	21	45	14	33	65	39	54
P/P&T	N+D	60	64	62	93	84	89	166	120	147
	I	9	10	9	14	13	13	25	18	22
	DV	0	0	0	6	5	6	11	8	9
	TOTAL	69	74	71	113	102	108	202	146	179
4/T	N+D	17	12	15	17	15	16	15	20	17
	I	3	2	2	3	2	2	2	3	3
	DV	0	0	0	1	1	1	1	1	1
	TOTAL	20	14	17	21	18	20	18	24	21
6/T	N+D	18	41	27	23	43	31	33	44	37
	I	3	6	4	3	6	5	5	7	6
	DV	0	0	0	1	3	2	2	3	2
	TOTAL	21	47	32	28	52	38	40	53	45
10/T	N+D	14	15	14	19	23	21	30	40	34
	I	2	2	2	3	4	3	5	6	5
	DV	0	0	0	1	2	1	2	3	2
	TOTAL	16	17	16	23	28	25	37	49	42
ADT	N+D	258	211	239	360	282	328	567	421	507
	I	39	32	36	54	42	49	85	63	76
	DV	0	0	0	23	18	21	37	27	33
	TOTAL	297	242	274	437	342	398	689	511	616
M/C	N+D	297	264	284	357	312	339	440	382	416
	I	24	23	24	25	25	25	21	24	22
	DV	0	0	0	10	10	10	7	9	8
	TOTAL	322	287	307	392	346	374	468	416	447
TOTAL	N+D	555	474	522	717	594	667	1007	803	924
	I	63	55	60	79	67	74	106	87	99
	DV	0	0	0	33	28	31	44	36	41
	TOTAL	618	529	582	829	688	772	1157	926	1063

NOTE

N : NORMAL TRAFFIC D : DIVERTED TRAFFIC

DV : DEVELOPED TRAFFIC I : INDUCED TRAFFIC

Figure 29.3.1 LAND USE AND CAPABILITY OF INFLUENCE AREA
PROPOSED ROUTE NO. IM – 29

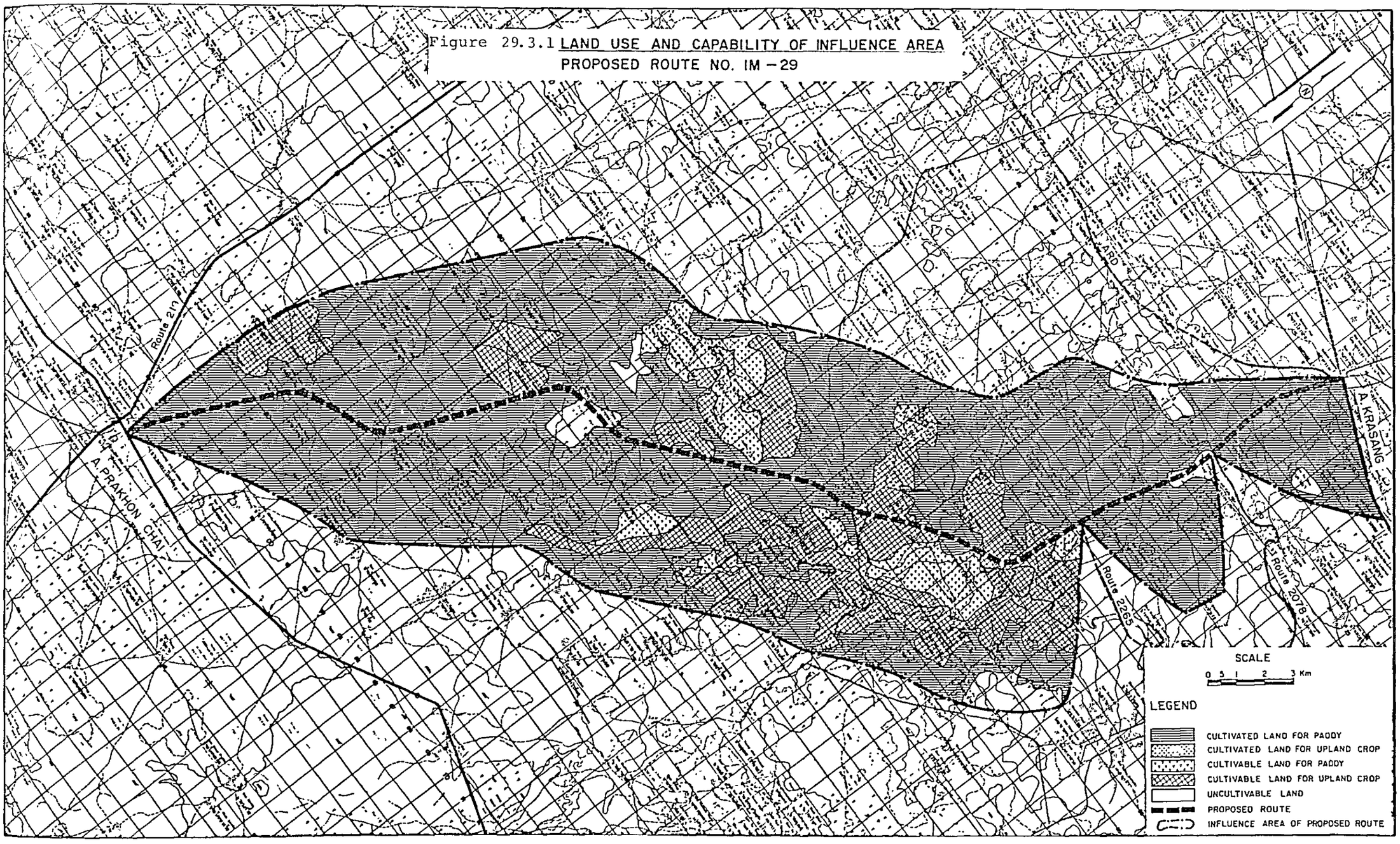
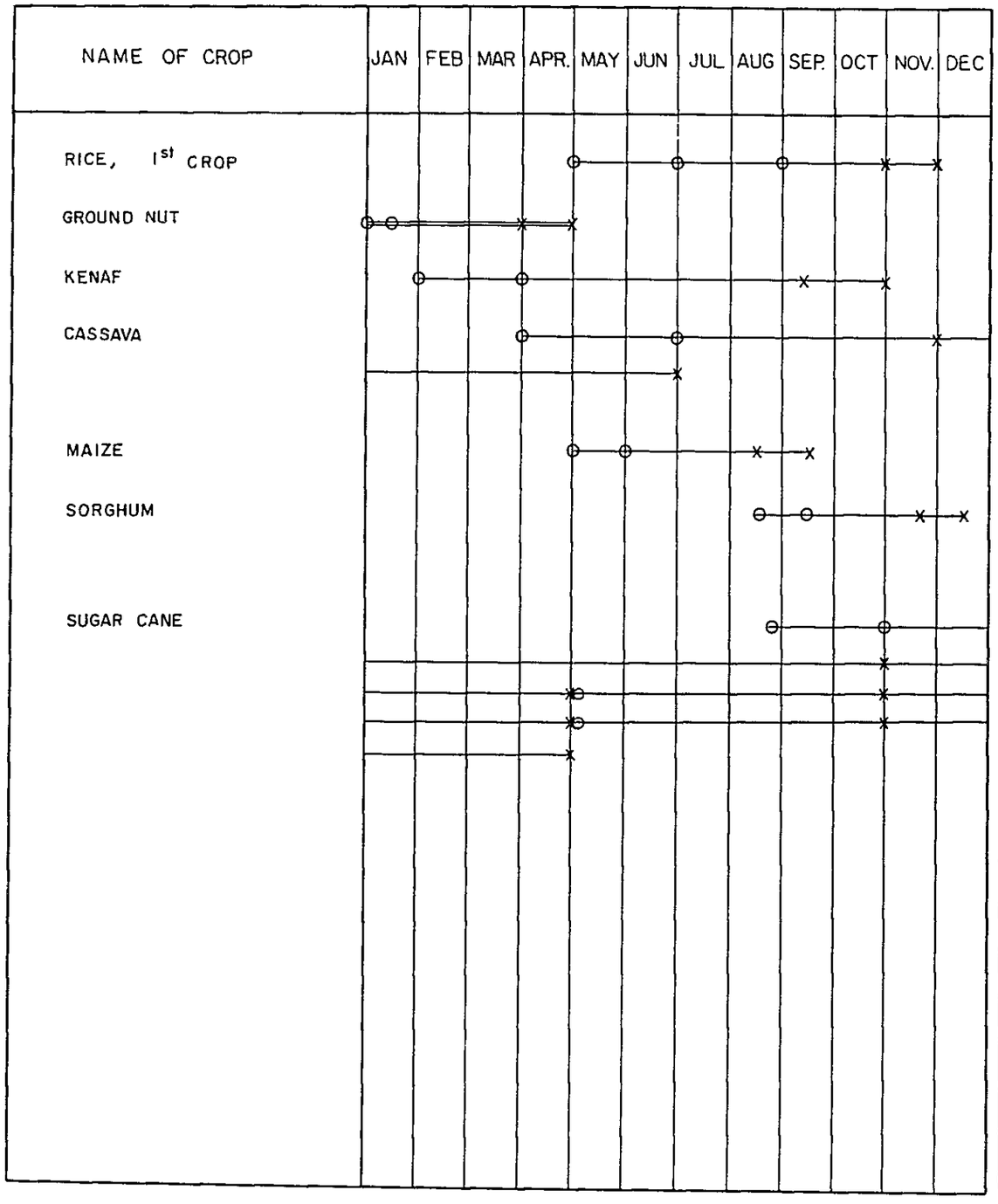


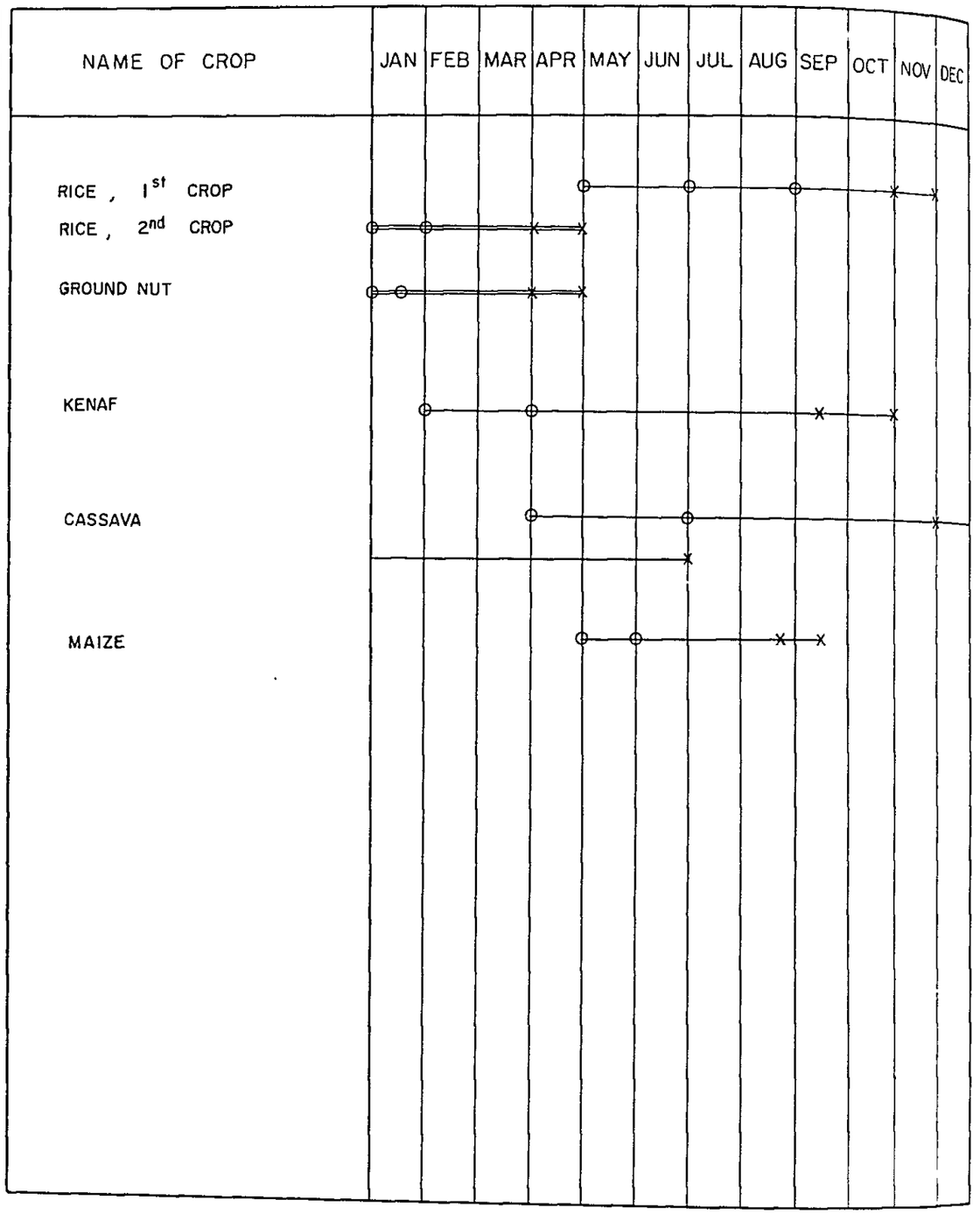
Figure 29.3.2 CROPPING CALENDAR (1)

1400 CHANGWAT BURI RAM



CROPPING CALENDAR (2)

1500 CHANGWAT SURIN



Note

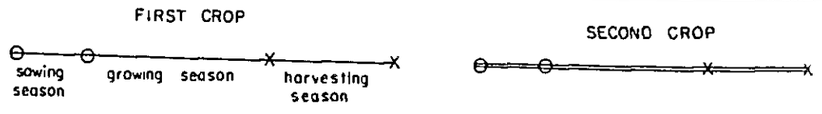


TABLE 29.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (KM^2)]

AMPHOE CODE	AMPHOE NAME	CULTIVATED LAND			UNUSED CULTIVABLE LAND		
		PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
		170.125 (272.2)	-	170.125 (272.2)	13.125 (21.0)	35.625 (57.0)	48.750 (78.0)
1401	M. BURI RAM	1.375 (2.2)	-	1.375 (2.2)	-	-	-
1405	KARASANG	54.375 (87.0)	-	54.375 (87.0)	5.000 (8.0)	8.750 (14.0)	13.750 (22.0)
1411	PRAKHON CHAI	107.500 (172.0)	-	107.500 (172.0)	8.125 (13.0)	19.375 (31.0)	27.500 (44.0)
1501	M. SURIN	6.875 (11.0)	-	6.875 (11.0)	-	7.500 (12.0)	7.500 (12.0)

TABLE 29.3.2 CROP PRODUCTION

ITEM		PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)											
1981		154.20	-	0.08	0.51	1.47	-	2.36	-	4.80	159.00
1987		155.12	-	0.08	0.52	1.53	-	2.39	-	4.90	160.02
1993	WITHOUT PROJECT	156.06	-	0.08	0.53	1.58	-	2.42	-	5.00	161.06
	WITH PROJECT	164.67	-	0.08	0.53	1.93	-	2.47	-	5.40	170.06
2001	WITHOUT PROJECT	157.31	-	0.08	0.54	1.66	-	2.46	-	5.15	162.46
	WITH PROJECT	165.99	-	0.08	0.54	2.03	-	2.50	-	5.56	171.55
CROP YIELD (KG/RAI)											
1981		205.2	-	162.4	181.3	2493.2	-	170.0	-		
1987		206.5	-	163.4	181.3	2493.2	-	170.0	-		
1993	WITHOUT PROJECT	207.7	-	164.4	181.3	2493.2	-	170.0	-		
	WITH PROJECT	210.2	-	166.4	182.4	2508.2	-	170.0	-		
2001	WITHOUT PROJECT	209.4	-	165.7	181.3	2493.2	-	170.0	-		
	WITH PROJECT	215.3	-	170.4	183.8	2528.3	-	170.0	-		
CROP PRODUCTION (TON)											
1981		31,644	-	13	92	3,672	-	402	-	4,416	36,060
1987		32,026	-	13	94	3,807	-	407	-	4,561	36,587
1993	WITHOUT PROJECT	32,412	-	13	96	3,946	-	412	-	4,712	37,124
	WITH PROJECT	34,612	-	13	96	4,846	-	419	-	5,622	40,234
2001	WITHOUT PROJECT	32,934	-	13	98	4,139	-	418	-	4,921	37,855
	WITH PROJECT	35,736	-	14	99	5,124	-	426	-	5,920	41,657

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 29.3.3 FARMGATE PRICE AND PRODUCTION COST

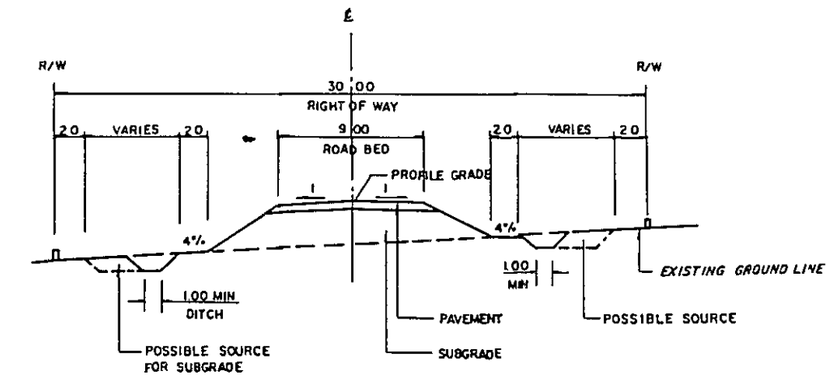
ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	4,144	-	6,799	7,597	681	-	4,636	-
WITH PROJECT (1987 - 2001)	4,248	-	6,799	7,597	698	-	4,752	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	566	-	392	1,008	734	-	664	-
WITH PROJECT (1987 - 2001)	579	-	412	1,028	754	-	664	-

TABLE 29.3.4 NET PRODUCTION VALUE

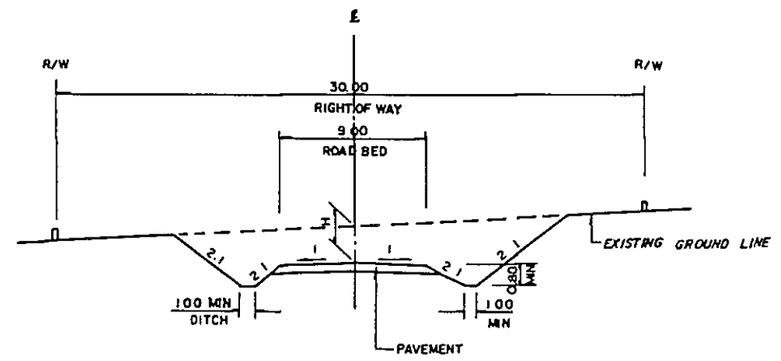
(1000 BAHT)

YEAR	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	44,960	2,038	46,998	46,206	2,103	48,309
1993	46,033	2,100	48,133	51,667	2,548	54,215
2001	47,490	2,188	49,678	55,677	2,699	58,376

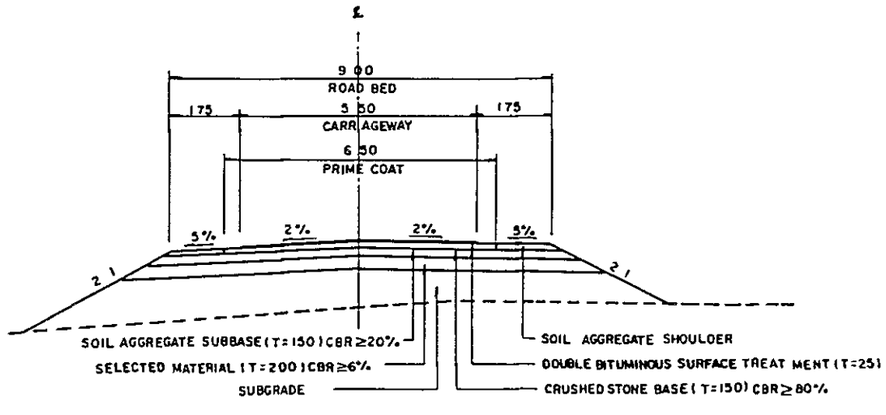
Figure 29.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE



FILL SECTION

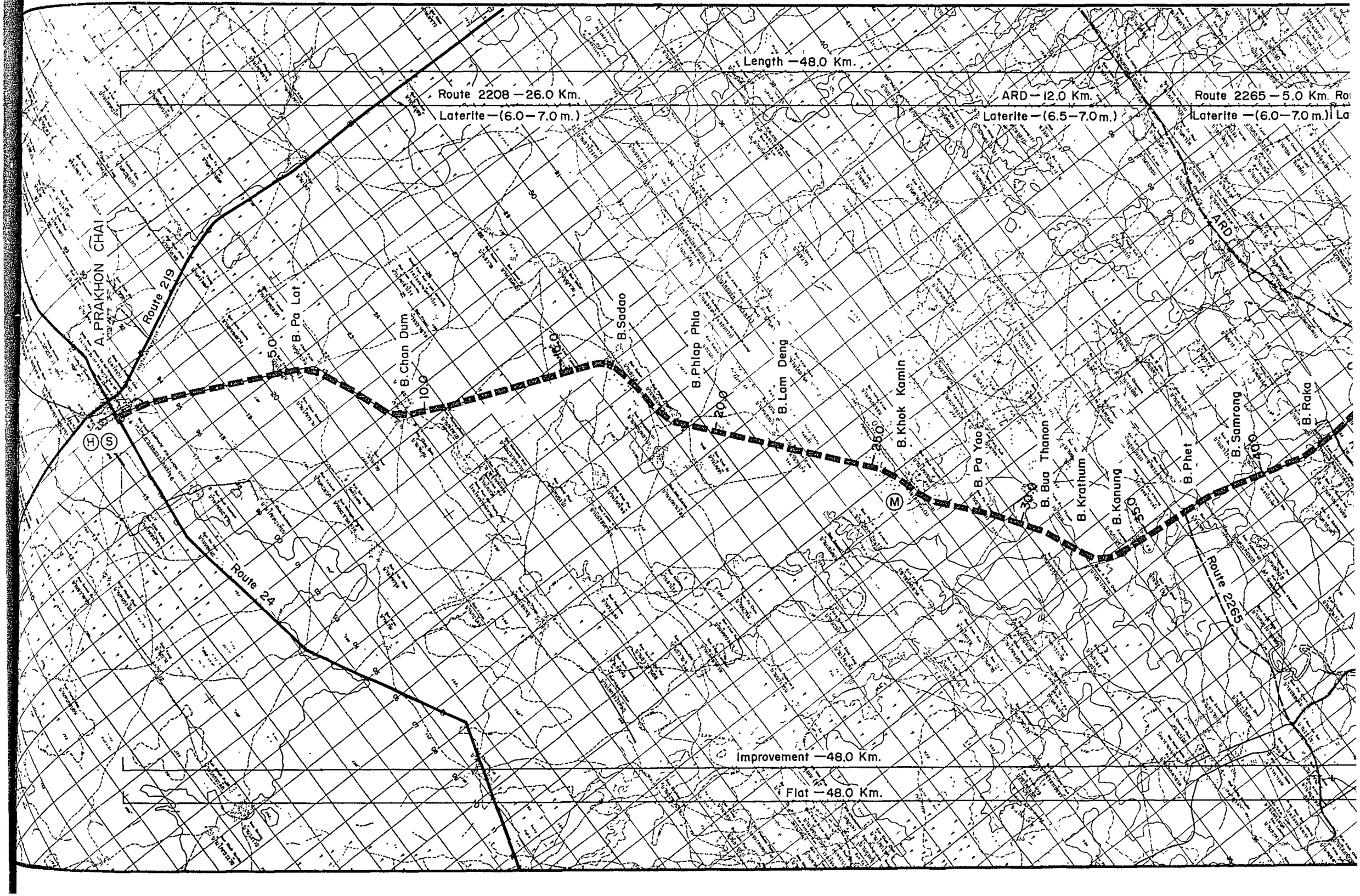


CUT SECTION

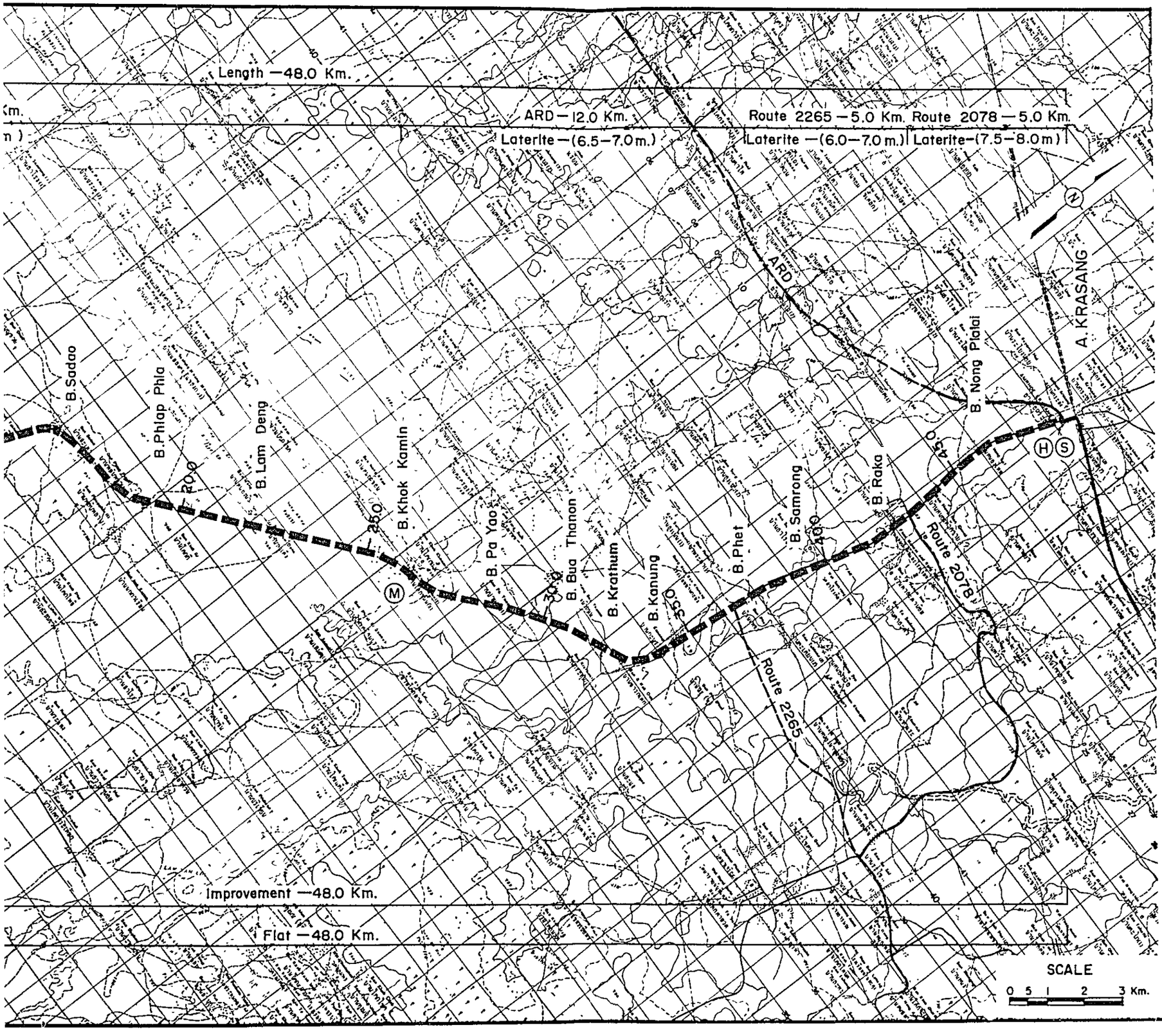


DOUBLE BITUMINOUS SURFACE TREATMENT (DBST) ROAD (Class F4)

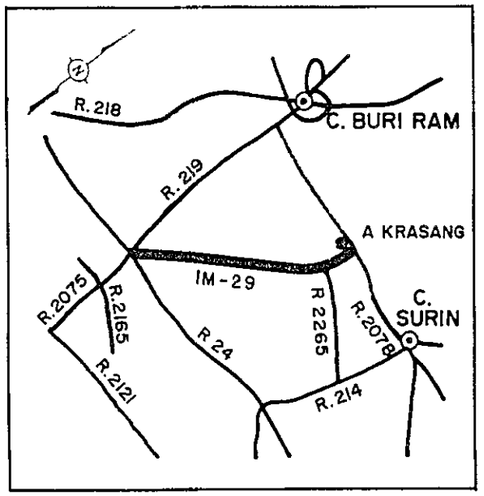
Figure 29.5.2 **PROPOSED ROUTE NO. IM—29** | C. BURI RAM, C. SURIN | A. PRAKHON CHAI (J.R. 24) — A. KRASANG | ROUTE NO. 2208 + ARD + 2265 + 2078 | L = 48.0 Km.



-29 C. BURI RAM — A. PRAKHON CHAI (J.R. 24) — A. KRASANG
C. SURIN ROUTE NO. 2208 + ARD + 2265 + 2078 L = 48.0 Km.



LOCATION MAP



BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	3 2	C—700 x 24 00	W—4 30 x 21 30
2	4 1	C—7 00 x 14 .00	W—4 20 x 11. 30
3.	5.5	C—7.00 x 22.00	W—4 20 x 20 00
4.	8.5	C—7.00 x 14 .00	W—4.20 x 12.00
5.	9.6	C—7 00 x 28.00	W—4.30 x 25 10
6.	20.8	C—7.00 x 28 00	W—4.20 x 25 20
7.	21.8	C—7.00 x 14 .00	W—5.40 x 10.20
8	29.2	C—7.00 x 36 00	C —4.50 x 36.00
9.	29.6	C—7 00 x 32 00	C —4.50 x 32.00
10.	37.1	C—7.00 x 12.00	C —4.50 x 12.00
11.	37.2	C—7 00 x 22.00	C —4.50 x 22.00

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE
- (H) HOSPITAL
- (M) MEDICAL CENTER
- (S) SECONDARY SCHOOL

Table 29.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-29 (48.0 km)

Items	Unit of Q'ty	Financial Unit Rate ฿	(DBST) Q'ty	(DBST) Financial Cost (10^3฿)	(DBST) Economic Cost (10^3฿)
DIRECT CONSTRUCTION COST					
Clearing and Grubbing	ha	15,000	113	1,695	1,542
Excavation - Soil	m^3	20	0	0	0
Excavation - Hard Rock	m^3	160	0	0	0
Embankment	m^3	45	150,200	6,759	6,150
Selected Material	m^3	80	99,600	7,968	7,091
Soil Aggregate Surface or Subbase	m^3	105	69,800	7,329	6,522
Crushed Stone Base	m^3	370	45,800	16,946	15,590
Soil Aggregate Shoulder	m^3	105	19,700	2,068	1,840
Prime Coat and DBST	m^2	55	258,500	14,218	12,796
Pipe Culvert	m	2,100	1,850	3,885	3,574
Box Culvert	m	16,000	0	0	0
Long Span Bridge	m	80,000	0	0	0
Short Span Bridge	m	40,000	246	9,840	8,757
Sub Total (a)				70,709	63,867
Miscellaneous Works (a) x 7%				4,950	4,471
Total (b)				75,659	68,338
PHYSICAL CONTINGENCY (b) x 15%				11,349	10,251
ENGINEERING AND ADMINISTRATION (b) x 10%				7,566	6,834
Sub Total				18,915	17,085
LAND ACQUISITION					
Highly Developed Land	ha	50,000	18	900	900
Less Developed Land	ha	15,000	0	0	0
Sub Total				900	900
GRAND TOTAL				95,474	86,323

Table 29.6.1 COST AND BENEFITS

(F4 STANDARD)

(1000 BAHT)

YEAR	COST CONST. COST	BENEFITS AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	DISCOUNTED(12%) COST	BENEFIT
1984	17,245	0	0	0	0	24,228	0
1985	43,111	0	0	0	0	54,078	0
1986	25,867	0	0	0	0	28,971	0
1987	0	1,311	7,979	-47	9,244	0	8,253
1988	0	1,869	8,597	-30	10,436	0	8,319
1989	0	2,426	9,215	-14	11,628	0	8,276
1990	0	2,984	9,833	3	12,820	0	8,147
1991	0	3,541	10,451	19	14,012	0	7,951
1992	0	4,099	11,069	36	15,204	0	7,703
1993	0	4,656	11,687	52	16,396	0	7,417
1994	23,232	5,160	12,633	77	17,870	10,509	7,217
1995	0	5,664	13,579	102	19,345	0	6,976
1996	0	6,168	14,524	127	20,819	0	6,703
1997	0	6,672	15,470	151	22,294	0	6,409
1998	0	7,176	16,416	176	23,768	0	6,101
1999	0	7,680	17,362	201	25,243	0	5,785
2000	0	8,184	18,308	226	26,717	0	5,467
2001	-40,194	8,688	19,254	250	28,192	-7,343	5,151
TOTAL	69,261	76,279	196,377	1,331	273,987	110,443	105,875

DISCOUNTED ECONOMIC COSTS :	110,443
DISCOUNTED ECONOMIC BENEFITS :	105,875
AGRICULTURAL DEVELOPMENT BENEFIT	27,370
VOC SAVING	78,190
RMC SAVING	315
NET PRESENT VALUE :	-4,568
BENEFIT COST RATIO :	0.96
INTERNAL RATE OF RETURN :	11.5 %

Table 29.7.1 SOCIAL INDICATORS

(Proposed Route IM-29)

Population (1,000)	
1982	: 59.8
1993	: 71.8
Average travelling speed, without (kph)	: 48
Isolation	
Access to Amphoe	
Average distance to Amphoe (km) 1/	: 12.0
Per capita time savings (10^{-4})	: 0.012
Score	: 35
Access to Artery Highway	
Average distance to highway (km) 1/	: 0
Per capita time savings (10^{-4})	: 0
Score	: 0
Impassability	
Impassable week a year	: 1
Impassability per year	: 0.019
Impassability per capita (10^{-4})	: 0.003
Score	: 25
Health	
Access to Hospital	
Average distance to Hospital (km) 1/	: 12.0
Per capita time savings (10^{-4})	: 0.012
Score	: 28
Access to Medical Facilities	
Average distance to facilities (km) 1/	: 7.3
Per capita time savings (10^{-4})	: 0.007
Score	: 28
Education	
Access to Secondary School	
Number of Student in 1993 (1,000) 2/	: 14.4
Average distance to school (km)	: 12.0
Per capita time savings (10^{-4})	: 0.058
Score	: 31
Teacher Intensity	
Number of teachers 3/	
University graduate	: -
Total	: 13
Number of Student	: 440
Indicators	
E1 4/	: -
E2 5/	: 29.5
E 6/	: 29.5
Degree of Improvement 7/	: 2.32
Score	: 148
Disparity	
G.P.V. in 1993 (Mn B) 8/	
With project	: 153.5
Without project	: 140.0
Per capita G.P.V. in 1993 (B)	
With project (W)	: 2,138
Without project (w)	: 1,950
Degree of Disparity	
(A/W) - (A/w) 9/	: 0.13
Score	: 232
Total Score	: 527

Note:

1/ ( ) shows the length or distance in without project case. Unless otherwise, lengthes are same both in with project case and without project case.

2/ Number of secondary school student estimated based on the projected population of the areas of influence applying ratios of secondary school students to the total population in the sample area.

3/ Numbers of the sample areas

4/ (Number of University Graduate Teachers)/(Total Number of Student) x 1,000

5/ (Total of Teachers)/(Total Number of Student) x 1,000

6/ Sum of 4/ and 5/

7/ Ratio of E value of each route to an average value of the same indicator E in case of the sample areas, 33 in number, along paved road near the proposed routes.
The average value of E in case of paved roads were calculated at 68.4 from the following data:

Number of university graduate teachers	438
Number of Teachers	1,285
Number of student	25,196

8/ Estimated gross value of crop production in the areas of influence

9/ "A" indicates an average per capita value of crop production in the Northeastern Region, which is estimated assuming that:
- GRP per capita of the Northeast is estimated at 11,897 Baht in 1993,
- Agricultural sector shares 40% of GRP, and
- Crop production shares 80% of agricultural production.

PROPOSED ROUTE NO. IM - 30

Changwat : Buri Ram / Nakhon Ratchasima

A. Huai Thalaeng - B. Kasang (J.R. 218)

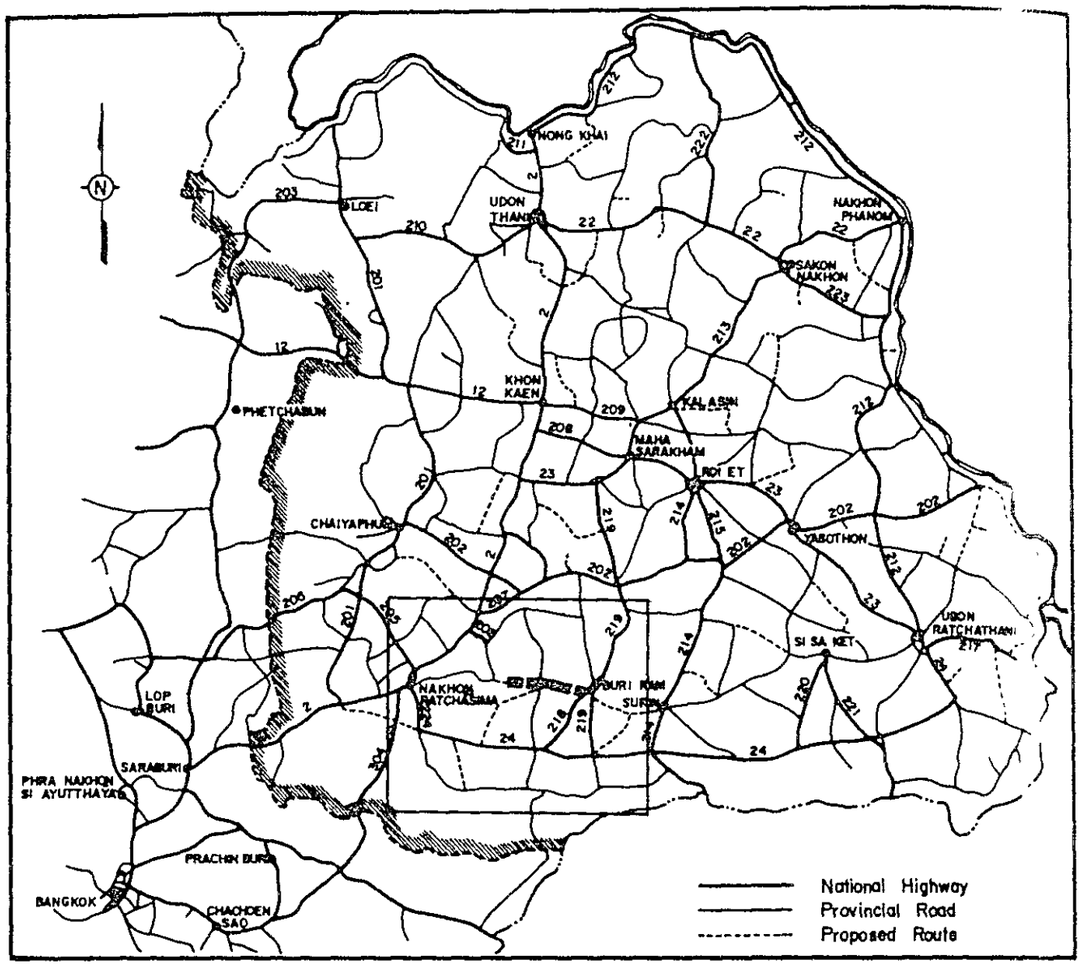
Length : 51.0 KM.

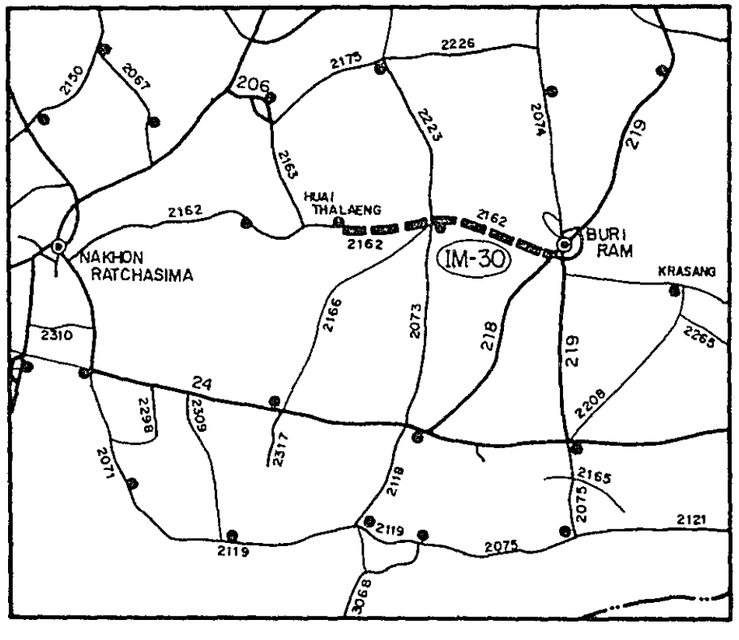
SUMMARY

PROPOSED ROUTE IM-30

Item	Description
Changwat	Buri Ram/Nakhon Ratchasima
Origin	A. Huai Thalaeng
Destination	B. Kasang (J.R.218)
Length	
Total	51.0 km
Improvement Section	44.5 km
DOH Road R.2162	42.0 km
ARD Road	0 km
Others	2.5 km
New Alignment Section	6.5 km
Surface Type and Condition	Soil Aggregate and Earth, Good ~ Poor
Terrain	Flat
Influence Area	
Area	269 km^2
Population (1982)	40,200
Principal Crops	Paddy
Traffic (ADT)	
Existing	184
1993	1,052
2001	1,427
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	96,372 . 10^3 ฿
Economic	87,320 . 10^3 ฿
IRR	14.6 %
B/C	1.24
Recommendation	For further consideration

LOCATION OF PROPOSED ROUTE





1. 概　　要

1.1　計画路線の概要

本路線は，Nakhon Ratchasima およびBuri Ramの両県にまたがる。ルートは，Huai Thalaeng郡を起点とし，東方に走りNong Maeng Thum 村，Lam Plai Mst郡Nong Talao村を経て，Ka Sang 村で終る。その総延長は51.0kmである。
(Figure 30.5.2 参照)

沿道の地形はほぼ平坦である。影響圏内には，いくつかの村があり，その総人口は，40,200人である。
沿道には，医療センターが３ヶ所あり，教育施設としては中学校が１ヶ所ある。

本路線はNakhon Ratchasima 県とBuri Rum県を直接結ぶことができ，しかも計画されている舗装道路と結ぶことによってUbon Ratchathani県までの舗装道路を完成させることを目途に計画されたものである。

1.2　現道の状況

計画路線に利用した現道の状況はTable　30.1.1 に要約し，その詳細はTable　30.1.2 のインベントリー調査の結果に示した。

2. 交　通

2.1　予測手法

本計画路線は道路改良後，交通所要時間の節約により転換交通や誘発交通が大量に期待できるため，交通量予測の手法として「配分方式」を適用することとした。

2.2　ゾーニング

本路線によって交通上変化が予想される地域について，５つの発生ゾーンを設定した。この地域から発生する交通の主要な着ゾーンとしてはHuai Thalang，Lam Plai Mat，Muang Buri Ramの３つのAmphoeを設定した。計画路線および関連する周辺道路は，計画路線について４リンク，周辺道路について１リンクの計５リンクに分割して予測を行うこととした。ゾーン界図およびゾーン・道路リンクの特性はFigure 30.2.1 およびTable　30.2.1，Table　30.2.2 に示すとおりである。

2.3　交通需要

１）旅客需要

基準年におけるＯ／Ｄペア別の旅客需要（トリップ／日）推定値はメインレポートの7.3.3.の１）で述べた算定方式に従って求めた。

推定結果は以下の通りである。

Zone	1	2	3	4	5	11
1	0	439	545	261	289	263
2	0	0	418	198	143	396
3	0	0	0	587	615	845
4	0	0	0	0	376	1215
5	0	0	0	0	0	0
11	0	0	0	0	0	0

Grand Total = 6585

この交通需要を道路リンクに配分することによって得られるリンク別交通需要の推定値は次のとおりである。

PASSENGER MOVEMENT (1982)

PROPOSED ROAD LINK	TRIPS PER DAY
1	397
2	1240
3	2022
4	2775

2）貨物需要

計画路線上の貨物交通需要（トン／日）はメインレポートの7.3.3.の１）で述べた方式によって求めた。推定のための基礎データおよび結果は次に示すとおりである。

Ratios of Total/Non-Agricultural Freight Movement

Year	1987	1993	2001
Ratio	1.39	1.26	1.15

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	13	7	20
2	56	31	87
3	104	59	163
4	157	88	245

2.4　交通需要の将来伸び率

1981－1987，1987－1993，1993－2007の各期間における旅客および貨物の交通需要の将来伸び率は，メインレポートの7.3.3.の１）で述べた予測式に従って求めた。予測の前提および得られた将来伸び率は以下の通りである。

GROWTH RATE OF PASSENGER MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981 – 1987	1987 – 1993	1993 – 2001
PER CAPITA INCOME	4.2	4.5	4.7
TRANS. PRICE INCREASE	4.5	4.5	4.5
POPULATION	1.9	1.6	1.4
PASSENGER MOVEMENT	5.9	6.0	6.0

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981 – 1987	1987 – 1993	1993 – 2001
NON-AGRI.	7.6	7.7	7.8
AGRICULTURE	0.3	0.2	0.2
FREIGHT	6.0	6.5	7.1

2.5　誘発および開発交通量

メインレポートの7.3.3.の3）で述べた方式を基に誘発および開発交通量の通常交通量に対する比率を求めた。

RATE OF INDUCED AND DEVELOPED TRAFFIC

(%)

ITEM	YEAR		
	1987	1993	2001
INDUCED	93.3	95.5	97.4
DEVELOPED	0.0	0.3	0.3

2.6　将来交通量

1）車種構成

計画路線上の旅客・貨物に関する将来交通需要を，以下の車種構成比によって車種別交通量に交換した。

TRAFFIC COMPOSITION

(UNIT : %)

LINK NO.	YEAR	PASSENGER					FREIGHT			
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T
1-4	1982	3.1	53.1	0.0	43.8	0.0	12.5	18.8	59.3	9.4
	1987	6.0	50.2	4.2	37.4	2.2	13.7	18.1	52.9	15.3
	1993	9.4	46.8	9.2	29.7	4.9	15.1	17.2	45.2	22.5
	2001	14.0	42.2	15.8	19.5	8.5	17.0	16.0	35.0	32.0

2）将来ＡＤＴ

計画路線上のリンク加重平均将来交通量は以下に示すとおりであり，またその道路リンク別交通タイプ別の詳細はTable　30.2.3に示す。

AVERAGE FUTURE TRAFFIC ON PROPOSED ROUTE

YEAR	TYPE OF VEHICLE								ADT	M/C	TOTAL
	P/C	L/B	M/B	H/B	P/P&T	4/T	6/T	10/T			
1987	21	14	130	8	189	20	58	17	456	382	837
1993	46	45	145	24	249	24	63	31	626	426	1052
2001	107	121	149	65	357	33	72	65	970	458	1427

3.　農業開発

3.1.　現況

影響圏の農耕地の殆どが水田であり，畑地では，ケナフおよびキャツサバが主体で，これに砂糖きび，落花生及び豆類が次いでいる。未開発可耕地は，主としてLam Plai Mat郡の地域に，水田と畑地の適地が残っている。

圏内の土地利用及び土地適応性の状況はTable　30.3.1とFigure 30.3.1に示し，また，Nakhon Ratcahasima県地域の代表的作物暦はFigure 30.3.2のとおりである。

3.2.　開発予測

影響圏内の将来の農業開発状況を，With ProjectとWithout Project の双方について予測した。予測した作付面積，単位当り収量及び生産量はTable　30.3.2.のとおりである。代表的作物の農家庭先価格と農業生産費とは，各県の資料及び現地調査の結果を参考にしてTable　30.3.3.のように見積った。

上記のごとく各作物ごとに予測された生産量と庭先価格により，生産価値を計算し，これから農業生産費及び別途見積られた開墾費を差引き，純生産価値（N.P.V）をTable 30.3.4.のように算出した。

このN.P.V のWith Projectの場合と，Without Project の場合の差が，この道路の開発便益である。

4. 走行費の節減

本報告書，第１巻，第７章で述べた概念と基礎データにもとづき関連する各道路リンクの走行費（以下＂ＶＯＣ＂という）をWith ProjectとWithout Project の両ケースについて計算した。

各リンクにおけるＶＯＣのコスト地に影響を与える道路状況は以下に示すとおりである。

Road Condition

Link		Without Project				With Project			
No.	Terrain	Length (Km)	/1 Road Class	Nos. of Wooden Bridge	Nos. of Narrow C.Bridge	Length (Km)	/1 Road Class	Nos. of Wooden Narrow Bridge
1	Flat	19.8	4	0	0	18.0	1 (F4)	0
2	Flat	3.5	2B	0	0	7.0		0
3	Flat	15.0	2B	0	0	15.0		0
4	Flat	11.0	2B	3	0	11.0		0

/1 Road 1 : Paved Road
Road 2A : Laterite Road with good surface condition and alignment
Road 2B : Laterite Road with godd surface condition but poor alignment
Road 3 : Laterite Road with poor surface conditon and alignment
Road 4 : Earth Road

ＶＯＣ節減は，With Projectの全リンクのＶＯＣとWithout Project の際のＶＯＣとの差で，当道路におけるＶＯＣの節減は次に示すとおりである。

Vehicle Operating Cost Saving

(Unit:1,000 Baht)

Road Class	1987	1993	2001
1 (F4)	10,877	17,416	32,098

5. エンジニアリング

5.1 予備設計

予備設計は，次に示す設計規準を基本に行った。

Design Standard : F4 (feasible)

Geometric Design : AASHTO (Rural Highways)

Typical Cross Section : as shown in Figure 30.5.1

Minimum Height of Embankment

Ordinary Section : 1.0m

Approach of Bridge in Flat Area : 2.0m

Flood Section : 0.7m (above flood level)

Pavement Structure

In case of F4 Standard

DBST : 2.5cm

Crushed Stone Base CBR≥80% : 15.0cm

Soil Aggregate Subbase CBR≥20% : 15.0cm

Selected Material CBR≥ 6% : 20.0cm

Pipe Culvert

Standard Size : ø 100cm

Standard Interval

Paddy Area : 200 m

Others : 500 m

Box Culvert

Standard Size : 2.4m x 2.4m

Location : as required

Bridge

Standard Type (width 7.0m)

Short Span Bridge : RC - Slab

Long Span Bridge : PC - Girder

Location : as shown in Bridge List in Figure 30.5.2

ルートの線形は，Figure 30.5.2 に示す。

5.2 工事数量および建設費

予備設計により工事数量と建設費は，各工種ごとに単価を付してTable 30.5.1 に示す。

道路規格Ｆ４の建設費を財務費用および経済費用に分けて集計すると，下表に示すとおりとなる。

F4 Standard (DBST) L= 51.0 km

Financial Cost 96,372 · 10^3 ¥

Economic Cost 87,320 · 10^3 ¥

6. 経済評価

年次別経済費用と便益及び評価結果はTable 30.6.1 に示す通りである。

このルートはＦ４規格でフィージブルである。

7. 社会インパクト

社会インパクトを示すデータ及び評価結果はTable 30.7.1 に示す通りである。

Table 30.1.1 SUMMARY OF ROAD INVENTORY

Item	Description		
Origin	A. Huai Thalaeng		
Destination	B. Kasang (J.R. 218)		
Length			
Total		51.0	km
Improvement Section		44.5	km
DOH Road	R. 2162	42.0	km
ARD Road		0	km
Others		2.5	km
New Alignment Section		6.5	km
Terrain	Flat		
Alignment (Hori./Vert.)	Fair, Poor/Fair		
Formation Width	3.0 m - 8.0 m, 6.6 m (Weighted average)		
Embankment Section			
Length		51.0	km
Height	0 m - 1.2 m		
Cut Section			
Length		0	km
Depth	m - m		
Surface Type and Condition			
SBST or DBST		0	km
Soil Aggregate	Good - Poor	11.5	km
Earth	Poor	39.5	km
Pipe Culvert	27 each		
Box Culvert	0 each	0	m
Bridge			
Permanent Bridge	1 each	45.0	m
Narrow Concrete Bridge	0 each	0	m (4m)
Wooden Bridge	3 each	50.3	m
Overflow Section	1 place	4.0	km

Table 30.1.2 ROAD INVENTORY (1)

PROPOSED ROUTE NO. IM-30 ROUTE NO. 2162 Rural 2166

A. HUAI THALAENG ~ B. KASANG (J.R. 218)

BURI RAM/NAKHON RATCHASIMA

L = 51.0 Km.

STATION (Km)		0		2		4		6		8		10		12		14		16		18		20		22		24		26		28		30
VILLAGE - Name - Household (H) - Population (P)								B. THA KHO KHAMAEN H = 100 P = 550		B. HOEY KHAEN H = 70 P = 340		B. NONG TAE H = 65 P = 325		B. NONG MAENG THUM H = 36 P = 120						B. NONG PHAONG H = 120 P = 600		B. YUOEY HOUNG H = 40 P = 200		B. PHAI NOI H = 40 P = 200		A. LAMPLAI MAT				B. BUTAWONG H = 300 P = 1500		
TERRAIN				Flat										Flat								Flat										
CROSS SECTION	Formation Width (m)	5.00	5.5	6.00		5.50		5.00						3.00	5.00							8.00								7.00		
	Embankment Height (m)	0.00		0.30				0.00		0.20				0.00								0.50		1.00		0.40	1.00			0.30		
	Cutting Depth (m)																															
PAVEMENT	Type/Length	La.		Earth										Earth								Laterite										
	Condition	Fair		Poor										Poor								Good										
FLOODING	Overflow Length(Km)/Height(m)			L=4.0 H=0.4																												
LAND USE	Left	Paddy												Paddy								Paddy										
	Right	Paddy												Paddy								Paddy										
PIPE CULVERT	Total Number																					19 Pipes										
BOX CULVERT & BRIDGE	Station (Km)																									23.0						
	Dimension																									C-Br. 9.00 x 45.0						
RIGHT OF WAY (m)														—																		
ALIGNMENT	Horizontal			Poor										Poor																Fair		
	Vertical			Fair										Fair																Fair		
ROUTE NO., AGENCIES				DOH 2162										Rural								DOH 2166								DOH 2162		

ROAD INVENTORY (2)

PROPOSED ROUTE NO. IM-30 ROUTE NO. 2162 Rural 2166 A. HUAI THALAENG ~ B. KASANG (J.R. 218) (Cont'd) L = 51.0 Km.

BURI RAM/NAKHON RATCHASIMA

STATION (Km)		30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60	
VILLAGE - Name / - Household (H) / - Population (P)		B. SEELIAM YAI H = 170 P = 850; B. NONG BUA KHOK; B. NONG TAIAE KHAY H = 95 P = 621; B. SEELIAM NOI H = 236 P = 1262; B. NONG TALAD H = 25 P = 125; B. SAI YONG H = 56 P = 280; B. MUANG H = 110 P = 550	
TERRAIN		Flat	
CROSS SECTION	Formation Width (m)	7.00 | 6.50 | 7.00 | 6.00 | 8.00	
	Embankment Height (m)	0.30 | 0.50 | 0.80 | 0.30 | 0.50 | 0.60 | 0.80 | 0.50 | 1.20	
	Cutting Depth (m)		
PAVEMENT	Type/Length	Laterite	
	Condition	Good	
FLOODING	Overflow Length(Km)/Height(m)		
LAND USE	Left	Paddy	
	Right	Paddy	
PIPE CULVERT	Total Number	8 Pipes	
BOX CULVERT & BRIDGE	Station (Km)	42.6 46.5 46.9	
	Dimension	W-Br. 4.50 x 20.30; W-Br. 4.50 x 15.00; W-Br. 4.50 x 15.00	
RIGHT OF WAY (m)			
ALIGNMENT	Horizontal	Fair	
	Vertical	Fair	
ROUTE NO., AGENCIES		DOH 2162	

Figure 30.2.1 ZONING AND ROAD NETWORK

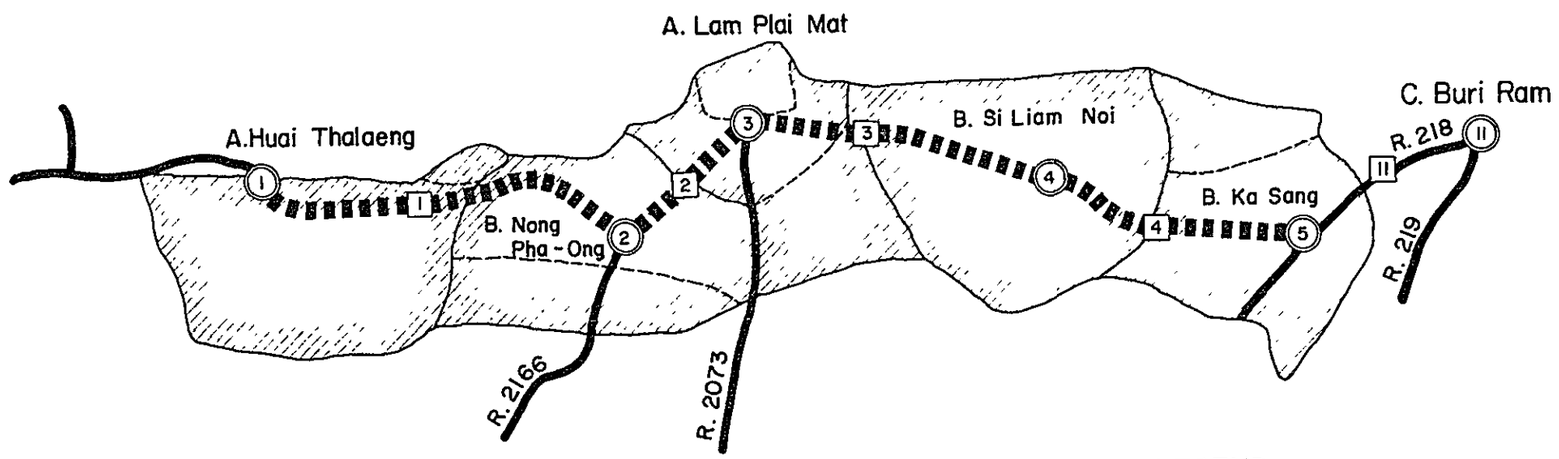


Table 30.2.1 ZONE CHARACTERISTICS

Zone	Administrative Division: Changwat	Amphoe	Tambon Code	Population: Tambon	%	Zone	Attraction
1	Nakhon Ratchasima	Huai Thalang	1	8,860	100	8.7	48.7
2	Buri Ram	Lam Plai Mat	6	4,750	100	4.8	
			14	5,624	60	3.4	
			Total			8.2	
3	Buri Ram	Lam Plai Mat	1	8,541	100	8.5	
			2	5,819	40	2.3	
			8	7,167	40	2.9	
			Total			13.7	43.9
4	Buri Ram	Lam Plai Mat	3	11,527	100	11.5	-
5	Buri Ram	Muang	4	14,623	100	14.6	
			14	8,125	30	2.4	
			Total			17.0	-
11	Buri Ram	Muang	1	25,719	100	25.7	
			2	16,773	10	1.7	
			Total			27.4	206.6

Table 30.2.2 LINK CHARACTERISTICS

Link No	Node Pair: Start Node	End Node	Length: $\bar{W}$	W	Grade: $\bar{W}$	W	Remark
1	1. A. Huai Thalaeng	2. B. Nong Pha-Ong	18.0	18.0	11	4	R.2162
2	2. B. Nong Pha-Ong	3. A. Lam Plai Mat	7.0	7.0	8	4	R.2166
3	3. A. Lam Plai Mat	4. B. Si Liam Noi	15.0	15.0	8	4	R.2162
4	4. B. Si Liam Noi	5. B. Ka Sang	11.0	11.0	8	4	R.2162
11	5. B. Ka Sang	11. C. Buri Ram	5.0	5.0	1	1	R.218

Table 30.2.3 TRAFFIC VOLUME ON ROUTE IM - 30

YEAR		1987					1993					2001				
LINK		1	2	3	4	AVR.	1	2	3	4	AVR.	1	2	3	4	AVR.
P/C	N+D	3	9	14	20	11	6	19	32	43	24	15	45	74	102	55
	I	10	9	11	10	10	22	20	25	21	22	51	46	57	50	52
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	13	18	25	29	21	28	39	56	65	46	66	92	132	152	107
L/B	N+D	2	6	10	14	7	6	19	31	42	23	16	51	83	114	62
	I	7	6	8	7	7	21	19	24	21	22	58	52	65	56	59
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	TOTAL	9	12	18	20	14	27	38	55	63	45	74	104	148	171	121
M/B	N+D	18	55	90	123	67	20	61	100	137	74	20	63	103	141	76
	I	62	56	70	60	63	69	62	77	67	70	71	64	80	69	72
	DV	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0
	TOTAL	80	111	159	183	130	89	124	177	205	145	91	128	183	211	149
H/B	N+D	1	3	5	7	4	3	10	17	23	12	9	28	45	62	33
	I	4	3	4	4	4	11	10	13	11	12	31	28	35	30	32
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	5	7	10	11	8	15	21	29	34	24	40	56	80	92	65
P/P&T	N+D	25	79	131	181	97	33	104	171	237	127	46	148	245	339	182
	I	89	81	102	89	92	117	107	134	117	121	168	155	194	170	174
	DV	0	0	0	0	0	0	1	1	1	1	1	1	1	2	1
	TOTAL	114	161	233	270	189	150	212	306	355	249	215	304	440	510	357
4/T	N+D	2	8	14	21	10	2	9	16	25	12	3	11	21	32	16
	I	7	8	11	10	9	10	10	14	13	12	14	15	20	19	17
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	9	16	25	32	20	12	19	31	38	24	16	26	42	51	33
6/T	N+D	5	22	41	62	30	5	23	43	65	32	6	25	47	70	34
	I	22	23	33	30	27	25	27	38	35	31	30	32	45	41	37
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	27	46	74	93	58	31	50	81	100	63	36	57	92	112	72
10/T	N+D	1	6	12	18	9	3	11	21	32	16	5	23	43	64	31
	I	6	7	9	9	8	13	13	19	17	15	27	29	41	38	34
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	8	13	22	27	17	15	25	40	50	31	33	52	84	102	65
ADT	N+D	57	189	318	447	236	78	256	431	604	320	120	394	660	924	490
	I	207	195	248	219	220	288	270	343	303	305	451	422	536	474	477
	DV	0	0	0	0	0	1	2	2	3	2	2	3	4	4	3
	TOTAL	264	383	565	665	456	367	528	776	910	626	572	819	1200	1402	970
M/C	N+D	107	246	333	392	254	135	295	386	440	297	182	369	451	478	351
	I	194	120	99	62	128	223	125	85	40	129	249	103	16	0	107
	DV	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	TOTAL	301	366	432	454	382	358	420	471	480	426	431	473	467	478	458
TOTAL	N+D	164	434	650	839	490	212	552	817	1044	616	302	763	1111	1401	840
	I	401	315	347	281	347	511	395	428	343	434	699	525	553	474	584
	DV	0	0	0	0	0	2	2	3	3	2	2	3	4	4	3
	TOTAL	565	749	997	1120	837	725	948	1247	1390	1052	1004	1291	1667	1879	1427

NOTE

N : NORMAL TRAFFIC D : DIVERTED TRAFFIC

DV : DEVELOPED TRAFFIC I : INDUCED TRAFFIC

Figure 30.3.1 LAND USE AND CAPABILITY OF INFLUENCE AREA
PROPOSED ROUTE NO. IM – 30

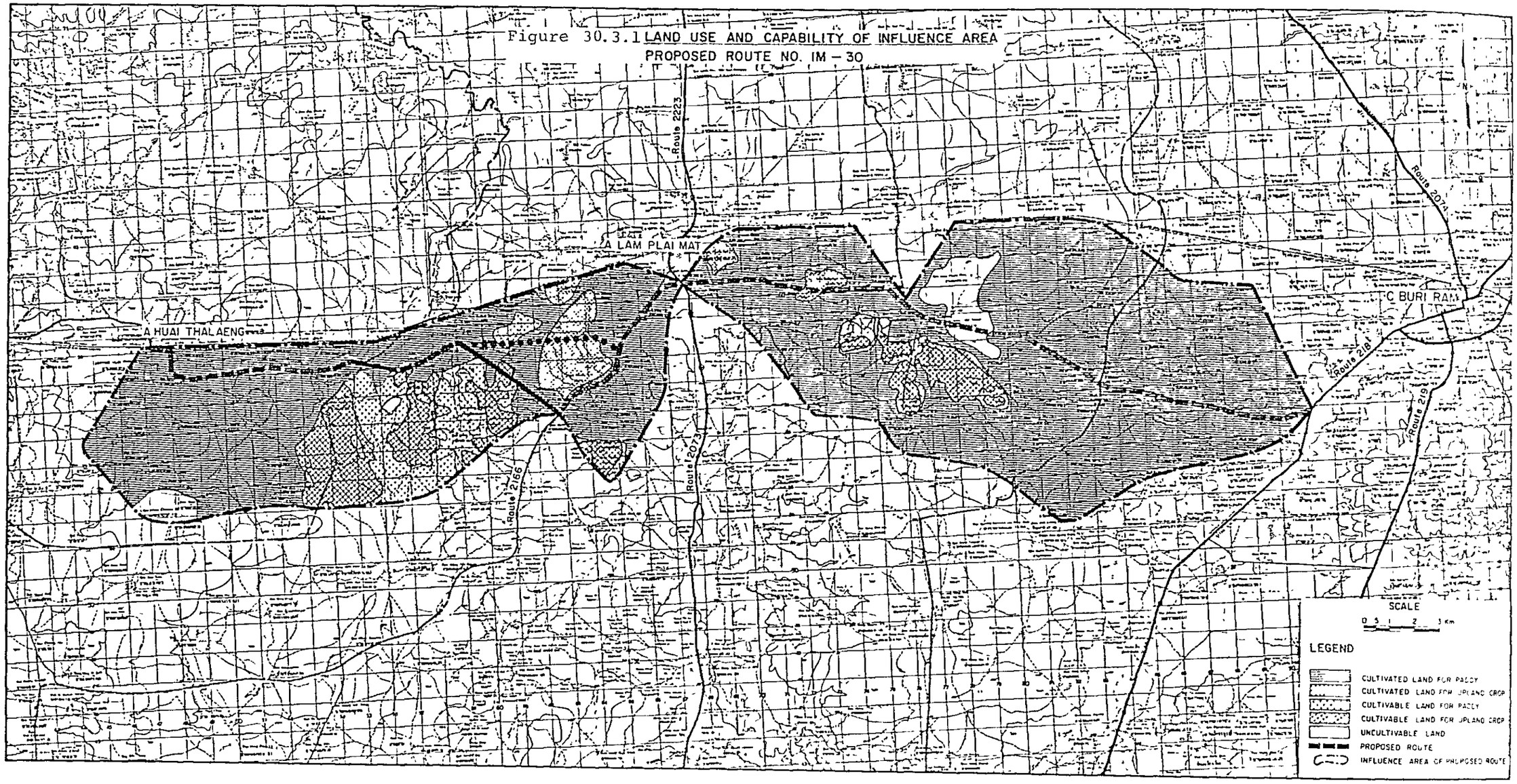
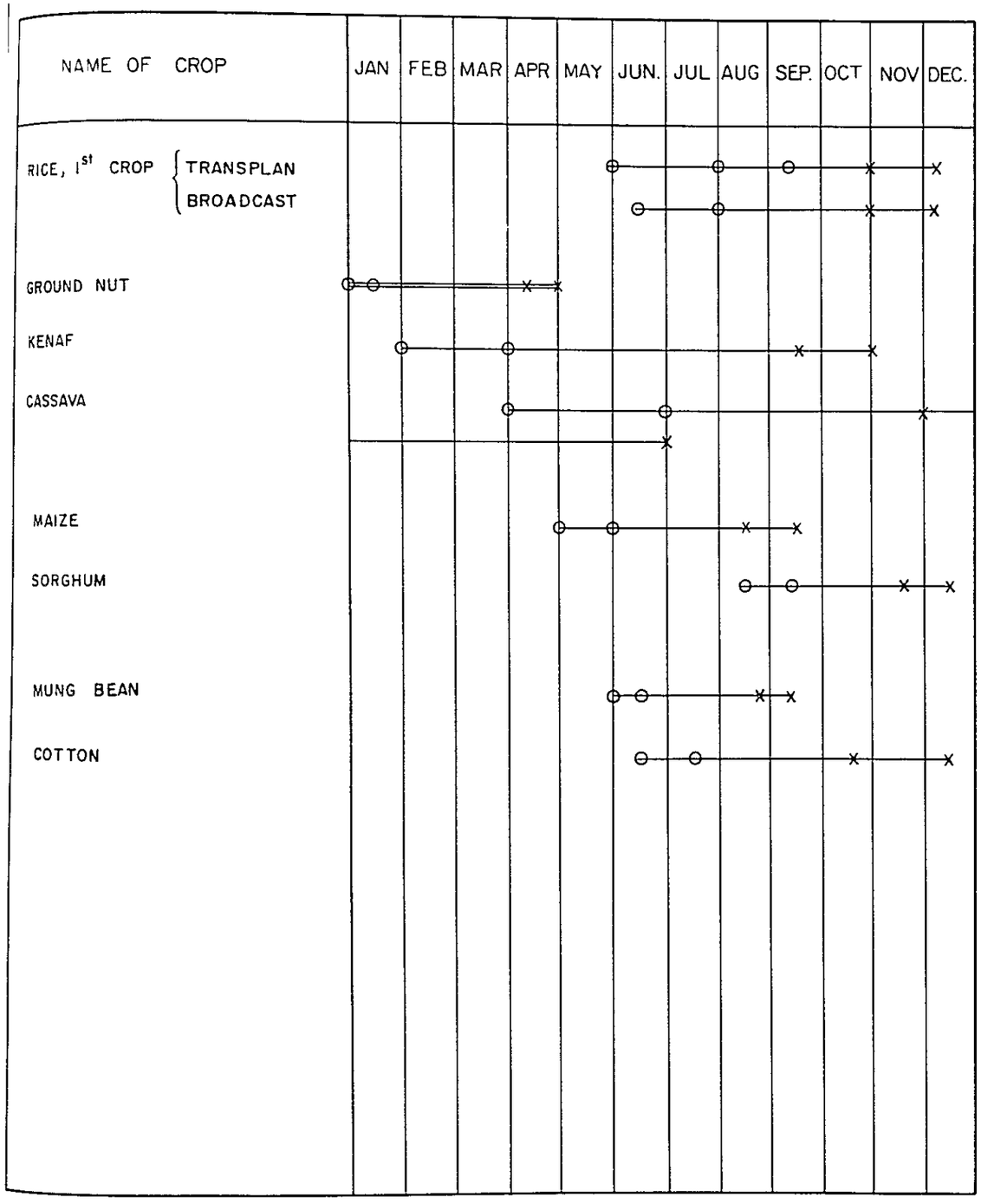


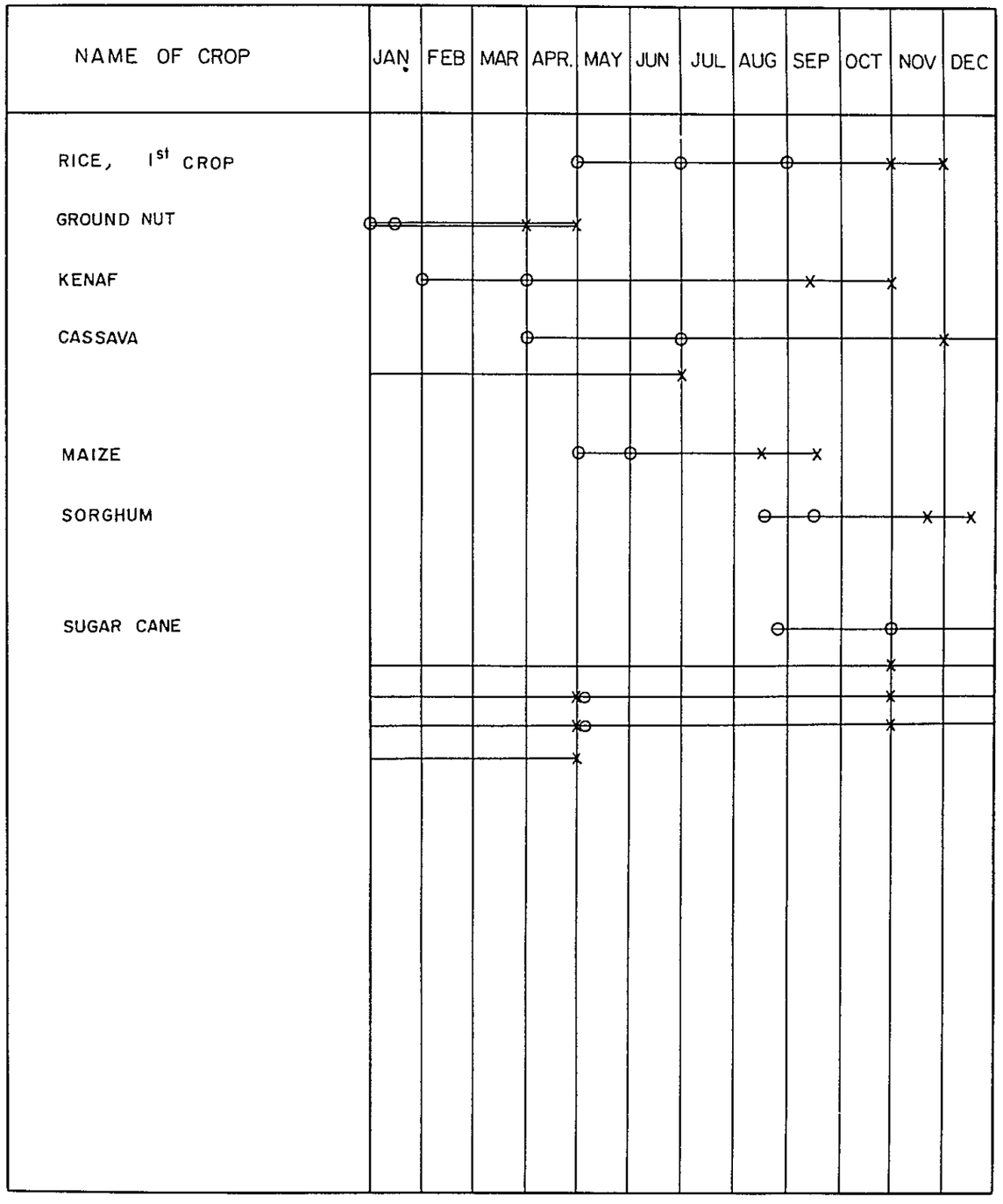
Figure 30.3.2 CROPPING CALENDAR (1)

1300 CHANGWAT NAKHON RATCHASIMA



CROPPING CALENDAR (2)

1400 CHANGWAT BURI RAM



Note

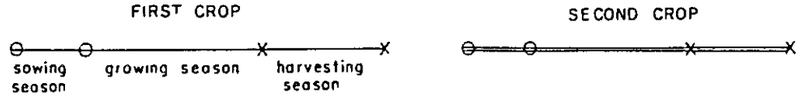


TABLE 30.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (KM^2)]

AMPHOE CODE	AMPHOE NAME	CULTIVATED LAND			UNUSED CULTIVABLE LAND		
		PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
		135.625 (217.0)	5.000 (8.0)	140.625 (225.0)	10.125 (16.2)	12.813 (20.5)	22.938 (36.7)
1310	HUAI THALAENG	30.000 (48.0)	-	30.000 (48.0)	0.125 (0.2)	1.563 (2.5)	1.688 (2.7)
1401	M. BURI RAM	32.500 (52.0)	-	32.500 (52.0)	-	-	-
1406	LAM PLAI MAT	73.125 (117.0)	5.000 (8.0)	78.125 (125.0)	10.000 (16.0)	11.250 (18.0)	21.250 (34.0)

TABLE 30.3.2 CROP PRODUCTION

ITEM			PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)												
1981			117.86	-	0.08	0.23	1.90	0.17	2.28	-	5.13	123.00
1987			119.01	-	0.08	0.23	1.98	0.17	2.28	-	5.24	124.25
1993	WITHOUT	PROJECT	119.01	-	0.08	0.23	2.07	0.17	2.28	-	5.35	124.36
	WITH	PROJECT	119.01	-	0.08	0.24	2.37	0.18	2.28	-	5.71	124.72
2001	WITHOUT	PROJECT	119.01	-	0.08	0.24	2.19	0.17	2.28	-	5.50	124.51
	WITH	PROJECT	119.01	-	0.08	0.25	2.50	0.18	2.28	-	5.88	124.89
CROP YIELD (KG/RAI)												
1981			218.3	-	119.0	213.0	2422.5	6875.0	170.0	-		
1987			219.6	-	119.7	213.0	2422.5	6916.4	170.0	-		
1993	WITHOUT	PROJECT	220.9	-	120.4	213.0	2422.5	6958.0	170.0	-		
	WITH	PROJECT	223.6	-	121.9	214.3	2437.0	6999.8	170.0	-		
2001	WITHOUT	PROJECT	222.7	-	121.4	213.0	2422.5	7013.8	170.0	-		
	WITH	PROJECT	229.0	-	124.8	216.0	2456.6	7112.5	170.0	-		
CROP PRODUCTION (TON)												
1981			25,724	-	10	49	4,606	1,139	387	-	6,267	31,991
1987			26,132	-	10	49	4,803	1,146	387	-	6,476	32,607
1993	WITHOUT	PROJECT	26,289	-	10	50	5,008	1,153	387	-	6,693	32,982
	WITH	PROJECT	26,606	-	10	52	5,769	1,231	387	-	7,544	34,149
2001	WITHOUT	PROJECT	26,500	-	10	51	5,295	1,162	387	-	6,997	33,497
	WITH	PROJECT	27,251	-	10	54	6,149	1,251	387	-	7,954	35,205

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 30.3.3 FARMGATE PRICE AND PRODUCTION COST

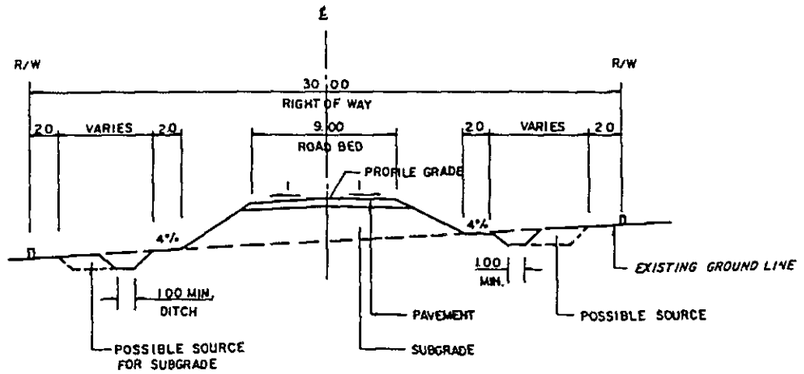
ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	4,190	-	6,839	7,468	670	562	4,347	-
WITH PROJECT (1987 - 2001)	4,295	-	6,839	7,468	687	562	4,456	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	573	-	392	1,023	731	2,183	631	-
WITH PROJECT (1987 - 2001)	583	-	412	1,043	753	2,208	631	-

TABLE 30.3.4 NET PRODUCTION VALUE

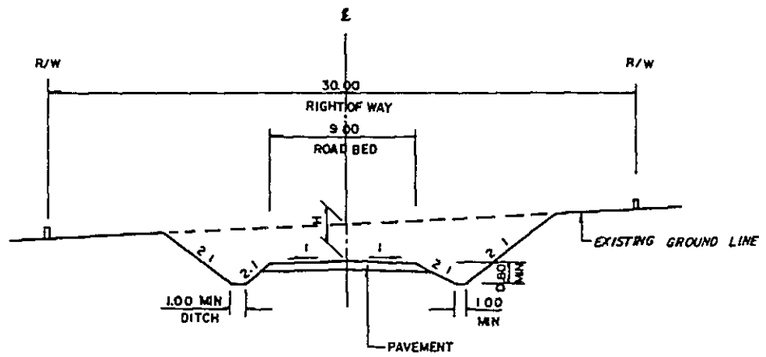
(1000 BAHT)

YEAR	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	41,246	2,447	43,693	42,798	2,511	45,309
1993	41,904	2,529	44,433	44,834	2,927	47,761
2001	42,788	2,646	45,434	47,605	3,113	50,718

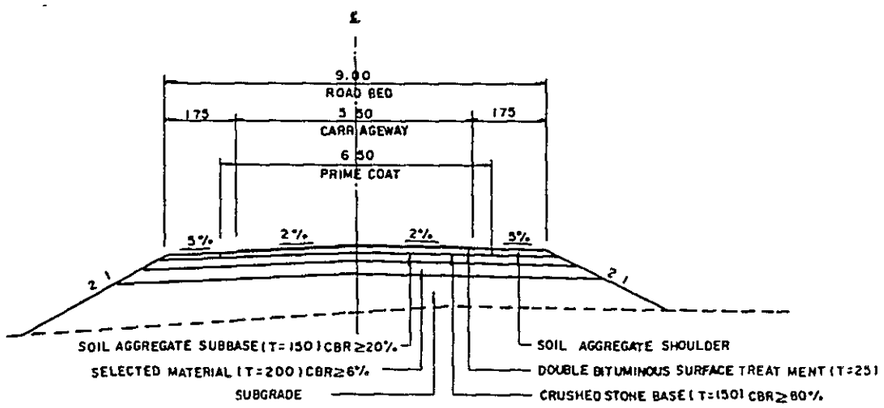
Figure 30.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE



FILL SECTION

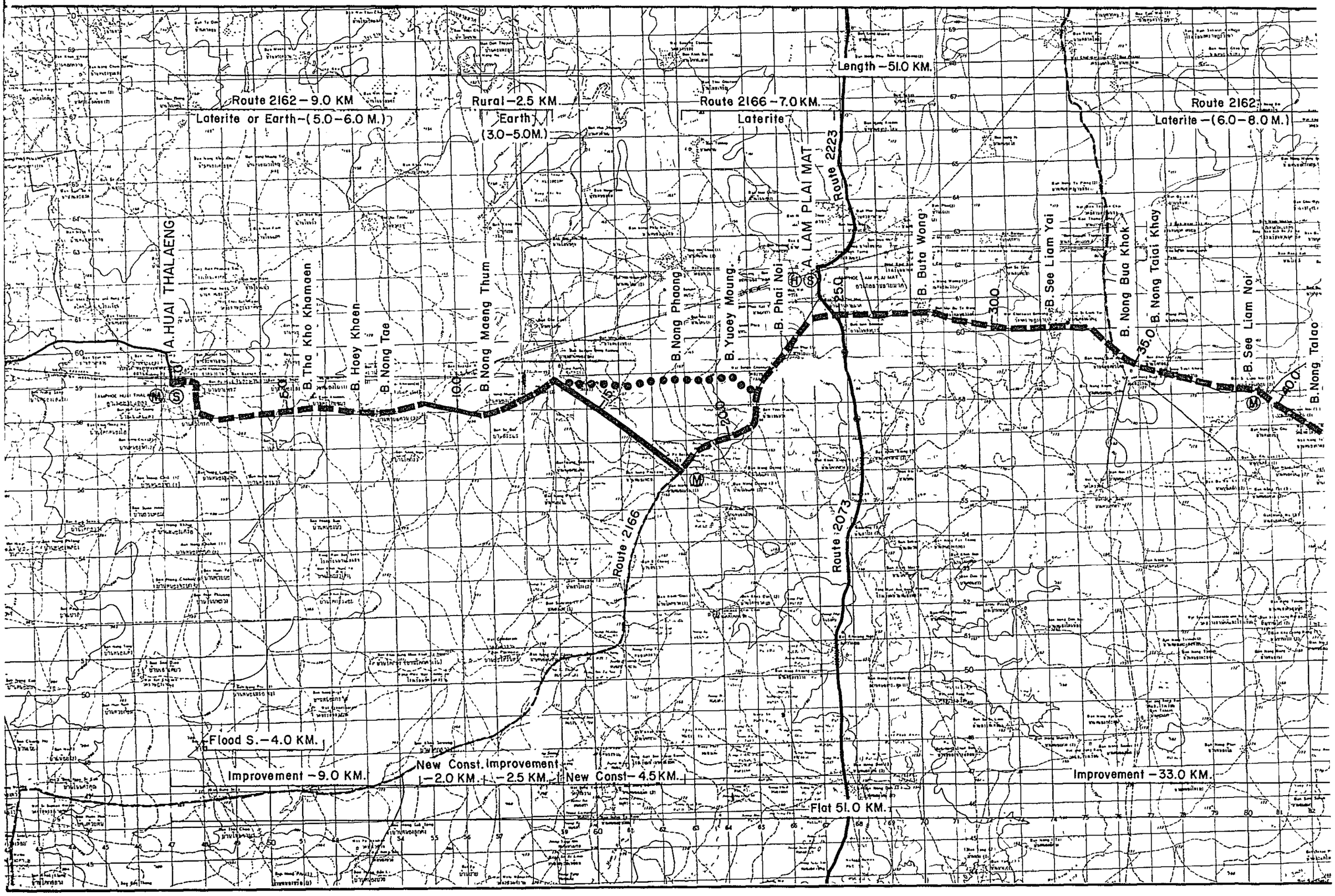


CUT SECTION



DOUBLE BITUMINOUS SURFACE TREATMENT (DBST) ROAD (Class F4)

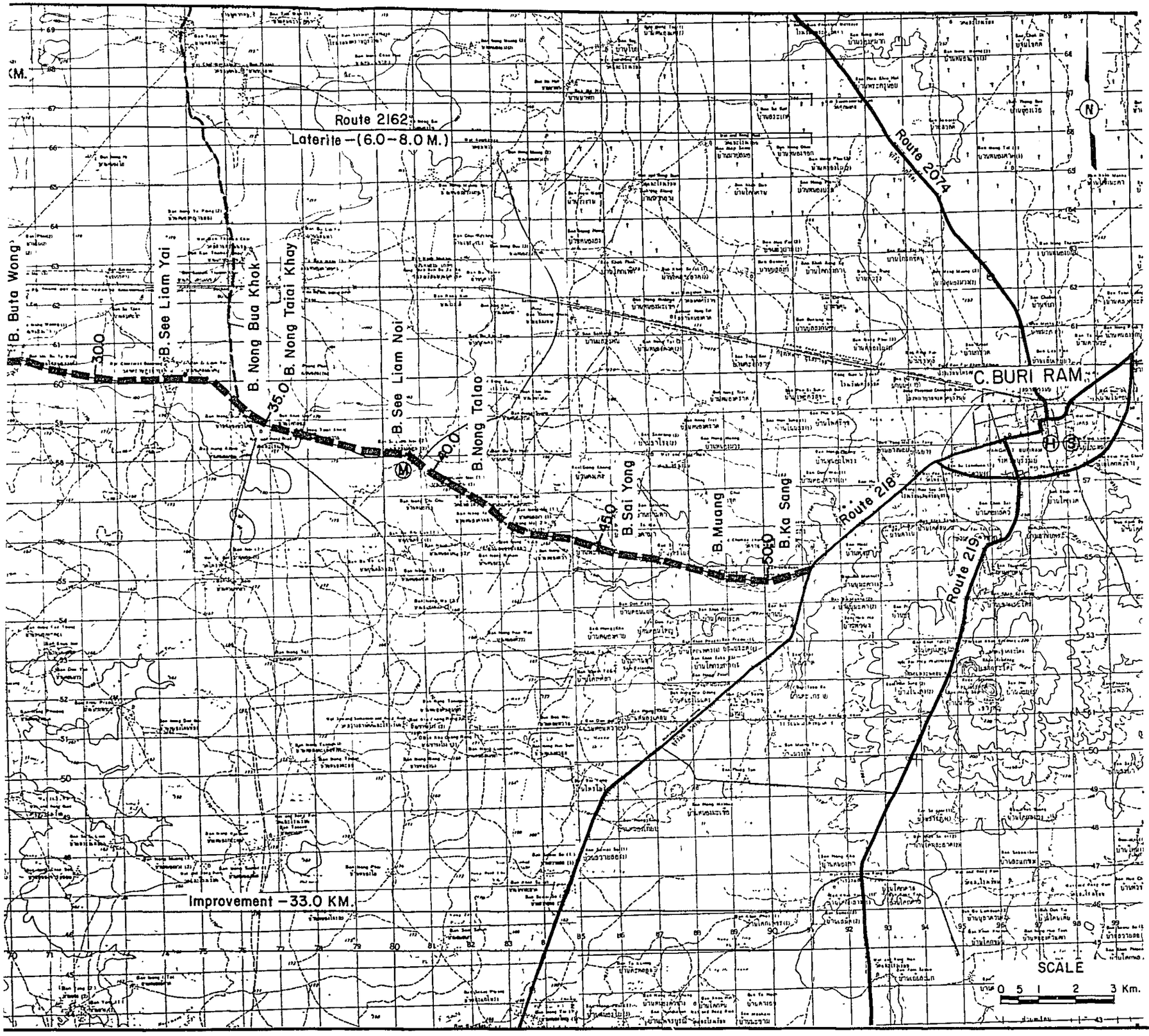
Figure 30.5.2 PROPOSED ROUTE NO. IM – 30 C. BURI RAM NAKHON RATCHASIMA A. HUAI THALAENG – B. KA SANG (ROUTE NO. 2162 + 2166 L



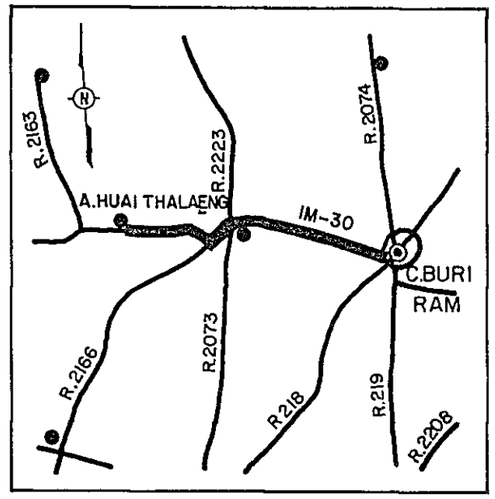
RATCHASIMA

A. HUAI THALAENG – B. KA SANG (J.R. 218)

ROUTE NO. 2162 + 2166 L = 51.0 Km.



LOCATION MAP



BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	23.0	—	C – 9.00 x 45.00
2	42.6	C – 7.00 x 24.00	W – 4.50 x 20.30
3	46.5	C – 7.00 x 18.00	W – 4.50 x 15.00
4	46.9	C – 7.00 x 18.00	W – 4.50 x 15.00

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE
- (H) HOSPITAL
- (M) MEDICAL CENTER
- (S) SECONDARY SCHOOL

Table 30.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-30 (51.0 km)

Items	Unit of Q'ty	Financial Unit Rate ฿	(DBST) Q'ty	Financial Cost (10^3฿)	Economic Cost(10^3฿)
DIRECT CONSTRUCTION COST					
Clearing and Grubbing	ha	15,000	124	1,860	1,692
Excavation - Soil	m^3	20	0	0	0
Excavation - Hard Rock	m^3	160	0	0	0
Embankment	m^3	45	205,600	9,252	8,419
Selected Material	m^3	80	108,100	8,648	7,696
Soil Aggregate Surface or Subbase	m^3	105	75,700	7,948	7,074
Crushed Stone Base	m^3	370	49,200	18,204	16,747
Soil Aggregate Shoulder	m^3	105	21,400	2,247	1,999
Prime Coat and DBST	m^2	55	280,500	15,428	13,885
Pipe Culvert	m	2,100	2,380	4,998	4,598
Box Culvert	m	16,000	20	320	288
Long Span Bridge	m	80,000	0	0	0
Short Span Bridge	m	40,000	60	2,400	2,136
Sub Total (a)				71,306	64,538
Miscellaneous Works (a) x 7%				4,991	4,518
Total (b)				76,297	69,056
PHYSICAL CONTENGENCY (b) x 15%				11,445	10,358
ENGINEERING AND ADMINISTRATION (b) x 10%				7,630	6,906
Sub Total				19,075	17,264
LAND ACQUISITION					
Highly Developed Land	ha	50,000	20	1,000	1,000
Less Developed Land	ha	15,000	0	0	0
Sub Total				1,000	1,000
GRAND TOTAL				96,372	87,320

Table 30.6.1 COST AND BENEFITS

(F4 STANDARD)

(1000 BAHT)

YEAR	COST CONST. COST	BENEFITS AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	DISCOUNTED(12%) COST	BENEFIT
1984	17,464	0	0	0	0	24,536	0
1985	43,660	0	0	0	0	54,767	0
1986	26,196	0	0	0	0	29,340	0
1987	0	1,616	10,877	-33	12,460	0	11,125
1988	0	1,892	11,967	4	13,862	0	11,051
1989	0	2,168	13,057	41	15,265	0	10,866
1990	0	2,443	14,147	79	16,668	0	10,593
1991	0	2,719	15,237	116	18,071	0	10,254
1992	0	2,995	16,326	153	19,474	0	9,866
1993	0	3,271	17,416	190	20,877	0	9,444
1994	24,684	3,522	19,252	250	23,023	11,166	9,299
1995	0	3,773	21,087	309	25,169	0	9,076
1996	0	4,025	22,922	368	27,315	0	8,795
1997	0	4,276	24,757	427	29,461	0	8,469
1998	0	4,527	26,592	487	31,607	0	8,113
1999	0	4,779	28,428	546	33,752	0	7,735
2000	0	5,030	30,263	605	35,898	0	7,346
2001	-40,707	5,282	32,098	665	38,044	-7,437	6,951
TOTAL	71,297	52,317	304,424	4,206	360,948	112,371	138,981

DISCOUNTED ECONOMIC COSTS : 112,371

DISCOUNTED ECONOMIC BENEFITS : 138,981

AGRICULTURAL DEVELOPMENT BENEFIT	20,146
VOC SAVING	117,604
RMC SAVING	1,231

NET PRESENT VALUE : 26,610

BENEFIT COST RATIO : 1.24

INTERNAL RATE OF RETURN : 14.6 %

Table 30.7.1 SOCIAL INDICATORS

(Proposed Route IM-30)

Population (1,000)	
1982	: 40.2
1993	: 48.6
Average travelling speed, without (kph)	: 42
Isolation	
Access to Amphoe	
Average distance to Amphoe (km) 1/	: 6.9
Per capita time savings (10^{-4})	: 0.014
Score	: 41
Access to Artery Highway	
Average distance to highway (km) 1/	: 25
Per capita time savings (10^{-4})	: 0.051
Score	: 111
Impassability	
Impassable week a year	: 1
Impassability per year	: 0.019
Impassability per capita (10^{-4})	: 0.004
Score	: 33
Health	
Access to Hospital	
Average distance to Hospital (km) 1/	: 3.6 (4.6)
Per capita time savings (10^{-4})	: 0.012
Score	: 28
Access to Medical Facilities	
Average distance to facilities (km) 1/	: 3.5 (3.8)
Per capita time savings (10^{-4})	: 0.009
Score	: 36
Education	
Access to Secondary School	
Number of Student in 1993 (1,000) 2/	: 9.7
Average distance to school (km)	: 3.6 (4.6)
Per capita time savings (10^{-4})	: 0.061
Score	: 33
Teacher Intensity	
Number of teachers 3/	
University graduate	: -
Total	: 11
Number of Student	: 234
Indicators	
E1 4/	: -
E2 5/	: 47.0
E 6/	: 47.0
Degree of Improvement 7/	: 1.46
Score	: 93
Disparity	
G.P.V. in 1993 (Mn B) 8/	
With project	: 121.3
Without project	: 116.5
Per capita G.P.V. in 1993 (B)	
With project (W)	: 2,496
Without project (w)	: 2,397
Degree of Disparity	
(A/W) - (A/w) 9/	: 0.05
Score	: 89
Total Score	: 464

Note:

1/ ( ) shows the length or distance in without project case. Unless otherwise, lengthes are same both in with project case and without project case.

2/ Number of secondary school student estimated based on the projected population of the areas of influence applying ratios of secondary school students to the total population in the sample area.

3/ Numbers of the sample areas

4/ (Number of University Graduate Teachers)/(Total Number of Student) x 1,000

5/ (Total of Teachers)/(Total Number of Student) x 1,000

6/ Sum of 4/ and 5/

7/ Ratio of E value of each route to an average value of the same indicator E in case of the sample areas, 33 in number, along paved road near the proposed routes.
The average value of E in case of paved roads were calculated at 68.4 from the following data:

Number of university graduate teachers	438
Number of Teachers	1,285
Number of student	25,196

8/ Estimated gross value of crop production in the areas of influence

9/ "A" indicates an average per capita value of crop production in the Northeastern Region, which is estimated assuming that:
- GRP per capita of the Northeast is estimated at 11,897 Baht in 1993,
- Agricultural sector shares 40% of GRP, and
- Crop production shares 80% of agricultural production.

PROPOSED ROUTE NO. IM - 31

Changwat : Buri Ram

A. Lam Plai Mat (J.R.2073) - A. Nong Ki (J.R.24)

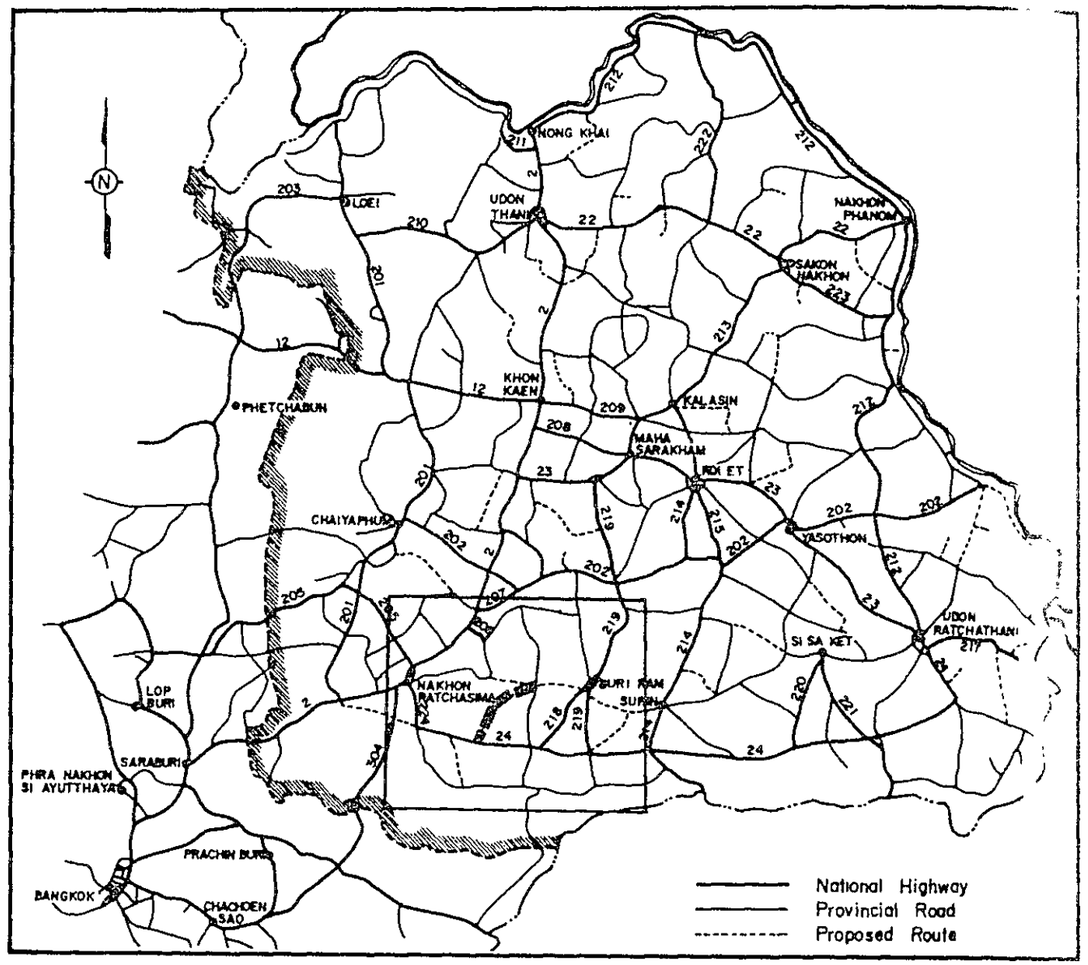
Length : 59.7 KM.

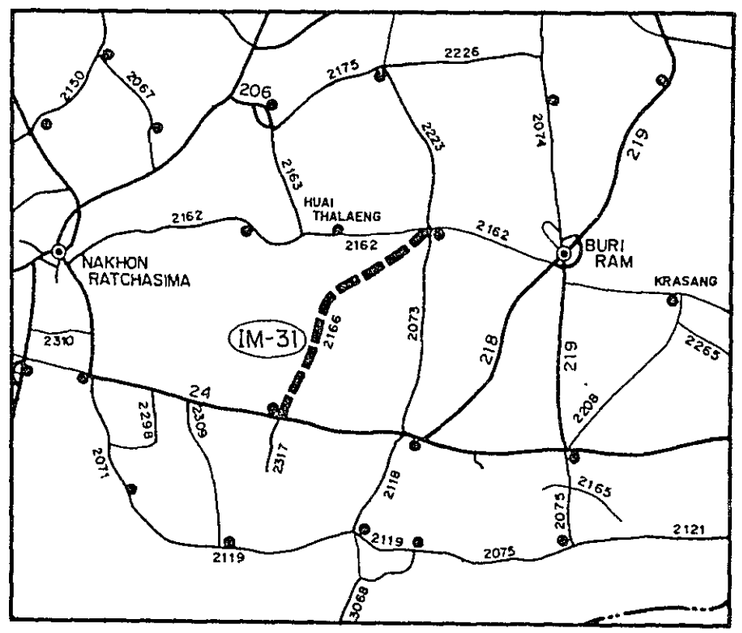
SUMMARY

PROPOSED ROUTE IM-31

Item	Description
Changwat	Buri Ram
Origin	A. Lam Plai Mat (J.R. 2073)
Destination	A. Nong Ki (J.R. 24)
Length	
Total	59.7 km
Improvement Section	59.7 km
DOH Road	R.2166 59.7 km
ARD Road	0 km
Others	0 km
New Alignment Section	0 km
Surface Type and Condition	Soil Aggregate and Earth, Poor
Terrain	Flat
Influence Area	
Area	353 km^2
Population (1982)	51,500
Principal Crops	Paddy
Traffic (ADT)	
Existing	183
1993	850
2001	659
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	93,083 · 10^3 ฿
Economic	84,259 · 10^3 ฿
IRR	15.1 %
B/C	1.28
Recommendation	For further consideration

LOCATION OF PROPOSED ROUTE





1 概　要

1.1 計画路線の概要

本路線は，Buri Ram県の南西部に位置する。ルートは，Lam Plai Mat郡の県道2073号線と交差する所を起点として南東に走り，Si Chawa村，Kham Yai村を経て，Nong Ki 郡を終る。その総延長は59.7kmである。（Figure 31.5.2 参照）

沿道の地形はほとんど平坦である。影響圏内ではいくつかの村があり，その総人口は51,500人である。

沿道には，医療センターが３ヶ所，病院が１ヶ所あり，教育施設としては中学校が２ヶ所ある。

本路線は農業的に開発の進んだ地域における２つの幹線道路国道24号線と県道2073号線を結ぶ重要な道路網の形成を目途と計画されたものである。

1.2 現道の状況

計画路線の利用した現道の状況はTable 31.1.1 に要約し，その詳細はTable 31.1.2 のインベントリー調査の結果に示した。

2. 交通

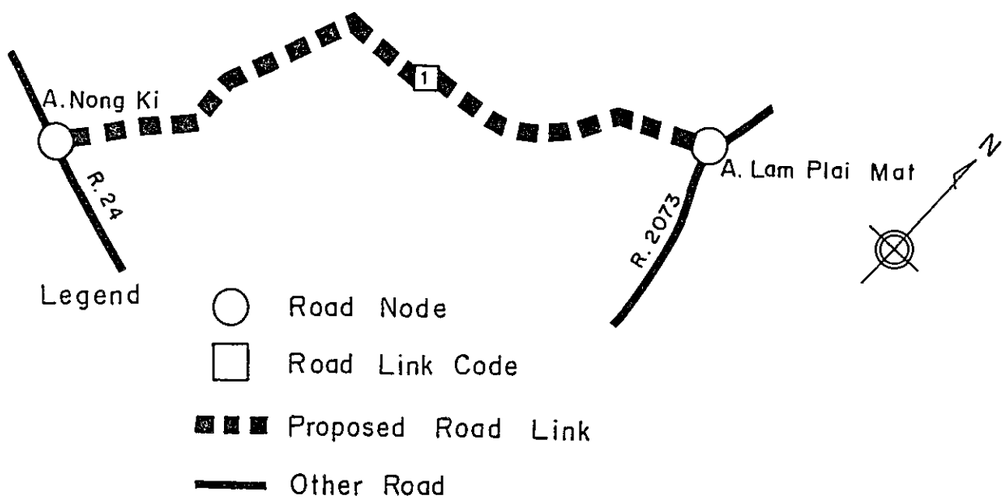
2.1 予測手法

計画対象路線に関し道路改良後の転換交通はほとんど無視し得るので，交通量予測には「伸び率方式」を適用することとした。

2.2 基準年交通量

道路リンク別車種別の基準年交通量は，ＤＯＨ交通量調査結果および本調査で実施したマニュアルカウンティングのデータを基として次のように推定した。

Proposed Road Link



Traffic Volume in Base Year

Source (base year)	Link No	Vehicle Type									
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T	ADT
DOH (1981)	1 1/	18	80	40	49	-	13	40	22	13	273
Manual Counts (1982)	1	-	20	47	10	-	2	-	10	-	89
Estimated	1	8	50	44	30	-	8	20	16	-	183

Note: 1/ Route 2166　　Section 0100　　Station Km 4+000

2.3　交通需要

計画路線上の旅客交通需要（トリップ／日）および貨物交通需要（トン／日）は，先に求めた基準年の交通量に路側インタビューによって得られる平均乗車人員もしくは平均貨物積載量をかけることによって推定した。推定結果は以下のとおりである。

PASSENGER MOVEMENT (1982)

PROPOSED ROAD LINK	TRIPS PER DAY
1	1470

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	64	50	115

2.4　交通需要の将来伸び率

1981－1987，1987－1993，1993－2001の各期間における旅客および貨物の交通需要の将来伸び率は，メインレポートの7.3.3の1）で述べた予測式に従って求めた。予測の前提および得られた将来伸び率は以下の通りである。

GROWTH RATE OF PASSENGER MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981 – 1987	1987 – 1993	1993 – 2001
PER CAPITA INCOME	4.2	4.5	4.7
TRANS. PRICE INCREASE	4.5	4.5	4.5
POPULATION	1.9	1.6	1.4
PASSENGER MOVEMENT	5.9	6.0	6.0

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981 – 1987	1987 – 1993	1993 – 2001
NON-AGRI.	7.6	7.7	7.8
AGRICULTURE	0.2	0.2	0.2
FREIGHT	4.4	4.4	4.5

2.5　誘発および開発交通量

メインレポートの7.3.3の3）で述べた方式を基に誘発および開発交通量の通常交通量に対する比率を求めた。

RATE OF INDUCED AND DEVELOPED TRAFFIC

（％）

ITEM	YEAR		
	1987	1993	2001
INDUCED	15.0	15.0	15.0
DEVELOPED	0.0	0.3	0.3

2.6　将来交通量

1）車種構成

計画路線上の旅客・貨物に関する将来交通需要を，以下の車種構成比によって車種別交通量に変換した。

TRAFFIC COMPOSITION

(UNIT : %)

LINK NO.	YEAR	PASSENGER P/C	P/P	L/B	M/B	H/B	FREIGHT P/T	4/T	6/T	10/T
1	1982	6.1	37.9	33.3	22.7	0.0	15.7	39.2	31.4	13.7
	1987	7.4	36.6	29.9	23.3	2.9	16.0	33.1	32.3	18.5
	1993	8.9	35.0	25.8	24.0	6.3	16.4	25.8	33.5	24.3
	2001	11.0	33.0	20.2	24.9	10.9	17.0	16.0	35.0	32.0

2）将来ＡＤＴ

計画路線上のリンク加重平均将来交通量は以下に示すとおりであり，またその道路リンク別交通タイプ別の詳細はTable 31.2.1に示す。

AVERAGE FUTURE TRAFFIC ON PROPOSED ROUTE

YEAR	TYPE OF VEHICLE P/C	L/B	M/B	H/B	P/P&T	4/T	6/T	10/T	ADT	M/C	TOTAL
1987	14	57	44	5	79	20	20	11	252	296	548
1993	22	65	61	16	100	18	23	17	321	338	659
2001	41	75	92	40	136	13	8	26	451	399	850

3. 農業開発

3.1. 現況

影響圏の農耕地の殆どが，水田であり，畑地では，主としてケナフとキャツサバが栽培されている。水田と畑地双方の適地は，未だ残っている。

圏内の土地利用及び土地適応性の状況はTable 31.3.1とFigure 31.3.1に示し，また，Buri Ram県地域の代表的作物暦は，Figure 31.3.2のとおりである。

3.2. 開発予測

影響圏内の将来の農業開発状況を，With ProjectとWithout Project の双方について予測した。予測した作付面積，単位当り収量及び生産量はTable 31.3.2.のとおりである。代表的作物の農家庭先価格と農業生産費とは，各県の資料及び現地調査の結果を参考にしてTable 31.3.3.のように見積った。

上記のごとく各作物ごとに予測された生産量と庭先価格により，生産価値を計算し，これから農業生産費及び別途見積られた開墾費を差引き，純生産価値（N.P.V）をTable 31.3.4.のように算出した。

このN.P.V のWith Projectの場合と，Without Project の場合の差が，この道路の開発便益である。

4. 走行費の節減

本報告書，第１巻，第７章で述べた概念と基礎データにもとづき関連する各道路リンクの走行費（以下“ＶＯＣ”という）をWith ProjectとWithout Project の両ケースについて計算した。

各リンクにおけるＶＯＣのコスト増に影響を与える道路状況は以下に示すとおりである。

Road Condition

Link No.	Terrain	Without Project Length (Km)	/1 Road Class	Nos. of Wooden Bridge	Nos. of Narrow C.Bridge	With Project Length (Km)	/1 Road Class	Nos. of Wooden Narrow Bridge
1	Flat	59.7	3	2	0	59.7	1 (P4)	0

/1 Road 1 : Paved Road

Road 2A : Laterite Road with good surface condition and alignment

Road 2B : Laterite Road with good surface condition but poor alignment

Raod 3 : Laterite Road with poor surface condition and alignment

Raod 4 : Earth Road

ＶＯＣ節減は，With Projectの全リンクのＶＯＣとWithout Project の際のＶＯＣとの差で，当道路におけるＶＯＣの節減は次に示すとおりである。

Vehicle Operating Cost Saving

(Unit: 1,000 Baht)

Road Class	1987	1993	2001
1 (F4)	12,075	17,467	28,069

5. エンジニアリング

5.1 予備設計

予備設計は，次に示す設計規準を基本に行った。

Design Standard : F4 (feasible)

Geometric Design : AASHTO (Rural Highways)

Typical Cross Section : as shown in Figure 31.5.1

Minimum Height of Embankment

- Ordinary Section : 1.0m
- Approach of Bridge in Flat Area : 2.0m
- Flood Section : 0.7m (above flood level)

Pavement Structure

In case of F4 Standard

- DBST : 2.5cm
- Crushed Stone Base CBR≥80% : 15.0cm
- Soil Aggregate Subbase CBR≥20% : 15.0cm
- Selected Material CBR ≥ 6% : 20.0cm

Pipe Culvert

- Standard Size : ø100cm
- Standard Interval
  - Paddy Area : 200 m
  - Others : 500 m

Box Culvert

- Standard Size : 2.4m x 2.4m
- Location : as required

Bridge

- Standard Type (width 7.0m)
  - Short Span Bridge : RC - Slab
  - Long Span Bridge : PC - Girder
- Location : as shown in Bridge List in Figure 31.5.2.

ルートの線形は，Figure 31.5.2に示す。

5.2 工事数量および建設費

予備設計による工事数量と建設費は，各工種ごとに単価を付してTable 31.5.1に示す。

道路規格Ｆ４の建設費を財務費用および経済費用に分けて集計すると，下表に示すとおりとなる。

F_4 Standard (DBST)		L = 59.7 km
	Financial Cost	93,083 · 10^3฿
	Economic Cost	84,259 · 10^3฿

6　経済評価

年次別経済費用と便益及び評価結果はTable　31.6.1に示す通りである。

このルートはＦ４規格でフィージブルである。

7.　社会インパクト

社会インパクトを示すデータ及び評価結果はTable　31.7.1に示す通りである。

Table 31.1.1 SUMMARY OF ROAD INVENTORY

Item	Description		
Origin	A. Lam Plai Mat (J.R. 2073)		
Destination	A. Nang Ki (J.R. 24)		
Length			
Total			59.7 km
Improvement Section			59.7 km
DOH Road	R. 2166		59.7 km
ARD Road			0 km
Others			0 km
New Alignment Section			0 km
Terrain	Flat		
Alignment (Hori./Vert.)	Fair / Fair		
Formation Width	6.5 m - 9.5 m		7.5 m (Weighted average)
Embankment Section			
Length			59.7 km
Height	0.2 m - 1.0 m		
Cut Section			
Length			0 km
Depth	m - m		
Surface Type and Condition			
SBST or DBST	Poor		6.5 km
Soil Aggregate	Poor		48.2 km
Earth	Poor		5.0 km
Pipe Culvert	27 each		
Box Culvert	1 each		11.0 m
Bridge			
Permanent Bridge	1 each		45.0 m
Narrow Concrete Bridge	0 each		0 m (4m)
Wooden Bridge	2 each		23.7 m
Overflow Section	3 places		1.7 km

Table 31.1.2 ROAD INVENTORY (1)

PROPOSED ROUTE NO. IM-31 ROUTE NO. 2166 A. LAM PLAI MAT (J.R. 2073) ∿ B. NONG KI (J.R. 24) L = 59.7 Km.

BURI RAM

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30													
VILLAGE - Name - Household (H) - Population (P)		A. LAMPLAI MAT	B. PHAI NOI H = 40 P = 200	B. YUOEY MONG H = 40 P = 200	B. NONG PHAOENG H = 120 P = 600	B. SICHAWA H = 74 P = 225	B. NONG MA KHA H = 50 P = 225	B. NONG NUA CHANG H = 60 P = 400	B. KHOK SAWANG H = 60 P = 300	B. SISANGA H = 25 P = 125	B. NON KHLON H = 200 P = 1000	B. BUNG CHANG H = 170 P = 850																		
TERRAIN		Flat																												
CROSS SECTION	Formation Width (m)	8.00							7.50				6.50		7.50															
	Embankment Height (m)	0.50	0.70	1.00	0.50			0.80	0.30	0.20	0.80	0.50	1.00	0.80	0.40															
	Cutting Depth (m)																													
PAVEMENT	Type/Length	Laterite		Earth					Laterite																					
	Condition	Poor																												
FLOODING	Overflow Length(Km)/Height(m)																													
LAND USE	Left	Paddy		Forest	Jute	Paddy		Jute	Paddy		Forest	Paddy																		
	Right	Forest	Paddy	Forest	Jute	Paddy		Jute	Paddy		Forest	Paddy																		
PIPE CULVERT	Total Number	27 Pipes																												
BOX CULVERT & BRIDGE	Station (Km)	2.7				11.6						24.0																		
	Dimension	C-Br. 9.00 x 45.00				W-Br. 5.60 x 11.30						W-Br. 4.60 x 12.40																		
RIGHT OF WAY (m)																														
ALIGNMENT	Horizontal	Fair																												
	Vertical	Fair																												
ROUTE NO., AGENCIES		DOH 2166																												

ROAD INVENTORY (2)

PROPOSED ROUTE NO. IM-31 ROUTE NO. 2166 A. LAM PLAI MAT (J.R. 2073) ∿ B. NONG KI (J.R. 24) (Cont'd) L = 59.7 Km.

BURI RAM

STATION (Km)		30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60	
VILLAGE - Name / - Household (H) / - Population (P)		B. NON SIK HUY H = 500 P = 2500; B. NON NGIU H = 50 P = 250; B. KHOK KLANG H = 380 P = 1900; B. NON SAMRAN H = 70 P = 350; B. SA DAOH WAN H = 100 P = 550; B. KHAM YAI H = 146 P = 830; B. KHAM NOI H = 120 P = 805; B. YOEI PRASIT H = 100 P = 750	
TERRAIN		Flat	
CROSS SECTION	Formation Width (m)	7.50 | 8.00 | 7.80 | 7.50 | 6.00 | 6.50 | 7.00 | 9.50 | 6.50 | 8.00 | 7.50 | 7.00 | 9.00	
	Embankment Height (m)	0.40	
	Cutting Depth (m)		
PAVEMENT	Type/Length	La. | DT | Laterite | DT | Laterite | DT | Laterite | DT	
	Condition	Poor	
FLOODING	Overflow Length(Km)/Height(m)	L=0.5 H=0.1	
LAND USE	Left	Paddy | Cassava | Bush | Paddy | Marsh | Paddy	
	Right	Paddy | Cassava | Paddy | Bush | Paddy	
PIPE CULVERT	Total Number		
BOX CULVERT & BRIDGE	Station (Km)	57.2	
	Dimension	C-Box 4.00 x 11.00	
RIGHT OF WAY (m)			
ALIGNMENT	Horizontal	Fair	
	Vertical	Fair	
ROUTE NO., AGENCIES		DOH 2166	

Table 31.2.1 TRAFFIC VOLUME ON ROUTE IM - 31

YEAR		1987		1993		2001	
LINK		1	AVR.	1	AVR.	1	AVR.
P/C	N+D	12	12	19	19	35	35
	I	2	2	3	3	5	5
	DV	0	0	0	0	0	0
	TOTAL	14	14	22	22	41	41
L/B	N+D	49	49	56	56	65	65
	I	7	7	8	8	10	10
	DV	0	0	0	0	0	0
	TOTAL	57	57	65	65	75	75
M/B	N+D	39	39	52	52	80	80
	I	6	6	8	8	12	12
	DV	0	0	0	0	0	0
	TOTAL	44	44	61	61	92	92
H/B	N+D	5	5	14	14	35	35
	I	1	1	2	2	5	5
	DV	0	0	0	0	0	0
	TOTAL	5	5	16	16	40	40
P/P&T	N+D	69	69	86	86	118	118
	I	10	10	13	13	18	18
	DV	0	0	0	0	0	0
	TOTAL	79	79	100	100	136	136
4/T	N+D	18	18	15	15	11	11
	I	3	3	2	2	2	2
	DV	0	0	0	0	0	0
	TOTAL	20	20	18	18	13	13
6/T	N+D	17	17	20	20	24	24
	I	3	3	3	3	4	4
	DV	0	0	0	0	0	0
	TOTAL	20	20	23	23	28	28
10/T	N+D	10	10	14	14	22	22
	I	1	1	2	2	3	3
	DV	0	0	0	0	0	0
	TOTAL	11	11	17	17	26	26
ADT	N+D	219	219	278	278	391	391
	I	33	33	42	42	59	59
	DV	0	0	1	1	1	1
	TOTAL	252	252	321	321	451	451
M/C	N+D	272	272	313	313	373	373
	I	24	24	25	25	25	25
	DV	0	0	1	1	1	1
	TOTAL	296	296	338	338	399	399
TOTAL	N+D	492	492	591	591	764	764
	I	56	56	67	67	84	84
	DV	0	0	2	2	2	2
	TOTAL	548	548	659	659	850	850

NOTE

N : NORMAL TRAFFIC D : DIVERTED TRAFFIC

DV : DEVELOPED TRAFFIC I : INDUCED TRAFFIC

Figure 31.3.1 LAND USE AND CAPABILITY OF INFLUENCE AREA
PROPOSED ROUTE NO. IM – 31

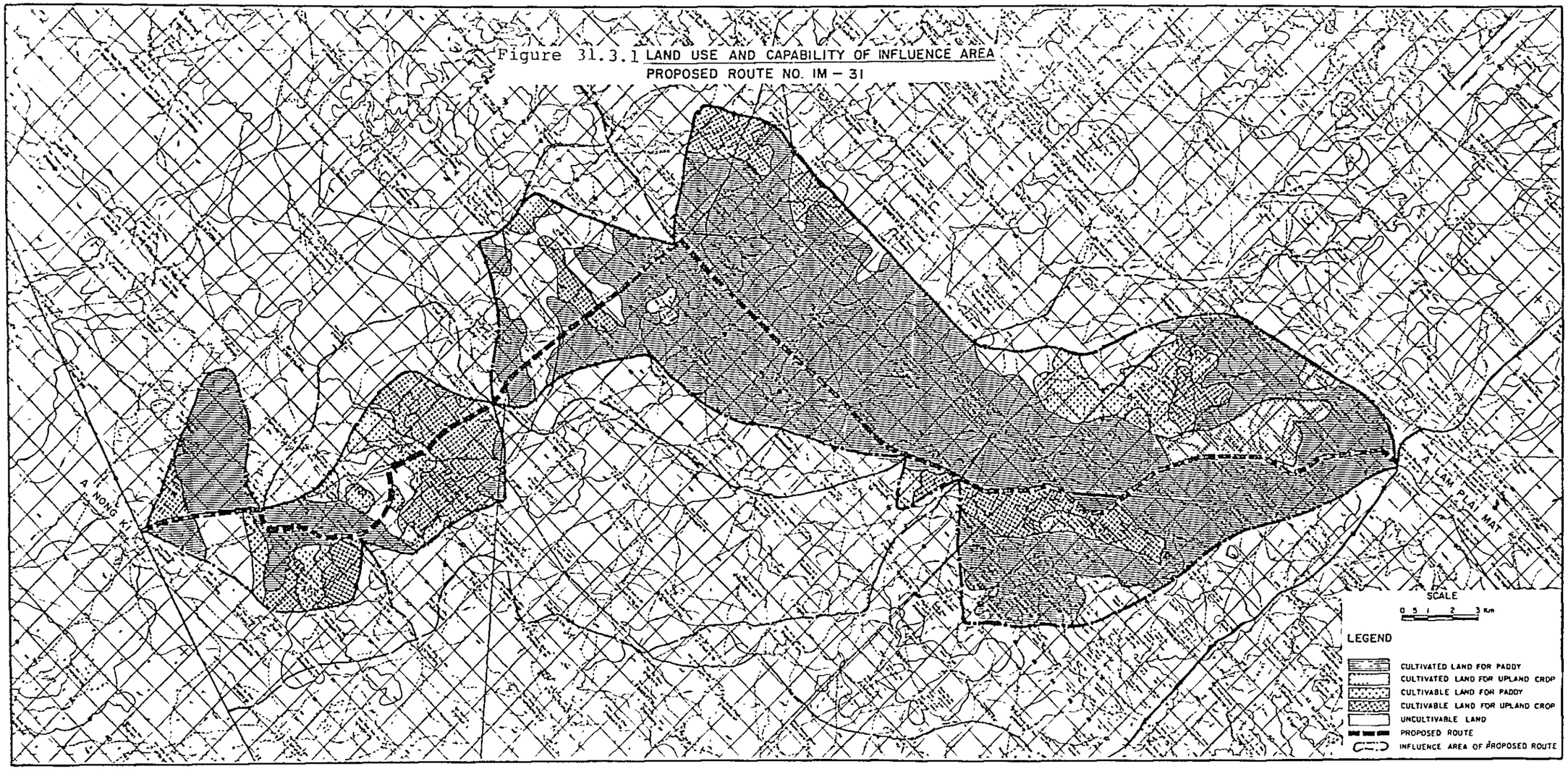


Figure 31.3.2 CROPPING CALENDAR

1400 CHANGWAT BURI RAM

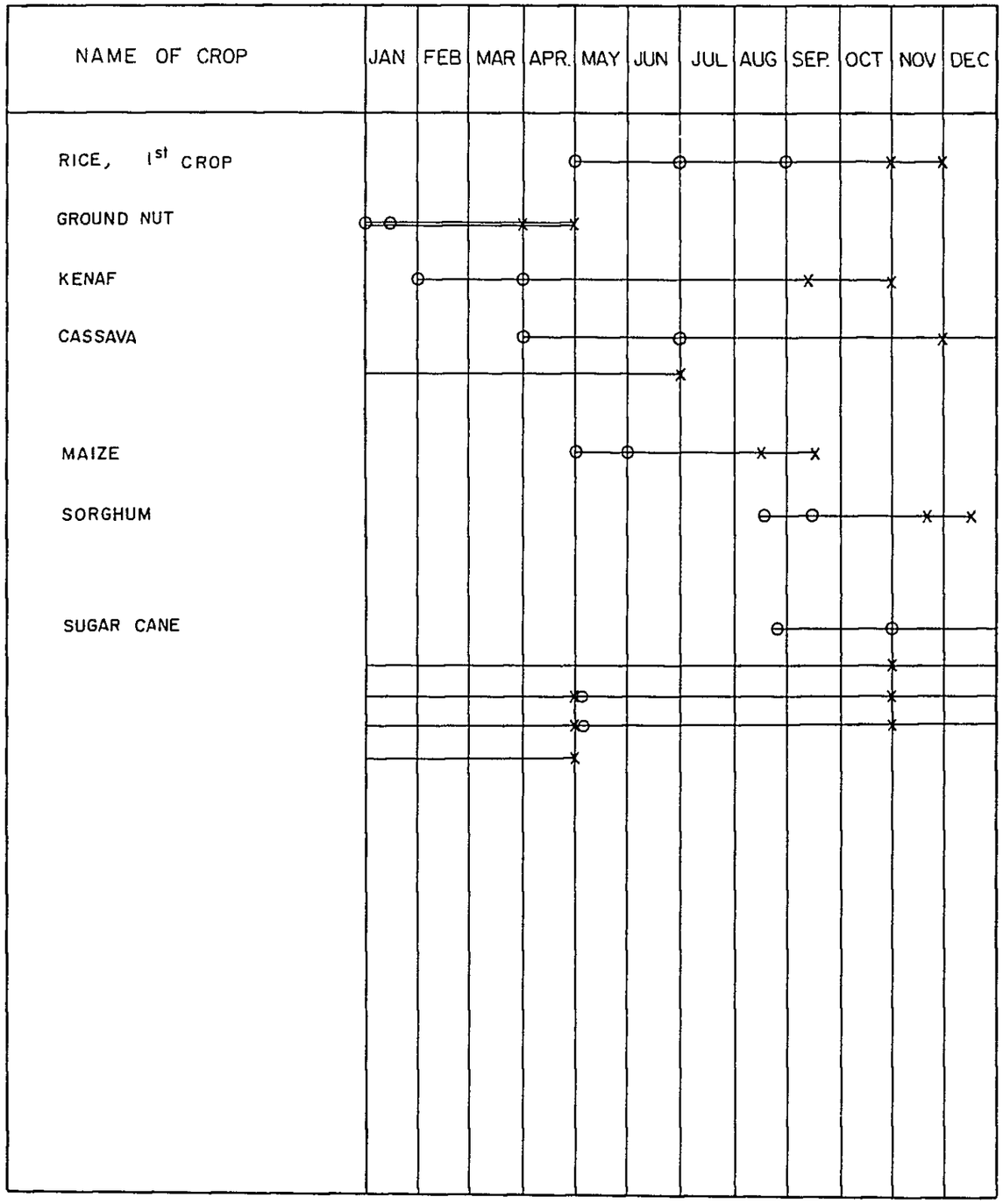


TABLE 31.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (KM^2)]

AMPHOE CODE	AMPHOE NAME	CULTIVATED LAND			UNUSED CULTIVABLE LAND		
		PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
		155.000 (248.0)	6.875 (11.0)	161.875 (259.0)	16.875 (27.0)	26.875 (43.0)	43.750 (70.0)
1406	LAM PLAI MAT	131.875 (211.0)	6.875 (11.0)	138.750 (222.0)	9.375 (15.0)	12.500 (20.0)	21.875 (35.0)
1407	NONG KI	23.125 (37.0)	-	23.125 (37.0)	7.500 (12.0)	14.375 (23.0)	21.875 (35.0)

TABLE 31.3.2 CROP PRODUCTION

ITEM			PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)												
1981			135.75	-	0.11	0.32	2.55	0.23	3.15	-	7.02	142.77
1987			135.75	-	0.11	0.32	2.66	0.23	3.15	-	7.16	142.91
1993	WITHOUT	PROJECT	135.75	-	0.11	0.32	2.77	0.23	3.15	-	7.31	143.06
	WITH	PROJECT	135.75	-	0.11	0.34	3.17	0.24	3.15	-	7.74	143.49
2001	WITHOUT	PROJECT	135.75	-	0.11	0.33	2.93	0.23	3.15	-	7.51	143.27
	WITH	PROJECT	135.75	-	0.11	0.34	3.36	0.24	3.15	-	7.97	143.72
CROP YIELD (KG/RAI)												
1981			226.1	-	119.0	213.0	2500.0	6875.0	170.0	-		
1987			227.5	-	119.7	213.0	2500.0	6916.4	170.0	-		
1993	WITHOUT	PROJECT	228.9	-	120.4	213.0	2500.0	6958.0	170.0	-		
	WITH	PROJECT	231.6	-	121.9	214.3	2515.0	6999.8	170.0	-		
2001	WITHOUT	PROJECT	230.7	-	121.4	213.0	2500.0	7013.8	170.0	-		
	WITH	PROJECT	237.2	-	124.8	216.0	2535.2	7112.5	170.0	-		
CROP PRODUCTION (TON)												
1981			30,698	-	14	67	6,373	1,566	535	-	8,662	39,360
1987			30,883	-	14	68	6,646	1,576	535	-	8,951	39,833
1993	WITHOUT	PROJECT	31,068	-	14	69	6,930	1,585	535	-	9,251	40,320
	WITH	PROJECT	31,443	-	14	73	7,983	1,693	535	-	10,418	41,861
2001	WITHOUT	PROJECT	31,318	-	14	70	7,327	1,598	535	-	9,672	40,990
	WITH	PROJECT	32,205	-	14	74	8,509	1,720	535	-	10,986	43,191

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 31.3.3 FARMGATE PRICE AND PRODUCTION COST

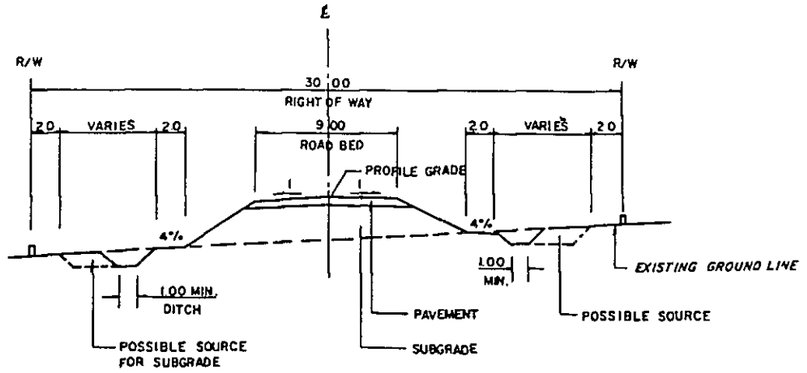
ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	4,144	-	6,839	7,468	670	562	4,347	-
WITH PROJECT (1987 - 2001)	4,248	-	6,839	7,468	687	562	4,456	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	573	-	392	1,023	734	2,183	631	-
WITH PROJECT (1987 - 2001)	583	-	412	1,043	754	2,208	631	-

TABLE 31.3.4 NET PRODUCTION VALUE

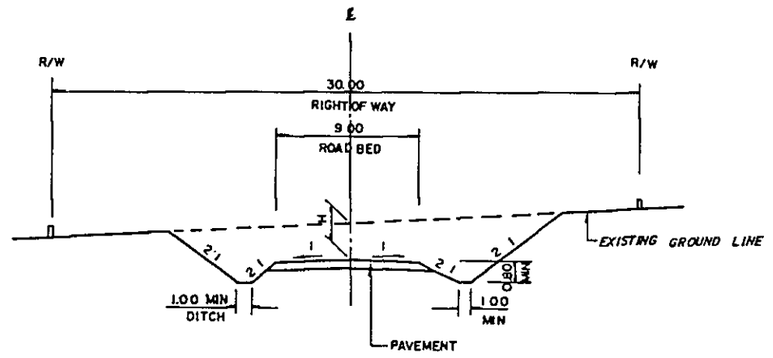
(1000 BAHT)

YEAR	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	50,193	3,437	53,630	52,046	3,534	55,580
1993	50,962	3,553	54,515	54,426	4,120	58,546
2001	51,996	3,719	55,715	57,665	4,381	62,046

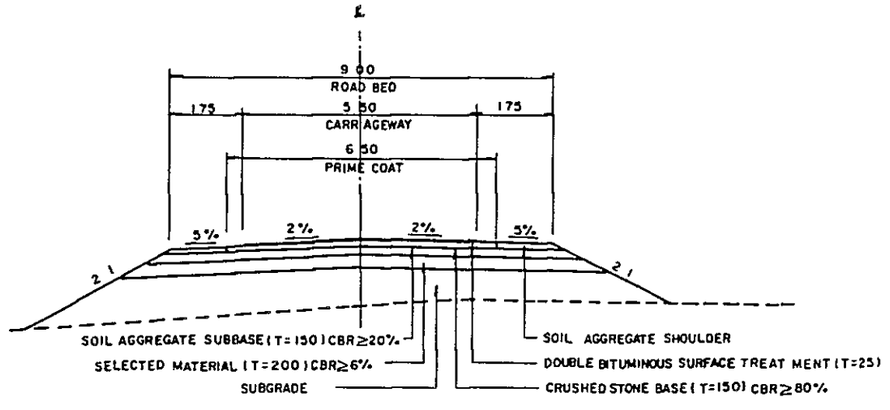
Figure 31.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE



FILL SECTION

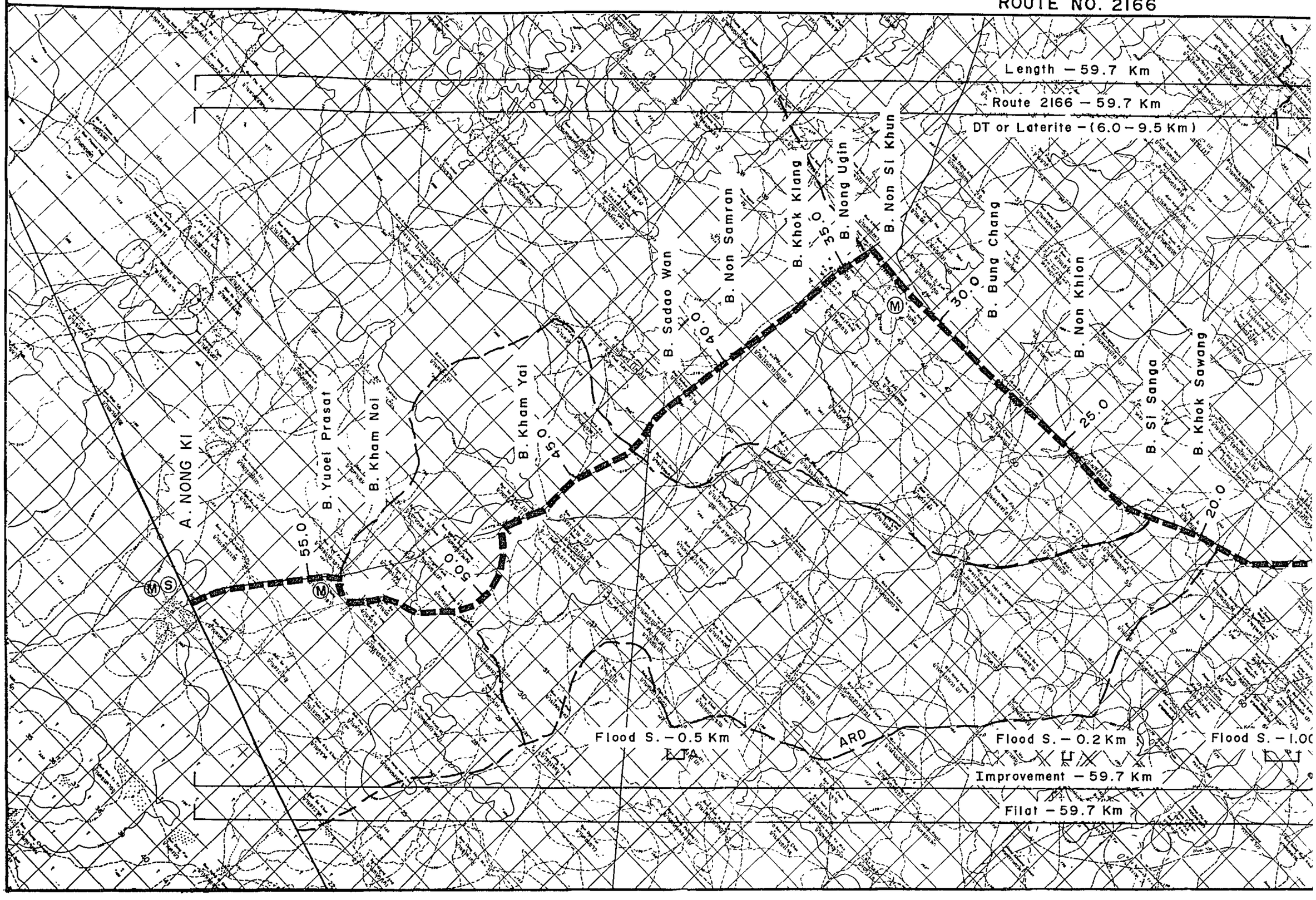


CUT SECTION



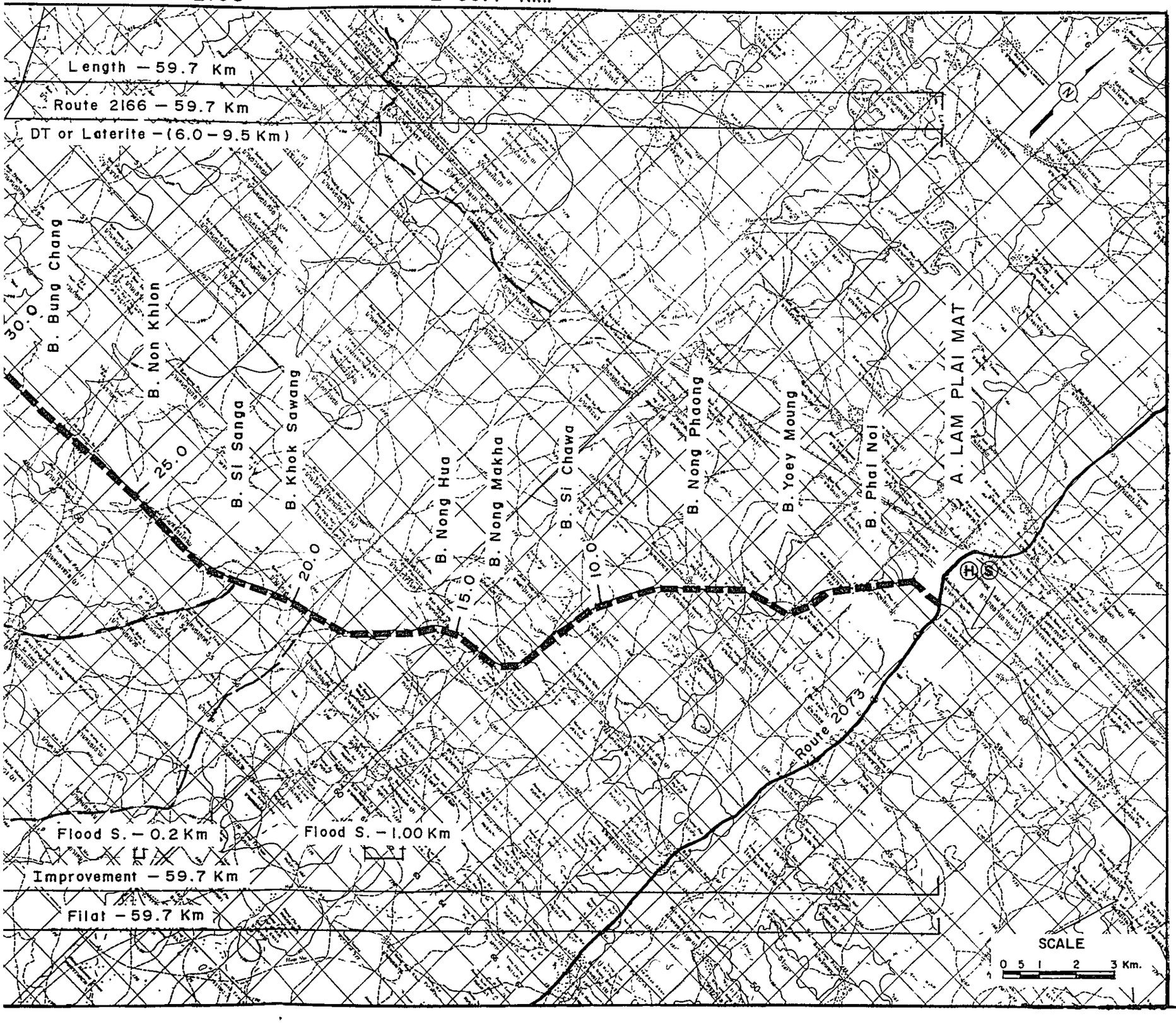
DOUBLE BITUMINOUS SURFACE TREATMENT (DBST) ROAD (Class F4)

Figure 31.5.2 **PROPOSED ROUTE NO. IM – 31** **C. BURI RAM** **A. LAM PLAI MAT (J.R. 2073) – ROUTE NO. 2166**

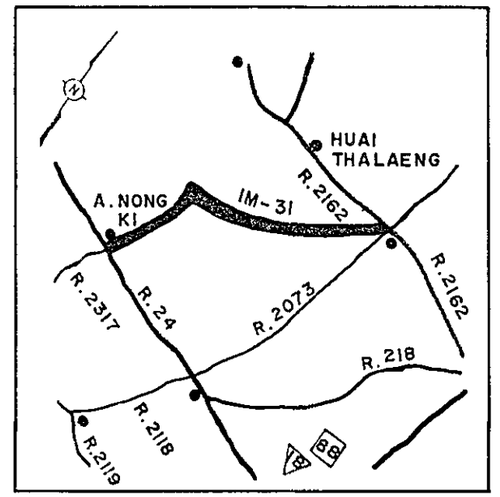


M A. LAM PLAI MAT (J.R. 2073) — A. NONG KI (J.R. 24)

ROUTE NO. 2166 L=59.7 Km.



LOCATION MAP



BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	2.7	C — 7.00 x 14.00	C — 9.00 x 45.00
2	11.6	C — 7.00 x 14.00	W — 5.60 x 11.30
3	24.0	—	W — 4.60 x 12.40

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE
- (H) HOSPITAL
- (M) MEDICAL CENTER
- (S) SECONDARY SCHOOL

Table 31.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-31 (59.7 km)

Items	Unit of Q'ty	Financial Unit Rate ฿	(DBST) Q'ty	(DBST) Financial Cost (10^3฿)	(DBST) Economic Cost (10^3฿)
DIRECT CONSTRUCTION COST					
Clearing and Grubbing	ha	15,000	134	2,010	1,829
Excavation - Soil	m^3	20	0	0	0
Excavation - Hard Rock	m^3	160	0	0	0
Embankment	m^3	45	142,200	6,399	5,823
Selected Material	m^3	80	112,800	9,024	8,031
Soil Aggregate Surface or Subbase	m^3	105	79,000	8,295	7,382
Crushed Stone Base	m^3	370	51,900	19,203	17,666
Soil Aggregate Shoulder	m^3	105	22,300	2,341	2,083
Prime Coat and DBST	m^2	55	292,600	16,093	14,484
Pipe Culvert	m	2,100	2,410	5,061	4,656
Box Culvert	m	16,000	3	48	43
Long Span Bridge	m	80,000	0	0	0
Short Span Bridge	m	40,000	28	1,120	996
Sub.Total (a)				69,594	62,997
Miscellaneous Works (a) x 7%				4,872	4,410
Total (b)				74,466	67,407
PHYSICAL CONTENGENCY (b) x 15%				11,170	10,111
ENGINEERING AND ADMINISTRATION (b) x 10%				7,447	6,741
Sub Total				18,617	16,852
LAND ACQUISITION					
Highly Developed Land	ha	50,000	0	0	0
Less Developed Land	ha	15,000	0	0	0
Sub Total				0	0
GRAND TOTAL				93,083	84,259

Table 31.6.1 COST AND BENEFITS

(F4 STANDARD)

(1000 BAHT)

YEAR	COST CONST. COST	BENEFITS AGRI. BENEFIT	BENEFITS VOC SAVING	BENEFITS RMC SAVING	BENEFITS TOTAL	DISCOUNTED(12%) COST	DISCOUNTED(12%) BENEFIT
1984	16,852	0	0	0	0	23,676	0
1985	42,129	0	0	0	0	52,847	0
1986	25,278	0	0	0	0	28,311	0
1987	0	1,950	12,075	-52	13,973	0	12,476
1988	0	2,285	12,974	-30	15,230	0	12,141
1989	0	2,621	13,873	-7	16,487	0	11,735
1990	0	2,956	14,771	16	17,744	0	11,276
1991	0	3,292	15,670	39	19,001	0	10,781
1992	0	3,627	16,569	62	20,257	0	10,263
1993	0	3,963	17,467	84	21,514	0	9,732
1994	28,895	4,258	18,793	119	23,170	13,071	9,358
1995	0	4,554	20,118	153	24,825	0	8,952
1996	0	4,850	21,443	187	26,480	0	8,526
1997	0	5,145	22,768	222	28,135	0	8,088
1998	0	5,441	24,094	256	29,791	0	7,647
1999	0	5,737	25,419	290	31,446	0	7,207
2000	0	6,033	26,744	325	33,101	0	6,773
2001	-38,759	6,328	28,069	359	34,757	-7,081	6,350
TOTAL	74,395	63,040	290,846	2,024	355,910	110,823	141,305

DISCOUNTED ECONOMIC COSTS :	110,823
DISCOUNTED ECONOMIC BENEFITS :	141,305
AGRICULTURAL DEVELOPMENT BENEFIT	24,310
VOC SAVING	116,477
RMC SAVING	518
NET PRESENT VALUE :	30,482
BENEFIT COST RATIO :	1.28
INTERNAL RATE OF RETURN :	15.1 %

Table 31.7.1 SOCIAL INDICATORS

(Proposed Route IM-31)

Population (1,000)	
1982	: 51.5
1993	: 62.2
Average travelling speed, without (kph)	: 48
Isolation	
Access to Amphoe	
Average distance to Amphoe (km) 1/	: 17.4
Per capita time savings (10^{-4})	: 0.019
Score	: 56
Access to Artery Highway	
Average distance to highway (km) 1/	: 0
Per capita time savings (10^{-4})	: 0
Score	: 0
Impassability	
Impassable week a year	: 2
Impassability per year	: 0.038
Impassability per capita (10^{-4})	: 0.006
Score	: 50
Health	
Access to Hospital	
Average distance to Hospital (km) 1/	: 15.0
Per capita time savings (10^{-4})	: 0.017
Score	: 40
Access to Medical Facilities	
Average distance to facilities (km) 1/	: 7.3
Per capita time savings (10^{-4})	: 0.008
Score	: 32
Education	
Access to Secondary School	
Number of Student in 1993 (1,000) 2/	: 15.6
Average distance to school (km)	: 15.0
Per capita time savings (10^{-4})	: 0.067
Score	: 36
Teacher Intensity	
Number of teachers 3/	
University graduate	: -
Total	: 17
Number of Student	: 494
Indicators	
E1 4/	: -
E2 5/	: 34.4
E 6/	: 34.4
Degree of Improvement 7/	: 1.99
Score	: 127
Disparity	
G.P.V. in 1993 (Mn B) 8/	
With project	: 143.3
Without project	: 137.5
Per capita G.P.V. in 1993 (B)	
With project (W)	: 2,304
Without project (w)	: 2,211
Degree of Disparity	
(A/W) - (A/w) 9/	: 0.05
Score	: 89
Total Score	: 430

Note:

1/ ( ) shows the length or distance in without project case. Unless otherwise, lengthes are same both in with project case and without project case.

2/ Number of secondary school student estimated based on the projected population of the areas of influence applying ratios of secondary school students to the total population in the sample area.

3/ Numbers of the sample areas

4/ (Number of University Graduate Teachers)/(Total Number of Student) x 1,000

5/ (Total of Teachers)/(Total Number of Student) x 1,000

6/ Sum of 4/ and 5/

7/ Ratio of E value of each route to an average value of the same indicator E in case of the sample areas, 33 in number, along paved road near the proposed routes.
The average value of E in case of paved roads were calculated at 68.4 from the following data:

Number of university graduate teachers	438
Number of Teachers	1,285
Number of student	25,196

8/ Estimated gross value of crop production in the areas of influence

9/ "A" indicates an average per capita value of crop production in the Northeastern Region, which is estimated assuming that:
- GRP per capita of the Northeast is estimated at 11,897 Baht in 1993,
- Agricultural sector shares 40% of GRP, and
- Crop production shares 80% of agricultural production.