

**PROPOSED ROUTE NO. IM - 21**

Changwat : Ubon Ratchathani

A.Trakan Phut Phon (J.R.2049)-A.Khemarat (J.R.202)

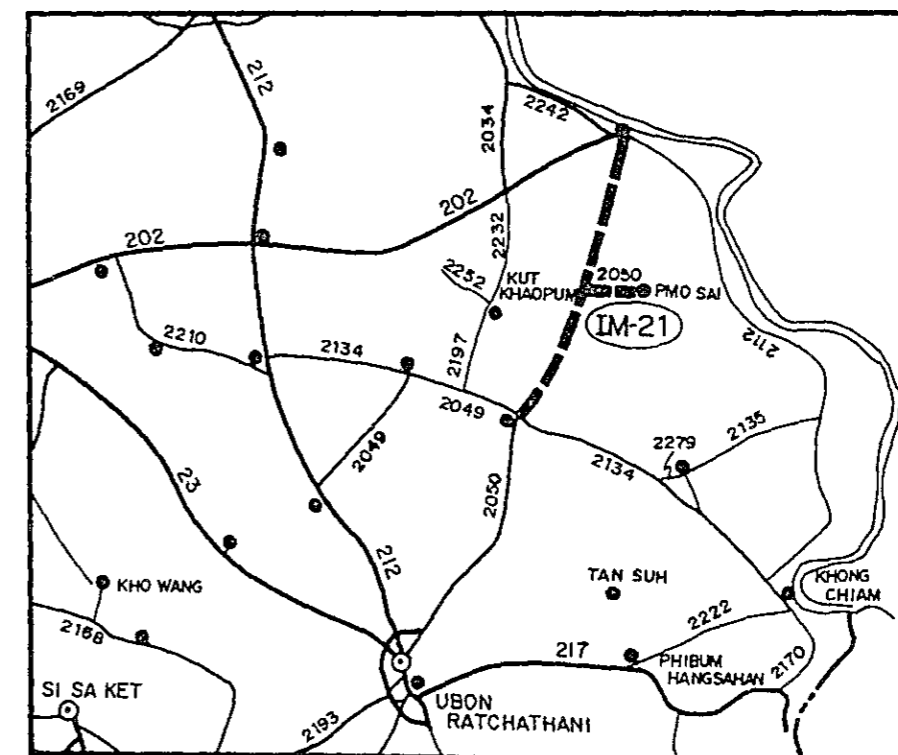
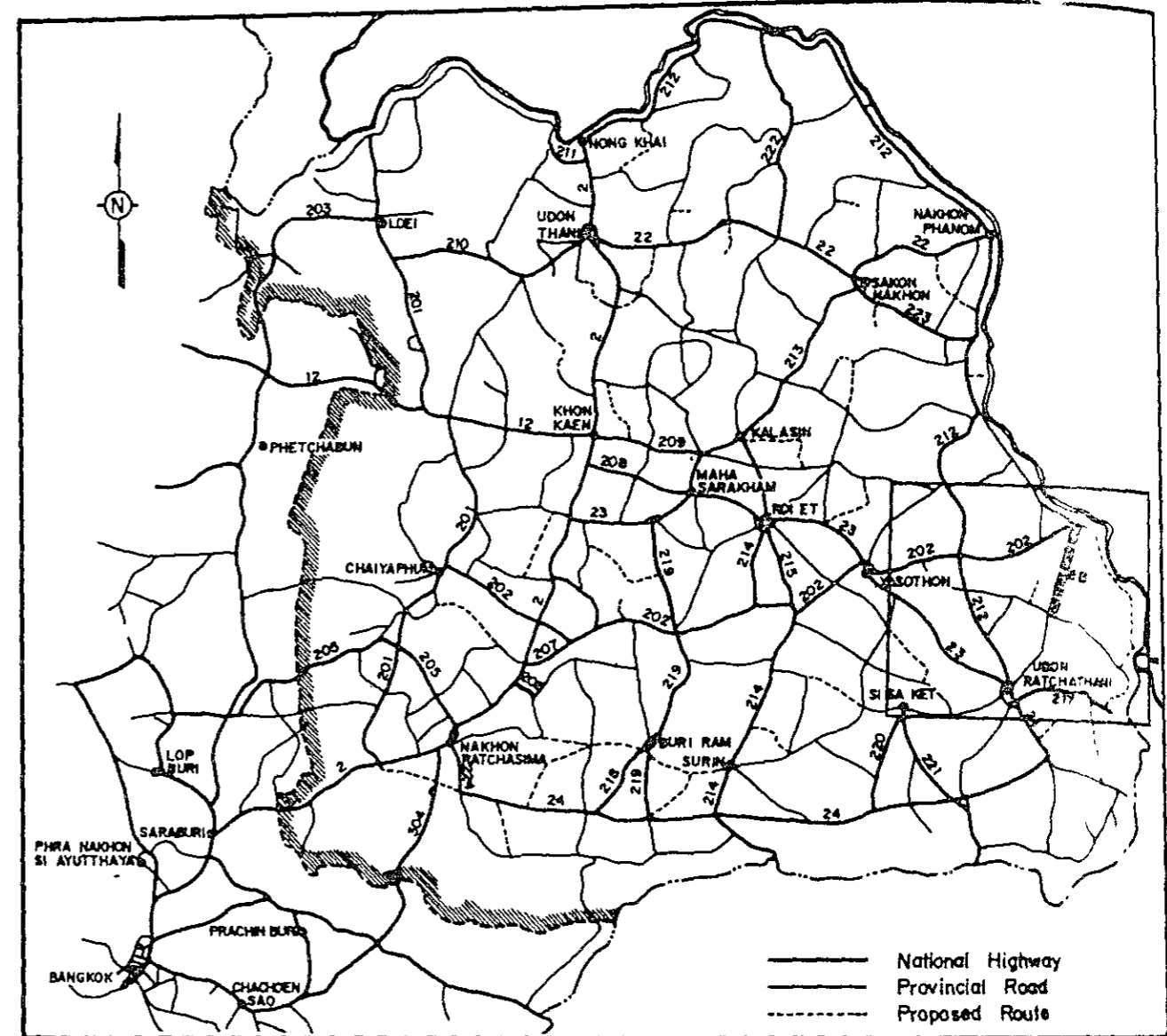
Length · 65.3 KM.

SUMMARY

PROPOSED ROUTE IM-21

Item	Description
Changwat	Ubon Ratchathani
Origin	A. Trakan Phut Phon (J.R.2049)
Destination	A. Khemarat (J.R.202)
Length	
Total	65.3 km
Improvement Section	65.3 km
DOH Road	R.2050 51.9 km
ARD Road	13.4 km
Others	0 km
New Alignment Section	0 km
Surface Type and Condition	Soil Aggregate, Good
Terrain	Flat and Rolling
Influence Area	
Area	440 km <sup>2</sup>
Population (1982)	47,400
Principal Crops	Paddy
Traffic (ADT)	
Existing	305
1993	1,046
2001	1,453
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	112,410 . 10 <sup>3</sup> ฿
Economic	101,589 . 10 <sup>3</sup> ฿
IRR	14.3 %
B/C	1.20
Recommendation	For immediate implementation

LOCATION OF PROPOSED ROUTE



## 1. 概要

### 1.1 計画路線の概要

本路線は、Ubon Ratchatani 県の北部に位置する。ルートは、県道2049号線のTrkan Phutphon郡を起点とし北に走り、Pho sai 準郡とNon Bok 村への道路が交差するBan Hua Nguaを経て、県道 202号線のKhemarat郡で終わる。その総延長は準郡への枝線も含め65.3 kmである。

沿道の地形は、ほとんど丘陵地である。影響圏内には、いくつかの村があり、その総人口は、47,400人である。沿道には、医療センターが1ヶ所、病院が1ヶ所あり、教育施設として中学校が3ヶ所ある。

本路線は、この地域とUbon Ratchatani 県および県道2050号線の舗装区間とを結ぶ重要な道路網の形成と共に、孤立しているPho Sai 準郡と県道2050号線を結ぶ重要な役割を果たす目途として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 21.1.1に要約し、その詳細はTable 21.1.2のイベントリー調査の結果に示した。

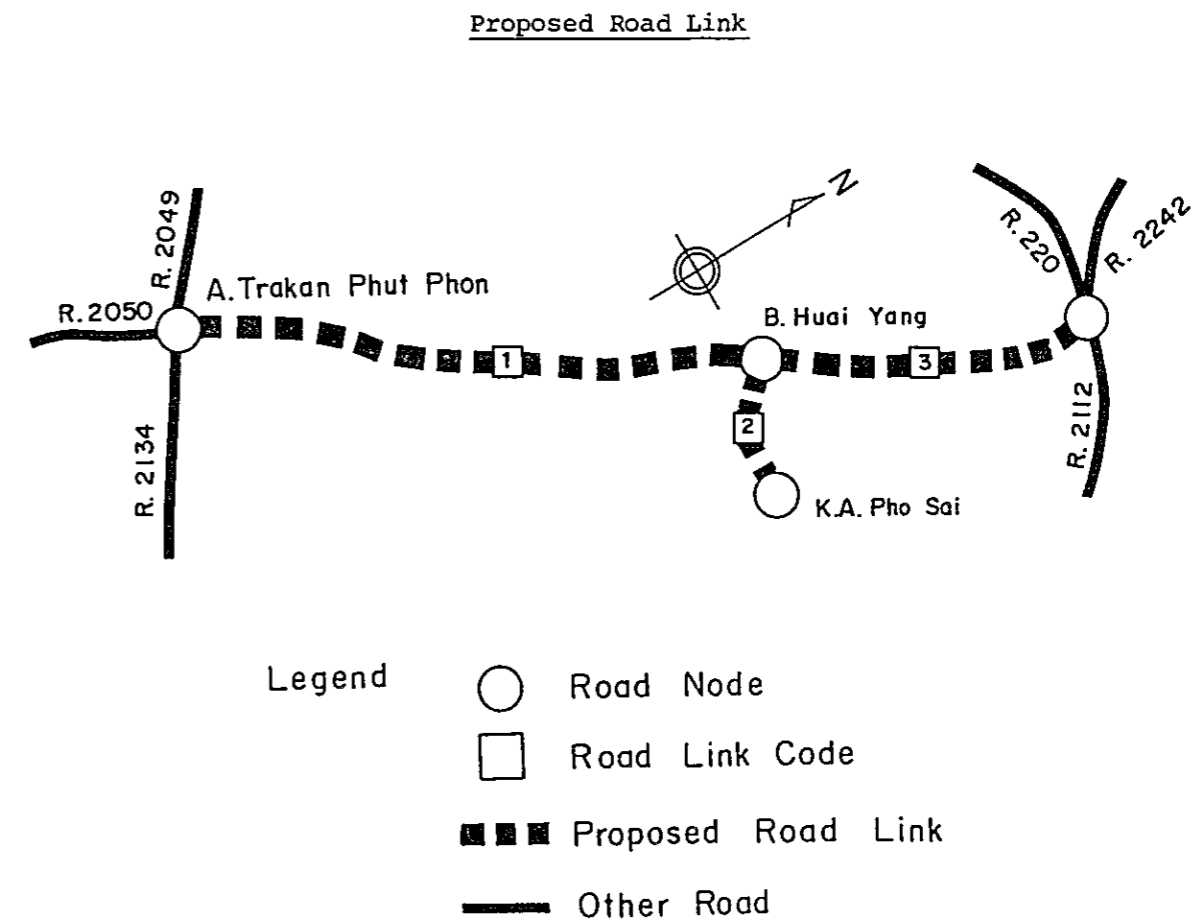
## 2. 交通

### 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。



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	1 <sup>1/</sup>	41	56	45	55	77	9	28	37	12	360
	2	n.a.									
	3 <sup>2/</sup>	24	80	55	68	37	13	40	42	4	362
Manual Counts (1982)	1	-	19	4	6	25	2	6	13	2	97
	2	-	7	-	5	1	1	-	5	-	19
	3	n.a.									
Estimated	1	41	56	45	55	77	9	28	37	12	360
	2	-	7	-	5	1	1	-	5	-	19
	3	24	80	55	67	37	13	40	42	4	362

Note: <sup>1/</sup> Route 2050 Section 0201 Station Km 12+000

<sup>2/</sup> Route 2050 Section 0201 Station Km 50+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	5101
2	793
3	3986

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONNAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	173	37	210
2	44	9	53
3	134	29	163

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	1993
	1987	1993	2001
PER CAPITA INCOME	4.2	4.5	4.7
TRANS. PRICE INCREASE	4.5	4.5	4.5
POPULATION	1.2	1.0	0.9
PASSENGER MOVEMENT	5.2	5.4	5.6

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981	1987	1993
	1987	1993	2001
NON-AGRI.	6.7	7.0	7.2
AGRICULTURE	1.0	0.7	0.2
FREIGHT	5.7	5.9	5.9

## 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

LINK NO.	YEAR	PASSENGER					FREIGHT				
		(UNIT : %)									
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T	
1	1982	15.0	20.4	16.4	20.1	28.1	10.5	32.6	43.0	14.0	
	1987	13.5	23.5	17.9	21.9	23.1	12.4	27.6	40.6	19.4	
	1993	12.1	26.6	19.4	23.8	18.1	14.4	22.6	38.2	24.8	
	2001	10.2	30.8	21.3	26.2	11.5	17.0	16.0	35.0	32.0	
2	1982	0.0	54.1	0.0	37.7	8.2	17.9	0.0	92.1	0.0	
	1987	3.6	50.5	4.4	33.2	8.4	17.6	4.2	69.7	8.4	
	1993	7.8	46.3	9.6	27.7	8.6	17.4	9.3	54.8	18.5	
	2001	13.5	40.6	16.6	20.4	8.9	17.0	16.0	35.0	32.0	
3	1982	9.1	30.4	20.9	25.5	14.1	13.1	40.4	42.4	4.0	
	1987	9.5	30.5	21.0	25.7	13.3	14.3	33.1	40.2	12.4	
	1993	9.8	30.6	21.1	25.9	12.5	15.5	25.8	38.0	20.8	
	2001	10.2	30.8	21.3	26.2	11.5	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 21.2.1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	41	64	84	66	110	27	41	15	447	375	823
1993	57	99	126	96	165	26	44	26	623	423	1046
2001	88	179	220	96	290	24	52	47	997	457	1454

## 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、畑地にはキャッサバ、落花生及びケナフが栽培されているが、限られている。未開発可耕地は、主として畑地が、圏内の中央部に残っている。

圏内の土地利用及び土地適応性の状況はTable 21.3.1とFigure 21.3.1に示し、また、Ubun Ratchathani県地域の代表的作物暦は、Figure 21.3.2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、単位当たり収量及び生産量はTable 21.3.2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、Table 21.3.3.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 21.3.4.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						
		Without Project			With Project			
No.	Terrain	Length (Km)	<sup>/1</sup> Nos. of Road Class	Nos. of Wooden Bridge	Nos. of Narrow C.Bridge	Length (Km)	<sup>/1</sup> Nos. of Road Class	Nos. of Wooden Narrow Bridge
1	Rolling	31.0	2B	0	0	31.0	1 (F4)	0
2	Flat & Rolling	13.4	3	4	0	13.4		0
3	Rolling	20.9	2B	4	0	20.9		0

<sup>/1</sup> Road 1 : Paved Road

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

Road 2B : Laterite Road with poor surface condition and 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)	14,077	20,246	32,072

#### 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 21.5.1
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 <sub>&gt;</sub> 80%	: 15.0cm
Soil Aggregate Subbase	CBR <sub>&gt;</sub> 20%	: 15.0cm
Selected Material	CBR <sub>&gt;</sub> 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 21.5.2

ルートの線形は、Figure 21.5.2 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は建設費は、各工事ごとに単価を付してTable 21.5.1 に示す。

道路規格別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 = 65.3 km

Financial Cost 112,410 . 10<sup>3</sup>¥

Economic Cost 101,589 . 10<sup>3</sup>¥

## 6. 経済評価

年次別経済費用と便益及び評価結果はTable 21.6.1 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 21.7.1 に示す通りである。

Table 21.1.1.1 SUMMARY OF ROAD INVENTORY

Item	Description	
Origin	A. Trakan Phut Phon (J.R. 2049)	
Destination	A. Khemarat (J.R. 202)	
Length		
Total		65.3 km
Improvement Section		65.3 km
DOH Road	R. 2050	51.9 km
ARD Road		13.4 km
Others		0 km
New Alignment Section		0 km
Terrain	Flat and Rolling	
Alignment (Hori./Vert.)	Fair / Fair	
Formation Width	5.0 m - 8.0 m, 7.4 m (Weighted average)	
Embankment Section		
Length		65.3 km
Height	0.2 m -	1.25 m
Cut Section		
Length		0 km
Depth	m -	m
Surface Type and Condition		
SBST or DBST	Good	9.8 km
Soil Aggregate	Good	42.1 km
Earth		0 km
Pipe Culvert	71 each	
Box Culvert	0 each	0 m
Bridge		
Permanent Bridge	6 each	209.0 m
Narrow Concrete Bridge	0 each	0 m (4m)
Wooden Bridge	8 each	215.9 m
Overflow Section	0 place	0 km



Table 21.1.2 ROAD INVENTORY (I)

PROPOSED ROUTE NO. IM-21

ROUTE NO. 2050

A. TRAKAN PHUT PHON (J.R. 2049) ~ A. KHEMARAT (J.R. 202)

L = 51.9 Km

UBON RATCHATHANI

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30			
VILLAGE																				
- Name																				
- Household (H)																				
- Population (P)																				
TERRAIN		Flat		Rolling																
CROSS SECTION	Formation Width (m)	7.50	7.00	7.00	7.00	5.00												7.50		
	Embankment Height (m)	1.00	0.60	0.30	0.40	0.60	1.25	0.65	1.00	0.30	0.20	0.50		0.30	0.20					
	Cutting Depth (m)																			
PAVEMENT	Type/Length	Laterite										D.T				Laterite				
	Condition	Good																		
FLOODING	Overflow Length(Km)/Height(m)																			
LAND USE	Left	Paddy	Bush	Paddy	Forest	Paddy	Orchard	Paddy	Orchard	Forest	Paddy	Forest				Paddy				
	Right	Paddy	Bush	Paddy	Forest	Paddy	Orchard	Paddy	Orchard	Forest	Paddy	Forest				Paddy				
PIPE CULVERT	Total Number																			
BOX CULVERT & BRIDGE	Station (Km)																			
	Dimension																			
RIGHT OF WAY (m)																				
ALIGNMENT	Horizontal	Fair																		
	Vertical	Fair																		
ROUTE NO., AGENCIES		DOH 2050																		

ROAD INVENTORY (2)

PROPOSED ROUTE NO. IM-21 ROUTE NO. 2050

A. TRAKAN PHUT PHON (J.R.2049) ~ A. KHEMARAT (J.R.202) (Cont'd)

L = 51.9 Km.

UBON RATCHATHANI

STATION (Km)		30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	
VILLAGE																		
- Name																		
- Household (H)																		
- Population (P)																		
TERRAIN																		
CROSS SECTION	Formation Width (m)																	
	Embankment Height (m)	1.00	0.30	0.0	0.75	0.20	1.00	0.30	1.00	0.30	0.20	0.30	0.50					
	Cutting Depth (m)																	
PAVEMENT	Type/Length																	
	Condition																	
FLOODING	Overflow Length(Km)/Height(m)																	
LAND USE	Left																	
	Right																	
PIPE CULVERT	Total Number																	
BOX CULVERT & BRIDGE	Station (Km)	30.7	31.8	34.3	35.1	36.5	37.8											48.1
	Dimension	C-Br. 9.00 x 15.00	C-Br. 9.00 x 30.00	C-Br. 9.00 x 36.00	W-Br. 4.50 x 30.00	W-Br. 4.50 x 45.00	W-Br. 4.50 x 25.30											W-Br. 4.30 x 17.00
RIGHT OF WAY (m)																		
ALIGNMENT	Horizontal																	
	Vertical																	
ROUTE NO., AGENCIES																		

ROAD INVENTORY (3)

PROPOSED ROUTE NO. IM-21 ROUTE NO. ARD

B. HUAIYANG ~ K.A. PHOSAI

L = 13.4 Km

UBON RATCHATHAI

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. HUAIYANG H = 180 P = 900		B. LUM PHUK H = 150 P = 750		B. DONYIAN H = 150 P = 750		B. PHALAI H = 400 P = 2000		B. LEO H = 75 P = 275		B. PHOSAI					
TERRAIN		Rolling															
CROSS SECTION	Formation width (m)	5.50															
	Embankment Height (m)	0.00				0.30											
	Cutting Depth (m)																
PAVEMENT	Type/Length	Laterite															
	Condition	Poor															
FLOODING	Overflow Length(Km)/Height(m)																
LAND USE	Left	← Forest		Paddy													
	Right	Forest		Paddy													
PIPE CULVERT	Total Number	12 Pipes															
BOX CULVERT & BRIDGE	Station (Km)	0.7	6.0			8.6	8.8										
	Dimension	W-Br. 3.50 x 30.50	W-Br. 4.0 x 10.00			W-Br. 3.40 x 38.50	W-Br. 3.00 x 19.60										
RIGHT OF W (m)		7.50		30.00													
ALIGNMENT	Horizontal	Fair															
	Vertical	Fair															
ROUTE NO., AGENCIES		ARD															

Table 21.2.1 TRAFFIC VOLUME ON ROUTE IM - 21

YEAR	1987				1993				2001				
	LINK	1	2	3	AVR.	1	2	3	AVR.	1	2	3	AVR.
P/C	N+D	51	3	33	35	68	9	47	49	99	24	77	77
	I	8	0	5	5	10	1	7	7	15	4	12	11
	DV	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	59	3	37	41	78	10	54	57	114	28	89	88
L/B	N+D	68	3	72	56	108	11	101	86	205	30	161	155
	I	10	1	11	8	16	2	15	13	31	4	24	23
	DV	0	0	0	0	0	0	0	0	1	0	1	1
	TOTAL	78	4	83	64	125	12	117	99	237	34	185	179
M/B	N+D	83	27	88	73	133	31	124	109	253	37	198	191
	I	12	4	13	11	20	5	19	16	38	6	30	29
	DV	0	0	0	0	1	0	0	0	1	0	1	1
	TOTAL	95	31	102	84	154	36	143	126	292	42	228	220
H/B	N+D	88	7	46	58	102	10	60	69	111	16	86	83
	I	13	1	7	9	15	1	9	10	17	2	13	13
	DV	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	101	8	53	66	117	11	69	80	128	19	100	96
P/P&T	N+D	101	46	118	95	167	58	163	143	325	80	254	252
	I	15	7	18	14	25	9	24	21	49	12	38	38
	DV	0	0	0	0	1	0	1	1	1	0	1	1
	TOTAL	116	53	136	110	192	67	188	165	375	92	293	290
4/T	N+D	27	1	31	23	27	3	27	22	26	7	21	21
	I	4	0	5	3	4	0	4	3	4	1	3	3
	DV	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	31	1	36	27	32	4	31	26	31	8	24	24
6/T	N+D	40	20	38	35	46	18	40	38	58	15	45	45
	I	6	3	6	5	7	3	6	6	9	2	7	7
	DV	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	46	24	44	41	53	21	46	44	67	17	52	52
10/T	N+D	19	2	12	13	30	6	22	22	53	13	41	41
	I	3	0	2	2	4	1	3	3	8	2	6	6
	DV	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	22	3	14	15	35	7	25	26	61	15	47	47
ADT	N+D	477	110	438	389	681	146	583	540	1130	222	882	864
	I	71	16	66	58	102	22	87	81	169	33	132	130
	DV	0	0	0	0	3	1	2	2	5	1	4	3
	TOTAL	548	126	504	447	786	168	673	623	1304	256	1018	997
M/C	N+D	404	171	393	353	463	208	444	404	497	270	495	450
	I	23	17	24	22	16	20	21	18	0	23	5	6
	DV	0	0	0	0	0	0	0	0	0	1	0	0
	TOTAL	427	188	418	375	479	228	465	423	497	294	500	457
TOTAL	N+D	881	281	832	742	1144	354	1027	945	1627	492	1377	1314
	I	95	33	90	81	118	42	108	99	169	56	137	136
	DV	0	0	0	0	3	1	3	2	5	1	4	4
	TOTAL	975	314	922	823	1265	396	1138	1046	1801	550	1518	1454

NOTE

N : NORMAL TRAFFIC  
 DV : DEVELOPED TRAFFIC

D : DIVERTED TRAFFIC  
 I : INDUCED TRAFFIC

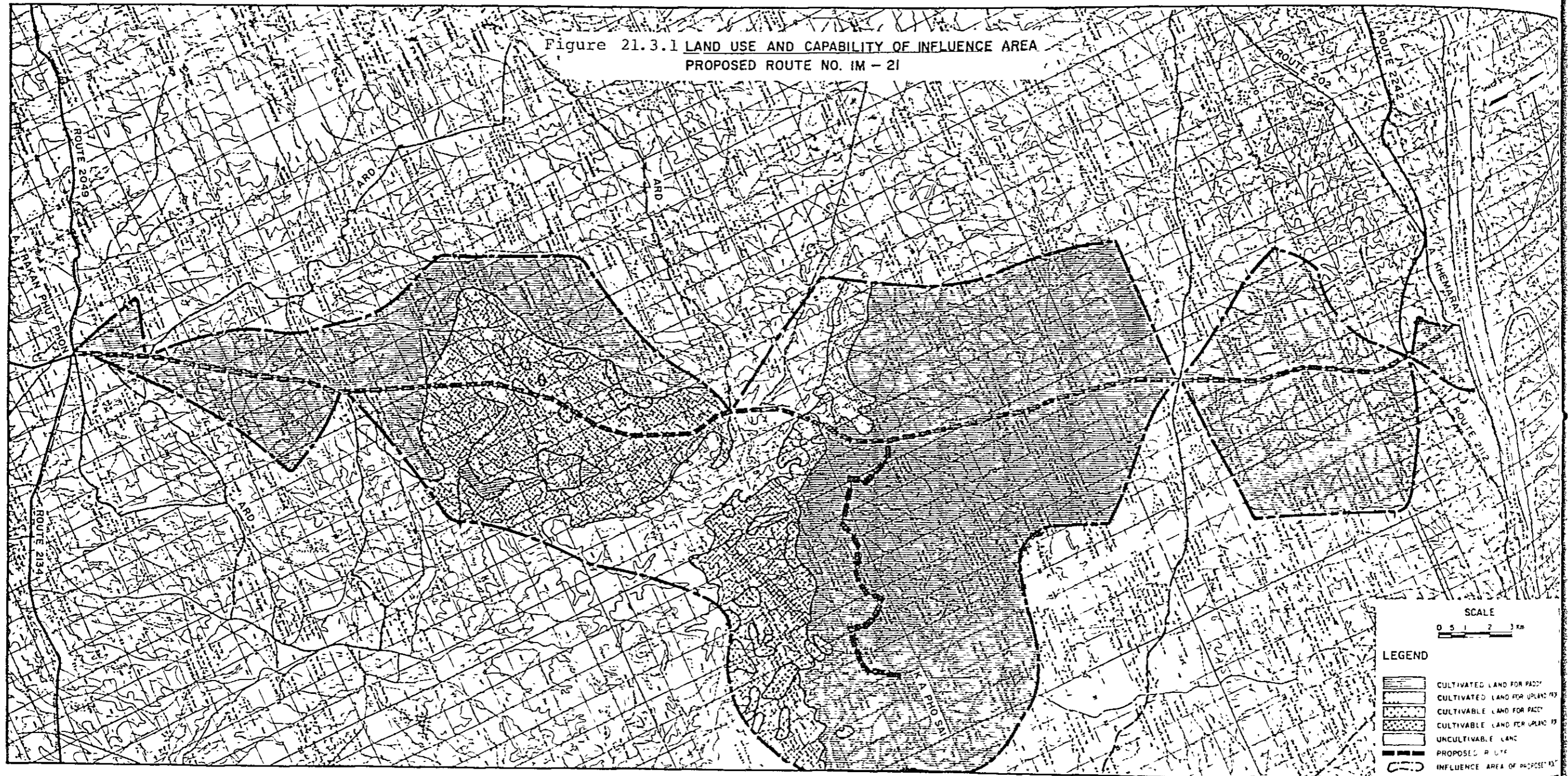
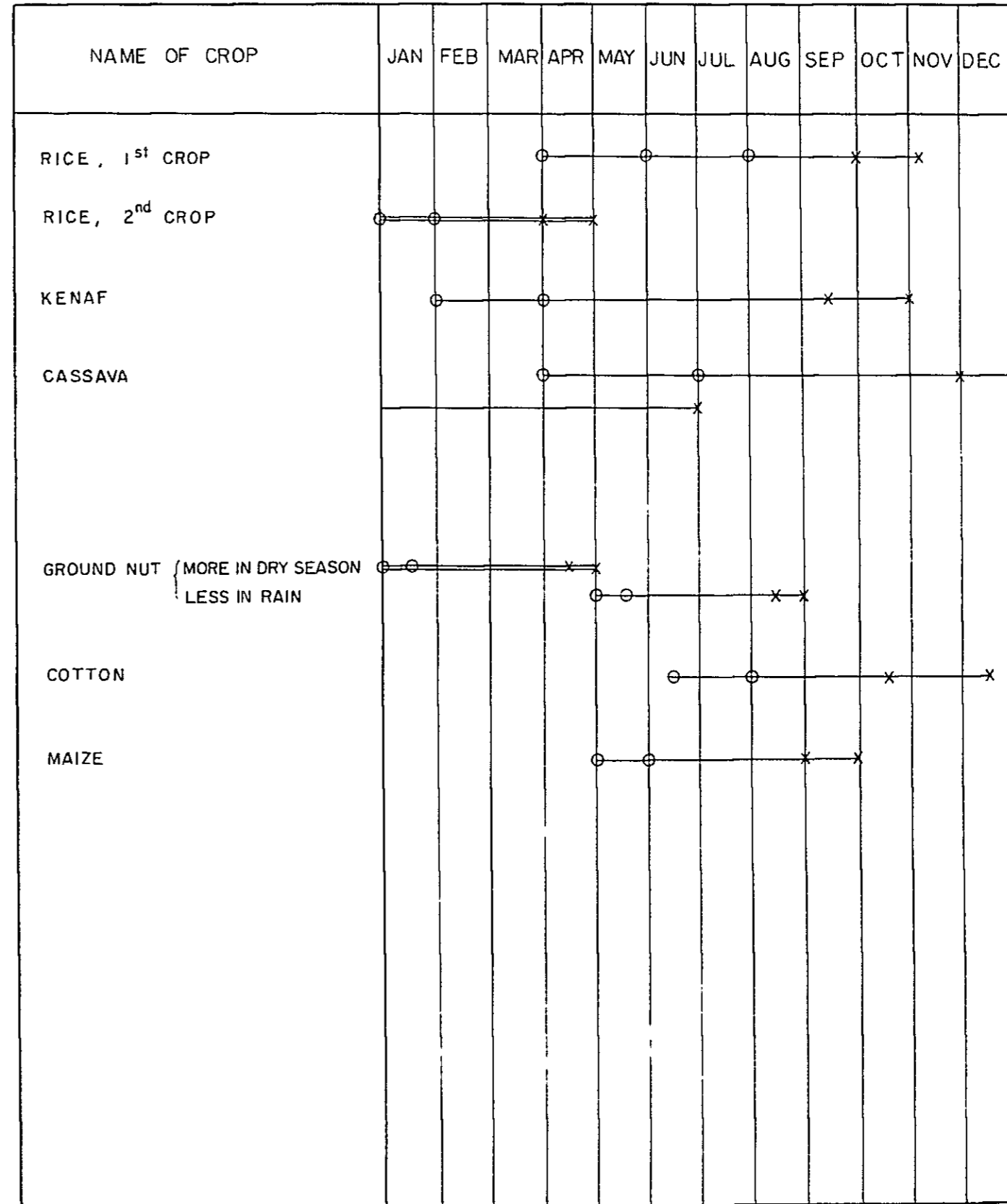


Figure 21.3.2 CROPPING CALENDAR

1100 CHANGWAT UBON RATCHATHANI



Note

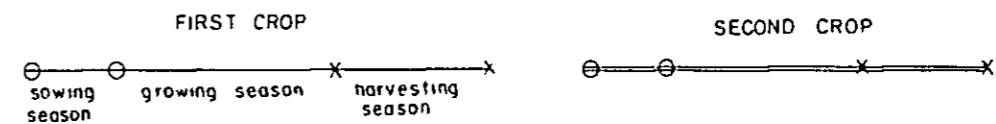


TABLE 21.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[ UNIT : 1000 RAI (HECTARE) ]

AMPHOE CODE	AMPHOE NAME	CULTIVATED LAND			UNUSED CULTIVABLE LAND		
		PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
		196.875 (315.0)	4.375 ( 7.0)	201.250 (322.0)	4.375 ( 7.0)	48.125 ( 77.0)	52.500 ( 84.0)
1103	KHEMARAJ	158.125 (253.0)	4.375 ( 7.0)	162.500 (260.0)	2.738 ( 4.7)	16.250 ( 26.0)	19.188 ( 30.7)
1110	NUT KAOFUN	11.250 ( 18.0)	-	11.250 ( 18.0)	0.813 ( 1.3)	10.625 ( 17.0)	11.438 ( 18.3)
1111	TRAKAN PHUTPHON	27.500 ( 44.0)	-	27.500 ( 44.0)	0.625 ( 1.0)	21.250 ( 34.0)	21.875 ( 35.0)

TABLE 21.3.2 CROP PRODUCTION

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)										
1981	184.22	-	-	0.33	4.01	-	0.25	-	4.63	188.85
1987	195.55	-	-	0.33	4.18	-	0.25	-	4.80	200.35
1993	WITHOUT PROJECT	-	-	0.33	4.36	-	0.25	-	4.98	207.12
	WITH PROJECT	-	-	0.37	4.99	-	0.26	-	5.66	207.80
2001	WITHOUT PROJECT	-	-	0.33	4.61	-	0.25	-	5.23	207.37
	WITH PROJECT	-	-	0.37	5.38	-	0.26	-	5.95	208.09
CROP YIELD (KG/RAI)										
1981	166.8	-	-	199.4	1985.3	-	147.4	-		
1987	167.8	-	-	199.4	1985.3	-	147.4	-		
1993	WITHOUT PROJECT	-	-	199.4	1985.3	-	147.4	-		
	WITH PROJECT	-	-	200.6	1997.2	-	147.4	-		
2001	WITHOUT PROJECT	-	-	199.4	1985.3	-	147.4	-		
	WITH PROJECT	-	-	202.2	2013.3	-	147.4	-		
CROP PRODUCTION (TON)										
1981	30,732	-	-	66	7,959	-	38	-	8,066	38,798
1987	32,819	-	-	66	8,299	-	38	-	8,406	41,226
1993	WITHOUT PROJECT	-	-	66	8,654	-	38	-	8,761	42,891
	WITH PROJECT	-	-	75	9,969	-	39	-	10,086	44,834
2001	WITHOUT PROJECT	-	-	66	9,150	-	38	-	9,258	43,661
	WITH PROJECT	-	-	76	10,626	-	39	-	10,744	46,619

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 21.3.3 FARMGATE PRICE AND PRODUCTION COST

ITEM	PADDY	MAIZE	BEANS	GRIND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	3,741	-	-	8,693	577	-	4,666	-
WITH PROJECT (1987 - 2001)	3,835	-	-	8,693	591	-	4,783	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	411	-	-	1,022	677	-	653	-
WITH PROJECT (1987 - 2001)	422	-	-	1,042	698	-	653	-

TABLE 21.3.4 NET PRODUCTION VALUE

YEAR	(1000 BAHT)					
	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	42,405	2,207	44,612	43,422	2,234	45,656
1993	44,598	2,290	46,888	48,039	2,687	50,726
2001	45,623	2,408	48,031	52,364	2,881	55,245



Figure 21.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE

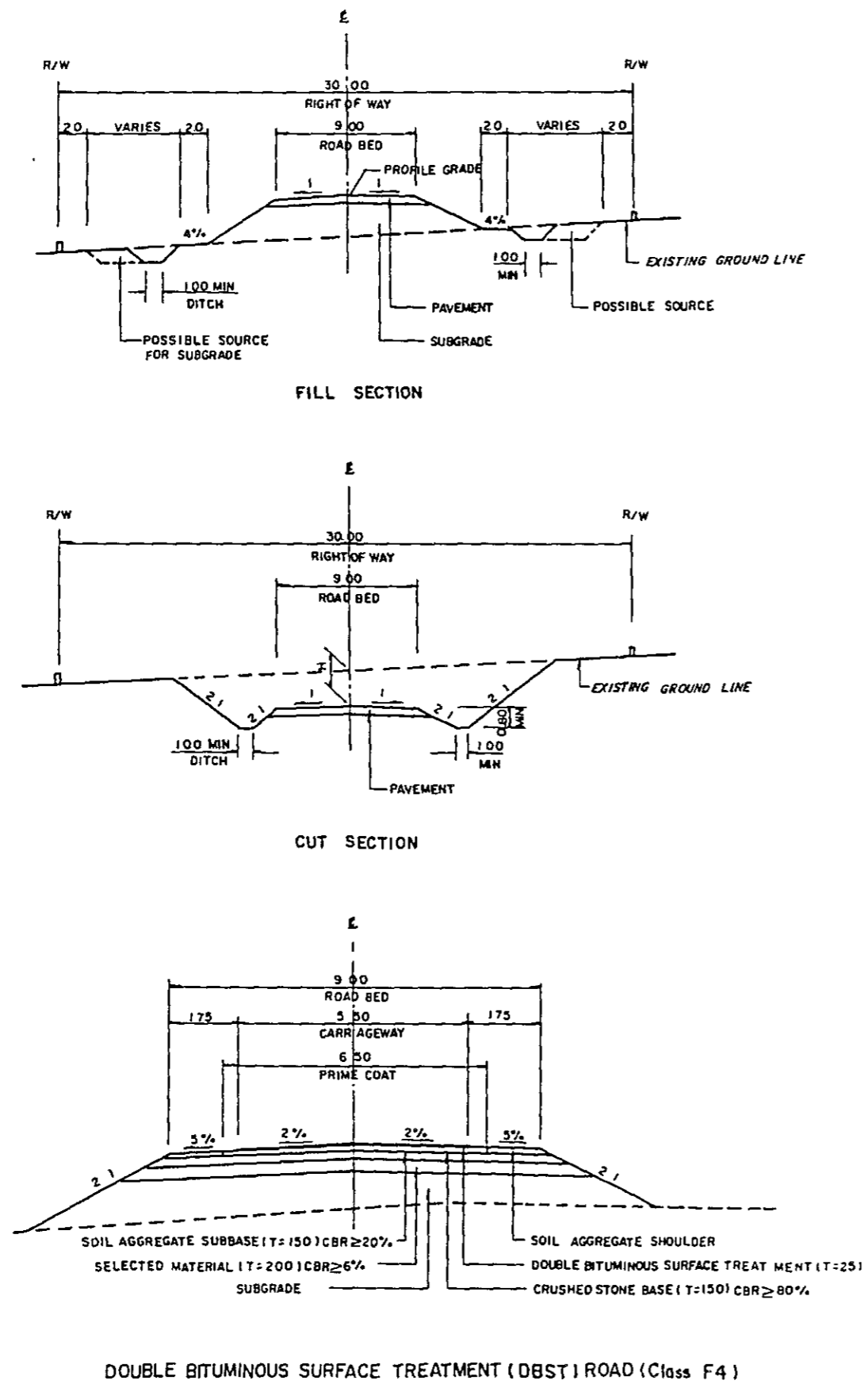
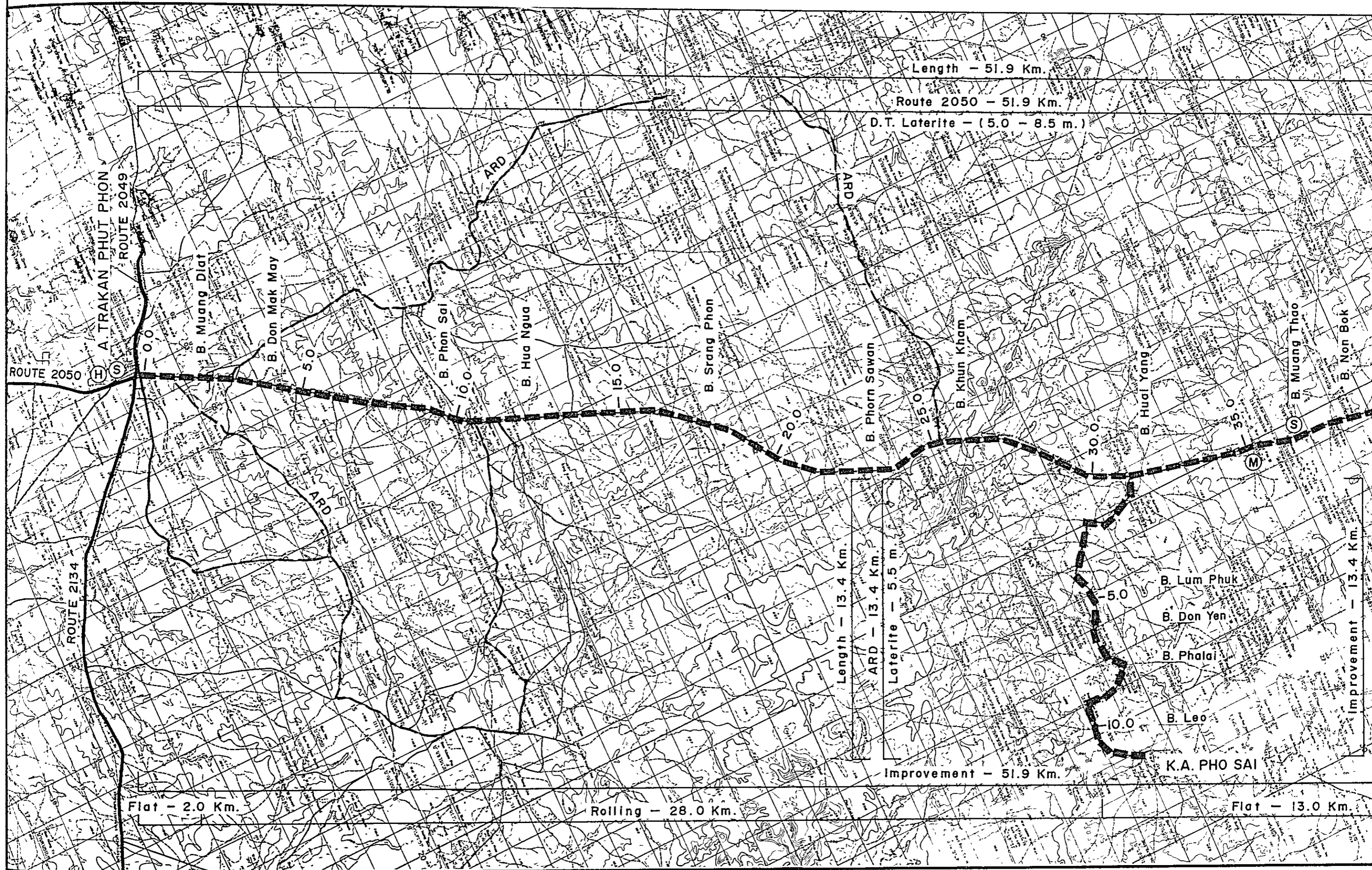


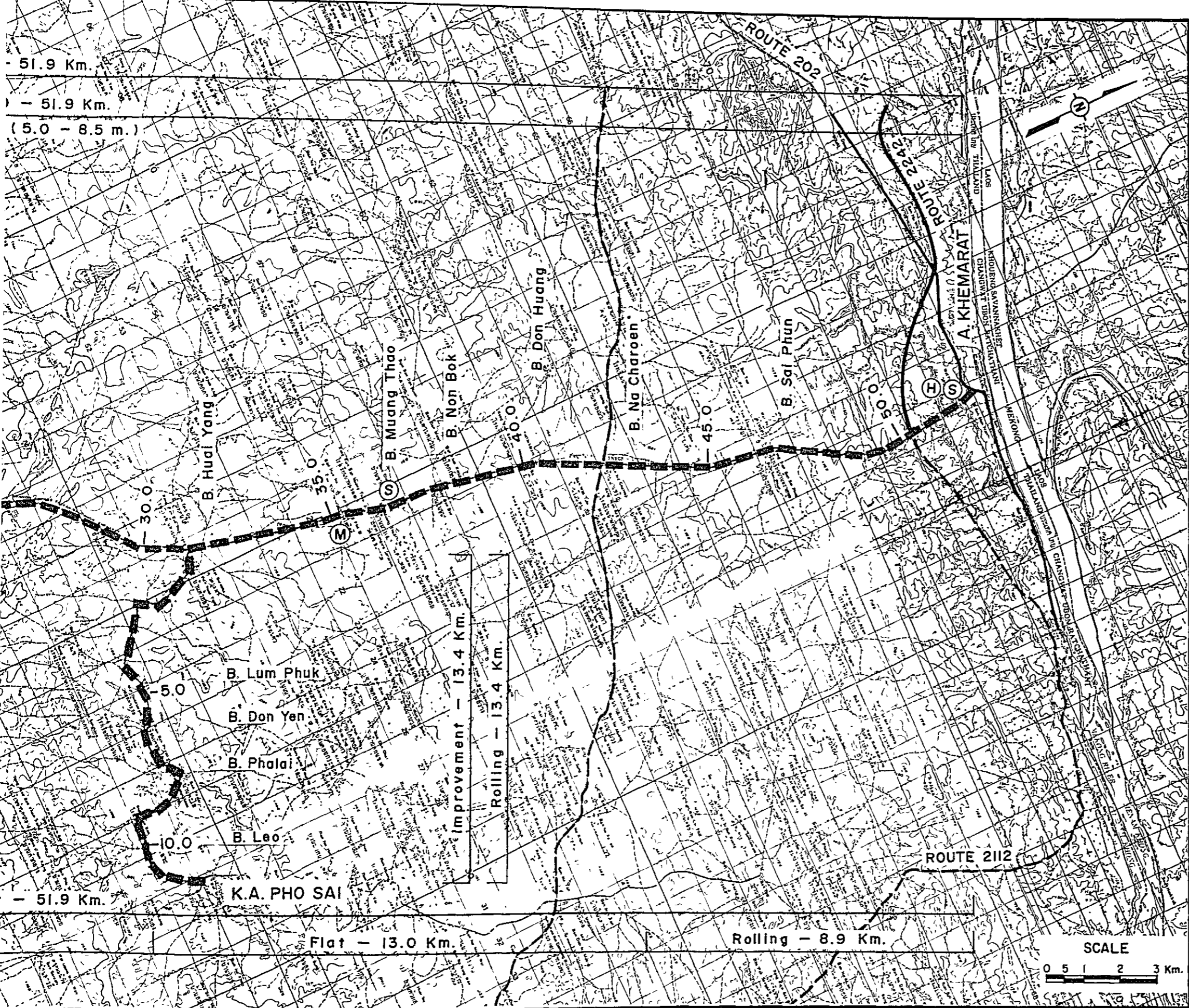
Figure 21.5.2 PROPOSED ROUTE NO. IM - 21

C. UBON RATCHATANI

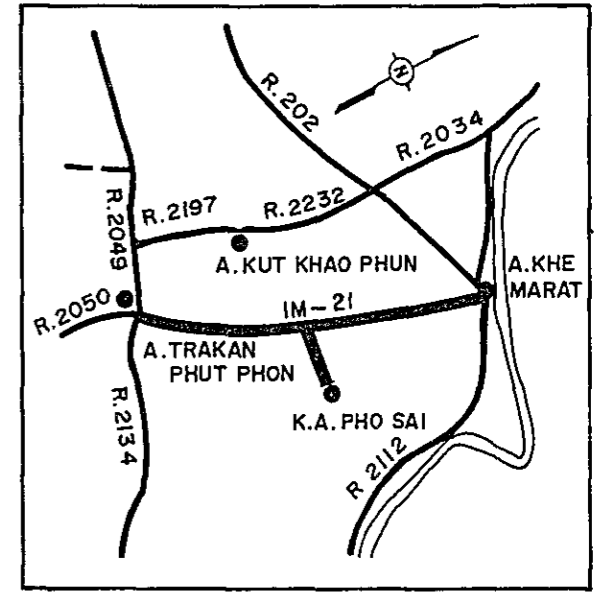
A. TRAKAN PHUT PHON (J.R. ROUTE NO. 2050 + ARD)



**RATCHATANI A. TRAKAN PHUT PHON (J.R. 2049) - A. KHEMARAT (J.R. 202)**  
**ROUTE NO. 2050 + ARD**  
**L = 51.9 + 13.4 = 65.3 Km.**



**LOCATION MAP**



**BRIDGE LIST**

No.	Station Km.	Proposed Bridge	Existing Bridge
1	11.2	—	C - 9.00 x 80.00
2	18.2	—	C - 9.00 x 18.00
3	25.3	—	C - 9.00 x 30.00
4	30.7	—	C - 9.00 x 15.00
5	31.8	—	C - 9.00 x 30.00
6	34.3	—	C - 9.00 x 36.00
7	35.1	C - 7.00 x 32.00	W - 4.50 x 30.00
8	36.5	C - 7.00 x 50.00	W - 4.50 x 45.00
9	37.8	C - 7.00 x 28.00	W - 4.50 x 25.30
10	48.1	C - 7.00 x 20.00	W - 4.30 x 17.00
(ARD)			
1	0.7	C - 7.00 x 34.00	W - 3.50 x 30.50
2	6.0	C - 7.00 x 12.00	W - 4.00 x 10.00
3	8.6	C - 7.00 x 42.00	W - 3.40 x 38.50
4	8.8	C - 7.00 x 22.00	W - 3.00 x 19.60

**LEGEND**

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

Table 21.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-21 (65.3 km)

Items	Unit of Q'ty	Financial Unit Rate ₪	(DBST)		
			Q'ty	Financial Cost (10 <sup>3</sup> ₪)	Economic Cost (10 <sup>3</sup> ₪)
DIRECT CONSTRUCTION COST					
Clearing and Grubbing	ha	15,000	150	2,250	2,047
Excavation - Soil	m <sup>3</sup>	20	0	0	0
Excavation - Hard Rock	m <sup>3</sup>	160	0	0	0
Embankment	m <sup>3</sup>	45	237,100	10,669	9,709
Selected Material	m <sup>3</sup>	80	117,700	9,416	8,380
Soil Aggregate Surface or Subbase	m <sup>3</sup>	105	82,400	8,562	7,700
Crushed Stone Base	m <sup>3</sup>	370	54,100	20,017	18,415
Soil Aggregate Shoulder	m <sup>3</sup>	105	23,300	2,446	2,177
Prime Coat and DBST	m <sup>2</sup>	55	305,300	16,792	15,113
Pipe Culvert	m	2,100	1,990	4,179	3,844
Box Culvert	m	16,000	0	0	0
Long Span Bridge	m	80,000	0	0	0
Short Span Bridge	m	40,000	240	9,600	8,544
Sub Total (a)				84,022	75,932
Miscellaneous Works (a) x 7%				5,882	5,315
Total (b)				89,904	81,247
PHYSICAL CONTINGENCY (b) x 15%				13,486	12,187
ENGINEERING AND ADMINISTRATION (b) x 10%				8,990	8,125
Sub Total.				22,476	20,312
LAND ACQUISITION					
Highly Developed Land	ha	50,000	0	0	0
Less Developed Land	ha	15,000	2	30	30
Sub Total				30	30
GRAND TOTAL				112,410	101,589

Table 21.6.1 COST AND BENEFITS (F4 STANDARD)

YEAR	COST		BENEFITS			DISCOUNTED (12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	20,318	0	0	0	0	28,545	0
1985	50,794	0	0	0	0	63,716	0
1986	30,477	0	0	0	0	34,134	0
1987	0	1,044	14,077	124	15,244	0	13,611
1988	0	1,492	15,105	163	16,759	0	13,360
1989	0	1,939	16,133	201	18,274	0	13,007
1990	0	2,387	17,162	240	19,789	0	12,576
1991	0	2,835	18,190	279	21,303	0	12,088
1992	0	3,282	19,218	318	22,818	0	11,560
1993	0	3,730	20,246	357	24,333	0	11,007
1994	31,605	4,165	21,725	414	26,303	14,297	10,624
1995	0	4,600	23,203	471	28,274	0	10,196
1996	0	5,035	24,681	529	30,244	0	9,738
1997	0	5,470	26,159	586	32,215	0	9,261
1998	0	5,905	27,637	643	34,185	0	8,775
1999	0	6,340	29,115	701	36,156	0	8,286
2000	0	6,775	30,594	758	38,126	0	7,801
2001	-46,474	7,210	32,072	815	40,097	-8,491	7,326
TOTAL	86,720	62,208	335,316	6,598	404,121	132,201	159,216
DISCOUNTED ECONOMIC COSTS :					132,201		
DISCOUNTED ECONOMIC BENEFITS :					159,216		
AGRICULTURAL DEVELOPMENT BENEFIT					22,184		
VOC SAVING					134,710		
RMC SAVING					2,322		
NET PRESENT VALUE :					27,014		
BENEFIT COST RATIO :					1.20		
INTERNAL RATE OF RETURN :					14.3 %		

Table 21.7.1 SOCIAL INDICATORS  
(Proposed Route IM-21)

<b>Population (1,000)</b>	
1982	: 47.4
1993	: 53.3
Average travelling speed, without (kph) : 48	
<b>Isolation</b>	
Access to Amphoe	
Average distance to Amphoe (km) <sup>1/</sup>	: 9.4
Per capita time savings (10 <sup>-4</sup> )	: 0.012
Score	: 35
Access to Artery Highway	
Average distance to highway (km) <sup>1/</sup>	: 34
Per capita time savings (10 <sup>-4</sup> )	: 0.044
Score	: 96
Impassability	
Impassable week a year	: -
Impassability per year	: 0
Impassability per capita (10 <sup>-4</sup> )	: 0
Score	: 0
<b>Health</b>	
Access to Hospital	
Average distance to Hospital (km) <sup>1/</sup>	: 16.3
Per capita time savings (10 <sup>-4</sup> )	: 0.021
Score	: 49
Access to Medical Facilities	
Average distance to facilities (km) <sup>1/</sup>	: 11.1
Per capita time savings (10 <sup>-4</sup> )	: 0.014
Score	: 56

<b>Education</b>	
Access to Secondary School	
Number of Student in 1993 (1,000) <sup>2/</sup>	: 10.1
Average distance to school (km)	: 10.0
Per capita time savings (10 <sup>-4</sup> )	: 0.069
Score	: 37
Teacher Intensity	
Number of teachers <sup>3/</sup>	
University graduate	: -
Total	: 16
Number of Student	: 387
Indicators	
E1 <sup>4/</sup>	: -
E2 <sup>5/</sup>	: 41.3
E <sup>6/</sup>	: 41.3
Degree of Improvement <sup>7/</sup>	: 1.66
Score	: 105
<b>Disparity</b>	
G.P.V. in 1993 (Mn B) <sup>8/</sup>	
With project	: 140.0
Without project	: 133.5
Per capita G.P.V. in 1993 (B)	
With project (W)	: 2,627
Without project (w)	: 2,505
Degree of Disparity	
(A/W) - (A/w) <sup>9/</sup>	: 0.05
Score	: 89
Total Score	: 467

Note:

- 1/ ( ) shows the length or distance in without project case. Unless otherwise, lengths 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 - 22**

Changwat : Ubon Ratchathani

A Khemarat - B. Huasa Phan (J.R.217)

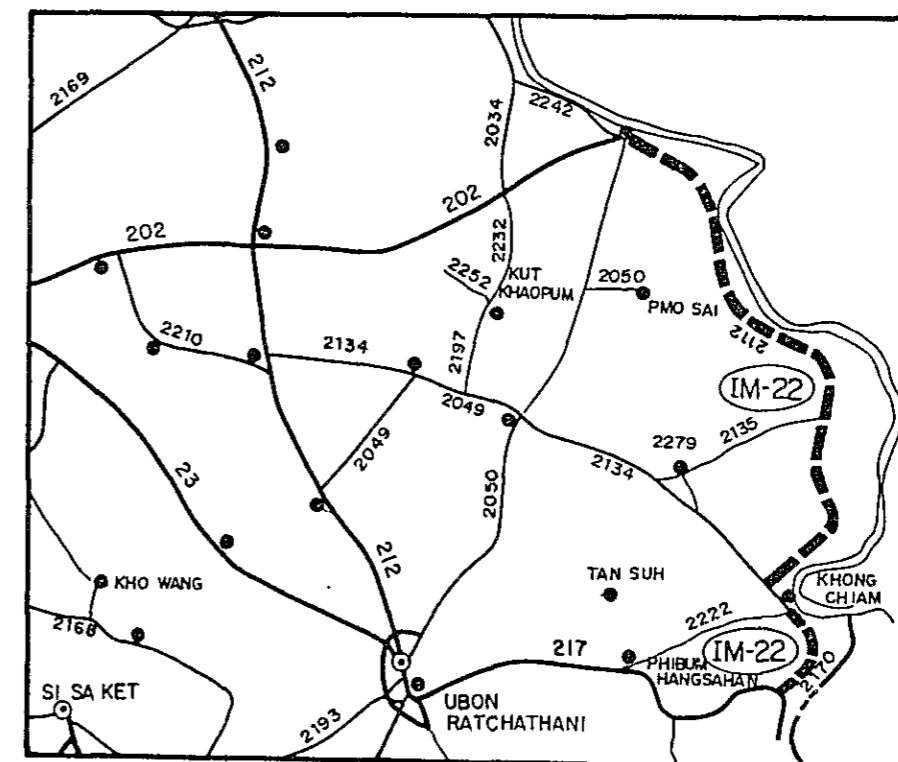
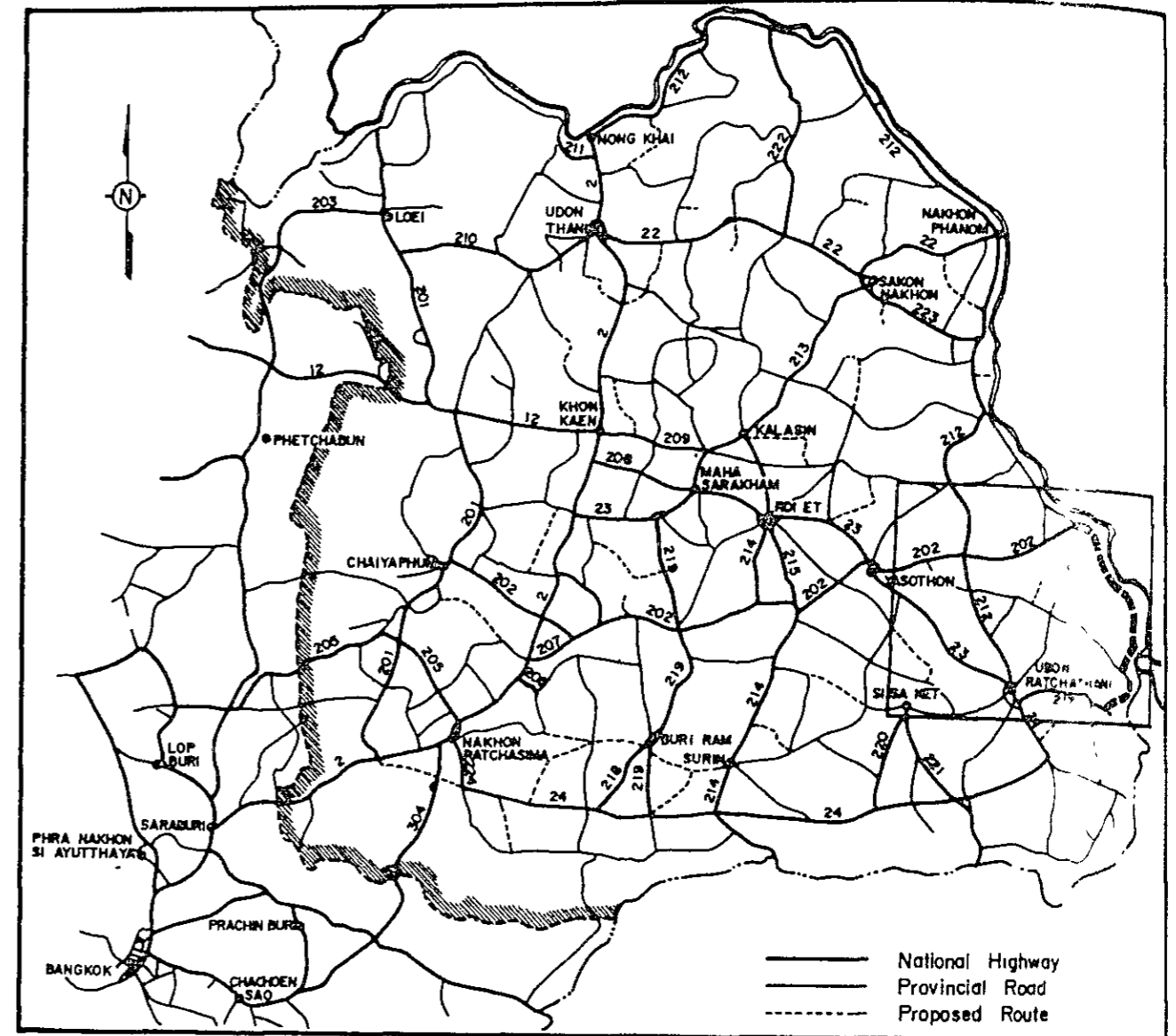
Length : 122.4 KM.

## LOCATION OF PROPOSED ROUTE

### SUMMARY

#### PROPOSED ROUTE IM-22

Item	Description
Changwat	Ubon Ratchathani
Origin	A. Khemarat
Destination	B. Huasa Phan (J.R.217)
Length	
Total	122.4 km
Improvement Section	122.4 km
DOH Road	R.2112, R.2173 122.4 km
ARD Road	0 km
Others	0 km
New Alignment Section	0 km
Surface Type and Condition	Soil Aggregate, Good - Poor
Terrain	Rolling and Mountainous
Influence Area	
Area	891 km <sup>2</sup>
Population (1982)	18,100
Principal Crops	Paddy
Traffic (ADT)	
Existing	83
1993	381
2001	538
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	217,108 . 10 <sup>3</sup> ฿
Economic	196,082 . 10 <sup>3</sup> ฿
IRR	4.5 %
B/C	0.48
Social Impact	High
Recommendation	For further consideration



## 1. 概要

### 1.1 計画路線の概要

本路線は、Ubon Ratchathani県の北東部に位置する。ルートは、Khemarat郡を起点とし、東西方向にと走り、Si Yark 村、Nam Thoeng村、KhogChaim 郡を経て、Ben Huasa Phanで終わる。その総延長は、122.4 kmである。(Figure 22.5.2 参照)

沿道の地形は、ほとんど丘陵地であり、山岳部が2ヶ所ある。影響圏内には、いくつかの村があり、その総人口は、18,100人である。Na Pho村には医療センターがただ1ヶ所あり、又ルートの起点であるSaitong 村には教育施設として中学校が1ヶ所ある。

国境を通るこのルートは、国家防衛上非常に重要な路線である。

### 1.2 現道の状況

計画路線に利用した現道の状況はTable 22.1.1に要約し、その詳細はTable 22.1.2のイベントリー調査の結果に示した。

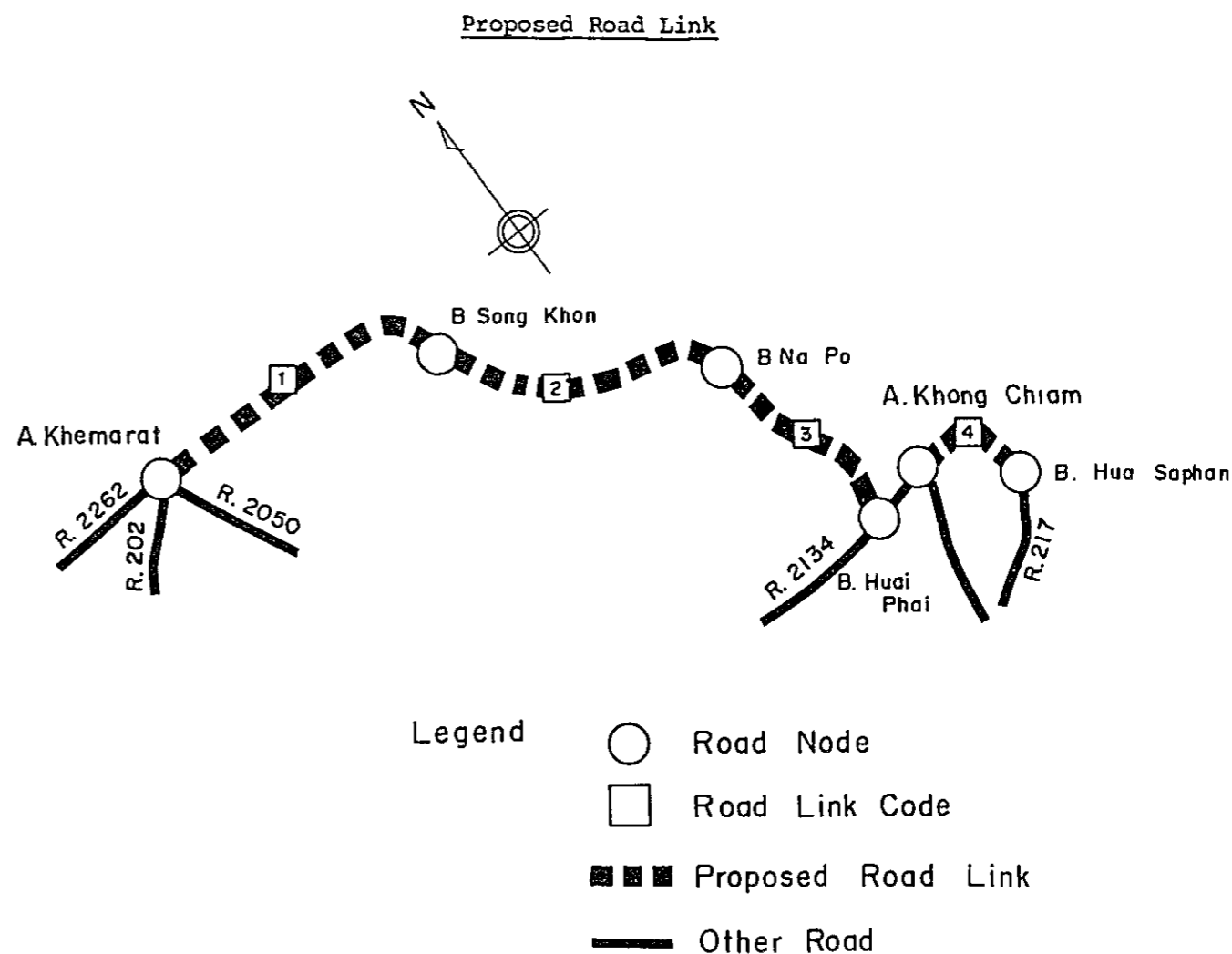
## 2. 交通

### 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。





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 <sup>1/</sup>	22	13	26	31	22	2	7	10	1	134
	2	n.a.									
	3 <sup>2/</sup>	1	3	4	5	2	-	2	3	-	20
	4 <sup>3/</sup>	67	36	29	35	-	6	18	-	-	191
Manual Counts (1982)	1	n.a.									
	2	-	13	15	5	3	2	-	14	1	52
	3	-	26	4	8	-	1	1	2	-	42
	4	n.a.									
Estimated	1	22	13	26	31	22	2	7	10	1	134
	2	-	13	15	5	3	2	-	14	1	52
	3	1	15	4	7	1	1	2	3	-	27
	4	67	36	29	35	-	6	18	-	-	191

Note: <sup>1/</sup> Route 2112 Station 0100 Station Km 24+000  
<sup>2/</sup> Route 2112 Station 0300 Station Km 99+600  
<sup>3/</sup> Route 2173 Station 0100 Station Km 6+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	1982
2	486
3	274
4	1479

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	23	13	37
2	20	11	32
3	5	3	9
4	11	6	17

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	1.5	1.3
PASSENGER MOVEMENT	5.8	5.9	5.9

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981	1987	1993
	1987	1993	2001
NON-AGRI.	7.5	7.6	7.7
AGRICULTURE	0.5	0.3	0.3
FREIGHT	5.0	5.0	5.0

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	19.3	11.4	22.8	27.2	19.3	10.0	35.0	50.0	5.0
	1987	16.6	17.2	22.4	26.9	17.0	12.1	29.3	45.5	13.1
	1993	13.9	23.0	21.9	26.6	14.6	14.2	23.6	41.0	21.2
	2001	10.2	30.8	21.3	26.2	11.5	17.0	16.0	35.0	32.0
2	1982	0.0	36.1	41.7	13.9	8.3	12.5	0.0	87.5	0.0
	1987	2.7	34.7	36.3	17.1	9.2	13.7	4.2	73.7	8.4
	1993	5.9	33.0	29.9	21.0	10.2	15.1	9.3	57.1	18.5
	2001	10.2	30.8	21.3	26.2	11.5	17.0	16.0	35.0	32.0
3	1982	4.8	38.1	19.0	33.3	4.8	16.7	33.3	50.0	0.0
	1987	6.3	36.5	19.5	31.2	6.4	16.8	28.8	46.1	8.4
	1993	8.2	34.6	20.0	28.7	8.4	16.9	23.3	41.3	18.5
	2001	10.7	32.1	20.6	25.4	11.1	17.0	16.0	35.0	32.0
4	1982	40.1	21.6	17.4	21.0	0.0	25.0	75.0	0.0	0.0
	1987	32.7	29.0	16.3	19.8	2.2	22.6	57.3	10.5	9.6
	1993	25.3	36.4	15.2	18.6	4.5	20.2	39.6	21.0	19.2
	2001	15.4	46.3	13.8	17.0	7.5	17.0	16.0	35.0	32.0

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	1.3	1.3

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 22.2.1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	18	24	25	12	28	4	9	2	121	173	294
1993	22	33	37	17	46	3	8	3	169	212	381
2001	28	49	60	26	87	3	7	6	267	272	538

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。

### 3. 農業開発

#### 3.1. 現況

影響圏は、Mekong河沿岸地帯と山岳地帯を通過しているため、その農耕地は限られている。圏内の北部地帯の農耕地は、殆ど水田であるが、一方、中央部と南部地帯の農耕地は、主として畑作地であり、ケナフ、キャッサバ、落花生等が栽培されている。未開発可耕地は、主として畑地がこの圏内の中央部および南部に残っている。

圏内の土地利用及び土地適応性の状況はTable 22.3.1とFigure 22.3.1に示し、また、Ubon Ratchathani県地域の代表的作物暦は、Figure 22.3.2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、単位当たり収量及び生産量はTable 22.3.2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、Table 22.3.3.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 22.3.4.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			Nos. of Wooden Narrow Bridge		
No.	Terrain	Length (Km)	<sup>/1</sup> Road Class	Nos. of Wooden Bridge	Nos. of Narrow C. Bridge	Length (Km)	<sup>/1</sup> Road Class			
							Case 1	Case 2	Case 3	
1	Rolling	36.0	3	5	0	36.0	1		0	
2	Rolling & Mountainous	42.5	2B	7	0	42.5	1 (F4)	2A	2A (F5)	0
3	Rolling	31.7	2B	6	0	31.7		2A		0
4	Rolling	12.2	3	2	0	12.2		1		0

<sup>/1</sup> 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)	11,981	17,339	27,897
1+2A (F4+F5)	10,815	15,783	25,549
2A (F5)	7,725	11,415	18,489

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 (if not feasible, F5)  
 Geometric Design : AASHTO (Rural Highways)  
 Typical Cross Section : as shown in Figure 22.5.1

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<sub>></sub>80% 15.0cm  
 Soil Aggregate Subbase CBR<sub>></sub>20% 15.0cm  
 Selected Material CBR<sub>≥</sub>6% 20.0cm

In case of F5 Standard

Soil Aggregate Surface CBR<sub>≥</sub>20% 15.0cm  
 Selected Material CBR<sub>≥</sub>6% 20.0cm

Pipe Culvert

Standard Size : φ 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 22.5.2

ルートの線形は、Figure 22.5.2 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は建設費は、各工事ごとに単価を付してTable 22.5.1 に示す。  
 道路規格別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。

Financial and Economic Construction Cost

Road Class	Length (Km)	Construction Cost (10 <sup>3</sup> ¥)		Remark
		Financial Cost	Economic Cost	
F4 (DBST)	122.4	217,108	196,082	
F5 (Soil Aggregate)	122.4	116,559	106,625	
F4 + F5	122.4	153,492	138,215	
F4	48.2	86,098	77,780	Adopted to link <sub>≥</sub> 300 in ADT
F5	74.2	67,396	60,436	Adopted to link < 300 in AD

## 6. 経済評価

年次別経済費用と便益及び評価結果はTable 22.6.1, 22.6.2及び22.6.3に示す通りである。

このルートはF4規格, F5規格共に1987年を供用開始とした場合にフィジブルでない。

## 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 22.7.1に示す通りである。このルートの社会的インパクトはかなり高い。

Table 22.1.1 SUMMARY OF ROAD INVENTORY

Item	Description	
Origin	A. Khemarat	
Destination	B. Huasa Phan (J.R. 217)	
Length		
Total		122.4 km
Improvement Section		122.4 km
DOH Road	R.2112, R.2173	122.4 km
ARD Road		0 km
Others		0 km
New Alignment Section		0 km
Terrain	Rolling and Mountainous	
Alignment (Hori./Vert.)	Fair and Partially Poor	
Formation Width	5.0 m - 7.0 m, 5.7 m (Weighted average)	
Embankment Section		
Length		119.4km
Height	0.2 m -	1.5 m
Cut Section		
Length		3.0 km
Depth	0.3 m -	m
Surface Type and Condition		
SBST or DBST	Poor	0.7 km
Soil Aggregate	Good - Poor	121.7 km
Earth		0 km
Pipe Culvert	122 each	
Box Culvert	1 each	20.0 m
Bridge		
Permanent Bridge	6 each	304.0 m
Narrow Concrete Bridge	0 each	0 m (4m)
Wooden Bridge	11 each	155.0 m
Overflow Section	0 place	0 km

Table 22.1.2 ROAD INVENTORY(1)

PROPOSED ROUTE NO. IM-22

ROUTE NO. 2112

A. KHEMARAT ~ B. HAUSA PHAN (J.R. 217)

L = 110.2 Km

C. UBON RATCHATHANI

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
VILLAGE																	
- Name				B. SAITHONG		B BUNG KHOUNG			B. PHANSAYAM (KHUNNANTHIANG)		B. THANG KHONG		B. DONNIN		B. PAK SAENG		B. SEE YA EK
- Household (H)				H = 45		H = 55			H = 12		H = 15		H = 30		H = 64		H = 13
- Population (P)				P = 225		P = 275			P = 60		P = 75		P = 150		P = 320		P = 65
TERRAIN									Rolling								
CROSS SECTION	Formation Width (m)									7.00							
	Embankment Height (m)	1.00	2.00	1.00		0.50	1.00	0.40		1.00		0.60			1.00	0.60	1.00
	Cutting Depth (m)																
PAVEMENT	Type/Length	DT		Laterite								Laterite					
	Condition									Poor							
FLOODING	Overflow Length(Km)/Height(m)																
LAND USE	Left		Paddy				Forest				Paddy		Forest			Paddy	Forest
	Right		Paddy				Forest				Paddy		Forest			Paddy	Forest
PIPE CULVERT	Total Number								113 pipes								
BOX CULVERT & BRIDGE	Station (Km)		1.6	4.1	6.4	8.7		11.6			18.4		22.0	23.9			29.3
	Dimension		C-Box 2-3.60 x 3.70 x 20.00	W-Br. 4.20 x 24.80	W-Br. 4.30 x 20.20	C-Br. 9.00 x 46.00		C-Br. 9.00 x 35.00			W-Br. 4.20 x 10.20		C-Br. 9.20 x 128.00	W-Br. 4.30 x 10.20			C-Br. 10.00 x 100.00
RIGHT OF WAY (m)																	
ALIGNMENT	Horizontal								Fair								
	Vertical								Fair								
ROUTE NO., AGENCIES		DOH 2050							DOH 2112								

ROAD INVENTORY (2)

PROPOSED ROUTE NO. IM-22

ROUTE NO. 2112

A. KHEMARAT ~ B. HAUSA PHAN (J.R. 217) (Cont'd)

L = 110.2 Km.

C. UBON RATCHATHANI

STATION (Km)		30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60			
VILLAGE																				
- Name																				
- Household (H)																				
- Population (P)																				
TERRAIN		Rolling												Mountainous						
CROSS SECTION	Formation Width (m)	7.00		8.00																
	Embankment Height (m)	0.30	0.60			1.20	1.00				0.60	1.00	0.60	1.00						
	Cutting Depth (m)			0.30																
PAVEMENT	Type/Length	Laterite																		
	Condition	Poor						Good												
FLOODING	Overflow Length(Km)/Height(m)																			
LAND USE	Left	Forest				Paddy	Forest	Paddy											Forest	
	Right	Forest				Paddy	Forest	Paddy											Forest	
PIPE CULVERT	Total Number																			
BOX CULVERT & BRIDGE	Station (Km)			34.9	37.2	38.5	39.4			44.1			48.8	50.1			53.4	58.0	58.6	59.4
	Dimension			W-Br. 4.20 x 23.20	W-Br. 4.20 x 14.00	W-Br. 4.20 x 26.00	C-Br. 9.00 x 77.50			W-Br. 4.20 x 15.50			C-Br. 9.00 x 24.00	C-Br. 9.00 x 56.00			C-Br. 9.00 x 27.00	C-Br. 9.00 x 39.00	C-Br. 9.00 x 16.00	C-Br. 9.00 x 25.00
RIGHT OF WAY (m)																				
ALIGNMENT	Horizontal									Fair										
	Vertical									Fair								Poor		
ROUTE NO., AGENCIES		DOH 2112																		



ROAD INVENTORY (3)

PROPOSED ROUTE NO. IM-22 ROUTE NO. 2112

A. KHEMARAT ~ B. HAUSA PHAN (J.R. 217) (Cont'd)

L = 110.2 Km

C. UBON RATCHATHANI

STATION (Km)		60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	
VILLAGE																		
- Name																		
- Household (H)																		
- Population (P)																		
TERRAIN		Mountainous			Rolling		Mountainous					Rolling						
CROSS SECTION	Formation Width (m)																	
	Embankment Height (m)																	
	Cutting Depth (m)																	
PAVEMENT	Type/Length	Laterite																
	Condition	Good																
FLOODING	Overflow Length(Km)/Height(m)																	
LAND USE	Left						Forest					Paddy			Forest			
	Right						Forest					Paddy			Forest			
PIPE CULVERT	Total Number																	
BOX CULVERT & BRIDGE	Station (Km)	60.9	63.2	64.3	66.6	68.3	69.6	72.5	76.9	77.4	81.3	84.2	89.9					
	Dimension	C-Br. 9.00 x 30.00	W-Br. 4.00 x 10.20	C-Br. 9.00 x 29.00	C-Br. 9.00 x 28.00	W-Br. 4.00 x 15.30	W-Br. 4.00 x 15.00	W-Br. 4.00 x 19.00	C-Br. 9.00 x 75.0	C-Br. 9.00 x 15.00	C-Br. 9.00 x 59.00	W-Br. 4.00 x 10.20	W-Br. 4.00 x 15.50					
RIGHT OF WAY (m)																		
ALIGNMENT	Horizontal	Fair																
	Vertical	Fair	Poor	Fair	Poor	Fair					Poor	Fair						
ROUTE NO., AGENCIES		DOH 2112																

ROAD INVENTORY (4)

PROPOSED ROUTE NO. IM-22

ROUTE NO. 2112

A. KHEMARAT ~ B. HAUSA PHAN (J.R. 217) (Cont'd)

L = 110.2 Km.

C. UBON RATCHATHANI

STATION (Km)		90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120				
VILLAGE																					
- Name																					
- Household (H)																					
- Population (P)																					
TERRAIN		Rolling																			
CROSS SECTION	Formation Width (m)	8.00																			
	Embankment Height (m)					1.50				1.20				1.00				0.50			
	Cutting Depth (m)																				
PAVEMENT	Type/Length	Laterite																			
	Condition	Good																			
FLOODING	Overflow Length(Km)/Height(m)																				
LAND USE	Left	Forest																			
	Right	Forest																			
PIPE CULVERT	Total Number																				
BOX CULVERT & BRIDGE	Station (Km)	92.8		94.0						104.6		107.2		110.1							
	Dimension	W-Br. 4.20 x 20.00		W-Br. 4.00 x 20.20						C-Br. 8.00 x 70.00		W-Br. 4.30 x 15.00		W-Br. 4.00 x 15.00							
RIGHT OF WAY (m)																					
ALIGNMENT	Horizontal	Fair																			
	Vertical	Fair																			
ROUTE NO., AGENCIES		DOH 2112																			

ROAD INVENTORY (5)

PROPOSED ROUTE NO. IM-22

ROUTE NO. 2173

B. HINLAD ~ B. HUASA PHAN (J.R. 217)

UBON RATCHATHANI

L = 12.2 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. HIN LAD H = 45 P = 225		B. NONG CHAD H = 90 P = 350						B. HUASA PHAN H = 300 P = 1500								
TERRAIN		Rolling																
CROSS SECTION	Formation Width (m)	5.0			6.0													
	Embankment Height (m)	0.30			0.50		0.30		1.00		0.30							
	Cutting Depth (m)																	
PAVEMENT	Type/Length	Laterite																
	Condition	Poor																
FLOODING	Overflow Length(Km)/Height(m)																	
LAND USE	Left	Forest						Orchard										
	Right	Forest						Orchard										
PIPE CULVERT	Total Number	9 pipes																
BOX CULVERT & BRIDGE	Station (Km)	2.2			7.1		8.9		10.3									
	Dimension	W-Br. 4.00 x 29.30			C-Br. 9.00 x 29.00		W-Br. 4.40 x 10.50		C-Br. 9.00 x 56.00									
RIGHT OF WAY (m)																		
ALIGNMENT	Horizontal	Fair																
	Vertical	Fair																
ROUTE NO., AGENCIES		DOH 2173																

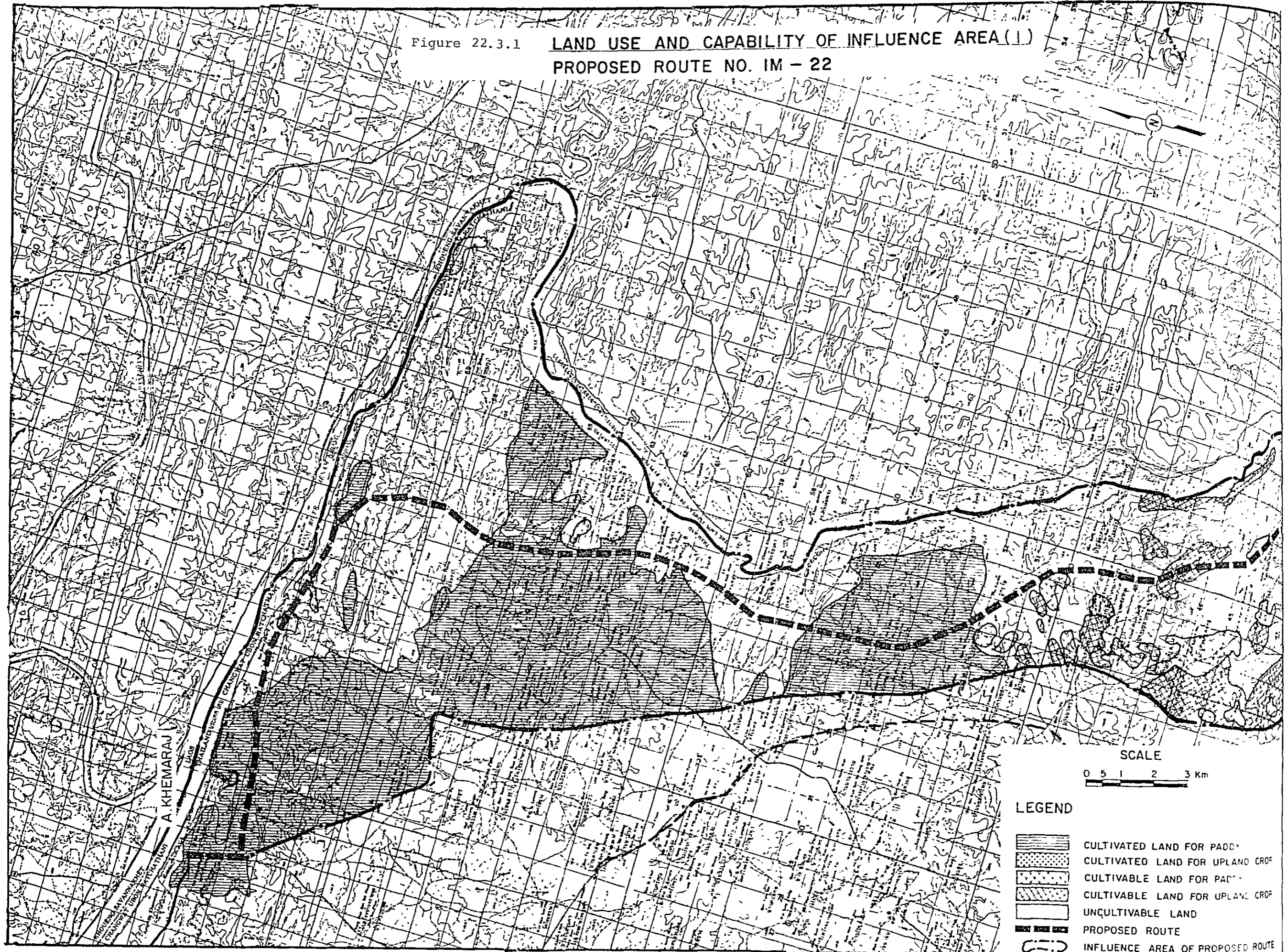
Table 22.2.1 TRAFFIC VOLUME ON ROUTE IM - 22

YEAR	1987					1993					2001					
	LINK	1	2	3	4 AVR.	1	2	3	4 AVR.	1	2	3	4 AVR.			
P/C	N+D	26	1	2	68	15	33	4	3	71	19	42	10	6	64	24
	I	4	0	0	10	2	5	1	0	11	3	6	2	1	10	4
	DV	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0
	TOTAL	30	1	2	79	18	38	4	4	82	22	49	12	7	74	28
L/B	N+D	36	17	5	34	21	52	19	8	43	28	87	21	12	57	42
	I	5	3	1	5	3	8	3	1	6	4	13	3	2	9	6
	DV	0	0	0	0	0	1	0	0	1	0	1	0	0	1	1
	TOTAL	41	20	6	39	24	61	23	9	50	33	102	25	14	67	49
M/B	N+D	43	8	9	41	22	63	14	11	52	31	107	26	15	71	52
	I	6	1	1	6	3	10	2	2	8	5	16	4	2	11	8
	DV	0	0	0	0	0	1	0	0	1	0	2	0	0	1	1
	TOTAL	49	9	10	48	25	74	16	13	61	37	125	31	17	82	60
H/B	N+D	27	4	2	5	10	35	7	3	12	15	47	12	6	31	23
	I	4	1	0	1	2	5	1	0	2	2	7	2	1	5	3
	DV	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
	TOTAL	31	5	2	5	12	40	8	4	15	17	55	13	8	36	26
F/P&T	N+D	30	19	11	64	24	58	24	14	104	39	130	34	20	194	75
	I	4	3	2	10	4	9	4	2	16	6	19	5	3	29	11
	DV	0	0	0	0	0	1	0	0	2	1	2	1	0	3	1
	TOTAL	34	21	13	73	28	67	28	16	121	46	152	40	23	226	87
4/T	N+D	6	1	2	8	3	5	2	1	5	3	4	3	1	2	3
	I	1	0	0	1	0	1	0	0	1	0	1	1	0	0	0
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	7	1	2	9	4	6	2	1	5	3	5	4	1	2	3
6/T	N+D	9	12	2	1	8	9	10	2	2	7	9	7	2	4	6
	I	1	2	0	0	1	1	2	0	0	1	1	1	0	1	1
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	10	14	3	2	9	10	12	3	3	8	10	9	2	5	7
10/T	N+D	3	1	0	1	1	4	3	1	2	3	8	7	2	4	6
	I	0	0	0	0	0	1	0	0	0	0	1	1	0	1	1
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	3	2	1	1	2	5	4	1	3	3	9	8	2	4	6
ADT	N+D	179	63	33	223	105	259	83	43	291	145	434	122	64	426	229
	I	27	10	5	33	16	39	12	6	44	22	65	18	10	64	34
	DV	0	0	0	0	0	4	1	1	4	2	7	2	1	7	4
	TOTAL	206	73	38	256	121	302	97	50	339	169	506	142	74	496	267
M/C	N+D	241	117	71	273	157	303	142	88	318	193	397	186	118	383	250
	I	22	13	8	23	15	25	15	10	25	18	25	18	13	24	20
	DV	0	0	0	0	0	2	1	1	2	2	2	2	1	2	2
	TOTAL	264	130	79	296	173	330	159	99	345	212	425	206	132	410	272
TOTAL	N+D	420	181	104	495	263	562	225	131	608	338	831	308	182	809	479
	I	49	22	13	57	31	64	27	16	68	39	91	37	22	88	54
	DV	0	0	0	0	0	6	3	2	7	4	9	4	2	9	5
	TOTAL	469	203	117	552	294	632	255	149	683	381	931	348	206	906	538

NOTE  
 N : NORMAL TRAFFIC                      D : DIVERTED TRAFFIC  
 DV : DEVELOPED TRAFFIC                I : INDUCED TRAFFIC





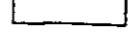

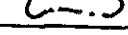
Figure 22.3.1

**LAND USE AND CAPABILITY OF INFLUENCE AREA (I)  
PROPOSED ROUTE NO. IM - 22**

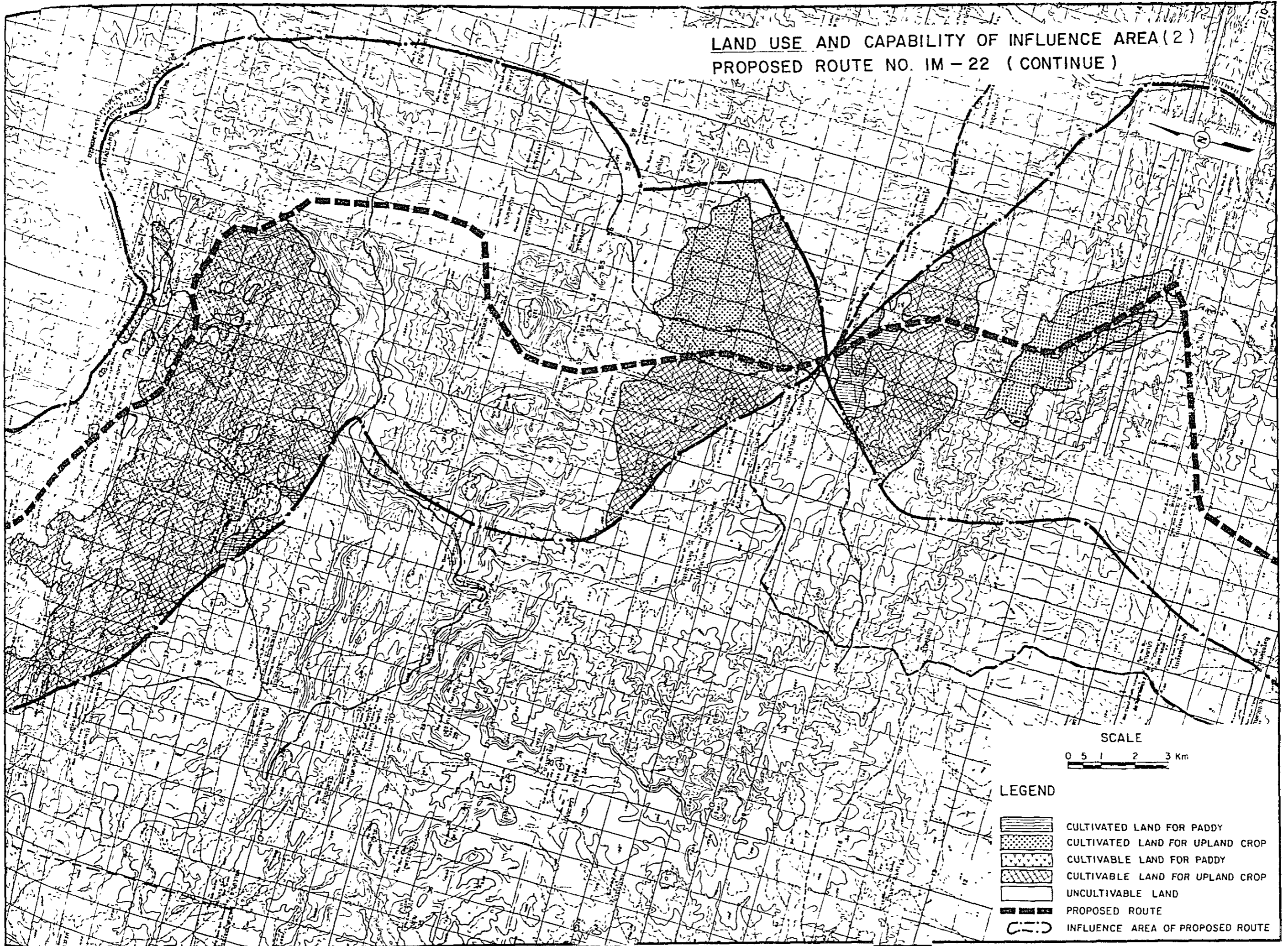


**SCALE**  
0 5 1 2 3 Km

**LEGEND**

-  CULTIVATED LAND FOR PADDY
-  CULTIVATED LAND FOR UPLAND CROP
-  CULTIVABLE LAND FOR PADDY
-  CULTIVABLE LAND FOR UPLAND CROP
-  UNCULTIVABLE LAND
-  PROPOSED ROUTE
-  INFLUENCE AREA OF PROPOSED ROUTE

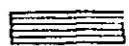

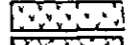
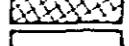

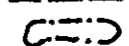

LAND USE AND CAPABILITY OF INFLUENCE AREA (2)  
 PROPOSED ROUTE NO. IM - 22 (CONTINUE)



SCALE  
 0 5 1 2 3 Km

**LAND USE AND CAPABILITY OF INFLUENCE AREA(3)  
PROPOSED ROUTE NO. IM - 22 (CONTINUE)**

SCALE  
0 5 1 2 3 km

- LEGEND**
-  CULTIVATED LAND FOR PADDY
  -  CULTIVATED LAND FOR UPLAND CROPS
  -  CULTIVABLE LAND FOR PADDY
  -  CULTIVABLE LAND FOR UPLAND CROPS
  -  UNCULTIVABLE LAND
  -  PROPOSED ROUTE
  -  INFLUENCE AREA OF PROPOSED ROUTE

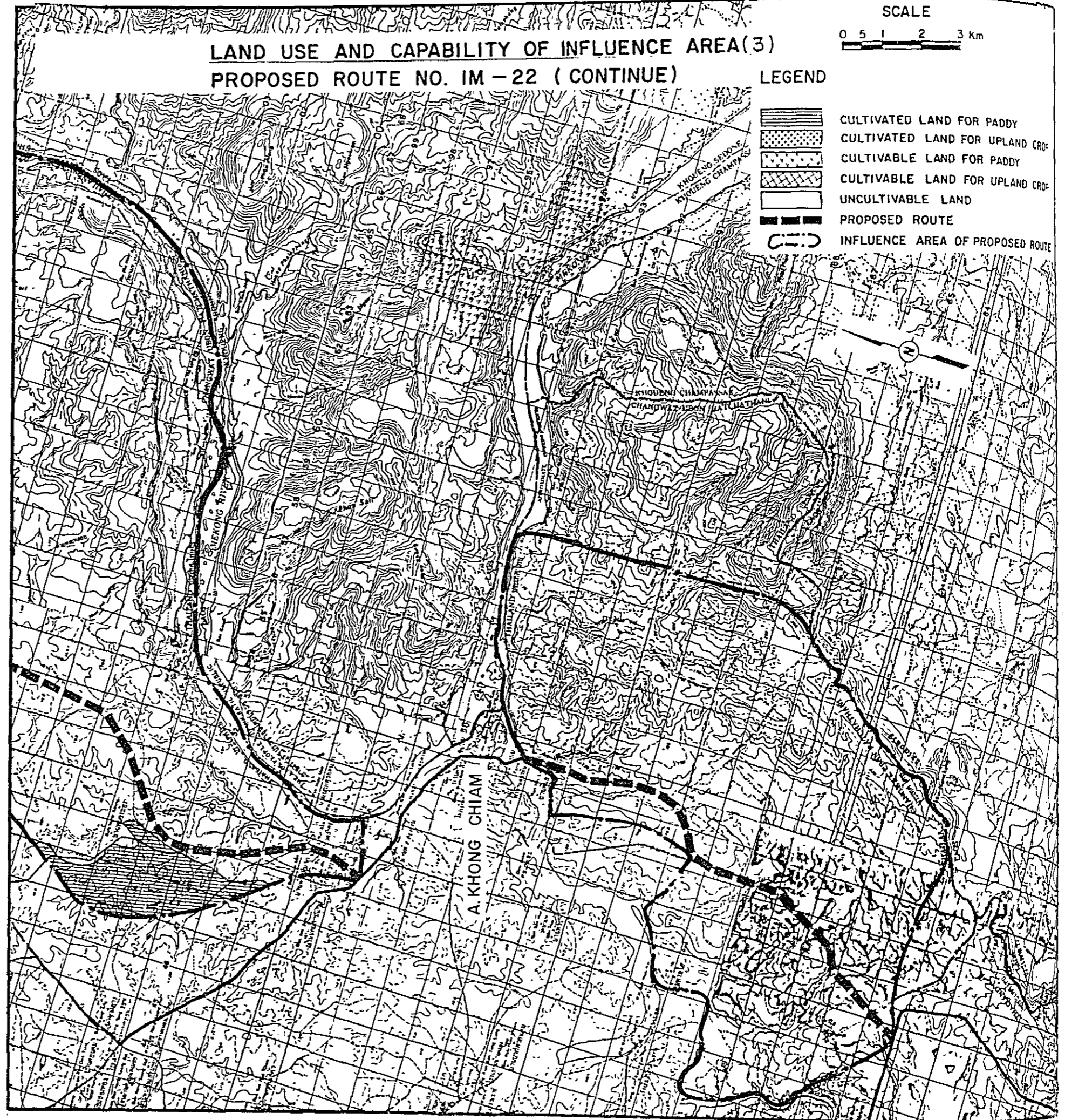
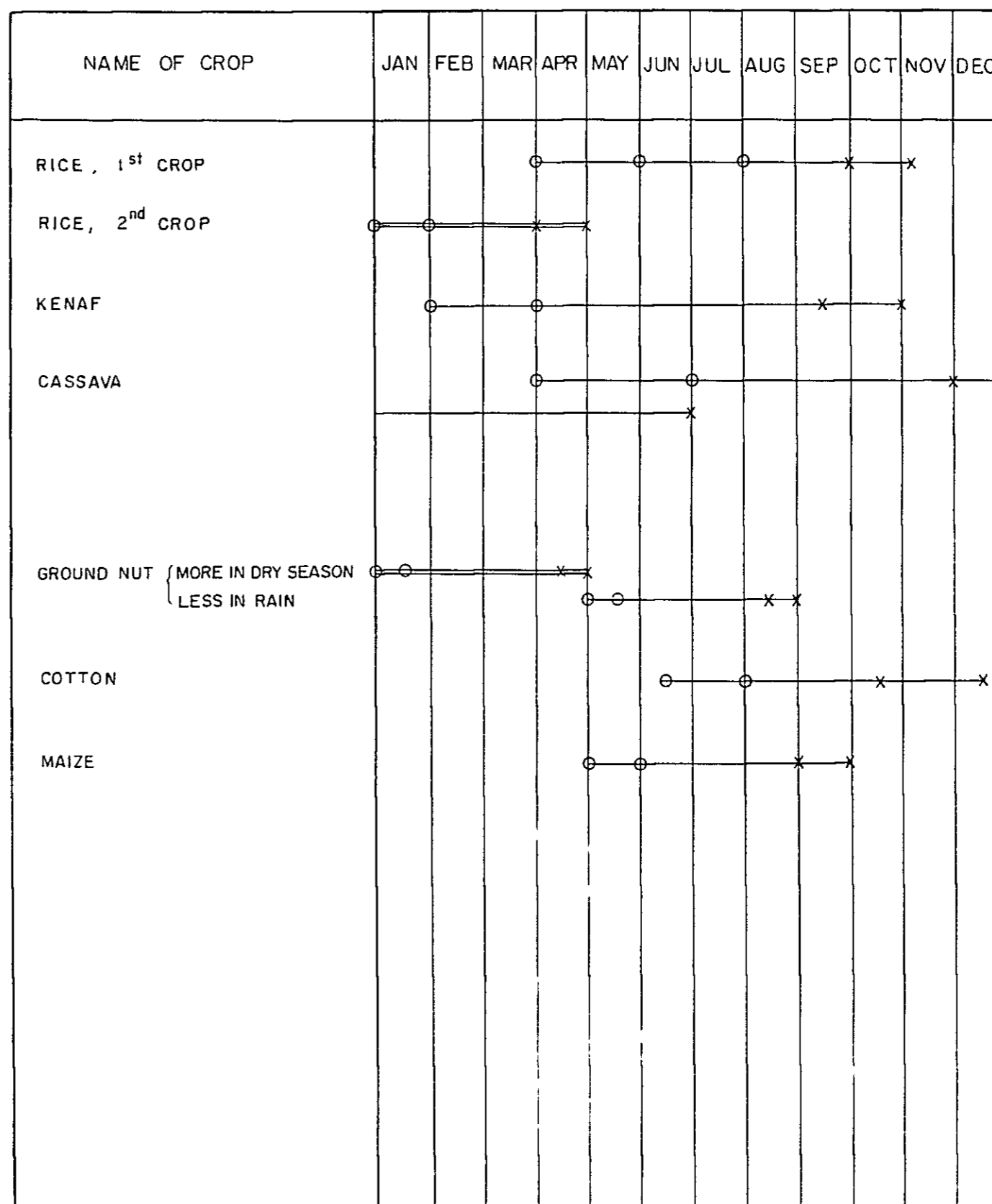


Figure 22.3.2 CROPPING CALENDAR

1100 CHANGWAT UBON RATCHATHANI



Note

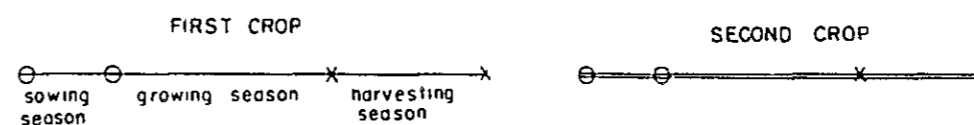




TABLE 22.3.1 CULTIVATED &amp; CULTIVABLE LAND

(1979)

[ UNIT : 1000 RAI (M 2) ]

AMPHOE CODE	AMPHOE NAME	CULTIVATED LAND			UNUSED CULTIVABLE LAND		
		PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
		72.500 (116.0)	11.875 ( 19.0)	84.375 (135.0)	4.500 ( 7.2)	63.438 (101.5)	67.938 (108.7)
1103	KHEMARAJ	65.625 (105.0)	0.625 ( 1.0)	66.250 (106.0)	3.750 ( 6.0)	42.500 ( 68.0)	46.250 ( 74.0)
1113	SI MUANG MAI	-	1.875 ( 3.0)	1.875 ( 3.0)	-	8.125 ( 13.0)	8.125 ( 13.0)
1114	KHONG CHIAM	6.875 ( 11.0)	9.375 ( 15.0)	16.250 ( 26.0)	0.750 ( 1.2)	12.813 ( 20.5)	13.563 ( 21.7)
1116	PIBUN MANGSAHAN	-	-	-	-	-	-

TABLE 22.3.2 CROP PRODUCTION

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)										
1981	69.59	-	-	0.69	3.20	-	8.01	-	11.92	81.51
1987	70.53	-	-	0.69	3.34	-	8.01	-	12.06	82.59
1993	WITHOUT PROJECT	70.53	-	0.69	3.48	-	8.01	-	12.20	82.73
	WITH PROJECT	70.53	-	0.78	4.22	-	8.25	-	13.27	83.81
2001	WITHOUT PROJECT	70.53	-	0.69	3.68	-	8.01	-	12.40	82.93
	WITH PROJECT	70.53	-	0.78	4.47	-	8.25	-	13.52	84.05
CROP YIELD (KG/RAI)										
1981	161.9	-	-	164.7	1888.2	-	146.0	-		
1987	162.8	-	-	164.7	1899.6	-	146.0	-		
1993	WITHOUT PROJECT	163.8	-	164.7	1911.0	-	146.0	-		
	WITH PROJECT	166.8	-	165.7	1922.5	-	146.0	-		
2001	WITHOUT PROJECT	165.1	-	164.7	1926.3	-	146.0	-		
	WITH PROJECT	172.2	-	167.0	1953.5	-	146.0	-		
CROP PRODUCTION (TON)										
1981	11,264	-	-	114	6,045	-	1,170	-	7,330	18,594
1987	11,485	-	-	114	6,341	-	1,170	-	7,627	19,111
1993	WITHOUT PROJECT	11,554	-	114	6,652	-	1,170	-	7,937	19,491
	WITH PROJECT	11,763	-	129	8,120	-	1,205	-	9,456	21,219
2001	WITHOUT PROJECT	11,646	-	114	7,090	-	1,170	-	8,376	20,022
	WITH PROJECT	12,145	-	130	8,725	-	1,205	-	10,062	22,207

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 22.3.3 FARMGATE PRICE AND PRODUCTION COST

ITEM	PADDY	MAIZE	BEANS	GRIND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	3,741	-	-	8,693	577	-	4,666	-
WITH PROJECT (1987 - 2001)	3,835	-	-	8,693	591	-	4,783	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	414	-	-	1,024	677	-	641	-
WITH PROJECT (1987 - 2001)	425	-	-	1,044	708	-	641	-

TABLE 22.3.4 NET PRODUCTION VALUE

YEAR	(1000 BAHT)					
	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	13,741	2,007	15,748	14,036	2,115	16,151
1993	13,999	2,089	16,088	15,104	2,593	17,697
2001	14,346	2,207	16,553	16,568	2,788	19,356

Figure 22.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE

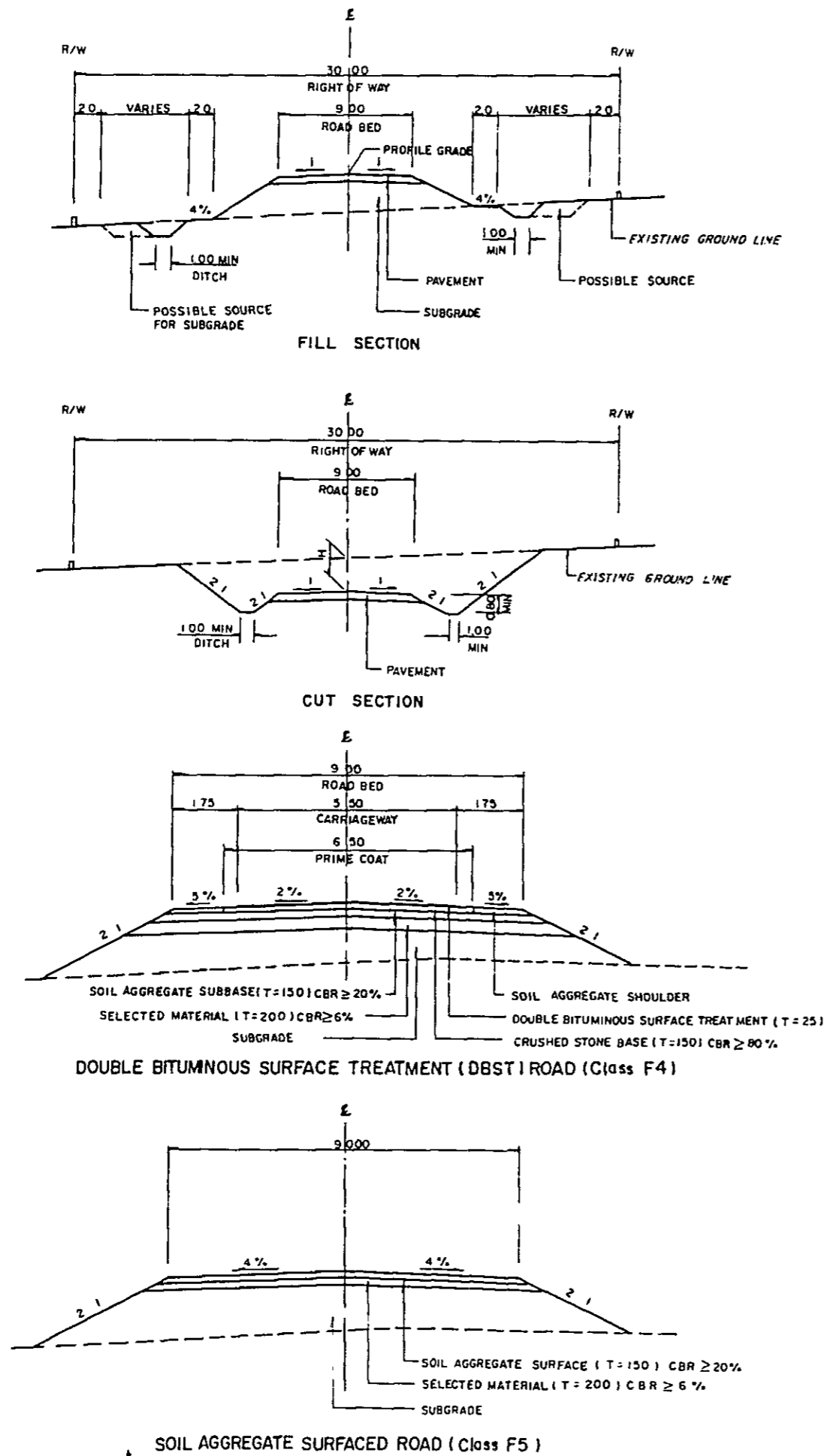
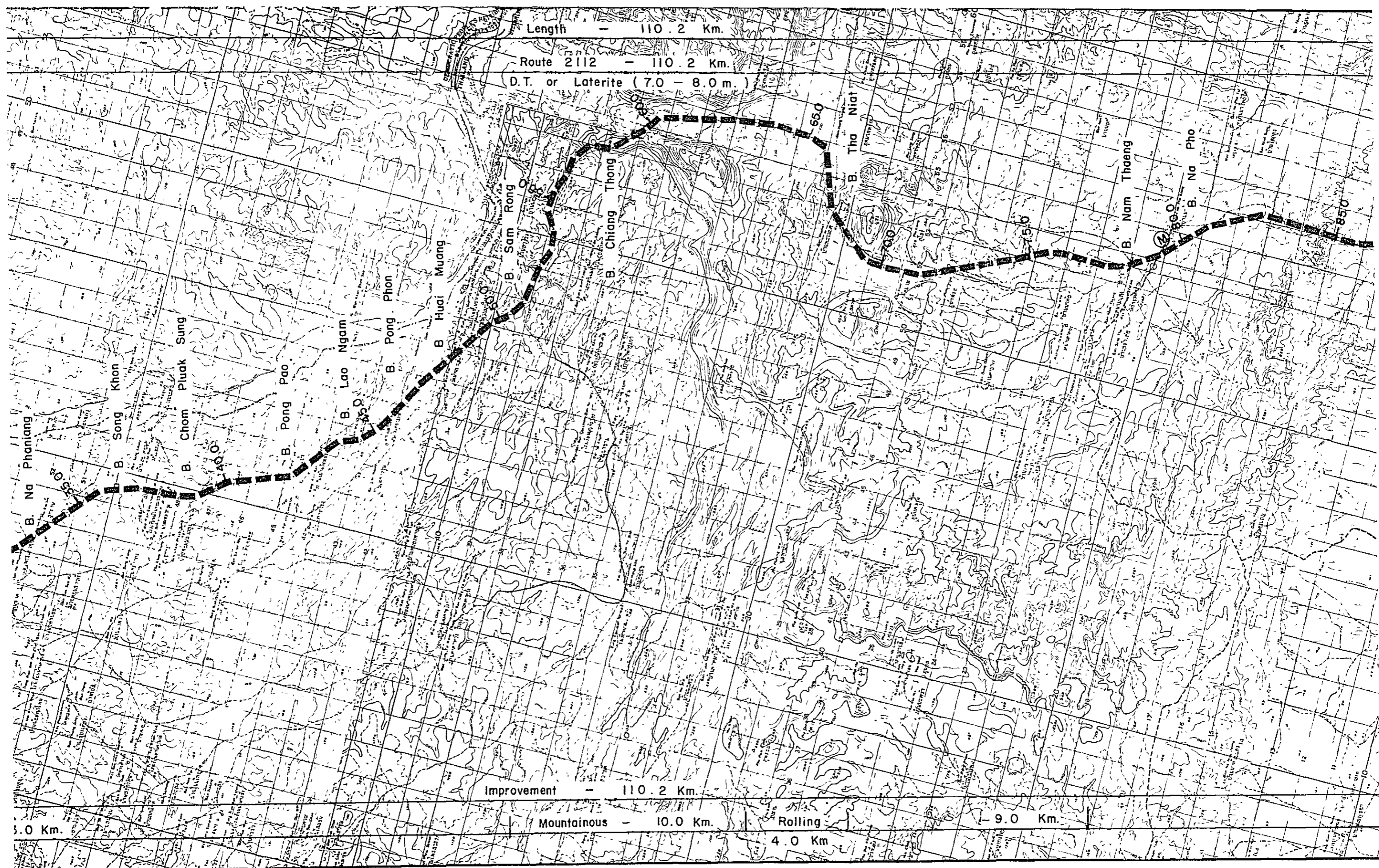
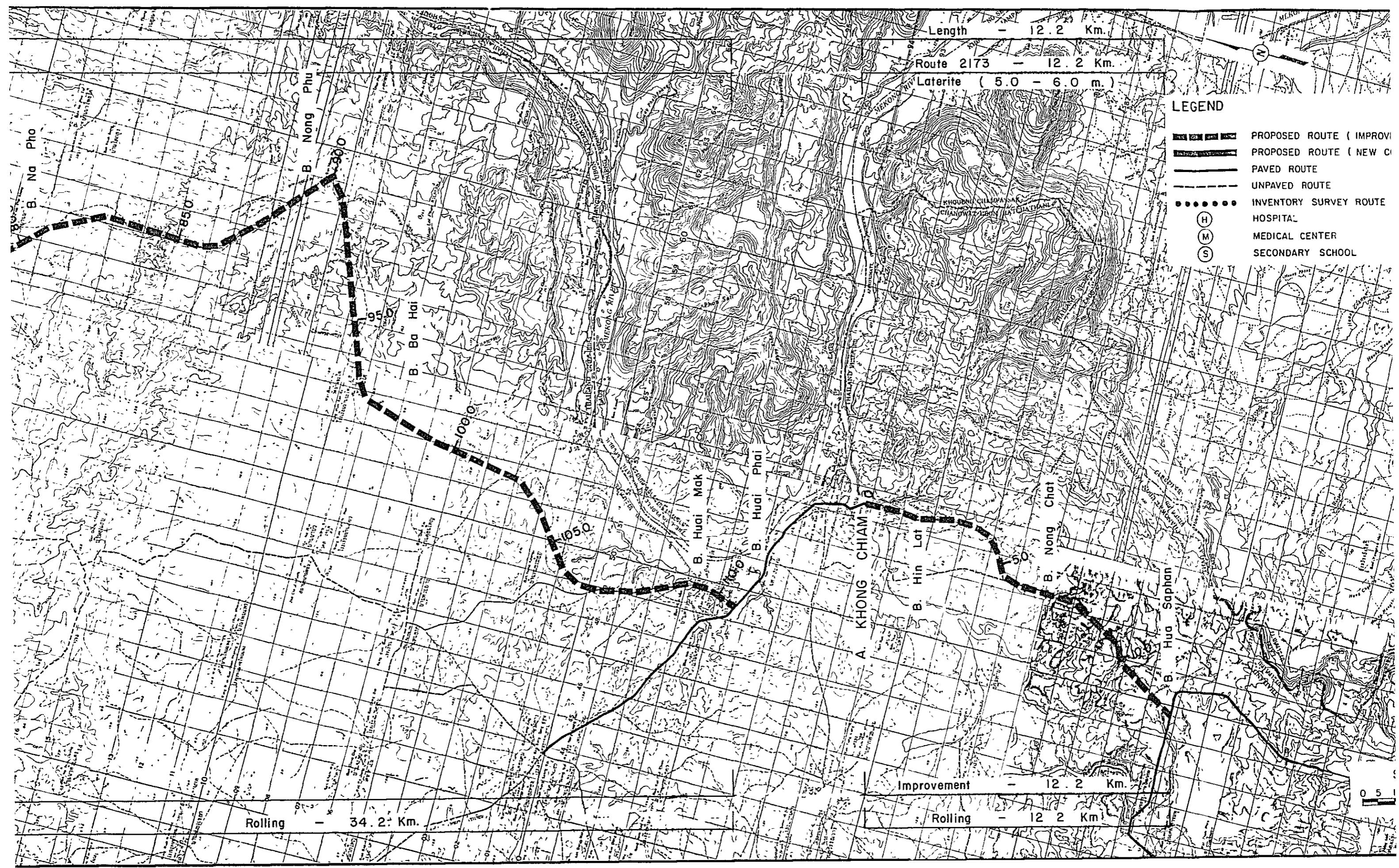


Figure 22.5.2 PROPOSED ROUTE





ASA PHAN ( J.R. 217 )  
 L=110.2+12.2=122.4 Km.



- LEGEND**
- PROPOSED ROUTE ( IMPROV )
  - PROPOSED ROUTE ( NEW C )
  - PAVED ROUTE
  - UNPAVED ROUTE
  - INVENTORY SURVEY ROUTE
  - HOSPITAL
  - MEDICAL CENTER
  - SECONDARY SCHOOL

Length - 12.2 Km.

Route 2173 - 12.2 Km.

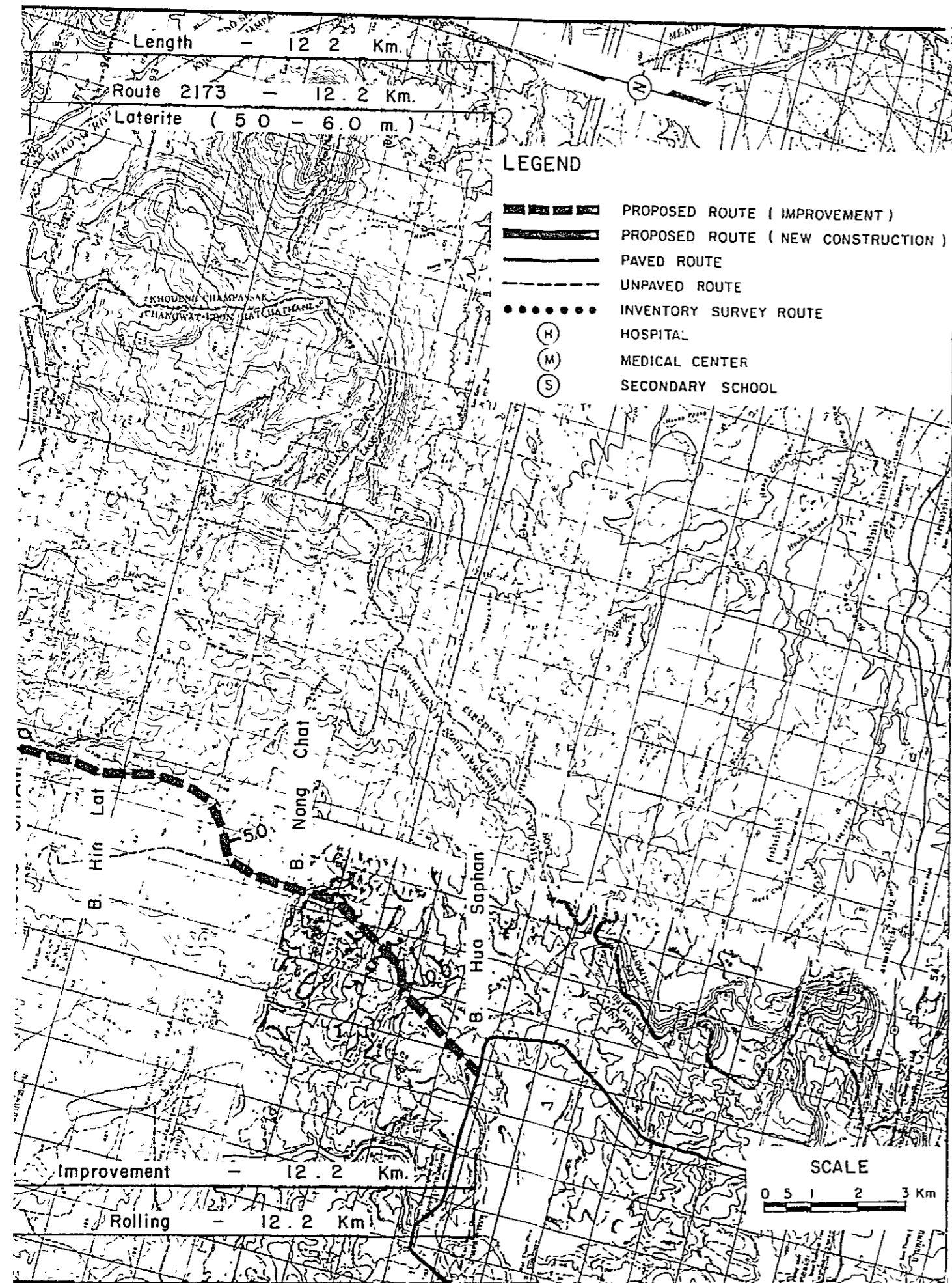
Laterite ( 5.0 - 6.0 m. )

Improvement - 12.2 Km.

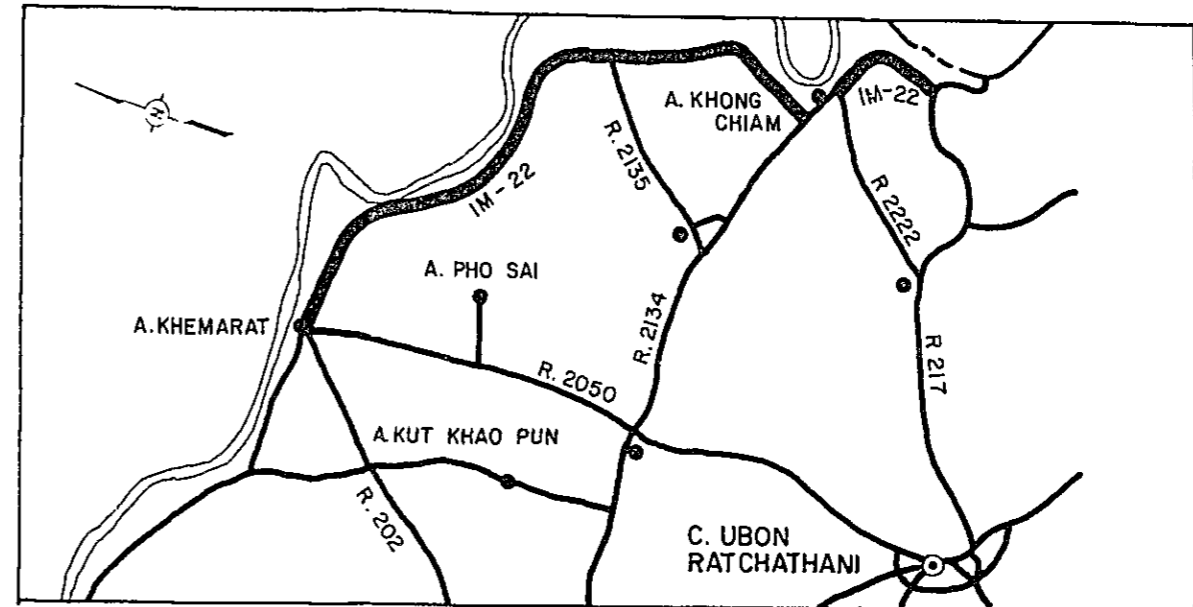
Rolling - 34.2 Km.

Rolling - 12.2 Km.

0.5



LOCATION MAP



BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	4.1	C-7.00 x 27.00	W-4.20 x 24.80
2	6.4	C-7.00 x 24.00	W-4.30 x 20.20
3	8.7	—	C-9.00 x 46.00
4	11.6	—	C-9.00 x 35.00
5	18.4	C-7.00 x 14.00	W-4.20 x 10.20
6	22.0	—	C-9.20 x 128.00
7	23.9	C-7.00 x 14.00	W-4.30 x 10.20
8	29.3	—	C-10.00 x 100.00
9	34.9	C-7.00 x 26.00	W-4.00 x 23.20
10	37.2	C-7.00 x 16.00	W-4.20 x 14.00
11	38.5	C-7.00 x 28.00	W-4.20 x 26.00
12	39.4	—	C-9.00 x 77.50
13	44.1	C-7.00 x 18.00	W-4.20 x 15.50
14	48.8	—	C-9.00 x 24.00
15	50.1	—	C-9.00 x 56.00
16	53.4	—	C-9.00 x 27.00
17	58.0	—	C-9.00 x 39.00
18	58.6	—	C-9.00 x 16.00
19	59.4	—	C-9.00 x 25.00
20	60.9	—	C-9.00 x 30.00
21	63.2	C-7.00 x 14.00	W-4.00 x 10.20
22	64.3	—	C-9.00 x 29.00
23	66.6	—	C-9.00 x 28.00

BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
24	68.3	C-7.00 x 18.00	W-4.00 x 15.30
25	69.6	C-7.00 x 18.00	W-4.00 x 15.00
26	72.5	C-7.00 x 21.00	W-4.00 x 19.00
27	76.9	—	C-9.00 x 75.00
28	77.4	—	C-9.00 x 15.00
29	81.3	—	C-9.00 x 59.00
30	84.2	C-7.00 x 12.00	W-4.00 x 10.20
31	89.9	C-7.00 x 18.00	W-4.00 x 15.50
32	92.8	C-7.00 x 22.00	W-4.20 x 20.00
33	94.0	C-7.00 x 24.00	W-4.00 x 20.20
34	104.6	—	C-8.00 x 70.00
35	107.2	C-7.00 x 18.00	W-4.30 x 15.00
36	110.1	C-7.00 x 18.00	W-4.00 x 15.00
( Route 2173 )			
1	2.2	C-7.00 x 32.00	W-4.00 x 29.30
2	7.1	—	C-9.00 x 29.00
3	8.9	C-7.00 x 14.00	W-4.00 x 10.50
4	10.3	—	C-9.00 x 56.00

Table 22.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-22 (122.4 km) (1)

Items	Unit of Q'ty	Financial Unit Rate ₪	(DBST)			(Soil Aggregate Surface)		
			Q'ty	Financial Cost (10 <sup>3</sup> ₪)	Economic Cost (10 <sup>3</sup> ₪)	Q'ty	Financial Cost (10 <sup>3</sup> ₪)	Economic Cost (10 <sup>3</sup> ₪)
DIRECT CONSTRUCTION COST								
Clearing and Grubbing	ha	15,000	278	4,170	3,794	278	4,170	3,794
Excavation - Soil	m <sup>3</sup>	20	41,600	832	748	41,600	832	748
Excavation - Hard Rock	m <sup>3</sup>	160	0	0	0	0	0	0
Embankment	m <sup>3</sup>	45	250,700	11,281	10,266	250,700	11,281	10,266
Selected Material	m <sup>3</sup>	80	258,300	20,640	18,369	258,000	20,640	18,369
Soil Aggregate Surface or Subbase	m <sup>3</sup>	105	180,700	18,973	16,886	180,700	18,973	16,886
Crushed Stone Base	m <sup>3</sup>	370	118,700	43,919	40,405	15,000	5,550	5,106
Soil Aggregate Shoulder	m <sup>3</sup>	105	51,100	5,365	4,775	6,500	682	607
Prime Coat and DBST	m <sup>2</sup>	55	669,400	36,817	33,135	85,300	4,692	4,223
Pipe Culvert	m	2,100	2,090	4,389	4,037	2,090	4,389	4,037
Box Culvert	m	16,000	6	96	86	6	96	86
Long Span Bridge	m	80,000	0	0	0	0	0	0
Short Span Bridge	m	40,000	396	15,840	14,097	396	15,840	14,097
Sub Total (a)				162,323	146,603	87,147	78,224	
Miscellaneous Works (a) x 7%				11,363	10,262	6,100	5,476	
Total (b)				173,686	156,865	93,247	83,700	
PHYSICAL CONTINGENCY (b) x 15%				26,053	23,530	13,787	12,555	
ENGINEERING AND								
ADMINISTRATION (b) x 10%				17,369	15,687	9,325	8,370	
Sub Total				43,422	39,217	23,312	20,925	
LAND ACQUISITION								
Highly Developed Land	ha	50,000	0	0	0	0	0	0
Less Developed Land	ha	15,000	0	0	0	0	0	0
Sub Total				0	0	0	0	
GRAND TOTAL				217,108	196,082	116,559	104,625	



CONSTRUCTION QUANTITIES AND COSTS (DBST + Soil Aggregate Surface) (2)

Items	Unit of Q'ty	Financial Unit Rate ₪	Route Number								
			IM-22 (1-2, 5-6) (48.2 km)			IM-22 (2-3, 3-4) (74.2 km)			IM-22 (T) (122.4 km)		
			Q'ty	Financial Cost (10 <sup>3</sup> ₪)	Economic Cost (10 <sup>3</sup> ₪)	Q'ty	Financial Cost (10 <sup>3</sup> ₪)	Economic Cost (10 <sup>3</sup> ₪)	Q'ty	Financial Cost (10 <sup>3</sup> ₪)	Economic Cost (10 <sup>3</sup> ₪)
<b>DIRECT CONSTRUCTION COST</b>											
Clearing and Grubbing	ha	15,000	113	1,695	1,542	165	2,475	2,252	278	4,170	3,794
Excavation - Soil	m <sup>3</sup>	20	0	0	0	41,600	832	748	41,600	832	748
Excavation - Hard Rock	m <sup>3</sup>	160	0	0	0	0	0	0	0	0	0
Embankment	m <sup>3</sup>	45	125,000	5,625	5,118	125,700	5,656	5,147	250,700	11,281	10,266
Selected Material	m <sup>3</sup>	80	100,700	2,056	7,169	157,300	12,584	11,199	258,000	20,640	18,369
Soil Aggregate Surface or Subbase	m <sup>3</sup>	105	70,500	7,402	6,588	110,200	11,571	10,298	180,700	18,973	16,886
Crushed Stone Base	m <sup>3</sup>	370	46,300	17,131	15,760	6,800	2,516	2,314	53,100	19,647	18,075
Soil Aggregate Shoulder	m <sup>3</sup>	105	20,000	2,100	1,869	2,900	304	271	22,900	2,404	2,140
Prime Coat and DBST	m <sup>2</sup>	55	261,300	14,372	12,934	38,500	2,118	1,906	299,800	16,489	14,840
Pipe Culvert	m	2,100	960	2,016	1,854	1,130	2,373	2,183	2,090	4,389	4,037
Box Culvert	m	16,000	6	96	86	0	0	0	6	96	86
Long Span Bridge	m	80,000	0	0	0	0	0	0	0	0	0
Short Span Bridge	m	40,000	147	5,880	5,233	249	9,960	8,864	396	15,840	14,097
Sub Total (a)				64,373	58,153		50,390	45,186		114,761	103,338
Miscellaneous Works (a) x 7%				4,506	4,071		3,527	3,163		8,033	7,234
Total (b)				68,879	62,224		53,917	48,349		122,794	110,573
PHYSICAL CONTEGENCY (b) x 15%				10,331	9,334		8,087	7,252		18,419	16,585
ENGINEERING AND											
ADMINISTRATION (b) x 10%				6,888	6,222		5,391	4,834		12,279	11,057
Sub Total				17,219	15,556		13,479	12,087		30,698	27,642
<b>LAND ACQUISITION</b>											
Highly Developed Land	ha	50,000	0	0	0	0	0	0	0	0	0
Less Developed Land	ha	15,000	0	0	0	0	0	0	0	0	0
Sub Total				0	0		0	0		0	0
GRAND TOTAL				86,098	77,780		67,396	60,436		153,492	138,215

Table 22.6.1 COST AND BENEFITS  
(F4 STANDARD)

YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	39,216	0	0	0	0	55,096	0
1985	98,041	0	0	0	0	122,983	0
1986	58,825	0	0	0	0	65,884	0
1987	0	403	11,981	-445	11,939	0	10,660
1988	0	576	12,874	-423	13,026	0	10,385
1989	0	748	13,767	-402	14,114	0	10,046
1990	0	921	14,660	-380	15,201	0	9,661
1991	0	1,094	15,553	-358	16,289	0	9,243
1992	0	1,266	16,446	-337	17,376	0	8,803
1993	0	1,439	17,339	-315	18,463	0	8,352
1994	59,242	1,609	18,659	-282	19,986	26,798	8,072
1995	0	1,779	19,979	-249	21,509	0	7,756
1996	0	1,949	21,299	-216	23,031	0	7,415
1997	0	2,118	22,618	-183	24,554	0	7,059
1998	0	2,288	23,938	-150	26,077	0	6,693
1999	0	2,458	25,258	-117	27,599	0	6,325
2000	0	2,628	26,578	-84	29,122	0	5,959
2001	-90,197	2,798	27,897	-51	30,644	-16,479	5,599
TOTAL	165,127	24,074	288,848	-3,992	308,930	254,282	122,027

DISCOUNTED ECONOMIC COSTS :	254,282
DISCOUNTED ECONOMIC BENEFITS :	122,027
AGRICULTURAL DEVELOPMENT BENEFIT	8,577
VOC SAVING	115,646
RMC SAVING	-2,196
NET PRESENT VALUE :	-132,255
BENEFIT COST RATIO :	0.48
INTERNAL RATE OF RETURN :	4.5 %

Table 22.6.2 COST AND BENEFITS  
(F4&F5 COMBINED)

YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	27,643	0	0	0	0	38,836	0
1985	69,108	0	0	0	0	86,689	0
1986	41,464	0	0	0	0	46,440	0
1987	0	403	10,815	-76	11,142	0	9,948
1988	0	576	11,643	-58	12,160	0	9,694
1989	0	748	12,471	-41	13,179	0	9,380
1990	0	921	13,299	-23	14,197	0	9,022
1991	0	1,094	14,127	-5	15,215	0	8,634
1992	0	1,266	14,955	12	16,234	0	8,224
1993	0	1,439	15,783	30	17,252	0	7,804
1994	26,717	1,609	17,004	57	18,670	12,085	7,540
1995	0	1,779	18,225	84	20,087	0	7,244
1996	0	1,949	19,445	111	21,505	0	6,924
1997	0	2,118	20,666	139	22,923	0	6,590
1998	0	2,288	21,887	166	24,341	0	6,248
1999	0	2,458	23,108	193	25,758	0	5,903
2000	0	2,628	24,328	220	27,176	0	5,561
2001	-63,579	2,798	25,549	247	28,594	-11,616	5,224
TOTAL	101,353	24,074	263,304	1,056	288,434	172,435	113,941

DISCOUNTED ECONOMIC COSTS :	172,435
DISCOUNTED ECONOMIC BENEFITS :	113,941
AGRICULTURAL DEVELOPMENT BENEFIT	8,577
VOC SAVING	105,199
RMC SAVING	165
NET PRESENT VALUE :	-58,494
BENEFIT COST RATIO :	0.66
INTERNAL RATE OF RETURN :	7.6 %

Table 22.6.3 COST AND BENEFITS  
(F5 STANDARD)

(1000 BAHT)

YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	20,925	0	0	0	0	29,398	0
1985	52,313	0	0	0	0	65,621	0
1986	31,387	0	0	0	0	35,153	0
1987	0	403	7,725	26	8,154	0	7,281
1988	0	576	8,340	31	8,947	0	7,133
1989	0	748	8,955	36	9,740	0	6,933
1990	0	921	9,570	41	10,533	0	6,694
1991	0	1,094	10,185	46	11,325	0	6,426
1992	0	1,266	10,800	52	12,118	0	6,139
1993	0	1,439	11,415	57	12,911	0	5,840
1994	7,502	1,609	12,299	64	13,972	3,394	5,643
1995	0	1,779	13,184	70	15,033	0	5,421
1996	0	1,949	14,068	77	16,094	0	5,182
1997	0	2,118	14,952	84	17,155	0	4,932
1998	0	2,288	15,837	91	18,216	0	4,676
1999	0	2,458	16,721	98	19,277	0	4,418
2000	0	2,628	17,605	105	20,338	0	4,162
2001	-48,128	2,798	18,489	112	21,399	-8,793	3,910
TOTAL	63,999	24,074	190,146	991	215,211	124,774	84,787

DISCOUNTED ECONOMIC COSTS :	124,774
DISCOUNTED ECONOMIC BENEFITS :	84,787
AGRICULTURAL DEVELOPMENT BENEFIT	8,577
VOC SAVING	75,844
RMC SAVING	366
NET PRESENT VALUE :	-39,986
BENEFIT COST RATIO :	0.68
INTERNAL RATE OF RETURN :	8.1 %

Table 22.7.1 SOCIAL INDICATORS  
(Proposed Route IM-22)

population (1,000)		Education	
1982	: 18.1	Access to Secondary School	
1993	: 21.6	Number of Student in 1993 (1,000) <sup>2/</sup>	: 4.8
Average travelling speed, without (kph)	: 48	Average distance to school (km)	: 25.4
Isolation		Per capita time savings (10 <sup>-4</sup> )	: 0.367
Access to Amphoe		Score	: 190
Average distance to Amphoe (km) <sup>1/</sup>	: 26.2	Teacher Intensity	
Per capita time savings (10 <sup>-4</sup> )	: 0.084	Number of teachers <sup>3/</sup>	
Score	: 255	University graduate	: -
Access to Artery Highway		Total	: 7
Average distance to highway (km) <sup>1/</sup>	: 12	Number of Student	: 283
Per capita time savings (10 <sup>-4</sup> )	: 0.039	Indicators	
Score	: 78	E1 <sup>4/</sup>	: -
Impassability		E2 <sup>5/</sup>	: 24.7
Impassable week a year	: -	E <sup>6/</sup>	: 24.7
Impassability per year	: 0	Degree of Improvement <sup>7/</sup>	: 2.77
Impassability per capita (10 <sup>-4</sup> )	: 0	Score	: 176
Score	: 0	Disparity	
Health		G.P.V. in 1993 (Mn B) <sup>8/</sup>	
Access to Hospital		With project	: 56.8
Average distance to Hospital (km) <sup>1/</sup>	: 25.4	Without project	: 53.5
Per capita time savings (10 <sup>-4</sup> )	: 0.081	Per capita G.P.V. in 1993 (B)	
Score	: 188	With project (W)	: 2,630
Access to Medical Facilities		Without project (w)	: 2,477
Average distance to facilities (km) <sup>1/</sup>	: 16.0	Degree of Disparity	
Per capita time savings (10 <sup>-4</sup> )	: 0.051	(A/W) - (A/w) <sup>9/</sup>	: 0.07
Score	: 204	Score	: 25
		Total Score	: 1,216

Note:

- <sup>1/</sup> ( ) shows the length or distance in without project case. Unless otherwise, lengths are same both in with project case and without project case.
- <sup>2/</sup> 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.
- <sup>3/</sup> Numbers of the sample areas
- <sup>4/</sup> (Number of University Graduate Teachers)/(Total Number of Student) x 1,000
- <sup>5/</sup> (Total of Teachers)/(Total Number of Student) x 1,000
- <sup>6/</sup> Sum of <sup>4/</sup> and <sup>5/</sup>
- <sup>7/</sup> 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
- <sup>8/</sup> Estimated gross value of crop production in the areas of influence
- <sup>9/</sup> "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.