STUDY ROUTE NO. 27

Rt. 106 (B. Mae Thoei)
- Thung Hua Chang
L = 16.6 Km
Changwat : Lamphun

1. GENERAL

1-1 Location of Route

The study route Rt. 1219 starts at B.Mae Thoei on Rt. 106 and connects to Amphoe Tung Hua Chang on Rt.1184, taking a length of 17 Km. (see Figure 27-1-1)

The terrain around the route is mostly mountainous of forest and bush. Due to such a topography, cultivated land is scarcely dotted around the road.

Population mostly concentrated in both ends of the road counts 4 thousand in total within the influence area.

1-2 Conditions of Existing Road

As the terrain is such a rolling to mountainous, horizontal alignment comprises winding alignment with small radius of curvature, particularly in the latter half of the route. Vertical alignment is also steep in the same section, thus causing cutting sections in places.

Road inventory of the route is given in Table 27-1-1.

Figure 27-1-1 ROUTE LOCATION

STUDY ROUTE NO. 27

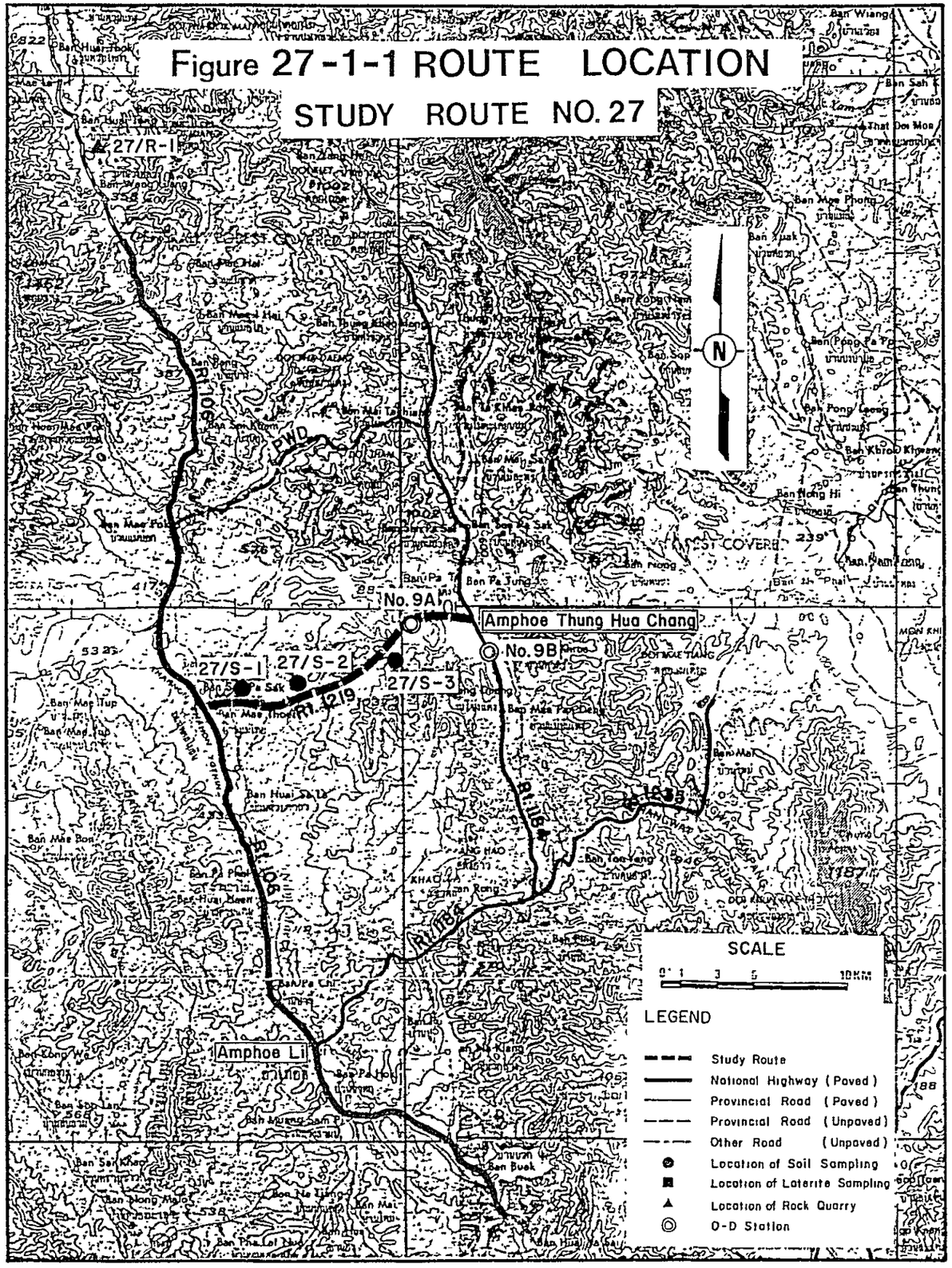


Table 27-1-1 SUMMARY OF ROAD INVENTORY - Route 27

Location (Changwat)	:	Lamphun	
Road belonged	:	DOH (Rt. 1219)	
Origin/Destination	:	Rt.106 (B.Mae Thoei)/Thung Hua Chang	
Length (Km)	:	16.6	
Terrain	:	Mountainous	
Conditions of Roadway	:		
Surface		Laterite	S.T.
Length (Km)		15.6	1.0
Width (m)		4.5~7.7	5.0~6.5
Embankment (m)		0.2~1.0	0.3~1.5
Cutting (m)		0.3~2.0	1.0
Hori./Vert. Alignments		Fair/Bad	Fair/Good
Surface Condition		Bad	Good
Bridge	:		
Number		7(Timber)	
Width/Acc. Length(m)		4.0/100.0	
Land Use	:	Forest/Bush	
Overflow Section	:		
Water Height/Length(m)		0.8/130	
		0.8/100	

2. TRAFFIC

The forecasting was carried out under the road conditions of F6 Standard, as a prior forecasting made under F4 Standard revealed that the traffic volumes would be considerably lower than 300 at 7th year after opening.

2-1 Traffic Zone and Road Links

Traffic zoning was made as shown in Figure 27-2-1.

The area of influence was divided into 2 traffic zones, and total population in the area amounts approximately to 3,500. The density in terms of population per unit Km of the proposed road length is 210. Annual rate of population increase in the area is 2.7% in the past 3 years, which is higher than the average of 2.2% in the Northern Region.

As the major destinations of transport demands originated in the area, two Amphoe of Li and Thung Hua Chang were chosen based on the O/D survey. Characteristics of the traffic zones are shown in Table 27-2-1.

The existing and proposed roads in the area together with surrounding roads concerned were divided into totalling 7 road links, 1 link in the proposed roads and 6 links in the surrounding roads. The details are shown in Table 27-2-2.

2-2 Transportation Demands

a) Passenger

Passenger transportation demands by O/D pair in the opening year of the project were estimated in both cases of with and without projects as follows:

Passenger O/D (without project)-1987

(trip/day)

	1	2	11	12	21
1	0	167	71	91	0
2	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
21	0	0	0	0	0

Passenger O/D (with project)-1987

(trip/day)

	1	2	11	12	21
1	0	283	71	126	0
2	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
21	0	0	0	0	0

b) Agricultural Freight

The major destination of agricultural freight originated in the influencial area was selected at A. Li, basing on the agro-economic survey results.

The estimated agricultural freight O/D volumes in 1987 for the both cases of with and without projects are as follows:

Agri. Freight O/D (without project)-1987

(1,000 ton/year)

	1	2	11	12	21
1	0.0	0.0	0.0	0.0	0.0
2	8.7	0.0	0.0	0.0	8.6
11	0.0	0.0	0.0	0.0	0.0
12	3.0	0.0	0.0	0.0	3.0
21	0.0	0.0	0.0	0.0	0.0

Figure 27-2-1 ZONING AND ROAD NETWORK

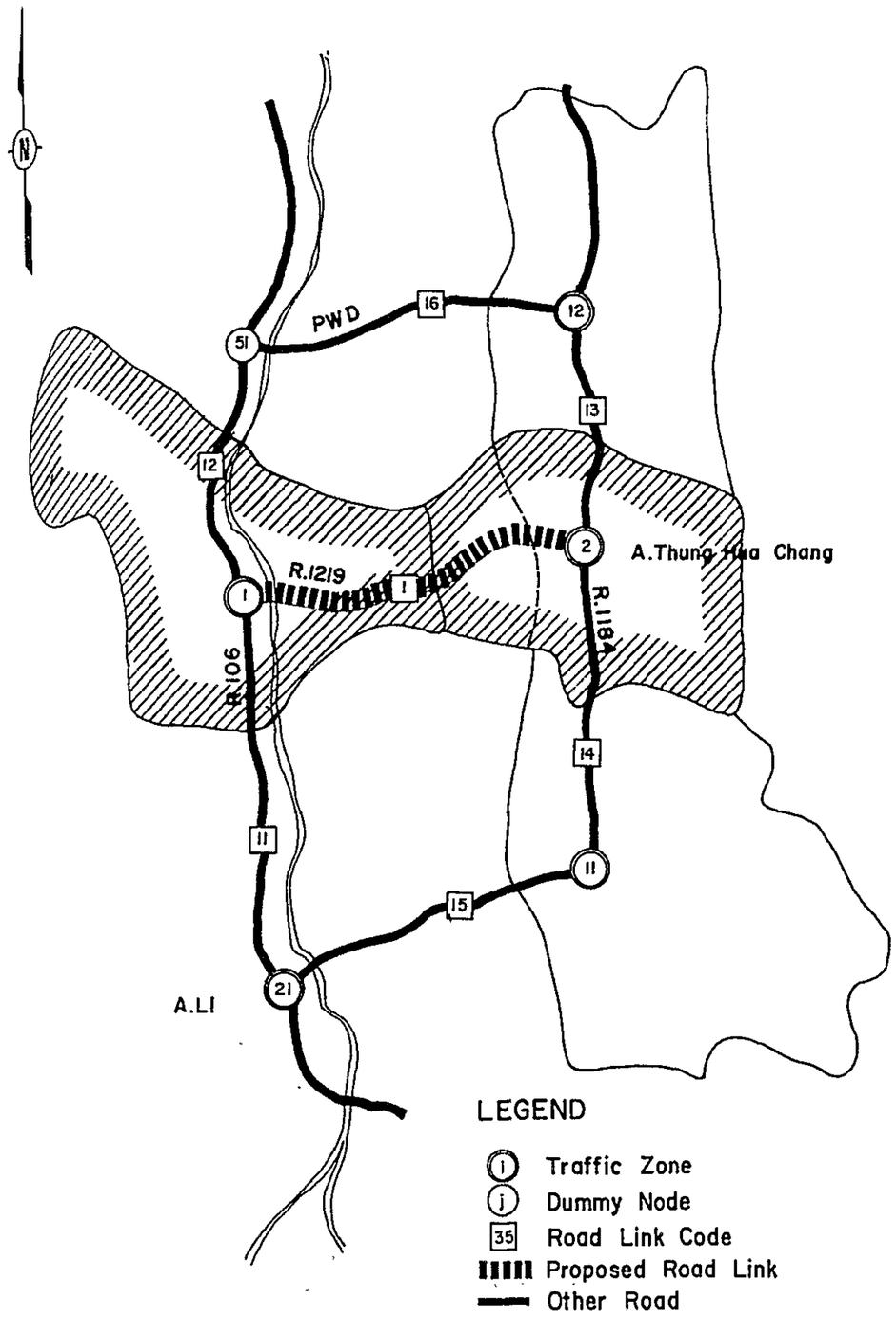


Table 27-2-1 ZONE CHARACTERISTICS

Traf. Zone	Relative Administrat. Div. Changwat	Amphoe	Tambon Code	% of Popul. in Traf. Zone	Popul. in 1981 (10^3)	Past Trend of Popul. Increase	Annual Rate of Increase 1981-1987	Projected Population in 1987 Generation	Attraction
1	L.N	Li	120502(1)	17	2.4				
			120502(2)	53	7.5				
			Total	-	9.9	0.3	0.7	10.3	10.3
2	L.N	T. Hua Chang	120601(1)	20	1.1				
			120601(2)	80	4.5				
			Total	-	5.6	7.6	2.4	6.5	6.5
11	L.N	T. Hua Chang	120602	100	3.3	6.9	2.4	3.8	3.8
12	L.N	T. Hua Chang	120603	100	5.4	1.3	1.2	5.9	5.9
21	L.N	Li	120500	100	47.3	2.3	1.7	-	51.9

Table 27-2-2 ROAD LINK CHARACTERISTICS

NO	SN	EN	LO	GOD	GOR	LW	GWD	GWR	TO	TW	REMARKS
1	1	2	16.6	9	11	16.6	8	11	24.9	24.9	R.1219
11	1	21	19.0	2	2	19.0	2	2	16.8	16.8	R.106
12	1	51	11.0	2	2	11.0	2	2	9.7	9.7	R.106
13	2	12	12.0	5	5	12.0	5	5	12.0	12.0	R.1184(DOH)
14	2	11	15.0	5	5	15.0	5	5	15.0	15.0	R.1184(DOH)
15	11	21	15.0	5	5	15.0	5	5	15.0	15.0	R.1184(DOH)
16	12	51	16.0	9	12	16.0	9	12	32.2	32.2	PWD

Note SN: Start Node, EN: End Node, LO: Link Length ($\bar{W}$), GOD: Road Grade in Dry Season ($\bar{W}$), GOR: Road Grade in Rainy Season ($\bar{W}$), LW: Link Length (W), GWD: Road Grade in Dry Season (W), GWR: Road Grade in Rainy Season (W), TO: Time ($\bar{W}$), TW: Time (W).

Agri. Freight O/D (with project)-1987

(1,000 ton/year)

	1	2	11	12	21
1	0.0	0.0	0.0	0.0	0.0
2	9.5	0.0	0.0	0.0	9.5
11	0.0	0.0	0.0	0.0	0.0
12	3.2	0.0	0.0	0.0	3.1
21	0.0	0.0	0.0	0.0	0.0

c) Non-agricultural Freight

The non-agricultural freight transportation demands are estimated based on the model described in 3-3-3 in the Summary Report. Their movements on each road link were obtained relating with the passenger movements which were derived from the assignment of the passenger O/D volumes shown in the above a).

2-3 Traffic Composition, Occupancy and Loading Ratio

a) Traffic Composition

In accordance with the examination of the classified traffic counts in the Phase I and II studies and DOH's traffic records, the traffic composition on the existing roads of the area was estimated as follows:

Existing Traffic Composition

Survey Points and Source	Passenger Traffic						Freight Traffic				
	P/C	P/P	L/B	M/B	H/B	Total	P/T	4/T	6/T	10/T	Total
No.9A(Phase II)	.00	.70	.10	.20	.00	1.00	.04	.00	.16	.44	1.00
No.9B(Phase II)	.00	.60	.40	.00	.00	1.00	.45	.06	.18	.30	1.00
R.1184 (DOH)	.08	.12	.66		.15	1.00	.84		.16	.00	1.00
R.1219 (DOH)	.03	.17	.67		.15	1.00	.77		.20	.03	1.00
Estimated	.03	.20	.40	.30	.07	1.00	.68	.09	.20	.03	1.00

Changes in traffic composition due to income growth and road surface condition were predicted for the both cases of with and without projects as shown in the following tables:

Passenger Traffic Composition

Year	Without Project					With Project				
	P/C	P/P	L/B	M/B	H/B	P/C	P/P	L/B	M/B	H/B
1981	.03	.20	.40	.30	.07	.03	.20	.40	.30	.07
1987	.03	.23	.38	.29	.07	.03	.23	.38	.29	.07
1993	.04	.26	.36	.28	.06	.04	.26	.36	.28	.06
2001	.04	.30	.34	.26	.06	.04	.30	.34	.26	.06

Freight Traffic Composition

Year	Without Project				With Project			
	P/T	4/T	6/T	10/T	P/T	4/T	6/T	10/T
1981-2001	.68	.09	.20	.03	.68	.09	.20	.03

b) Occupancy

Occupancy by vehicle type and the average were determined as follows:

Occupancy

Vehicle Type	Person per Vehicle
P/C	3.1
P/P	4.4
L/B	10.9
M/B	16.2
H/B	38.3
Ave. (1993, $\overline{W}$)	12.0
(1993, W)	12.0

c) Loading Ratio

Loading ratio by vehicle type and the average were determined as follows:

Loading Ratio

Vehicle Type	Ave. Load of Loaded Truck	Rate of Loaded Trucks	Loading Ratio (ton)
P/T	0.65	.45	0.3
4/T	2.0	.50	1.0
6/T	4.1	.55	2.3
10/T	12.6	.60	7.6
Ave.($\overline{W}$)	-	-	1.0
(W)	-	-	1.0

2-4 Growth Rates of Transportation Demands

The growth rates of passenger, agricultural freight and non-agricultural freight transport demands for the periods of 1987-1993 and 1993-2001 were projected. The basis for the estimation of growth rate for passenger, and the projected rates are shown in the following tables:

The Basis for Estimation of Passenger Demands Growth

Indicator	Annual Growth Rate (%) 1987 - 1993	1993 - 2001	Elasticity
Per capita Income	6.6	6.4	1.08
Transportation price	3.6	3.6	-0.24
Population	1.4	1.1	1.00

Growth Rate of Transportation Demands

Type of Demand	Annual Growth Rate (%) 1987 - 1993	1993 - 2001	Index 1987=100 1993	2001
Passenger	7.7	7.1	156	270
Agri. Freight	1.3	0.7	108.3	114.2
Non-Agri. Freight	9.2	8.4	170	323

2-5 Forecasted Traffic

a) Forecasted Traffic by Vehicle Type

The forecasted traffic is summarized in the following table:

Forecasted Traffic

Year	P/C	L/B	M/B	H/B	P/P P/T	4/T	6/T	10/T	ADT	M/C
1987	1	8	6	1	36	4	9	1	67	87
1993	1	12	9	2	47	5	11	2	90	118
2001	2	20	15	4	70	7	15	2	136	174

b) Forecasted Traffic by Road Link

Details of the forecasted traffic by road link by traffic type are shown in the following table, taking a sample of the case of 1993:

Forecasted Traffic by Road Link

TRAFFIC VOLUME ON ROUTE 27 (F6) (1993)

LINK		1	AVR.
P/C	N+D	1	1
	I	0	0
	DV	0	0
	TOTAL	1	1
L/B	N+D	12	12
	I	0	0
	DV	0	0
	TOTAL	12	12
M/B	N+D	9	9
	I	0	0
	DV	0	0
	TOTAL	9	9
H/B	N+D	2	2
	I	0	0
	DV	0	0
	TOTAL	2	2
P/P&T	N+D	45	45
	I	0	0
	DV	2	2
	TOTAL	47	47
4/T	N+D	5	5
	I	0	0
	DV	0	0
	TOTAL	5	5
6/T	N+D	11	11
	I	0	0
	DV	1	1
	TOTAL	11	11
10/T	N+D	2	2
	I	0	0
	DV	0	0
	TOTAL	2	2
ADT	N+D	87	87
	I	0	0
	DV	3	3
	TOTAL	90	90
M/C	N+D	116	116
	I	0	0
	DV	2	2
	TOTAL	118	118
TOTAL	N+D	204	204
	I	0	0
	DV	5	5
	TOTAL	208	208

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

3. AGRICULTURAL DEVELOPMENT

3-1 Crop Production

As the route runs through hilly terrain, the area of influence is mainly covered by upland crops. Remained cultivable land is also for upland crops.

Major crops in the area include garlic, chilli, vegetables, fruits, beans. The area has short of rice production and imports rice from outside areas to meet the local demand. Most of the upland crops are shipped out to markets along Route 106, especially to Amphoe Li.

Land use and capability in the area of influence is illustrated in Figure 27-3-1. Typical cropping calendar in Lamphun area is also shown in Figure 27-3-2. Based on the estimated planted area and yields, the future crop production in the area of influence after opening of the proposed road is given in the following Table 27-3-1.

3-2 Net Value Added

In accordance with the concept discussed in chapter 4 of Summary Report, net value added was calculated for both cases, with project and without project. The agricultural development benefit, indicated by the increment of net value added of crop production in the with project case, attributable to the project is estimated at 1.3, 3.6 and 1.8 in million Baht for 1987. 1993 and 2001 respectively.

Figure 27-3-1 LAND USE AND CAPABILITY OF INFLUENCE AREA STUDY ROUTE NO. 27

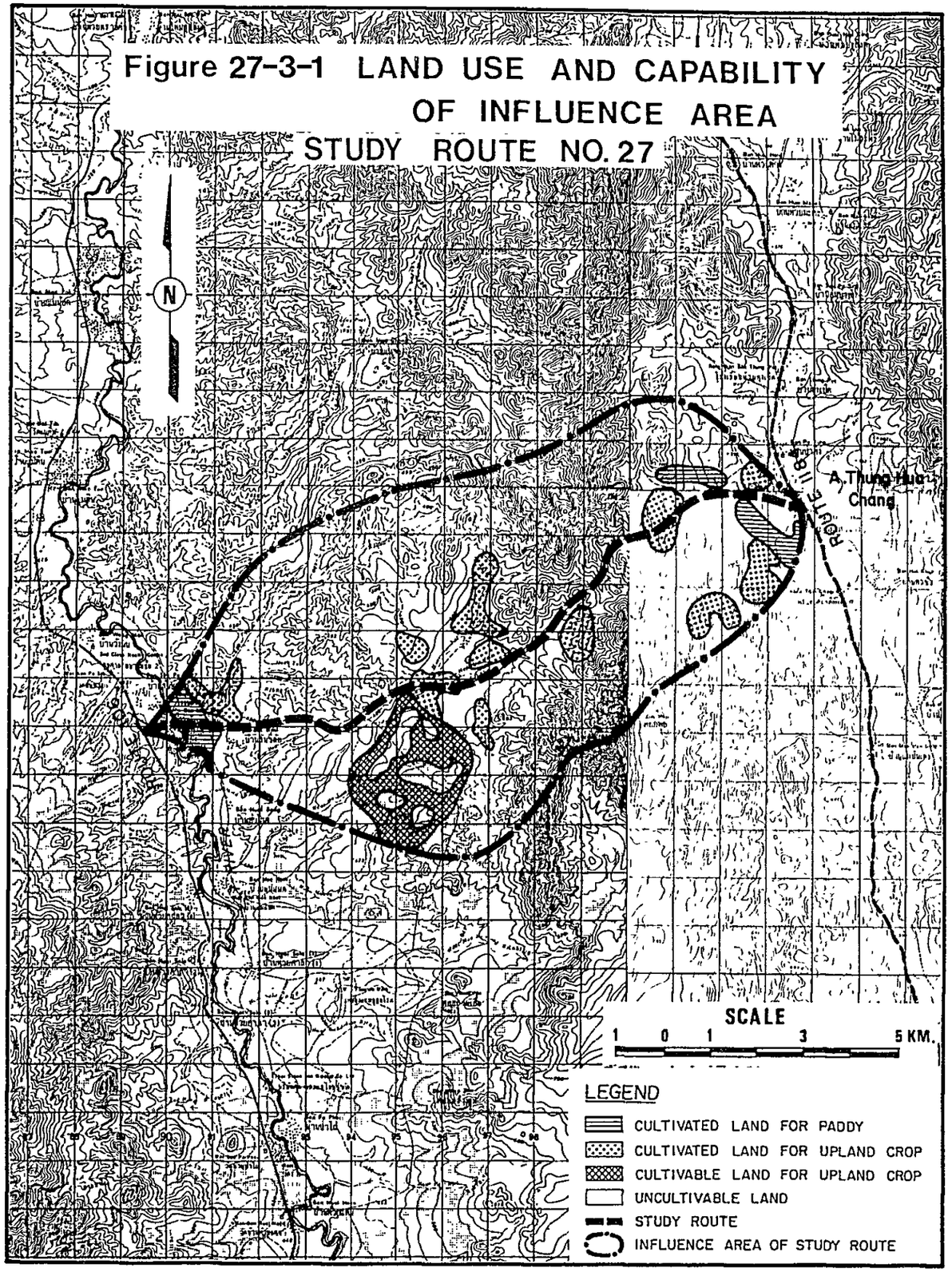


Figure 27-3-2 TYPICAL CROPPING CALENDAR - Route 27

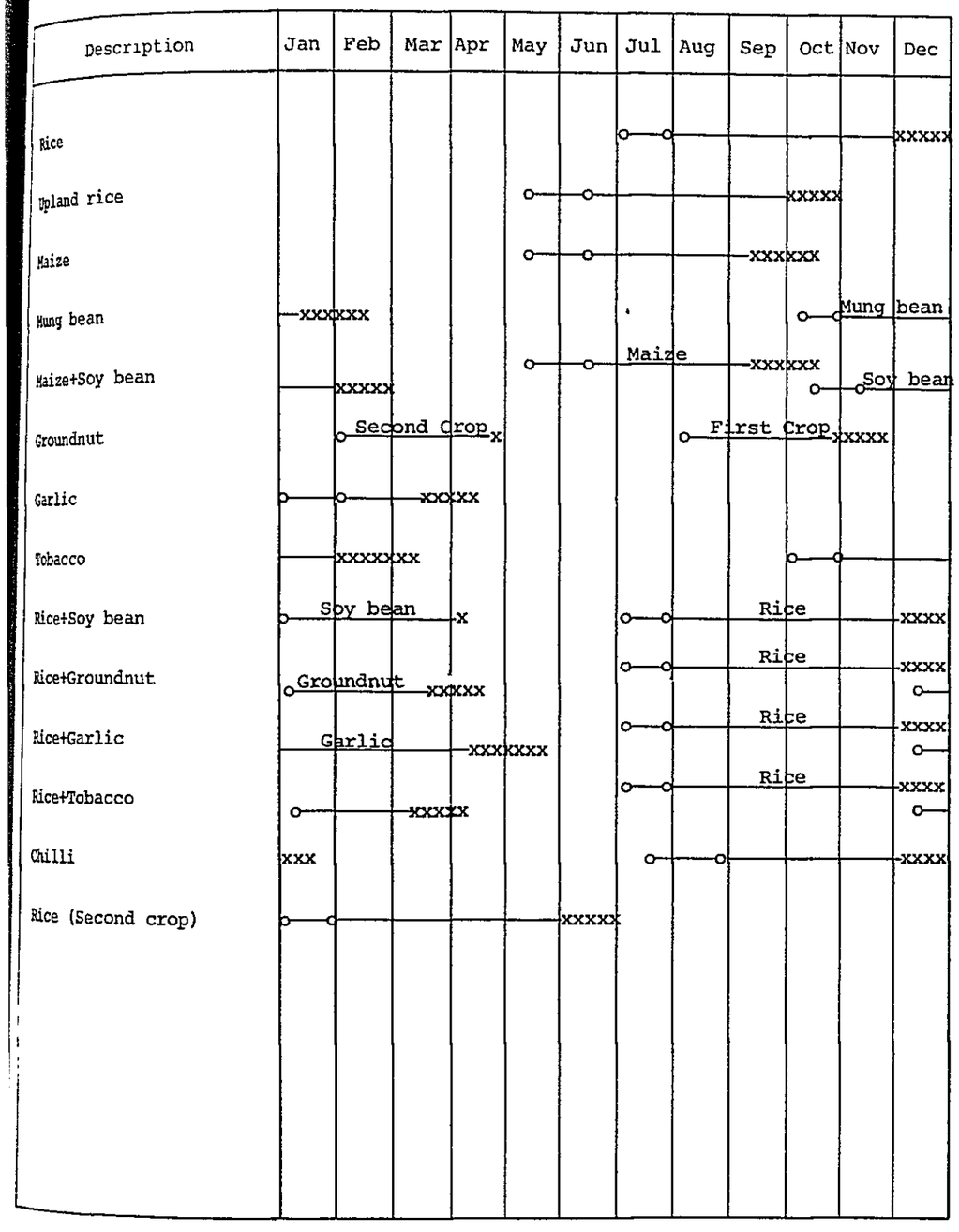


Table 27-3-1 CROP PRODUCTION - Route 27

(1000 TON)

CROP	1987		1993		2001	
	W/O	W	W/O	W	W/O	W
PADDY	0.5	0.6	0.6	0.6	0.6	0.6
MAIZE	0.1	0.1	0.1	0.1	0.1	0.1
MUNG BEAN	0.1	0.1	0.1	0.1	0.1	0.1
SOY BEAN	0.1	0.1	0.1	0.1	0.1	0.1
GROUND NUTS	0.2	0.3	0.3	0.3	0.3	0.3
SORGHUM	0.0	0.0	0.0	0.0	0.0	0.0
CASSAVA	0.0	0.0	0.0	0.0	0.0	0.0
SUGAR CANE	0.0	0.0	0.0	0.0	0.0	0.0
TOBACCO	0.1	0.1	0.1	0.1	0.1	0.1
COTTON	0.0	0.0	0.0	0.0	0.0	0.0
GARLIC	0.7	0.8	0.8	0.9	0.9	0.9
CHILLI	0.3	0.3	0.3	0.3	0.3	0.3
SESAME	0.0	0.0	0.0	0.0	0.0	0.0
VEGETABLES	0.9	1.0	1.0	1.1	1.0	1.1
FRUITS	0.5	0.6	0.6	0.7	0.6	0.7
OTHERS	0.0	0.0	0.0	0.0	0.0	0.0

4. ROAD USERS COST SAVINGS

In accordance with the concept and basic data described in Chapter 5 of Summary Report, sums of VOC on each road link concerned were calculated in both cases of with project and without project.

Road users cost savings, defined as the difference of total link VOC in the case of with project and that in the without project case, were estimated at 0.6, 0.7 and 1.1 in million Baht for 1987, 1993 and 2001 respectively.

5. ENGINEERING

5-1 Soils and Materials

Test results of subgrade soil, materials for subbase and shoulders and crushed rocks along the route or in the vicinity of the project area are shown in Table 27-5-1.

Location of samplings for the soil test done in this study are shown in the Location Map of Figure 27-1-1.

5-1-1 Subgrade Soils

Subgrade soils along the study route consists mainly of coarse sand with N.P. in the mountainous area and silty soil of low plasticity index of about 7.0% in the flat area. They were classified as A-1-6 for coarse sand and A-4 for silty soil in the AASHTO Classification. CBR values were about 30% for coarse sand and about 4.0% for silty soil.

5-1-2 Subbase and Shoulder Materials

Test results of coarse sand sampled in the mountainous section of the study route indicated that the plasticity index of the portion passing No. 4 sieve was N.P. and the soaked CBR was about 30%.

From the test result, the coarse sand along the study route are suitable for use in subbase and shoulder.

5-1-3 Rock Material

The rock quarry available for the proposed road is the source 27/R-1, at about Km Post 100+000, along Rt. 106. The fine aggregates passing #40 sieve is non-plastic and Los Angeles abrasion loss was around 26% less than specified 40% in DOH specification. One test result indicated that the CBR value is 75% a little bit less than DOH specified value.

5-2 Preliminary Design

Design speed employed in the studies is 30 Km/hr according to F6 class of DOH DOH Design Standard.

5-2-1 Alignment and Earthwork

The existing road includes some gradients steeper than 10% and sharp horizontal curves. They were improved in accordance with the geometric design criteria.

As the result, the cutting depth of 1.0 m to 3.0 m in an accumulated length of 1.4 km arised. The widening of 1.3 m to 4.5 m together with raising up of 0.5 m was required through the remaining length.

5-2-2 Pavement Design

F6 standard was applied for this study route based on forecasted ADT. The soil aggregated surfacing was, therefore, designed for main section. However, in the sections which pass through dense populated areas and approach sections to existing paved roads, about 3.5 km in total length, SBST pavement was designed.

A) Soil Aggregated Surfacing

In accordance with the DOH's Standard for typical pavement structure, the following thickness of the soil aggregated surfacing was designed.

Soil aggregated surfacing	CBR $\geq$ 20	150 mm
Selected material	CBR $\geq$ 6	200 mm

B) SBST Pavement

1) Design Traffic Number (DTN)

The basic data on traffic volume for DTN calculation are as follows:

Table 27-5-1 TEST RESULTS OF SOILS AND MATERIALS

Description	Sample No.	Location of Source (KM)	Depth (m)	Description of Sample	AASHO Classification	Sieve Analysis (% Passing) 50.0	25.0	19.0	9.5	#4	#10	#40	#200	Plasticity LL (%)	PI (%)	Compaction DH-T STD. Opt. Mc. (%)	γd gm/cc.	Lab.CBR CBR (%)	Swell (%)	Moisture Content (After Soaked) (%)	Abrasion (%)
Subgrade Soil	27/S-1	1+800 (L.6 m)	0.3-1.0	coarse sand with gravel	A-1-b	-	-	100	93.6	83.2	70.2	38.6	4.2	N - P		8.8	1.995	27.5	-	12.0	
	27/S-2	5+000 (L.8)	0.15-1.0	coarse sand with gravel	A-1-b	-	-	100	90.0	65.0	38.6	30.6	17.4	N - P		5.4	2.280	30.0	-	10.9	
	27/S-3	10+100 (R.8	0.2-1.0	silty soils	A-4	-	-	-	100	98.8	97.6	87.6	66.8	27.8	6.6	12.7	1.830	3.9	1.04	20.9	
Crushed Rock	27/R-1	Km. Post 100+00 Rt. 106			A-1-a	100	95.2	86.9	77.5	57.8	27.3	8.9	4.6			6.8*	2.280*	750	-		26.0

Note : * Compaction by DH-T-MOD

	Heavy Truck	Medium Truck	Heavy Bus	Total	Remarks
Average Number of Heavy Vehicles	1	9	1	11	ADT in 1987

Using the traffic analysis chart, DTN obtained for DTN7 (7 years design period) and DTN15 (15 years) were 1.0 and 2.5, respectively.

2) Design CBR

SBST pavement was planned in the beginning and the end sections of the study route. Only one CBR test was carried out in these section and it was 3.9%. This value was applied for Design CBR.

3) Thickness of Pavement

Thickness of full-depth asphaltic concrete were obtained from the thickness Design Chart as 130 mm and 155 mm for TA7 (7 years design period) and TA15 (15 years), respectively.

Thickness of pavement structures of SBST was determined from calculated TA7 130 mm full-depth asphaltic concrete as follows:

SBST		12 mm
Crushed stone subbase	CBR $\geq$ 80	150 mm
Soil aggregate subbase	CBR $\geq$ 20	150 mm

Thickness of overlay required at 7th year is 25 mm (TA15-TA7) in case of asphaltic concrete. If it is planned with SBST, the layer composition is as follows:

SBST		12 mm
Crushed stone base	CBR $\geq$ 80	50 mm

5-2-3 Drainage

1) Pipe Culvert

Pipe culverts (ø1.0m) are installed at every sag points all along the proposed road.

2) Box Culvert

Box culvert (2.4 m x 2.4 m) was planned at the water course having small catchment area. The number of cells of culvert was determined by comparing discharge with flow capacity as shown in the following table.

List of Box Culvert

Station	Existing Structure	Catchment Area (km^2)	Intensity (mm^3/sec)	Discharge (m^3/sec)	Proposed 1/ Structure	Capacity (m^3/sec)
0+500	BR-T (4.0x4.5)	4	80	46	C-B 2(2.4x2.4)	50
1+250	BR-T (4.0x5.0)	5	70	49	C-B 2(2.4x2.4)	50
8+300	BR-T (4.0x7.0)	3	116	55	C-B 2(2.4x2.4)	71
11+100	BR-T (4.0x5.0)	2	150	53	C-B 2(2.4x2.4)	71
13+400	BR-T (4.0x5.0)	2	147	51	C-B 2(2.4x2.4)	71

Note: 1/ Length of culvert is 10.0 m

5-2-4 Bridges

Long span bridge was planned at Li river (Station 0+700) based on the results of the river cross section survey. Short span bridge was planned where the river is relatively narrow and shallow. The length of bridge was determined by comparing discharge with flow capacity of bridge opening.

List of Bridge

Station	Existing Structure	Catchment Area (km^2)	Intensity (mm/h)	Discharge (m^3/sec)	Proposed Structure 1/	Capacity (m^3/sec)
0+700	BR-T (4.0x65.0)	1153	40	807	BR-C-65.0	1305
6+700	BR-T (4.0x4.0)	14	66	133	BR-C-14.0	138
15+400	BR-T (4.0x4.0)	8	90	113	BR-C-12.0	114
				Total length	= 91.0 m	

Note: 1/ Carriageway width of bridge is 7.0 m

6. CONSTRUCTION COST

Construction costs were obtained ay applying the unit rates to the respective work quantities calculated on the basis of the engineering studies.

Rock materials used for SBST, base course and structure works were supposed to be transported from rock quarry 27/R-1 with a hauling distance of 50 km. The transportation cost for this hauling distance was reflected to each unit rate.

The construction cost together with land acquisition cost are given in Table 27-6-1.

The construction period for the proposed road was estimated to be 2 years. Yearly disbursements of construction cost together with price contingency are shown in the following table.

YEARLY COST DISBURSEMENT - Route 27

(Million Baht)

	1984		1985		1986		Total		
	L/C[1/]	F/C[2/]	L/C	F/C	L/C	F/C	L/C	F/C	Total
Construction Cost	-	-	3.4	3.1	7.9	7.3	11.3	10.4	21.7
Price Contingency[3/]	-	-	1.5	0.7	4.7	2.3	6.2	3.0	9.2
Total	-	-	4.9	3.8	12.6	9.6	17.5 (0.76)	13.4 (0.58)	30.9 (1.34)

Note: 1/ Local Currency

2/ Foreign Currency

3/ At assumed annual escalation rates as follows (% p.a.):

	Local C.	Foreign C.
1981 - 1983	15	7.5
1983 - 1987	10	6.5

( ) Million US$ Equivalent (1US$ = 22.63 Baht)

Table 27-6-1 CONSTRUCTION COST - Route 27 (F- 6 / 16.6 Km)

Description	Unit of Quantity	Financial Unit Rate (Baht)	Quantity	Economic Cost (10^3 ฿)
Clearing & Grubbing	ha	17,000	28	433
Roadway Excavation-Classified Earth	m^3	36	36,300	1,176
Roadway Excavation-Classified Soft Rock	m^3	80	0	0
Embankment-Side Borrow	m^3	45	55,000	2,252
Embankment-Borrow Pit	m^3	60	0	0
Embankment-Selected Material	m^3	80	18,300	1,303
Subbase-Soil Aggregate	m^3	106	16,700	1,575
Base-Crushed Rock	m^3	333	1,600	490
Shoulder-Soil Aggregate	m^3	170	600	91
Asphaltic Prime Coat	m^2	11.0	1,580	16
Single Bituminous Surface Treatment	m^2	27.8	1,580	40
R.C. Pipe Culvert	m	2,500	250	575
R.C. Box Culvert	m	18,300	100	1,647
R.C. Bridge-Short Span	m	40,400	26	935
P.C. Bridge-Long Span	m	70,200	65	4,061
Sub-Total				14,594
Miscellaneous Works[1/]				1,022
Total Direct Construction Cost				15,616
PHYSICAL CONTINGENCY[2/]				2,342
DESIGN AND CONSTRUCTION SUPERVISION[3/]				1,562
Total				19,520
Land Acquisition				
Highly Devel'd Land	ha	50,000	0	0
Less Devel'd Land	ha	15,000	0	0
Grand Total				19,520
FINANCIAL COST (10^3 Baht)				(21,742)

NOTE: 1/ 7% Of direct construction cost of major work items.

2/ 15% Of direct construction cost.

3/ 10% Of direct construction cost.

7. EVALUATION

In accordance with the basic conditions of economic evaluation discussed in Chapter 8 of Summary Report and economic costs and benefits estimated as in the foregoing sections, internal rate of return of the proposed road project was calculated at 11.8% on the basis of F6 class standard. This implies that economic viability of the proposed project is marginal, assuming that the opportunity cost of capital is 12%.

Details of costs and benefits stream are given in Table 27-7-1.

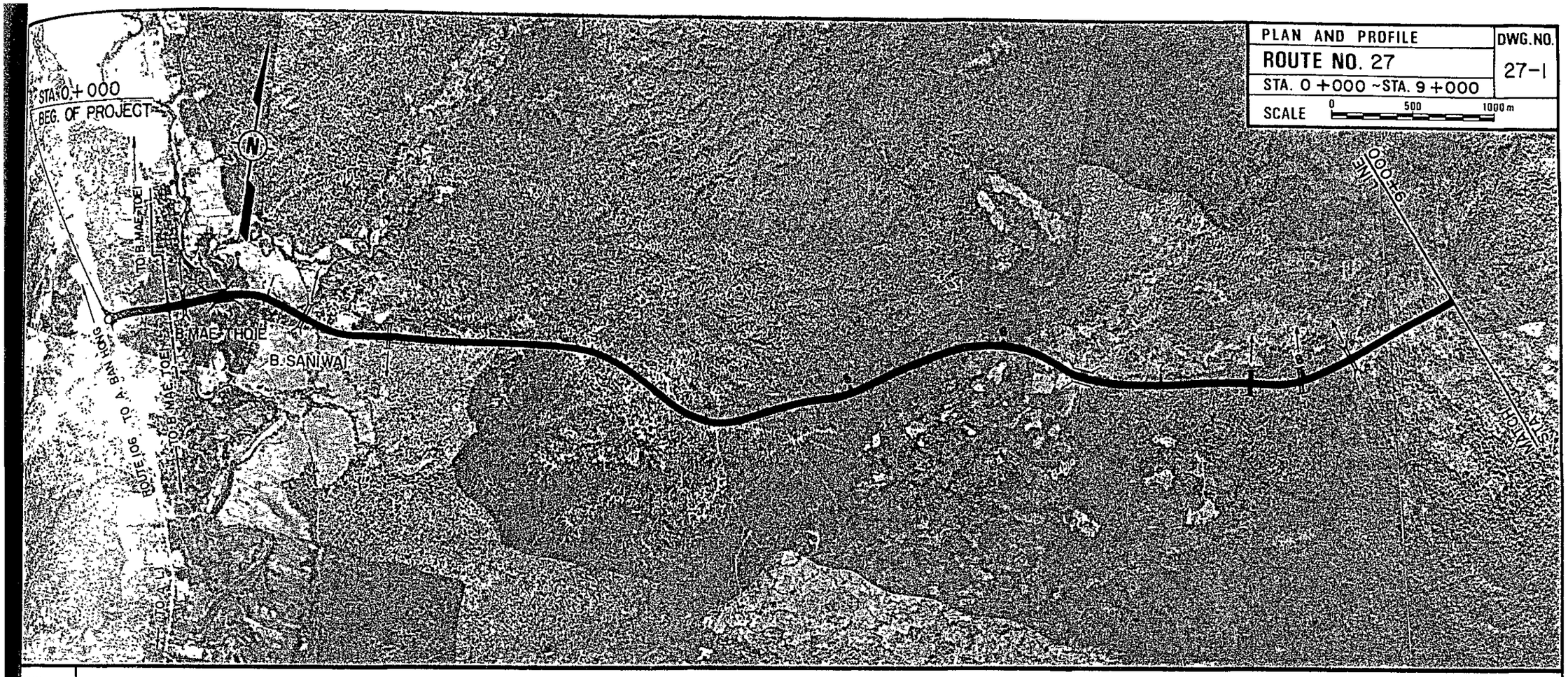
Table 27-7-1 COSTS AND BENEFITS STATEMENT - Route 27 (F6)

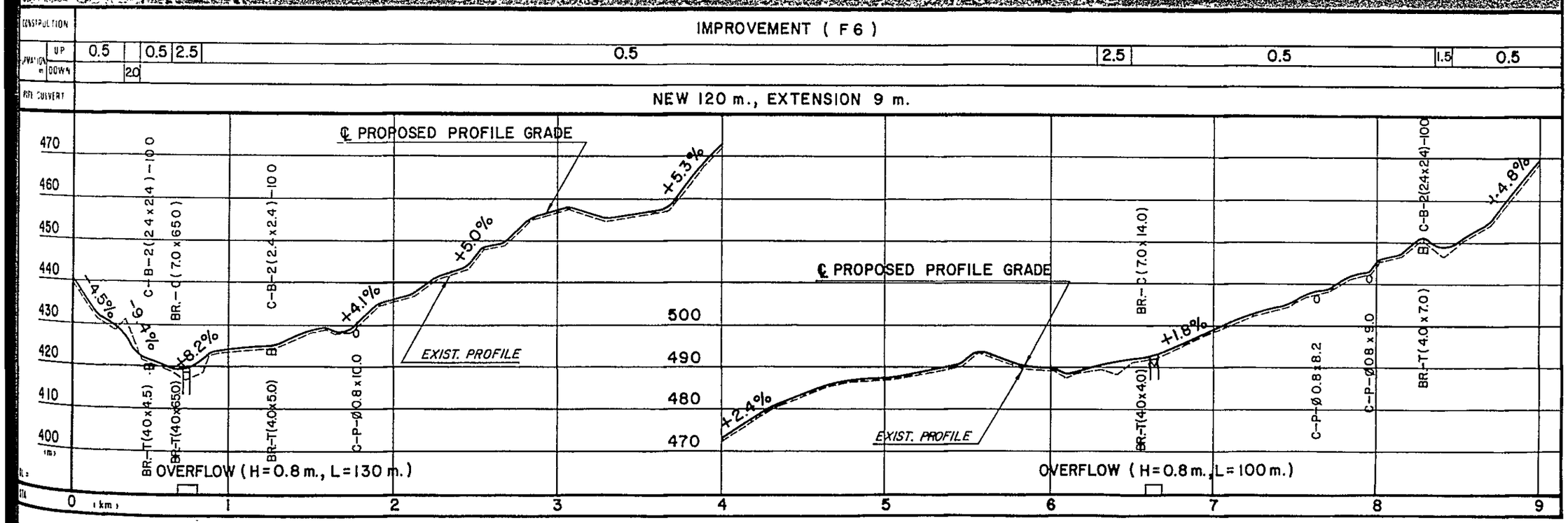
(1000 BAHT)

	COST	BENEFITS				DISCOUNTED(12%)	
YEAR	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	5,860	0	0	0	0	7,351	0
1986	13,650	0	0	0	0	15,299	0
1987	0	1,337	545	-0	1,882	0	1,681
1988	0	1,707	577	-0	2,284	0	1,821
1989	0	2,077	608	-0	2,685	0	1,911
1990	0	2,447	640	-0	3,086	0	1,962
1991	0	2,816	672	-0	3,488	0	1,979
1992	0	3,186	703	-0	3,889	0	1,970
1993	0	3,556	735	0	4,291	0	1,941
1994	1,686	3,335	780	0	4,116	763	1,662
1995	0	3,115	826	0	3,941	0	1,421
1996	0	2,894	872	0	3,765	0	1,212
1997	0	2,673	917	0	3,590	0	1,032
1998	0	2,452	963	0	3,415	0	877
1999	0	2,232	1,009	0	3,240	0	743
2000	0	2,011	1,054	0	3,065	0	627
2001	-8,979	1,790	1,100	0	2,890	-1,640	528
TOTAL	12,227	37,627	12,002	-0	49,628	21,772	21,366

DISCOUNTED ECONOMIC COSTS :	21,772
DISCOUNTED ECONOMIC BENEFITS :	21,366
AGRICULTURAL DEVELOPMENT BENEFIT	16,458
VOC SAVING	4,909
RMC SAVING	-0
NET PRESENT VALUE :	-406
BENEFIT COST RATIO :	0.98
INTERNAL RATE OF RETURN :	11.8 %

PLAN AND PROFILE	DWG.NO.
ROUTE NO. 27	27-1
STA. 0 +000 ~STA. 9 +000	
SCALE 0 500 1000 m	





PLAN AND PROFILE	DWG. NO.
ROUTE NO. 27	27-2
STA. 9+000 ~ STA. 16+600	
SCALE 0 500 1000 m