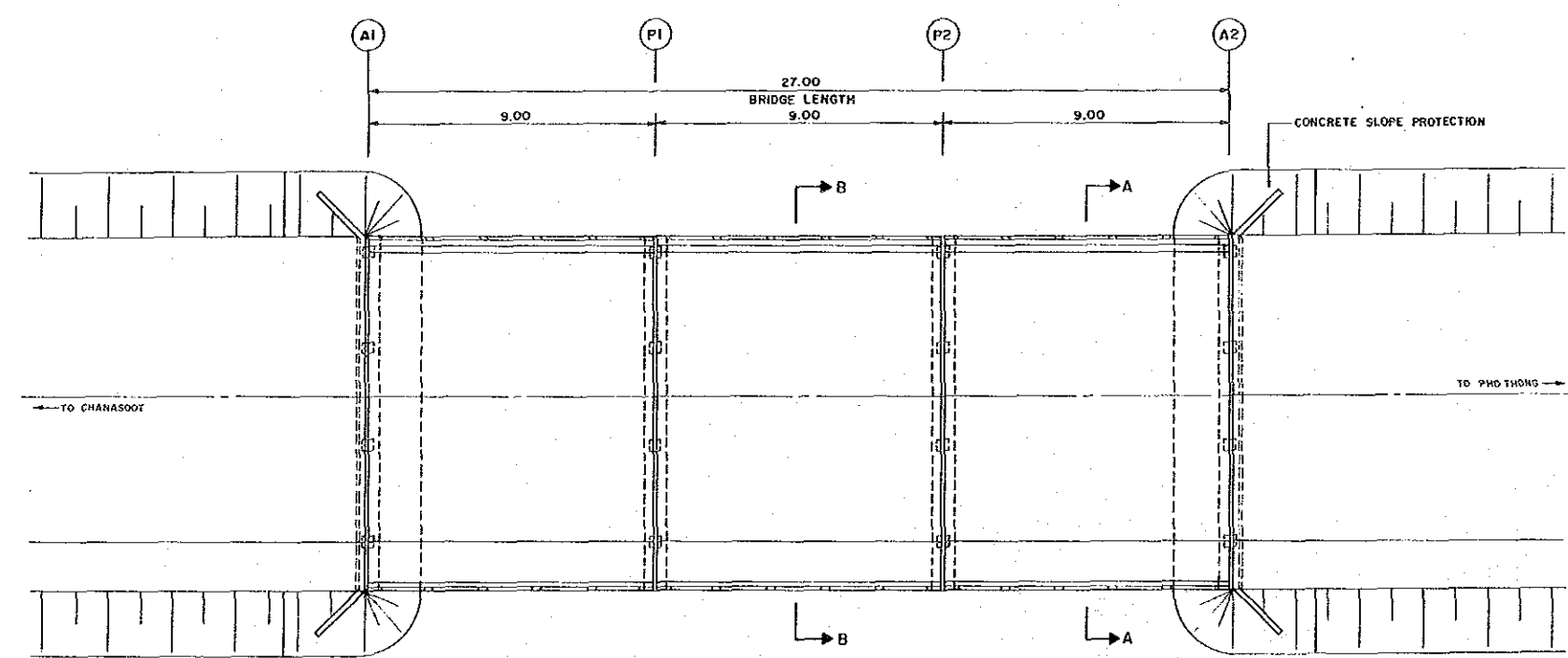
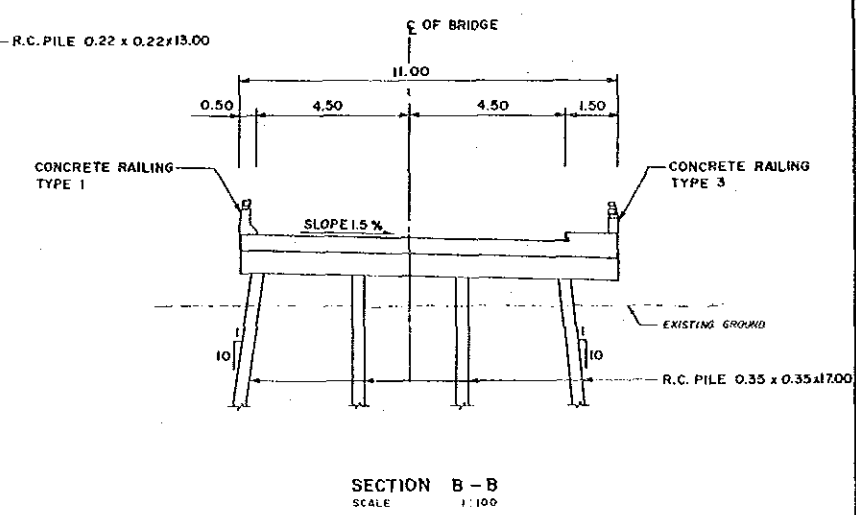
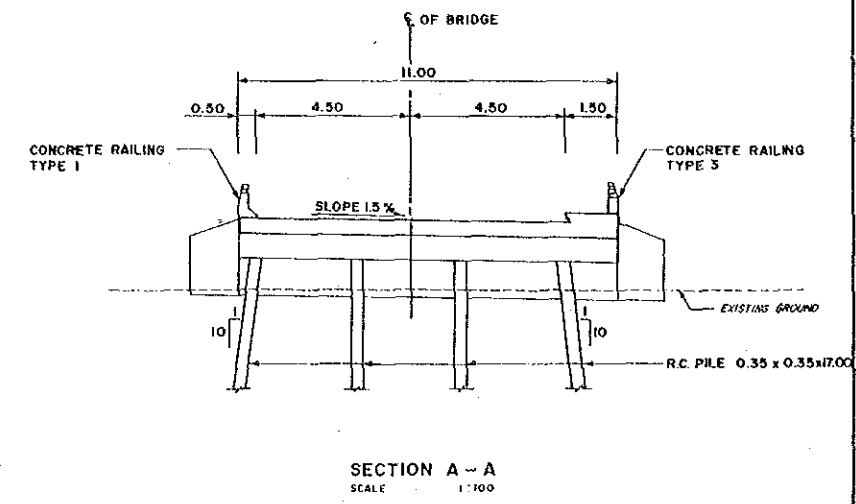
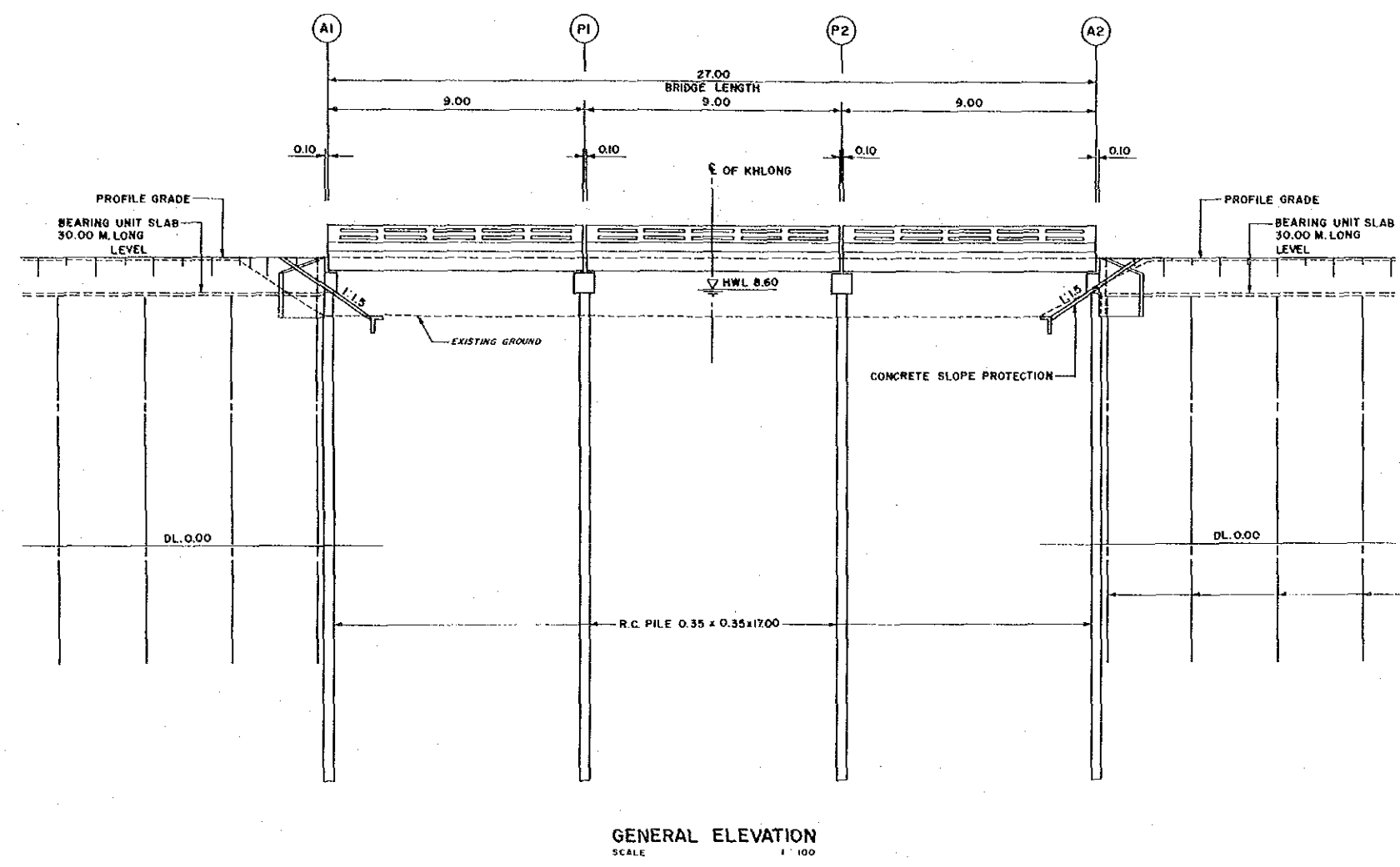


BH-1

M.	N-VALUE 10 20 30 40 50
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ITEM	UNIT	QUANTITY
1. CONCRETE CLASS B (1 1/2) FOR BRIDGE DECK	M ³	152
CLASS B (1 1/2) FOR PILE BENT PIER AND ABUTMENT	M ³	71
CLASS SPECIAL B (1 1/2) FOR BEARING UNIT SLAB	M ³	198
2. STEEL REINFORCEMENT	T	54
3. R.C. PILE 0.35 x 0.35 M.	LM	372
4. R.C. PILE 0.22 x 0.22 M.	LM	1232
5. CONCRETE RAILING TYPE 1	LM	27
TYPE 3	LM	27
6. CONCRETE FOR SLOPE PROTECTION	M ²	118

PROJECT IM - 12

Changwat : Ang Thong/Ayutthaya

A. Pho Thong - A. Sena

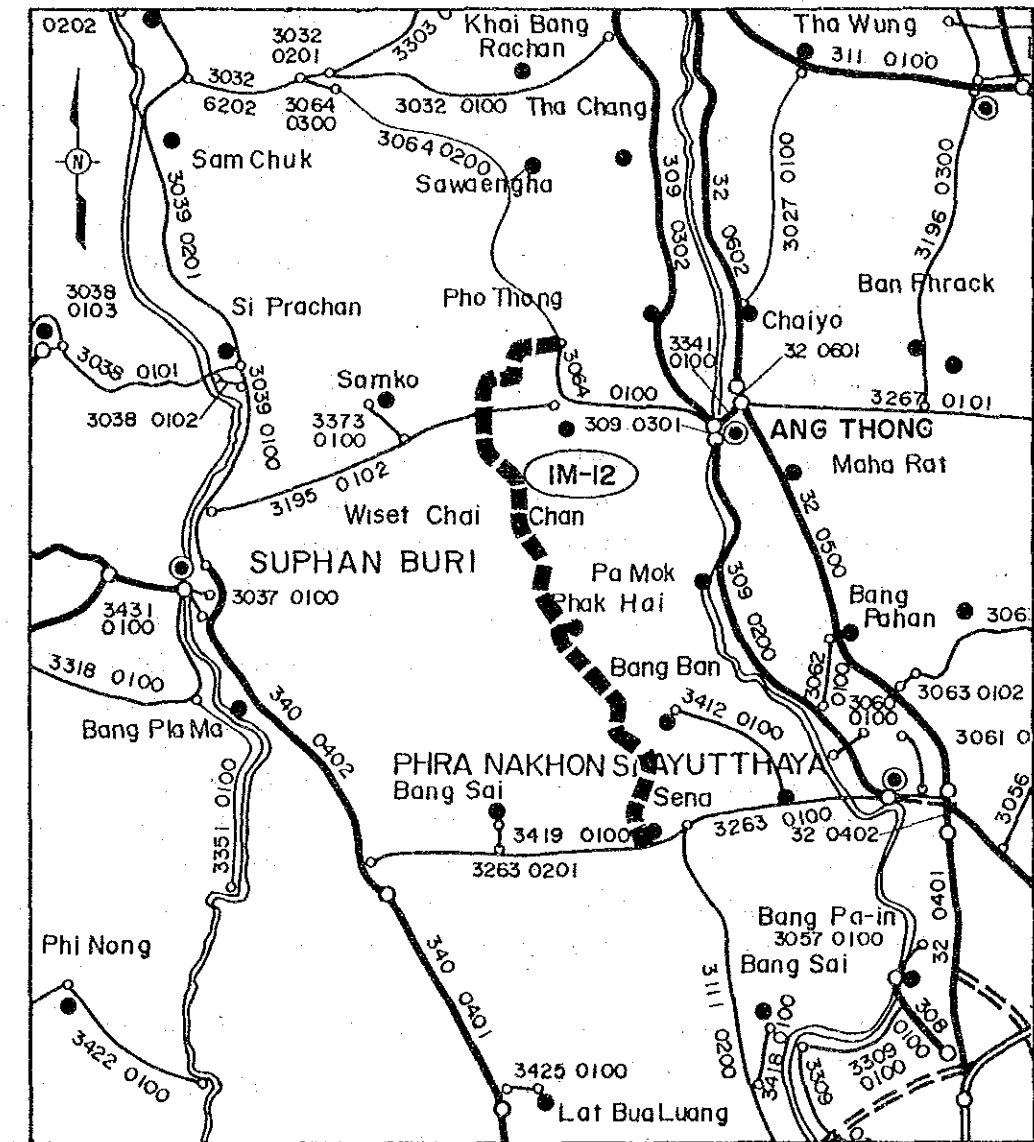
Length : 51.0 km

SUMMARY

PROJECT IM-12

ITEM	DESCRIPTION
Changwat	Ang Thong/Ayutthaya
Origin	A. Pho Thong
Destination	A. Sena
Route No.	RID
Project Length	51.00 km
Standard	
- Existing	—
- Proposed	F2
Traffic	
- Base	321 ~ 432
- 2000	1,000 ~ 1,600
- 2008	1,500 ~ 2,500
Pavement Type	
- Existing	SBST/Laterite
- Proposed	AC pavement (t = 10)
Bridges	
- New Construction	2 sites, 88 m
- Replacement	—
Construction Costs	
- Financial	245,340,000 Baht
- Economic	216,902,000 Baht
Economic Evaluation	
- IRR	15.1%
- B/C	1.28

LOCATION OF PROJECT ROUTE



SCALE
5 0 10 Km.

LEGEND :

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

1. GENERAL

The proposed route is located in Changwat Ang Thong and Changwat Ayutthaya. It originates at the junction with Route 3064 in Amphoe Pho Thong in Changwat Ang Thong, and runs southward to end at the junction with Route 3263 in Amphoe Sena in Changwat Ayutthaya. Its total length is 51 km.

The road is made on top of the eastern embankment of a large-scale canal throughout its length. The surrounding terrain is flat. The embankment is generally high, reaching 3.0 m in some places. Horizontal alignment is generally fair with some poor sections. There are eight adequate permanent bridges and two narrow concrete bridges requiring widening. Both sides of the road (the western side is across the canal) are well cultivated with paddy. The road has asphaltic pavement except for the last 10 km section, which is of laterite surface. The first 12 km section, between Routes 3064 and 3195, has little traffic and is therefore in good condition. The remaining section has more traffic and is in poor condition at places.

There are seven sharp curves below standard in the existing road. The first curve is the approach to a bridge near STA 28 + 000. However, vehicles must reduce speed approaching this arch type bridge anyway, and the existing curvature of $R = 121$ m (the standards call for R more than 160 m) was considered within the acceptable range. Alignment improvement, therefore, was not applied to this section.

The S-shaped curve between STA 28 + 400 and STA 28 + 700 was planned to be improved in its alignment within the easily acquirable right-of-way despite the existing adjoining bridge, whose shape is not a pronounced arch like the one at STA 28 + 000.

The existing road alignment shows a considerable detour between STA 30 + 000 and STA 33 + 000 as illustrated in the attached Plan. The results of site surveys indicated a high degree of difficulty for a shortcut because of the proximity of a wat and houses along the road and possible flooding along the river. It was decided, therefore, to apply only minor improvements in alignment to two sharp curves in this section.

The sharp curve near STA 34 + 000 was planned to be corrected as much as possible because the bridge crossing the canal is flat.

The section between STA 49 + 643 and STA 50 + 971 (the end point at Route 3263) is to be newly constructed with a length of 1.3 km. Its alignment was determined by avoiding existing houses and public facilities.

There is a plan to upgrade this road in future to a secondary national highway together with Route 3111 as described in the description of IM-11. Consideration was given to the smooth connection with Route 3111. Because of the existence of bridges, however, the two roads could not be set closer than shown here.

This road, upon improvement, will form an alternate, together with IM-11, to Route 309 and will provide a fast north-south road to the area surrounded by Routes 309 and 340. Traffic can be expected to divert from Route 309 to a certain degree.

2. TRAFFIC FORECAST

Base Traffic Volume

(Unit: Vehicles/Day)

Project Code	Section	Year	Traffic Volume							ADT
			MC	PC	LB	HB	LT	MT	HT	
IM-12	RID-N	1988	465	39	87	16	120	52	26	340
	RID-M	1988	443	24	0	0	221	68	8	321
	RID-S	1988	250	63	42	0	272	48	7	432

Traffic Growth Rate

(Unit: Percent)

Project	Section	Period	MC	PC	LB	HB	LT	MT	HT
IM-12	RID-N	-1993	8.46	8.80	5.44	6.77	9.17	7.93	9.14
		1994-2000	6.86	6.25	5.28	7.57	7.06	7.67	7.95
		2000-2008	5.39	5.70	4.99	2.31	4.92	6.18	6.76
	RID-M	-1993	8.46	8.80	5.44	6.77	9.17	7.93	9.14
		1994-2000	6.86	6.25	5.28	7.57	7.06	7.67	7.95
		2000-2008	5.39	5.70	4.99	2.31	4.92	6.18	6.76
	RID-S	-1993	8.46	8.80	5.44	6.77	9.17	7.93	9.14
		1994-2000	6.86	6.25	5.28	7.57	7.06	7.67	7.95
		2000-2008	5.39	5.70	4.99	2.31	4.92	6.18	6.76

Diverted Traffic Volume

(Unit: Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-12	RID-N	1994	0	6	0	0	63	14	37	120
		2000	0	9	0	0	95	22	58	184
		2008	0	15	0	0	139	36	98	288
	RID-M	1994	0	19	0	0	193	14	37	263
		2000	0	28	0	0	290	22	58	398
		2008	0	44	0	0	426	36	98	604
	RID-S	1994	0	19	0	0	193	14	37	263
		2000	0	28	0	0	290	22	58	398
		2008	0	44	0	0	426	36	98	604

Induced Traffic Volume

(Unit: Vehicles/Day)

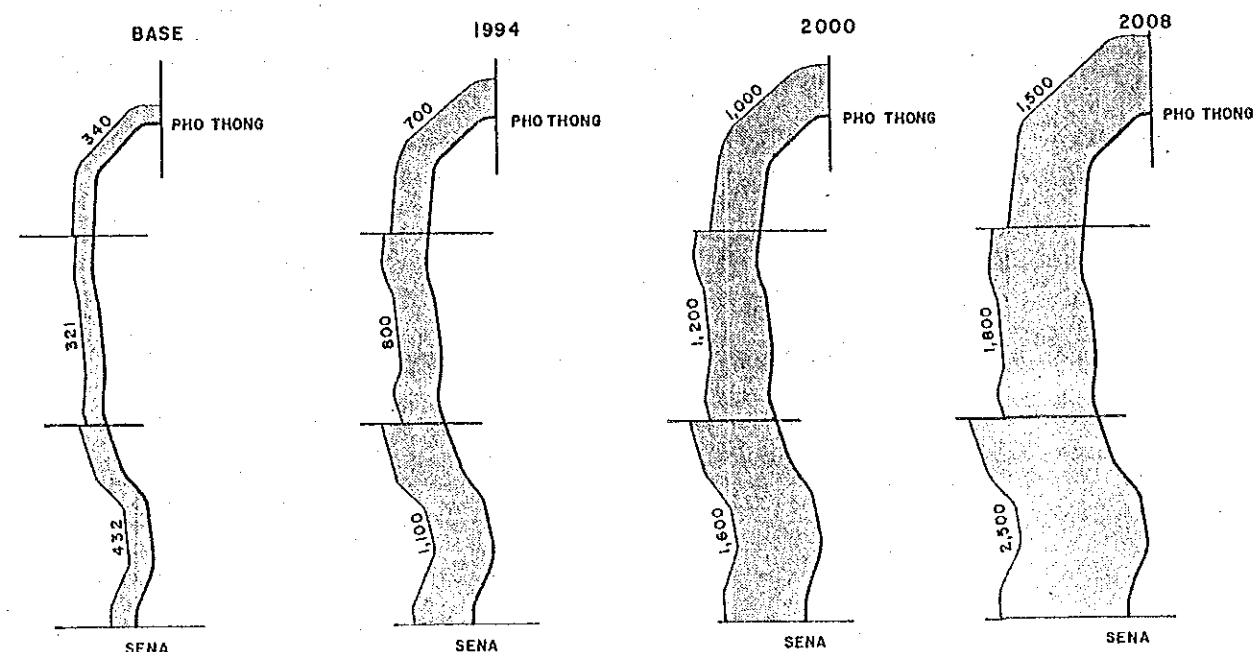
Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-12	RID-S	1994	80	23	14	0	103			140
		2000	118	32	18	0	156			206
		2008	178	51	27	0	229			307

Future Traffic Volume

(Unit: Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-12	RID-N	1994	746	70	119	24	262	96	80	651
		2000	1110	100	163	37	395	150	127	972
		2008	1690	156	240	44	580	242	214	1476
	RID-M	1994	711	58	1	1	559	121	50	790
		2000	1058	84	2	2	842	189	79	1198
		2008	1610	131	3	3	1237	306	134	1814
	RID-S	1994	481	144	71	2	747	90	48	1102
		2000	715	207	97	3	1125	140	77	1649
		2008	1087	323	143	3	1653	226	130	2478

Note. N: North section M: Middle section S: South section



UNIT : VEHICLE / DAY

PROJECT IM - 12

3. ENGINEERING

3.1 Materials and Boring Results

(1) Materials

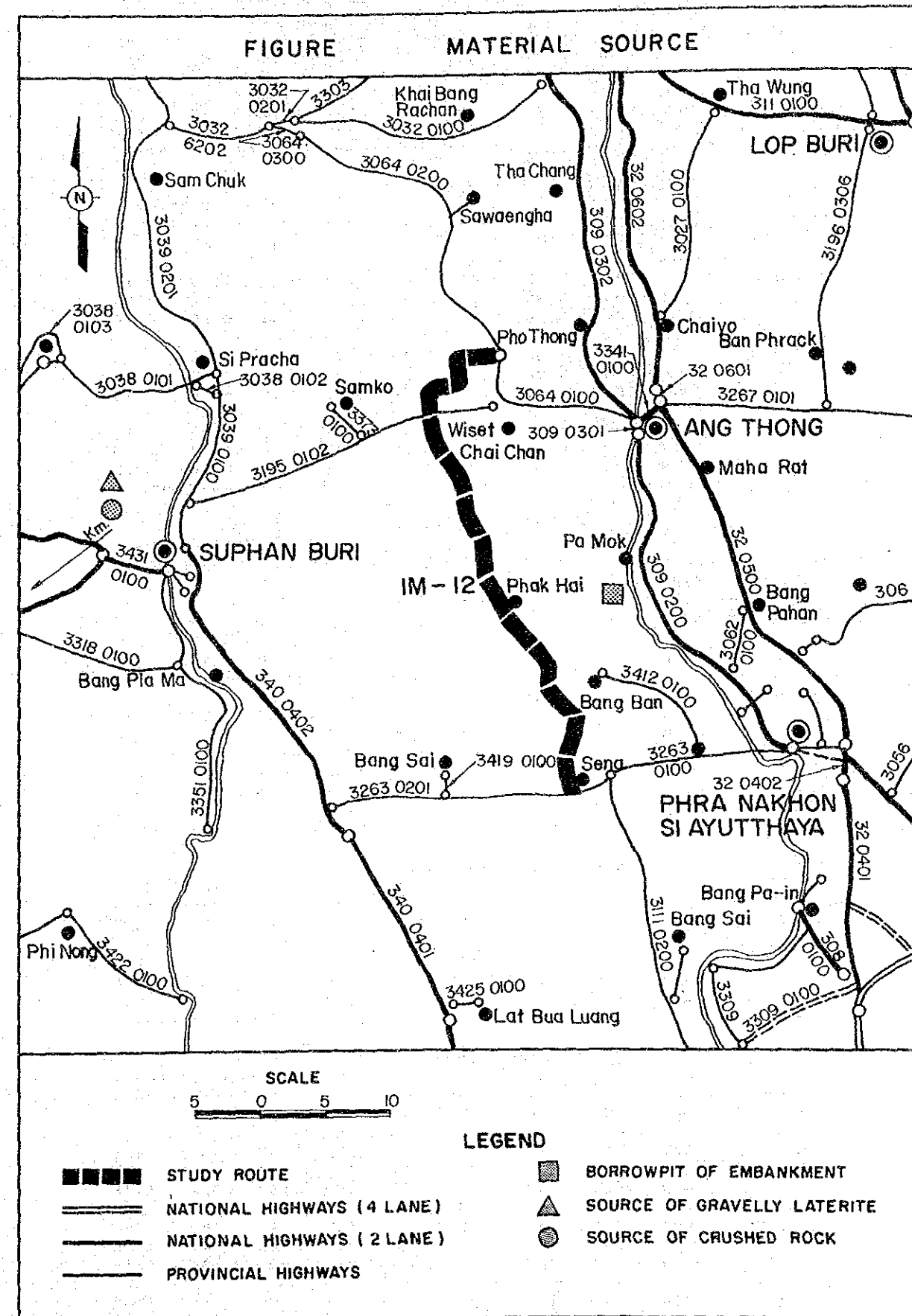
DESCRIPTION OF MATERIAL SOURCES

Material	Source	Description of Sample	Estimated Quantity cu.m.	Hauling Distance (km)
Soil	Route 309 Km Left Side 0.2 Km	Silty Fine & Trace Medium Sand	Plentiful	23
Laterite	Route 324 Km 130+000 Left Side 7.0 Km	Gravelly Laterite	Plentiful	63
Crushed Rock	Route 1 Km 130+000 Both Sides	Lime Stone	Plentiful	68

RESULTS OF LABORATORY TESTS

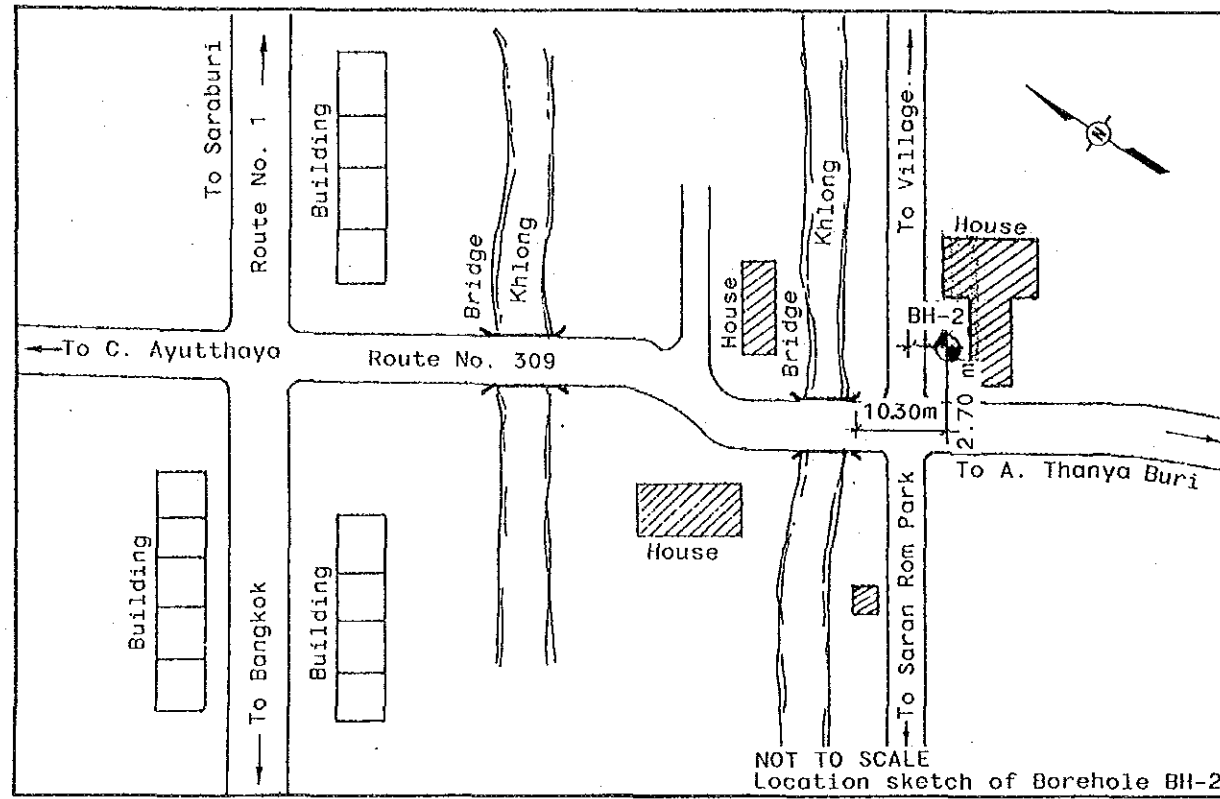
	Sieve Analysis % Passing								Plasticity		Comp. Lab. C.B.R.			
	50.0	25.0	19.0	9.5	#4	#10	#40	#200	LL	PI	Dpt. 95%	gn/cc	CBR 95%	Swell %
Soil						100	91	34	-	NP	16.4	1.69	9.0	-0.4
Laterite	100	98	96	89	75	52	29	17	28.5	10.0	8.4	2.11	25	-
Crushed Rock														

Note : Abrasion test result of Crushed Rock 22.6 %



(2) Boring Results

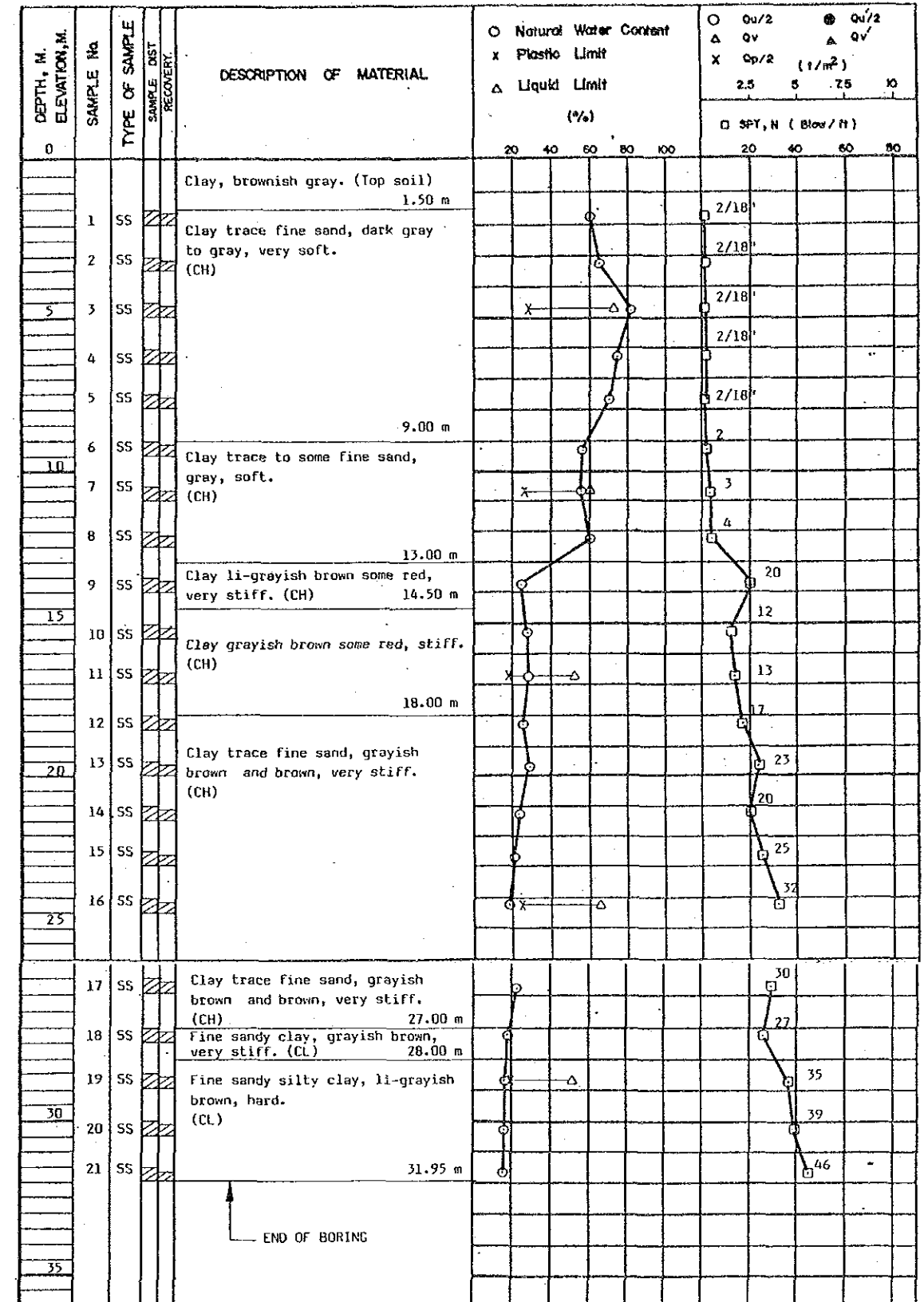
BOREHOLE LOCATION



SUMMARY OF TEST RESULTS

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT γ_{m^3}	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH γ_{m^2}				STANDARD PENETRATION (N)
	FROM	TO		LL	PL	PL								UNCONFINED SHEAR $Q_{u/2}$	FIELD VANE SHEAR		POCKET PENETRATION $\frac{1}{2} Q_p$	
								No. 3/8"	No. 4	No. 10	No. 40	No. 200			Q_v	Q_v'		
SS-1	1.50	1.95	59.5				1.69					CH				2.5	2/18'	
SS-2	3.00	3.45	63.1				1.64		100	99	98	CH				2.5	2/18'	
SS-3	4.50	4.95	80.5	73.4	29.1	44.3	1.54					CH				1.2	2/18'	
SS-4	6.00	6.45	73.3									CH				1.2	2/18'	
SS-5	7.50	7.95	69.5				1.59					CH				1.2	2/18'	
SS-6	9.00	9.45	57.2									CH				1.2	2	
SS-7	10.50	10.95	55.3	59.8	26.5	33.3	1.69					CH				2.5	3	
SS-8	12.00	12.45	60.0						100	99	89	CH				2.5	4	
SS-9	13.50	13.95	23.5				2.00					CH				16.2	20	
SS-10	15.00	15.45	26.8				1.88		100	99	97	CH				15.0	12	
SS-11	16.50	16.95	27.8	51.3	19.4	31.9	1.87					CH				15.0	13	
SS-12	18.00	18.45	24.7				1.88					CH				16.2	17	
SS-13	19.50	19.95	21.9				1.93			100	99	CH				20.0	23	
SS-14	21.00	21.45	23.1				1.97					CH				16.2	20	
SS-15	22.50	22.95	20.5				2.00					CH				18.7	25	
SS-16	24.00	24.45	19.2	66.0	26.4	39.6	2.02					CH				22.5	32	
SS-17	25.50	25.95	22.1				1.97					CH				22.5	30	
SS-18	27.00	27.45	19.1				2.08		100	99	98	CL				-	27	
SS-19	28.50	28.95	18.1	50.5	20.0	30.5	2.03					CL				22.5	35	
SS-20	30.00	30.45	16.8				2.07		100	99	97	CL				22.5	39	
SS-21	31.50	31.95	16.9									CH				22.5	46	

BORING LOG



3.2 Preliminary Design

(1) Geometric Design Criteria

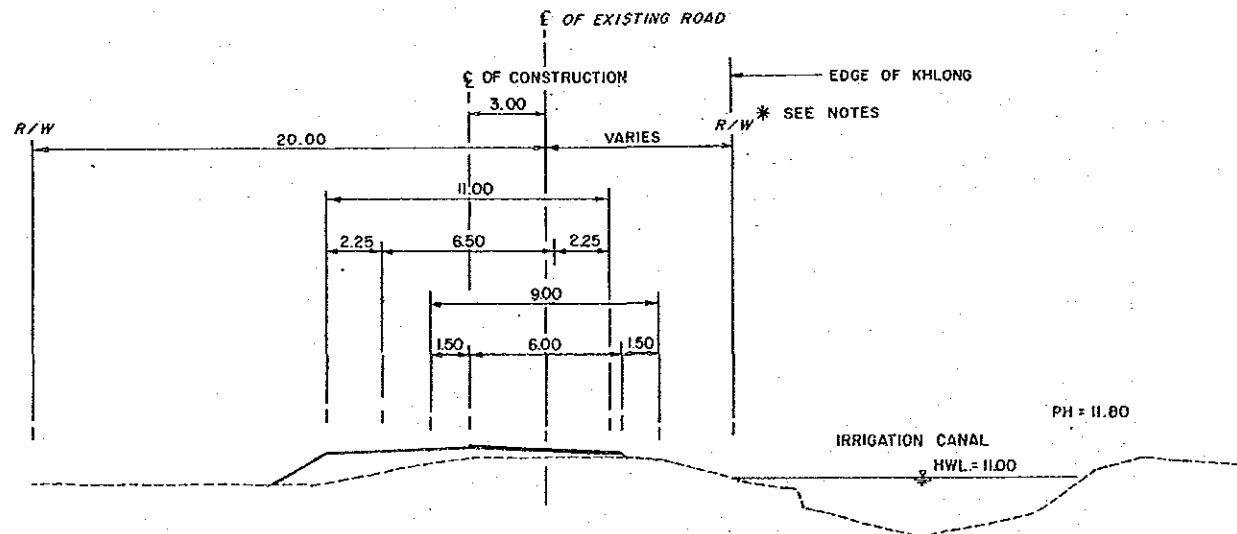
Design Standard : F-2
 Design Speed : 70-90 km/h

Geometric Design Criteria

Description	Design Speed (km/h)		
	70	80	90
Minimum Radius & Curvature (m)	160	210	280
Minimum Stopping Sight Distance (m)	90	115	140
Maximum Gradient (%)	7	6	5

(2) Pavement Design

Design CBR of Subgrade	Cumulative No. of ESA W18 x 10 (10 years)	Thickness of Pavement Structure (cm)	
4.0	530	Surface	10
		Base	20
		Subbase	15



STA. 0+000 TO STA. 17+100
 STA. 34+117 TO STA. 49+300
 TYPICAL CROSS SECTION
 IM-12 ROAD CLASS F2

- NOTES
1. FROM STA. 17+100 TO STA. 34+117
R/W WIDTH 40 M.
 2. FROM STA. 49+300 TO STA. 51+010
NEW R/W WIDTH 40 M.

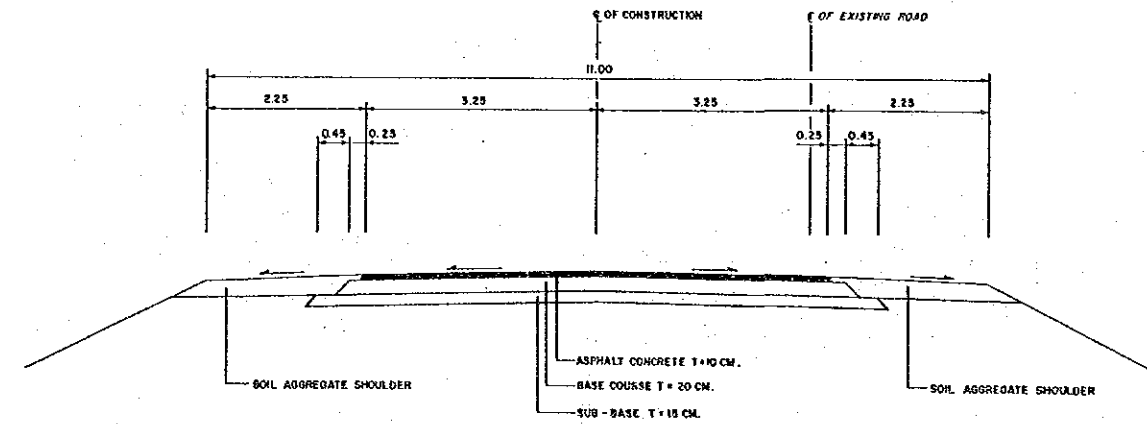


FIGURE TYPICAL PAVEMENT STRUCTURE FOR FLEXIBLE PAVEMENT IM-12

(3) Culverts

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
1	1+323	RCP 1-Dia 0.30x17.00	RCP 1-Dia 0.60x21.00
2	5+581	RCP 1-Dia 0.30x17.50	RCP 1-Dia 0.60x24.00
3	6+619	RCP 1-Dia 0.30x18.00	RCP 1-Dia 0.60x28.00
4	8+600	RCP 1-Dia 0.30x15.50	RCP 1-Dia 0.60x22.00
5	9+887	RCP 1-Dia 0.30x18.20	RCP 1-Dia 0.60x20.00
6	11+869	RCP 1-Dia 0.30x15.00	RCP 1-Dia 0.60x19.00
7	12+992	RCP 1-Dia 0.30x16.50	RCP 1-Dia 0.60x19.00
8	18+109	RCP 1-Dia 1.00x23.00	REMAIN
9	19+968	RCP 1-Dia 1.00x18.00	EXTEND 1-Dia 1.00x 2.00
10	21+042	RCP 1-Dia 1.00x19.20	REMAIN
11	21+682	RCP 1-Dia 1.00x17.50	EXTEND 1-Dia 1.00x 3.00
12	22+675	RCP 1-Dia 1.00x17.00	EXTEND 1-Dia 1.00x 2.00
13	24+141	RCP 3-Dia 1.00x19.80	EXTEND 3-Dia 1.00x 4.00
14	25+349	RCP 1-Dia 1.00x21.70	REMAIN
15	25+887	RCP 3-Dia 1.00x25.50	REMAIN
16	26+550	RCP 1-Dia 1.00x17.00	EXTEND 1-Dia 1.00x 3.00
17	27+075	RCP 1-Dia 1.00x17.20	EXTEND 1-Dia 1.00x 4.00
18	27+525	RCP 1-Dia 1.00x19.60	EXTEND 1-Dia 1.00x 4.00
19	30+114	RCP 1-Dia 1.00x17.10	EXTEND 1-Dia 1.00x 3.00
20	30+991	BOX 1-2.80x3.00x13.60	REMAIN

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
21	31+422	RCP 1-Dia 1.00x16.30	EXTEND 1-Dia 1.00x 6.00
22	32+295	BOX 1-2.80x3.00x12.90	REMAIN
23	33+977	RCP 1-Dia 1.00x15.50	EXTEND 1-Dia 1.00x 6.00
24	36+133	RCP 2-Dia 1.00x21.00	EXTEND 2-Dia 1.00x 6.00
25	37+086	RCP 1-Dia 0.60x17.00	EXTEND 1-Dia 0.60x 6.00
26	39+290	RCP 1-Dia 1.00x33.00	REMAIN
27	40+208	RCP 1-Dia 0.60x19.00	REMAIN
28	40+534	RCP 1-Dia 0.80x21.50	EXTEND 1-Dia 0.80x 8.00
29	40+682	RCP 1-Dia 0.80x17.20	REMAIN
30	41+073	RCP 1-Dia 1.00x36.00	REMAIN
31	41+481	RCP 1-Dia 0.80x15.70	REMAIN
32	42+805	RCP 1-Dia 1.00x21.50	REMAIN
33	42+962	RCP 1-Dia 0.60x20.00	EXTEND 1-Dia 0.60x 6.00
34	43+349	RCP 1-Dia 1.00x11.50	EXTEND 1-Dia 1.00x14.00
35	44+087	RCP 1-Dia 1.00x12.00	EXTEND 1-Dia 1.00x14.00
36	44+900	RCP 1-Dia 1.00x14.20	EXTEND 1-Dia 1.00x10.00
37	46+956	RCP 1-Dia 1.00x11.20	EXTEND 1-Dia 1.00x12.00
38	48+338	RCP 3-Dia 1.00x20.50	EXTEND 3-Dia 1.00x 6.00
39	49+600	-	RCP 2-Dia 1.00x18.00
40	50+940	-	BOX 2-3.00x3.00x15.00

(4) Bridges

NO	CHAINAGE	EXISTING BRIDGE	PROPOSED BRIDGE
1	0+453	8.00x24.00 SLAB TYPE	REMAIN
2	9+548	8.00x28.00 SLAB TYPE	REMAIN
3	15+671	6.30x 5.00 SLAB TYPE	REMAIN
4	20+369	8.00x 5.00 SLAB TYPE	REMAIN
5	28+023	8.00x70.00 SLAB TYPE	REMAIN
6	28+314	8.00x35.00 SLAB TYPE	REMAIN
7	31+661	8.00x44.30 SLAB TYPE	REMAIN
8	33+461	3.90x 4.50 SLAB TYPE	7.00x18.00 STEEL TYPE
9	34+142	8.00x50.00 SLAB TYPE	REMAIN
10	49+263	8.00x100.00 SLAB TYPE	REMAIN
11	50+287	-	11.00x70.00 SLAB TYPE

3.3 Quantities and Construction and Road Maintenance Costs

(1) CONSTRUCTION QUANTITIES AND COSTS
(Project IM-12 Length = 51.0 km)

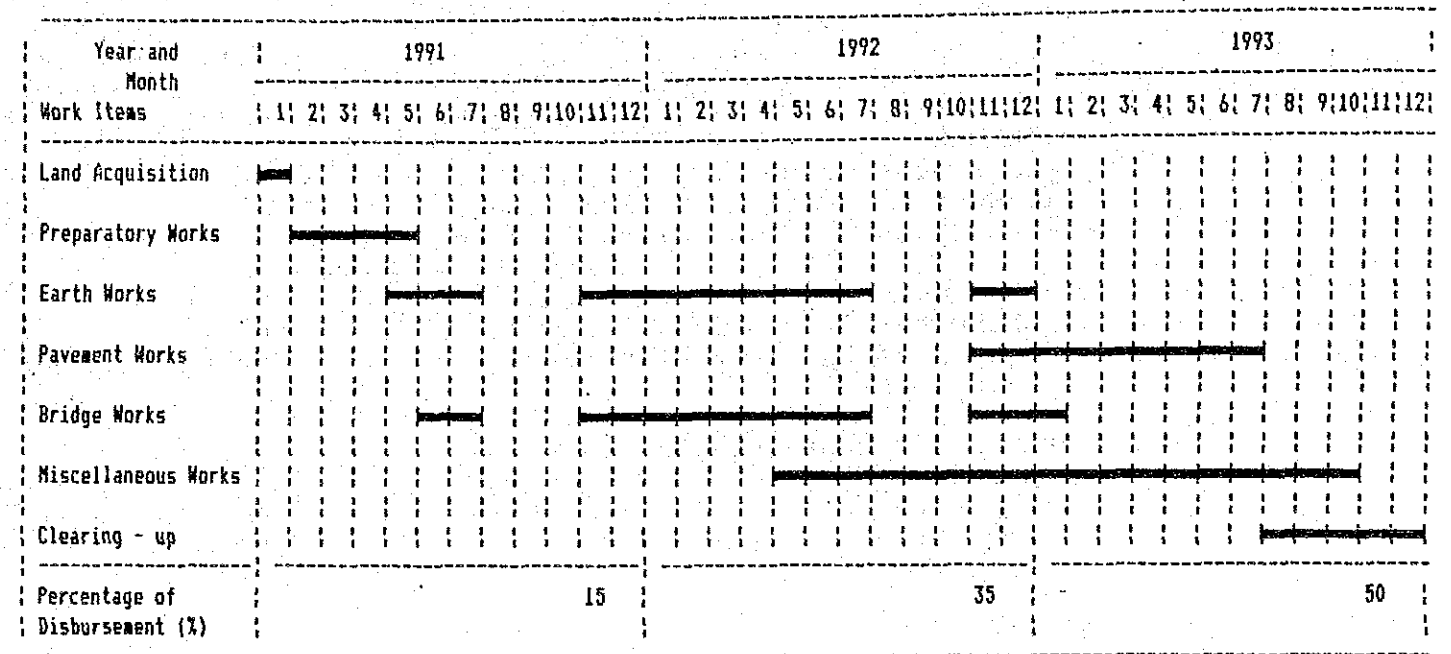
Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost		Residual Value		
					%	1000 Baht	%	1000 Baht	
EARTHWORK									
Clearing & Grubbing	ha	10,000	54	540	85	459	90	413	
Roadway Excavation (Unclassified)	m ³	18	21,400	385	84	323	90	291	
Roadway Excavation (Classified Unsuitable Material below Grade)	m ³	38	-	-	84	-	90	-	
Embankment (Common)	m ³	33	-	-	86	-	90	-	
Embankment (Borrow)	m ³	111	553,200	61,405	86	52,808	90	47,527	
Removal of Existing Structure	each	60,000	1	60	84	50	90	45	
Sub Total				62,390		53,640		48,276	
SUBBASE and BASE COURSES									
Subbase	m ³	218	28,600	6,235	83	5,175	50	2,588	
Aggregate base	m ³	343	78,000	26,754	84	22,473	50	11,237	
Shoulder (Soil Aggregate)	m ³	252	38,200	9,626	83	7,990	50	3,995	
Sub Total				42,615		35,638		17,820	
SURFACE COURSES									
Asphaltic Prime Coat	m ²	11	380,900	4,190	93	3,897	50	1,949	
Asphaltic Tack Coat	m ²	5	328,600	1,643	93	1,528	50	764	
Double Bituminous Surface Treatment	m ²	33	-	-	91	-	50	-	
Asphalt Concrete Surfacing	ton	930	77,600	72,168	90	64,951	50	32,476	
Portland Cement Concrete Pavement	m ³	1,687	-	-	90	-	50	-	
Sub Total				78,001		70,376		35,189	
STRUCTURES (Equivalent)									
RC Pipe Culvert (D=1.00 m)	m	1,800	260	468	88	412	50	206	
RC Box Culvert (2-2.40x 2.40 m)	m	10,000	24	240	90	216	50	108	
RC Bridge (W=11.0 m)	m	66,000	70	4,620	87	4,019	50	2,010	
Steel Bridge (W=7.0 m)	m	42,000	18	756	87	658	50	329	
Bearing Unit	m ²	1,600	-	-	87	-	50	-	
Sub Total				6,084		5,305		2,653	
Total (a)					189,090		164,959		103,938
Miscellaneous Work ((a) x 7%)				1s	13,236	87	11,515	0	0
CONTRACT AMOUNT (b)					202,326		176,474		103,938
PHYSICAL CONTINGENCIES ((b) x 10%) (c)				1s	20,233		17,647		10,394
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)				1s	22,256	100	22,256	0	0
LAND ACQUISITION									
Developed Land	ha	200,000	-	-					
Less Developed Land	ha	75,000	7	525					
Total (e)				525	100	525	100	525	
PROJECT COST ((b) + (c) + (d) + (e))					245,340		216,902		114,857
AVERAGE COST PER KM					4,811				

(2) Road Maintenance Costs

(Unit : Baht/Year)

	Without Project	With Project
1994	873,578	515,714
2004	964,995	942,367

3.4 Construction Schedule



4. BENEFITS

ROAD CONDITIONS

(unit : km)

Section	Without Project									With Project					
	Road Length	Paved			Laterite			No. of Narrow Bridge	No. of Wooden Bridge	Road Length	Road Paved	No. of Narrow Bridge	No. of Wooden Bridge		
		Good	Fair	Poor	Good	Fair	Poor							Good	Fair
RID-N	12.1	-	-	5.1	2.0	5.0	-	-	-	-	-	12.1	12.1	-	-
RID-M	16.8	-	-	6.4	-	10.4	-	-	-	1	-	16.8	16.8	-	-
RID-S	22.6	-	-	14.7	-	7.9	-	-	-	1	-	22.1	22.1	-	-

VOC AND TIME SAVINGS

(1000 BAHT)

Year	VOC Savings			Time Savings			Total Savings		
	Normal Traffic	Induced Traffic	Total	Normal Traffic	Induced Traffic	Total	Normal Traffic	Induced Traffic	Total
1994	28,679	4	28,683	6,198	1,006	7,205	34,885	1,003	35,888
2000	38,916	14	38,930	8,101	1,476	9,577	47,045	1,462	48,508
2008	54,907	14	54,921	11,014	2,213	13,227	65,948	2,200	68,148

5. ECONOMIC EVALUATION

COST AND BENEFIT STATEMENT



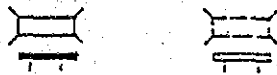



(1000 BAHT)

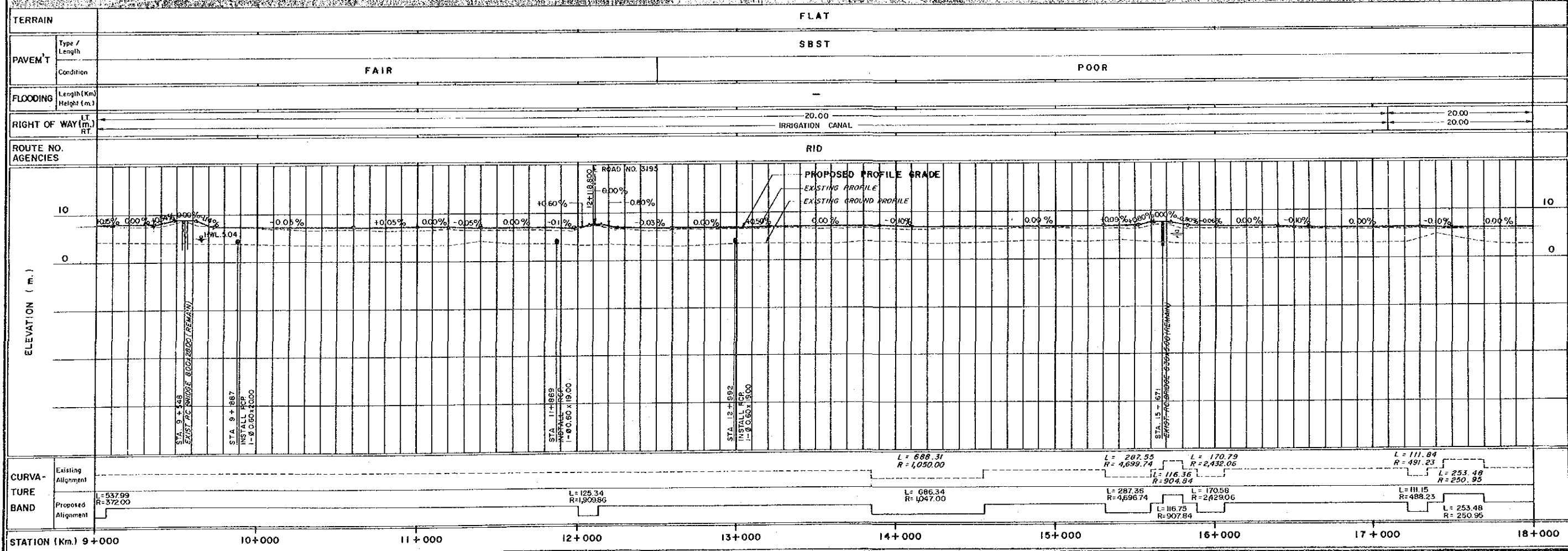
YEAR	COST		BENEFITS			DISCOUNTED (12%)	
	CONST. COST	VOC SAVING	TIME SAVING	MAINT. SAVING	TOTAL	COST	BENEFIT
1991	32,535				0	45,709	0
1992	75,916				0	95,229	0
1993	108,451				0	121,465	0
1994		28,683	7,205	358	36,246	0	32,362
1995		30,391	7,600	334	38,325	0	30,552
1996		32,099	7,996	310	40,405	0	28,759
1997		33,807	8,391	286	42,484	0	26,999
1998		35,515	8,786	262	44,563	0	25,286
1999		37,223	9,182	238	46,643	0	23,631
2000		38,930	9,577	214	48,721	0	22,039
2001		40,929	10,034	190	51,153	0	20,660
2002		42,928	10,490	166	53,584	0	19,323
2003		44,927	10,946	142	56,015	0	18,035
2004	35,762	46,926	11,402	118	58,446	11,514	16,802
2005		48,925	11,858	94	60,877	0	15,626
2006		50,923	12,314	70	63,307	0	14,508
2007		52,922	12,771	46	65,739	0	13,452
2008	(114,857)	54,921	13,227	23	68,171	(23,502)	12,455
TOTAL	137,807	620,049	151,779	2,851	774,679	250,415	320,489

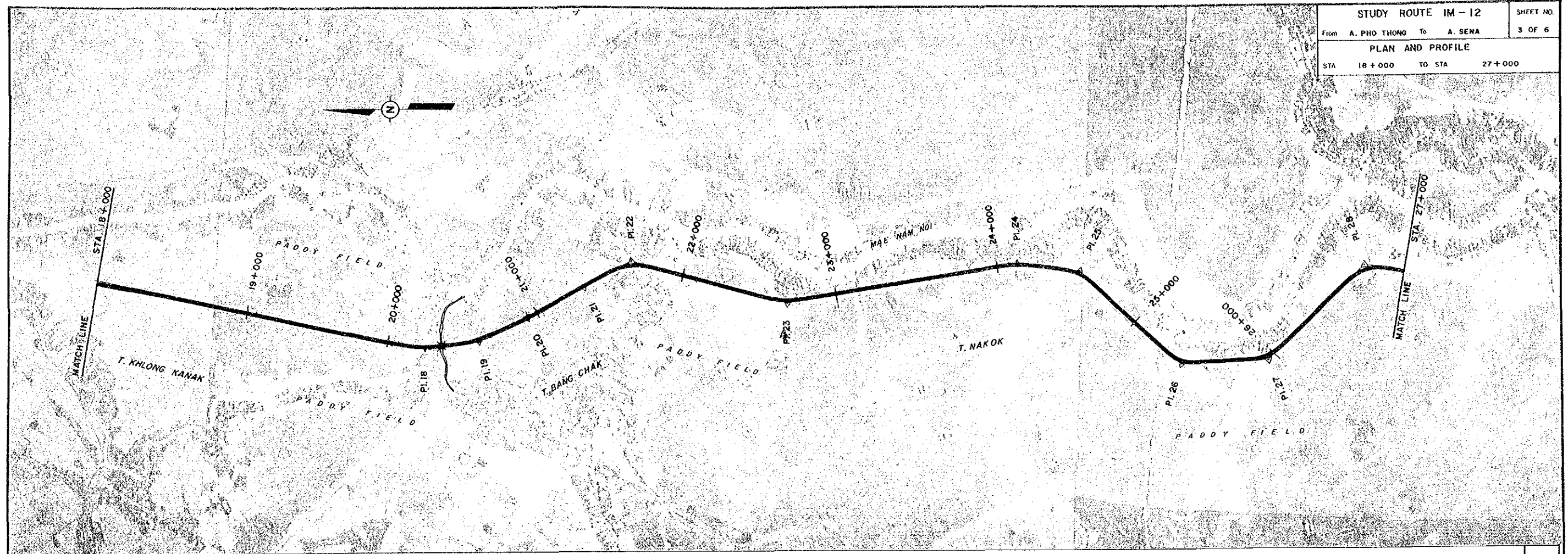
NET PRESENT VALUE : 70,074
 BENEFIT COST RATIO : 1.28
 INTERNAL RATE OF RETURN : 15.1%
 FIRST YEAR RATE OF RETURN : 12.3%

6. DRAWINGS

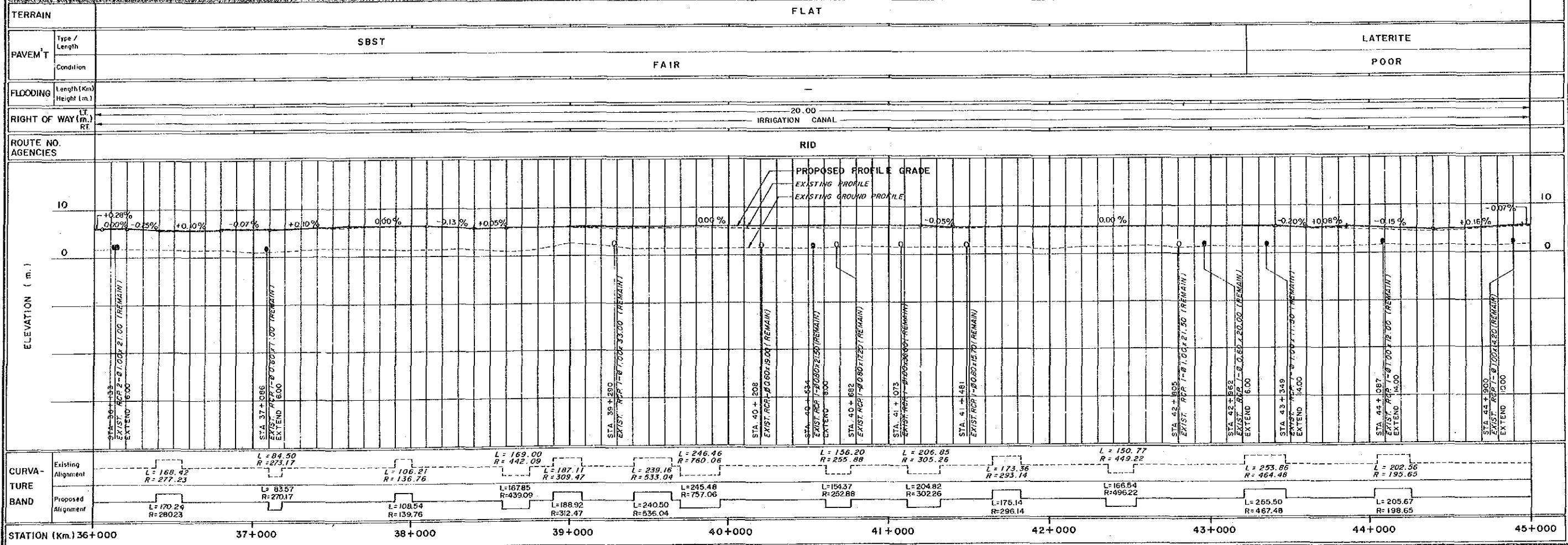
ABBREVIATIONS and SYMBOLS for PLAN and PROFILE

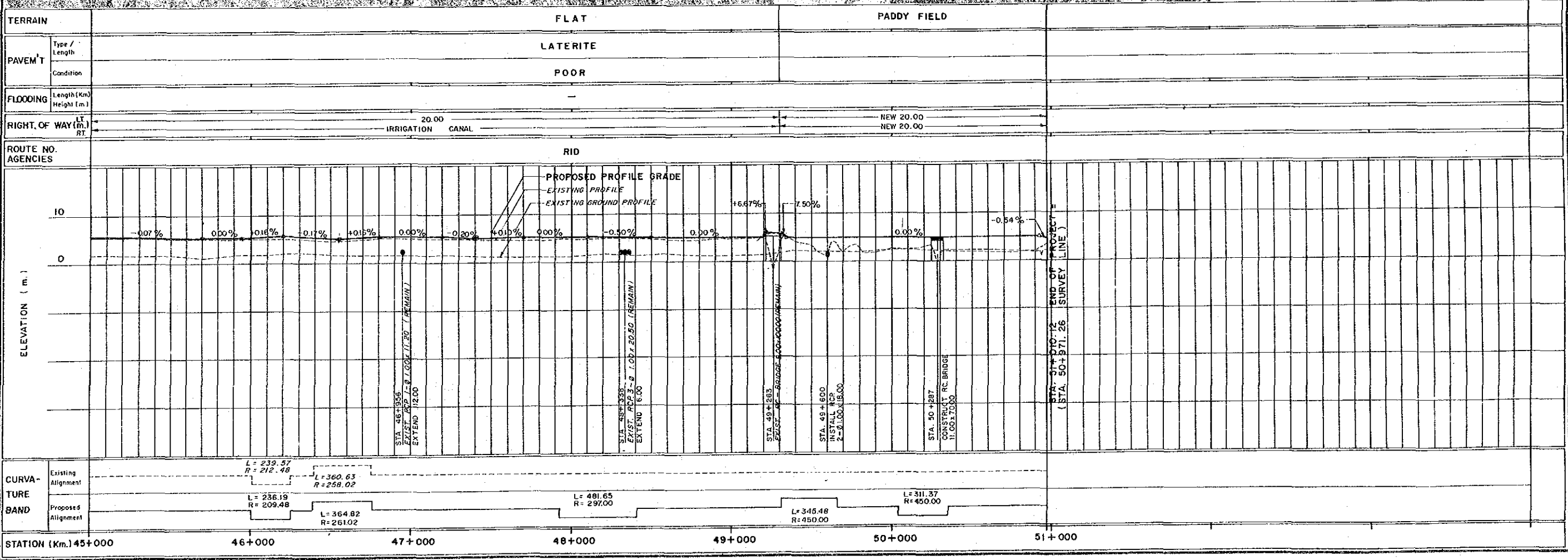
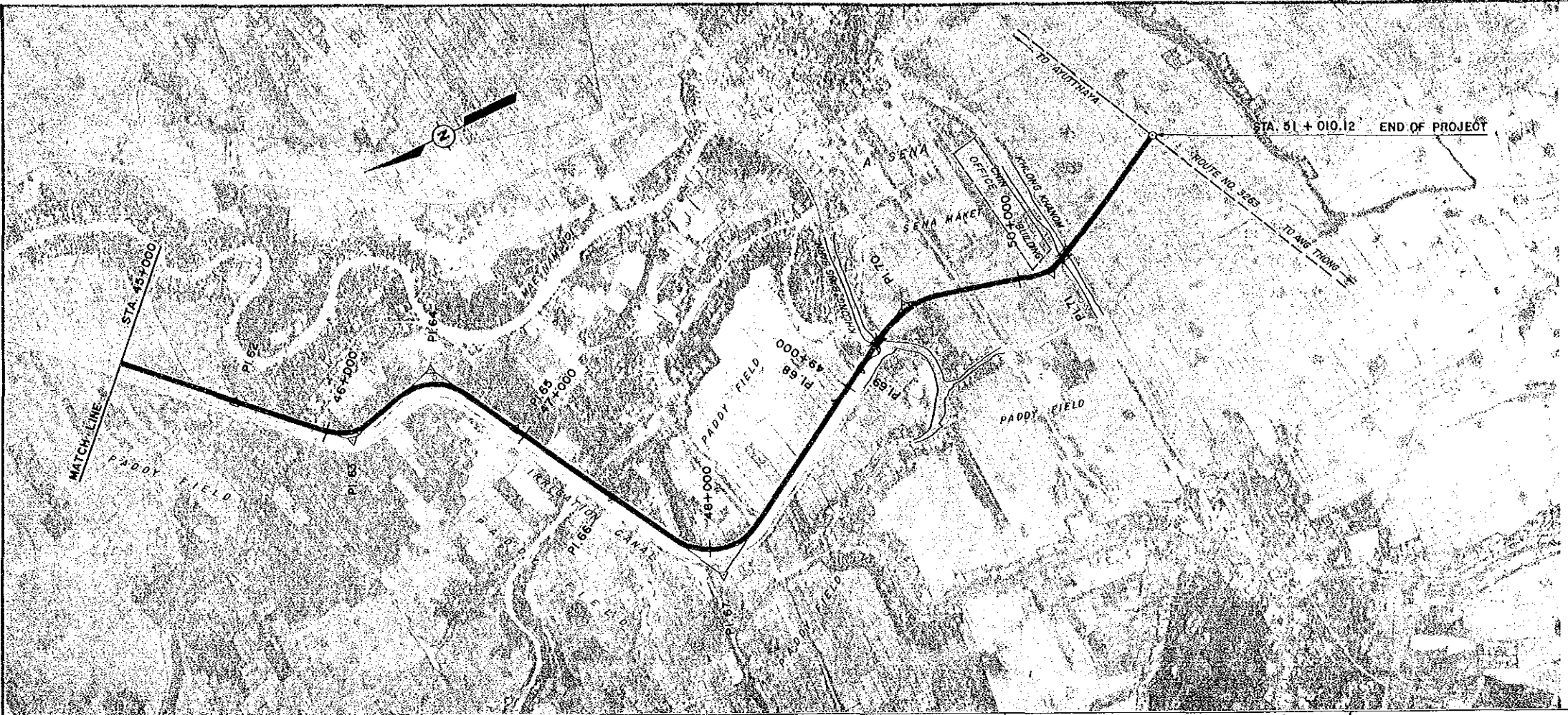
	NEW CONSTRUCTION SECTION OF STUDY ROUTE
	IMPROVEMENT SECTION OF STUDY ROUTE
	BRIDGE (PROPOSED, EXISTING)
	BOX CULVERT (PROPOSED, EXISTING)
	PIPE CULVERT (PROPOSED, EXISTING)
	HIGH WATER LEVEL
HWY	HIGHWAY
PI	POINT OF HORIZONTAL INTERSECTION
NO. or #	NUMBER
Δ	DEFLECTION ANGLE
R	RADIUS OF CURVATURE
T	TANGENT LENGTH
L	LENGTH OF CURVE
RT	RIGHT
LT	LEFT
EXIST.	EXISTING
EXTD.	EXTEND
RC-P-n- $\phi a \times l$	PIPE CULVERT, n (ROW), ϕa (DIAMETER, m), l (LENGTH, m)
RC-B-n-a \times b \times l	BOX CULVERT, n (NO. OF CELLS), a \times b \times l (CLEAR SPAN \times DEPTH \times LENGTH, m)
BR-T-a \times l - n	TIMBER BRIDGE, a \times l (WIDTH \times LENGTH, m), n (NO. OF SPANS)
BR-RC-a \times l - n	CONCRETE BRIDGE, a \times l (ROADWAY WIDTH \times LENGTH, m) n (NO. OF SPANS)

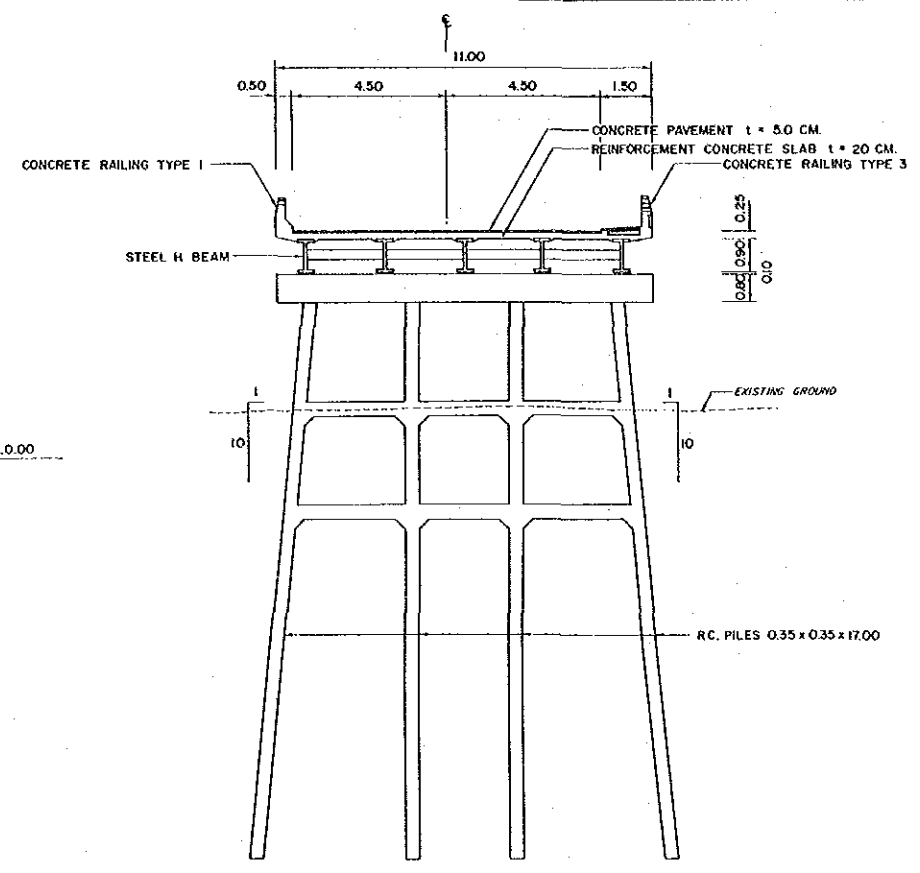
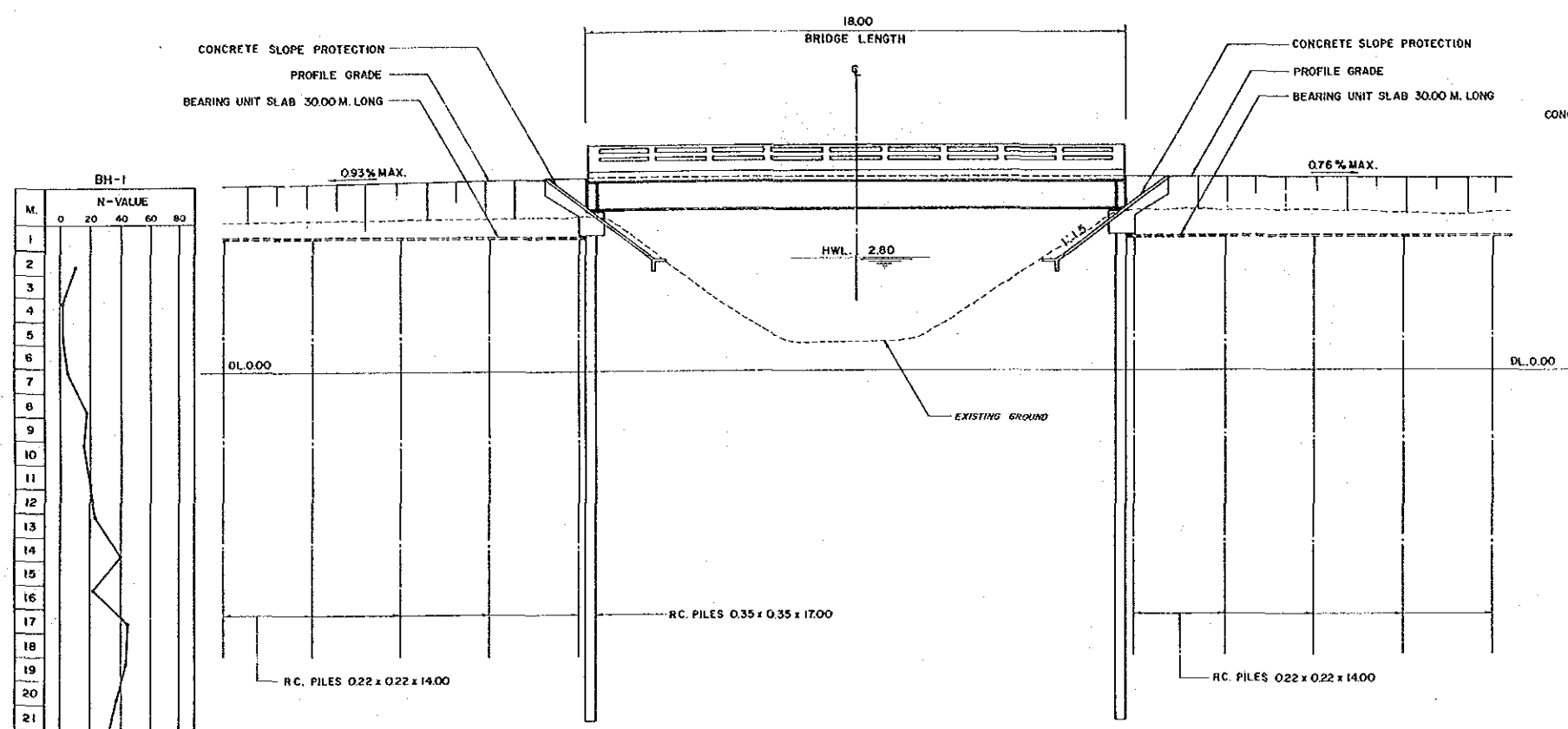




TERRAIN		FLAT	
PAVEM'T	Type / Length	SBST	
	Condition	VERY POOR	FAIR
FLOODING	Length (km) Height (m.)	-	
RIGHT OF WAY (m.)	RT	20.00	20.00
ROUTE NO. AGENCIES		RID	
CURVA-TURE BAND	Existing Alignment	<p>PROPOSED PROFILE GRADE</p> <p>EXISTING PROFILE</p> <p>EXISTING GROUND PROFILE</p>	
	Proposed Alignment	<p>0.00% -0.10% 0.00% +0.05% 0.00% -0.13% +0.40% 0.00% 0.00% -0.04% +0.5% -0.5% 0.00% -0.07% 0.00% -0.05% 0.00% -0.13% +0.5% 0.00% -0.09% +0.20% 0.00% -0.10% 0.00%</p>	
STATION (Km.)	18+000	19+000	20+000
	21+000	22+000	23+000
	24+000	25+000	26+000
	27+000		

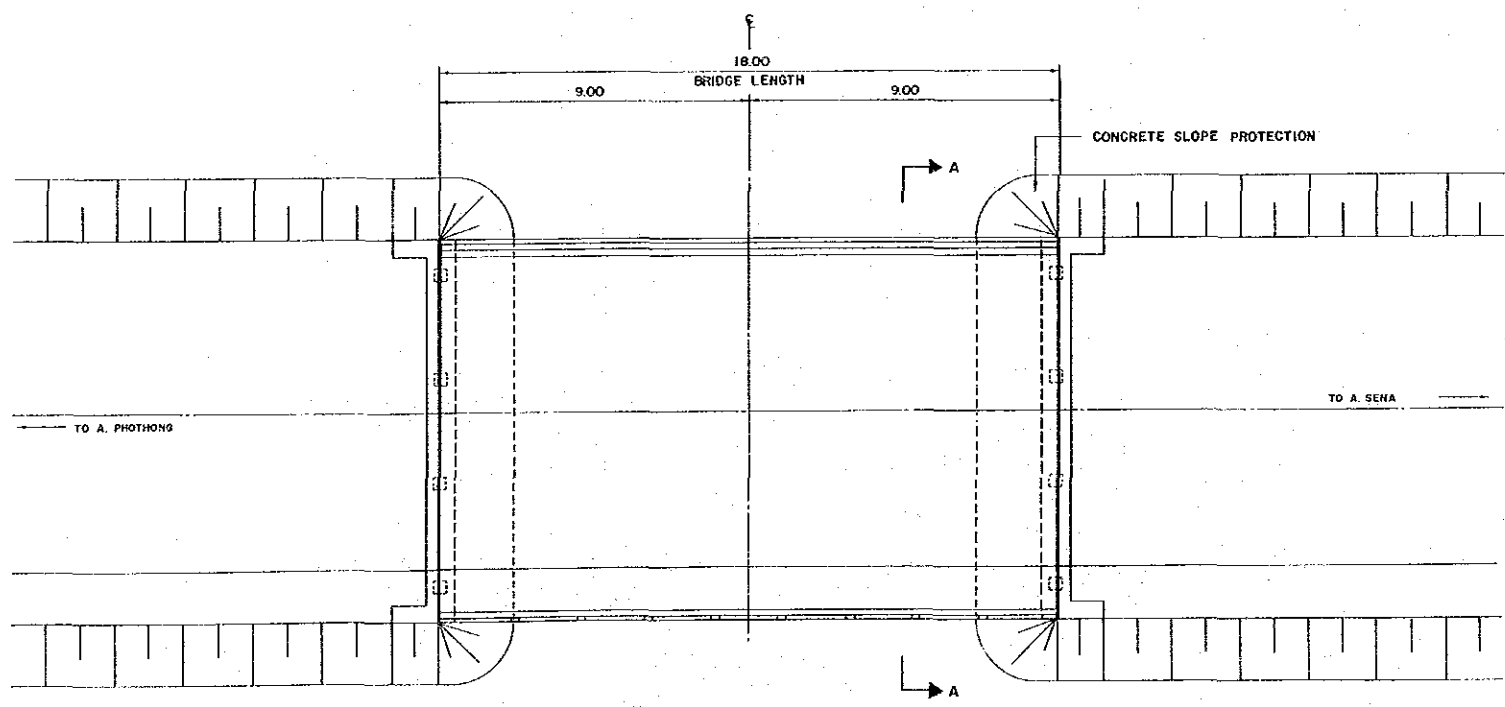




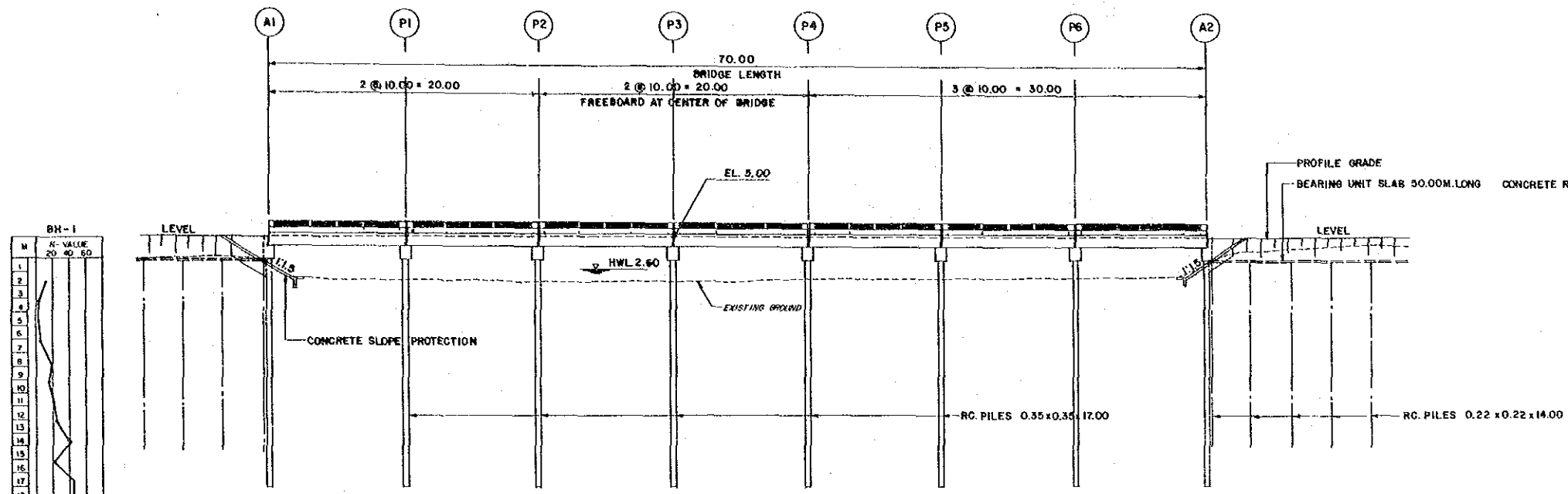


BH-1

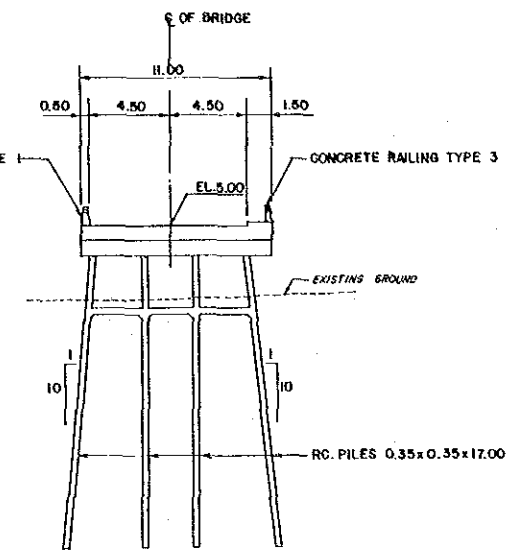
M.	N-VALUE			
0	20	40	60	80
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				



ITEM	UNIT	QUANTITY
1. CONCRETE		
CLASS B(1 1/2) FOR BRIDGE DECK	M ³	48
CLASS B(1 1/2) FOR PILE BENT ABUTMENT	M ³	48
CLASS SPECIAL B(1 1/2) FOR BEARING UNIT SLAB	M ³	-
2. STEEL GIRDER	T	38
3. STEEL REINFORCEMENT	T	23
4. RC. PILE 0.22 x 0.22 M.	LM	1,232
RC. PILE 0.35 x 0.35 M.	LM	180
5. CONCRETE RAILING TYPE 1	LM	18
CONCRETE RAILING TYPE 3	LM	18
6. CONCRETE SLOPE PROTECTION	M ²	103



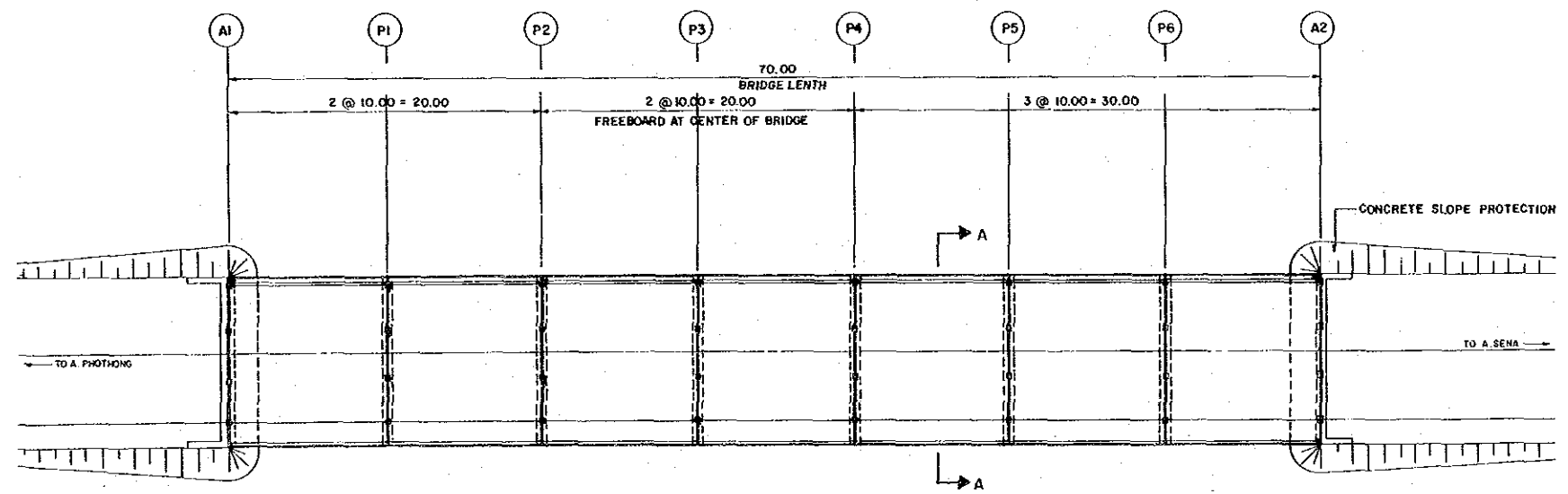
GENERAL ELEVATION
 SCALE 1 : 200



SECTION A-A
 SCALE 1 : 200

BH-1

M	K-VALUE
1	20
2	40
3	60
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	



GENERAL PLAN
 SCALE 1 : 200

ITEM	UNIT	QUANTITY
1. CONCRETE		
CLASS B (1/2) FOR BRIDGE DECK	M ³	440
CLASS B (1/2) FOR PILE BENT	M ³	139
PIER & ABUTMENT	M ³	139
CLASS SPECIAL B (1/2) FOR BEARING UNIT SLAB	M ³	198
2. STEEL REINFORCEMENT	T	139
3. RC. PILE 0.22 x 0.22 M.	LM	1,232
4. RC. PILE 0.35 x 0.35 M	LM	743
5. CONCRETE RAILING TYPE 1	LM	70
TYPE 3	LM	70
6. CONCRETE SLOPE PROTECTION	M ²	120

PROJECT IM - 13

Changwat : Ayutthaya

A. Bang Pa-In - C. Ayutthaya

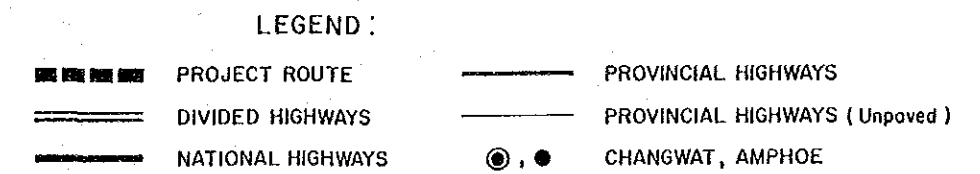
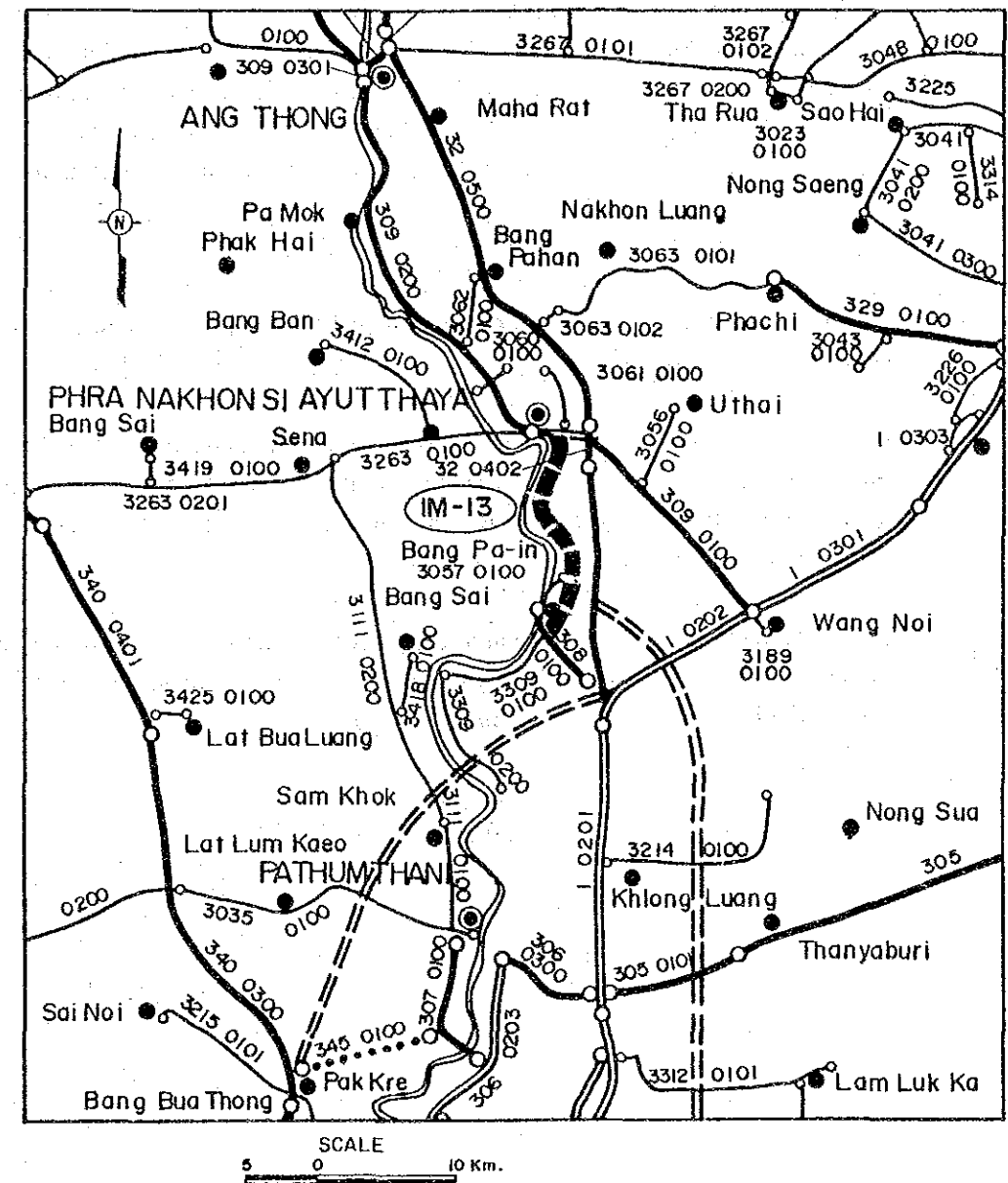
Length : 17.8 km

SUMMARY

PROJECT IM-13

ITEM	DESCRIPTION
Changwat	Ayutthaya
Origin	A. Bang Pa-In (J.R. 308)
Destination	C. Ayutthaya (J.R. 309)
Route No.	Rt. 3059
Project Length	17.80 km
Standard	
- Existing	—
- Proposed	F2
Traffic	
- Base	340
- 2000	1,500
- 2008	2,100
Pavement Type	
- Existing	Laterite
- Proposed	AC pavement (t=10)
Bridges	
- New Construction	—
- Replacement	—
Construction Costs	
- Financial	81,048,000 Baht
- Economic	71,884,000 Baht
Economic Evaluation	
- IRR	21.7%
- B/C	1.93

LOCATION OF PROJECT ROUTE



1. GENERAL

The proposed route lies in Changwat Ayutthaya. It originates at the junction with Route 308 in Amphoe Bang Pa-In, runs northward paralleling the Chao Phya River and ends at the junction with Route 309 in Muang Ayutthaya. Its total length is 17.8 km.

The road was under the jurisdiction of PWD but was transferred to DOH this year. The last 1 km section is applied with SBST. The terrain is flat. There are nine permanent bridges along the road. Both sides of the first 2 km section, which runs along the eastern edge of Bang Pa-In town, are paddy fields. The eastern side of the remaining section is well cultivated by paddy for the entire length, but the western side faces the river. The current use of the existing road appears to be to serve residents in the area along the road.

The surface condition of the existing road is fair at present.

Horizontal alignment of the existing road is poor, and the alignment improvement of 22 sharp curves was planned.

It is necessary to raise the pavement height, since the existing road surface is at about the same height as the H.W.L. from the origin to STA 15+000. From STA 15+000 to the end point, however, the existing road surface is sufficiently high, and only widening and overlay are required.

Upon completion of the improvement, however, the first 2 km section could play a role as a bypass to the town of Bang Pa-In, and the remaining section could be used for tourist traffic visiting Ayutthaya and Bang Pa-In.

2. TRAFFIC FORECAST

Base Traffic Volume

(Unit: Vehicles/Day)

Traffic Volume										
Project Code	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-13	PWD	1988	253	33	83	67	120	10	27	340

Traffic Growth Rate

(Unit: Percent)

Project	Section	Period	MC	PC	LB	HB	LT	MT	HT
IM-13	PWD	-1993	5.96	6.15	6.53	5.30	5.62	6.85	6.36
		1994 -2000	5.39	5.65	6.31	5.30	4.80	5.17	4.62
		2000 -2008	4.93	5.56	4.50	4.55	4.63	4.68	3.73

Diverted Traffic Volume

(Unit: Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-13	PWD	1994	0	97	53	196	179	13	13	551
		2000	0	135	76	267	237	18	17	750
		2008	0	208	108	381	341	26	23	1087

Induced Traffic Volume

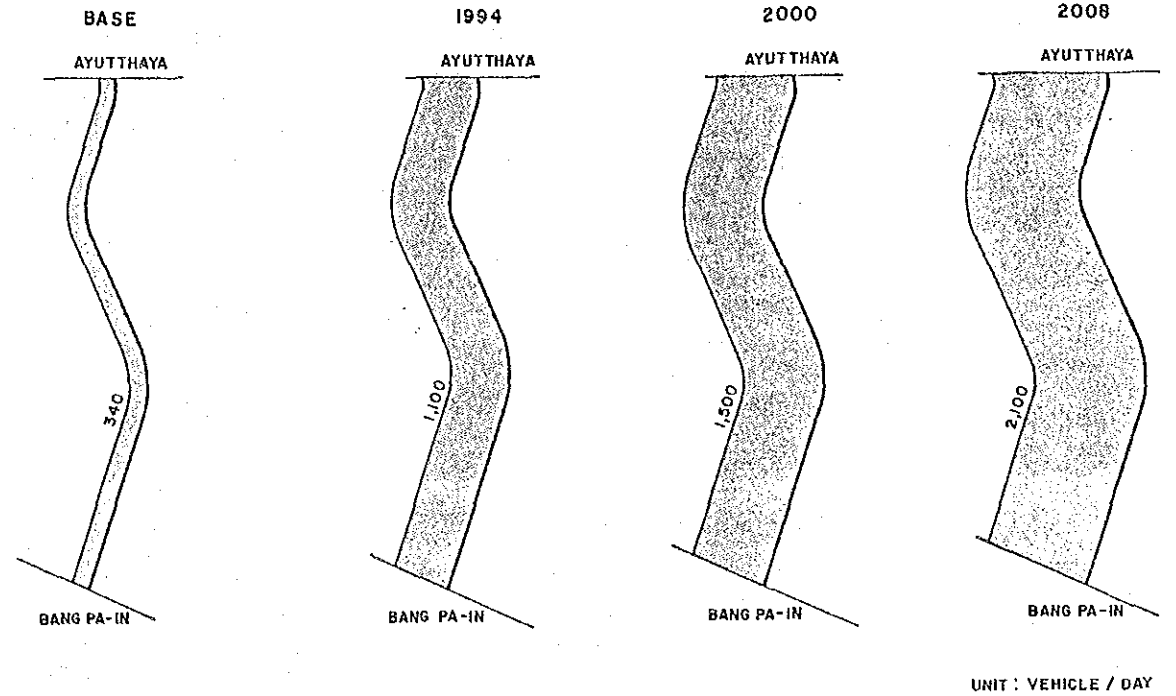
(Unit: Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-13	PWD	1994	32	5	14	6	18			43
		2000	44	7	20	8	24			59
		2008	65	11	28	12	34			85

Future Traffic Volume

(Unit: Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-13	PWD	1994	388	149	187	294	362	28	51	1071
		2000	532	207	270	400	480	38	67	1462
		2008	782	319	384	571	690	54	90	2108



PROJECT IM-13

UNIT: VEHICLE / DAY

3. ENGINEERING

3.1 Materials and Boring Results

(1) Materials

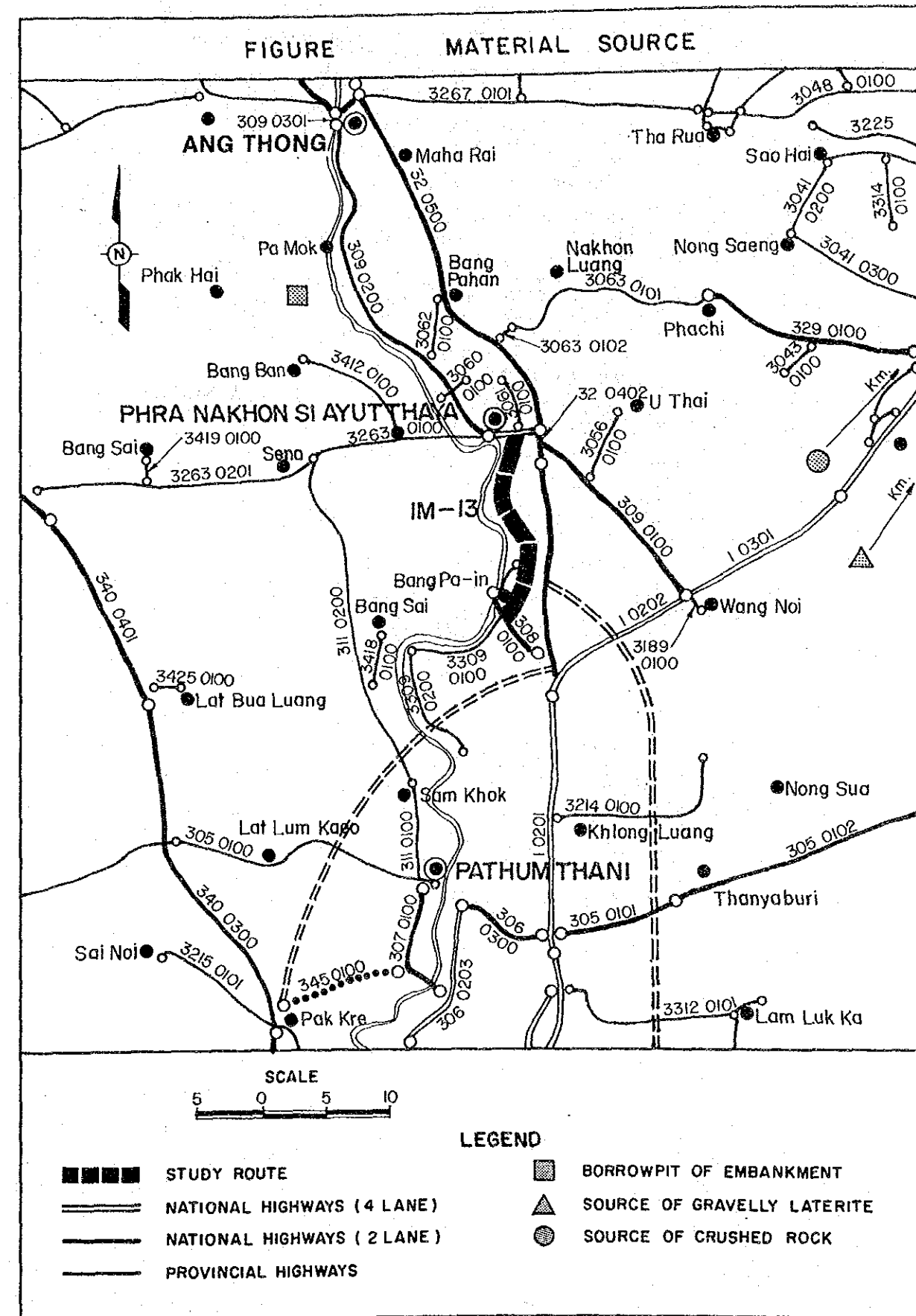
DESCRIPTION OF MATERIAL SOURCES

Material	Source	Description of Sample	Estimated Quantity cu.m.	Hauling Distance (km)
Soil	Route 3111 Km 31+000 Left Side 0.3 Km	Fine Sand	Plentiful	29
Laterite	Route 3024 Km 18+700 Right Side 3.4 Km	Gravelly Laterite	60,000	52
Crushed Rock	Route 1 Km 134+000 Both Sides	Lime Stone	Plentiful	57

RESULTS OF LABORATORY TESTS

	Sieve Analysis % Passing								Plasticity		Comp. DM-T Stand.		Lab. C.B.R.	
	50.0	25.0	19.0	9.5	#4	#10	#40	#200	LL	PI	Opt. 95%	gn/cc	CBR 95%	Swell %
Soil					100	95	66	9	-	HP	13.8	1.70	23.2	0
Laterite	100	97	90	62	39	27	17	8	29.8	9.6	7.8	2.02	51.0	-
Crushed Rock													>80	

Note : Abrasion test result of Crushed Rock 22.6 %



3.2 Preliminary Design

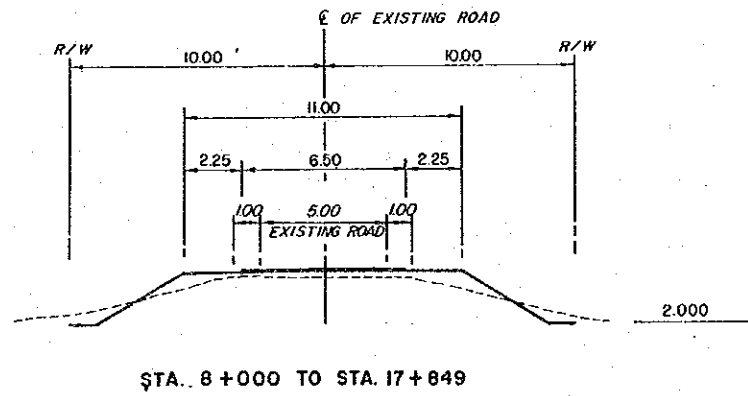
(1) Geometric Design Criteria

Design Standard : F-2

Design Speed : 70-90 km/h

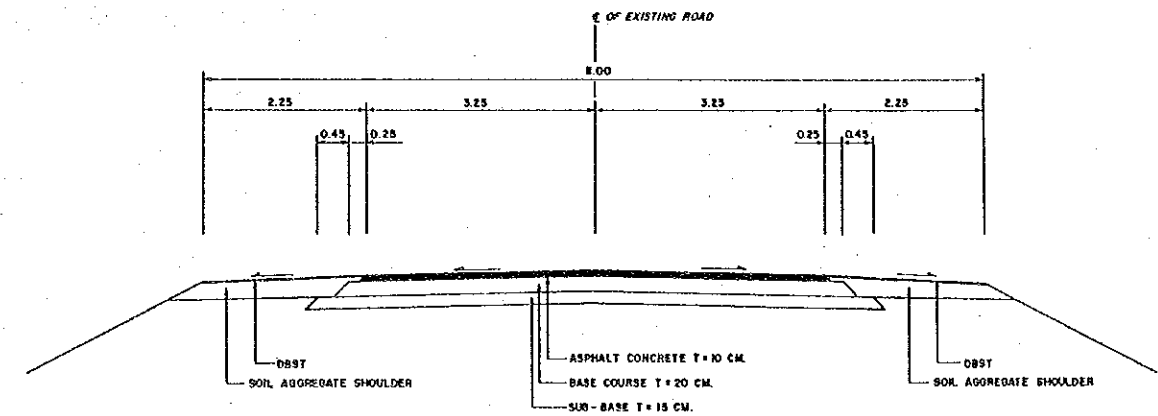
Geometric Design Criteria

Description	Design Speed (km/h)		
	70	80	90
Minimum Radius & Curvature (m)	160	210	280
Minimum Stopping Sight Distance (m)	90	115	140
Maximum Gradient (%)	7	6	5



(2) Pavement Design

Design CBR of Subgrade	Cumulative No. of ESA W18 x 10 (10 years)	Thickness of Pavement Structure (cm)	
4.0	630	Surface	10
		Base	20
		Subbase	15



(3) Culverts

NO.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
1	1+074	RCP 1-Dia 1.00x22.50	REMAIN
2	1+462	RCP 1-Dia 1.00x22.65	REMAIN
3	1+929	RCP 1-Dia 1.00x20.60	REMAIN
4	2+901	RCP 1-Dia 1.00x16.00	REMAIN
5	4+478	RCP 1-Dia 1.00x16.50	REMAIN
6	8+021	RCP 1-Dia 1.00x15.30	EXTEND 1-Dia 1.00x 2.00
7	9+800	RCP 1-Dia 1.00x14.50	EXTEND 1-Dia 1.00x 2.00
8	17+105	BOX 2-3.00x3.00x10.00	EXTEND 2-3.00x3.00x1.00
9	17+529	BOX 2-3.00x3.00x 8.00	EXTEND 2-3.00x3.00x3.00

(4) Bridges

NO	CHAINAGE	EXISTING BRIDGE	PROPOSED BRIDGE
1	0+615	7x30 SLAB TYPE	REMAIN
2	0+902	7x34 SLAB TYPE	REMAIN
3	1+733	7x25 SLAB TYPE	REMAIN
4	2+805	7x36 SLAB TYPE	REMAIN
5	4+850	7x10 SLAB TYPE	REMAIN
6	6+172	7x56 SLAB TYPE	REMAIN
7	15+219	8x18 SLAB TYPE	REMAIN
8	16+142	8x30 SLAB TYPE	REMAIN
9	16+446	8x30 SLAB TYPE	REMAIN

3.3 Quantities and Construction and Road Maintenance Costs

(1) CONSTRUCTION QUANTITIES AND COSTS

(Project IM-13 Length = 17.8 km)

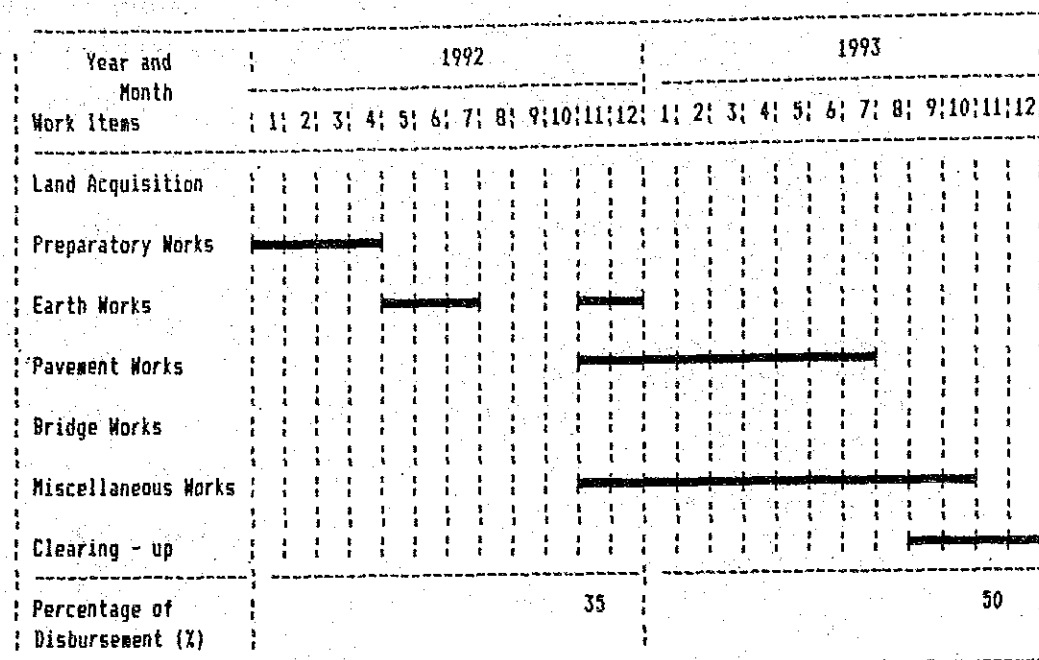
Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost		Residual Value		
					%	1000 Baht	%	1000 Baht	
EARTHWORK									
Clearing & Grubbing	ha	10,000	22	220	85	187	90	168	
Roadway Excavation (Unclassified)	m ³	18	19,700	355	84	298	90	268	
Roadway Excavation (Classified Unsuitable Material below Grade)	m ³	38	-	-	84	-	90	-	
Embankment (Common)	m ³	33	-	-	86	-	90	-	
Embankment (Borrow)	m ³	123	139,500	17,159	86	14,757	90	13,281	
Removal of Existing Structure	each	60,000	-	-	84	-	90	-	
Sub Total				17,734		15,242		13,717	
SUBBASE and BASE COURSES									
Subbase	m ³	209	11,500	2,404	83	1,995	50	998	
Aggregate base	m ³	335	27,100	9,079	84	7,626	50	3,813	
Shoulder (Soil Aggregate)	m ³	243	13,100	3,183	83	2,642	50	1,321	
Sub Total				14,666		12,263		6,132	
SURFACE COURSES									
Asphaltic Prime Coat	m ²	11	132,200	1,454	93	1,352	50	676	
Asphaltic Tack Coat	m ²	5	114,300	572	93	532	50	266	
Double Bituminous Surface Treatment	m ²	33	79,100	2,610	91	2,375	50	1,188	
Asphalt Concrete Surfacing	ton	920	27,000	24,840	90	22,356	50	11,178	
Portland Cement Concrete Pavement	m ³	1,653	-	-	90	-	50	-	
Sub Total				29,476		26,615		13,308	
STRUCTURES (Equivalent)									
RC Pipe Culvert (D=1.00 m)	m	1,800	20	36	88	32	50	16	
RC Box Culvert (2-2.40x 2.40 m)	m	10,000	7	70	90	63	50	32	
RC Bridge (W=11.0 m)	m	66,000	-	-	87	-	50	-	
PC Bridge (W=11.0 m)	m	96,000	-	-	87	-	50	-	
Bearing Unit	m ²	1,600	-	-	87	-	50	-	
Sub Total				106		95		48	
Total (a)				61,982		54,215		33,205	
Miscellaneous Work ((a) x 7%)				1s	4,339	87	3,775	0	0
CONTRACT AMOUNT (b)				66,321		57,990		33,205	
PHYSICAL CONTINGENCIES ((b) x 10%) (c)				1s	6,632		5,799		3,321
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)				1s	7,295	100	7,295	0	0
LAND ACQUISITION									
Developed Land	ha	200,000	4	800					
Less Developed Land	ha	-	-	-					
Total (e)				800	100	800	100	800	
PROJECT COST ((b) + (c) + (d) + (e))				81,048		71,884		37,326	
AVERAGE COST PER KM				4,553					

(2) Road Maintenance Costs

(Unit : Baht/Year)

	Without Project	With Project
1994	197,105	170,660
2004	197,105	281,559

3.4 Construction Schedule



4. BENEFITS

ROAD CONDITIONS

(unit : km)

		Without Project						With Project							
		Paved			Laterite			No. of		No. of		No. of		No. of	
Section	Road Length	Good	Fair	Poor	Good	Fair	Poor	Narrow Bridge	Wooden Bridge	Road Length	Paved Good	Narrow Bridge	Wooden Bridge		
PWD	18.1	-	-	-	-	-	-	18.1	-	-	17.8	17.8	-	-	

VOC AND TIME SAVINGS

(1000 BAHT)

Year	VOC Savings			Time Savings			Total Savings		
	Normal Traffic	Induced Traffic	Total	Normal Traffic	Induced Traffic	Total	Normal Traffic	Induced Traffic	Total
1994	11,489	91	11,580	5,396	268	5,665	17,068	177	17,245
2000	15,577	129	15,706	7,388	372	7,760	23,223	243	23,466
2008	22,571	181	22,752	10,617	535	11,151	33,549	354	33,903