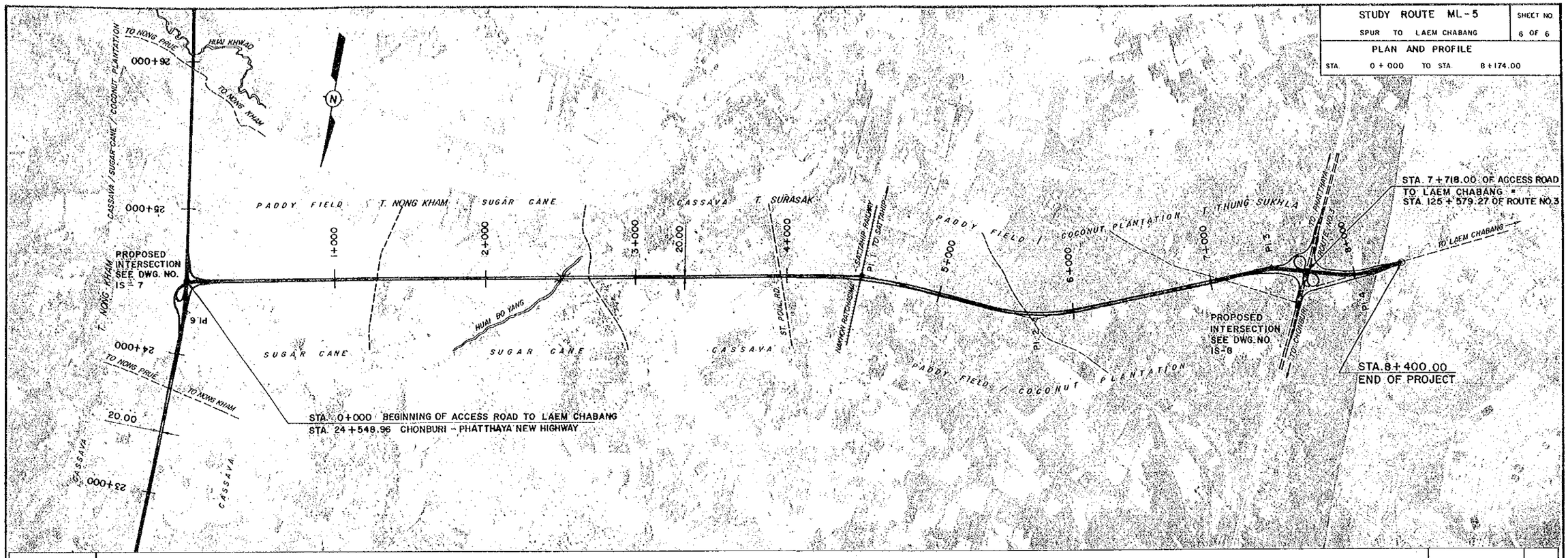
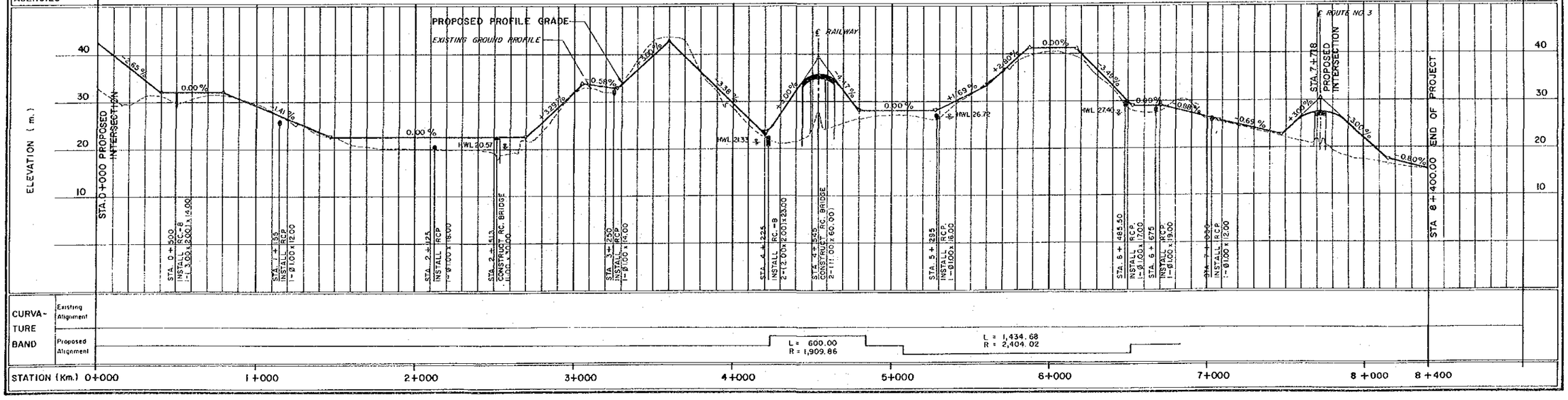
STUDY ROUTE ML-5	SHEET NO 6 OF 6
SPUR TO LAEM CHABANG	
PLAN AND PROFILE	
STA 0 + 000 TO STA 8 + 174.00	



TERRAIN		MORDERATE LT. ROLLING
PAVEMENT	Type / Length	—
	Condition	—
FLOODING	Length (Km) / Height (m)	—
RIGHT OF WAY (m.)		80.00
ROUTE NO. AGENCIES		ACCESS ROAD TO LAEM CHABANG



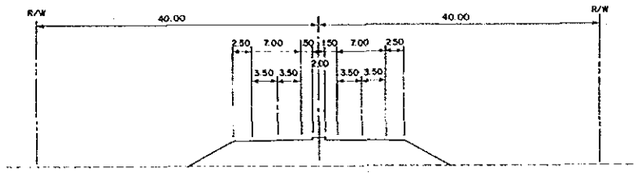
CURVATURE BAND	Existing Alignment	
	Proposed Alignment	L = 600.00 R = 1,909.86 ; L = 1,434.68 R = 2,404.02

STATION (Km.) 0+000 1+000 2+000 3+000 4+000 5+000 6+000 7+000 8+000 8+400

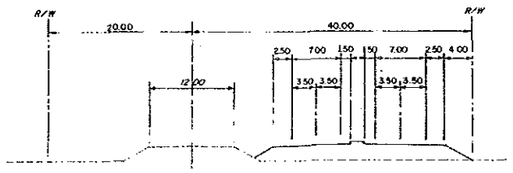
STUDY ROUTE ML-5	DWG NO
From CHONBURI BYPASS To PHATTHAYA	15-6

LAYOUT OF INTERSECTION AND PROFILE

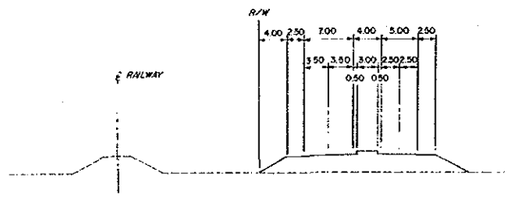
CHONBURI - PHATTHAYA NEW HIGHWAY, BEGINNING POINT



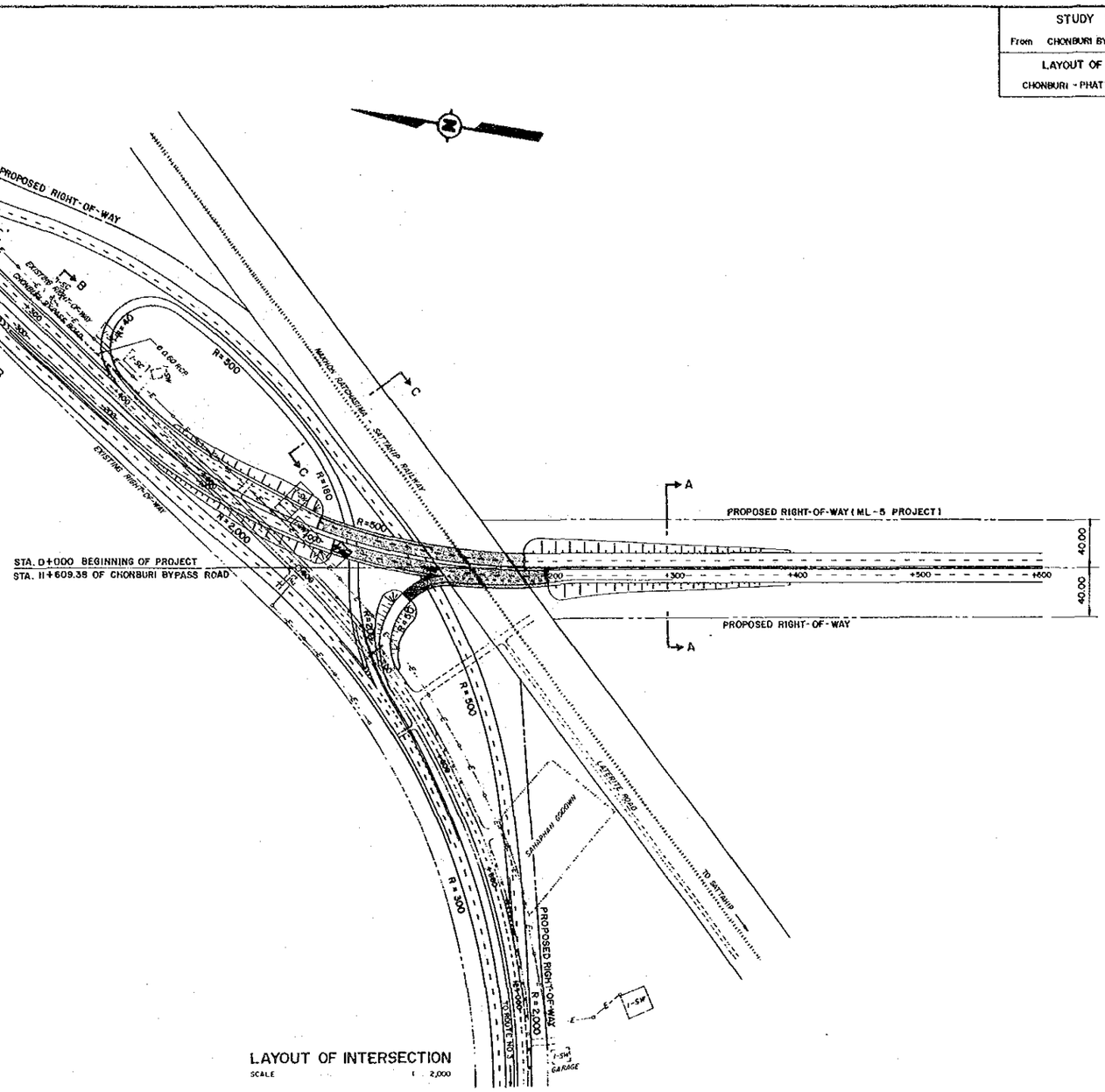
SECTION A – A



SECTION B – B

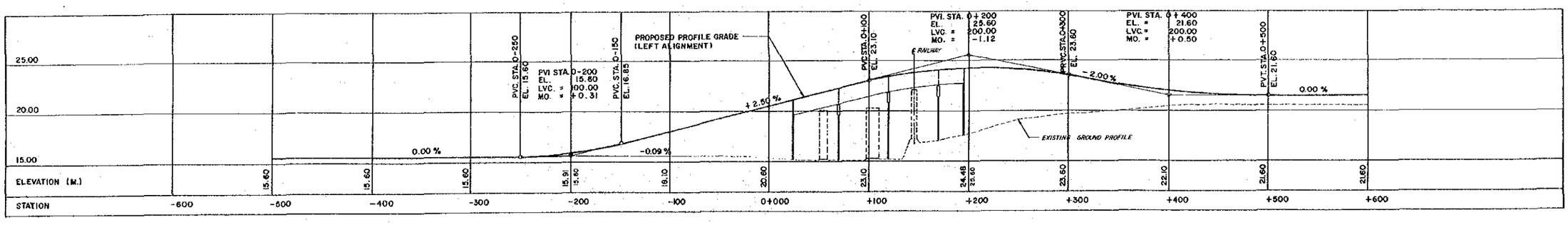


SECTION C – C



LAYOUT OF INTERSECTION

SCALE 1 : 2,000



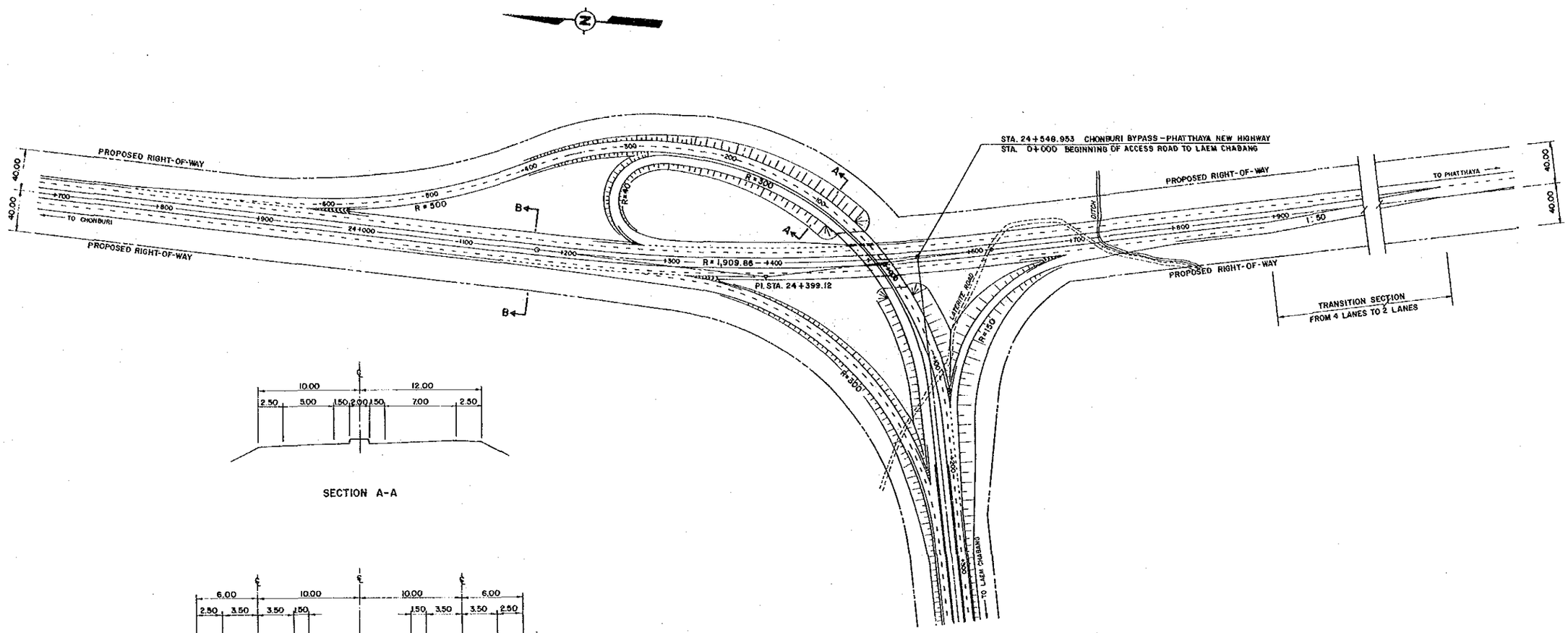
PROFILE OF MAIN RAMP

SCALES HORIZ 1 : 2,000 VERT. 1 : 200

STUDY ROUTE ML-5	DWG. NO.
From CHONBURI BYPASS To PHATTHAYA	IS-7

LAYOUT OF INTERSECTION AND PROFILE

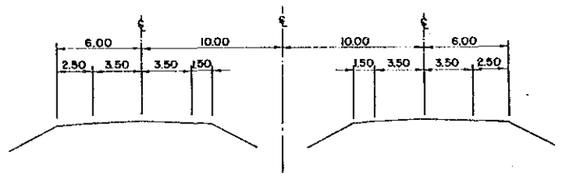
CHONBURI - PHATTHAYA NEW HIGHWAY, DIVERSION POINT



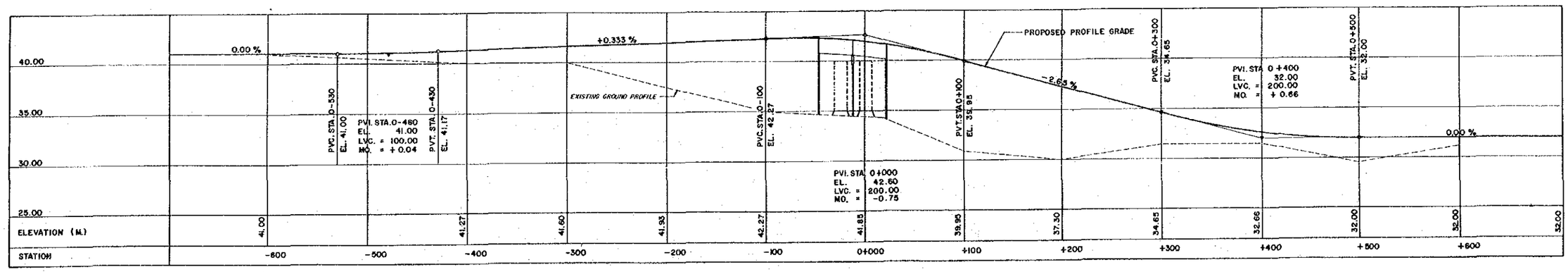
LAYOUT OF INTERSECTION

SCALE 1 : 2,000

SECTION A-A



SECTION B-B



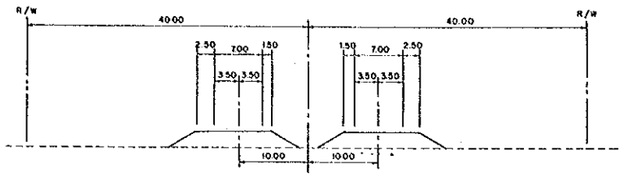
PROFILE OF MAIN RAMP

SCALES HORIZ. 1 : 2,000 VERT. 1 : 200

STUDY ROUTE ML-5	DWG. NO.
From CHONBURI BYPASS To PHATTHAYA	15-8

LAYOUT OF INTERSECTION AND PROFILE

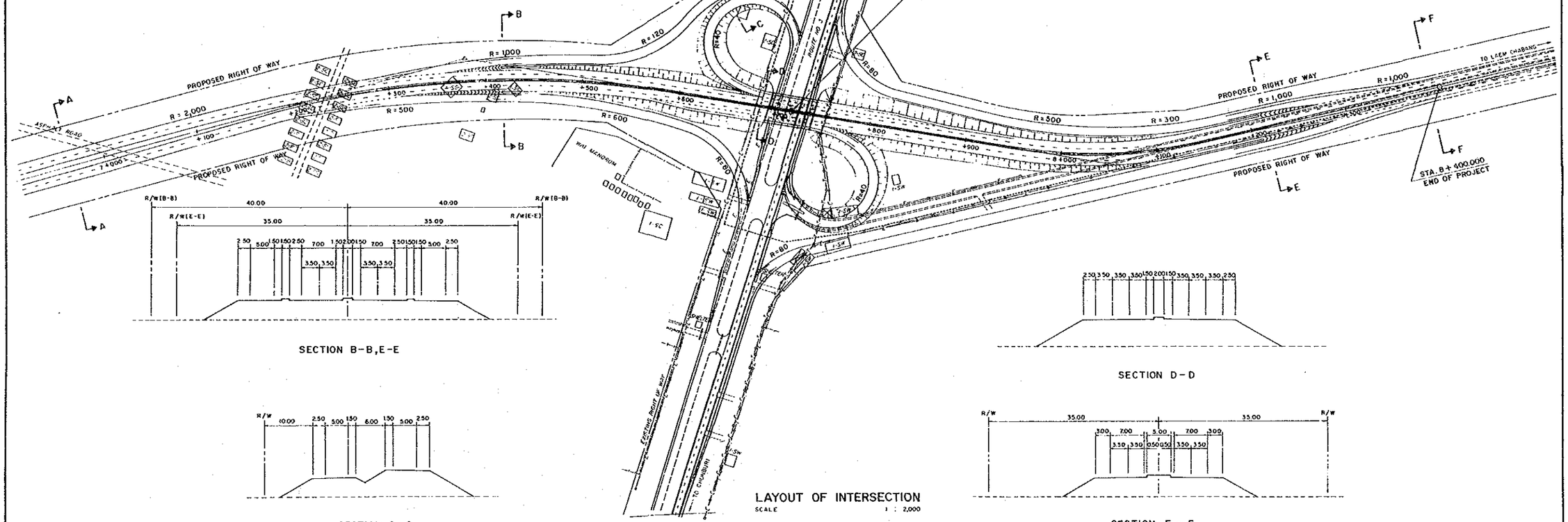
CHONBURI-PHATTHAYA NEW HIGHWAY, LAEM CHABANG



SECTION A-A

SECTION B-B,E-E

SECTION C-C

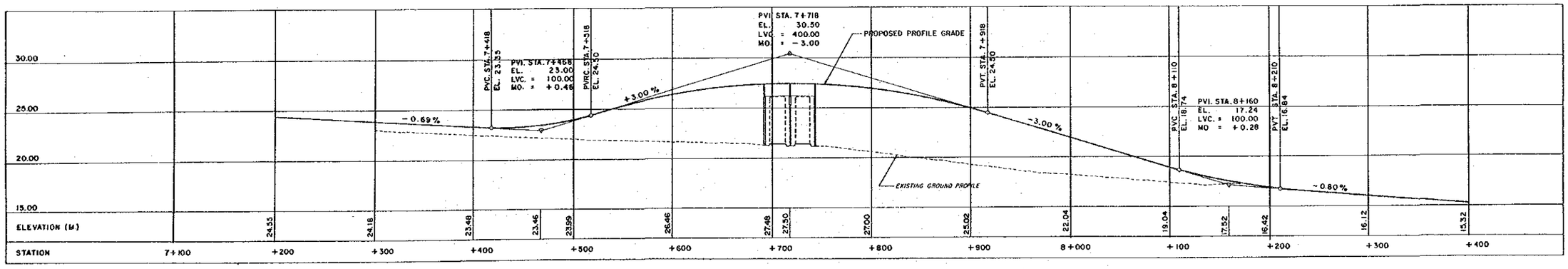


LAYOUT OF INTERSECTION

SCALE 1 : 2,000

SECTION D-D

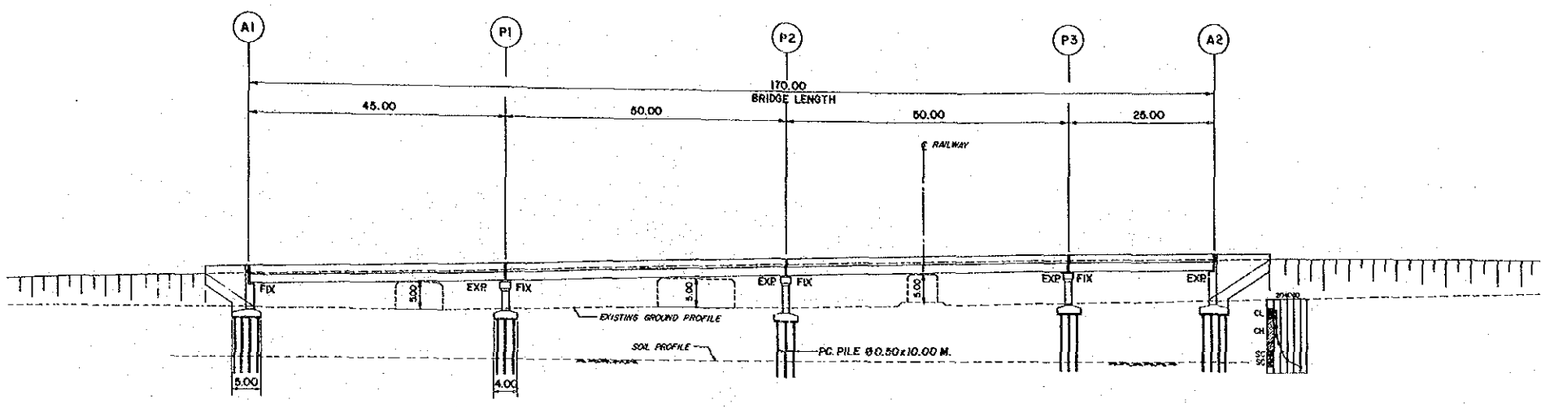
SECTION F-F



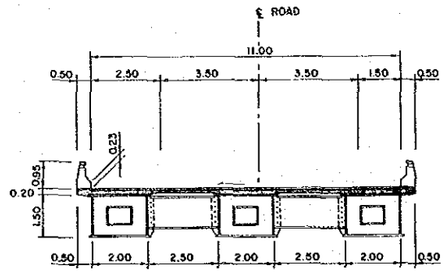
PROFILE OF MAIN RAMP

SCALES HORIZ. 1 : 2,000 VERT. 1 : 200

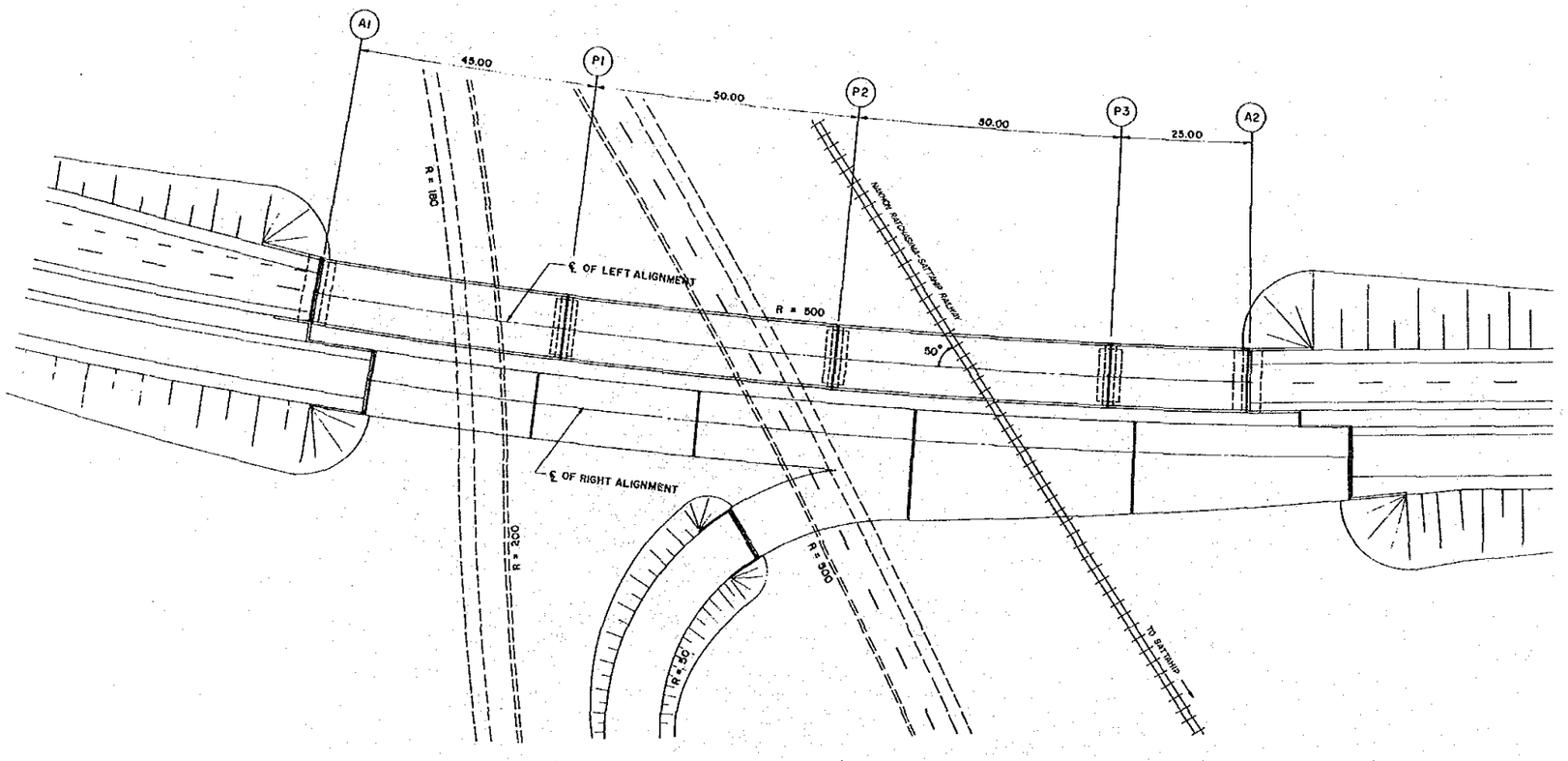
STUDY ROUTE ML-5	DWG. NO.
From CHONBURI BYPASS To PHATTHAYA	BR-6
OVERPASS BRIDGE - PLAN, ELEVATION AND SECTION	
CHONBURI - PHATTAYA NEW HIGHWAY, BEGINNING POINT	



GENERAL ELEVATION
SCALE 1 : 500

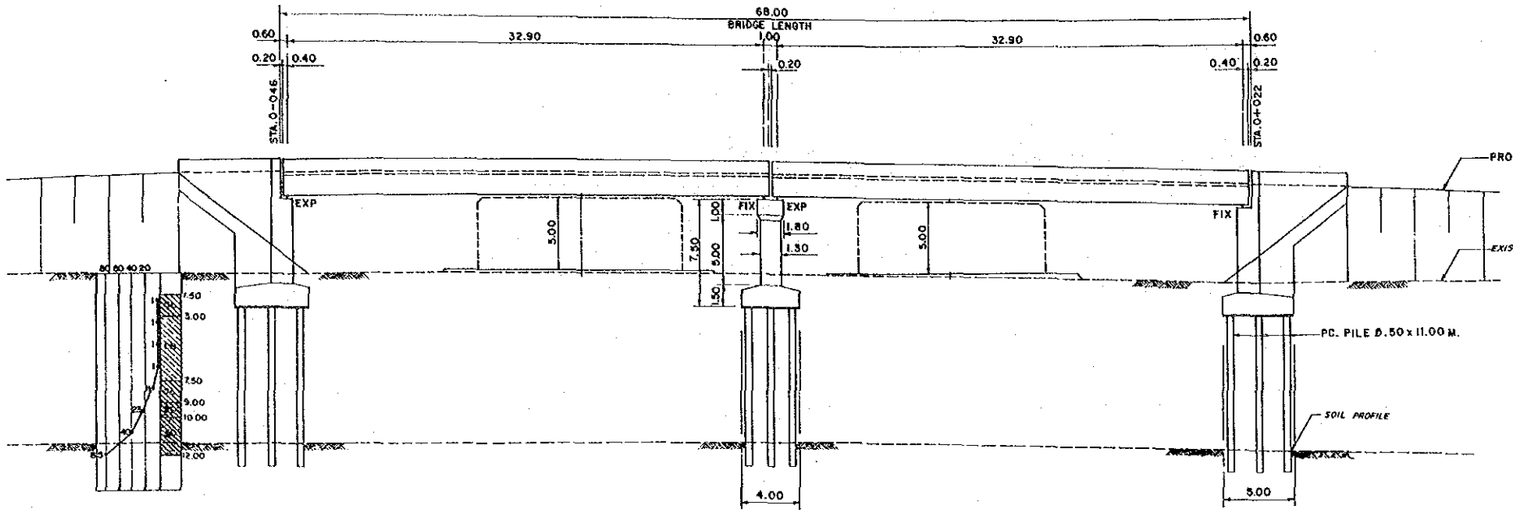


SUPERSTRUCTURE CROSS SECTION
SCALE 1 : 100

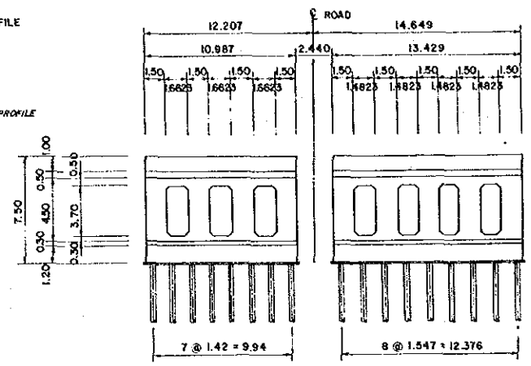


GENERAL PLAN
SCALE 1 : 500

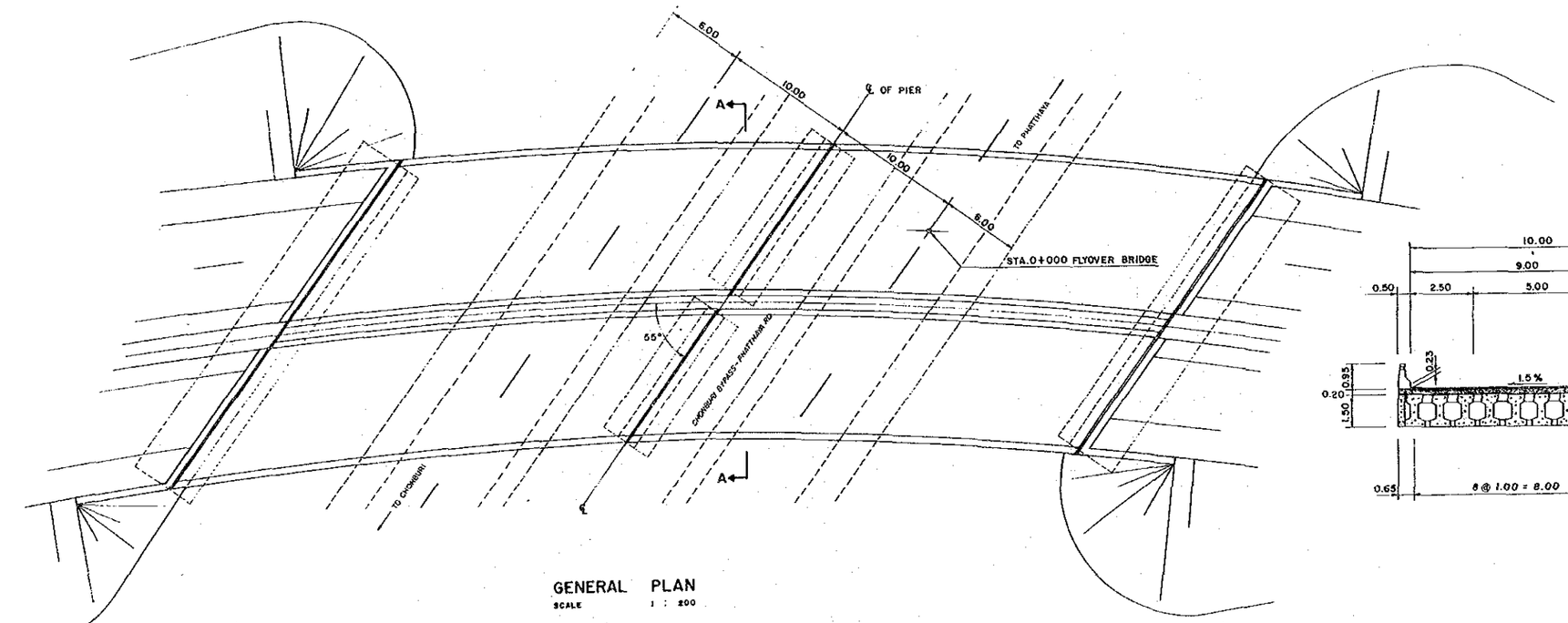
STUDY ROUTE ML-5	DWG. NO.
From CHONBURI BYPASS To PHATTHAYA	BR-7
OVERPASS BRIDGE - PLAN, ELEVATION AND SECTION	
CHONBURI - PHATTAYA NEW HIGHWAY, DIVERSION POINT	



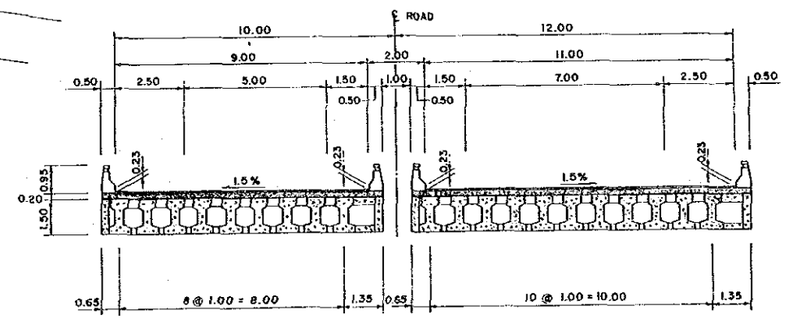
GENERAL ELEVATION
SCALE 1 : 200



PIER DETAILS
SCALE 1 : 200

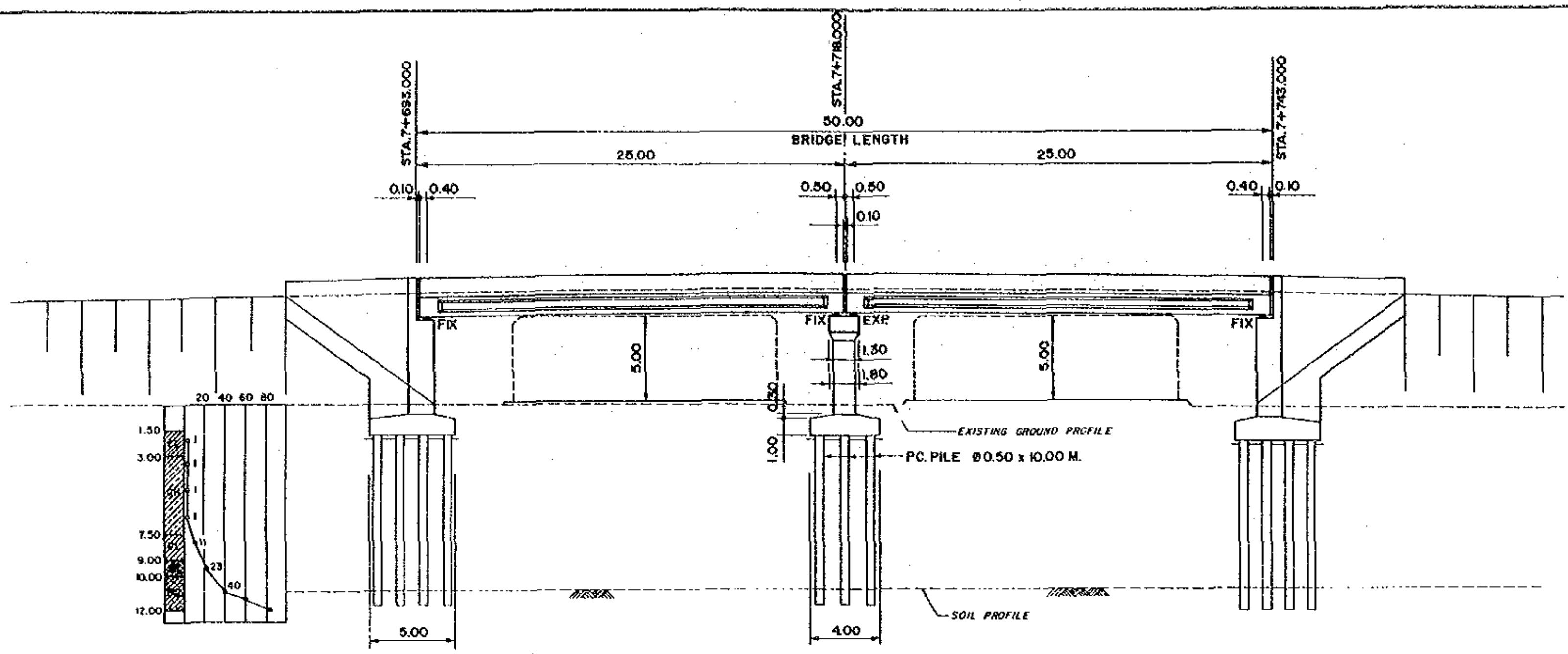


GENERAL PLAN
SCALE 1 : 200

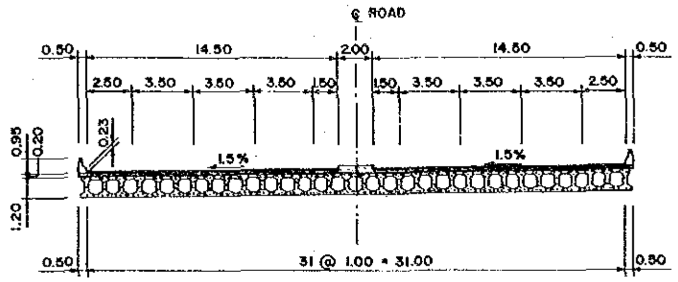


SECTION A-A
SCALE 1 : 100

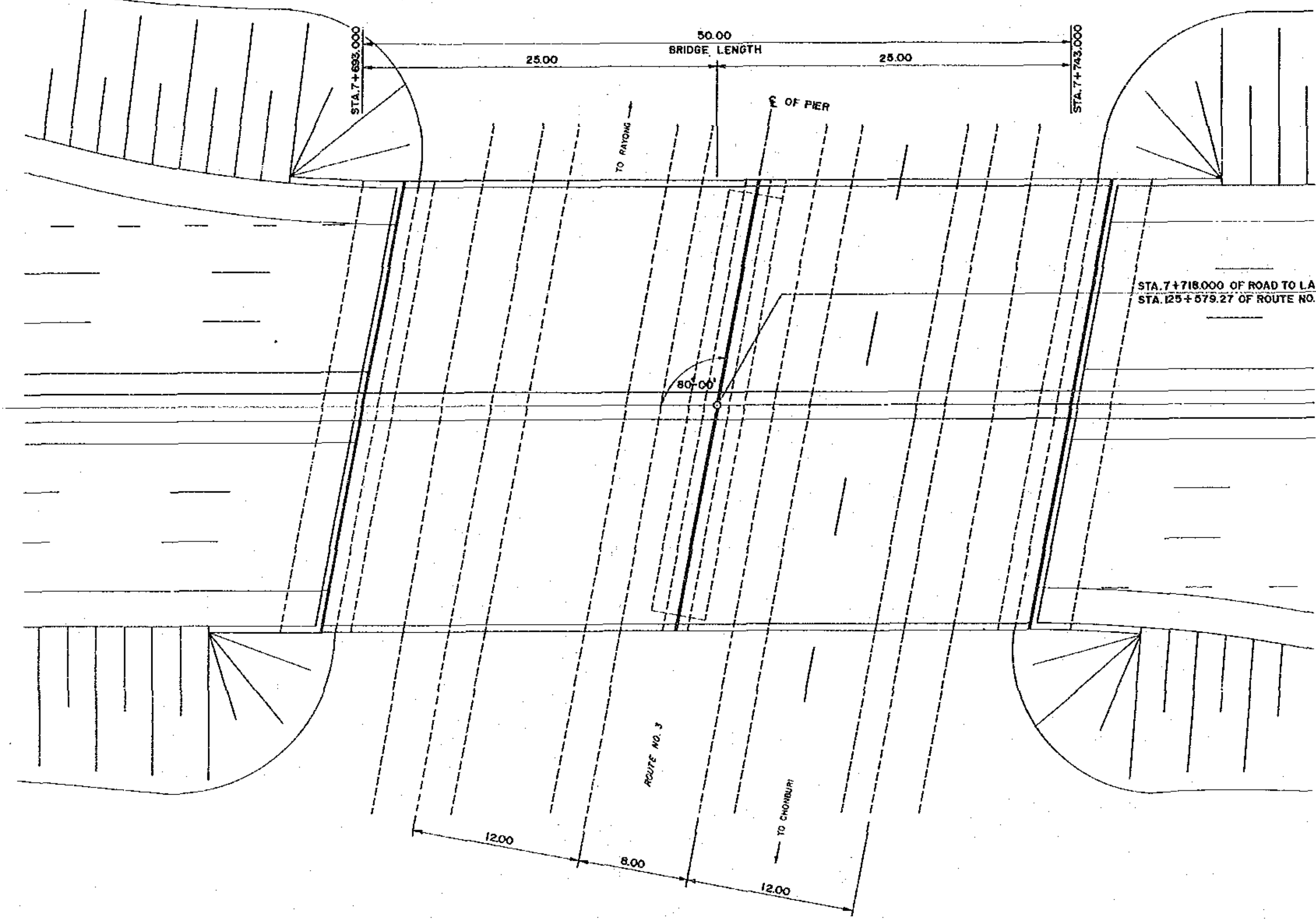
STUDY ROUTE ML-5	DWG. NO.
From CHONBURI BYPASS To PHATTHAYA	BR - 8
OVERPASS BRIDGE - PLAN, ELEVATION AND SECTION	
CHONBURI - PHATTAYA NEW HIGHWAY, LAEM CHABANG	



GENERAL ELEVATION
SCALE 1 : 200

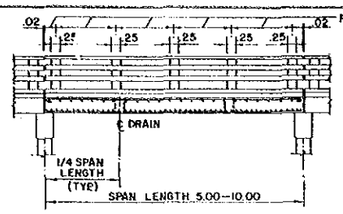


SUPERSTRUCTURE CROSS SECTION
SCALE 1 : 200

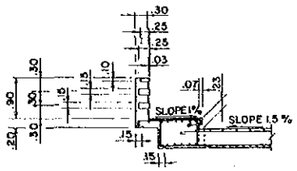


GENERAL PLAN
SCALE 1 : 200

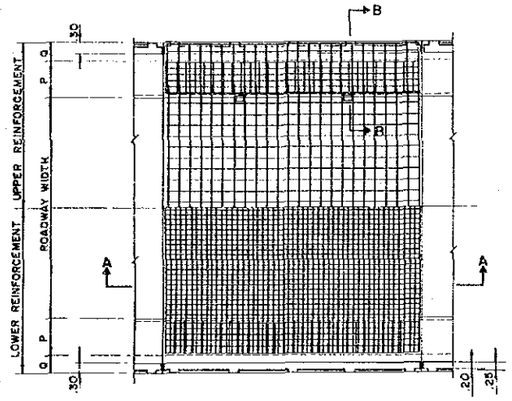
STUDY ROUTE ML-5	DWG. NO.
From CHONBURI BYPASS To PHATTHAYA	BR-9
STANDARD BRIDGES DETAILS	
PLAN, ELEVATIONS, SECTION AND TABLE	



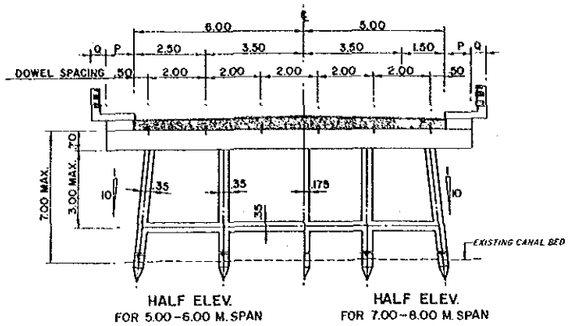
SECTION A-A



SECTION B-B

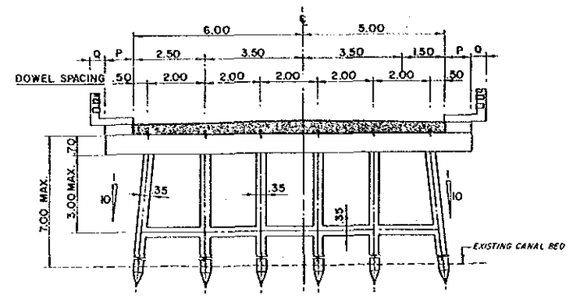


REINFORCEMENT PLAN



HALF ELEV. FOR 5.00-6.00 M. SPAN

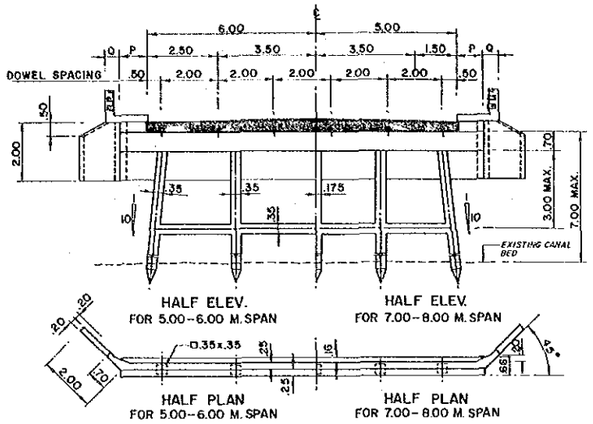
HALF ELEV. FOR 7.00-8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

PILE BENT ELEVATION

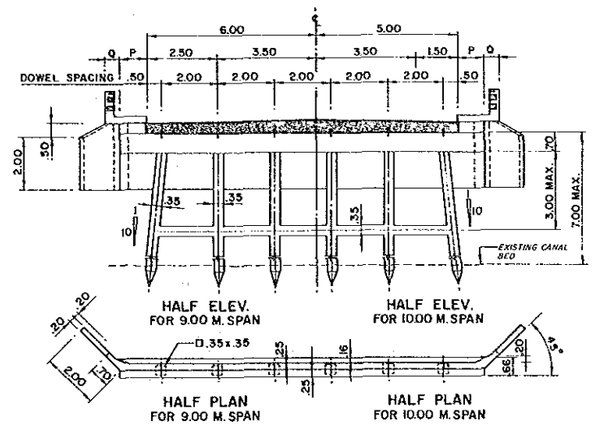


HALF ELEV. FOR 5.00-6.00 M. SPAN

HALF ELEV. FOR 7.00-8.00 M. SPAN

HALF PLAN FOR 5.00-6.00 M. SPAN

HALF PLAN FOR 7.00-8.00 M. SPAN



HALF ELEV. FOR 9.00 M. SPAN

HALF ELEV. FOR 10.00 M. SPAN

HALF PLAN FOR 9.00 M. SPAN

HALF PLAN FOR 10.00 M. SPAN

TABLE OF SLAB THICKNESS									
SPAN	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	15.00
SLAB THICKNESS	0.36	0.39	0.43	0.47	0.53	0.59	0.65	0.71	0.82

SUMMARY OF BRIDGE					
	STATION	SPAN (m)	NUMBER OF SPAN	LENGTH (m)	REMARK
ROAD ML-5 DISTRICT CHONBURI	002+576	6.0	6	36.0	2-WAY
	005+345	15.0	2	30.0	2-WAY
	011+327	8.0	6	48.0	2-WAY
	012+565	8.0	6	48.0	2-WAY
	014+066	8.0	10	80.0	2-WAY
	015+992	10.0	10	100.0	2-WAY
	016+881	13.0	4	52.0	2-WAY
	026+084.50	6.0	5	30.0	2-WAY
	029+922	6.0	3	18.0	1-WAY
	035+987.50	15.0	1	15.0	1-WAY
	040+470	12.5	2	25.0	1-WAY
	002+513	10.0	6	60.0	2-WAY, SPUR
	TOTAL		61	542.0	

PC.-GIRDER					
	STATION	SPAN (m)	NUMBER OF SPAN	LENGTH (m.)	REMARK
ML-5	004+545	10.0	12	120	RAILWAY OVERCROSSING

NOTES :

1. DESIGN STRESSES:
   a) CONCRETE , f_c = 70 KSC.
   b) STEEL , f_s = 1,400 KSC. (INTERMEDIATE GRADE)
   f_s = 1,200 KSC. (STRUCTURAL GRADE)
2. CONCRETE SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM^2 FOR .15x.15x.15 CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT, MIN.	350	KG.
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP, MAX	10	CM.

3. CLEAR CONCRETE COVER FOR TOP REINFORCEMENT IN SLAB BRIDGE SHALL BE 3.5 CM. ELSEWHERE OF SLAB BRIDGE AND SIDEWALK SHALL BE 2.5 CM.
4. ALL CONCRETE EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFER UNLESS OTHERWISE INDICATED.
5. REBARS #4 OR LARGER SHALL BE INTERMEDIATE GRADE DEFORMED BARS, OTHERS SHALL BE STRUCTURAL GRADE PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR IN CASE OF PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMED TO AASHO SPECIFICATIONS SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
10. PAINTING SHALL BE PROVIDED ON ALL SURFACES AT BRIDGE ENDS WHICH EXPOSED TO TRAFFIC. WHITE AND BLACK COLOUR SHALL BE PAINTED ALTERNATELY. WHITE COLOUR SHALL BE LIGHT REFLECTED TYPE.
11. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
12. BAR MARK S101 MAY BE TAKEN OUT ONE BAR ON EACH SIDE OF THE BRIDGE WHEREVER THEY PASS THROUGH DRAIN PIPES. IF THE LOCATIONS OF THESE BARS ARE NEAR V-DRIP SUCH THAT CONCRETE COVER IS NOT ADEQUATE, THEY SHALL BE PLACED ON TOP OF ST 101. OTHER BARS WHICH PASS THROUGH DRAIN PIPES SHALL BE BENT ALONG THE PIPES.
13. ALL PIERS WHICH DO NOT HAVE LOG PROTECTION WALLS SHALL BE HAUNCH UNDER THE TOP CROSS BRACING.
14. IF ANY NOTES ON THE DRAWINGS OF PIERS CONTRADICT THE NOTES ON THIS DRAWING, THEY WILL BE SUPERSEDED BY THESE NOTES.
15. IN CASE OF 0.50 M. SIDEWALK, P AND R SHALL BE 0.50 M. AND REBARS IN EDGEBEAM SHALL BE THE SAME AS SHOWN FOR 0.40 M. SIDEWALK EXCEPT FOR 10.0 M. SPAN WHICH BAR MARKS SW101 AND T104 ARE 12 BARS.
16. THIS DRAWING IS ADAPTED FROM DOH DWG NO 3 A05-106-14/1A IN CASE OF ANY DISCREPANCY BETWEEN SUCH DRAWINGS ARISES, THE DOH. STANDARD DRAWING WILL PREVAIL UNDER THE APPROVAL OF THE ENGINEER.

PROJECT ML. - 7

Changwat : Bangkok, Chachoengsao

A. Min Buri - M. Chachoengsao

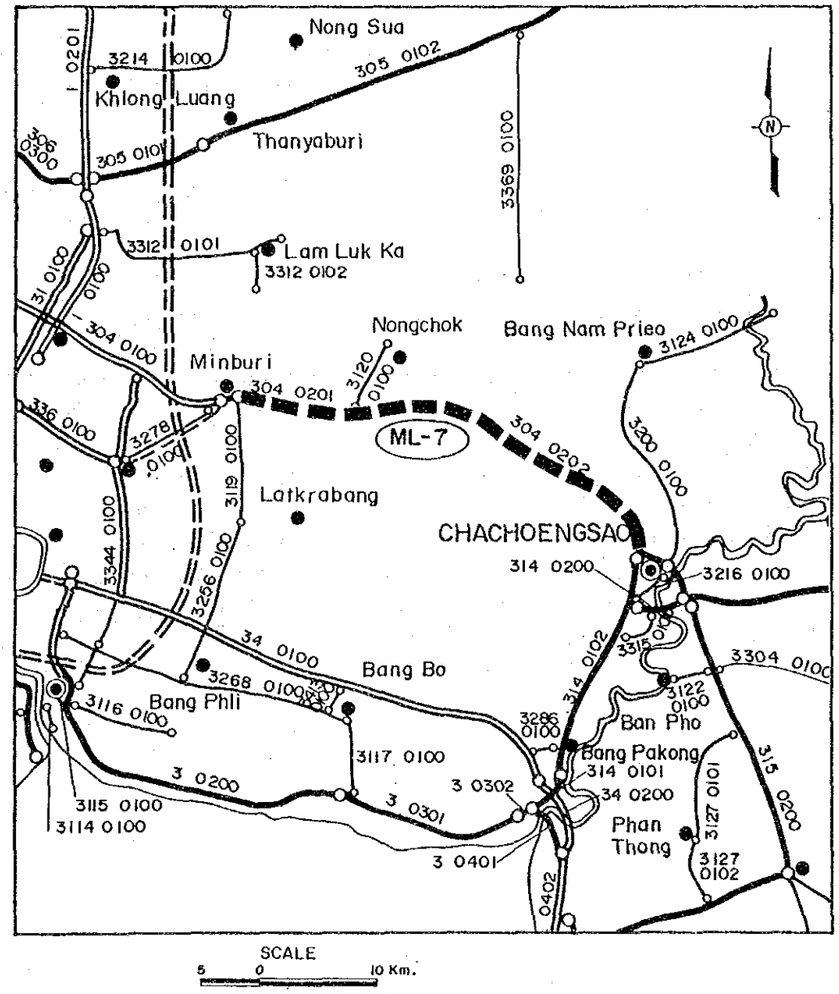
Length : 40.94 km

SUMMARY

PROJECT ML-7

ITEM	DESCRIPTION
Changwat	Bangkok, Chachoengsao
Origin	A. Min Buri
Destination	M. Chachoengsao
Route No.	Rt. 304
Project Length	40.94 km
Standard	
- Existing	S3
- Proposed	SD
Traffic	
- Base	5,926 ~ 6,121
- 2000	11,000 ~ 13,400
- 2008	16,100 ~ 19,600
Pavement Type	
- Existing	AC pavement
- Proposed	AC pavement (10 cm thick surface)
Bridges	
- New Construction	32 bridges, 1,909 m
- Replacement	—
Intersections	
- Channelization	1 each
Construction Costs	
- Financial	754,017,000 Baht
- Economic	664,890,000 Baht
Economic Evaluation	
- IRR	21.9%
- B/C	2.10

LOCATION OF PROJECT ROUTE



1. GENERAL

Project ML-7 is to expand Route 304 from Amphoe Min Buri to Muang Chachoengsao from the existing two to four lanes. The total length of the project is 40.94 km.

The terrain is flat and both sides of the road are fully cultivated with paddy.

The existing road has an asphalt concrete carriageway of 6.00 m width and 2.00 m wide shoulders. The surface condition is fair. There are 32 bridges but horizontal and vertical alignments are good.

As the road is the main road connecting Chachoengsao with Bangkok, traffic is heavy and is expected to grow further.

Therefore, this project is proposed to accommodate the increase in future traffic. The project is the widening and overlay of the existing road on the north side.

Currently construction is underway on Route 304 leading to the starting point of the project with a wide raised median. The project road maintains the same profile up to a bridge at Km 36 + 800 in the first 1 km section, where the alignment is poor due to being in the Min Buri urban area. For the remainder of the length, the median of the project road is narrowed to allow the construction of an additional two-lane carriageway within the existing right-of-way. The existing alignment is altered to three lanes at Km 36 + 500 to 37 + 500, Km 54 + 800 to 55 + 200 and Km 76 + 100 to 76 + 300 to ease the existing sharp curves. The vertical alignment of the new carriageway is set at the level shown in the original design of the existing carriageway, the level of which has since sunk.

2. TRAFFIC FORECAST

Base Traffic Volume

(Unit:Vehicles/Day)

Project Code	Section	Year	Traffic Volume MC	PC	LB	HB	LT	MT	HT	ADT
ML-7	304-40KM	1988	935	1440	911	597	1680	911	387	5926
	304-J.314	1988	1512	1371	355	391	2967	597	440	6121
	Average	-	1224	1406	633	494	2324	754	414	6024

Traffic Growth Rate

(Unit:Percent)

Project	Section	Period	MC	PC	LB	HB	LT	MT	HT
ML-7	304-40KM	-1993	5.07	5.94	5.83	3.94	3.36	4.60	3.78
		1994 -2000	5.36	5.88	5.11	5.07	5.14	4.68	3.98
		2000 -2008	5.18	5.86	4.98	4.29	4.57	4.53	4.01
	304-J.314	-1993	5.53	6.23	6.90	4.15	3.73	4.95	3.78
		1994 -2000	5.39	5.94	5.03	4.99	5.16	4.78	4.62
		2000 -2008	5.17	5.91	4.94	4.05	4.60	4.49	4.26

Development Traffic

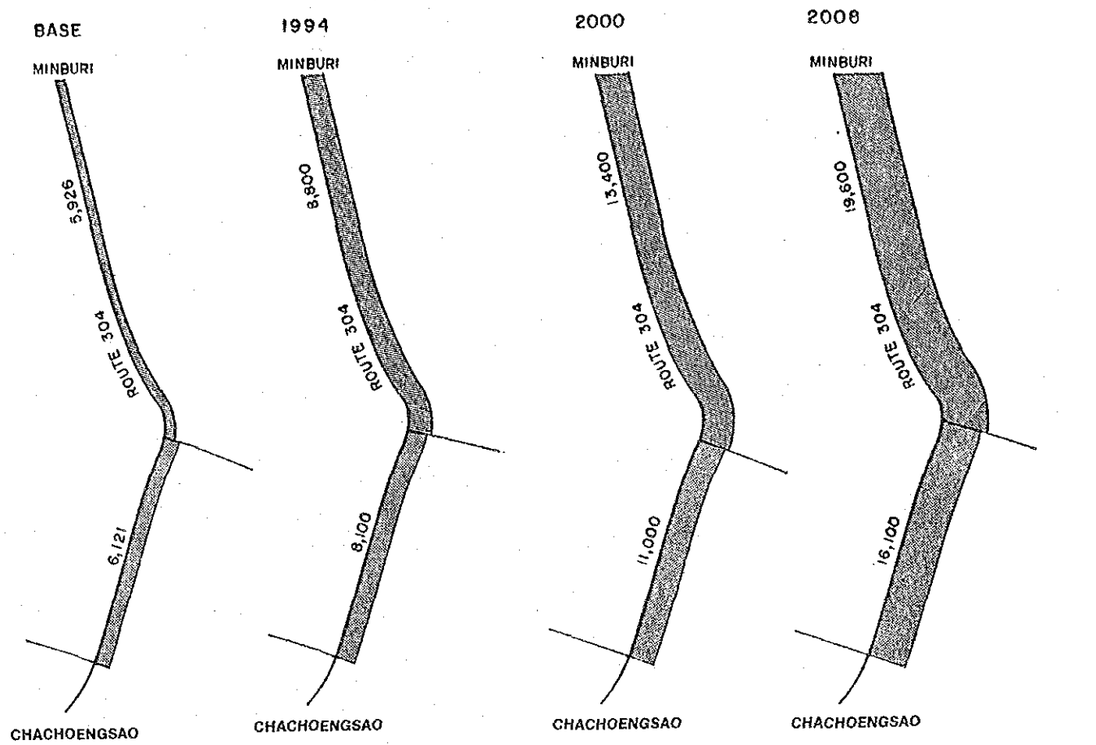
(Unit:Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	Total
ML-7	304-40KM	1994	261	246	65	63	468	100	69	1011
		2000	715	695	175	169	1267	264	182	2752
		2008	1070	1100	257	232	1815	375	254	4033

Future Traffic Volume

(Unit:Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
ML-7	304-40KM	1994	1522	2281	1336	824	2552	1294	554	8841
		2000	2440	3562	1889	1193	4082	1836	794	13356
		2008	3654	5622	2786	1665	5840	2616	1092	19621
	304-J.314	1994	2086	1965	521	503	3747	796	554	8086
		2000	2858	2778	699	674	5067	1054	727	10999
		2008	4278	4398	1028	926	7261	1498	1015	16126
	Average	1994	1804	2123	929	664	3150	1045	554	8464
		2000	2649	3170	1294	934	4575	1445	761	12178
		2008	3966	5010	1907	1296	6551	2057	1054	17874



Project ML-7

UNIT : VEHICLE/DAY

3. ENGINEERING

3.1 Materials and Boring Results

(1) Materials

DESCRIPTION OF MATERIAL SOURCES

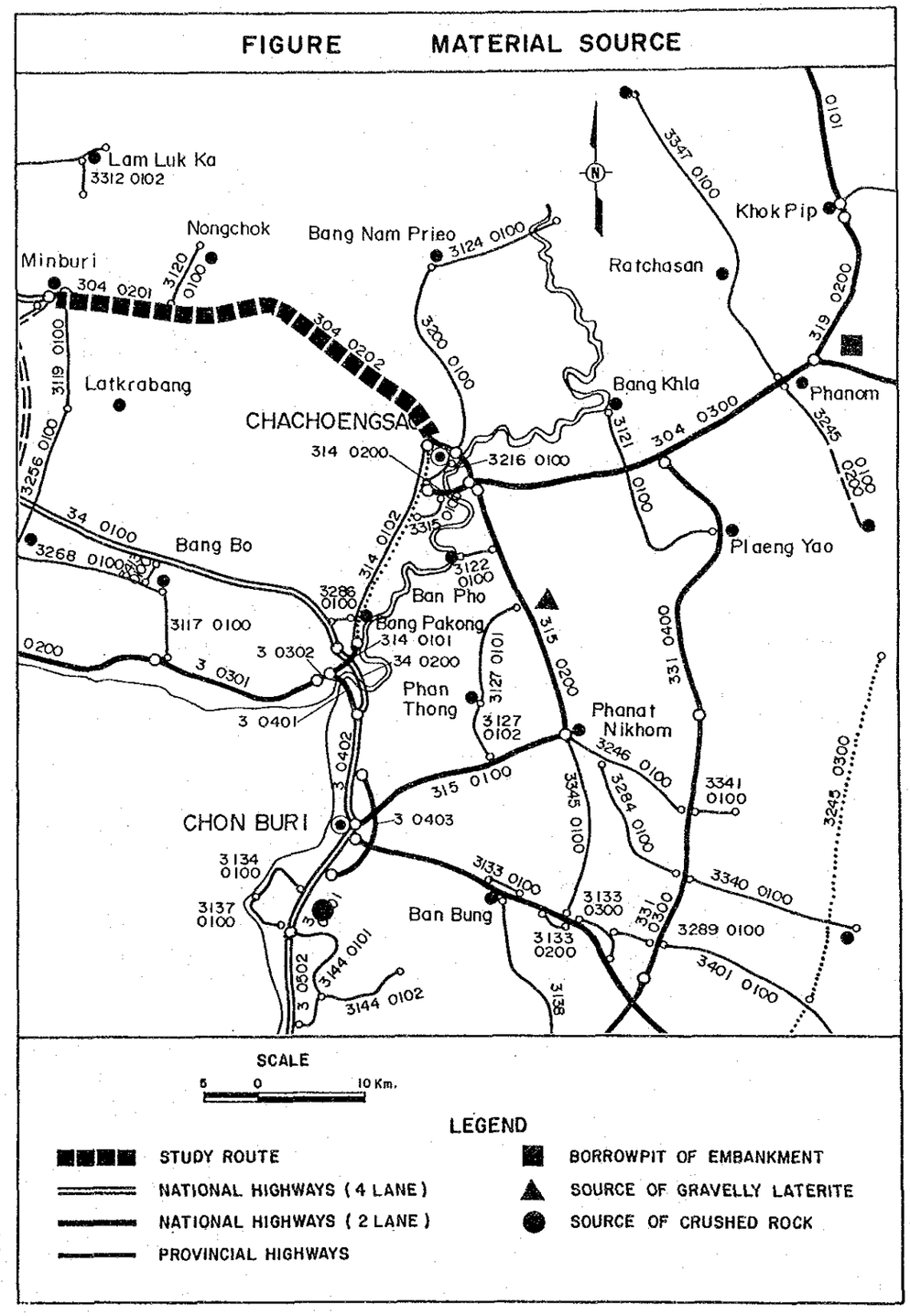
Material	Source	Description of Sample	Estimated Quantity cu.m.	Hauling Distance (km)
Soil	Route 304 Km 127+700 Left Side 1.0 Km	Silty Sand	Plentiful	70.00
Laterite	Route 315 Km 19+900 Left Side 5.0 Km	Gravelly Laterite	83,000	53.00
Crushed Rock	Route 3 Km 99+150 Left Side 2.1 Km	Lime Stone	Plentiful	70.00

RESULTS OF LABORATORY TESTS

	Sieve Analysis % Passing								Plasticity		Comp. DH-T Stand. Opt.		Lab. C.B.R. CBR	Swell
	50.0	25.0	19.0	9.5	#4	#10	#40	#200	LL	PT	95%	gm/cc	95%	%
Soil					100	93.5	62.8	15.2		-NP-	-	1.849	7.0	-
Laterite	100	95.8	93.1	77.1	59.9	25.9	16.6	12.5	29.8	8.8	7.4	2.206	37.3	-
Crushed Rock	-	-	-	-	-	-	-	-	-	-	-	-	>80	-

Note: Abrasion test result of Crushed Rock 31.2 %

FIGURE MATERIAL SOURCE



(2) Boring Results

BOREHOLE LOCATION

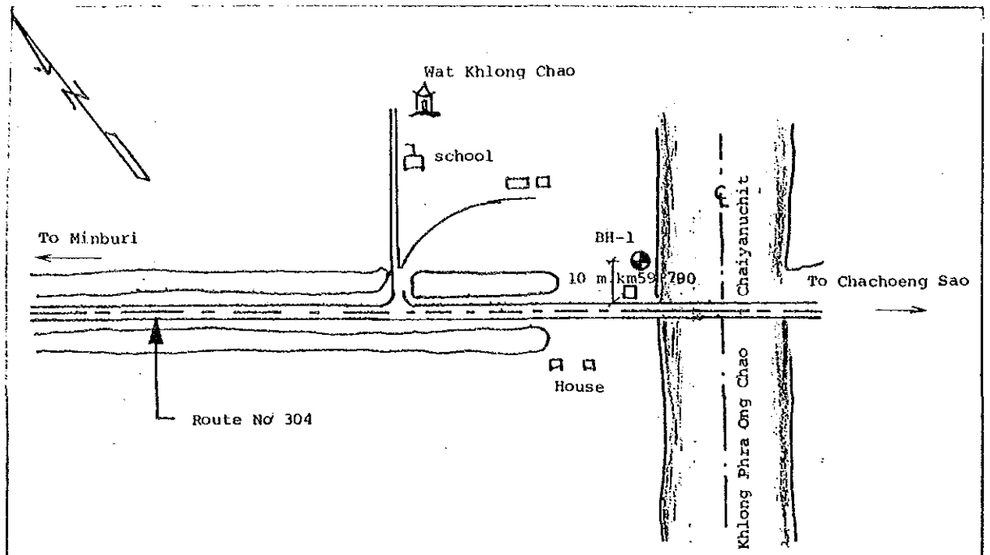
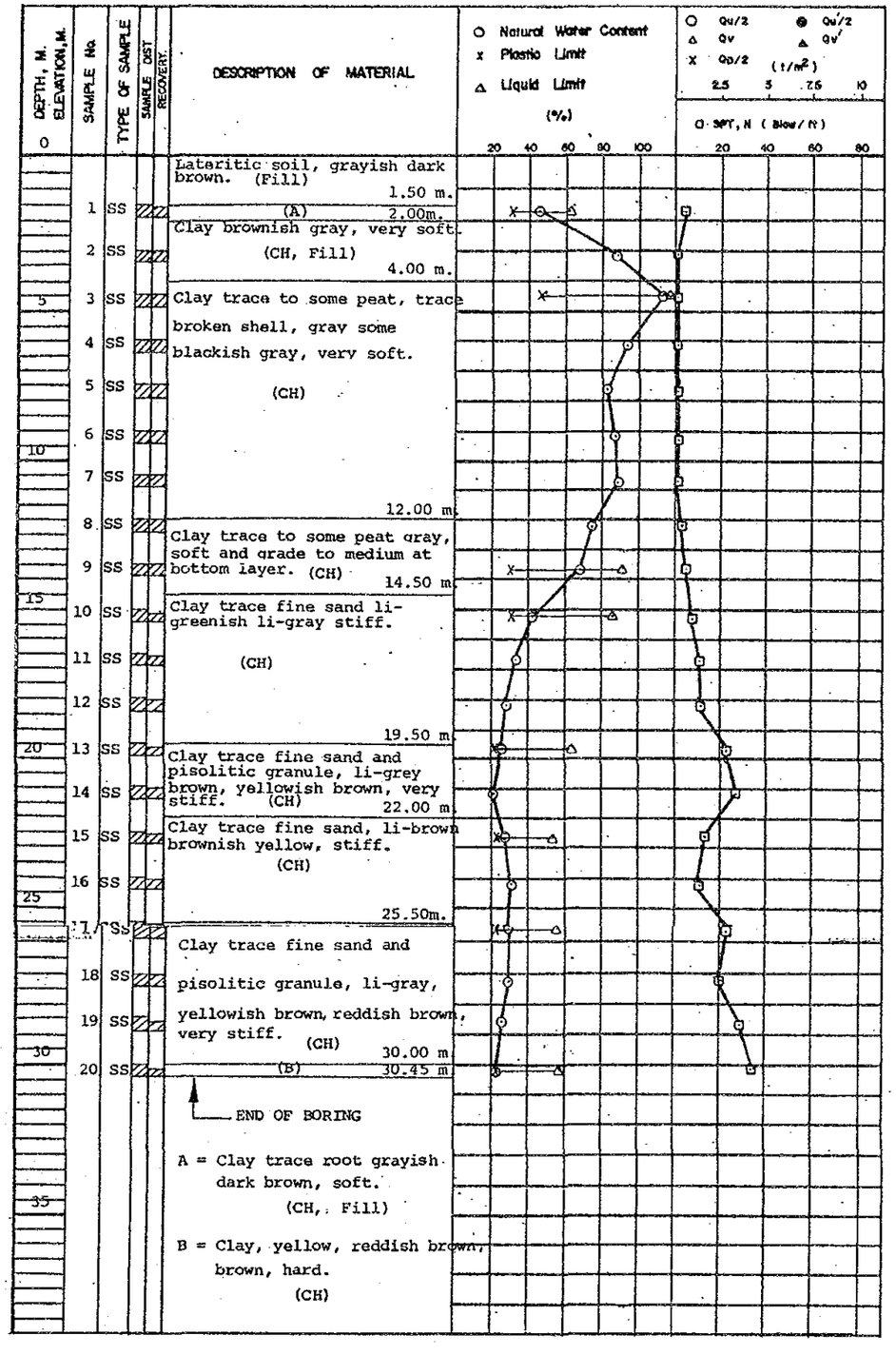


Fig 2 Sketch of Borehole Location BH-1
Route No. 304; Minburi-Chachoeng Sao at km 59 + 790

BORING LOG



SUMMARY OF TEST RESULTS

SAMPLE No.	DEPTH M. FROM	DEPTH M. TO	WATER CONTENT %	ATTERBERG LIMIT % LL.	ATTERBERG LIMIT % PL.	ATTERBERG LIMIT % PI.	WET UNIT WEIGHT t/m³	SIEVE ANALYSIS % FINER No. 3/8"	No. 4	No. 10	No. 40	No. 100	CLASSIFICATION	UNDRAINED SHEAR STRENGTH t/m.² UNCONFINED SHEAR Qu/2	Qu'/2	FIELD VANE SHEAR Qv	Qv'	POCKET PENETRATION ½Qp	STANDARD PENETRATION (N)
SS-1	1.50	1.95	44.8	61.2	30.3	30.9	1.68			100	98	95	CH					2.5	4
SS-2	3.00	3.45	88.5										CH					1.2	1
SS-3	4.50	4.95	114.9	122.2	44.8	77.4				100	99	99	CH					–	1
SS-4	6.00	6.45	94.2										CH					–	1
SS-5	7.50	7.95	81.0				1.55						CH						1
SS-6	9.00	9.45	85.4				1.47						CH						1
SS-7	10.50	10.95	86.4										CH						1
SS-8	12.00	12.45	77.4										CH					1.2	3
SS-9	13.50	13.95	66.6	91.8	29.2	62.6	1.63				100	99	CH					1.2	5
SS-10	15.00	15.45	41.3	86.8	30.1	56.7	1.79					100	CH					6.5	9
SS-11	16.50	16.95	34.6				1.86						CH					8.5	12
SS-12	18.00	18.45	28.5				1.94						CH					11.0	13
SS-13	19.50	19.95	24.8	63.2	20.0	43.0	2.02		100	99	99	97	CH	22.4				13.5	22
SS-14	21.00	21.45	20.4				2.04						CH	22.4				16.5	25
SS-15	22.50	22.95	26.1	56.4	22.1	34.3	1.93		100	99	97	94	CH	9.6				11.2	14
SS-16	24.00	24.45	31.0				1.99						CH	8.9				9.5	12
SS-17	25.50	25.95	27.4	57.2	21.6	35.6	1.95	100	99	99	99	98	CH	11.4				11.5	22
SS-18	27.00	27.45	27.1				1.92						CH	14.9				17.5	20
SS-19	28.50	28.95	24.2				2.00						CH	15.4				13.7	27
SS-20	30.00	30.45	22.9	59.7	22.7	37.0	2.03				100	97	CH	28.9				22.5+	36

3.2 Preliminary Design

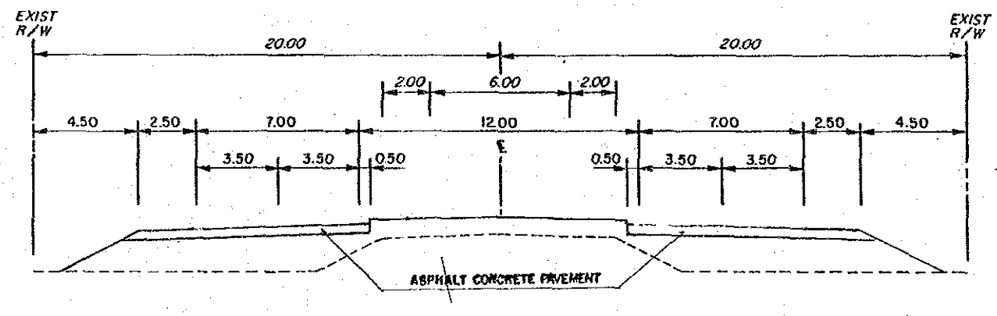
(1) Geometric Design Criteria

Design Standard : SD

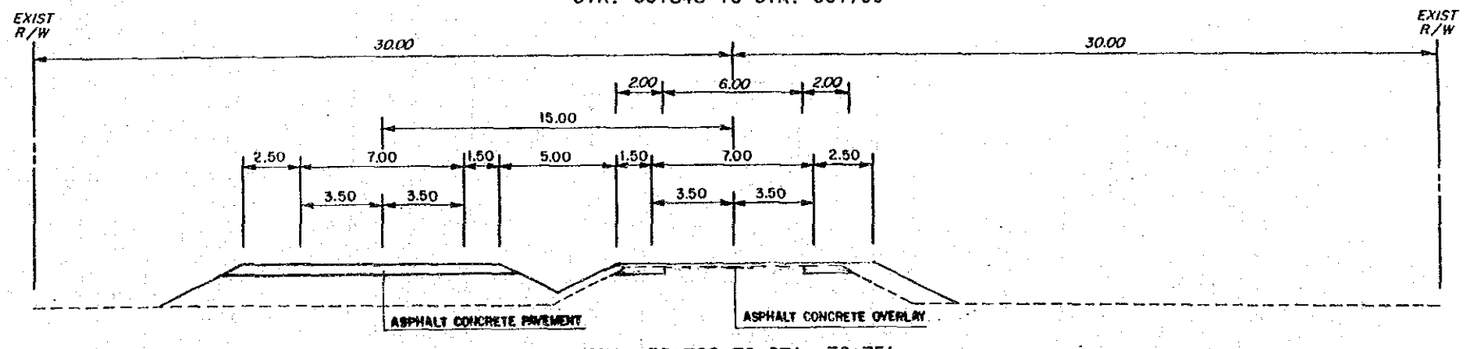
Design Speed : 70–90 km/h

Geometric Design Criteria

Description	Design Speed (km/h)		
	90	80	70
Minimum Radius & Curvature (m)	280	210	160
Minimum Stopping Sight Distance (m)	140	115	90
Maximum Gradient (%)	7	8	9



STA. 35+848 TO STA. 36+700



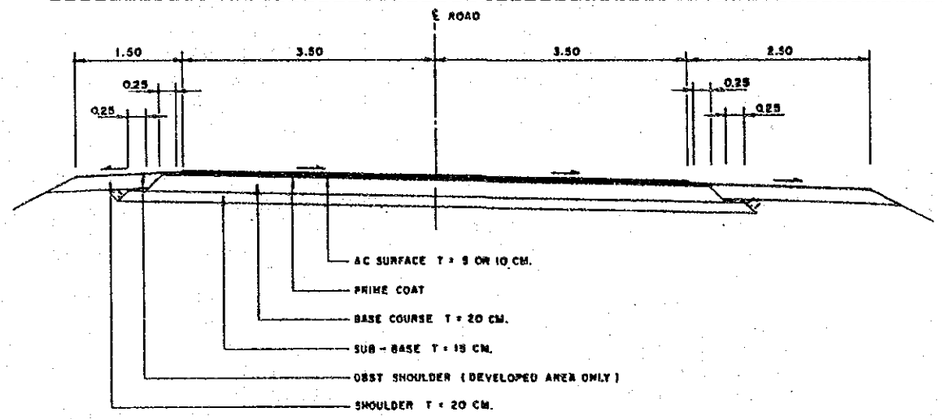
STA. 36+700 TO STA. 76+754

TYPICAL CROSS SECTION (ROUTE ML-7)

(2) Pavement Design

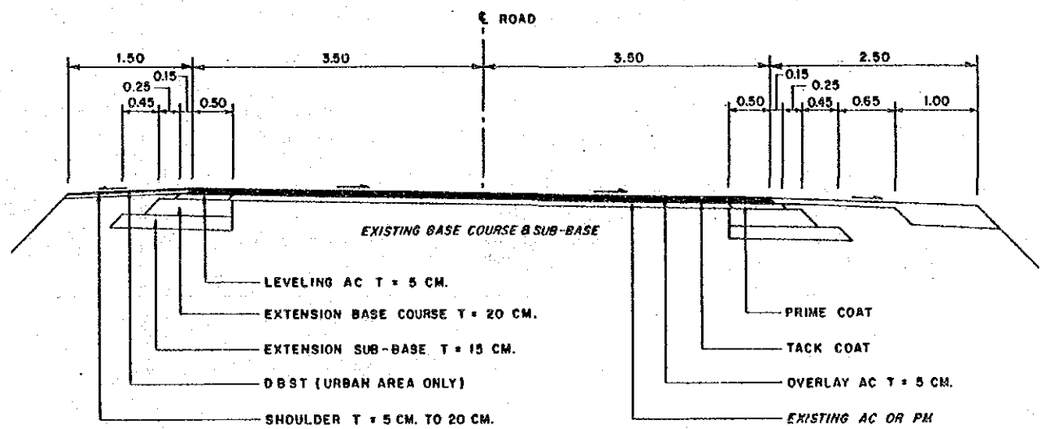
Pavement for New Construction Lane

Design CBR of Subgrade	Cumulative No. of ESA W18 x 10 (10 years)	Thickness of Pavement Structure (cm)	
7.0	5,226	Surface	10
		Base	20
		Subbase	15



Initial Overlay for Existing Lane

Type of Overlay	Design CBR	Cumulative of ESA W18 x 10 (10 years)	Required D or SN	FRL * Dxeff or SNxeff	Overlay Dol or SNol	Thickness (cm)
AC	6.0	5,226	3.25	1.41	1.84	10



(3) Culverts

No.	CHAINAGE	EXISTING CULVERT	NEW CULVERT	
			LT ROADWAY	RT ROADWAY
1	36+161		EXTEND 13 m.LT	EXTEND 13 m.RT
2	37+920	RCP 3 - Ø 1.20x16.00	3 - Ø 1.20x20.00	EXTEND 4 m.RT
3	38+900	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
4	39+340	RCP 2 - Ø0.60x13.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
5	40+650	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
6	40+950	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
7	41+675	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
8	41+850	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
9	42+675	RCP 2 - Ø0.60x19.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
10	42+975	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
11	43+750	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
12	44+625	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
13	44+975	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
14	46+700	RCP 2 - Ø0.60x19.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
15	47+375	RCP 3 - Ø0.60x19.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
16	47+700	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
17	48+425	RCP 2 - Ø0.60x18.00	1 - Ø1.00x19.00	1 - Ø1.00x19.00
18	49+775	RCP 2 - Ø0.60x19.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
19	50+700	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
20	51+100	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
21	52+300	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
22	53+125	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
23	53+975	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
24	54+300	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
25	55+850	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
26	56+275	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
27	56+650	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
28	57+225	RCP 2 - Ø0.60x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
29	58+850	RCP 2 - Ø0.60x19.00	1 - Ø1.00x19.00	1 - Ø1.00x19.00
30	60+975	RCP 1 - Ø0.80x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
31	62+905	RCP 1 - Ø0.80x18.00	1 - Ø1.00x18.00	REMAIN
32	65+985	RCP 1 - Ø0.80x18.00	1 - Ø0.80x18.00	EXTEND 2m.RT
33	69+716	RCP 1 - Ø1.00x18.00	1 - Ø1.00x18.00	1 - Ø1.00x18.00
34	72+550	RCP 3 - Ø1.00x20.00	3 - Ø1.00x20.00	REMAIN
35	75+064	RCP 3 - Ø1.00x18.00	3 - Ø1.00x18.00	
36	76+129	RCP 3 - Ø1.00x18.00		REMAIN
37	76+146	RCP 3 - Ø0.80x18.00		REMAIN
38	76+550	RCP 2 - Ø1.80x1.80x16.00	EXTEND 12m. LT	EXTEND 12m. RT
39	ROAD CONNECTION S = 27 LOCATIONS			

(4) Bridges

NO.	STATION	EXISTING RC BRIDGE	PROPOSED RC BRIDGE	
* 1	36+802	8.00x100.00	11.00x100.00	SLAB TYPE
2	38+658	8.00x 16.00	11.00x 16.00	SLAB TYPE
3	39+910	11.00x 24.00	11.00x 24.00	SLAB TYPE
4	40+385	7.00x 15.00	11.00x 15.00	SLAB TYPE
5	41+310	8.00x 40.00	11.00x 40.00	SLAB TYPE
6	42+365	8.00x 25.00	11.00x 25.00	SLAB TYPE
7	43+285	11.00x 15.00	11.00x 15.00	SLAB TYPE
8	44+170	8.00x 35.00	11.00x 35.00	SLAB TYPE
9	45+475	8.00x 22.00	11.00x 22.00	SLAB TYPE
10	46+285	8.00x 24.00	11.00x 24.00	SLAB TYPE
11	48+020	8.00x 45.00	11.00x 45.00	SLAB TYPE
12	48+735	8.00x 21.00	11.00x 21.00	SLAB TYPE
13	49+280	8.00x 10.00	11.00x 10.00	SLAB TYPE
14	50+285	8.00x 24.00	11.00x 24.00	SLAB TYPE
15	51+705	8.00x 21.00	11.00x 21.00	SLAB TYPE
16	52+675	8.00x 28.00	11.00x 28.00	SLAB TYPE
17	53+450	8.00x 24.00	11.00x 24.00	SLAB TYPE
18	54+600	8.00x 37.00	11.00x 37.00	SLAB TYPE
19	55+050	8.00x 25.00	11.00x 25.00	SLAB TYPE
20	56+960	8.00x 30.00	11.00x 30.00	SLAB TYPE
21	57+775	7.00x114.00	11.00x114.00	SLAB TYPE
22	58+500	8.00x 32.00	11.00x 33.00	SLAB TYPE
23	59+780	8.00x138.00	11.00x138.00	GIRDER TYPE
24	61+910	8.00x 90.00	11.00x 90.00	SLAB TYPE
25	64+715	8.00x132.00	11.00x132.00	GIRDER TYPE
26	67+075	8.00x 15.00	11.00x 15.00	SLAB TYPE
27	67+915	8.00x 15.00	11.00x 15.00	SLAB TYPE
28	68+660	8.00x 19.00	11.00x 19.00	SLAB TYPE
29	70+760	8.00x 18.00	11.00x 18.00	SLAB TYPE
30	71+725	8.00x 38.00	11.00x 38.00	SLAB TYPE
31	75+260	8.00x 16.00	11.00x 16.00	SLAB TYPE
32	76+060	8.00x 15.00	2-11.00x350.00	GIRDER TYPE

3.3 Quantities and Construction and Road Maintenance Costs

(1) CONSTRUCTION QUANTITIES AND COSTS

(Project ML-7 Length = 40.94 km)

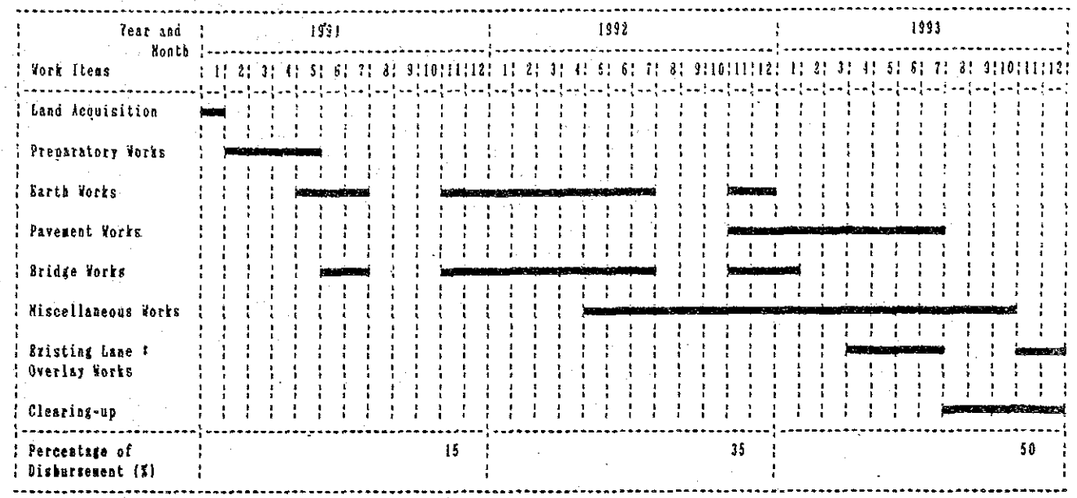
Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost %	Economic Cost 1000 Baht	Residual Value %	Residual Value 1000 Baht
EARTHWORK								
Clearing & Grubbing	ha	15,000	98	1,470	85	1,250	90	1,125
Roadway Excavation (Unclassified)	m^3	18	52,000	936	84	786	90	708
Roadway Excavation (Classified)	m^3	38	41,000	1,558	84	1,309	90	1,178
Embankment (Common)	m^3	33	36,000	1,188	86	1,022	90	920
Embankment (Borrow)	m^3	168	1,260,000	211,680	86	182,045	90	163,840
Removal of Existing Structure	each	60,000	-	-	84	-	90	-
Sub Total				216,832		186,411		167,771
SUBBASE and BASE COURSES								
Subbase	m^3	203	68,000	13,804	83	11,457	50	5,729
Aggregate base	m^3	349	80,100	27,955	84	23,482	50	11,741
Shoulder (Soil Aggregate)	m^3	236	47,800	11,281	83	9,363	50	4,682
Sub Total				53,040		44,303		22,152
SURFACE COURSES								
Asphaltic Prime Coat	m^2	11	350,600	3,857	93	3,587	50	1,793
Asphaltic Tack Coat	m^2	5	573,000	2,865	93	2,664	50	1,332
Double Bituminous Surface Treatment	m^2	33	6,600	218	91	198	50	99
Asphalt Concrete Surfacing	ton	921	107,100	98,639	90	88,775	50	44,388
Portland Cement Concrete Pavement	m^3	1,657	-	-	90	-	50	-
Sub Total				105,579		95,224		47,612
STRUCTURES (Equivalent)								
RC Pipe Culvert (D=1.00 m)	m	1,800	2,249	4,048	88	3,562	50	1,781
RC Box Culvert (2-2.40x 2.40 m)	m	10,000	14	140	90	126	50	63
RC Bridge (W=11.0 m)	m	66,000	825	54,450	87	47,372	50	23,686
PC Bridge (W=11.0 m)	m	96,000	1,084	104,064	87	90,536	50	45,268
Bearing Unit	m^2	2,500	15,840	39,600	87	34,452	50	17,226
Sub Total				202,302		176,048		88,024
Total (a)				577,752		501,986		325,559
Miscellaneous Work ((a) x 7%)	ls			40,443	87	35,185	0	0
CONTRACT AMOUNT (b)				618,195		537,171		325,559
PHYSICAL CONTINGENCIES ((b) x 10%) (c)	ls			61,820		53,717		32,556
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)	ls			68,002	100	68,002	0	0
LAND ACQUISITION (Average) (e)	ha	3,000,000	2	6,000	100	6,000	100	6,000
PROJECT COST ((b) + (c) + (d) + (e))				754,017		664,890		364,115
AVERAGE COST PER KM				18,418				

(2) Road Maintenance Costs

(Unit : Baht/Year)

	Without Project	With Project
Existing	796,979	-
1994	1,037,706	631,176
2008	1,146,483	1,050,192

3.4 Construction Schedule



4. BENEFITS

ROAD CONDITIONS

(unit : km)

Section	Without Project: Road Length	Paved: Good	Paved: Good /Fair	Paved: Fair	Paved: Fair /Poor	Paved: Poor	Laterite: Good	Laterite: Fair	Laterite: Poor	No. of Narrow Bridge	No. of Wooden Bridge	With Project: Road Length	With Project: Paved Good	With Project: No. of Narrow Bridge	With Project: No. of Wooden Bridge
304-40	21.3	-	-	21.3	-	-	-	-	-	-	-	21.3	21.3	-	-
304-J.314	19.7	-	-	19.7	-	-	-	-	-	-	-	19.7	19.7	-	-

BENEFITS

(1000 BAHT)

Year	VOC Savings: Nomal Traffic	VOC Savings: Induced Traffic	VOC Savings: Total	Time Savings: Nomal Traffic	Time Savings: Induced Traffic	Time Savings: Total	Total Savings: Nomal Traffic	Total Savings: Induced Traffic	Total Savings: Total
1994	105,799	-	105,799	56,237	-	56,237	162,036	-	162,036
2000	151,219	-	151,219	84,719	-	84,719	235,938	-	235,938
2008	238,926	-	238,926	142,219	-	142,219	381,145	-	381,145

5. ECONOMIC EVALUATION

COST AND BENEFIT STATEMENT

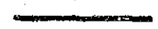
(1000 BAHT)

	COST	BENEFITS				DISCOUNTED(12%)	
YEAR	CONST. COST	VOC SAVING	TIME SAVING	MAINT. SAVING	TOTAL	COST	BENEFIT
1991	104,833				0	147,283	0
1992	230,611				0	289,278	0
1993	329,445				0	368,978	0
1994		105,799	56,237	(190)	161,846	0	144,505
1995		113,369	60,984	(234)	174,119	0	138,807
1996		120,939	65,731	(279)	186,391	0	132,669
1997		128,509	70,478	(323)	198,664	0	126,255
1998		136,079	75,225	(367)	210,937	0	119,691
1999		143,649	79,972	(412)	223,209	0	113,085
2000		151,219	84,719	(456)	235,482	0	106,520
2001		162,182	91,907	(501)	253,588	0	102,420
2002		173,145	99,094	(545)	271,694	0	97,976
2003		184,109	106,282	(589)	289,802	0	93,308
2004	53,643	195,072	113,469	(634)	307,907	17,272	88,516
2005		206,036	120,657	(678)	326,015	0	83,680
2006		216,999	127,844	(722)	344,121	0	78,864
2007		227,962	135,032	(767)	362,227	0	74,119
2008	(364,115)	238,926	142,219	(811)	380,334	(74,505)	69,486
TOTAL	354,417	2,503,994	1,429,850	(7,508)	3,926,336	748,306	1,569,901

NET PRESENT VALUE :	821,595
BENEFIT COST RATIO :	2.10
INTERNAL RATE OF RETURN :	21.9%
FIRST YEAR RATE OF RETURN :	17.9%

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

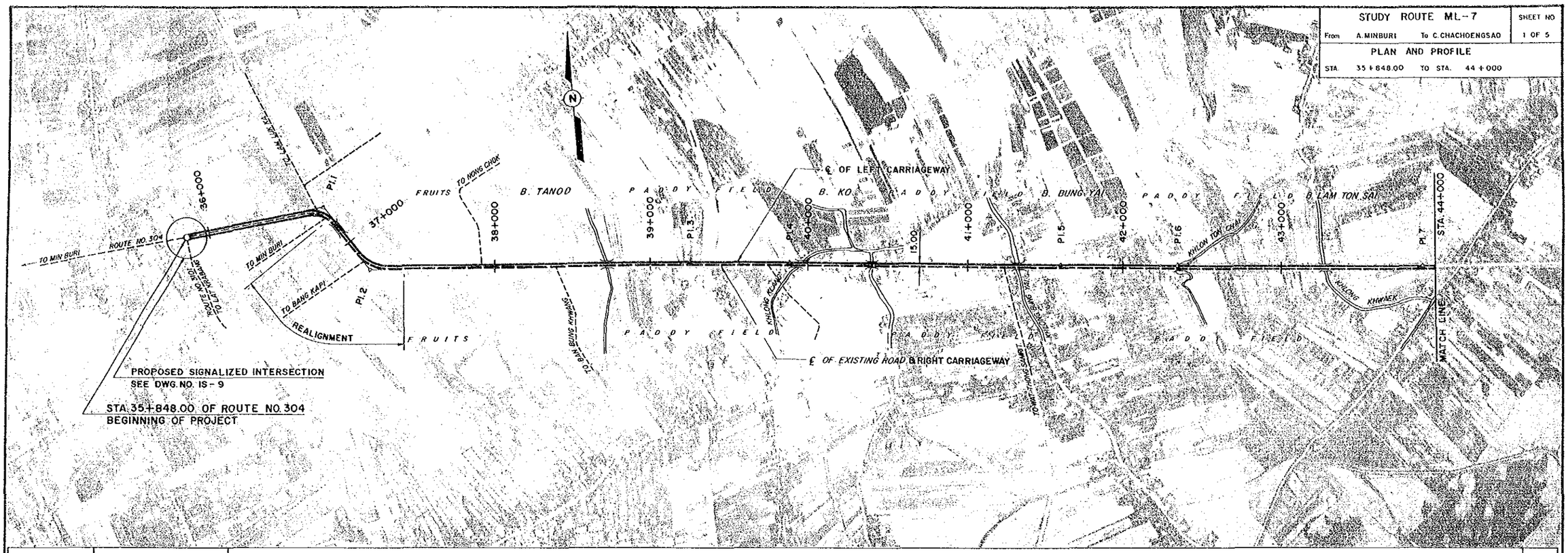
RC-P-n-ϕa×l	PIPE CULVERT, n (ROW), ϕa (DIAMETER, m), l (LENGTH, m)
RC-B-n-a×b×l	BOX CULVERT, n (NO. OF CELLS), a×b×l (CLEAR SPAN × DEPTH × LENGTH, m)
BR-T-a×l−n	TIMBER BRIDGE, a×l (WIDTH × LENGTH, m), n (NO. OF SPANS)
BR-RC-a×l−n	CONCRETE BRIDGE, a×l (ROADWAY WIDTH × LENGTH, m) n (NO. OF SPANS)

STUDY ROUTE ML-7 | SHEET NO 1 OF 5

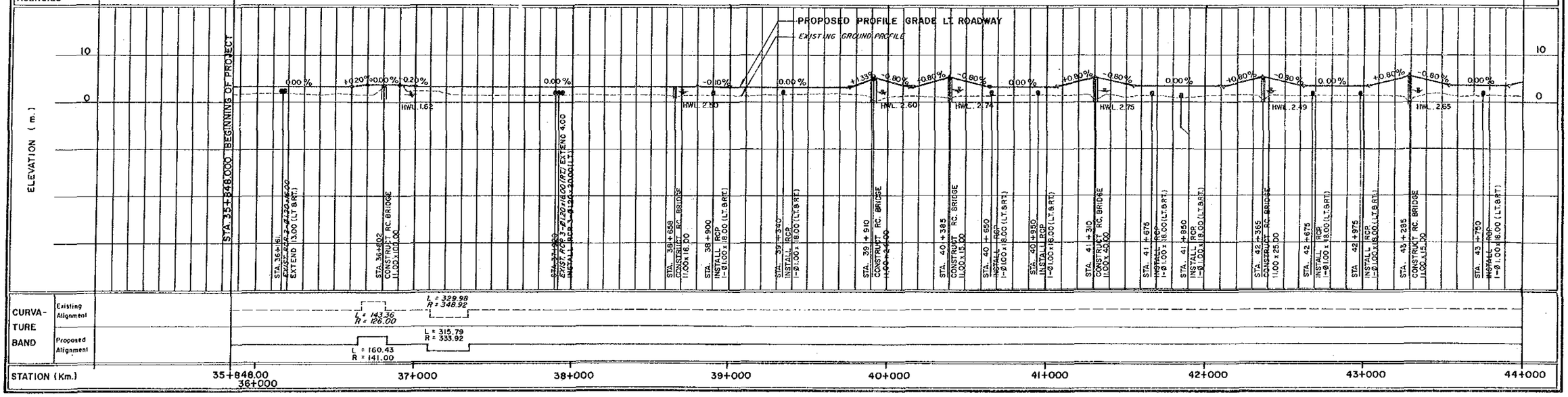
From A.MINBURI To C.CHACHOENGSAO

PLAN AND PROFILE

STA 35+848.00 TO STA. 44+000

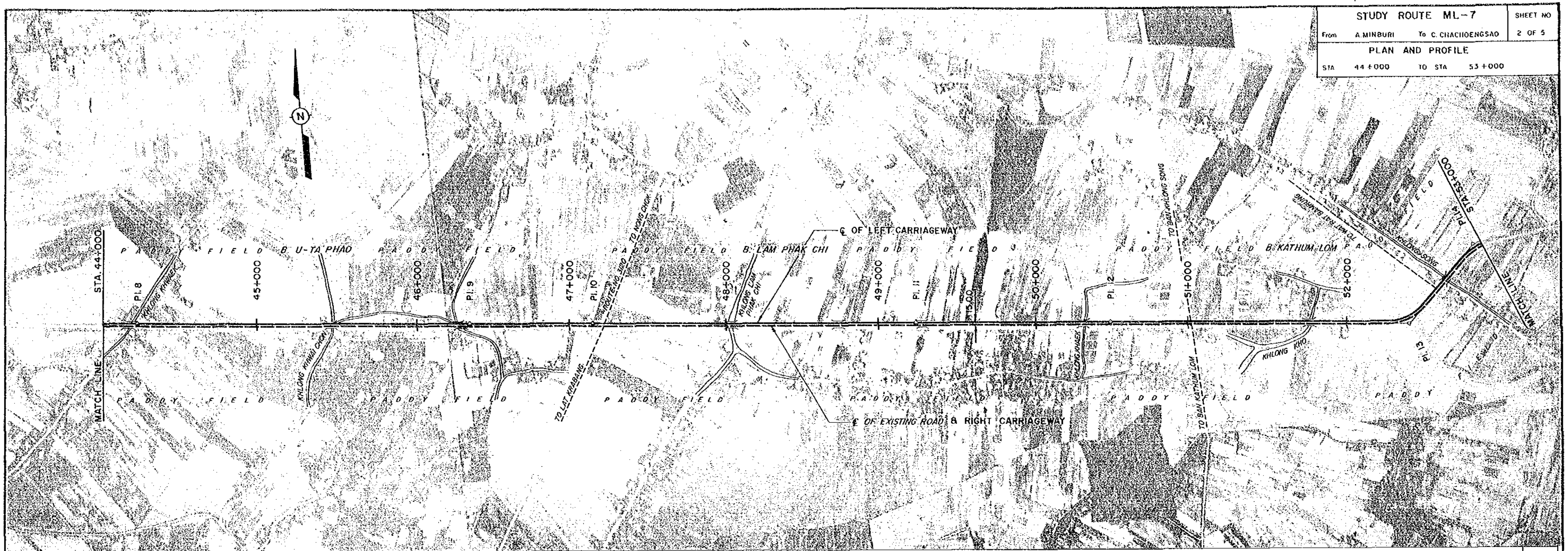


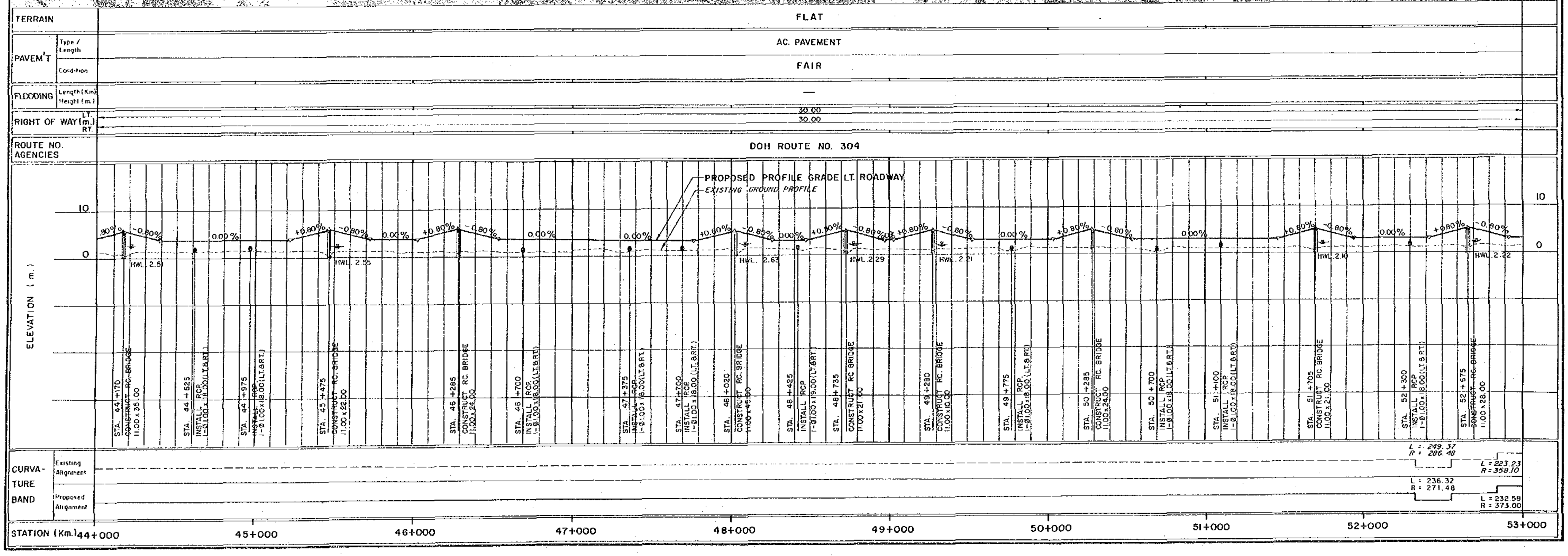
TERRAIN		FLAT
PAVEM'T	Type / Length	AC. PAVEMENT
	Condition	FAIR
FLOODING	Length (Km) Height (m)	—
RIGHT OF WAY (m.)	LT.	WIDENING 20.00 TO 30.00 / 30.00
	RT.	20.00 / 30.00
ROUTE NO. AGENCIES		DOH ROUTE NO. 304



CURVATURE BAND	Existing Alignment	L = 143.36, R = 126.00 / L = 329.98, R = 348.92
	Proposed Alignment	L = 160.43, R = 141.00 / L = 315.79, R = 333.92
STATION (Km.)		35+848.00 (36+000), 37+000, 38+000, 39+000, 40+000, 41+000, 42+000, 43+000, 44+000

STUDY ROUTE ML-7		SHEET NO
From A.MINBURI	To C. CHACHOENGSAO	2 OF 5
PLAN AND PROFILE		
STA 44+000	TO STA 53+000	



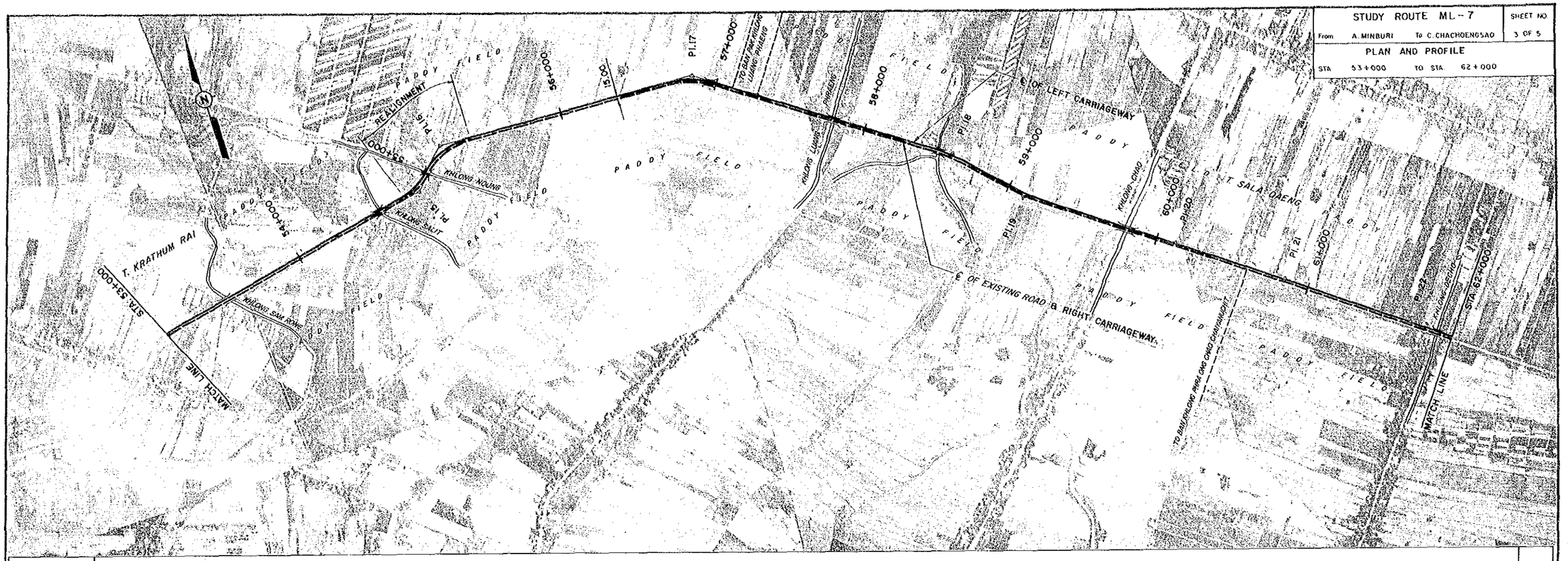


STUDY ROUTE ML-7 | SHEET NO. 3 OF 5

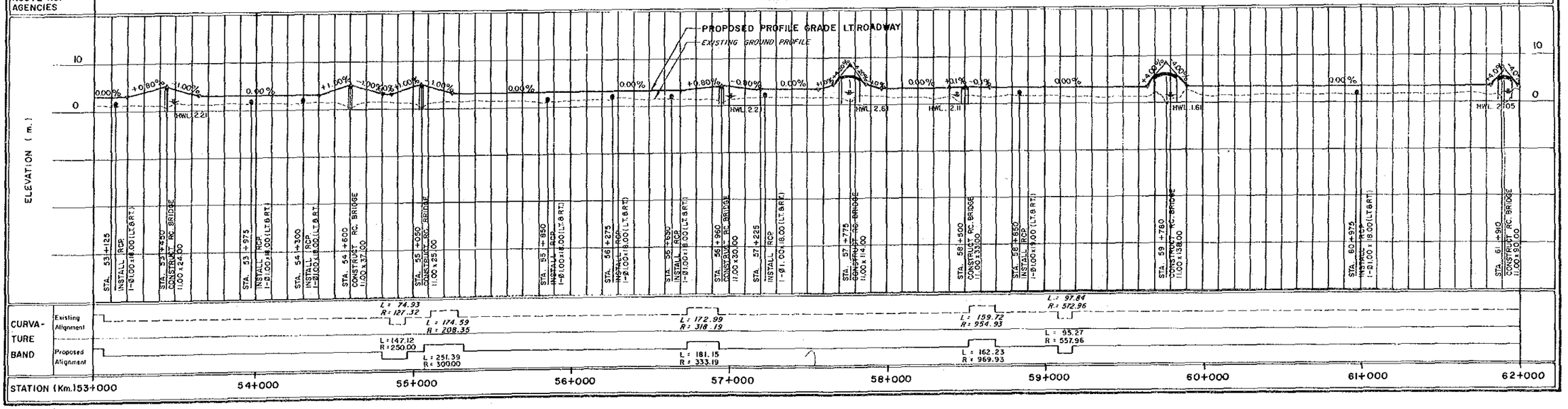
From A. MINBURI To C. CHACHOENGSAO

PLAN AND PROFILE

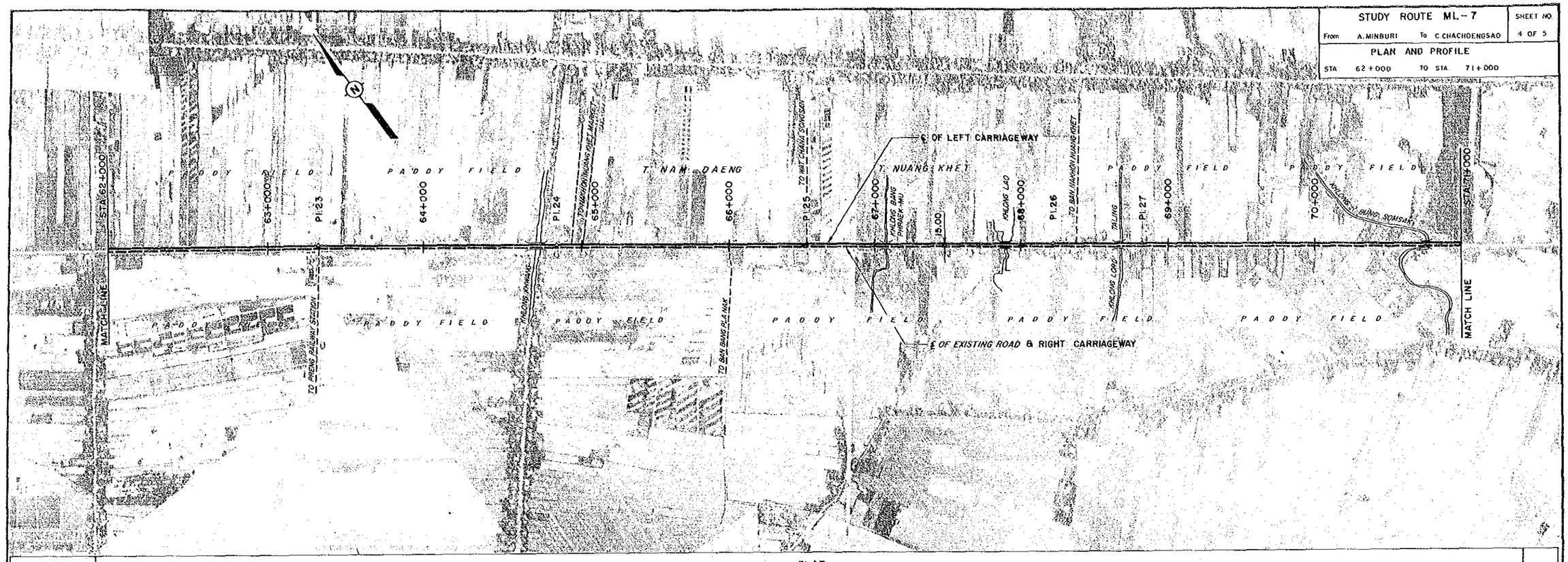
STA. 53+000 TO STA. 62+000



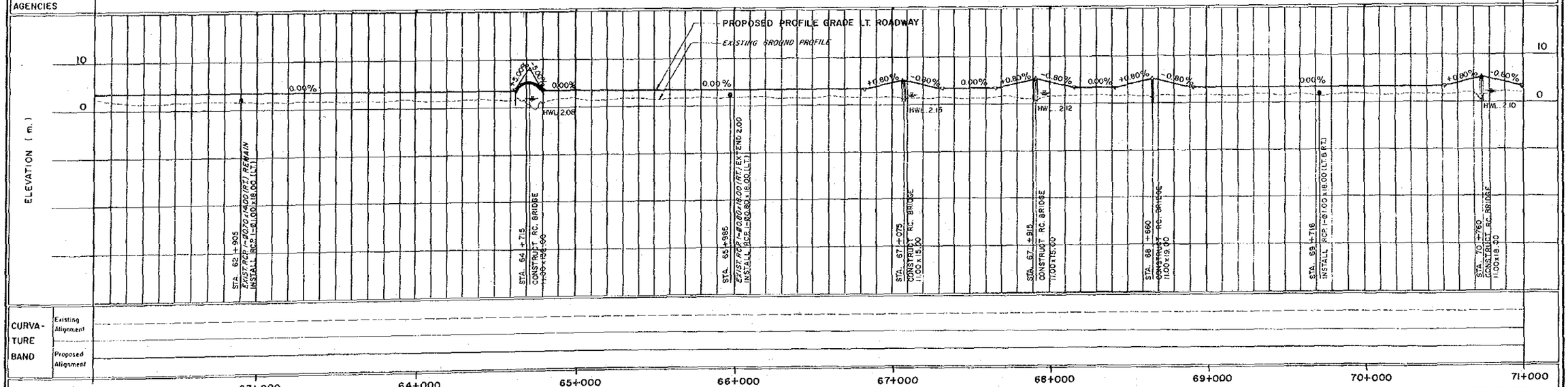
TERRAIN		FLAT
PAVEM'T	Type / Length	AC. PAVEMENT
	Condition	FAIR
FLOODING	Length (Km) / Height (m)	—
RIGHT OF WAY (m.)	LT.	30.00
	RT.	30.00
ROUTE NO. AGENCIES		DOH ROUTE NO. 304



STUDY ROUTE ML-7	SHEET NO.
From A. MINBURI To C. CHACHOENGSAO	4 OF 5
PLAN AND PROFILE	
STA 62+000 TO STA 71+000	



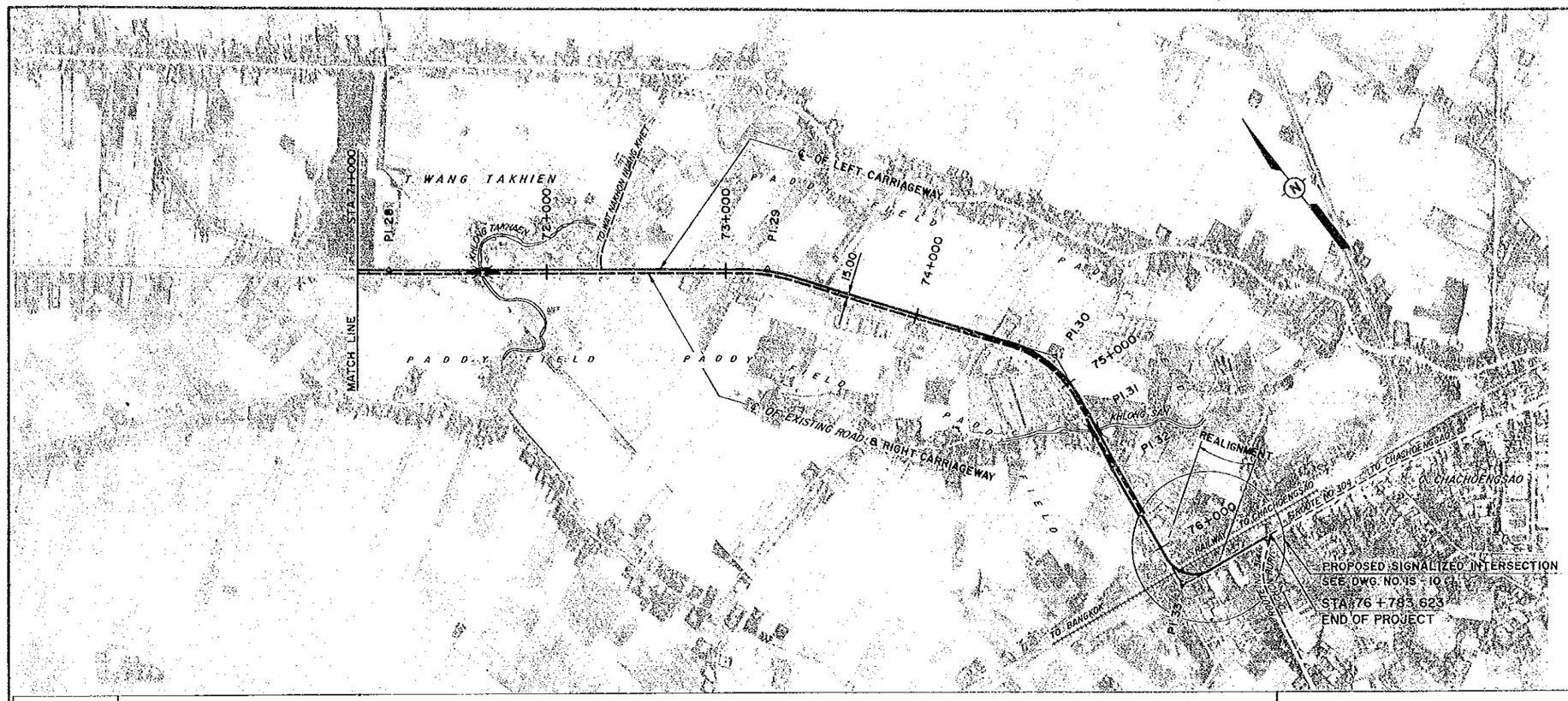
TERRAIN		FLAT
PAVEMENT	Type / Length	AC. PAVEMENT
	Condition	FAIR
FLOODING	Length (Km.) Height (m.)	—
RIGHT OF WAY (m.)	LT.	30.00
	RT.	30.00
ROUTE NO. AGENCIES		DOH ROUTE NO. 304



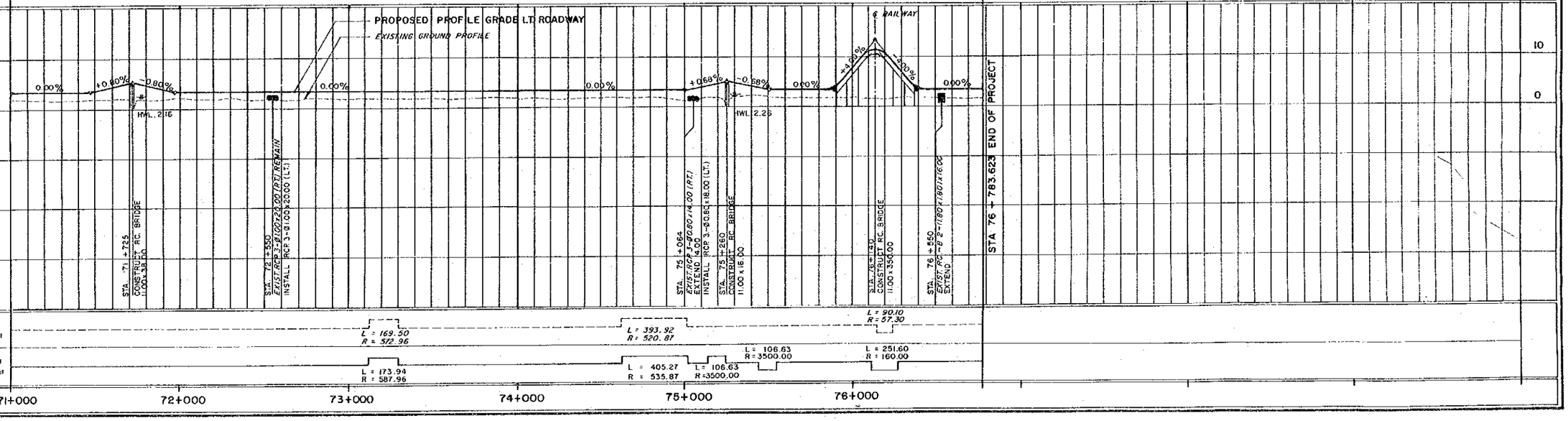
CURVATURE BAND	Existing Alignment	—
	Proposed Alignment	—

STATION (Km.) 62+000 | 63+000 | 64+000 | 65+000 | 66+000 | 67+000 | 68+000 | 69+000 | 70+000 | 71+000

STUDY ROUTE ML-7	SHEET NO
From A.MINBURI To C.CHACHOENGSAO	5 OF 5
PLAN AND PROFILE	
STA 71+000 TO STA. 77+000	

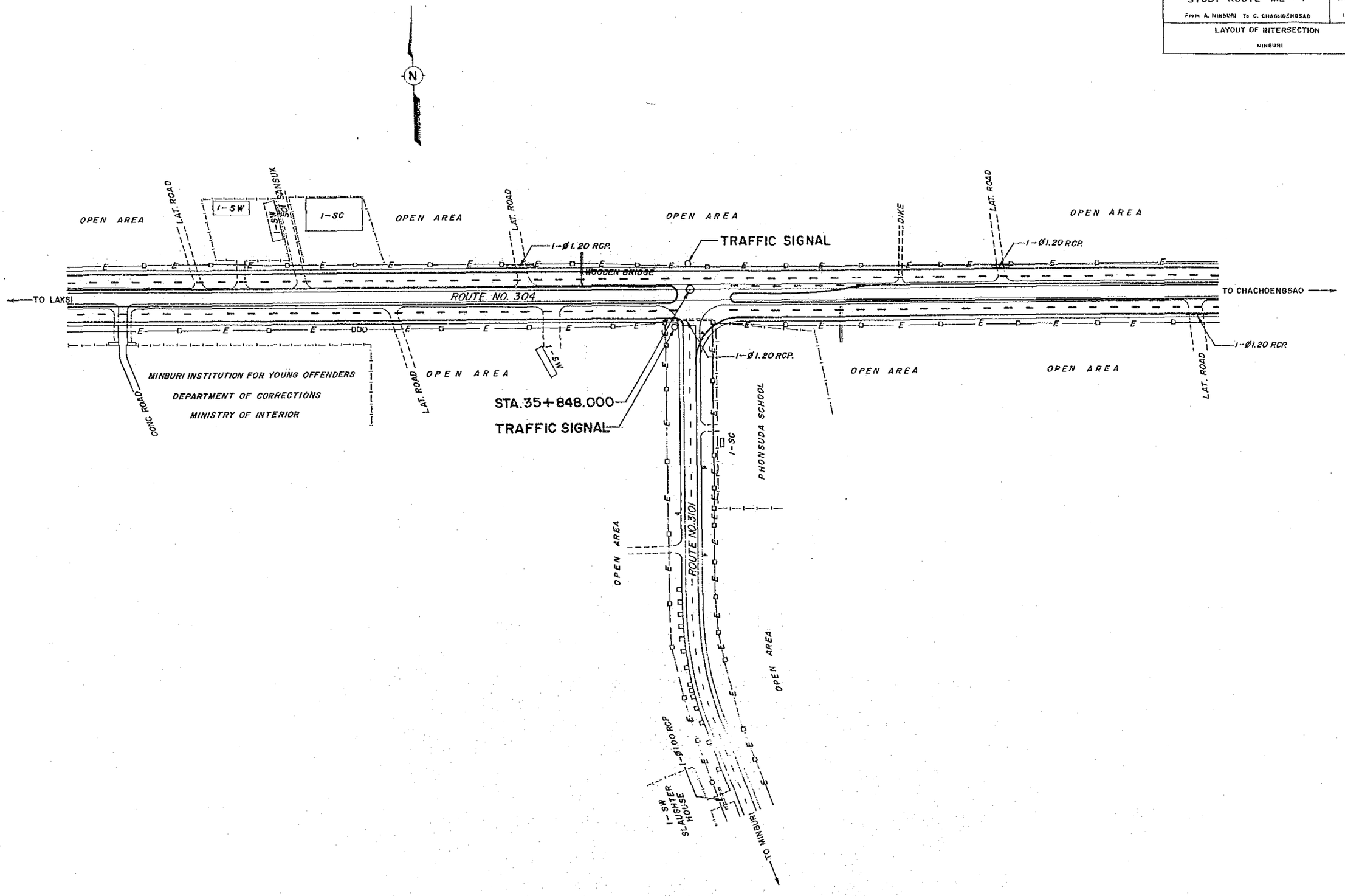


TERRAIN		FLAT
PAVEM'T	Type / Length	AC. PAVEMENT
	Condition	FAIR
FLOODING	Length (Km) / Height (m)	—
RIGHT OF WAY (m.)	LT.	30.00 / VARIES
	RT.	30.00 / VARIES
ROUTE NO. AGENCIES		DOH ROUTE NO. 304



CURVATURE BAND	Existing Alignment	L = 169.50, R = 572.96 / L = 393.92, R = 520.87 / L = 90.10, R = 57.30
	Proposed Alignment	L = 173.94, R = 587.96 / L = 405.27, R = 535.87 / L = 106.63, R = 3500.00 / L = 106.63, R = 3500.00 / L = 251.60, R = 160.00
STATION (Km.)		71+000 72+000 73+000 74+000 75+000 76+000

STUDY ROUTE ML - 7	SHEET NO
From A. MINBURI To C. CHACHOENGSAO	15 - 9
LAYOUT OF INTERSECTION	
MINBURI	

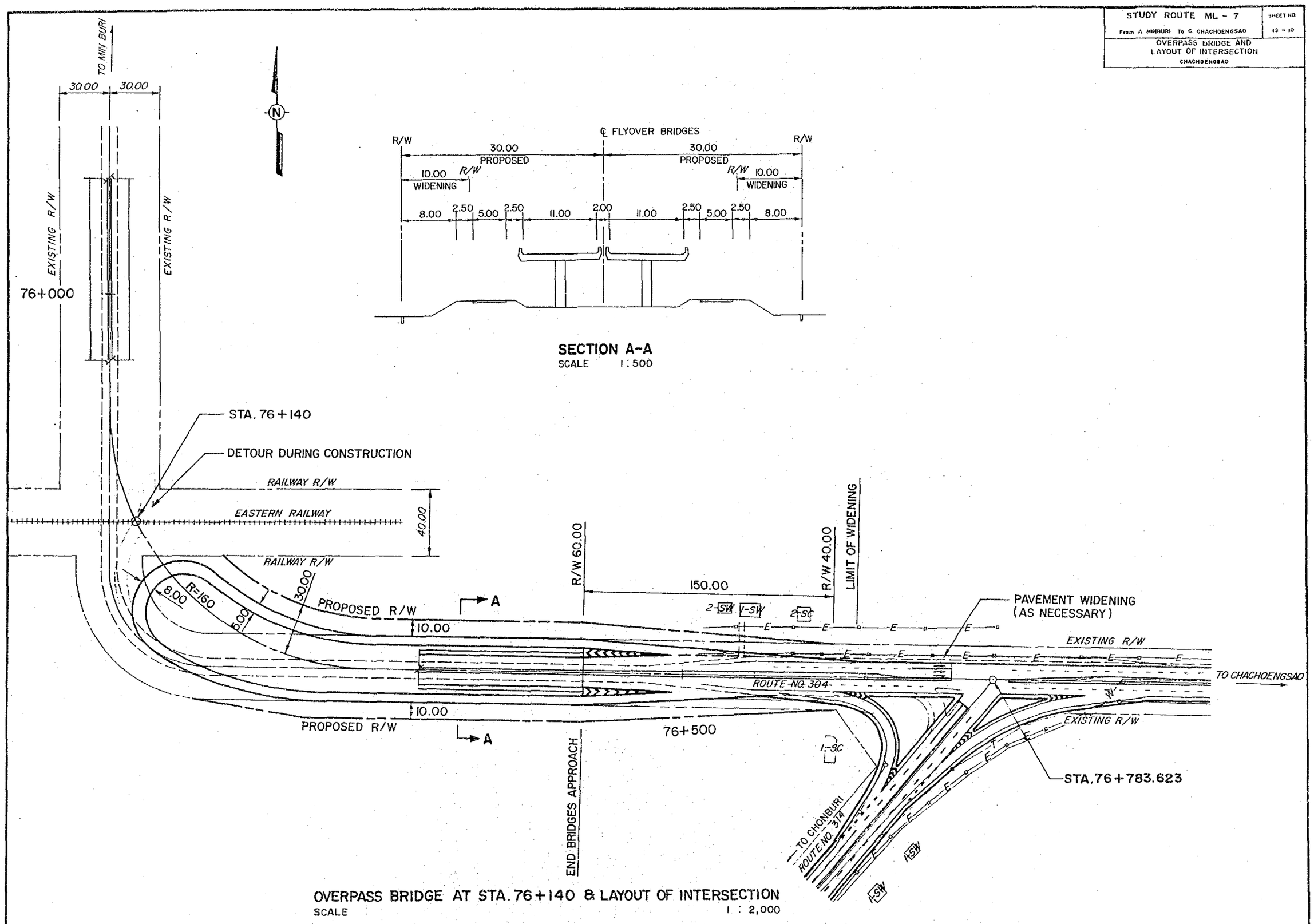


LAYOUT OF INTERSECTION

SCALE 1 : 2,000

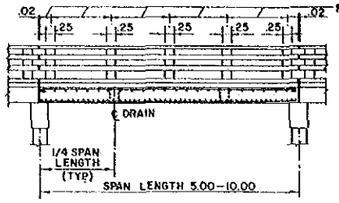
STUDY ROUTE ML - 7	SHEET NO.
From A. MINBURI To C. CHACHOENGSAO	15 - 10
OVERPASS BRIDGE AND LAYOUT OF INTERSECTION CHACHOENGSAO	

SECTION A-A
SCALE 1:500

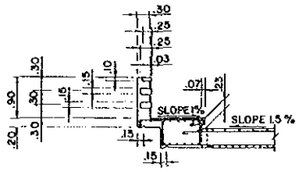


OVERPASS BRIDGE AT STA. 76+140 & LAYOUT OF INTERSECTION
SCALE 1 : 2,000

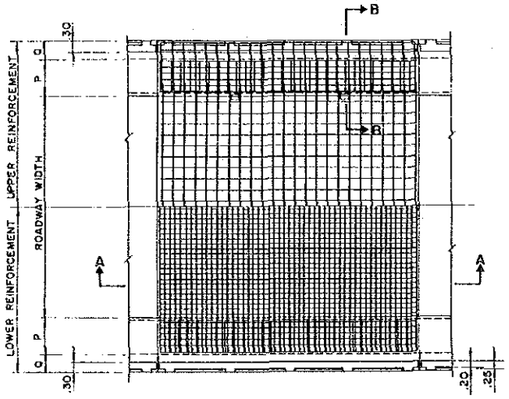
STUDY ROUTE ML-7	DWG NO.
From A. MINBURI To C. CHACHOENGSAO	BR-10
STANDARD BRIDGES DETAILS	
PLAN, ELEVATIONS, SECTION AND TABLE	



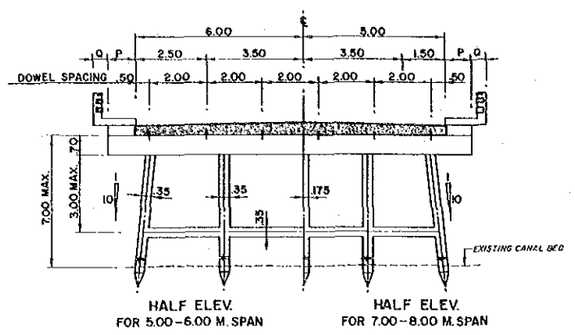
SECTION A-A

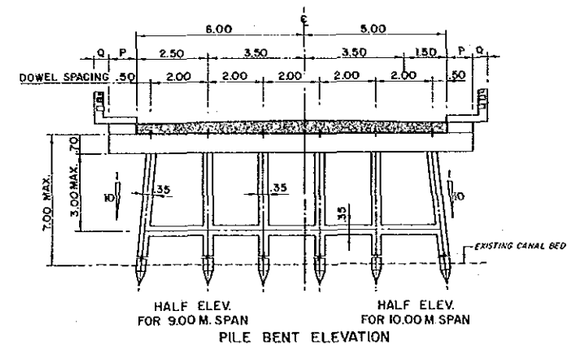


SECTION B-B

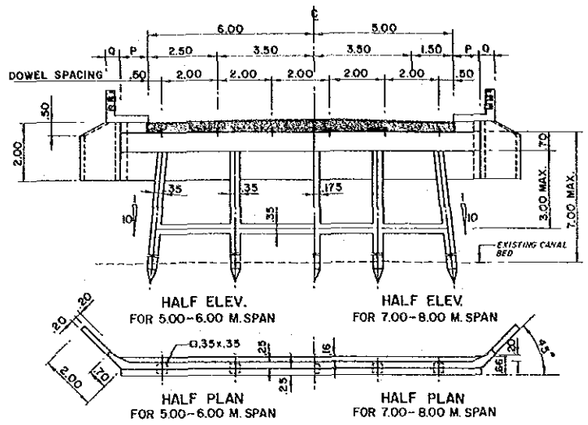


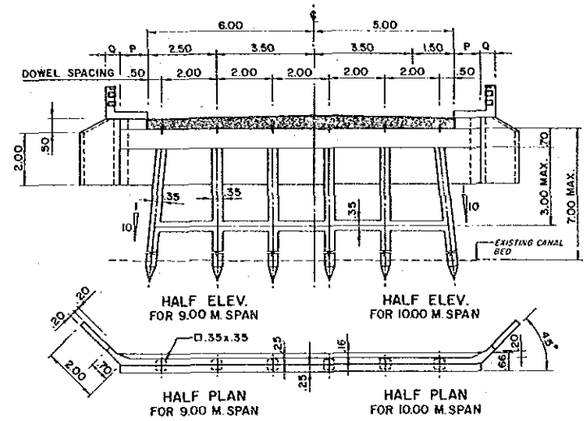
REINFORCEMENT PLAN





PILE BENT ELEVATION





NOTES :

1. DESIGN STRESSES:
   a) CONCRETE , f_c = 70 KSC.
   b) STEEL , f_s = 1,400 KSC. (INTERMEDIATE GRADE)
   f_s = 1,200 KSC. (STRUCTURAL GRADE)
2. CONCRETE SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM^2 FOR .15 x .15 x .15 CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS :

PORTLAND CEMENT, MIN.	350	KG.
SAND	0.43	M^3
CRUSHED ROCK OR GRAVEL	0.86	M^3
CONCRETE SLUMP, MAX	10	CM.

3. CLEAR CONCRETE COVER FOR TOP REINFORCEMENT IN SLAB BRIDGE SHALL BE 3.5 CM. ELSEWHERE OF SLAB BRIDGE AND SIDEWALK SHALL BE 2.5 CM.
4. ALL CONCRETE EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFER UNLESS OTHERWISE INDICATED.
5. REBARS #4 OR LARGER SHALL BE INTERMEDIATE GRADE DEFORMED BARS, OTHERS SHALL BE STRUCTURAL GRADE PLAIN BARS UNLESS OTHERWISE INDICATED.
6. LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
7. LAP LENGTH SHALL NOT BE LESS THAN 40 DIAMETERS OF BIGGER BAR IN CASE OF PLAIN BARS AND 24 DIAMETERS OF BIGGER BAR FOR DEFORMED BARS.
8. IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMED TO AASHO SPECIFICATIONS SHALL BE USED AND ADDITIONAL CONCRETE COVER OF 2.5 CM. FROM NORMAL CASE ALL AROUND SHALL BE PROVIDED WITHOUT ALTERING THE LOCATIONS OF REBARS.
9. ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
10. PAINTING SHALL BE PROVIDED ON ALL SURFACES AT BRIDGE ENDS WHICH EXPOSED TO TRAFFIC. WHITE AND BLACK COLOUR SHALL BE PAINTED ALTERNATELY. WHITE COLOUR SHALL BE LIGHT REFLECTED TYPE.
11. ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
12. BAR MARK S101 MAY BE TAKEN OUT ONE BAR ON EACH SIDE OF THE BRIDGE WHEREVER THEY PASS THROUGH DRAIN PIPES. IF THE LOCATIONS OF THESE BARS ARE NEAR V-DRIP SUCH THAT CONCRETE COVER IS NOT ADEQUATE, THEY SHALL BE PLACED ON TOP OF ST 101. OTHER BARS WHICH PASS THROUGH DRAIN PIPES SHALL BE BENT ALONG THE PIPES.
13. ALL PIERS WHICH DO NOT HAVE LOG PROTECTION WALLS SHALL BE HAUNCH UNDER THE TOP CROSS BRACING.
14. IF ANY NOTES ON THE DRAWINGS OF PIERS CONTRADICT THE NOTES ON THIS DRAWING, THEY WILL BE SUPERSEDED BY THESE NOTES.
15. IN CASE OF 0.50 M. SIDEWALK, P AND R SHALL BE 0.50 M. AND REBARS IN EDGEBEAM SHALL BE THE SAME AS SHOWN FOR 0.40 M. SIDEWALK EXCEPT FOR 10.0 M. SPAN WHICH BAR MARKS SW101 AND T104 ARE 12 BARS.
16. THIS DRAWING IS ADAPTED FROM DOH DWG NO 3 AD5-106-14/1A IN CASE OF ANY DISCREPANCY BETWEEN SUCH DRAWINGS ARISES, THE DOH. STANDARD DRAWING WILL PREVAIL UNDER THE APPROVAL OF THE ENGINEER.

TABLE OF SLAB THICKNESS

SPAN	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	15.00
SLAB THICKNESS	0.36	0.39	0.43	0.47	0.53	0.59	0.65	0.71	0.82

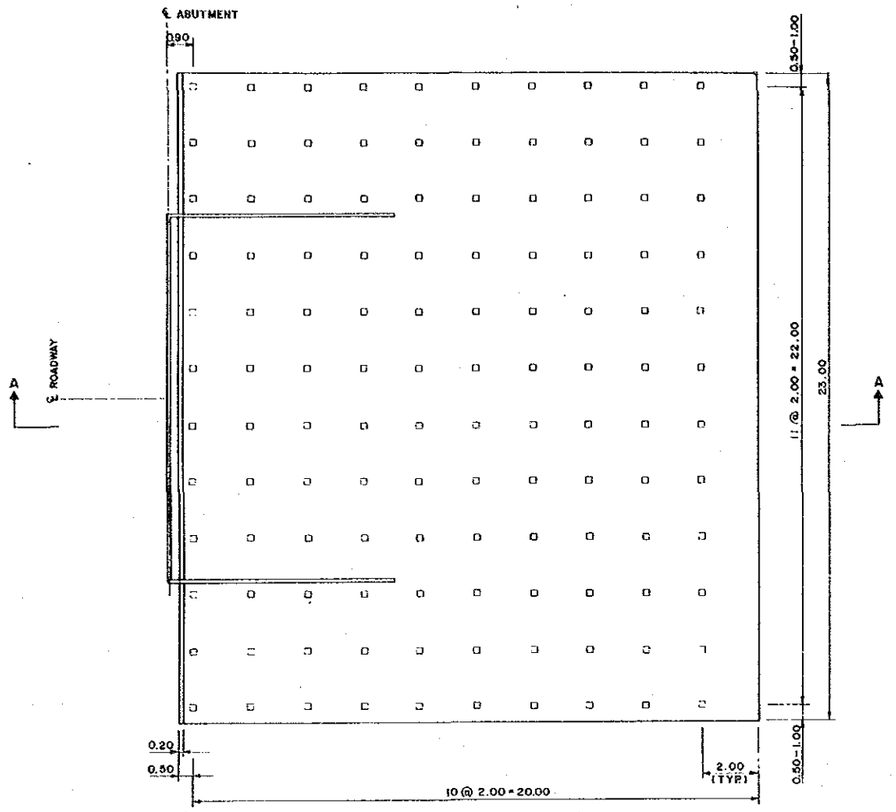
PC.- GIRDER

	STATION	SPAN (m)	NUMBER OF SPAN	LENGTH (m.)	REMARK
ML-7	57+775			114	
	59+780			138	
	64+715			132	
	76+060			350	

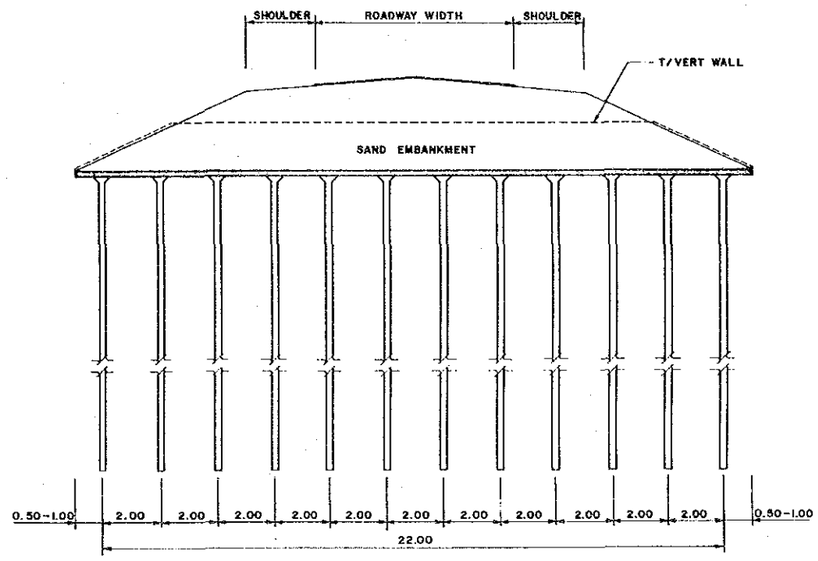
SUMMARY OF BRIDGE

	STATION	SPAN (m)	NUMBER OF SPAN	LENGTH (m)	REMARK
ROAD ML-7	36+802	10.0	10	100.0	1-WAY
DISTRICT	38+658	8.0	2	16.0	1-WAY
CHACHOENGSAO	39+910	8.0	3	24.0	1-WAY
	40+385	15.0	1	15.0	1-WAY
	41+310	10.0	4	40.0	1-WAY
	42+365	12.5	2	25.0	1-WAY
	43+285	15.0	1	15.0	1-WAY
	44+170	7.0	5	35.0	1-WAY
	45+475	7.3	3	22.0	1-WAY
	46+285	8.0	3	24.0	1-WAY
	48+020	9.0	5	45.0	1-WAY
	48+735	7.0	3	21.0	1-WAY
	49+280	10.0	1	10.0	1-WAY
	50+285	8.0	3	24.0	1-WAY
	51+705	7.0	3	21.0	1-WAY
	52+675	7.0	4	28.0	1-WAY
	53+450	8.0	3	24.0	1-WAY
	54+600	9.25	4	37.0	1-WAY
	55+050	12.5	2	25.0	1-WAY
	56+960	10.0	3	30.0	1-WAY
	58+500	11.0	3	33.0	1-WAY
	61+910	10.0	9	90.0	1-WAY
	67+075	15.0	1	15.0	1-WAY
	67+915	15.0	1	15.0	1-WAY
	68+660	9.5	2	19.0	1-WAY
	70+760	9.0	2	18.0	1-WAY
	71+725	9.5	4	38.0	1-WAY
	75+260	8.0	2	16.0	1-WAY
	TOTAL		89	825.0	

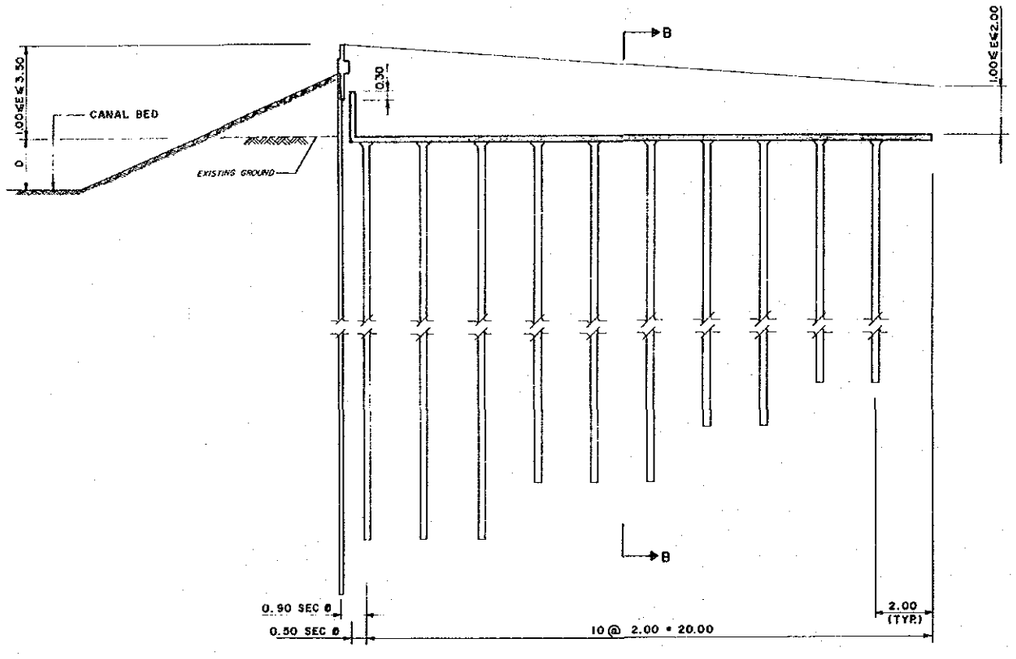
STUDY ROUTE ML-7	DWG. NO.
From A. MINBURI To C. CHACHOENGSAO	BU-2
BEARING UNIT	
PILING PLAN AND SECTIONS	



PILING PLAN FOR NON-SKEW BRIDGE
SCALE 1 : 100



SECTION B-B
SCALE 1 : 100



SECTION A-A
SCALE 1 : 100

PROJECT IM - 23

Changwat : Ayutthaya

J. R. 32 - J. R. 3022

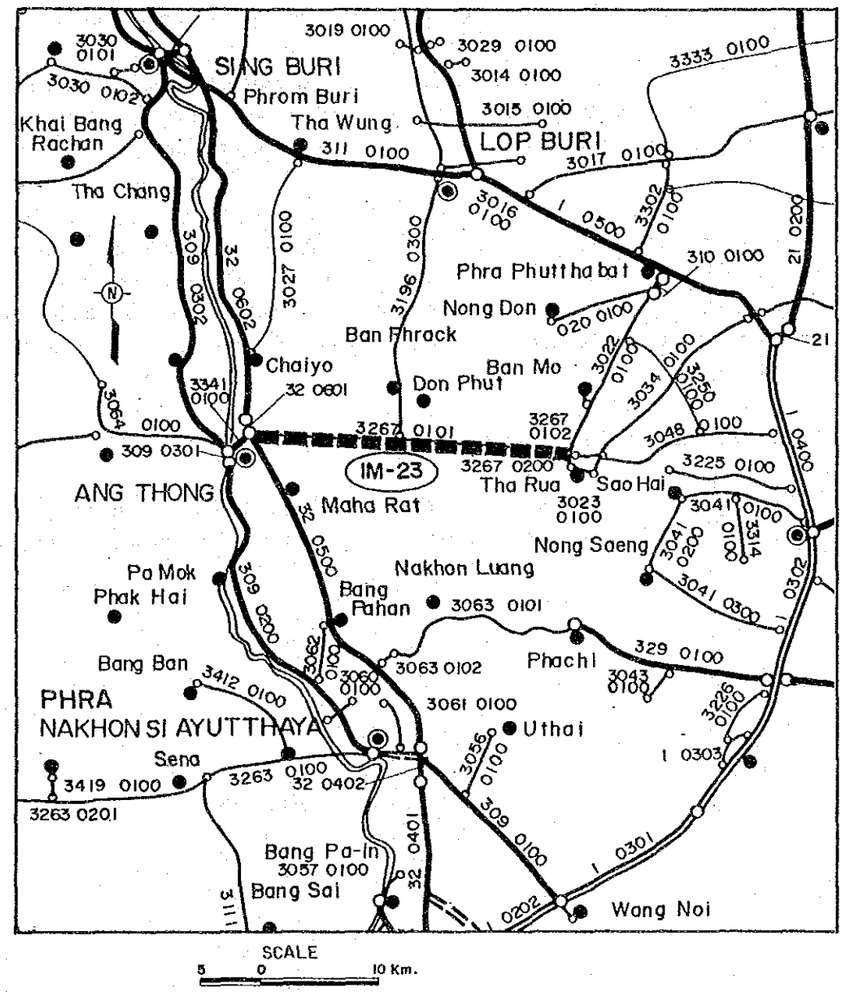
Length : 26.87 km

SUMMARY

PROJECT IM-23

ITEM	DESCRIPTION
Changwat	Ayutthaya
Origin	J.R. 32
Destination	A. Tha Rua – J.R. 3022
Route No.	Rt. 3267
Project Length	26.87 km
Standard	
- Existing	F4
- Proposed	F1
Traffic	
- Base	1,960 ~ 2,651
- 2000	3,800 ~ 5,600
- 2008	5,400 ~ 7,900
Pavement Type	
- Existing	AC pavement
- Proposed	PCC pavement (23 cm thick concrete slab)
Construction Costs	
- Financial	164,043,000 Baht
- Economic	147,322,000 Baht
Economic Evaluation	
- IRR	21.5%
- B/C	1.95

LOCATION OF PROJECT ROUTE



1. GENERAL

Project IM-23 is the upgrading of existing Route 3267 in Changwat Ang Thong and Changwat Ayutthaya.

It originates at the junction with Route 32 in Ban Nam Phung and runs eastward to end at the junction with Route 3022 in Ban Kaok Manao with a total length of 26.87 km.

DOH previously classified this road among those to be rehabilitated but later decided to upgrade it from the existing F4 to F1 including work to raise the embankment. The reason for this decision was that this road is the main road connecting the Changwats of Ang Thong and Saraburi.

The terrain is flat, and the area along the road is fully cultivated with paddy. There is a cement production plant of Siam Cement Company in Amphoe Tha Rua near the end point of this road and heavy vehicle traffic on this road is heavy. The existing road contains several flood-prone sections and soil conditions are not favorable. Consequently, the existing road condition is often poor.

There are nine permanent bridges with a total length of 886 m.

The alignment of the proposed road follows the existing road, and cement concrete pavement with a widened width is adopted due to the expected high level of heavy vehicle traffic.

2. TRAFFIC FORECAST

Base Traffic Volume

(Unit:Vehicles/Day)

Project Code	Section	Year	Traffic Volume MC	PC	LB	HB	LT	MT	HT	ADT
IM-23	3267- 5KM	1987	464	504	92	146	980	395	534	2651
	3267-20KM	1988	414	264	89	226	769	175	437	1960
	Average	-	439	384	91	186	875	285	486	2306

Traffic Growth Rate

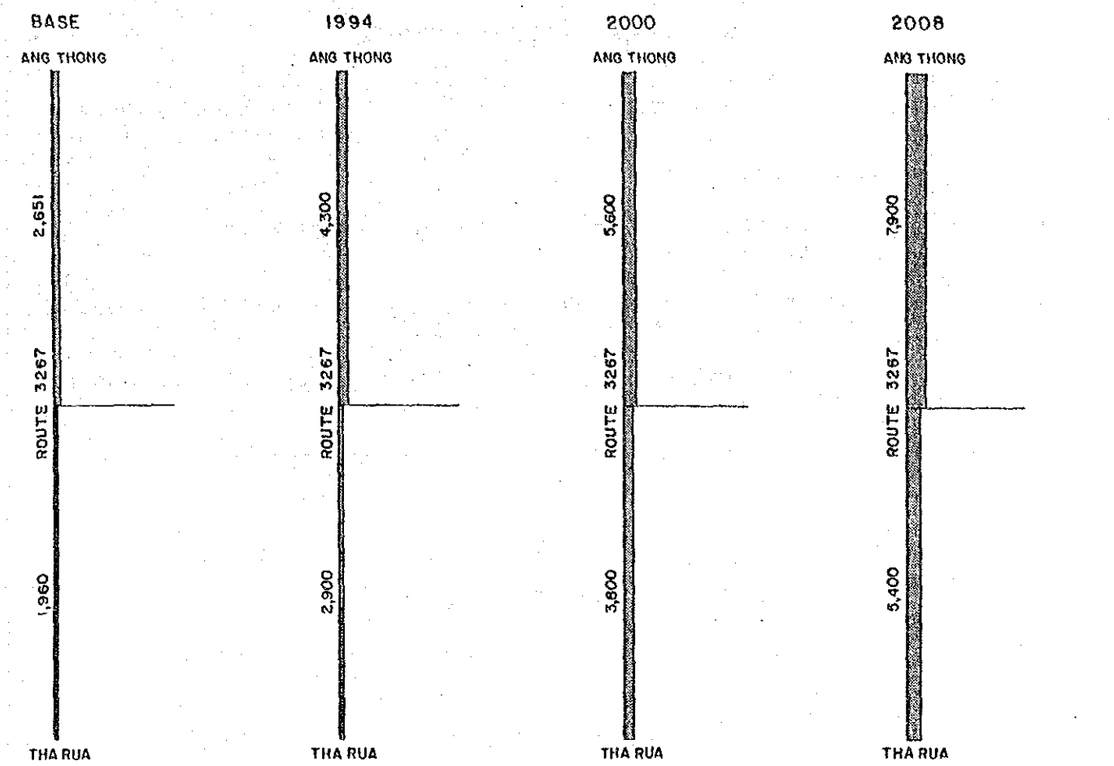
(Unit:Percent)

Project	Section	Period	MC	PC	LB	HB	LT	MT	HT
IM-23	3267- 5KM	-1993	7.61	9.45	5.41	7.48	6.41	7.31	8.16
	3267-20KM	1994 -2000	4.44	4.98	5.10	4.93	4.64	4.92	3.39
		2000 -2008	4.41	4.56	5.10	4.88	4.44	4.51	4.01

Future Traffic Volume

(Unit:Vehicles/Day)

Project	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
IM-23	3267- 5KM	1994	752	910	132	236	1489	633	884	4284
		2000	976	1219	179	315	1955	844	1080	5592
		2008	1379	1741	266	461	2768	1201	1480	7917
	3267-20KM	1994	624	436	122	340	1098	261	669	2926
		2000	809	583	164	454	1441	348	817	3807
		2008	1143	833	244	665	2040	495	1119	5396
	Average	1994	688	673	127	288	1294	447	777	3605
		2000	893	901	172	385	1698	596	949	4700
		2008	1261	1287	255	563	2404	848	1300	6657



Project IM-23

UNIT : VEHICLE / DAY

3. ENGINEERING

3.1 Materials and Boring Results

(1) Materials

DESCRIPTION OF MATERIAL SOURCES

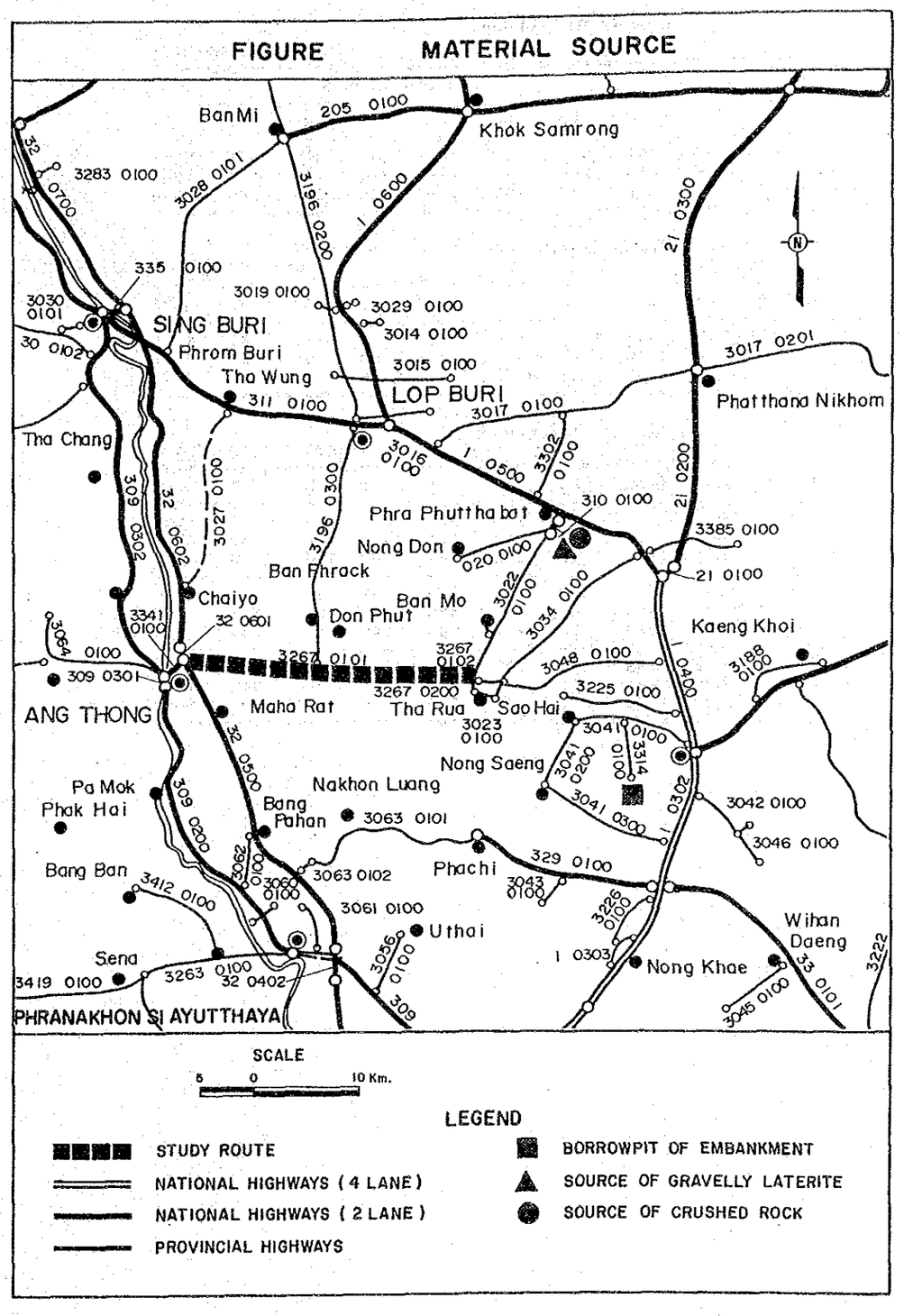
Material	Source	Description of Sample	Estimated Quantity cu.m.	Hauling Distance (km)
Soil	Route 3041 Km 8+000 Right Side 1.0 Km	Silty Sand	Plentiful	27.00
Laterite	Route 3022 Km 18+700 Right Side 3.4 Km	Gravelly Laterite	60,000	35.00
Crushed Rock	Route 1 Km 129+500 Both Sides	Lime Stone	Plentiful	35.00

RESULTS OF LABOTATORY TESTS

	Sieve Analysis % Passing								Plasticity		Comp. DH-T Stand. Opt.		Lab. C.B.R. CBR	Swell
	50.0	25.0	19.0	9.5	#4	#10	#40	#200	LL	PI	95%	gm/cc	95%	%
Soil				100	97.0	89.1	67.6	44.4	27	11.1	10.6	1.970	6.2	-
Laterite	100	97.5	90.1	62.1	39.4	27.4	17.3	7.8	29.8	9.6	-	1.957	51	-
Crushed Rock	-	-	-	-	-	-	-	-	-	-	-	-	>80	-

Note: Abrasion test result of Crushed Rock 25.4 %

FIGURE MATERIAL SOURCE



3.2 Preliminary Design

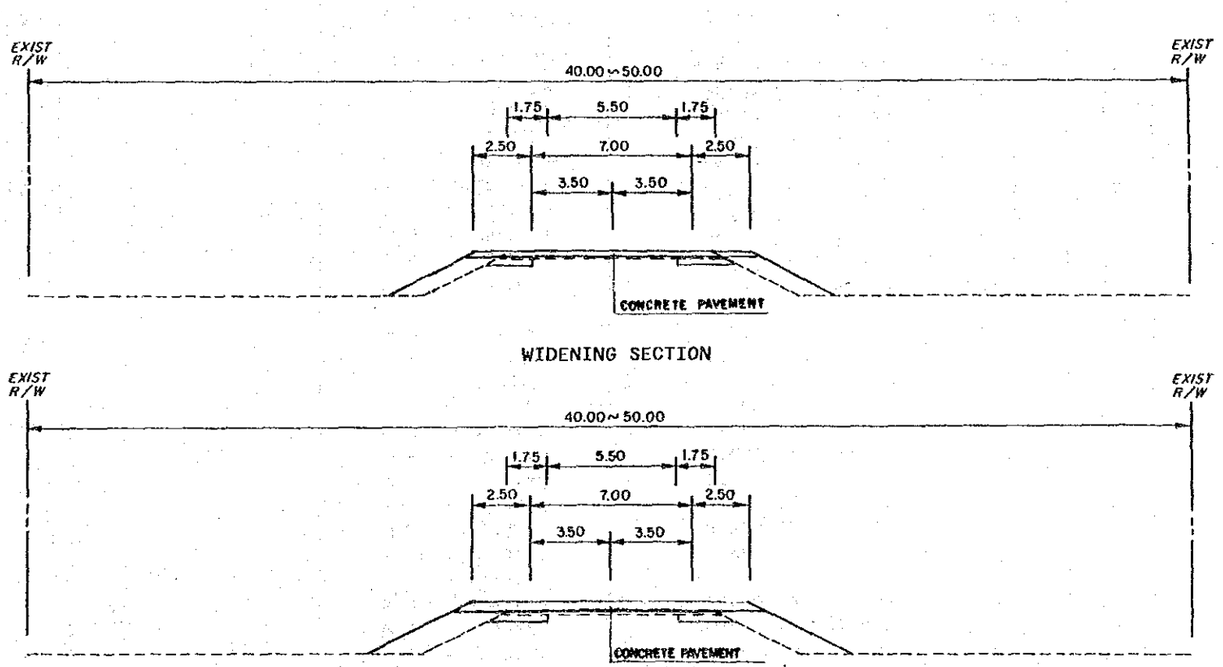
(1) Geometric Design Criteria

Design Standard : F1

Design Speed : 70–90 km/h

Geometric Design Criteria

Description	Design Speed (km/h)		
	90	80	70
Minimum Radius & Curvature (m)	280	210	160
Minimum Stopping Sight Distance (m)	140	115	90
Maximum Gradient (%)	7	8	9



TYPICAL CROSS SECTION (ROUTE IM-23)

(3) Culverts

No.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
1	0+020*	RCP 1 - Ø0.60X18	EXTEND = 4 M
2	0+191*	RCP 1 - Ø1.00X15	EXTEND = 5 M
3	0+651*	RCP 1 - Ø1.00X17	EXTEND = 3 M
4	0+988	RCP 1 - Ø1.00X16	EXTEND = 8 M
5	1+251	RCP 1 - Ø1.00X14	EXTEND = 8 M
6	1+410	RCP 1 - Ø0.60X13	EXTEND = 9 M
7	1+629	RCP 1 - Ø0.60X15	EXTEND = 3 M
8	1+732	RCP 1 - Ø0.60X14	EXTEND = 6 M
9	1+845	BOX 2 - 4.00X3.50X14	REMAIN
10	1+939	RCP 1 - Ø0.80X14	EXTEND = 6 M
11	2+460*	RCP 1 - Ø1.00X17	EXTEND = 3 M
12	3+157*	BOX 3 - 2.10X2.10X17	REMAIN
13	3+236*	RCP 1 - Ø0.60X24	REMAIN
14	3+612	RCP 1 - Ø1.00X23	REMAIN
15	4+809	RCP 1 - Ø1.00X24	EXTEND = 2 M
16	5+028	RCP 1 - Ø1.00X31	EXTEND = 5 M
17	5+485	BOX 3 - 3.00X3.50X17	REMAIN
18	5+637*	RCP 1 - Ø0.60X24	EXTEND = 4 M
19	5+838	RCP 3 - Ø1.00X30	REMAIN
20	6+336	RCP 3 - Ø1.00X22	EXTEND = 6 M
21	6+811	RCP 3 - Ø1.00X23	EXTEND = 5 M
22	7+242*	RCP 1 - Ø0.60X23	REMAIN
23	7+361	RCP 3 - Ø1.00X23	EXTEND = 5 M
24	7+742*	RCP 1 - Ø0.60X25	REMAIN
25	7+850	RCP 3 - Ø1.00X22	EXTEND = 5 M
26	8+142*	RCP 1 - Ø0.60X30	REMAIN
27	8+287	RCP 3 - Ø1.00X30	EXTEND = 4 M
28	8+452*	RCP 1 - Ø0.60X25	EXTEND = 4 M
29	8+758	RCP 3 - Ø1.00X24	EXTEND = 4 M
30	9+308	RCP 3 - Ø1.00X32	EXTEND = 6 M
31	9+561	RCP 1 - Ø1.00X28	EXTEND = 4 M
32	9+639	BOX 2 - 4.20X3.50X15.30	REMAIN
33	10+151	BOX 3 - 3.50X3.00X17.30	REMAIN
34	10+217*	RCP 1 - Ø1.00X21	EXTEND = 5 M
35	10+386	RCP 2 - Ø1.00X20	EXTEND = 8 M
36	10+700	RCP 1 - Ø1.00X20	EXTEND = 8 M
37	10+833	RCP 1 - Ø0.60X26	EXTEND = 4 M
38	11+207	RCP 1 - Ø1.00X20	EXTEND = 8 M
39	11+311	RCP 1 - Ø0.60X18	EXTEND = 8 M
40	11+797	RCP 1 - Ø1.00X17	EXTEND = 11 M
41	12+564	RCP 1 - Ø1.00X23	EXTEND = 6 M
42	12+840	RCP 2 - Ø1.00X24	EXTEND = 5 M
43	13+525	RCP 1 - Ø1.00X31	EXTEND = 5 M
44	13+809	RCP 2 - Ø1.00X23	EXTEND = 5 M
45	14+023	RCP 1 - Ø1.00X20	EXTEND = 6 M
46	14+090	RCP 1 - Ø1.00X23	EXTEND = 4 M
47	14+416	RCP 2 - Ø1.00X22	EXTEND = 5 M
48	14+846*	RCP 1 - Ø0.60X19	EXTEND = 3 M
49	15+443	RCP 2 - Ø1.00X21	EXTEND = 4 M
50	15+582*	RCP 1 - Ø1.00X17	EXTEND = 4 M
51	15+967*	RCP 1 - Ø0.80X20	EXTEND = 6 M
52	16+692	RCP 1 - Ø1.00X17	EXTEND = 4 M
53	17+195	BOX 2 - 2.50X2.50X58	REMAIN
54	18+170*	RCP 2 - Ø0.60X17	EXTEND = 4 M
55	18+297*	RCP 1 - Ø1.00X17	EXTEND = 4 M
56	18+881	RCP 1 - Ø1.00X13	EXTEND = 9 M
57	19+450	BOX 2 - 2.50X2.50X45	REMAIN
58	19+934	RCP 1 - Ø0.60X15	EXTEND = 4 M
59	20+404	RCP 1 - Ø0.60X16	EXTEND = 4 M
60	20+779	RCP 1 - Ø0.60X16	EXTEND = 4 M
61	20+970*	RCP 1 - Ø0.60X14	EXTEND = 4 M
62	21+325*	RCP 2 - Ø1.00X16	EXTEND = 4 M
63	21+506	RCP 1 - Ø0.60X18	EXTEND = 5 M
64	22+126	RCP 1 - Ø0.60X17	EXTEND = 5 M
65	22+816	RCP 1 - Ø0.60X20	EXTEND = 5 M
66	23+407*	RCP 1 - Ø0.60X22	EXTEND = 5 M
67	23+534	RCP 1 - Ø0.60X14	EXTEND = 4 M
68	23+958	RCP 1 - Ø0.60X21	EXTEND = 5 M
69	24+135*	RCP 1 - Ø0.60X16	EXTEND = 4 M
70	24+635*	RCP 1 - Ø1.00X17	EXTEND = 4 M
71	24+977	RCP 1 - Ø1.00X17	EXTEND = 4 M
72	25+344	RCP 1 - Ø1.00X16	EXTEND = 4 M
73	25+760	RCP 1 - Ø0.00X15	EXTEND = 4 M
74	26+537	RCP 1 - Ø1.00X15	EXTEND = 4 M
75	26+652	RCP 1 - Ø0.60X16	EXTEND = 4 M
76	26+838	RCP 1 - Ø0.60X15	EXTEND = 4 M

(4) Bridges

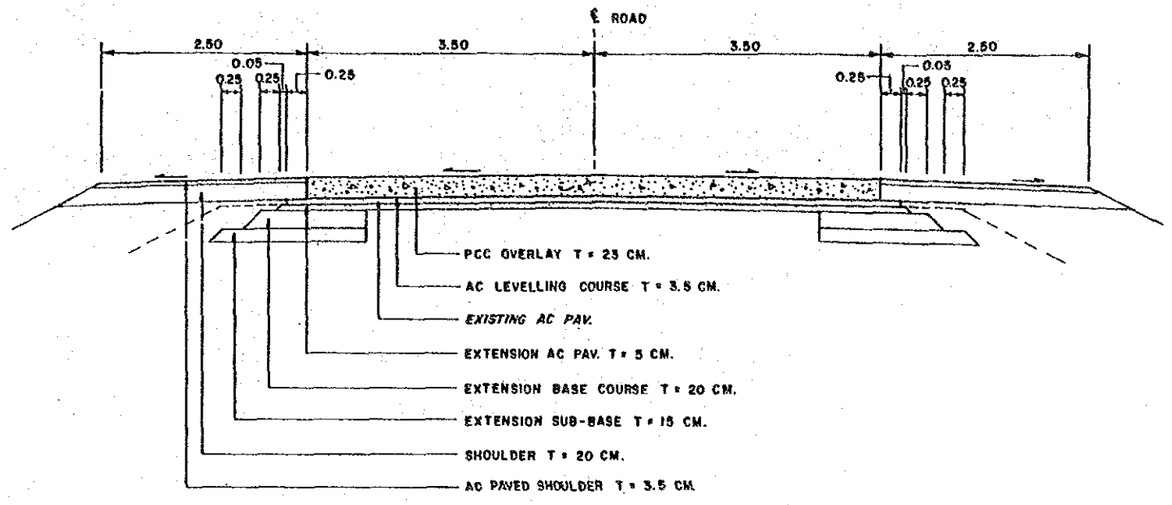
NO.	STATION	EXISTING RC BRIDGE	PROPOSED RC BRIDGE
1	2+785	8.00x120.00	-
2	3+873	8.00x 40.00	-
3	4+250	8.00x120.00	-
4	4+426	8.00x 76.00	-
5	5+323	8.00x190.00	-
6	9+973	8.00x 54.00	-
7	11+261	8.00x 16.00	-
8	12+144	8.00x 60.00	-
9	26+263	8.00x210.00	-

Note: All existing bridges are to be removed.

(2) Pavement Design

Initial Overlay for Existing Lane

Type of Overlay	Design CBR	Cumulative of ESA W18 x 10 (20 years)	Required D or SN	FRL * Dxeff or SNxeff	Overlay Dol or SNol	Thickness (cm)
PCC	6.0	10,336	D = 23 cm	-	D=23 cm	Slab 23 Levelling 3.5



(1) CONSTRUCTION QUANTITIES AND COSTS

(Project IM-23 Length = 26.87 km)

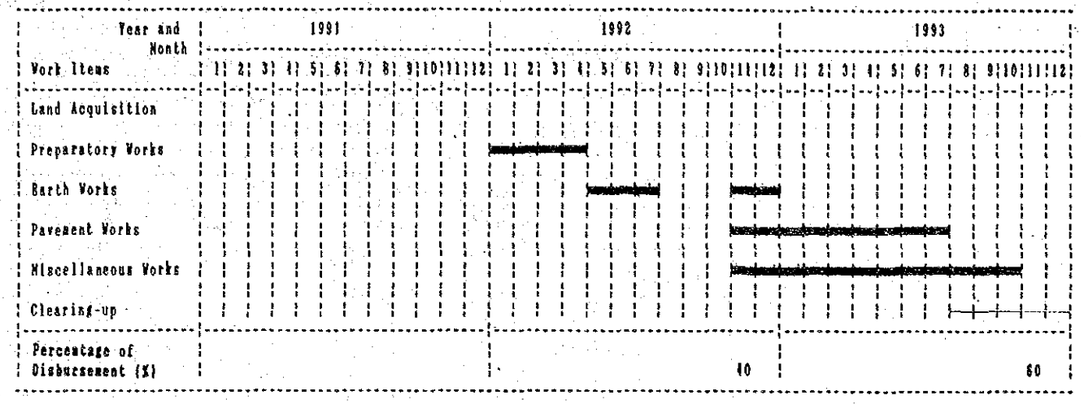
Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost %	Economic Cost 1000 Baht	Residual Value %	Residual Value 1000 Baht
EARTHWORK								
Clearing & Grubbing	ha	10,000	52	520	85	442	90	398
Roadway Excavation (Unclassified)	m^3	18	-	-	84	-	90	-
Roadway Excavation (Classified)	m^3	38	3,200	122	84	102	90	92
Embankment (Common)	m^3	33	-	-	86	-	90	-
Embankment (Borrow)	m^3	110	120,500	13,255	86	11,399	90	10,259
Removal of Existing Structure	each	60,000	-	-	84	-	90	-
Sub Total				13,897		11,943		10,749
SUBBASE and BASE COURSES								
Subbase	m^3	168	12,900	2,167	83	1,799	50	899
Aggregate base	m^3	308	15,050	4,635	84	3,894	50	1,947
Shoulder (Soil Aggregate)	m^3	196	30,100	5,900	83	4,897	50	2,448
Sub Total				12,702		10,589		5,294
SURFACE COURSES								
Asphaltic Prime Coat	m^2	11	53,800	592	93	550	50	275
Asphaltic Tack Coat	m^2	5	161,250	806	93	750	50	375
Double Bituminous Surface Treatment	m^2	32	-	-	91	-	50	-
Asphalt Concrete Surfacing	ton	907	32,800	29,750	90	26,775	50	13,387
Portland Cement Concrete Pavement	m^3	1,630	41,900	68,297	90	61,467	50	30,734
Sub Total				99,445		89,542		44,771
STRUCTURES (Equivalent)								
RC Pipe Culvert (D=1.00 m)	m	1,800	367	661	88	581	50	291
RC Box Culvert (2-2.40x 2.40 m)	m	10,000	-	-	90	-	50	-
RC Bridge (W=11.0 m)	m	63,000	-	-	87	-	50	-
PC Bridge (W=11.0 m)	m	90,000	-	-	87	-	50	-
Bearing Unit	m^2	2,200	-	-	87	-	50	-
Sub Total				661		581		291
Total (a)				126,704		112,656		61,105
Miscellaneous Work ((a) x 7%)	ls			8,869	87	7,716	0	0
CONTRACT AMOUNT (b)				135,573		120,372		61,105
PHYSICAL CONTINGENCIES ((b) x 10%) (c)	ls			13,557		12,037		6,111
ENGINEERING AND SUPERVISION (((b) + (c)) x 10%) (d)	ls			14,913	100	14,913	0	0
LAND ACQUISITION (Average) (e)	ha	-	-	-	100	-	100	-
PROJECT COST ((b) + (c) + (d) + (e))				164,043		147,322		67,216
AVERAGE COST PER KM				6,105				

(2) Road Maintenance Costs

(Unit : Baht/Year)

	Without Project	With Project
Existing	471,273	-
1994	518,510	271,790
2008	605,918	347,805

3.4 Construction Schedule



4. BENEFITS

ROAD CONDITIONS

(unit : km)

Section	Without Project											With Project			
		Paved				Laterite									
	Road Length	Good	Good /Fair	Fair	Fair /Poor	Poor	Good	Fair	Poor	No. of Narrow Bridge	No. of Wooden Bridge	Road Length	Paved Good	No. of Narrow Bridge	No. of Wooden Bridge
3267-5km	10.1	-	-	-	-	10.1	-	-	-	-	-	10.1	10.1	-	-
3267-20km	15.8	-	-	-	7.0	8.8	-	-	-	-	-	15.8	15.8	-	-

BENEFITS

(1000 BAHT)

Year	VOC Savings			Time Savings			Total Savings		
	Nomal Traffic	Induced Traffic	Total	Nomal Traffic	Induced Traffic	Total	Nomal Traffic	Induced Traffic	Total
1994	27,961	-	27,961	7,737	-	7,737	35,698	-	35,698
2000	36,197	-	36,197	10,196	-	10,196	46,393	-	46,393
2008	51,125	-	51,125	14,673	-	14,673	65,798	-	65,798

IM-23

COST AND BENEFIT STATEMENT

(1000 BAHT)

YEAR	COST	BENEFITS				DISCOUNTED(12%)	
	CONST. COST	VOC SAVING	TIME SAVING	MAINT. SAVING	TOTAL	COST	BENEFIT
1992	58,929				0	73,921	0
1993	88,393				0	99,000	0
1994		27,961	7,737	209	35,907	0	32,060
1995		29,334	8,147	210	37,691	0	30,047
1996		30,706	8,557	210	39,473	0	28,096
1997		32,079	8,967	211	41,257	0	26,220
1998		33,451	9,376	212	43,039	0	24,421
1999		34,824	9,786	213	44,823	0	22,709
2000		36,197	10,196	213	46,606	0	21,082
2001		38,063	10,756	214	49,033	0	19,804
2002		39,929	11,315	215	51,459	0	18,557
2003		41,795	11,875	215	53,885	0	17,350
2004		43,661	12,435	216	56,312	0	16,188
2005		45,527	12,994	217	58,738	0	15,077
2006		47,393	13,554	218	61,165	0	14,017
2007		49,259	14,114	218	63,591	0	13,012
2008	(67,216)	51,125	14,673	219	66,017	(13,754)	12,061
TOTAL	80,106	581,304	164,482	3,210	748,996	159,167	310,701

NET PRESENT VALUE :	151,534
BENEFIT COST RATIO :	1.95
INTERNAL RATE OF RETURN :	21.5%
FIRST YEAR RATE OF RETURN :	18.5%

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-ϕa×l	PIPE CULVERT, n (ROW), ϕa(DIAMETER, m), l (LENGTH, m)
RC-B-n-a×b×l	BOX CULVERT, n (NO. OF CELLS), a×b×l (CLEAR SPAN × DEPTH × LENGTH, m)
BR-T-a×l−n	TIMBER BRIDGE, a×l (WIDTH × LENGTH, m), n (NO. OF SPANS)
BR-RC-a×l−n	CONCRETE BRIDGE, a×l (ROADWAY WIDTH × LENGTH, m) n (NO. OF SPANS)

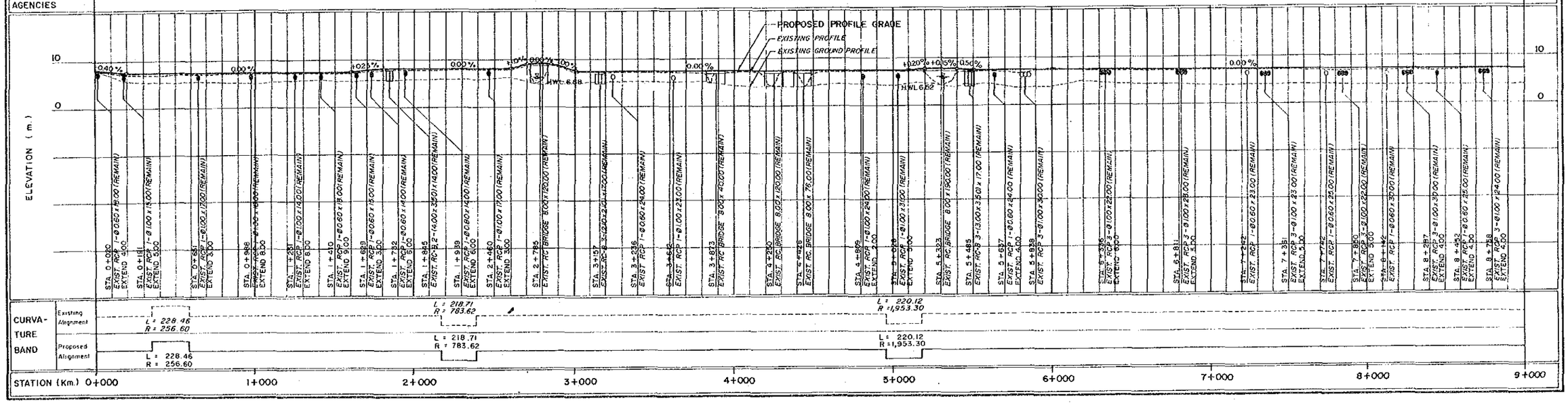
STUDY ROUTE IM-23 | SHEET NO 1 OF 3

From ROUTE 32 To THA RUA (JR 3022)

PLAN AND PROFILE

STA 0+000 TO STA 9+000

TERRAIN		FLAT
PAVEM'T	Type / Length	AC. PAVEMENT
	Condition	POOR
FLOODING	Length (Km) Height (m.)	— FLOOD —
RIGHT OF WAY (m.)		40.00 — 50.00
ROUTE NO. AGENCIES		DOH ROUTE NO. 3267



CURVATURE BAND	Existing Alignment	L = 228.46, R = 256.60 — L = 218.71, R = 783.62 — L = 220.12, R = 1,953.30
	Proposed Alignment	L = 228.46, R = 256.60 — L = 218.71, R = 783.62 — L = 220.12, R = 1,953.30

STATION (Km.) 0+000 1+000 2+000 3+000 4+000 5+000 6+000 7+000 8+000 9+000