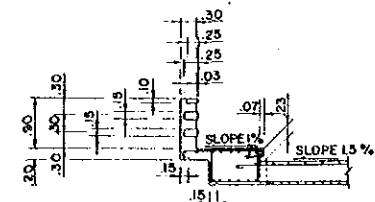
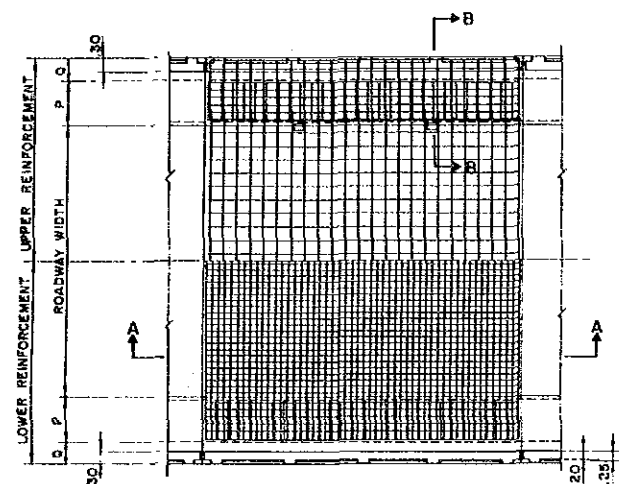


SECTION A-A



SECTION B-B

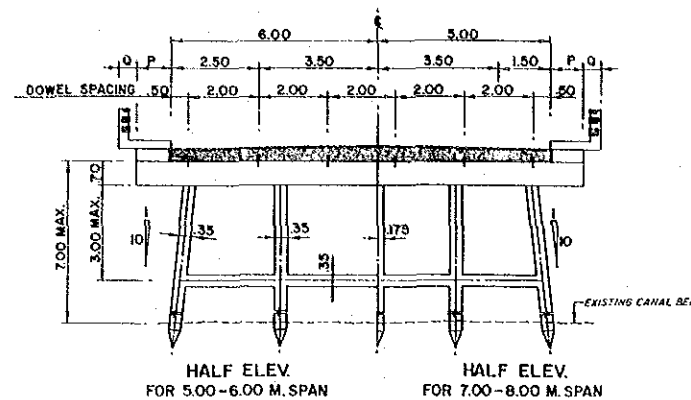


REINFORCEMENT PLAN

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

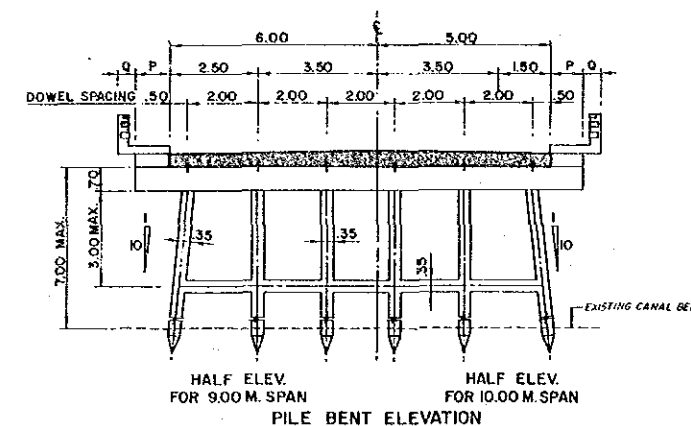
SUMMARY OF BRIDGE					
	STATION	SPAN (m.)	NUMBER OF SPAN	LENGTH (m.)	REMARK
ROAD ML-2 DISTRICT CHONBURI	154+170	10.0	6	60.0	2-WAY
	156+395	12.0	4	48.0	2-WAY
	158+245	12.0	4	48.0	2-WAY
	158+570	6.0	5	36.0	2-WAY
	169+010	13.0	2	26.0	2-WAY
	TOTAL		22	218.0	

PC.- GIRDER					
	STATION	SPAN (m.)	NUMBER OF SPAN	LENGTH (m.)	REMARK
ML-2	304+280	11.8	5	59.0	



HALF ELEV.  
FOR 5.00-6.00 M. SPAN

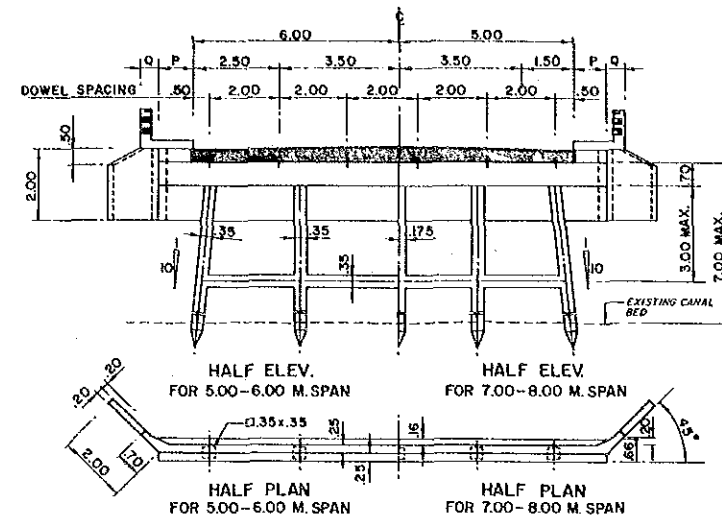
HALF ELEV.  
FOR 7.00-8.00 M. SPAN



HALF ELEV.  
FOR 9.00 M. SPAN

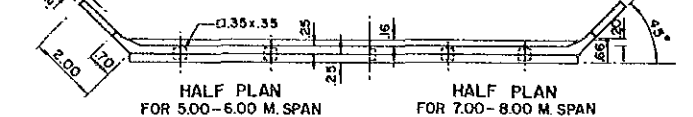
HALF ELEV.  
FOR 10.00 M. SPAN

PILE BENT ELEVATION



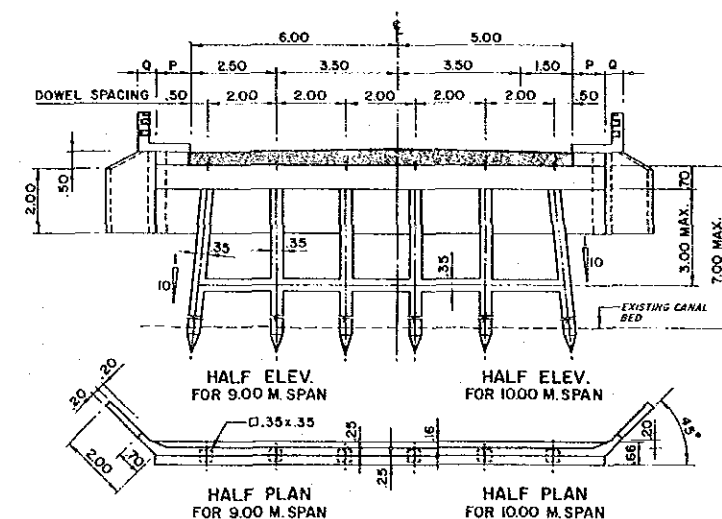
HALF ELEV.  
FOR 5.00-6.00 M. SPAN

HALF ELEV.  
FOR 7.00-8.00 M. SPAN



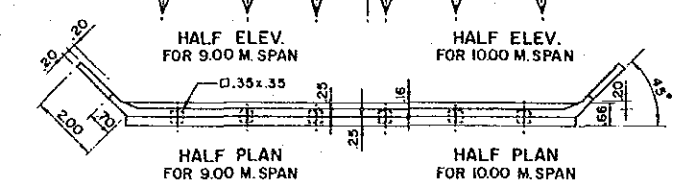
HALF PLAN  
FOR 5.00-6.00 M. SPAN

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

# NOTES:

- DESIGN STRESSES:  
a) CONCRETE,  $f_c = 70$  KSC.  
b) STEEL,  $f_s = 1,400$  KSC. (INTERMEDIATE GRADE)  
 $f_s = 1,200$  KSC. (STRUCTURAL GRADE)
- CONCRETE SHALL HAVE MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF 210 KG/CM<sup>2</sup> FOR 15x15x15 CUBE AT 28 DAYS. AN APPROXIMATE MIX DESIGN PER CUBIC METER IS SUGGESTED AS FOLLOWS:  
PORTLAND CEMENT, MIN. 350 KG.  
SAND 0.43 M<sup>3</sup>  
CRUSHED ROCK OR GRAVEL 0.86 M<sup>3</sup>  
CONCRETE SLUMP, MAX 10 CM.
- 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.
- ALL CONCRETE EXPOSED CORNERS SHALL HAVE 2 CM. CHAMFER UNLESS OTHERWISE INDICATED.
- REBARS #4 OR LARGER SHALL BE INTERMEDIATE GRADE DEFORMED BARS, OTHERS SHALL BE STRUCTURAL GRADE PLAIN BARS UNLESS OTHERWISE INDICATED.
- LOCATIONS OF LAP SPLICE OF REBARS SHALL BE APPROVED BY THE ENGINEER.
- 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.
- IN CASE OF SALINE PROTECTION, HIGH SULPHATE RESISTANT PORTLAND CEMENT TYPE 5 CONFORMED TO AASHTO 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.
- ALL MATERIALS SHALL BE USED UNDER THE APPROVAL OF THE ENGINEER.
- 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.
- ALL DIMENSIONS SHOWN ARE IN METERS UNLESS OTHERWISE INDICATED.
- 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-DRAIN SUCH THAT CONCRETE COVER IS NOT ADEQUATE, THEY SHALL BE PLACED ON TOP OF S101. OTHER BARS WHICH PASS THROUGH DRAIN PIPES SHALL BE BENT ALONG THE PIPES.
- ALL PIERS WHICH DO NOT HAVE LOG PROTECTION WALLS SHALL BE HAUNCH UNDER THE TOP CROSS BRACING.
- IF ANY NOTES ON THE DRAWINGS OF PIERS CONTRADICT THE NOTES ON THIS DRAWING, THEY WILL BE SUPERSEDED BY THESE NOTES.
- IN CASE OF 0.50 M. SIDEWALK, P AND R SHALL BE 0.50 M. AND REBARS IN EDGE BEAM SHALL BE THE SAME AS SHOWN FOR 0.40 M. SIDEWALK EXCEPT FOR 10.0 M. SPAN WHICH BAR MARKS S101 AND T104 ARE 12 BARS.
- 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.

**PROJECT ML - 4**

**Changwat : Rayong, Chanthaburi**

**A. Klaeng - C. Chanthaburi**

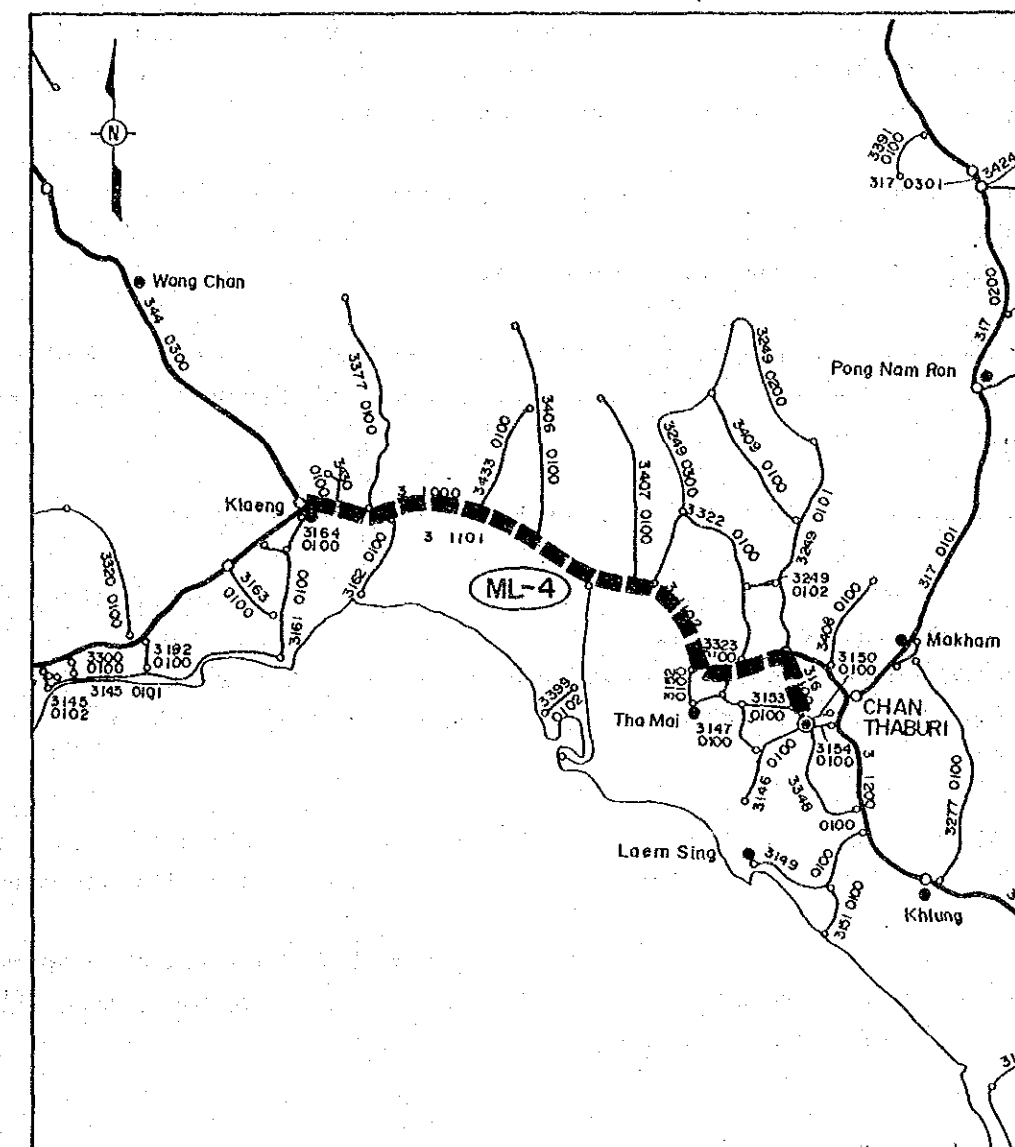
**Length : 61.86 km**

# SUMMARY

## PROJECT ML-4

ITEM	DESCRIPTION
Changwat	Rayong, Chanthaburi
Origin	A. Klaeng
Destination	C. Chanthaburi
Route No.	Rt. 3 and Rt. 316
Project Length	61.86 km
Standard	
- Existing	P1 (Rt. 3) and S4 (Rt. 316)
- Proposed	PD (RT. 3) and SD (Rt. 316)
Traffic	
- Base	7,102~ 7,367
- 2000	14,200~ 17,700
- 2008	21,400~ 25,900
Pavement Type	
- Existing	AC pavement
- Proposed	AC pavement (5~ 10 cm thick surface)
Bridges	
- New Construction	25 bridges, 514.5 m
- Replacement	6 bridges, 358 m
Intersections	
- Channelization	1 each
Construction Costs	
- Financial	593,260,000 Baht
- Economic	534,823,000 Baht
Economic Evaluation	
- IRR	19.7%
- B/C	2.03

## LOCATION OF PROJECT ROUTE



SCALE  
5 0 10Km.

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

## 1. GENERAL

Project ML-4 is to upgrade a part of Route 3, and extends over Changwat Rayong and Changwat Chanthaburi from Amphoe Klaeng in Rayong to Changwat Chanthaburi with a total length of 61.3 km.

The existing road has a two-lane asphaltic concrete carriageway of 7.00 m width and 2.50 m shoulders. The terrain is generally flat, but there is a 6 km stretch of rolling section towards the end. All major structures for drainage are adequate.

The alignment is generally good. Land use along the road is predominantly for orchards after about 12 km of paddy and coconut palm plantations. Patches of rubber plantation are increasingly found on the approach to Chanthaburi.

The road can be heavily trafficked by trucks carrying fruits during peak season. Trucks transporting raw rubber as well as parawood are increasing, reflecting the growing economy in the surrounding area.

This project, therefore, is planned to increase the capacity of the road.

The proposed project is to increase the number of lanes from two to four. The alignment of the additional carriageway runs parallel to the existing road on the sea side. The existing right-of-way width of 40 m is not sufficient, and an additional right-of-way width of 20 m needs to be acquired on the sea side except in the built-up section, where the right-of-way is to remain unchanged.

The upgrading of a part of Route 316 connecting Route 3 and the Chanthaburi municipal area is included in this project. This section is also required to become a four-lane road.

The existing right-of-way width is 30 m. It is expected that rapid development will take place along the route. There are already many valuable houses and rowhouses developed alongside. Therefore a four-lane suburban type road is planned.

## 2. TRAFFIC FORECAST

### Base Traffic Volume

(Unit: Vehicles/Day)

Project Code	Section	Year	Traffic Volume							
			MC	PG	LB	HB	LT	MT	HT	ADT
ML-4	3-1000	1986	2697	1349	750	278	3230	655	840	7102
	3-1102	1988	1537	891	953	186	3851	566	856	7303
	316	1988	2395	920	1169	195	4500	373	210	7367
	Average	-	2210	1053	957	220	3860	531	635	7257

### Traffic Growth Rate

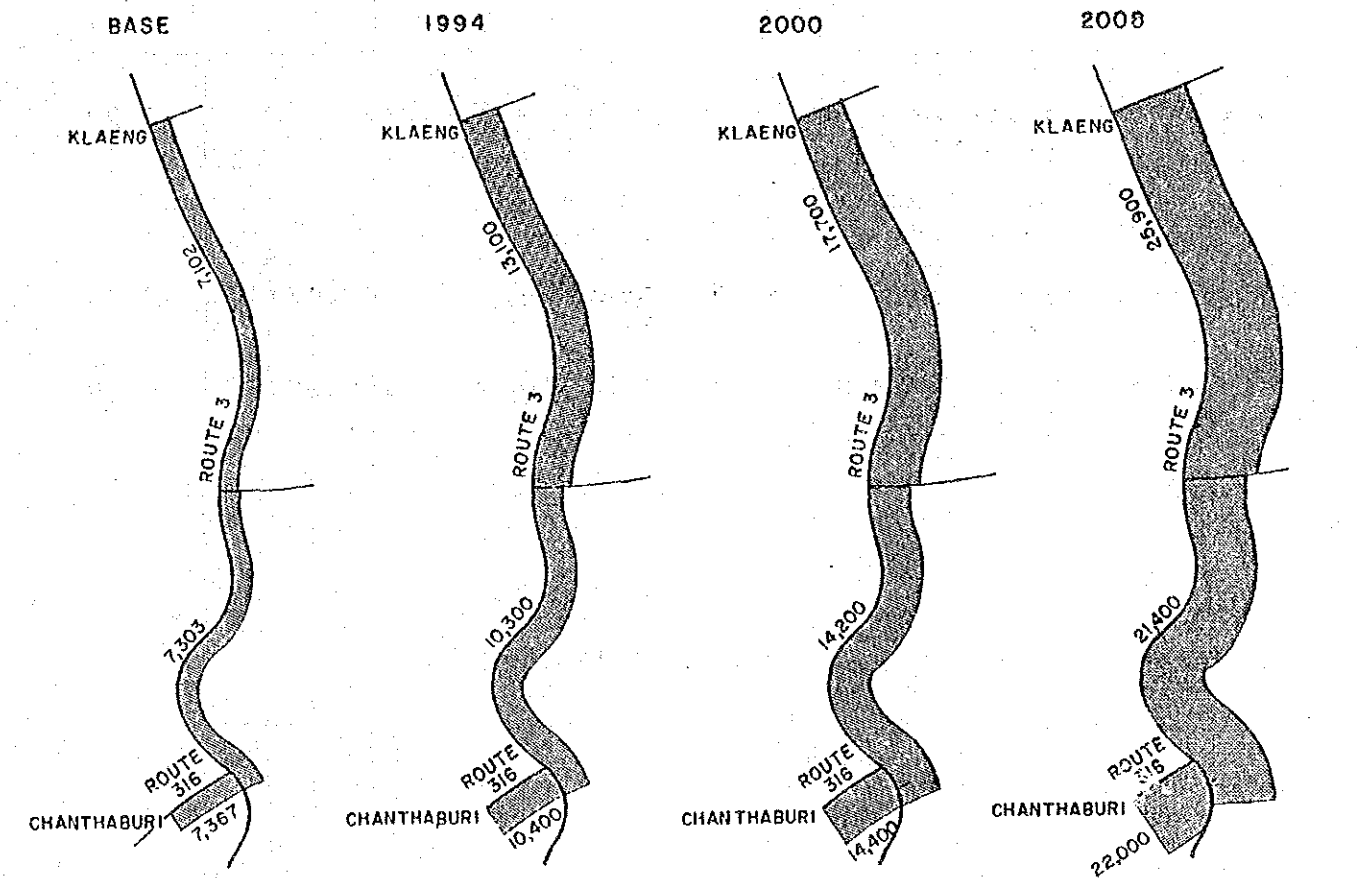
(Unit: Percent)

Project Code	Section	Period	MC	PC	LB	HB	LT	MT	HT
ML-4	3-1000	-1993	8.36	7.66	7.98	5.69	8.93	8.47	8.47
		1994-2000	5.37	5.35	7.68	5.11	4.74	4.67	4.61
		2000-2008	5.13	5.13	7.17	5.09	4.54	4.19	3.00
	3-1102	-1993	5.97	6.69	6.91	6.28	5.53	5.84	5.40
		1994-2000	5.57	5.82	7.78	4.90	5.04	5.36	5.47
		2000-2008	5.16	5.52	8.02	4.29	4.65	4.38	3.54

### Future Traffic Volume

(Unit: Vehicles/Day)

Project Code	Section	Year	MC	PC	LB	HB	LT	MT	HT	ADT
ML-4	3-1000	1994	4985	2382	1383	431	6157	1211	1552	13116
		2000	6823	3256	2155	581	8129	1593	2034	17748
		2008	10181	4858	3750	864	11596	2212	2577	25857
	3-1102	1994	2168	1304	1435	264	5294	792	1174	10263
		2000	3002	1831	2249	352	7111	1084	1616	14243
		2008	4490	2814	4169	493	10229	1527	2135	21367
	316	1994	3379	1346	1760	277	6187	522	288	10380
		2000	4678	1890	2759	369	8310	713	396	14437
		2008	6996	2905	5114	516	11954	1005	523	22017
	Average	1994	3511	1677	1526	324	5879	842	1005	11253
		2000	4834	2326	2388	434	7850	1130	1349	15476
		2008	7222	3526	4344	624	11260	1581	1745	23080



Project ML-4

UNIT : VEHICLE / DAY



### 3. ENGINEERING

#### 3.1 Materials and Boring Results

##### (1) Materials

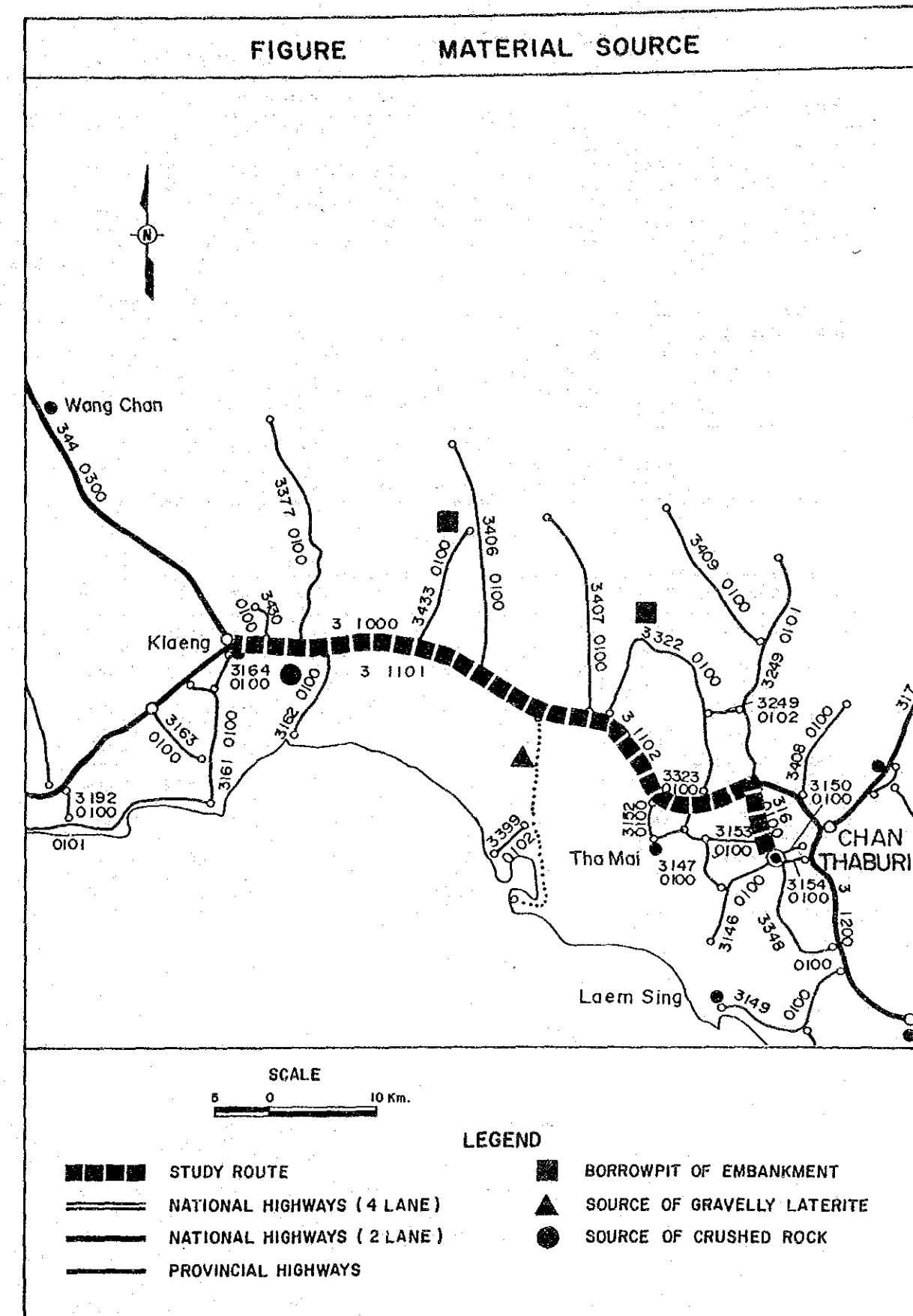
##### DESCRIPTION OF MATERIAL SOURCES

Material	Source	Description of Sample	Estimated Quantity cu.m.	Hauling Distance (km)
Soil	Route 3433 Km 7+00 Both sides	Silty Sand	Plentiful	14.00
	Route 3322 Km 5+00 Left Side 0.1 Km	Silty Sand		
Laterite	Route 3399 Km 1+000 Both sides	Gravelly Laterite	>200,000	17.00
Crushed Rock	Route 3 Km 285+500 Right Side 0.0 Km	Lime Stone	Plentiful	16.00

##### RESULTS OF LABORATORY TESTS

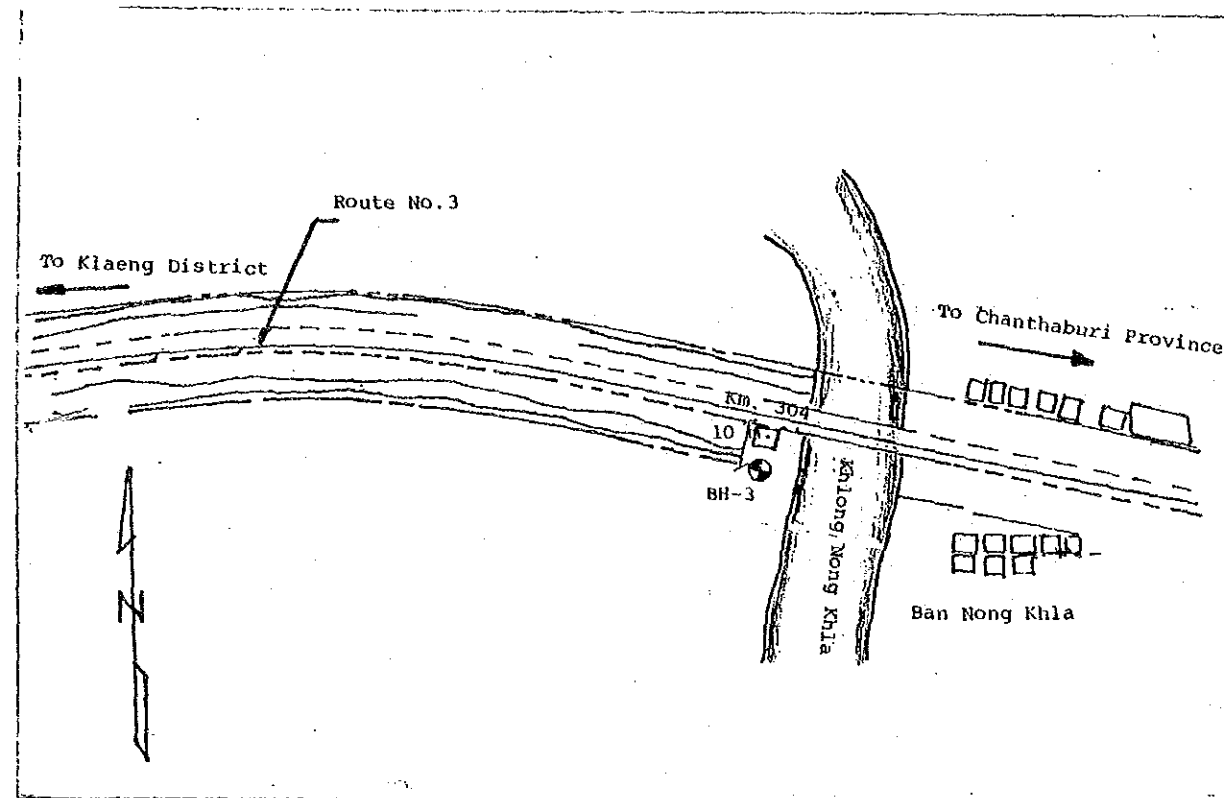
	Sieve Analysis % Passing								Plasticity		Comp.		Lab. C.B.R.	
	50.0	25.0	19.0	9.5	#4	#10	#40	#200	LL	PT	DH-T Stand.		CBB	Swell
											Opt.	gm/cc		
	95%										95%	%		
Soil				100	93.4	90.2	62.2	50.9	41.9	13.6	15.7	1.910	9.6	-
Laterite			100	97.2	90.2	65.1	51.4	42.3	38.2	16.7	8.3	1.940	8.7	-
Crushed Rock	-	-	-	-	-	-	-	-	-	-	-	-	>80	

Note: Abrasion test result of Crushed Rock 30.6 %



(2) Boring Results

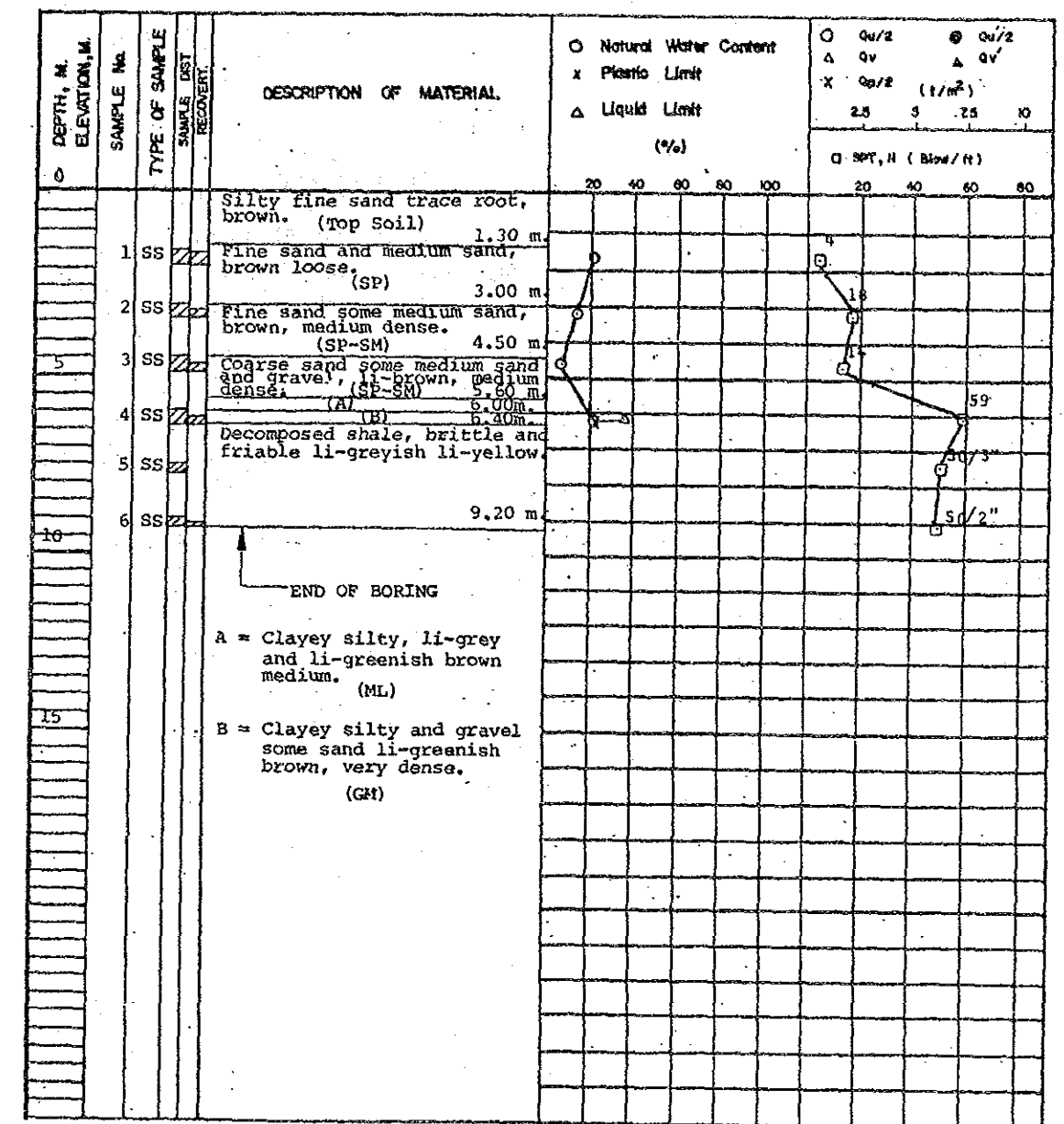
BOREHOLE LOCATION



SUMMARY OF TEST RESULTS

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT $\gamma_m$	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH $\gamma_m$					STANDARD PENETRATION (N)
	FROM	TO		LL.	PL.	PI.		No. 1/8"	No. 4	No. 10	No. 40	No. 200		UNCONFINED SHEAR		FIELD VANE SHEAR		POCKET PENETRATION $Q_p$	
														$Q_u/2$	$Q_u/n$	$Q_v$	$Q_v'$		
SS-1	1.50	1.95	20.8				1.62		100	97	57	4	SP						4
SS-2	3.00	3.45	15.9				1.78	100	98	91	56	9	SP-SM						18
SS-3	4.50	4.95	9.4				1.80	94	77	45	20	6	SP-SM						14
SS-4	6.00	6.45	20.2	36.2	30.2	6.0		85	64	55	51	40	GM						59
SS-5	7.50	7.73		-No Recovery-										Decomposed Shale					50/3"
SS-6	9.00	9.20												Decomposed Shale					50/2"

BORING LOG



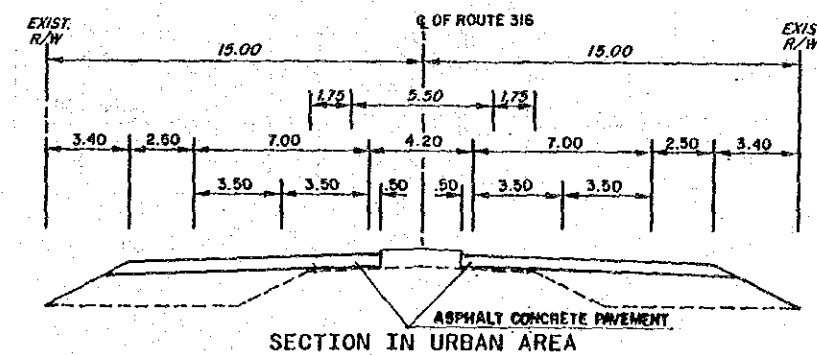
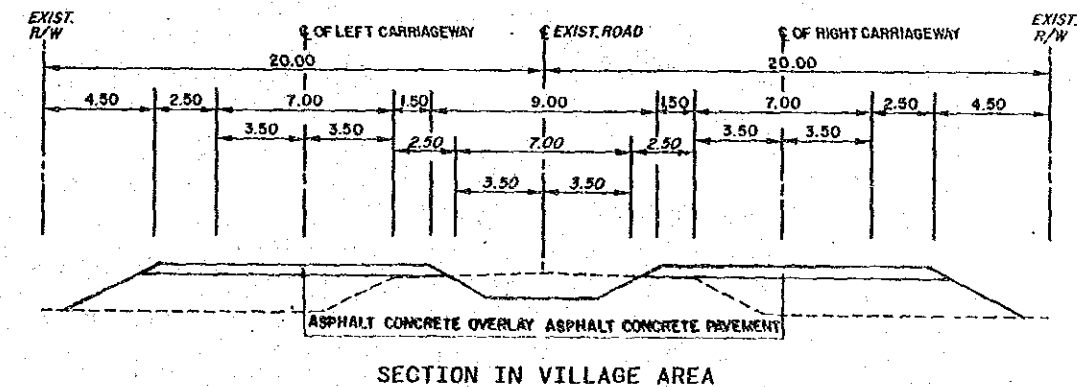
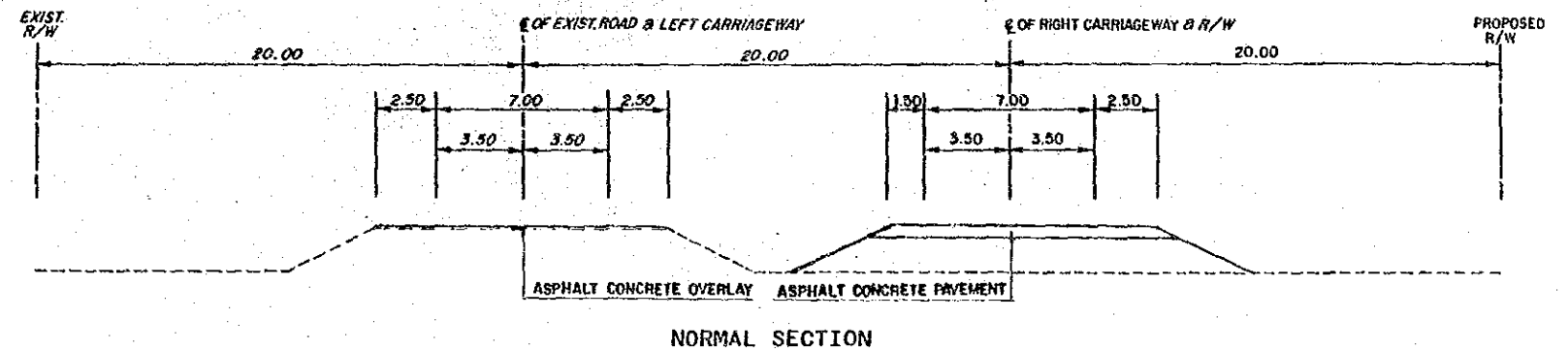
### 3.2 Preliminary Design

#### (1) Geometric Design Criteria

Design Standard	:	PD (Route 3), SD (Route 316)
Design Speed	:	PD - Flat 80-100 km/h Rolling 60-70 km/h SD - Flat 70-90 km/h

#### Geometric Design Criteria

Description	Design Speed (Km/h)				
	100	90	80	70	60
Minimum Radius & Curvature (m)	360	280	210	160	120
Minimum Stopping Sight Distance (m)	160	140	115	90	75
Maximum Gradient (%)	6	7	8	9	10

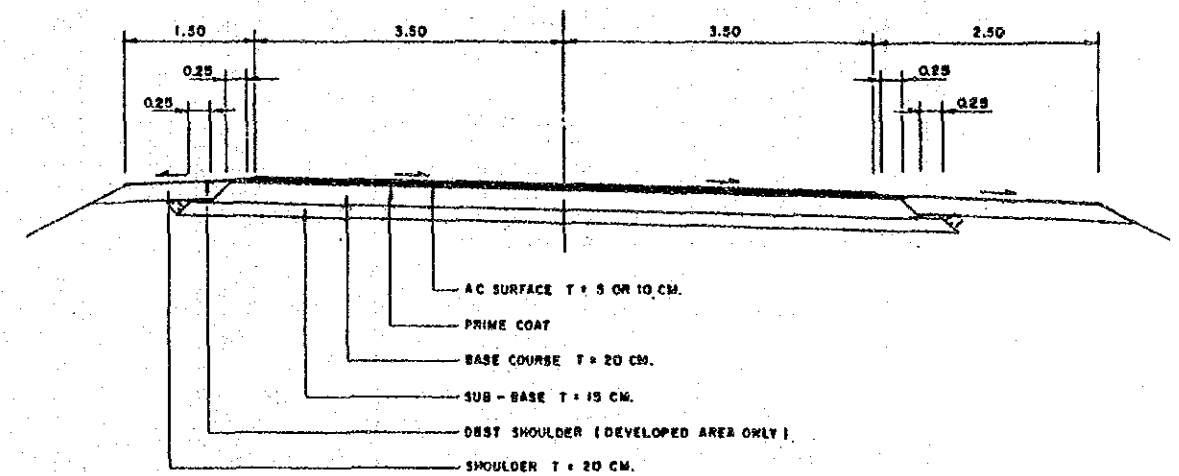


TYPICAL CROSS SECTION (ROUTE ML-4)

(2) Pavement Design

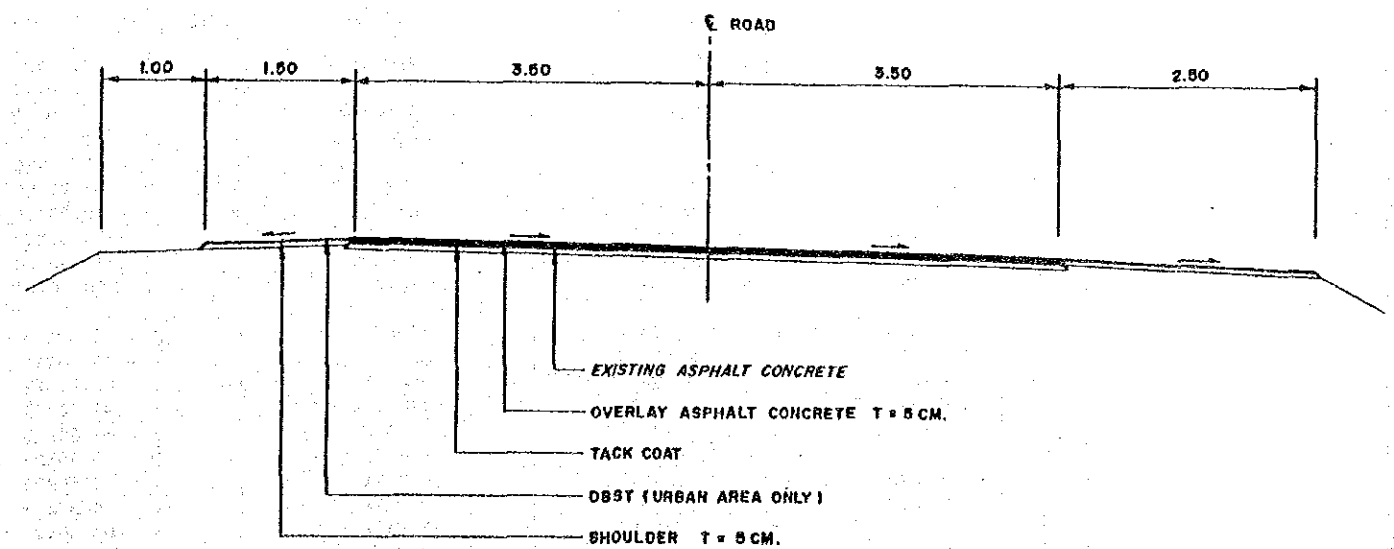
Pavement for New Construction Lane

Section	Design CBR of Subgrade	Cumulative No. of ESA W18 x 10 (10 years)	Thickness of Pavement Structure (cm)		
1	8.7	7,785	Surface	10	SN = 2.3
			Base	20	
			Subbase	15	
2	8.7	2,194	Surface	5	SN = 2.6
			Base	20	
			Subbase	20	



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	9.6	7,785	3.20	1.41	1.79	10.0



## (3) Culverts

No.	CHAINAGE	EXISTING CULVERT	NEW CULVERT	
			LT ROADWAY	RT ROADWAY
1	268+755	2 - Ø1.00X11.10	EXTEND(2X10=20)	2 - Ø1.0X22
2	269+495	2 - Ø0.08X22.00	REMAIN	2 - Ø0.8X21
3	269+850	2 - Ø1.00X22.00	REMAIN	2 - Ø1.0X21
4	270+325	2 - Ø1.00X21.00	REMAIN	2 - Ø1.0X21
5	270+575	2 - Ø1.00X21.00	REMAIN	2 - Ø1.00X21
6	271+200	2 - Ø1.00X21.00	REMAIN	2 - Ø1.00X21
7	271+550	2 - Ø1.00X20.00	REMAIN	2 - Ø1.00X19
8	272+775	2 - Ø1.00X21.00	REMAIN	2 - Ø1.00X21
9	273+078	2 - Ø0.80X23.00	REMAIN	2 - Ø0.80X21
10	273+725	2 - Ø1.00X20.00	REMAIN	2 - Ø1.00X19
11	274+200	2 - Ø1.00X21.00	REMAIN	2 - Ø1.00X21
12	274+379	6 - Ø1.00X22.50	REMAIN	2 - Ø1.00X21
13	274+600	2 - Ø1.00X21.00	REMAIN	2 - Ø1.00X21
14	276+790	2 - Ø0.60X22.00	REMAIN	2 - Ø0.80X21
15	277+925	3 - Ø0.60X22.00	REMAIN	3 - Ø0.80X21
16	278+150	2 - Ø1.00X19.00	REMAIN	2 - Ø1.00X19
17	278+550	2 - Ø1.00X19.00	REMAIN	2 - Ø1.00X19
18	278+761	3 - Ø1.00X22.50	REMAIN	3 - Ø1.00X21
19	278+150	2 - Ø1.00X20.00	REMAIN	2 - Ø1.00X19
20	280+113	1 - Ø0.60X23.00	REMAIN	2 - Ø0.80X21
21	280+621	1 - Ø0.60X22.00	REMAIN	1 - Ø0.80X21
22	281+008	1 - Ø0.60X24.00	REMAIN	1 - Ø0.80X22
23	281+381	1 - Ø1.00X22.00	REMAIN	1 - Ø1.00X21
24	281+570	1 - Ø0.60X25.00	REMAIN	1 - Ø0.80X22
25	283+120	3 - Ø1.00X25.00	REMAIN	3 - Ø1.00X23
26	284+300	-	2-Ø1.00X18	2 - Ø1.00X18
27	285+486	2 - Ø0.80X25.00	REMAIN	2 - Ø0.80X22
28	286+263	1 - Ø0.60X19.50	REMAIN	1 - Ø0.80X20
29	287+006	1 - Ø0.60X20.50	REMAIN	1 - Ø0.80X20
30	287+435	2 - Ø0.80X23.00	REMAIN	2 - Ø0.80X21
31	288+469	1 - Ø0.60X25.00	REMAIN	1 - Ø0.80X22
32	289+879	2 - Ø1.00X24.00	REMAIN	2 - Ø1.00X22
33	290+302	2 - Ø0.80X23.40	REMAIN	2 - Ø0.80X21
34	291+529	Box 2 - 2.40X2.00X15.00	REMAIN	Box 2-2.40X2.00X15.00
35	292+185	1 - Ø0.80X25.50	REMAIN	1 - Ø0.80X22
36	294+586	1 - Ø1.00X20.00	REMAIN	1 - Ø1.00X20
37	294+975	-	1-Ø1.00X20	1 - Ø1.00X20
38	295+398	1 - Ø0.80X23.00	REMAIN	1 - Ø0.80X22
39	296+250	2 - Ø0.80X21.30	REMAIN	2 - Ø0.80X21
40	296+450	1 - Ø0.60X23.30	REMAIN	1 - Ø0.80X21
41	296+741	1 - Ø0.80X21.00	REMAIN	1 - Ø0.80X21
42	297+256	1 - Ø0.80X23.50	REMAIN	1 - Ø0.80X22
43	298+062	1 - Ø0.60X21.50	REMAIN	1 - Ø0.80X20
44	298+850	-	1-Ø1.00X20	1 - Ø1.00X20
45	299+956	1 - Ø1.00X20.10	REMAIN	1 - Ø1.00X20
46	300+810	2 - Ø0.60X21.30	REMAIN	2 - Ø0.80X20
47	301+178	1 - Ø0.60X22.00	REMAIN	1 - Ø0.80X21
48	301+332	1 - Ø0.60X20.20	REMAIN	1 - Ø0.80X20
49	301+450	1 - Ø0.60X22.00	REMAIN	1 - Ø0.80X21
50	301+598	2 - Ø0.60X23.00	REMAIN	2 - Ø0.80X21
51	302+187	2 - Ø0.80X23.00	REMAIN	2 - Ø0.80X21
52	303+208	1 - Ø0.80X25.20	REMAIN	1 - Ø0.80X22
53	303+800	-	1-Ø1.00X22	1 - Ø1.00X22
54	304+111	5 - Ø1.00X27.00	REMAIN	5 - Ø1.00X25
55	304+496	1 - Ø0.60X25.20	REMAIN	1 - Ø0.80X24
56	304+818	1 - Ø0.60X26.00	REMAIN	1 - Ø0.80X23
57	305+962	1 - Ø0.60X19.30	REMAIN	1 - Ø0.80X18
58	306+818	3 - Ø1.00X26.00	REMAIN	3 - Ø1.00X24
59	307+092	2 - Ø1.00X27.00	REMAIN	2 - Ø1.00X26

No.	CHAINAGE	EXISTING CULVERT	NEW CULVERT	
			LT ROADWAY	RT ROADWAY
60	307+425	1 - Ø0.60X25.00	REMAIN	1 - Ø0.80X23
61	307+708	1 - Ø0.60X20.00	REMAIN	1 - Ø0.80X21
62	307+866	1 - Ø1.00X24.00	REMAIN	1 - Ø1.00X22
63	308+194	5 - Ø1.00X38.00	REMAIN	5 - Ø1.00X30
64	308+784	5 - Ø1.00X27.00	REMAIN	5 - Ø1.00X26
65	309+851	1 - Ø0.60X23.80	REMAIN	1 - Ø0.80X22
66	310+366	1 - Ø0.60X26.00	REMAIN	1 - Ø0.80X24
67	311+030	4 - Ø1.00X26.00	REMAIN	4 - Ø1.00X23
68	311+662	1 - Ø0.60X21.40	REMAIN	1 - Ø0.80X20
69	313+816	1 - Ø0.60X22.00	REMAIN	1 - Ø0.80X23
70	314+175	-	1-Ø0.80X20	1 - Ø0.80X20
71	318+816	1 - Ø1.00X24.00	REMAIN	1 - Ø1.00X24
72	319+317	1 - Ø0.60X23.00	REMAIN	1 - Ø0.80X22
73	319+520	1 - Ø1.00X18.00	REMAIN	1 - Ø1.00X18
74	320+152	2 - Ø1.00X24.00	REMAIN	2 - Ø1.00X24
75	320+507	1 - Ø0.80X22.00	REMAIN	1 - Ø0.80X23
76	320+800	-	1-Ø1.00X22	1 - Ø1.00X24
77	321+984	1 - Ø0.80X24.00	REMAIN	1 - Ø0.80X23
78	322+360	1 - Ø1.00X24.50	REMAIN	1 - Ø1.00X22
79	322+614	1 - Ø0.80X24.00	REMAIN	1 - Ø0.80X22
80	323+762	2 - Ø1.00X31.00	REMAIN	2 - Ø1.00X28

No.	CHAINAGE	EXISTING CULVERT	NEW CULVERT
	ROUTE 316 *****		
1	1 + 858.5	1 - Ø0.60 x 17	2 - Ø1.00 x 31
2	2 + 695.8	1 - Ø0.60 x 24	1 - Ø1.00 x 31
3	3 + 765.2	1 - Ø1.00 x 15	2 - Ø1.00 x 31
4	6 + 100	-	2 - Ø1.00 x 31



(4) Bridges

NO.	STATION	EXISTING RC BRIDGE	PROPOSED RC BRIDGE
1	269+178	8.00x42.00 SLAB TYPE	11.00x42.00 SLAB TYPE
2	269+640	8.00x16.00 SLAB TYPE	11.00x16.00 SLAB TYPE
3	270+060	8.00x30.00 SLAB TYPE	11.00x30.00 SLAB TYPE
4	270+842	8.00x16.00 SLAB TYPE	11.00x16.00 SLAB TYPE
5	271+980	8.00x20.00 SLAB TYPE	11.00x20.00 SLAB TYPE
6	272+442	8.00x46.50 SLAB TYPE	11.00x46.50 SLAB TYPE
7	273+464	8.00x12.00 SLAB TYPE	11.00x12.00 SLAB TYPE
8	275+950	8.00x40.00 SLAB TYPE *	11.00x40.00 SLAB TYPE
9	276+285	8.00x20.00 SLAB TYPE	11.00x20.00 SLAB TYPE
10	277+469	8.00x12.00 SLAB TYPE	11.00x12.00 SLAB TYPE
11	282+645	8.00x18.00 SLAB TYPE	11.00x18.00 SLAB TYPE
12	285+030	8.00x20.00 SLAB TYPE *	11.00x20.00 SLAB TYPE
13	287+910	8.00x32.00 SLAB TYPE *	11.00x32.00 SLAB TYPE
14	289+770	8.00x24.00 SLAB TYPE	11.00x24.00 SLAB TYPE
15	292+006	8.00x16.00 SLAB TYPE *	11.00x16.00 SLAB TYPE
16	292+628	8.00x12.00 SLAB TYPE *	11.00x12.00 SLAB TYPE
17	292+741	8.00x12.00 SLAB TYPE	11.00x12.00 SLAB TYPE
18	298+550	8.00x12.00 SLAB TYPE	11.00x12.00 SLAB TYPE
19	299+392	8.00x20.00 SLAB TYPE	11.00x20.00 SLAB TYPE
20	302+857	8.00x24.00 SLAB TYPE	11.00x24.00 SLAB TYPE
21	303+383	8.00x16.00 SLAB TYPE	11.00x16.00 SLAB TYPE
22	304+280	8.00x59.00 BOX GIRDER *	11.00x59.00 BOX GIRDER
23	306+278	8.00x18.00 SLAB TYPE	11.00x18.00 SLAB TYPE
24	309+508	8.00x16.00 SLAB TYPE	11.00x16.00 SLAB TYPE
25	311+511	8.00x16.00 SLAB TYPE	11.00x16.00 SLAB TYPE
26	312+715	8.00x12.00 SLAB TYPE	11.00x12.00 SLAB TYPE
27	313+500	8.00x16.00 SLAB TYPE	11.00x16.00 SLAB TYPE
28	315+150	8.00x24.00 SLAB TYPE	11.00x24.00 SLAB TYPE
29	319+164	8.00x32.00 SLAB TYPE	11.00x32.00 SLAB TYPE
30	321+666	8.00x24.00 SLAB TYPE	11.00x24.00 SLAB TYPE
31	323+485	8.00x16.00 SLAB TYPE	11.00x16.00 SLAB TYPE

Notes: All existing bridges to be retained except for those marked \* which will be replaced (due to right-of-way restriction in village sections).

### 3.3 Quantities and Construction and Road Maintenance Costs

#### (1) CONSTRUCTION QUANTITIES AND COSTS

(Project ML-4 Length = 61.86 km)

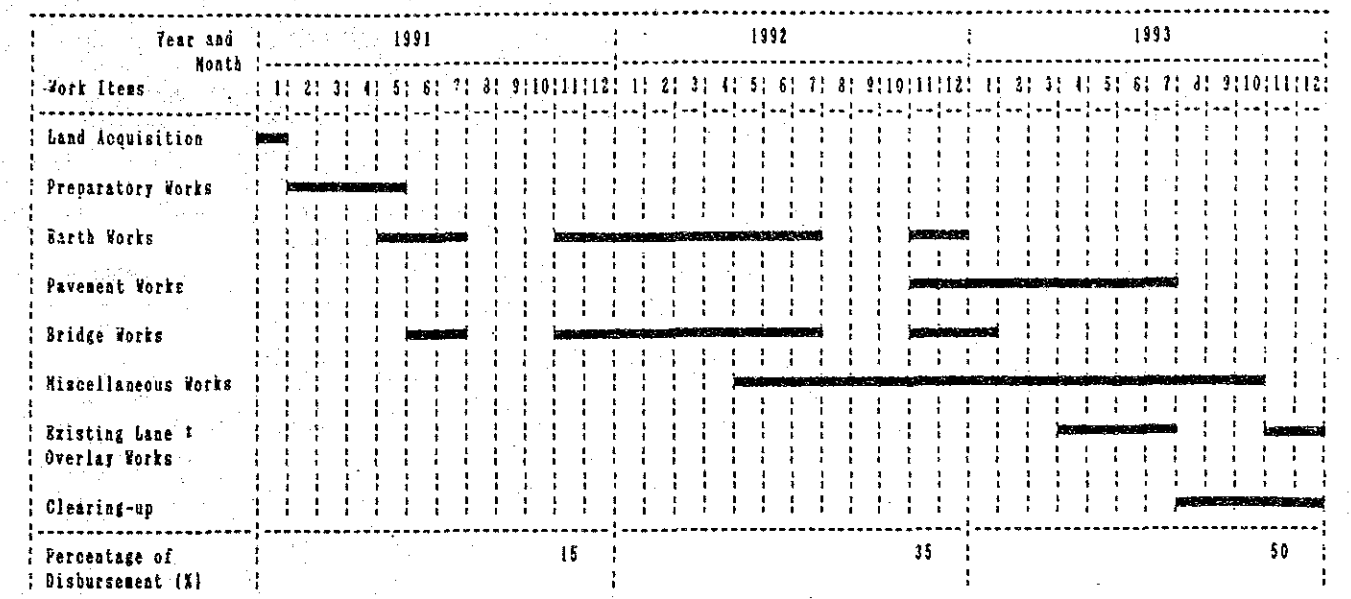
Item	Unit	Financial Unit Rate Baht	Quantity	Financial Total Cost 1000 Baht	Economic Cost		Residual Value		
					%	1000 Baht	%	1000 Baht	
EARTHWORK									
Clearing & Grubbing	ha	10,000	179	1,790	85	1,522	90	1,369	
Roadway Excavation (Unclassified)	m <sup>3</sup>	18	298,000	5,364	84	4,506	90	4,055	
Roadway Excavation (Classified)	m <sup>3</sup>	38	-	-	84	-	90	-	
Embankment (Common)	m <sup>3</sup>	33	209,000	6,897	86	5,931	90	5,338	
Embankment (Borrow)	m <sup>3</sup>	83	1,255,000	104,165	86	89,582	90	80,624	
Removal of Existing Structure	each	60,000	6	360	84	302	90	272	
Sub Total				118,576		101,843		91,658	
SUBBASE and BASE COURSES									
Subbase	m <sup>3</sup>	141	100,700	14,199	83	11,785	50	5,892	
Aggregate base	m <sup>3</sup>	269	121,400	32,657	84	27,432	50	13,716	
Shoulder (Soil Aggregate)	m <sup>3</sup>	166	65,200	10,823	83	8,983	50	4,492	
Sub Total				57,679		48,200		24,100	
SURFACE COURSES									
Asphaltic Prime Coat	m <sup>2</sup>	11	556,600	6,123	93	5,694	50	2,847	
Asphaltic Tack Coat	m <sup>2</sup>	5	780,100	3,901	93	3,627	50	1,814	
Double Bituminous Surface Treatment	m <sup>2</sup>	32	113,900	3,645	91	3,317	50	1,658	
Asphalt Concrete Surfacing	ton	901	155,800	140,376	90	126,338	50	63,169	
Portland Cement Concrete Pavement	m <sup>3</sup>	1,635	-	-	90	-	50	-	
Sub Total				154,044		138,976		69,488	
STRUCTURES (Equivalent)									
RC Pipe Culvert (D=1.00 m)	m	1,800	3,476	6,257	88	5,506	50	2,753	
RC Box Culvert (2-2.40x 2.40 m)	m	9,000	14	126	90	113	50	57	
RC Bridge (W=11.0 m)	m	63,000	754	47,502	87	41,327	50	20,663	
PC Bridge (W=11.0 m)	m	86,000	118	10,148	87	8,829	50	4,414	
Bearing Unit	m <sup>2</sup>	2,200	-	-	87	-	50	-	
Sub Total				64,033		55,775		27,887	
Total (a)				394,331		344,794		213,133	
Miscellaneous Work ( (a) x 7% )		1s		27,603	87	24,015	0	0	
CONTRACT AMOUNT (b)				421,934		368,809		213,133	
PHYSICAL CONTINGENCIES ( (b) x 10% ) (c)		1s		42,193		36,881		21,313	
ENGINEERING AND SUPERVISION ( ((b) + (c)) x 10% ) (d)		1s		46,413	100	46,413	0	0	
LAND ACQUISITION (Average) (e)		ha	940,000	88	82,720	100	82,720	100	82,720
PROJECT COST ( (b) + (c) + (d) + (e) )				593,260		534,823		317,166	
AVERAGE COST PER KM				9,590					

(2) Road Maintenance Costs

(Unit : Baht/Year)

	Without Project	With Project
Existing	1,353,929	-
1994	1,809,219	2,110,786
2008	1,883,142	1,625,928

3.4 Construction Schedule



#### 4. BENEFITS

##### ROAD CONDITIONS

(unit : km)

Section	Road Length	Without Project							With Project						
		Paved				Laterite									
		Good	Fair	Poor	Good	Fair	Poor	NO. of Narrow Bridge	NO. of Wooden Bridge	Road Length	Paved Good	NO. of Narrow Bridge	NO. of Wooden Bridge		
3-1000	16.4	-	16.4	-	-	-	-	-	-	16.4	16.4	-	-	-	-
3-1102	39.3	-	15.0	16.0	8.3	-	-	-	-	39.3	39.3	-	-	-	-
316	6.1	-	-	6.1	-	-	-	-	-	6.1	6.1	-	-	-	-

##### 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	65,543	-	65,543	25,072	-	25,072	90,615	-	90,615
2000	88,702	-	88,702	37,676	-	37,676	126,378	-	126,378
2008	358,698	-	358,698	228,231	-	228,231	586,929	-	586,929

## 5. ECONOMIC EVALUATION

### COST AND BENEFIT STATEMENT

(1000 BAHT)






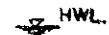
YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	VOC SAVING	TIME SAVING	MAINT. SAVING	TOTAL	COST	BENEFIT
1991	150,535				0	211,491	0
1992	158,236				0	198,491	0
1993	226,051				0	253,177	0
1994		65,543	25,072	(257)	90,358	0	80,677
1995		69,403	27,173	(322)	96,254	0	76,733
1996		73,263	29,274	(387)	102,150	0	72,708
1997		77,123	31,375	(451)	108,047	0	68,666
1998		80,983	33,476	(516)	113,943	0	64,654
1999		84,843	35,577	(581)	119,839	0	60,714
2000		88,702	37,676	(646)	125,732	0	56,875
2001		122,451	61,496	(711)	183,236	0	74,006
2002		156,201	85,315	(775)	240,741	0	86,814
2003		189,950	109,134	(840)	298,244	0	96,027
2004	81,592	223,700	132,954	(905)	355,749	26,270	102,269
2005		257,449	156,773	(970)	413,252	0	106,071
2006		291,199	180,592	(1,034)	470,757	0	107,885
2007		324,948	204,412	(1,099)	528,261	0	108,093
2008	(317,166)	358,698	228,231	(1,164)	585,765	(64,898)	107,017
TOTAL	299,248	2,464,456	1,378,530	(10,658)	3,832,328	624,531	1,269,209

NET PRESENT VALUE : 644,678  
 BENEFIT COST RATIO : 2.03  
 INTERNAL RATE OF RETURN : 19.7%  
 FIRST YEAR RATE OF RETURN : 12.2%



## 6. DRAWINGS

### ABBREVIATIONS and SYMBOLS for PLAN and PROFILE

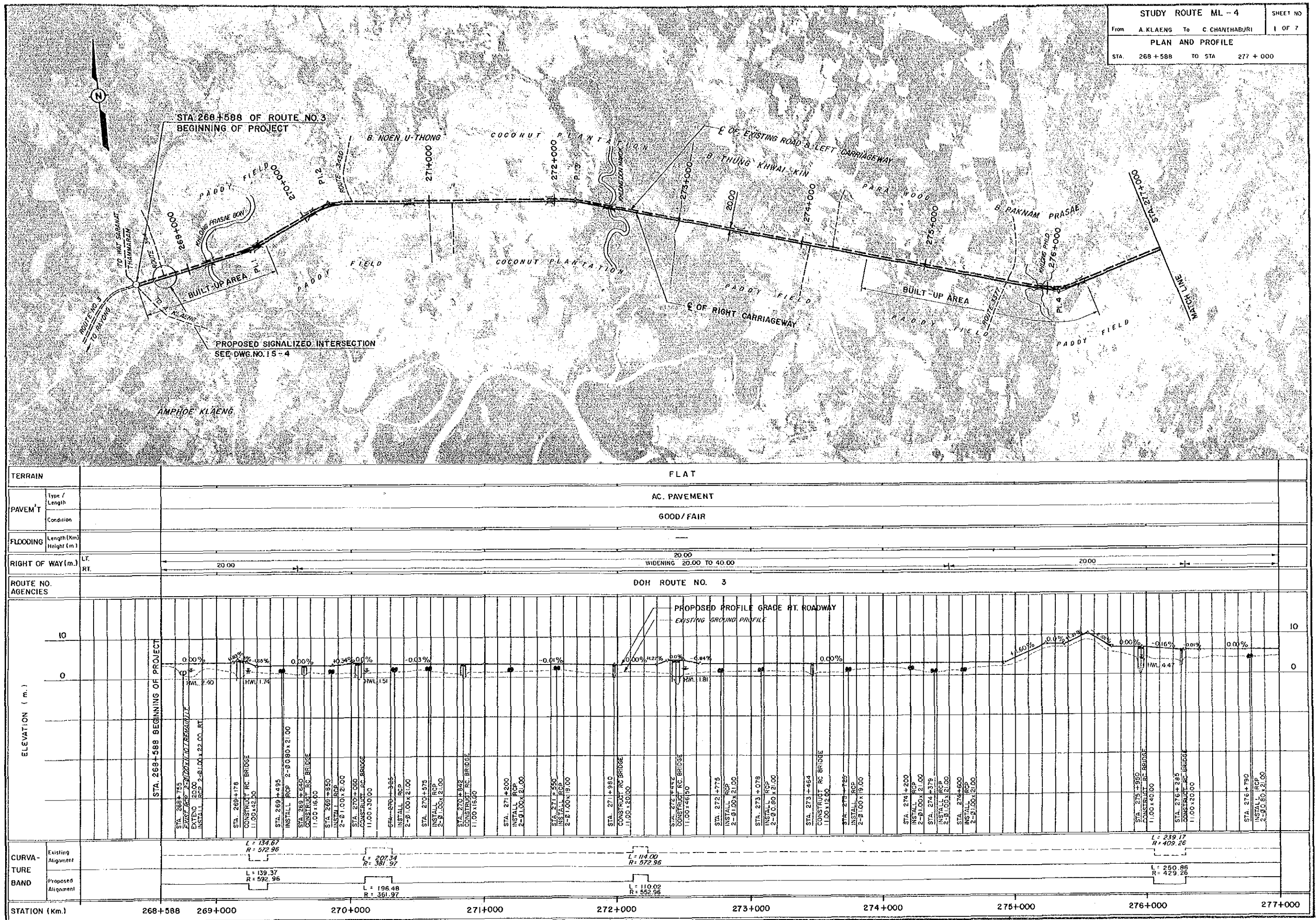
	NEW CONSTRUCTION SECTION OF STUDY ROUTE
	IMPROVEMENT SECTION OF STUDY ROUTE
	BRIDGE (PROPOSED, EXISTING)
	BOX CULVERT (PROPOSED, EXISTING)
	PIPE CULVERT (PROPOSED, EXISTING)
	HIGH WATER LEVEL

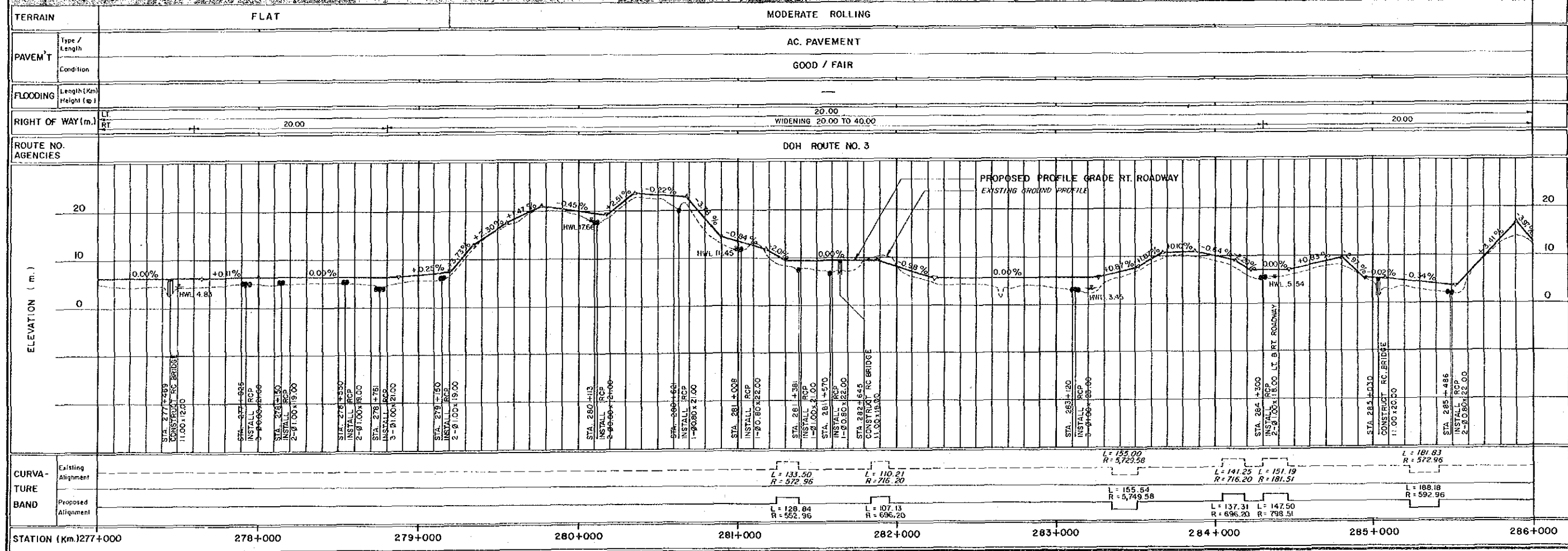
HWY	HIGHWAY
PI	POINT OF HORIZONTAL INTERSECTION
NO. or #	NUMBER
$\Delta$	DEFLECTION ANGLE
R	RADIUS OF CURVATURE
T	TANGENT LENGTH
L	LENGTH OF CURVE
RT	RIGHT
LT	LEFT
EXIST.	EXISTING
EXTD.	EXTEND

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

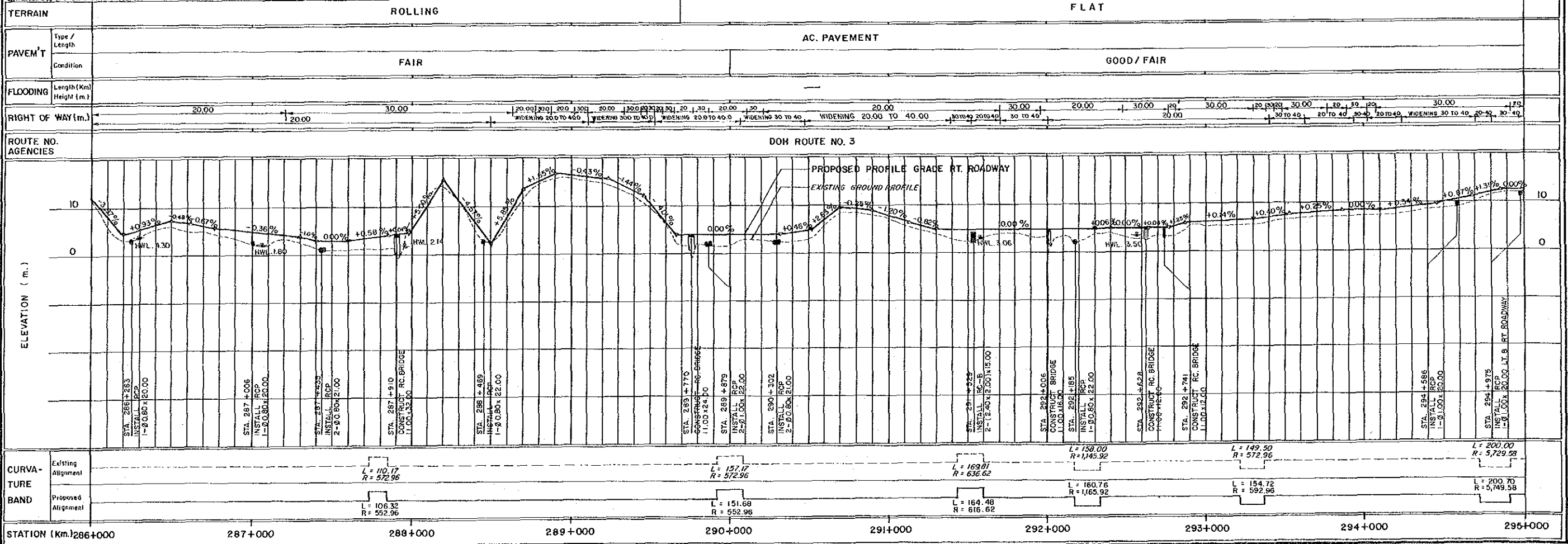
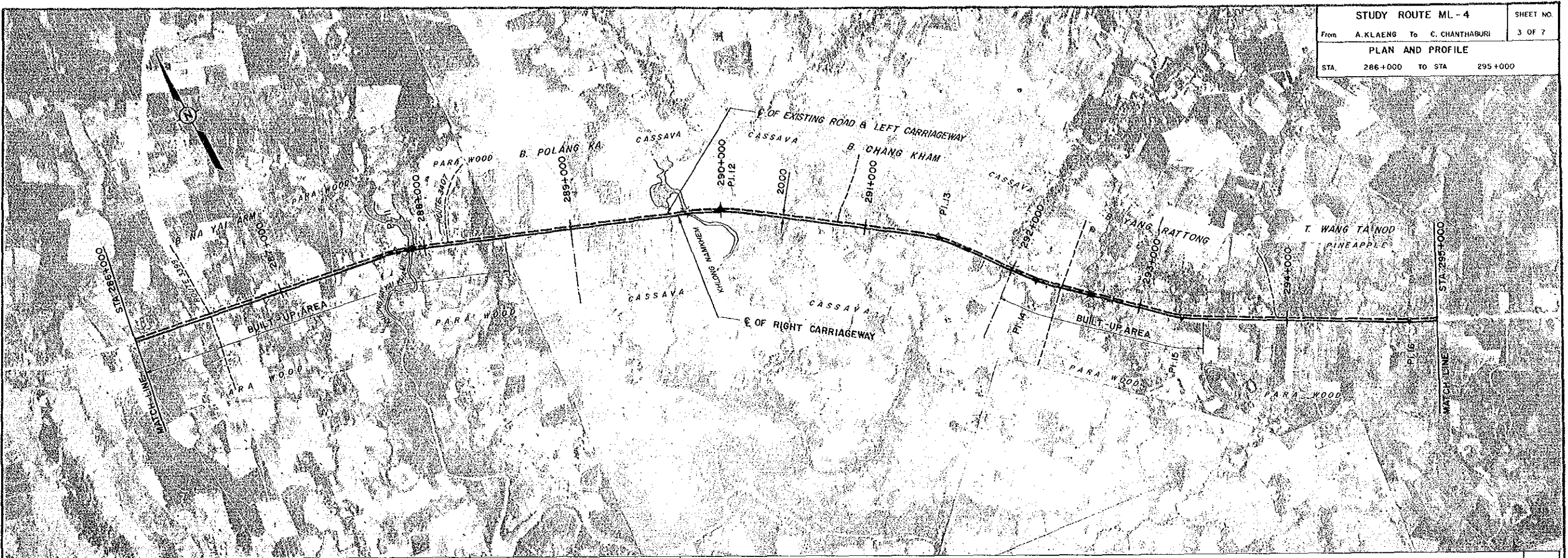
## PLAN AND PROFILE

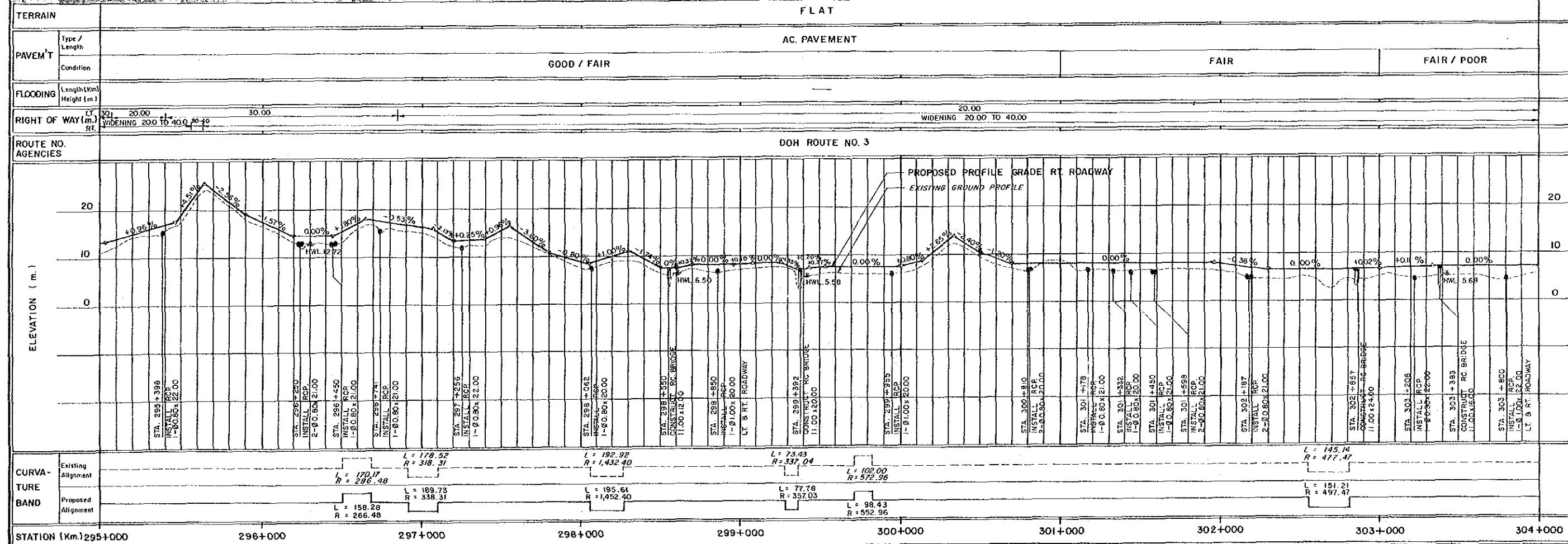
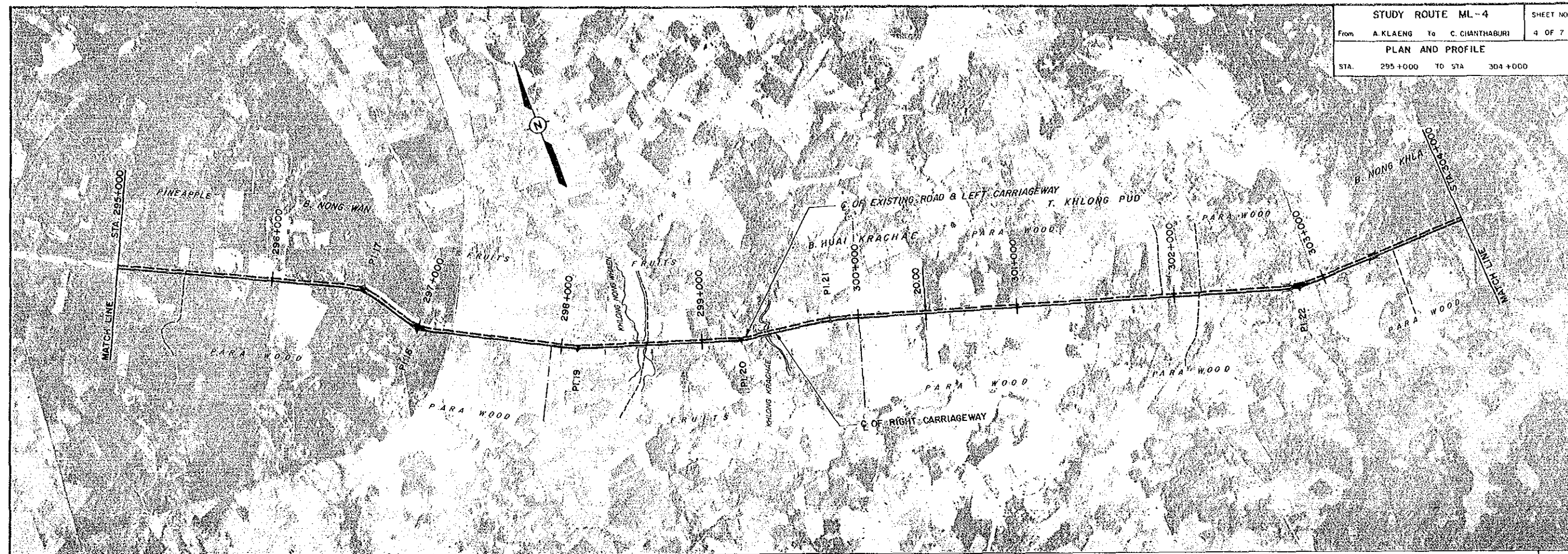
STA.	268 + 588	TO STA	277 + 000
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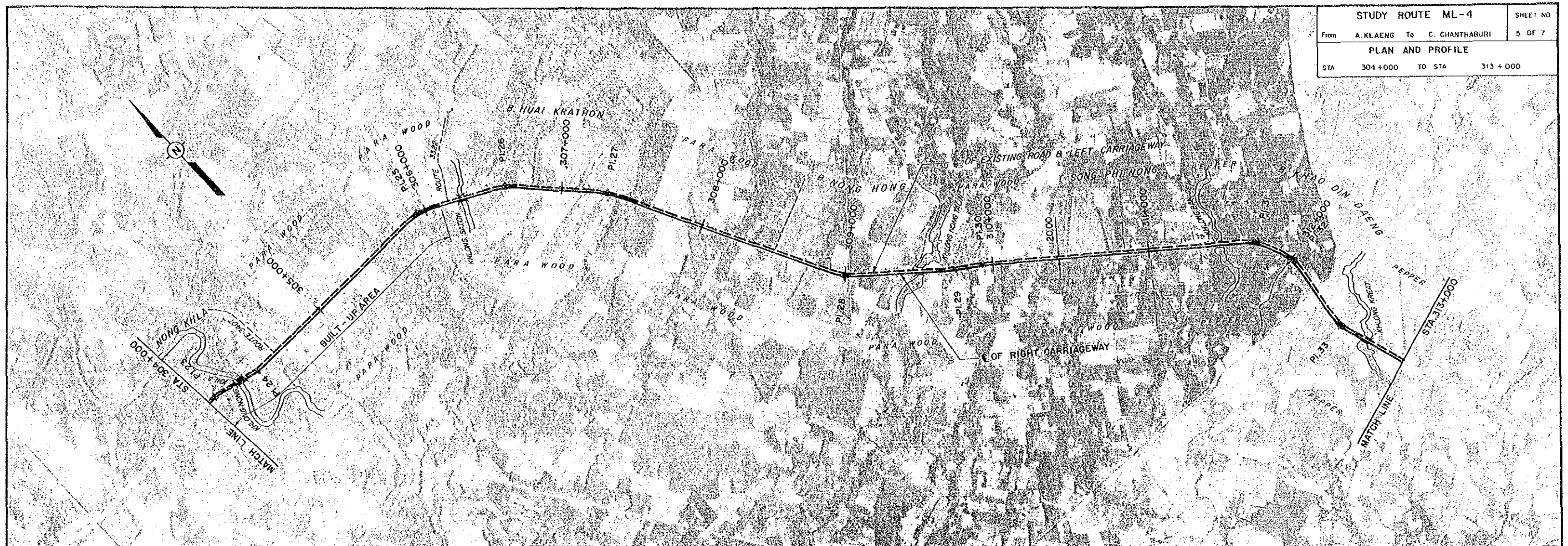








STA	304 + 000	TO STA	313 + 000
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TERRAIN		MODERATE ROLLING	
PAVEM'T	Type / Length	AC. PAVEMENT	
	Condition	FAIR / POOR	FAIR
FLOODING	Length (km) Height (m.)		
RIGHT OF WAY (m.)	LT RT	WIDENING 20.00 TO 40.00	
ROUTE NO. AGENCIES	DOH ROUTE NO. 3		
ELEVATION (m.)			
	<p>PROPOSED PROFILE GRADE RT. ROADWAY</p> <p>EXISTING GROUND PROFILE</p>		
CURVA-TURE	Existing Alignment	<p>L = 142.83 R = 572.96</p> <p>L = 205.00 R = 409.26</p> <p>L = 170.42 R = 477.47</p> <p>L = 154.17 R = 572.96</p> <p>L = 163.69 R = 409.26</p> <p>L = 137.67 R = 1,145.92</p> <p>L = 119.58 R = 1,432.40</p> <p>L = 185.83 R = 318.31</p> <p>L = 141.00 R = 318.31</p> <p>L = 201.55 R = 409.26</p>	
BAND	Proposed Alignment	<p>L = 157.28 R = 552.96</p> <p>L = 147.81 R = 592.96</p> <p>L = 194.98 R = 389.26</p> <p>L = 163.27 R = 457.47</p> <p>L = 148.78 R = 552.96</p> <p>L = 171.69 R = 429.26</p> <p>L = 140.06 R = 1,169.92</p> <p>L = 117.91 R = 1,412.40</p> <p>L = 174.15 R = 298.31</p> <p>L = 132.33 R = 298.31</p> <p>L = 28.49 R = 423.26</p>	
STATION (Km.) 304+000 305+000 306+000 307+000 308+000 309+000 310+000 311+000 312+000 313+000			