MALAYSIA URBAN TRANSPORT STUDY IN GREATER METROPOLITAN AREAS GEORGE TOWN, BUTTERWORTH AND BUKIT MERTAJAM

FINAL REPORT

PHASE II - STAGE II

BUTTERWORTH RING ROAD PROJECT

Preliminary Engineering Plans March 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

GOVERNMENT OF MALAYSIA

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82-034(2/2)



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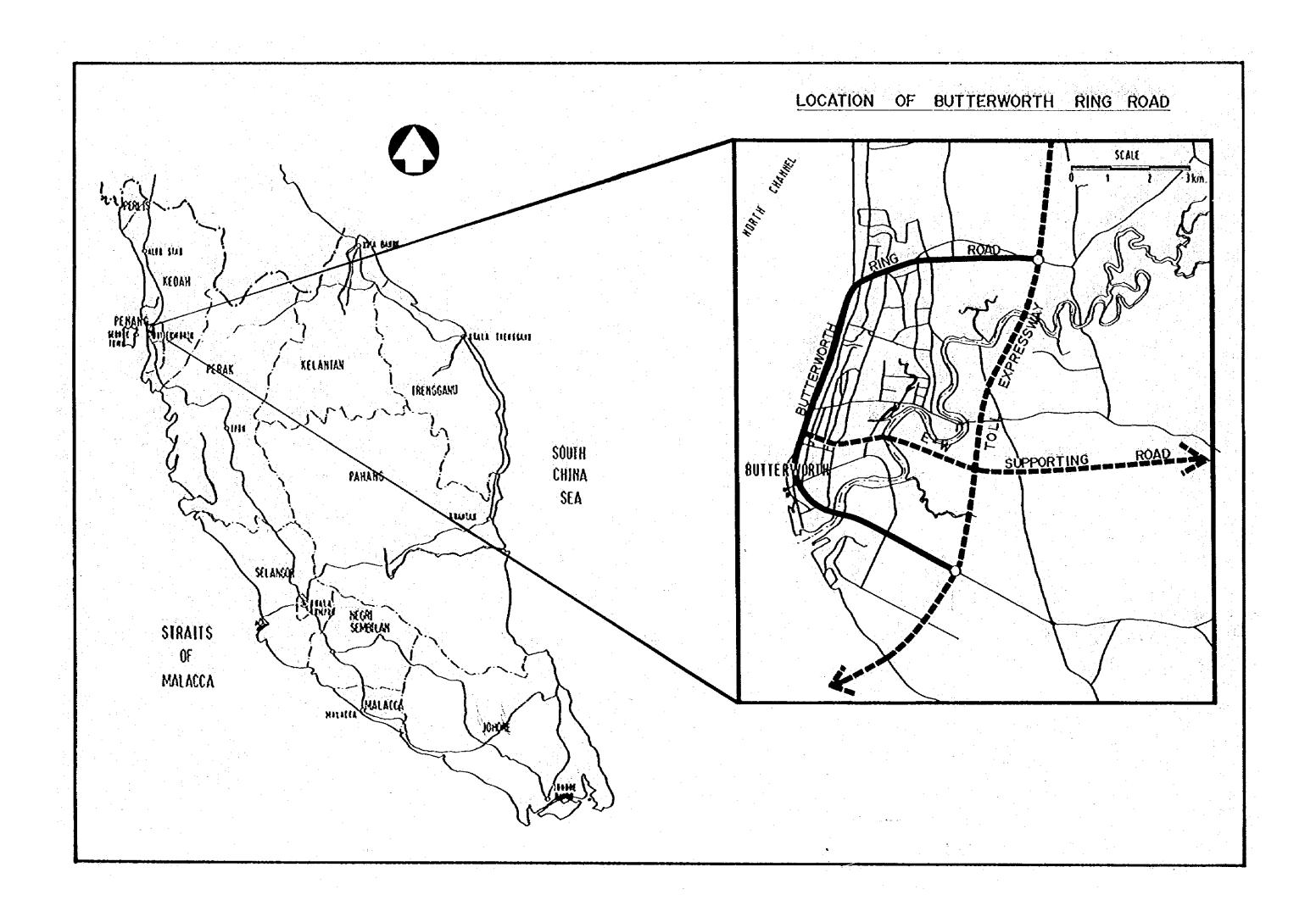
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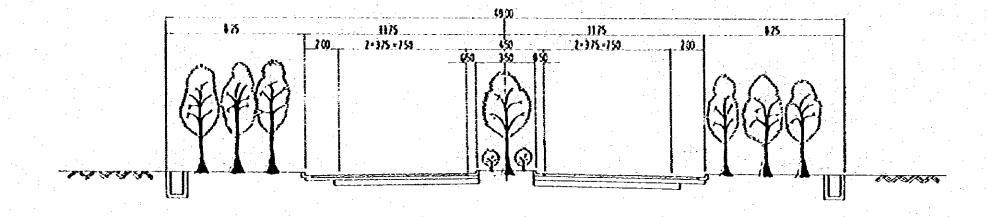
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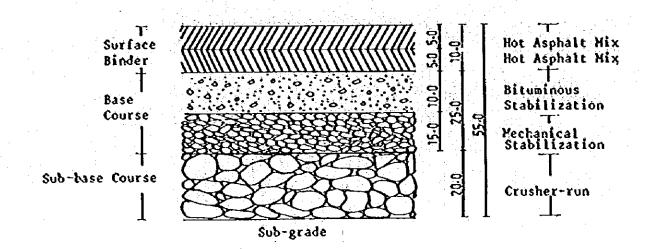


PRELIMINARY ENGINEERING DRAWINGS

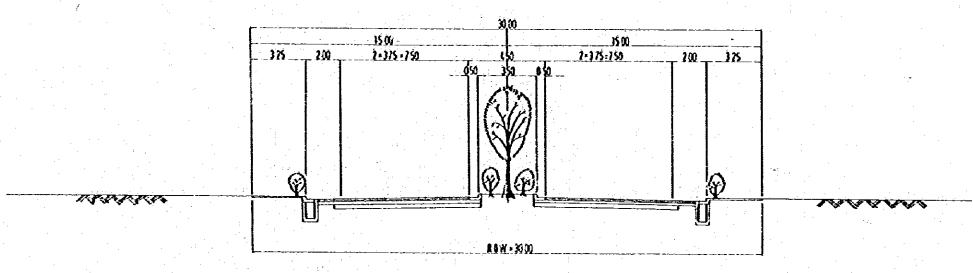
TYPICAL CROSS - SECTION



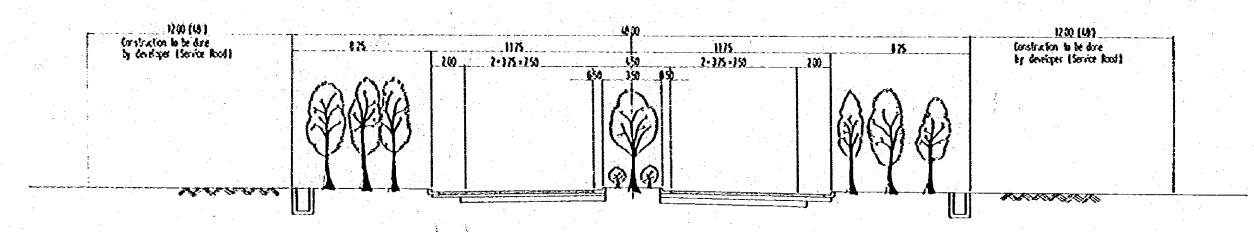
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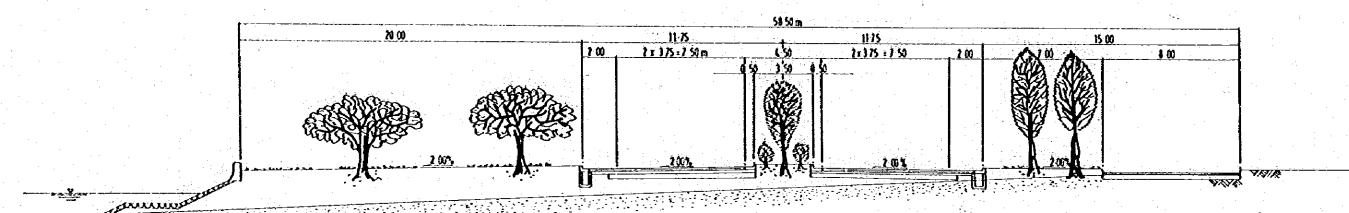
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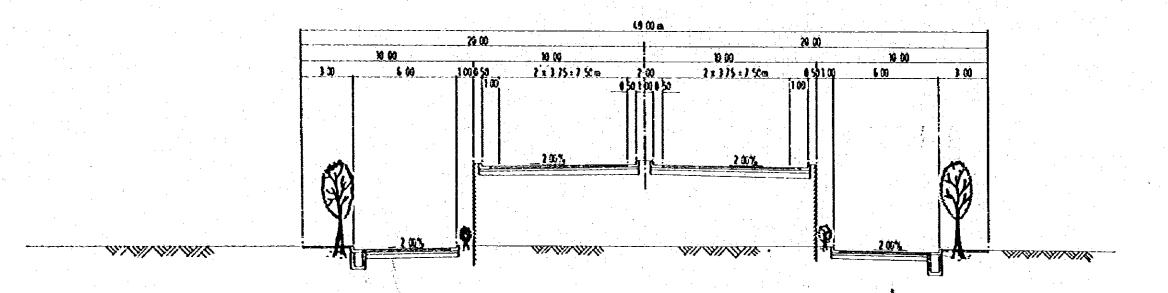
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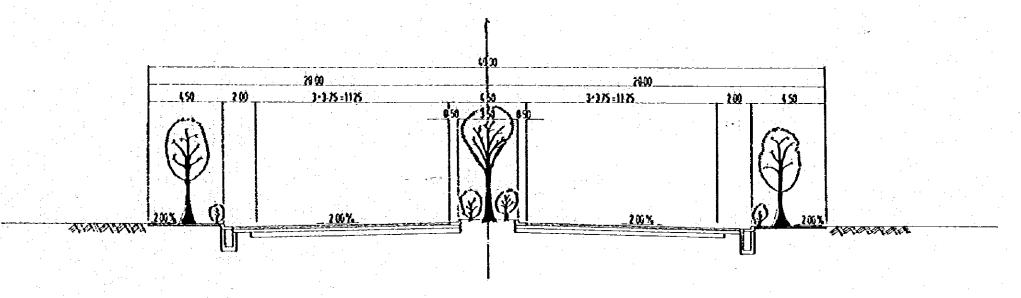


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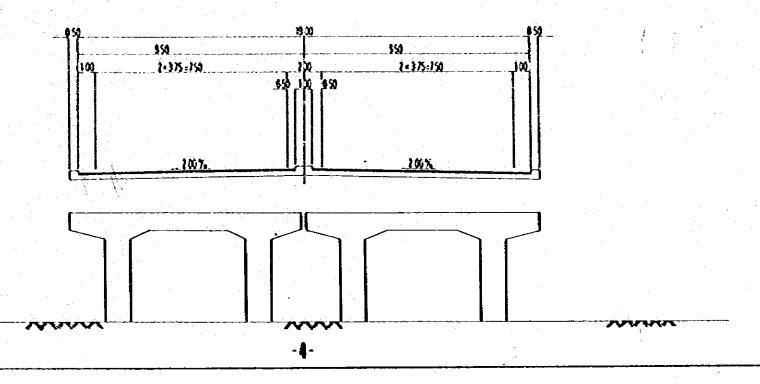


Improvement of existing JALAN PRAI

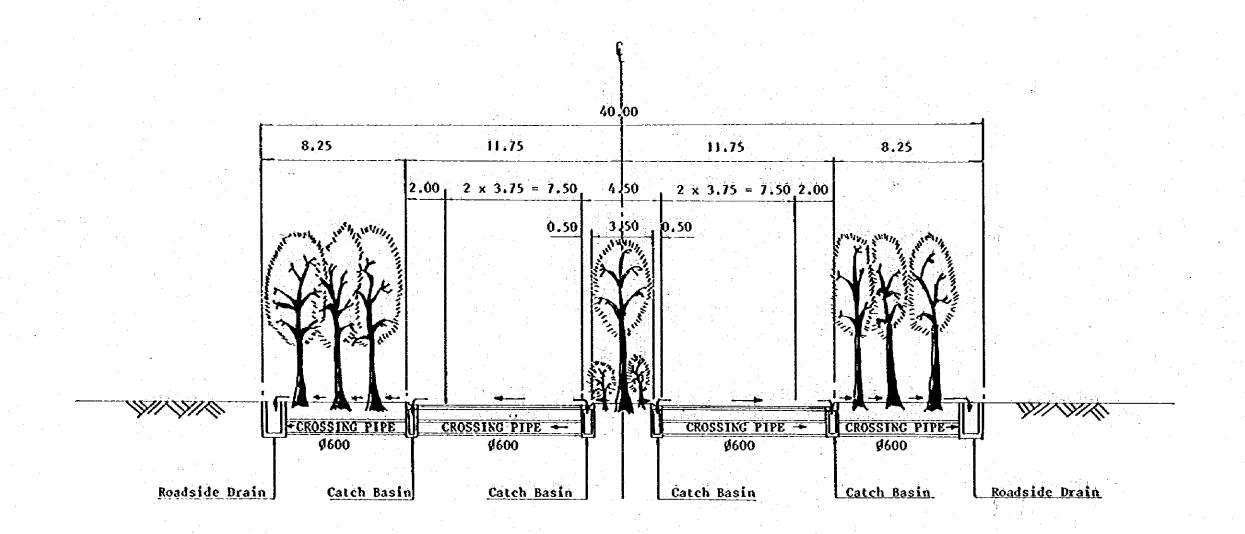
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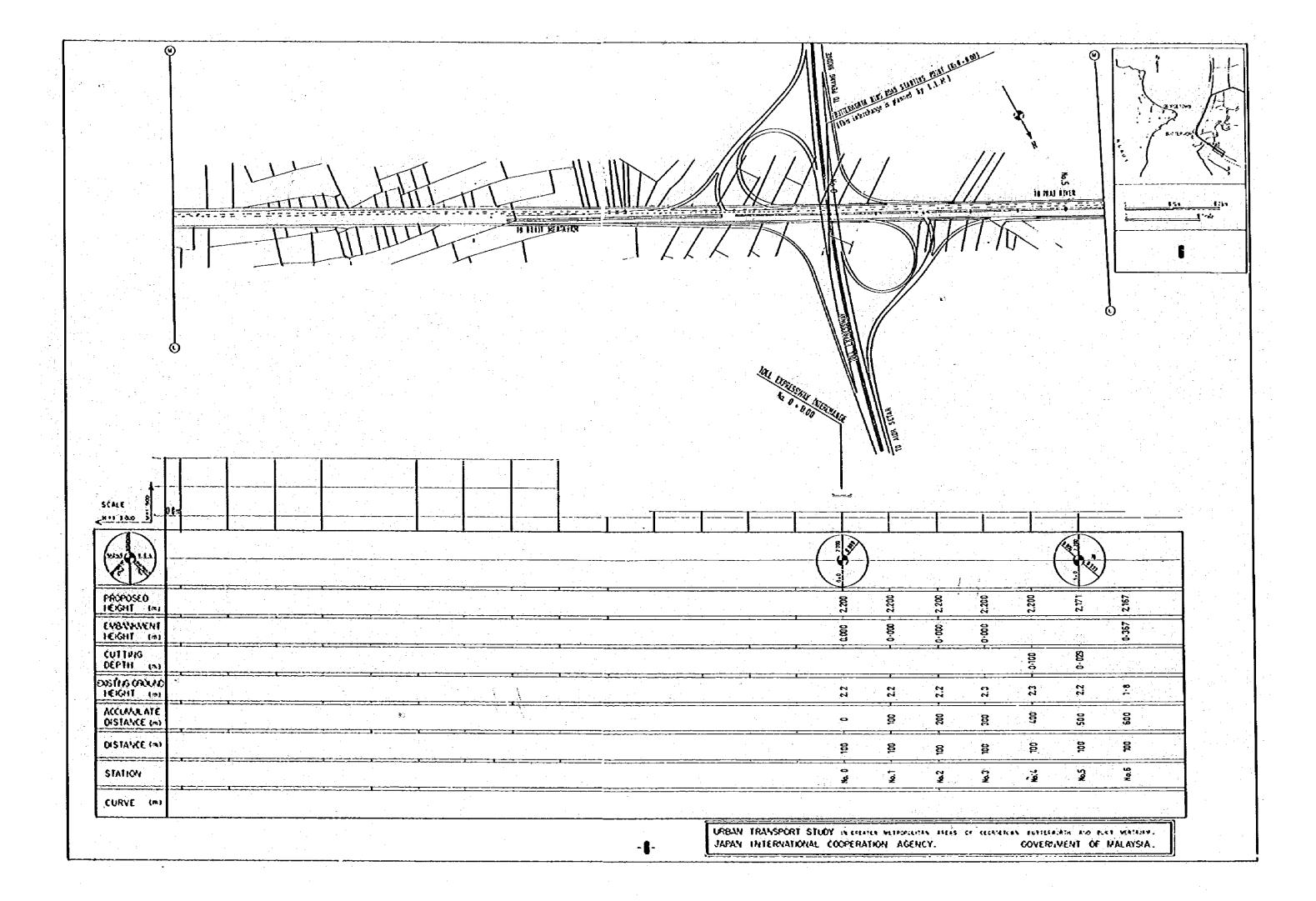


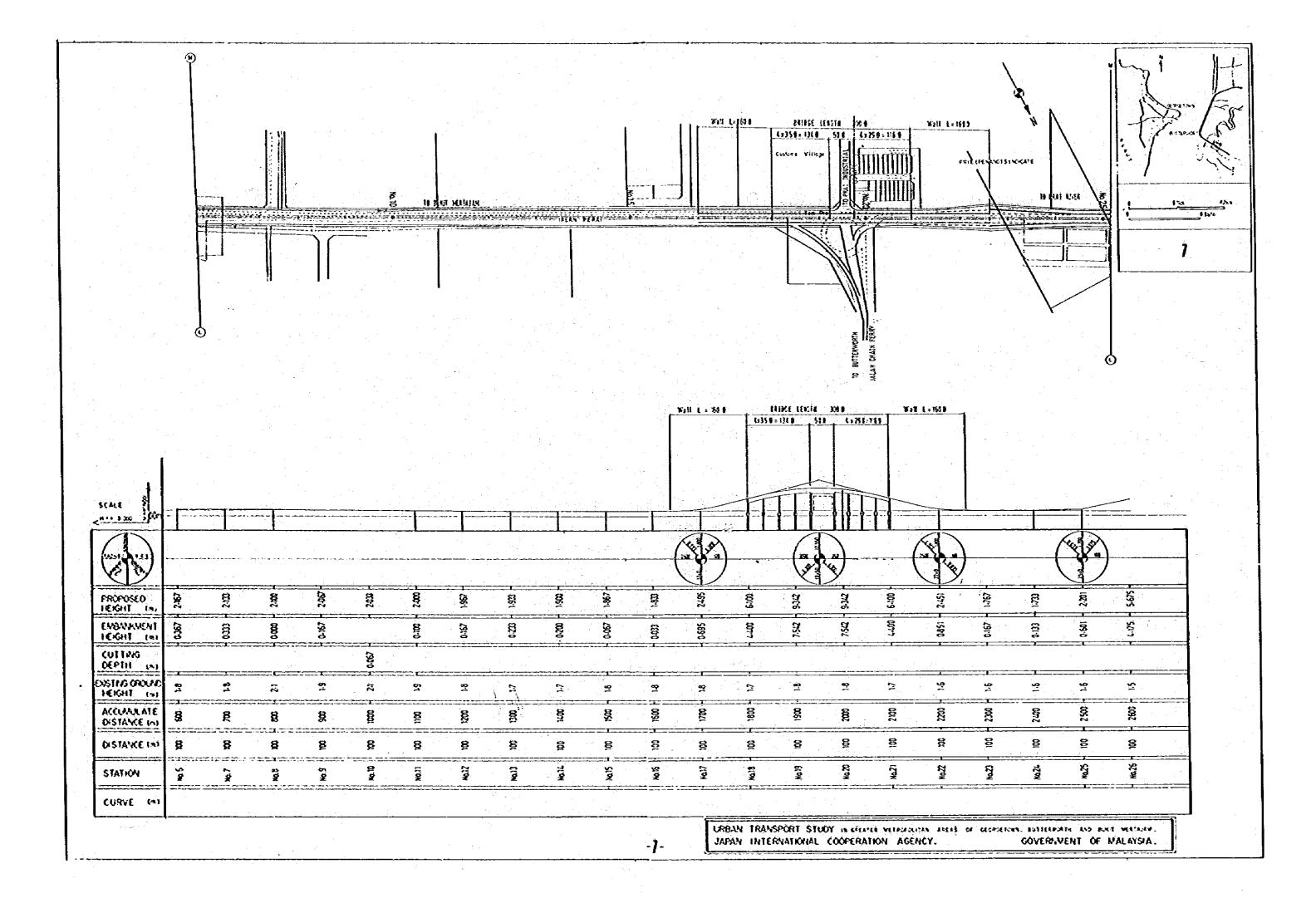
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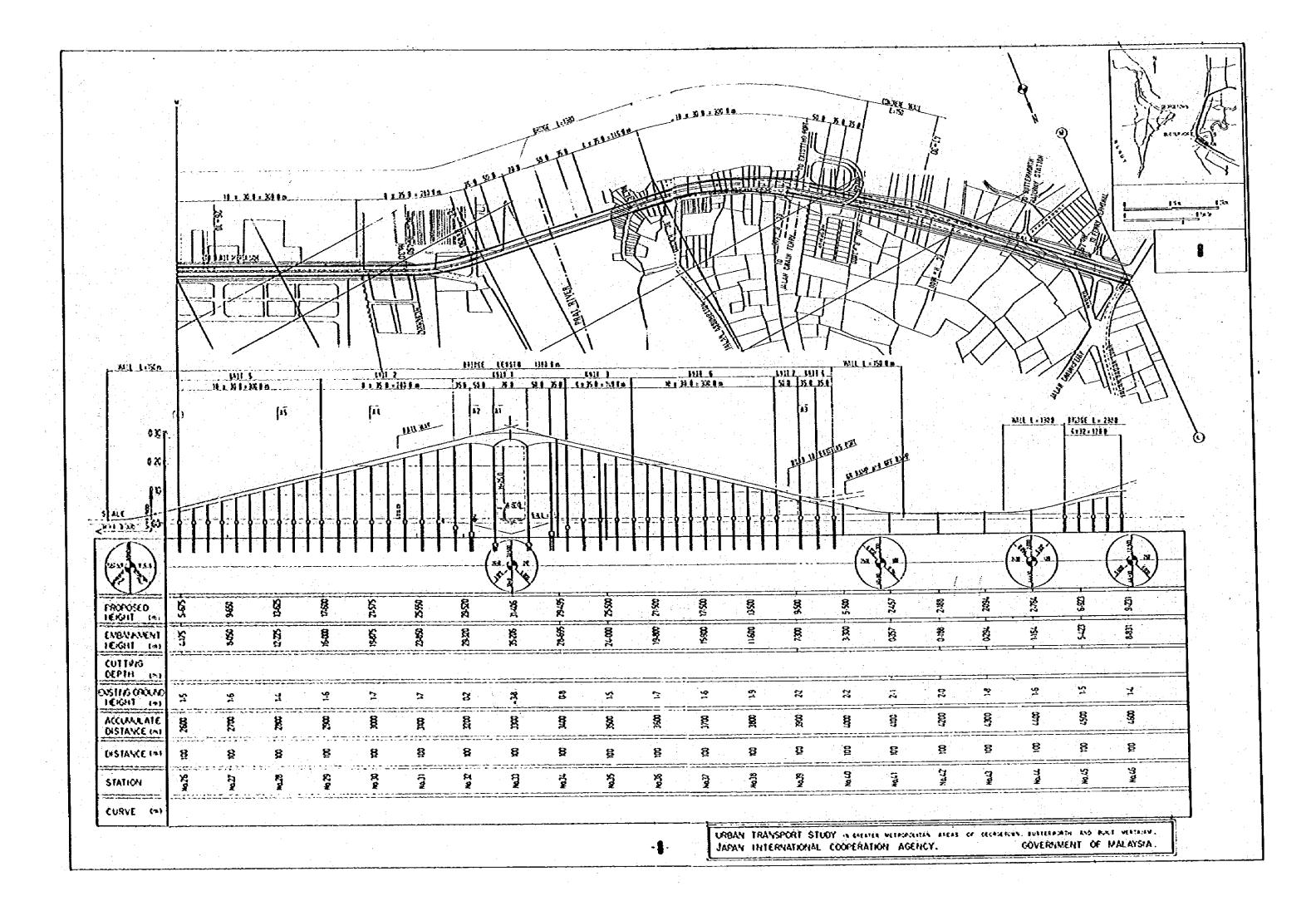


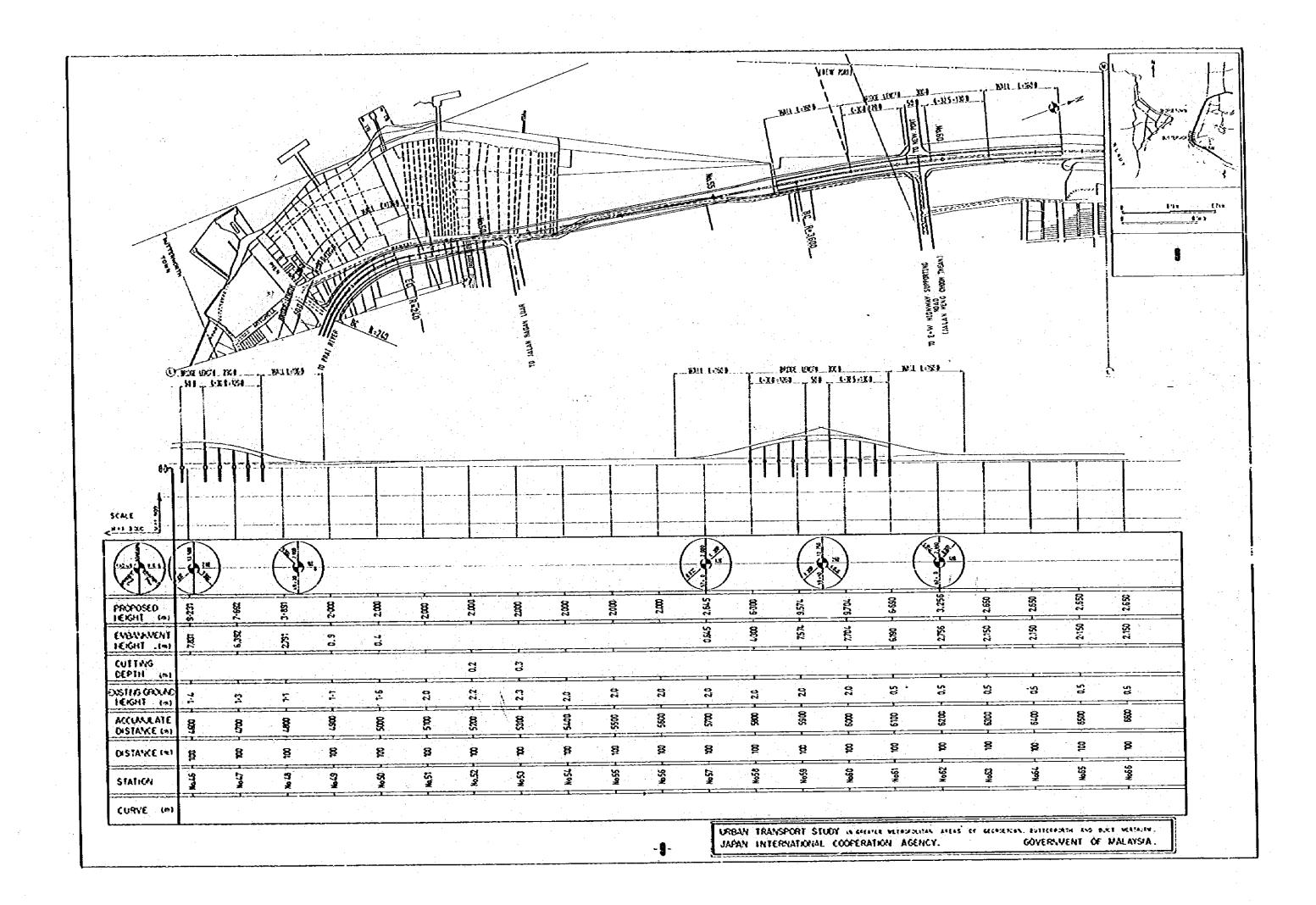
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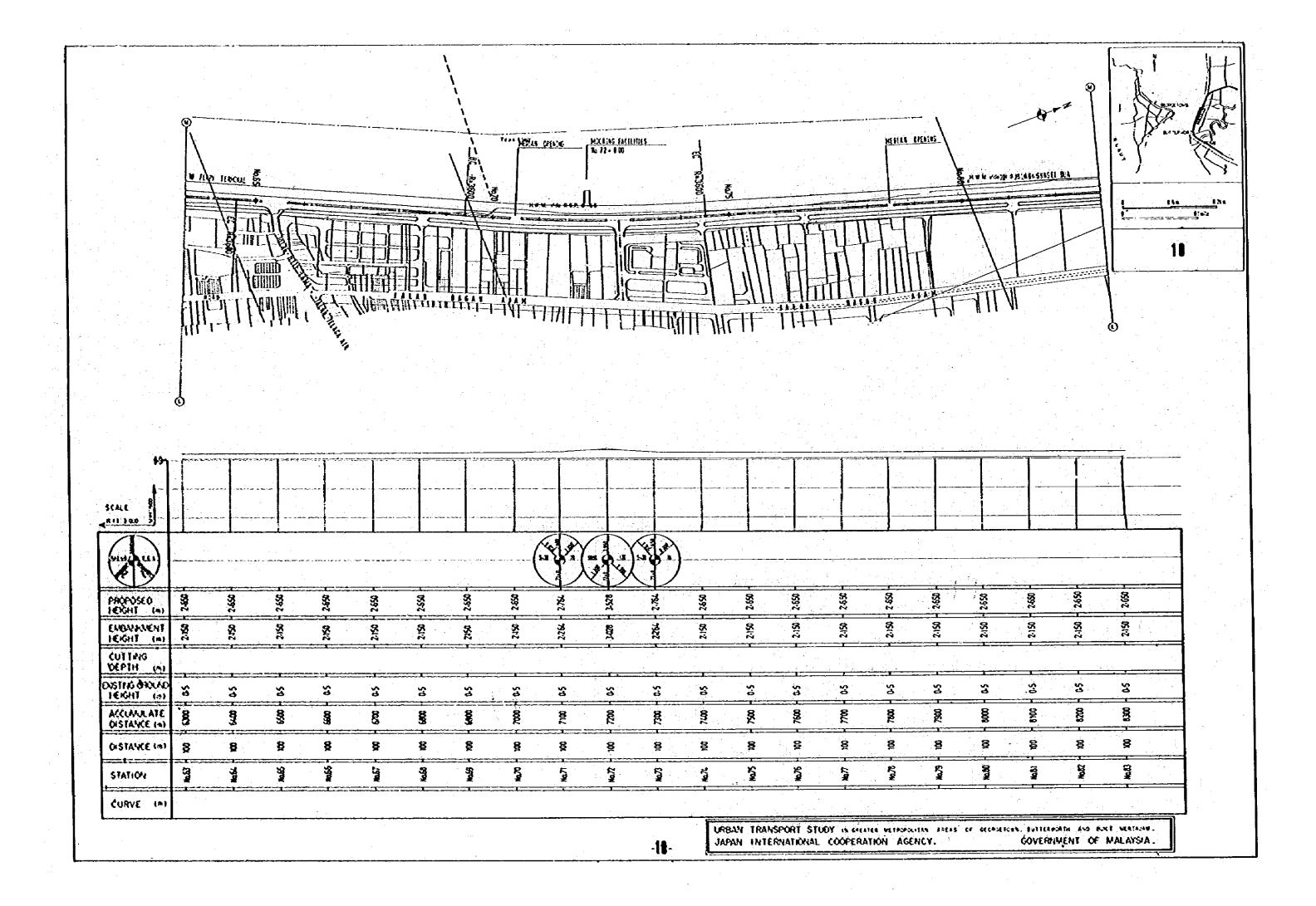


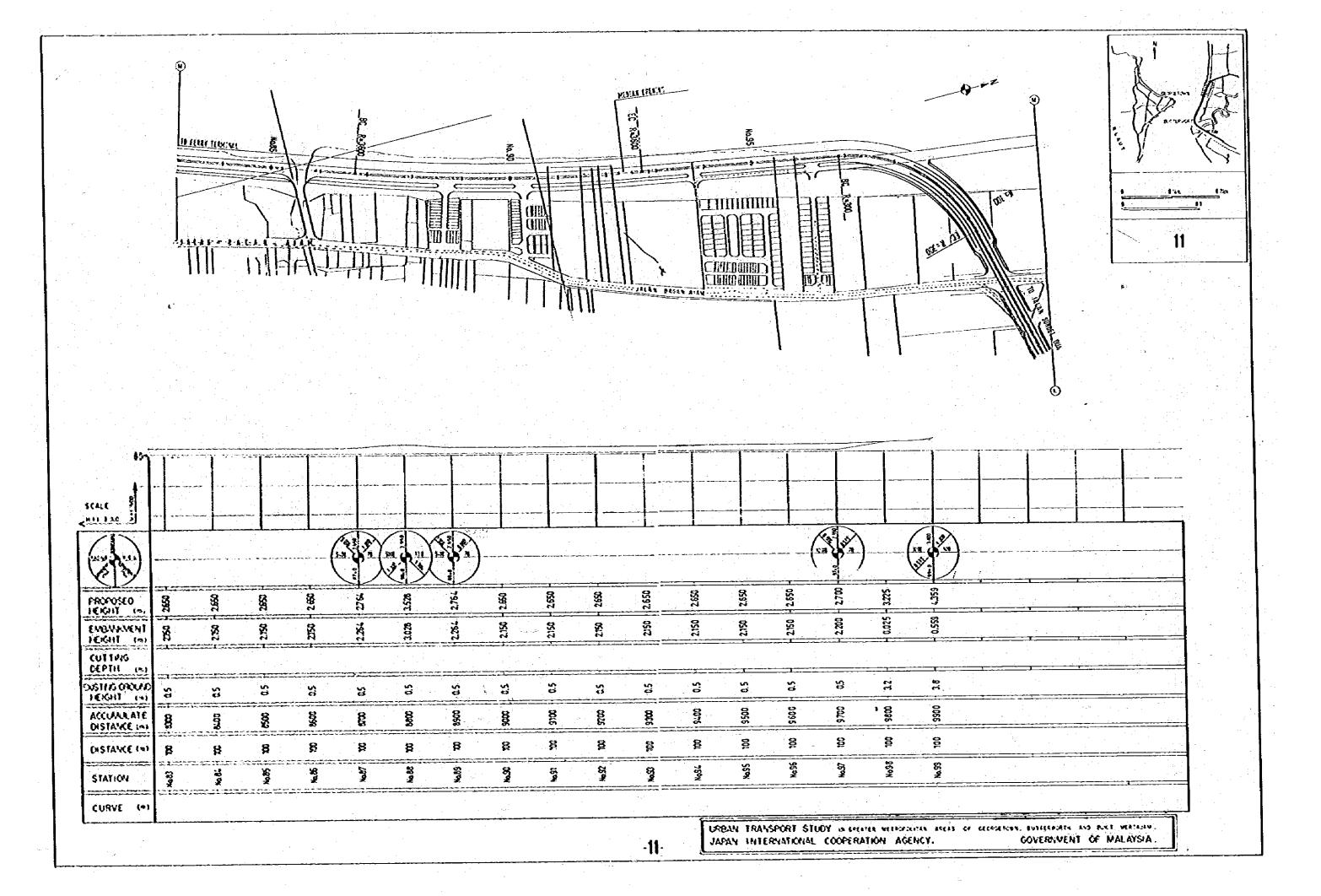


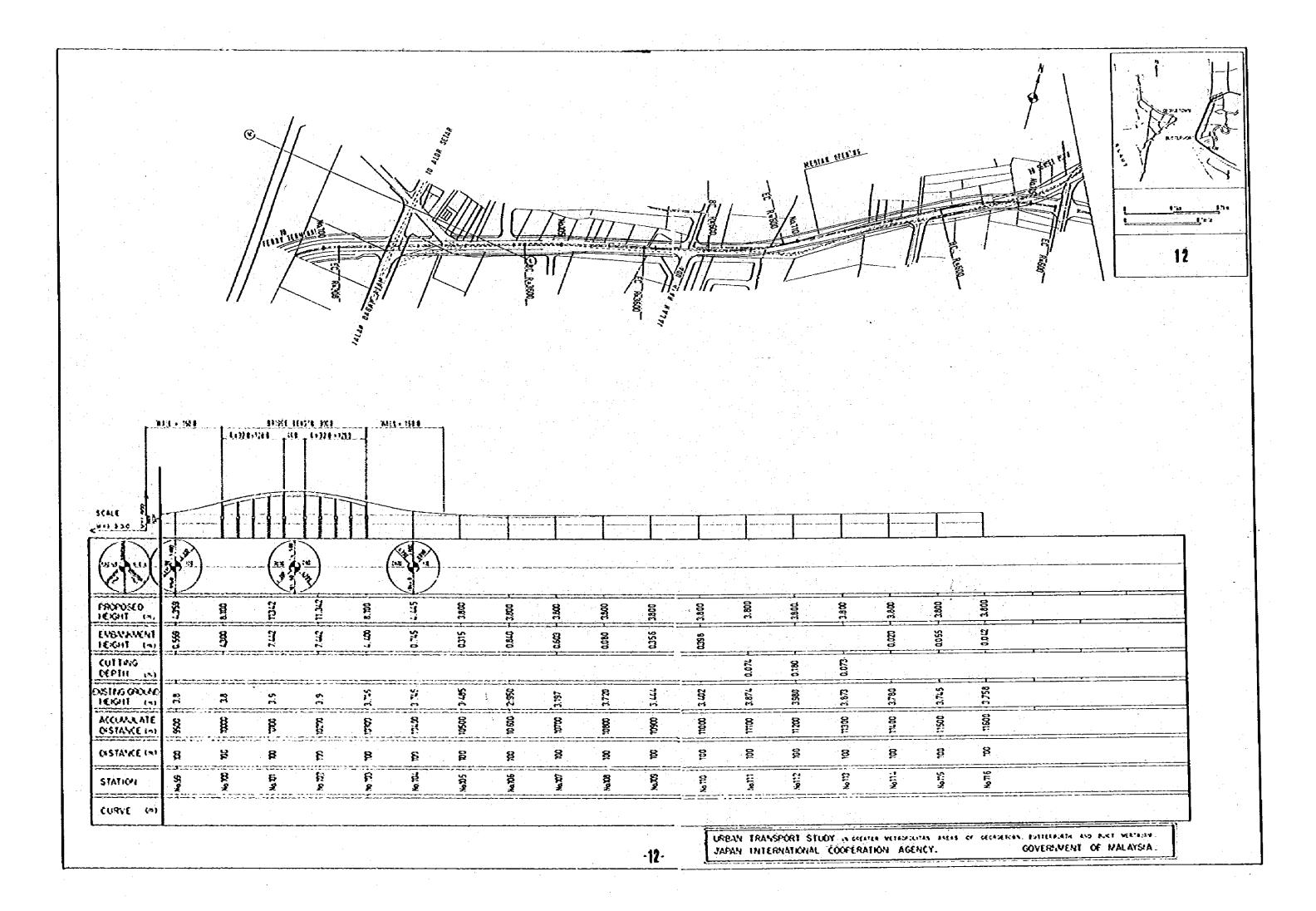


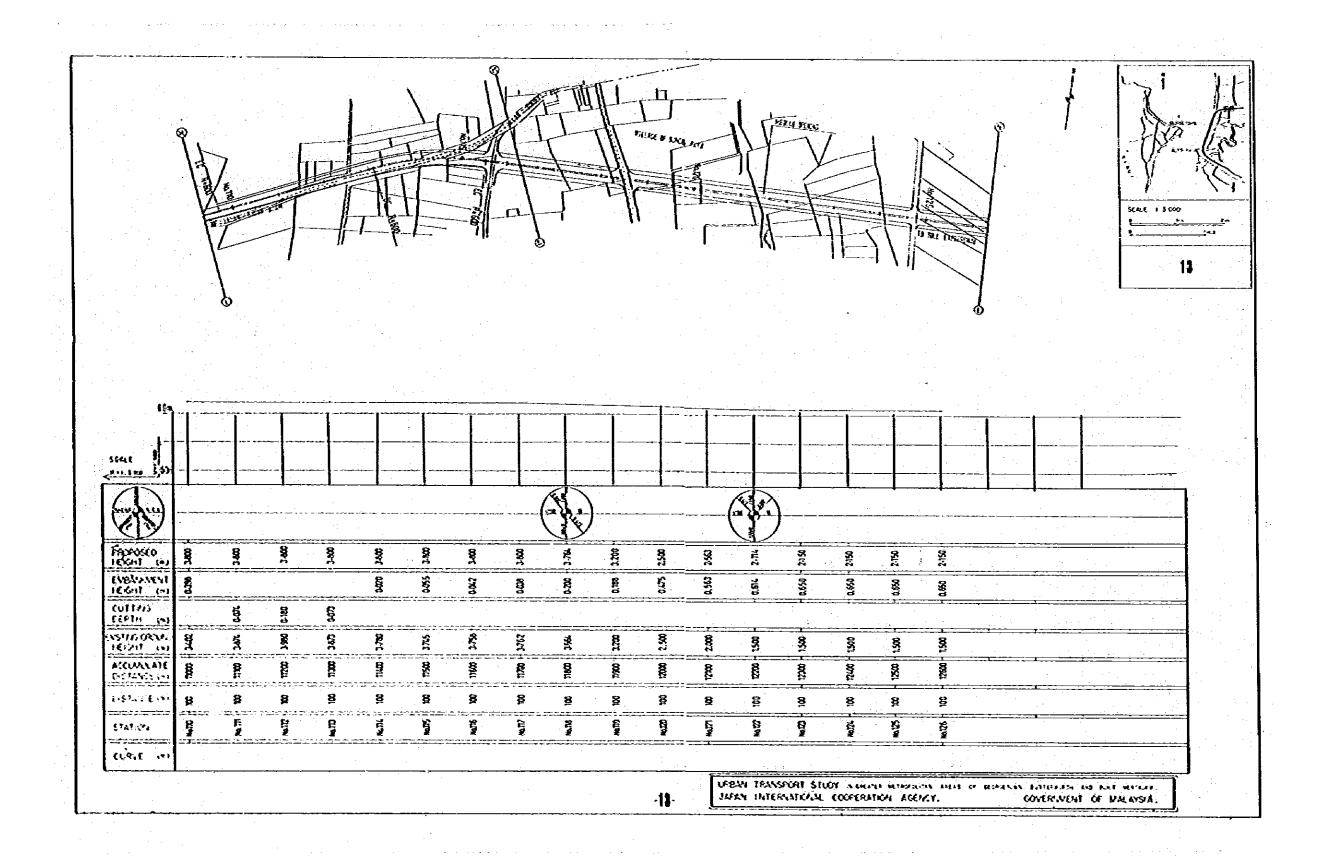


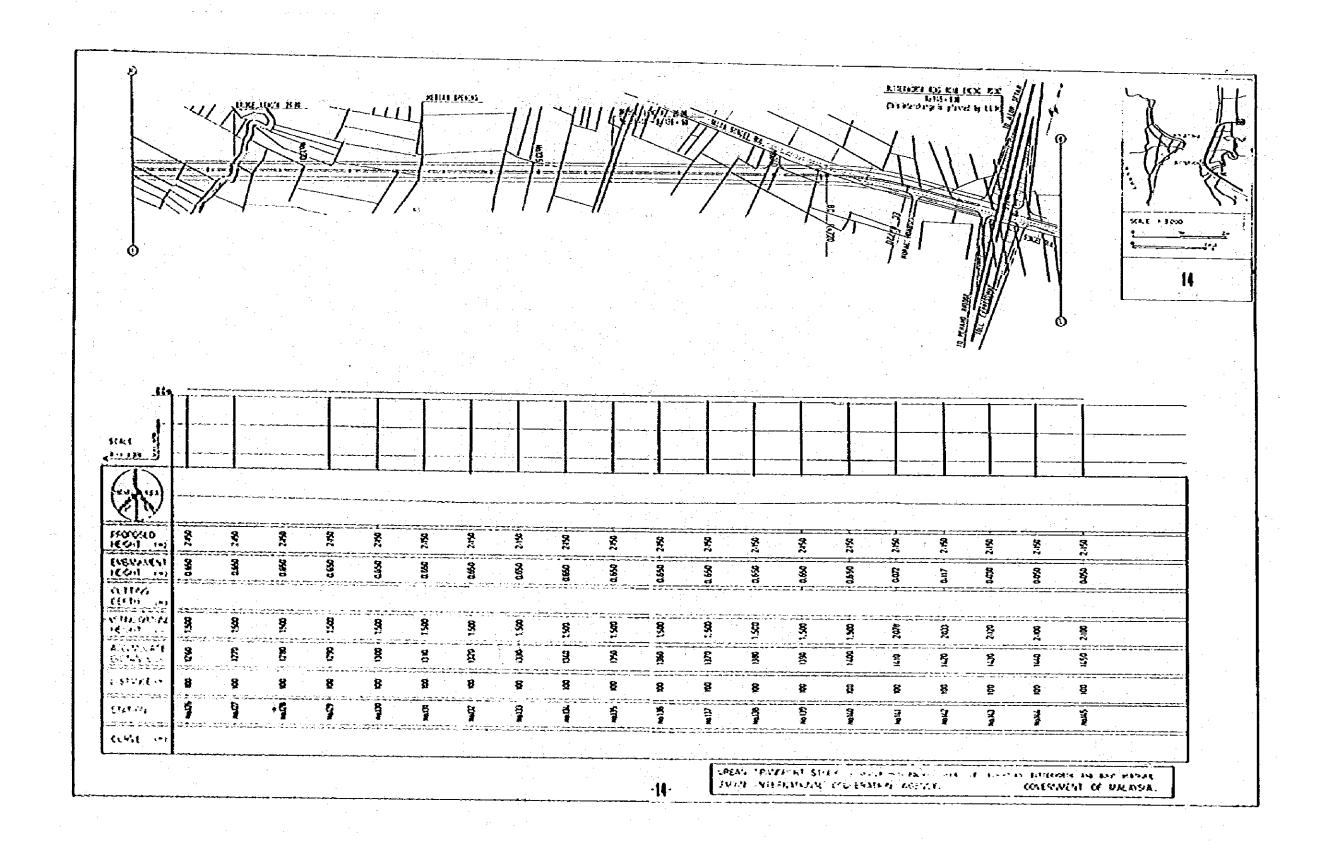




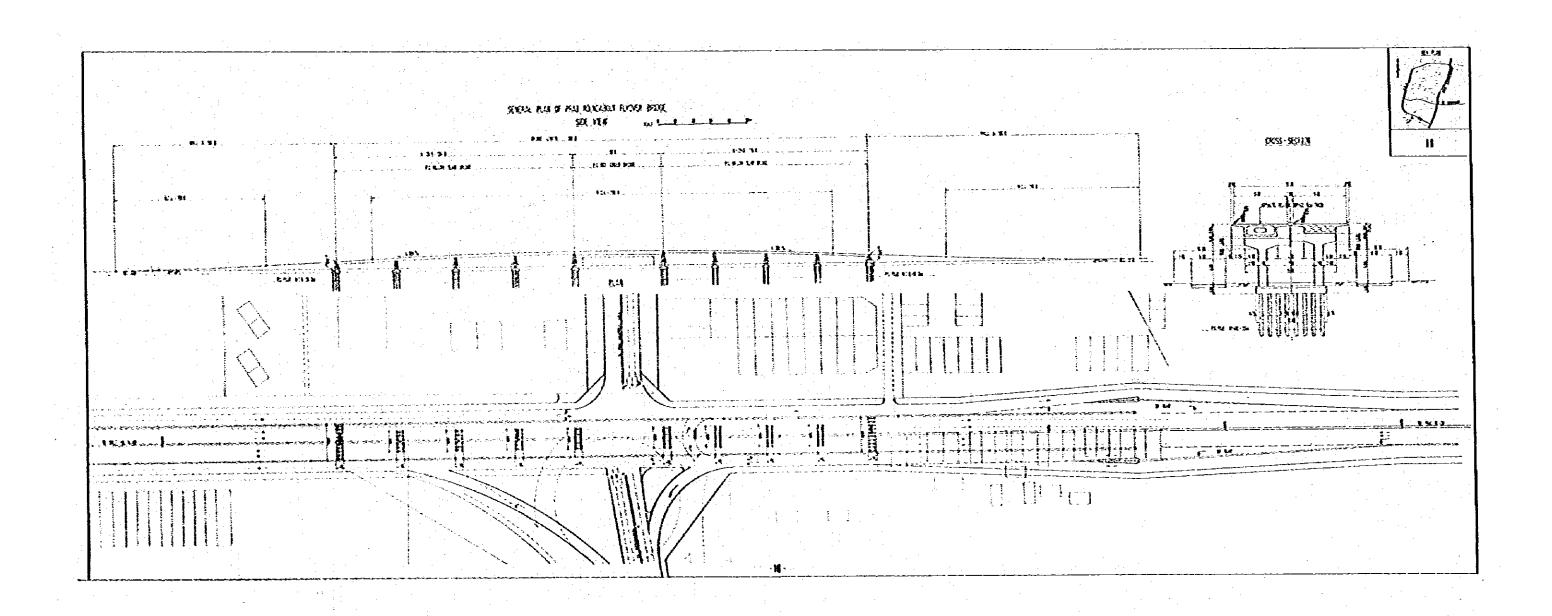


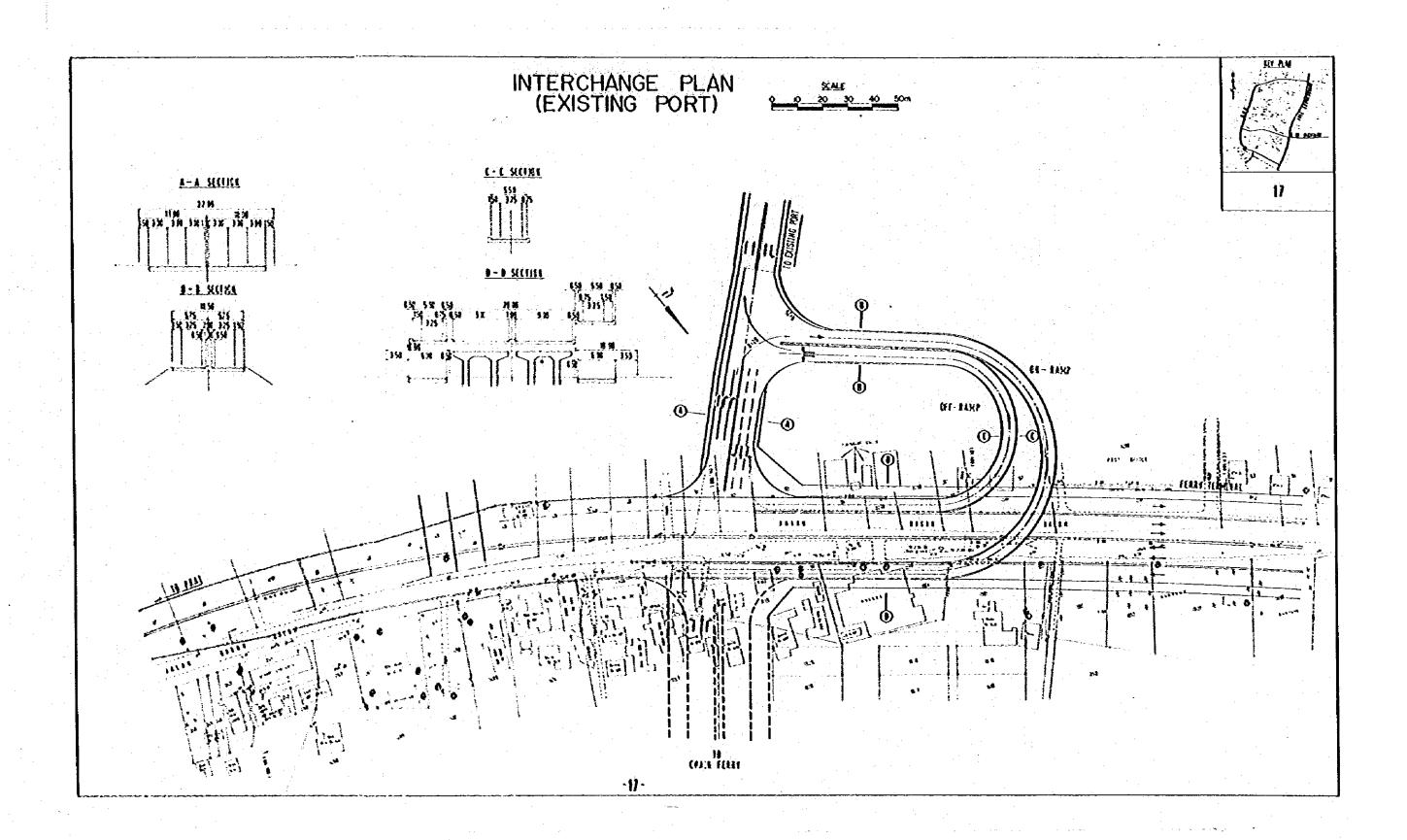






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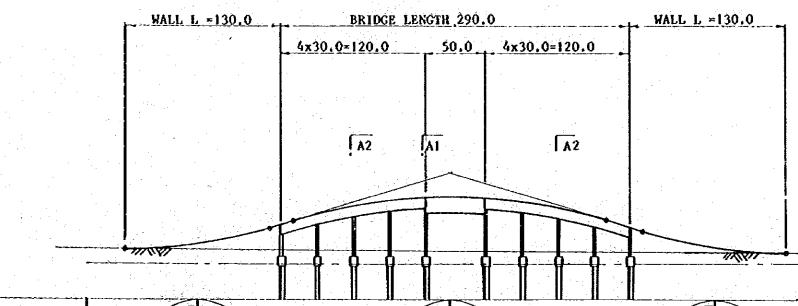


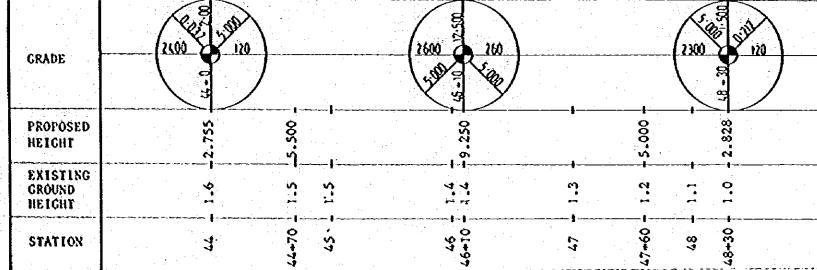


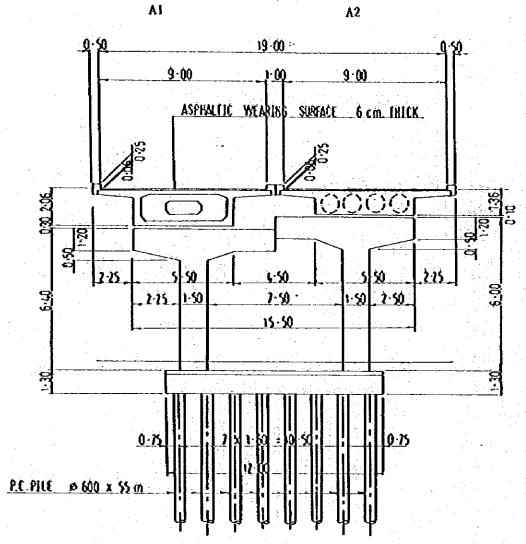
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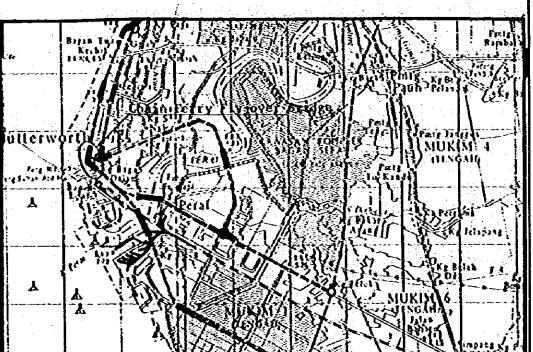
CROSS-SECTION

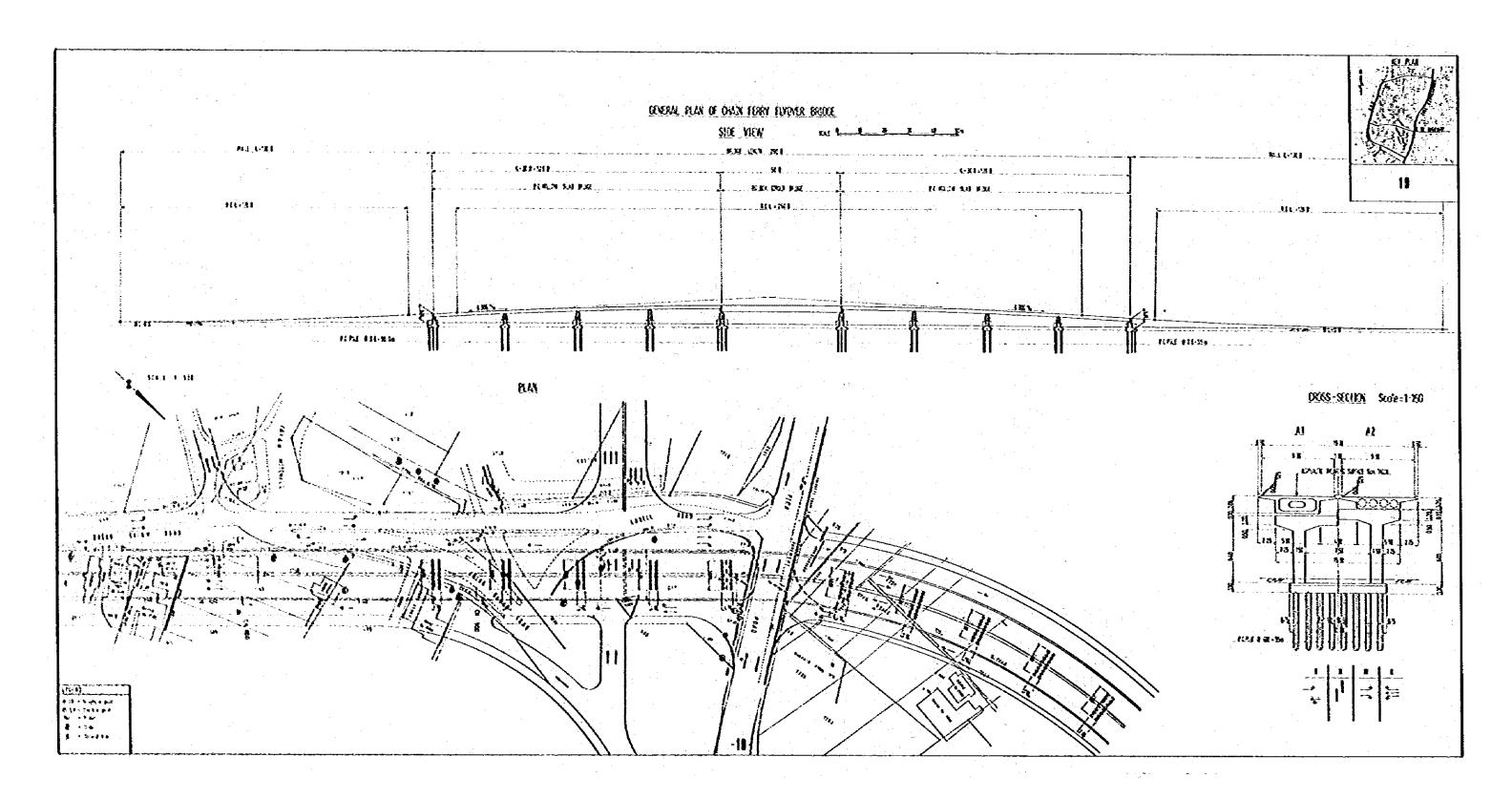


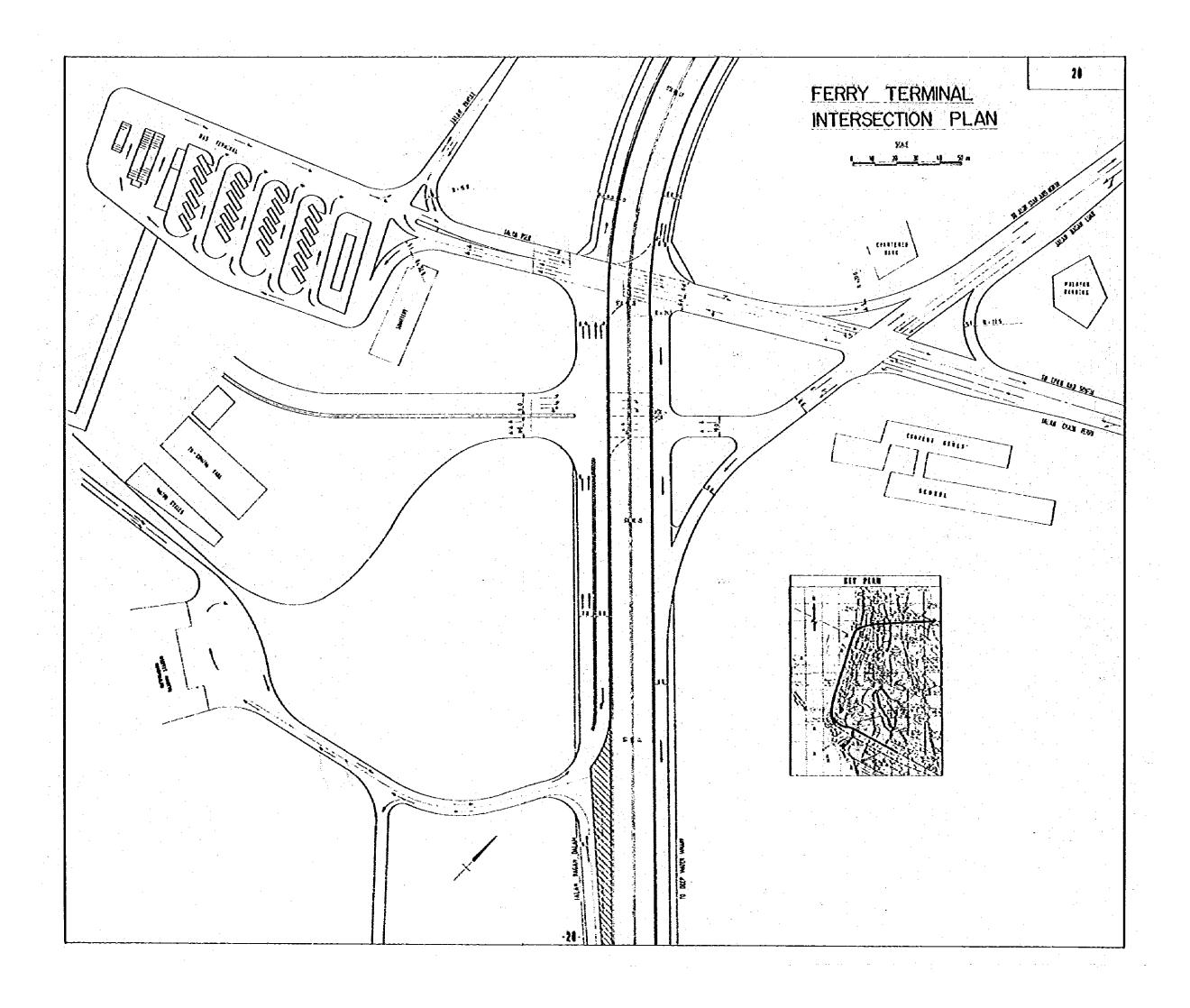


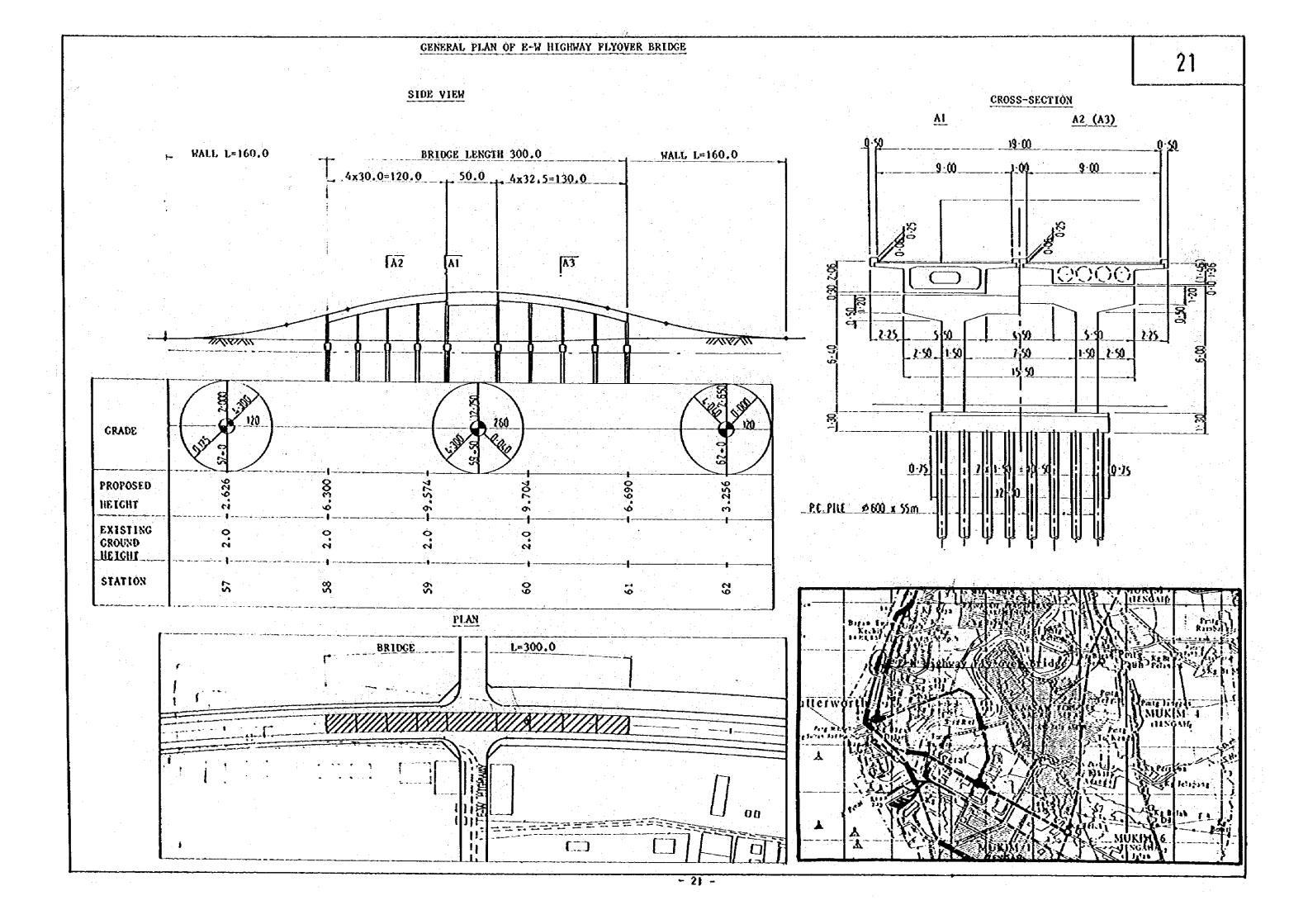


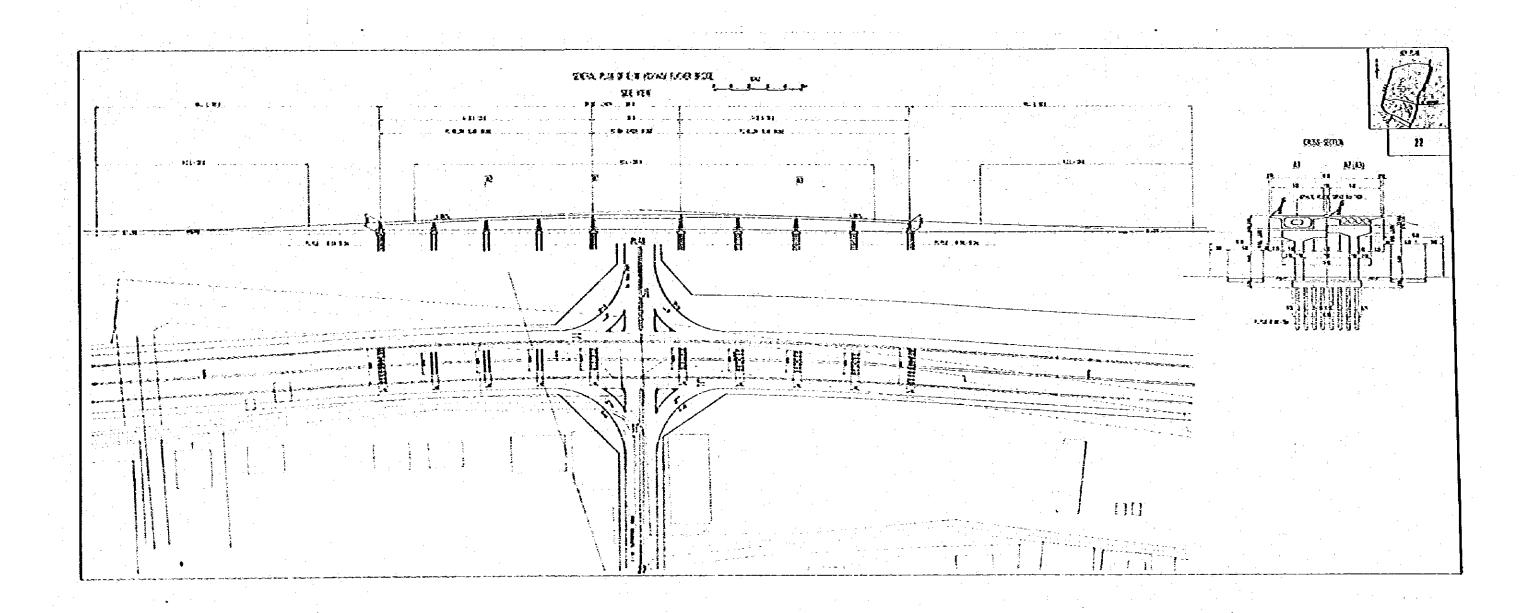


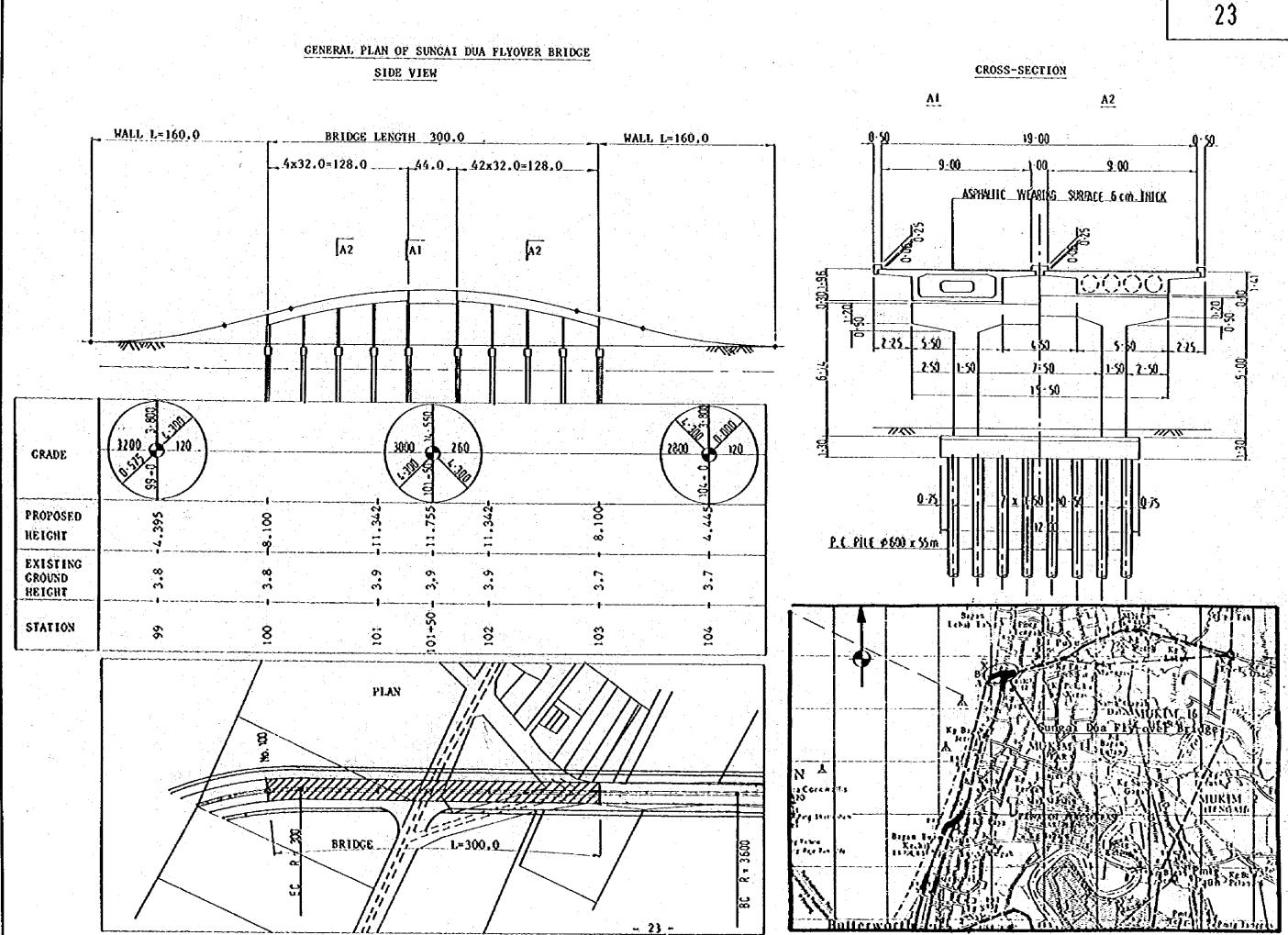


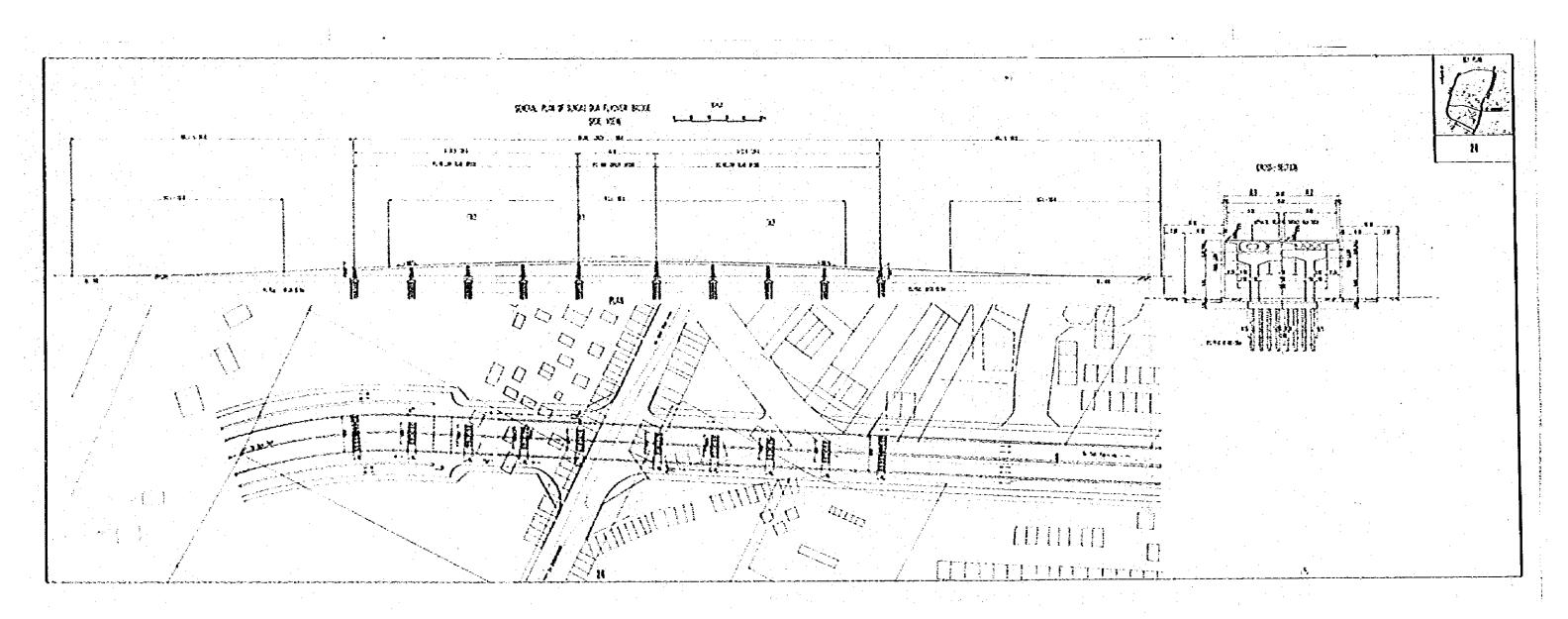


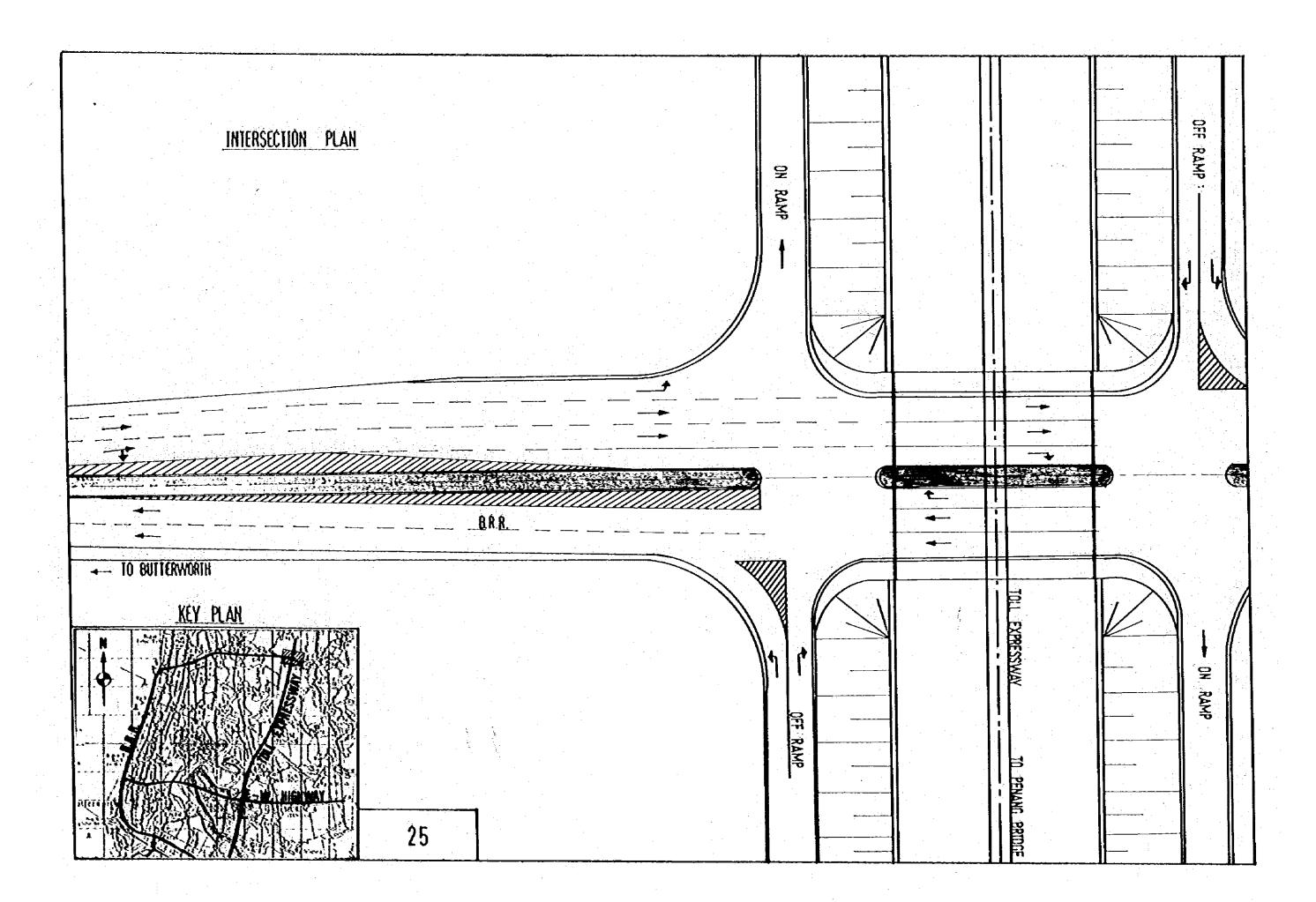






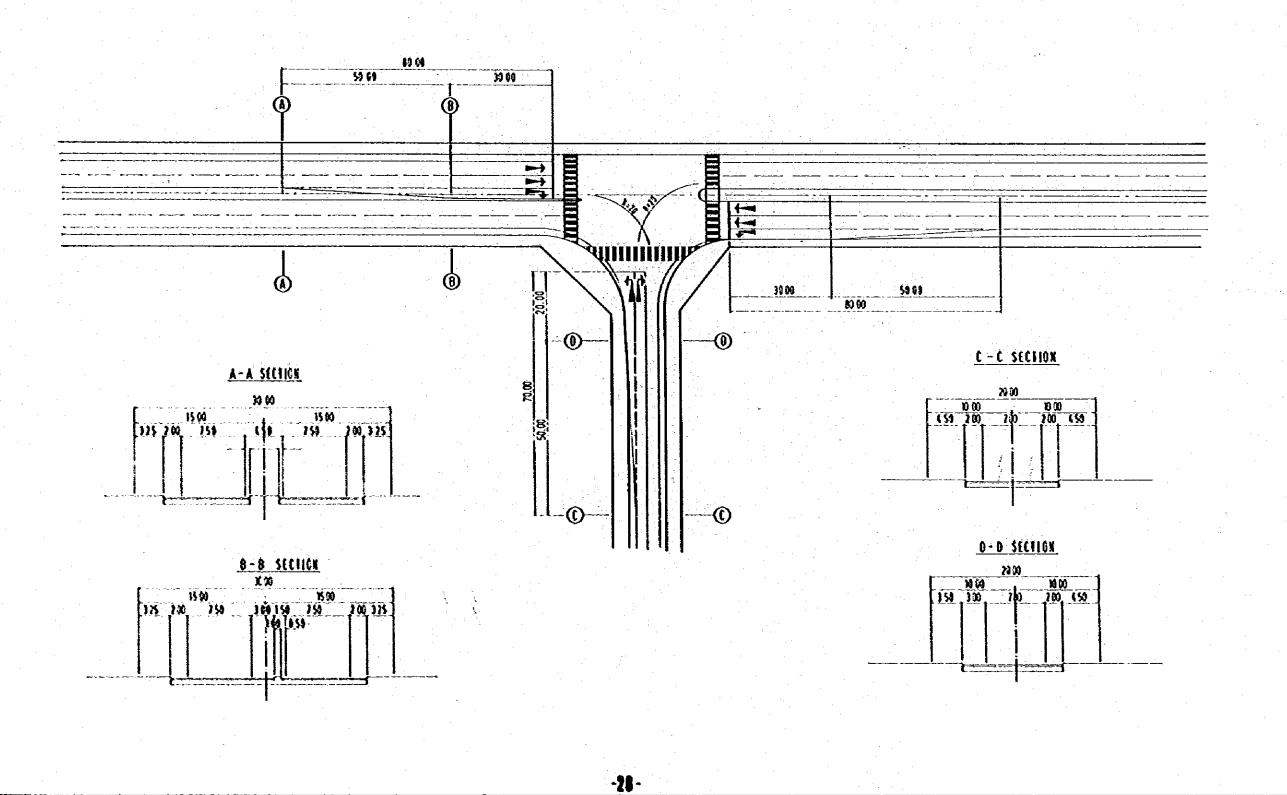






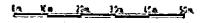
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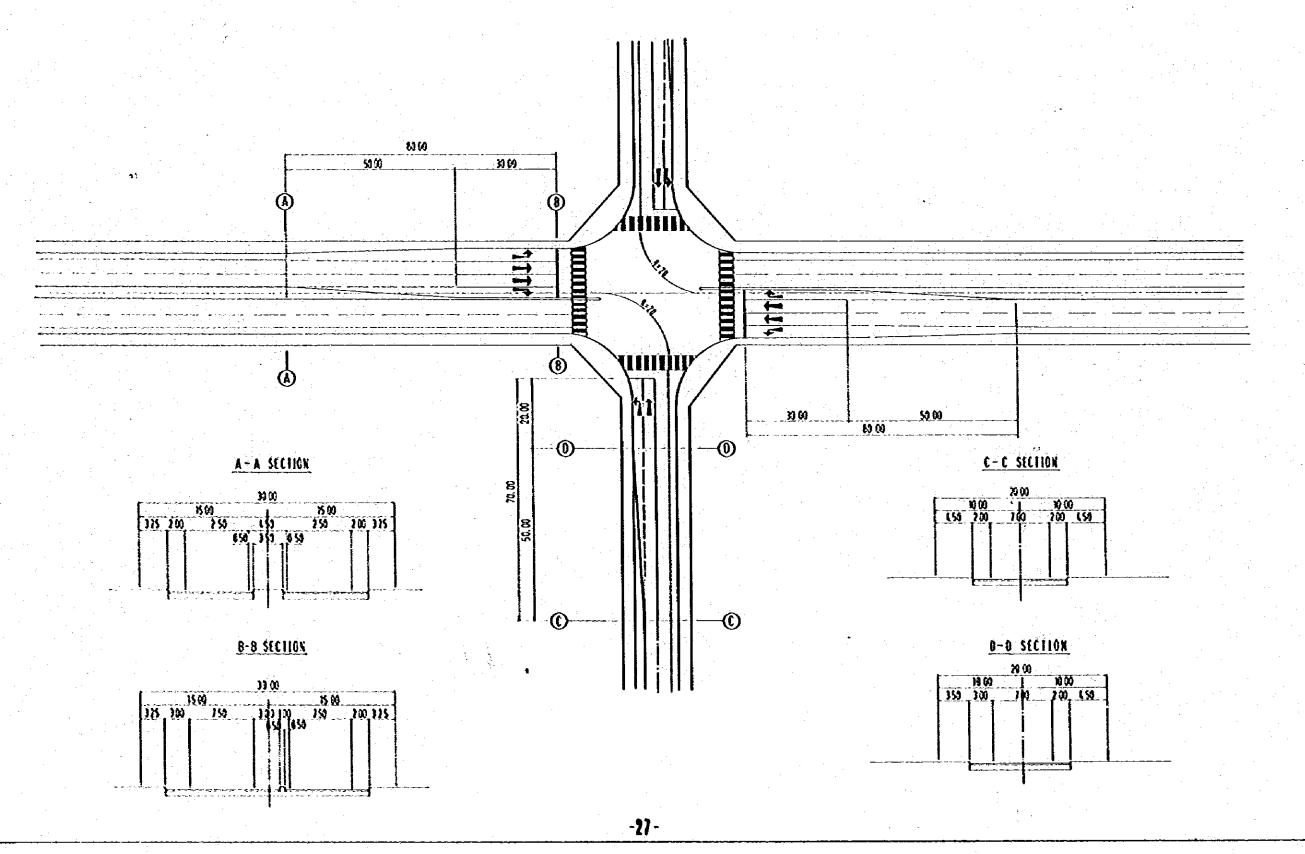
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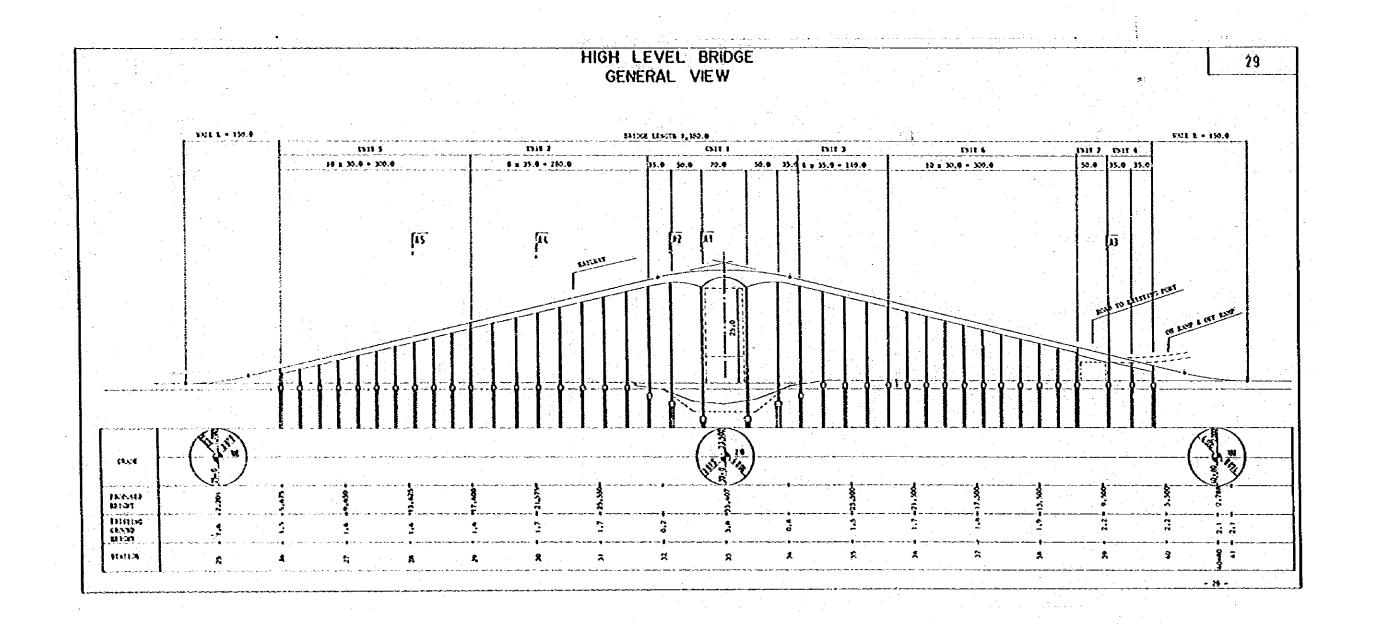


TYPICAL AT GRADE INTERSECTION PLAN

TALE



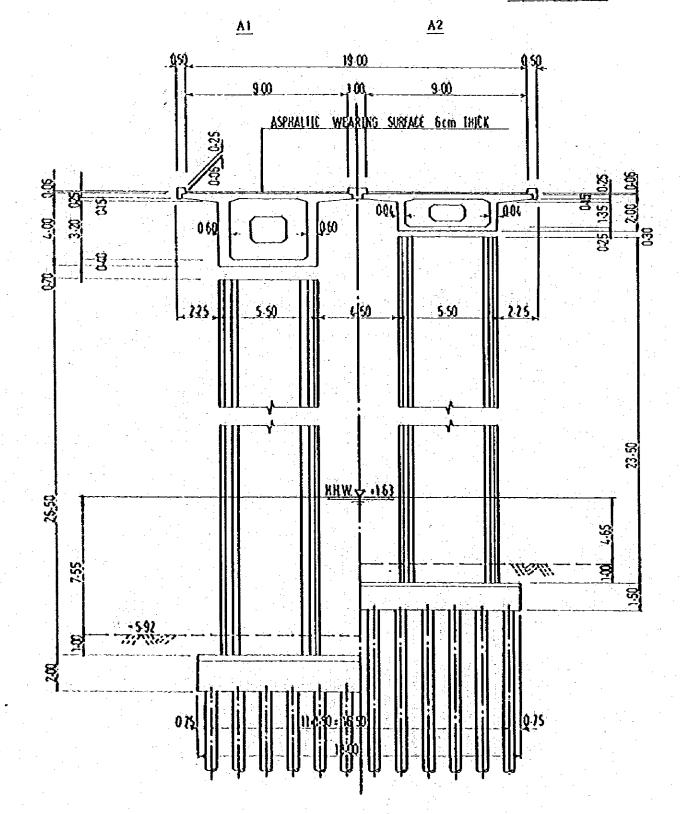


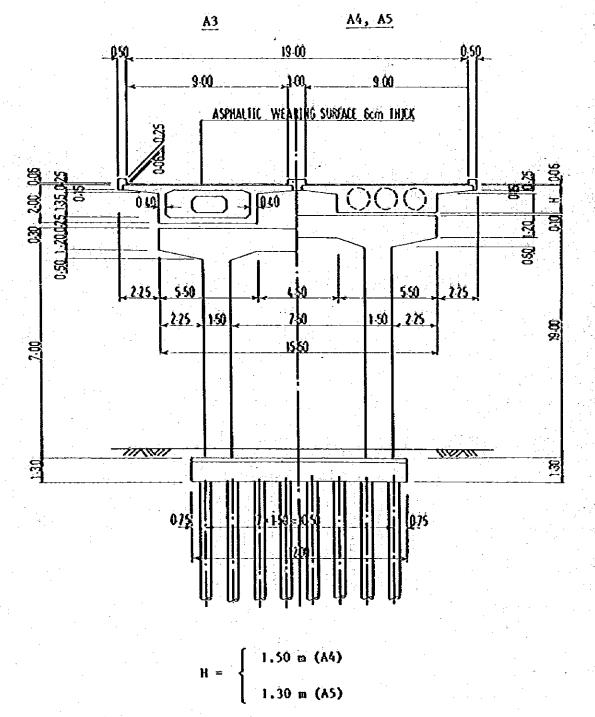


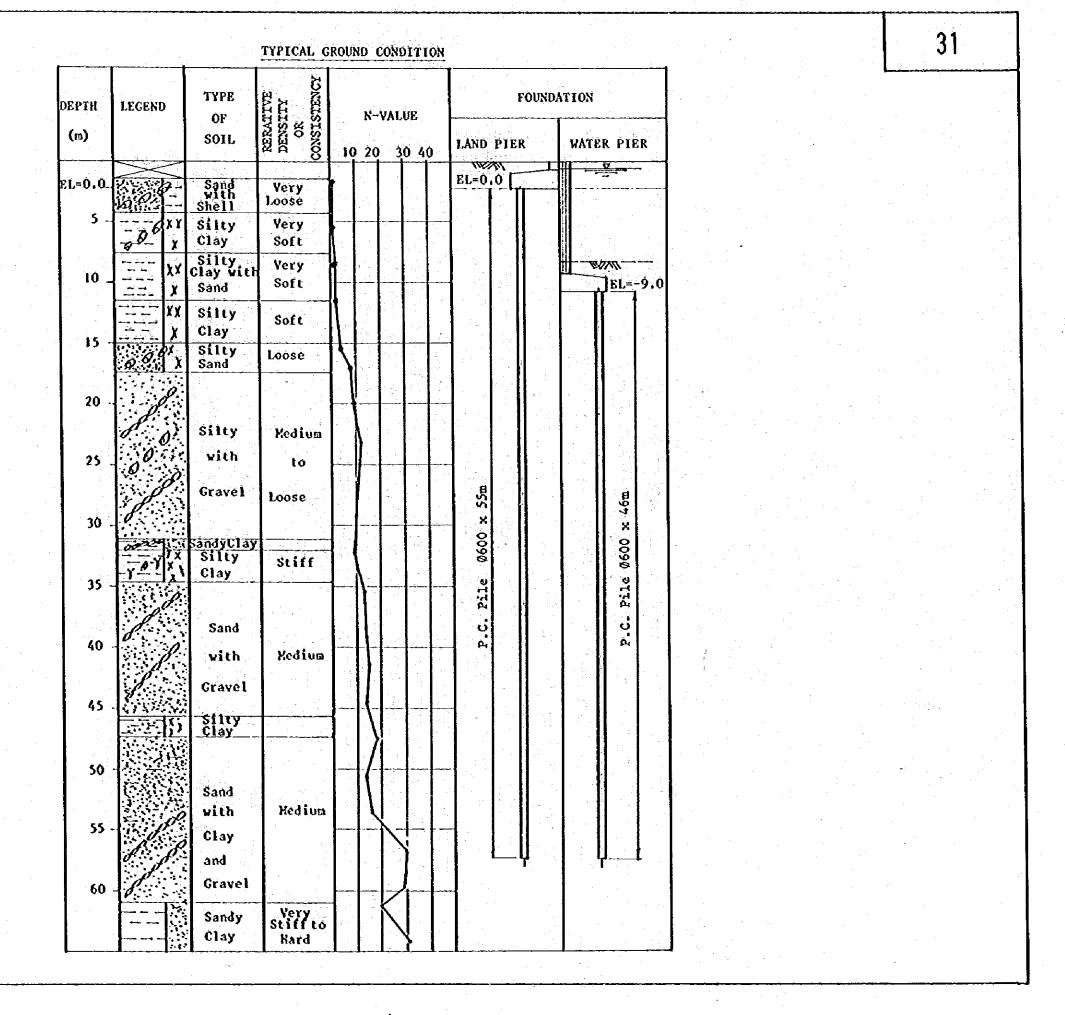


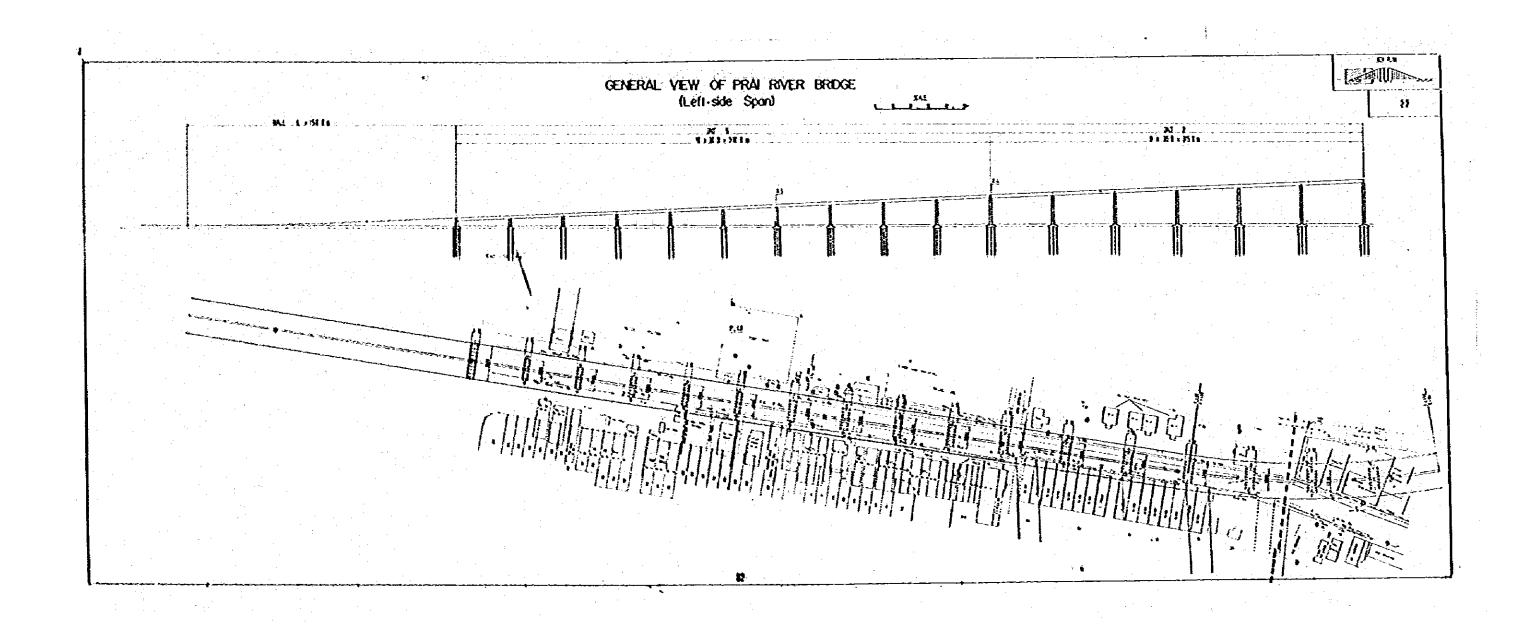
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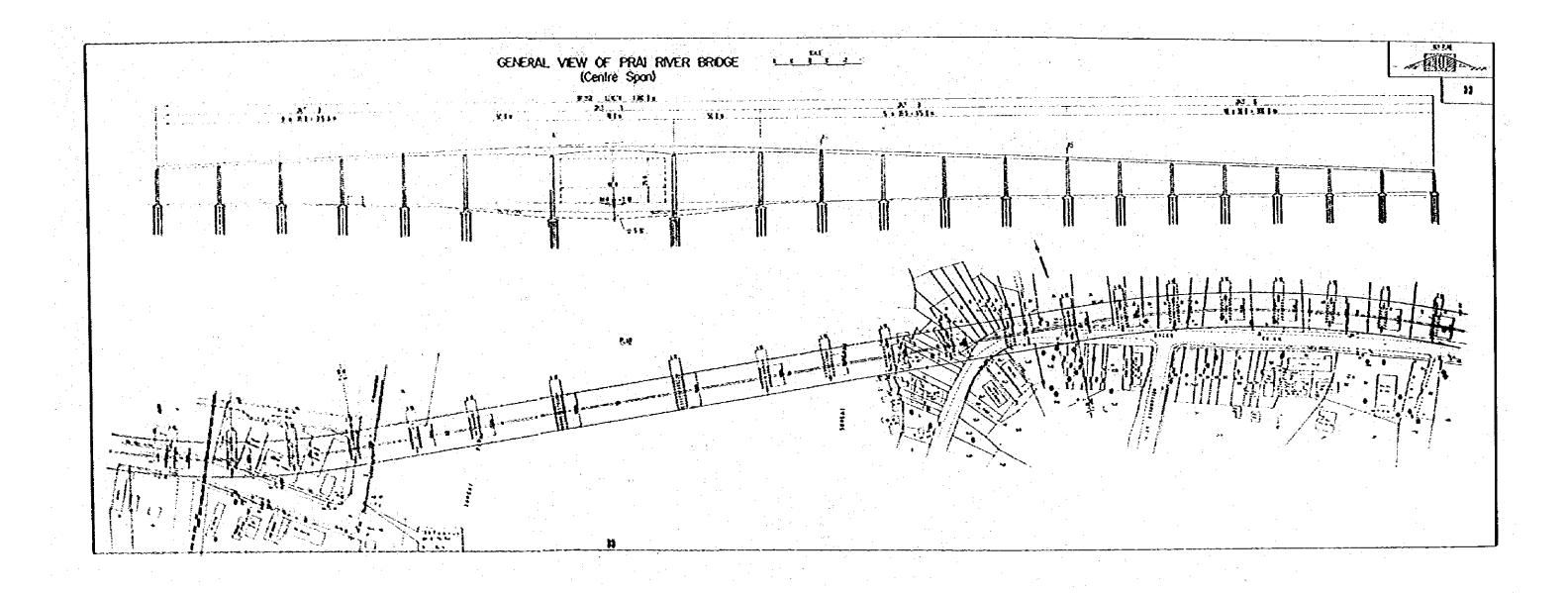
CROSS-SECTION

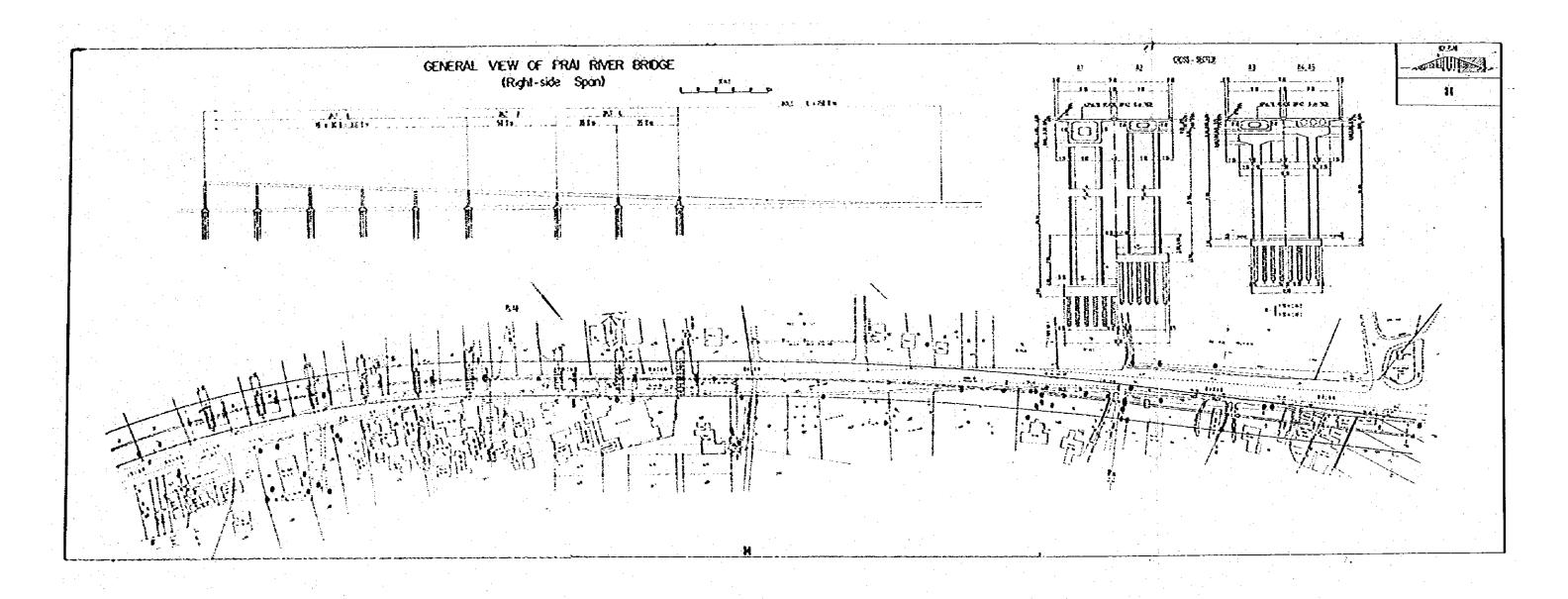


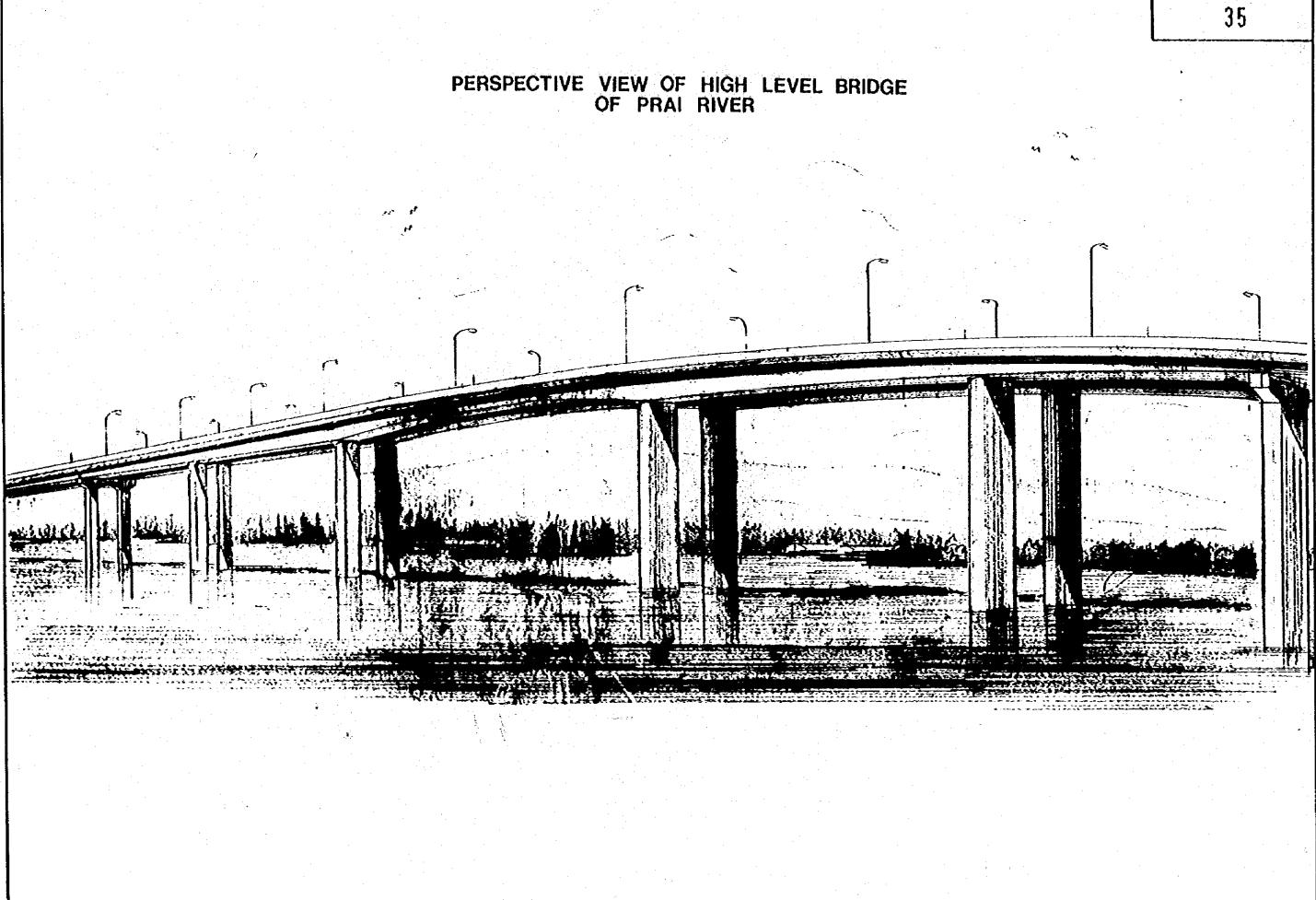




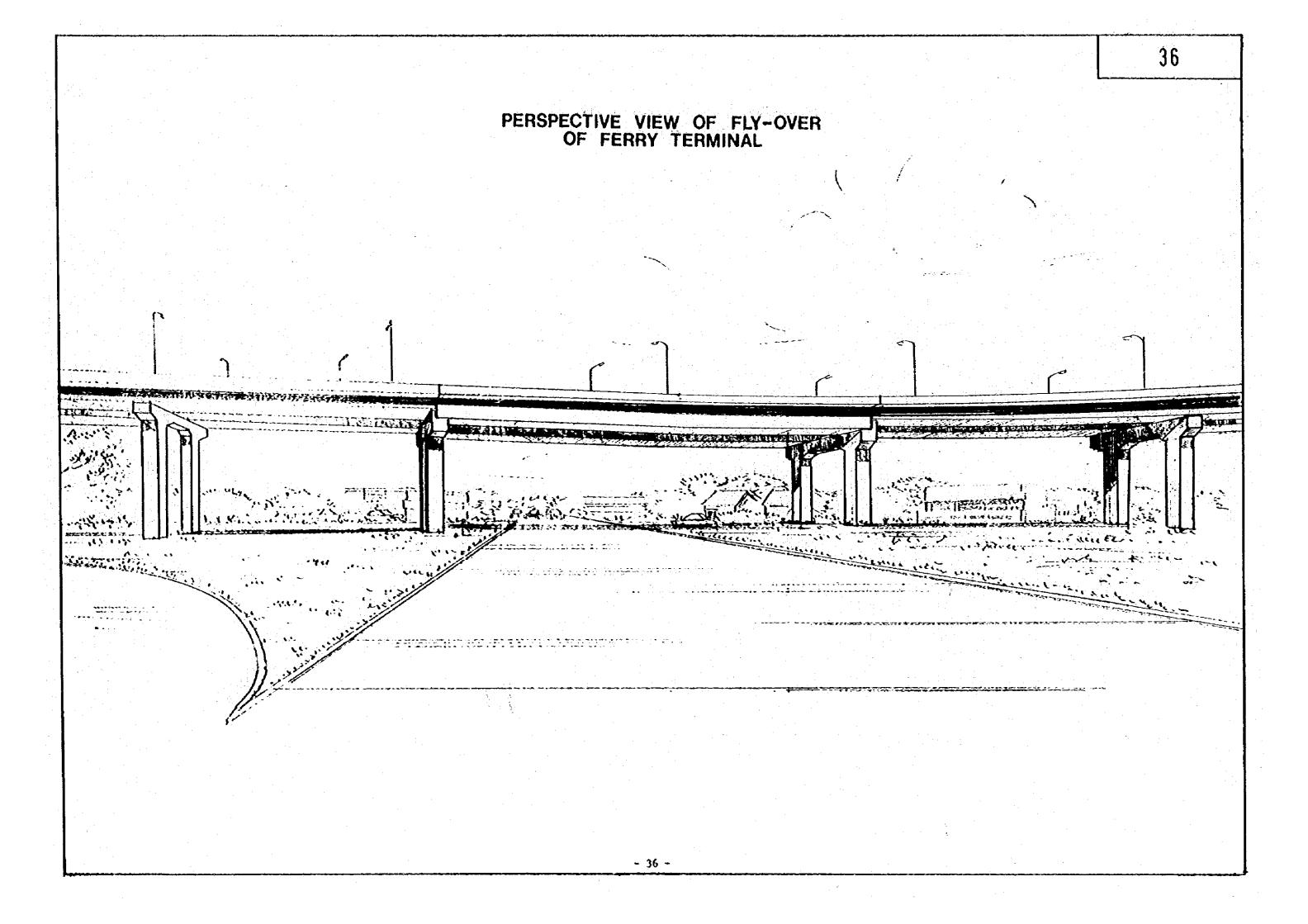


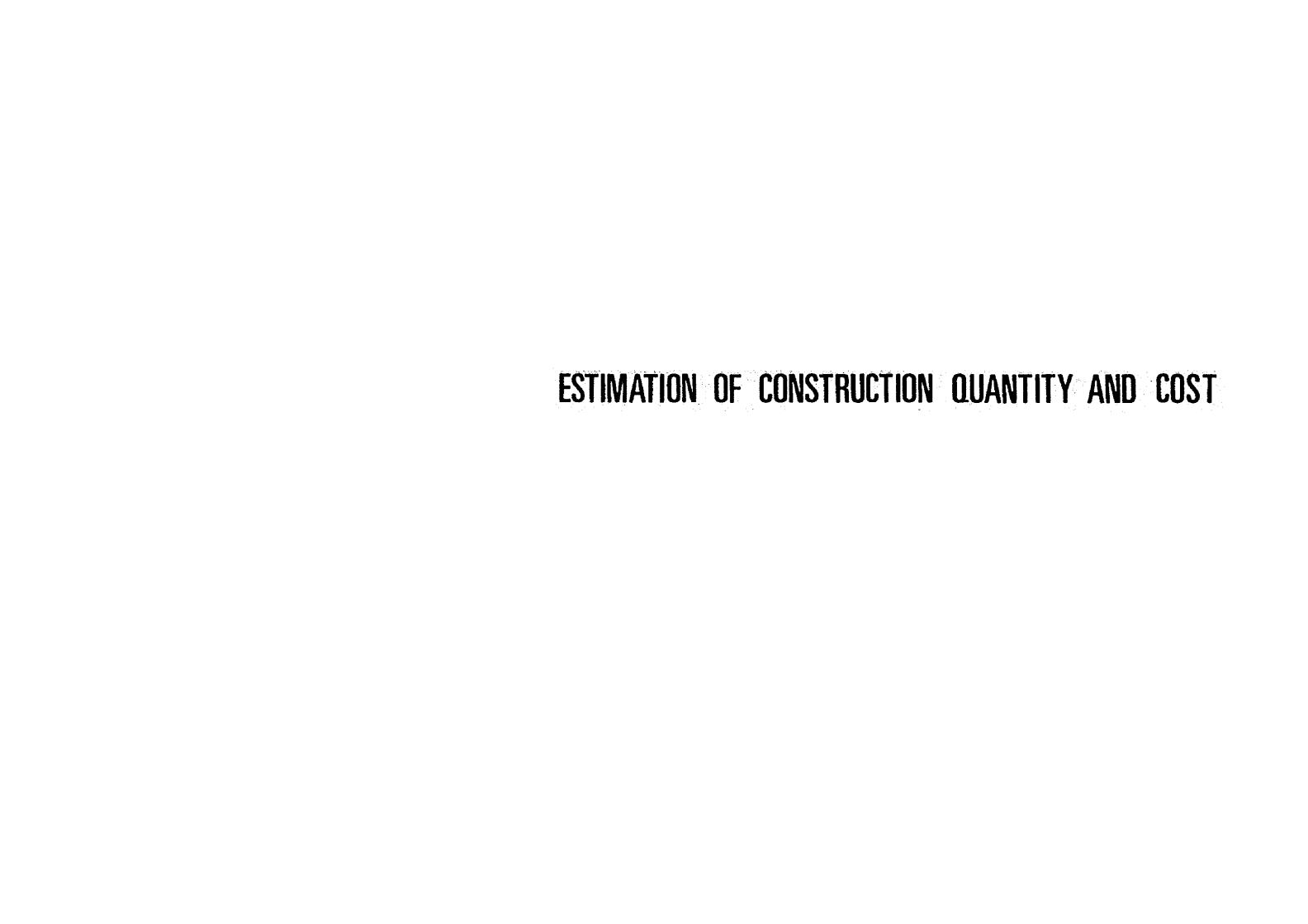


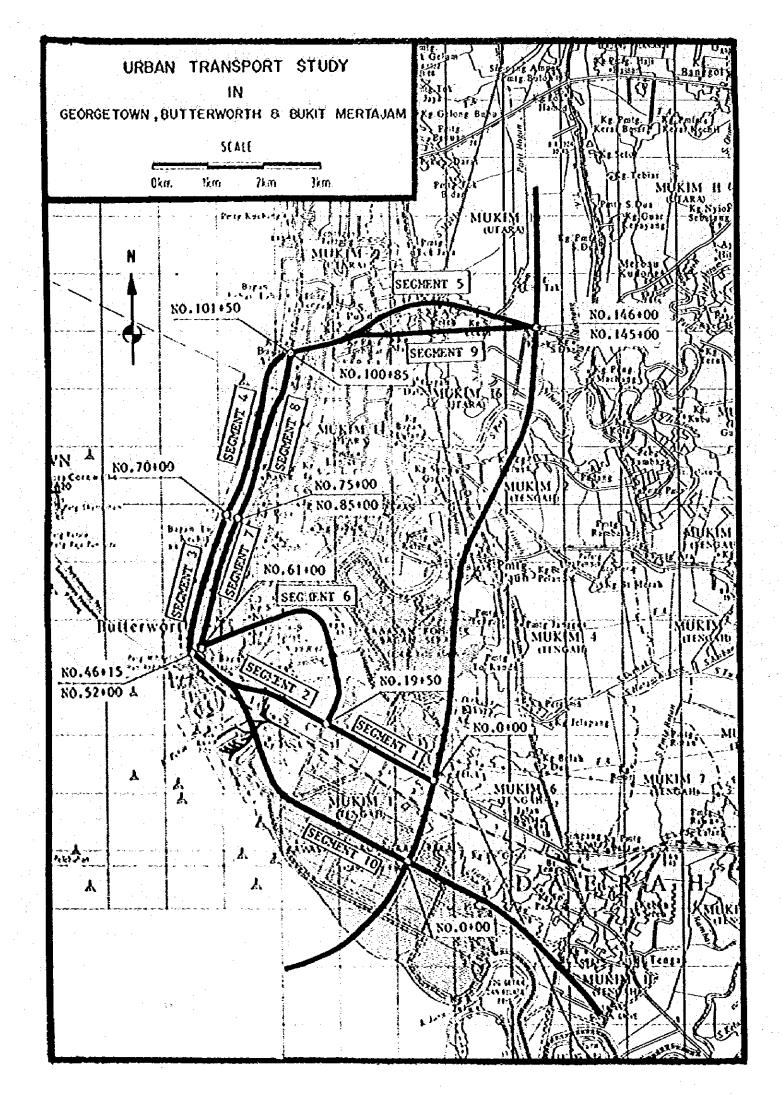




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Segment	Station No.	Length (m)	Remarks
1	No.0+100 - No.19+50	1,950	
2	No.19+50 - No.46+15	2,665	
3	No.46+15 - No.70+00	2,385	
4	No.70+00 - No.101+50	3,150	
5	No.101+50 - No.146+00	4,450	
6	No.19+50 - No.61+00	4,450	
7	No.61+00 - No.85+00	2,400	
8	No.75+00 - No.100+85	3,085	
9	No.101+50 - No.145+00	4,350	
10	No.0+00 - No.52+00	5,200	

CONSTRUCTION QUANTITY BY SEGMENT (ROAD)

(4 - Lane)

		<u> </u>			<u> </u>	<u> </u>		Quantity					
Item	Sub-Item	Class	Vnit	Segment I	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8	Seggent 9	Segment 10
	Residential		m ²	_0	27,400	45,300	8,720	0	39,244	32,300	31,600	20,000	46,100
Site Clearing	Field		₁₃ 2	0	0	0	56,000	44,960	0	0	0	69,384	0
Excavation	Śoil	comon	_m 3	11,486	2,126	14,106	2,080	99,333	20,073	8,100	19,459	110,409	14,900
Waste	Soil	connon	_m 3	7,701	0	0	0	28,733	9,146	300	12,860	0	4,600
Embankment	Soi 1	common	m3	3,785	7,003	116,800	367,920	70,600	10,926	7,800	6,599	139,115	10,300
Slope	Grass		m ²	0	0	0	. 0	0	0	0	0	11,200	0
T	Sidewalk	Grass & Tree	<u>m</u> 2	12,853	14,630	37,222	79,417	4,208	25,292	16,800	1,300	4,208	21,500
Turling	Open Space	Grass	m2	0	0	0	-	-	<u>-</u>	-	-	-	
		1.0 x 1.0	m	3,760	4,080	4,470	6,300	8,900	7,700	4,800	6,420	8,700	7,200
	Pipe Culvert	D = 600	D	400	520	720	945	880	840	500	600	800	600
Drainage		3.0 x 3.0	В	0	0	50	100	0	0	0	0	0	0
	Box Culvert	5.0 x 5.0	D)	0	0	0	50	0	0	0	0	0	0
	Transfer	D = 24"	D	0	0	0	0	3,800	0	0	0	0	0
	Mooring		Vol.	0	0	0	1	0	0	0	0	0	0
Wall	Hasonry	H = 4.0	m ²	894	1,705	2,571	895	894	3,748	2,600	2,348	894	2,600
	Revetment	Stone	19	0	0	1,200	2,950	0	0	0	0	0	0
	Carriageway	Asphalt	m ²	17,230	7,245	36,100	51,820	44,493	29,586	18,500	30,934	63,193	29,800
	Shoulder	Asphalt	_B 2	2,593	Ò	4,560	8,520	7,395	6,765	4,000	10,980	10,695	2,900
Pavement	Service Road	Asphalt	ra ²	3,720	25,080	13,980	20,760	3,720	7,360	10,500	7,020	3,720	16,300
	Sidewalk	Concrete Block	²³ 2	12,853	14,630	9,922	7,917	4,208	25,292	16,800	20,633	4,208	21,500
	Overlay	Asphalt	m ²	16,515	1,755	. -	0	34,453	37,599	15,400	20,123	10,453	26,500
	Kerb	Concrete	m	4,220	4,680	5,740	8,970	9,220	8,080	5,800	6,960	9,020	7,500
Additional	Central Reserved	Concrete	P	1,800	500	1,980	3,000	4,300	3,390	1,900	3,285	4,200	2,400
Facility	Guard Rail	Steel	E3	320	610	920	320	320	1,340	900	840	320	900
	Lighting	Steel	n	3,010	2,665	1,785	3,150	400	1,450	900		400	3,300
	Lane-Marks	Paint	F3	1,950	2,600	2,390	3,150	4,450	4,150	2,400		4,350	5,200
	At-Grade	Signal	No.	0.5	1	2.5	2.5	2,5	3	2.5	2.5	2.5	2.5
Intersection	Interchange	Diamond Type	Vol.	Ò	0	0	0	1.0	0	0	0	1,0	0
	1, 50	Concrete	2			*	-	1			-		
Bridge	1. 50	Concrete	n ²	150	2,165	405	150	150	600	_	270	150	+
Approach	Road		а	0	0	150	300	_	_	_	_		-

CONSTRUCTION QUANTITY BY SECHENT (ROAD)

(6 - Lane)

		r					<u> </u>			<u> </u>			
Item	Sub-Item	Class	Vnit	Segment 1	Segment 2	Segment 3	Segment 4	Quantity Segment 5	Segment 6	Segment 7	Segment 8	Segment 9	Segment 10
	Residential		m ²	600	50,015	52,500	-		55,244	-	-	_	_
Site Clearing	Field		₁₉ 2	O	0	0	-		0	•			-
Excavation	Soil	corrion	_m 3	18,219	8,502	13,125	-	-	31,319.8	-	-	_	_
Waste	Soil	corrion	₁₃ 3	13,189	0	0	_	-	17,846.9		÷	-	_
Embankment	Soil	cossion	_m 3	5,030	14,647	22,500	_	-	13,472.9	•		_	-
Slope	Grass		_{EE} 2	0	0	0		-	0	<u> </u>	<u> </u>		-
Turfing	Sidevalk	Grass & Tree	m _S	12,853	15,645	0		_	25,292.6	<u>-</u>			_
TOTATING	Open Space	Grass	m ²	0	0	0	-	••	0		<u> - </u>	<u>-</u>	-
	<u> </u>	1.0 x 1.0	B	3,760	4,370	0	_	<u>- 1</u>	7,700			<u> -</u>	
	Pipe Culvert	D = 600	ea ·	500	650	4,470	_		1.050	- 1.	_		- '
Drainage		3.0 x 3.0	to to	0	0	0			0	**	-		-
•	Box Culvert	5.0 x 5.0	10	0	0	0	<u>.</u>	-	Ó	. · · · -		<u> </u>	-
	Transfer	D = 24"	E)	0	0	0	_	-	0	_		-	-
	Mooring		Yol.	0	0	0	-	_	0	-	_	_	_
Wall	Hasonry	H = 4.0	n ²	894	2,405	1,200	_	<u>- 11</u>	3,748	. - .	<u>-</u>	-	
	Reyetment	Stone	. .	0	0	0	-	-	0	_			_
	Carraigevay	Asphalt	_{ES} 2	26,811	23,197	24,675		-	49,436				_
	Shoulder	Asphalt	m ²	4,920	0	3,150	· - ;	-	7,540	-	_	_	_
Pavement	Service Road	Asphalt	₁₃ 2	3,720	25,530	7,440	-	-	7,360	_			-
	Sidevalk	Concrete Block	_m 2	12,853	15,645	9,100	-	-	25,292.6	_		_	
	Overlay	Asphalt	132	18,108	2.047	0	-	-	42,658	_			-
	Kerb	Concrete	m	4,220	5,270	5,740	-	-	8,080	<i>į</i> –		_	-
Additional	Central Reserved	Concrete	100	1,800	990	1,980	-		3,390	-	-	-	-
	Guard Rail	Steel	m	320	860	920	_	-	1,340	-	-	-	-
Facility	Lighting	Steel	n	3,010	2,665	1,785	**	-	1,450		-	-	-
	Lane-Hirks	Paint	[3	1,950	2,600	2,390	<u> </u>		4,150	-		_	-
e Manig Amuse dan da Agrada, malgana surrescribbi, dhi yi ay sar surre e	At-Grade	Signal	No.	0.5	1	2.5	_	_	3	_	-	-	_
Intersection	Interchange	Diamond Type		0	1	0	•	-	0	_	-	-	
	L 50	Concrete	132	0	0	. 0	-	-	0	-	-	-	
Bridge	L 50	Concrete	m ²	0	0	0		_	0				-
Approach	Road		n	0	0	0		-	0	-	_	_	_

CONSTRUCTION QUANTITY OF BRIDGE

	Grade		Prai Roundabout Ply-over	Pre	i River Bri	dge		Ferry	E-W Highway	Bagan Jermal	Sungai I)ua	Prai	Prai	Sungai
	Grade	Unit	Bridge	High Level	Ramp	Medium	Fly-over	Bridge	Fly-over Bridge	Fly-over Bridge	Fly-over I	idge	River Bridge	River Bridge	Dua Bridge
		[s	1 - 2, 6	2	2	2	10 - 3 2 - 3	6 - 7	3 8 7	8	4 - 5	8 - 5 8 - 9	6	10	5 & 9
	40	₀₁ 3	3,700	17,500	1,900	9,600	3,700	5,100	3,700	1,600	3,800	1,900	300	24,000	600
Concrete	25	_{ta} 3	1,300	10,000	800	5,800	1,300	1,500	1,300	600	1,300	700	1,300	13,900	300
Steel Reinforcement	410	t	440	2,470	210	1,460	430	590	440	190	450	230	230	3,400	80
Prestressed Wire		t	200	980	90	630	190	260	200	90	200	100	80	1,350	-
Structural	85-4360	ŧ	5	20	-	15	-	5	5	5	- ;	-	_	25	
Wearing Surface	6cm	m ²	5,400	24,840	2,810	14,940	5,220	7,200	5,400	2,340	5,400	2,700	2,380	34,200	810
Expansion Joint		n	72	252	60	180	72	72	72	72	72	36	85	347	108
Guard Rail		ED.	600	2,760	940	1,660	580	800	600	520	600	600	500	3,800	90
P.C. Pile	\$600	a	9,020	45,400	5,100	25,000	8,700	12,000	9,000	3,900	9,200	4,600	5,400	62,500	1,600
Steel Sheet Pile	****	į,	*	920	-	920		-	÷	-		-	_	1,200	_
Landing Stage		₁₃ 2	-	870	-	870	<u>-</u>	-	-	-		-	_	1,200	
	40	rs3	3,700	24,800	1,900	13,600	3,700	5,100	3,700	1,600	3,800	1,900	1,840	34,000	600
Concrete	25	m3	1,300	14,000	800	8,200	1,300	1,500	1,300	600	1,300	700	1,840	19,700	300
Steel Reinforcement	410	t	440	3,500	210	2,070	430	590	440	190	450	230	330	4,800	80
Prestressed Wire		t	200	1,390	90	890	190	260	200	90	200	100	110	1,910	-
Structural Steel	BS-4360	, t	5	30	-	20	11 -	5	5	5	-	_	_	35	_
Wearing Surface	6cm	20,5	5,400	35,190	2,810	21,160	5,220	7,200	5,400	2,340	5,400	2,700	3,370	48,450	810
Expansion Joint		m	72	357	60	255	72	72	72	72	72	36	121	491	10
Cuard Rail		m	600	2,760	940	1,660	580	800	600	520	600	600	500	3,800	90
P.C. Pile	¥600	<u> </u>	9,020	64,300	5,100	35,400	8,700	12,000	9,000	3,900	9,200	4,600	7,650	88,540	1,60
Steel Sheet Pile		t	-	1,300	- 1	1,300	_	_	-	-		-	-	1,700	_
Landing Stage	* * * * * * * * * * * * * * * * * * *	132		870		870			-	-	-	••	-	1,200	-

TOTAL CONSTRUCTION COST FOR ROAD

4 - lane

.,		Segment I	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8	Segment 9	Segment 10
<i>z</i> ,	F.C.	1,141,476	2,729,952	3,141,514	6,264,173	3,824,203	2,306,960	1,470,411	2,035,391	3,281,611	3,507,360
NOIL	L.C.	1,262,000	2,693,176	3,557,198	6,859,901	3,328,035	2,721,851	1,752,717	2,231,474	3,175,992	3,598,212
COST	Sub Total	2,403,476	5,423,128	6,698,712	13,124,074	7,152,238	5,028,811	3,223,128	4,266,865	6,457,603	7,105,572
SXO	Тах	129,961	290,457	404,533	846,455	370,174	255,256	162,024	222,160	354,284	371,354
	Total	2,533,437	5,713,585	7,103,245	13,970,529	7,522,412	5,284,067	3,385,152	4,489,025	6,811,887	7,476,926

6 - lane

		Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8	Segment 9	Segment 10
	F.C.	1,386,762	2,916,375	1,412,871	NIL	NIL	2,799,350	NIL	NIL	NIL	NIL
ĺ	L.C.	1,444,950	2,829,861	1,527,787	NIL	ŇIL	3,089,335	NIL	NIL	NIL	NIL
COST	Sub Total	2,831,712	5,746,236	2,940,658	NIL	ХIL	5,888,685	ИIL	NIL	NIL	NIL
12	Tax	151,401	306,356	152,157	NIL	NIL	298,270	NIL	NIL	NIL	NIL
8	Total	2,983,113	6,052,592	3,092,815	NIL	NIL	6,186,955	RIL	NIL	NIL	NIL

CONSTRUCTION COSTS FOR BRIDGE

·				4 - IA	RES			6 - L	ANES	
ITEX	OUNDABOUT R BRIDGE HIGH LEVEL RAMP MEDIUM RRY FLYOVER DGE FLYOVER BRIDGE L FLYOVER BRIDGE DUA FLYOVER 10GE	SEGMENT	L.C.	F.C.	TAX	TOTAL	L.C.	F.C.	TAX	TOTAL
PRAI R	OUNDABOUT	1 -> 2 1 -> 6	2,131,663	2,521,234	244,889	4,897,786	2,131,663	2,521,234	244,889	4,897,786
FLYOVE	R BRIDGE	10	2,131,663	2,521,234	244,889	4,897,786	2,131,663	2,521,234	244,889	4,897,786
	HIGH LEVEL	2	12,072,490	15,353,155	1,443,455	28,869,100	17,102,694	21,750,303	2,044,895	40,897,892
PRAL RIVER	RAMP	2	1,068,838	1,234,429	121,225	2,424,492	1,068,838	1,234,429	121,225	2,424,492
	KEDIUM	2	7,752,373	10,419,877	956,434	19,128,684	10,982,528	14,761,492	1,354,948	27,098,968
CHAIN FEE	RRY FLYOVER	10 ↔ 3 2 ↔ 3	2,056,145	2,427,120	235,961	4,719,226	2,056,145	2,427,120	235,961	4,719,226
BRIC	DGE	6 c> 7	2,836,062	3,347,752	325,463	6,509,277	2,836,062	3,347,752	325,463	6,509,277
E-M HICHWAY		3 & 7	2,129,501	2,518,266	244,619	4,892,386	2,129,501	2,518,266	244,619	4,892,386
BAGAN JERHAI		8	925,760	1,095,795	106,398	2,127,953	925,760	1,095,795	106,398	2,127,953
SUNGAT	DUA FLYOVER	4 8 5	2,118,051	2,491,083	242,586	4,851,720		_	4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	_
BR	IDGE	8 5 8 9	1,059,026	1,245,541	121,293	2,425,860	1,059,026	1,245,541	121,293	2,425,860
PRAI RI	VER BRIDGE	6	1,139,994	1,479,512	137,869	2,757,375	1,614,992	2,095,975	195,314	3,906,28
PRAI R1	VER BRIDGE	10	16,621,544	21,138,402	1,987,366	39,747,312	_	-	- :	<u>-</u>
SUNGAI	DUA BRIDGE	5 & 9	392,000	423,000	43,000	858,000	392,00	423,000	43,000	858,000

TOTAL CONSTRUCTION COST BY SECHENT (4-lane)

						Construct	tion Cost	· · · · · · · · · · · · · · · · · · ·			ion tion			
Segment	Station No.	Length		Roa	d			Bri	idge		isit isit ensa	Cos	:t 	
		(m)	F.C.	L.C.	Tax	Total	F.C.	L.C.	Tax	Total	Lank Acqu S Comp	Total P.C. L.C.	Tax	Total
Segment 1	0+19+50	1,950	1,141,476	,262,000	129,961	2,533,437	1,260,617	1,065,832	122,444	2,448,89	0	4,729,925 2,402,093 2,327,832	252,405	4,982,330
Segment 2	19+50>46+15	2,665	2,729,952	2,693,176	290,457	5,713,585	7,827,322	4,166,395	1,683,885	33,677,606		42,209,845 20,557,27421,652,571	1,974,342	44,184,18
	46+15>70	2,385	3,141,514	3,557,198			3,731,826					20,312,112 6,873,340 13,438,772		21,779,240
	46+15760	1,385	1,031,037	1,197,557	119,768	2,348,362	2,472,693	2,092,823	· · · · · · · · · · · · · · · · · · ·			13,518,110 3,503,730 10,014,380		13,878,64
Segment 3	60>70	1,600	2,110,477	2,359,641	284,765	4,754,883	1,259,133	1,064,751		2,446,19		6,794,002 3,369,610 3,424,392		7,201,070
	70→75	500	446,822	439,349	51,361	937,532	1,095,795	925,760	106,398	2,127,95	31,527,000	4,434,726 1,542,617 2,892,109	157,759	4,592,48
Segment 4	70>101+50	3,150	6,264,173	5,859,901	846,455	13,970,529	1,245,542	1,059,025				16,839,641 7,509,715 9,329,926	1	17,807,38
Segrent 5	101+50>146+0	4,450	3,824,203	3,328,035	370,174	7,522,412	1,668,542	1,451,025				15,704,805 5,492,745 10,212060		16239,27
Segment 6	19+50+ 61+0	4,150	2,306,960	2,721,851	255,256	5,284,067	4,414,005	3,623,857			77,177,000	20 2/3 673	678,301	20921,97
Segment 7	61+0 > 85+0	2,400	1,470,411	,752,717	162,024	3,385,157	24,192,142	3,547,533	407,350	8,147,02	\$35,601,00	46,563,803	569 374	47,133,17
Segment 8	75+0 ÷100+85	3,085	2,035,391	2,231,474	222,160	4,489,02	51,718,566	1,455,273	167,044	3,340,88	39,223,000	16 663 704		17,052,90
Segment 9	101+50+145+0	4,350	3,281,611	3,175,992	354,284	6,811,88	71,045,771	921,513	3 103,646	2,070,93	02,865,000	11 280 887	457,930	11,747,81
Segment 10	0>52+0	5,200	3,507,360	3,598,212	371,354	7,476,92	624,873,19	69,781,280	02,350,23	5 47,004,71	13,374,000	66 106 010	2 721 589	57,855,63

CONSTRUCTION COST BY SECHENT (6-lane)

						Constru	iction Cos	t			ion			
Segment	Station No.	Length (m)		Road				Bridg	ge ·		ເດີ ເກີຣກິດ ກອກຮອ		ost	
		(e)	P.C.	L.C.	Tax	Total	r.c.	L.C.	Tax	Total	Lan Acqu S Comp	Total F.C. L.C.	Tax	Total
Segment 1	0-19+50	1,950	1,386,762	1,444,950	151,401	2,983,113	1,260,617	1,065,832	122,444	2,448,893	1,796,000	6,954,161 2,647,379 4,306,782	273,845	7,228,006
Segment 2	19+50-46+15	2,665	2,916,375	2,829,861	306,356	6,052,592	24,224,480	9,196,599	2,285,315	45,706,394	6 003 000	55 169 315	2,591,671	57,760,98
Segment 3	46+15-60	1,385	1,412,871	1,527,787	152,157	3,092,815	2,472,693	2,092,823	240,286	4,805,802	3,891,000	16,397,174 3,885,564 2,511,610	392,443	16,789 617
Segment 6	19+50-61	4,150	2,799,350	3,089,335	298,270	6,186,955	5,030,468	4,098,855	480,489	9,609,812	10,831,000	25,849,008 7,829,818 8,019,190	778,759	26,627,76

Segment 1

(4-lane)

Segment 1		•				Unit Cost	:		Constructi	on Cost	
Item	Sub-Item	Class	Unit	Quantity	r.c.	L.C.	Tax	F.C.	lC.	Tax	Total
Site	Residential		m ²	0	1.90	1.26	0.16	0	0	0	0
Clearing	Field		m ²	0	0.26	0.17	0.02	0	O	0	0
Excavation	Soil	Conson	ъ3	11,486	1,24	0.89	0.11	14,242.64	10,222.54	1,263.46	25,728.64
Waste	Soil	corron	_{[3}	7,761	1.74	1.89	0.29	13,400	14,555	2,233	30,188
Embankment	Soil	common	та3	3,785	3.85	1.46	0.51	14,572.25	5,526,1	1,930.35	22,028.7
Slope	Grass		m ²	0	0	5.25	0.30	0	0	0	0
	Sidevalk	Grass & Tree	132	12,853.4	1.26	4.94	0.32	16,195.28	63,495.8	4,113.09	83,804.17
Turling	Open Space	Grass	m2	0	0	5.25	0.30	Ō	Ô	0	0
		1.0 × 1.0	œ	3,760	46.78	90.58	5.65	175,892.8	340,580.8	21,244	537,716.6
	Roadside	1.0 × 0.5	a	0	25.73	80.00	3.38	0	0	0	0
Drainage	Pipe Culvert	D = 600		400	46.21	77,71	5.23	18,484	31,084	2,092	51,660
Diamage	Dan Caluari	3.0 x 2.0	E)	0	489.60	577.43	58.50	0	0	0	0
	Box Culvert	3,0 x 3.0	E	0	612.00	721.79	73.12	0	0	0	0
	Transfer	D = 24"	п	0	239.30	91.33	14.59	0	0	0	0
	Hooring		Vol.	0	6,139.00	38,155.00	5,970.00	0	0	Ó	0
Wall	Hasonry	H = 4.0	n2	894	26.21	64.03	6.26	23,431.74	57,242.82	5,596.44	86,271
	Revetment	Stone	IJ	0	818.70	1,169.70	132.70	0	0	0	0
	Carriage	Asphalt	ъ2	17,230	17.49	12.76	1.43	301,352.7	219,854.8	24,638.9	545,846.4
	Shoulder	Asphalt	n ²	2,593	13.64	9.13	1.10	35,368.52	23,674.09	2,852.3	61,894.91
Pavezent	Service Road	Asphalt	n _S	3,720	13.64	9.13	1.10	50,740.8	33,963.6	4,092	88,796.4
	Sidevalk	Concrete Block	B2	12,853.4	5.49	7.61	0.62	70,565.17	97,814.37	7,969.11	176,348.65
	Overlay	Asphalt	12 ²	16,515	11.00	8.00	1.00	181,665	132,120	16,515	330,300
	Kerb	Concrete	n	4,220	8.54	14.52	1.16	36,038.8	61,274.4	4,895.2	102,208.4
Additional Facility	Central Reserved	Concrete	E)	1,800	20.86	43.86	3.28	37,548	78,948	5,904	122,400
	Guard Rail	Steel	51	320	44.11	3.22	6.23	14,115.2	1,030.4	1,993.6	17,139.2
	Lighting	Steel	n	3,010	40.00	19.00	7.00	120,400	57,190	21,070	198,660
	Lane-Marks	Paint	n	1,950	0.50	0.60	0.05	975	1,170	97.5	2,242.5
	At-Grade	Signal	No.	0,5	32,976	64,506	2,922	16,488	32,253	1,461	50,202
Intersection		Diamond Type	Vol.	0	357,359	303,075	46,703	0	0	0	0
	1.	Loop Type	ļ	0	1,330,379	1,156,337	132,370	0	0	0	0
Approach	Road	<u> </u>	8	0	462.46	498.20	48.71	Ó	0	0	0
	otal		. L-				<u></u>	1,141,476	1,262,000	129,961	2,533,437
	uisition Cost	1.0 x 1.0 m 1.0 x 0.5 m 1.0 x 0.5 m 1.0 x 3.0 m			<u> </u>		<u></u>	+		<u>L:</u>	

Segment 2 Hig		- lane				Unit Cost	 		Constructi	on Cost	
Item	Sub-Item	Class	Vnit	Quantity	r.c.	L.C.	Tax	F.C.	L.C.	Tax	Total
Site	Residential	3 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	¹³ 2	27,400	1.90	1.26	0.16	52,060	34,524	4,384	90,968
Clearing	Field		m ²	0	0.26	0.17	0.02	0	0	. 0	0
Excavation	Soil	common	_m 3	5,771	1.24	0.89	0.11	7,156.04	5,136.19	634.81	12,927.0
Waste	Soil	comion	m ³	0	1.74	1.89	0.29	0	0	0	0
Embankment	Soil	COLITION	rg3	13,060	3.85	1.46	0.51	50,281	19,067.6	6,660.6	76,009.2
Slope	Crass		₁₉ 2	0	0	5.25	0.30	0	0	0	0
	Sidevalk	Grass & Tree	m ²	15,645	1.26	4.94	0.32	19,712.7	77,286.3	5,006.4	102,005.4
Turling	Open Space	Grass	_{E1} 2	0	0	5.25	0.30	.0	0	0	0
•	0-2-21	1.0 × 1.0	m	4,370	46.78	90.58	5.65	204,428.6	395,834.6	24,690.5	624,953.
	Roadside	1.0 × 0.5	D	0	25.73	80.00	3.38	0	0	0	0
Drainage	Pipe Culvert	D = 600		520	46.21	77,71	5.23	24,029.2	40,409.2	2,719.6	67,158
brainage	Box Culvert	3.0 x 2.0	n	0	489.60	577.43	58.50	0	0	0	0
	BOX CUIVELL	3.0 x 3.0	n	0	612.00	721.79	73.12	0	0	0	0
	Transfer	D = 24"	ព	0	239.30	91.33	14.59	0	0	Ò	0
	Mooring	-	Vol.	0	6,139.00	38,155.00	5,970.00	0	0	0	0
Wall	Hasonry	H = 4.0	E-5	2,405	26.21	64.03	6.26	63,035.05	153,992.15	15,055.3	232,082.
	Revetment	Stone	п	0	818.70	1,169.70	132.70	0	0	0 :	0
	Carriage	Asphalt	12 ₃	16,065	17.49	12.76	1.43	280,976.85	204,989.4	22,972.95	508,939.
	Shoulder	Asphalt	n ²	0	13.64	9.13	1.10	0	0	0	0
Pavement	Service Road	Asphalt	n ²	25,530	13.64	9.13	1.10	348,229.2	233,088.9	28,083	609,401.
	Sidewalk	Concrete Block	n ²	15,645	5.49	7.61	0.62	85,891.05	119,058.45	9,699.9	214,649.
	Overlay	Asphalt	n ²	1,755	11.00	8.00	1.00	19,305	14,040	1,755	35,100
	Kerb	Concrete	D	5,270	8.54	14.52	1.16	45,005.8	76,520.4	6,113.2	127,639.
Additional Facility	Central Reserved	Concrete	ก	990	20.86	43.86	3.28	20,651.4	43,421.4	3,247.2	67,320
	Guard Rail	Steel	ti	860	44.11	3.22	6.23	37,934.6	2,769.2	5,357.8	46,061.
	Lighting	Steel	n	2,665	40.00	19.00	7.00	106,600	50,635	18,655	175,890
	Lane-Marks	Paint	12)	2,600	0.50	0.60	0.05	1,300	1,560	130	2,990
	At-Grade	Signal	No.	1	32,976	64,506	2,922	32,976	64,506	2,922	100,404
Intersection		Diamond Type	Yol,	0	357,359	303,075	46,703	0	0	0	0
	Road	Loop Type	Yol.	1	1,330,379	1,156,337	132,370	1,330,379	1,156,337	132,370	2,619,086
Annroach	L		n	0	462.46	498.20	48.71	0	0	0	0
Vibrioacii	Approach D 0					<u> </u>		2,729,952	2,693,176	290,457	5,713,586

Segment 2 Medium Leyel

4-lane

	leatur Leyer			R		Hair Cart			Construction	n Cast	
Item	Sub-Item	Class	Unit	Quantity	P.C	Unit Cost L.C.	Tax	r.c.	L.C.	Tax	Total
					r.c.	л.с.					ومنسطونينا بالبداد
Site	Residential	: <u> </u>		27,400	1.90	1.26	0.16	52,060	34,524	4,384	90,968
Clearing	Field		<u>_</u>	0	0.26	0.17	0.02	0	0	0	0
Excavation	Soil	cornon	_m 3	12,554	1.24	0.89	0.11	15,566.96	11,173.06	1,380.94	28,120.96
Waste	Soil	COEXIOU	₁₃ 3	0	1.74	1.89	0.29	Ó	0	0	0
Embankisent	Soi1	cormon	₁₃ 3	11,924	3.85	1.46	0.51	45,907.4	17,409.04	6,081.24	69,397.68
Slope	Crass		m2	0	0	5.25	0.30	0	0	0	0
	Sidewalk	Grass & Tree	₁₃ 2	14,891.5	1.26	4,94	0.32	18,763.29	73,564.01	4,765.28	97,092.58
Turling	Open Space	Grass	12/2	0	0	5.25	0.30	0	0	0	0
		1.0 × 1.0	E)	5,040	46.78	90.58	5.65	235,771;2	456,523.2	28,476	720,770.4
	Roadside	1.0 x 0.5	n	Ó	25.73	80.00	3.38	0	0	0	0
	Pipe Culvert	D = 600		520	46.21	77.71	5.23	24,029.2	40,409.2	2,719.6	67,158
Drainage		3.0 × 2.0	ca	0	489.60	577.43	58.50	0	Ó	0	0
	Box Culvert	3,0 × 3.0	ឆ	Ó	612.00	721,79	73.12	0	0	0	0
	Transfer	D = 24 ¹¹	ta	0	239.30	91.33	14.59	0	0	0	0
	Hooring		Vol.	0	6,139.00	38,155.00	5,970.00	0	0	Q	0
Wall	Masonry	K = 4.0	_{E1} 2	3,103	26.21	64.03	6.26	81,329.63	198,685.09	19,424.78	299,439.5
	Revetcent	Stone	ta et	0	818.70	1,169.70	132.70	0	0	0	0
	Carriage	Asphalt	12	24,232	17.49	12.76	1.43	423,817.68	309,200.32	34,651.76	767,669.7
	Shoulder	Asphalt	12	2,470	13.64	9.13	1.10	33,690.8	22,551.1	2,717	58,958.9
Pavement	Service Road	Asphalt	12 ²	15,660	13.64	9.13	1.10	213,602.4	142,975.8	17,226	373,804.2
	Sidevalk	Concrete Block	to ²	14,981.5	5.49	7.61	0.62	82,248.44	114,009.22	9,288.53	205,546.1
	Overlay	Asphalt	n ²	5,547	11.00	8.00	1.00	61,017	44,376	5,547 •	110,940
	Kerb	Corcrete	ធ	5,870	8.54	14.52	1.16	50,129.8	85,232.4	6,809.2	142,171.4
Additional Facility	Central Reserved	Concrete	t	1,540	20.86	43.86	3.28	32,124.4	67,544.4	5,051.2	104,720
•	Guard Rail	Steel	B	1,110	44.11	3.22	6.23	48,962.1	3,574.2	6,915.3	59,451.6
	Lighting	Steel	ta .	2,140	40.00	19.00	7,00	85,600	40,660	14,980	141,240
	Lane-Harks	Paint	ם	2,600	0.50	0,60	0.05	1,300	1,560	130	2,990
	At-Grade	Signal	No.	1	32,976	64,506	2,922	32,976	64,506	2,922	100,404
Intersection	Interchange	Diamond Type	Yol,	0	357,359	303,075	46,703	0	0	0	0
		l.oop Type	Yol.	0	1,330,379	1,156,337	132,370	0	0	0	0
Approach	Road		ŗà.	0	462.46	498.20	48.71	0	0	0	0
To	otal							1,538,896	1,728,477	173,470	3,440,843
Land Acqu	sisition Cost										

Segment 3

(4-lane)

Item	Sub-Item	Class	Unit	Quantity	Unit Cost			Construction Cost			
					F.C.	L.C.	Tax	F.C.	L.C.	Тах	Total
Site	Residential		ra ²	45,300	1,90	1.26	0.16	86,070	57,078	7,248	150,396
Clearing	Field		₁₃ 2	0	0.26	0.17	0.02	0	0	0	0
Excavation	Soil	connon	173	14,106	1.24	0.89	0.11	17,491.44	12,554.34	1,551.66	31,597.44
Kaste	Soil	comon	13	0	1,74	1.89	0.29	0	0	0	0
Embankment	Soil	comon	₁₃ 3	116,800	3.85	1.46	0.51	449,680	170,528	59,568	679,776
Slope	Grass		122	0	0	5.25	0.30	0	Ö	0	Ó
	Sidewalk	Grass & Tree	™ 2	37,222.6	1.26	4,94	0.32	46,900.48	183,879.64	11,911.23	242,691.35
Turling	Open Space	Grass	1.32	0	0	5.25	0.30	Ó	0	0	Ó
	Roadside	1,0 x 1.0	in .	4,470	46.78	90.58	5.65	209,106.6	404,892.6	25,255.5	639,254.7
	Avadside	1.0 x 0.5	n.	0	25.73	80.00	3.38	Ō	Ò	0	Ó
Drainage	Pipe Culvert	D = 600		720	46.21	77.71	5.23	33,271,2	55,951.2	3,765.6	92,988
V. a. noge	Box Culvert	3.0 x 2.0	ta	50	489.60	577.43	58.50	24,480	28,871.5	2,925	56,276.5
		3.0 x 3.0	D	0	612.00	721.79	73.12	0	0	0	0
	Transfer	D = 24"	n	Q	239.30	91.33	14.59	0	0	Ó	· · · · · · · · · · · · · · ·
Wall	Hooring		Yol,	0	6,139.00	38,155.00	5,970.00	0	Ò	0	0
	Masonry	H = 4.0	τ,2	2,571	26.21	64.03	6.26	67,385.91	164,621.13	16,094.46	248,101.5
antender de de general de natural de la companya d	Revetment	Stone	pa .	1,200	818.70	1,169.70	132.70	982,440	1,403,640	159,240	2,545,320
	Carriage	Asphalt	n ²	36,100	17.49	12.76	1.43	631,389	460,636	51,623	1,143,648
	Shoulder	Asphalt	a _s	4,560	13,64	9.13	1.10	62,198,4	41,632.8	5,016	108,847,2
Pavement	Service Road	Asphalt	n2	13,980	13.64	9,13	1,10	190,687.2	127,637.4	15,378	333,702.6
	Sidevalk	Concrete Block	n2	9,922.6	5.49	7.61	0.62	54,475.07	75,510.99	6,152,01	136,138.07
	Overlay	Asphalt	m ²	0	11.00	8.00	1.00	0	0	0	0
	Kerb	Concrete	n	5,740	8.54	14.52	1.16	49,019.6	83,344.8	6,658,4	139,022.8
Additional Facility	Central Reserved	Concrete	t)	1,980	20.86	43.86	3.28	41,302.8	86,842.8	6,494,4	134,640
	Guard Rail	Steel	b	920	44.11	3.22	6.23	40,581.2	2,962.4	5,731,6	49,275,2
	Lighting	Steel	ta i	1,785	40.00	19.00	7.00	71,400	33,915	12,495	117,810
	Lane-Harks	Paint	ឡ	2,390	0.50	0.60	0.05	1,195	1,434	119.5	2,748.5
Intersection	At-Grade	Signal	No.	2.5	32,976	64,506	2,922	82,440	161,265	7,305	251,010
	Interchange	Diamond Type	Vol.	0	357,359	303,075	46,703	0	0	û	0
		Loop Type	Yol.	0	1,330,379	1,156,337	132,370	0	0	0	0
Approach	Road		n		462.46	498.20	48.71	0	0	Q	0
To	Total					·		3,141,514	3,557,198	404,533	7,103,245
	isition Cost							 	L		

Segment 4

(4-lane)

Item	Sub-Item	Class	Unit	Quantity	Unit Cost			Construction Cost			
tten					F.C.	L.C.	Tax	F.C.	L.C.	Tax	Total
Site	Residential		₁₃ 2	8,720	1.90	1.26	0.16	16,568	10,987	1,395	28,950
Clearing	Field	:	_m 2	56,000	0.26	0.17	0.02	14,560	9,520	1,120	25,200
Excavation	Soil	CORTOR	13	2,080	1.24	0.89	0.11	2,579.2	1,851.2	228.8	4,659.2
Waste	Soil	common	₁₃ 3	0	1.74	1.89	0.29	Ó	0	0	0
Embankment	Soil	common	_m 3	367,920	3.85	1.46	0.51	1,416,492	537,163.2	187,639.2	2,141,294.4
Slope	Grass		₁₂ 2	0	0	5,25	0.30	0	0	0	Ô
m	Sidevalk	Grass & Tree	m ²	79,417.5	1.26	4.94	0.32	100,066.05	392,322.45	25,413.6	517,802.1
Turling	Open Space	Grass	n ²	0	0	5.25	0.30	0	0	0	0
. i	Roadside	1,0 x 1,0	m	6,300	46.78	90.58	5.65	294,714	570,654	35,595	900,963
	vogazide	1.0 x 0.5	F)	0	25.73	80.00	3.38	0	o	Ó	0
Drainage	Pipe Culvert	D = 600		945	46.21	77.71	5.23	43,668.45	73,435.95	4,942.35	122,046.75
Diamage	Box Culvert	3.0 x 2.0	ទ	100	489.60	577.43	58.50	48,960	57,743	5,850	112,553
		3.0 x 3.0	ព	50	612.00	721.79	73.12	30,600	360,089.5	3,656	70,345.5
	Transfer	$D = 24^{H}$	n	0	239.30	91.33	14.59	O	0	0	0
	Mooring		Yol.	O	6,139.00	38,155.00	5,970.00	6,139	38,155	5,970	50,264
Wall	Masonry	H = 4.0	17,2	894	26.21	64.03	6.26	23,431.74	57,242.82	5,596.44	86,271
	Revetment	Stone	n	2,950	818.70	1,169.70	132.70	2,415,165	3,450,615	391,465	6,257,245
	Carriage	Asphalt	E12	51,820	17.49	12.76	1.43	906,331.8	661,223.2	74,102,6	1,641,657,6
	Shoulder	Asphalt	₁₃ 2	8,520	13.64	9.13	1.10	116,212.8	77,787.6	9,372	203,372,4
Pavezent	Service Road	Asphalt	n ₅	20,760	13.64	9.13	1.10	283,166.4	189,538.8	22,836	495,541.2
	Sidewalk	Concrete Block	n2	7,917.5	5,49	7.61	0.62	43,467.08	60,252.18	4,908,85	108,628.1
	Overlay	Asphalt	n ²	0	11.00	8.00	1.00	0	0	0	0
	Kerb	Concrete	E3	8,970	8.54	14.52	1,16	76,603.8	130,244.4	10,405.2	217,253.4
Additional Facility	Central Reserved	Concrete	n	3,000	20.86	43.86	3.28	62,580	131,580	9,840	204,000
	Guard Rail	Steel	ນ	320	44.11	3.22	6.23	14,115.2	1,030.4	1,993.6	17,139.2
	Lighting	Steel	ħ	3,150	40.00	19.00	7.00	126,000	59,850	22,050	207,900
	Lane-Marks	Paint	B	3,150	0.50	0.60	0.05	1,575	1,890	157.5	3,622,5
Intersection	At-Grade	Signal	No.	2,5	32,976	64,506	2,922	82,440	161,265	7,305	251,010
	Interchange	Diamond Type	Vol.	0	357,359	303,075	46,703	0	0	0	0
		Loop Type	Yol.	0	1,330,379	1,156,337	132,370	0	0	0	0
Approach	Road		t)	300	462.46	498.20	48.71	138,738	149,460	14,613	302,811
<u> </u>	Total							6,264,173	6,859,901	846,455	13,970,529
	isition Cost		 					<u> </u>	·	 	<u> </u>

Segment 5 4 - lane

Icem	Sub-Item	Class	Vnit	Quantity	Unit Cost			Construction Cost			
					F.C.	L.C.	Tax	F.C.	L.C.	Tax	Total
Site	Residential		m ²	0	1.90	1.26	0.16	0	0	0	. 0
Clearing	Field		1n ²	44,960	0.26	0.17	0.02	11,689	7,643	899	20,232
Excavation	Soil ,	COLESON	_m 3	99,333.8	1.24	0.89	0,11	123,173.91	88,407.08	10,926.72	222,507.71
Waste	Soil	COLLEOU	n ³	28,733.8	1.74	1.89	0.29	49,997	54,307	8,333	112,636
Embankment	Soil	compon	ra3	70,600	3.85	1.46	0.51	271,810	103,076	36,006	410,892
Slope	Grass		n _S	0	0	5.25	0.30	0	0	0	0
	Sidewalk	Crass & Tree	₁₃ 2	4,208	1.26	4.94	0.32	5,302.08	20,787.52	1,346.56	27,436.16
Turling	Open Spacé	Grass	r.2	0	0	5.25	0.30	0	0	0	0
		1.0 x 1.0	n	8,900	46.78	90.58	5.65	416,342	806,162	50,285	1,272,789
	Roadside	1.0 × 0.5	្សា	0	25.73	80.00	3.38	0	0	0	0
	Pipe Culvert	D = 600		880	46.21	77.71	5.23	40,664.8	68,384.8	4,602.4	113,652
Drainage		3.0 × 2.0	10	0	489.60	577.43	58.50	0	0	Ò	0
	Box Culvert	3.0 x 3.0	n	Ó	612.00	721.79	73.12	0	0	0	0
	Transfer	D = 24"	n	3,800	239.30	91.33	14.59	909,340	347,054	55,442	1,311,836
Kall	Mooring	1	Yol.	0	6,139.00	38,155.00	5,970.00	0	0	0	0
	Hasonry	H = 4.0	п2	894	26.21	64.03	6.26	23,431.74	57,242.82	5,596.44	86,271
	Revetment	Stone	EA	0	818.70	1,169.70	132.70	0	0	0	0
	Carriage	Asphalt	132	44,493	17.49	12.76	1.43	778,182.57	567,730.68	63,624.99	1,409,538.2
	Shoulder	Asphalt	ti _Š	7,395	13.64	9.13	1.10	100,867.8	67,516.35	8,134.5	176,518.6
Pavement	Service Road	Asphalt	n ²	3,720	13.64	9.13	1.10	50,740.8	33,963.6	4,092	88,796.4
	Sidewalk	Concrete Block	132	4,208	5.49	7.61	0.62	23,101,92	32,022.88	2,608.96	57,733.7
	Overlay	Asphalt	n2	34,453	11.00	8.00	1.00	378,983	275,624	34,453	689,060
Additional Facility	Kerb	Concrete	n	9,220	8,54	14.52	1.16	78,738.8	133,874.4	10,695.2	223,308.4
	Central Reserved	Concrete	ta	4,300	20.86	43.86	3.28	89,698	188,598	14,104	292,400
	Guard Rail	Steel	В	320	44.11	3.22	6.23	14,115.	1,030.4	1,993.6	17,139.2
	Lighting	Steel	r	400	40.00	19.00	7,00	16,000	7,600	2,800	26,400
	Lane-Harks	Paint	D	4,450	0.50	0.60	0,05	2,225	2,670	222.5	5,117.5
Intersection	At-Grade	Signal	No.	2,5	32,976	64,506	2,922	82,440	161,265	7,305	251,010
	Interchange	Diamond Type	Yol,	1.0	357,359	303,075	46,703	357,359	303,075	46,703	707,137
		Loop Type	Yol.	0	1,330,379	1,156,337	132,370	0	0	0	0
Approach	Road		n	0	462.46	498.20	48.71	0	0	0	0
	Total					J	_1	3,824,203	3,328,035	370,174	7,522,412
	land Acquisition Cost				_				1	J	