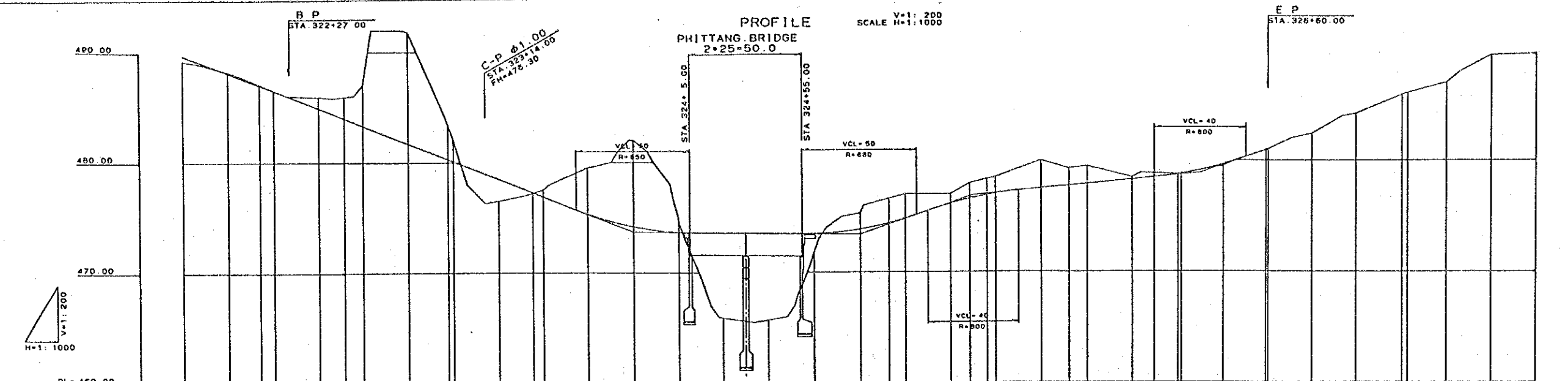
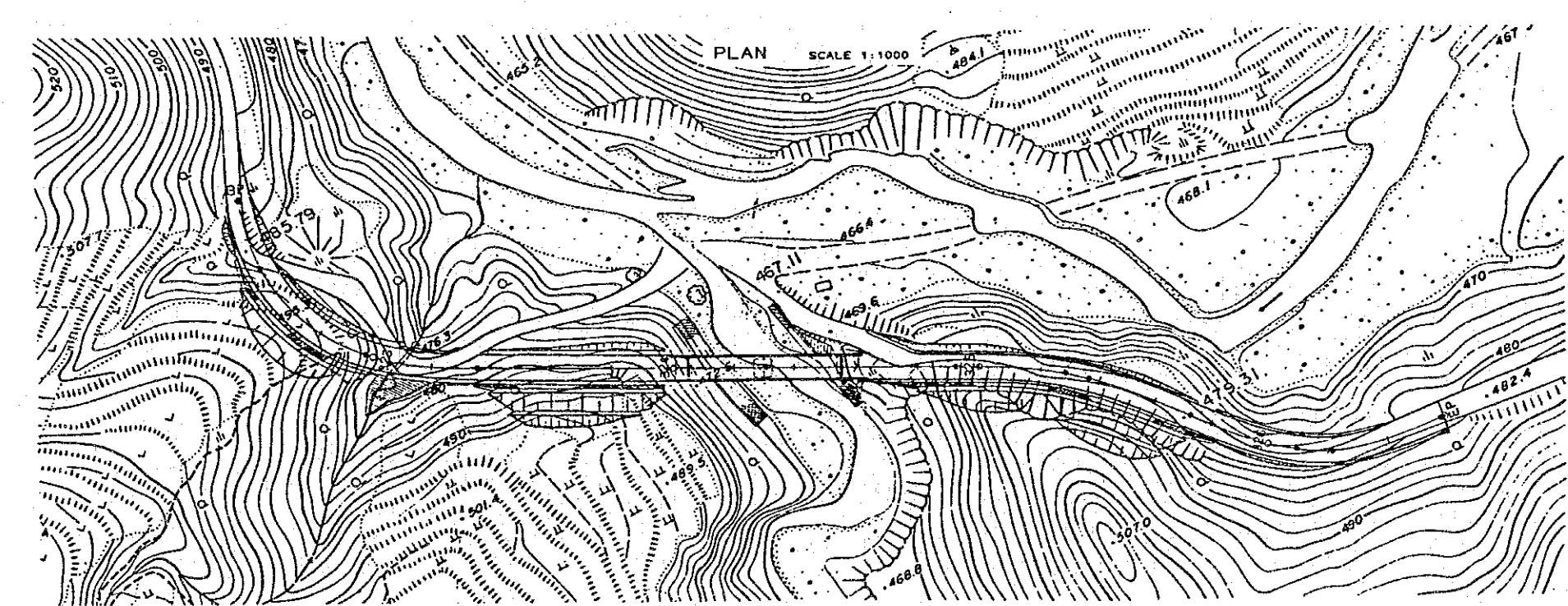


Figure 4.6.14 Plan and Profile of Approach Road for Kamara Bridge

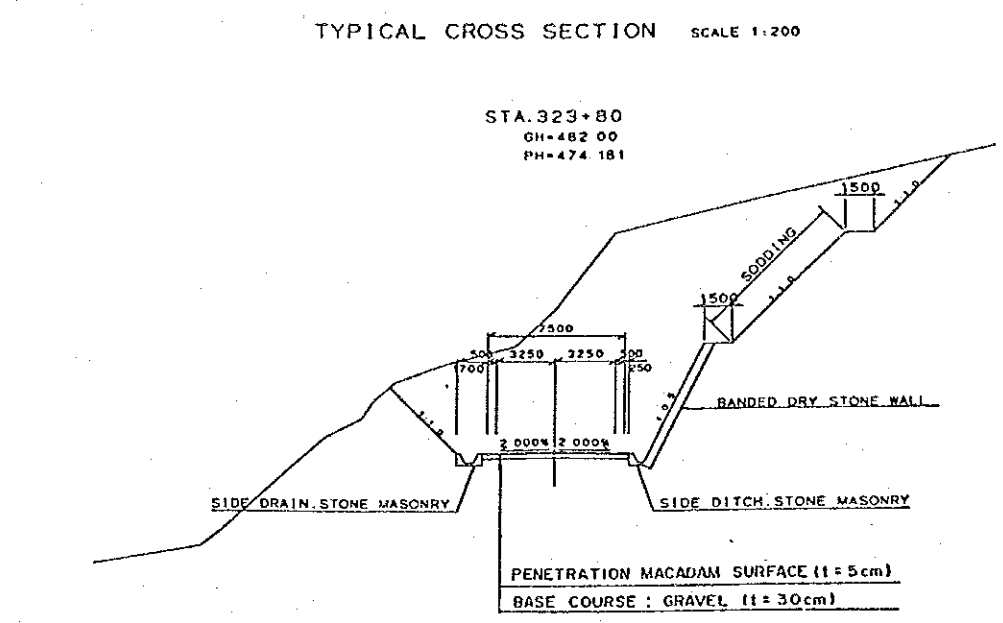
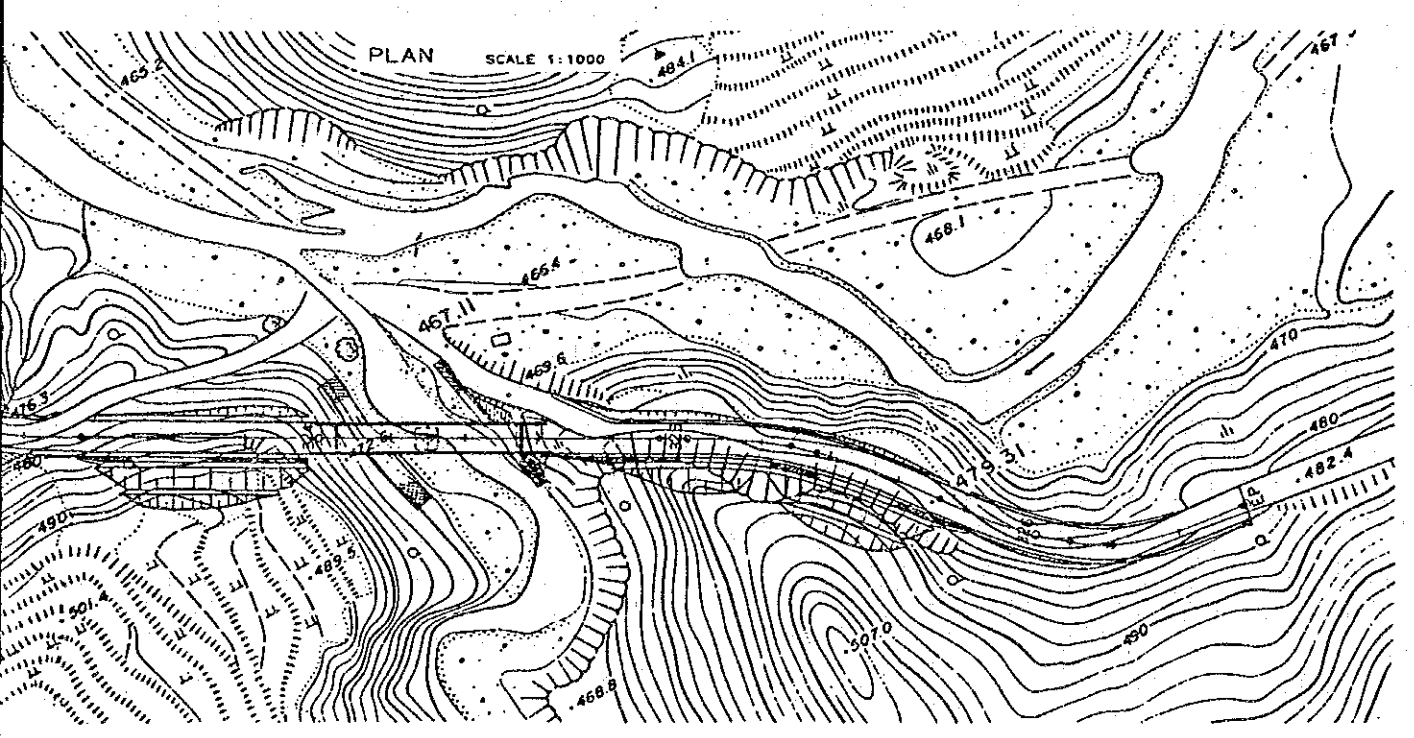
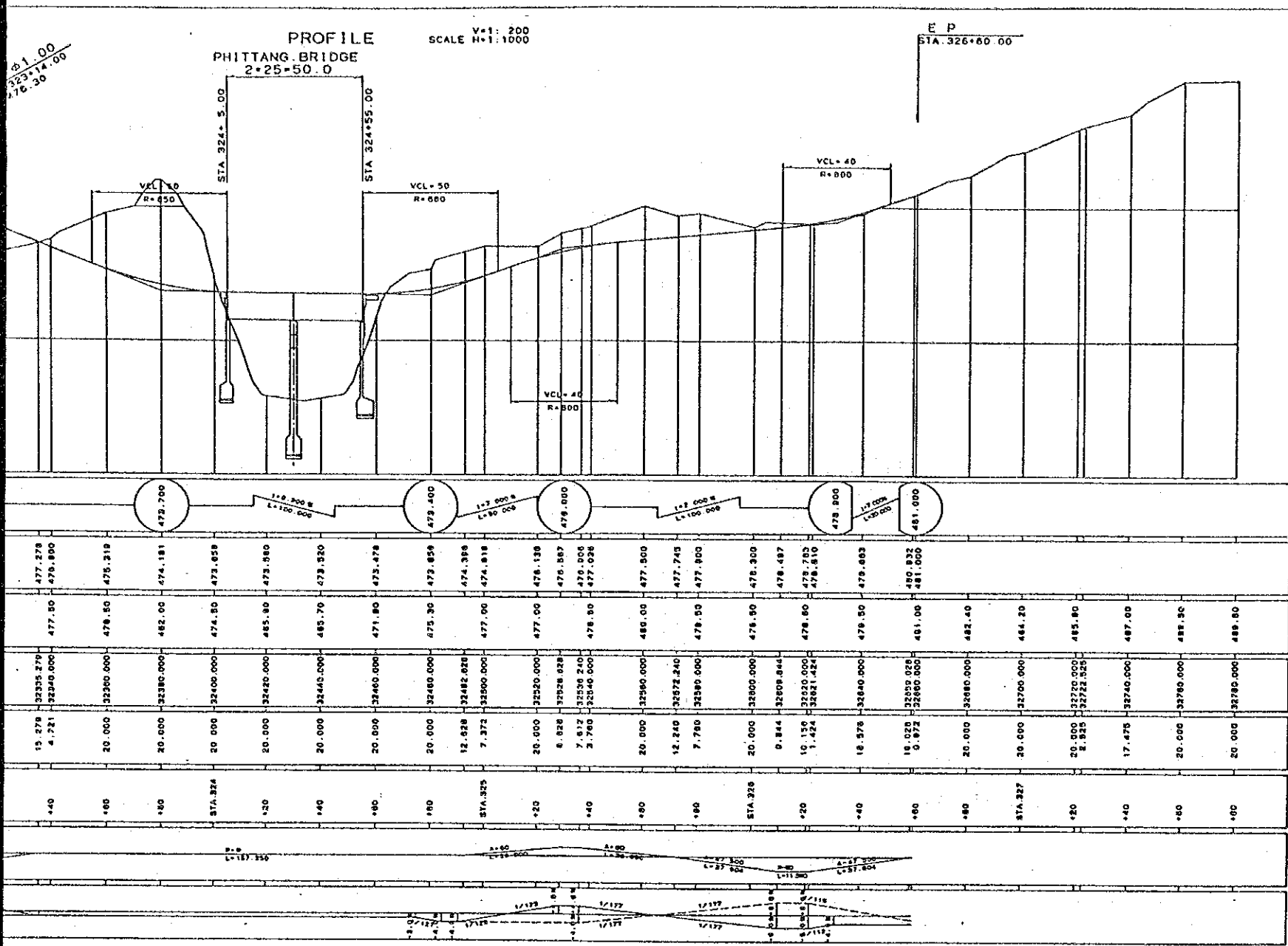


GRADE	PROPOSED HEIGHT	GROUND HEIGHT	ACCUMULATED DISTANCE	DISTANCE	STATION	CURVE ELEMENT	SUPERELEVATION
485.700	489.700	488.20	32180.000	4.018	STA 321+80		1/125
485.940	488.100	488.20	32200.000	20.000	STA 322+00		1/125
485.900	486.000	486.50	32219.766	19.766	+20		1/125
485.850	485.000	485.90	32220.000	0.234	+40		1/125
485.888	483.300	483.300	32240.000	20.000	+80		1/125
485.700	481.700	481.80	32251.400	11.400	+80		1/125
485.265	480.100	482.00	32260.000	8.600	STA 323+00		1/125
478.500	478.500	478.50	32265.000	5.000	+20		1/125
477.278	478.000	477.00	32280.000	15.000	+40		1/125
473.219	473.219	478.50	32300.000	20.000	+80		1/125
474.181	473.858	482.00	32320.000	20.000	STA 324+00		1/125
473.858	473.858	474.50	32340.000	20.000	+20		1/125
473.820	473.820	485.80	32360.000	20.000	+40		1/125
473.478	473.478	485.70	32380.000	20.000	+80		1/125
473.858	473.858	471.80	32400.000	20.000	STA 325+00		1/125
474.386	474.386	475.30	32420.000	20.000	+20		1/125
474.618	474.618	477.00	32440.000	20.000	+40		1/125
476.138	476.138	477.00	32460.000	20.000	+80		1/125
476.800	476.800	478.50	32480.000	20.000	STA 326+00		1/125
477.038	477.038	478.80	32500.000	20.000	+20		1/125
477.500	477.500	479.810	32520.000	20.000	+40		1/125
477.745	477.745	479.810	32540.000	20.000	+80		1/125
478.300	478.300	481.00	32560.000	20.000	STA 327+00		1/125
478.487	478.487	482.40	32580.000	20.000	+20		1/125
478.810	478.810	484.20	32600.000	20.000	+40		1/125
479.683	479.683	485.60	32620.000	20.000	+80		1/125
481.000	481.000	487.00	32640.000	20.000	STA 328+00		1/125
481.000	481.000	488.50	32660.000	20.000	+20		1/125
481.000	481.000	489.50	32680.000	20.000	+40		1/125
481.000	481.000	488.80	32700.000	20.000	+80		1/125

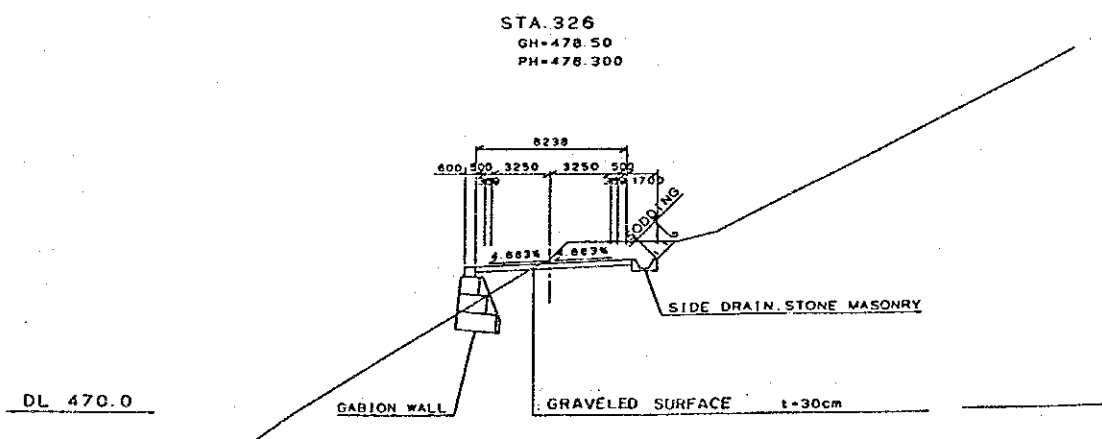


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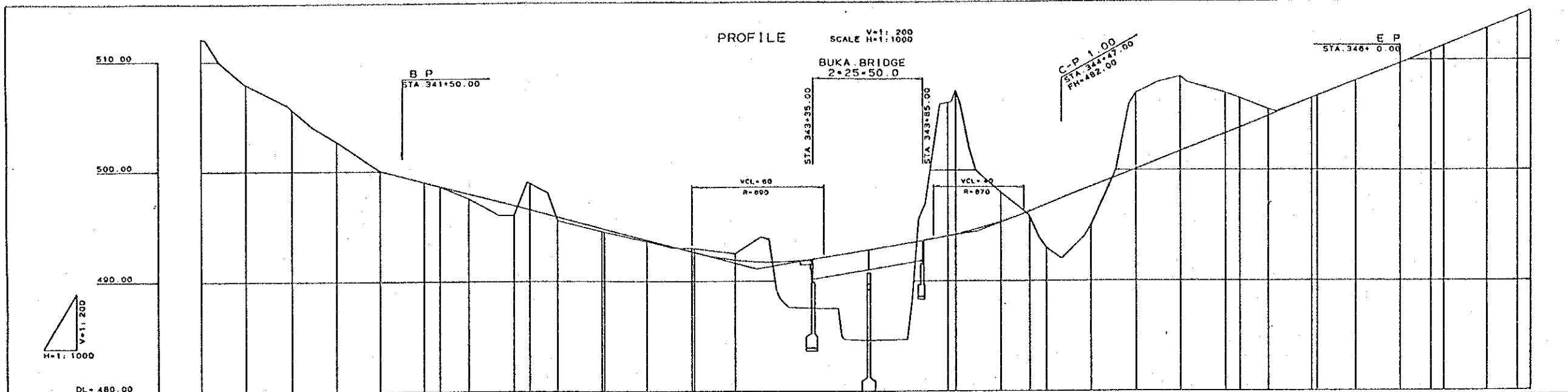


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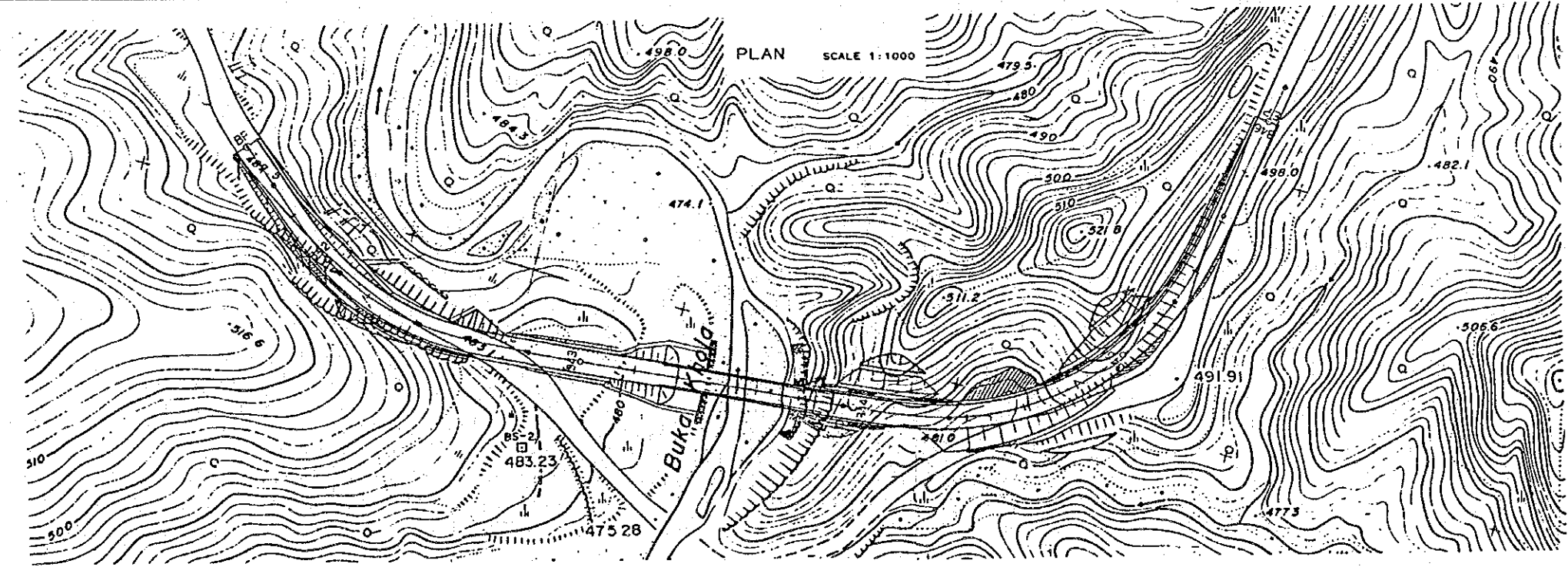


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Figure 4.6.15 Plan and Profile of Approach Road for Phittang Bridge



GRADE																					
PROPOSED HEIGHT																					
GROUND HEIGHT	502.10	497.80	495.80	492.76	490.00	489.20	488.975	488.908	487.825	488.00	486.488	483.825	484.80	484.775	484.718	483.80	483.725	483.00	481.813	478.80	481.720
ACCUMULATED DISTANCE	24080.000	24080.000	24100.000	24120.000	24140.000	24180.000	24187.212	24187.212	24200.000	24200.000	24207.212	24220.000	24240.000	24240.000	24241.128	24250.000	24250.000	24250.000	24250.000	24250.000	24250.000
DISTANCE	8.473	20.000	20.000	20.000	20.000	7.212	12.788	20.000	7.212	12.788	20.000	1.128	18.872	20.000	1.128	20.000	1.128	18.872	20.000	20.000	20.000
STATION	340+00	+40	341+00	+20	+40	+60	+80	342+00	+20	+40	+60	+80	343+00	+20	+40	+60	+80	344+00	+20	+40	+60
CURVE ELEMENT																					
SUPERELEVATION																					



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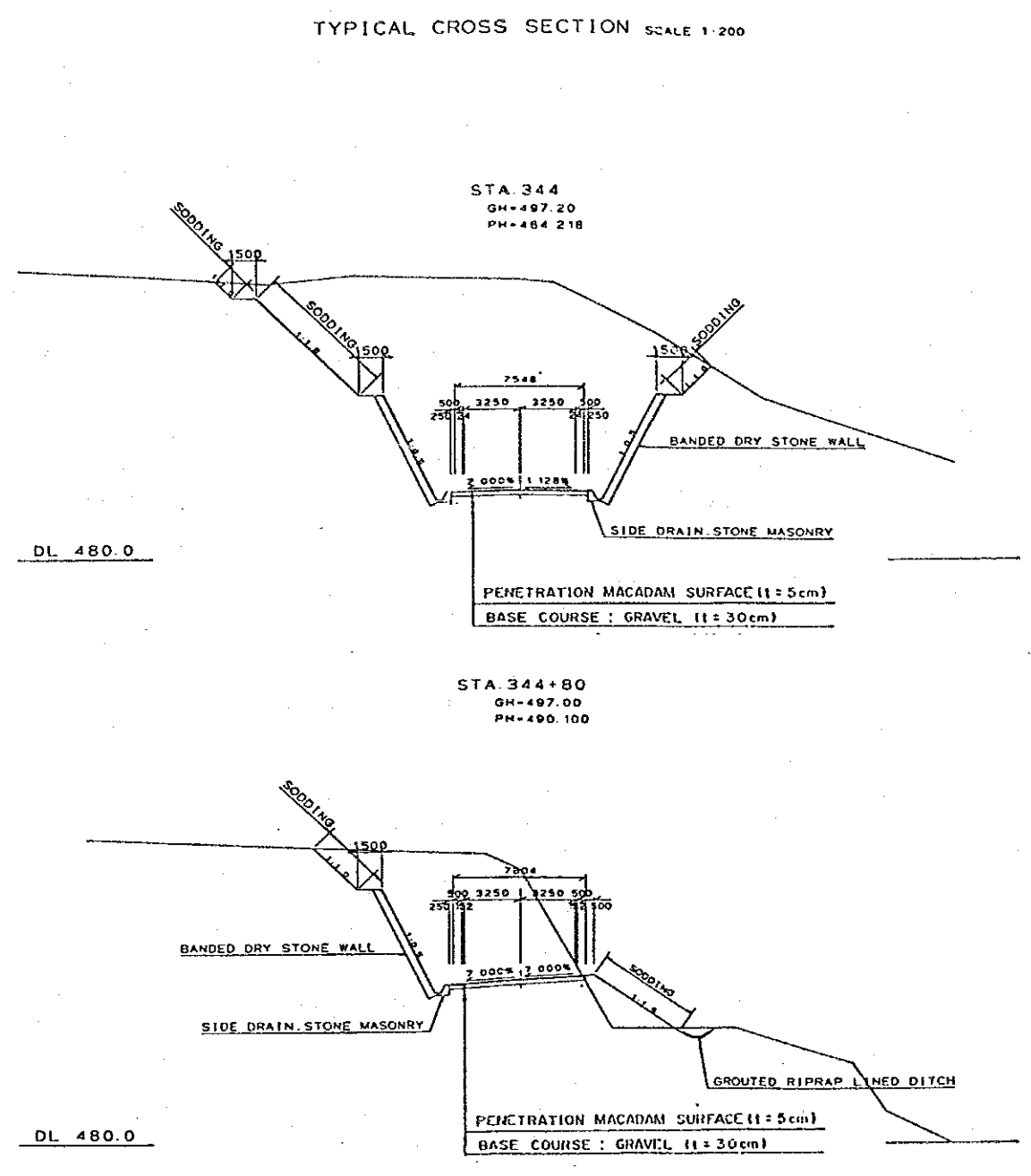
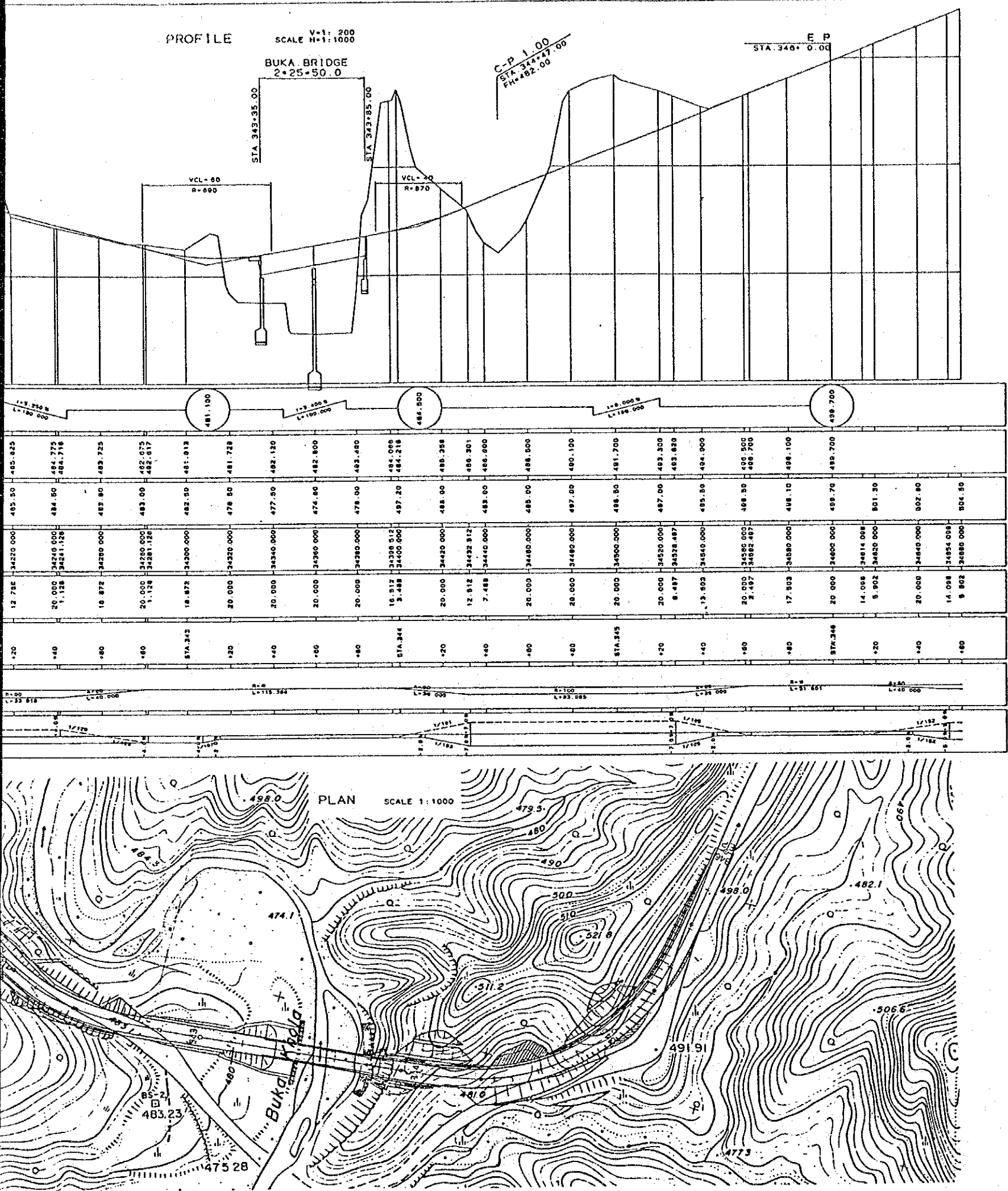
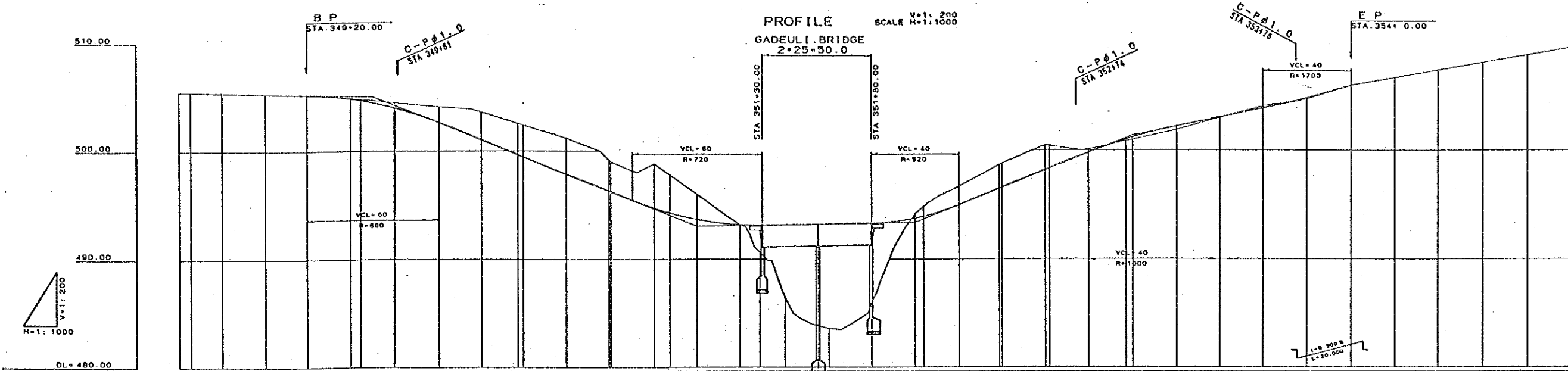
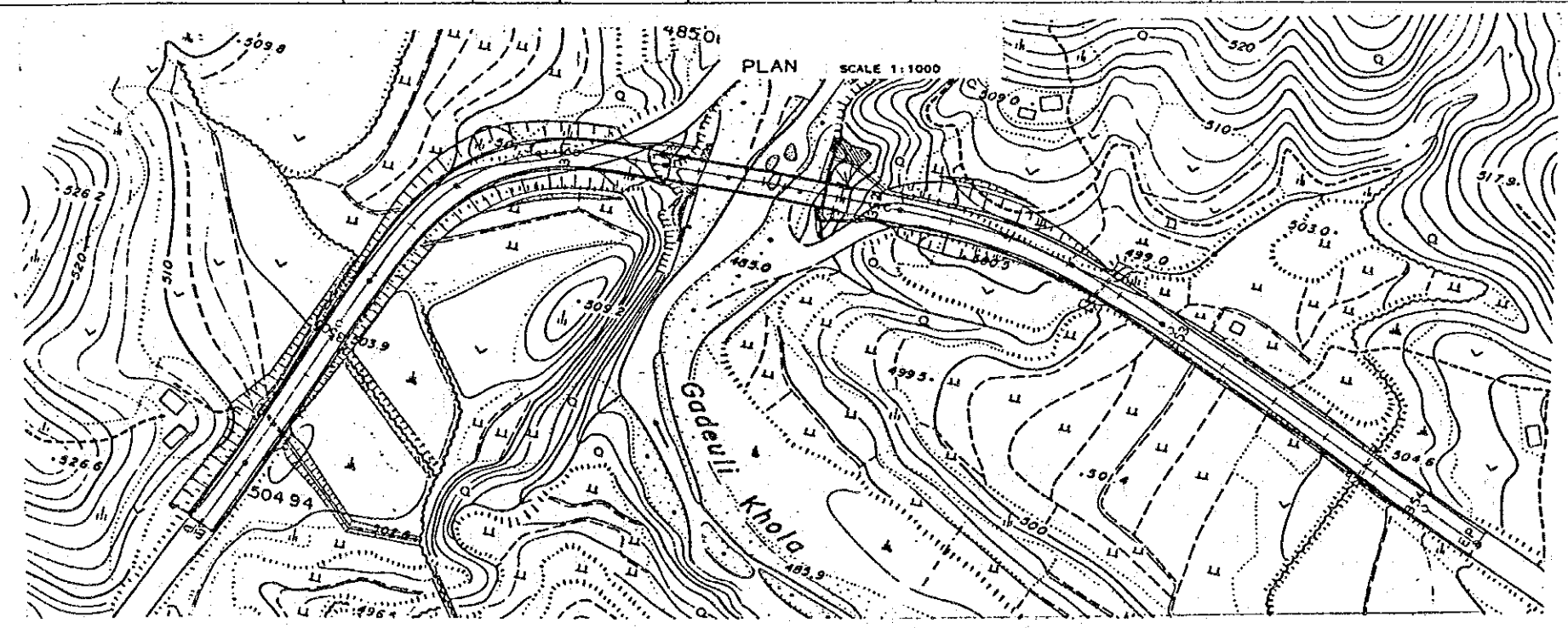


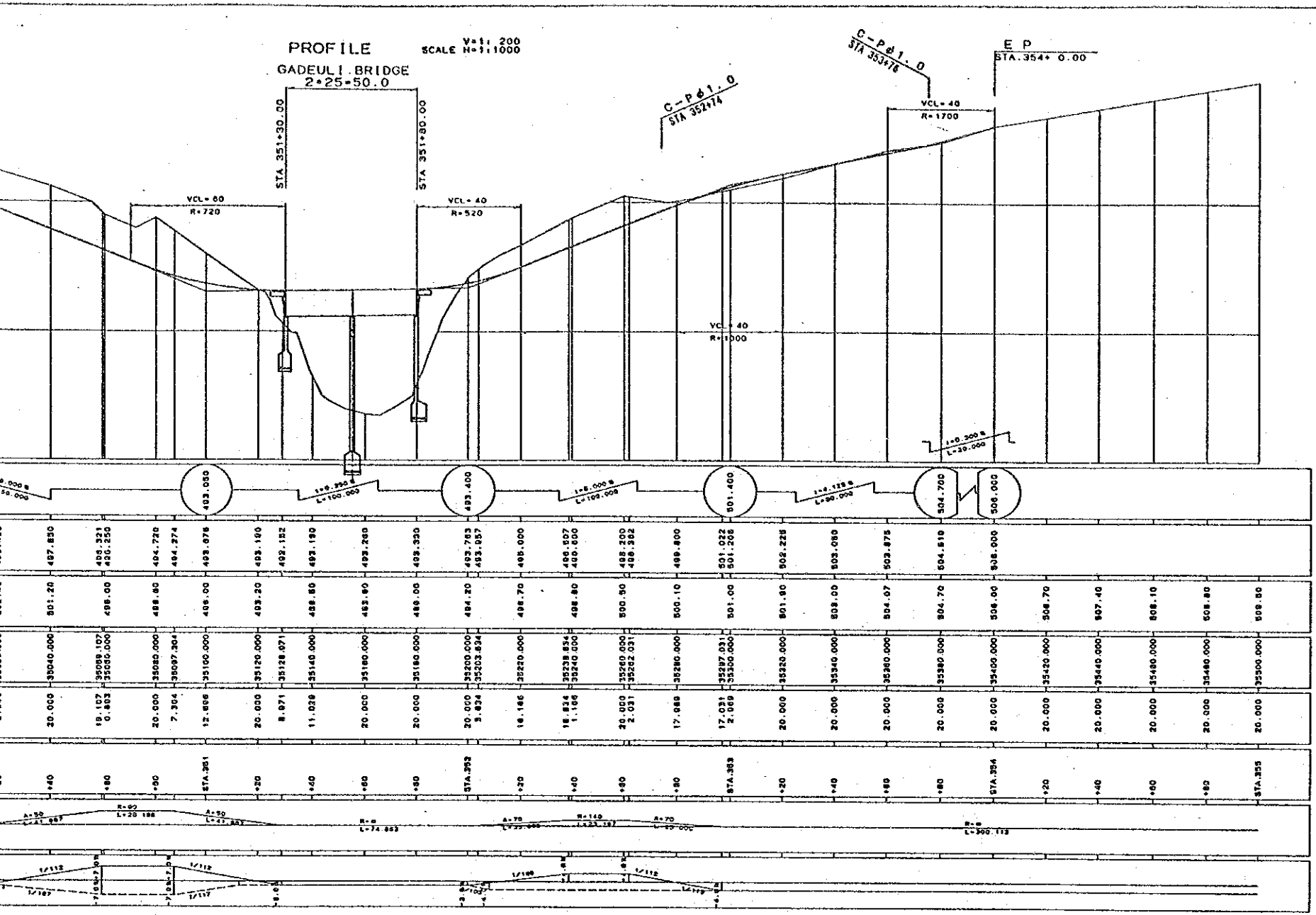
Figure 4.6.16 Plan and Profile of Approach Road for Buka Bridge



GRADE	PROPOSED HEIGHT	GROUND HEIGHT	ACCUMULATED DISTANCE	DISTANCE	STATION	CURVE ELEMENT	SUPERELEVATION
505.200	505.200	505.10	0.003	0.003	STA. 348.000		
505.050	505.050	505.40	0.351	0.351	348.351		
504.950	504.950	505.30	14.809	14.809	348.809		
504.702	504.702	505.20	20.000	20.000	349.000		
504.850	504.850	504.96	20.000	20.000	349.000		
504.000	504.000	504.89	4.322	4.322	349.422		
502.850	502.850	504.70	18.478	18.478	349.900		
501.050	501.050	504.10	20.000	20.000	350.000		
499.055	499.055	503.40	20.000	20.000	350.000		
489.450	489.450	502.40	17.440	17.440	350.174		
487.850	487.850	499.00	2.569	2.569	350.743		
483.180	483.180	489.00	8.000	8.000	350.800		
484.274	484.274	488.20	16.157	16.157	351.357		
483.876	483.876	488.25	0.852	0.852	351.357		
483.180	483.180	488.80	20.000	20.000	351.600		
483.182	483.182	484.274	7.304	7.304	351.600		
483.260	483.260	484.00	12.898	12.898	351.600		
483.330	483.330	483.20	20.000	20.000	351.600		
483.763	483.763	483.80	8.971	8.971	351.600		
483.957	483.957	486.80	11.028	11.028	351.600		
485.000	485.000	483.80	20.000	20.000	351.600		
485.007	485.007	488.70	20.000	20.000	351.600		
485.050	485.050	488.00	18.186	18.186	351.600		
485.200	485.200	488.80	18.824	18.824	351.600		
485.802	485.802	489.86	1.189	1.189	351.600		
489.800	489.800	500.90	20.000	20.000	351.600		
489.900	489.900	500.10	2.031	2.031	351.600		
501.022	501.022	500.10	17.965	17.965	351.600		
501.205	501.205	501.00	17.031	17.031	351.600		
502.225	502.225	501.90	2.089	2.089	351.600		
503.050	503.050	501.90	20.000	20.000	351.600		
503.875	503.875	503.00	20.000	20.000	351.600		
504.818	504.818	504.07	20.000	20.000	351.600		
506.000	506.000	504.70	20.000	20.000	351.600		
506.70	506.70	508.00	20.000	20.000	351.600		
507.40	507.40	508.70	20.000	20.000	351.600		
508.10	508.10	507.40	20.000	20.000	351.600		
508.80	508.80	509.10	20.000	20.000	351.600		
509.90	509.90	508.80	20.000	20.000	351.600		
		509.90	20.000	20.000	351.600		



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TYPICAL CROSS SECTION SCALE 1:200

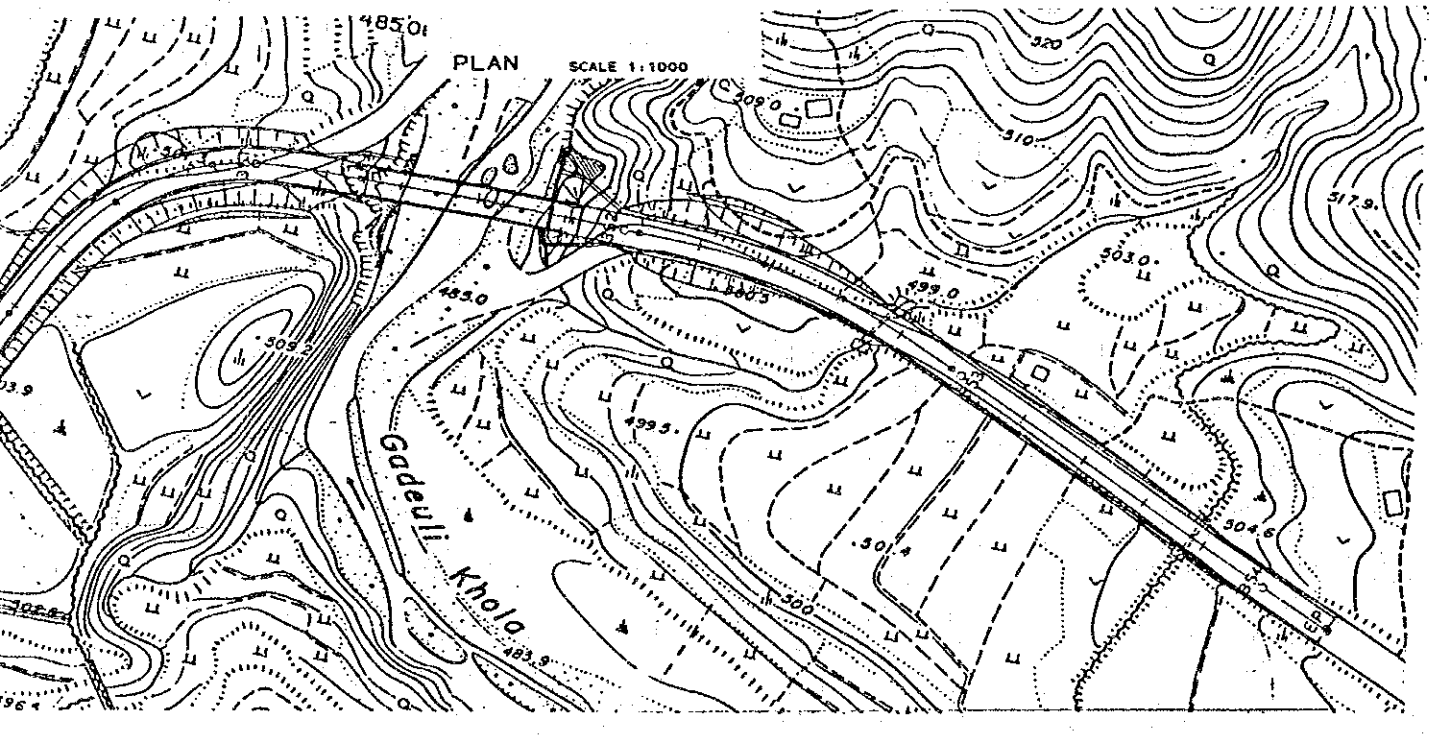
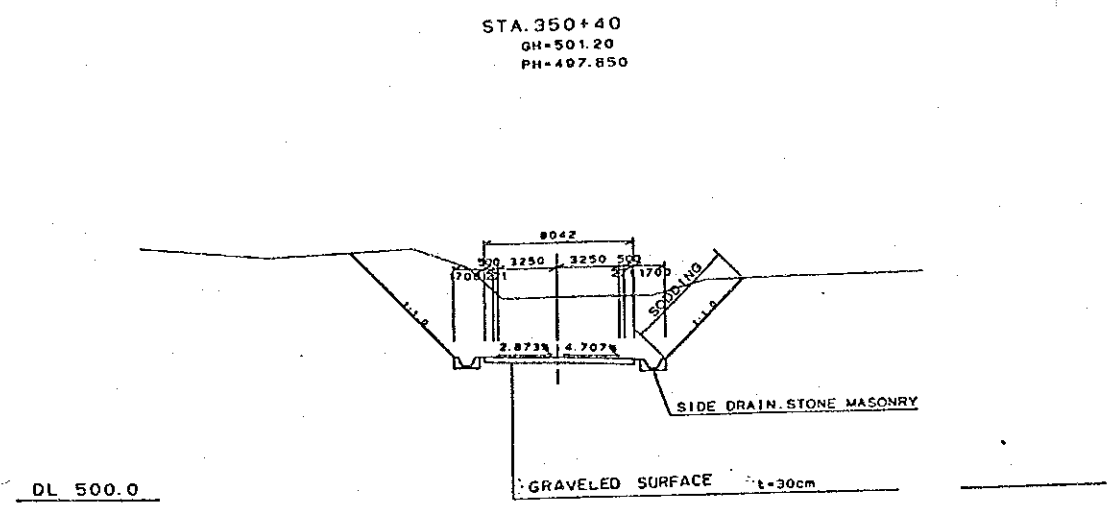


Figure 4.6.17 Plan and Profile of Approach Road for Gadeuli Bridge

LOCATION MAP OFF CAUSEWAY SCALE 1:4,000

LIST OFF MINOR CAUSEWAY (R.B.L.C)

No.	NAME	STATION	LENGTH	REMARKS
1	Bhiman	172 + 15 ~ 172 + 75	60	
2	184	184 + 50 ~ 184 + 80	30	
3	Sukhe	194 + 25 ~ 194 + 65	40	
4	201	200 + 90 ~ 201 + 30	40	
5	212	211 + 93 ~ 212 + 23	30	
6	Bhurenge	217 + 60 ~ 217 + 90	30	
7	Thado	223 + 15 ~ 223 + 45	30	
8	Kinrang	226 + 80 ~ 227 + 20	40	
9	Baghwara	229 + 50 ~ 230 + 10	60	
10	Maintar	234 + 15 ~ 234 + 75	60	
11	Dawai	238 + 95 ~ 239 + 35	40	
12	Pagnighat	246 + 10 ~ 246 + 90	80	
13	Jelba	250 + 65 ~ 251 + 45	80	
14	Beljhor	258 + 15 ~ 258 + 45	30	
15	Kalyani	260 + 80 ~ 261 + 10	30	
16	Balabathan	265 + 35 ~ 266 + 15	80	
17	Dhapsar	272 + 30 ~ 272 + 80	50	

NOTES R.B.L.C MEANS RIVERBED LEVEL CAUSEWAY

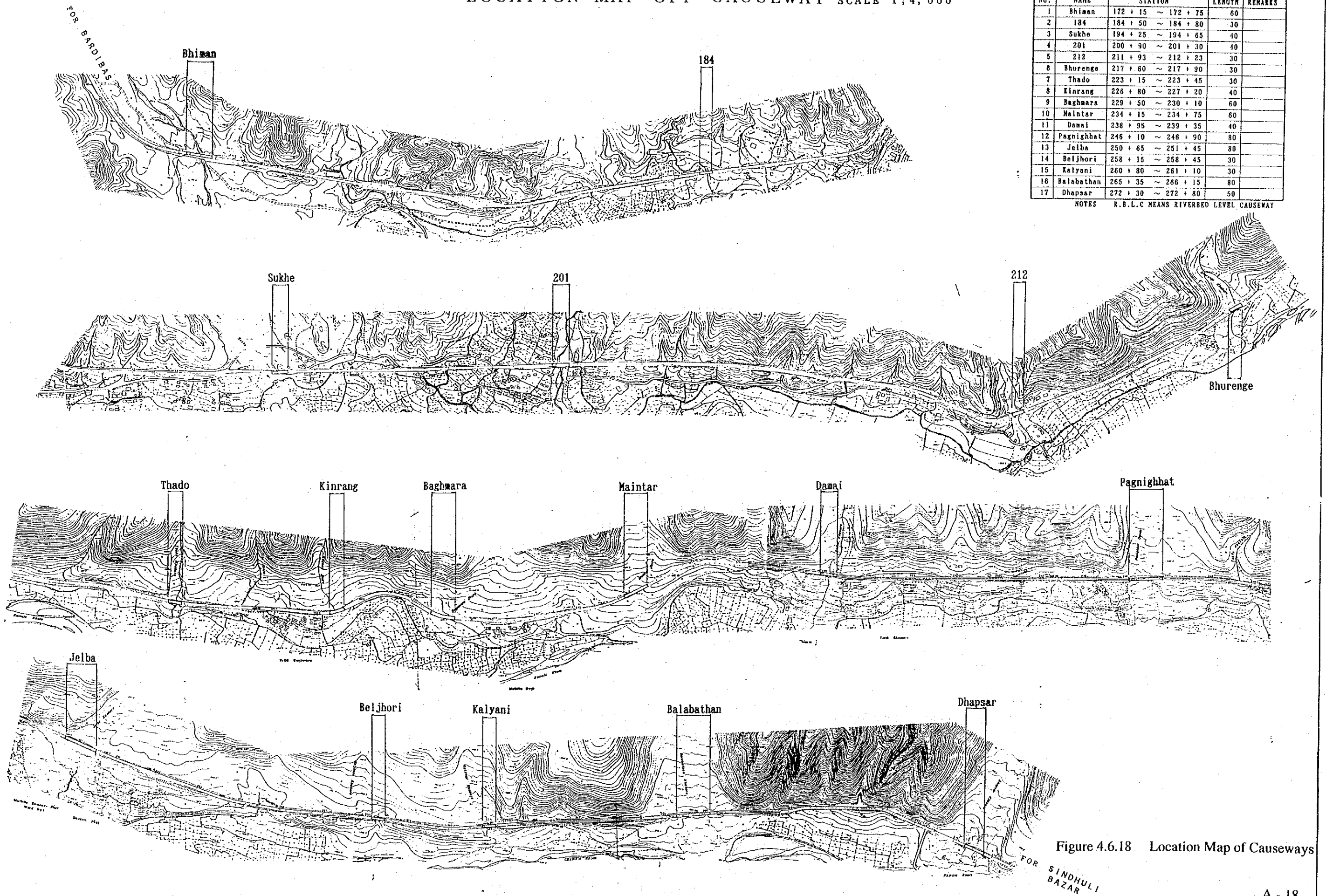
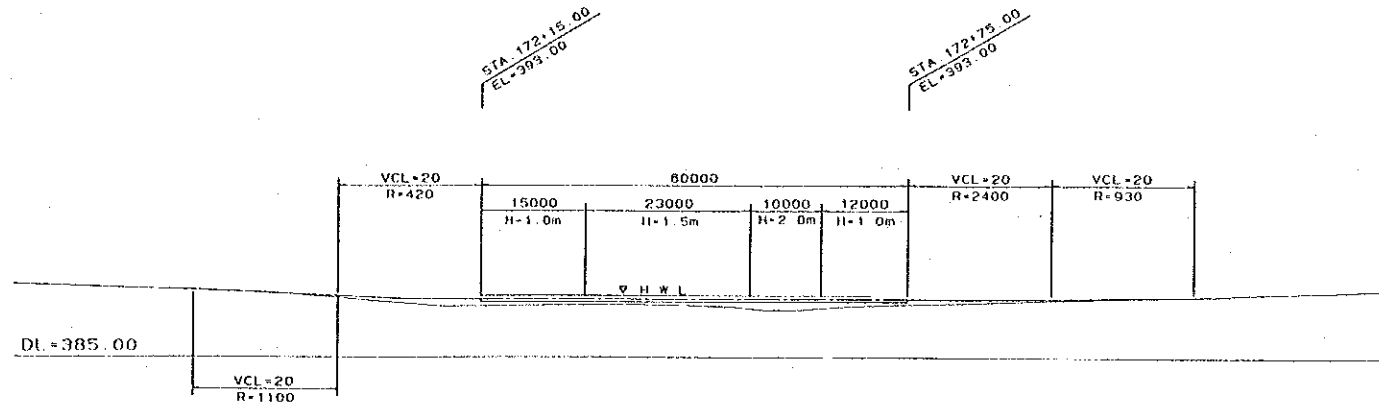


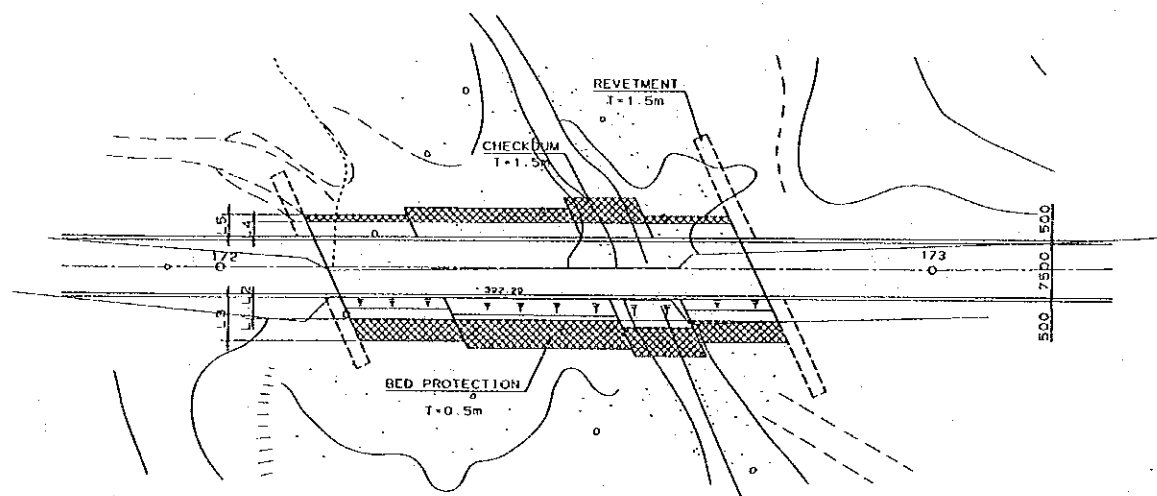
Figure 4.6.18 Location Map of Causeways



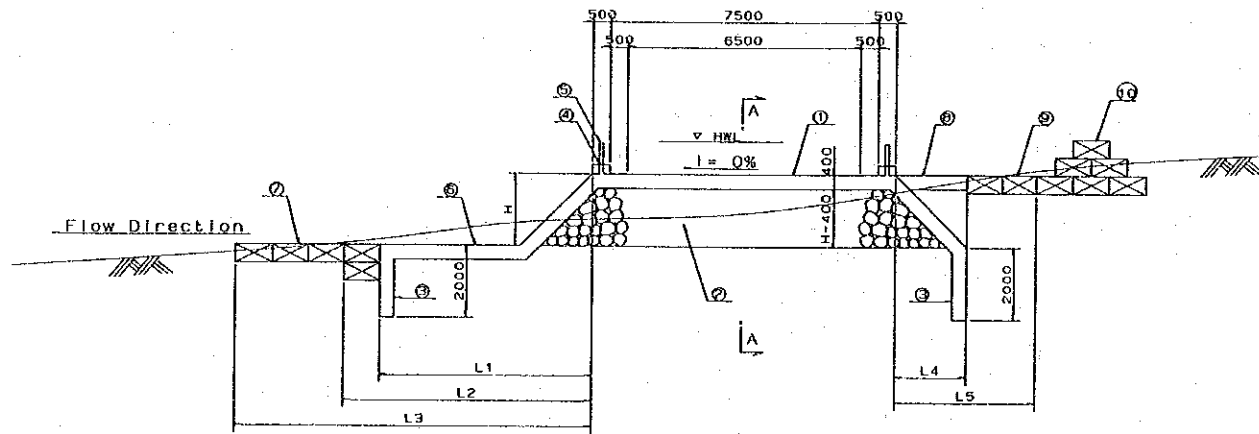
PROFILE SCALE 1:500



PLAN SCALE 1:500



TYPICAL SECTION OF RIVER BED LEVEL CAUSEWAY (RBLC)

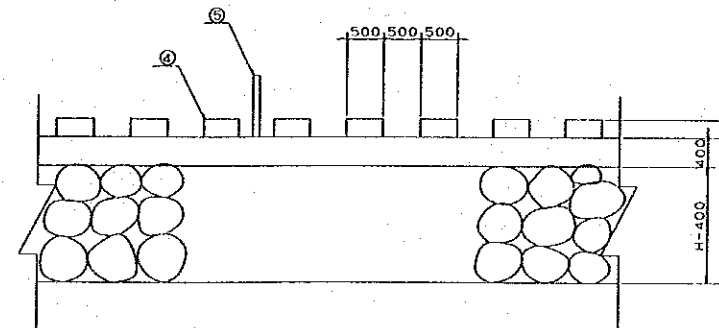


DIMENSION OF APRON

HEAD 'H'	L1	L4	REMARKS
H=0.0m	0.0	0.0	FOR CUT
H=0.0m	3.0	2.0	FOR GROUND LEVEL
H=1.0m	3.0	2.0	
H=1.5m	3.0	2.0	
H=2.0m	4.0	2.0	

(UNIT:m)

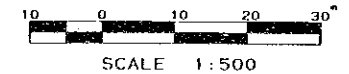
SECTION A-A



DIMENSION OF BED PROTECTIN

HEAD 'H'	L2	L3	L5	REMARKS
H=0.0m	0.0	0.0	0.0	FOR CUT
H=0.0m	3.0	6.0	3.0	FOR G.L
H=1.0m	3.0	6.0	3.0	
H=1.5m	3.0	7.0	4.0	
H=2.0m	4.0	8.0	4.0	

(UNIT:m)



NOTES

- R.B.L.C. MEANS RIVERBED LEVEL CAUSEWAY
- V.C. MEANS VENTED CAUSEWAY
- S.B. MEANS SUBMERSIBLE BRIDGE

NOTES

- 1 40cm THICKNESS CONCRETE SURFACING GRADE=180kg/cm<sup>2</sup> WITH RE-BAR BY D13 CTC 300mm
- 2 30cm RANDOM RUBBLE MASONRY SET IN CONCRETE.GRADE=180kg/cm<sup>2</sup>
- 3 CUT-OFF-WALL BY REINFORCED CONCRETE (H=2.0m, L=40cm)
- 4 CONCRETE CURB 1+500mm, H=250mm Ø 1.0m
- 5 REINFORCED CONCRETE DELINEATORS Ø 1.0m
- 6 DOWN STREAM APRON
  - L1=0.60\*4 H, L=40cm
- 7 DOWN STREAM RIVER BED PROTECTION, GABION MATTRESS
  - L2=0.3+4√H\*a T=1.0m
  - L3=0.63+4√H\*a T=0.5m
- 8 UP STRETREAM APRON
  - L4=L1/2, T=40cm
- 9 UP STREAM RIVER BED PROTECTION, GABION MATTRESS
  - L5=L3/2, T=0.5m
- 10 CHECKDAM, GABION MATTRESS T<sub>max</sub>=2.0m ON RIVER BED PROTECTION
- 11 APRON CONCRETE, GRADE=180kg/cm<sup>2</sup> WITH RE-BAR BY D13 CTC 300mm
- 12 'a' MEANS RUN OFF DISCHARGE PER A LINER METER (m/sec)
- 13 RIVER BED PROTECTION AND CHECKDAM SHALL BE PROVIDED ONLY ON MAIN WATER COURSE
- 14 MINIMUM CONCRETE COVER TO RE-BAR 5cm

MATWRIAL LIST

ITEM	CLASS	UNIT	H=0.0m FOR CUT	H=0.0m FOR LEVEL GROUND	H=1.0m	H=1.5m	H=2.0m	REMARKS
CONCRETE	ck=180kg/cm <sup>2</sup>	m <sup>2</sup>	4.41	6.09	8.74	8.83	9.31	
FORME		m <sup>2</sup>	8.20	8.20	11.10	12.51	13.93	
REINFORCEMENT		kg	180	230	260	260	300	SD-295A
MASOMRY	30cm RUNDOM RUBBLE	m <sup>2</sup>	0.00	0.00	4.66	9.10	14.03	

Figure 4.6.19 Standard Section of Causeway

## **APPENDIX B**

- 1. MEMBER LIST OF SURVEY TEAM**
- 2. SURVEY SCHEDULE**
- 3. MEMBERS LIST OF PERSON MET DURING THE BASIC DESIGN STUDY**
- 4. MINUTES OF DISCUSSIONS**
- 5. COST ESTIMATION BORNE BY HMG**

## 1. MEMBER LIST OF SURVEY TEAM

### Organization of Basic Design Team

Assignment	Name	Position
Team Leader	Shin INOUE	Assistant Director Grant Aid Division Economic Cooperation Bureau Ministry of Foreign Affairs
Project Coordinator	Toshiyuki IWAMA	Second Basic Design Study Division Grant Aid Study & Design Department Japan International Cooperation Agency
Chief Consultant	Masaru KOSHIBA	Nippon Koei Co., Ltd.
Consultant	Yoshihisa YAMASHITA	Nippon Koei Co., Ltd.

## 2. SURVEY SCHEDULE

### Itinerary of the Study

Cumulative days	Date	Place/Agencies	Activities
1	Oct. 22 (Sat)	Tokyo - Bangkok	(Koshiba, Yamashita)
2	23 (Sun)	Bangkok - Kathmandu Department of Road (DOR)	(Koshiba, Yamashita) Submission of Draft Report
3	24 (Mon)	DOR	Explanation of Draft Report
4	25 (Tue)	Kathmandu Tokyo - Bangkok	Cost Data Collection (Inoue, Iwama)
5	26 (Wed)	DOR  Bangkok - Kathmandu JICA, Nepal Embassy of Japan	Explanation and Discussion on Draft Report (Inoue, Iwama)  Courtesy Call
6	27 (Thu)	DOR Disaster Prevention Technical Centre	Discussion on Draft Report Explanation on Draft Report
7	28 (Fri)	Dhulikhel	Site observation
8	29 (Sat)	Kathmandu - Sindhuli Bazar - Bardibas - Kulekhani	Site observation
9	30 (Sun)	Kulekhani - Kathmandu DOR	Site observation Discussion on Draft Report
10	31 (Mon)	Ministry of Finance, Joint Secretary, Mr. R.B. Bhattarai National Planning Commission, Member, Dr. B. Bhadra DOR	Courtesy call Courtesy call Discussion on Draft Report
11	Nov. 1 (Tue)	DOR  Embassy of Japan	Signing of Minutes of Discussions Reporting the result of Minutes of Discussion
12	2 (Wed)	JICA	Reporting the result of Minutes of Discussion
13	3 (Thu)	Kathmandu	Cost Data Collection
14	4 (Fri)	Kathmandu - Bangkok	
15	5 (Sat)	Bangkok - Tokyo	

### 3. MEMBERS LIST OF PERSON MET DURING THE BASIC DESIGN STUDY

#### Members List of Person met during the Basic Design Study

(1) Department of Roads, Ministry of Works and Transport

- (i) Director General : Mr. N. P. Chalise
- (ii) Deputy Director General (Foreign Cooperation) : Mr. S. J. Thapa
- (iii) Deputy Director General (Design) : Mr. G. S. Pradhan
- (iv) Deputy Director General (Planning) : Mr. S. K. Regmi
- (v) Deputy Director General (Maintenance) : Mr. M. B. Karkee
- (vi) Deputy Director General (Mechanical) : Mr. K. B. Khadgi

(2) Ministry of Finance

- (i) Joint Secretary : Mr. R. B. Bhattarai

(3) National Planning Commission

- (i) Member : Dr. B. Bhadra

(4) Embassy of Japan

- (i) Ambassador : Mr. S. Yoshida
- (ii) Councilor : Mr. M. Ishikawa
- (iii) Second Secretary : Mr. T. Sato

(5) JICA Nepal Office

- (i) Resident Representative : Mr. Y. Kohori
- (ii) Deputy Resident Representative : Mr. H. Murakami
- (iii) Assistant Resident Representative : Mr. N. Naito

(6) Water Induced Disaster Prevention Technical Centre

- (i) Project Director : Mr. S. R. Rimal
- (ii) Chief Advisor : Mr. H. Oi

MINUTES OF DISCUSSIONS ON  
THE BASIC DESIGN STUDY ON THE PROJECT  
FOR CONSTRUCTION OF SINDHULI ROAD  
(SECTION I: BARDIBAS - SINDHULI-BAZAR)  
IN THE KINGDOM OF NEPAL  
(Consultation on Draft Report)

In response to a request from his Majesty's Government of Nepal (HMG/N), the Government of Japan decided to conduct a Basic Design Study on the project for construction of Sindhuli Road (Section I: Bardibas - Sindhuli-Bazar) and entrusted the study to the Japan International Cooperation Agency (JICA).

In order to explain and to consult the Nepal side on the components of the draft report, JICA sent to Nepal a study team, which is headed by Mr. Shin Inoue, Grant Aid Cooperation Div., Economic Cooperation Bureau, MOFA and is scheduled to stay in the country from October 23 to November 4, 1994.

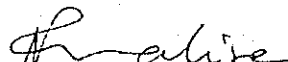
As a result of the discussions and field survey, both parties confirmed the items described on the Attachment.

Kathmandu, November 1, 1994



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Mr. Shin Inoue  
Leader  
Draft Report Explanation Team,  
JICA



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Mr. Niranjana P. Chalise  
Director General  
Department of Roads  
HMG/N

## ATTACHMENT

### 1. Components of the draft report

HMG/N has in principle agreed to the components of the draft report proposed by the team, with some changes as agreed during the meetings. These amendments will be incorporated in the final report.

### 2. Japan's Grant Aid System

(1) HMG/N has understood the system of Japanese Grant Aid explained by the team.

(2) HMG/N will take necessary measures, described in Annex for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

### 3. Request by HMG/N

Nepalese side requested to the Japanese side to initiate the preparatory work for section II at appropriate time so that section II could be implemented in time to achieve the anticipated target of the project as recommended in the After Care Study.

Japanese side agreed to communicate this request to the Japanese Government for due consideration.

### 4. Further Schedule

The team will make the final report in accordance with the confirmed items, and submit it to HMG/N around February 1995.

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*SD*

Annex: Necessary measures to be taken by HMG/N in case Japan's Grant Aid is executed.

1. To secure the site for the Project.
2. To provide necessary land for construction of the bridges, approach roads and causeways.
3. To demolish and/or remove any impediments within the above mentioned land.
4. To organize and finance the maintenance activities that will be needed for section I.
5. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.
6. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.
7. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Nepal with respect to the supply of the products and services under the verified contracts.
8. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contracts, such facilities as may be necessary for their entry into Nepal and stay therein for the duration of their work.
9. To use and maintain properly and effectively all the facilities constructed and equipment purchased under the Grant after handing over to HMG/N.
10. To bear the expenses other than those to be borne by the Grant.
11. To coordinate and/or solve issues related to the Project which may be raised from third parties or inhabitants in the Project area during the implementation of the Project.

*Q*

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5.COST ESTIMATION BORNE BY HMG

Cost Estimation Borne by the HMG

I. Estimated Land acquisition and House Compensation Cost (ROW = 50m)

Land acquisition Cost	Estimated Rate(NRs)	Areas(sq.m)	Amount(NRs)	Remarks
(1) Waste Land	20	77,700	1,554,000	ROW=50m
(2) Farm or Home lots	55	90,000	4,950,000	ROW=50m
Sub-Total (1)+(2)			6,504,000	
House Compensation Cost	Estimated Rate(NRs)	nos.	Amount(NRs)	Remarks
(3)	200,000	22	4,400,000	ROW=50m
Total (1)+(2)+(3)			10,904,000	

II. Estimated DOR Administration Cost

Office Staff = 24 + 2(supporting staff) = 26persons

Average Salary = 3,000NRs/month

3,000 x 26 persons = 78,000 NRs/ month

Allowance, Office expenditure (100% of total salary)

78,000 NRs/ month

Total

156,000NRs/ month

DOR Administration Cost during the Construction Period

156,000 NRs x 12 months = 1,872,000 NRs

III. Maintenance Cost

(1) Fuel

	PS		Fuel per hour
Bulldozer -1 nos.	104PS	0.122litre/hr/PS	12.69 litre/hr
Backhoes -1 nos.	120PS	0.129litre/hr/PS	15.48 litre/hr
Wheel Loaders -2 nos.	86PS	0.119litre/hr/PS	20.46 litre/hr
Crawler Loader -1 nos.	112PS	0.104litre/hr/PS	11.65 litre/hr
Dump Trucks -3 nos.	253PS	0.039litre/hr/PS	29.60 litre/hr
Vibratory Roller -1 nos.	28PS	0.109litre/hr/PS	3.05 litre/hr
Truck Crane -1 nos.	160PS	0.034litre/hr/PS	5.44 litre/hr
Motor Grader -1 nos.	94PS	0.071litre/hr/PS	6.67 litre/hr
4 Wheel Jeeps -2 nos.	85PS	0.035litre/hr/PS	5.95 litre/hr
Total			111 litre/hr

6hr/day x 50%= 3.0hr/day

111litre x 12NRs. x 3.0hr/day x 25day = 100,000NRs./month

(2) Labour

50persons/day x 100NRs/day = 5,000 NRs./day

5,000 x 25day = 125,000NRs/month

(3) Materials

Cement	Stone Masonry $2,500\text{m}^3 = 500\text{ton} \times 5,060\text{NRs/ton} = 2,530,000\text{NRs}$
Gabion wire	Gabion box $5,000\text{m}^3 = 162,500 \text{ kg} \times 36\text{NRs./kg} = 5,850,000\text{NRs}$
<u>Total</u>	<u>8,380,000NRs</u>

(4) Spare Equipment etc.

Yearly Spare equipment Cost etc. = Total Equipment Cost x 5%  
 $47,000,000\text{NRs} \times 0.05 \times 1/12 = 195,800 \text{ NRs/month}$

Total of (1)+(2)+(4) = 420,800NRs/month

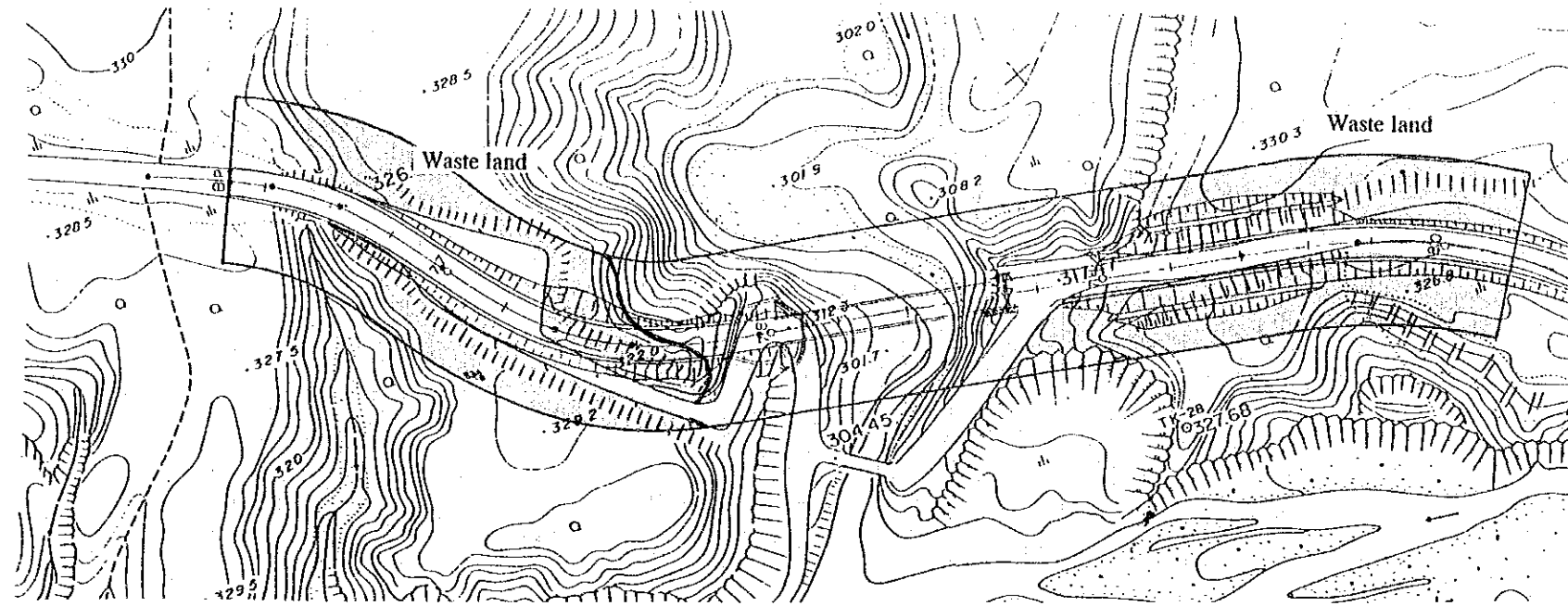
DOR Maintenance Cost during the Construction Period

$(3) + (4) \times 12\text{months} = 13,429,600\text{NRs}$

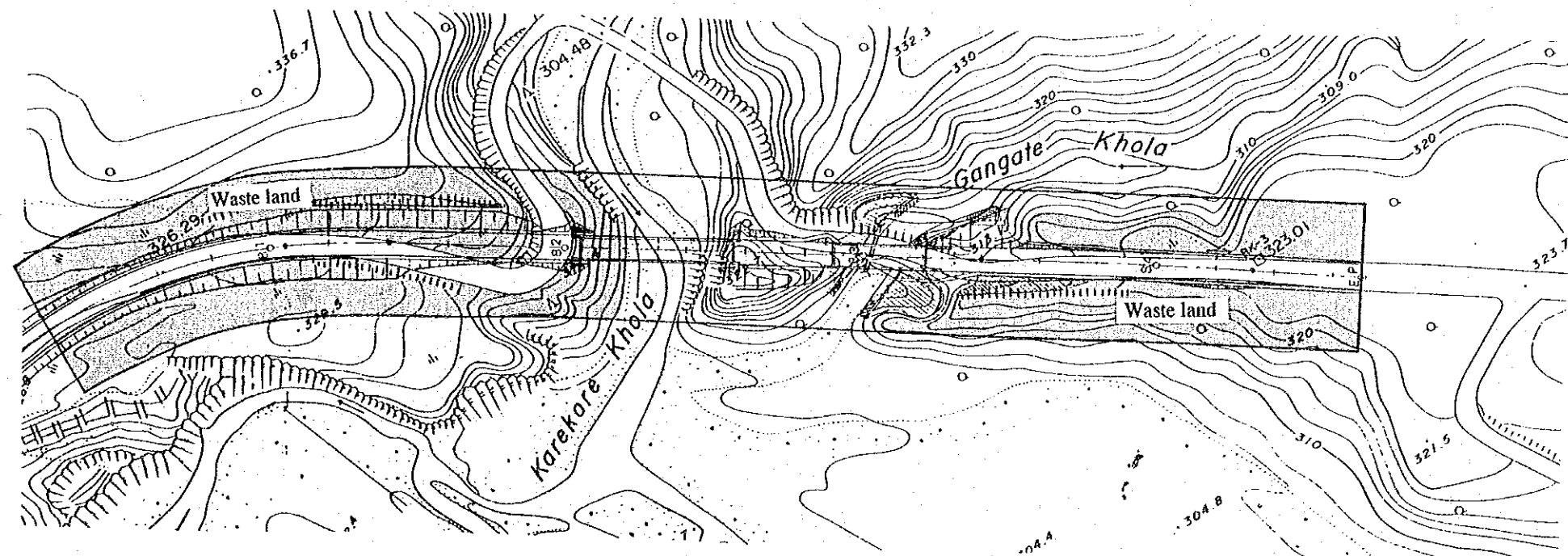
LAND AND HOUSES TO BE COMPENSATED OR ACQUIRED IN SECTION I

	Land to be Acquired (sq.m)		Houses to be Compensated(nos.)	
	Waste land	Farm or home lots	in the Road	within ROW=50m
Approach Road of Bhogate Bridge	8,400			
Approach Road of Karkare and Gangate Bridge	13,000			
Approach Road of Ratu Bridge	12,900	20,100	9	8
Approach Road of Shindhuse Bridge	6,100	24,700	3	6
Approach Road of Kamara Bridge	16,800	16,300		6
Approach Road of Phittang Bridge	8,000	4,400		
Approach Road of Buka Bridge	12,500	5,300		
Approach Road of Gadeuli Bridge		19,200		2
Total	77,700	90,000	12	22

Approach Road of Bhogate Bridge

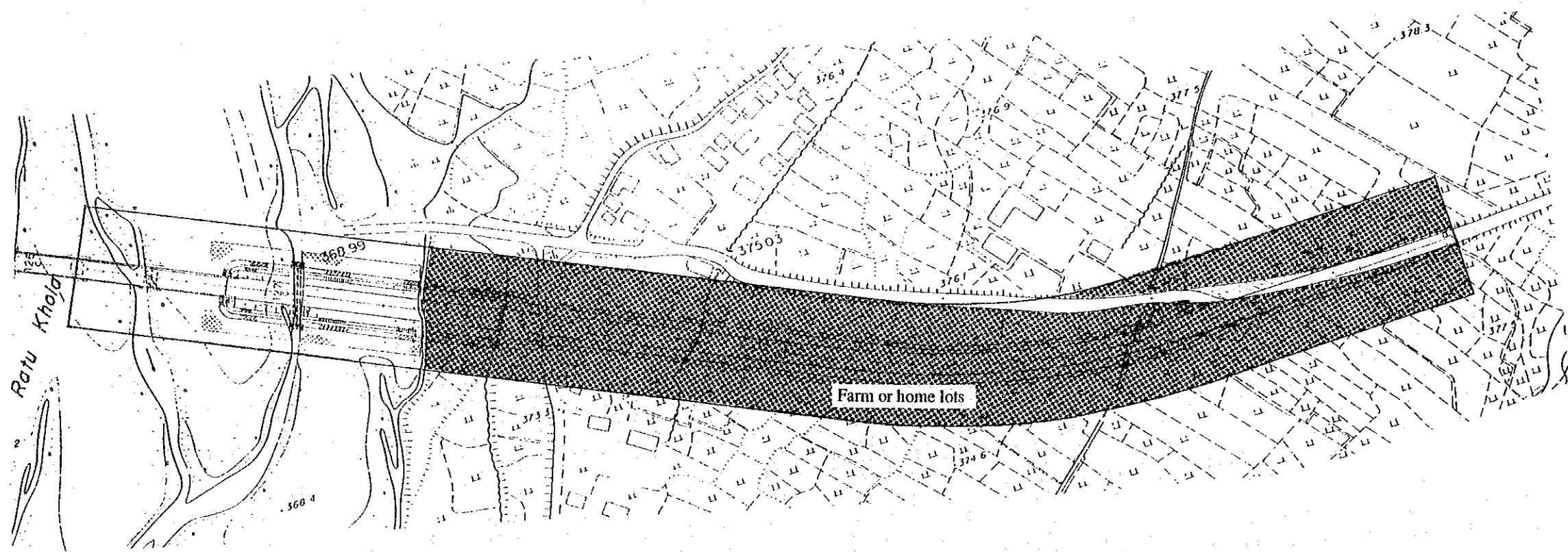
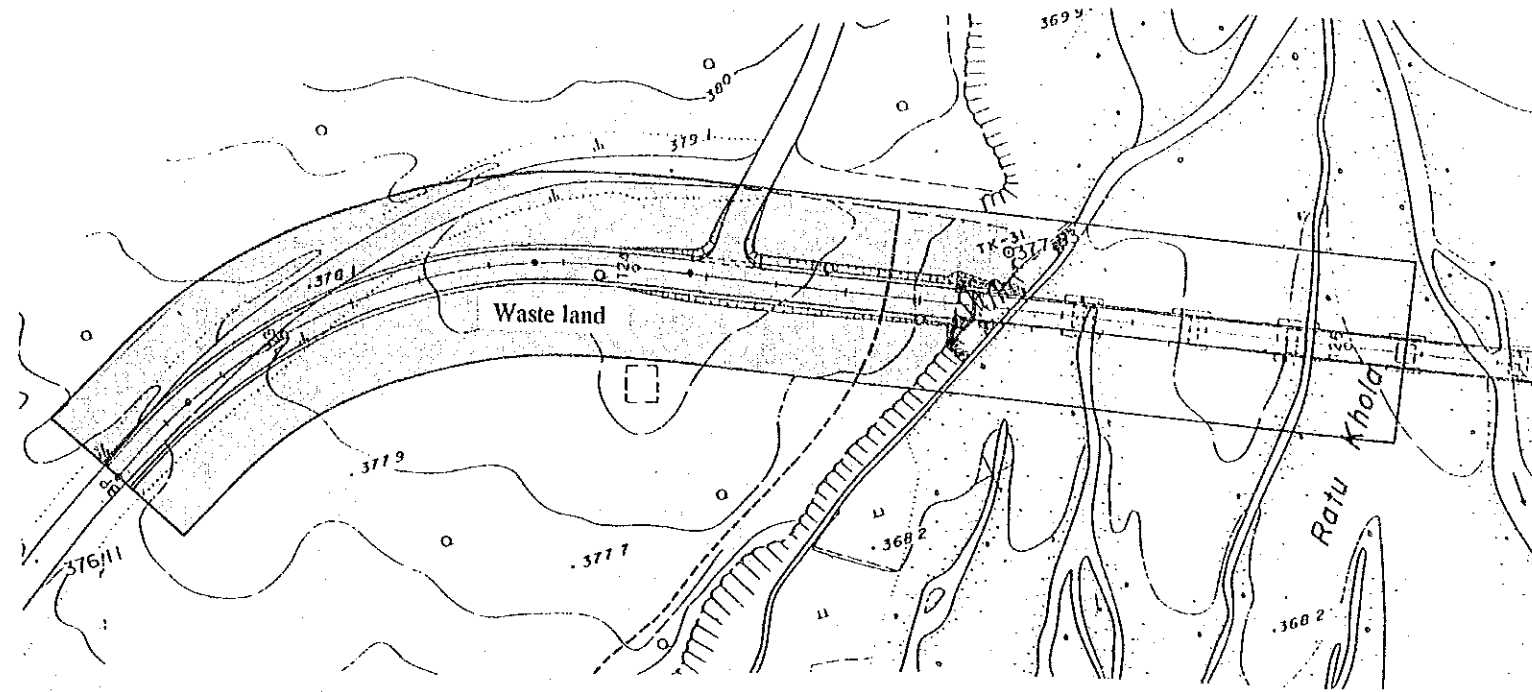


Approach Road of Karkare and Gangate Bridge



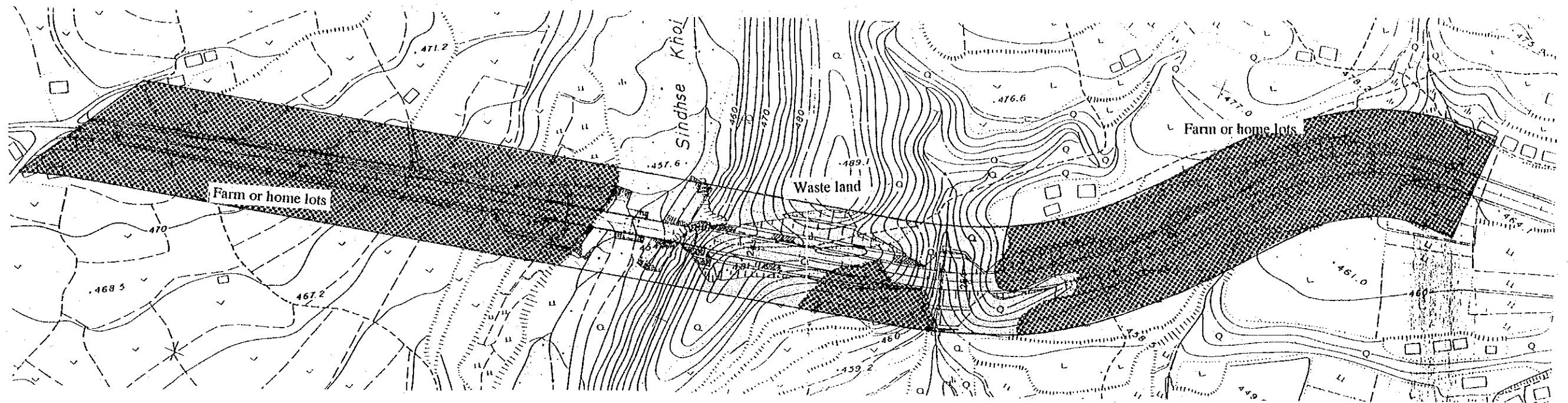
LAND AND HOUSES TO BE COMPENSATED OR ACQUIRED IN SECTION I

Approach Road of Ratu Bridge

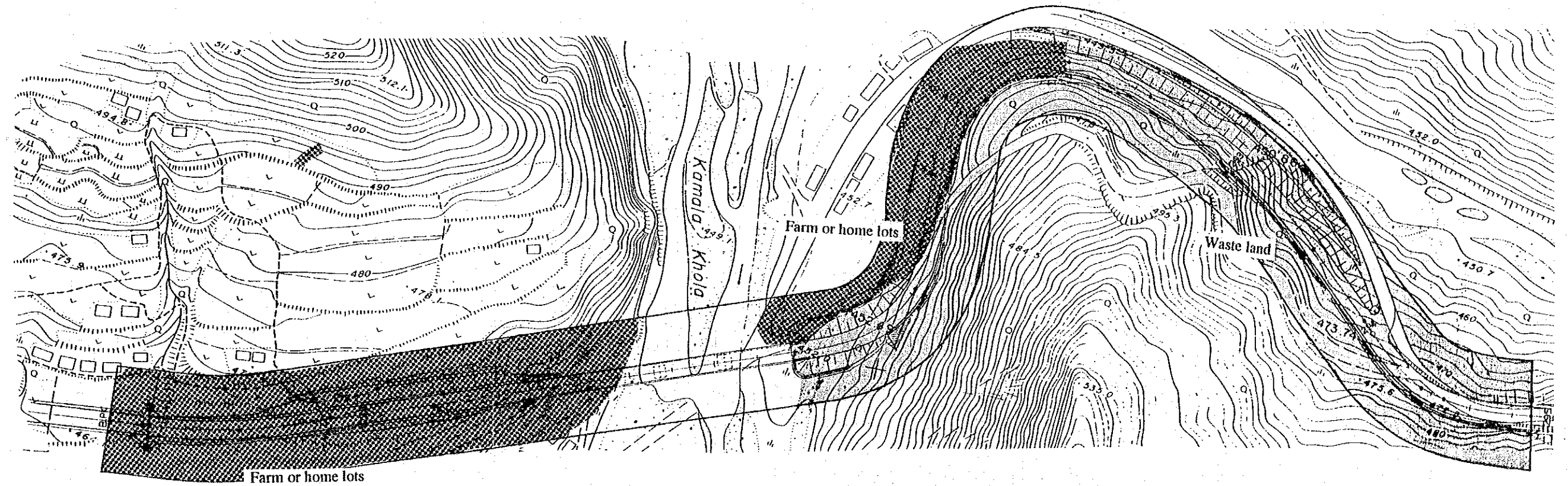


LAND AND HOUSES TO BE COMPENSATED OR ACQUIRED IN SECTION I

Approach Road of Shindhuse Bridge

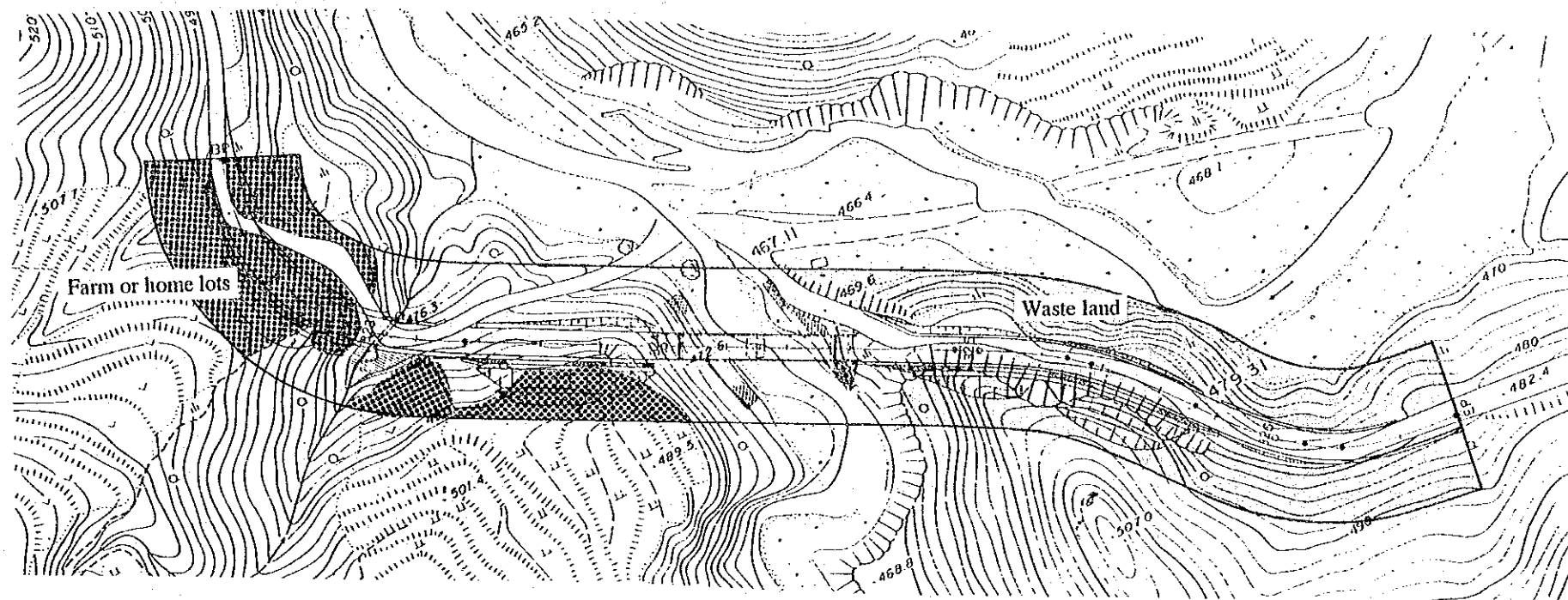


Approach Road of Kamara Bridge

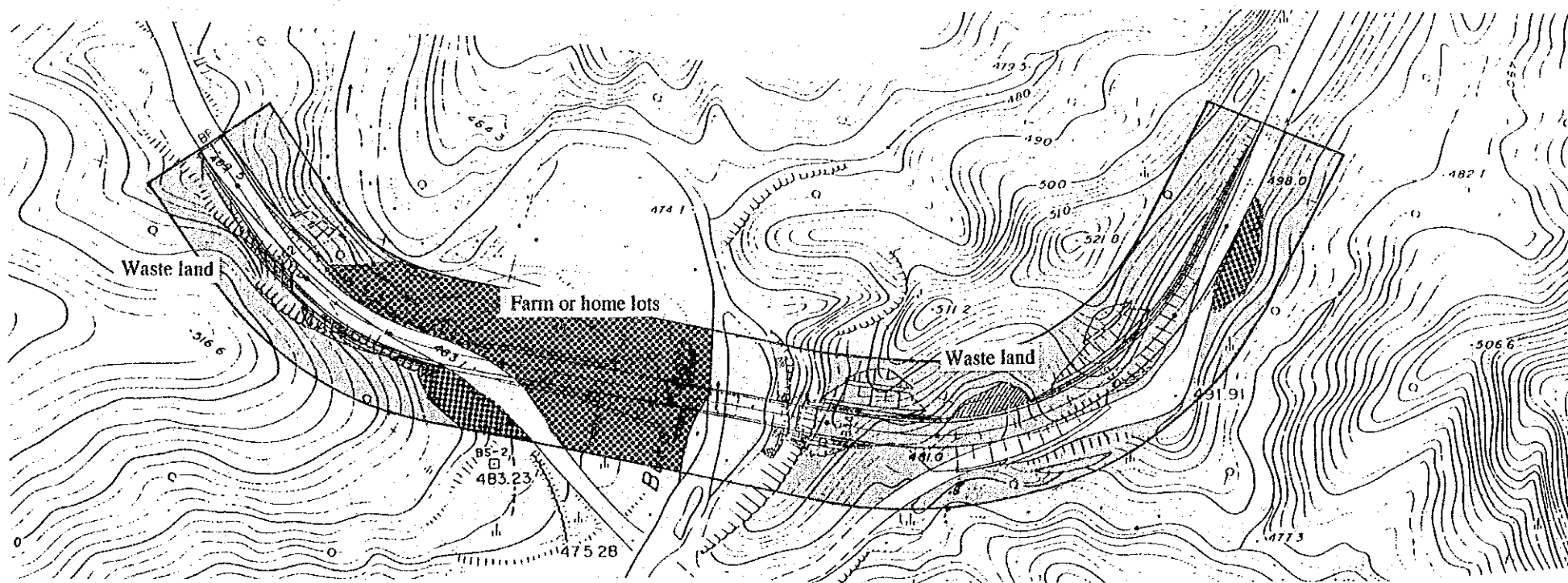


LAND AND HOUSES TO BE COMPENSATED OR ACQUIRED IN SECTION I

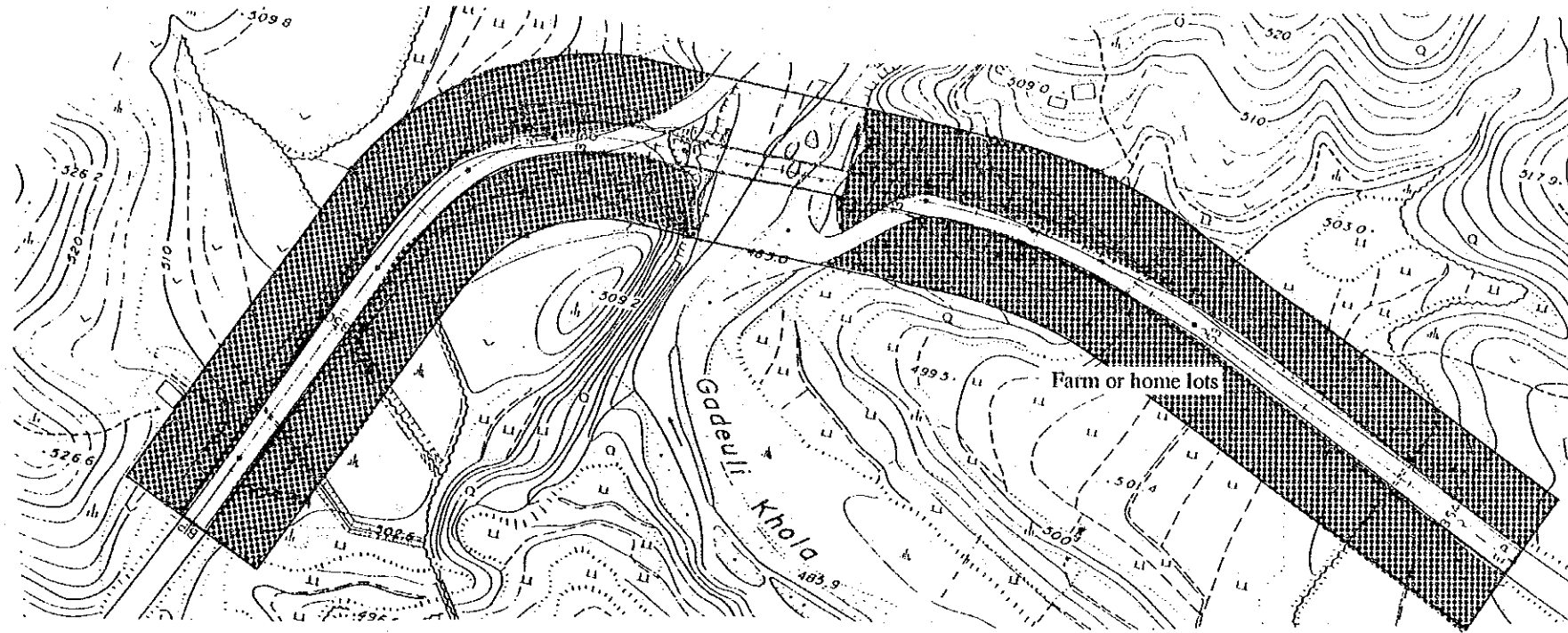
Approach Road of Phittang Bridge



Approach Road of Buka Bridge



Approach Road of Gadeuli Bridge

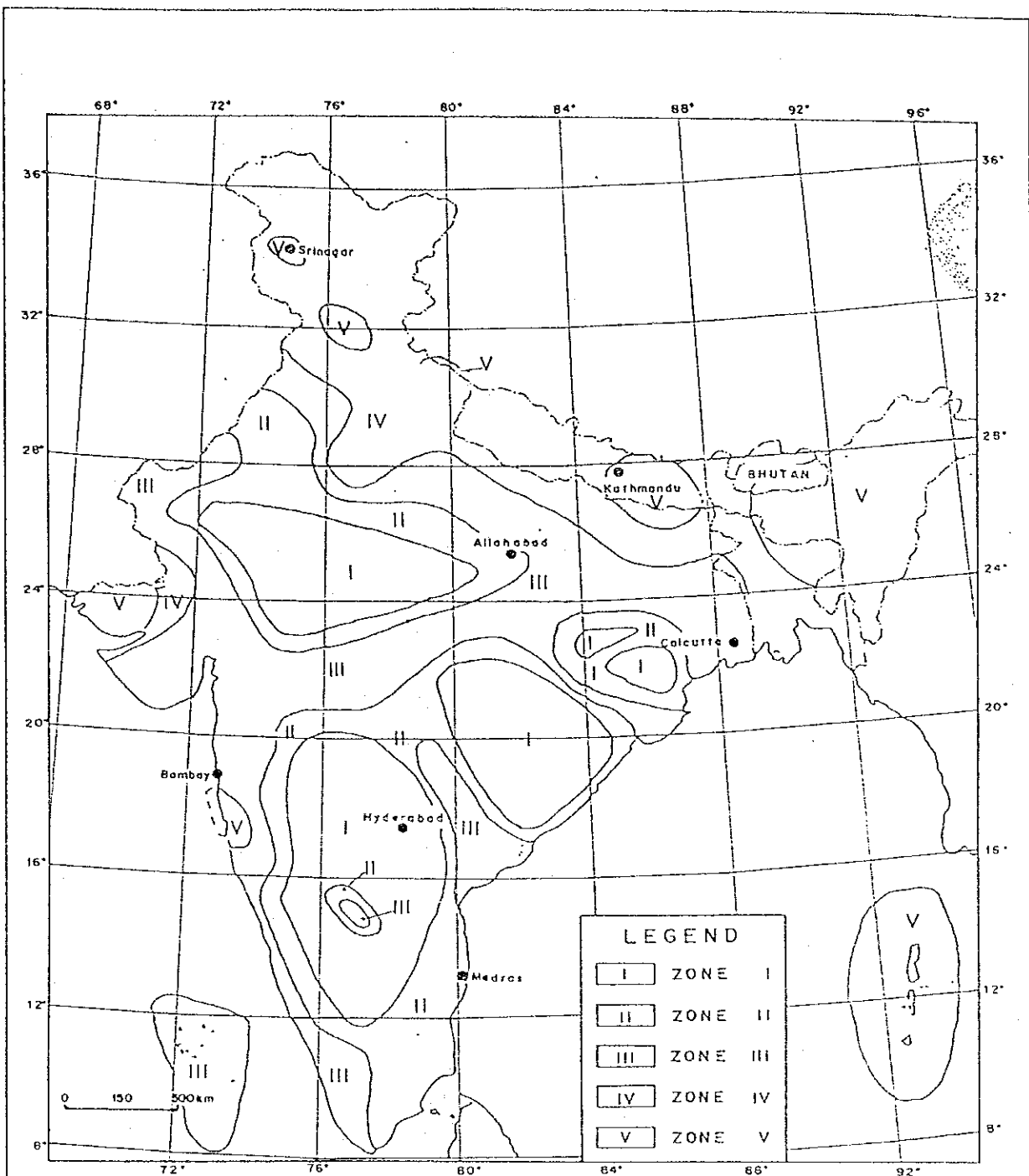


LAND AND HOUSES TO BE COMPENSATED OR ACQUIRED IN SECTION I



# APPENDIX C

## ENGINEERING SUPPORTING DATA



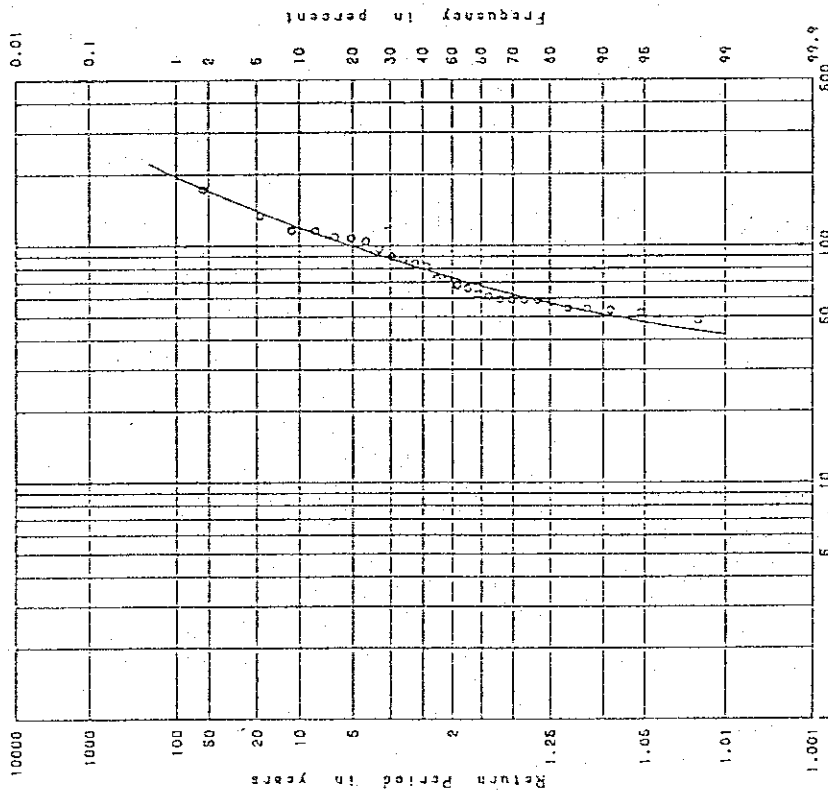
Taken from:  
KAILA, K.L., GAUR, V.K., AND NARAIN, H. (1972):

Map of India showing seismic zones, appended to IS 1893-1970 (ISI 1971), Indian standard criteria for earthquake resistant design of structures. Intensities of future earthquakes on Modified Mercalli scale associated with seismic zones I, II, III, IV, and V as per this map are respectively, V or less, VI, VII, VIII and IX and above  
Bull. Seism. Soc. Am. 62

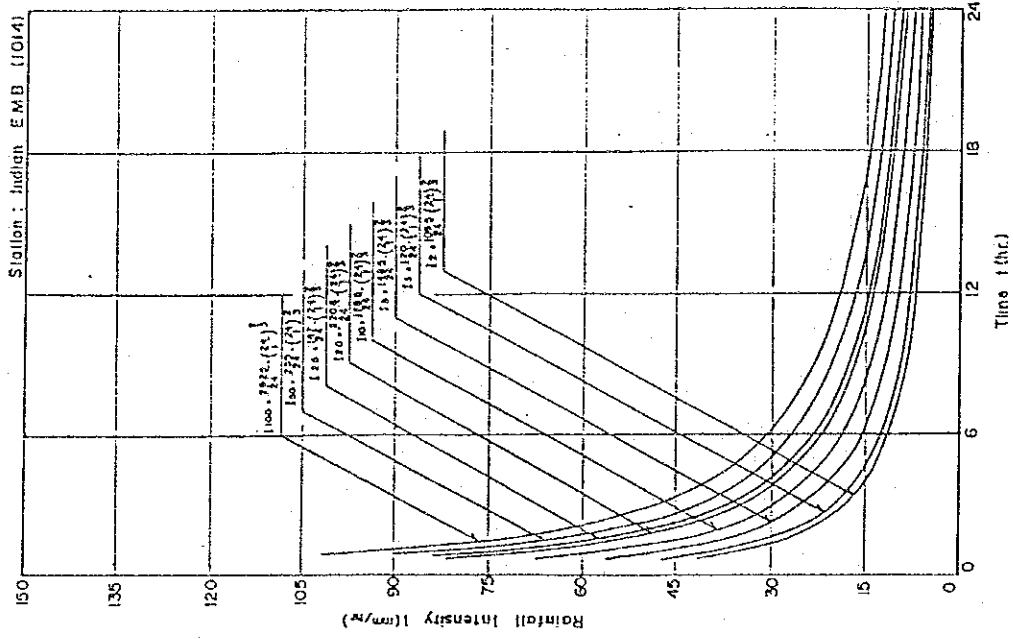
Map of Seismic Zones in India

Station : INDIAN EMB. (1014)  
 District :  
 Kind of Record : 24 HRS RAINFALL  
 Period of Record : 1948-1975

Region :  
 Altitude of Station : Meters



RAINFALL (MM)  
 Frequency Curve



Station : Indian EMB. (1014)  
 Rainfall Intensity Curve

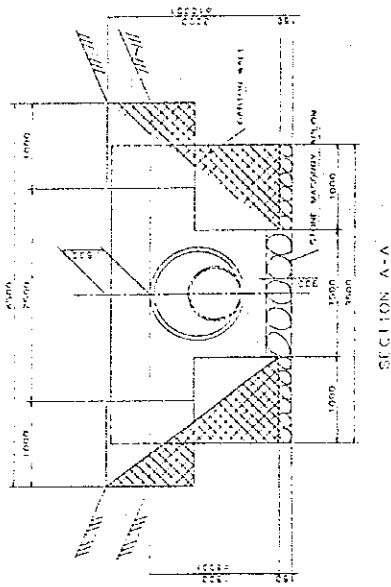
The Summary Results of Hydraulic Calculation

Basin No.	Name of River	Catchment Area (km <sup>2</sup> )	Runoff Peak (1/100) m <sup>3</sup> /sec.	Runoff Peak (1/50) m <sup>3</sup> /sec.	Estimated Velocity (m/sec.)	Height of <u>1/</u> Flood Level (m)
1.	Bhogate	5.4	199	177	4.5	3.1
2.	Karekare	5.2	157	140	3.4	1.8
3.	Ratu <u>2/</u>	42.4	960	855	3.5	1.4
4.	Bhiman <u>2/ 3/</u>	3.9	130	116	3.3	1.5
5.	Sukha <u>2/ 3/</u>	2.1	74	66	2.6	1.2
6.	Sindhure	2.1	80	71	2.5	1.0
7.	Kamala	142.8	2,857	2,546	4.1	4.9
8.	Phitting	7.4	246	219	3.2	2.9
9.	Buka	13.4	406	362	2.8	3.5
10.	Gadeuli	31.6	779	694	5.1	3.9
11.	Gwang	12.9	418	372	6.6	1.8
12.	Ardleri	20.7	390	334	4.8	1.2
13.	Nigauli	21.0	405	347	6.2	1.7
14.	Arubote	17.3	301	258	4.9	1.8
15.	Knarare	4.4	108	93	4.8	1.0
16.	Bhote	16.9	267	229	4.8	1.6
17.	Gangate	19.2	343	294	4.5	2.2
18.	Dhamile	28.7	500	429	6.3	2.5
19.	Sandi	7.4	170	146	6.4	1.6
20.	Ghyampe	14.8	332	285	7.8	2.0
21.	Mamti	17.0	319	274	4.9	1.5
22.	Bhayakure	22.3	442	379	4.9	2.1
23.	Daune	10.5	213	183	6.5	1.8
24.	Narke	18.1	343	294	8.4	2.9
25.	Roshi	410.7	3,258	2,794	7.9	8.4

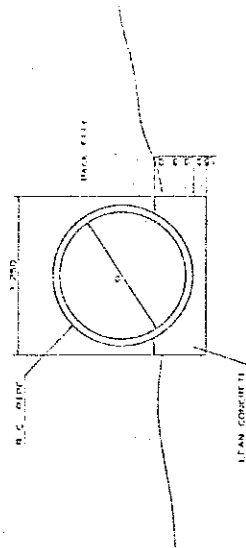
Note: 1/ Height of flood level measures from the lowest point of river bed.

2/ Estimated velocity and flood level are calculated under the condition of providing man-made river banks.

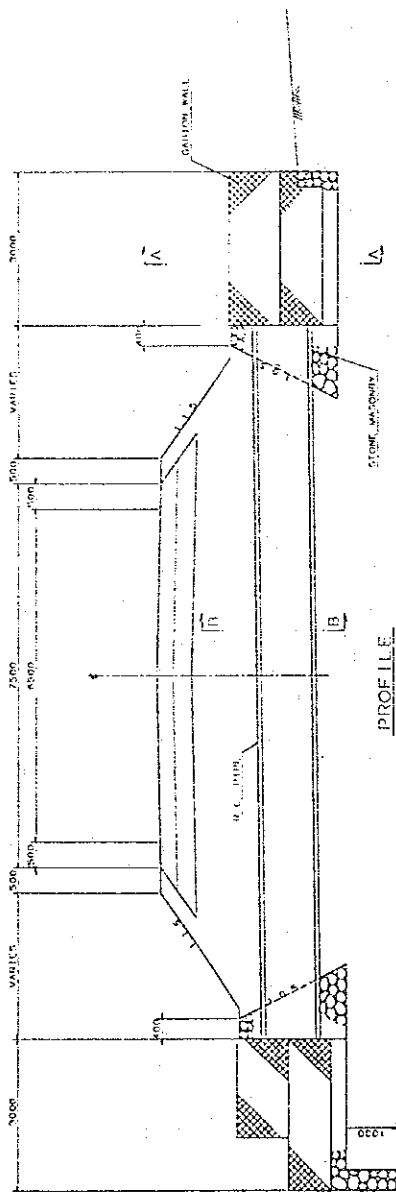
3/ Due to providing man-made banks, these bridges are categorized under medium bridge.



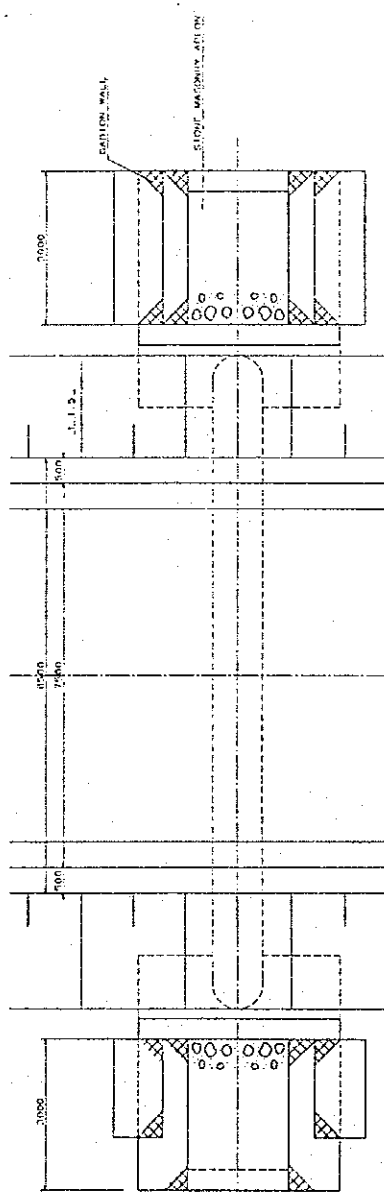
SECTION A-A



SECTION B-B  
(TOP VIEW)  
SECTION C-C  
(SIDE VIEW)



PROFILE



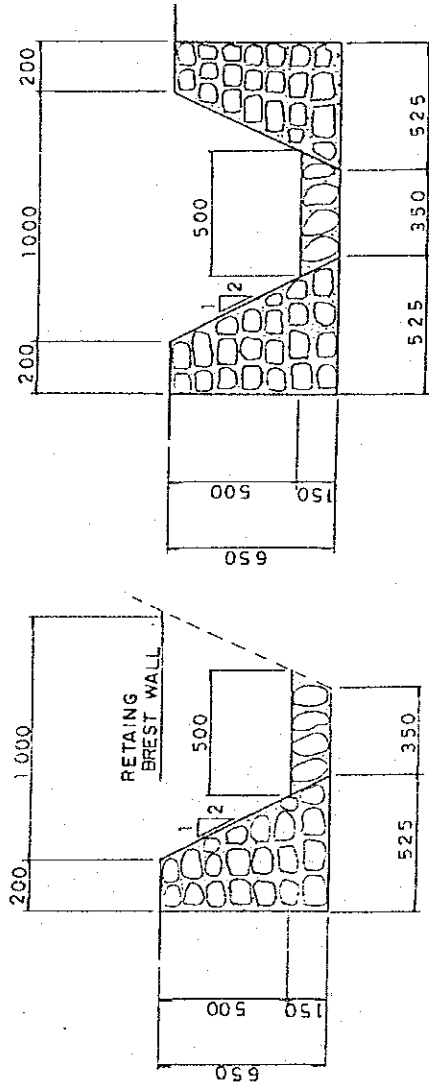
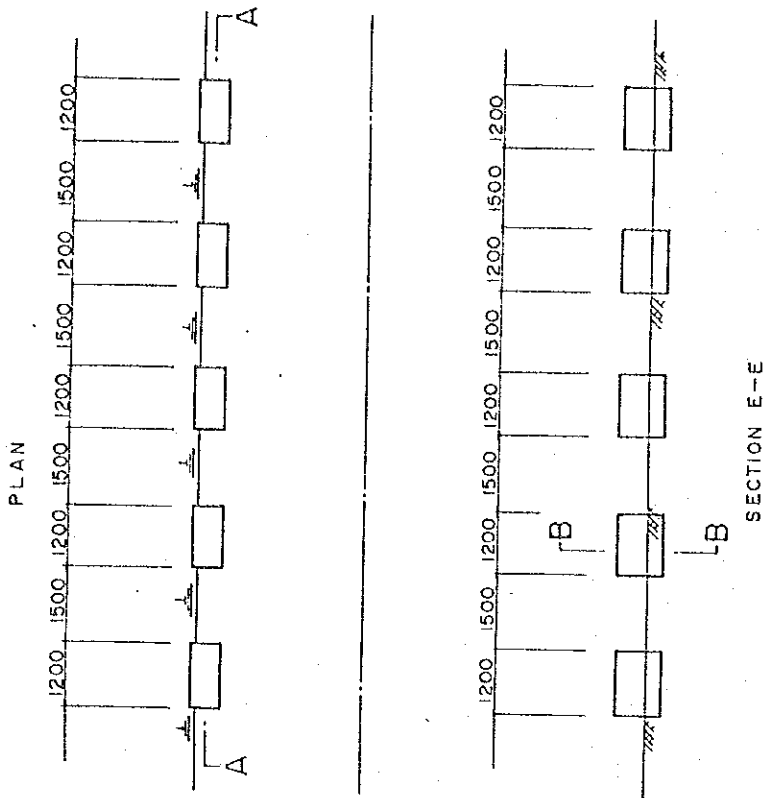
PLAN

LIST OF PIPE CULVERT

STATION	LENGTH	D	REMARKS
127+4.0	73.0	1.00	
127+6.0	23.0	1.00	
127+8.0	21.0	1.00	
127+8.0	7.0	1.00	
127+8.0	17.0	1.00	
128+4.0	15.0	1.00	
128+4.0	39.0	1.00	
128+4.0	9.0	1.00	
128+4.0	16.0	1.00	
128+4.0	20.0	1.00	
128+4.0	15.0	1.00	
128+4.0	15.0	1.00	
128+4.0	14.0	1.00	
128+4.0	14.0	1.00	
128+4.0	14.0	1.00	

DRAINAGE STRUCTURES

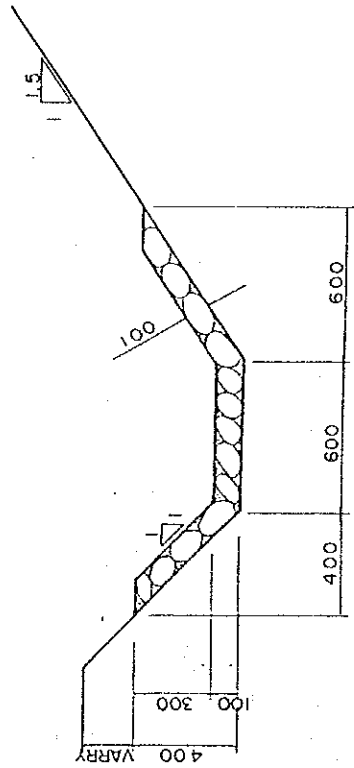
STONE MASONRY PARAPET



SIDE DRAIN STONE MASONRY

SIDE DITCH STONE MASONRY

Scale 1:20

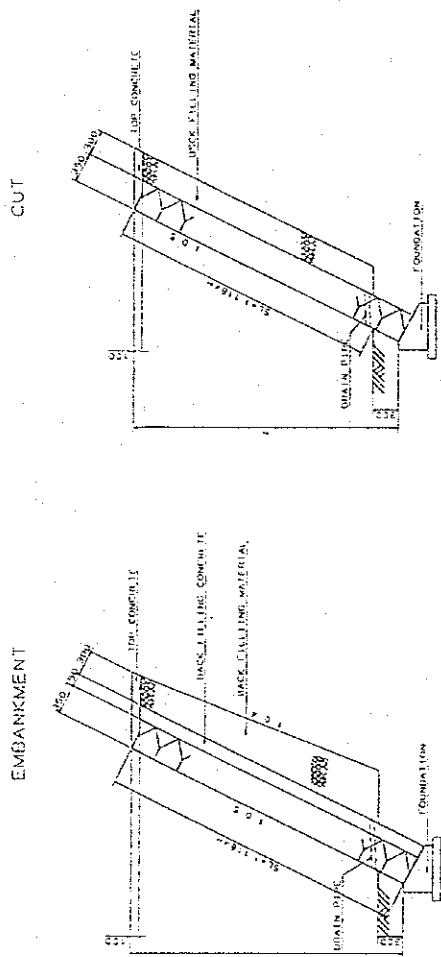


GROUTED RIPRAP LINED DITCH

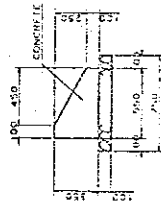
Scale 1:20

STONE MASONRY

TYPICAL CROSS SECTION S. 1-30



FOUNDATION DETAILED DESIGN S. 1-20











JICA