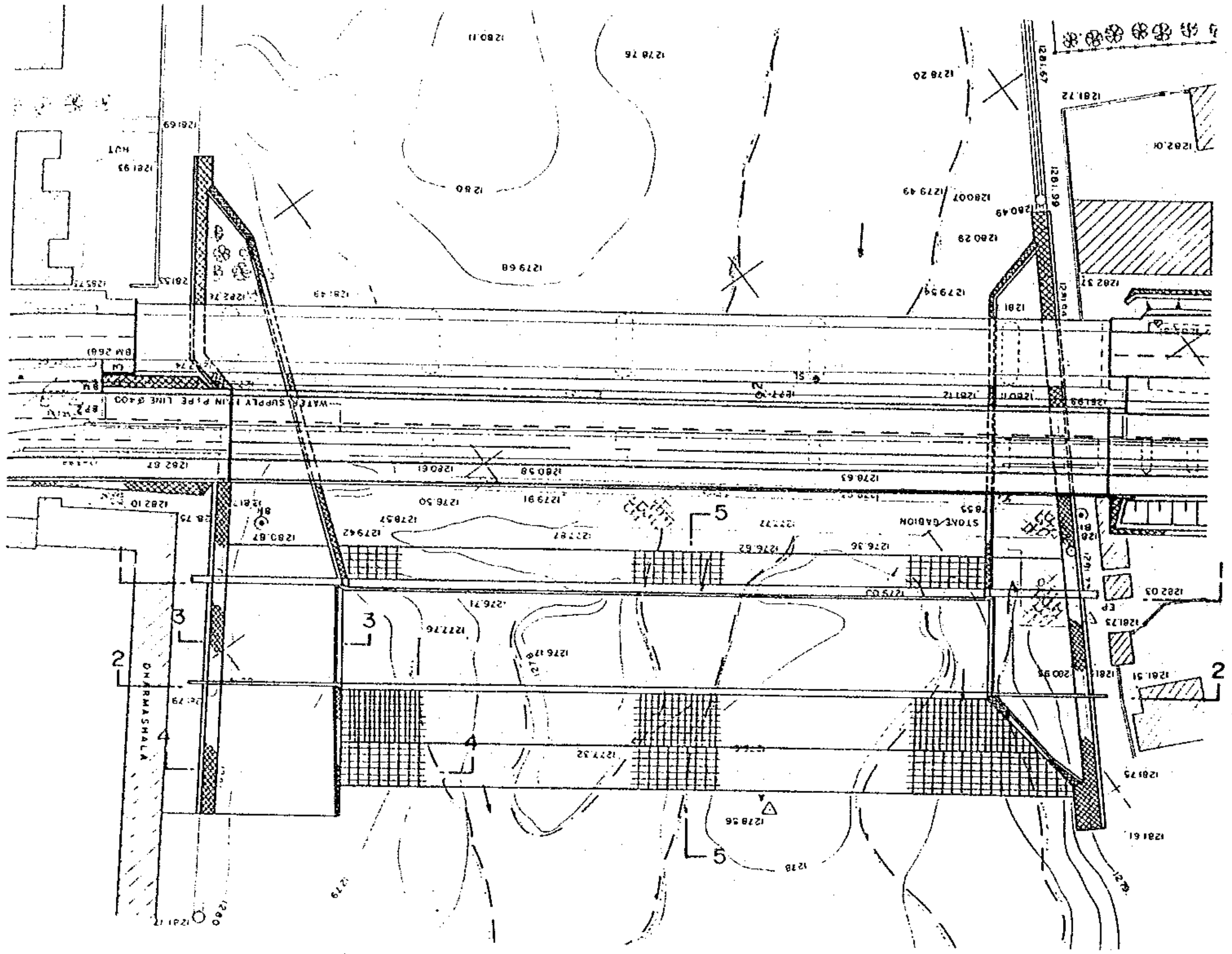

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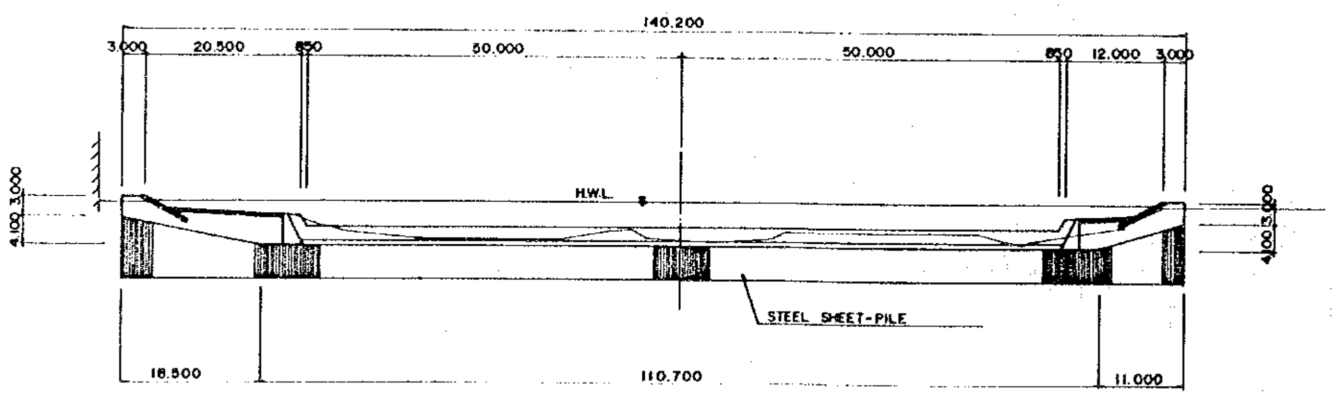

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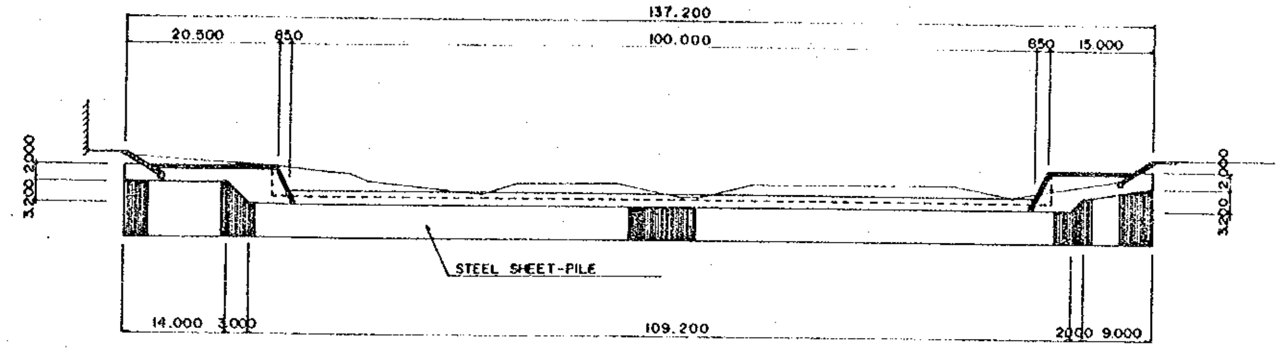
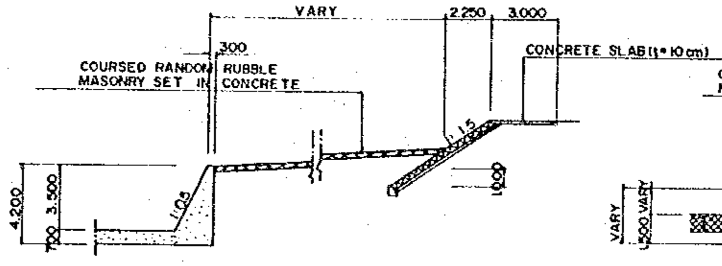


2-2 SECTION



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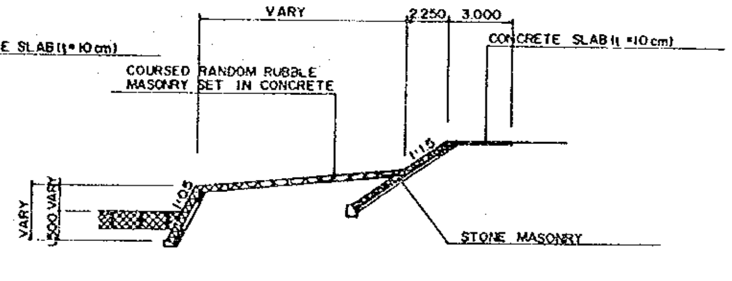
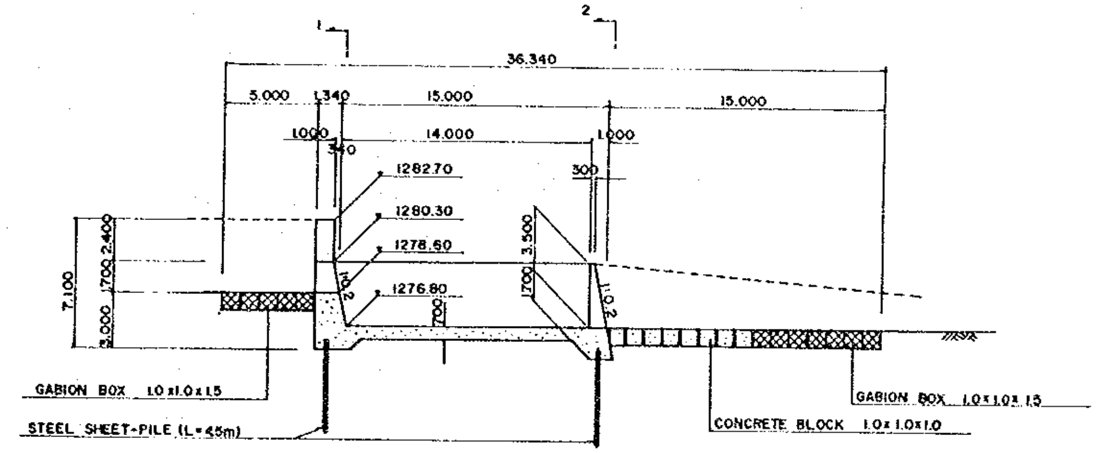
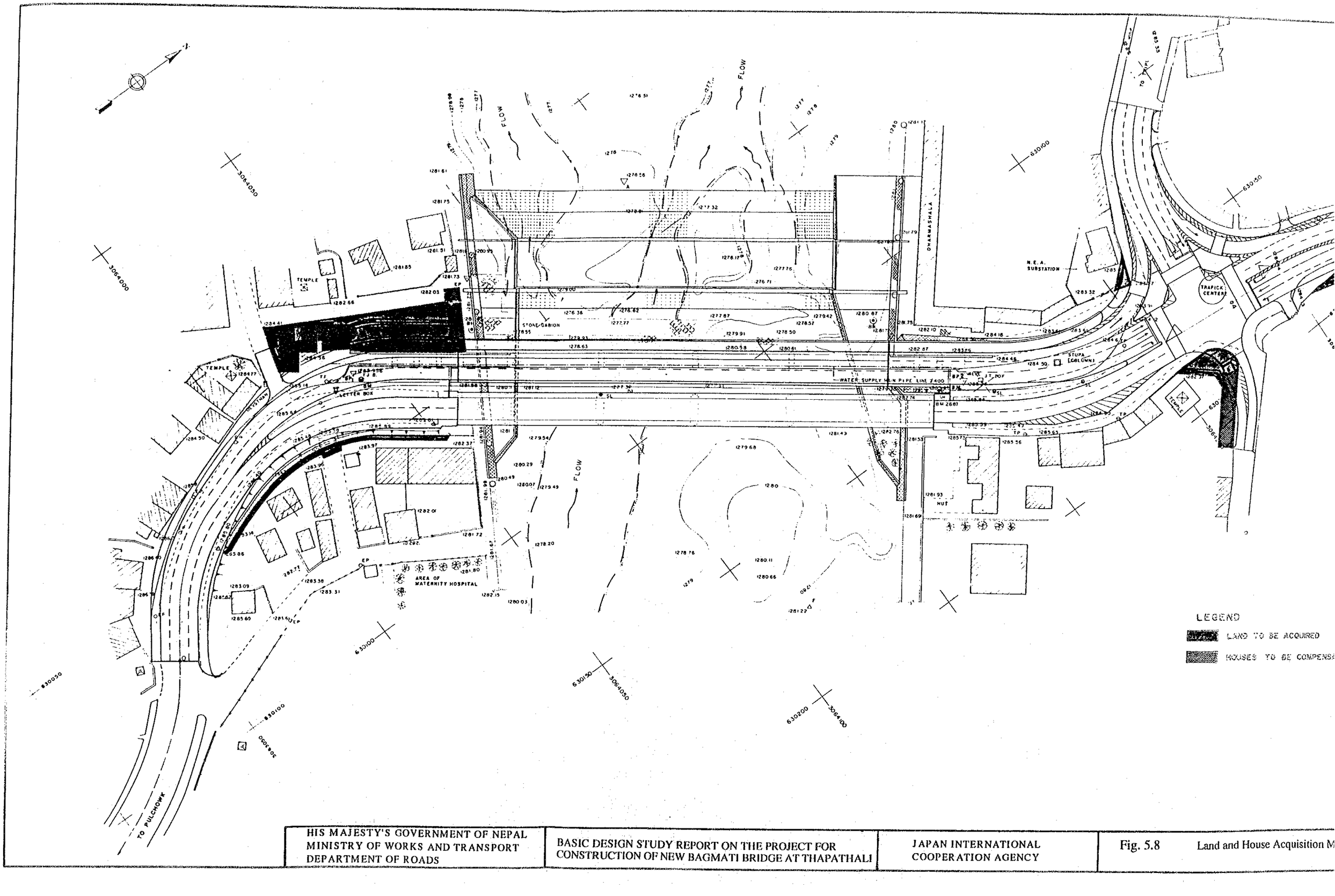


4-4 SECTION

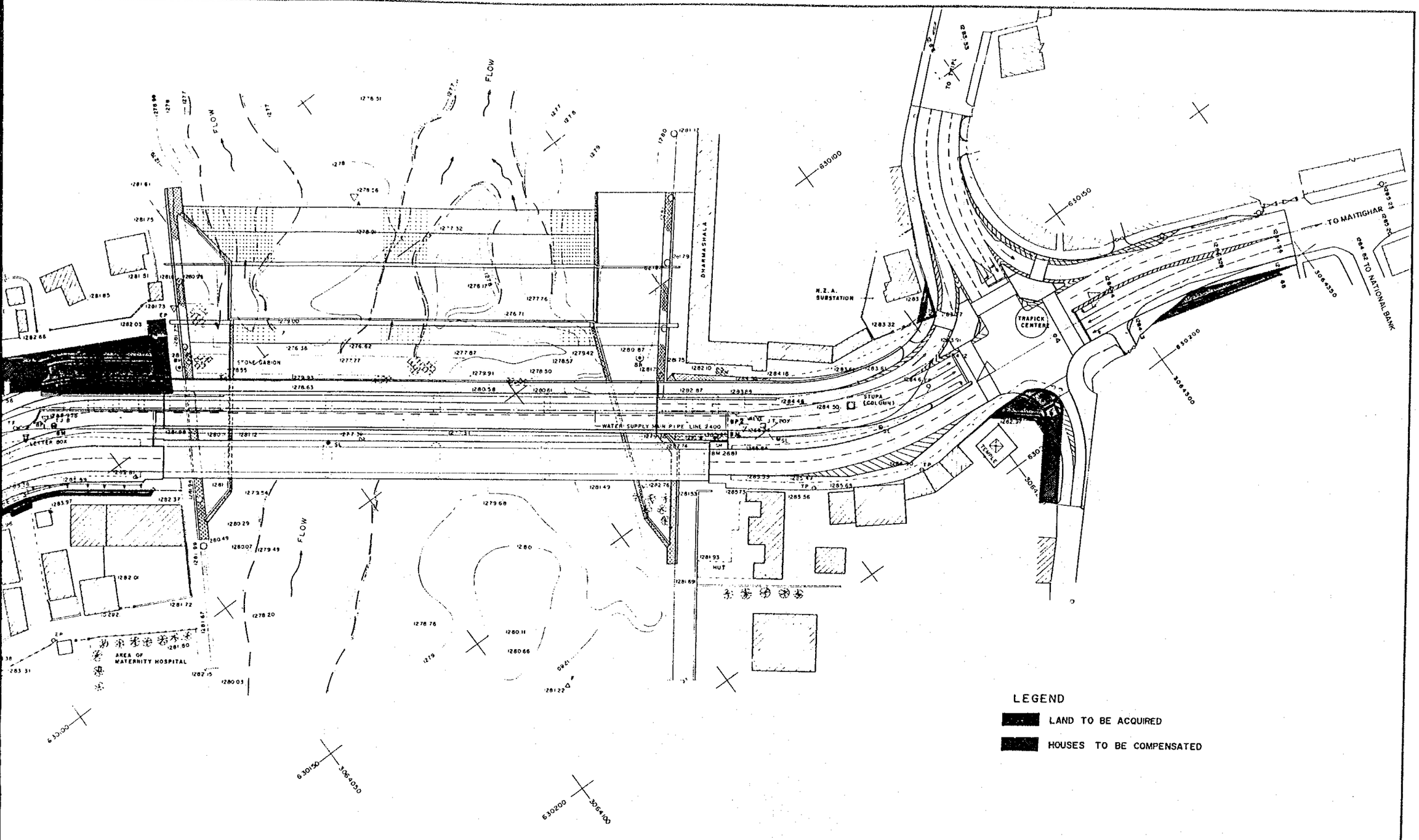


5-5 SECTION

HIS MAJESTY'S GOVERNMENT OF NEPAL MINISTRY OF WORKS AND TRANSPORT DEPARTMENT OF ROADS	BASIC DESIGN STUDY REPORT ON THE PROJECT FOR CONSTRUCTION OF NEW BAGMATI BRIDGE AT THAPATHALI	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 5.7 Protection Plan of Lowering of River-bed and Bank Slope	DATE OCTOBER 1993	SHEET NO. /



HIS MAJESTY'S GOVERNMENT OF NEPAL MINISTRY OF WORKS AND TRANSPORT DEPARTMENT OF ROADS	BASIC DESIGN STUDY REPORT ON THE PROJECT FOR CONSTRUCTION OF NEW BAGMATI BRIDGE AT THAPATHALI	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 5.8 Land and House Acquisition M



HIS MAJESTY'S GOVERNMENT OF NEPAL MINISTRY OF WORKS AND TRANSPORT DEPARTMENT OF ROADS	BASIC DESIGN STUDY REPORT ON THE PROJECT FOR CONSTRUCTION OF NEW BAGMATI BRIDGE AT THAPATHALI	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 5.8 Land and House Acquisition Map	DATE OCTOBER 1993	SHEET NO.

5.6 Construction Plan and Method

5.6.1 Conditions considered in Construction Plan and Method

The construction plan and method has been studied taking into consideration the following conditions:

(1) Implementation of the Project

In consideration of the fact that the Project will be executed under the grant aid from the Japanese Government, construction plan will be studied and prepared in line with the conditions and procedure of Japan's grant aid program.

(2) Weather Conditions

The rainy season in the project area is from June to September and the maximum monthly rainfall average 400 mm. The bridge foundation work, erection of superstructure work and road pavement work will be affected by rains so that annual workable days as well as construction time schedule as well as annual workable days should be determined taking into account the above rainy season, especially flood period.

(3) Traffic Management during the Construction

Special attention should be paid traffic management so that the construction should not interfere traffic flow on the existing bridge and intersection. Temporary diversion with a traffic signal devices, if required, should be provided properly during the improvement of approach road and intersection. A part-time traffic suspension, especially trolley bus operation, would be unavoidable during the construction of intersection.

(4) Affect on Environment

Care must be taken to the adjacent buildings and valuable structures during the construction of bridge. No water pollution should be allowed during the construction of pile foundation.

(5) Relocation of Public Utilities

Many items of public utilities, such as water main, electric cable, telephone cable, etc. are located in and around the project site, which might be affected by construction of the Project. Relocation of these utilities must be done very carefully in close cooperation with the police and authorities concerned. Advanced notice shall be announced through radio or paper before starting the relocation of utilities.

(6) Availability of Local Equipment and Materials

- Local Plant and Equipment

Some kind of construction equipment are available on rental basis from the local in Katmandu, such as National Construction Corporation (NCC), Department of Roads (DOR) and local contractors. However, these equipment are mostly old model in poor condition and capacity and numbers of equipment are small and insufficient. Equipment available in Kathmandu are only those which are used for land preparation and hauling of the construction materials, such as, sand, stone and bricks as follows:

- Tipper Truck (6 - 8 ton)
- Dump Truck (8 - 11 ton)
- Bulldozer (16 - 21 ton)

- Local Materials

Construction materials, such as cement, reinforcement bar, gabion wire, etc. are available from the market in Kathmandu and could be utilized for the project in principle, though some materials happen to be in short supply in the market. The materials of soil, gravel, sand and crushed stone are available from the following sources:

Materials	Materials Sources (Borrow Pits and Quarry Sites)
Soil	; Kapan, Thimi and Gokarna Ban
Gravel	; Chuninikhel
Sands	; Pikhel, Kapan and Basundhara
Crushed Stone	; Jhalungtar, Godawari and Thankot

5.6.2 Construction and Supervision Plan

It was planned that the construction materials should be procured in Nepal as far as possible. However, materials which would be difficult in respect to quality as well as procurement in Nepal will be procured from Japan.

(1) Construction Materials

Materials of fuel and oil, cement, aggregate materials, timber except plywood, gabion wire, reinforcing bars, asphalt bitumen are available in the country so that these materials were planned to be procured in the local market.

The materials of steel plate, traffic control devices, street lighting columns and traffic signal will be imported from Japan. However, the procurement of these materials shall be made upon approval of DOR on its specifications.

(2) Construction Equipment

All equipment and their ancillary and spare parts excluding trucks will be procured from Japan, since there are not procurable in Nepal.

5.6.3 Implementation Plan

The implementation plan of the Project is presented in accordance with the Japan's grant aid program as shown below:

(1) Detailed design

Immediately after the Exchange of Note (E/N), the Japanese consultant, recommended by JICA and entrusted by the Government of Nepal, will be carried out the detailed design including the preparation of tender documents.

At the same time, DOR will undertake such works as land acquisition and house compensation and removal, relocation of utilities, etc. which are to be executed by the Nepalese side.

The detailed design work will be undertaken by the consultant either in Nepal or in Japan. The DOR's approval will be needed for the detailed design documents before tendering. The work items of detailed design required for the implementation of the project are summarized below:

(i) Study and survey

- Discussion and arrangements on the detailed design with DOR based on the basic design.
- Detailed survey of the construction sites.

- Review of the site conditions of construction to be necessary for the preparation of detailed design, cost estimate and construction plan.

(ii) Detailed Design and Preparation of Tender Documents

- Detailed design and preparation of tender drawings.
- Preparation of documents of tendering.
- Confirmation of construction cost based on the detailed design.
- Approval of the detailed design and tender documents by the Government of Nepal.

(2) Pre-construction Services and Construction

After signing the Exchange of Note (E/N) on construction contract, the consultant will enter into a contract with DOR on supervision services and carry out an assistance in pre-qualification of tenderers, tendering, evaluation of tenders and drafting of contract.

(3) Construction

The Japanese contractor, after signing the contract with DOR, will carry out the construction work in accordance with the construction documents. The work will be undertaken under the supervision of consultant.

The consultant's chief engineer will be posted at the construction site during the period required for supervision services. He will coordinate all construction related matters with the agencies and officials of the project including the Government of Nepal, the Embassy of Japan and JICA in Nepal.

The principal activities to be carried out by the consultant are given below:

(i) Examination of approval of shop drawings

- To inspect, examine and approve shop drawing, samples, catalogues, etc. and inspect equipment at the manufacturer's plant, if any.

(ii) Inspection of construction works

- To ensure that the construction complies with the contract in terms of schedule, construction methods and quality, and inspect and approve all field works.

(iii) Approval of Payment

- To approve payment claimed by the contractor based on the progress of the works.

(iv) Reporting

- To prepare regular progress report on all matters concerning construction and submit them to the Government of Nepal and Japanese Government.

(v) Handing over of completed works

- To hand over to the Government of Nepal the completed works after inspection and examination of the works after confirmation of fulfillment of al contractual obligations. Upon acceptance of the works by the Government of Nepal the consultant will be discharged.

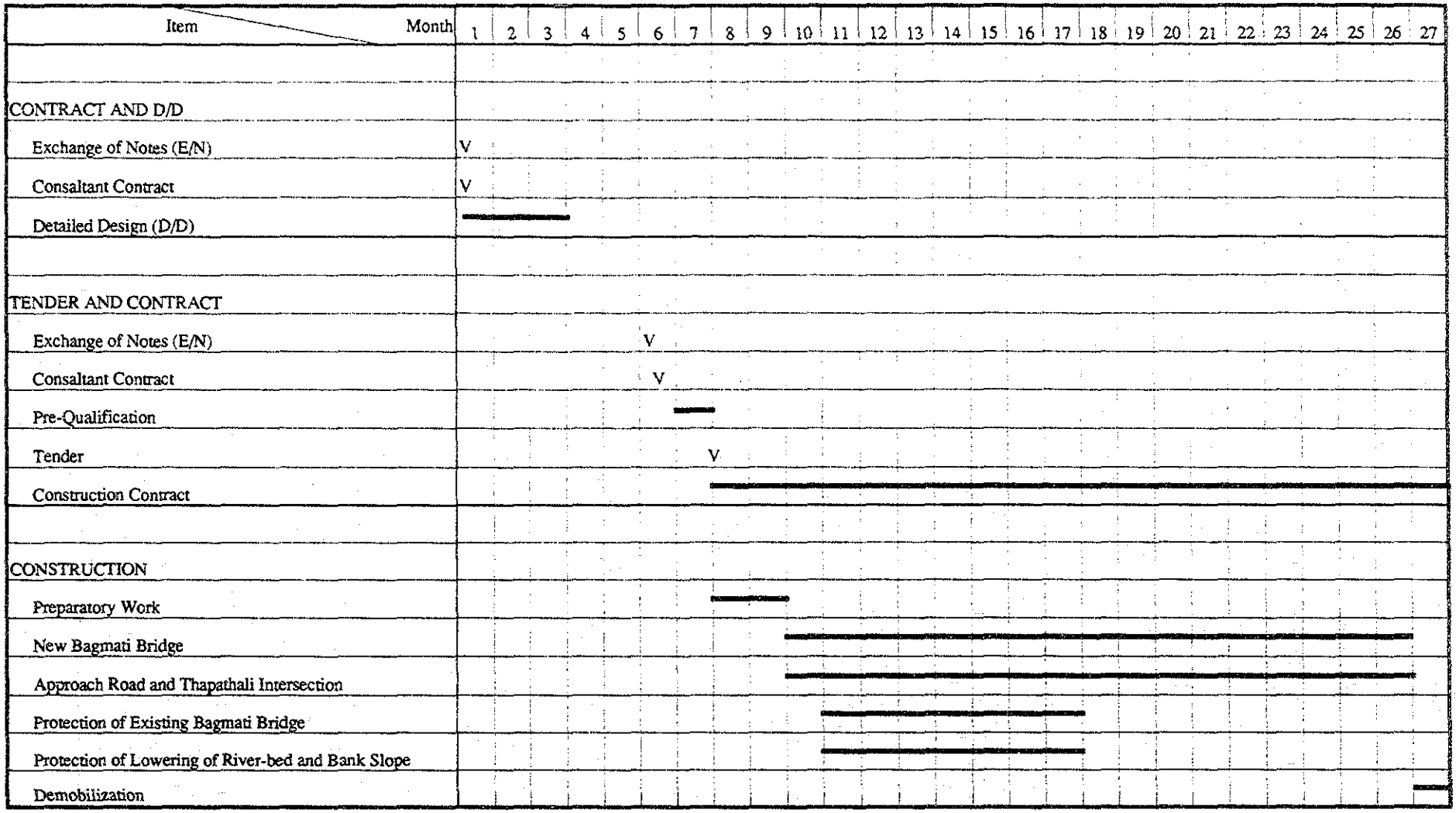
5.6.4 Implementation Schedule

The tentative implementation schedule is presented as shown in Fig. 5.9 and planned to be implemented in three years as shown below:

(1) 1st Year : Detailed design (3 months)

(2) 2nd and 3rd years : Construction (21 months)

Figure 5.9 Implementation Schedule



5.6.5 Undertakings of the Nepalese Government

(1) Responsibilities of Nepalese Side

The Government of Nepal will be responsible for the land acquisition and house compensation prior to the commencement of construction by the contractor. Also responsible for relocation and protection of the existing public utilities, such as water main, electric pole and wire, telephone cable, etc. The Government of Nepal will also be responsible for ordering of design, supervision and construction works, taking necessary arrangement of payment and taking-over of the completed bridge and road structures.

In addition to the above, the Government of Nepal shall undertake the following:

- To furnish data necessary for the detailed design
- To bear commission for the banking services based on the Banking Arrangement.
- To ensure prompt unloading. tax exemption and customs clearance at the port of disembarkation in Nepal for the equipment, materials and vehicles required for the project.
- To ensure tax exemption for the consultant and contractor engaged in the project execution
- To issue visa, traffic certificates and other certificates necessary for the execution of the project to the consultant and contractor.
- To ensure contractual payments to the consultant and the contractor.
- To bear expenses required for proper and effective maintenance after completion of the project, and
- To bear all the expenses necessary for the execution of the project other than those to be borne by the grant aid.

(2) Local Funds to be Required (unit: Million NRs.)

	1st Year	2nd Year	3rd Year
- Compensation for Land & Houses	10.0	-	-
- Relocation of Utilities	22.0	-	-
- Administration & Operation of Project	-	1.0	1.0
Total	32.0	1.0	1.0

Chapter 6

Chapter 6 Project Evaluation and Conclusion

Due to immigration of people from the other parts of Nepal, the population of Kathmandu Valley is on the increase and reached 1.0 million approx. in 1991. This has raised a variety of urban problems including sprawling of urban area, slumming inside the city, traffic congestion on the city roads and poor facilities of public transport, mainly caused by inadequate provision of urban infrastructure. Especially, the project site at Bagmati Bridge where the largest traffic volume is counted among the city roads, has been a bottleneck of vehicle traffic in the city due to insufficient river crossing capacity.

The implementation of the project is expected to dissolve the most heaviest congested point in the city and achieve the various social and economic effects as well as the improvement of daily life of the people in the city. The following are the direct and indirect effects expected from the project:

(1) Direct Effects

- Daily traffic volume on the existing 2-lane Bagmati Bridge is at the level of 48,000 vehicle per day which is far beyond the traffic capacity of 2-lane bridge and traffic congestion has been chronically occurred in every morning and evening. Provision of new 2-lane bridge to be constructed in parallel with the existing Bagmati Bridge make a extension of the river crossing capacity which would dissolve the chronicle traffic congestion in the city.

- Present Tapathali intersection, located at the entrance of the proposed new bridge, is the at-grade intersection with a roundabout controlled by traffic signal. The intersection is always congested due to small traffic capacity of the roundabout and poor maintenance of traffic signals. Improvement of intersection by widening of traffic lanes with turning and storage lanes will ensure a smooth traffic flow and reduce a traffic accidents inside the intersection.

- Existing Bagmati Bridge is still in danger of overturning due to lowering of the river-bed scouring. Protection of foundation against lowering the river-bed will extend the life of existing Bagmati Bridge.

- Construction of new Bagamti Bridge might be functioned as a detour bridge connecting Kathmandu city and Lalitpur city, in case of the emergency of the existing Bagmati Bridge.

(2) Indirect Effects

- Project will not only facilitate the anticipated traffic demand in between Kathmandu and Lalitpur but also release the traffic congestion and solve the bottleneck of the traffic movement in the area of Tapathali which will enhance the regional economy and accelerate land-use development in both cities.

- Project will exert an influence on a large majority of people and area in Kathmandu and Lalitpur cities. Total population that will benefit directly from the implementation of the Project is estimated to be 50% of the urban population (530,000 people) approx. Area that will benefit from the project would cover the whole urbanized areas of Kathmandu and Lalitpur cities

- Amount of saving costs in terms of vehicle operating and time cost are expected to be large, which will enhance the social and economic activities in Kathmandu.

- Improvement of traffic bottleneck will streamline the traffic flow in the city and driving condition of road to the level that reduce amount of exhaust gas from the vehicle, which would improve the air pollution in Kathmandu Valley.

Despite these positive achievements of the project implementation, however, it will be difficult for the Government of Nepal to independently implement the whole projects due to financial constraints.

Therefore, the provision of Japanese grant aid for the Project is deemed to be appropriate. The size and contents of the Project indicated as a result of the Basic Design Study are also deemed appropriate in terms of the project scale for Japanese grant aid cooperation. It is concluded therefore that early implementation of the project is deemed to be appropriated.

APPENDIX

Appendix 1 Organization of Basic Design Team

Assignment	Name	Position
Team Leader	Katsutoshi OHTA	Professor Department of Urban Engineering Faculty of Engineering Tokyo University
Project Coordinator	Yasujiro SUZUKI	Japan International Corporation Agency
Chief Consultant	Hiroki SHINKAI	Nippon Koei Co., Ltd.

Appendix 2 Itinerary of the Study

Cumulative Days	Date	Place	Activities
1	Oct. 3 (Sun)	Tokyo ~ Bangkok	
2	4 (Mon)	Tokyo ~ Bangkok • Japanese Embassy, JICA	Courtesy call
3	5 (Tue)	Department of Roads (DOR)	Presentation and explanation of Draft Report, Discussion on Questionnaire and Reply
4	6 (Wed)	DOR	Site inspection with DOR
5	7 (Thu)	DOR	Meeting with Mayor, and other government agencies
6	8 (Fri)	DOR Japanese Embassy JICA	Signing of Minutes of Discussions Reporting the result of Minutes of Discussion
7	9 (Sat)	Kathmandu ~ Bangkok	Leaving for Tokyo
8	10 (Sun)	Bangkok ~ Tokyo	

Appendix 3 Members List of Person met during the Basic Design Study

(1)	Department of Roads, Ministry of Works and Transport		
	(i)	Director General	: Mr. V.P. Shrestha
	(ii)	Deputy Director General	: Mr. G.S. Pradhan
	(iii)	Deputy Director General	: Mr. D.B. Banstola
	(iv)	Deputy Director General	: Mr. M. B. Karkee
	(v)	Deputy Director General	: Dr. S.B.S. Tuladhar
	(vi)	Project Manager, Bridge Reconstruction Project (Phase 2)	: Mr. R.B. Dhakhar
(2)	Ministry of Finance		
	(i)	Joint Secretary	: Mr. R.B. Bhattarai
(3)	Ministry of Housing and Physical Planning		
	(i)	Regional Director	: Mr. B.P. Sharma
(4)	National Planning Commission		
	(i)	Under Secretary	: Mr. S.L. Shrestha
(5)	Lalitpur City		
	(i)	Mayor	: Mr. B.R. Shakya
(6)	Embassy of Japan		
	(i)	Ambassador	: Mr. T. Itoh
	(ii)	Councilor	: Mr. Ishikawa
	(iii)	Second Secretary	: Mr. Ishiwatari
(7)	JICA Kathmandu Office		
	(i)	Vice Representative	: Mr. Murakami
	(ii)	Staff	: Mr. Masaki

MINUTES OF DISCUSSIONS ON THE BASIC DESIGN STUDY OF THE PROJECT FOR THE BRIDGE RECONSTRUCTION (PHASE 3) IN KATHMANDU VALLEY IN THE KINGDOM OF NEPAL

In response to the request of His Majesty's Government of Nepal (hereinafter referred to as HMG/N) for Grant Aid for the Project for the Bridge Reconstruction in Kathmandu (Phase 3) (hereinafter referred to as "the Project"), the Government of Japan decided to conduct a basic design study on the Project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to the Kingdom of Nepal the study team headed by Mr. Katsutoshi OHTA, Professor, Tokyo University, from October 3 to October 10, 1993.

The team had a series of discussions on the Project with the officials concerned of HMG/N and, as a result of the discussions, both parties agreed to recommend to their respective governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the project.

Kathmandu, October 8, 1993

Mr. Katsutoshi OHTA
Team Leader
Basic Design Study Team
JICA

Mr. V.P. SHRESTHA
Director General
Department of Roads
Ministry of Works and Transport

ATTACHMENT

1. Title of the Project

The title of the Project to be used for further implementation is "The Project for Construction of New Bagmati Bridge at Thapathali in Kathmandu".

2. Objectives of the Project

The objective of the Project is to construct the New Bagmati Bridge across the Bagmati River at Thapathali in order to remove the bottleneck of the traffic in Kathmandu City.

3. Executing Organization

The executing agency for the implementation of the Project is Department of Roads, Ministry of Works and Transport.

4. Components of the Draft Report

The Government of Nepal has agreed and accepted in principle the components of the Draft Report proposed by the Team. Major items on the Project discussed and confirmed in the meeting were presented in Annex-I.

5. Japan's Grant Aid System

The Nepalese side has understood the Japan's grant aid system explained by the Team including the principle that a Japanese consultant firm and Japanese general contractor should be used for the implementation of the Project.

6. Necessary Measures taken by Nepal

HMG/N will take the necessary measures as shown in the Annex-II for smooth implementation of the Project on condition that the grant aid assistance by the Government of Japan is extended to the Project.

7. Further Schedule

The team will make the Final Report in accordance with the confirmed items and send it to His Majesty's Government of Nepal by the end of November 1993.

Annex-I

The briefing/discussion was held regarding the Project for New Bagmati (Thapathali) Bridge on 5th and 7th Octpber, 1993 with DOR officials, the Mayor of Lalitpur Municipality, Director General, Department of Housing and Urban Development, and Under Secretary, National Planning Commission.

The following points were acknowledged and clarified by the Team and the Nepalese side:

1. The five points have been acknowledged by Department of Roads as follows:

   (i) Department of Roads understood that the basic design for the grant aid project will not include the improvement of 3 intersections, namely, Maitighar, Tripureshwor, Koteshwor, as mentioned at the annual meeting between His Majesty's Government of Nepal and Government of Japan.

   (ii) The pedestrian bridges proposed in the original design of Thapathali Intersection will not be included in the basic design, to preserve vista and urgency of the additional bridge. Necessity of pedestrian bridge shall be studied again in future when the traffic volume exceeds the capacity of intersection taking into account the possibility of under path.

   (iii) The repair and protective works of existing bridge as mentioned in the feasibility study is solely to prevent collapsing of piers.

   (iv) While the intersection is under construction the trolley-bus service can be made available only from Maitighar on-wards for few weeks (if necessary). Trolley-buses are not generally in operation during night time.

   (v) Cooperation of traffic police is possible for traffic control during construction time.

2. The following points have been clarified by the Team and Department of Roads:

   (vi) Land acquisition of the project site has already been started (since Sept. 24, 1993) by Department of Roads according to the draft map of site received from JICA Kathmandu Office.

(vii) Department of Roads is ready to bear expenses to relocate existing power lines, telephone cables, water pipes etc., to ease the construction work. Materials of water main and high power cable will be supplied within the grant but relocation work shall be done by Nepalese side.

(viii) Department of Roads will make space available near the Ring Road for disposal of waste/storage place due to the removal of existing truss bridge.

(ix) Introduction of traffic lights manufactured in Japan can be placed at intersection. Department of Roads does not have such restriction by law, so far. Sufficient spare parts as well as operation and maintenance training shall be considered under the Project.

(x) Existing bus-stop being used for trolley-bus services at Thapathali shall be shifted to the outside of the Project area in order to obtain the smooth peredstrain flow near the intersection.

Annex-II

Necessary Measures to be taken by HMG/N

1. To secure land necessary for the execution of the Project and provide enough space for such construction as temporary site offices, working area, stockyard and so on;

2. To ensure that river area necessary for the construction of the facilities be freely accessible;

3. To clear, level and reclaim the project sites;

4. To ensure prompt customs clearance and internal transportation in the Kingdom of Nepal of the products purchased under the Grant;

5. To exempt Japanese nationals from custom duties, internal taxes and other fiscal levies which may be imposed in the Kingdom of Nepal with respect to the supply of the products and services under the verified Contracts;

6. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry to the Kingdom of Nepal and stay therein for the performance of their work;

7. To ensure that facilities constructed and the products purchased under the Grant be maintained and used properly and effectively for the execution of the Project;

8. To provide necessary permissions, licenses and other authorizations for carrying out the Project;

9. To bear two kinds of commissions to the Japanese foreign exchange bank for the banking services, based upon the "Banking Arrangement", namely, the advising commission of the "Authorization to Pay" and payment commission; and

10. To bear all expenses, other than those to be borne by the grant aid, necessary for the Project.

Questionnaire to the Nepal Government on the project for Reconstruction of Bridge in Kathmandu (Phase 3).

1. We wish you would acknowledge following fine points to the Government of Nepal before the arrival of mission.

(1) The basic design for the grant aid project will not include the improvement of 3 intersections, namely, intersections at Naittighar, Tripreswar, and Koteswar, as mentioned at the Annual Meeting between Government of Nepal and Government of Japan.

(2) The basic design for the grant aid project will not include establishment of pedestrian bridges near the bridge to preserve vista and due to the lack of urgency.

(3) The repair of existing bridge is solely to prevent collapse of their piers as mentioned in the feasibility study (F/S).

On condition that Japan's Grant Aid is extended to the Project, the followings should be taken into account ;

(4) While the intersection is under construction, it is possible that the trolley-bus service will not be available for a few weeks and/or in the nighttime.

(5) Corporation of police authority is necessary for traffic control.

2.The following points should be clarified and reported to JICA office in Kathmandu before the department of the mission from Japan.

(6) Is the acquisition of the project site in progress?

Concrete explanation on this point (progress of site acquisition) is expected at the arrival the mission.

(The map of site necessary to be acquired will soon be sent to JICA office in Kathmandu directly from the consultant.)

(7) Are the Government of Nepal ready to bear the expense of temporary removal, removal, dispose and establishment of public facilities (namely, waterpipe, electric wire and telephone wire), which are buried in the existing bridge for pedestrian and bicycle?

What is the reason if the Government of Nepal will not be able to bear the expense?

(8) Has the space been secured for the disposal of waste due to the removal of existing truss bridge (for the pedestrian and bicycle)?

Place to stock the removed materials is necessary for recycle. The mission, however, suggests not to utilize them again.

(9) The mission plans to introduce traffic lights manufactured in Japan at the intersection.

What is the opinion of the Nepal Government on this plan?

Are there any law and/or regulation on traffic lights?

(10) Does the Government of Nepal have a plan to build the bus-terminal near the Tapatali intersection?

In other words, do they intend to acquire land for the bus stop?

ANNEX 6

His Majesty's Government
MINISTRY OF WORKS & TRANSPORT
Department of Roads

Telex: 2570 Roads NP
Fax: 977-1-225993
Phone: 2-11109, 2-11377, 2-13243, 2-13348, 2-15774

Babar Mahal, Kathmandu.

Ref. No. 050/51 - 209
Your Ref. No.

Date Oct. 1, 1993

Subject:- Project for Reconstruction of Bridge in Kathmandu Valley (Phase 3)

Mr. Toshikazu Masaki
Assistant Resident Representative
JICA Nepal Office
Tripureswar, Kathmandu.

Dear Mr. Masaki,

We are in receipt of your letter Ref. No. JICA 365 - 93, dated Sept. 21, 1993.

Enclosed please find the reply of the questionnaire from the Department of Roads on the Project for Reconstruction of Bridges in Kathmandu Valley (Phase 3).

We would like to apprecaite your cooperation in this regard.

Thanking you.

Sincerely yours,

(Varun Prasad Shrestha)
Director General

Reply to the Questionnaire on the Project for Reconstruction of Bridge in Kathmandu Valley (Phase 3)

1. **The five points raised have been acknowledged by Department of roads as follows:**

(1) Department of Roads understood that the basic design for the grant aid project will not include the improvement of 3 intersections, namely, Maitighar, Tripureshwor, Koteshwor, as mentioned at the annual meeting between Government of Nepal and Government of Japan.

(2) The pedestrian bridges near the bridge at Kupondol will not be included in the basic design, to preserve vista and due to the lack of urgency. But pedestrian bridges near Thapathali intersection are very necessary and urgent.

(3) The repair and protective works of existing bridge as mentioned in the feasibility study is solely to prevent collapse of their piers.

(4) While the intersection is under construction the trolley-bus service can be made available only from Maitighar on-wards for few weeks (if necessary). Trolley-buses are not generally in operation during night time.

(5) Cooperation of traffic police is possible for traffic control during construction time.

2. **The following points have been clarified by Department of Roads as the answers of questionnaire:**

(6) Land acquisition of the project site has already been started (since Sept. 24, 1993) by the Project for Reconstruction of Bridges in Kathmandu Valley (Phase 2) according to the draft map of site received from JICA Kathmandu office.

(7) As before, Department of Roads is ready to bear expenses to relocate existing power lines, telephone cables, water pipes etc., so that they may be kept out of the way (if not possible to included within the grant/contract).

(8) As before, Department of Roads can make available space for disposal of waste/storage place due to the removal of existing truss bridge.

(9) Introduction of traffic lights manufactured in Japan can be placed at intersection. Department of Roads does not have such restriction by law, so far. But these traffic lights should be viable for maintenance purpose in future.

(10) Department of Roads does not have a plan to build the bus-terminal near Thapathali intersection at present.

Materials Required for Shifting Utilities from/near the Bridge to be Demolished:

For Shifting 11 KV Electricity Transmission Line:

1. **Electric Cable (covered/insulated by suitable duct):**

   Type: ACSR Type, Aluminium/Steel Reinforced conductor)
   Length: 200m*6 = 1200m
   Size: 0.10 sq. inch
   Wire in X-Section=7 No.

2. **Electric Pole:**

   Type: Hollow Steel Electric Pole
   Height: 15m
   Number: 4
   Size: 300mm @ Bottom and Tapered towards Top.

For Shifting 400mm Water Main Lines:

1. **Water Pipes:**

   Type: Ductile Steel Pipe (Kobuta Pipe)
   A-1, British Standard
   Length: 250m
   Size: 16" (400mm)

2. **Sluice Vulve:**

   Number: 1
   Size: 400mm

3. **Wash Vulve:**

   Number: 1
   Size: 400mm

Note: Other materials of good quality meeting the above standard can be used.

10/08/1993

Appendix 8. Engineering Supporting Data

Description of Construction Materials

(1) Borrow Pits of Soils

Three sites were identified for the borrow pits of soil (subgrade materials). They were: Thimi, Gokarna Ban and Kapan:

Thimi borrow pit

Thimi borrow pit is located along the Kathmandu-Bhaktapur road. The quarry site is in the form of hillock approximately 15-20m high from sorrounding ground level. Huge quantity of soil were already exavated from that part as a filling material for construction of building complexes.

Two samples were collected from that borrow pit, one from 3 m high from ground level and another from the toe of the hillock. Both the samples were similar and according to visual classification they were classified as light grey to grey sandy silt with some clay.

It is estimated that around 15,00,000 m^3 of soil can be excavated from that area.

Gokarna Ban

The site lies just opposite of Gokarna Safari Park along Kathmandu-Sankhu road. One sample was collected from there. The soil was classified as dark grey clayey silt with medium to fine sand.

The site is accessable throughout the year and the estimated quantity which could be borrowed from there is approximately 20,00,000 m^3.

Kapan

The site is located one kilometer north from the Mahankal Chaur. At present the borrow pit is being used for extraction of sands, which is underlain by 3-5m thick soil. The soil is classified as light grey silty sand with traces of gravels. It is estimated that approximately 50,000 m^3 of soil can be borrowed from there.

(2) Borrow Pit for Gravels

Two samples of gravels were collected from chunnikhel, which is located 4 kilometer south from Nakkhu. The samples collected were dark brown sandy gravels. The estimated quantity of gravels, which can be extracted from there is approximately 1,00,000 m^3 to 2,00,000 m^3.

(3) Borrow Pit of Sands

Three sites namely Pikhel, Kapan and Basundhara were identified for quariying of sands. Two samples were extracted from each site. Brief description of site and visual classification of sands are presented below.

Pikhel

The site is situated 4 km north from Bhaktapur, Unlike in other borrow pit areas, the sands at Pikhel is being extracted by digging holes. The sand of the area is of very good quality containing less then 1% of silt. Samples were extracted from two holes. The samples collected are classified as white micacious medium to fine sand. Available quantity is estimated to be around 1,00,000 m^3 (Deposit unlimited)

Kapan

Sands were extracted from the same area, from where the soil sample was collected. Two samples; one from the lower part and another from the top was extracted for assessment of their basic properties. The sands which were available were light grey white micaceous gravelly sand with traces of silt. The estimated quantity of sand, which could be extracted from there is 1,00,000 m^3 and further extension of 1,00,000 m^3 is possible.

Basundhara

The site is located close to the Ring Road near Marajganj. Two samples were collected from there, which were similar and are classified as light grey to white micaceous sand with gravels and traces of silt. Approximately from 50,000 m^3 of sand can be extracted from that borrow area. Further extension of 1,00,000 m^3 is possible.

(4) Borrow Pits for Crushed Stone

Three sites were identified for borrow areas of crushed stones. They were:

- Godavari Marble Industries, Godavari
- Thankot crushing plants, Thankot
- Purna Roda Dhunga Udyog, Jhalungtar

Brief description about the sites and their daily capacity is given below.

Godavari Marble Industries, Godavari

The crushing plant is located 12 km south from Kathmandu. The plant produces mainly two sizes of stones; from 12.5 mm to 19.05 mm and from 19.05 mm to 50 mm. The capacity of plant in average is 60 m^3 per day.

Thankot crushing plant

In Thankot areas, there are seven crushing plant. Sources of stone quarry for all the plants is Mahadev Besi. The sizes of aggregate which they produce is also same as from Godavari. Total capacity of all the plants is 40m3 per day.

Purna Road Dhunga Udyog

The Purna Roda Udyog is located near Bajrabarahi and is approximately 12 km south of Kathmandu. The sizes of aggregate which they produce is also from 12.50 mm to 40.00 mm and from 19.05 mm to 50.00 mm. The estimated capacity of plant is 50 m^3 per day.

Test Result Summary Sheet of Borrow Pits

Location	No.	Description of Soil	Percentage of				Atterberg Limits			NMC %	Bulk Density gm/cm3	Specific Gravity gm/cm3	Compact %	CBR
			Gravel	Sand	Silt	Clay	LL %	PL %	PI %					
Gokarna	2.	Dark Grey Clayey Silt Medium to Fine Sand	2.12	30.88	60.20	6.80				31.36	1.93	2.73	97.6	3.13
Thimi	1.	Grey Clayey Silt with Fine Sand		21.30	78.70					32.98	2	2.63	95.3	4.13
Thimi	2.	Light Grey Micacious Sandy Silt with Clay		16.77	81.18	3.05	38.95			21.98	1.87	2.69	102.4	4.5
Kapan	3.	Light Grey Silty Sand and Traces Gravels	9.46	63.47	25.07	2.00	25.45			18.84		2.66	97.6	6.73
Chunikhel	1.	Dark Brown Sandy Gravels	76.70	20.15	2.35	0.75				12.89	1.87	2.58	98.4	38.3
Chunikhel	2.	Dark Brown Sandy Gravels	77.80	19.25	2	0.95				14.99	1.59	2.62	98.75	45.33
Kapan	Upper	Light Grey to White Micacious Gravelly Sand	14.53	84.12	1.35					5.4	1.77	2.66		
Thankot	1.	Bluish Grey Fourty Down Gravels	100.00							0.435		2.67		
Thankot	2.	Blush Grey Fifty Down Gravels	100.00							0.1		2.71		
Godawari	1.	Redish Brown Fourty Down Gravels	100.00							0.24		2.64		
Godawari	2.	Radish Brown fifty Down Gravels	100.00							0.32		2.61		
Jhalungtar	1.	Light Brown Fourty Down Gravels	100.00							0.1		2.63		
Jhalungtar	2.	Light Brown Fifty Down Gravels	100.00							0.2		2.73		

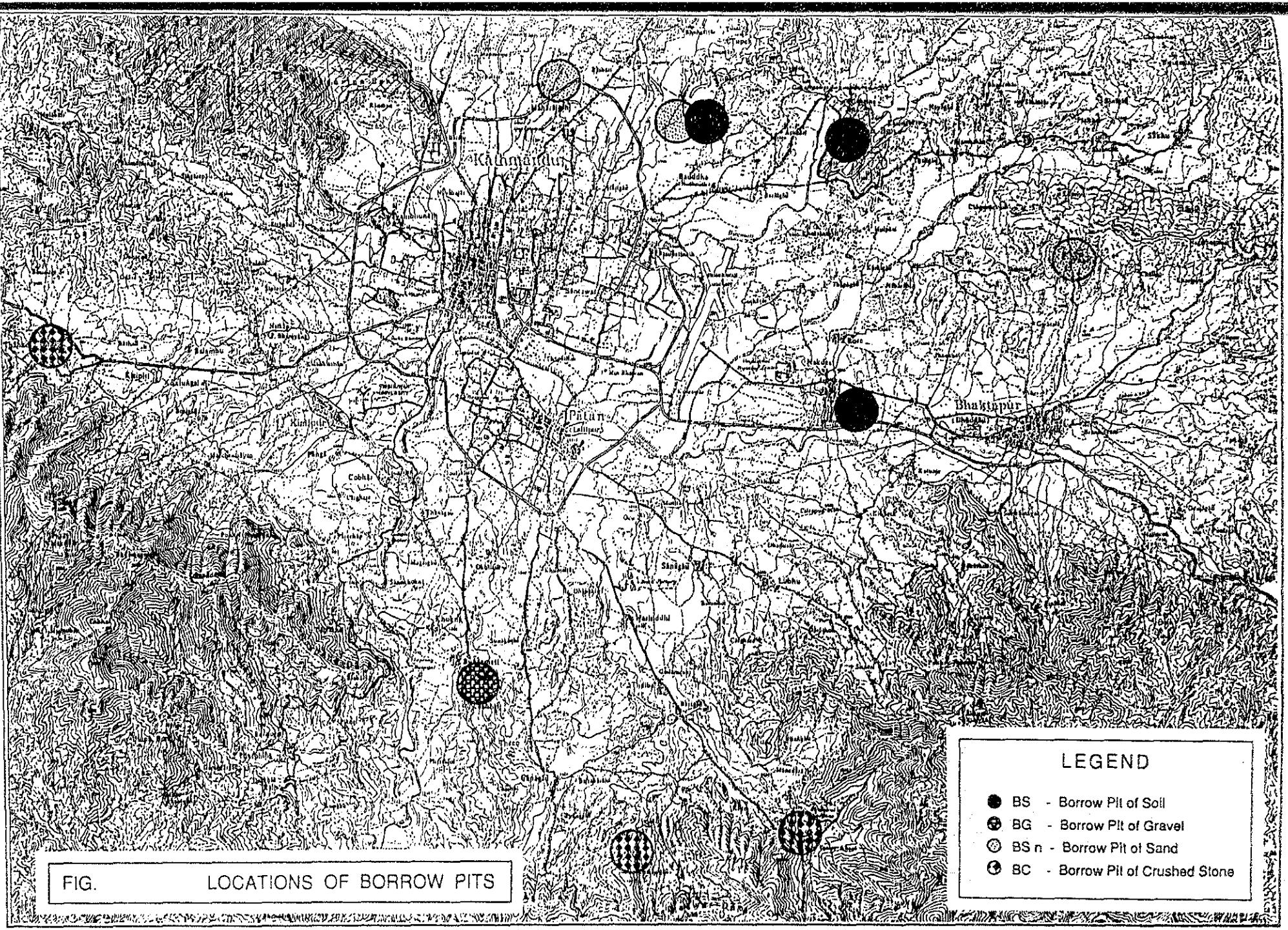


FIG. LOCATIONS OF BORROW PITS

Table Test Result Summary Sheet of Bridge Sites

Bridge No. 2 Location : Thapathali

Sam-ple' Type	B. H. No.	Depth m	Percentage							NMC %	Bulk Density gm/cm3	Speficif Gravity gm/cm3	SPT Value N	Qu kg/cm2	Consolidation mv cm2/kg	Remarks
			Gravel	Sand	Silt	Clay	LL %	PL %	PI %							
DS	Right	4	-	6	78.0	16.0	89.5	69.09	20.14	73.63	-	2.56	15			
DS	Bank	12	-	10	66.0	24.0	95.0	65.68	29.32	70.13	-	2.65	16			
UD	(1)	17	-	7	84.0	9.0	103.2	65.52	37.68	77.10	1.43	2.49	-	1.63	0.0201	
UD		10	-	7	80.5	12.5	100.7	60.18	40.52	79.45	1.41	2.63	15	1.32	0.0195	
DS	Left	8	-	10.5	69	20.5	102.3	57.29	45.01	95.09	-	2.66	13			
DS	Bank	11	36.8	62.0	2	1.8	-	-	-	30.71	-	2.66	-			
UD	(2)	9	-	8.0	80	12.0	78.2	38.78	39.42	55.95	-	2.56	-			
UD		28	-	5.0	77	18.0	92.2	64.33	27.67	77.63	1.54	2.46	12	1.34	0.0212	

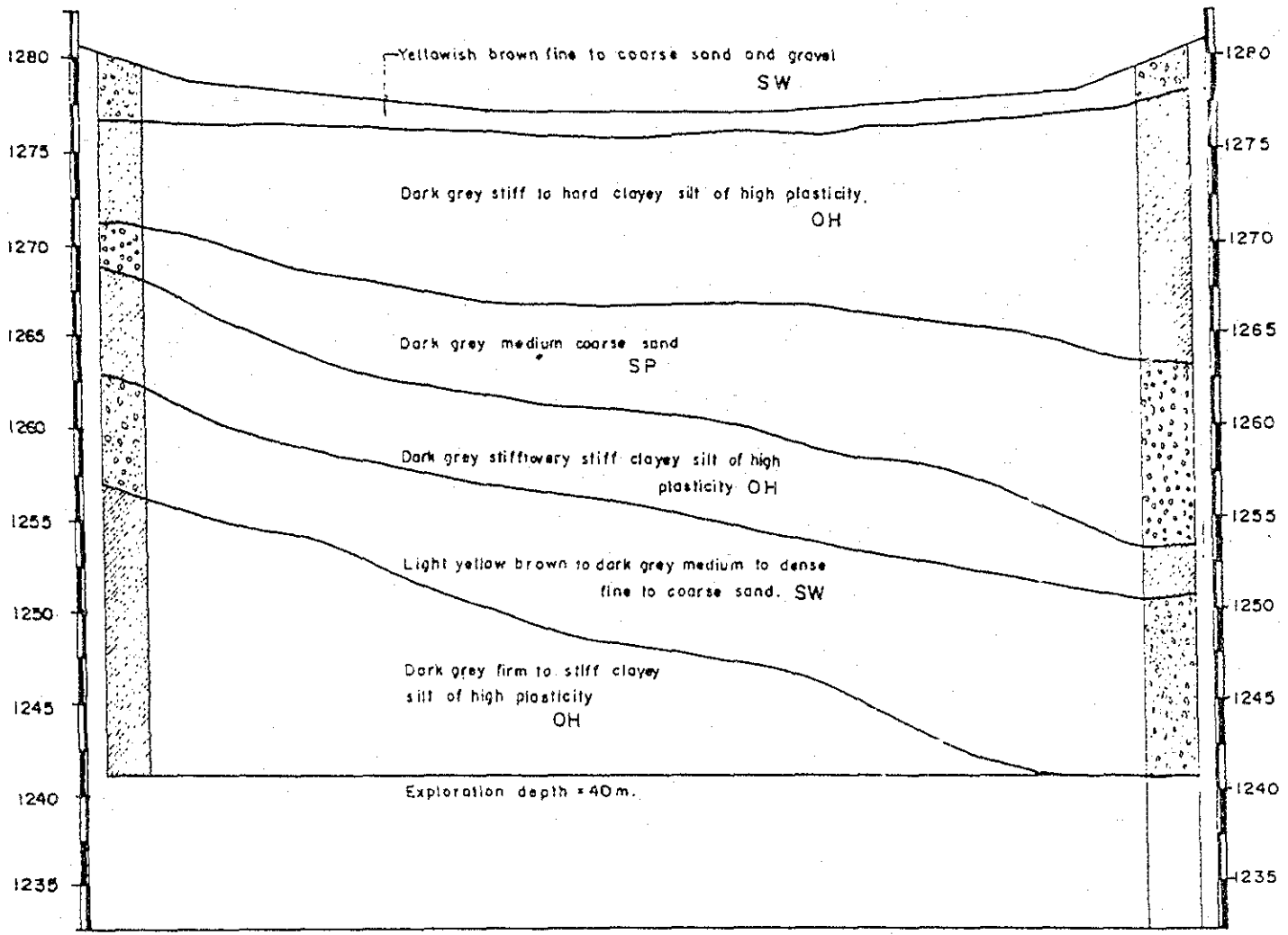


FIG. PROFILE ALONG BRIDGE AXIS
BRIDGE NO 2, THAPATHALI

VERTICAL SCALE: 0 2.5 5 7.5 10

HORIZONTAL SCALE: 0 5 10 15 20

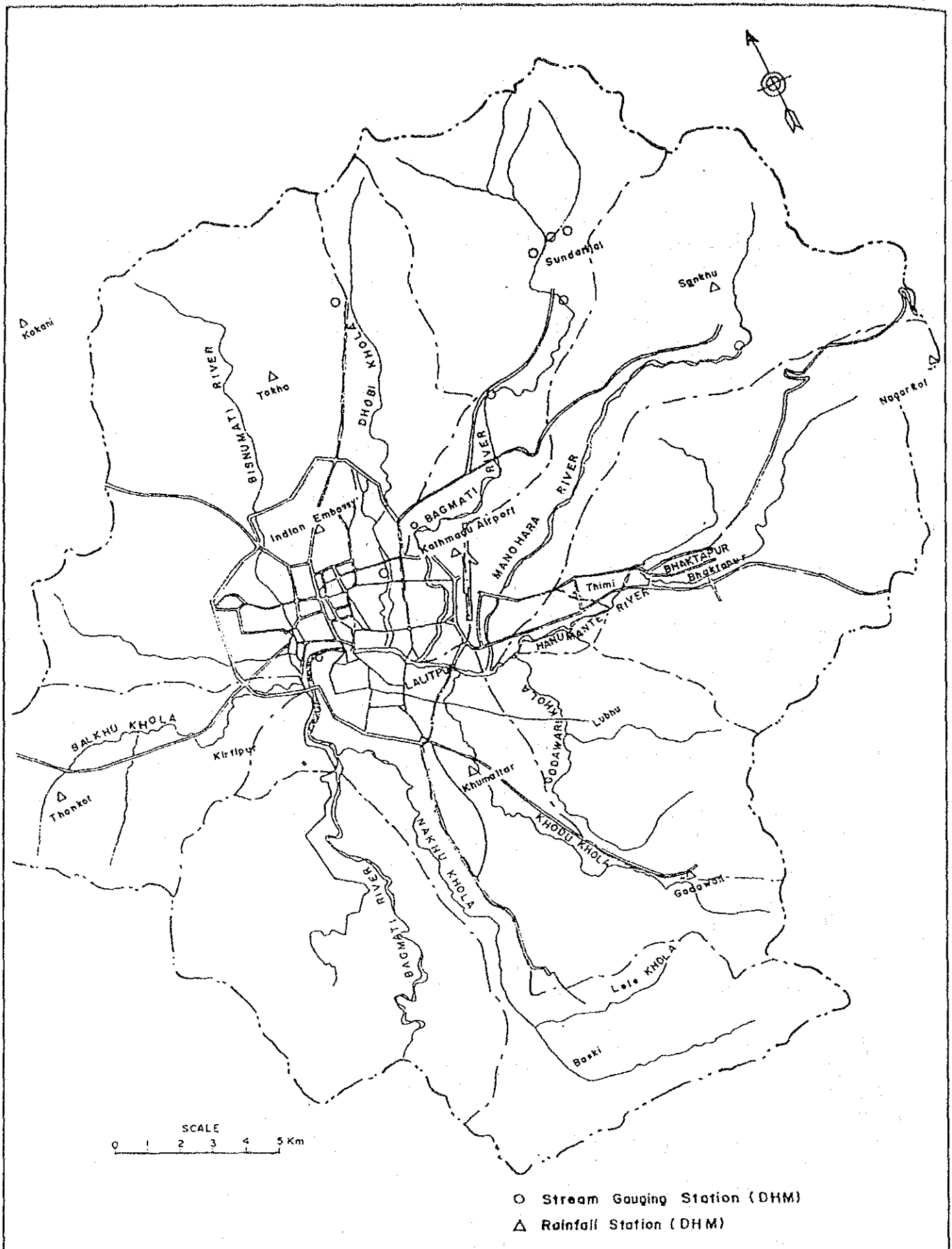


Figure LOCATION MAP OF RAINFALL STATION AND STREAM GAUGING STATION

Table RAINFALL RECORD IN KATHMANDU VALLEY

YEAR	ANNUAL TOTAL							
	KTM. Airport	Godavari	Kakani	Khumaltar	Bhaktapur	Sankhu	Thankot	Nagarkot
1977	1298.0	1617.0	2392.0	1145.0	*	*	*	1798.0
1978	1556.0	2211.0	3241.0	1698.0	*	*	*	2700.0
1979	1356.0	1584.0	1734.0	950.0	*	*	*	1658.0
1980	1341.0	1548.0	2843.0	1009.0	*	*	*	1783.0
1981	1370.0	1698.0	2375.0	1159.0	*	*	*	1066.0
1982	1168.0	1672.0	*	1158.0	*	*	*	1045.0
1983	1449.0	1918.0	2986.0	1309.0	*	*	*	1266.0
1984	1313.0	2214.0	2672.0	1330.0	*	*	*	1435.0
1985	1786.0	2553.0	3288.0	1535.0	*	*	*	*
1986	1495.0	1910.0	3054.0	1367.0	*	*	*	2089.0
1987	1395.2	2061.1	2322.0	1449.2	1484.6	1728.0	2254.0	1645.2
1988	1373.8	1973.7	2774.9	1496.8	1784.8	1905.5	2024.4	1581.2
1989	1132.0	1644.7	3162.0	996.3	1095.0	2117.2	2029.6	*
1990	1532.7	2086.7	2993.8	1173.9	1752.7	2372.7	2111.6	2132.0
1991	997.5	1509.1	2689.5	870.0	896.9	1439.0	1619.6	1742.2
MEAN	1370.9	1880.0	2751.9	1243.1	1402.8	1912.5	2007.8	1687.7

Table RAINFALL AT KATHMANDU ARPORT

Year	Jan.			Feb			Mar.			Apr.			May.			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.			Annual	Annual
	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	Total
1977		12.0	0.4	12.0	12.0	0.4	9.0	17.0	0.5	21.0	104.0	3.5	27.0	90.0	2.9	50.0	266.0	8.9	51.0	323.0	10.4	58.0	338.0	10.9	18.0	79.0	2.6	10.0	29.0	0.9	8.0	14.0	0.5	10.0	14.0	0.5	58.0	1298.0
1978	3.0	5.0	0.2	8.0	11.0	0.4	39.0	69.0	2.2	14.0	42.0	1.4	18.0	143.0	4.6	36.0	299.0	10.0	67.0	324.0	10.5	71.0	392.0	12.6	30.0	160.0	5.3	71.0	109.0	3.5	0.0	0.0	0.0	1.0	2.0	0.1	71.0	1556.0
1979	2.0	6.0	0.2	22.0	39.0	1.4	0.0	1.0	0.0	12.0	42.0	1.4	12.0	37.0	1.2	48.0	258.0	8.6	86.0	447.0	14.4	76.0	320.0	10.3	52.0	99.0	3.3	12.0	36.0	1.2	4.0	6.0	0.2	51.0	65.0	2.1	86.0	1356.0
1980	1.0	1.0	0.0	9.0	18.0	0.6	19.0	46.0	1.5	7.0	10.0	0.3	32.0	124.0	4.0	100.0	349.0	11.6	50.0	296.0	9.5	31.0	238.0	7.7	54.0	184.0	6.1	38.0	69.0	2.2	0.0	0.0	0.0	6.0	6.0	0.2	100.0	1341.0
1981	11.0	14.0	0.5	0.0	0.0	0.0	22.0	60.0	1.9	38.0	101.0	3.4	54.0	216.0	7.0	35.0	141.0	4.7	36.0	304.0	9.8	47.0	267.0	8.6	50.0	225.0	7.5	0.0	0.0	0.0	16.0	42.0	1.4	0.0	0.0	0.0	54.0	1370.0
1982	9.0	14.0	0.5	10.0	22.0	0.8	16.0	36.0	1.2	10.0	49.0	1.6	14.0	40.0	1.3	88.0	200.0	6.7	52.0	238.0	7.7	52.0	384.0	12.4	38.0	155.0	5.2	8.0	9.0	0.3	18.0	18.0	0.6	3.0	3.0	0.1	88.0	1168.0
1983	16.0	18.0	0.6	2.0	4.0	0.1	15.0	30.0	1.0	14.0	79.0	2.6	29.0	110.0	3.5	39.0	81.0	2.7	72.0	500.0	16.1	45.0	194.0	6.3	44.0	288.0	9.6	43.0	130.0	4.2	0.0	0.0	0.0	15.0	15.0	0.5	72.0	1449.0
1984	14.0	14.0	0.5	14.0	17.0	0.6	14.0	14.0	0.5	21.0	60.0	2.0	19.0	96.0	3.1	70.0	275.0	9.2	30.0	250.0	8.1	77.0	302.0	9.7	45.0	260.0	8.7	17.0	18.0	0.6	0.0	0.0	0.0	7.0	7.0	0.2	77.0	1313.0
1985	6.0	10.0	0.3	3.0	3.0	0.1	4.0	4.0	0.1	13.0	25.0	0.8	22.0	133.0	4.3	36.0	161.0	5.4	51.0	418.0	13.5	52.0	434.0	14.0	69.0	376.0	12.5	52.0	167.0	5.4	0.0	0.0	0.0	28.0	55.0	1.8	69.0	1786.0
1986	0.0	0.0	0.0	20.0	23.0	0.8	7.0	16.0	0.5	24.0	93.0	3.1	21.0	97.0	3.1	65.0	316.0	10.5	78.0	381.0	12.3	62.0	219.0	7.1	48.0	221.0	7.4	26.0	80.0	2.6	0.0	0.0	0.0	32.0	49.0	1.6	78.0	1495.0
1987	2.7	3.2	0.1	25.0	43.3	1.5	9.6	35.9	1.2	11.0	34.4	1.1	18.0	57.6	1.9	16.8	116.4	3.9	86.5	498.8	16.1	39.3	256.3	8.3	45.6	171.2	5.7	124.4	159.3	5.1	0.0	0.0	0.0	18.3	18.8	0.6	124.4	1395.2
1988	0.6	0.6	0.0	9.7	19.1	0.7	21.9	68.0	2.2	14.7	42.3	1.4	37.3	152.9	4.9	36.5	239.5	8.0	66.0	397.3	12.8	60.5	278.7	9.0	27.0	134.4	4.5	11.5	17.6	0.6	7.4	11.7	0.4	7.4	11.7	0.4	66.0	1373.8
1989	31.3	47.4	1.5	9.7	10.7	0.4	5.8	12.1	0.4	3.3	4.0	0.1	46.0	148.7	4.8	29.3	135.5	4.5	57.0	328.0	10.6	27.0	206.0	6.6	38.7	196.5	6.6	18.9	42.4	1.4	0.0	0.0	0.0	0.7	0.7	0.0	57.0	1132.0
1990	0.0	0.0	0.0	18.0	42.2	1.5	15.8	59.5	1.9	26.2	116.2	3.9	73.2	108.3	3.5	47.0	285.5	9.5	56.4	345.6	11.1	53.8	308.5	10.0	39.2	188.2	6.3	48.2	78.7	2.5	0.0	0.0	0.0	0.0	0.0	0.0	73.2	1532.7
1991	14.6	20.7	0.7	10.0	11.4	0.4	19.2	45.2	1.5	17.1	26.3	0.9	42.8	145.3	4.7	24.4	114.5	3.8	36.9	190.3	6.1	44.7	280.7	9.1	27.6	137.7	4.6	0.4	0.4	0.0	0.2	0.2	0.0	21.5	24.9	0.8	44.7	997.5
Max	31.3			25.0			39.0			38.0			73.2			100.0			86.5			77.0			69.0			124.4			18.0			51.0			124.4	1786.0
Mean		11.1	0.4		18.4	0.7		34.2	1.1		55.2	1.8		113.3	3.7		215.8	7.2		349.4	11.3		296.5	9.5		191.7	6.4		63.0	2.0		6.1	0.2		18.1	0.6	74.6	1370.9

Table RAINFALL AT GODAVARI

Year	Jan.			Feb.			Mar.			Apr.			May.			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.			Annual	Annual
	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	total	mean daily	max	Total
1977	7.0	12.0	0.4	15.0	18.0	0.6	6.0	11.0	0.4	20.0	104.0	3.5	26.0	135.0	4.4	56.0	194.0	6.5	114.0	656.0	21.2	51.0	299.0	9.6	28.0	90.0	3.0	12.0	35.0	1.1	7.0	7.0	0.2	56.0	56.0	1.8	114.0	1617.0
1978	2.0	2.0	0.1	10.0	25.0	0.9	51.0	78.0	2.5	34.0	66.0	2.2	21.0	128.0	4.1	71.0	368.0	12.3	83.0	414.0	13.4	87.0	626.0	20.2	67.0	374.0	12.5	99.0	124.0	4.0	0.0	1.0	0.0	4.0	5.0	0.2	99.0	2211.0
1979	5.0	6.0	0.2	30.0	52.0	1.9	1.0	1.0	0.0	16.0	48.0	1.6	24.0	64.0	2.1	81.0	330.0	11.0	97.0	548.0	17.7	93.0	345.0	11.1	21.0	70.0	2.3	14.0	34.0	1.1	5.0	7.0	0.2	63.0	79.0	2.5	97.0	1584.0
1980	0.0	0.0	0.0	7.0	12.0	0.4	8.0	25.0	0.8	15.0	19.0	0.6	31.0	111.0	3.6	103.0	440.0	14.7	68.0	439.0	14.2	45.0	390.0	12.6	54.0	75.0	2.5	16.0	31.0	1.0	0.0	0.0	0.0	6.0	6.0	0.2	103.0	1548.0
1981	10.0	30.0	1.0	0.0	0.0	0.0	12.0	45.0	1.5	24.0	96.0	3.2	24.0	138.0	4.5	32.0	186.0	6.2	36.0	420.0	13.5	58.0	350.0	11.3	169.0	413.0	13.8	0.0	0.0	0.0	18.0	20.0	0.7	0.0	0.0	0.0	169.0	1698.0
1982	10.0	15.0	0.5	6.0	16.0	0.6	31.0	55.0	1.8	16.0	44.0	1.5	20.0	80.0	2.6	55.0	304.0	10.1	68.0	375.0	12.1	65.0	523.0	16.9	66.0	229.0	7.6	6.0	11.0	0.4	14.0	18.0	0.6	2.0	2.0	0.1	68.0	1672.0
1983	18.0	21.0	0.7	4.0	8.0	0.3	5.0	7.0	0.2	17.0	59.0	2.0	51.0	214.0	6.9	23.0	91.0	3.0	84.0	587.0	18.9	65.0	455.0	14.7	48.0	298.0	9.9	56.0	164.0	5.3	0.0	0.0	0.0	14.0	14.0	0.5	84.0	1918.0
1984	26.0	26.0	0.8	17.0	20.0	0.7	12.0	12.0	0.4	25.0	65.0	2.2	43.0	158.0	5.1	71.0	417.0	13.9	49.0	449.0	14.5	61.0	490.0	15.8	110.0	538.0	17.9	25.0	28.0	0.9	0.0	0.0	0.0	10.0	11.0	0.4	110.0	2214.0
1985	9.0	20.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	16.0	27.0	0.9	23.0	140.0	4.5	42.0	226.0	7.5	120.0	847.0	27.3	62.0	484.0	15.6	90.0	455.0	15.2	82.0	274.0	8.8	0.0	0.0	0.0	47.0	80.0	2.6	120.0	2553.0
1986	0.0	0.0	0.0	20.0	24.0	0.9	10.0	26.0	0.8	24.0	85.0	2.8	35.0	133.0	4.3	80.0	461.0	15.4	96.0	432.0	13.9	60.0	316.0	10.2	51.0	314.0	10.5	13.0	56.0	1.8	3.0	3.0	0.1	36.0	60.0	1.9	96.0	1910.0
1987	2.0	3.0	0.1	30.5	74.9	2.7	19.8	60.5	2.0	23.5	56.3	1.9	12.6	38.2	1.2	79.0	198.5	6.6	83.6	801.1	25.8	86.4	430.2	13.9	46.0	181.9	6.1	172.0	201.0	6.5	0.0	0.0	0.0	15.0	15.5	0.5	172.0	2061.1
1988	2.0	3.0	0.1	16.0	25.0	0.9	28.9	81.3	2.6	23.2	68.8	2.3	21.7	125.4	4.0	48.5	279.5	9.3	57.5	465.1	15.0	52.5	523.7	16.9	53.5	253.7	8.5	14.0	15.3	0.5	24.7	30.7	1.0	63.5	102.2	3.3	63.5	1973.7
1989	33.3	53.0	1.7	9.7	12.3	0.4	11.3	16.3	0.5	2.8	2.8	0.1	30.2	155.3	5.0	27.7	150.0	5.0	61.8	541.3	17.5	68.2	321.3	10.4	46.8	339.7	11.3	17.2	52.7	1.7	0.0	0.0	0.0	0.0	0.0	0.0	68.2	1644.7
1990	0.0	0.0	0.0	23.5	60.4	2.2	12.2	60.5	2.0	22.4	68.9	2.3	32.9	148.6	4.8	44.0	241.5	8.1	91.3	659.3	21.3	110.0	576.7	18.6	58.0	244.8	8.2	9.4	24.6	0.8	0.0	0.0	0.0	1.4	1.4	0.0	110.0	2086.7
1991	23.2	38.7	1.2	10.5	15.5	0.6	35.4	61.1	2.0	42.0	63.0	2.1	11.2	45.7	1.5	49.8	228.0	7.6	92.8	356.8	11.5	57.4	506.3	16.3	31.0	168.2	5.6	0.0	0.0	0.0	0.0	0.0	0.0	24.5	25.8	0.8	92.8	1509.1
Max	33.3			30.5			51.0			42.0			51.0			103.0			120.0			110.0			169.0			172.0			24.7			63.5			172.0	2553.0
Mean		15.3	0.5		24.2	0.9		36.0	1.2		58.2	1.9		120.9	3.9		274.3	9.1		532.7	17.2		442.4	14.3		269.6	9.0		70.0	2.3		5.8	0.2		30.5	1.0	104.4	1880.0

Table TEMPERATURE AT KATHMANDU AIRPORT

Year	Jan.			Feb			Mar.			Apr.			May.			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.			Mean in Year
	mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			
	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	
1977	16.8	0.5	8.7	20.3	3.0	11.7	25.4	7.1	16.3	25.0	11.3	18.2	25.7	13.5	19.6	27.9	17.6	22.8	27.8	19.7	23.8	27.6	19.0	23.3	27.1	17.4	22.3	24.0	11.6	17.8	21.7	8.6	15.2	17.6	2.2	9.9	17.4
1978	16.1	-0.4	7.9	18.7	2.0	10.4	21.6	5.1	13.4	25.6	10.4	18.0	27.2	17.0	22.1	27.4	19.2	23.3	27.4	19.8	23.6	28.4	20.0	24.2	26.7	18.5	22.6	24.6	13.8	19.2	21.0	9.0	15.0	19.8	3.3	11.6	17.6
1979	18.4	2.5	10.5	18.8	4.1	11.5	24.0	6.2	15.1	27.4	12.6	20.0	30.4	15.6	23.0	28.9	19.2	24.1	27.7	20.5	24.1	27.2	20.1	23.7	26.7	17.6	22.2	24.9	13.3	19.1	22.7	9.8	16.3	17.9	5.0	11.5	18.4
1980	17.5	1.9	9.7	19.5	4.9	12.2	23.0	8.0	15.5	29.4	12.1	20.8	28.2	16.9	22.6	27.8	20.2	24.0	27.8	20.8	24.3	27.8	20.4	24.1	26.9	19.0	23.0	24.5	12.1	18.3	22.4	7.2	14.8	19.3	4.1	11.7	18.4
1981	16.8	2.9	9.9	20.3	4.8	12.6	22.2	8.2	15.2	24.2	12.5	18.4	26.1	16.3	21.2	28.0	19.1	23.6	27.0	20.6	23.8	27.8	20.4	24.1	26.7	18.6	22.7	25.6	13.3	19.5	22.7	6.8	14.8	19.4	2.1	10.8	18.0
1982	18.9	2.8	10.9	18.5	3.5	11.0	22.8	7.5	15.2	26.5	10.9	18.7	29.9	14.4	22.2	28.5	18.5	23.5	28.7	19.6	24.2	28.9	20.2	24.6	27.3	17.8	22.6	25.6	11.2	18.4	21.3	7.9	14.6	18.8	3.9	11.4	18.1
1983	17.1	0.1	8.6	20.7	2.4	11.6	26.0	8.3	17.2	28.3	11.2	19.8	27.5	17.1	22.3	28.2	20.0	24.1	28.1	20.3	24.2	29.2	19.8	24.5	26.3	17.3	21.8	27.2	14.4	20.8	22.6	5.8	14.2	19.4	3.4	11.4	18.4
1984	16.7	1.0	8.9	19.0	1.6	10.3	23.4	5.8	14.6	25.1	10.2	17.7	26.8	15.3	21.1	30.4	18.1	24.3	28.3	20.5	24.4	28.7	20.2	24.5	27.8	19.1	23.5	26.0	13.7	19.9	22.9	7.0	15.0	18.9	1.5	10.2	17.8
1985	18.1	2.4	10.3	20.1	3.7	11.9	26.3	9.0	17.7	28.6	12.1	20.4	28.0	15.5	21.8	28.9	19.2	24.1	27.1	19.6	23.4	28.8	20.2	24.5	26.7	18.3	22.5	24.4	13.7	19.1	22.2	7.0	14.6	19.3	4.8	12.1	18.5
1986	18.3	2.7	10.5	20.1	3.5	11.8	24.6	7.2	15.9	26.4	11.1	18.8	27.1	13.9	20.5	28.9	18.9	23.9	28.2	20.1	24.2	28.7	19.5	24.1	26.9	18.0	22.5	24.8	12.3	18.6	22.3	8.1	15.2	18.7	2.8	10.8	18.0
1987	18.5	2.4	10.5	20.6	5.3	13.0	23.2	8.0	15.6	27.1	10.9	19.0	29.1	13.4	21.3	28.8	19.0	23.9	27.6	20.1	23.9	27.5	19.4	23.5	27.4	18.4	22.9	25.6	12.9	19.3	23.4	7.8	15.6	20.6	4.2	12.4	18.4
1988	19.1	3.0	11.1	21.6	5.3	13.5	23.9	7.6	15.8	28.6	10.9	19.8	28.9	15.7	22.3	28.4	18.5	23.5	28.3	19.9	24.1	27.9	19.7	23.8	28.6	18.5	23.6	28.4	13.3	20.9	24.4	6.4	15.4	20.3	5.0	12.7	18.8
1989	17.5	2.7	10.1	21.7	2.3	12.0	25.6	7.0	16.3	30.0	8.6	19.3	29.7	15.6	22.7	29.4	18.9	24.2	28.1	19.5	23.8	29.5	19.2	24.4	28.9	18.6	23.8	28.6	13.3	21.0	23.7	6.0	14.9	20.7	1.8	11.3	18.6
1990	22.2	3.2	12.7	19.9	5.2	12.6	22.1	7.0	14.6	26.2	10.8	18.5	27.1	16.1	21.6	29.2	19.6	24.4	27.6	20.1	23.9	28.3	19.4	23.9	27.5	18.5	23.0	25.6	13.0	19.3	24.4	7.3	15.9	20.2	3.7	12.0	18.5
Mean	18.0	2.0	10.0	20.0	3.7	11.8	23.9	7.3	15.6	27.0	11.1	19.1	28.0	15.5	21.7	28.6	19.0	23.8	27.8	20.1	24.0	28.3	19.8	24.1	27.3	18.3	22.8	25.7	13.0	19.3	22.7	7.5	15.1	19.4	3.4	11.4	18.2
Max	22.2			21.7			26.3			30			30.4			30.4			28.7			29.5			28.9			28.6			24.4			20.7			
Mini		-0.4			1.6			5.1			8.6			13.4			17.6			19.5			19			17.3			11.2			5.8			1.5		

Table RELATIVE HUMIDITY AT KATHMANDU AIRPORT

Year	Jan.			Feb			Mar.			Apr.			May.			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.			Mean in Year
	mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			
	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	
1977	96.0	66.0	81.0	90.0	50.0	70.0	79.0	46.0	62.5	78.0	57.0	67.5	78.0	58.0	68.0	77.0	71.0	74.0	86.0	80.0	83.0	86.0	80.0	83.0	86.0	76.0	81.0	89.0	72.0	80.5	91.0	75.0	83.0	96.0	73.0	84.5	76.5
1978	94.0	65.0	79.5	92.0	59.0	75.5	83.0	51.0	67.0	75.0	54.0	64.5	81.0	67.0	74.0	83.0	74.0	78.5	85.0	78.0	81.5	85.0	70.0	77.5	90.0	80.0	85.0	94.0	75.0	84.5	95.0	77.0	86.0	97.0	65.0	81.0	77.9
1979	99.0	66.0	82.5	96.0	61.0	78.5	85.0	41.0	63.0	92.0	56.0	74.0	87.0	46.0	66.5	90.0	65.0	77.5	94.0	80.0	87.0	96.0	82.0	89.0	96.0	75.0	85.5	98.0	76.0	87.0	97.0	72.0	84.5	97.0	74.0	85.5	80.0
1980	95.0	64.0	79.5	90.0	52.0	71.0	80.0	50.0	65.0	65.0	41.0	53.0	72.0	58.0	65.0	82.0	74.0	78.0	84.0	78.0	81.0	84.0	77.0	80.5	88.0	79.0	83.5	91.0	72.0	81.5	92.0	72.0	82.0	97.0	68.0	82.5	75.2
1981	96.0	65.0	80.5	90.0	55.0	72.5	84.0	57.0	70.5	78.0	56.0	67.0	80.0	66.0	73.0	79.0	68.0	73.5	86.0	81.0	83.5	85.0	78.0	81.5	89.0	75.0	82.0	91.0	67.0	79.0	95.0	78.0	86.5	97.0	73.0	85.0	77.9
1982	97.0	67.0	82.0	95.0	62.0	78.5	80.0	52.0	66.0	71.0	47.0	59.0	61.0	44.0	52.5	76.0	67.0	71.5	83.0	71.0	77.0	83.0	81.0	82.0	88.0	79.0	83.5	93.0	71.0	82.0	95.0	77.0	86.0	97.0	70.0	83.5	75.3
1983	94.0	68.0	81.0	91.0	65.0	78.0	81.0	61.0	71.0	78.0	60.0	69.0	77.0	73.0	75.0	73.0	64.0	68.5	87.0	83.0	85.0	82.0	81.0	81.5	85.0	80.0	82.5	89.0	76.0	82.5	98.0	72.0	85.0	98.0	70.0	84.0	78.6
1984	96.0	62.0	79.0	95.0	52.0	73.5	81.0	48.0	64.5	66.0	43.0	54.5	78.0	68.0	73.0	82.0	77.0	79.5	85.0	82.0	83.5	82.0	79.0	80.5	90.0	78.0	84.0	88.0	71.0	79.5	89.0	64.0	76.5	93.0	67.0	80.0	75.7
1985	94.0	66.0	80.0	90.0	58.0	74.0	74.0	41.0	57.5	65.0	38.0	51.5	72.0	58.0	65.0	76.0	68.0	72.0	84.0	82.0	83.0	84.0	79.0	81.5	87.0	79.0	83.0	91.0	77.0	84.0	98.0	72.0	85.0	97.0	72.0	84.5	75.1
1986	97.0	65.0	81.0	96.0	58.0	77.0	79.0	43.0	61.0	74.0	54.0	64.0	73.0	58.0	65.5	79.0	71.0	75.0	84.0	81.0	82.5	84.0	78.0	81.0	87.0	81.0	84.0	93.0	71.0	82.0	97.0	72.0	84.5	98.0	68.0	83.0	76.7
1987	97.7	64.5	81.1	95.8	58.0	76.9	93.2	58.4	75.8	74.8	50.8	62.8	65.0	50.5	57.8	75.6	70.2	72.9	86.2	84.8	85.5	87.3	79.4	83.4	87.3	76.9	82.1	92.3	73.9	83.1	96.1	68.7	82.4	96.6	64.3	80.5	77.0
1988	96.3	57.8	77.1	92.2	52.6	72.4	86.3	49.5	67.9	69.6	45.0	57.3	75.1	58.6	66.9	78.8	70.9	74.9	83.4	80.7	82.1	87.6	80.2	83.9	87.3	74.8	81.1	91.5	73.0	82.3	91.6	60.2	75.9	93.3	67.2	80.3	75.1
1989	96.1	72.2	84.2	93.9	56.3	75.1	82.5	45.4	64.0	61.8	30.7	46.3	69.7	60.8	65.3	75.6	71.4	73.5	83.9	79.1	81.5	85.4	77.9	81.7	85.8	79.6	82.7	89.6	74.5	82.1	94.0	67.3	80.7	94.5	66.9	80.7	74.8
1990	90.6	59.3	75.0	95.5	66.7	81.1	84.7	53.5	69.1	76.6	57.0	66.8	75.4	62.2	68.8	77.5	74.1	75.8	84.4	81.8	83.1	86.1	78.1	76.2	86.9	77.3	82.1	87.0	71.9	79.5	92.4	62.6	77.5	95.4	61.2	78.3	76.1
Mean	95.6	64.8	80.2	93.0	57.5	75.3	82.3	49.8	66.1	73.2	49.3	61.2	74.6	59.2	66.9	78.9	70.4	74.6	85.4	80.2	82.8	85.5	78.6	89.0	88.1	77.9	83.0	91.2	73.0	82.1	94.4	70.7	82.5	96.2	68.5	82.4	76.6
Max	99.0	72.2	84.2	96.0	66.7	81.1	93.2	61.0	75.8	92.0	60.0	74.0	87.0	73.0	75.0	90.0	77.0	79.5	94.0	84.8	87.0	96.0	82.0	77.5	96.0	81.0	85.5	98.0	77.0	87.0	98.0	78.0	86.5	98.0	74.0	85.5	80.0
Mini	90.6	57.8	75.0	90.0	50.0	70.0	74.0	41.0	57.5	61.8	30.7	46.3	61.0	44.0	52.5	73.0	64.0	68.5	83.0	71.0	77.0	82.0	70.3	76.2	85.0	74.8	81.0	87.0	67.0	79.0	89.0	60.2	75.9	93.0	61.2	78.3	74.8

Table TEMPRATURE AT GODAVARI

Year	Jan.			Feb			Mar.			Apr.			May.			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.			Mean in Year
	mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			mean			
	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	max	min	daily	
1977	14.2	2.1	8.2	17.4	4.3	10.9	23.0	8.8	15.9	23.0	10.6	16.8	23.0	12.2	17.6	25.6	15.7	20.7	24.8	17.6	21.2	25.0	17.0	21.0	24.2	16.2	20.2	21.1	12.2	16.7	18.7	9.1	13.9	15.0	4.7	9.9	16.1
1978	12.9	2.0	7.5	15.9	4.4	10.2	18.6	7.6	13.1	23.4	11.7	17.6	25.3	15.5	20.4	24.7	17.4	21.1	24.8	12.6	18.7	25.1	18.1	21.6	23.8	16.0	19.9	22.2	12.4	17.3	18.4	8.2	13.3	16.8	4.8	10.8	15.9
1979	15.3	3.9	9.6	15.6	4.3	10.0	21.2	7.2	14.2	24.8	12.2	18.5	27.6	14.8	21.2	26.3	17.4	21.9	25.0	18.4	21.7	24.6	17.8	21.2	24.1	15.6	19.9	21.6	12.2	16.9	19.5	9.9	14.7	14.1	4.8	9.5	16.6
1980	13.9	2.9	8.4	16.0	4.9	10.5	20.3	8.2	14.3	27.1	13.0	20.1	25.7	14.9	20.3	24.9	18.1	21.5	24.5	18.5	21.5	24.2	18.1	21.2	21.9	16.0	19.0	19.7	10.5	15.1	18.4	7.9	13.2	15.2	5.4	10.3	16.3
1981	13.0	3.9	8.5	17.6	6.1	11.9	19.6	8.7	14.2	22.0	11.8	16.9	23.9	14.7	19.3	25.8	17.5	21.7	24.0	18.9	21.5	24.7	18.5	21.6	23.5	16.8	20.2	22.1	12.5	17.3	17.7	7.6	12.7	13.7	4.3	9.0	16.2
1982	15.1	3.7	9.4	14.8	4.1	9.5	19.2	8.4	13.8	23.3	11.7	17.5	26.3	15.1	20.7	25.2	17.6	21.4	25.5	18.6	22.1	24.9	18.4	21.7	23.2	16.7	20.0	21.3	11.9	16.6	16.8	8.5	12.7	14.4	4.9	9.7	16.2
1983	12.5	2.7	7.6	15.4	3.4	9.4	20.9	8.0	14.5	22.8	11.3	17.1	24.0	14.3	19.2	26.9	17.5	22.2	25.2	18.6	21.9	24.9	18.5	21.7	23.9	17.5	20.7	21.2	13.1	17.2	17.3	8.3	12.8	13.9	3.4	8.7	16.1
1984	12.9	1.8	7.4	16.7	4.1	10.4	22.3	9.8	16.1	24.9	12.5	18.7	24.5	16.0	20.3	25.0	18.4	21.7	23.8	18.6	21.2	24.9	17.9	21.4	22.3	15.6	19.0	22.2	13.9	18.1	17.1	7.5	12.3	14.6	4.3	9.5	16.3
1985	13.8	3.5	8.7	16.2	4.6	10.4	23.4	10.7	17.1	25.6	13.6	19.6	24.9	14.6	19.8	25.7	17.8	21.8	23.2	18.3	20.8	24.9	18.7	21.8	22.6	16.6	19.6	20.5	13.1	16.8	17.2	7.7	12.5	14.8	5.0	9.9	16.5
1986	13.8	3.6	8.7	16.5	5.0	10.8	20.9	8.6	14.8	23.4	11.7	17.6	24.1	13.5	18.8	25.6	18.3	22.0	24.7	16.0	20.4	25.0	14.9	20.0	22.7	13.4	18.1	20.4	10.2	15.3	17.3	8.4	12.9	14.5	4.3	9.4	15.7
1987	14.3	3.9	9.1	16.7	5.9	11.3	19.5	8.2	13.9	24.0	12.1	18.1	26.0	13.4	19.7	26.2	15.0	20.6	24.1	15.7	19.9	24.2	15.2	19.7	23.8	15.8	19.8	21.3	12.2	16.8	18.3	7.3	12.8	15.8	4.4	10.1	16.0
1988	14.7	4.1	9.4	17.2	5.7	11.5	20.3	8.0	14.2	25.1	11.4	18.3	25.4	15.4	20.4	25.2	17.8	21.5	24.8	19.1	22.0	24.1	18.6	21.4	24.4	17.4	20.9	22.8	12.8	17.8	18.8	7.4	13.1	15.5	5.7	10.6	16.7
1989	12.7	3.0	7.9	16.5	3.5	10.0	20.8	8.5	14.7	25.9	11.9	18.9	26.0	16.0	21.0	25.6	17.8	21.7	24.5	18.4	21.5	24.4	18.2	21.3	23.5	17.5	20.5	22.3	13.1	17.7	17.6	7.3	12.5	14.7	3.8	9.3	16.4
1990	16.4	5.5	11.0	15.1	5.4	10.3	18.2	7.3	12.8	23.4	11.1	17.3	24.3	15.1	19.7	26.6	18.6	22.6	24.0	18.9	21.5	24.7	18.6	21.7	23.7	17.5	20.6	21.1	12.7	16.9	19.5	8.8	14.2	15.8	5.5	10.7	16.6
Mean	14.0	3.3	8.6	16.3	4.7	10.5	20.6	8.4	14.5	24.2	11.9	18.0	25.1	14.7	19.9	25.7	17.5	21.6	24.5	17.7	21.1	24.7	17.8	21.2	23.4	16.3	19.9	21.4	12.3	16.9	18.0	8.1	13.1	14.9	4.7	9.8	16.3
Max	16.4			17.6			23.4			27.1			27.6			26.9			25.5			25.1			24.4			22.8			19.5			16.8			
Mini		1.8			3.4			7.2			10.6			12.2			15			12.6			14.9			13.4			10.2			7.3			3.4		

Table RELATIVE HUMIDITY AT GODAVARI

Year	Jan	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean in Year
	'0845	'0845	'0845	'0845	'0845	'0845	'0845	'0845	'0845	'0845	'0845	'0845	
1977	78.0	72.0	67.0	66.0	69.0	74.0	84.0	78.0	81.0	81.0	82.0	82.0	76.2
1978	75.0	75.0	66.0	64.0	76.0	83.0	85.0	81.0	83.0	80.0	67.0	74.0	75.8
1979	72.0	72.0	55.0	57.0	60.0	69.0	83.0	84.0	81.0	84.0	82.0	82.0	73.4
1980	76.0	78.0	65.0	50.0	68.0	83.0	89.0	90.0	90.0	82.0	78.0	81.0	77.5
1981	89.0	81.0	78.0	78.0	80.0	81.0	93.0	92.0	91.0	77.0	79.0	82.0	83.4
1982	77.0	79.0	77.0	69.0	65.0	85.0	86.0	86.0	86.0	84.0	87.0	86.0	80.6
1983	80.0	75.0	70.0	68.0	82.0	80.0	95.0	94.0	93.0	84.0	82.0	77.0	81.7
1984	74.0	70.0	80.0	72.0	84.0	90.0	94.0	90.0	93.0	84.0	85.0	85.0	83.4
1985	83.0	84.0	71.0	68.0	82.0	86.0	95.0	93.0	94.0	89.0	85.0	87.0	84.8
1986	83.0	78.0	73.0	74.0	79.0	85.0	91.0	86.0	91.0	85.0	86.0	80.0	82.6
1987	82.1	81.1	84.9	72.1	65.7	80.6	92.3	90.6	92.6	89.9	80.3	80.3	82.7
1988	84.1	82.2	81.4	72.2	84.8	91.1	95.1	94.9	93.8	85.0	80.8	85.9	85.9
1989	86.2	70.5	76.2	63.0	76.7	86.5	88.2	93.9	94.7	87.7	82.2	77.0	81.9
1990	85.3	81.0	81.1	76.2	84.8	87.9	93.3	93.9	91.6	81.1	76.2	80.4	84.4
Mean	80.3	77.1	73.3	67.8	75.5	83.0	90.3	89.1	89.7	83.8	80.9	81.4	81.0
Max	89.0	84.0	84.9	78.0	84.8	91.1	95.1	94.9	94.7	89.9	87.0	87.0	
Mini	72.0	70.0	55.0	50.0	60.0	69.0	83.0	78.0	81.0	77.0	67.0	74.0	

Table MAXIMUM DAILY RAINFALL RECORD (1)

YEAR	KAKANI		TOKHA		SUNDARIJAL		INDIAN EMBASSY	
	DATE	RAINFALL	DATE	RAINFALL	DATE	RAINFALL	DATE	RAINFALL
1940	-	-	-	-	*	*	-	-
1941	-	-	-	-	AUG.08	102.1	-	-
1942	-	-	-	-	AUG.14	111.8	-	-
1943	-	-	-	-	JUL. 20	137.4	-	-
1944	-	-	-	-	AUG. 10	91.4	-	-
1945	-	-	-	-	AUG. 02	126.5	-	-
1946	-	-	-	-	JUL. 05	147.6	-	-
1947	-	-	-	-	*	*	*	*
1948	-	-	-	-	AUG.26	95.0	AUG. 27	81.8
1949	-	-	-	-	JUL. 01	58.0	MAY. 18	61.0
1950	-	-	-	-	JUL. 14	87.1	JUN. 21	104.6
1951	-	-	-	-	AUG. 17	51.3	JUN. 30	66.0
1952	-	-	-	-	AUG.27	74.7	AUG. 27	58.7
1953	-	-	-	-	JUL. 01	105.9	JUL. 02	115.6
1954	-	-	-	-	JUL. 27	162.6	JUL. 27	173.2
1955	-	-	-	-	*	*	JUL. 26	52.8
1956	-	-	-	-	AUG.17	72.4	MAY. 25	54.4
1957	-	-	-	-	AUG. 30	58.4	AUG. 06	57.9
1958	-	-	-	-	*	*	SEP. 06	58.9
1959	-	-	-	-	AUG.11	86.4	JUL. 14	48.1
1960	-	-	-	-	JUL. 25	61.0	JUL. 29	59.4
1961	-	-	-	-	MAR. 16	127.0	AUG. 13	87.4
1962	JUN. 13	146.8	-	-	JUN. 10	116.8	JUN.10	72.4
1963	AUG. 19	92.2	-	-	AUG.31	121.9	JUL. 21	54.0
1964	AUG. 18	127.5	-	-	JUL. 14	83.8	JUN. 21	84.2
1965	JUL. 09	73.4	-	-	JUL. 08	66.5	JUN. 18	72.0
1966	-	-	-	-	JUN. 30	86.4	AUG. 24	115.2
1967	-	-	-	-	AUG. 23	85.0	JUL. 10	134.0
1968	-	-	-	-	JUL. 15	82.0	OCT. 05	75.4
1969	-	-	-	-	AUG.19	77.4	AUG. 19	59.1
1970	-	-	-	-	MAY. 21	95.2	JUL. 15	68.0
1971	-	-	-	-	JUN. 11	93.1	JUN. 12	109.0
1972	JUL. 28	161.0	-	-	NOV. 27	92.4	JUL. 28	107.4
1973	SEP. 18	160.0	JUL. 19	120.0	*	*	AUG. 11	96.9
1974	MAR. 30	100.0	JAN. 15	83.5	MAY. 31	90.2	SEP.11	53.4
1975	JUL. 08	74.0	JUL. 30	94.4	AUG. 03	131.2	JUL. 28	89.9
1976	JUL. 23	80.0	JUL. 10	71.2	MAY. 21	99.4		
1977	JUL. 04	100.0	AUG. 01	80.4	AUG. 22	87.4		
1978	JUN . 06	148.7	MAR.12	61.4				
1979	JUL. 02	139.0	JUL. 23	90.6				
1980	JUN. 25	156.0	JUN. 19	130.0				
1981	AUG. 30	131.0						
1982	*	*						
1983	JUN. 24	144.0						
1984	AUG. 26	124.0						
1985	AUG. 04	100.0						
1986	JUL. 16	116.0						
1987	OCT. 20	88.0						
1988	AUG. 07	83.2						
1989	JUL. 30	132.0						
1990	AUG. 15	97.6						
1991	AUG. 07	85.5						

Table MAXIMUM DAILY RAINFALL RECORD (2)

YEAR	SANKHU		KATHMANDU AIRPORT		NAGARKOT		THANKOT	
	DATE	RAINFALL	DATE	RAINFALL	DATE	RAINFALL	DATE	RAINFALL
1940	-	-	-	-	-	-	-	-
1941	-	-	-	-	-	-	-	-
1942	-	-	-	-	-	-	-	-
1943	-	-	-	-	-	-	-	-
1944	-	-	-	-	-	-	-	-
1945	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	-	-
1947	-	-	-	-	-	-	-	-
1948	-	-	-	-	-	-	-	-
1949	-	-	-	-	-	-	-	-
1950	-	-	-	-	-	-	-	-
1951	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-	-
1961	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	*	*
1967	-	-	-	-	-	-	*	*
1968	-	-	OCT. 05	80.4	-	-	*	*
1969	-	-	AUG. 19	48.5	-	-	AUG.12	46.2
1970	-	- *	JUL. 16	73.5	-	-	May-18	92.0
1971	AUG.07	44.0	JUN. 12	83.6	*	*	JUN. 12	126.8
1972	JUN. 03	90.0	JUL. 28	102.8	JUL. 16	60.8	JUL. 28	134.8
1973	JUL. 05	46.0	JUL. 25	102.0	AUG. 07	94.0	OCT. 13	112.0
1974	JUL. 31	46.0	AUG. 21	71.2	JUL. 23	80.8	May-02	132.4
1975	SEP. 27	44.0	AUG. 03	89.2	JUL. 28	81.2	JUL. 28	100.4
1976	May-11	40.8	JUN. 10	73.2	AUG. 23	82.0	JUN. 02	106.4
1977	JUL. 02	40.8	AUG. 05	57.6	JUN. 20	88.5	AUG. 10	60.8
1978	JUL. 16	126.0	AUG.10	71.2	JUL. 28	92.1	JUL. 16	135.0
1979	AUG. 14	90.0	JUL. 24	86.0	JUL. 24	96.4	JUL. 24	132.0
1980	JUL. 14	80.0	JUN. 09	100.1	JUN. 09	95.5	JUN. 09	84.4
1981	May-16	67.5	May-21	53.5	JUL. 29	79.3	SEP. 29	100.3
1982	JUL. 06	60.0	JUN. 28	87.6	AUG. 15	69.0	SEP. 14	41.3
1983	JUL. 22	102.0	JUL. 17	72.0	AUG. 02	72.5	SEP. 22	75.9
1984	AUG. 13	85.0	AUG. 16	76.5	JUN. 28	85.0	SEP. 08	75.1
1985	May-01	80.5	SEP. 17	69.3	*	*	SEP. 15	80.1
1986	JUL. 31	80.0	JUL. 16	77.6	JUL. 31	179.4	JUN. 24	100.5
1987	OCT. 20	95.5	OCT. 20	124.4	OCT. 20	90.6	OCT. 20	157.4
1988	AUG.1,JUN18	65.0	JUL. 12	66.0	AUG. 01	72.4	SEP. 08	122.4
1989	AUG. 08	82.0	JUL. 30	57.0	AUG. 08	97.6	JUL. 16	70.3
1990	JUL.9, AUG. 9	92.0	May-29	73.2	JUL. 14	101.2	AUG. 27	116.2
1991	AUG. 08	91.0	AUG. 15	44.7	JUN.01	92.5	AUG.28	54.3

Table

MAXIMUM DAILY RAINFALL RECORD (3)

YEAR	BHAKTAPUR		KHUMALTAR		GODAVARI	
	DATE	RAINFALL	DATE	RAINFALL	DATE	RAINFALL
1940	-	-	-	-	-	-
1941	-	-	-	-	-	-
1942	-	-	-	-	-	-
1943	-	-	-	-	-	-
1944	-	-	-	-	-	-
1945	-	-	-	-	-	-
1946	-	-	-	-	-	-
1947	-	-	-	-	-	-
1948	-	-	-	-	-	-
1949	-	-	-	-	-	-
1950	-	-	-	-	-	-
1951	-	-	-	-	-	-
1952	-	-	-	-	-	-
1953	-	-	-	-	JUL. 27	57.2
1954	-	-	-	-	JUL. 26	174.0
1955	-	-	-	-	AUG. 06	83.2
1956	-	-	-	-	May-24	90.0
1957	-	-	-	-	AUG. 05	66.2
1958	-	-	-	-	OCT. 03	60.7
1959	-	-	-	-	JUL. 25	111.5
1960	-	-	-	-	JUL. 06	77.5
1961	-	-	-	-	*	*
1962	-	-	-	-	JUN. 28	97.2
1963	-	-	-	-	*	*
1964	-	-	-	-	*	*
1965	-	-	-	-	*	*
1966	-	-	-	-	*	*
1967	-	-	*	*	*	*
1968	-	-	OCT. 05	117.0	*	*
1969	-	-	AUG. 19	45.0	-	-
1970	-	-	JUL. 16	100.0	*	*
1971	*	*	JUN. 12	90.0	JUN.11	123.0
1972	JUL. 28	58.8	JUL. 28	48.0	JUL. 20	109.4
1973	*	*	JUL. 25	85.0	JUL. 25	122.2
1974	*	*	-		JUL. 15	88.0
1975	JUN. 28	41.6	JUL. 28	101.6	JUL. 28	159.6
1976	AUG. 08	54.4	SEP. 19	62.0	JUN. 10	117.4
1977	AUG. 28	67.2	JUN. 07	60.2	JUL. 08	114.2
1978	OCT. 06	74.3	JUL. 03	135.0	OCT. 06	99.4
1979	JUL. 24	73.8	AUG. 21	86.0	JUL. 24	96.8
1980	JUN. 09	69.5	JUN. 09	58.2	JUN. 19	103.1
1981	SEP.29	51.9	SEP. 29	85.5	SEP. 30	168.5
1982	JUL. 04	41.3	APR. 27	76.0	JUL. 07	68.0
1983	JUL. 16	80.5	JUL. 05	70.0	JUL. 04	84.0
1984	AUG. 26	69.1	SEP. 06	65.5	SEP. 06	110.0
1985	SEP. 05	78.6	SEP. 05	71.5	JUL. 07	119.5
1986	JUN.29	107.6	JUN. 29	73.0	JUL. 26	96.0
1987	AUG. 06	62.0	OCT. 21	118.0	OCT. 20	172.0
1988	JUN. 18	96.0	DEC. 27	78.0	DEC. 26	63.5
1989	SEP. 21	68.8	JUL. 01	51.0	AUG. 07	68.2
1990	AUG. 12	62.6	JUL. 14	62.6	AUG. 13	110.0
1991	JUL. 08	41.0	APR. 01	44.2	JUL. 08	92.8

Table PROBLE DAILY RAINFALL

Return Period (Years)	Method		
	Hazen	Gambel	Pearson III
2	98.79	98.60	98.29
5	128.26	130.90	127.43
10	146.35	152.29	146.48
20	164.45	172.80	164.23
50	186.89	199.35	188.18
80	198.40	212.86	200.05
100	203.71	219.25	205.94
200	220.30	239.07	223.91

Table

Calculation Of Flood Water Level

	Return Period (Years)	W.D. (m)	A (Sq. m.)	P (m)	R (m)	I	V (m/s)	Q=A.V (m^3/s)	Design F.D. (m^3/s)	W.L. Of Flood
Bagmati	100	4.30	500.00	220.00	2.27	1/400	2.88	1440.51	1367.49	1277.30
Bridge NO. 1	10	4.10	410.00	210.00	1.95	1/400	2.60	1067.44	972.66	1277.10
Bagmati	100	4.20	354.00	129.18	2.74	1/400	3.26	1155.38	1121.01	1280.10
Bridge NO. 2	10	3.70	285.00	125.00	2.28	1/400	2.89	822.84	797.35	1279.60
Bagmati	100	4.20	390.00	182.00	2.14	1/400	2.77	1080.38	1061.28	1284.20
Bridge NO. 3	10	3.48	324.54	182.09	1.78	1/400	2.45	795.13	754.86	1283.68
Bagmati *	100								217.17	1286.45
Bridge NO. 4	10								154.47	1285.94
Manahara Ri.	100	4.64	280.00	117.00	2.39	1/400	2.98	834.94	822.14	1286.07
(C.S.-16-16)	10	4.14	240.00	107.00	2.24	1/400	2.86	685.40	584.77	1285.57
Dhobi Khola	100	3.01	60.72	62.45	0.97	1/250	2.07	125.63	104.68	1284.15
(C.S. 18-18)	10	2.50	45.00	50.00	0.90	1/250	1.97	88.43	74.45	1283.60

* Given by non-uniform flow calculation

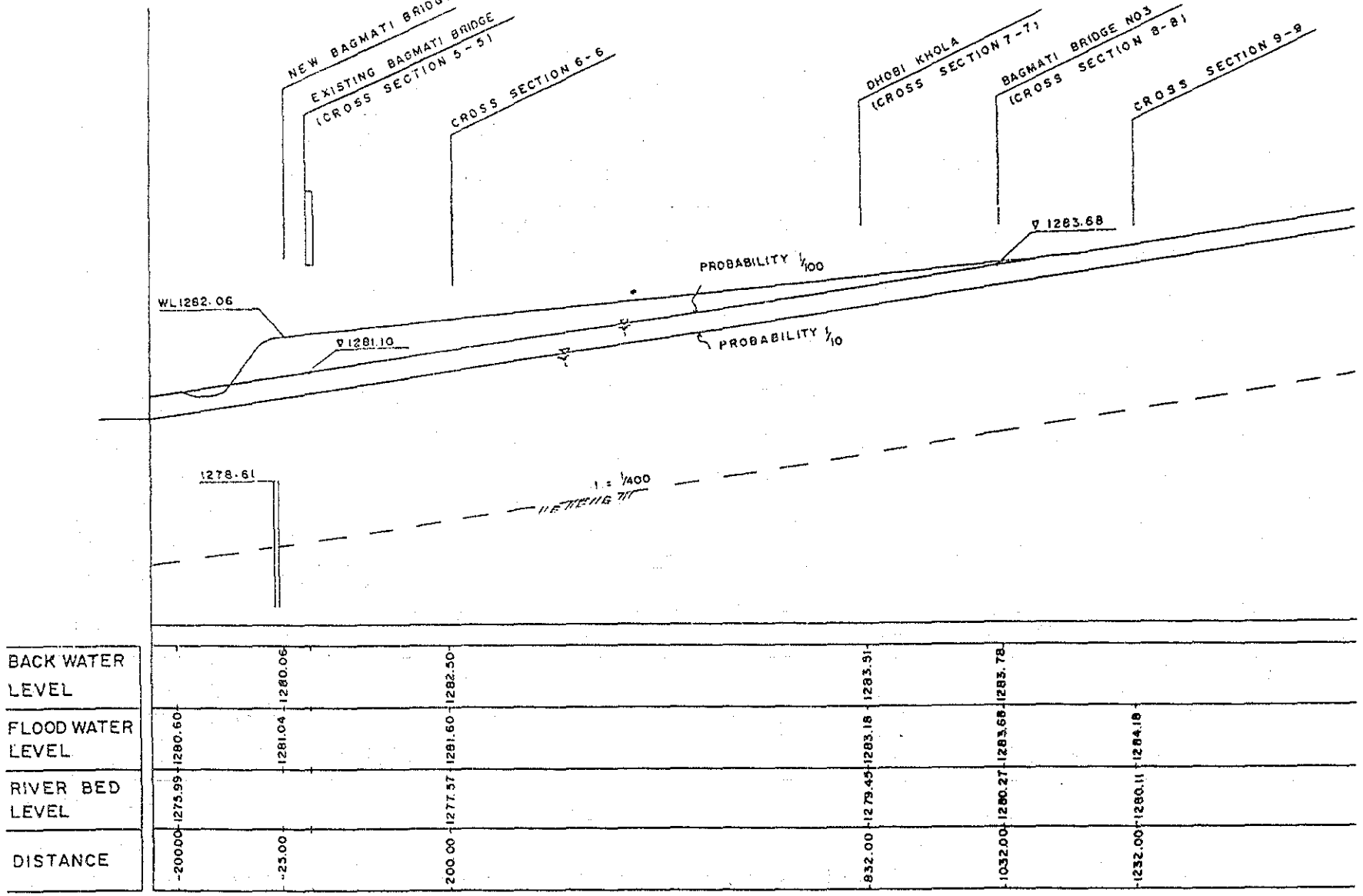


FIG. BACK WATER BY GROUND SILL AT DOWNSTREAM OF BAGMATI BRIDGE NO. 2

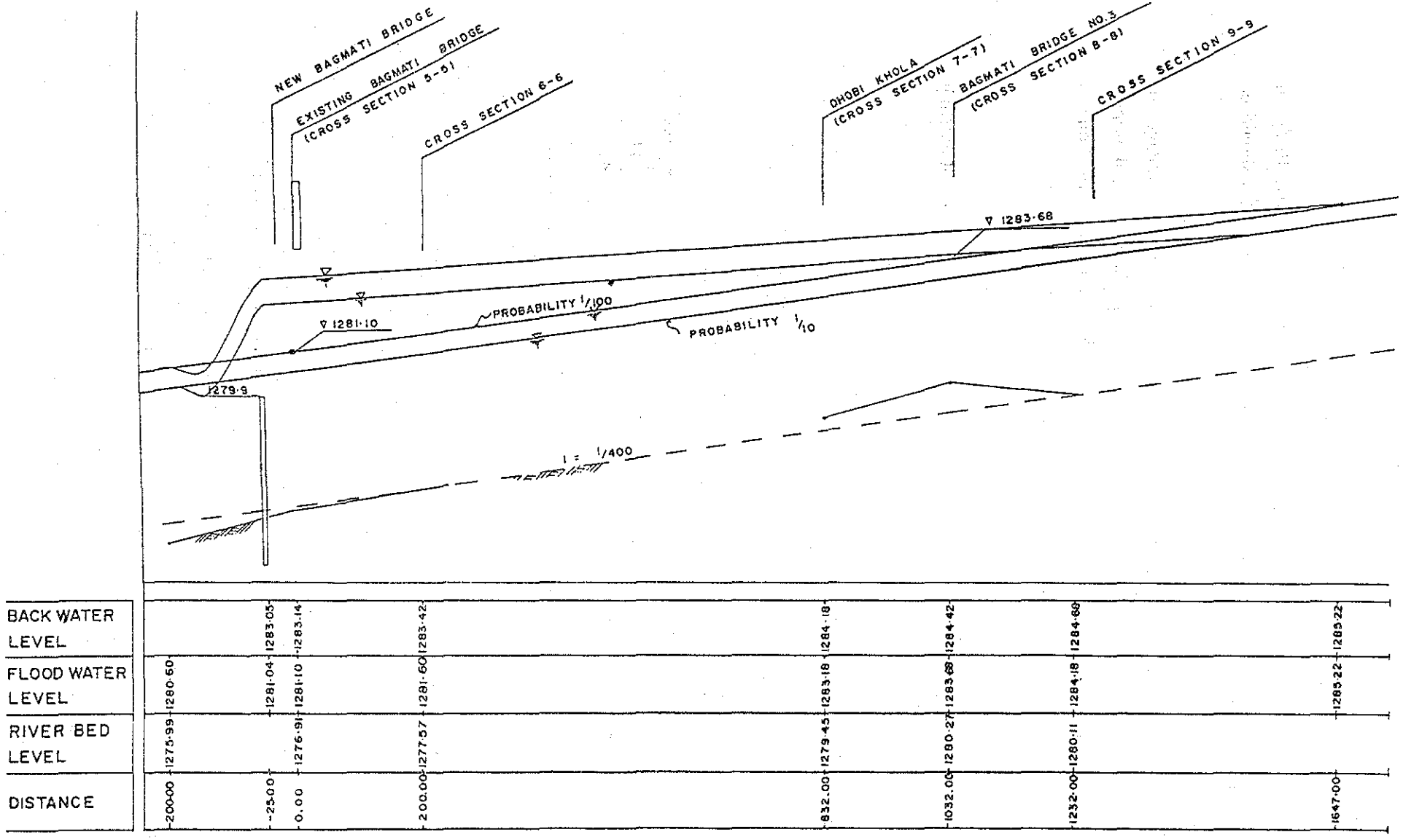


FIG. BACK WATER BY GROUND SILL AT DOWNSTREAM OF BAGMATI BRIDGE NO. 2

Proposed Gro··

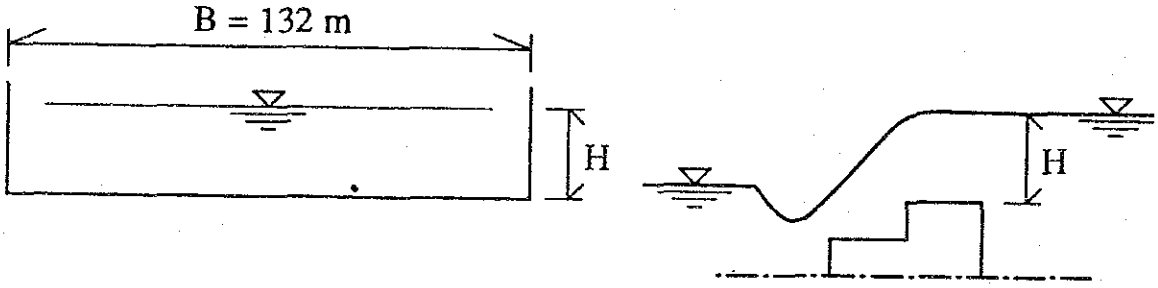
Existing ground sill is constructed to protect piers of Bagmati Bridge at Thapathali when New Bridge is constructed the ground sill should be reconstructed to maintain present condition.

In view point of hydraulics, high ground sills have disadvantages of inundation problems in upstream area. Back water calculation is performed on the following two alternative to study the effect due to change height of ground sill.

Alternative 1

Crest of proposed ground sill is 1279.9 of the same level as one of existing ground sill.

Design discharge	1,121.01 m^3/s
Crest width	132.0 m



Calculation of head over crest is performed by following formula.

$$Q = 0.35\ B\ \sqrt{2}\ g\ H^{3/2}$$

where, Q : discharge (m^3/s)
B : width of crest (m)
g : acceleration due to gravity = 9.8 m/sec^2
H : head over crest

given H = 3.15
Q = 1143.5m/s > 1121.2 m^3/s ------- OK

Water elevation at control point over crest is;

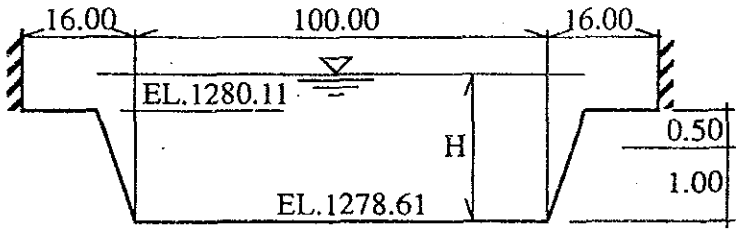
1279.9 + 3.15 = 1283.05

The result of calculation of back water is shown on Fig.A4.3.5 (1/2). In this case, innandation area due to backwater upstream is approximately 60 ha.

Alternative (2)

Crest of proposed ground sill is 1278.56 of the same level as top of footing of pier of Bagmati Bridge at Thapathali.

Design discharge	1,121.7 m^3/s
Under Crest width	130 m
Upper Crest Width	132



given H = 3.5 m

Q = 1128.5 m^3/sec > 1121.7 m^3/s OK

Water elevation at control point over crest is;

1278.56 + 3.50 = 1282.06 m

The result of calculation of back water is shown on Fig.A4.3.5 (2/2). In this case, innandation problem due to back water upstream is almost evaded.

Therefore it is recommended that crest of proposed ground sill is lowered upto 1278.56 on the basis of view point of hydraulics.

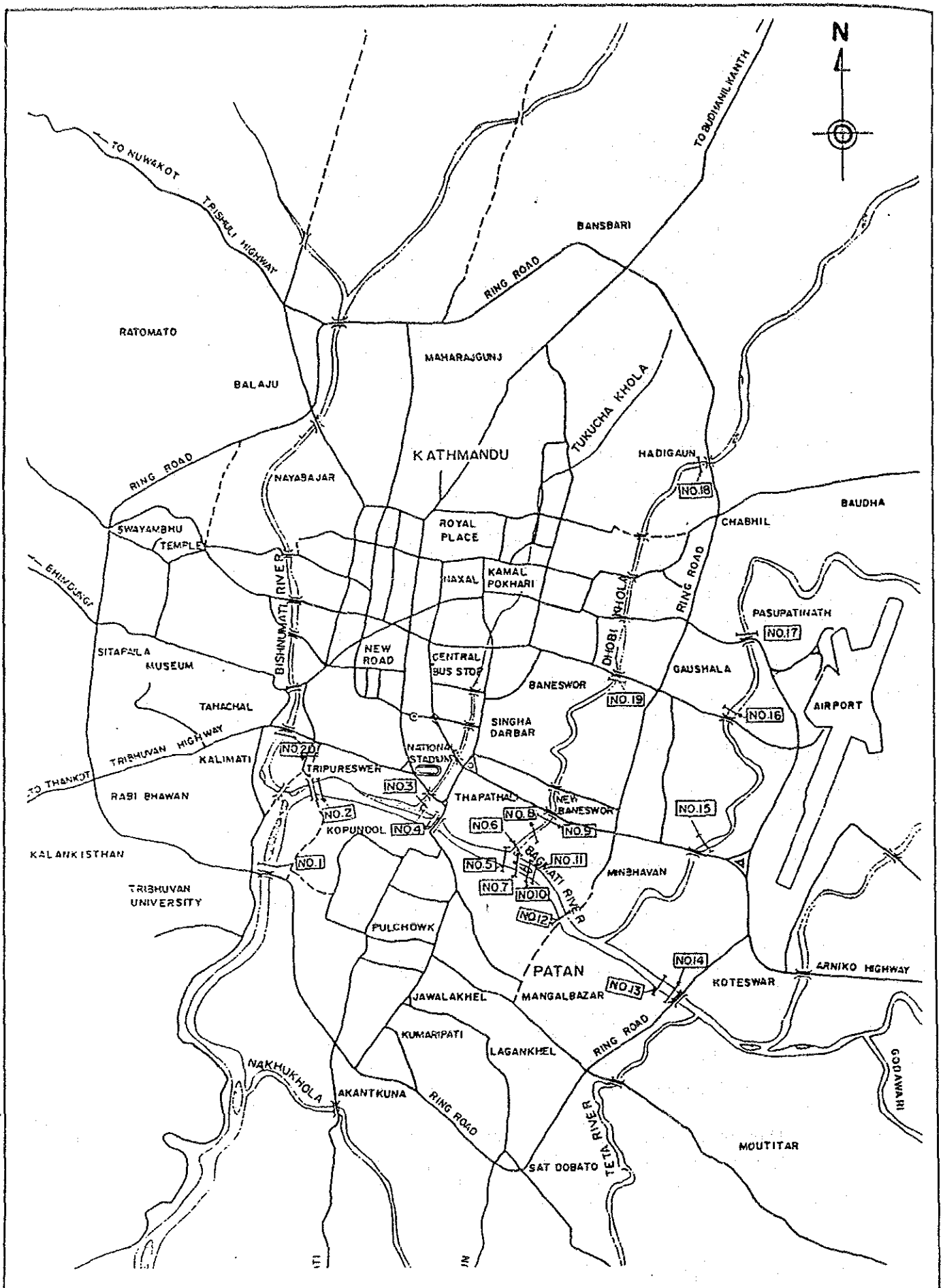
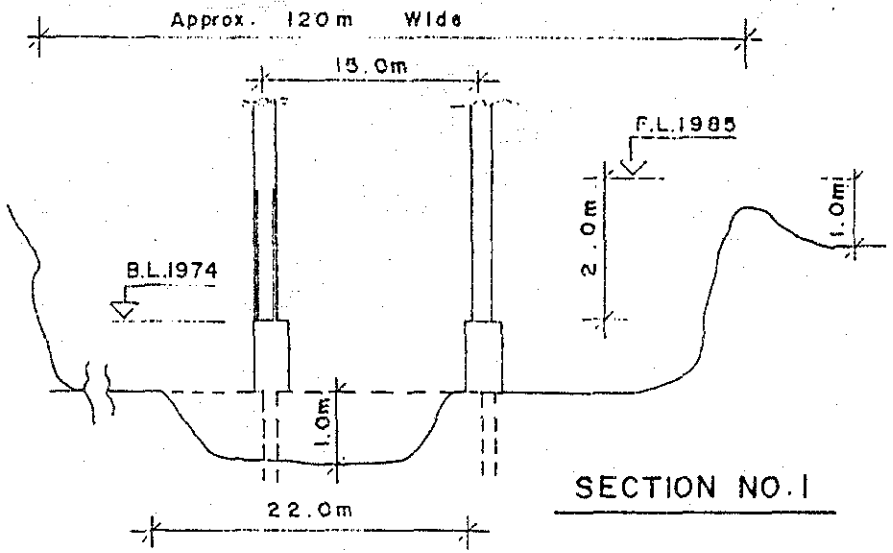


Figure **LOCATION OF REFERED FLOOD LEVEL ENQUIRY SECTION**

DATE : 6|9|92

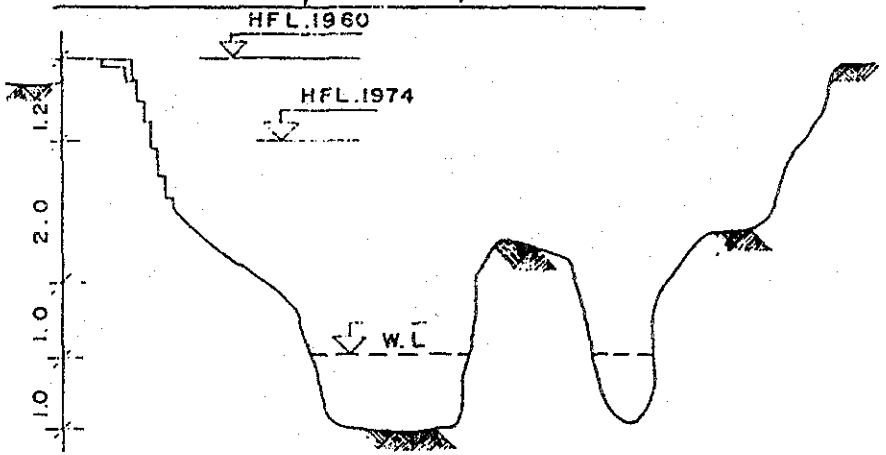
BAGMATI BRIDGE; BALKHU, RING ROAD (Br. No.7)



SECTION NO.1

DATE: 14|9|92

BAGMATI RIVER; BIRAUTA, KOPUNDOL

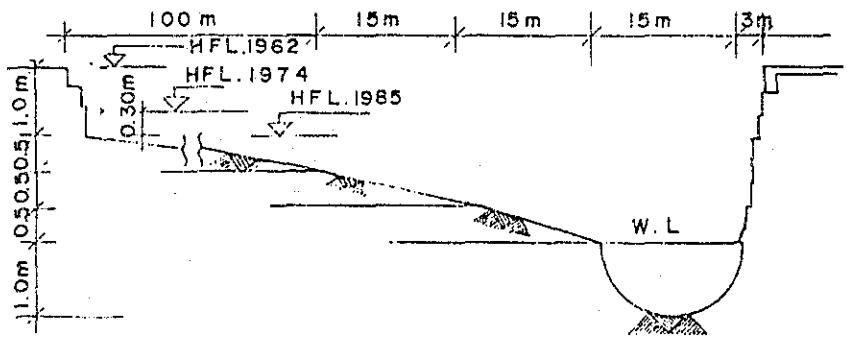


SECTION LOCATION: 200m D S OF BAGMATI BRIDGE

SECTION NO.3

DATE: 14|9|92

BAGMATI RIVER; RAJDAHA TIRTHA, SANEPA

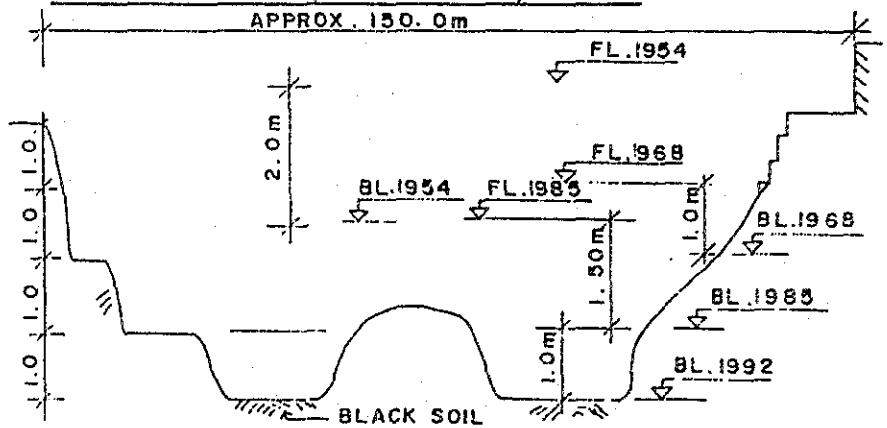


SECTION LOCATION: 100m U/S OF SUSPERISION BRIDGE, TEKU

SECTION NO.2

DATE: 7|9|92

BAGMATI BRIDGE; THAPATHALI, Br. No.5

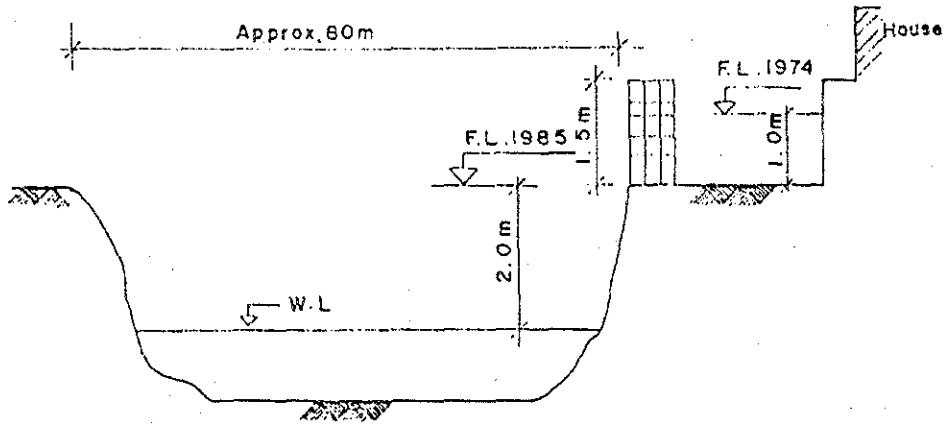


SECTION LOCATION; 40m D/S OF BRIDGE

SECTION NO.4

DATE: 8|9|92

BAGMATI RIVER; D/S OF DHOBIKHOLA

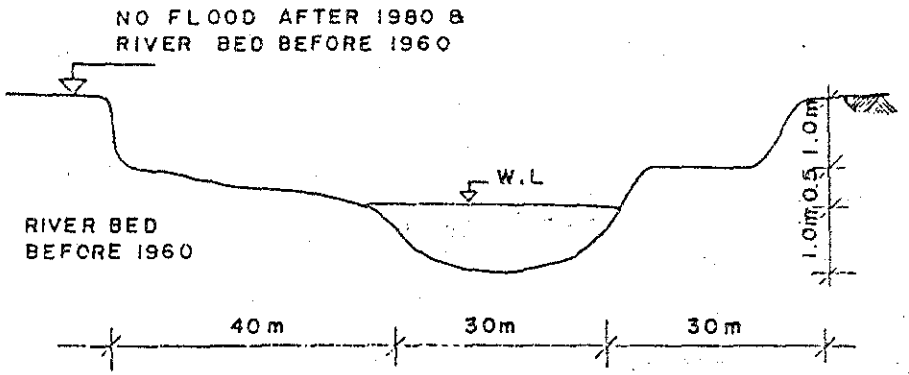


SECTION LOCATION: 20m D/S OF CONFLUENCE OF DHOBI KHOLA

SECTION NO. 5 (SURVEY SECTION NO 7)

DATE: 11|9|92

BAGMATI RIVER U/S OF DHOBI KHOLA CONFLUENCE



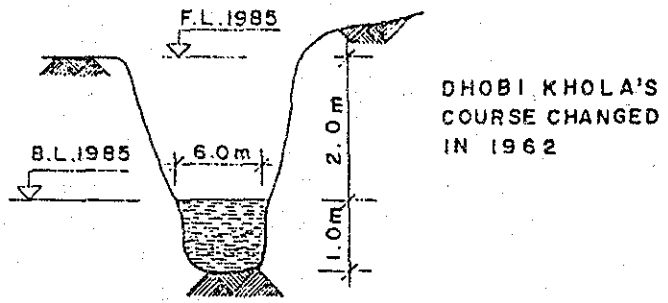
SECTION LOCATION: 150m DIS OF PHANTAL BARAHI AT L/S

SECTION NO. 7

A-36

DATE: 8|9|92

DHOBI KHOLA; CONFLUENCE WITH BAGMATI

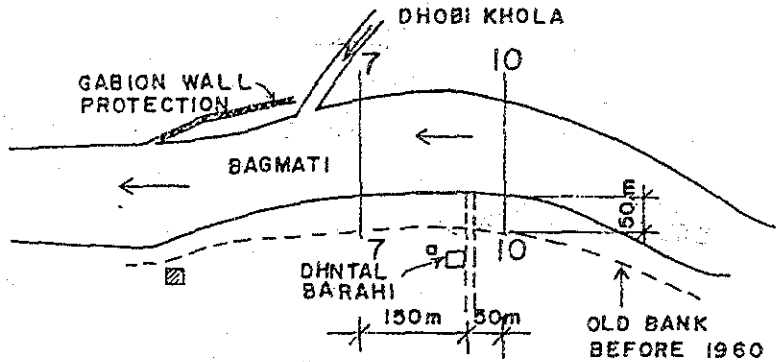


SECTION LOCATION: 15m U/S OF CONFLUENCE WITH BAGMATI

SECTION NO. 6

DATE: 11|9|92

LOCATION PLAN OF SECTIONS AT DHNTAL BARAHI

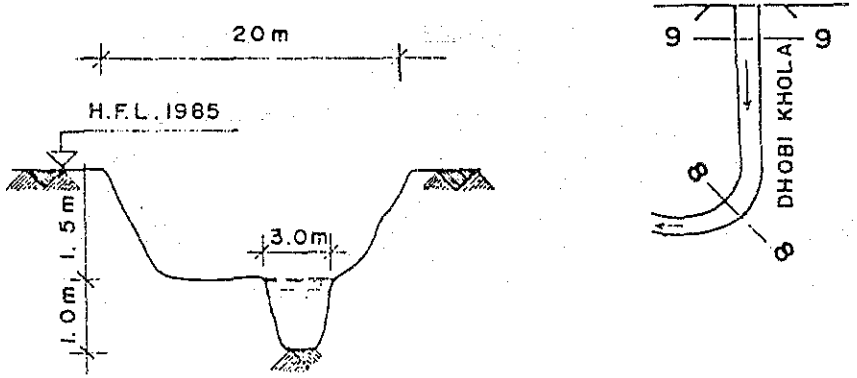


LOCATION: DHOBI KHOLA CONFLUENCE WITH BAGMATI

FOR SECTION NO. 7 & 10

DATE: 8|9|92

DHOBI KHOLA; BUDDHA NAGER

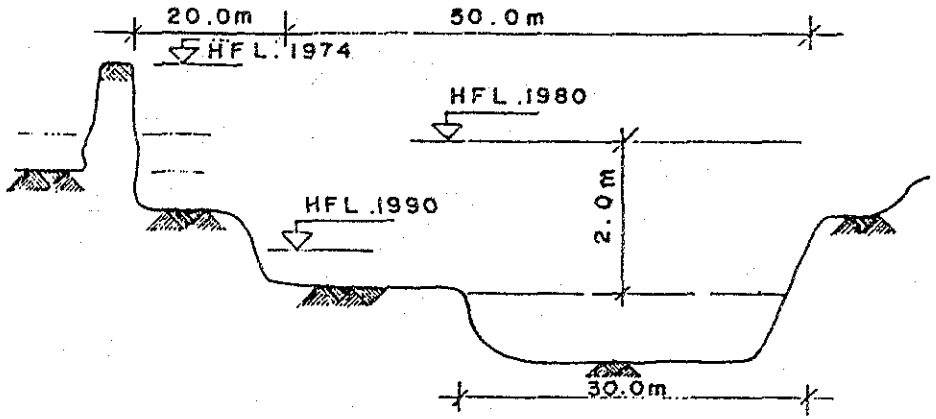


SECTION LOCATION: 500m D/S OF BRIDGE (BABARMAHAL)

SECTION NO. 8

DATE: 11|9|92

BAGMATI AT DHANTAL BARAHI

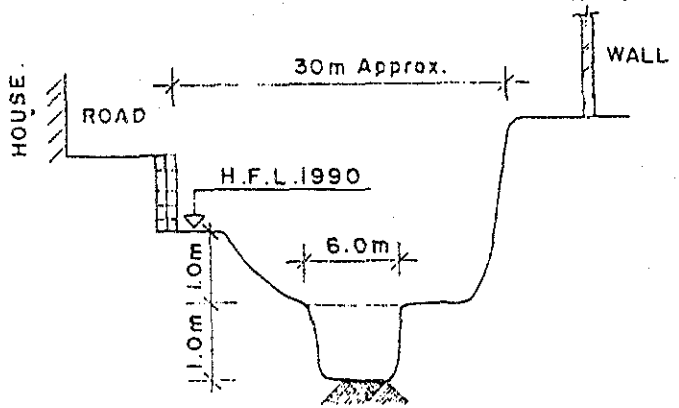


SECTION LOCATION: 50m U/S OF DHANTAL BARAHI AT L/B

SECTION NO. 10

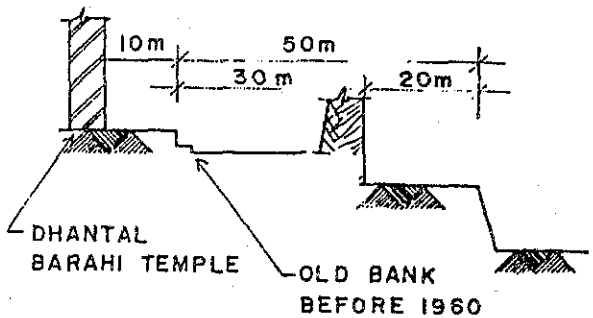
DATE: 8|9|92

DHOBI KHOLA BRIDGE BABAR MAHAL BR. NO



SECTION LOCATION: 15 m D/S OF DHOBIKHOLA BRIDGE

SECTION NO.9 (SURVEY SECTION NO.10)

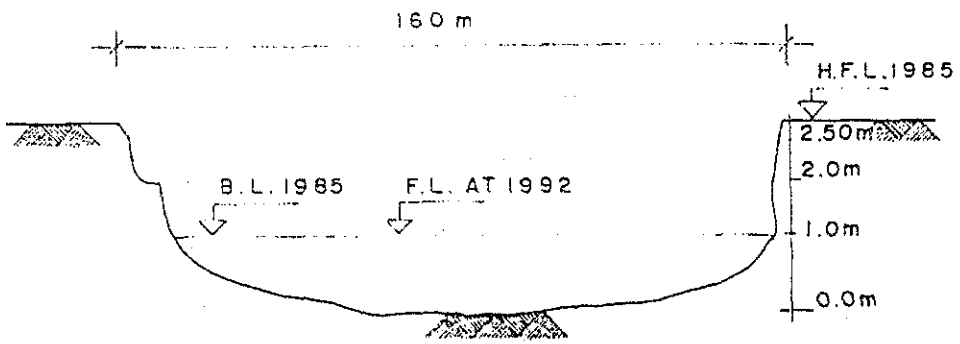


SECTION LOCATION: 50m U/S OF DHANTAL BARAHI AT L/B

SECTION: NO. 10 CONTINUED

DATE : 8|9|92

BAGMATI RIVER, BUDDHANAGAR

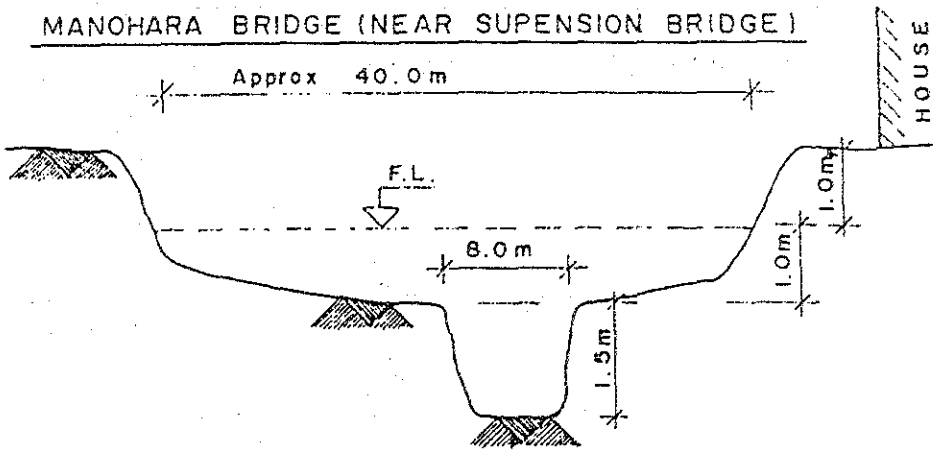


SECTION LOCATION : 400 m U/S OF DHOBIKHOLA CONFLUENCE

SECTION NO. 11

DATE : 8|9|92

MANOHARA BRIDGE (NEAR SUPENSION BRIDGE)

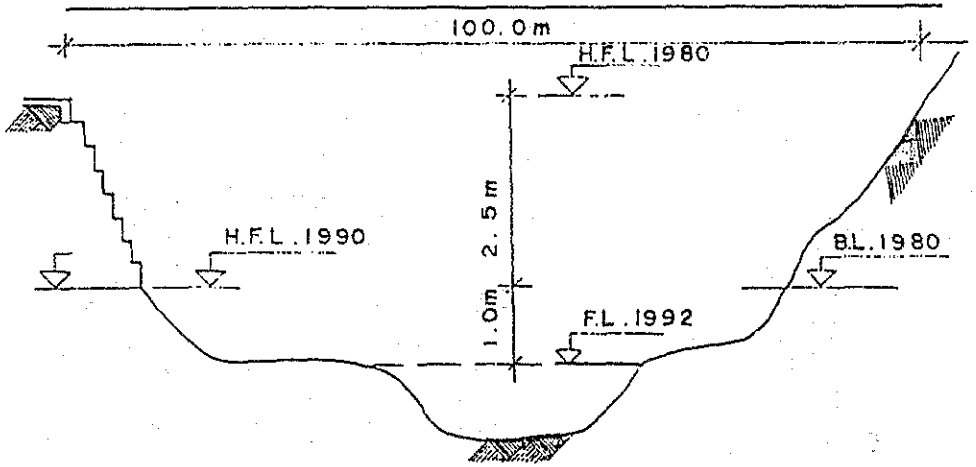


SECTION LOCATION: 100m U/S OF SUSPENSION BRIDGE

SECTION NO. 13

DATE : 8|9|92

BAGMATI BRIDGE SANKHAMUL PEDESTRAN CROSSING

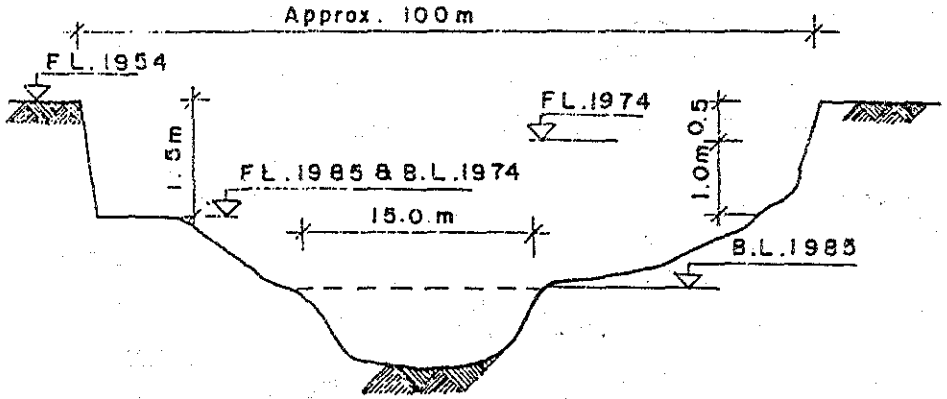


SECTION LOCATION: 10m D/S OF PEDESTRIAN CROSSING

SECTION NO.12

DATE: 7|9|92

MANOHARA BRIDGE; RING ROAD, BALKUMARI

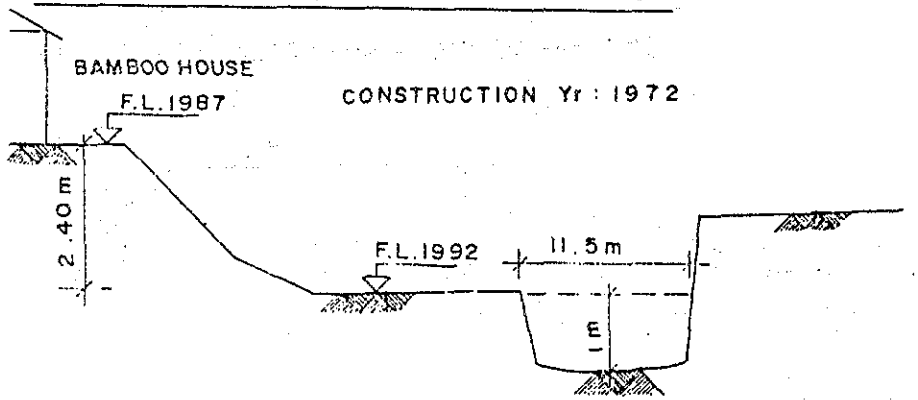


SECTION LOCATION: 15m D|S OF BRIDGE

SECTION NO.14

DATE: 6|9|92

BAGMATI BRIDGE; MINBHAWAN (Br. No.3)

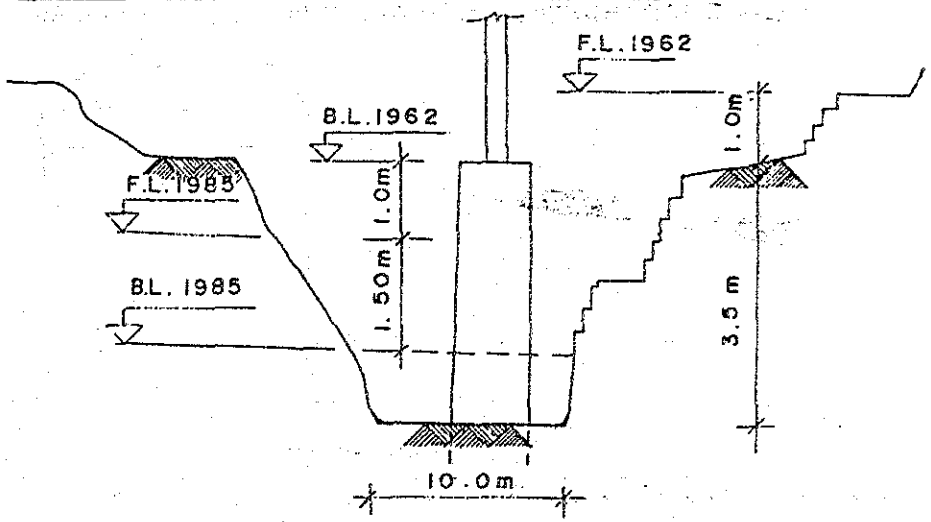


SECTION LOCATION: 30m U/S OF BRIDGE

SECTION NO.15

DATE: 7|9|92

BAGMATI BRIDGE; PRAYAG GHAT (Br. No 2)



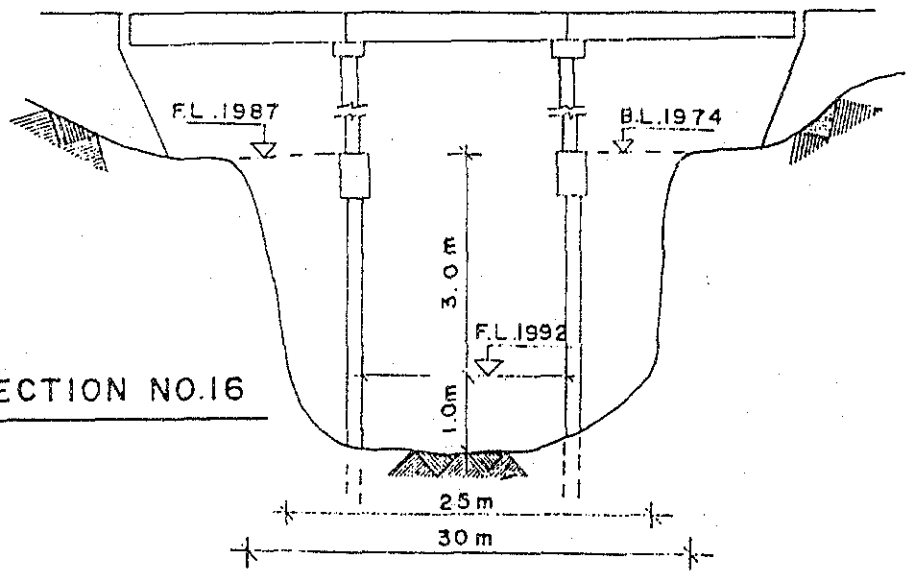
LOCATION: 20m U/S OF BRIDGE

SECTION NO.17

DATE: 6|9|92

BAGMATI BRIDGE; TILGANGA, PASUPATI (Br. No 1)

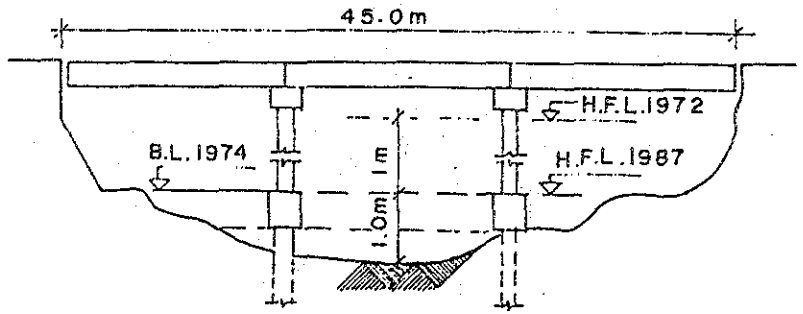
CONSTRUCTION 1974



SECTION NO.16

DATE: 6|9|92

DHOBI KHOLA; CHABAHIL RING ROAD (Br.No11)

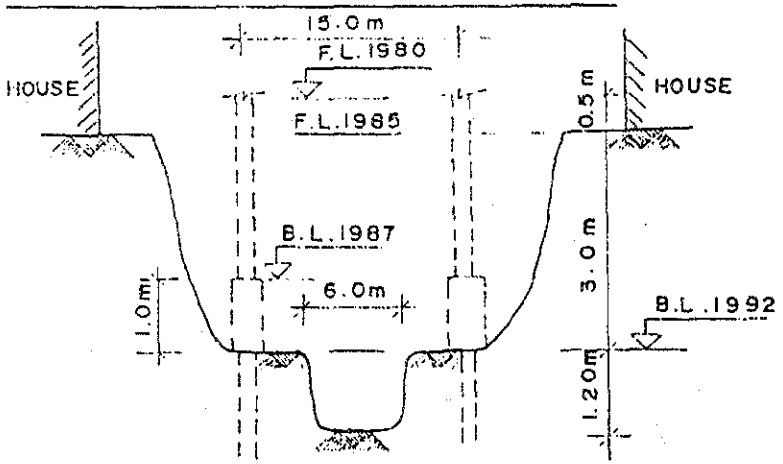


SECTION LOCATION: 15m D/S OF BRIDGE

SECTION NO.18

DATE: 7|9|92

DHOBI KHOLA; MAITI DEVI (Br. No13)

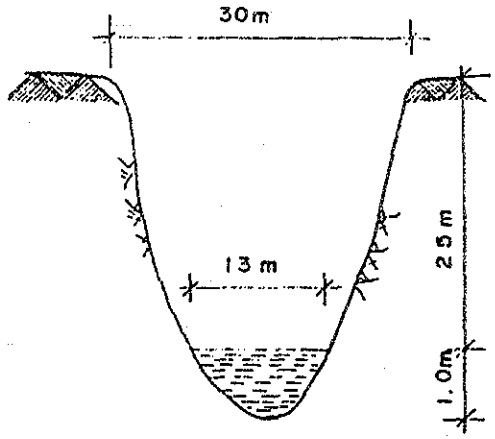


SECTION LOCATION: 10m D/S OF BRIDGE

SECTION NO.19

DATE: 24|9|92

BAGMATI RIVER, CHOVAR



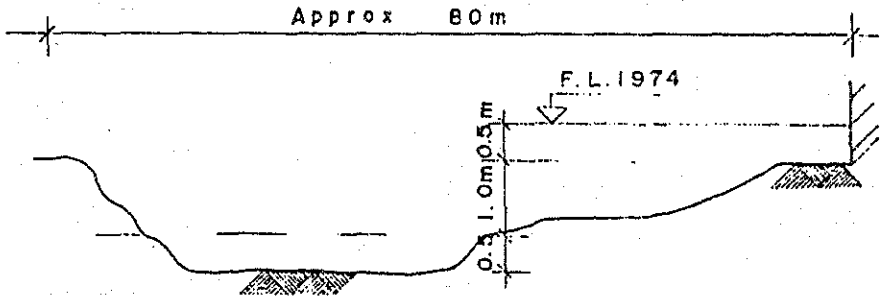
SECTION LOCATION: 15m U/S OF BRIDGE AT CHOVAR

SECTION NO.21

A-40

DATE: 6|9|92

BISHNUMATI BRIDGE; TEKU (Br. No.10)

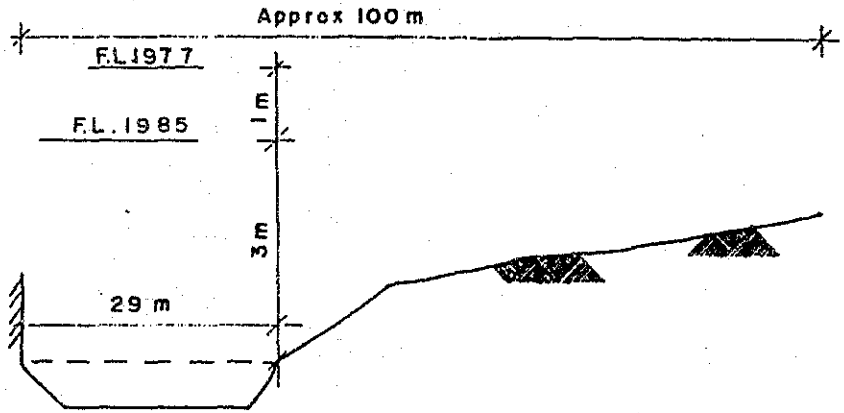


SECTION LOCATION: 15m D/S OF BRIDGE.

SECTION NO.20

DATE: 24|19|92

BAGMATI RIVER, KHOKANA VILLAGE, KHOKANA BRIDGE



SECTION LOCATION: 10m U/S OF KHOKANA BRIDGE

SECTION NO.22

Figure MAP OF INDIA SHOWING SEISMIC ZONES

Table SEISMIC COEFFICIENTS FOR SOME IMPORTANT TOWNS (BNCI)

Town	Zone	Horzontal Seismic Coefficient
Agra	III	0.0 4
Ahmadabad	III	0.0 4
Ajmer	I	0.0 1
Allahabad	II	0.0 2
Almora	IV	0.0 5
Ambala	IV	0.0 5
Amristar	IV	0.0 5
Asansol	III	0.0 4
aurangabad	I	0.0 1
Bahraich	IV	0.0 5
Bangalore	I	0.0 1
Barauni	IV	0.0 5
Bareilly	III	0.0 4
Baroda	III	0.0 4
Bhatinda	III	0.0 4
Bhilai	I	0.0 1
Bhopal	II	0.0 2
Bhubaneswar	III	0.0 4
Bhuj	V	0.0 8
Bikaner	III	0.0 4
Bokaro	III	0.0 4
Bombay	III	0.0 4
Burdwan	III	0.0 4
Calcutta	III	0.0 4
Calicut	III	0.0 4
Chandigarh	IV	0.0 5
Chitradurga	I	0.0 1
Coimbatore	III	0.0 4
Cuttack	III	0.0 4
Darbhanga	V	0.0 8
Darjiling	IV	0.0 5
Dehra Dun	IV	0.0 5
Delhi	IV	0.0 5
Durgapur	III	0.0 4
Gangtok	IV	0.0 5
Gauhati	V	0.0 8
Gaya	III	0.0 4
Gorakhpur	IV	0.0 5
Hyderabad	I	0.0 1
Imphal	V	0.0 8
Jaipur	II	0.0 2
Jamshedpur	II	0.0 2
Jhansi	I	0.0 1
Jodhpur	I	0.0 1
Jorhat	V	0.0 8
Jabalpur	III	0.0 4
Kanpur	III	0.0 4
Kathmandu	V	0.0 8
Kohima	V	0.0 8
Kurnool	I	0.0 1
Lucknow	III	0.0 4
Ludhiana	IV	0.0 5
Madras	II	0.0 2
Madurai	II	0.0 2
Mandi	V	0.0 8
Managalore	III	0.0 4
Monghyr	IV	0.0 5
Moradabad	IV	0.0 5
Mysore	I	0.0 1
Nagpur	II	0.0 2
Nainital	IV	0.0 5
Nasik	III	0.0 4
Nellore	II	0.0 2
Panjim	III	0.0 4
Patiala	III	0.0 4
Patna	IV	0.0 5
Pilibhit	IV	0.0 5
Pondicherry	II	0.0 2
Pune	III	0.0 4
Rajpur	I	0.0 1
Rajkot	III	0.0 4
Ranchi	II	0.0 2
Roorkee	IV	0.0 5
Raurkela	I	0.0 1
Sadiya	V	0.0 8
Simla	IV	0.0 5
Sironj	I	0.0 1
Srinagar	V	0.0 8
Surat	III	0.0 4
Tezpur	V	0.0 8
Thanjavur	II	0.0 2
Tiruchchirappalli	II	0.0 2
Trivandrum	III	0.0 4
Udaipur	II	0.0 2
Varanasi	III	0.0 4
Vijayawada	III	0.0 4
Vishakhapatna	II	0.0 2

Note : The coefficients given are according to 5.2.1 and should be suitably modified for important structures according to 5.2.2 and 5.4

Table

LIST OF EARTHQUAKES OF MORE THAN 5 MAGNITUDE ON RICHTER SCALE, OCCURRED WITHIN THE NEPAL REGION

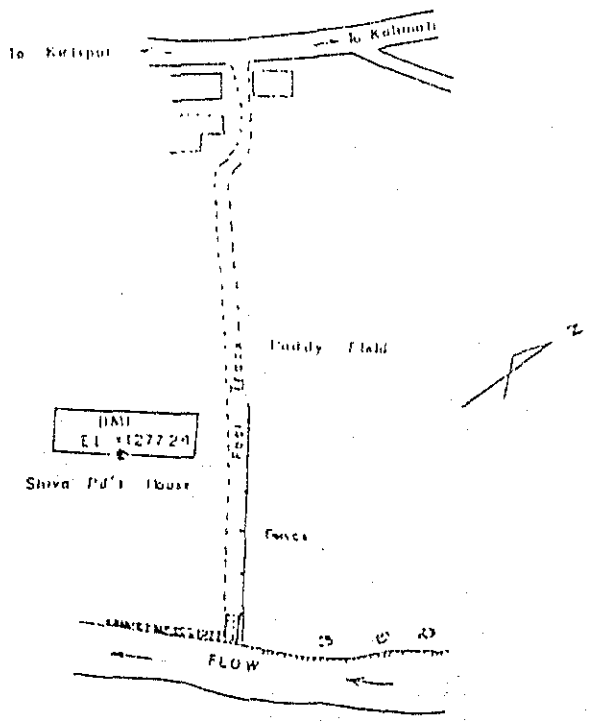
Y	MD	EPCL	AREA	LAT DEG N	LONG DEG E	DEPT KM	INT MM	MAG	REF
1966	12	18	WEST NEPAL	29.600	81.000			5.0	USC
1966	12	21		29.650	80.790			5.2	ISC
1967	01	05		30.000	86.000			5.2	LAO
1967	08	14		28.000	80.000			5.0	LAO
1967	12	18		29.460	81.710			5.0	ISC
1968	05	27	NEPAL	29.700	80.400			5.1	USV
1969	02	04		28.300	81.400			5.1	LAO
1969	02	11		28.100	82.700			6.2	LAO
1969	02	13		27.900	85.400			5.0	LAO
1969	02	13		28.000	81.800			5.3	LAO
1969	02	24		27.900	85.600			5.2	LAO
1969	03	03		30.040	79.840			5.0	ISC
1969	03	05		29.200	81.100			5.2	HARI
1970	02	12		29.240	81.570			5.3	ISC
1970	02	26		27.620	85.700			5.0	ISC
1971	05	03	TIBET	30.790	84.330	27		5.3	ISC
1971	12	04	NEPAL	27.930	87.950	29		5.2	ISC
1972	02	04	TIBET	30.340	84.470	18		5.1	ISC
1972	03	15	TIBET	30.425	84.502	33		5.3	NEIS
1972	04	28	TIBET	31.340	84.920	32		5.0	ISC
1973	01	02	TIBET	61.170	88.080	43		5.1	ISC
1973	04	22	TIBET	28.135	86.993	33		5.2	NEIS
1973	10	16	NEPAL	28.219	82.945	33		5.2	NEIS
1974	03	03	TIBET	30.740	86.320			5.5	ISC
1974	03	24	NEPAL	27.660	86.000			5.4	ISC
1974	09	27	NEPAL	28.590	85.510	20		5.5	ISC
1974	12	23	NEPAL	29.320	81.380	45		5.2	ISC
1975	01	31	NEPAL	28.100	84.729	33		5.4	NEIS
1975	06	19		26.740	87.500			5.1	NEIS
1975	09	06	NEPAL	29.210	81.950	33		5.1	ISC
1975	11	26	TIBET	28.150	87.800	33		5.0	ISC
1976	05	10	NEPAL	29.284	81.460	33		5.2	NEIS
1976	09	14	TIBET	29.795	89.559	82		5.5	NEIS
1976	09	29	NEPAL	29.817	81.390	33		5.0	NEIS
1976	10	23	TIBET	28.676	86.228	63		5.1	NEIS
1977	01	06	TIBET	31.048	88.058	33		5.2	NEIS
1977	03	16	TIBET	31.300	89.380	33		5.0	ISC
1977	11	18	TIBET	32.693	88.388	33		6.5	NEIS
1978	02	10	NEPAL	28.030	84.700			5.3	ISC
1978	08	08	TIBET	32.270	83.100			5.1	ISC
1978	10	04	NEPAL	27.834	85.963	33		5.2	NEIS
1979	05	20	NEPAL INDIA BORDER	30.029	80.310	33		5.9	NEIS
1979	06	19	NEPAL INDIA BORDER	26.740	87.480			5.2	ISC
1980	02	22	TIBET	30.550	88.860	14		5.7	ISC
1980	06	25	TIBET	30.130	81.760	23		5.1	ISC
1980	07	29	NEPAL	29.340	81.210	3		5.7	ISC
1980	07	29	NEPAL	29.598	81.092	18		6.1	NEIS
1980	10	03	TIBET	31.354	87.666	33		5.0	NEIS
1980	10	10	NEPAL	29.170	81.208	33		5.0	NEIS
1980	11	18	TIBET	29.550	85.180	24		5.0	ISC
1980	11	19	SIKKIM	27.400	88.800			6.0	ISC
1981	05	15		29.504	81.942			5.1	
1982	04	05		27.496	88.984			5.1	NEIS
1983	02	02	INDIA CHINA BORDER	27.032	91.870	33		5.2	NEIS
1983	03	01	INDIA CHINA BORDER	28.610	95.982	33		5.0	NEIS
1984	02	19	NEPAL INDIA BORDER	29.659	80.550	58		5.0	NEIS
1984	04	15	TIBET	31.586	82.262	33		5.0	NEIS
1984	05	13	NEPAL	29.606	81.884	33		5.6	NEIS
1984	05	21	INDIA BANGLADESH	23.663	91.519	33		5.3	NEIS
1984	12	30	INDIA BANGLADESH	24.598	92.839	33		5.6	NEIS
1985	06	15		34.630	82.990	20		5.4	ISC
1986	01	10		28.650	86.560	63		5.5	ISC
1986	02	12		34.670	82.930	33		5.0	ISC
1986	03	01		34.680	82.960	33		5.0	NEIS
1986	04	26		32.150	76.400	33		5.5	ISC
1986	06	29		31.220	86.820	33		5.9	ISC
1986	07	06		34.450	80.200	9		5.7	ISC
1986	07	16		31.050	78.000	4		5.6	ISC
1986	07	19		31.180	86.860	17		5.1	ISC
1986	09	09		31.450	85.050	7		5.4	ISC
1987	01	19		28.200	83.600	33		5.2	ISC
1987	08	09		29.470	83.740	74		5.5	ISC
1988	04	20		27.020	86.720	55		5.4	ISC
1988	08	20		26.770	86.610	71		6.4	PDE
1989	02	09		30.040	89.760	33		5.4	PDE
1989	04	03		29.120	90.020	10		5.2	PDE
1989	05	22		27.550	87.770	33		5.0	PDE
1990	02	22		29.070	89.940	33		5.0	PDE

Abbreviation

Y = year
M = month
D = day
EPCL = epicentre location
LAT = latitude
LONG = longitude
Dept = depth of hypocentre
Mag = Magnitude
REF = Reference Agency
ISC = International Seismological Centre, UK
NEIS = National Earthquake Informations Service, USA
PDE = Preliminary Determination of epicentre

Fig. (1) LOCATION DETAIL OF BM

BRIDGE # 1



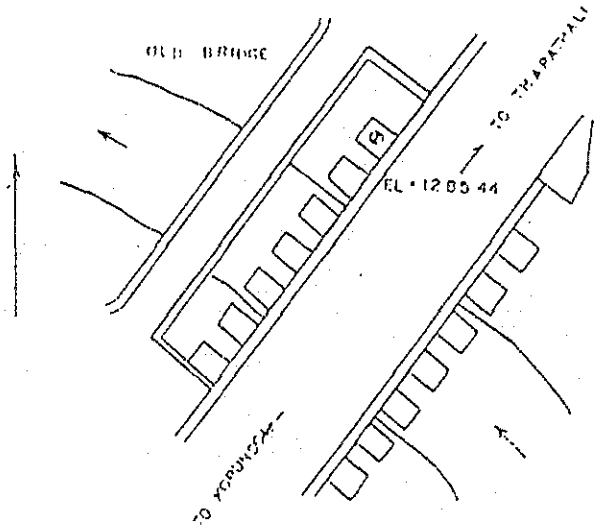
NOTES –

From Kuleshwor (In Between Kulimath & Balkhu joint) follow the Rd. 45 m.m. Towards Balkhu & Turn left and Follow Foot track towards the River Bagmati As shown in the sketch the B.M. (1) is fixed at the Plinth level of Shiva Pd's House

Fig. (2) LOCATION DETAIL OF BM

BRIDGE NO.2

(258 NO. OF GEODETIC SURVEY)



NOTES –

This BM is fixed by Geodetic Branch of department of survey at the D/S edge of Right Abutment of Thapathali Bridge on Deck Level.

JICA