APPENDIX

A-1 Minutes of Discussions

Appendix A-1 Minutes of Discussions

MINUTES OF DISCUSSIONS
FOR THE BASIC DESIGN STUDY
ON THE WATER SUPPLIES TO URBAN & SEMI-URBAN CENTRES
IN THE KINGDOM OF NEPAL

In response to the request from His Majesty's Government of Nepal, the Government of Japan decided to conduct a Basic Design Study on the Water Supplies to Urban and Semi-urban Centres (herein-after referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to the Kingdom of Nepal a study team headed by Mr. Shigeru HATAYA, KEIYO - South Construction office, Water Works Bureau, CHIBA Prefectural Government for 61 days, starting from March 20, 1988 to May 19, 1988.

The team had a series of discussions and exchanged views with the officials concerned of His Majesty's Government of Nepal led by Mr. S.N. SHARMA, Chief Engineer, Department of Water Supply and Sewerage, Ministry of Housing and Physical Planning and conducted a field survey to the proposed project sites.

As the result of the discussions and the surveys, both sides agreed to recommend to their respective governments that the major points of understandings reached between them, attached herewith, should be examined towards the realization of the project.

Kathmandu, April 1st, 1988

Mr. Shigeru HATAYA
Leader of Japanese
Basic Design Study Team
JICA

S.N. SHARMA

Mr. S. N. SHARMA
Chief Engineer,
Department of Water
Supply & Sewerage, Ministry
of Housing and Physical Planning

ATTACHMENT

1. Objective

The objective of the project is to construct and to rehabilitate the Water Supply facilities including the provision of materials and spare parts, in order to supply safe and adequate water to the inhabitants in 9 urban and semi-urban centres.

2. Executing Agency

Department of Water Supply and Sewerage, Ministry of Housing and Physical Planning, is responsible for the technical and administrative matters of the Project.

3. Undertaking of the Government of Japan

The team will convey to the Government of Japan the intention of His Majesty's Government of Nepal that the former takes necessary measures to cooperate in construction and/or rehabilitation of water supply facilities in urban and semi-urban centres listed in ANNEX I within the scope of Japanese Grant Aid program.

4. Understanding of Japan's Grant Aid System

The Nepalese side has understood Japan's Grant Aid System explained by the team.

5. Undertaking of His Majesty's Government of Nepal

His Majesty's Government of Nepal will take the necessary measures listed in ANNEX II, as proposed by the team on condition that the Grant Aid would be extended to the Project.

6. Reconfirmation of the Minute of Discussions

Both sides reconfirmed the ANNEX II of Minutes of Discussions for the Preliminary Study on the Project signed on December 11, 1987 in Kathmandu, Nepal by JICA team leader and Chief Engineer of Department of Water Supply and Sewerage.

ANNEX I

The Project sites

* Mahendranagar
* Dhangadhi
*Tansen
* Bharatpur
* Gaushala
* Lahan
* Rajbiraj
* Bhadrapur and Chandragadi
* Ilam

ANNEX II

1. To acquire the land or the right of way required for the Project implementation

2. To clear, level and reclaim site prior to commencement of the construction. However attempts will be made to select land which is flat and does not require levelling and reclaiming.

3. To ensure the land or right of way necessary for construction of the temporary access roads from the existing rural roads to the proposed tubewell sites.

4. To allow transportation of vehicles, machine rigs and construction equipment on the existing national roads and rural roads.

5. To exempt import duties and incidental expenses and to take necessary measures for custom clearance of the materials, equipment and spare parts brought for the implementation of the Project. These exemptions shall be subject to the existing Nepalese rules and regulations which are applicable to similar grant aid program.

6. To provide facilities for distribution of electricity, water supply, drainage, telephone lines and other incidental facilities to the Project site, as required for satisfactory operation and maintenance of the project.

7. To fully maintain the water supply systems which are constructed and rehabilitated under the Japanese Grant Aid in cooperation with Panchayats, water user's committees and other relevant authorities concerned under the coordinating role of the Department of Water Supply and Sewerage.

J. Hatayo

A-2 Composition of the Team

MEMBER LIST
OF
JAPAN INTERNATIONAL COOPERATION AGENCY STUDY TEAM
FOR
BASIC DESIGN STUDY ON THE PROJECT FOR THE WATER SUPPLIES TO URBAN AND SEMI-URBAN CENTERS
IN
THE KINGDOM OF NEPAL

1.	Team Leader	Mr. Shigeru HATAYA
2.	Project Manager	Mr. Tadanori SUZUKI
3.	Water Supply Planner	Mr. Eijiro UENO
4.	Water Intake Facility	Mr. Akihiko TOGO
5.	Water Supply Facility	Mr. Seimi MOCHIZUKI
6.	Pipeline and Network	Mr. Isao MISONO
7.	Cost Estimator (Home Work Only)	Mr. Shigeru.KOMATU

A-3 Schedule of Site Survey

List 1. Itinerary of Field Work for Team A

No.	Month/ Date	Place	Activities
1	Mar. 20	In-flight	Departure, Tokyo (JL-717)
2	21	KATHMANDU	Arrival, KATHMANDU (TG-311) Visit to Japanese Embassy & JICA office
3	22	- do -	Visit to Ministry of Housing and physical planning (Courtesy Call & Discussion)
4	23	KATHMANDU TANSEN	Trip from KATHMANDU to TANSEN
5	24	TANSEN	Site Survey
6	25	TANSEN BARATPUR	Site Survey, Trip from TANSEN to BARATPUR
7	26	BARATPUR KATHMANDU	Trip from BARATPUR to KATHMANDU
8	27	KATHMANDU BHADRAPUR	Trip from KATHMANDU to BHADRAPUR, Site Survey
9	28	BHADRAPUR ILAM	BHADRAPUR to Ilam, Site Survey
10	29	ILAM BHADRAPUR	Trip from Ilam to BHADRAPUR, Site Survey
11	30	BHADRAPUR KATHMANDU	Trip from BHADRAPUR to KATHMANDU
12	31	KATHMANDU	Discussion with DWSS for the Minutes of the Study
13	Apr. 1	KATHMANDU	Signing of Minutes for the Study
14	2	BANGKOK	Leave for Tokyo (TG 312) (Mr. HATAYA and Mr. SUZUKI)
15	3	TOKYO	Arrival Tokyo (TG-740)

Note:
1) Team A: Mr. HATAYA, Mr. SUZUKI and Mr. TOGO*
2) Team B: Mr. UENO, Mr. TOGO* (from Team A), Mr. MOCHIZUKI and Mr. MISONO
3) Site Survey Covers - the activities of discussion, data collection, site investigation of water resources, water quality analysis, topographical survey and other necessary works

List 2.1 Itinerary of Field Work for Team B

No.	Month/ Date	Place	Activities
1	Mar. 20	In-flight	Departure, Tokyo (JL-717)
2	21	KATHMANDU	Arrival, KATHMANDU (TG-311) Visit to Japanese Embassy & JICA office
3	22	- do -	Visit to Ministry of Housing and physical planning (Courtesy Call & Discussion)
4	23	KATHMANDU TANSEN	Trip from KATHMANDU to TANSEN
5	24	TANSEN	Site Survey
6	25	TANSEN BARATPUR	Site Survey, Trip from TANSEN to BARATPUR
7	26	BARATPUR	Site Survey
8	27	- do -	- do -
9	28	- do -	- do -
10	29	- do -	- do -
11	30	BARATPUR KATHMANDU	Site Survey, Trip from BARATPUR to KATHMANDU
12	31	KATHMANDU	Discussion with DWSS for the minutes of the study
13	Apr. 1	- do -	Attendance of Signing of Minutes
14	2	- do -	Holiday
15	3	- do -	Site Survey (Data collection from DWSS, MPLD and agencies concerned)
16	4	- do -	- do -
17	5	- do -	- do -
18	6	- do -	- do -

List 2.2 Itinerary of Field Work for Team B

No.	Month/ Date	Place	Activities
19	Apr. 7	KATHMANDU MAHENDRANAGAR	Trip from KATHMANDU, DHANGADHI to MAHENDRANAGAR
20	8	MAHENDRANAGAR	Site Survey
21	9	- do -	- do -
22	10	- do -	- do -
23	11	MAHENDRANAGAR DHANGADHI	Trip from MAHENDRANAGAR to DHANGADHI, Site Survey
24	12	DHANGADHI	Site Survey
25	13	- do -	- do -
26	14	- do -	- do -
27	15	DHANGADHI KATHMANDU	Trip from DHANGADHI to KATHMANDU
28	16	KATHMANDU	Holiday
29	17	- do -	Discussion with DWSS
30	18	- do -	Data collection from DWSS and agencies concerned
31	19	- do -	- do -
32	20	KATHMANDU BHADRAPUR	Trip from KATHMANDU, BIRATNAGAR to BHADRAPUR
33	21	BHADRAPUR ILAM	BHADRAPUR to ILAM, Site Survey
34	22	- do -	Site Survey
35	23	- do -	- do -
36	24	- do -	- do -
37	25	ILAM BHADRAPUR	Site Survey, Trip from ILAM to BHADRAPUR
38	26	BHADRAPUR	Site Survey
39	27	- do -	- do -
40	28	BHADRAPUR RAJBIRAJ	Site Survey, Trip from BHADRAPUR to RAJBIRAJ

List 2.3 Itinerary of Field Work for Team B

No.	Month/ Date	Place	Activities
41	Apr. 29	BHADRAPUR RAJBIRAJ	Site Survey
42	30	RAJBIRAJ	Site Survey
43	May 1	- do -	Site Survey of LAHAN
44	2	- do -	- do -
45	3	RAJBIRAJ JANAKPUR	Site Survey, Trip from LAHAN to JANAKPUR
46	4	JANAKPUR	Site Survey of GAUSHALA
47	5	GAUSHALA	Site Survey of GAUSHALA and to HETAUDA
48	6	HETAUDA KATHMANDU	Trip from HETAUDA to KATHMANDU
49	7	KATHMANDU	Holiday
50	8	- do -	Discussion with DWSS and Data collection
51	9	- do -	Data collection from DWSS and Agencies concerned
52	10	- do -	- do -
53	11	- do -	- do -
54	12	- do -	Arrangement of Data
55	13	- do -	- do -
56	14	- do -	Holiday
57	15	- do -	Discussion with DWSS
58	16	- do -	Data arrangement
59	17	KATHMANDU	Discussion with DWSS, visit to Japanese Embassy and JICA office
60	18	BANGKOK	Leave for Tokyo (TG-312)
61	19	TOKYO	Arrival Tokyo (TG-640)

A-4 List of Interviewees

LIST OF INTERVIEWEES

Ministry of Finance		
	Mr. Rajendra B. Karki	
Ministry of Water of Water Resources		
	Mr. M.S. Dhakal	Secretary
	Mr. H.J. Malla	Additional Secretary
Department Water Supply and Sewerage		
	Mr. S.N. Sharma	Chief Engineer
	Mr. Mukti M. Joshi	Acting Superintending Engineer
	Mr. Dinesh C.Pyakural	Senior Divisional Engineer
	Mr. Tashi Tenzing	Divisional Engineer
	Mr. P.K. Tulchan	Engineer
	Mr. B. Acharya	Engineer

Mahendranagar	Water Supply Project Office	Mr. M.P. Sharma	Divisional Engineer
Dhangadhi	"	Mr. D.P. Aryal	Engineer
Tansen	"	Mr. R.P. Singh	"
Bharatpur	"	Mr. M.R. Khan	Divisional Engineer
Janakpur	"	Mr. H.P. Sharma	"
Lahan	"	Mr. R.D. Shah	Engineer
Rajbiraj	"	Mr. A.M.L. Das	Divisional Engineer
Chandragadhi	"	Mr. B.B. Kharel	Engineer
Ilam	"	Mr. M.L. Chaudhary	Divisional Engineer

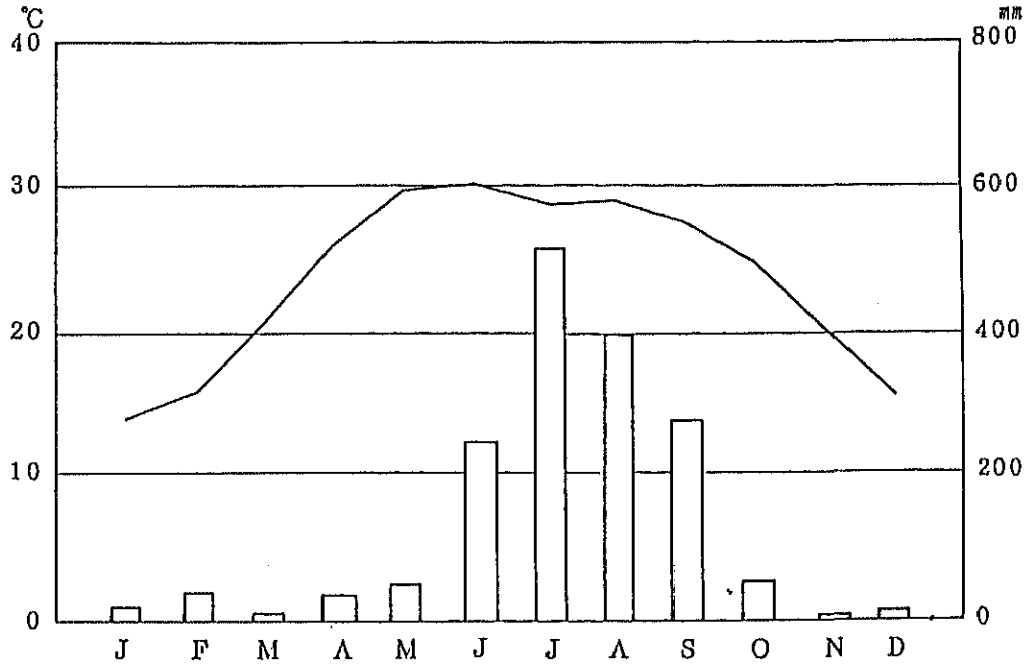
Embassy of Japan in Nepal	Mr. T. Nishina	First Secretary
	Mr. T. Muromoto	Second Secretary
JICA Nepal Office	Mr. H. Ono	Resident Representative
	Mr. M. Sugimoto	Assistant Resident Representative
	Mr. M. Tokiwa	Assistant Resident Representative

B-1 ~ B-5 Natural Condition

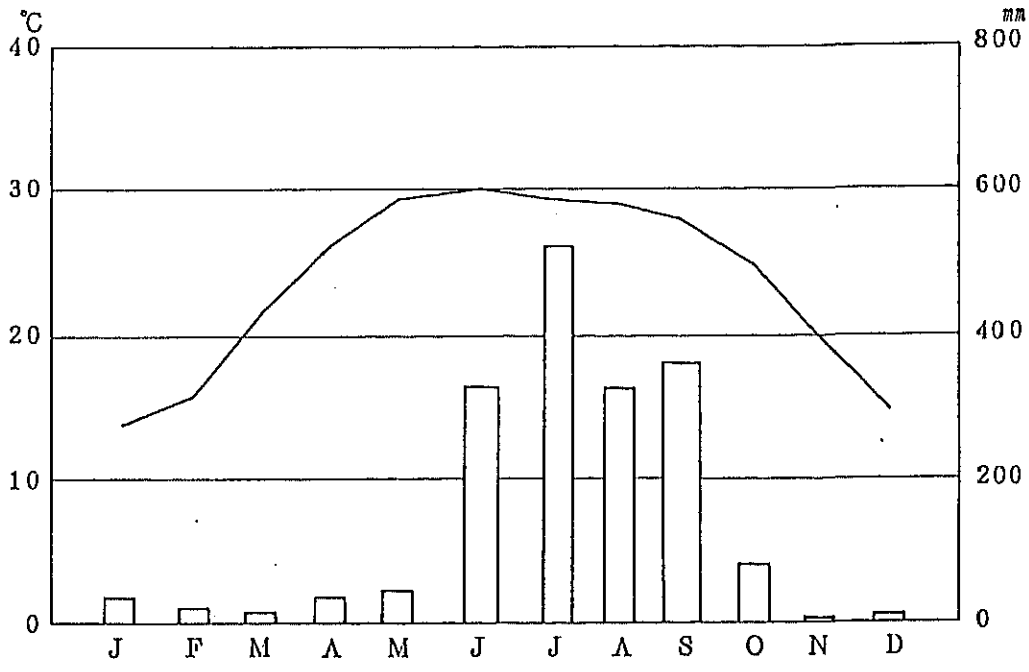
Appendix B－1

Monthly Mean Temperature
and Mean Precipitation （Ｍａｈｅｎｄｒａ Ｎａｇａｒ／Ｄｈａｎｇａｄｈｉ）

Mahendra Nagar P:1971-77,83-84
T:1977-81,83-84



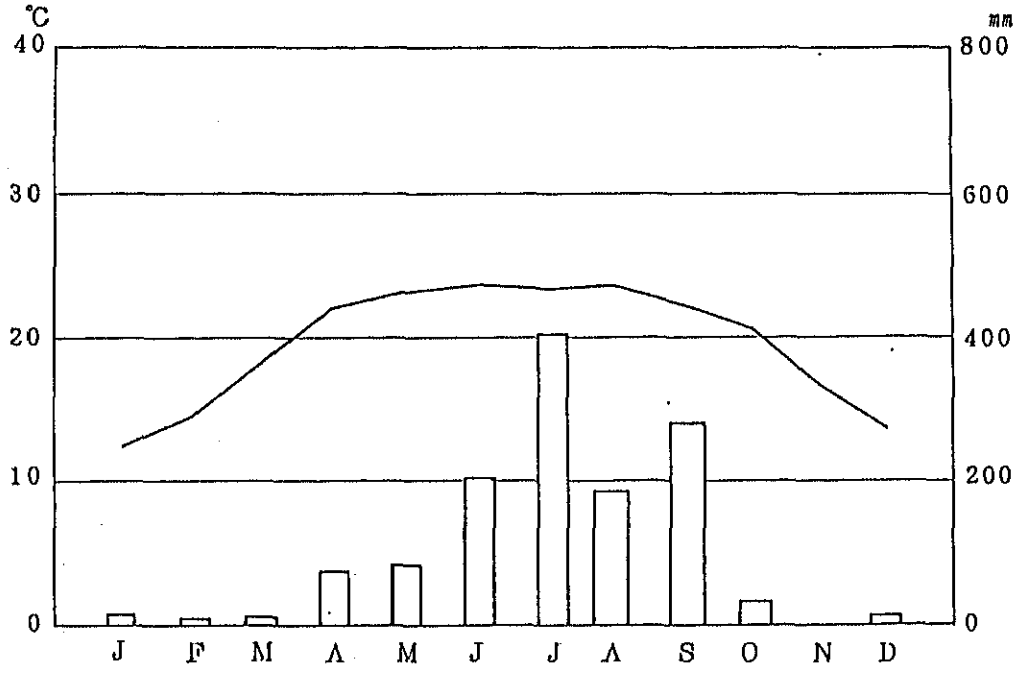
Dhangadhi P:1971-74,83-84
T:1975-84



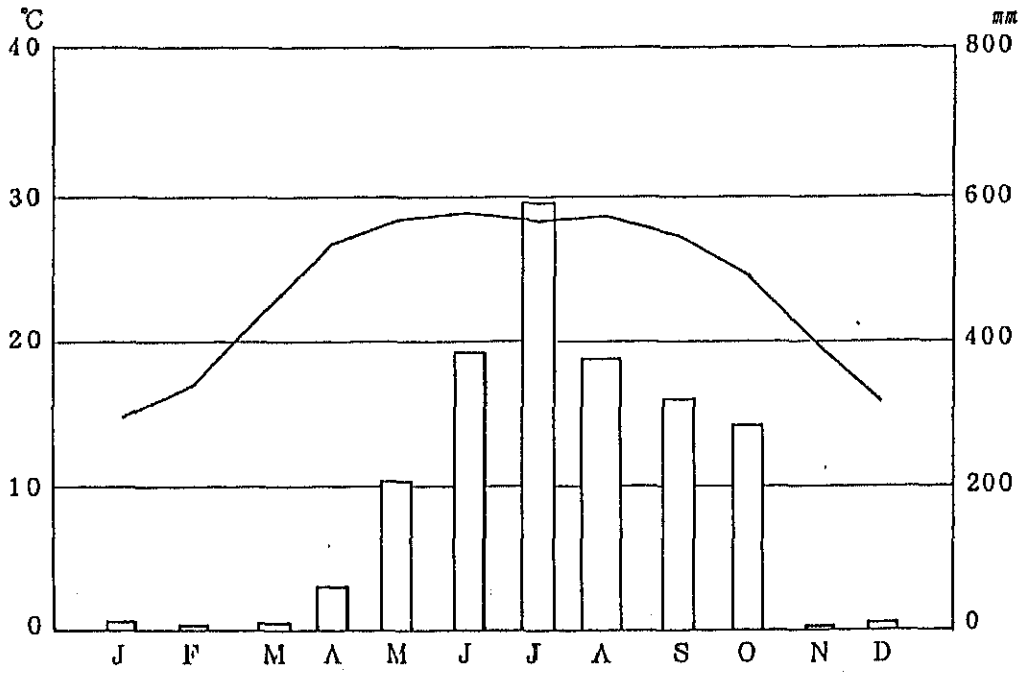
Appendix B－2

Monthly Mean Temperature
and Mean Precipitation　（Tansen／Bhartpur）

Tansen　P:1971-73,83-84
T:1972-74,76-84

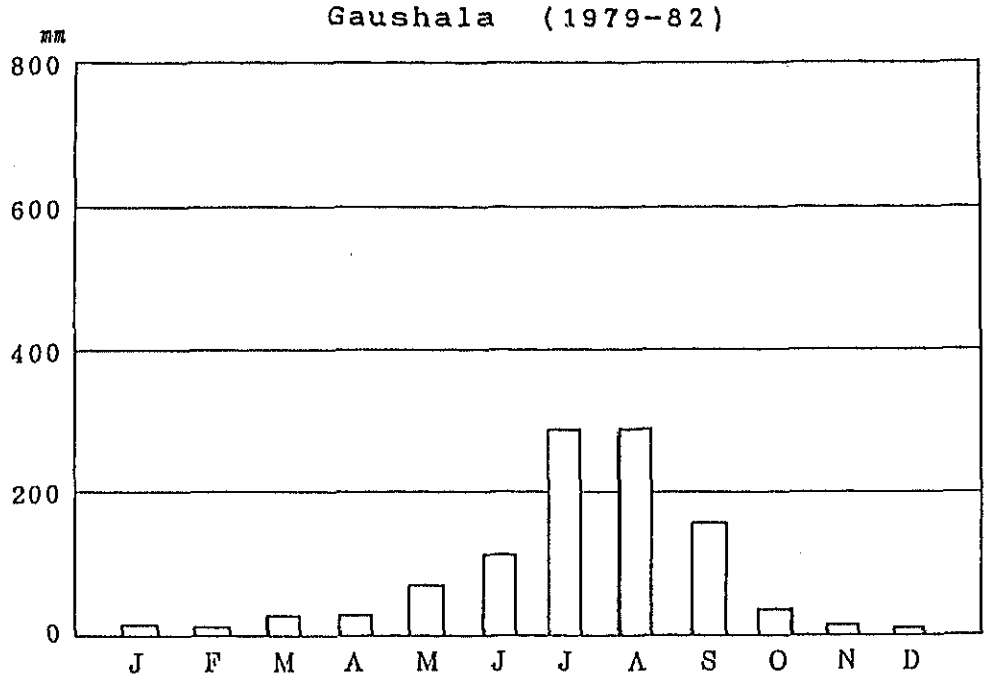


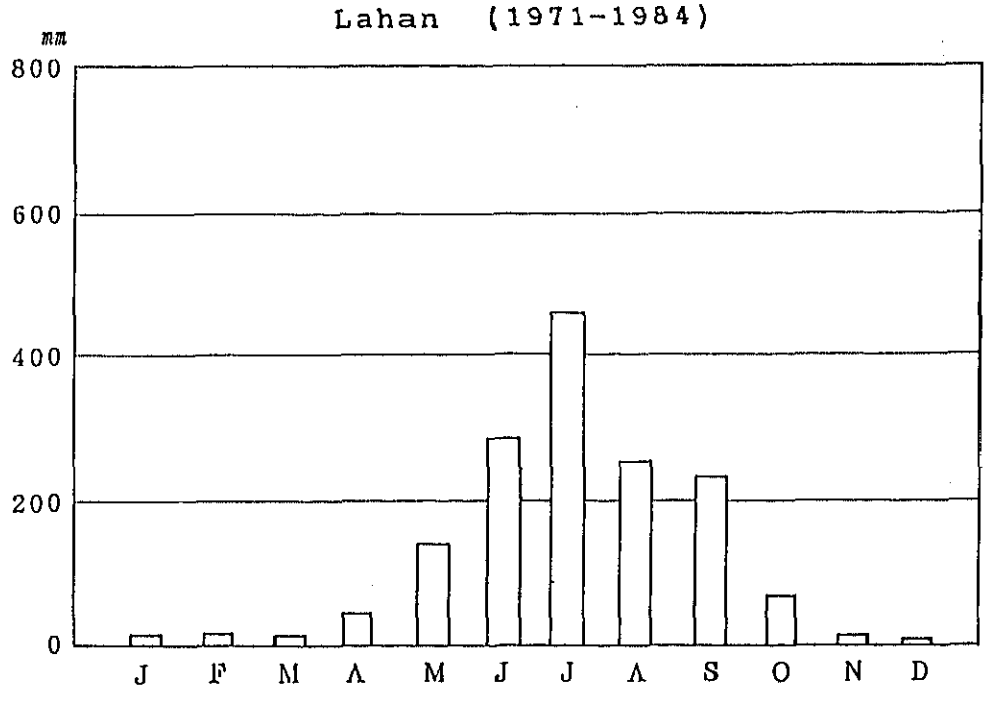
Rumpur(Bharatpur)　P:1971,83-84
T:1971-84



Appendix B－3

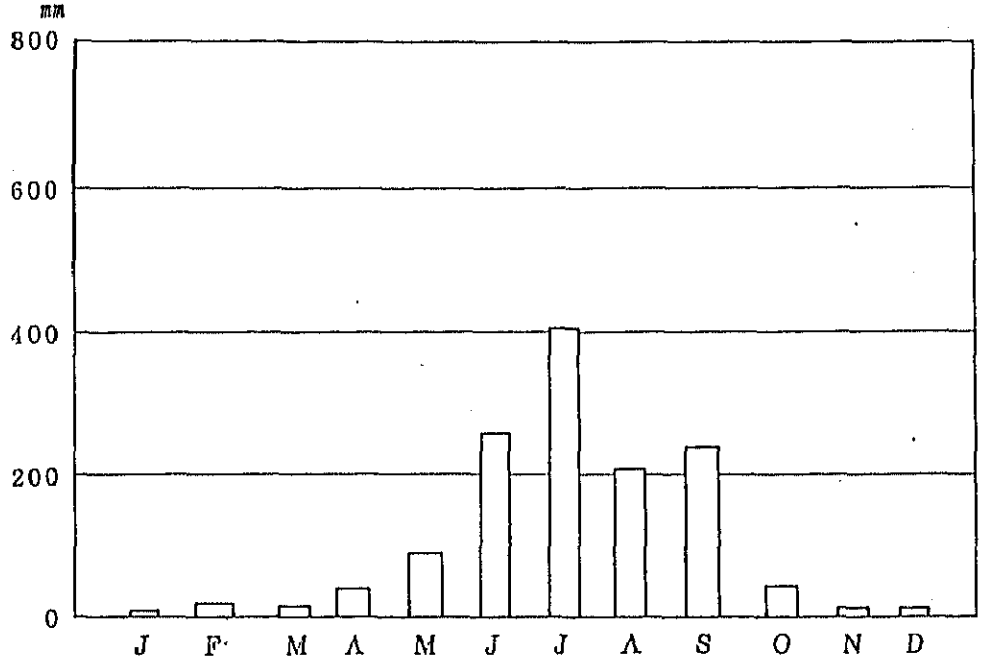
Monthly Mean Temperature and Mean Precipitation (Gaushala／Lahan)



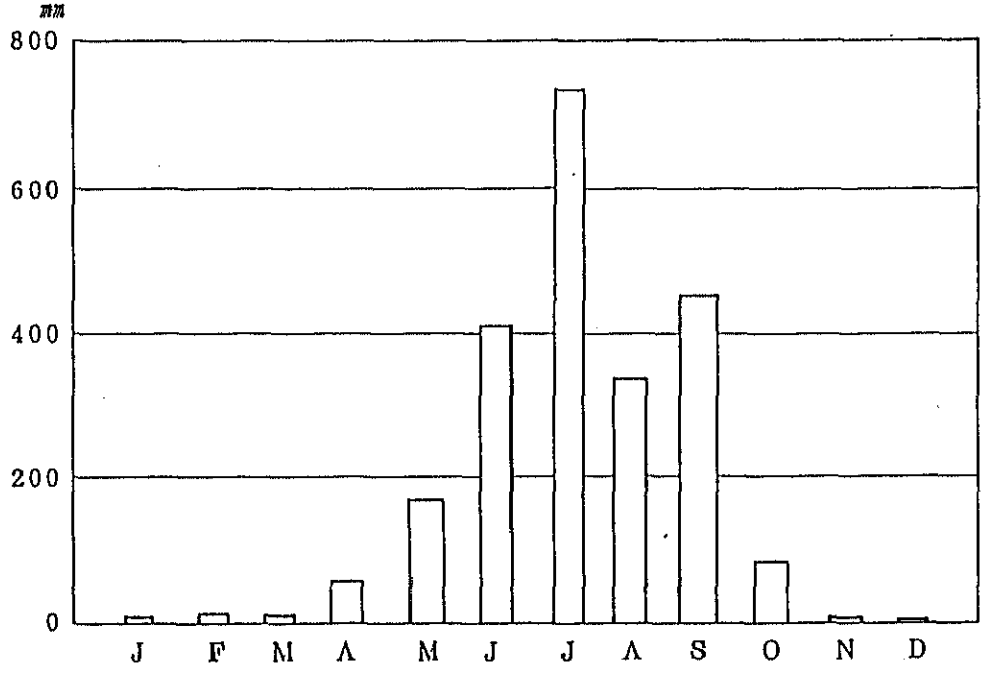


Appendix B－4
Monthly Mean Temperature and Mean Precipitation (Rajbiraj／Chandragadhi)

Rajbiraj (1972,74-84)



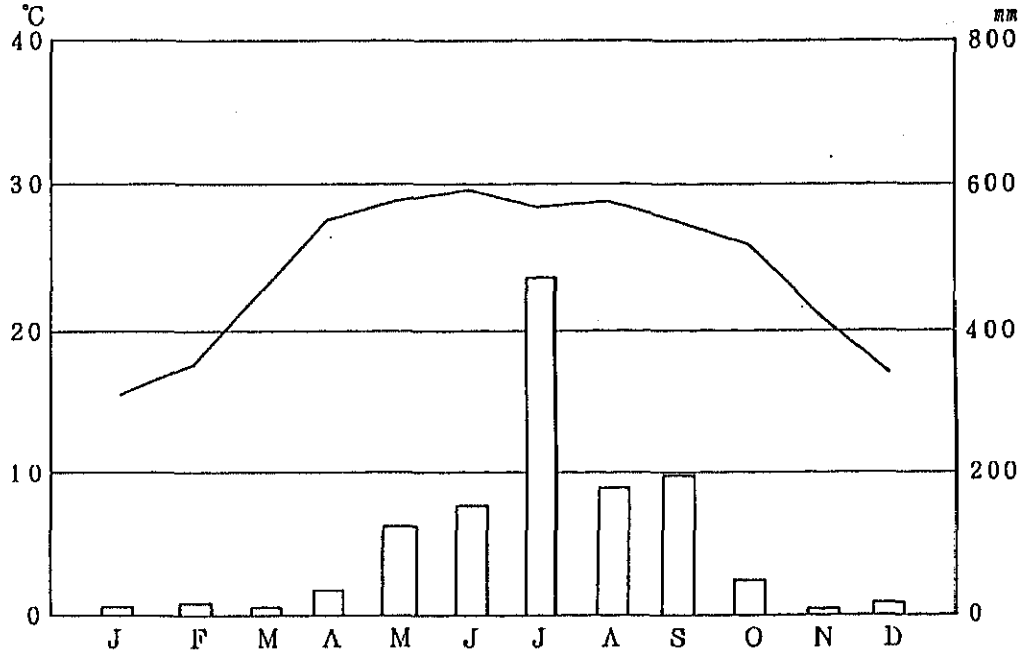
Chandragadhi (1971-76,78-84)



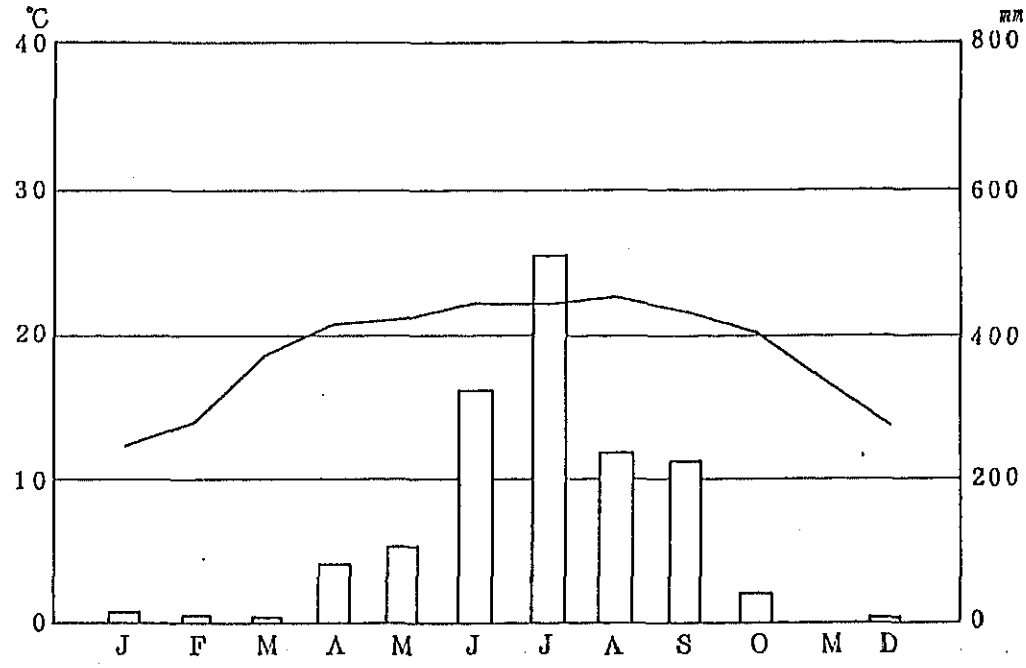
Appendix B－5

Monthly Mean Temperature
and Mean Precipitation （Janakpur（Lahan）／Ilam）

Ilam P:1971-72,74-75,83-84
T:1971-84

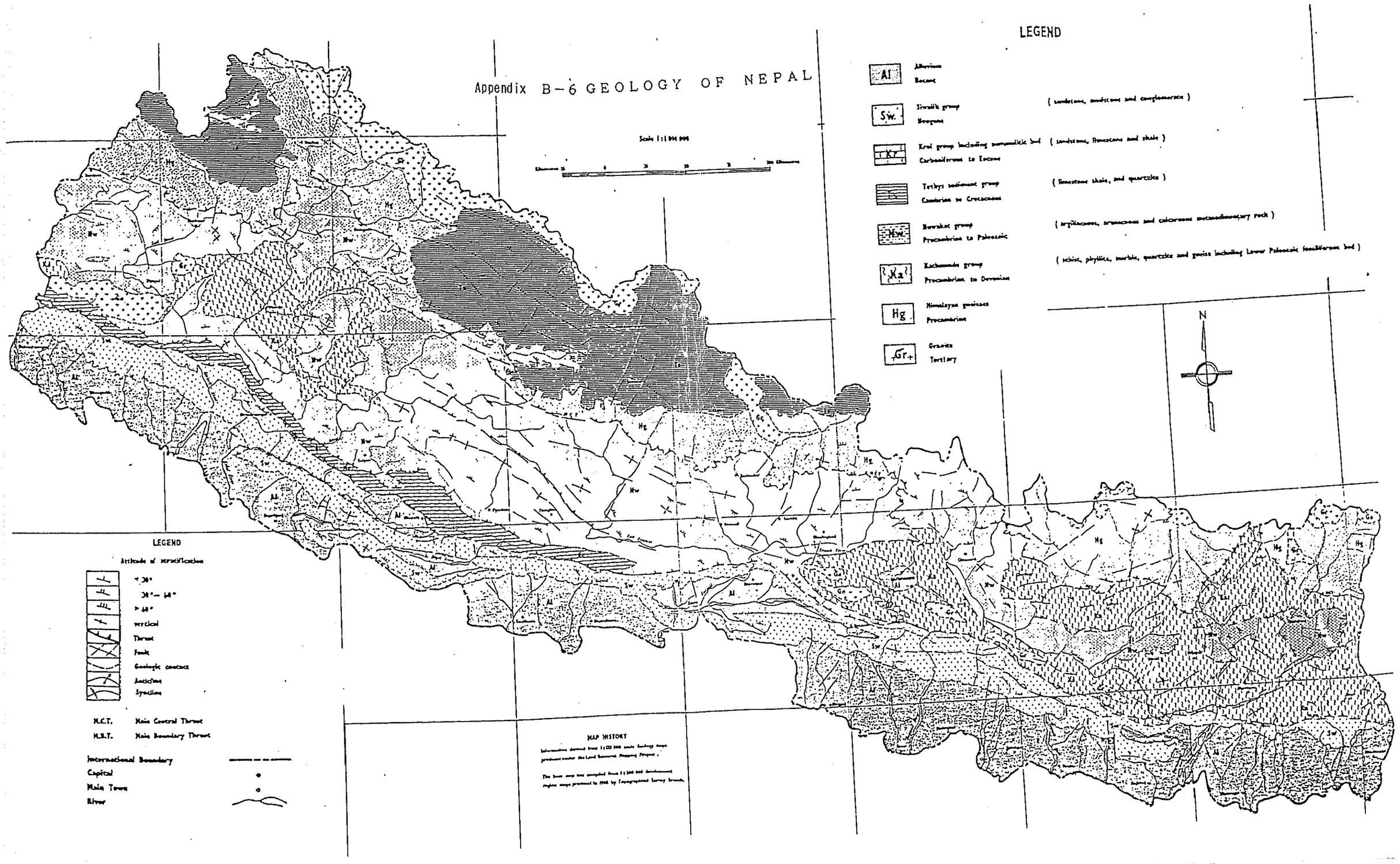


Janakpur P:1979-84
T:1971-80,81-84



B-6 ~ B-9 Geology Condition

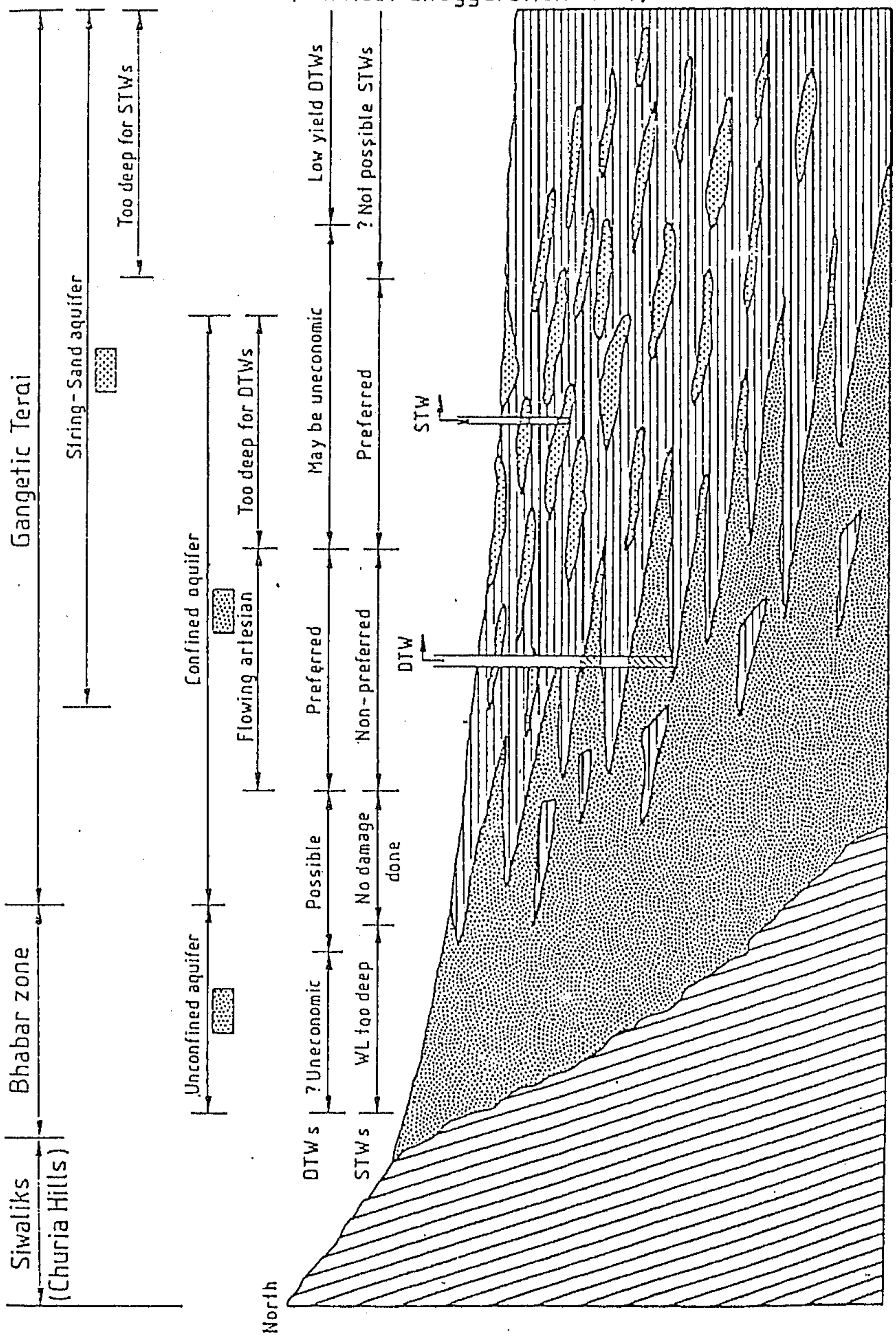
Appendix B-6 GEOLOGY OF NEPAL



Appendix B – 7

Schematic Section Through Terai Aquifers

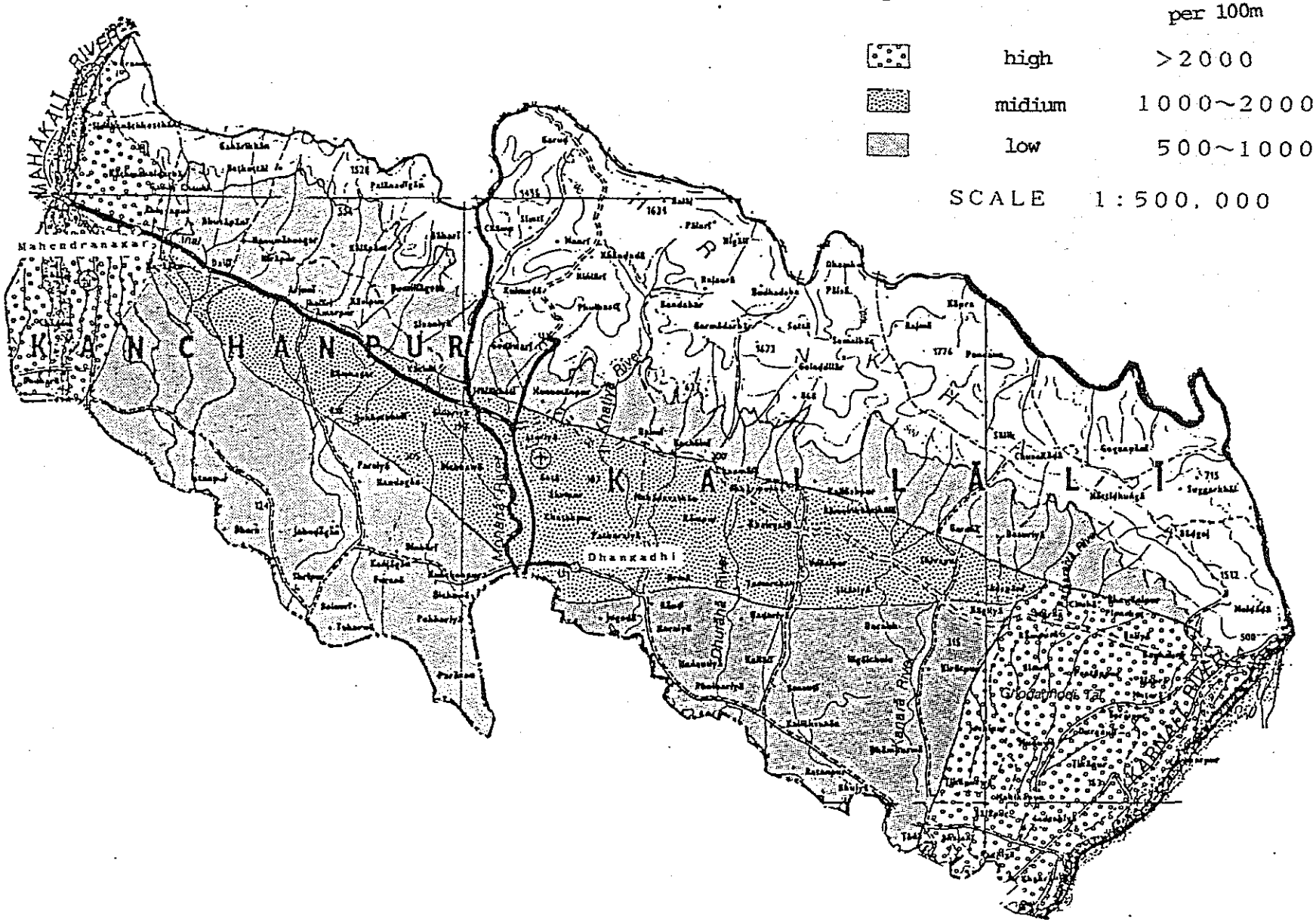
(Vertical exaggeration 20:1)



Appendix B－8

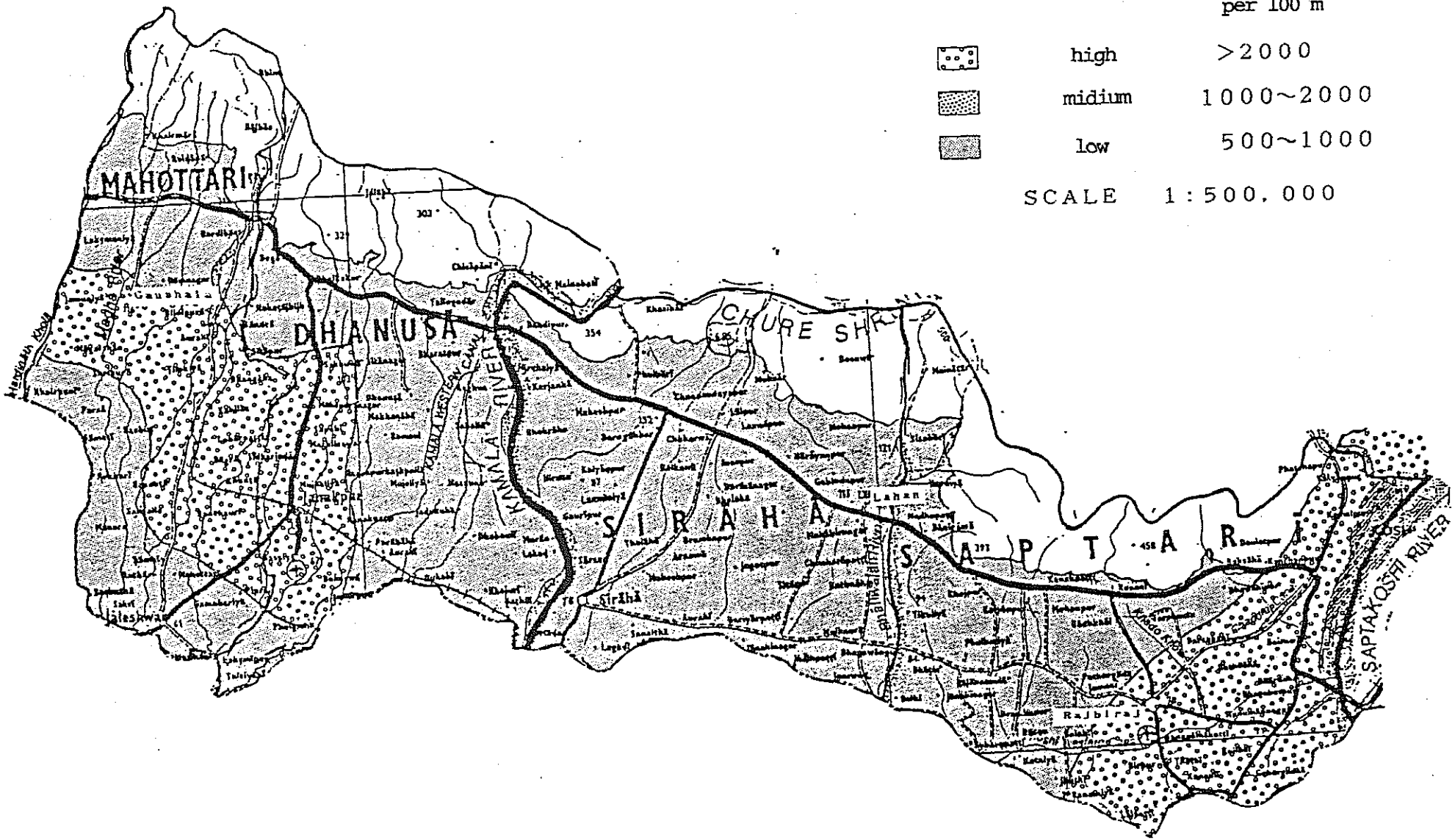
Aquifer Distribution Map (For Deep Well)

KANCHANPUR, KAILALI



Appendix B－9 Aquifer Distribution map (For Deep Well)

MAHOTTARI, DHANUSA, SIRAHA, SAPTARI

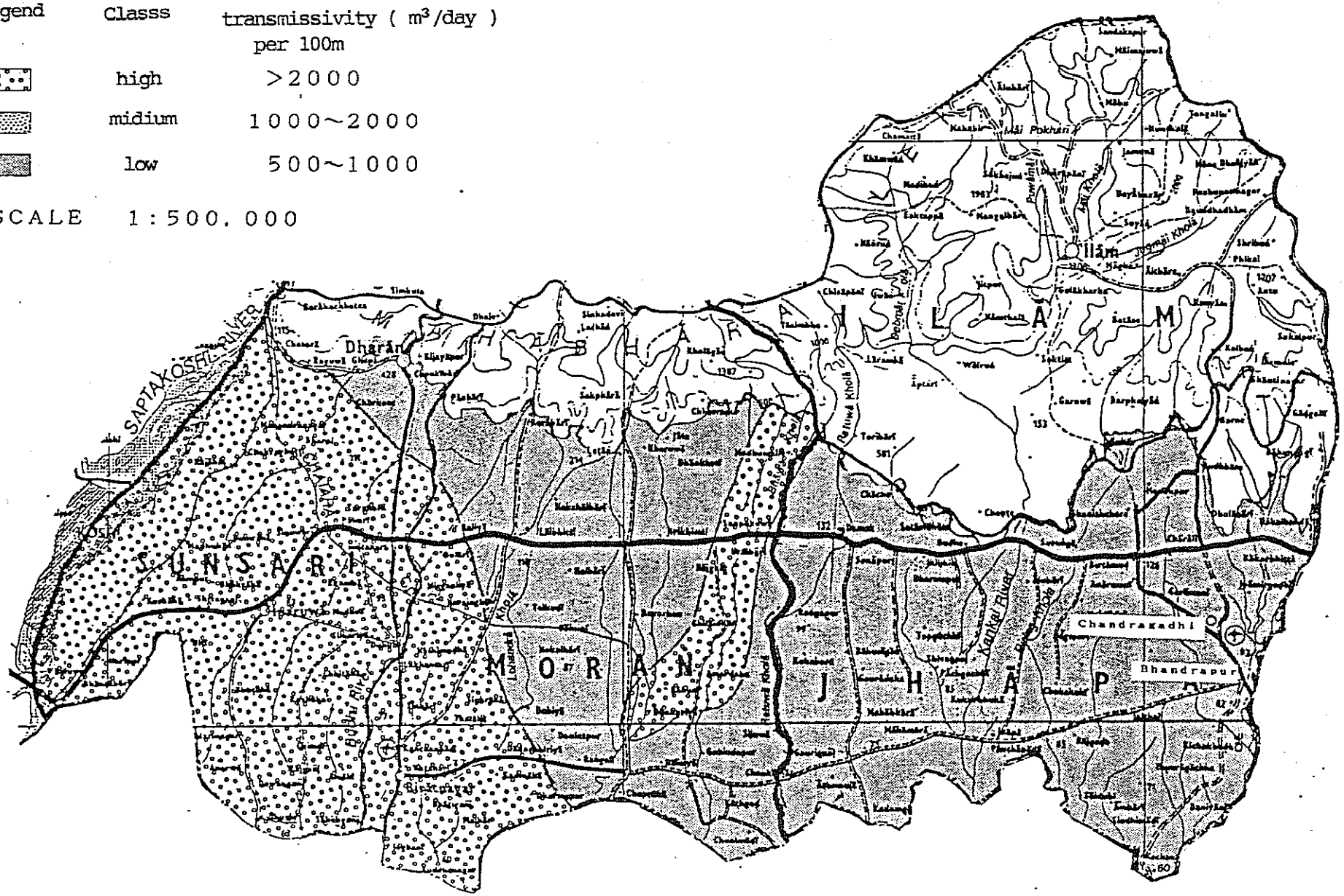


Appendix B－10 Aquifer Distribution Map (For Deep Well)

SUNSARI, MORAN, JHAPA, ILAM

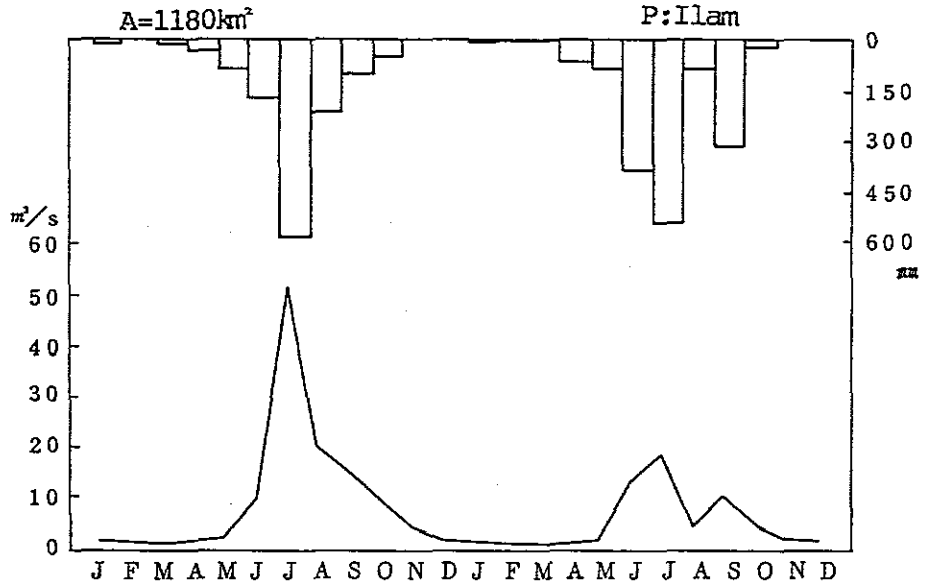
Legend	Classs	Coefficient of transmissivity (m^3/day) per 100m
	high	>2000
	midium	1000～2000
	low	500～1000

SCALE 1:500,000



B-11 Mean Flow Rate of River Near Ilam

Kaikai Mai at Mainachuli (1974-75)



Appendix B-11 Mean Flow Rate of Rivers Near Ilam

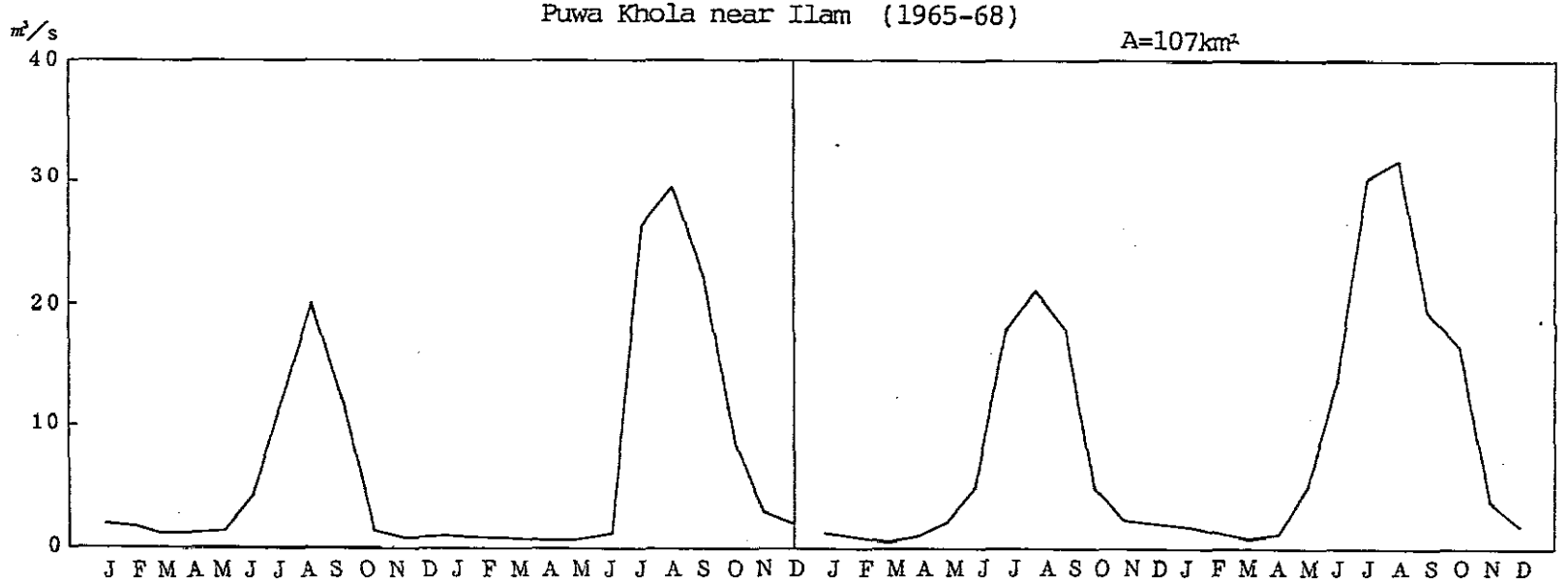
Flow Rate of Kaikai Mainachuli

Observation period	1973 - 1976			
Maximum Flow Rate	5.710 m3/s	water level	5.12 m	7/28/74
Minimum Flow Rate	5.44 m3/s			4/18 - 7/13/74

Flow rate of Puwa Khola

Observation period	1965 - 1968			
Maximum Flow Rate	211 m3/s	water level	4.98 m	10/ 4/68
Minimum Flow Rate	0.13 m3/s			5/ 4/67

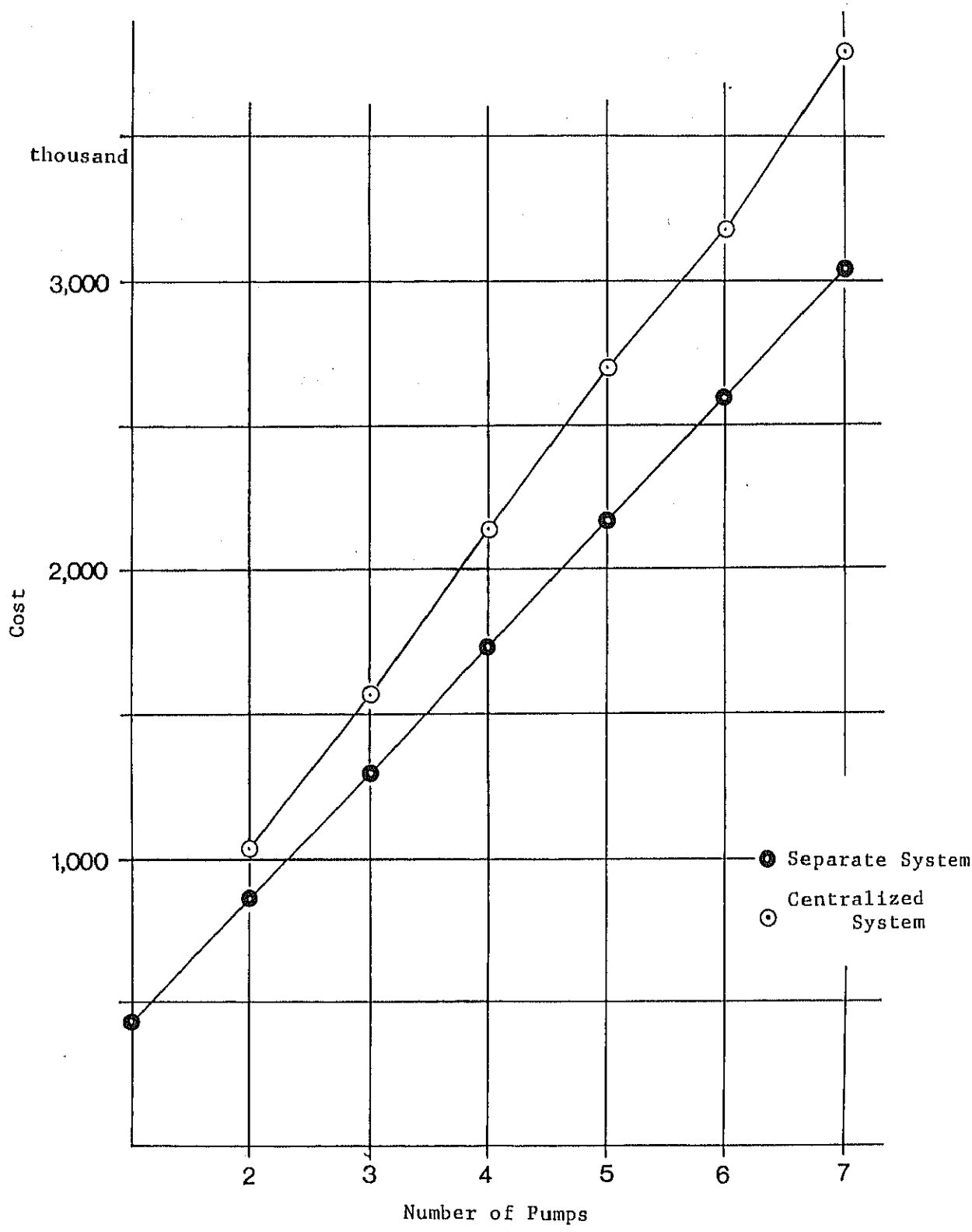
Puwa Khola near Ilam (1965-68)



C-1 Comparison of Diesel Generators System

Appendix-C.1 Comparison of Diesel Generators System

	Separate system	Centralized system
Diessel Generator	To install a number of separate small scale Generators of capacity to meet the necessary pump capacity of each wells, at close proximity to the well concerned.	To install one single generator of large scale with the necessary capacity to meet the pump capacity of all the wells in the project area, at a central location.
Pump and generator house	To build the pump house at each sites of deep wells, along with the generator and its control panel.	To build the pump house at each sites of deep wells along with the control panel, while the control generator house in the DWSS premises with deep well, pumps, generator and divergence panel.
Control panel	To install the control panel in each pump house.	To install a control panel in the generator house. power supply to pumping is through the divergence panel. Pump control panels are to be installed at each pump house in order to control the pumping operation.
Power trans-mission	Power transmission net-work confined to the pump house only.	Power transmission net-. work to be in both pump house and generator house and also the link net-work. Voltage of power supply is to be 440V, hence a transformer is not necessary.



Comparison of Various Power Sources

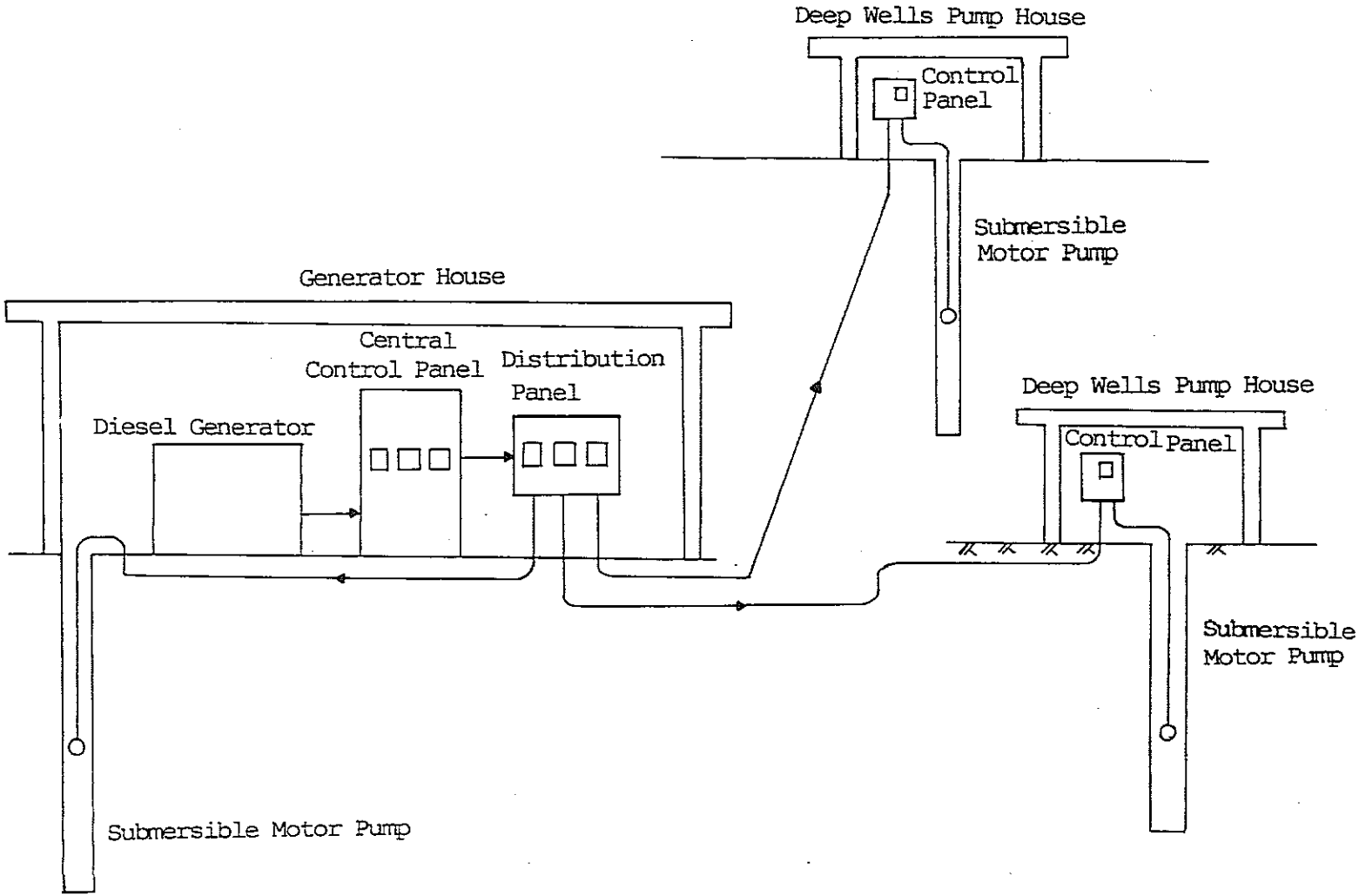


Figure - Schematic Diagram of Centralized System

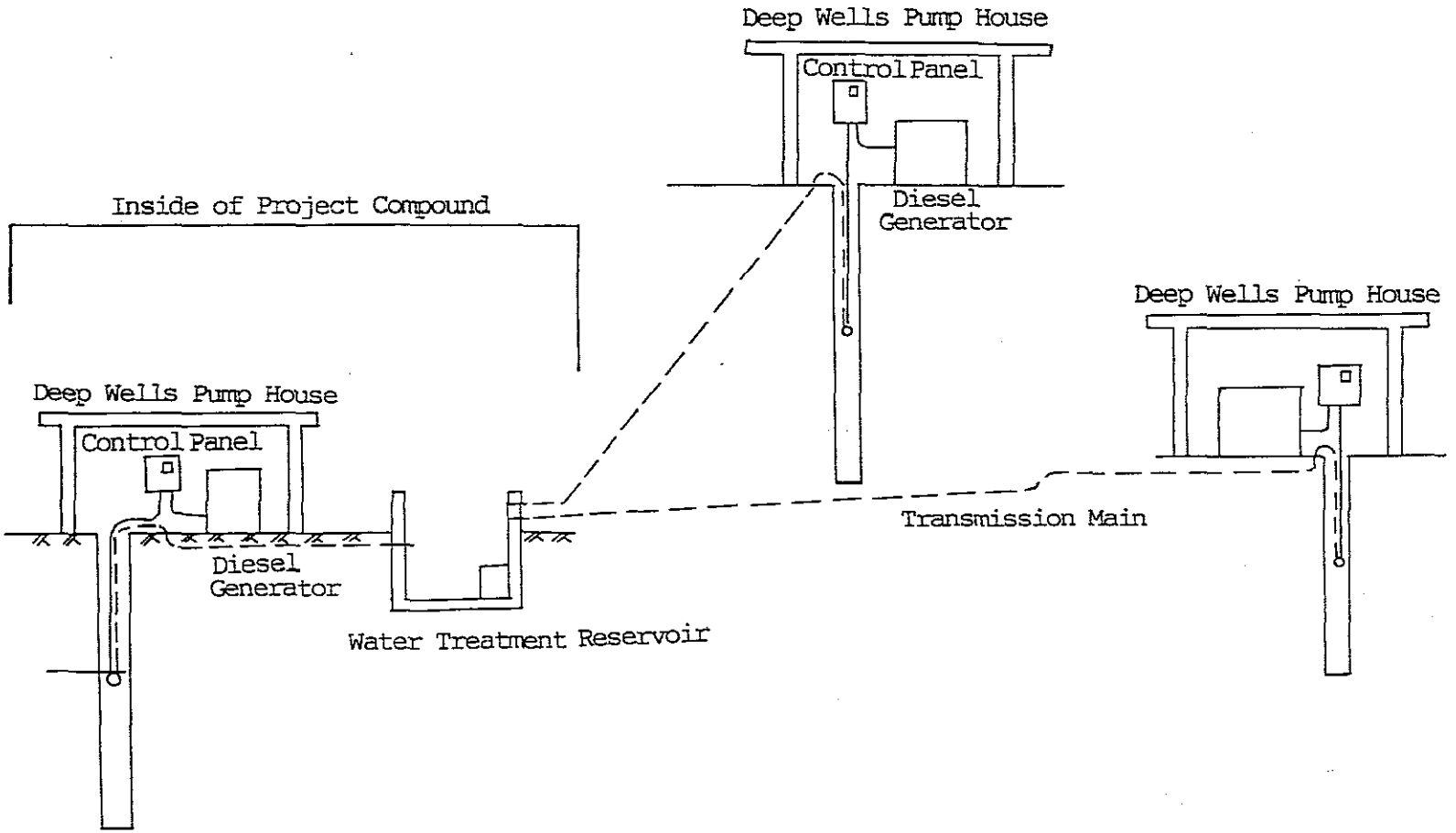


Figure - Schematic Diagram of Separate System

C-2 Comparison of Iron Removal Methods

Appendix-C-2 Comparison of Iron Removal Methods

The following three methods of iron removal are being evaluated for their suitability.

1. Aeration
2. Oxidation by chlorination
3. Oxidation by chlorination with coagulation/flocculation and sedimentation.

In all the above three alternatives basically soluble iron is oxidized to insoluble iron precipitate and is to be removed by rapid filtration. Then the iron removal facility includes filtration as well. An overview on these 3 iron removal alternatives is given below.

1) Aeration

In this method oxygen (O_2) in the air is utilized as the oxidizing agent to oxidize Ferrous ion (Fe^{2+}) to Ferric ion (Fe^{3+}), which is insoluble in water. This method of aeration involves exposing the water (liquid) to the atmosphere in such a manner as to enhance the "gas transfer" with liquid. However the rate of oxidation reaction is rather low, hence a lengthly time of exposure (detention time) or intense gas transfer mechanism is a prerequisite for complete oxidation of Fe^{2+}. The limitations of this aeration method of iron removal are as follows;

(a) In efficient gas transfer would cause unsatisfactory removal of iron.

(b) The oxidation rate of reaction is affected by pH and density of silica in the water.

(c) All types of iron cannot by oxidized, hence some are not removed.

2) Oxidation by chlorination

In this method chlorine (Cl_2) is used, referred to as prechlorination, as the oxidizing agent instead of the O_2 of the aeration method.
Chlorine may be added to the water either in the form of liquid chlorine or other chlorine derivatives such as bleaching powder (chlorinated lime). Use of bleaching powder has the advantage of iron removal being accomplished by precipitation as well as oxidation, due to the availability of the lime component in it.
In addition, due to its other advantages as mentioned before such as disinfection, bleaching powder is recommended. Also in this method direct filtration is used proceeding chlorination without any facilities for coagulation/flocculation and sedimentation, hence it is suitable for only raw water with not very high iron content and turbidity.

3) Oxidation by chlorination with coagulation/flocculation and sedimentation.

This method is the most effective one for the removal of iron and turbidity, especially for high iron content and turbidity.
In this method oxidation, coagulation/flocculation and sedimentation facilities would remove all forms of iron including colloidal one, and the coagulation/flocculation step assists in better floc formation, and the sedimentation step helps in removal of coarse flocs by preventing the overloading to the subsequent filtration step.
The addition of coagulation/flocculation aids such as polyaluminium chloride (PAC), NaOH (for PH adjustment) etc is also required.

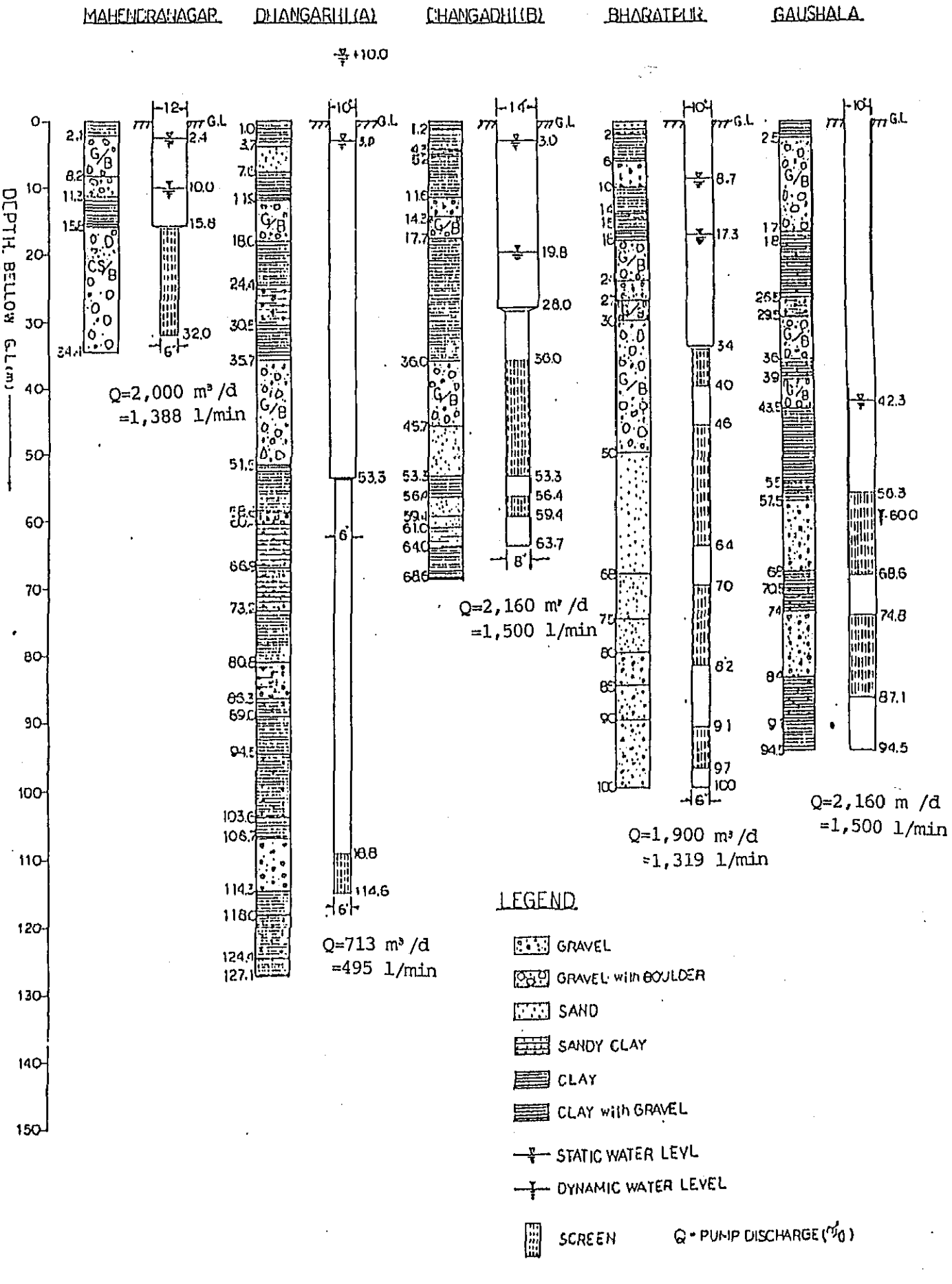
A brief comparison of these iron removal methods is shown as follows;

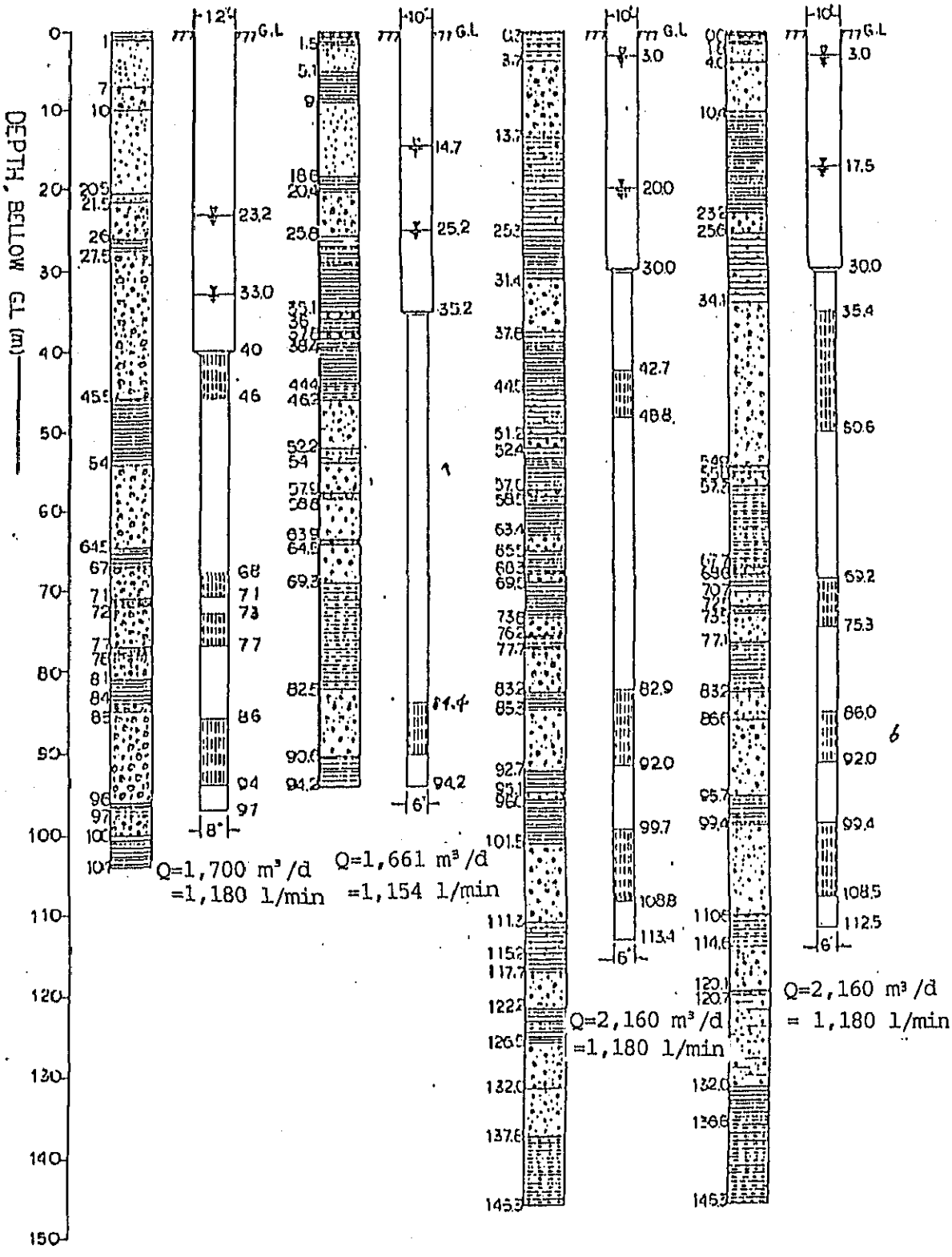
Appendix-C.2 Comparison of Removal Methods on Various Irons

Types of Treatment	Oxidation by Aeration (aeration tank)	Oxidation with Chlorine	Oxidation with Chlorine and Sedimentation	Remarks
[Forms of Various Irons]				
ferrous ions (soluble)	advantage	advantage	advantage	
F (III) (suspended/colloid)	not commonly used	advantage	advantage	
organic irons (colloid) or mineral iron (colloid)	not appropriate	not commonly used	advantage	
Condition of Treatment	more than pH 7 absence of humic matters		pH adjustment required	
Inhibition (allowable concentrations)	silicide (less than 30 mg/l)			
Required Power	1.5 KW (X1) fan	not specific disinfection facility available	1.5 KW (X1) mixer 0.75KW (X2) mixer 0.4 KW (X2) mixer 0.2KW (X2) injection pump	
Required Size	not large	comparatively small	comparatively large	
Chemicals	not required	bleaching powder 20 kg/day	bleaching powder 20 kg/day PAC 90 1/day NaOH (flake) 15 kg/day	available chlorine is 35 %(wt/v) of bleaching powder

D-1 Well Logs of Existing Well

Appendix-D.1 Well Logs of Existing Wells



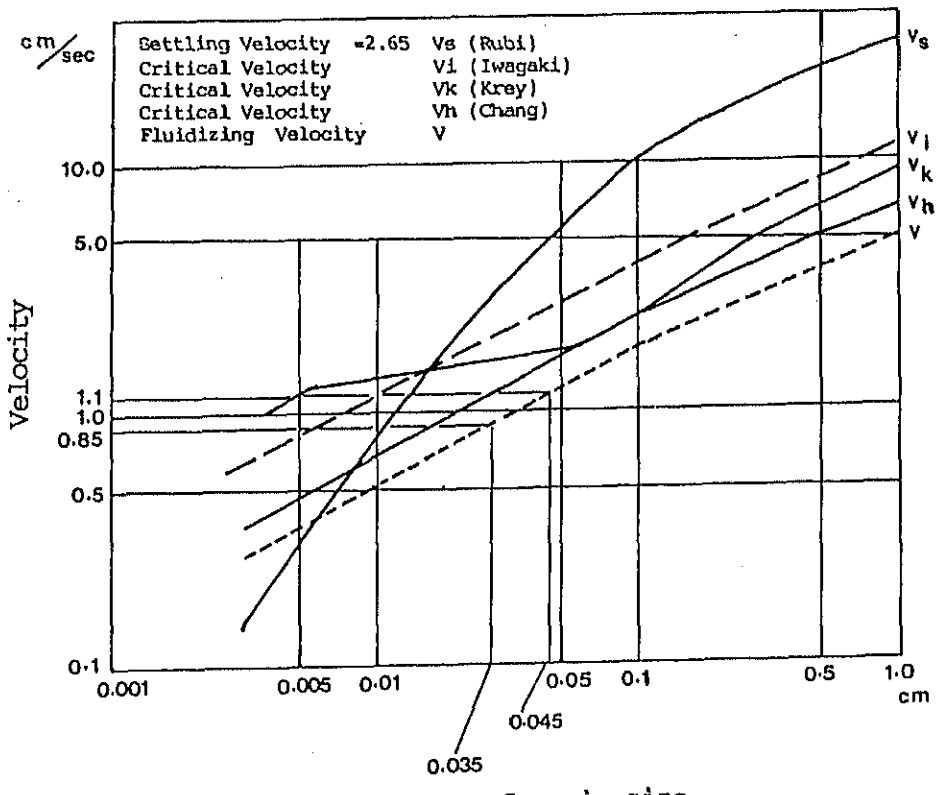

LAHAN
RAJBIRAJ
BHADRAPUR
CHANDRAGADI
DEPTH, BELOW GL (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
12"
8"
10"
6"
G.L
23.2
33.0
40
46
68
71
73
77
86
94
97
14.7
25.2
35.2
94.2
3.0
20.0
30.0
42.7
48.8
82.9
92.0
99.7
108.8
113.4
17.5
30.0
35.4
60.6
69.2
75.3
86.0
92.0
99.4
108.5
112.5
Q=1,700 m³/d
=1,180 l/min
Q=1,661 m³/d
=1,154 l/min
Q=2,160 m³/d
=1,180 l/min
Q=2,160 m³/d
= 1,180 l/min

D-2 Dimension of Existing Well

Appendix-D.2 DIMENSION OF EXISTING DEEP WELLS

SITE	Well Size						static water level (m3)	dynamic water level (m3)	descent water level (m3)	yields of water (m3/day)	specific yields (m3/day/m)	constant
	diameter (mm)	depth (m)	diameter (mm)	depth (m)	total depth (m)	length of strainer						
Mahendranagar	300	15.8	150	16.2	32.0	16.2	2.4	10.0	7.6	2000	263.2	16.24
Dhangadhi	250	53.3	150	61.3	114.6	20.3	10.0	2.8	12.8	713	55.7	9.60
Bharatpur	250	34.0	150	66	100.0	42.0	8.7	17.3	8.6	2125	220.9	5.26
Gaushala	250	-	-	-	94.5	24.6	42.3	60.0	17.7	2160	122.0	4.96
Lahan	300	40.0	150	57	97.0	21.0	23.2	33.0	9.8	1700	173.5	8.26
Rajbiraj	300	35.2	200	59	94.2	9.8	14.7	25.2	10.5	1661	137.6	
Bhadrapur	250	30.0	150	83.4	113.4	24.3	3.0	20.0	17.0	2160	127.1	
Chandragadhi	250	30.0	150	82.5	112.5	36.4	3.0	17.5	14.5	1700	117.2	3.22

D-3 Critical Velocity of Grain Size



Diameter of grain size

Appendix-D.3

Figure - Critical Velocity of Grain Size

D-4 Comparison of Pipes

Appendix D-4

Comparision of Pipes;
-Technical comparision between Ductile iron and Steel pipes-
basic conditions : Water pressure - 2kg/cm2 , Earth covering 1 m

Result : From engineering point of view, Ductile iron pipe is more advantageous than steel pipe.

		Ductile Iron Pipes		Steel Pipes	
Specification		JIS-G-5526/5527		JIS-G-3443 STW 30 coupling/welding	
Coating		Exterior : coal tar epoxy Interior : cement mortar		Exterior : asphalt vinilon cloth Interior : tar epoxy	(Rank)
Characteristics	pipe strength	tensile strength : more than 42 kg/mm2 bending strength : more than 60 kg/mm2	A	tensile strength : more than 41 kg/mm2 bending strength : more than 41 kg/mm2	A A
	compressive strength	high resistance	A	earth covering is necessary	B
	tensil strength	high resistance	A	high resistance	A
	waterproof in joint	i)T form joint : high watertightness ii)A form joint : high watertightness	A A	i)proper welding is necessary ii)coupling is required	B A
	flexibility	high flexibility	A	i)an expansion flexible pipe shall be used ii)if coupling is used flexible pipe is not necessary	B A
	joint works	i)T form joint : easy working and not affected by the climate ii)A form joint : easy working	A A	i)skilled person is required , work depends on climate ii)coupling is easy	C A
	earth covering	excavated earth can be used	A	sand bed is necessary	B
	corrosion resistance	mortar lining	A	interior coating is difficult for small size pipe	C
	ease of handling	high resistance for impact load interior lining should not be harmed	B	not to harm the exterior coating, packing is required	C
	storage	no problem	A	rust arrises when interior is hurt	B

Note JIS : Japanese Industrial Standard

E-1 Running Cost of Pumps

Appendix E-1

Running Cost of Pumps

1. Existing Submersible Pump : 15 KW
2. Pumps : New Pumps Only
3. Gaushala Area : Assures Electricity is Available

	Load			Condition	Running Cost of Generator	Running Cost of Electric Power
	Submersible Pumps KW	Pumps KW	Total KW	Operation Hour per Day hr/day	Yen/Month	Yen/Month
MAHENDRANAGAR	18.5×2 T 37 KW	11 ×2 T 22 KW	59	12	Yen/hr hr day 652 ×12 ×30 = 234,720 (50KVA×1, 22KVA×2)	Yen/hr hr day 253.7 ×12 ×30 +19,293=110,625
DHANGADHI	22 ×1 T 22 KW	11 ×2 T 22 KW	44	13	486 ×13 ×30 = 182,520 (50KVA×1, 33KVA×1)	189.2 ×13 ×30 +14,388= 88,176
BHARATPUR	22 ×4 T 88KW	22 ×2 T 44 KW	132	21	1,553 ×21 ×30 = 978,390 (100KVA×1, 33KVA×4)	567.6 ×21 ×30 +43,164=400,752
GAUSHALA	37 ×1 T 37 KW	5.5×2 T 11 KW	48	14	880 ×14 ×30 = 369,600 (70KVA×1, 33KVA×1)	206.4 ×14 ×30 +15,696=102,384
LAHAN	22 ×3 T 66 KW	15 ×2 T 30 KW	96	13	908 ×13 ×30 = 354,120 (50KVA×1, 33KVA×3)	412.8 ×13 ×30 +31,392=192,384
RAJBIRAJ	22 ×4 T 88 KW	18.5×2 T 37 KW	125	16	1,320 ×16 ×30 = 633,600 (70KVA×1, 33KVA×4)	537.5 ×16 ×30 +38,259=296,259
BHADRAPUR & CHANDRAGADHI	30 ×3 T 90 KW	11 ×4 T 41 KW	131	16	908 ×16 ×30 = 435,840 (50KVA×2, 33KVA×3)	563.3 ×16 ×30 +42,837=313,221
ILAM	–	–	–	–	–	–
SUMMARY					3,008,790 Yen/Month	1,503,801 Yen/month

(1) Diesel Generator

Exchange Rate Yen 5.73/1NRp

Standard	Power	Hourly Consumption Rate of Oil ℓ/hr	Unit Cost of Light Oil yen/ℓ	Hourly Consumption Rate of Light Oil yen/hr	Hourly Consumption Rate of Oil (Light Oil Cost X 10%) yen/hr	Total Operation Cost per Hour yen/hr
22KVA	40ps	3.7ℓ/hr	50	184	184×0.1=18	202
33KVA	43PS	4.0ℓ/hr	50	200	200×0.1=20	220
50KVA	49PS	4.5ℓ/hr	50	225	225×0.1=23	248
70KVA	87PS	8.0ℓ/hr	50	400	400×0.1=40	440
100KVA	133PS	12.2ℓ/hr	50	612	612×0.1=61	673

(2) Electric Charge

Note : Electric Charge of 440 V for the Drinking Water Division is applied.

	Unit Rate of Charge per KW Y/KW	Hourly Charge yen/hr	Base Charge per Month Yen/Month	Base Charge per Year Yen/Year	Remarks
1KW	(0.75×5.73) 4.3	4.3	(57×5.73) 327	327×12=3,924	

F－1　Minutes of Discussions

Appendix F-1

MINUTES OF DISCUSSIONS
ON
THE DRAFT REPORT OF THE BASIC DESIGN STUDY
ON
THE PROJECT FOR THE WATER SUPPLIES TO URBAN AND SEMI-URBAN CENTRE
IN
THE KINGDOM OF NEPAL

At the request of His Majesty's Government of Nepal for Grant Aid on the Project for the water supplies to Urban and Semi-Urban centers (herein-after 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 the Basic Design Study Team headed by Mr. Shigeru Hataya. Keiyo-South Construction Office. Water Works Bureau, Chiba Prefectural Government to Nepal from March 20 to May 19, 1988.

As the result of the survey and discussion, JICA prepared a Draft Final Report on the study and dispatched a Mission headed by Mr. H. Suzuki, JICA to explain and discuss the Report from August 21 to August 29, 1988.

Both parties had a series of discussions on the Report and have 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 September 9, 1988

S. N. SHARMA
Director General
Dept. of Water Supply and Sewerage (DWSS)

HIDEO ONO
Resident Representative
On behalf of The Basic Design Study Team
Japan International Cooperation Agency (JICA)

ATTACHMENT

1. The Nepal side principally has agreed to the basic design proposed in the Draft Final Report (with minor but appropriate alterations in design, facilities and equipment, mutually agreed upon to be incorporated in the Final Report).

2. The Final Report (10 copies in English) on the Project will be submitted to the Nepal side by the end of October, 1988.

3. The Nepal side understood the system of Japan's Grant Aid Programme and confirmed the arrangements to be taken by His Majesty's Government of Nepal for the realization of the Project as agreed upon in the "Minutes of Discussions" dated April 1, 1988.

4. His Majesty's Government of Nepal will release the necessary budget at the proper time in conjunction with the construction works to be taken by the Japanese side.

5. DWSS side stated that counterpart training opportunities should be provided in the course of implementation of the Project. JICA Team explained that the HMG Nepal may be able to send Project counterpart(s) under JICA's training programme (technical cooperation) since inclusion of training in the Exchange of Notes or in the commercial contract will not be acceptable.

F－2　Minutes of Meetings

Appendix F-2

Minutes of Meetings

Kathmandu
29 Aug. 1988

1. Dates/Time/Place of Meetings.

- 23 Aug '88 12.30 - 14.00 at DWSS
- 25 Aug '88 10.30 - 18.30 -do-
- 26 Aug '88 12.00 - 14.00 -do-

2. Discussions

1) General items

(1) DWSS side explained that no serious damage has been reported so far due to Sunday (21 August) earthquake to any of existing Water Supply Schemes in proposed areas except a crack observed on the elevated tank in Rajbiraj.

(2) DWSS side stated that signing of the proposed Minutes of Discussion by the time of Team's departure will be difficult. Since the Minutes will be the last document that DWSS signs before receiving, by HMG Nepal, of Japanese draft of Exchange of Notes, DWSS needs to get a prior consent of Ministry's higher authorities. Team expressed its sincere hope to expedite the procedure.

(3) DWSS side stated that counterpart training opportunities should be provided in the course of implementation of the Project. Team explained that the HMG Nepal may be able to send Project's counterpart(s) under JICA's training program (technical cooperation) since inclusion of training in the Exchange of Notes or in the commercial contract will not be acceptable.

2) Basic design report

(1) Team explained, first of all , that unexpected volume of work delayed the completion of the draft final report. This is due to the fact that distribution of the present and the future water demands are not precisely analysed in the previous feasibility report. In addition, maps produced by the same report are kinds of sketch map only good for provision of general feature of the town water supply. In order to formulate the basic designs, preparation of precise town maps was to be made by interpreting air photos and some other maps.

(7) The contents of the Basic Design Report are satisfactory and acceptable. However, DWSS emphasized following technical aspects of the project and the team agreed to include these items in the final report.

- In the future, the power source of the water supply facilities has to be obtained from the national grid of which power line extension is under progress. For this purpose, cost estimates for extension of the power branch lines are to be included in the Basic Design Report.

- Since existing pumps have been in operation for more than 10 years, all these pumps require replacement.

- The capacity of one borehole is sufficient for the water demand at Gaushala, however one additional borehole has to be drilled for smooth operation and maintenance purpose.

- An office building and attendants quarter are required at Gaushala.

- Each pump house and new facilities to be constructed require fence for security purpose.

- The appropriate tools for operation and maintenance such as the following are necessary;

  * Compressor ..... 2 units
  * Crane truck ..... 2 units
  * Chain block ..... 8 units
  * Concrete mixer ..... 4 units
  * Electric welder .... 3 units

3) Grant Aid Program

(1) Team explained the main features of Japan's Grant Aid System including single year budgeting, contracts with Japanese firms and verification by the Japanese Government, as well as the recipient government's obligation.

In this regard team also mentioned that the project cost which has so far been estimated could neither be committed nor disbursed within a year. It is therefore probable that E/N will be signed every year for 3 to 4 years until the whole project areas could be covered. DWSS understood that the work shall be done by stages.

(2) Team explained that the next event is the consultation between the Foreign Affairs and Finance Ministries in Japan with regard to the justification of the project and the amount of capital grant for the Project.

This will be followed by sending, by Japan's Foreign Affairs Ministry, of E/N draft to HMG Nepal.

(Above minutes are drafted by JICA Team)

3. Participants.

These meetings were attended by:

DWSS side		Team	
Mr. S. M. Sharma	.....	Mr. H. Suzuki	.....
Mr. M. M. Joshi	.....	Mr. E. Ueno	.....
Mr. R. Dutta	.....	Mr. A. Togo	.....
Mr. P. N. Nepal	.....	Mr. M. Sugimoto	
Mr. Tashi Tenzing	.....	(JICA Nepal Office)